Final Mitigation Plan
Apple Valley Project

DMS Project #: 100063 | Contract #: 7531 | USACE Action ID: SAW- 2018-01150
DWR Project #: 20181028 | RFP: 16-007334

November 2019

French Broad River Basin | HUC 06010105 | Henderson County, North Carolina

Prepared By:
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For Environmental Banc & Exchange, LLC
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Prepared For:
NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

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 NCDMS operations and procedures for the delivery of compensatory mitigation.

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

REPLY TO
ATTENTION OF:

October 15, 2019

Regulatory Division

Re: NCIRT Review and USACE Approval of the NCDMS Apple Valley Mitigation Site / Henderson County / SAW-2018-01150; NCDMS Project # 100063

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 Apple Valley Draft Mitigation Plan, which closed on September 1, 2019. 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
Paul Wiesner, Harry Tsomides– NCDMS
Bradley Breslow—RES

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

REPLY TO
ATTENTION OF:

CESAW-RG/Browning September 30, 2019

MEMORANDUM FOR RECORD

SUBJECT: Apple Valley 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: Apple Valley Site, Henderson County, NC

USACE AID#: SAW-2018-01150

NCDMS #: 100063

30-Day Comment Deadline: September 1, 2019

DWR Comments, Mac Haupt and Erin Davis:

1. Page 15, Section 4.1 Geomorphology – "… constructing a channel that maintains stable dimension, plan, and profile." Please update "plan" to "pattern" or "planform".
2. Page 16, Section 4.2 – A mix of Priority 1 and 2 restoration is noted for the upper end of the project; however, Priority 2 restoration is not mentioned in Section 6.2 or 6.4. If Priority 2 restoration is proposed, please specify the approximate length of reach. Please note that soil amendments may be needed in Priority 2 area(s) to support the establishment of groundcover and woody stems.
3. Page 25, Section 6.3 –
    a. Completion of construction by the end of May means potentially planting in June, which would put the 180-day vegetative monitoring in December. Page 30 identifies the end of the growing season as November 8th. Planting beyond the IRT 2016 guidance date of March 15th is not recommended, particularly for installation of (dormant) live stakes, and may result in an extended monitoring period being required.
    b. Please confirm that a single target community is being proposed for the entire Project Site (stream side, wetland, and upland areas). If multiple planting zones are proposed, please show zones on a figure/design sheet and reference in the planting table.
4. Page 26, Table 14 – DWR requests capping the proposed percentage of green ash (*Fraxinus pennsylvanica*) to be planted at 5% since emerald ash borer (*Agrilus planipennis*) has been confirmed in Henderson county and has the potential to impact long-term tree density and canopy cover.
5. Page 27, Section 6.4 – Please update Bottomland Hardwood Forest to Montane Alluvial Forest (referenced in Section 6.3 as the project target community).
6. Page 28, Table 15 – Should ditch filling be included in the comments for Wetland W3 supporting restored hydrology?

7. Page 30, Section 7.1 – DWR prefers the use of pressure tranducer gauges over crest gauges in order to more accurately track the frequency and duration of overbank events.
8. Page 32, Section 8 – Figure 10 includes locations of proposed "groundwater" gauges, not flow gauges.
9. Page 33, Section 8.7 – Note that construction completion for the record drawings and baseline report also means installation of all fencing and signage, in addition to planting completion.
10. Page 34, Table 16 – Since the project reach is classified as perennial, the 30-day flow performance standard should be removed.
11. Page 34, Table 16 – DWR would prefer quarterly data collection and inspection of crest gauges and pressure tranducers to reduce the risk of data loss due to instrument malfunction.
12. Figure 10 – DWR requests the installation of three (3) additional groundwater gauge, or relocation of either gauge AW2 or AW3 and installation of two (2) additional gauges. Recommended locations of new gauges are (1) in the wetland re-establishment area between the relic stream channel and proposed channel near Station 4+50, (2) in the wetland re-establishment area close to the western easement boundary between Stations 6+00 and 7+50, and (3) in the wetland re-establishment area close to the western easement boundary and veg plot between Stations 10+00 and 11+00.
13. Sheet 1 – Please explain why no toe protection is proposed along the outer meanders near Stations 0+50 and Station 1+00 and why the benches are so narrow. The bench widths do not appear adequate and DWR is concerned about the long-term stability of this stream segment.
14. Sheet S2 – The two western ditches identified on Figure 8 have been included as part of the existing stream channel on the design sheets. Will this affect calculating/reporting stream impacts?
15. Sheet S3 – Please confirm whether the ditch/swale section from the easement boundary to the stream culvert crossing will be filled (as shown on Figure 8). If not, DWR recommends a ditch plug be installed at the easement boundary.
16. Sheet P1 – Please confirm that the Since *Juncus effusus* has a seed bank onsite, was an alternative species considered for the site seed mix?
17. Sheet D2 –
    a. In channel or ditch sections to be backfilled below top of bank, please consider planting obligate species if there is a likelihood of standing water during the growing season.
    b. Sheet D2 – DWR would like to see a minimum channel plug length of 50 feet rather than 30 feet.
18. Sheet D3 –
    a. DWR generally prefers the use of brush toe over the single log toe protection treatment.
    b. Sheet D3 – The brush toe note #3 refers to silky willow, which should be updated to tag alder or also included in the plant list.
    c. Sheet D3 – Sod mats are identified as a potential bank stabilization treatment. Please include a detail for this treatment in Appendix A or add treatment information to applicable existing detail(s).
19. Sheet F1 – Please include sufficient gate points along the existing/proposed fence line for the site to be accessed by regulatory and stewardship staff.
20. Appendix F – Please confirm that the landowner will be responsible for fence maintenance during the seven-year monitoring period.
21. General comment – "Reaches" plural is used multiple times throughout the plan. Please update to reflect the single project reach.

USACE Comments, Kim Browning:

1. 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.
2. Please depict photo points/digital image stations on Figures 10. If the fixed cross-section locations are to be used, please describe that in the text in section 7.1.
3. Please discuss how fescue will be treated in conjunction with buffer establishment.

4. Credit Release: NCDMS has recently requested that all previously mentioned As-Built reports will now be referred to as Record Drawing. Please verify this with DMS and correct as advised.
5. Based on the summary in the detailed hydric soils study, the site appears to be mostly Toxaway soils and should have a hydroperiod of 12%, as stated in section7.2. There is some concern over meeting hydrology around the area of stream proposed for Priority 2 restoration.
6. Section 7.3: please add “260 trees “ to year five.
7. Table 16: Hydraulic performance of 30 days continuous flow should be removed considering this is a perennial stream and that standard is only applicable to intermittent streams.
8. Please specify on the design sheets which section of stream is planned for P2. Also please depict where the ditch plug will occur, and how much. It’s recommended that at least 50 feet be plugged with high content clay soils.

Kim Browning
Mitigation Project Manager
Regulatory Division

M E M O R A N D U M

302 Jefferson Street, Suite 110 Raleigh, North Carolina 27605 919.209.1062 tel.
919.829.9913 fax

TO: NCIRT and NCDMS

FROM: Brad Breslow - RES

DATE: November 22, 2019

RE: Response to Apple Valley Final Draft Mitigation Plan Comments DMS Project ID No. 100063, Contract #7531

Mac Haupt & Erin Davis, DWR:

1. Page 15, Section 4.1 Geomorphology – "… constructing a channel that maintains stable dimension, plan, and profile." Please update "plan" to "pattern" or "planform".
   "Plan" has been updated to "planform," per the comment.

2. Page 16, Section 4.2 – A mix of Priority 1 and 2 restoration is noted for the upper end of the project; however, Priority 2 restoration is not mentioned in Section 6.2 or 6.4. If Priority 2 restoration is proposed, please specify the approximate length of reach. Please note that soil amendments may be needed in Priority 2 area(s) to support the establishment of groundcover and woody stems.
   Floodplain benching is not required on this project. References to P2 restoration have been removed from the document to avoid confusion. Floodplain grading at the transition from the existing alignment at the top of the project is slightly steeper than the majority of the project, due to spatial constraints there, but entrenchment ratios remain well above 2.2.

3. Page 25, Section 6.3 –
   a. Completion of construction by the end of May means potentially planting in June, which would put the 180-day vegetative monitoring in December. Page 30 identifies the end of the growing season as November 8th. Planting beyond the IRT 2016 guidance date of March 15th is not recommended, particularly for installation of (dormant) live stakes, and may result in an extended monitoring period being required.
      Currently the completion of construction is estimated by the end of summer 2020 and planting will occur between November and March. Planting will not occur beyond the recommended date of March 15th.

   b. Please confirm that a single target community is being proposed for the entire Project Site (stream side, wetland, and upland areas). If multiple planting zones are proposed, please show zones on a figure/design sheet and reference in the planting table.
      There is a single target community throughout the proposed Project easement.

4. Page 26, Table 14 – DWR requests capping the proposed percentage of green ash (*Fraxinus pennsylvanica*) to be planted at 5% since emerald ash borer (*Agrilus planipennis*) has been confirmed in Henderson county and has the potential to impact long-term tree density and canopy cover.
   Green ash has been removed from the species list, and northern red oak has been added at 15% of the total species composition.

5. Page 27, Section 6.4 – Please update Bottomland Hardwood Forest to Montane Alluvial Forest (referenced in Section 6.3 as the project target community).
   In Section 6.4, the reference to Bottomland Hardwood Forest has been corrected to Montane Alluvial Forest per the comment.

6. Page 28, Table 15 – Should ditch filling be included in the comments for Wetland W3 supporting restored hydrology?
   Ditch filling has been added to the comments for W3 in Table 15.

7. Page 30, Section 7.1 – DWR prefers the use of pressure transducer gauges over crest gauges in order to more accurately track the frequency and duration of overbank events.
   Language has been updated to "flow monitoring gauge" instead of "crest gauges." Overbank events will be captured with a pressure transducer style monitoring gauge.

8. Page 32, Section 8 – Figure 10 includes locations of proposed "groundwater" gauges, not flow gauges.
   Figure 10 has been updated to include the locations of both groundwater gauges and the flow monitoring gauge per the comment.

9. Page 33, Section 8.7 – Note that construction completion for the record drawings and baseline report also means installation of all fencing and signage, in addition to planting completion.
   Language has been added to Section 8.7 to clarify that the record drawings and baseline report will include "…a description of the fencing," and a "description of the signage," in addition to the description of the initial species composition.

10. Page 34, Table 16 – Since the project reach is classified as perennial, the 30-day flow performance standard should be removed.
    The 30-day flow performance standard was removed from Table 16 per the comment.

11. Page 34, Table 16 – DWR would prefer quarterly data collection and inspection of crest gauges and pressure transducers to reduce the risk of data loss due to instrument malfunction.
    Language has been updated from "Semiannually" to "quarterly" to match Section 8.3. Similarly, "Crest gauges and/or pressure transducers" has been changed to "pressure transducer flow monitoring gauge."

12. Figure 10 – DWR requests the installation of three (3) additional groundwater gauge, or relocation of either gauge AW2 or AW3 and installation of two (2) additional gauges. Recommended locations of new gauges are (1) in the wetland re-establishment area between the relic stream channel and proposed channel near Station 4+50, (2) in the wetland re-establishment area close to the western easement boundary between Stations 6+00 and 7+50, and (3) in the wetland re-establishment area close to the western easement boundary and veg plot between Stations 10+00 and 11+00.
    Gauge AW2 has been moved and two gauges have been added to the suggested locations. ***Figure 10*** *and* ***Section 8.5*** *have been updated to reflect this change.*

13. Sheet 1 – Please explain why no toe protection is proposed along the outer meanders near Stations 0+50 and Station 1+00 and why the benches are so narrow. The bench widths do not appear adequate and DWR is concerned about the long-term stability of this stream segment.
Sheet 1 has been updated with toe protection added to the outer meander bends near stations 0+50 and Station 1+00. Floodplain benching is not proposed on this project. Floodplain grading at the transition from the existing alignment at the top of the project is slightly steeper than the majority of the project, due to spatial constraints there, but entrenchment ratios remain well above 2.2.

14. Sheet S2 – The two western ditches identified on Figure 8 have been included as part of the existing stream channel on the design sheets. Will this affect calculating/reporting stream impacts?
These identified ditches are not jurisdictional features and will not affect stream impacts. These were identified only to ensure they will be filled as part of the wetland restoration activities.

15. Sheet S3 – Please confirm whether the ditch/swale section from the easement boundary to the stream culvert crossing will be filled (as shown on Figure 8). If not, DWR recommends a ditch plug be installed at the easement boundary.
The swale in question is called out to be filled on Sheet W1 of the planset.

16. Sheet P1 – Please confirm that the Since *Juncus effusus* has a seed bank onsite, was an alternative species considered for the site seed mix?
Juncus effusus has been replaced with Impatiens capensis in the proposed riparian seed mix. However, as the proposed mix may change based on seed availability at the time of construction if Impatiens capensis is not available at the time, another species may need to be selected .

17. Sheet D2 –
    a. In channel or ditch sections to be backfilled below top of bank, please consider planting obligate species if there is a likelihood of standing water during the growing season.
    RES will do its best to plant bare roots and seed mixes in their preferred habitat during site planting.

    b. DWR would like to see a minimum channel plug length of 50 feet rather than 30 feet.
    Plug length has been updated per the comment.

18. Sheet D3 –
    a. DWR generally prefers the use of brush toe over the single log toe protection treatment.
    Log toe protection will not be used on this project; references to log toes have been removed from the planset.

    b. The brush toe note #3 refers to silky willow, which should be updated to tag alder or also included in the plant list.
    Silky willow has been updated to tag alder per the comment.

    c. Sod mats are identified as a potential bank stabilization treatment. Please include a detail for this treatment in Appendix A or add treatment information to applicable existing detail(s).
    Sod mats will not be used on this project to avoid replanting pasture grasses along the new channel. References to this type of bank stabilization have been removed from the document.

19. Sheet F1 – Please include sufficient gate points along the existing/proposed fence line for the site to be accessed by regulatory and stewardship staff.
Gates will be installed in the fence for site access. Two gates have been added to Sheet F1 showing their proposed locations.

20. Appendix F – Please confirm that the landowner will be responsible for fence maintenance during the seven-year monitoring period.
As stated, maintenance of the livestock exclusion fencing will be the responsibility of the landowner.

21. General comment – "Reaches" plural is used multiple times throughout the plan. Please update to reflect the single project reach.
The word "Reaches" has been corrected to a singular "Reach" throughout the document.

Kim Browning, USACE:

1. 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.
As much as possible RES will place woody debris throughout the buffers and wetlands. This will be heavily dependent on the material that remains after construction as there is not a lot of harvestable material onsite.

2. Please depict photo points/digital image stations on Figures 10. If the fixed cross-section locations are to be used, please describe that in the text in section 7.1.
*Digital image stations will be located at each vegetation monitoring plot and cross-section. Cross-section locations are subject to change from those shown on **Figure 10** once construction is complete.*

3. Please discuss how fescue will be treated in conjunction with buffer establishment.
Fescue that is not destroyed during floodplain grading and ripping will be treated with herbicide prior to bareroot planting.

4. Credit Release: NCDMS has recently requested that all previously mentioned As-Built reports will now be referred to as Record Drawing. Please verify this with DMS and correct as advised.
In Appendix D, the Credit Release Schedule, any mention of "as-built reports" has been replaced with "record drawings", per the comment.

5. Based on the summary in the detailed hydric soils study, the site appears to be mostly Toxaway soils and should have a hydroperiod of 12%, as stated in Section 7.2. There is some concern over meeting hydrology around the area of stream proposed for Priority 2 restoration.
Floodplain benching is not required on this project. References to P2 restoration have been removed from the document to clarify. Floodplain grading at the transition from the existing alignment at the top of the project is slightly steeper than the majority of the project, due to spatial constraints there, but the proposed channel bottom is no deeper than the existing stream through that section. Therefore, RES feels that this area at the top of the reach will be able to meet the hydroperiod of 12%. A wetland gauge is located in this area and will be reported annually in monitoring reports.

6. Section 7.3: please add "260 trees" to year five.
This has been added per the comment.

7. Table 16: Hydraulic performance of 30 days continuous flow should be removed considering this is a perennial stream and that standard is only applicable to intermittent streams.
   As mentioned in comment 10. above, the 30-day flow performance standard has been removed from Table 16.

8. Please specify on the design sheets which section of stream is planned for P2. Also please depict where the ditch plug will occur, and how much. It's recommended that at least 50 feet be plugged with high content clay soils.
   Floodplain benching is not proposed on this project. References to P2 restoration have been removed from the document to clarify. Ditch plugs are not proposed on this project; however, channel plugs are proposed along portions of the channel that is to be abandoned. Additionally, the channel plug detail has been updated per comment; see detail Sheet D2. Floodplain drainage features (all swales) are called out to be filled on sheet W1 in the planset, and two callouts have been added to this sheet to clarify these features. References to "plugging ditches" within the document have been corrected to "filling ditches" to clarify this.

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Appendices

1 PROJECT INTRODUCTION

1.1 Project Components

The Apple Valley Project ("Project") is located within a rural watershed in Henderson County, North Carolina approximately eight miles northeast of the town of Hendersonville. The Project lies within the French Broad River Basin, North Carolina Division of Water Resources (NCDWR) sub-basin 04-03-02, and United States Geological Survey (USGS) 14-digit hydrologic unit code (HUC) 06010105030040 (**Figure 1**). The Project proposes to restore 1,437 linear feet (LF) of stream, re-establish 2.755 acres of wetland, enhance 0.288 acres of wetland, and provide water quality benefit downstream of a 277-acre drainage area. The Project is in the Broad Basins Level IV ecoregion.

The Project area is comprised of a 6.42-acre easement involving one unnamed tributary and two associated riparian wetland areas, totaling 1,574 existing LF and 0.288 existing acres, respectively, which drain directly into Clear Creek, a tributary of the French Broad River. The stream and wetland mitigation components are summarized in **Table 1a** and **Table 1b**. The Project is accessible from Smith Road off of Old Clear Creek Road. Coordinates for the Project areas are as follows: 35.417132° N, 82.363875° W.

1.2 Project Outcomes

The stream proposed for restoration has been significantly impacted by livestock production, agricultural practices, and a lack of riparian buffer. The proposed wetland re-establishment areas have been significantly impacted by livestock production, ditching, channel entrenchment, and land-use practices. The wetlands proposed for enhancement have been impacted by livestock production and land-use practices. Proposed improvements to the Project will help meet the river basin needs expressed in the 2009 French Broad River Basin Restoration Priorities (RBRP) as well as ecological improvements to the riparian corridor within the easement.

Through stream restoration, wetland re-establishment, and wetland enhancement the Project presents 1,437 LF of proposed stream and 3.043 acres of proposed wetland, generating 1,487.490 Cold Stream Mitigation Units (SMU) and 2.899 Wetland Mitigation Units (WMU) (**Table 1a** and **Table 1b**). This mitigation plan is consistent with the August 10, 2018 Post Contract IRT Meeting Minutes and IRT response emails (**Appendix B**).

Table 1a. Apple Valley Project Components Summary – Stream Mitigation

Stream Mitigation			
Mitigation Approach	**Linear Feet**	**Ratio**	**Cold SMU**
Restoration	1,437	1	1,437.000
Total	**1,437**		**1,437.000**
		Non-standard Buffer Width Adjustment	**50.490***
		Total Adjusted SMUs	**1,487.490**

* Credit adjustment for Non-standard Buffer Width calculation using the Wilmington District Stream Buffer Credit Calculator issued by the USACE in January 2018. See section 6.6 for further information.

Table 1b. Apple Valley Project Components Summary - Wetland Mitigation

Wetland Mitigation			
Mitigation Approach	**Acreage**	**Ratio**	**WMU**
Re-establishment	2.755	1	2.755
Enhancement	0.288	2	0.144
Total	**3.043**		**2.899**

2 WATERSHED APPROACH

The Project was selected based on its potential to support the objectives and goals of the DMS 2009 French Broad RBRP. The French Broad RBRP identified several restoration needs for the entire River Basin, as well as for HUC 06010105. The majority of seven counties are included in the French Broad River Basin, as well as some of the largest urban areas in the mountains, including the Asheville, Waynesville, Hendersonville, and Black Mountain. The Project watershed was identified as a Targeted Local Watershed (TLW) (HUC 06010105030040, Mud Creek Watershed, Clear Creek TLW), a watershed that exhibits both the need and opportunity for stream and riparian buffer restoration. Approximately 35% of this TLW is agricultural lands with much of this land in apple orchards, from which pesticides have been identified as the primary stressor for Clear Creek, although sediment and nutrients are also contributing stressors. Further, Clear Creek is a 303(d) listed waterbody due to "fair fish community" and "poor benthos" classifications (NCDEQ, 2018). Goals outlined in the 2009 RBRP and the Mud Creek Local Watershed Plan (NCEEP, 2009; Mud Creek Watershed Restoration Council, 2003) include:

1. *Implement wetland and stream restoration projects that reduce sources of sediment and nutrients by restoring riparian buffer vegetation, stabilizing banks, excluding livestock, and restoring natural geomorphology, especially in headwater streams;*

2. *Restore and protect habitat for priority fish, mussel, snail, and crayfish species in the basin [see Wildlife Resource Commission (2005) for a complete list];*

3. *Cooperate with land trusts and resource agencies to help leverage federal and state grant funding for watershed restoration and conservation efforts;*

4. *Protect high quality habitats, especially those prioritized by the Natural Heritage Program as Significant Natural Heritage Areas;*

5. *Focus restoration efforts in the Mud Creek and South Hominy Creek LWP areas; and*

6. *Work with local partners to improve management of stormwater runoff, controlling both stormwater volume and pollutants, and promote low impact development techniques to lessen impacts of new development, especially in the expanding areas of Asheville, Black Mountain, Fletcher, and Hendersonville.*

The Project will address two of the goals outlined in the 2009 French Broad RBRP. Restoring the Project stream with a stable, natural design will improve erosion, sedimentation, and habitat degradation in the Mud Creek area (RBRP Goals 1 and 5). By establishing a permanent conservation at the Project, aquatic habitat and riparian buffers within the Mud Creek Watershed will be protected in perpetuity. As stated above, pesticides from apple orchards and row crops are the primary stressors in this watershed leading to biological degradation; 40 percent of this project's drainage area is in crop production, and the majority of that land is in apple orchards. Additionally, excess nutrient loads and sedimentation are also major stressors for the watershed, and the Project will help address these stressors as described in **Section 2.1**.

2.1 Site Selection

Currently, the Project area lacks riparian buffers and has cattle accessing the stream, which has resulted in bank erosion, sediment deposition, and channel incision. The Project will directly and indirectly address stressors identified in the RBRP by stabilizing eroding stream banks, reconnecting an incised stream to its floodplain, re-establishing wetland hydrology in the former riparian wetlands, enhancing the hydrology of

existing riparian wetlands, reducing sediment and nutrient loads, and restoring forested buffers on the stream channel. Project-specific goals and objectives will be addressed further in **Section 5**. A project watershed map with the Project's drainage areas is shown on **Figure 2** and watershed planning priority boundaries are shown on **Figure 1.**

The land required for the construction, management, and stewardship of this Project includes a portion of one parcel in Henderson County with the following ownership in **Table 2** & **Figure 3**. Once finalized, a copy of the land protection instrument will be included in **Appendix C**. The Division of Mitigation Services (DMS) Conservation Easement model template will be utilized to draft the site protection instruments. The landowner will be responsible for fence maintenance and repairs to exclude livestock from the conservation easement after monitoring has concluded, and the conservation easement document will include the applicable language.

Table 2. Project Parcel and Landowner Information

Owner of Record	PIN Or Tax Parcel ID#	Stream Reach and Wetland Areas
Heather L. Coston	9692-73-8946 (Henderson County)	All

3 BASELINE AND EXISTING CONDITIONS

3.1 Watershed Summary Information

Drainage Area and Land Cover

The Project area is comprised of one unnamed tributary that flows generally north to south, as well as two riparian wetland areas, all of which drain into Clear Creek, located approximately 0.14 miles downstream of the Project. The drainage area for the Project reach is 277 acres (0.43 mi^2) (**Table 3**). Primary land use within the drainage area consists of approximately 47% forest, 40% cropland, 7% pasture, and 5% residential, with minor components of open water and bare land (**Figure 4**). Historic and current land-use within the immediate Project area have allowed cattle direct access to the stream and wetlands. These activities have negatively impacted both water quality and streambank stability along the Project stream and have negatively impacted soil formation and vegetation in the Project wetlands. Project site characteristics are summarized in **Table 9** at the end of the section.

Table 3. Project Watershed Summary Information

Level IV Ecoregion	66j – Broad Basins
River Basin	French Broad
USGS Hydrologic Unit 8-digit	06010105
USGS Hydrologic Unit 14-digit	06010105030040
DWR Sub-basin	04-03-02
Project Drainage Area (acres)	277
Percent Impervious Area	5%

Surface Water Classification

The project tributaries have not been classified, but the portion of Clear Creek that the Project reach drains to has been assigned a Class B classification and Trout Waters supplemental classification (NCDEQ, 1998). Class B waters are protected for primary recreation as well as all class C uses, such as secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture. Primary recreation includes swimming, skin diving, water skiing, and similar uses involving body contact with water where such activities take place in an organized manner or on a frequent basis. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner (NCDEQ, n.d.). Trout Waters is a supplemental classification intended to protect freshwaters which have conditions which shall sustain and allow for trout propagation and survival of stocked trout on a year-round basis. This classification is not the same as the NC Wildlife Resources Commission's Designated Public Mountain Trout Waters designation (NCDEQ, n.d.).

3.2 Landscape Characteristics

Physiography and Topography

The Project is located in the Broad Basins level IV ecoregion within the Blue Ridge level III ecoregion. This region is drier, with lower elevations and less relief than the more mountainous Blue Ridge regions like the Southern Metasedimentary Mountains or the Southern Crystalline Ridges and Mountains. It also has less boulder colluvium than those surrounding regions and more saprolite. Soils in the region show some variation among the uplands, terraces, and floodplains, but are mostly well-drained Ultisols. Vegetation in the region includes a mix of oaks and pines that is more similar to the Piedmont, and while some areas are mostly forested, on the whole it is more developed than other Blue Ridge regions (Griffith et al., 2002). The topography of the project area is a nearly level to slightly concave floodplain between

steeper slopes with elevations ranging from 2,197 feet to 2,172 feet. The valley along the project reach is open with a consistent one percent slope. A few smaller topographic features are present, including shallow depressions and areas of slightly higher elevation that are better drained.

The project reach conveys an increased sediment load relative to reference conditions. This increased loading is a result of heavy agricultural and livestock practices, and while the channel substrate is still mostly fine to coarse gravel, without intervention this is likely to change towards finer materials as the channel bed and banks continue to degrade.

Geology and Soils

According to geology data from the North Carolina Geologic Survey, published in 1985, the Project is within map unit SOgg, occurring in the Chauga Belt. This map unit is associated with intrusive rocks of the granite gneiss formation that formed from the Ordovician to Silurian periods within 438 million years ago. The formation is poorly foliated and interlayered with biotine augen gneiss.

The NRCS Web Soil Survey shows several mapping units across the Project. Map units include four soil series. The soil series found on the Project are described below and summarized in **Table 4**.

Project soils are mapped by the NRCS within the easement as Bradson gravelly loam, Codorus loam, Edvard soils, and Hayesville loam (NRCS, n.d.; **Figure 5**). Bradson gravelly loam makes up approximately one percent of the easement, is well drained, and is found on stream terraces and fans. Codorus loam makes up approximately 84 percent of the easement and is somewhat poorly drained and found on nearly level floodplains at zero to two percent slopes. Edvard soils make up approximately 14 percent of the easement, is well drained, and is found on mountain slopes and ridges. Hayesville loam makes approximately one percent of the easement, is well drained, and is located on ridges and interfluves.

Table 4. Mapped Soil Series

Map Unit Symbol	Map Unit Name	Percent Hydric	Drainage Class	Hydrologic Soil Group	Landscape Setting
BaB	Bradson gravelly loam, 2 to 7 percent slopes	0%	Well	B	Stream terraces and fans
Co	Codorus loam (Arkaqua), 0 to 2 percent slopes, frequently flooded	5%	Somewhat Poorly	B/D	Nearly level floodplains
EwE	Edvard soils 15 to 25 percent slopes	0%	Well	B	Mountain slopes and ridges
HyC	Hayesville loam, 8 to 15 percent slopes	0%	Well	C	Ridges and interfluves

Site Soil Survey

A soil survey was performed on the Project parcel by a licensed soil scientist in July 2018 to evaluate the potential for wetland re-establishment (**Appendix B**). Hydric indicators were evaluated using visible morphologic characteristics and criteria based on the "Field Indicators of Hydric Soils in the United States, version 8.1" (NRCS, 2017). Hydric indicators were found within the first 12 inches within the Project area,

and hydric soils were found to be limited to the floodplain with the exception of a few areas extending up the toe of slope (**Figure 6**). Soils were observed to have a range of characteristics similar to the NRCS mapped Codorus series described above, and especially its hydric Toxaway inclusion. The typical surface horizon was characterized by a dark sandy loam that is high in organic material, suggesting the floodplain was naturally saturated for long periods of time, historically, and is suitable for wetland re-establishment. One island of upland soil was found surrounded by hydric soil and is likely the result of a single depositional event. The northernmost area of hydric soil is disturbed, most likely from historic earthwork, and contains small berms that overburden the hydric soils. This disturbance may have been from the construction of the upstream pond, farm buildings, or farm access. Shallow swales and ditches have been constructed across the floodplain to limit ponding and reduce hydrology at the seeps. The loamy and sandy texture of the soils are susceptible to rapid drainage from even these modest drainage improvements. These drainage improvements, combined with the incised channel, have lowered the water table and limited hydrology across the Project (**Appendix B**).

Existing Vegetation

Vegetation around the unbuffered Project reach is primarily composed of pasture grasses, herbaceous vegetation and scattered trees. The reach has been grazed by livestock and thus lacks a well-developed understory and shrub strata. Vegetation within the wetland areas consists of common rush (*juncus effuses*), shallow sedge (*Carex lurida*), swamp aster (*Symphyotrichum puniceum*), red maple (*Acer rubrum*), American sycamore (*Platanus occidentalis*), and river birch (*Betula nigra*), as well as the invasive Chinese privet (*Ligustrum sinense*).

3.3 Land Use – Historic, Current, and Future

Historic aerial imagery indicates that the Project has been used extensively for agricultural purposes since at least 1956. The location of the stream has changed slightly over that time but has not moved significantly. The Project was in apple orchards through 2001 but was converted to pasture by 2005. The area directly east of the project transitioned from agriculture to a small single-family residential area in the early 1990s (**Figure 7**). The area remains in an agricultural community, and apple orchards remain active directly north of the Project. Several watershed characteristics, such as groundwater, vegetation, surface drainage, and potentially soil parameters have been modified. Livestock currently have access to the majority of the Project area and are actively degrading the channel and wetlands, while riparian buffers are narrow or non-existent. Soil structure and surface texture have been altered from long-term active grazing.

The future land use for the Project area will include 6.42 acres of conservation easement that will be protected in perpetuity. The Project easement will have 1,437 linear feet of high functioning stream, 2.899 acres of high functioning riparian wetlands, a minimum 30-foot riparian buffer, and will exclude livestock with fencing. Outside the Project, the area will likely remain in agricultural and single-family residential use.

3.4 Regulatory Considerations

Federal Emergency Management Agency (FEMA)/ Hydrologic Trespass

According to the North Carolina Floodplain Mapping Information System, the Project reach is not within a flood hazard zone (FEMA, 2008) (**Figure 6**). The Project can be found on Flood Insurance Rate Map (FIRM) panel 9692 (map number 3700969200J), effective date October 2, 2008. A DMS Floodplain Requirements Checklist form was completed for the Project and is included in **Appendix L**.

Environmental Screening and Documentation

To ensure that a project meets the "Categorical Exclusion" criteria, the Federal Highways Administration (FHWA) and NCDMS have developed a categorical exclusion (CE) checklist that is included as part of each mitigation project's Environmental Screening process. The CE Approval Form for the Apple Valley Project is included in **Appendix K** and was approved by DMS and FHWA in November 2018.

Threatened and Endangered Species

Plants and animals with a federal classification of endangered or threatened are protected under provisions of Sections 7 and 9 of the Endangered Species Act of 1973, as amended. A desktop analysis was performed to identify rare species or unique habitats on-site, including using the USFWS Information for Planning and Conservation (IPAC) online tool and performing a query of the October 2018 North Carolina Natural Heritage Program database of natural heritage element occurrences (USFWS, 2018; NCNHP, 2018). Additionally, a field investigation was conducted to evaluate federally protected species potentially occurring on the Project. A letter was sent to the USFWS was requesting review of the project and input on whether there are any possible concerns for threatened and endangered species. No correspondence has been received at the time of submittal. Additionally, to comply with the NLEB 4(d) streamlined rule for federal agencies, the required consultation form was submitted by the Federal Administration to the USFWS as part of the Categorical Exclusion. It was determined that the project "may affect the NLEB, but any incidental take of the NLEB is not prohibited by the final 4(d) rule." However, RES will avoid tree cutting from May 15 – August 15, if possible, in order to protect sensitive summer roosting habitat. Documentation of all correspondence is included in **Appendix K**.

The Fish and Wildlife Coordination Act requires consultation with state fish and wildlife agencies when "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted…or otherwise controlled or modified." A letter was sent to the NCWRC on June 26, 2018 requesting review and comment of possible issues with respect to fish and wildlife resources on the Project. NCWRC responded on August 3, 2018 and had no comment for any species. Documentation is included in **Appendix K.**

Cultural Resources

A review of the North Carolina State Historic Preservation Office GIS Web Service database and a field evaluation were conducted to evaluate potential occurrences near or on the Project. The Zeb Dalton House (HN1124) is located within a 0.5-mile radius of the Project. The Project will not threaten or impact this historic location. No archeological artifacts have been observed or noted during preliminary surveys of the Project for restoration purposes. Letters describing the Project and requesting review or comment on potential resources in its vicinity were sent to the North Carolina Department of Cultural Resources, State Historic Preservation Office (SHPO; June 27, 2018), to the Eastern Band of Cherokee Indians (EBCI; September 13, 2018), to the Cherokee Nation (CN; October 5, 2018), and to the United Keetoowah Band of Cherokee Indians in Oklahoma (UKBCI; October 5, 2018). RES received a response letter from SHPO on July 19, 2018 which confirmed that no known historic resources would be affected by the project. No correspondence has been received from the EBCI, the CN, or the UKBCI at the time of submittal. All correspondence is included in **Appendix K**.

Table 5. Regulatory Considerations

Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States - Section 404	Yes	No	Appendix I
Waters of the United States - Section 401	Yes	No	Appendix I
Endangered Species Act	Yes	Yes	Appendix K
National Historic Preservation Act	Yes	Yes	Appendix K
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Magnuson Stevens Act - Essential Fisheries Habitat	No	N/A	N/A

3.5 Reach Summary Information

The Project area is comprised of a single easement area along one unnamed tributary (AV1) that drains into Clear Creek south of the road that terminates the Project (**Figures 2** & **6**). Results of the preliminary data collections are presented in **Table 6**. Morphological parameters are located in **Appendix B**; a district assessment form is located in **Appendix H**.

Table 6. Summary of Existing Channel Characteristics

Reach	Drainage Area (ac)	A_{BKF} [1] (ft^2)	BKF Width (ft)	BKF Mean Depth (ft)	Low Bank Height (ft)	Width:Depth Ratio	Bank Height Ratio	Entrenchment Ratio	Sinuosity	Slope (ft/ft)
AV1	277	7.0-7.7	6.4-9.9	0.8-1.1	1.7-1.9	5.8-12.8	1.3-1.4	>2.2	1.32	0.010

[1] A_{BKF}= cross-sectional area (measured at approximate bankfull stage as estimated using existing conditions data and NC Regional Curve equations where field indicators were not present)

Existing Channel Morphology

AV1

Reach AV1 begins at the northern limits of the project and flows south to the southern limits of the project at the Smith Road crossing. The reach is currently degrading and approaching a G-type channel. The channel valley is moderately confined and widens moving downstream on the reach. Livestock have full access to the stream except for approximately 200 feet at the most upstream end; subsequently the channel banks exhibit moderate erosion and slumping from hoof shear. The riparian buffers are mostly non-existent, with few scattered trees. Vegetation consists of mixed pasture grasses that are moderately grazed. At the upstream end, where livestock do not access, the vegetation consists of small trees and shrubby vegetation with a weedy understory.

Reach AV1
Looking upstream

Reach AV1
Looking downstream

Channel Classification

The stream has been classified as perennial using the NCDWR Stream Identification Form version 4.11 and is a C-stream type as classified using the Rosgen stream classification system (Rosgen, 1996). **Table 7** summarizes these stream parameters and the stream determination score can be found in **Appendix G**. Stream determinations have been verified by the USACE.

Table 7. Summary of Stream Parameters

Reach	Hydrology Status	Stream Determination Score	Reach Length (LF)	Rosgen Stream Classification
AV1	Perennial	36	1,574	C4

3.6 Existing Wetlands and Hydric Soils

A survey of existing wetlands was performed on July 31, 2018. Wetland boundaries were delineated using current methodology outlined in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987). Soils were characterized and classified using the Field Indicators of Hydric Soils in the United States, Version 8.1 (NRCS, 2017). Indicators used are valid for the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region Version 2.0 (2012). Within the boundaries of the Project, two small jurisdictional wetlands are present (**Figure 6**). Wetlands are labeled as W1 (Wetland 1) and W2 (Wetland 2) and are described in **Table 8**. A preliminary jurisdictional determination (PJD) request was sent to the USACE on September 13, 2018 and a confirmed PJD was received on November 9, 2018 (**Appendix I)**. NC WAM forms were completed for the existing wetlands and are located in **Appendix H**.

Table 8. Jurisdictional Wetland Summary

Wetland ID	Area (acres)	Cowardin Type	Hydrology Source	Soil Series	Dominant Vegetation
W1	0.275	PEM1m	Groundwater, overland	Codorus	Soft rush (*Juncus effuses*), shallow sedge (*Carex lurida*), and swamp aster (*Symphoyotrichum puniceum*), fescue
W2	0.013	PSS1	Groundwater, overland	Codorus	Red maple (*Acer rubrum*), soft rush (*Juncus effuses*), shallow sedge (*Carex lurida*), marsh dayflower (*Murdannia keisak*)

The USFWS National Wetland Inventory Map (NWI) does not depict any additional wetland areas within the Project (**Figure 6**).

Existing Wetland Characteristics

W1

Wetland W1 is located on the left bank of reach AV1, approximately in the middle of the reach and on the low terrace between the top of bank and the toe of slope at the end of the floodplain. The wetland has been degraded by land clearing for agriculture and livestock grazing. Current vegetation consists of herbaceous wetland species but is regularly disturbed by livestock. One groundwater monitoring well was installed on the southern edge of W1 on November 11, 2018 and recorded the hydroperiod of the wetland through June 28, 2019 (**Figure 6**). While this period only captures part of a growing season, the wetland still more than met criteria with a hydroperiod of 24.0% (**Appendix B**). The well will be maintained through construction (2019) to capture the rest of the growing season.

Wetland W1
Looking downstream

W2

Wetland W2 is located at the northernmost end of the project on the right bank of reach AV1 in a ditch-like or channel-like feature below an off-site pond (**Figure 6**). The wetland likely captures pond overflow and roadside runoff from Old Clear Creek Road. Current vegetation consists of small trees and shrubby vegetation, with a weedy understory.

Wetland W2
Looking west

Existing Hydric Soils

H1

Potential wetland area H1 is located along both banks of reach AV1 throughout its existing floodplain in the mapped hydric soils area (**Figure 6**). Hydric soils were mapped by a licensed soil scientist and exhibit characteristics of historically wet soils. This area was likely a riparian wetland prior to its development for agricultural uses and the subsequent downcutting of the Project reach (**Appendix B**). Land clearing for agriculture and cattle grazing have impacted this area, and channel incision has degraded hydrology. Two groundwater monitoring wells were installed on November 11, 2018 south of W1 and recorded the hydroperiod of the proposed wetland re-establishment area through June 28, 2019 (**Figure 6**). Well AW2 did not meet wetland criteria, with a hydroperiod of 1.8%, and showed groundwater elevation staying consistently deeper than 12" below the surface, except for significant rainfall events. In contrast, well AW3 did meet wetland criteria, with a hydroperiod of 24.4%, although groundwater elevation at this location was more responsive to precipitation events than well AW1 in Wetland W1 (**Appendix B**). These two wells will be maintained through construction to capture the rest of the growing season. Current vegetation is regularly disturbed by livestock but consists mainly of pasture grasses with few scattered trees.

Potential wetland area H1
Looking upstream

Potential wetland area H1
Looking downstream

Table 9. Project Attribute Table

Project Background Information			
Project Name	Apple Valley Project		
County	Henderson		
Project Area (acres)	6.42		
Project Coordinates (latitude and longitude)	35.417132, -82.363875		
Planted Acreage (Acres of Woody Stems Planted)	6.09		
Project Watershed Summary Information			
Physiographic Province	66j - Broad Basins		
River Basin	French Broad		
USGS Hydrologic Unit 8-digit	06010105	USGS Hydrologic Unit 14-digit	06010105030040
DWR Sub-basin	04-03-02		
Project Drainage Area (Acres and Square Miles)	277 acres (0.43 sq mi)		
Project Drainage Area Percentage of Impervious Area	5%		
CGIA Land Use Classification	Managed herbaceous cover		
Reach Summary Information			
Parameters	**AV1**		
Length of reach (linear feet)	1437		
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined		
Drainage area (Acres and Square Miles)	277 ac (0.43 sq mi)		
Perennial, Intermittent, Ephemeral	Perennial		
NCDWR Water Quality Classification	None		
Stream Classification (existing)	E4 / C4		
Stream Classification (proposed)	C4		
Evolutionary trend (Simon)	II		
FEMA classification	Zone X (Minimal Risk)		
Wetland Summary Information			
Parameters	**Wetland 1**	**Wetland 2**	**Wetland 3**
Size of Wetland (acres)	0.275	0.013	2.755
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian Non-riverine	Riparian Non-riverine	Riparian Non-riverine
Mapped Soil Series	Codorus loam (Arkaqua)	Codorus loam (Arkaqua)	Codorus loam (Arkaqua)
Drainage class	Somewhat poorly	Somewhat poorly	Somewhat poorly
Soil Hydric Status	Yes (Per LSS)	Yes (Per LSS)	Yes (Per LSS)
Source of Hydrology	Groundwater and surface flow	Groundwater and surface flow	Groundwater, surface flow, and stream flooding
Restoration or enhancement method (hydrologic, vegetative etc.)	Hydrologic enhancement & vegetative restoration	Hydrologic enhancement & vegetative restoration	Hydrologic & vegetative restoration
Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	No	Appendix I
Water of the United States - Section 401	Yes	No	Appendix I
Endangered Species Act	Yes	Yes	Appendix K
Historic Preservation Act	Yes	Yes	Appendix K
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

4 FUNCTIONAL UPLIFT POTENTIAL

The Stream Functions Pyramid Framework (Harman et. al. 2012) uses stream functions to describe project objectives, existing condition assessments and monitoring, performance metrics, and design criteria. The Framework separates stream functions into five categories, ordered into a hierarchy, which communicate the interrelations among functions and illustrate the dependence of higher-level functions (biology, physicochemical, and geomorphology) on lower level functions (hydrology and hydraulics). Functions that affect the greatest number of other functions are illustrated at the base of the Pyramid, while functions that have the least effect on other functions are illustrated at the top.

Fischenich (2006) found that the most critical functions include those that address hydrodynamic processes, sediment transport processes, stream stability and riparian buffer restoration. By addressing these fundamental functions and processes, a restored stream and riparian system are capable of supporting more dependent functions that typically require time to establish, such as diverse biological communities, chemical and nutrient processes, diverse habitats and improved water and soil quality. The objectives of this Project will address the most critical functional objectives that will allow for a more restored stream and riparian area over time.

A functional based approach broadens the reach-scale goals of a restoration project by contextualizing the functional uplift to the watershed scale. By applying an ecosystem restoration approach, the proposed Project will provide localized ecological and water quality benefits that could, in combination with other restoration projects within the watershed, have beneficial impacts on the French Broad River Basin. The restoration approach at the reach scale of this Project will benefit the hydraulic and geomorphology functions of the system but could also benefit the upper-level functions (physicochemical and biology) over time and in combination with other restoration projects within the watershed. Anticipated functional benefits and improvements within the Project area, as based on the Function-Based Framework, are outlined in **Table 9.**

4.1 Anticipated Functional Benefits and Improvements

Hydrology

According to the Stream Functions Pyramid Framework, hydrology is defined as the transport of water from the watershed to the channel. The Project will locally address several historic hydrologic disturbances including deforestation and channelization; however, it is not anticipated that the Project will have a significant effect on hydrology at the watershed scale. For wetland function, hydrology is typically defined as the water table being close to ground surface for a portion of the growing season. It is anticipated that stream restoration and filling of ditches and the existing channel will raise the water table through the floodplain, restoring the hydrology to historic riparian wetlands on the Project and enhancing the hydrology of existing wetlands.

Hydraulic

The hydraulic function of the Pyramid is defined as transport of water in the channel, on the floodplain, and through sediments. The greatest potential uplift at the Project will be achieved through increasing floodplain connectivity throughout the Project. Floodplain connectivity and stable flow dynamics are actively degrading through the Project and approaching not functioning. Floodplain connectivity is functioning-at-risk through the Project reach and will be improved to functioning by reducing bank height ratios and increasing entrenchment ratios. Stable flow dynamics are functioning-at-risk through the Project reach and will be improved to functioning by constructing a new stable channel with adequate energy dissipation and grade control.

Geomorphology

Geomorphology, as defined within the Pyramid Framework, is the transport of wood and sediment to create bed forms and dynamic equilibrium. Sediment transport will be improved in the Project reach, which is currently functioning-at-risk, by reducing the excess sediment load entering the stream. This reduction will be achieved by establishing a functional buffer and constructing a channel that maintains stable dimension, planform, and profile. Channel stability and bedform diversity will be improved in the reach by installing a mix of rock and log structures to promote a natural combination of riffle-pool sequences. Channel substrate will be supplemented by off-site material to facilitate channel bed stability and habitat creation. Transport and storage of woody debris will be improved through increases in channel roughness from plantings and the installation of structures. Existing riparian vegetation is not-functioning. Therefore, riparian buffers will be planted out to a minimum of 30 feet to improve the riparian vegetation to functioning levels, while also providing terrestrial habitat. All of these functional parameters are interconnected and depend on each other, improving this wide range of parameters will result in long-term functional geomorphic uplift.

Physicochemical

The Pyramid Framework defines the physicochemical category as temperature and oxygen regulation and the processing of organic matter and nutrients. Although this Project would support the overarching goal in the French Broad River Basin Priorities to reduce sources of sediment and nutrients, it is difficult to measure nutrient and sediment reduction at this project level because they can be affected by so many variables. However, several restoration actions are known to help reduce nutrients and sediment even though they may not be measurable at the project level. These activities include filtering of runoff through buffer areas, converting active farm fields to forested buffers, and improving denitrification and nutrient uptake through buffer zones and wetlands. Additional benefits may also come from functional uplift of the lower-level stream functions (hydraulics and geomorphology), which will reduce sediment and nutrients in the system through bank stabilization and reforestation. Temperature regulation will also be improved through the restoration of canopy tree species to the stream buffer areas. Oxygen regulation will occur through two actions: first, the temperature of the water directly impacts the amount of gas held by the water. Therefore, by planting the buffer to shade the channel, water temperature is decreased and dissolved oxygen is increased. Second, the drop structures placed in the stream create mixing zones where oxygen dissolves much faster than the standard exchange rate of oxygen to dissolved oxygen. The processing of organic matter will be improved once healthy riffles are shallow enough to catch twigs and branches that then retain leaves. Many of these physicochemical benefits occur slowly over time and are dependent on multiple variables within the stream ecosystem. Therefore, it is not practical or feasible to directly measure these parameters within the monitoring time frame of this project. With that said, it is logical to use existing riparian buffer and visual performance standards to demonstrate the positive correlation between geomorphic parameters and physicochemical parameters. For example, as riparian buffer trees grow, as represented in annual monitoring reports, it is anticipated that canopy cover is actively shading the stream channel and reducing water temperature. This is not a substitute for direct physicochemical monitoring, but it is a useful tool to help project the long-term benefits of the Project in terms of its functional uplift.

Biology

The highest category of the Pyramid is biology and is defined as the biodiversity and life histories of aquatic and terrestrial life, specifically referring to animals. As mentioned for the physicochemical stream function, it will be difficult to see measurable results of the functional uplift of the biological functions at a project scale during the monitoring time frame of the project. However, since the life histories of many species likely to benefit from stream and wetland restoration are depending on all the lower-level functions, the functional uplift from the hydraulic and geomorphic levels would likely have a positive effect on the biology over time and in combination with other projects within the watershed is anticipated. Again, there is no substitute for direct biological monitoring, but it is important to understand the hierarchy of the Stream

Functions Pyramid Framework in order to help project long-term benefits of the Project, though only categories two and three (hydraulics and geomorphology) will be directly measured during the seven-year monitoring period.

4.2 Potential Constraints

There are no significant hydrologic or infrastructure constraints to the Project. No overhead or underground utility lines are present. There are no proposed crossings in the stream and no breaks in the proposed easement.

The Project will avoid hydrologic trespass. While existing wetland area exists outside of the Project boundary currently, proposed wetlands should be contained within the easement. Flood stage should not be adversely affected by the Project. The upper end of the Project proposes restoration that provides the same or more flood storage as compared to existing conditions. Similarly, some amount of floodplain grading is proposed throughout the project, so floodplain storage should not change significantly from existing conditions. Further, the grade to the east of the Project rises quickly from the toe of slope of the floodplain and should prevent floodwaters from expanding significantly in that direction.

No General Aviation or Commercial airports are located within five miles of the proposed project. The Project is located within five miles of one privately owned and operated airport (Bearwallow Farm Airport), which is approximately three miles north of the Project. While existing mature trees are generally not threatened, a tree survey has been conducted to design the mitigation measures and access to minimize impacts to significant specimen trees.

5 MITIGATION PROJECT GOALS AND OBJECTIVES

Through the comprehensive analysis of the Project's maximum functional uplift using the Stream Functions Pyramid Framework, specific, attainable goals and objectives will be realized by the Project. These goals clearly address the degraded water quality and nutrient input from farming that were identified as major watershed stressors in the 2009 French Broad River RBRP. The Project will address outlined RBRP Goals 1 and 5 (listed in **Section 2**).

The Project goals are:

- Improve water transport from watershed to the channel in a non-erosive manner in a stable channel;
- Improve flood flow attenuation on-site and downstream by allowing for overbank flows and connection to the floodplain;
- Improve instream habitat;
- Reduce sediment, nutrient, and fecal coliform inputs into stream system;
- Restore hydrology to riparian wetlands in the floodplain;
- Enhance hydrology in existing riparian wetlands;
- Restore native floodplain and wetland vegetation; and
- Indirectly support the goals of the 2009 French Broad RBRP to improve water quality and to reduce sediment and nutrient loads, especially in the Mud Creek watershed.

The Project objectives to address the goals are:

- Design and reconstruct the stream channel sized to convey bankfull flows that will maintain a stable dimension, profile, and planform;
- Add in-stream structures and bank stabilization measures to protect the restored stream;
- Install habitat features such as brush toes, woody materials, and pools of varying depths to the restored stream;
- Fill existing drainage features in the floodplain to slow water drawdown and re-establish wetland hydrology;
- Remove fill materials on the upstream end of the project to unbury the hydric soils there;
- Rip floodplain soil prior to planting to increase surface roughness and infiltration, to improve wetland hydrology;
- Increase forested riparian buffers to at least 30 feet on both sides of the channel along the Project reach with a hardwood riparian plant community;
- Install approximately 1,810 linear feet of livestock exclusion fencing along the easement boundary to ensure livestock will no longer have stream access;
- Treat exotic invasive species; and
- Establish a permanent conservation easement on the Project that will exclude future livestock from the stream channel and its associated buffers and prevent future land-use changes.

Anticipated functional uplift, benefits, and improvements within the Project area, as based on the Function Based Framework are outlined in **Table 10.**

Agricultural Best Management Practices (BMPs)

A suite of agricultural BMPs will be utilized for the Project to reduce direct effluent inputs, pollutant contamination, and sediment loading. The combination of riparian buffer planting, bank stabilization, and stream restoration, with the following agricultural BMPs: livestock fencing and livestock watering facilities, will ultimately lead to the functional uplift of the Project, while still allowing livestock production to persist through the installation of alternative water sources. To account for the elimination of livestock water access, landowners will be provided a total of two watering facilities, which will provide high quality drinking water to livestock.

Table 10. Functional Benefits and Improvements

Level	Function	Goal	Objective	Measurement Method
1	***Hydrology°*** *Transport of water from the watershed to the channel*	to transport water from the watershed to the channel in a non-erosive manner and maintain a stable water table in riparian wetlands	Convert the land-use of streams and their watersheds from pasture to riparian forest	Percent Project drainage area converted to riparian forest (indirect measurement)
2	***Hydraulic*** *Transport of water in the channel, on the floodplain, and through the sediments*	to transport water in a stable non-erosive manner	Improve flood bank connectivity by reducing bank height ratios and increasing entrenchment ratios	Cross sections Crest gauges Bank Height Ratio Entrenchment Ratio
3	**Geomorphology** *Transport of wood and sediment to create diverse bedforms and dynamic equilibrium*	to create a diverse bedform and a stable channel that achieves healthy dynamic equilibrium and provides suitable habitat for life	Reduce erosion rates and channel stability to reference reach conditions Improve bedform diversity (pool spacing, percent riffles, etc.) Increase buffer width to 30 feet	As-built stream profile Cross sections Visual monitoring Vegetation plots
4	**Physicochemical °** *Temperature and oxygen regulation; processing of organic matter and nutrients*	to achieve appropriate levels for water temperature, dissolved oxygen concentration, and other important nutrients including but not limited to Nitrogen and Phosphorus through buffer planting and fencing	*Unmeasurable Objective/Expected Benefit* Establish native hardwood riparian buffer and exclude livestock.	Vegetation plots (indirect measurement) Established fencing and perpetual conservation easement (indirect measurement)
5	**Biology *** *Biodiversity and life histories of aquatic life histories and riparian life*	to achieve functionality in levels 1-4 to support the life histories of aquatic and riparian plants and animals through instream	*Unmeasurable Objective/Expected Benefit* Improve aquatic habitat through the installation of habitat features, construction of pools at varying depths, and planting the riparian buffer	As-Built Survey (in-direct measurement

*° These categories are measured indirectly; *These categories are not quantifiably measured*

6 MITIGATION WORK PLAN

6.1 Reference Stream

The restoration portions of the Project are currently characterized by agricultural and livestock practices. Physical parameters of the Project were used, as well as other reference materials, to determine the target stream type. The "Classification of the Natural Communities of North Carolina" was also used to narrow the potential community types that would have existed at the Project (Schafale, 2012). An iterative process was used to develop the final information for the Project design.

Targeted reference conditions included the following:

- Located within the physiographic region and ecoregion,
- Similar land use on-site and in the watershed,
- Similar soil types on-site and in the watershed,
- Ideal, undisturbed habitat – several types of woody debris present,
- Similar topography,
- Similar slope,
- Pattern common among Mountain streams, and
- Minimal presence of invasive species.

Reference Watershed Characterization

The selected reference stream is South Fork Mills River in the Pisgah National Forest, located east of US-276 North in Henderson County, NC. The reach that was surveyed and analyzed flows southwest to northeast and is approximately 300 feet long. The drainage area for this segment of South Fork Mills River is 0.19 square miles (125 acres). The land use in the watershed is characterized as mostly forested (95.2 percent) with minor components of shrub/scrub (2.7 percent), impervious (1.9 percent), agriculture (0.1 percent), and open water (0.1 percent). Site photographs of the reference stream are located in **Appendix B.**

The current State classifications for this reference reach are WS-II, Tr, and ORW (NCDWQ 2012a). WS-II waters are used as sources of water supply for drinking, culinary, or food processing purposes where a WS-I classification is not feasible. The supplemental classification Tr is intended to protect freshwaters which have conditions which shall sustain and allow for trout propagation and survival of stocked trout on a year-round basis. This classification is not the same as the NC Wildlife Resources Commission's Designated Public Mountain Trout Waters designation. The supplemental classification ORW is intended to protect unique and special waters having excellent water quality and being of exceptional state or national ecological or recreational significance.

Reference Discharge

Several hydrologic models/methods were used to develop a bankfull discharge along with indicators of bankfull stage for the reference site. Existing drainage area, land use, slope, roughness, and cross-sectional area were all factors considered when performing the calculations. Using a combination of Mountain Regional Curves, in-house spreadsheet tools, and a project specific regional flood frequency analysis, the existing discharge for South Fork Mills River was calculated to be approximately 16 to 23 cubic feet per second (ft^3/s). See **Section 6.2** for a more detailed description of the hydrologic analyses performed for this project.

Reference Channel Morphology

In comparison to the restoration reach, reference reach South Fork Mills River is slightly smaller than the designed restoration reach when comparing pattern, dimension and profile, which is the reason for using a scaling factor for design comparison. The scaling factor is based on the difference in bankfull width of the reference channel. The designed reach would then have the necessary dimensions of either a smaller or larger stream corresponding to differences in drainage area. South Fork Mills River was typically 8.1 feet wide and 1.0 feet deep. The cross-sectional area was typically around 8.3 square feet with a width to depth ratio around 7.9.

Reference Channel Stability Assessment

The South Fork Mills River reference reach is stable and shows no evidence of incision or erosion in the portion that was surveyed and analyzed. The stream appears to maintain its slope and has sufficient amounts of vegetation to secure its banks. Riparian buffer widths exceed fifty feet on each side. The reference reach channel demonstrates a stable meandering pattern and a well-vegetated riparian buffer.

6.2 Design Parameters

Stream Restoration Approach

The treatment plan and design approach were developed based on the existing conditions, project goals, and objectives outlined in **Sections 3** and **5**. The Project will include only Priority I Restoration. Stream restoration will incorporate the design of a single-thread meandering channel, with parameters based on data from previous project experience, published regional empirical relationships, and reference reaches. A combination of analog, empirical, and analytical design techniques will be used to determine the design discharge and to verify design stability. Conceptual plan views are provided in **Figure 8**.

The detailed treatment plan and design approach is as follows:

Reach AV1

An offline priority I restoration approach is proposed for the reach to address eroding banks and channel entrenchment. Restoration activities include:

- Regrading a new single thread channel in the existing floodplain;
- Installing log and rock structures to provide grade control and habitat;
- Establishing a riffle-pool sequence throughout the reach;
- Installing brush toe protection on meander bends;
- Filling the existing channel;
- Livestock exclusion; and
- Riparian planting.

Typical Design Sections

Typical cross sections for riffles and pools are shown on the design plan sheets in **Appendix A**. The cross-section dimensions were developed for the design reach by using an in-house spreadsheet. The cross sections were altered slightly to facilitate constructability; however, the cross-sectional area, width to depth ratio, and side slopes were preserved.

Meander Pattern

The design plans showing the proposed channel alignment are provided in **Appendix A**. The meander pattern was derived from empirical relationships as well as past project experience, to avoid on-site constraints, to follow the valley pattern, and to make the channel more constructible. The morphologic parameters summarized in the **Appendix B**.

Longitudinal Profiles

The design profiles are presented in **Appendix A**. These profiles extend throughout the entire project for the proposed channel alignment. The profiles were designed using empirical relationships, past project experience, and data collected from the reference reach survey. The bed slopes and bankfull energy gradients were determined for the design reach based on the existing valley slope and the sinuosity of the design reach. Log and rock structures will be utilized in the design to control grade, divert flows, and provide additional habitat diversity and stability.

In-Stream Structures

Structures will be incorporated into the channel design to provide additional stability and improve aquatic habitat. Native materials and vegetation will be used for revetments and grade control structures where applicable. Typical structures that will protect the channel bed will include log sills, and cross vanes.

Woody debris will be placed throughout the channel. Woody habitat features installed will include brush toe and log sills. Bank stability measures include the installation of live stakes and brush toe. Typical details for proposed in-stream structures and revetments are in **Appendix A**.

Wetland Re-establishment Approach

The existing hydrologic soil area H1 will be re-established as a functioning riparian wetland, W3, by restoring hydrology and planting native vegetation. Hydrology throughout this area has been impacted by channel incision and constructed drainage improvements. Through a combination of priority one stream restoration, plugging and filling the old stream channel, and filling the constructed drainage features, hydrology will be restored to W3. Surface roughening through shallow soil ripping will improve infiltration and slow runoff through the floodplain, further improving hydrology to W3. Surface roughening will also create microtopography and shallow depressional areas, re-establishing more natural conditions and establishing habitat diversity (**Appendix B**). Historic land-use impacts will be addressed through the planting of a native hardwood community, as described in **Section 6.3**. Finally, fencing out livestock and establishing a permanent conservation easement for the Project will protect this area in perpetuity.

Wetland Enhancement Approach

Wetlands W1 and W2 will be enhanced from existing conditions through hydrologic improvement and the planting of native vegetation. Existing hydrology has been impacted by channel incision, and as such, priority one stream restoration will raise the groundwater table and improve the hydrology to these wetlands. Surface roughening through shallow soil ripping will improve infiltration and slow runoff through these areas, further improving hydrology. Historic land-use impacts will also be addressed through the planting of a native hardwood community, as described in **Section 6.3**. Finally, fencing out livestock and establishing a permanent conservation easement for the Project will protect these areas in perpetuity.

Data Analysis

Stream Hydrologic Analysis

Hydrologic evaluations were performed for the design reach using multiple methods to determine and validate the design bankfull discharge and channel geometry required to provide regular floodplain inundation. The use of various methods allows for comparison of results and eliminates reliance on a single model. Peak flows (**Table 11**) and corresponding channel cross sectional areas were determined for comparison to design parameters using the following methods:

- Regional Flood Frequency Analysis,
- NC and VA Regional Curves for the Mountains.

Regional Flood Frequency Analysis

A flood frequency analysis was completed for the study region using historic gauge data on all nearby USGS gauges with drainage areas between 5.5 and 1334 mi^2. Flood frequency equations were developed for the 1.1-, 1.25-, and 1.5-year peak discharges based on the gauge data. Discharges were then computed for the design reach. These discharges were compared to those predicted by the regional curves and reference reach.

Regional Curve Regression Equations

The North Carolina Mountain regional curves by Harman et al. (2003) and the Virginia Mountain regional curves by Keaton et al. (2005) for discharge were used to predict the bankfull discharge for the Project. The NC regional curves predicted flows that are similar to those predicted by the 1.5-year flood frequency, while the VA curves are lower, closer to the flows predicted by the 1.1-year flood frequency. The regional curve equations for NC discharges by Harman et al. (2003) and for VA discharges by Keaton et al. (2005):

(1) $Q_{bkf}=100.64(DA)^{0.76}$ (Harman et al., 2003)
(2) $Q_{bkf}=43.249*(DA)^{0.7938}$ (Keaton et al., 2005)

Where Q_{bkf}=bankfull discharge (ft^3/s) and DA=drainage area (mi^2).

Table 11. Peak Flow Comparison

Reach	Drainage Area (Ac)	FFQ $Q_{1.1}$	FFQ $Q_{1.25}$	FFQ $Q_{1.5}$	NC Regional Curve Q (1)	VA Regional Curve Q (2)	Design Q
AV1	277	20	31	47	53	22	25

Sediment Transport Analysis

An erosion and sedimentation analysis was performed to confirm that the restoration design creates a stable gravel bed channel that neither aggrades nor degrades over time. Typically, sediment transport is assessed to determine a stream's ability to move a specific grain size at specified flows. Various sediment transport equations are applied when estimating entrainment for gravel bed streams found in the Mountains. The US Army Corps of Engineers (USACE) report, *Stability Thresholds for Stream Restoration Materials* (Fischenich, 2001), was used to obtain permissible shear stresses and velocities. Data found in this document was obtained from multiple sources using different testing conditions. The following methods and published documents were utilized during the sediment transport analysis:

- Permissible Shear Stress Approach, and
- Permissible Velocity Approach.

Shear Stress Approach

Shear stress is a commonly used tool for assessing channel stability. Allowable channel shear stresses are a function of bed slope, channel shape, flows, bed material (shape, size, and gradation), cohesiveness of bank materials, vegetative cover, and incoming sediment load. The shear stress approach compares calculated shear stresses to those found in the literature.

Critical shear stress is the shear stress required to initiate motion of the channel's median particle size (D_{50}).

Table 12. Comparison of Allowable and Proposed Shear Stresses

Reach	Proposed Bed Shear Stress at Bankfull Stage (lbs/ft^2)	Existing Critical Shear Stress (lbs/ft^2)	Allowable Shear Stress[1]		
			Coarse Gravel (lbs/ft^2)	Cobble (lbs/ft^2)	Vegetation (lbs/ft^2)
AV1	0.44	0.50	0.33 to 0.67	0.67 to 2.0	0.7 to 1.7

[1](Fischenich, 2001)

Review of the above table shows that the proposed bed shear stresses for the Project design reach are above the critical shear stress of the existing channel material. Therefore, all proposed riffles will be supplemented with a substrate mix that has a critical shear stress greater than the proposed bed shear stress at bankfull.

Velocity Approach

Published data are readily available that provide entrainment velocities for different bed and bank materials. A comparison of calculated velocities to these permissible velocities is a simple method to aid in the verification of channel stability. **Table 13** compares the proposed velocities calculated using Manning's equation with the permissible velocities.

Table 13. Comparison of Permissible and Proposed Velocities

Reach	Manning's "n" Value	Design Velocity (ft/s)	Proposed Bed Material	Permissible Velocity[1] (ft/sec)
AV1	0.035	3.4	Coarse gravel	2.5 - 6

[1](Fischenich, 2001)

Sediment Supply

There is significant instability and erosion along the channel, which appears to be a result of historic cattle activity and agricultural activities occurring up to and along channel banks and not from watershed activities. It is anticipated that sediment supply from agricultural land adjacent to the project will decrease as buffers are enhanced and widened and as the channel is stabilized and realigned.

6.3 Vegetation and Planting Plan

Plant Community Restoration

The restoration of the plant communities is an important aspect of the restoration Project. The selection of plant species is based on what is typically native to the area. Several sources of information were used to determine the most appropriate species for the restoration project.

A Montane Alluvial Forest will be the target community along the Project reach. The target community will be used for the planting areas within the Project, shown in **Appendix A**. The plant species list has been developed and can be found in **Table 14**. Species with high dispersal rates are not included because of local occurrence, adjacent seed sources, and the high potential for natural regeneration. The high dispersal species include red maple and sweetgum, and both species are common in Montane Alluvial Forests. However, sweetgum especially seems to be associated with more disturbed examples, so while these species could be counted towards success, they should be monitored to ensure they do not outcompete the other proposed species (Schafale and Weakley, 1990; Schafale, 2012).

The restoration of plant communities along the Project will provide stabilization and diversity. For rapid stabilization of the stream banks (primarily outside meanders) black willow (*Salix nigra*) and tag alder (*Alnus serrulata*) were chosen for live stakes along the restored channel because of their rapid growth patterns and high success rates. Willows grow at a faster rate than the species planted around them, and they stabilize the stream banks. Willows will also be quicker to contribute organic matter to the channel. When the other species are bigger, the black willows will slowly stop growing or die out because the other species would outgrow them and create shade that the willows do not tolerate. The live stake species will be planted along the outside of the meander bends three feet from the top of bank, creating a three-foot section along the top of bank. The live stakes will be spaced one per linear foot with alternate spacing vertically.

It is anticipated that the construction will be completed at the end of summer 2020; therefore, vegetation planting will be conducted no later than March 15th, and there will be at least 180 days until the initiation of the first year of monitoring. Furthermore, any replanting that may occur throughout the monitoring phase of the Project will occur between November 15 and March 15, per the October 2016 USACE/NCIRT monitoring guidance.

Table 14. Proposed Plant List

Bare Root Planting Tree Species				
Species	**Common Name**	**Spacing (ft)**	**Unit Type**	**% of Total Species Composition**
Platanus occidentalis	American sycamore	9X6	Bare Root	15
Betula nigra	River birch	9X6	Bare Root	15
Quercus rubra	Northern red oak	9X6	Bare Root	15
Celtis laevigata	Sugarberry	9X6	Bare Root	10
Diospyros virginiana	Persimmon	9X6	Bare Root	10
Nyssa sylvatica	Blackgum	9X6	Bare Root	10
Cephalanthus occidentalis	Buttonbush	9X6	Bare Root	10
Liriodendron tulipifera	Tulip poplar	9X6	Bare Root	10
Quercus montana	Chestnut oak	9X6	Bare Root	5

Live Staking and Live Cuttings Bundle Tree Species		
Species	**Common Name**	**% of Total Species Composition**
Salix nigra	Black willow	50
Alnus serrulata	Tag Alder	50

On-Site Invasive Species Management

Treatment for invasive species will be required within the entire conservation easement. Invasive species will require different and multiple treatment methods, depending on plant phenology and the location of the species being treated (**Appendix J**). All treatment will be conducted as to maximize its effectiveness and reduce chances of detriment to surrounding native vegetation. Treatment methods will include mechanical (cutting with loppers, clippers, or chain saw) and chemical (foliar spray, cut stump, and hack and squirt techniques). Plants containing mature, viable seeds will be removed from the Project and properly disposed. All herbicide applicators will be supervised by a certified ground pesticide applicator with a North Carolina Department of Agriculture and Consumer Services (NCDA&CS) license and adhere to all legal and safety requirements according to herbicide labels, and NC and Federal laws. Management records will be kept on the plant species treated, type of treatment employed, type of herbicide used, application technique, and herbicide concentration and quantities used. These records will be included in all reporting documents.

Soil Restoration

After construction activities, the subsoil will be scarified, and any compaction will be deep tilled before the topsoil is placed back over the Project. Any topsoil that is removed during construction will be stockpiled and placed over the Project during final soil preparation. This process should provide favorable soil conditions for plant growth. Rapid establishment of vegetation will provide natural stabilization for the Project.

6.4 Mitigation Summary

Natural channel design techniques have been used to develop the restoration design described in this document. The combination of the analog, empirical, and analytical design methods was determined to be appropriate for this Project because the watershed is rural, the causes of disturbance are known and have been abated, and there are minimal infrastructure constraints. The original design parameters were developed through an iterative process using analytical and empirical tools and numerical simulations of fluvial processes and checked against measured analog/reference reach data. The designs presented in this report provide for the restoration of natural Mountain gravel-bed channel features and stream bed diversity to improve benthic habitat. The proposed design will allow flows that exceed the design bankfull stage to spread out over the floodplain.

A large portion of the existing stream will be filled using material excavated from the restoration channel. However, multiple segments will be left partially filled to provide habitat diversity and flood storage. Native woody material will be installed throughout the restored reach to reduce bank stress, provide grade control, and increase habitat diversity.

Forested riparian buffers will be established along the Project reach. An appropriate riparian plant community (Montane Alluvial Forest) will be established to include a diverse mix of species. The plant species list has been developed and can be found in **Table 14**. Although there is one planting zone, certain targeted species will be planted in the appropriate target community location. Replanting of native species will occur where the existing buffer is impacted during construction.

In combination with restoration activities, a suite of agricultural BMPs will be used on-site: livestock exclusion fencing and livestock watering facilities. This combination of BMPs will ultimately lead to the functional uplift of the Project by minimizing sedimentation, nutrient input, and fecal coliform input from ongoing livestock and agricultural production outside of the conservation easement.

Due to the nature of the project, complete avoidance of stream and wetland impacts is not possible. Proposed stream impacts, including stream relocation, will be replaced on-site. Wetland impacts associated with restoration efforts will only temporarily impact wetlands and will provide an overall increase in wetland function and area with the addition of native trees and shrubs along the stream banks, and restored hydrology. All stream and wetland impacts will be accounted for in the Pre-Construction Notification (PCN) form.

6.5 Determination of Credits

Mitigation credits presented in **Table 15** are projections based upon Project design (**Figure 8**; **Appendix A**). Upon completion of Project construction, the project components and credits data will only be revised to be consistent with the as-built condition if there is a large discrepancy. Any deviation from the mitigation plan post approval, including adjustments to credits, will require a submittal of a Mitigation Plan Addendum. This will be approved by the NC IRT.

Table 15. Apple Valley Project (ID-100063) - Mitigation Assets and Components

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Migitation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)			As-Built Footage or Acreage	Comments
AV1	1,574	1,437	Cold	R	1	1.00000				Full channel restoration, riparian planting, livestock exclusion, permanent conservation easement
Wetland W1	0.275	0.275	RNR	E		2.00000				Improved hydrology via P1 stream restoration, planting, livestock exclusion, permanent conservation easement
Wetland W2	0.013	0.013	RNR	E		2.00000				Improved hydrology via P1 stream restoration, planting, livestock exclusion, permanent conservation easement
Wetland W3	0	2.755	RNR	R		1.00000				Restored hydrology via P1 stream restoration, planting, livestock exclusion, ditch filling, permanent conservation easement

Project Credits

Restoration Level	Stream			Riparian Wetland		Non-rip Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riv		
Restoration			1,437.000				
Re-establishment				2.755			
Rehabilitation							
Enhancement				0.144			
Enhancement I							
Enhancement II							
Creation							
Preservation							
Totals			**1,437.000**	**2.899**			
Total Adjusted SMUs			**1,487.490***				

*Credit adjustment for Non-standard Buffer Width calculation using the Wilmington District Stream Buffer Credit Calculator issued by the USACE in January 2018. See section 6.6 for further information.

6.6 Credit Calculations for Non-Standard buffer Widths

To calculate functional uplift credit adjustments, the Wilmington District Stream Buffer Credit Calculator from the USACE in January 2018 was utilized. To perform this calculation, GIS analysis was performed to determine the area (in square feet) of ideal buffer zones and actual buffer zones around the Project stream. Minimum standard buffer widths are measured from the top of bank (50 feet in Piedmont and Coastal Plain counties or 30 feet in mountain counties). The ideal buffers are the maximum potential size (in square feet) of each buffer zone measured around the creditable stream reach, calculated using GIS, including areas outside of the easement. The actual buffer is the square feet in each buffer zone, as measured by GIS, excluding non-forested areas, all other credit type (e.g., wetland, nutrient offset, buffer), easement exceptions, open water, areas failing to meet the vegetation performance standard, etc. The stream length, mitigation type, ideal buffer, and actual buffer are all entered into the calculator. This data is processed, and the resulting credit amounts are totaled for the whole project. In conclusion, the Buffer Credit Calculator calculated a net gain of 50.49 credits; therefore, the total adjusted SMUs for the Project is 1,487.490 (**Table 1a, Figure 9**).

7 PERFORMANCE STANDARDS

The success criteria for the Project will follow the 2016 USACE Wilmington District Stream and Wetland Compensatory Mitigation Update and subsequent agency guidance. Specific success criteria components are presented below.

7.1 Stream Restoration Success Criteria

Bankfull Events

Four bankfull flow events must be documented within the seven-year monitoring period. The bankfull events must occur in separate years. Otherwise, the stream monitoring will continue until four bankfull events have been documented in separate years. A flow monitoring gauge will be installed on AV1.

Cross Sections

There should be little change in as-built cross sections. If changes do take place, they should be evaluated to determine if they represent a movement toward a less stable condition (for example down-cutting or erosion) or are minor changes that represent an increase in stability (for example settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross sections shall be classified using the Rosgen stream classification method, and all monitored cross sections should fall within the quantitative parameters defined for channels of the design stream type. Bank height ratio shall not exceed 1.2, and the entrenchment ratio shall be above 2.2 within restored riffle cross sections (for C and E streams). Channel stability should be demonstrated through a minimum of four bankfull events documented in the seven-year monitoring period.

Digital Image Stations

Digital images will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal images should not indicate the presence of developing bars within the channel or an excessive increase in channel depth. Lateral images should not indicate excessive erosion or continuing degradation of the banks over time. A series of images over time should indicate successional maturation of riparian vegetation.

7.2 Wetland Restoration Success Criteria

Hydrology

The NRCS provides a current WETS table for Henderson County upon which to base a normal rainfall amount and average growing season. The closest comparable data station was determined to be WETS station Hendersonville 1 NE in Hendersonville, NC (NRCS, n.d.). This station is located off 7th Avenue East near the intersection with Dana Road approximately 8 miles south-southwest of the proposed mitigation project. The growing season for Henderson County is 227 days long, extending from March 26 to November 8, and is based on a daily minimum temperature greater than 28 degrees Fahrenheit occurring in five of ten years (**Appendix B**).

Because of the surface roughing and shallow depressions, a range of hydroperiods with areas of seasonal inundation is expected. RES proposes a target hydroperiod of twelve percent (approximately 28 days) for the duration of the monitoring period.

Digital Image Stations

The visual assessments will include vegetation density, vigor, invasive species, and easement encroachments. Visual assessments of wetland success will include an area walkthrough and structure and gauge inspection. Digital images will be taken at fixed representative locations to record each monitoring event, as well as any noted problem areas or areas of concern. Results of visual monitoring will be presented in a plan view exhibit with a brief description of problem areas and digital images. A series of images over time should indicate successional maturation of wetland vegetation.

7.3 Vegetation Success Criteria

Specific and measurable success criteria for plant density within the wetland areas on the Project will follow IRT Guidance. The interim measures of vegetative success for the Project will be the survival of at least 320 planted three-year old trees per acre at the end of Year 3, 260 planted five-year old trees at six feet in height at the end of Year 5, and the final vegetative success criteria will be 210 trees per acre with an average height of eight feet at the end of Year 7. Volunteer trees will be counted, identified to species, and included in the yearly monitoring reports, but will not be counted towards vegetative success. Moreover, any single species can only account for up to 50 percent of the required number of stems within any vegetation plot. Any stems in excess of 50 percent will be shown in the monitoring table but will not be used to demonstrate success.

8 MONITORING PLAN

Annual monitoring data will be reported using the DMS Monitoring Report Template dated June 2017 and NC IRT monitoring template. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, research purposes, and assist in decision making regarding project close-out. Monitoring reports will be prepared annually and submitted to DMS. Monitoring of the Project will adhere to metrics and performance standards established by the USACE's April 2003 Wilmington District Stream Mitigation Guidelines and the NC IRT's October 2016 Wilmington District Stream and Wetland Compensatory Mitigation Update. **Table 16** outlines the links between project objectives and treatments and their associated monitoring metrics and performance standards within the context of functional uplift based on the Stream Functions Pyramid Framework. **Table 17** outlines the monitoring quantities and schedules for the Project. **Figure 10** is a monitoring map with locations for vegetation plots, wetland gauges, and crest gauges.

8.1 As-Built Survey

An as-built survey will be conducted following construction to document channel size, condition, and location, and monitoring gauge locations, following the 2016 IRT guidance. The survey will include a complete profile of thalweg, water surface, bankfull, and top of bank to compare with future geomorphic data. Longitudinal profiles will not be required in annual monitoring reports unless requested by USACE. Stream channel stationing will be marked with stakes placed near the top of bank every 200 feet.

8.2 Visual Monitoring

Visual monitoring of all mitigation areas will be conducted a minimum of twice per monitoring year by qualified individuals. The visual assessments will include vegetation density, vigor, invasive species, and easement encroachments. Visual assessments of stream stability will include a complete streamwalk and structure inspection. Digital images will be taken at fixed representative locations to record each monitoring event, as well as any noted problem areas or areas of concern. Results of visual monitoring will be presented in a plan view exhibit with a brief description of problem areas and digital images. Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal photos should indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral photos should not indicate excessive erosion or continuing degradation of the banks over time. A series of photos over time should indicate successional maturation of riparian vegetation.

8.3 Hydrology Events

One flow monitoring gauge will be installed to document the occurrence of bankfull events, and the gauge will be capable of tracking the frequency and duration of overbank events. Gauge data will be collected at least quarterly.

8.4 Cross Sections

Permanent cross sections will be installed at an approximate frequency of one per 20 bankfull widths with half in pools and half in riffle on the Project reach. Morphological data will be measured and recorded for all cross-sections; however, only riffle cross sections will include bank height ratio and entrenchment ratio measurements. Cross sections will be monitored in Years 1, 2, 3, 5, and 7.

8.5 Hydroperiod Monitoring

Wetland hydrology will be monitored to document hydric conditions in the wetland re-establishment areas. This will be accomplished with automatic recording pressure transducer gauges installed in representative

locations across the re-establishment areas (**Figure 10**). Three existing gauges will be augmented with five more after construction. The current existing wetland gauge, AW2, will be moved once construction is complete. The gauges will be downloaded quarterly and wetland hydroperiods will be calculated during the growing season. Gauge installation will follow current NCIRT guidance. Visual observations of primary and secondary wetland hydrology indicators will also be recorded during quarterly Project visits.

8.6 Vegetation Monitoring

Vegetation monitoring plots will be a minimum of 0.02 acres in size and cover a minimum of two percent of the planted area (Peet, Wentworth, and White, 1998; USACE, 2016). There will be five plots within the planted area (6.09 acres; **Figure 10**). Plots will be a mixture of fixed and random plots, with four fixed plots and one random plot. Planted area indicates all area in the easement that will be planted with trees. Existing wooded areas are not included in the planted area. The following data will be recorded for all trees in the fixed plots: species, height, planting date (or volunteer), and grid location. For random plots, species and height will be recorded for all woody stems. The location (GPS coordinates and orientation) of the random plots will be identified in the annual monitoring reports. Vegetation will be planted and plots established at least 180 days prior to the initiation of the first year of monitoring. Monitoring will occur in Years 1, 2, 3, 5, and 7 between July 1st and leaf drop. Invasive and noxious species will be monitored so that none become dominant or alter the desired community structure of the Project. If necessary, RES will develop a species-specific treatment plan.

8.7 Scheduling/Reporting

A baseline monitoring report and as-built drawings documenting stream and wetland restoration activities will be developed within 60 days of the planting completion on the Project. The report will include all information required by DMS mitigation plan guidelines, including elevations, photographs and sampling plot locations, gauge locations, a description of the fencing, description of the signage, and a description of initial species composition by community type. The report will also include a list of the species planted and the associated densities. Baseline vegetation monitoring will include species, height, date of planting, and grid location of each stem. The baseline report will follow DMS As-Built Baseline Monitoring Report Template June 2017, USACE guidelines, and the October 2017 Mitigation Credit Calculation Memo.

The monitoring program will be implemented to document system development and progress toward achieving the success criteria. The restored stream morphology and wetland hydrology will be assessed to determine the success of the mitigation. The monitoring program will be undertaken for seven years or until the final success criteria are achieved, whichever is longer.

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to DMS. The monitoring reports will include all information and be in the format required by USACE.

Table 16. Monitoring Requirements

Level	Treatment	Objective	Monitoring Metric	Performance Standard
1 *Hydrology*	Convert land-use of Project reach from pasture to riparian forest	Improve the transport of water from the watershed to the Project reach in a non-erosive way	NA	NA
2 *Hydraulic*	Reduce bank height ratios and increase entrenchment ratios by reconstructing the channel to mimic reference reach conditions	Improve flood bank connectivity by reducing bank height ratios and increase entrenchment ratios	Pressure transducer flow monitoring gauge: Inspected quarterly	Four bankfull events occurring in separate years
			Cross sections: Surveyed in Years 1, 2, 3, 5 and 7	Entrenchment ratio shall be above 2.2 within the restored reach (C and E)
				Bank height ratio shall not exceed 1.2
3 *Geomorphology*	Establish a riparian buffer to reduce erosion and sediment transport into the project stream. Establish stable banks with livestakes, erosion control matting, and other in stream structures.	Reduce erosion rates and channel stability to reference reach conditions Improve bedform diversity (pool spacing, percent riffles, etc. Increase buffer width to 30 feet	As-built stream profile	NA
			Cross sections: Surveyed in Years 1, 2, 3, 5 and 7	Entrenchment ratio shall be no less than 2.2 within restored the reach
				Bank height ratio shall not exceed 1.2
			Visual monitoring: Performed at least semiannually	Identify and document significant stream problem areas; i.e. erosion, degradation, aggradation, etc.
			Vegetation plots: Surveyed in Years 1, 2, 3, 5 and 7	MY 1-3: 320 trees/acre MY 5: 260 trees/acre (6 ft tall) MY 7: 210 trees/acre (8 ft tall)
4 *Physicochemical*	Exclude livestock from riparian areas with exclusion fence or conservation easement, and plant a riparian buffer	*Unmeasurable Objective/Expected Benefit* Establish native hardwood riparian buffer and exclude livestock.	Vegetation plots: Surveyed in Years 1, 2, 3, 5 and 7 (*indirect measurement*)	MY 1-3: 320 trees/acre MY 5: 260 trees/acre (6 ft tall) MY 7: 210 trees/acre (8 ft tall)
			Visual assessment of established fencing and conservation signage: Performed at least semiannually (*indirect measurement*)	Inspect fencing and signage. Identify and document any damaged or missing fencing and/or signs

Table 17. Monitoring Quantities and Schedules

Parameter	Quantity	Frequency	Notes
Pattern	1 project reach	Baseline	Additional surveys will be performed upon request by USACE
Dimension	8 cross sections	Baseline, Monitoring years 1, 2, 3, 5, and 7	Surveyed cross sections will be split between riffles and pools
Profile	1 project reach	Baseline	Additional surveys will be performed upon request by USACE
Surface Water Hydrology	1 flow monitoring gauge	Annual	A pressure transducer gauge will be installed on-site; the device will be inspected on a quarterly basis to document the occurrence of bankfull events
Groundwater Hydrology	6 groundwater monitoring wells	Annual	Pressure transducers will be installed on-site; the devices will be inspected on a quarterly basis to document wetland hydroperiods
Vegetation	4 fixed vegetation plots and 1 random plot	Monitoring years 1, 2, 3, 5, and 7	Vegetation will be monitored per IRT guidelines
Exotic and Nuisance Vegetation	N/A	Annual	Locations of exotic and nuisance vegetation will be mapped
Project Boundary	N/A	Semi-annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped
Stream Visual	N/A	Annual	Semi-annual visual assessments

9 ADAPTIVE MANAGEMENT PLAN

In the event the mitigation site or a specific component of the mitigation site fails to achieve the necessary performance standards as specified in the mitigation plan, the sponsor shall notify the members of the IRT and work with the IRT to develop contingency plans and remedial actions.

10 LONG-TERM MANAGEMENT PLAN

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

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

11 REFERENCES

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Figures List

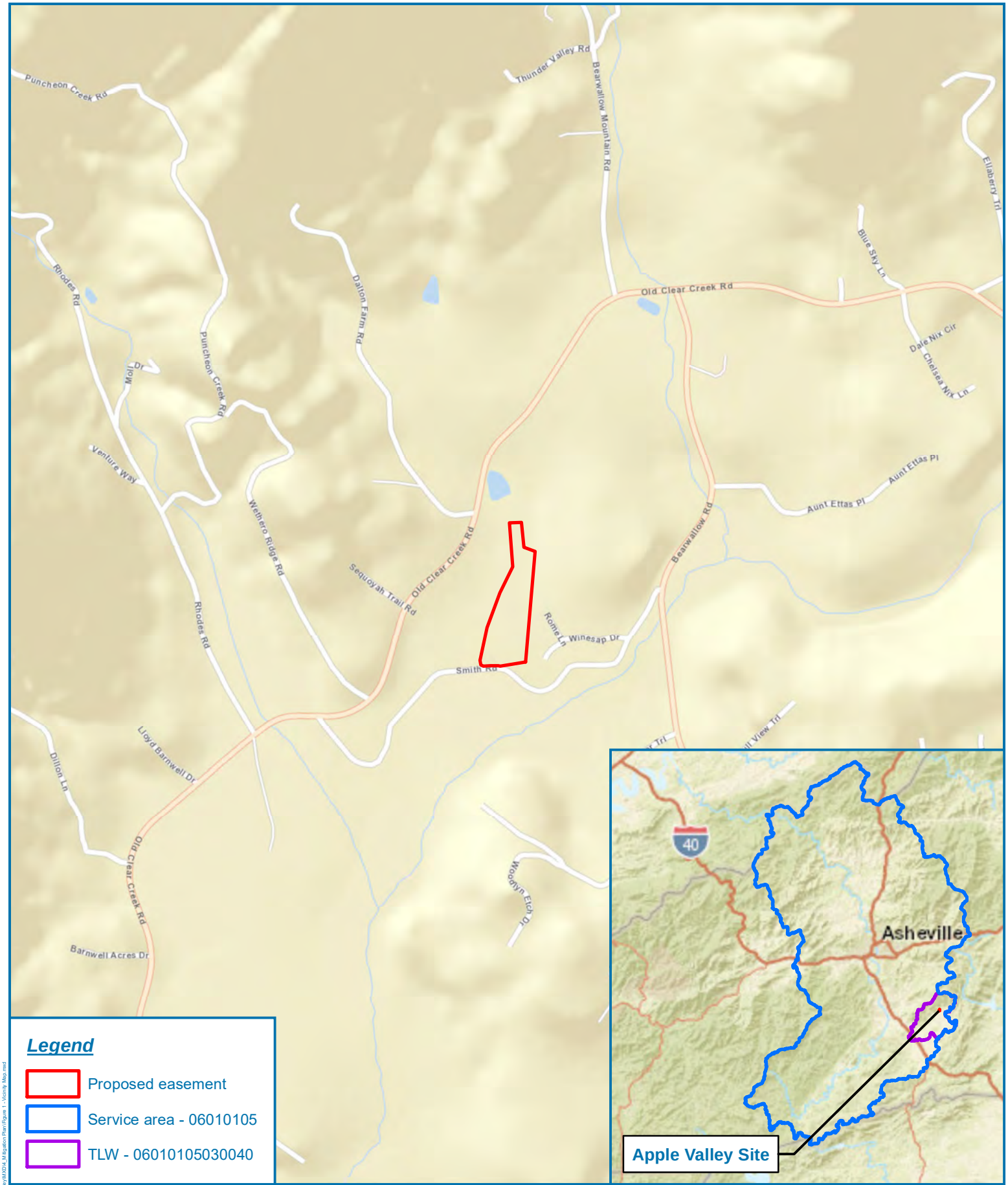


Figure 1 - Project Vicinity

Apple Valley Project

Henderson County, North Carolina

Date:	5/7/2019
Drawn by:	SCF
Checked by:	JRM
	1 inch = 1,000 feet

res

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\4_Mitigation Plan\Figure 1 - Vicinity Map.mxd

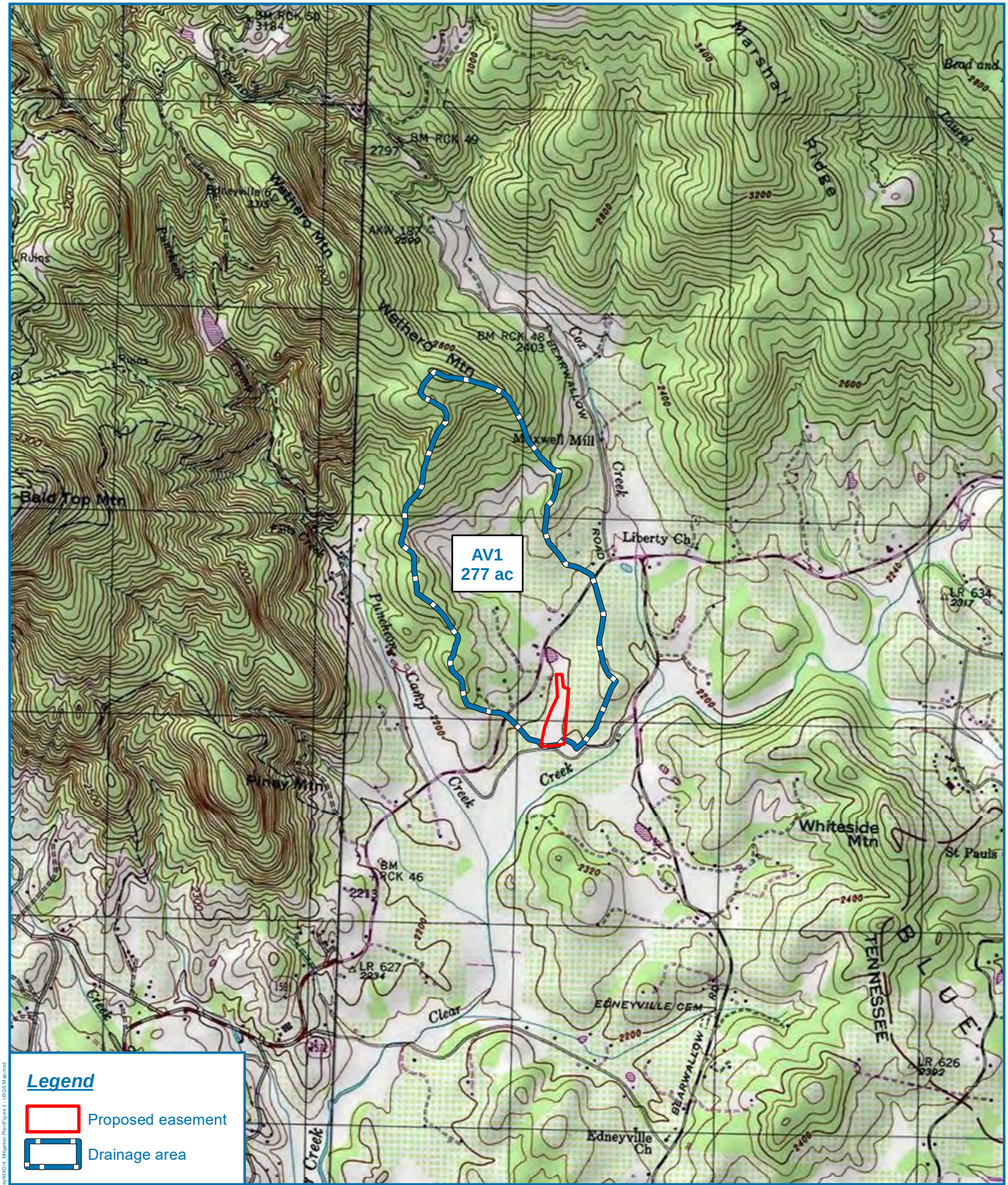


Figure 2 - USGS Quadrangle
Bat Cave (1970)
Apple Valley Project
Henderson County, North Carolina

Date: 7/12/2019
Drawn by: SCF
Checked by: JRM
1 inch = 2,000 feet

res

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\4_Mitigation Plan\Figure 2 - USGS Map.mxd

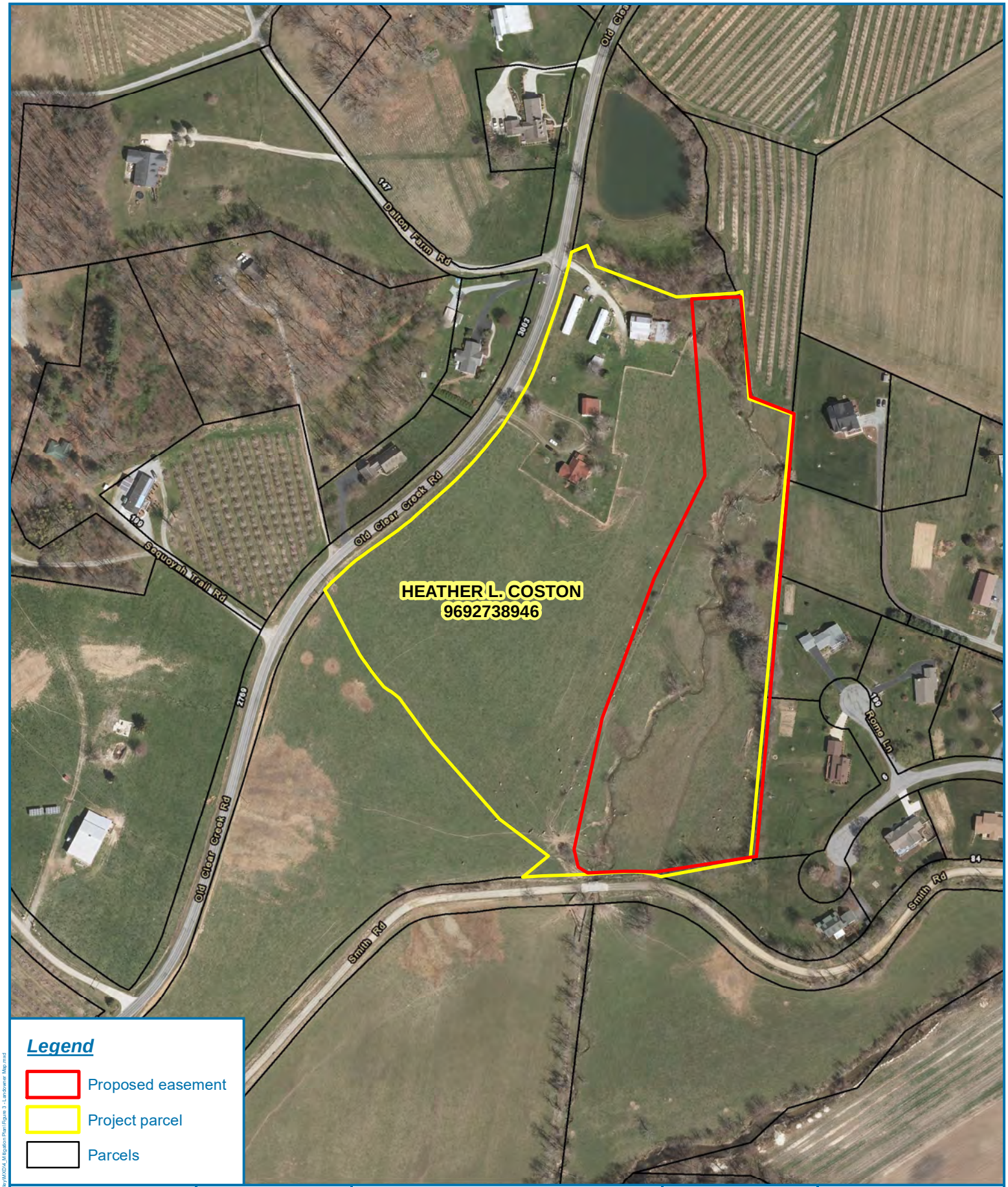


Figure 3 - Landowner Parcel

Apple Valley Project

Henderson County, North Carolina

Date:	5/7/2019
Drawn by:	SCF
Checked by:	JRM
	1 inch = 250 feet

res

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\4_Mitigation Plan\Figure 3 - Landowner Map.mxd

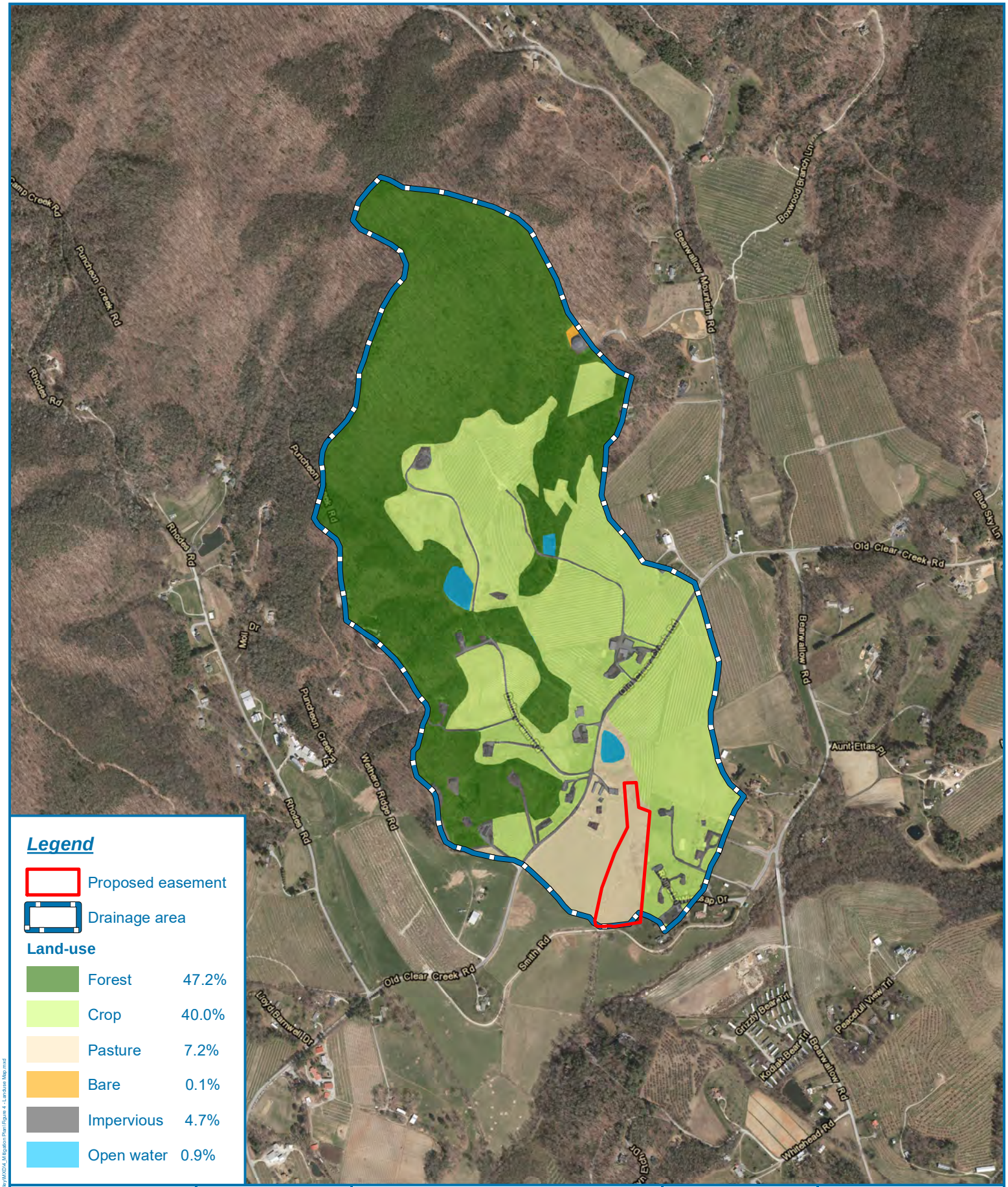


Figure 4 - Land-use

Apple Valley Project

Henderson County, North Carolina

Date: 5/7/2019

Drawn by: SCF

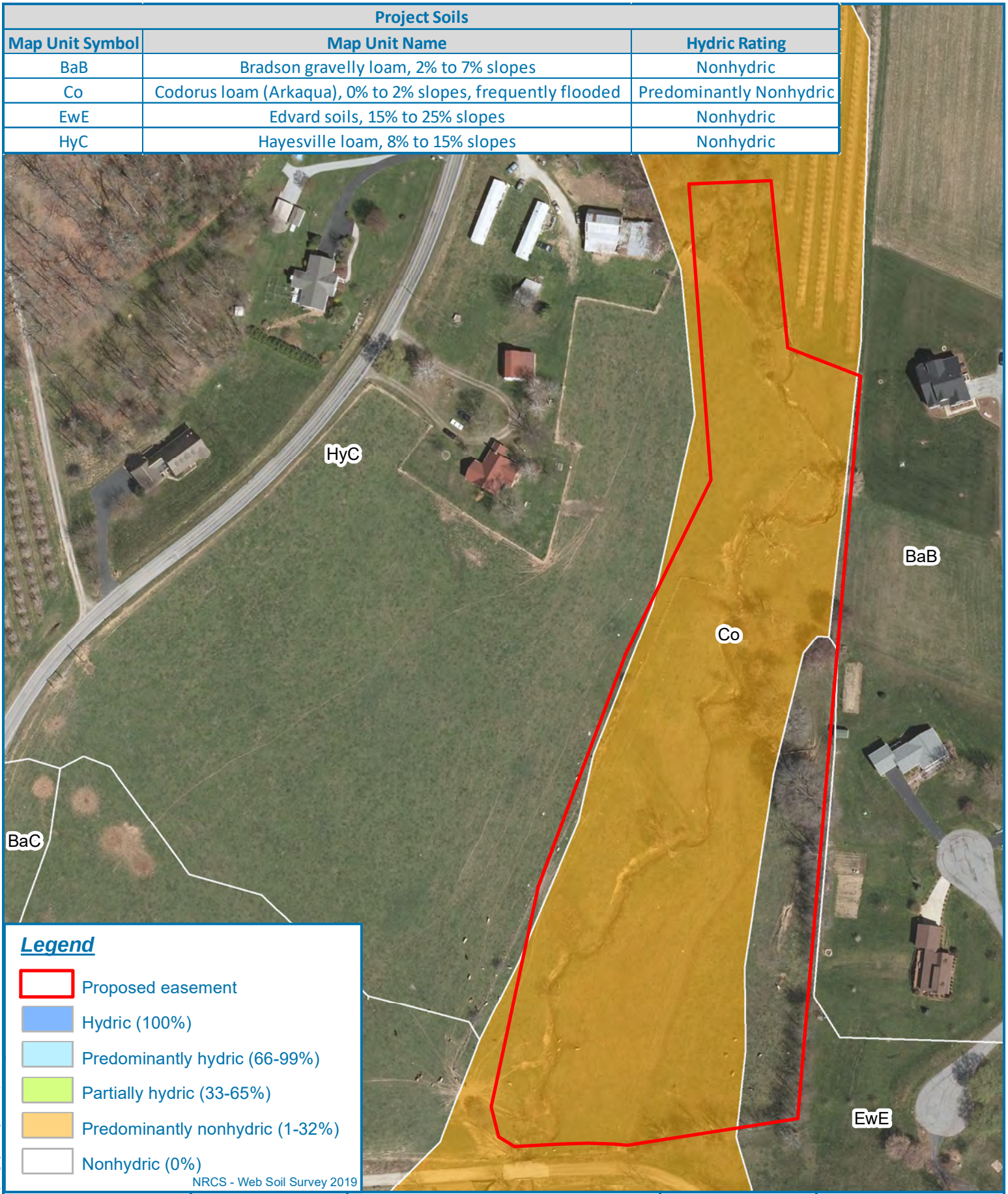
Checked by: JRM

1 inch = 1,000 feet

res

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\4_Mitigation Plan\Figure 4 - Landuse Map.mxd

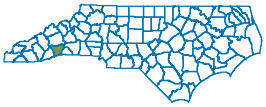
Project Soils		
Map Unit Symbol	**Map Unit Name**	**Hydric Rating**
BaB	Bradson gravelly loam, 2% to 7% slopes	Nonhydric
Co	Codorus loam (Arkaqua), 0% to 2% slopes, frequently flooded	Predominantly Nonhydric
EwE	Edvard soils, 15% to 25% slopes	Nonhydric
HyC	Hayesville loam, 8% to 15% slopes	Nonhydric



Legend

- Proposed easement
- Hydric (100%)
- Predominantly hydric (66-99%)
- Partially hydric (33-65%)
- Predominantly nonhydric (1-32%)
- Nonhydric (0%)

NRCS - Web Soil Survey 2019



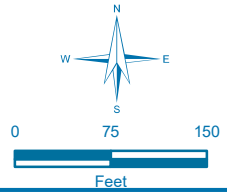


Figure 5 - Mapped Soils

Apple Valley Project

Henderson County, North Carolina

Date: 5/7/2019

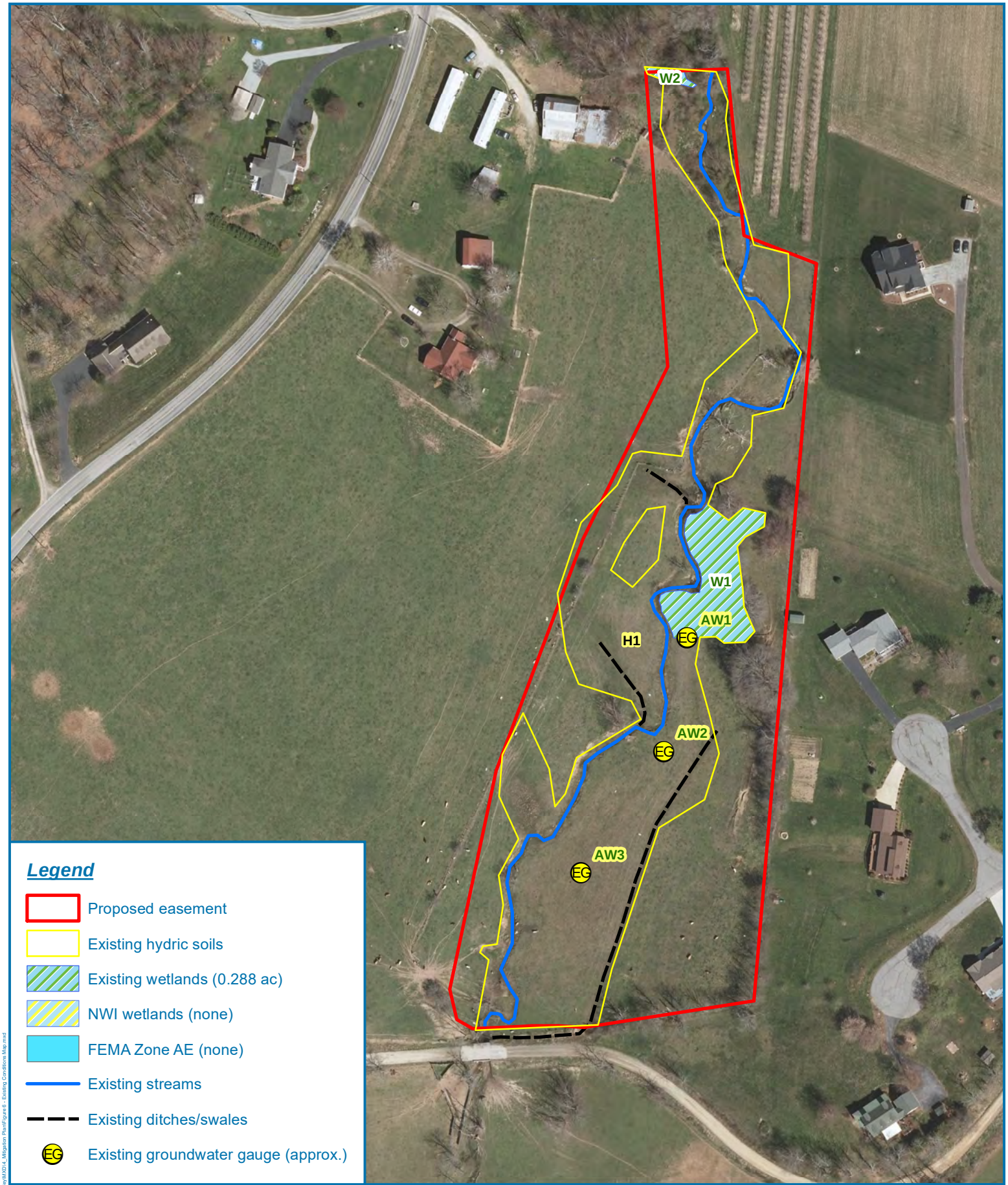
Drawn by: SCF

Checked by: JRM

1 inch = 150 feet

res

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\4_Mitigation Plan\Figure 5 - Soils Map.mxd



Legend

- Proposed easement
- Existing hydric soils
- Existing wetlands (0.288 ac)
- NWI wetlands (none)
- FEMA Zone AE (none)
- Existing streams
- Existing ditches/swales
- EG Existing groundwater gauge (approx.)

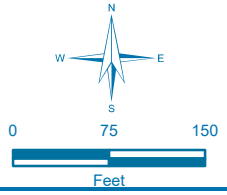


Figure 6 - Existing Conditions

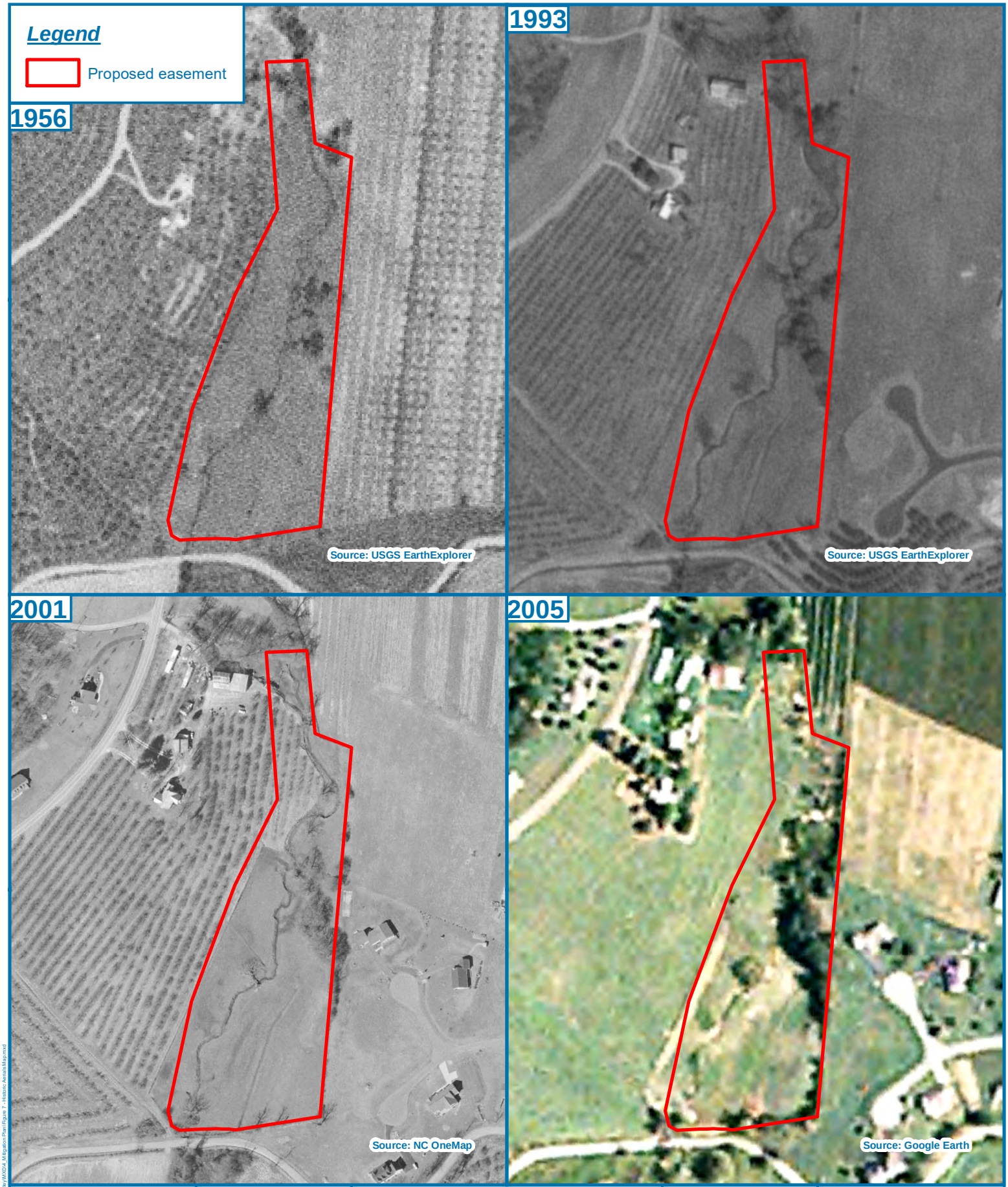
Apple Valley Project

Henderson County, North Carolina

Date:	7/18/2019
Drawn by:	SCF
Checked by:	JRM
	1 inch = 150 feet

res

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\4_Mitigation Plan\Figure 6 - Existing Conditions Map.mxd



N
W E
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Feet

Figure 7 - Historical Conditions

Apple Valley Project

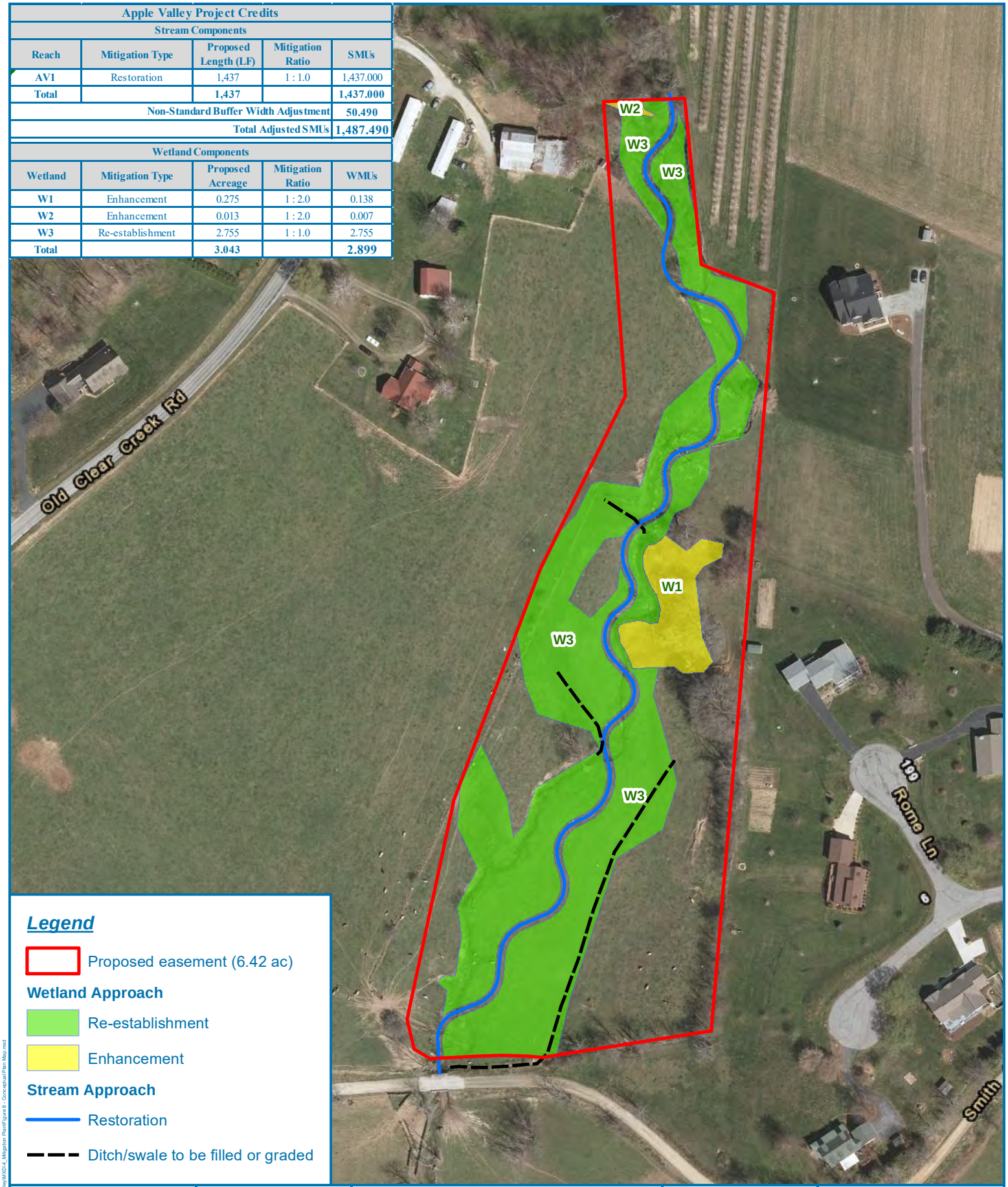
Henderson County, North Carolina

Date:	5/7/2019
Drawn by:	SCF
Checked by:	JRM
	1 inch = 300 feet

res

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\4_Mitigation Plan\Figure 7 - Historic Aerials Map.mxd

Apple Valley Project Credits				
Stream Components				
Reach	**Mitigation Type**	**Proposed Length (LF)**	**Mitigation Ratio**	**SMUs**
AV1	Restoration	1,437	1 : 1.0	1,437.000
Total		**1,437**		**1,437.000**
			Non-Standard Buffer Width Adjustment	**50.490**
			Total Adjusted SMUs	**1,487.490**
Wetland Components				
Wetland	**Mitigation Type**	**Proposed Acreage**	**Mitigation Ratio**	**WMUs**
W1	Enhancement	0.275	1 : 2.0	0.138
W2	Enhancement	0.013	1 : 2.0	0.007
W3	Re-establishment	2.755	1 : 1.0	2.755
Total		**3.043**		**2.899**



Legend

- Proposed easement (6.42 ac)

Wetland Approach

- Re-establishment
- Enhancement

Stream Approach

- Restoration
- Ditch/swale to be filled or graded

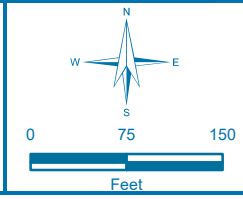


Figure 8 - Conceptual Design Plan

Apple Valley Project

Henderson County, North Carolina

Date: 11/20/2019

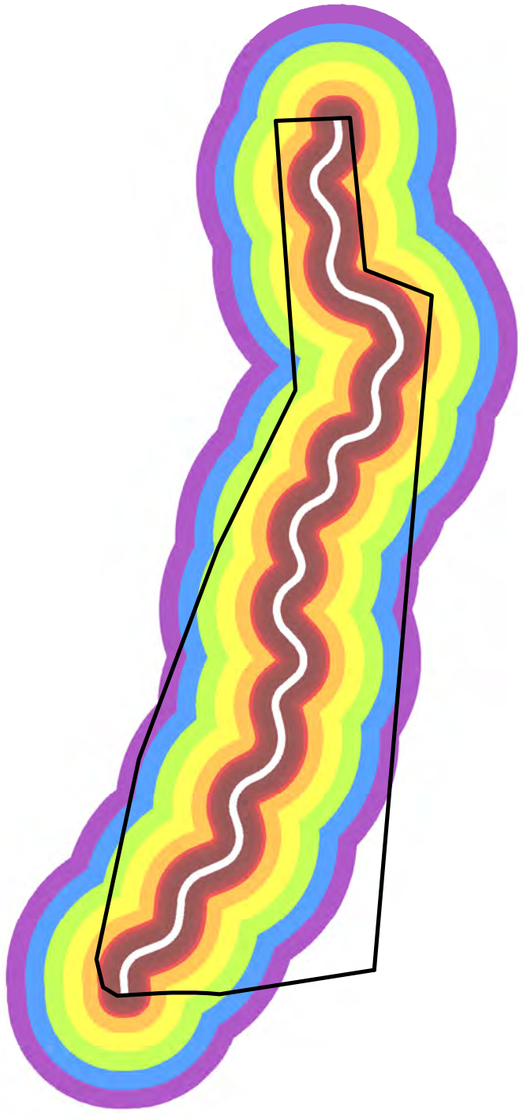
Drawn by: SCF

Checked by: JRM

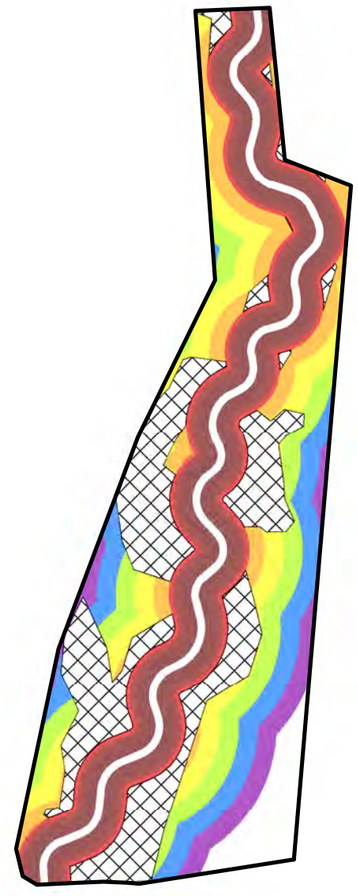
1 inch = 150 feet

res

Ideal Buffers



Actual Buffers



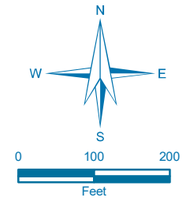


Figure 9 - Buffer Width Zones

Apple Valley Project

Henderson County, North Carolina

Date: 5/7/2019	Drawn by: SCF
Checked by: JRM	1 in = 200 feet

Legend

- Proposed easement
- Ineligible area

Buffer Zone (ft)

- 15
- 20
- 25
- 30
- 50
- 75
- 100
- 125
- 150

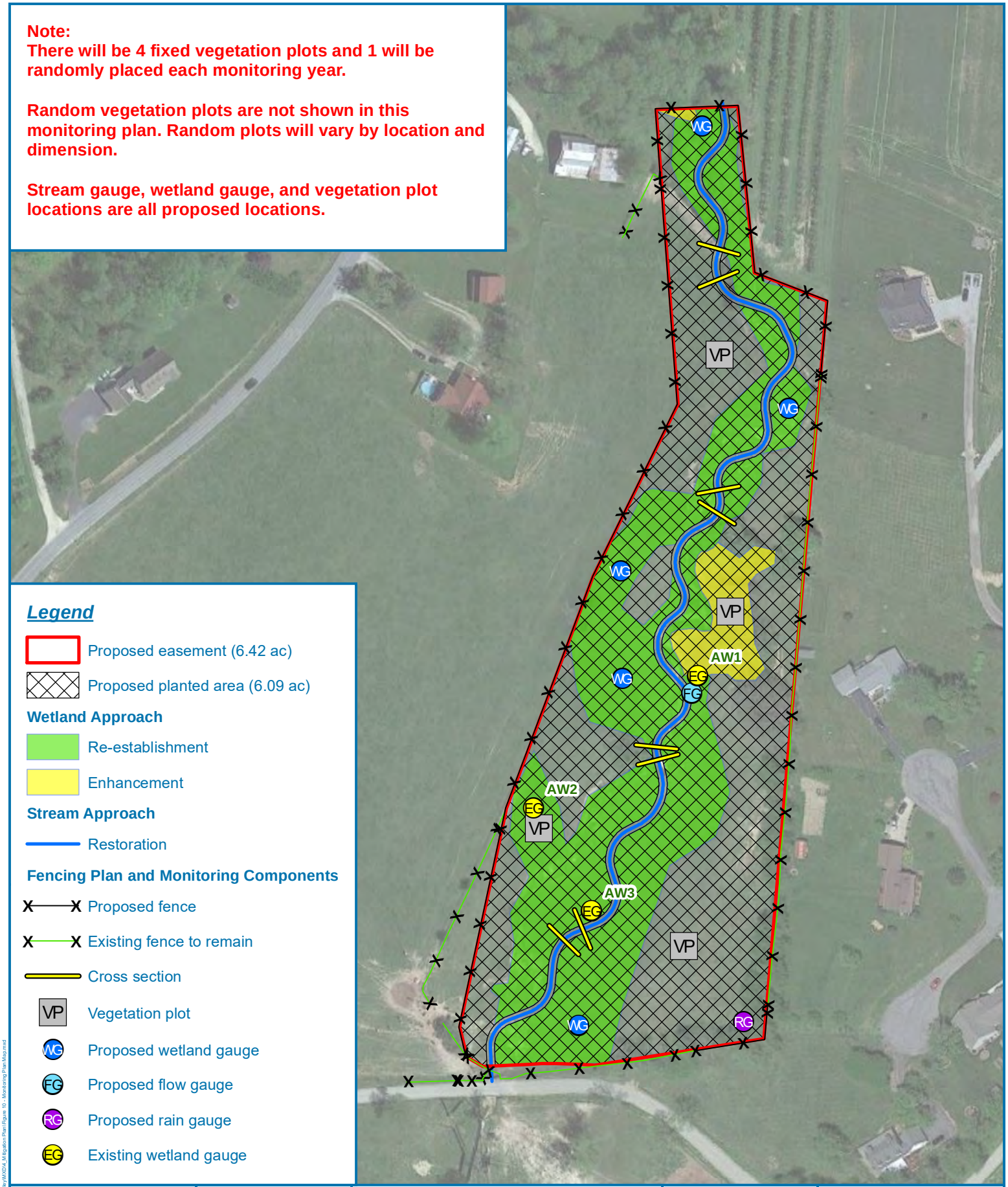
Buffer Width Zone (feet from Ordinary High Water Mark)									
Buffer Zones	less than 15 feet	>15 to 20 feet	>20 to 25 feet	>25 to 30 feet	>30 to 50 feet	>50 to 75 feet	>75 to 100 feet	>100 to 125 feet	>125 to 150 feet
Max Possible Buffer (square feet)	43,110	14,370	14,370	14,370	57,480	71,850	71,850	71,850	71,850
Ideal Buffer (square feet)	**44,100**	**15,012**	**15,162**	**15,295**	**61,972**	**78,452**	**80,499**	**83,479**	**86,775**
Actual Buffer (square feet)	**42,962**	**14,103**	**14,020**	**13,760**	**20,058**	**24,263**	**24,222**	**22,169**	**12,685**
Zone Multiplier	50%	20%	15%	15%	9%	7%	6%	5%	3%
Buffer Credit Equivalent	719	287	216	216	129	101	86	72	43
Percent of Ideal Buffer	97%	94%	92%	90%	32%	31%	30%	27%	15%
Credit Adjustment	-19	-17	-16	-22	42	31	26	19	6

Total Baseline Credit	Credit Loss in Required Buffer	Credit Gain for Additional Buffer	Net Change in Credit from Buffers	Total Credit
1,437.000	-73.805	124.295	50.490	1,487.490

Note:
There will be 4 fixed vegetation plots and 1 will be randomly placed each monitoring year.

Random vegetation plots are not shown in this monitoring plan. Random plots will vary by location and dimension.

Stream gauge, wetland gauge, and vegetation plot locations are all proposed locations.



Legend

- Proposed easement (6.42 ac)
- Proposed planted area (6.09 ac)

Wetland Approach

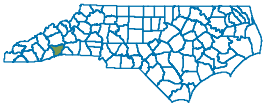
- Re-establishment
- Enhancement

Stream Approach

- Restoration

Fencing Plan and Monitoring Components

- Proposed fence
- Existing fence to remain
- Cross section
- VP — Vegetation plot
- WG — Proposed wetland gauge
- FG — Proposed flow gauge
- RG — Proposed rain gauge
- EG — Existing wetland gauge



N
W E
S

0 75 150
Feet

Figure 10 - Monitoring Plan

Apple Valley Project

Henderson County, North Carolina

Date: 11/26/2019

Drawn by: SCF

Checked by: JRM

1 inch = 150 feet

res

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MX004_Mitigation Plan\Figure 10 - Monitoring Plan Map.mxd

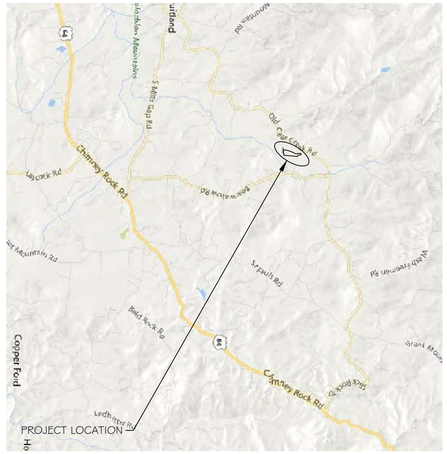
Appendix A - Plan Sheets

APPLE VALLEY PROJECT

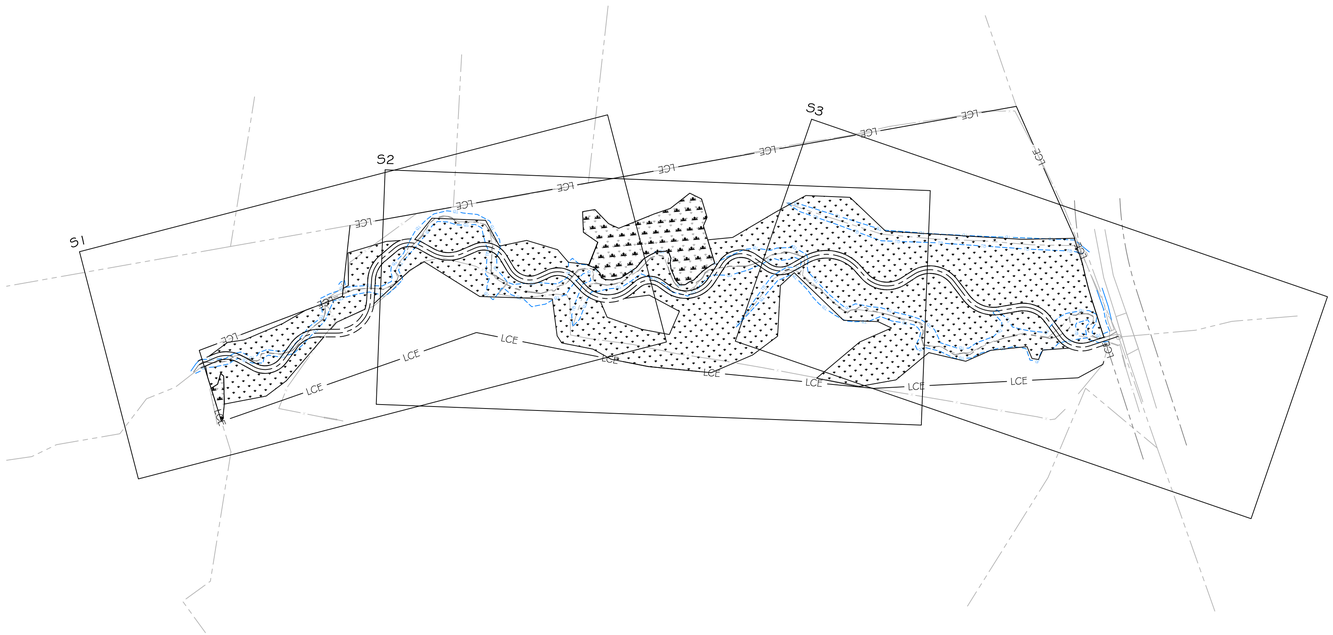
HENDERSON COUNTY, NORTH CAROLINA

FRENCH BROAD RIVER BASIN: HUC 06010105
NOVEMBER 2019

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST, SUITE 110
RALEIGH, NC 27605



VICINITY MAP
NTS



SITE MAP
NTS

Sheet List Table	
Sheet Number	Sheet Title
-	COVER
A1	OVERALL AERIAL
E1	NOTES
E2	EXISTING CONDITIONS
S1	REACH AV1
S2	REACH AV1
S3	REACH AV1
W1	WETLAND PLAN
P1	PLANTING PLAN
F1	FENCING PLAN
D1	DETAILS
D2	DETAILS
D3	DETAILS
D4	DETAILS

DMS PROJECT #: 100063
CONTRACT #: 7531
USACE ACTION ID #: SAW-2018-01150
RFP #: 16-007334

res
302 Jefferson Street, Suite 110
Raleigh, NC 27605
Main: 919.829.9909
www.res.us

Engineering Services Provided By:
Angler Environmental LLC
License: F-1428

SEAL

PLOT DATE: 11/D22/2019

REVISIONS:

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER:

-

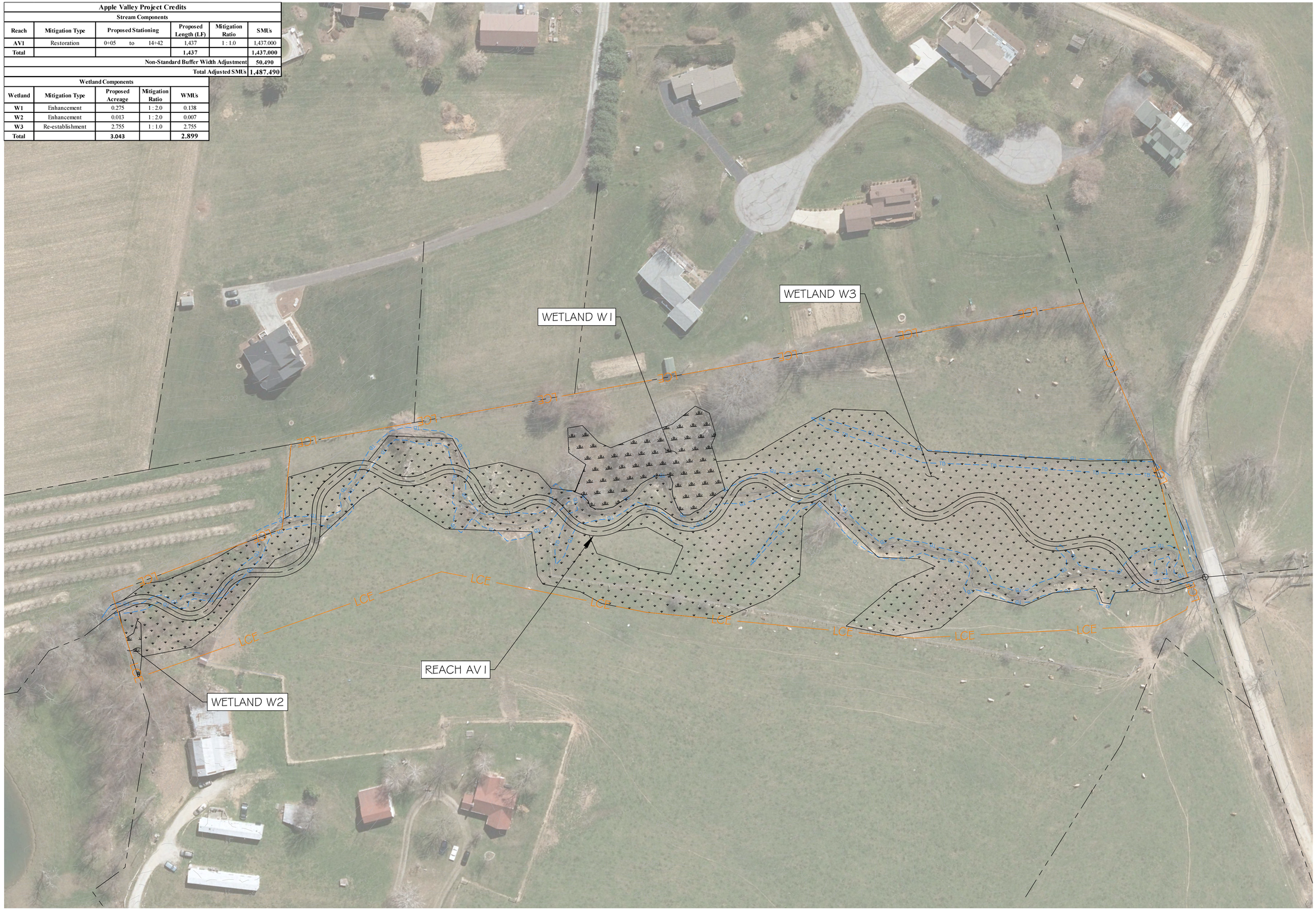
Apple Valley Project Credits

Stream Components

Reach	Mitigation Type	Proposed Stationing	Proposed Length (LF)	Mitigation Ratio	SMUs
AV1	Restoration	0+05 to 14+42	1,437	1 : 1.0	1,437.000
Total			1,437		1,437.000
				Non-Standard Buffer Width Adjustment	50.490
				Total Adjusted SMUs	1,487.490

Wetland Components

Wetland	Mitigation Type	Proposed Acreage	Mitigation Ratio	WMUs
W1	Enhancement	0.275	1 : 2.0	0.138
W2	Enhancement	0.013	1 : 2.0	0.007
W3	Re-establishment	2.755	1 : 1.0	2.755
Total		3.043		2.899



FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_SITE.dwg SAVED BY: Stasking

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Engineering Services Provided By:
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License: F-1428

SEAL

FULL SCALE: 1"=50

0 50 100

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
11/22/2019

REVISIONS:

RELEASED FOR:
PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME:
APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

DRAWING TITLE:
OVERALL AERIAL

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER:

A1

STREAM CONSTRUCTION NOTES:

1. ALL PROPOSED CHANNELS AND TEMPORARY AND PERMANENT CROSSINGS SHALL BE CONSTRUCTED IN A DRY CONDITION VIA OFFLINE CONSTRUCTION WHERE POSSIBLE. PUMP AROUND OPERATIONS SHOULD BE LIMITED TO AREAS WHERE THE EXISTING AND PROPOSED CHANNEL ALIGNMENTS OVERLAP.
2. ALL IMPERVIOUS DIKES AND PUMPING APPARATUS SHALL BE REMOVED FROM THE STREAM AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL UNLESS OTHERWISE APPROVED BY THE ENGINEER. WITH APPROVAL, A PUMP AROUND MAY BE ALLOWED TO RUN CONTINUOUSLY IF THERE IS NO FORECAST FOR RAIN OVERNIGHT, AND/OR THE PUMP APPARATUS IS MAINTAINED AND MONITORED CONTINUOUSLY.
3. EXISTING WETLANDS CANNOT BE ENCROACHED UPON UNDER ANY CIRCUMSTANCES IF NOT APPROVED AS DESIGNATED IMPACT AREAS. HIGH VISIBILITY FENCING MUST BE PLACED AROUND ALL EXISTING WETLANDS THAT ARE LOCATED ADJACENT TO CONSTRUCTION ACTIVITIES AND/OR ARE LOCATED WITHIN THE PROPOSED CONSERVATION EASEMENT.
4. REMOVE AND STOCKPILE TOPSOIL WITHIN AREAS THAT ARE TO BE CUT 9" OR MORE BELOW EXISTING GRADE. STOCKPILED TOPSOIL IS TO BE PLACED ALONG THE FLOODPLAIN BENCHES.
5. STRUCTURES ARE TO BE INSTALLED IN LOCATIONS SHOWN ON PLAN SHEETS (AS INDICATED ON THE STRUCTURE TABLES) USING METHODS DESCRIBED IN THE DETAIL SHEETS. PRIOR TO FINE GRADING, OBTAIN APPROVAL OF THE ENGINEER ON INSTALLATION OF STRUCTURES.
6. NATIVE SUBSTRATE MATERIAL SHALL BE TAKEN FROM THE EXISTING CHANNEL AND INSTALLED ON THE PROPOSED BED OF SHALLOW/RIFFLE CHANNEL SECTIONS PER THE TYPICAL RIFFLE DETAIL.
7. DURING STREAM CONSTRUCTION ACTIVITIES, THE WORK AREA SHALL BE STABILIZED AT THE END OF EACH WORKING DAY.

STREAM CONSTRUCTION SEQUENCE:

1. CONDUCT PRE-CONSTRUCTION MEETING INCLUDING OWNER, ENGINEER, ASSOCIATED CONTRACTORS, HENDERSON CO. EROSION CONTROL PERSONNEL, AND OTHER AFFECTED PARTIES. CONTACT HENDERSON CO. EROSION CONTROL PERSONNEL AT 828-694-6521.
2. OBTAIN EROSION CONTROL PERMIT FROM HENDERSON CO. AND ALL OTHER APPROVALS NECESSARY TO BEGIN AND COMPLETE THE PROJECT.
3. CONTRACTOR IS FULLY RESPONSIBLE FOR CONTACTING ALL APPROPRIATE PARTIES AND ASSURING THAT UTILITIES ARE LOCATED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. CALL NC ONE-CALL (PREVIOUSLY ULOCO) AT 1-800-632-4949 FOR UTILITY LOCATING SERVICES 48 HOURS PRIOR TO COMMENCEMENT OF ANY WORK. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
4. PRIOR TO CONSTRUCTION, STABILIZED GRAVEL ENTRANCE/EXIT AND ROUTES OF INGRESS AND EGRESS SHALL BE ESTABLISHED AS SHOWN ON THE PLANS AND DETAILS. MAINTAIN EXISTING DRIVEWAY OVERTOPPING ELEVATION / PROFILE.
5. PREPARE STAGING AND STOCKPILING AREAS IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS OR AS APPROVED BY THE ENGINEER. ANY EXCESS SPOIL FROM STREAM CONSTRUCTION SHALL BE USED TO CONSTRUCT CHANNEL PLUGS AS SHOWN ON PLANS.
6. INSTALL PUMP AROUND APPARATUS AND IMPERVIOUS DIKES AT UPSTREAM END OF PROJECT. AS CONSTRUCTION PROGRESSES, MOVE PUMP AROUND OPERATION DOWNSTREAM. (SEE DETAILS ON SHEET D1)
7. INSTALL SILT FENCE, TEMPORARY CROSSINGS AND ALL OTHER EROSION CONTROL MEASURES AS SHOWN ON PLANS.
8. CONSTRUCT UPSTREAM PORTION OF THE CHANNEL FIRST, WORKING IN AN UPSTREAM TO DOWNSTREAM DIRECTION, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
9. ROUGH GRADING OF CHANNEL SHALL BE PERFORMED PRIOR TO INSTALLATION OF STRUCTURES.
10. INSTALL STRUCTURES AS SHOWN ON PLANS AND DETAILS. PRIOR TO FINE GRADING, OBTAIN APPROVAL OF THE ENGINEER ON INSTALLATION OF STRUCTURES.
11. UPON COMPLETION OF FINE GRADING, INSTALL EROSION CONTROL MATTING OR SOD MATS ALONG CHANNEL BANKS.
12. FILL AND STABILIZE ABANDONED SEGMENTS OF THE EXISTING CHANNEL AS SHOWN ON PLAN AND DETAILS, OR PER DIRECTION OF THE ENGINEER.
13. INSTALL LIVE STAKE, BARE ROOT, AND CONTAINERIZED PLANTINGS AS SPECIFIED ON THE PLANTING PLAN AND DETAILS.

LEGEND

- EXISTING CONTOUR MAJOR — 50 —
- EXISTING CONTOUR MINOR
- PROPOSED CONTOUR MAJOR 50
- PROPOSED CONTOUR MINOR
- EXISTING WETLAND
- EXISTING STREAM
- EXISTING TOP OF BANK TB
- EXISTING BOTTOM OF BANK BB
- PROPERTY LINE
- EXISTING FENCELINE x
- EXISTING TREELINE
- PROPOSED TOP OF BANK
- PROPOSED CENTERLINE OF CHANNEL
- LIMITS OF PROPOSED CONSERVATION EASEMENT LCE
- PROPOSED CHANNEL PLUG (SEE DETAIL D2)
- EXISTING TREE
- TOE PROTECTION (SEE DETAIL D3)
- RIFFLE GRADE CONTROL (SEE DETAIL D4)
- LOG SILL (SEE DETAIL D3)
- ROCK CROSS VANE (SEE DETAIL D4)
- LOG STRUCTURE (PROFILE)
- ROCK STRUCTURE (PROFILE)

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PLOT DATE: 11/22/2019

REVISIONS:

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

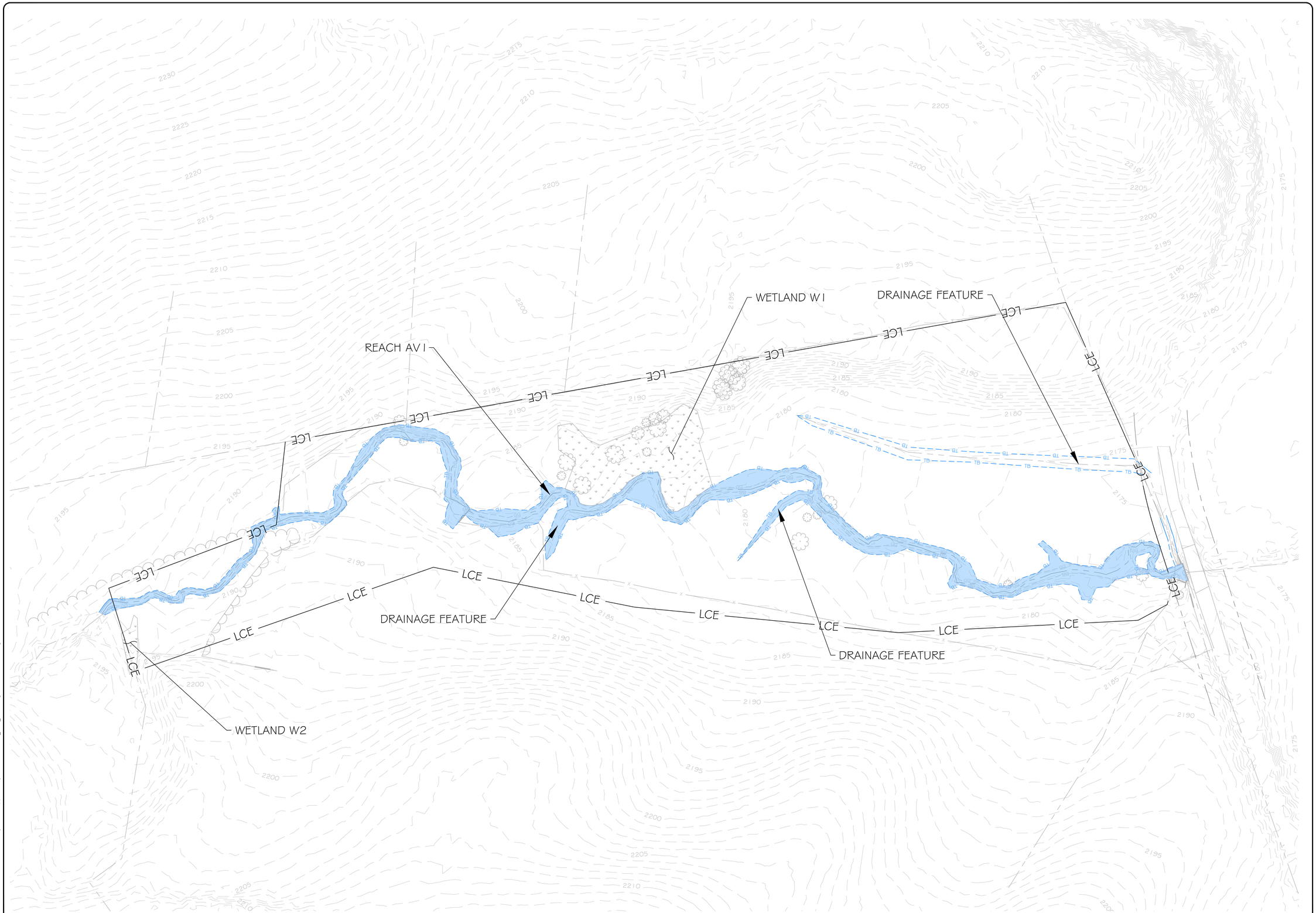
PROJECT NAME: APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

DRAWING TITLE: NOTES

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER: E1

FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_SITE.dwg SAVED BY: Stasking



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SEAL

FULL SCALE: 1"=50

0 50 100

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1" = HALF SCALE

PLOT DATE:
11/22/2019

REVISIONS:

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PROJECT NAME:
APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

DRAWING TITLE:
EXISTING CONDITIONS

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
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CHECKED:	AFM

SHEET NUMBER:

E2

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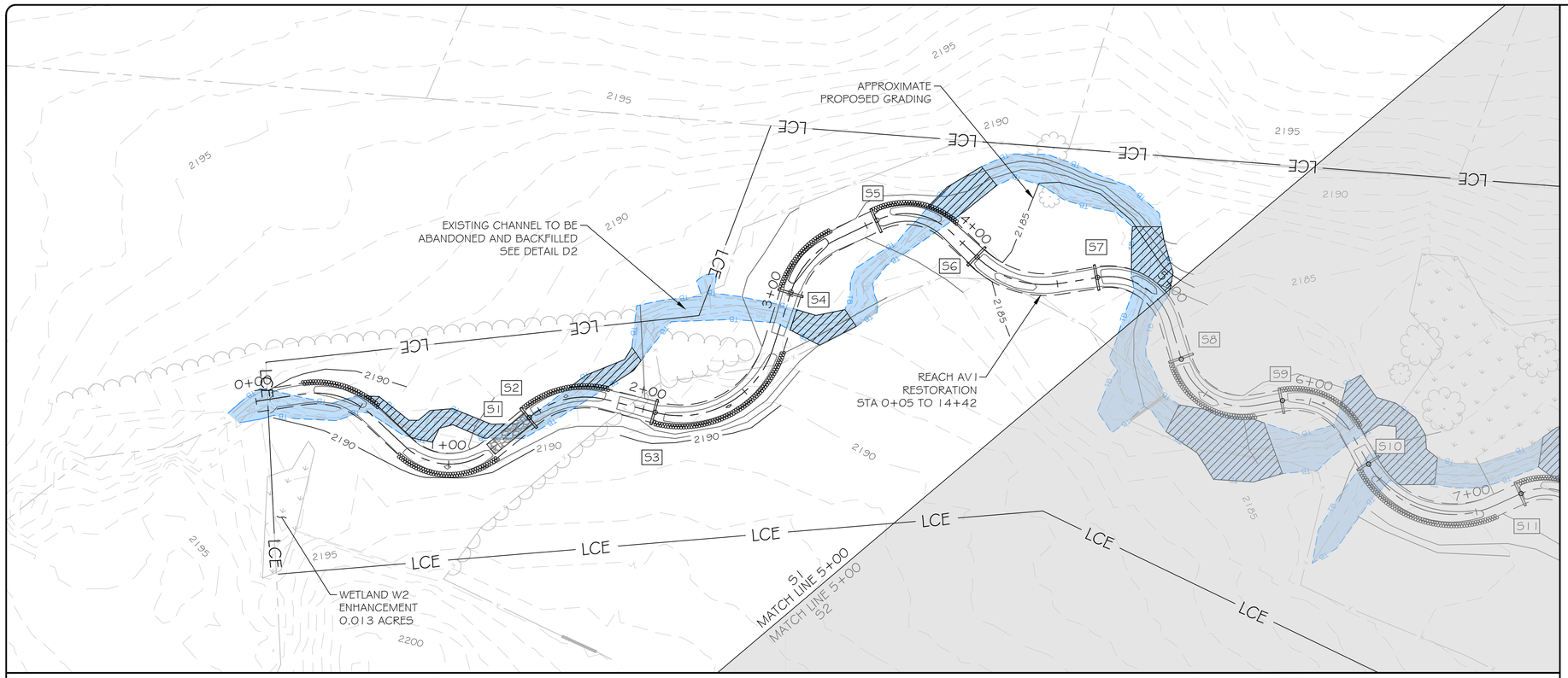

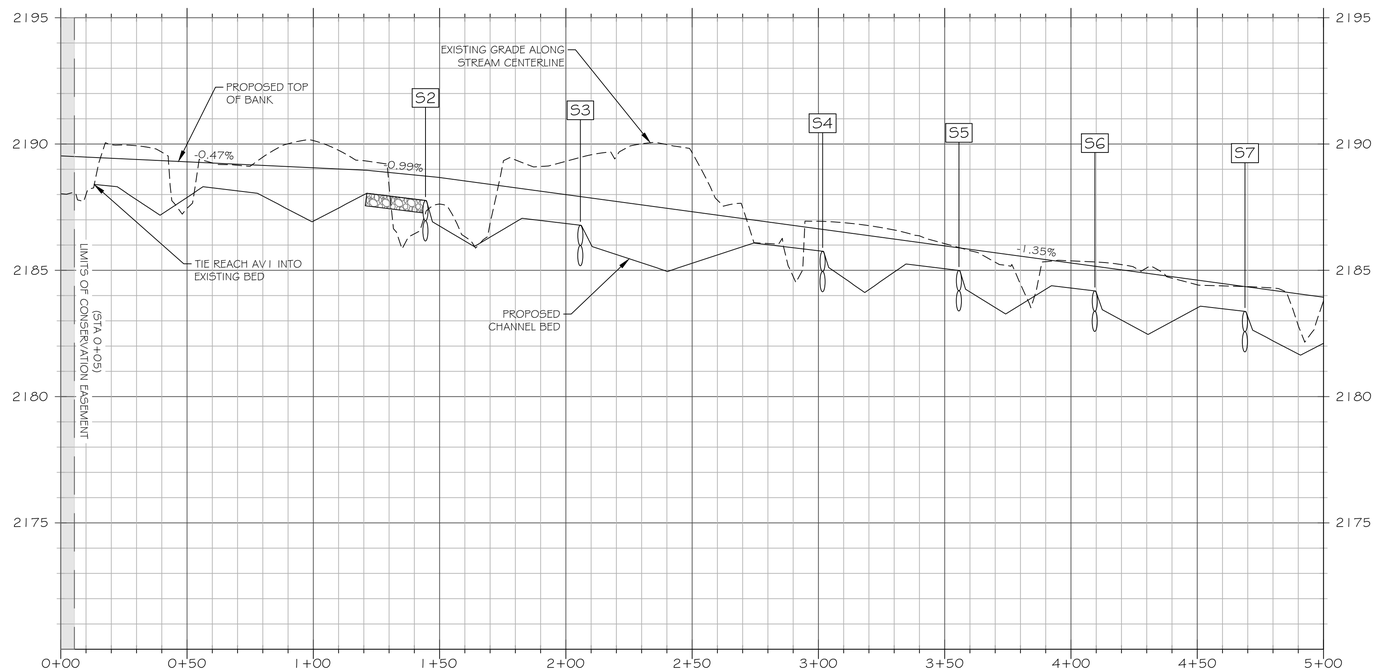

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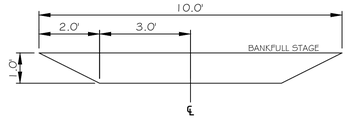
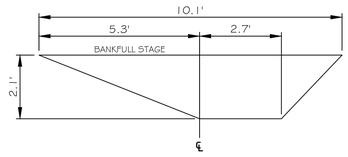
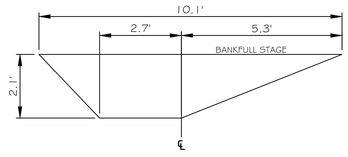
REACH AV1 STA 0+05 TO STA 14+42



TYPICAL RIFFLE CROSS SECTION
(SEE SHEET D4)



TYPICAL RIGHT MEANDER CROSS SECTION



TYPICAL LEFT MEANDER CROSS SECTION

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SEAL

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
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PLOT DATE:
11/22/2019

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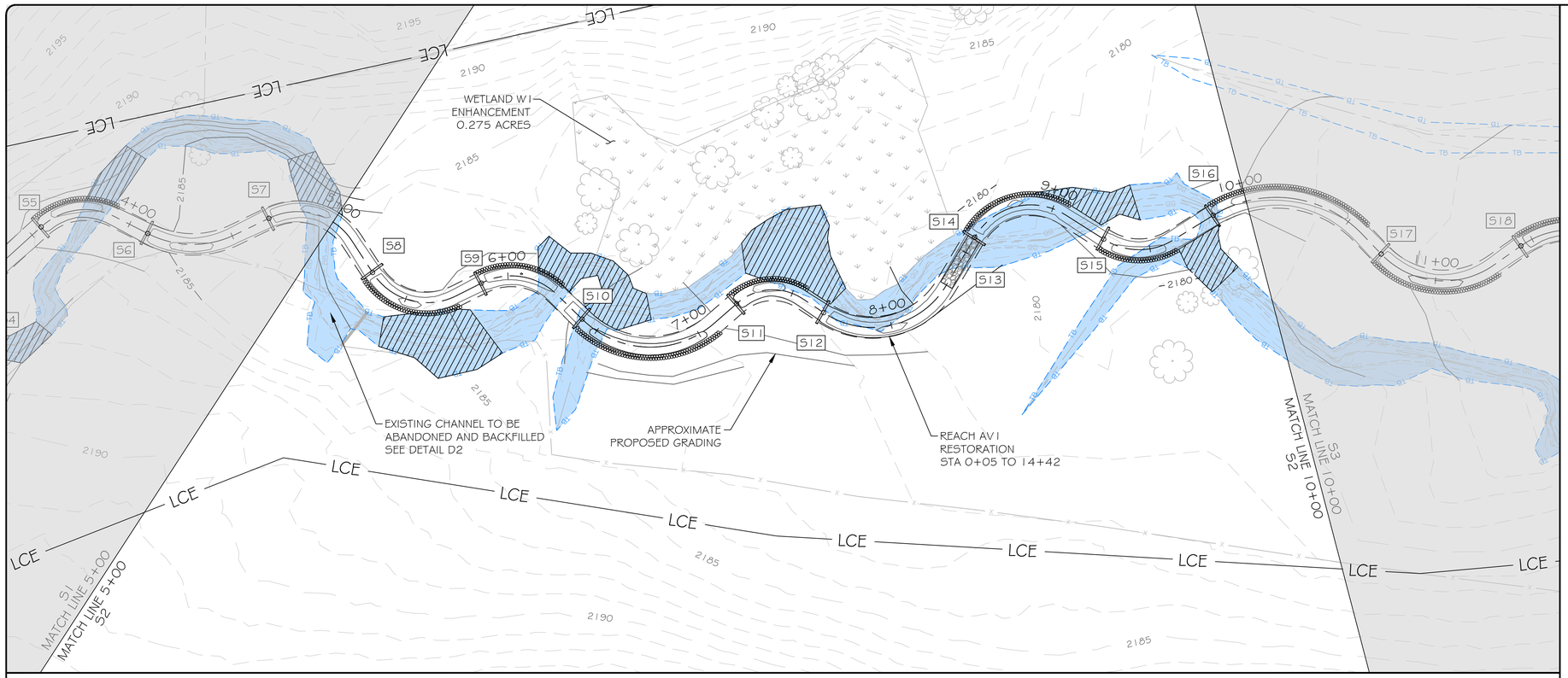
PROJECT NAME:
APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH AV1

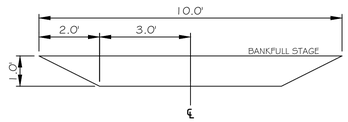
PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER:
S1

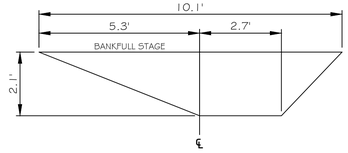
FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_AJ1.dwg SAVED BY: Stasking



REACH AV1 STA 0+05 TO STA 14+42



TYPICAL RIFFLE CROSS SECTION
(SEE SHEET D4)



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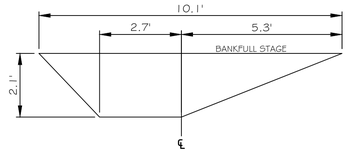

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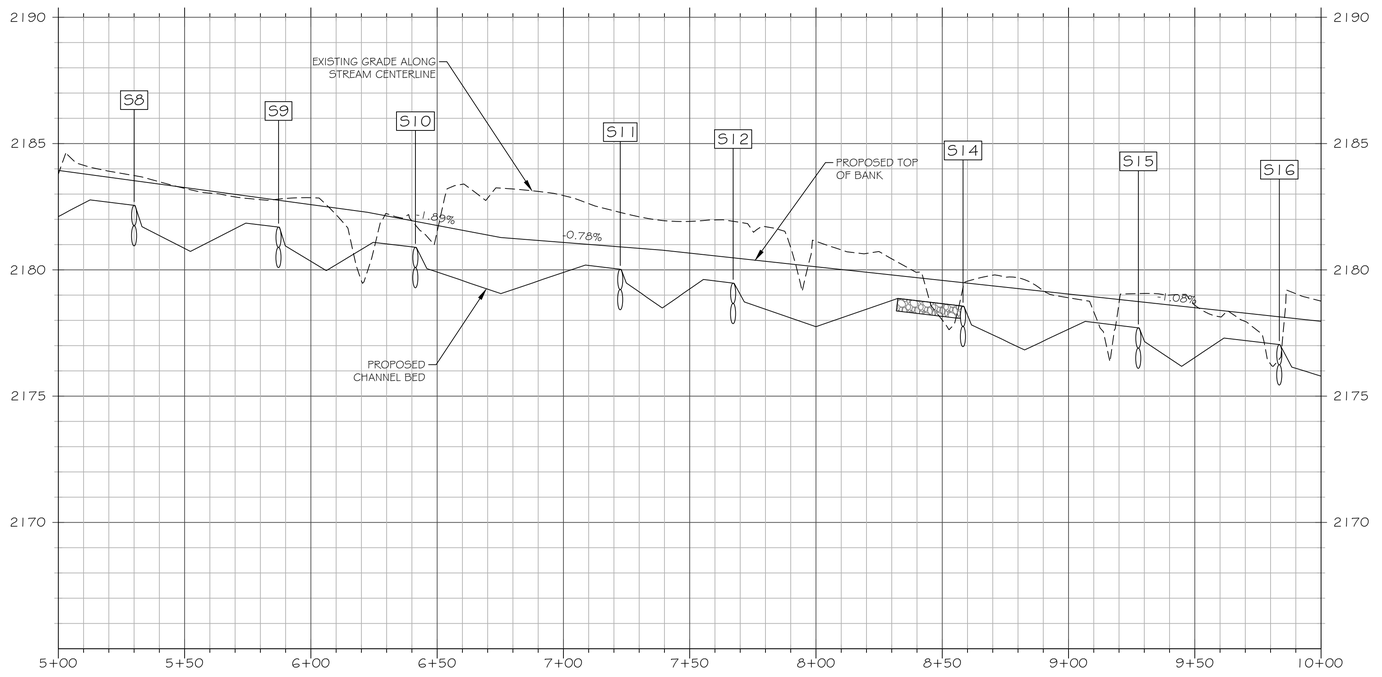

SCALE: HOR 1"=30'; VERT 1"=3'

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SEAL

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
11/22/2019

REVISIONS:

RELEASED FOR:
PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME:
APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

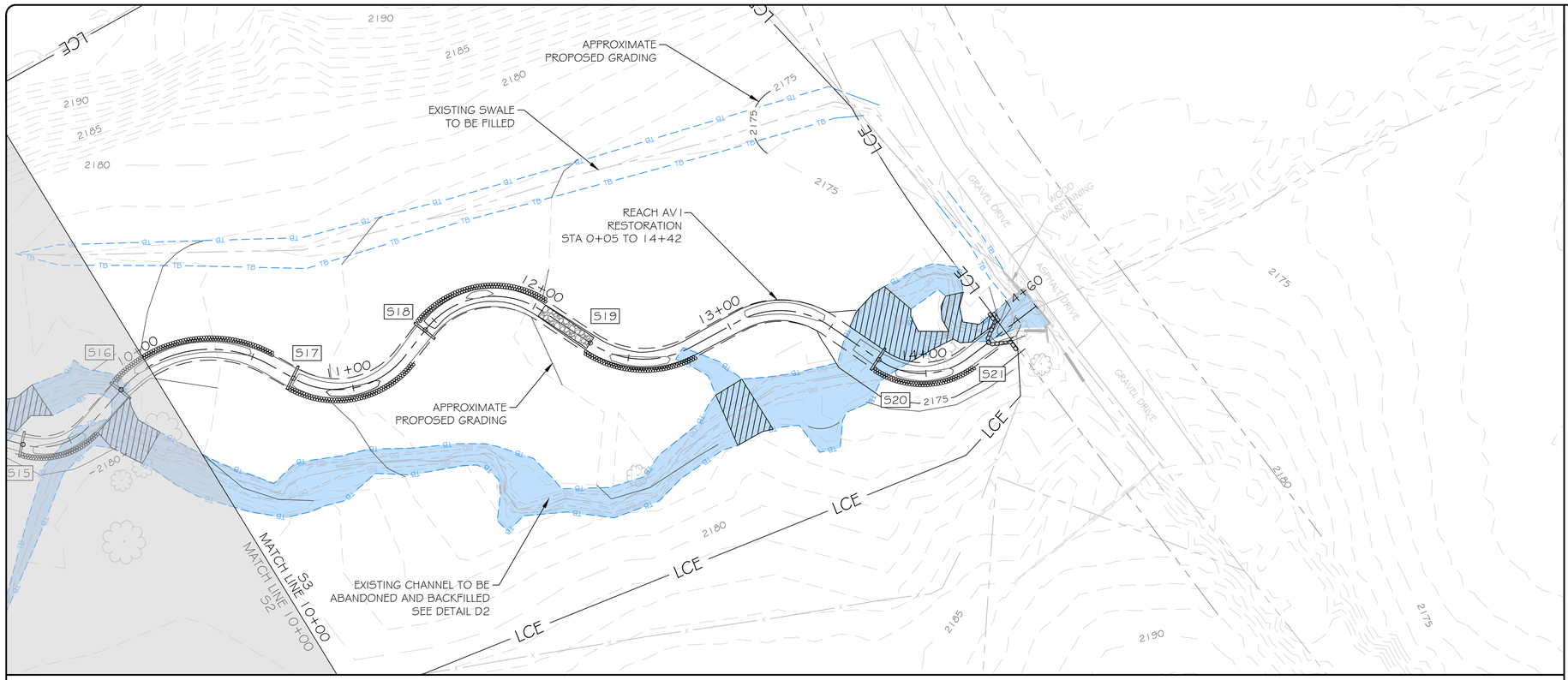
DRAWING TITLE:
REACH AV1

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

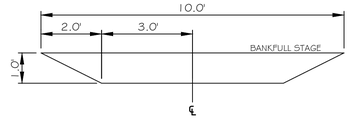
SHEET NUMBER:

S2

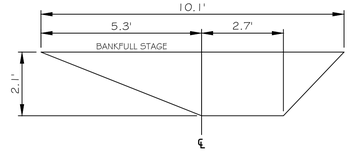
FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_AJ1.dwg SAVED BY: Stasking



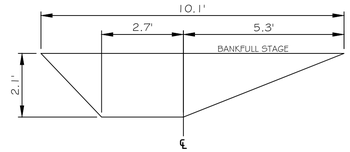
REACH AV1 STA 0+05 TO STA 14+42



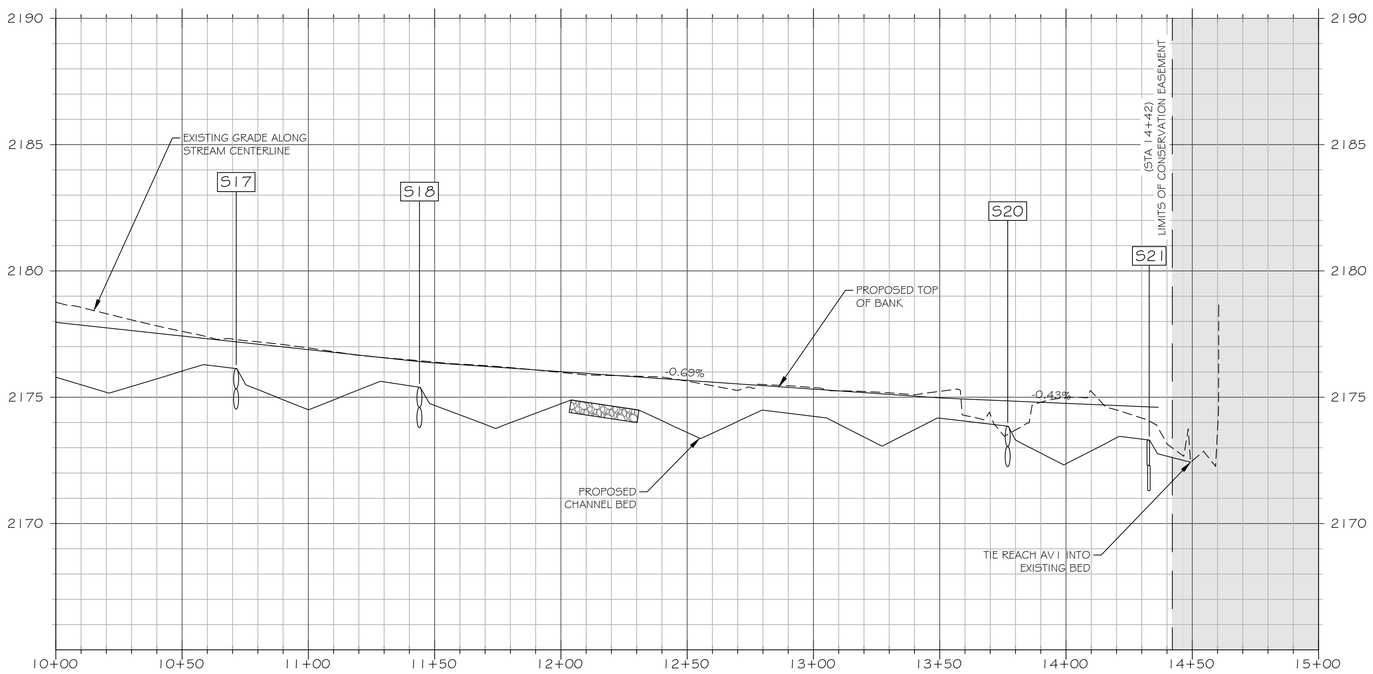
TYPICAL RIFFLE CROSS SECTION
(SEE SHEET D4)



TYPICAL RIGHT MEANDER CROSS SECTION



TYPICAL LEFT MEANDER CROSS SECTION



SCALE: HOR 1"=30'; VERT 1"=3'

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SEAL

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0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 11/22/2019

REVISIONS:

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME: APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH AV1

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER: S3

FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_AJ1.dwg SAVED BY: Stasking

WETLAND LEGEND

WETLAND ENHANCEMENT
0.288 AC

WETLAND RE-ESTABLISHMENT
2.755 AC

EXISTING CHANNEL TO BE ABANDONED AND BACKFILLED SEE DETAIL D2

WETLAND W1
ENHANCEMENT
0.275 ACRES

SWALE TO BE FILLED

LCE

FEATURE TO BE FILLED

WETLAND W3
RE-ESTABLISHMENT
2.755 ACRES

FEATURE TO BE FILLED

WETLAND W2
ENHANCEMENT
0.013 ACRES

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SEAL

FULL SCALE: 1"=50

0 50 100

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PLOT DATE:
11/22/2019

REVISIONS:

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PROJECT NAME:
APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

DRAWING TITLE:
WETLAND PLAN

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER:

W1

FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_SITE.dwg SAVED BY: Stasking

PLANTING LEGEND

LIMITS OF CONSERVATION EASEMENT — LCE —

EXISTING TREELINE

PROPERTY LINE

RIPARIAN PLANTING (TOTAL AREA: 6.09 AC)

PLANTING TABLE

Permanent Riparian Seed Mix		
Common Name	Scientific Name	Percent Composition
Virginia Wildrye	*Elymus virginicus*	25%
Indian Grass	*Sorghastrum nutans*	25%
Little Blue Stem	*Schizachynum scoparium*	10%
Orange Jewelweed	*Impatiens capensis*	10%
Blackeyed susan	*Rudbeckia hirta*	10%
Deertongue	*Dichanthelium clandestinum*	10%
Common Milkweed	*Asclepias synaca*	5%
Showy Goldenrod	*Solidago erecta*	5%

Live Staking and Live Cuttings Bundle Tree Species		
Common Name	Scientific Name	Percent Composition
Black willow	*Salix nigra*	50%
Tag alder	*Alnus serrulata*	50%

Bare Root Planting Tree Species		
Common Name	Scientific Name	Percent Composition
American sycamore	*Platanus occidentalis*	15%
River Birch	*Betula nigra*	15%
Northern red oak	*Quercus rubra*	15%
Sugarberry	*Celtis laevigata*	10%
Persimmon	*Diospyros virginiana*	10%
Blackgum	*Nyssa sylvatica*	10%
Buttonbush	*Cephalanthus occidentalis*	10%
Tulip poplar	*Linodendron tulipifera*	10%
Chestnut oak	*Quercus montana*	5%

PLANTING NOTES

ALL PLANTING AREAS

1. EROSION CONTROL MEASURES SHALL BE PROPERLY MAINTAINED UNTIL PERMANENT VEGETATION IS ESTABLISHED AND FINAL APPROVAL HAS BEEN ISSUED. THE CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES AT THE END OF EACH WORKING DAY TO ENSURE MEASURES ARE FUNCTIONING PROPERLY.
2. DISTURBED AREAS NOT AT FINAL GRADE SHALL BE TEMPORARILY VEGETATED WITHIN 10 WORKING DAYS. UPON COMPLETION OF FINAL GRADING, PERMANENT VEGETATION SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 10 WORKING DAYS. SEEDING SHALL BE IN ACCORDANCE WITH EROSION CONTROL PLAN.
3. ALL DISTURBED AREAS SHALL BE PREPARED PRIOR TO PLANTING BY DISC OR SPRING-TOOTH CHISEL PLOW TO MINIMUM DEPTH OF 12 INCHES. MULTIPLE PASSES SHALL BE MADE ACROSS PLANTING AREAS WITH THE IMPLEMENT AND THE FINAL PASS SHALL FOLLOW TOPOGRAPHIC CONTOURS.
4. BARE ROOT PLANTINGS SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET D2. LIVE STAKES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET D2.
5. TREATMENT/REMOVAL OF INVASIVE SPECIES, PINES AND SWEET GUMS LESS THAN 6" DBH SHALL BE PERFORMED THROUGHOUT THE PLANTED AREA.
6. SPECIES SHALL BE DISTRIBUTED SUCH THAT 3 TO 6 PLANTS OF THE SAME SPECIES ARE GROUPED TOGETHER.
7. BARE ROOT PLANTING DENSITY IS APPROXIMATELY 800 STEMS PER ACRE.
8. LIVE STAKES ARE PROPOSED ALONG THE OUTSIDE OF MEANDER BENDS AND ALONG BOTH BANKS OF STRAIGHT REACHES ADJACENT TO POOLS.
9. TEMPORARY SEED MIX SHALL BE APPLIED AT A RATE OF 150 LBS/ACRE TO ALL DISTURBED AREAS WITH SLOPES EQUAL TO OR STEEPER THAN 3:1.
10. PERMANENT RIPARIAN SEED MIX SHALL BE APPLIED TO ALL DISTURBED AREAS WITHIN THE CONSERVATION EASEMENT AT A RATE OF 15 LBS/ACRE.
11. PERMANENT HERB SEED MIX SHALL BE APPLIED TO ALL DISTURBED AREAS WITHIN THE CONSERVATION EASEMENT BREAKS AT A RATE OF 15 LBS/ACRE.
12. PERCENT COMPOSITION OF PLANTINGS MAY VARY BASED ON SPECIES AVAILABILITY AT TIME OF PLANTING.

REACH AV1

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SEAL

FULL SCALE: 1"=50

0 50 100

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PLOT DATE: 11/22/2019

REVISIONS:

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PROJECT NAME: APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

DRAWING TITLE: PLANTING PLAN

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
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SHEET NUMBER:

P1

FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_SITE.dwg SAVED BY: Stasking

LEGEND

EXISTING FENCE TO BE LEFT (APPROX. 1,700 LF)

EXISTING FENCE TO BE REMOVED (APPROX. 1,200 LF)

PROPOSED FENCE (APPROX. 1,700 LF)

WETLAND W1

REACH AV1

WETLAND W2

INSTALL GATE

REMOVE APPROX. 1,200 LF OF FENCE AND DISPOSE OF OFF-SITE

INSTALL APPROX. 1,700 LF OF WOVEN WIRE FENCE SEE DETAIL D2

EXISTING FENCE OUTSIDE OF EASEMENT TO BE LEFT

INSTALL GATE

FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_SITE.dwg SAVED BY: Stasking

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PROJECT NAME: APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

DRAWING TITLE: FENCING PLAN

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER:

F1

WHEN AND WHERE TO USE IT
SILT FENCE IS APPLICABLE IN AREAS:

WHERE THE MAXIMUM SHEET OR OVERLAND FLOW PATH LENGTH TO THE FENCE IS 100-FEET.
WHERE THE MAXIMUM SLOPE STEEPNESS (NORMAL [PERPENDICULAR] TO FENCE LINE) IS 2H:1V.
THAT DO NOT RECEIVE CONCENTRATED FLOWS GREATER THAN 0.5 CFS.

DO NOT PLACE SILT FENCE ACROSS CHANNELS OR USE IT AS A VELOCITY CONTROL BMP.

CONSTRUCTION SPECIFICATIONS:

1. USE A SYNTHETIC FILTER FABRIC OF AT LEAST 95% BY WEIGHT OF POLYOLEFINS OR POLYESTER, WHICH IS CERTIFIED BY THE MANUFACTURER OR SUPPLIER AS CONFORMING TO THE REQUIREMENTS IN ASTM D 6461. SYNTHETIC FILTER FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABILIZERS TO PROVIDE A MINIMUM OF 6 MONTHS OF EXPECTED USABLE CONSTRUCTION LIFE AT A TEMPERATURE RANGE OF 0° TO 120° F.
2. ENSURE THAT POSTS FOR SEDIMENT FENCES ARE 1.33 LB/LINEAR FT STEEL WITH A MINIMUM LENGTH OF 5 FEET. MAKE SURE THAT STEEL POSTS HAVE PROJECTIONS TO FACILITATE FASTENING THE FABRIC.

CONSTRUCTION:

1. CONSTRUCT THE SEDIMENT BARRIER OF EXTRA STRENGTH SYNTHETIC FILTER FABRICS.
2. ENSURE THAT THE HEIGHT OF THE SEDIMENT FENCE DOES NOT EXCEED 24 INCHES ABOVE THE GROUND SURFACE. (HIGHER FENCES MAY IMPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE.)
3. CONSTRUCT THE FILTER FABRIC FROM A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID JOINTS. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FILTER CLOTH ONLY AT A SUPPORT POST WITH 4 FEET MINIMUM OVERLAP TO THE NEXT POST.
4. EXTRA STRENGTH FILTER FABRIC WITH 6 FEET POST SPACING DOES NOT REQUIRE WIRE MESH SUPPORT FENCE. SECURELY FASTEN THE FILTER FABRIC DIRECTLY TO POSTS. WIRE OR PLASTIC ZIP TIES SHOULD HAVE MINIMUM 50 POUND TENSILE STRENGTH.
5. EXCAVATE A TRENCH APPROXIMATELY 4 INCHES WIDE AND 8 INCHES DEEP ALONG THE PROPOSED LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
6. PLACE 12 INCHES OF THE FABRIC ALONG THE BOTTOM AND SIDE OF THE TRENCH.
7. BACKFILL THE TRENCH WITH SOIL PLACED OVER THE FILTER FABRIC AND COMPACT. THOROUGH COMPACTION OF THE BACKFILL IS CRITICAL TO SILT FENCE PERFORMANCE.
8. DO NOT ATTACH FILTER FABRIC TO EXISTING TREES.

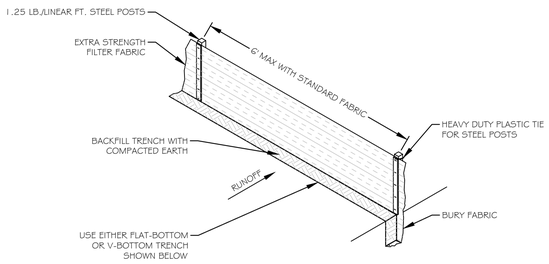
MAINTENANCE:

INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.

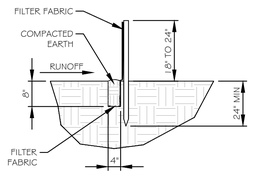
SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.

REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.

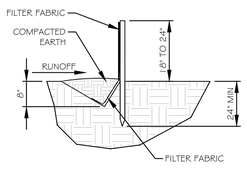
REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.



SILT FENCE INSTALLATION



FLAT-BOTTOM TRENCH DETAIL



V-SHAPED TRENCH DETAIL

TEMPORARY SILT FENCE

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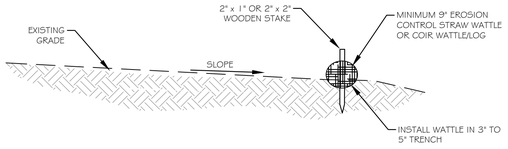


NOTE:
EROSION CONTROL WATTLES OR COIR LOGS/WATTLES MAY BE USED IN PLACE OF SILT FENCE.

EROSION CONTROL WATTLE

NTS

INSTALLATION NOTES:

SITE PREPARATION

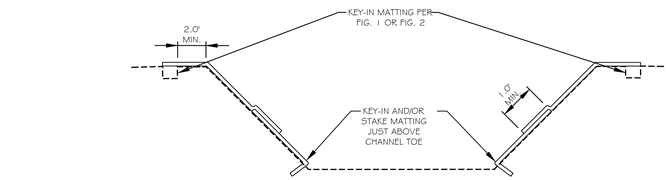
1. GRADE AND COMPACT AREA.
2. REMOVE ALL ROCKS, CLODS, VEGETATION, AND OBSTRUCTIONS SO THAT MATTING WILL HAVE DIRECT CONTACT WITH THE SOIL.
3. PREPARE SEEDBED BY LOOSENING 3 TO 4 INCHES OF TOPSOIL ABOVE FINAL GRADE.
4. TEST SOILS FOR ANY NUTRIENT DEFICIENCIES AND SUBMIT SOIL TEST RESULTS TO THE ENGINEER. APPLY ANY TREATMENT SUCH AS LIME OR FERTILIZERS TO THE SOIL IF NEEDED.

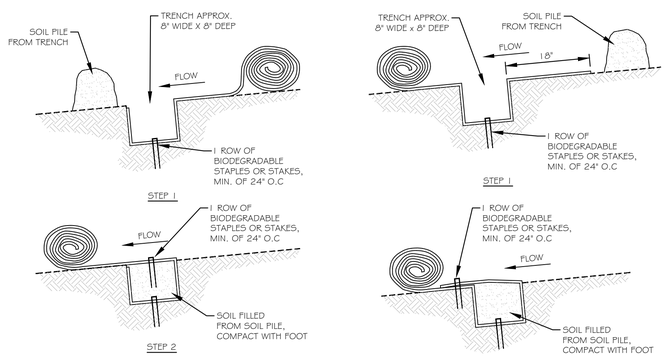
SEEDING

1. SEE PLANTING SHEETS FOR SEEDING REQUIREMENTS.
2. APPLY SEED TO SOIL BEFORE PLACING MATTING.

INSTALLATION - STREAM BANK

1. SEE GRADING NOTES ON PLAN AND PROFILE SHEETS AND DETAIL SHEETS FOR INFORMATION REGARDING WHAT AREAS ARE TO RECEIVE COIR MATTING.
2. OVERLAP ADJACENT MATS 3" (IN DIRECTION PARALLEL TO FLOW) AND ANCHOR EVERY 12" ACROSS THE OVERLAP. THE UPSTREAM MAT SHOULD BE PLACED OVER THE DOWNSTREAM MAT.
3. EDGES SHOULD BE SHINGLED AWAY FROM THE FLOW OF WATER.
4. LAY MAT LOOSE TO ALLOW CONTACT WITH SOIL. DO NOT STRETCH TIGHT.
5. ANCHOR MAT USING BIODEGRADABLE STAKES OR PINS.
6. CUT 8" x 8" TRENCH ALONG TOP OF BANK FOR MAT TERMINATION AS SHOWN IN FIGURES 1 & 2. EXTEND MAT 2 TO 3 FEET PAST TOP OF BANK.
7. PLACE ADJACENT ROLLS IN THE ANCHOR TRENCH WITH A MINIMUM OF 4" OVERLAP. SECURE WITH BIODEGRADABLE STAKES OR PINES, BACKFILL ANCHOR TRENCH, AND COMPACT SOIL.
8. STAPLE AT 12" INTERVALS ALONG OVERLAP.
9. STREAM BANK MATTING TO BE INSTALLED FROM TOE OF BANK TO A MINIMUM OF 2.0' PAST TOP OF BANK. SEE FIGURE 3 FOR TERMINATION AT TOP OF BANK.
10. IF MORE THAN ROLL IS REQUIRED TO COVER THE CHANNEL FROM THE TOP OF BANK DOWN TO THE TOE, THEN OVERLAP MATTING BY A MINIMUM OF 1'.





EROSION CONTROL MATTING MUST MEET OR EXCEED THE FOLLOWING REQUIREMENTS:

- 100 % COCONUT FIBER (COIR) TWINE WOVEN INTO A HIGH STRENGTH MATRIX.
- THICKNESS - 0.35 IN. MINIMUM.
- SHEAR STRESS – 5 LBS/SQFT
- FLOW VELOCITY- OBSERVED 16 FT/SEC
- WEIGHT - 29 OZ/SY
- OPEN AREA - 38%
- SLOPES – UP TO A MAXIMUM OF 1:1

COIR MATTING

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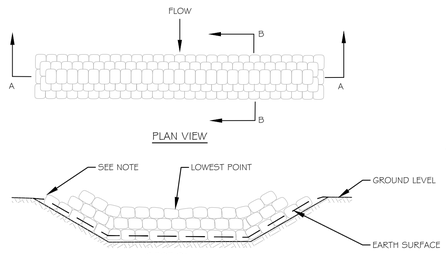
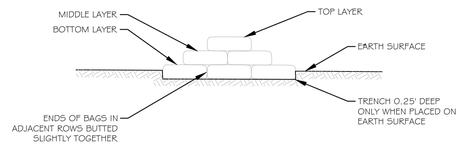


NOTE: END OF DIKE AT GROUND LEVEL TO BE HIGHER THAN THE LOWEST POINT OF FLOW CHECK. SUFFICIENT SANDBAGS ARE TO BE PLACED TO PREVENT SCOURING.



SANDBAG BARRIERS SHALL BE CONSTRUCTED OF THREE LAYERS OF SANDBAGS. THE BOTTOM LAYER SHALL CONSIST OF 3 ROWS OF BAGS, THE MIDDLE LAYER SHALL CONSIST OF 2 ROWS OF BAGS AND THE TOP LAYER SHALL CONSIST OF 1 ROW OF BAGS. THE RECOMMENDED DIMENSION OF A FILLED SANDBAG SHALL BE APPROXIMATELY 0.5 FT X 0.5 FT X 1.5 FT.

SANDBAG IMPERVIOUS DIKE

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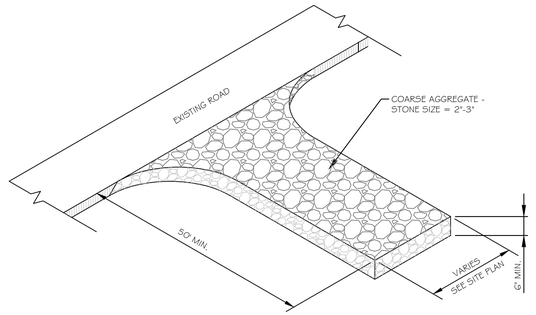

PURPOSE:

STABILIZED CONSTRUCTION ENTRANCES SHOULD BE USED AT ALL POINTS WHERE TRAFFIC WILL BE LEAVING A CONSTRUCTION SITE AND MOVING DIRECTLY ONTO A PUBLIC ROAD.

CONSTRUCTION SPECIFICATIONS:

1. CLEAR THE ENTRANCE AND EXIT AREA OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL AND PROPERLY GRADE IT.
2. PLACE THE GRAVEL TO THE SPECIFIC GRADE AND DIMENSIONS SHOWN ON THE DETAIL, AND SMOOTH IT.
3. PROVIDE DRAINAGE TO CARRY WATER TO A SEDIMENT TRAP OR OTHER SUITABLE OUTLET.
4. USE GEOTEXTILE FABRICS BECAUSE THEY IMPROVE STABILITY OF THE FOUNDATION IN LOCATIONS SUBJECT TO SEEPAGE OR HIGH WATER TABLE.

MAINTENANCE:

MAINTAIN THE GRAVEL PAD IN A CONDITION TO PREVENT MUD OR SEDIMENT FROM LEAVING THE CONSTRUCTION SITE. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH 2-INCH STONE. AFTER EACH RAINFALL, INSPECT ANY STRUCTURE USED TO TRAP SEDIMENT AND CLEAN IT OUT AS NECESSARY. IMMEDIATELY REMOVE ALL OBJECTIONABLE MATERIALS SPILLED, WASHED, OR TRACKED ONTO PUBLIC ROADWAYS, OR AIRFIELD PAVEMENTS.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

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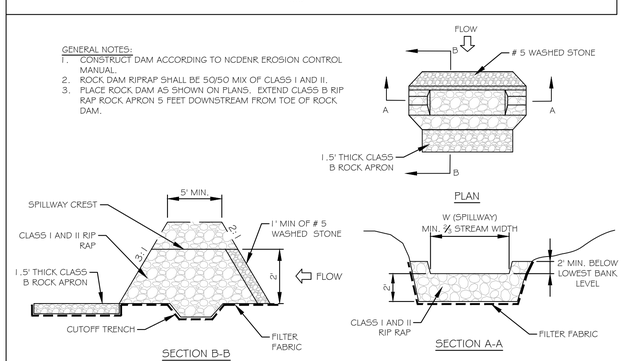
GENERAL NOTES:

1. CONSTRUCT DAM ACCORDING TO NCDENR EROSION CONTROL MANUAL.
2. ROCK DAM RIPRAP SHALL BE 50/50 MIX OF CLASS I AND II.
3. PLACE ROCK DAM AS SHOWN ON PLANS. EXTEND CLASS B RIP RAP ROCK APRON 5 FEET DOWNSTREAM FROM TOE OF ROCK DAM.



TEMPORARY ROCK CHECK DAM

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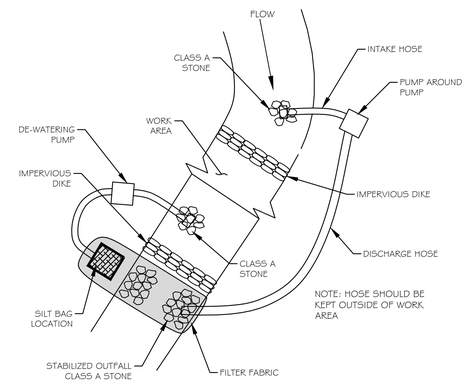
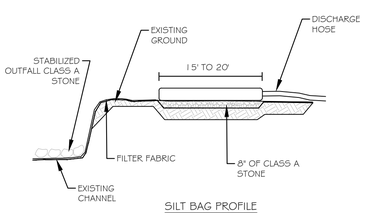
NOTES:

1. EXCAVATION SHALL BE PERFORMED ONLY IN DRY AND/OR ISOLATED SECTIONS OF CHANNEL.
2. IMPERVIOUS DIKES SHOULD BE USED TO ISOLATE WORK AREAS FROM STREAM FLOW.
3. THE CONTRACTOR SHALL NOT DISTURB MORE AREA THAN CAN BE STABILIZED IN ONE WORKING DAY. A MAXIMUM OF 200 FEET MAY BE DISTURBED AT ANY ONE TIME.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING PUMP SIZE SUFFICIENT TO PUMP BASE FLOW.
5. DIKE MUST BE CONSTRUCTED OF NON-ERODIBLE MATERIALS SUCH AS SANDBAGS.

SEQUENCE OF CONSTRUCTION:

1. INSTALL STILLING BASIN AND STABILIZED OUTFALL USING CLASS A RIP RAP AT THE DOWNSTREAM END OF THE DESIGNATED PROJECT WORKING AREA.
2. THE CONTRACTOR SHALL INSTALL THE PUMP AROUND PUMP AND THE TEMPORARY PIPING THAT WILL CONVEY THE BASE FLOW FROM UPSTREAM OF THE WORK AREA TO THE STABILIZED OUTFALL.
3. INSTALL UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. INSTALL THE DOWNSTREAM IMPERVIOUS DIKE AND DEWATERING PUMPING APPARATUS IF NEEDED TO DEWATER THE ENTRAPPED AREA. THE PUMP AND HOSE FOR THIS PURPOSE SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA. THIS WATER WILL ALSO BE PUMPED TO AN OUTFALL STABILIZED WITH CLASS A RIP RAP.
5. THE CONTRACTOR SHALL EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF THE IMPERVIOUS DIKE. WHEN DEWATERING AREA, ALL DIRTY WATER MUST BE PUMPED THROUGH A SILT BAG. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE/PIPING STARTING WITH THE DOWNSTREAM DIKE FIRST.
6. ONCE THE WORKING AREA IS COMPLETED, REMOVE ALL RIP RAP AND IMPERVIOUS DIKES AND STABILIZE DISTURBED AREAS WITH SEED AND MULCH.
7. ALL WORK IN CHANNEL MUST BE COMPLETED BEFORE REMOVING IMPERVIOUS DIKE.





PUMP AROUND & DEWATERING DETAIL

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Engineering Services Provided By:
Angler Environmental, LLC
License: F-1428

SEAL

PLOT DATE:
11/22/2019

REVISIONS:

RELEASED FOR:
PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME:
APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

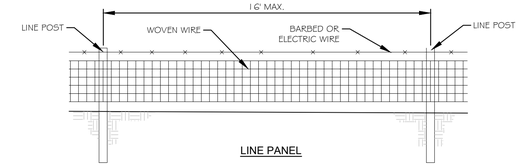
DRAWING TITLE:
DETAILS

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

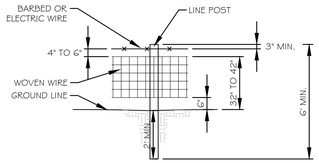
SHEET NUMBER:

D1

FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_DETAILS.dwg SAVED BY: Stasking



LINE PANEL



WOVEN WIRE WITH ONE BARB DETAIL

WOVEN WIRE:
ASTM CLASS 3 GALVANIZED.
TOP AND BOTTOM WIRES MIN. 12 GAUGE.
INTERMEDIATE AND STAY WIRES MIN.
12 1/2 GAUGE.

NOTES:
1. LINE POSTS (WOODEN): MIN. 4 IN. DIAM. OR 4 IN. SQUARE.
2. LINE POSTS (STEEL): STUDDED OR PUNCHED T, U, OR Y SHAPED, WITH ANCHOR PLATES.
3. MIN. WEIGHT 1.3 LBS./FT. (EXCLUDING ANCHOR PLATE). POSTS SHALL BE DRIVEN A MINIMUM OF 18" DEEP AND MUST BE AT LEAST 5.5 FT IN LENGTH
4. SPECIES AND TREATMENT FOR ALL WOOD: USE UNTREATED DURABLE POSTS OF SPECIES SUCH AS RED CEDAR, BLACK LOCUST OR OSAGE-ORANGE WITH BARK REMOVED, OR NON-DURABLE WOOD THAT IS PRESERVATIVE PRESSURE TREATED 0.40 LBS./CUBIC FOOT CCA, OR EQUIVALENT NON-CCA TREATMENT). DO NOT USE RED PINE.

WOVEN WIRE FENCE (NRCS DETAIL 382A)

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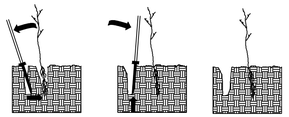
DIBBLE PLANTING METHOD
USING THE KBC PLANTING BAR

1. INSERT PLANTING BAR AS SHOWN AND PULL HANDLE TOWARD PLANTER.
2. REMOVE PLANTING BAR AND PLACE SEEDING AT CORRECT DEPTH.
3. INSERT PLANTING BAR 2 INCHES TOWARD PLANTER FROM SEEDING.



4. PULL HANDLE OF BAR TOWARD PLANTER, FIRMING SOIL AT BOTTOM.
5. PUSH HANDLE FORWARD FIRMING SOIL AT TOP.
6. LEAVE COMPACTION HOLE OPEN. WATER THOROUGHLY.

PLANTING NOTES:

PLANTING BAG
DURING PLANTING, SEEDLINGS SHALL BE KEPT IN A MOIST CANVAS BAG OR SIMILAR CONTAINER TO PREVENT THE ROOT SYSTEMS FROM DRYING.

KBC PLANTING 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.

ROOT PRUNING
ALL SEEDLINGS SHALL BE ROOT PRUNED, IF NECESSARY, SO THAT NO ROOTS EXTEND MORE THAN 10 INCHES BELOW THE ROOT COLLAR.

NOTES:
BARE ROOTS SHALL BE PLANTED 6 FT. TO 10 FT. ON CENTER, RANDOM SPACING, AVERAGING 8 FT. ON CENTER. APPROXIMATELY 680 PLANTS PER ACRE.

BARE ROOT PLANTING

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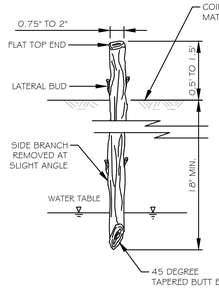
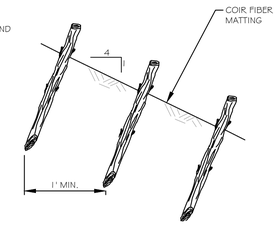


DETAIL
LIVE STAKES SHOULD BE LONG ENOUGH TO REACH BELOW THE GROUNDWATER TABLE. (GENERALLY, A LENGTH OF 2 TO 3 FEET IS SUFFICIENT.) ADDITIONALLY, THE STAKES SHOULD HAVE A DIAMETER IN THE RANGE OF 0.75 TO 2 INCHES.



NOTE:
1. ACCEPTABLE SPECIES INCLUDE BLACK WILLOW (*SALIX NIGRA*) AND TAG ALDER (*ALNUS SERRULATA*).
2. LIVE STAKES SHALL BE PLANTED IN AN AREA EXTENDING 3 FEET OUT FROM TOP OF BANK TO JUST BELOW BANKFULL.
3. LIVE STAKES SHALL BE SPACED 3 FEET APART, ALTERNATE SPACING.

LIVE STAKE

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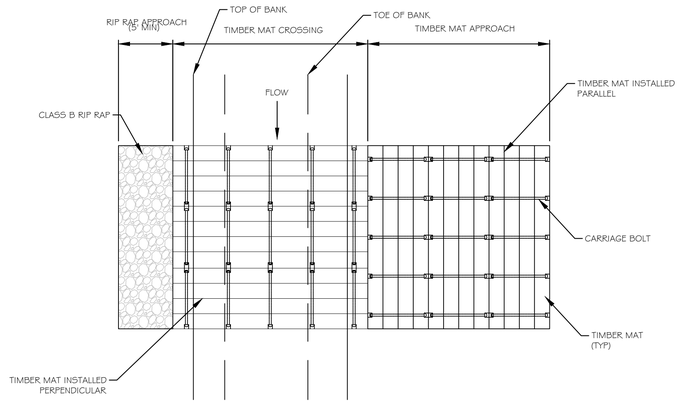
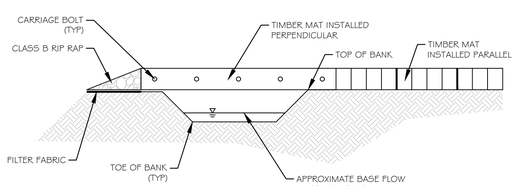


PLAN VIEW



SECTION VIEW

NOTES:
1. TIMBER MATS SHALL BE USED FOR TEMPORARY CONSTRUCTION ACCESS TO TRAVERSE WET AND/OR MUDDY ARES ADJACENT TO THE STREAM AND TO CROSS THE STREAM AND OTHER CONCENTRATED FLOW AREAS.
2. THE STREAM CROSSING SHALL BE INSTALLED WHEN FLOW IS LOW. THERE SHALL BE MINIMAL TO NO DISTURBANCE OF THE CHANNEL BED AND BANKS AS A RESULT OF INSTALLING THE APPROACHES OR CROSSING.
3. THE LENGTH OF TIMBER MAT REQUIRED TO CROSS THE STREAM OR CONCENTRATED FLOW AREAS SHALL BE SUCH THAT THE TIMBER MAT EXTENDS PAST THE TOP OF BANK ON EACH SIDE OF THE CROSSING A SUFFICIENT DISTANCE TO SUPPORT THE MAXIMUM EQUIPMENT SIZE USING THE CROSSING.
4. STREAM CROSSINGS SHALL BE INSTALLED WITH THE TIMBER MAT LENGTHS ORIENTED PERPENDICULAR TO THE TOPS OF THE STREAM BANKS. TIMBER MAT STREAM APPROACHES SHALL BE INSTALLED WITH THE TIMBER MAT LENGTHS ORIENTED PARALLEL TO THE TOPS OF THE STREAM BANKS.
5. STREAM CROSSING APPROACHES FROM DRY AREAS SHALL BE CONSTRUCTED USING CLASS B RIP RAP PLACED OVER FILTER FABRIC.
6. ALL TIMBER MATS, FILTER FABRIC, AND RIP RAP SHALL BE COMPLETELY REMOVED FROM THE SITE WHEN THE CROSSING IS REMOVED.

TIMBER MAT TEMPORARY CROSSING

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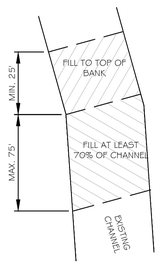

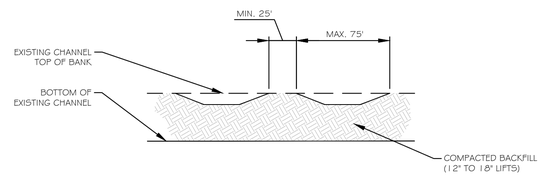

NOTES:
1. FILL EXISTING CHANNEL TO TOP OF BANK ELEVATION WHEN POSSIBLE.
2. CHANNEL MUST BE FILLED IN 12" TO 18" LIFTS.
3. IF CHANNEL CANNOT BE COMPLETELY FILLED TO TOP OF BANK, FILL TO TOP OF BANK FOR 25' OUT OF EVERY 100' SEGMENT.

CHANNEL BACKFILL

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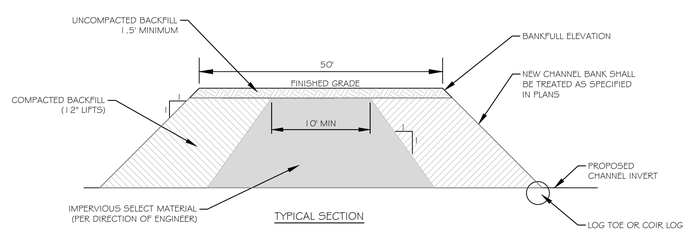
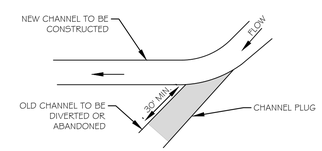


TYPICAL SECTION



PLAN VIEW

CHANNEL PLUG

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SEAL

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HENDERSON COUNTY, NORTH CAROLINA

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PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER:

D2

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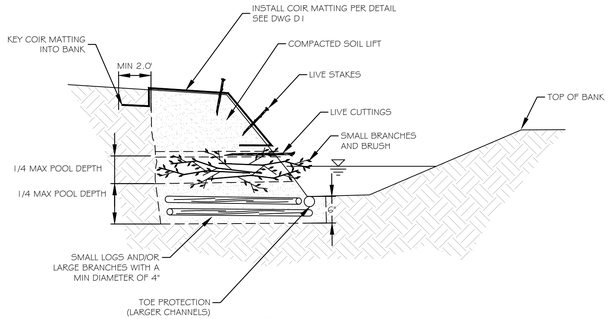
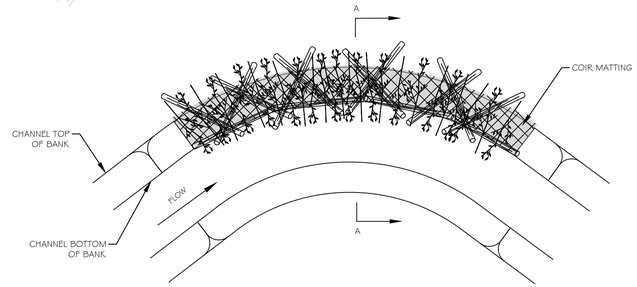


SECTION A-A

NOTES:

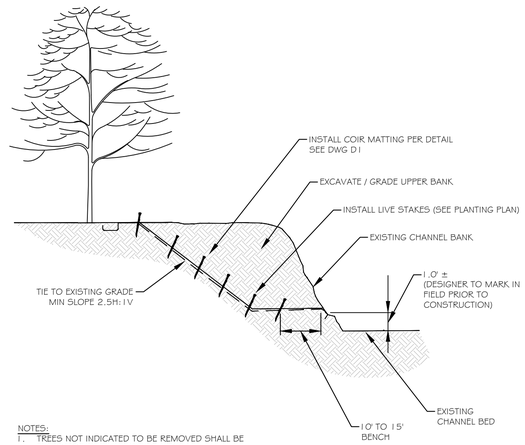
1. OVER EXCAVATE THE OUTSIDE BEND OF THE CHANNEL. PLACE LARGER BRANCHES AND LOGS IN A CRISS-CROSS PATTERN. LOCK IN PLACE WITH FILL COVERING 6 IN TO 12 IN OF THE LARGER BRANCHES/SMALL LOGS.
2. PLACE SMALLER BRANCHES AND BRUSH OVER THE LARGER BRANCHES/SMALL LOGS (HARDWOOD SPECIES ONLY) AND COMPACT LIGHTLY TOGETHER. BACKFILL AND COMPACT TO LOCK IN PLACE.
3. PLACE LIVE CUTTINGS OVER THE SMALL BRANCHES AND BRUSH. ACCEPTABLE LIVE CUTTINGS SPECIES INCLUDE BLACK WILLOW (SALIX NIGRA) AND SILKY WILLOW (SALIX SERICEA). WILLOW CUTTINGS SHOULD BE RINSED AT CUTTING POINT TO ALLOW BETTER ROOTING.
4. INSTALL EROSION CONTROL (COIR) MATTING OVER COMPACTED SOIL PER DIRECTION OF ENGINEER. COIR MATTING SHOULD BE KEYED INTO TOP OF BANK.
5. INSTALL 1 TO 3 ROWS OF LIVE STAKES ABOVE THE LIVE CUTTINGS LAYER PER DIRECTION OF ENGINEER.



TYPICAL PLAN VIEW

BRUSH TOE

NTS

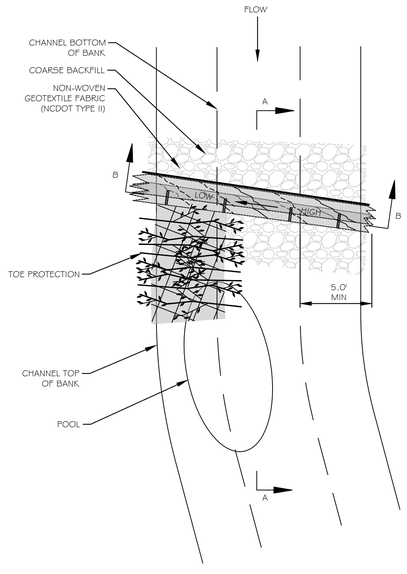


NOTES:

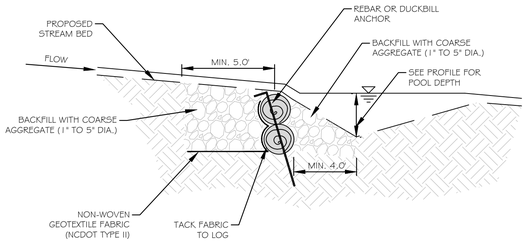
1. TREES NOT INDICATED TO BE REMOVED SHALL BE PROTECTED DURING CONSTRUCTION IN ACCORDANCE WITH PLANS.
2. SEED AND MULCH ALL BANKS PRIOR TO INSTALLING COIR MATTING.

TYPICAL BANK GRADING

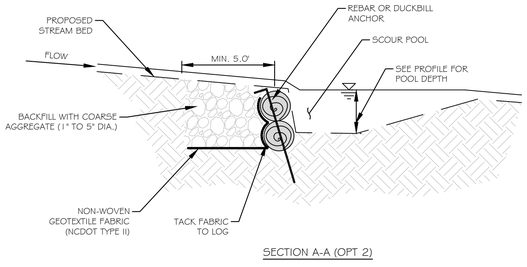
NTS



TYPICAL PLAN VIEW



SECTION A-A (OPT 1)



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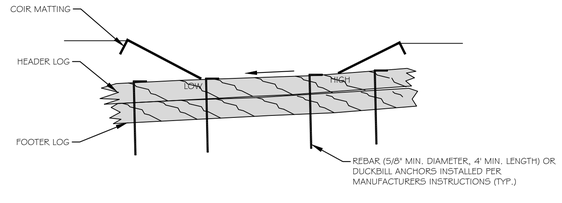

SECTION B-B

NOTES:

1. LOGS SHOULD BE RELATIVELY STRAIGHT HARDWOOD AND RECENTLY HARVESTED
2. HIGH SIDE OF LOG SHALL BE APPROX. 0.2' HIGHER THAN LOW END
3. LOG DIMENSIONS:
   MIN DIAM. = 12", MIN LENGTH = 18'
   NAIL FILTER FABRIC USING 3" 10D GALVANIZED COMMON NAIL EVERY 1.5' ALONG THE LOG
4. DUCKBILL ANCHORS MAY BE USED IN PLACE OF REBAR

LOG SILL

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SEAL

PLOT DATE: 11/22/2019

REVISIONS:

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME: APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

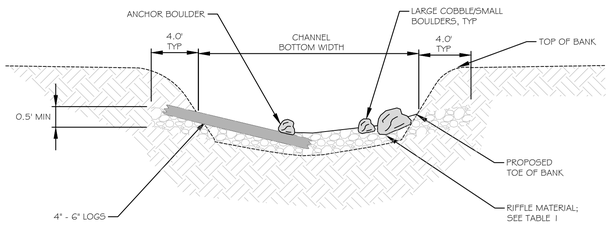
DRAWING TITLE: DETAILS

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

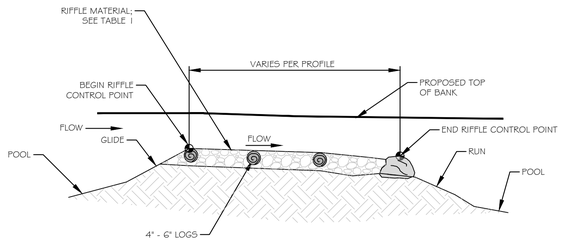
SHEET NUMBER:

D3

FILE NAME:S:\@RES GIS\Projects\NC\Apple Valley\CAD\DWG\0484_SHT_DETAILS.dwg SAVED BY: Stasking



CROSS SECTION A-A'



PROFILE

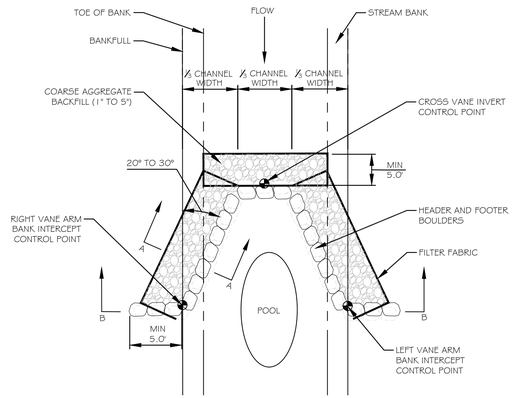
RIFFLE GRADE CONTROL

NTS

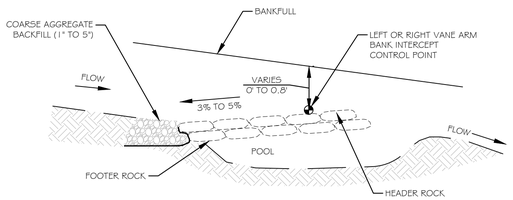
NOTES:

1. CONSTRUCTED RIFFLES SHALL BE INSTALLED IN NEWLY GRADED CHANNEL SECTIONS, AS SPECIFIED BY THE DESIGNER.
2. ELEVATION CONTROL POINTS SHALL BE DESIGNATED AT THE BEGINNING AND END OF RIFFLE POINTS TO ESTABLISH PART OF THE PROFILE OF THE CHANNEL. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE RIFFLE INSTALLATION WITHIN A TOLERANCE OF ±0.2'.
3. RIFFLE MATERIAL SHALL BE COMPRISED OF ROCKS AND LOGS. THE ROCK MATERIAL COMPOSITION SHALL MATCH TABLE 1. RIFFLE MATERIAL SHALL BE EXCAVATED, STOCKPILED, AND RE-USED FROM ABANDONED CHANNEL SECTIONS. ROCK RIFFLE MATERIAL OBTAINED OFFSITE SHALL BE SLIGHTLY ROUNDED, "RIVER-TYPE" ROCK, UNLESS OTHER ROCK CHARACTERISTICS ARE APPROPRIATE FOR THE CHANNEL.
4. SPACING AND NUMBER OF LOGS SHOULD BE BASED ON RIFFLE LENGTH AND MAY VARY BASED ON LOG AVAILABILITY. LOGS SHOULD BE SPACED EQUALLY AND ANCHORED TO THE CHANNEL BED WITH BOULDERS.
5. THE PLACEMENT OF RIFFLE MATERIAL SHALL BE DONE IN A MANNER TO CREATE A SMOOTH PROFILE, WITH NO ABRUPT "JUMP" (TRANSITION) BETWEEN THE UPSTREAM POOL-GLIDE AND THE RIFFLE, AND LIKEWISE NO ABRUPT "DROP" (TRANSITION) BETWEEN THE RIFFLE AND THE DOWNSTREAM RUN-POOL. THE FINISHED CROSS SECTION OF THE RIFFLE MATERIAL SHALL GENERALLY MATCH THE SHAPE AND DIMENSIONS SHOWN ON THE RIFFLE TYPICAL SECTION WITH SOME VARIABILITY OF THE THALWEG LOCATION AS A RESULT OF THE SMALL POOLS AND LOGS.
6. THE END OF RIFFLE CONTROL POINT MAY TIE IN TO ANOTHER IN-STREAM STRUCTURE (LOG SILL , J-HOOK, ETC.). NO LOGS SHOULD BE INCLUDED WITHIN THE FOOTPRINT OF THE PROPOSED STRUCTURE.
7. THE CONSTRUCTED RIFFLE SHALL BE KEYED IN TO THE STREAM BANKS AND/OR BED AS DESIGNATED BY THE DESIGNER. THE "KEY" SHALL EXTEND BEYOND THE TOP OF BANK AT THE BEGINNING (CREST) OF THE RIFFLE. WHERE PRESERVATION OF EXISTING STREAM BANK VEGETATION IS A PRIORITY A "KEY" MAY NOT BE USED (OR THE DIMENSIONS MAY BE ADJUSTED) TO LIMIT DISTURBANCE.

TABLE 1 - RIFFLE COMPOSITION		
REACH	STONE SIZE	%
AV1	NATIVE	25
	#57	50
	SURGE	25



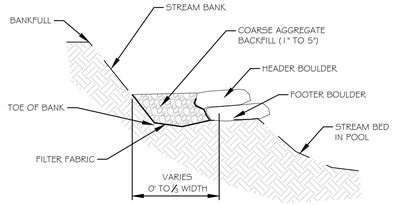
PLAN VIEW



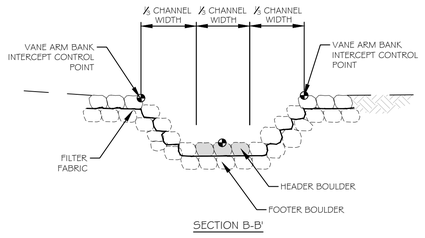
PROFILE VIEW

ROCK CROSS VANE

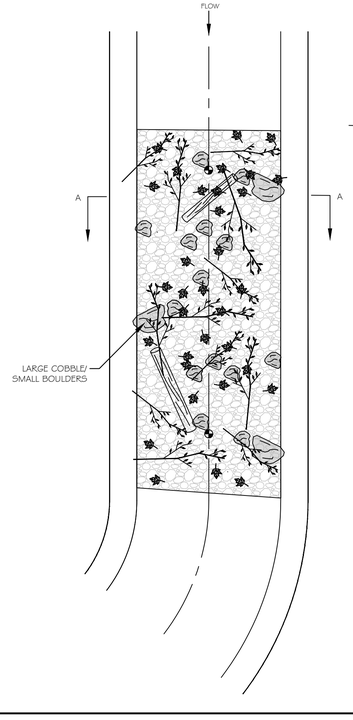
NTS

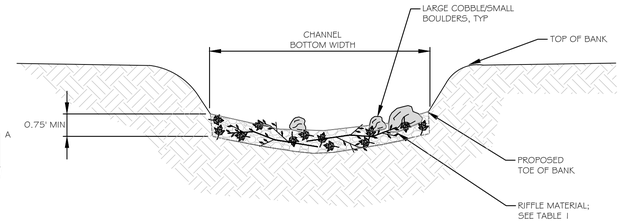


SECTION A-A'

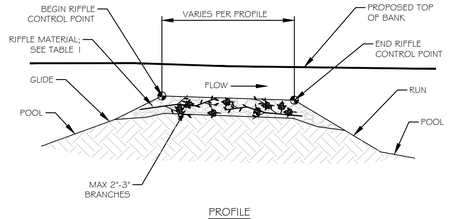


SECTION B-B'





CROSS SECTION A-A'



PROFILE

TYPICAL RIFFLE

NTS

NOTES:

1. TYPICAL RIFFLES SHALL BE INSTALLED IN NEWLY GRADED CHANNEL SECTIONS.
2. ELEVATION CONTROL POINTS SHALL BE DESIGNATED AT THE BEGINNING AND END OF RIFFLE POINTS TO ESTABLISH PART OF THE PROFILE OF THE CHANNEL. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE RIFFLE INSTALLATION WITHIN A TOLERANCE OF ±0.2'.
2. RIFFLE MATERIAL SHALL BE COMPRISED OF STONE AND WOODY MATERIAL PER TABLE 2. WOODY MATERIAL SHALL CONSIST OF LOGS, BRANCHES, AND BRUSH NO GREATER THAN 3" IN DIAMETER.
3. THE NATIVE MATERIAL SHALL BE EXCAVATED, STOCKPILED, AND RE-USED FROM ABANDONED CHANNEL SECTIONS PER TABLE 2.
4. THE PLACEMENT OF RIFFLE MATERIAL SHALL BE DONE IN A MANNER TO CREATE A SMOOTH PROFILE, WITH NO ABRUPT "JUMP" (TRANSITION) BETWEEN THE UPSTREAM POOL-GLIDE AND THE RIFFLE, AND LIKEWISE NO ABRUPT "DROP" (TRANSITION) BETWEEN THE RIFFLE AND THE DOWNSTREAM RUN-POOL. THE FINISHED CROSS SECTION OF THE RIFFLE MATERIAL SHALL GENERALLY MATCH THE SHAPE AND DIMENSIONS SHOWN ON THE RIFFLE TYPICAL SECTION WITH SOME VARIABILITY OF THE THALWEG LOCATION AS A RESULT OF THE SMALL POOLS AND LOGS.
5. THE END OF RIFFLE CONTROL POINT MAY TIE IN TO ANOTHER IN-STREAM STRUCTURE (LOG SILL, J-HOOK, ETC.). NO WOODY MATERIAL SHOULD BE INCLUDED WITHIN THE FOOTPRINT OF THE PROPOSED STRUCTURE.

TABLE 2 - RIFFLE COMPOSITION		
REACH	STONE SIZE	%
AV1	#3	20
	#57	60
	WOOD	20

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SEAL

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PROJECT NAME:
APPLE VALLEY PROJECT
HENDERSON COUNTY, NORTH CAROLINA

DRAWING TITLE:
DETAILS

PROJECT NUMBER:	0484
PROJECT MANAGER:	BPB
DESIGNED:	DIS
DRAWN:	SCF
CHECKED:	AFM

SHEET NUMBER:

D4

Appendix B –
Data/Analysis/Supplementary Information

IRT Meeting Minutes

M E M O R A N D U M

302 Jefferson Street, Suite 110 Raleigh, North Carolina 27605 919.209.1052 tel. 919.829.9913 fax

TO: **Harry Tsomides, DMS**

FROM: **Brad Breslow, RES**

DATE: **August 10, 2018**

RE: **Apple Valley Site Post-Contract IRT Site Visit Minutes**
CU: 06010105
DMS Project No: 100063
DEQ Contract No: 7531
County: Henderson
Location; 35.419880, -82.364447
DMS Project Manager: Harry Tsomides

Meeting Summary:
Date/Time: July 31st, 2018- 8:00 am
IRT Attendees: Todd Tugwell (USACE), Mac Haupt (NCDWR)
DMS Attendees: Paul Wiesner, Harry Tsomides, Kirsten Ullman, Periann Russell, Matthew Reid
RES Attendees: Brad Breslow, Matt DeAngelo, George Lankford (Lankford, LLC)

General Summary:
IRT members agreed that the Apple Valley Site (the "Site) is suitable to provide compensatory stream and mitigation and final credit ratios will be determined in the approved Mitigation Plan. The group agreed that stream and wetland treatment(s) and seemed appropriate and no adjustments to contracted credit amounts are expected. RES and DMS understand that final design approaches and crediting rationale must be fully justified in the mitigation plan.

Specific Comments:

- Mac Haupt and George Lankford commented that the on-site soils were more typical of a Toxaway Series even though the NRCS has the area mapped as Codorus. Mac commented that he would be more comfortable with the wetland hydrology performance standards for Toxaway (12-16%), as outlined in the 2016 Wilmington District Stream and Wetland Compensatory Mitigation Update.

- Group agreed that a Priority 1 Restoration approach that would include a mixture of off-line and in-line stream restoration was ideal approach to maximize functional uplift for the stream and wetland restoration.

- Hydrologic improvements to the wetland would come from raising the elevation of the stream bed, plugging the multiple drainage ditches, and minor grading to promote infiltration.

- Group agreed that it would be ideal to expand the easement area to the west of the existing fenceline to potentially capture more wetland area.

- Todd and Mac asked for RES to install pre-construction hydrology wells to document existing hydrology. RES agreed to install 2-3 gauges as soon as feasible.

- Todd asked if the upstream pond off the property affects the hydrology of the Site, but RES confirmed that the pond is offline and has a very minimal effect on the 270 acre watershed.

- Group generally agreed with limits of the jurisdictional wetlands, but this would need to be confirmed by the JD.

- Paul Wiesner mentioned how projects in this area often require extra coordination with SHPO and sometimes archaeological surveys are needed. RES and DMS will coordinate on this during ERTR phase to limit any surprises.

- Minor constraints discussed during the project included:

    - the layout of the existing cattle crossing at the bottom end of the project. RES agreed to discuss other options with the landowner for moving cattle to the pasture south of the DOT road and will also reach out to DOT regarding the issue of moving cows across the right of way;

    - the narrow easement area near the upper end of the project might not provide sufficient buffer. RES is in process of negotiating this with landowner(s).

Legend

- Proposed Easement (5.94 ac)
- Project Parcel
- Parcels

Stream Mitigation

- Restoration

Wetland Mitigation

- Re-Establishment
- Enhancement

Stream Mitigation				
Reach	Approach	Length (LF)	Ratio	SMU
AJ1	Restoration	1,466	1:1	1,466
Non-Standard Buffer Width Adjusted Total				1,549
Wetland Mitigation				
Approach		Area (ac)	Ratio	WMU
Restoration		2.85	1:1	2.85
Enhancement		0.19	2:1	0.10
Total		3.04		2.95

N W E S

0 100 200

Feet

Figure 7 - Conceptual Map

Apple Valley Mitigation Site

Henderson County, North Carolina

Date: 2/2/2018

Drawn by: ATP

res

Document Path: D:\Dropbox (RES)\@RES GIS\Projects\NC\DMS RFP Feb 8 2018\Apple Valley\MXD\DMS RFP Figure 7 - Conceptual - Apple.mxd

WETS Table for Sampson County

WETS Table

WETS Station: HENDERSONVILLE 1 NE, NC								
Requested years: 1988 - 2018								
Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	48.6	28.3	38.4	4.93	3.28	5.90	7	2.7
Feb	52.4	30.5	41.5	4.14	2.73	4.97	6	1.2
Mar	59.5	36.5	48.0	5.01	3.33	6.01	8	1.3
Apr	68.6	44.2	56.4	4.44	3.13	5.26	7	0.1
May	75.5	52.9	64.2	4.34	2.62	5.27	7	0.0
Jun	81.7	60.8	71.3	5.01	3.13	6.05	9	0.0
Jul	84.4	64.9	74.6	5.65	3.50	6.83	9	0.0
Aug	83.0	64.0	73.5	5.36	3.65	6.39	9	0.0
Sep	77.3	57.5	67.4	4.85	2.61	5.92	7	0.0
Oct	68.4	45.7	57.1	3.89	1.83	4.76	5	0.0
Nov	59.0	35.5	47.3	4.51	2.97	5.41	6	0.3
Dec	50.7	30.9	40.8	5.12	3.62	6.07	7	1.9
Annual:					50.61	63.92		
Average	67.4	46.0	56.7	-	-	-	-	-
Total	-	-	-	57.25			87	7.5

GROWING SEASON DATES			
Years with missing data:	24 deg = 10	28 deg = 7	32 deg = 7
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 21	28 deg = 24	32 deg = 24
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	3/13 to 11/19: 251 days	3/26 to 11/8: 227 days	4/11 to 10/23: 195 days
70 percent *	3/8 to 11/25: 262 days	3/22 to 11/13: 236 days	4/7 to 10/28: 204 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
1898						5.71	11.21	8.61	7.81	M11.64	3.08	3.95	52.01
1899	3.75	9.43	9.27	4.21	3.74	5.08	4.07	5.40	2.26	2.38	1.80	7.09	58.48
1900	M3.94	10.10	5.76	8.06	3.83	8.79	5.75	1.53	3.80	4.10	3.47	4.98	64.11
1901	3.39	1.76	6.55	8.52	8.94	9.13	5.22	26.58	5.78	2.90	1.32	12.51	92.60
1902	2.15	8.75	5.99	1.90	2.14	5.51	1.74	M3.31	5.97	4.26	3.46	5.65	50.83
1903	4.24	10.00	10.56	4.38	2.88	7.01	6.50	5.56	3.52	1.98	2.42	1.55	60.60
1904	2.48	3.80	5.88	2.13	4.68	4.25	M3.70	6.31		0.01	3.20	3.13	39.57
1905	5.20	5.86	2.57	2.02	7.97	7.02	12.90	11.31	1.83	3.42	0.38	8.70	69.18
1906	12.40	1.21	6.81	2.42	3.11	10.28	6.72			4.26	2.78	4.04	54.

													03
1907	0.39	1.69	3.51	2.91	5.69	5.67	2.91	3.64	5.53	0.91	6.29	M9.07	48.21
1908	M5.54	8.19	4.01	5.35	3.74	3.05	6.81	12.17	2.78	M10.53	M1.51	6.39	70.07
1909	M4.44	5.84	6.74	4.14	6.65	10.46	5.04	5.64	6.48	3.58	0.57	5.70	65.28
1910	3.57	4.58	1.91	2.35	6.97	5.38	9.58	11.74	3.49	4.78	0.21	5.05	59.61
1911	4.68	3.06	3.26	7.91	1.88	0.96	2.58	5.51	2.63	6.33	3.88	6.51	49.19
1912	2.32	M4.90	7.70	4.54	6.99	7.08	7.72	3.17	4.94	1.75	2.53	3.05	56.69
1913	3.41	4.13	10.14	2.93							M0.53	5.56	26.70
1914	2.10	4.13	2.81	6.11	0.95	3.89	3.98	5.24	2.99	9.14	8.27	11.73	61.34
1915	7.62	5.71	4.01	0.43	7.62	7.30	2.74	7.59	5.03	6.60	4.46	8.52	67.63
1916	2.44	5.86	2.00	3.48	4.50	7.82	22.09	4.83	2.26	3.39	1.56	3.15	63.38
1917	4.19	M4.23	8.76	3.27	3.40	3.35	5.39	3.97	7.87	3.55	0.30	2.06	50.34
1918	7.95	2.23	2.28	4.43	4.52	4.18	4.30	1.89	3.94	14.59	3.07	12.85	66.23
1919	6.23	4.07	7.87	2.52	6.30	8.28	5.12	4.36	0.22	3.03	1.80	2.18	51.98
1920	4.06	3.44	7.61	M9.49	2.91	7.85	5.15	13.57	4.60	1.18	3.59	7.96	71.41
1921	5.53	5.34	3.02	5.34	4.82	4.24	6.07	4.16	M5.96	2.97	3.87	2.93	54.25
1922	4.54	5.46	M7.67	4.68	M5.67	5.34	M8.85				0.75	7.62	50.58
1923	4.53	2.59	5.73	4.06	11.07	3.07	4.05	5.27	6.28	1.33	4.54	4.52	57.04
1924	8.32	4.59	4.15	7.35	3.09	M2.74	M6.68	2.08	9.14	1.59	0.63	5.75	56.11
1925	6.79	1.72	2.46	2.59	M2.43	2.37	1.82	0.49	1.06	4.61	4.65	1.88	32.87
1926	6.17	4.77	4.12	2.82	2.07	1.87	6.00	2.77	3.37	1.93	6.82	M5.36	48.07
1927	1.59	M4.48	M3.70	3.37	2.87	3.66	5.99	5.23	1.94	4.38	3.77	8.20	49.18
1928	2.00	3.80	5.65	6.34	5.98	7.05	9.38	12.07	7.08	6.38	1.08	M1.13	67.94
1929	4.77	6.94	7.72	3.84	7.01	7.42	3.41	1.94	13.77	8.24	5.09	2.83	72.98
1930	2.48	0.54	0.96	1.63	3.29	3.34	2.40	3.11	6.03	1.10	4.75	4.61	34.24
1931	2.59	2.19	3.95	4.46	4.26	2.10	5.02	4.47	0.50	1.84	0.74	12.51	44.63
1932	6.78	2.79	4.73	2.00	4.30	M8.15	7.35	3.44	2.72	10.35	4.70	8.22	65.53
1933	2.16	4.89	4.14	4.71	5.27	4.74	5.92	9.92	4.02	2.60	1.74	2.86	52.97
1934	3.96	4.51	7.72	4.48	4.54	11.56	6.02	5.95	5.85	5.01	7.31	2.67	69.58
1935	6.57	2.83	3.16	4.25	5.07	2.77	11.63	6.65	2.77	1.97	7.86	3.10	58.63
1936	11.24	4.92	6.82	8.18	1.60	1.45	6.60	6.99	6.20	7.45	2.04	7.96	71.45
1937	9.80		1.10	5.51	4.04	2.28	6.70	6.32	5.13	10.13	1.51	1.69	54.21
1938	2.97	1.77	5.86	2.54	4.16	6.05	10.19	1.66	3.76	0.28	4.94	2.82	47.00
1939	6.03	10.66	3.44	4.10	3.25	2.00	4.91	7.55	1.61	0.99	0.91	2.48	47.93
1940	4.17	4.02	3.83	5.16	2.86	5.26	5.06	16.68	0.	2.12	3.55	6.31	59.

									44				46
1941	2.13	1.45	3.63	5.27	1.60	4.96	9.57	5.15	0.45	1.95	2.57	7.18	45.91
1942	3.30	4.77	6.32	0.95	12.70	4.84	4.36	5.63	6.14	1.51	1.97	8.79	61.28
1943	M6.30	2.93	5.86	4.35	4.76	11.19	8.09	0.70	3.03	0.12	4.20	2.95	54.48
1944	3.84	8.75	8.08	4.11	3.77	4.08	2.55	2.72	7.56	3.23	3.27	3.29	55.25
1945	1.53	6.86	4.97	5.36	3.54	2.59	7.50	4.96	9.07	M2.79	2.55	5.82	57.54
1946	5.77	6.22	7.54	3.49	5.77	3.70	4.38	4.56	3.34	4.57	4.30	2.03	55.67
1947	8.93	1.36	3.93	3.85	2.70	5.95	4.95	5.04	2.63	9.92	5.70	2.59	57.55
1948	4.00	5.33	7.27	1.55	4.08	3.44	5.64	7.02	5.24	1.52	12.54	M4.49	62.12
1949	4.41	3.92	5.35	M5.98	5.13	5.12	12.71	12.60	2.87	7.82	2.00	3.88	71.79
1950	3.94	1.86	7.01	1.05	5.73	4.46	11.31	2.66	6.78	5.08	1.37	7.38	58.63
1951	1.34	2.82	M5.77	4.43	1.44	11.15	1.84	2.89	2.99	1.77	4.75	7.80	48.99
1952	5.63	4.16	11.67	4.15	2.62	4.78	2.49	8.79	3.87	1.01	M2.82	3.42	55.41
1953	5.89	6.58	4.91	2.91	M1.77	6.55	5.38	4.66	4.86	0.35	1.94	6.38	52.18
1954	M7.48	4.50	6.53	3.04	4.43	2.05	5.23	1.90	0.30	1.82	5.02	5.33	47.63
1955	1.96	4.86	3.70	5.64	4.83	4.21	5.42	2.76	0.60	3.43	2.10	0.93	40.44
1956	1.49	7.52	3.20	5.95	2.94	2.67	6.21	3.64	4.63	4.02	1.72	4.24	48.23
1957	M4.09	6.57	M1.88	8.65	1.88	9.54	1.72	2.51	9.71	2.99	8.36	4.72	62.62
1958	4.68	4.26	5.11	8.26	3.63	2.75	9.56	1.08	1.25	2.00	2.87	4.67	50.12
1959	4.51	M2.43	M5.59	6.22	7.38	1.28	3.83	5.84	9.37	9.69	1.76	3.56	61.46
1960	4.48	7.31	6.98	3.99	4.09	2.79	2.75	10.75	3.61	4.15	0.76	1.43	53.09
1961	3.27	6.96	5.11	5.11	4.87	5.60	5.81	18.12	1.95	1.49	5.37	9.70	73.36
1962	5.49	3.86	6.01	M2.17	1.33	7.35	3.47	2.20	2.98	5.34	5.04	2.52	47.76
1963	2.63	1.89	9.80	4.18	2.16	5.23	4.85	1.70	5.70	0.13			38.27
1964	2.88	4.58	7.04	8.31	2.04	3.17	7.77	13.39	7.39	M3.25	4.21	3.48	67.51
1965	3.26	5.96	5.22	5.59	4.29	5.94	6.90	7.25	2.55	4.58	1.56	0.23	53.33
1966	3.66	9.16	2.36	5.00	4.56	1.73	3.83	6.10	6.52	5.77	4.08	2.61	55.38
1967	3.27	2.82	2.93	1.37	6.12	7.23	6.17	9.32	3.36	3.73	2.88	7.37	56.57
1968	3.57	0.64	5.44	2.63	5.45	6.76	3.80	1.76	3.25	6.09	3.76	3.61	46.76
1969	3.31	5.18	4.94	4.25	3.00	9.20	4.51	11.24	4.84	3.11	3.44	5.23	62.25
1970	2.15	2.99	3.58	3.31	2.79	3.25	3.70	5.28	0.57	9.07	2.14	2.97	41.80
1971	3.24	5.69	3.70	2.42	4.34	2.62	5.49	7.30	5.33	10.10	3.40	4.26	57.89
1972	3.90	2.16	4.24	2.26	9.74	9.77	4.07	3.09	4.21	4.88	5.72	6.01	60.05
1973	5.46	5.54	10.58	4.24	9.37	5.94	5.64	2.28	4.69	4.04	3.39	10.63	71.80
1974	4.46	3.97	4.90	5.98	4.82	4.63	5.64	8.31	4.	1.49	4.50	2.92	55.

									16				78
1975	5.19	5.62	10.85	0.65	7.84	3.74	3.44	4.32	7.79	6.21	6.29	6.39	68.33
1976	4.04	2.18	5.09	0.13	11.18	5.60	3.22	4.83	4.73	6.86	2.66	5.36	55.88
1977	1.83	1.54	8.53	4.74	2.84	4.08	2.30	7.71	10.22	5.18	7.90	3.34	60.21
1978	9.16	0.46	5.64	3.62	5.48	1.10	5.14	8.72	1.79	0.32	3.11	5.35	49.89
1979	7.62	M6.30	9.78	8.16	6.57	4.44	5.41	2.75	6.93	2.31	6.83	1.52	68.62
1980	3.67	1.20	10.58	6.54	5.95	4.35	3.97	3.34	4.46	2.72	3.47	0.75	51.00
1981	0.39	5.31	3.70	2.74	5.52	2.96	2.53	0.99	2.90	2.60	1.10	6.21	36.95
1982	5.44	7.16	1.80	5.35	5.57	5.19	8.69	3.85	2.11	4.02	5.32	5.05	59.55
1983	3.60	6.67	8.98	6.96	4.08	1.52	1.74	1.40	6.32	4.93	5.64	10.28	62.12
1984	3.35	6.82	5.16	5.40	6.61	4.85	5.28	6.27	0.16	2.87	3.08	1.97	51.82
1985	M3.74	5.33	1.08	2.92	2.95	3.05	7.11	8.09	1.06	4.16	6.73	0.92	47.14
1986	1.45	2.02	2.76	0.52	7.53	3.64	1.16	7.97	3.74	6.27	6.73	5.89	49.68
1987	4.34	6.24	5.37	2.81	1.43	4.69	4.79	4.25	7.73	0.36	4.35	3.66	50.02
1988	3.98	1.35	1.67	3.68	1.19	3.67	3.35	4.28	2.63	4.23	3.95	1.61	35.59
1989	3.10	4.94	5.32	2.32	6.05	11.92	7.68	6.88	9.84	3.07	4.70	3.99	69.81
1990	5.52	9.12	10.16	1.70	4.17	1.91	4.89	7.08	1.35	9.11	1.51	5.01	61.53
1991	5.13	1.66	8.16	6.97	6.03	4.09	5.71	6.75	2.58	1.48	2.81	4.09	55.46
1992	3.50	4.48	4.65	5.83	6.58	6.54	1.91	8.41	6.31	4.90	10.22	4.45	67.78
1993	7.36	3.44	M9.00	4.25	3.29	0.64	3.73	4.59	1.39	1.80	4.65	5.39	49.53
1994	8.27	4.38	8.38	5.04	2.35	8.10	9.70	14.41	5.42	4.44	5.85	4.78	81.12
1995	10.57	4.99	3.71	2.05	4.27	8.21	3.07	10.86	3.06	7.49	5.41	1.60	65.29
1996	10.84	3.63	5.34	2.83	2.37	5.14	8.06	3.14	4.77	0.83	6.41	4.88	58.24
1997	5.85	6.66	8.38	6.97	2.26	5.95	3.73	1.13	M5.45	M4.61	2.26	3.33	56.58
1998	11.96	9.78	5.32	7.43	2.92	6.08	0.80	2.39	1.97	3.36	2.79	3.88	58.68
1999	5.16	4.85	2.78	4.11	2.60	5.01	3.52	4.33	2.17	4.29	5.54	2.50	46.86
2000	4.39	3.80	5.01	6.05	M1.38	3.50	4.23	2.51	3.56	0.03	4.44	3.17	42.07
2001	M2.86	3.09	6.42	1.42	2.37	3.66	8.27	2.59	5.80	1.77	1.53	2.47	42.25
2002	4.47	1.67	5.45	1.84	5.52	3.25	1.77	2.18	7.29	4.13	4.66	7.32	49.55
2003	1.81	5.22	5.73	6.48	9.15	4.65	11.13	11.16	3.76	2.62	M5.90	4.28	71.89
2004	1.26	5.80	1.93	3.04	4.21	M9.16	M4.67	3.45	19.87	0.87	6.69	5.16	66.11
2005	2.39	4.12	M2.70	M3.47	M1.95	14.21	M11.23	6.36	0.48	2.04	5.07	5.44	59.46
2006	3.91	2.15	1.12	M5.30	1.36	6.41	5.88	M5.65	7.68	3.95	M5.16	M6.40	54.97
2007	M1.80	M2.88	M0.48	2.82	1.40	M3.07	3.67	M3.73	2.25	2.52	3.25	5.78	33.65
2008	1.88	4.39	5.60	3.22	M2.56	0.90	5.57	3.85	2.	0.70	2.96	5.36	39.

									23				22
2009	2.72	1.19	6.74	4.27	M6.61	5.28	M2.15	6.28	11.79	5.94	5.89	M10.37	69.23
2010	7.88	3.80	M3.52	2.67	4.51	M2.27	2.34	2.62	4.28	3.93	2.77	6.82	47.41
2011	M2.53	M2.67	M9.42	M5.35	M2.30	3.87	3.75	4.71	7.01	M2.41	6.15	5.23	55.40
2012	4.64	1.44	M3.37	4.91	M6.14	1.19	M5.92	7.71	6.17	3.95	0.82	5.24	51.50
2013	8.53	4.21	3.59	6.56	6.00	6.49	17.23	5.22	3.00	1.68	4.80	8.66	75.97
2014	2.91	3.24	2.82	6.13	4.04	4.18	4.81	3.84	3.01	3.31	5.24	2.83	46.36
2015	3.57	2.74	2.37	4.88	1.21	4.57	2.51	3.26	4.99	11.84	8.81	8.72	59.47
2016	4.21	7.04	1.05	1.21	4.84	4.32	10.97	5.73	0.53	0.69	0.98	3.25	44.82
2017	4.41	0.88	6.63	9.47	8.44	3.41	8.85	3.94	5.46	8.78	1.32	2.61	64.20
2018	5.34	6.12	3.99	5.24	16.61	3.69	3.92	7.02	4.91	9.97	7.24	14.07	88.12
2019	6.03	8.82	M1.81										16.66
Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.													
Data missing for all days in a month or year is blank.													
Creation date: 2016-07-22													

Soils Survey Report

FINAL-Detailed Hydric Soils Study
Apple Valley Mitigation Site
Henderson County NC

Prepared for:

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December 2018 Soil Scientist Seal

This report describes the results of the soil evaluation performed at the Apple Valley Mitigation Site in Henderson County, NC. All subsequent transfers of the report by the user shall be made by transferring the complete report, including figures, maps, appendices, all attachments and disclaimers.

Study Objectives and Scope

The purpose of the study was to determine the presence of and to delineate the extent of hydric soils that are potentially suitable for hydrologic restoration and mitigation. This evaluation is a soil delineation and all boundaries shown are based on the detailed field evaluation. All soil boundaries shown are based on the detailed field assessment. Jurisdictional wetlands are located within the project boundaries and have been delineated. Concurrence by the Corps was obtained during a site visit on November 2, 2018.

The potential for hydrologic restoration of soils at the Apple Valley site are evaluated considering the existing land use and conditions with the sites ability for creating a hydroperiod suitable in the existing landscape and soils. Practical modifications discussed that utilize the available natural hydrology may include, but are not limited to surface drainage modifications, plugging drainage ditches, removal of fill materials, and microtopographic alteration such as surface roughening or enhancing existing depressions. Recommendations for removal of fill material are typically limited due to cost and potentially negative environmental impacts where an extensive area is involved. Restoration potential assumes a successful design and an ability to construct the site modifications necessary to restore adequate hydrology to hydric soil areas.

This report presents an evaluation of the subject property's suitability as wetland restoration/mitigation and is based upon a field evaluation and detailed hydric soil investigation. The observations and opinions stated in this report reflect conditions apparent on the subject property at the time of the site evaluation. My findings, opinions, conclusions, and recommendations are based on the locations and boundaries of the property as evident in the field and professional experience.

Project Information and Background

The site is approximately 9.0 miles northeast of Hendersonville. The project is located southeast of Old Clear Creek Road (SR 1591) and north of Smith Road (SR 1590). The study area covers approximately 6 acres along an unnamed tributary to Clear Creek. The topography of the site is a wide floodplain on a smaller tributary with a gentle valley slope and slightly concave between toe slopes. The site extends approximately 1,300 linear feet upstream of Smith Road. Below Smith Road the stream flows approximately 750 feet to Clear Creek.

Current land use is active pasture within the floodplain and portions of the adjacent upland slopes. A number of shallow ditches and swales are present that improve surface water removal. The livestock have full access to the stream except for approximately 200 feet at the upstream end. The stream banks are unprotected and are exhibiting erosion and sloughing. Vegetation at the site is mix of pasture grasses that are moderately grazed. Within low lying areas scattered rushes and sedges are present. Surrounding land use consists of apple orchards, residential homes, small farms, and undeveloped land. Upstream of the site and off of the project parcel, a small, offline pond is present. A small seepage wetland is present on the east floodplain and within the wetland scattered trees are present.

This evaluation focused upon areas having hydric soil characteristics and modified drainage features. The potential for restoration or enhancement of these hydric soils was evaluated and suitability for wetland mitigation is discussed.

Methodology

The NRCS mapping of the project area was reviewed to determine general soil characteristics that may be encountered. Soil map unit characteristics were identified including parent materials and an expected range of morphological characteristics such as drainage, texture, seasonal high-water table, and soil use limitations. Soil map unit taxonomic classifications were used to help determine a potential hydroperiod

for the restored hydrology. The NRCS map units are suitable for comparing the potential land uses of large areas. More specific soil information is needed to determine a sites suitability for a specific land use.

To investigate site specific soil characteristics, a detailed hydric soil delineation was completed in July 2018 to describe the soils within the landscape setting and current management system. The existing hydrology and drainage modifications are documented with relevant soil characteristics that may affect potential hydrology. A series of soil borings were performed across the site to evaluate soil variability and to delineate the boundary between hydric soil and upland soil. Soil borings were used to described current soil characteristics and assess the extent of hydric soil suitable for restoration. These boring observations do not contain adequate detail to classify these soils to a series. This report addresses hydric soil found within the pasture and wetland.

The soils evaluation used visible morphologic characteristics to determine hydric indicators and access current hydrology using criteria based on "Field Indicators of Hydric Soils in the United States" (USDA, NRCS, 2016, Version 8.1). Indicators used are valid for the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region Version 2.0 within Major Land Resource Area (MLRA) 130B- Southern Blue Ridge and Land Resource Region (LRR) N- East and Central Farming and Forest Region. A hydroperiod success criteria is proposed based upon Corps mitigation guidelines (US Army Corps of Engineers. 2016).

The soil boundary was delineated based on soil borings information, landscape position, and topographic relief. Boring locations were approximately located using the Trimble Outdoor Navigator smart phone application and exported to Google Earth. The hydric soil boundary points were delineated by placing pin flags along the hydric/non-hydric soil boundary. These points were collected with a GPS system by RES staff and were used to draw the boundaries for the figures and to calculate acreage.

At the Apple Valley site, more than 49 shallow borings from 12 to 36 inches were evaluated to delineate and characterize the soils. Representative profiles document and describe the range of characteristics found across the site. These characteristics include texture, color, mottling, and saturation-water table where present. Other important observations were noted as observed. The report describes soils and site conditions the project site within the landscape setting and current management regime, including conclusions and recommendations for suitable hydrologic restoration.

NRCS Soil Mapping Review

Floodplain soils typical of this area formed in sandy and loamy alluvium with the surrounding uplands formed in colluvium or residuum. These floodplains typically have a few higher elevations of alluvial deposits and a mix of linear concave features and shallow elevated hummocks. Soil texture and slope have the largest effect on the natural drainage in these landscapes. The soils mapped by the USDA, Soil Conservation Service (SCS) Soil Survey of Henderson County (USDA 1980) indicate one major soil mapping unit across the project. The single map unit is a somewhat poorly drained Codorus loam (Arkaqua). Note that some series have been reclassified by the NRCS to a similar series having the same taxonomy and management recommendations, such as the Codorus loam (Arkaqua). The original map unit name is kept with the updated series in parenthesis for consistency. The surrounding upland soil map units are well drained Hayesville loam, Bradson Gravelly loam and Evard soil (Table). The Codorus (Arkaqua) is not classified as hydric by the NRCS, but is known to contain potential inclusions of Toxaway that is classified as a hydric soil. The surrounding map units are not classified as hydric and are not expected to contain hydric inclusions.

Codorus typically has a brown loam surface layer with a brown clayey subsoil having gray mottles. This soil is found in shallow depressions on nearly level floodplains. Toxaway has a thick surface of dark gray

to black silt loam. The underlying layer is a dark gray sandy loam. The surface layer is high in organic matter and is found on depressional areas of larger floodplains.

Table 1. NRCS Mapped Soil Units General Unit Characteristics - Apple Valley Site

Series*	Taxonomic Class	Drainage Class	Hydric Rating	Seasonal High Water Table (in)	Farmland classification
Codorus loam (Arkaqua)					
Arkaqua (90%)	*Fluvaquentic Dystrudepts*	somewhat poorly	No	18 to 24	Prime farmland if drained
*Toxaway (5%)	*Cumulic Humaquepts*	Very poorly drained	Yes	0 to 12	
Hayesville loam, 7 to 15 percent slopes					
Hayesville (90%)	*Typic Kanhapludults*	well	No	>80	Farmland of statewide importance
Bradson gravelly loam, 2 to 7 percent slopes					
Bradson (90%)	*Typic Kanhapludults*	well	No	>80	Prime farmland
Evard soils, 15 to 25 percent slopes					
Evard (95%)	*Typic Kanhapludults*	well	No	>80	Farmland of local importance

*Map unit inclusions with potential hydric soil.

Results and Discussion

Landscape Setting

The project is located in a rural area of Henderson County at the edge of the rolling intermountain plateau. Historically, the expected natural community of this floodplain was likely a mosaic of bottomland hardwood forest and mixed hardwoods grading to a mesic upland oak-hickory hardwood forest. The site is currently actively grazed with livestock with surrounding land use of primarily apple orchards and undeveloped forest with scattered small residential homes on small farms. The stream valley is enclosed by steeper mountain sides. The project landscape is a moderately wide, concave to nearly level floodplain having a gentle, subtlety concave, valley slope. A few smaller topographic features are present, including shallow depressions and areas of slightly higher elevation that are better drained. The main drainage feature of the project site is an unnamed tributary that exits the project by passing under Smith Road and onto the larger floodplain of Clear Creek. The stream is moderately incised with eroding banks due to a lack of woody vegetation and direct access by livestock. The destabilized stream banks are promoting active erosion throughout.

Along the toe of slope a number of seepage areas are present. Hydrology of the seeps are variable and most appear to have a somewhat limited hydroperiod due to their smaller size and a potential dependence on seasonal rainfall. The jurisdictional wetland is a larger seepage area on the eastern side of the floodplain. Shallow swales and ditches have been constructed to limit ponding across the floodplain and reduce hydrology at the seeps. Because of the sandy nature of much of the site soil, the shallow surface drainage and incised channel, hydrology at this site is limited. Shallow ditches currently drain the concave to nearly level backwater areas. Along the eroded stream banks, the stratification of alluvial deposits is visible. In some areas a layer containing small gravel is exposed at 16 to 30 inches.

Site Soils Description

Soil borings throughout the project exhibited hydric soil indicators within 12 inches of the soil surface. that are typical of the landscape setting. Hydric soil occurs throughout the floodplain, extending across the valley from slope to slope and the length of the project (Figure 2). Small areas of disturbed soils of fill or past deposition are present.

Based upon the borings examined, soils are loamy with a dark brown surface horizon underlain by gray loam having redoximorphic mottles (Appendix A). Deeper borings into a C horizon exhibited sandy textured horizons and were often observed to intersect the water table. Soils were found to be darker in color than the mapped Codorus soils and contain a higher organic matter content. The site soils appear to be most similar to the darker colored Toxaway soil series, the common inclusion in the map unit.

Near the upstream end of the project, soils appear disturbed with irregular mounds that appear to be fill and the presence of a swale/ditch paralleling the property line. The source of fill may be from construction of the nearby barn and out building. The swale extends toward the road and along the base of the pond on the adjoining property, possibly constructed or enhanced during construction of the nearby pond. The loamy and sandy texture of the soils are susceptible to rapid drainage from the modest drainage improvements at this site and result in lowering the water table and limiting hydrology.

Soils at this site appear to correspond to the NRCS map unit inclusion of Toxaway with limited areas of better drained Codorus in higher elevations. The better drained areas appear to correspond to the mapped Codorus series and the poorly drained soil appear similar to Toxaway series. Variation in observed soil characteristics appears primarily related to elevation and disturbances. The deeper sandy layer and the gravel layer observed along the incised channel can provide rapid lateral drainage that may be expected to rapidly lower the water table and limit saturation. This effect would also limit saturation in the slope seepage areas.

Hydric Indicators

The hydric soil indicators present at the Apple Valley site are the *A11- Depleted Below Dark Surface*, *F3-Deplteted Matrix*, and *F8-Redox Depressions*. The *A11* indicator is formed in conditions of long saturation to allow the accumulation of dark organic matter. The *A11* and *F8* indicators are found in the lower elevation with the *F3* is found throughout this landscape. The *F8* indicator may have been more widespread but land use of cultivation, livestock, and potential deposition events would destroy or obscure this indicator. The incised stream and shallow ditches appear to limit surface ponding, reducing infiltration and shortening natural hydroperiods. A reduced hydroperiod limits the opportunity for biological processes characteristic of wetlands to occur. Drainage conditions have restricted or eliminated the reformation of redoximorphic features and is slowing oxidizing organic matter.

Existing hydrology

Existing hydrology sources at the Apple Valley Site are stream flow, groundwater discharge along the toe of slope, and upland runoff. The natural hydrology of the site is limited because of increased drainage across the site. The incised stream has lowered the groundwater table and the ditches and swales remove surface water and limit ponding. The soils are susceptible to further drainage from exposed horizons with higher lateral drainage potential. The stream channel may have been relocated to one side of the floodplain, especially within the nearly level, lower portion of the project area where sinuosity is low.

Raising the stream bed will raise the local water table and restore natural overbank flows to provide hydrology to floodplain soil. Creating surface roughness while enhancing small depressional areas will increase saturation and surface storage. The existing seeps will extend hydrology once subsurface drainage is reduced through limiting the exposed highly permeable subsoil horizons. The natural

hydrology regime can be restored through a combination of raising the water table, increasing flood events, retaining the existing groundwater discharge, and increasing floodplain surface storage.

Hydroperiod Guidance of Restored Soils

Based upon field observation across the Apple Valley site, the NRCS mapped unit appears to have a moderate correlation to actual site conditions with soils exhibiting characteristics most similar to expected inclusion of Toxaway. Site soils have a subsoil of sandy loam, silt loam or sandy clay loam and likely have a slightly higher rate of internal drainage than the mapped soil units. The mapped soil series of Codorus is classified as a somewhat poorly drained *Fluvaquentic Dystrudepts* but field observations indicate a more developed dark surface most like the very poorly drained Toxaway (*Cumulic Humaquepts*) series. The site evaluation indicates soil no longer have the appropriate natural hydrology and that restoration of the natural longer hydroperiod is possible. Because of the site's drainage modifications, restoration to a more natural longer hydroperiod is possible utilizing practical modifications..

Mitigation guidance for Common Mountain Soil Series (US Army Corps of Engineers 2016) suggests a hydroperiod for the Toxaway series of 12-16 percent during which the water table is within 12 inches of the surface (Table 3). Hydrologic success for the soils at this should be expected to range from 9 to 16 percent. Areas in the lower elevations may be saturated for periods closer to 16 percent and higher elevations and where the hydric soils transition to upland areas may be expected to be closer to 9 percent.

Table 2. Hydroperiod Proposed Success Criteria - Apple Valley Site

Drier ←----------→ Wetter

Mapping Unit/Series	Codorus loam (arkaqua)	Toxaway silt loam
Taxonomic Classification	*Fluvaquentic Dystrudepts*	*Cumulic Humaquepts*
Parent Material	loamy alluvium	loamy alluvium
Topographic Slope Setting (down/across)	linear/linear-	concave-linear/concave
Flooding/Ponding Frequency	frequently/none	frequent/none
Permeability	moderate	moderately
Ksat (most limiting layer)	mod high to high	mod high to high
	0.57 to 1.98 in/hr	0.57 to 1.98 in/hr
Available Water Capacity (water storage in profile)	mod (~7.7 in)	mod (~8.1 in)
Runoff Class	low	very high
Hydrologic Soil Group	B/D	B/D
Hydroperiod Range *	7-9%	12-16%

**Hydroperiod follows US Army Corps of Engineers. 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update. North Carolina Interagency Review Team - October 24, 2016.*

An appropriate hydroperiod for this site will require successful stream restoration to meet the suggested hydrologic criteria. Additional recommendations include, but are not limited to surface drainage modifications to limit rapid surface drainage, plugging drainage ditches, and removal of fill materials. Because the long-term land use has modified the surface, microtopographic alteration such as surface roughening or enhancing existing depressions should also be performed prior to planting.

Recommendations and Summary Conclusions

The site is currently in agricultural use that differs from the historic landscape and has an altered hydrologic regime. The current land use is grazing livestock with surface modifications to enhance surface drainage and an incising stream channel. Past landscape/land use changes at this site includes enhanced surface drainage, an incised channel that was potentially. The incised channel has exposed sandy and gravelly horizons capable of allowing more rapid drainage of soils. The observed soils over the site are similar to inclusions expected within the mapped soil units. The sources for hydrologic input at the Apple Valley site are stream overbank events, upland runoff, , and numerous seeps along the toe of slope at the edges of the hydric soil.

The observed soils have a dark loamy surface underlain by either a black or a gray depleted layer, usually containing redoximorphic features. Redoximorphic concentration were observed within 10 inches across much of the site. The observed hydric indicators are *A11-Depleted Below Dark Surface*, *F3- Depleted Matrix*, and occasionally the *F8- Redox Depressions*. Prior to past depositional events, the *A12-Thick Dark Surface*, was also likely present. These indicators point to a historically saturated condition with a range of hydroperiods.

The soils observed across the site appear to be mostly Toxaway (*Cumulic Humaquepts*) soils suitable for restoration and have an expected hydroperiod of 10 to 16 percent. Within the upper reaches of the soil unit, a 9 to 12 percent hydroperiod may be expected. Natural variability across the site should be expected with wetter areas ranging to 16 percent in the lower elevations and depressions and 9 percent near the upland boundary lacking slope seepage.

Because of the sites observed soil characteristics and landscape position hydrologic restoration of the soil may be accomplished by raising the bed elevation of the tributary to allow more frequent access to the floodplain and to restore the groundwater elevation to historic condition. To mimic natural systems, surface coarsening and creation of shallow depressions throughout the restoration area will reestablish more natural conditions and provide an appropriate landscape for diverse habitat. Due to compaction and long-term agricultural use, a shallow ripping of the surface along the contour to no more than a depth of 8 to 10 inches is recommended. This decompaction will create adequate porosity for infiltration, enhance storage, and improve vegetative survival and growth. All ripping should be conducted in the dry to maximize its effectiveness. Benefits of decompaction at this site include, reduced surface flow velocity, improved infiltration rate, improved soil structural properties (important for vegetative establishment), and enhanced surface and subsurface biogeochemical cycling and storage. Decompaction will improve planting conditions to increase survival and enhance long-term growth.

Successful hydrologic restoration at this site can provide numerous soil related functional uplifts. These include, storage of floodwaters, trapping of sediments from agricultural runoff, nutrients, and pollutants. The wetland will increase infiltration of runoff, reestablish a natural oxidation-reduction cycle that improves nutrient and chemical transformations. Other benefits include increased organic carbon capture/accumulation, improved soil structure (surface primarily), and increases in microbial and fungal populations important for soil health. Large scale benefits may include diverse wildlife habitat and community connectivity.

This report describes the results of the soil evaluation performed at the Apple Valley Mitigation Site in Henderson County, NC. Any subsequent transfer of the report by the user shall be made by transferring the complete report, including figures, maps, appendices, all attachments and disclaimers.

References

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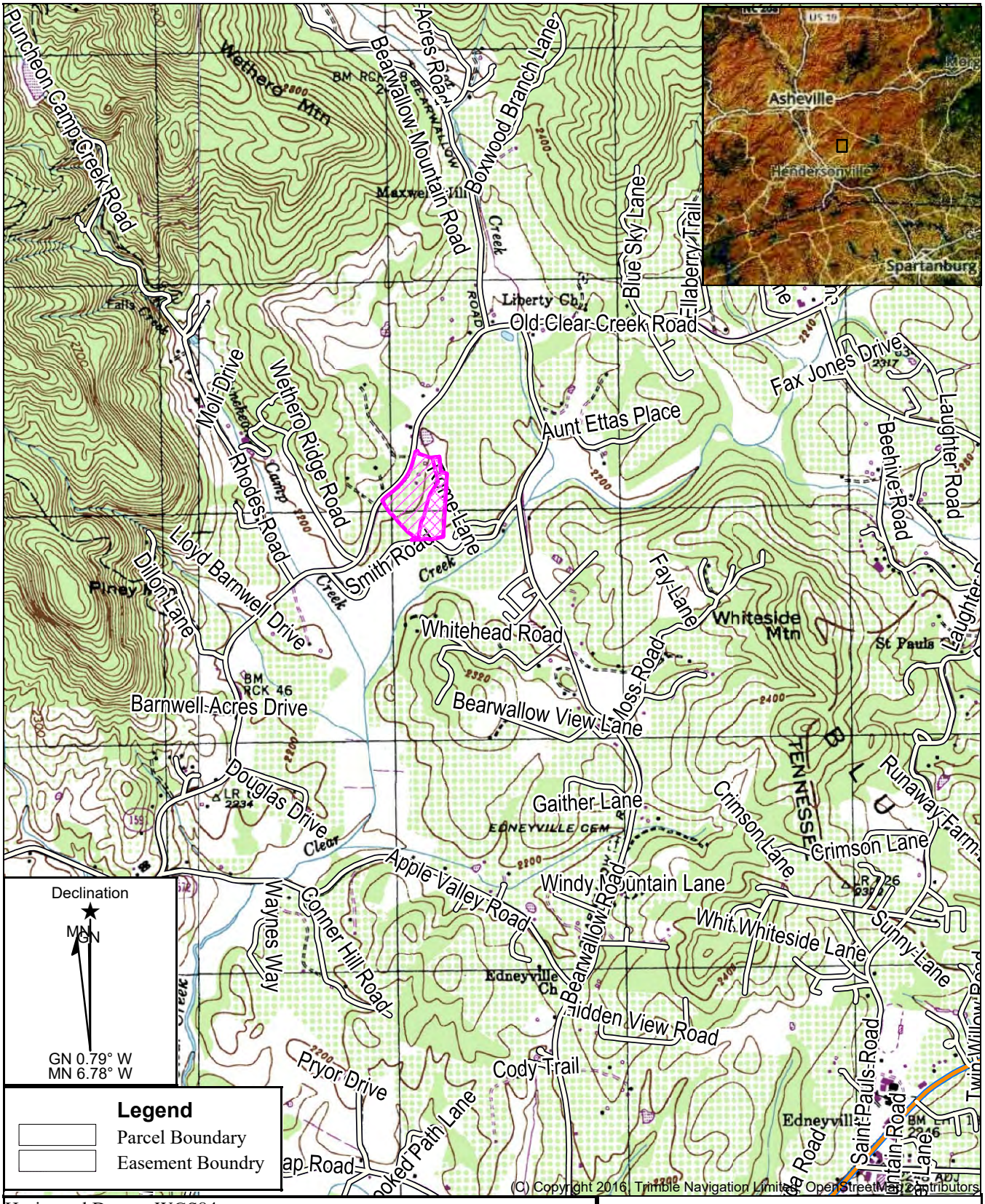
Figures

APPENDICES

Appendix A Soil Boring Log
Appendix B Photos
Appendix C NRCS Web Soil Survey Report



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Feet

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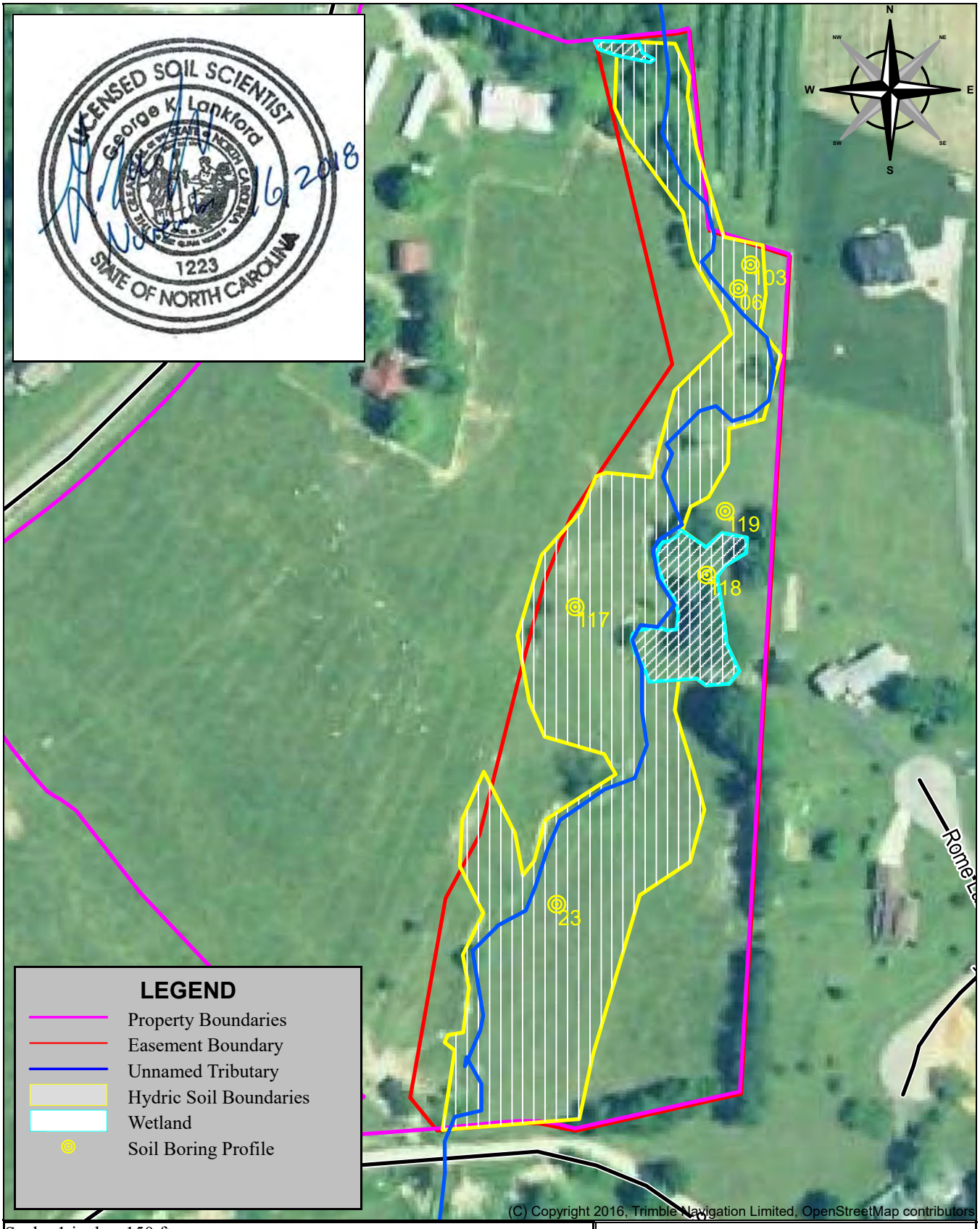
Miles

Apple Valley Mitigation Site
Figure 1. Vicinity Map-USGS
Henderson County, NC



Scale: 1 inch = 150 ft.
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Feet

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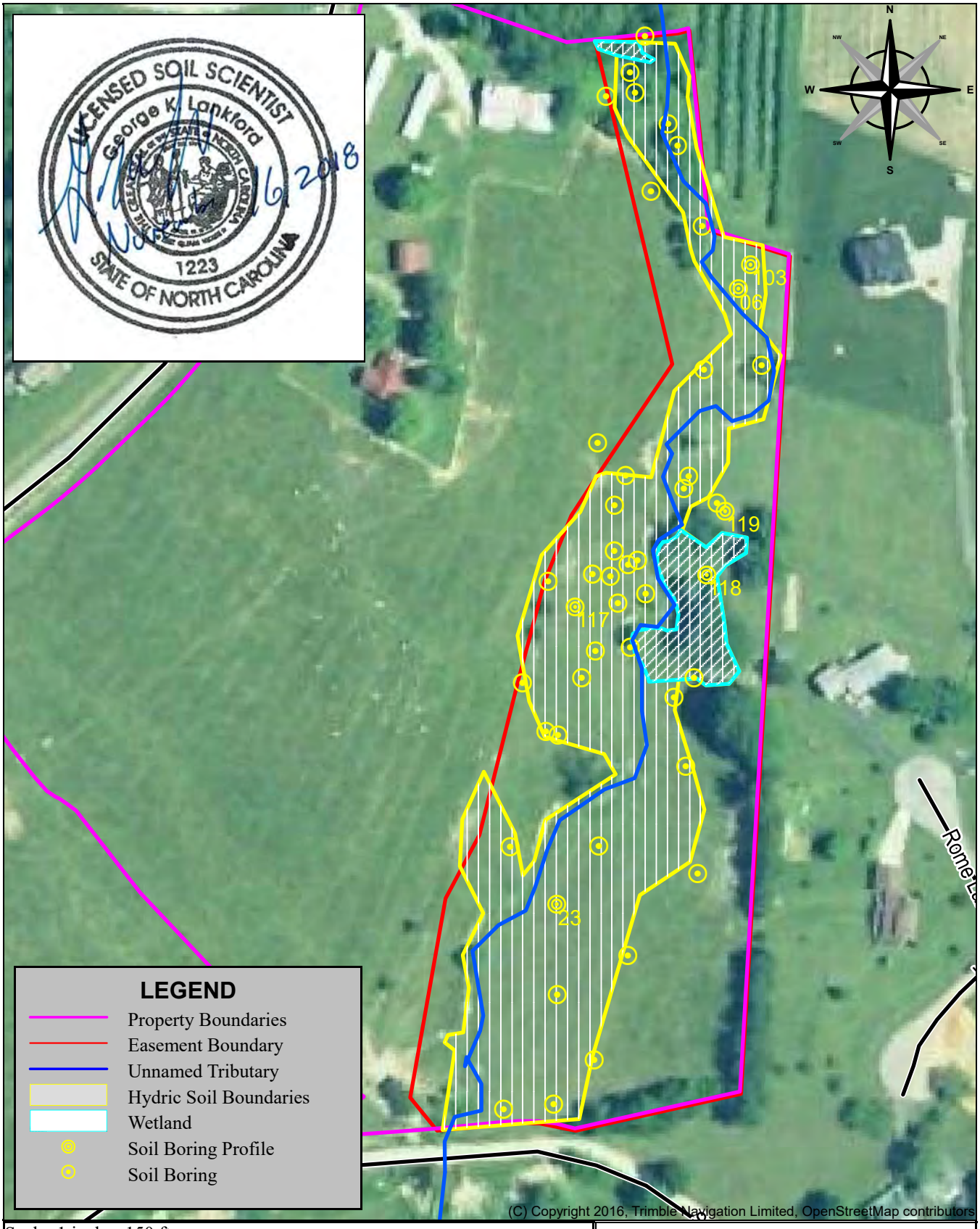
Miles

Apple Valley Mitigation Site
Figure 2. Hydric Soils
Henderson County, NC



Scale: 1 inch = 150 ft.
Horizontal Datum: WGS84

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Feet

0.00 0.01 0.02 0.03 0.04 0.05 0.06
Miles

Apple Valley Mitigation Site
Figure 3. Soil Boring Locations
Henderson County, NC

Appendix A
Apple Valley Site-Henderson County NC
Soil Boring Descriptions

Table. Representative Soil Profiles - Apple Valley Site

Depth (inches)	Color		Mottle Percentage (Location*)	Texture**	Notes
	Matrix	Mottle			
SB 6 (December 19, 2017)			Hydric Indicators WT at -13 F3-Depleted Matrix F8-Redox Depressions		
0-3	10 YR 3/3			SL	
3-9	7.5 YR 4/1	7.5 YR 3/4	25% (PL)	SL	micaceous – 10 %
9-14	7.5 YR 4/1	7.5 YR 5/6	15% (PL)	SL	
14-19	10 YR 4/4	10 YR 3/2	25% (PL)	LS	
19-25	10 YR 3/3			S	Saturated at -19
SB 23 (December 19, 2017)			Hydric Indicators WT at -23 A11- Depleted Below Dark Surface		
0-17	7.5 YR 4/1			SL	
17-20	N 2.5/-	5 YR 3/4	2% (PL)	SL	old root channels-buried A
20-28	N 2.5/-				
SB 103 (July 30, 2018)			Hydric Indicators WT at -19 F3-Depleted Matrix F8-Redox Depressions		
0-1	10 YR 3/2			SL	
1-8	10 YR 4/2	10 YR 4/6	7% (PL)	SL	
8-18	2.5 Y 2.5/1	5 YR 4/6	10% (PL)	SL	
18-26	2.5 Y 3/2			cS	
SB 117 (July 30, 2018)			Hydric Indicators WT at -23 F3-Depleted Matrix-(Relict)		
0-4	2.5 Y 3/2			SL	
4-11	2.5 Y 4/4	2.5 Y 5/6	15% (PL)	SL	
11-26	2.5 Y 5/2	5 YR 4/4 5 YR 2.5/2	10% (PL) 2% (PL)	fSL	
26-29	5 YR 4/6			cS	
SB 118 (July 30, 2018) data point - wetland			Hydric Indicators WT at -surface A11- Depleted Below Dark Surface F3-Depleted Matrix		
0-7	2.5 Y 2.5/1			L	
7-17	2.5 Y 4/1	2.5 Y 4/4 7.5 YR 3/4	15% (PL) 5% (PL)	CL	
17-21	2.5 Y 2.5/1			L	auger refusal-rock/cobble at -21

Appendix A
Apple Valley Site-Henderson County NC
Soil Boring Descriptions

Table. Representative Soil Profiles - Apple Valley Site

Depth (inches)	Color		Mottle Percentage (Location*)	Texture**	Notes
	Matrix	Mottle			
SB 119 (July 30, 2018) data point – non-jurisdictional			Hydric Indicators WT at -31 F3-Depleted Matrix – buried relict		
0-10	2.5 Y 3/2			SL	may be potential fill
10-28	2.5 Y 2.5/1			SL	
28-36	2.5 Y 3/1			SL/LS	

WT = observed apparent water table
*PL =pore lining, M = matrix
**Texture (follows USDA textural classification)
S = sand, L = loam, Si = silt, C = clay
f = fine, c = coarse (textural modifiers for sand)

Soil Scientist Seal

Appendix B
Apple Valley Site – Henderson County, NC
Photo Log

November 2018

1. Hydric soil on floodplain with *F3-Depleted Matrix* indicator at Profile # 23.

2. Floodplain landscape for Profile # 23.

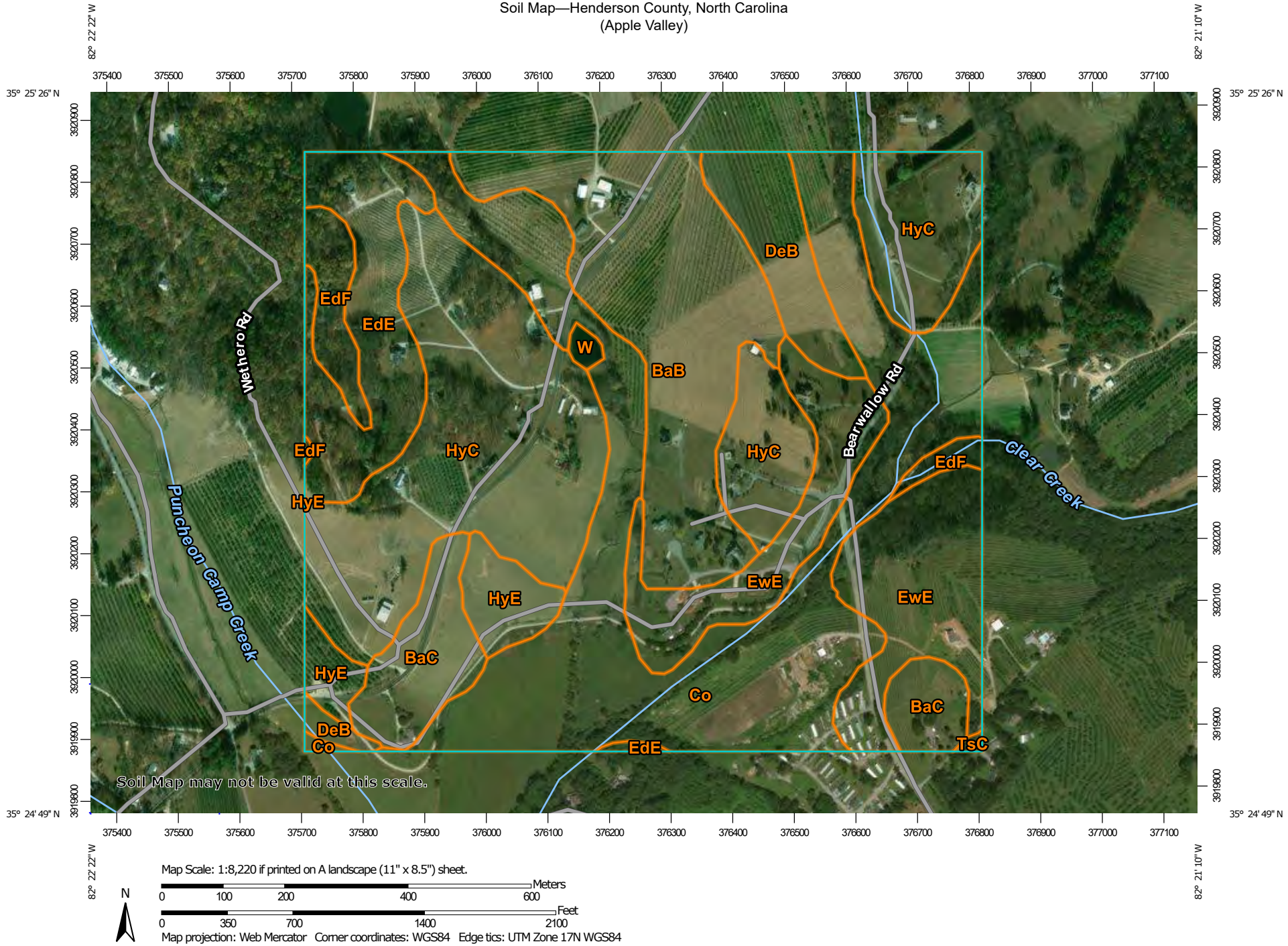
Appendix B
Apple Valley Site – Henderson County, NC
Photo Log

November 2018

3. Hydric soil below toe of slope and edge of floodplain with *A11-Depleted Below Dark Surface* indicator at Profile # 117.

4. Exposed gravel horizon along incised stream channel.

Soil Map—Henderson County, North Carolina
(Apple Valley)



Map Scale: 1:8,220 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Henderson County, North Carolina
Survey Area Data: Version 17, Sep 26, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 19, 2015—Mar 15, 2017

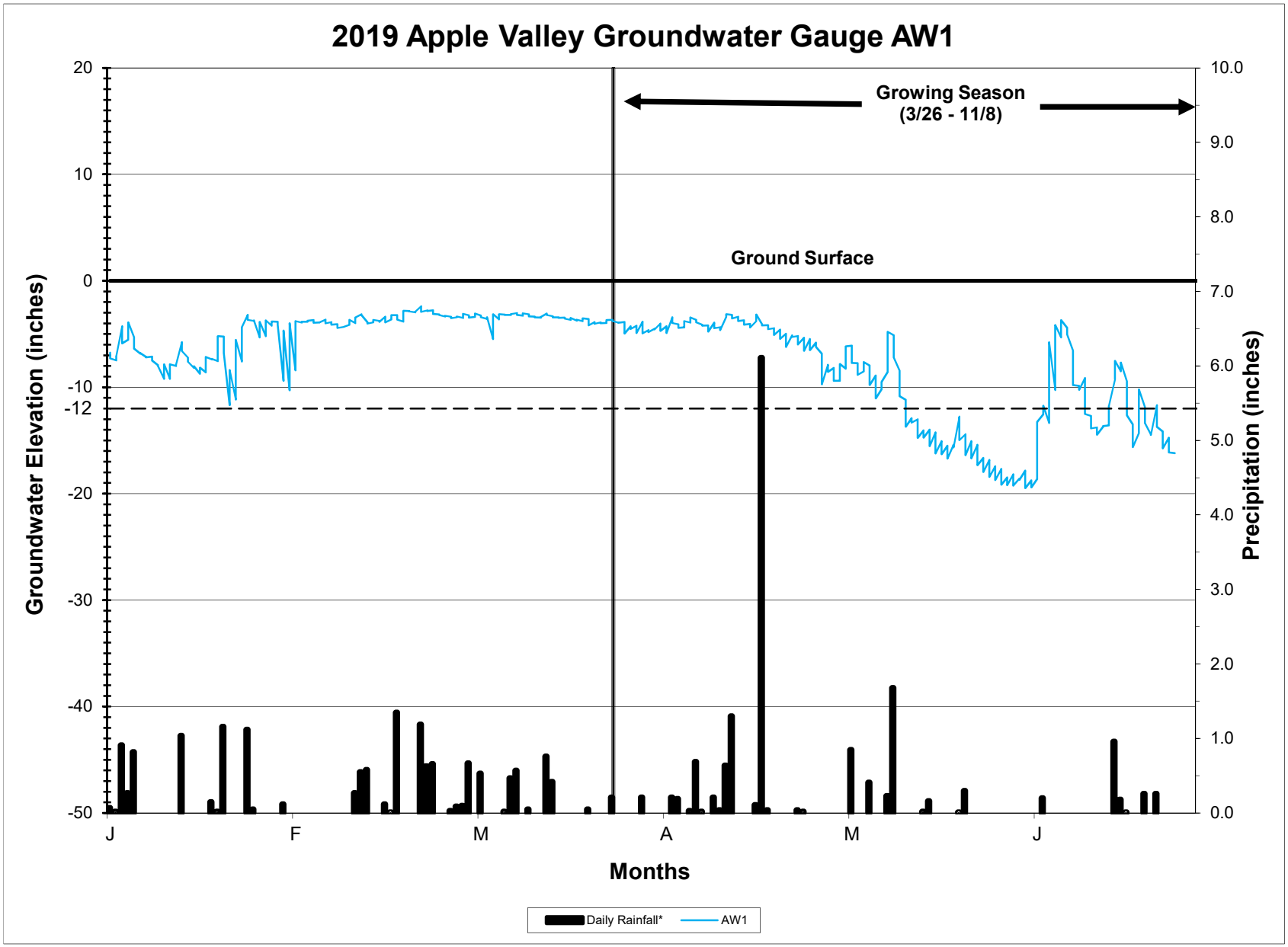
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

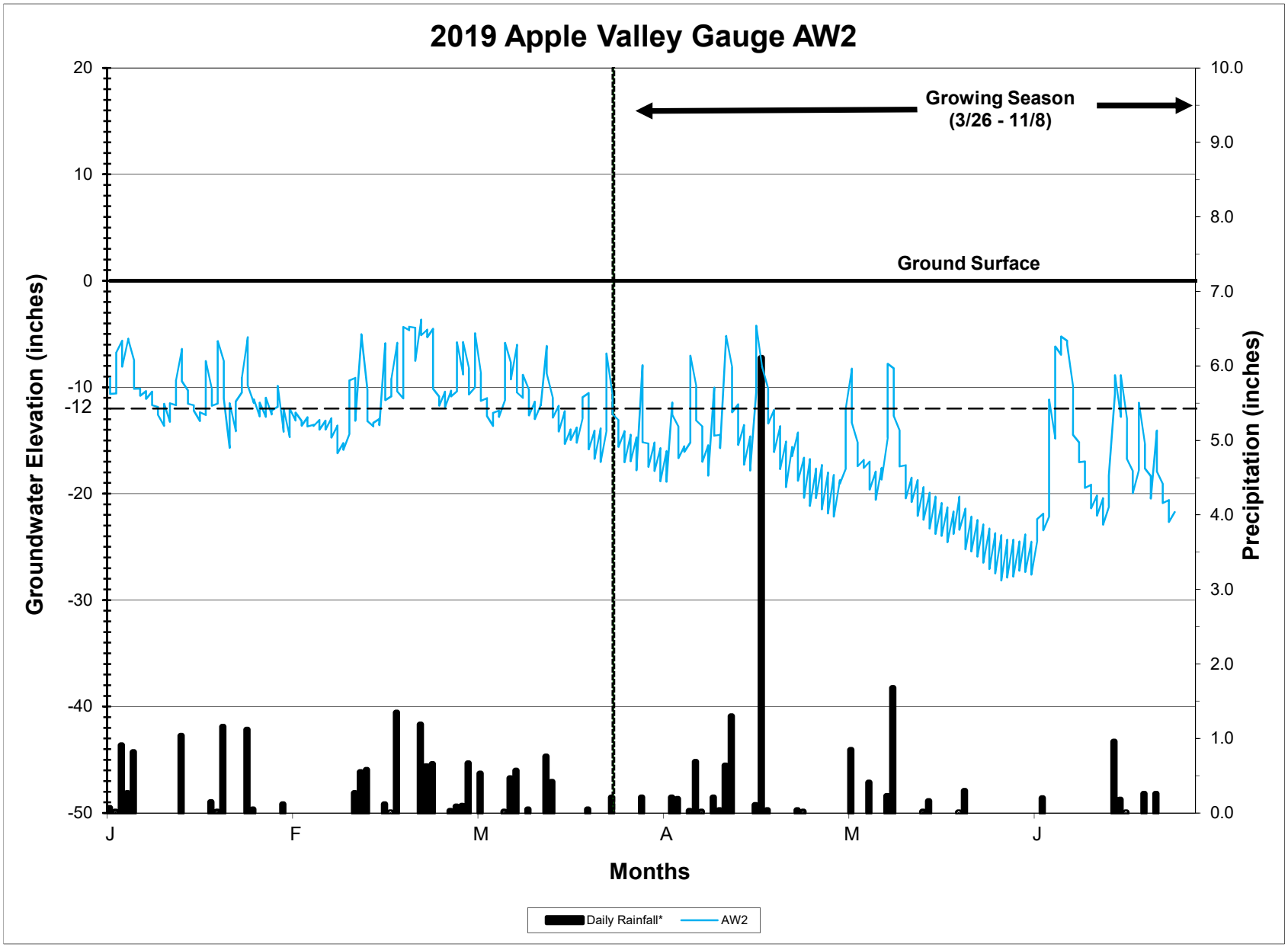
Map Unit Legend

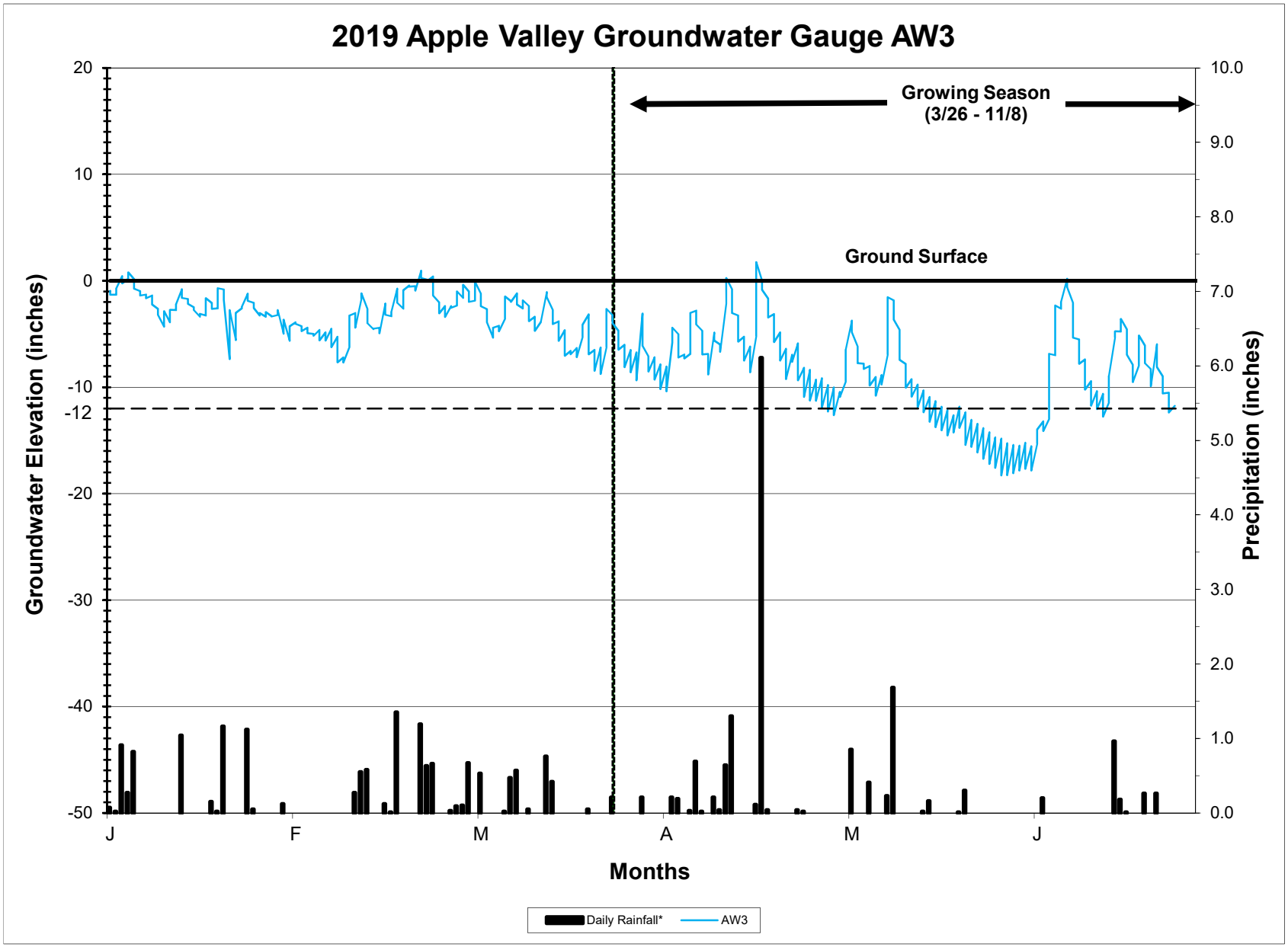
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BaB	Bradson gravelly loam, 2 to 7 percent slopes	38.4	14.5%
BaC	Bradson gravelly loam, 7 to 15 percent slopes	14.0	5.3%
Co	Codorus loam (arkaqua)	69.1	26.2%
DeB	Delanco (dillard) loam, 2 to 7 percent slopes	10.8	4.1%
EdE	Edneyville (edneytown) fine sandy loam, 15 to 25 percent slopes	18.7	7.1%
EdF	Edneyville (edneytown) fine sandy loam, 25 to 45 percent slopes	6.4	2.4%
EwE	Evard soils, 15 to 25 percent slopes	32.8	12.4%
HyC	Hayesville loam, 7 to 15 percent slopes	65.7	24.8%
HyE	Hayesville loam, 15 to 25 percent slopes	7.5	2.9%
TsC	Tusquitee loam, 7 to 15 percent slopes	0.2	0.1%
W	Water	0.7	0.3%
Totals for Area of Interest		**264.3**	**100.0%**

Wetland Groundwater Well Data

2019 Max Hydroperiod (Growing Season 26-Mar through 8-Nov, 227 days) Well Data for January 1, 2019 thru June 28, 2019 Success Criterion: 5%					
Gauge	**Max Consecutive**		**Cumulative**		**Occurrences**
	Days	**Percent of growing Season**	**Days**	**Percent of growing Season**	
AW1	54.5	24.0%	66.0	29.1%	5
AW2	4.0	1.8%	16.5	7.3%	12
AW3	55.5	24.4%	77.0	33.9%	3


2019 Apple Valley Groundwater Gauge AW1
Growing Season
(3/26 - 11/8)
Ground Surface
Groundwater Elevation (inches)
Precipitation (inches)
20
10
0
-10
-12
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
J
F
M
A
M
J
Months
Daily Rainfall*
AW1


2019 Apple Valley Gauge AW2
Growing Season
(3/26 - 11/8)
Ground Surface
Groundwater Elevation (inches)
Precipitation (inches)
20
10
0
-10
-12
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
J
F
M
A
M
J
Months
Daily Rainfall*
AW2


2019 Apple Valley Groundwater Gauge AW3
Growing Season
(3/26 - 11/8)
Ground Surface
Groundwater Elevation (inches)
Precipitation (inches)
Months
J
F
M
A
M
J
20
10
0
-10
-12
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Daily Rainfall*
AW3

Morphology Table

Apple Valley Morphological Parameters

	Reference Reach		Existing				Design	
	South Fork Mill River		AV1				AV1	
Feature	Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool
Drainage Area (ac)	125		277				277	
Drainage Area (mi^2)	0.20		0.43				0.43	
NC Regional Curve Discharge (cfs)[2]	29		53				53	
VA Regional Curve Discharge (cfs)[3]	12		22				22	
Design/Calculated Discharge (cfs)[1]	**16-27**		-				**25**	
Dimension								
BKF Cross Sectional Area (ft^2)	7.5	11.3	7.7	6.7	7.0	6.9	8.0	12.5
BKF Width (ft)	7.5	10.4	9.9	7.1	6.4	10.0	10.0	10.1
BKF Mean Depth (ft)	1.0	1.1	0.8	1.0	1.1	0.7	0.8	1.2
BKF Max Depth (ft)	1.4	2.2	1.4	1.7	1.3	1.5	1.0	2.1
Wetted Perimeter (ft)	8.9	12.5	10.6	8.5	8.0	11.3	10.5	11.3
Hydraulic Radius (ft)	0.8	0.9	0.7	0.8	0.9	0.6	0.8	1.1
Width/Depth Ratio	7.6	9.9	12.8	7.4	5.8	14.5	12.5	8.2
Floodprone Width (ft)	>50	>50	30.0	23.8	>30	30.0	>30	>30
Entrenchment Ratio	>2.2	NA	3.0	3.4	>2.2	3.0	>2.2	>2.2
Bank Height Ratio	1.0	1.0	1.4	1.6	1.3	1.5	1.0	1.0
Substrate								
Description (D50)	Gravel		Gravel		Gravel		Gravel	
D16 (mm)	0.062		6.4		2.6		-	
D50 (mm)	14		23		17		-	
D84 (mm)	40		40		43		-	
Pattern								
	Min	**Max**	**Min**		**Max**		**Min**	**Max**
Channel Beltwidth (ft)	23.0	40.0	-		-		20	60
Radius of Curvature (ft)	7.5	24.2	-		-		20	60
Radius of Curvature Ratio	1.0	3.2	-		-		2.5	7.5
Meander Wavelength (ft)	35.0	46.0	-		-		70	140
Meander Wavelength Ratio	3.0	5.3	-		-		8.8	17.5
Profile								
	Min	**Max**	**Min**		**Max**		**Min**	**Max**
Riffle Length (ft)	8.0	8.0	-		-		10	30
Run Length (ft)	5.0	5.0	-		-		-	-
Pool Length (ft)	14.0	14.0	-		-		33	75
Pool -to-Pool Spacing (ft)	30.0	30.0	-		-		30	50
Additional Reach Parameters								
Valley Length (ft)	246		1240				1240	
Channel Length (ft)	289		1574				1437	
Sinuosity	1.17		1.27				1.16	
Valley Slope (ft/ft)	0.011		0.013				0.013	
Channel Slope (ft/ft)	0.009		0.010				0.011	
Rosgen Classification	E4		E4 / C4 moving to G4c				C4	

[1] Bankfull stage was estimated using NC Regional Curve equations and existing conditions data

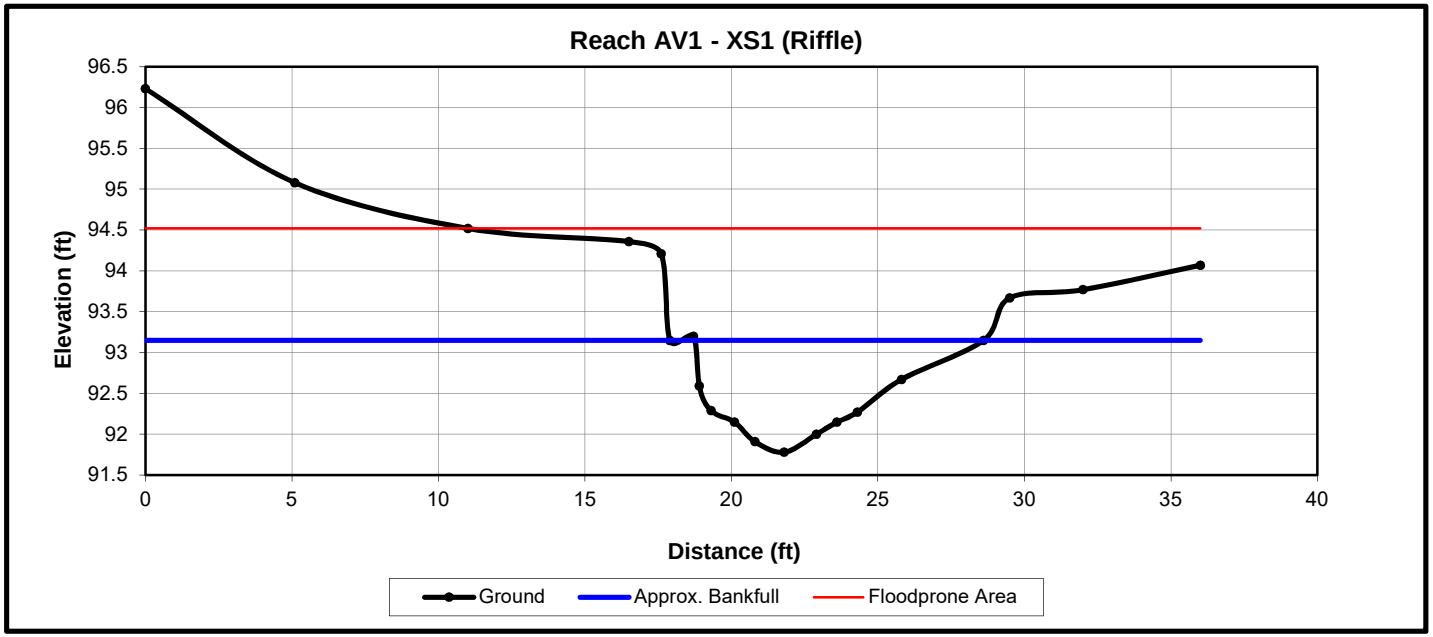
[2] NC Regional Curve equations source: Harman et al. (2003)

[3] VA Regional Curve equations source: Keaton et al. (2005)

Project and Reference Reach Cross Section Plots

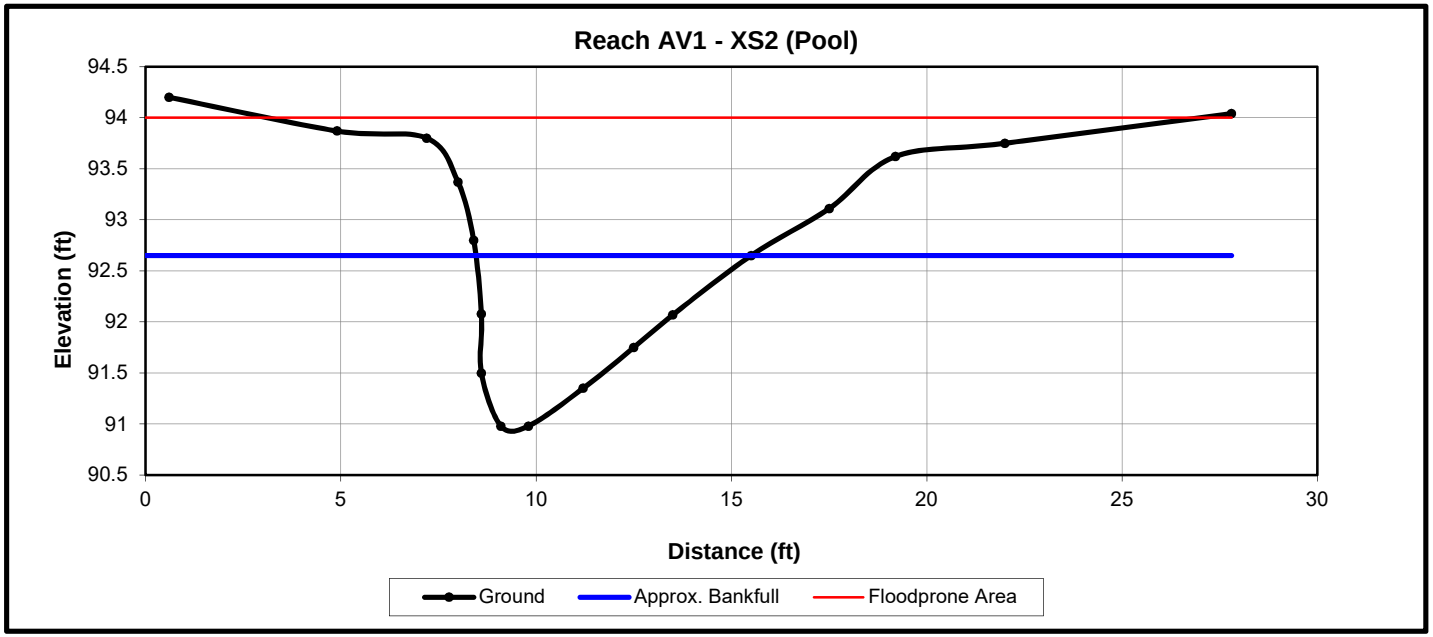
Upstream

Downstream



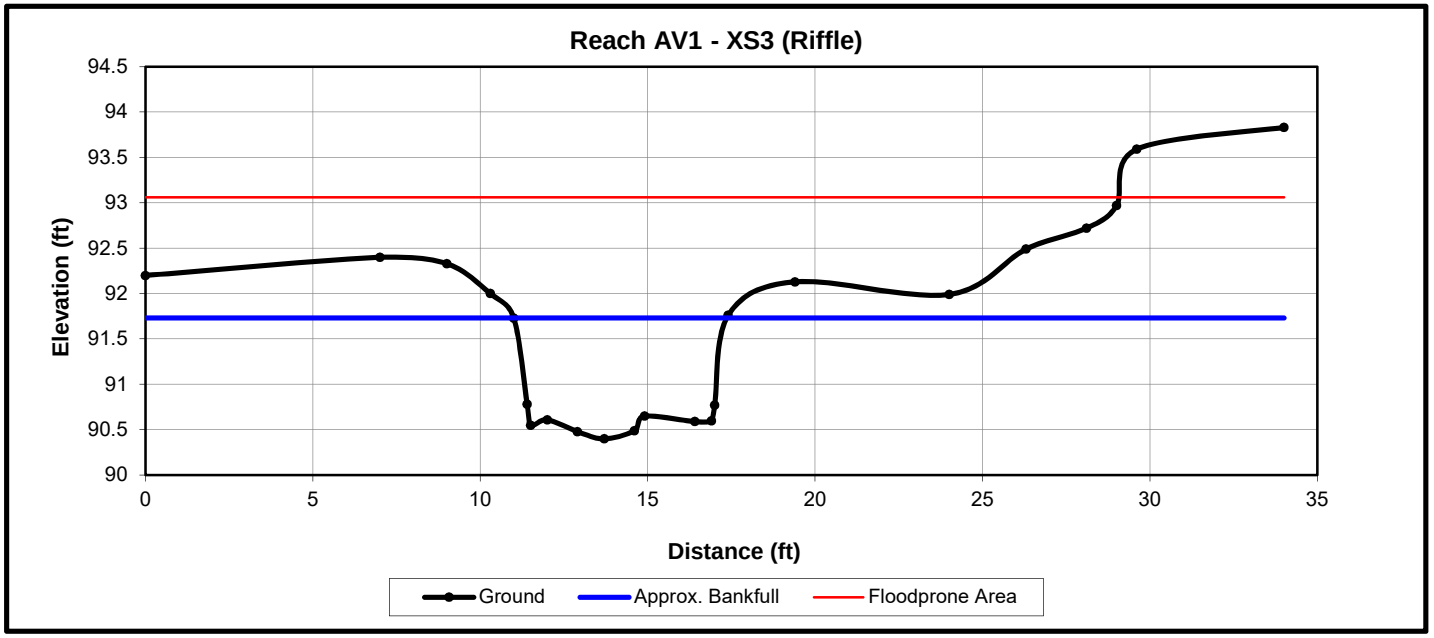
Upstream

Downstream



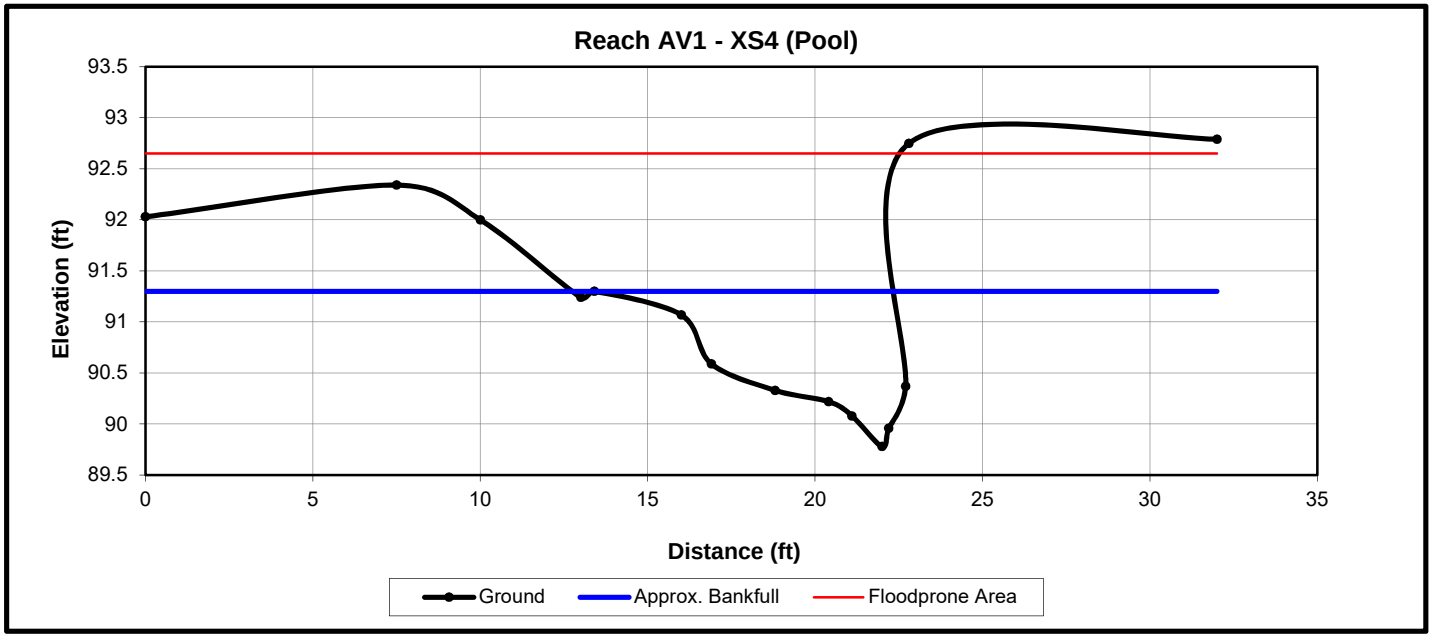
Upstream

Downstream



Upstream

Downstream



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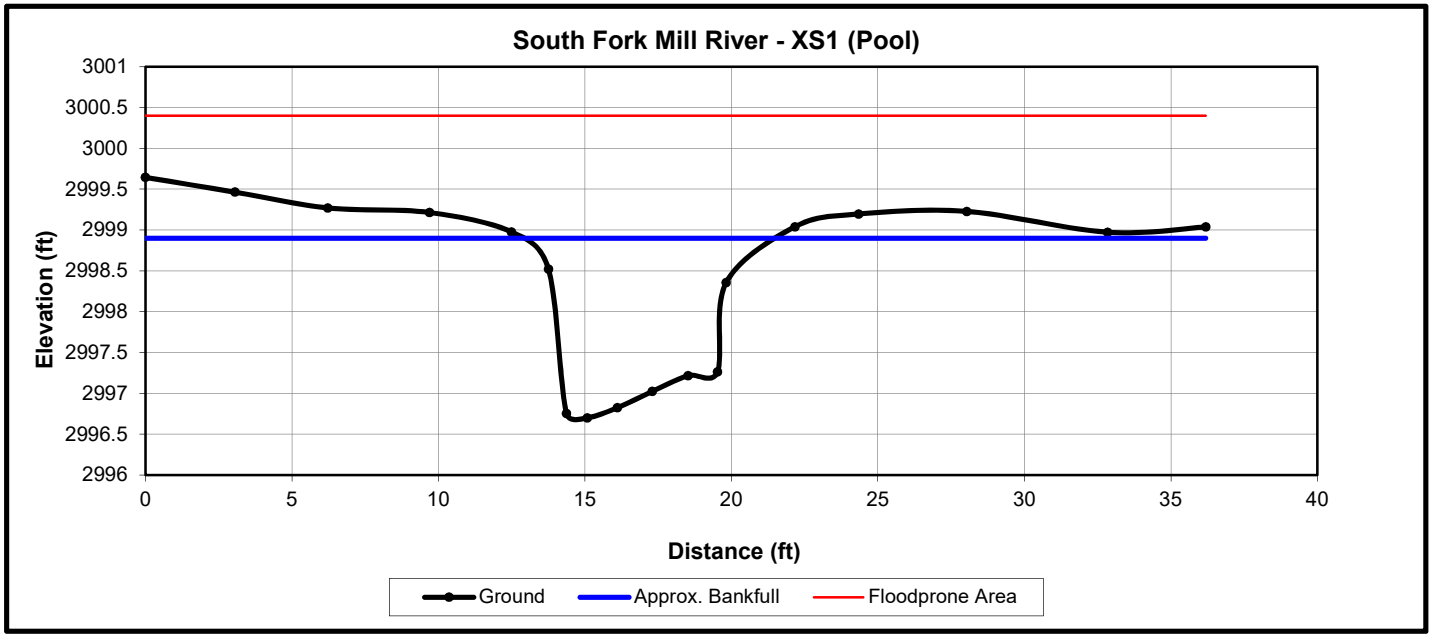

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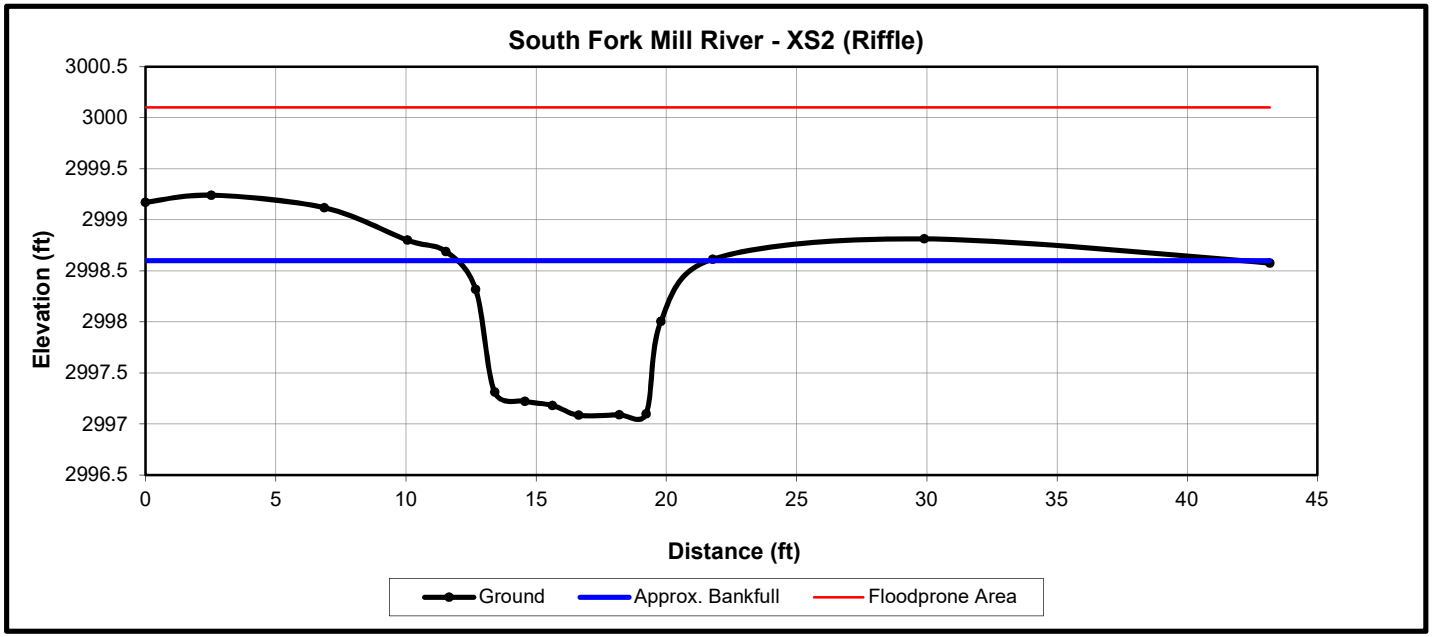

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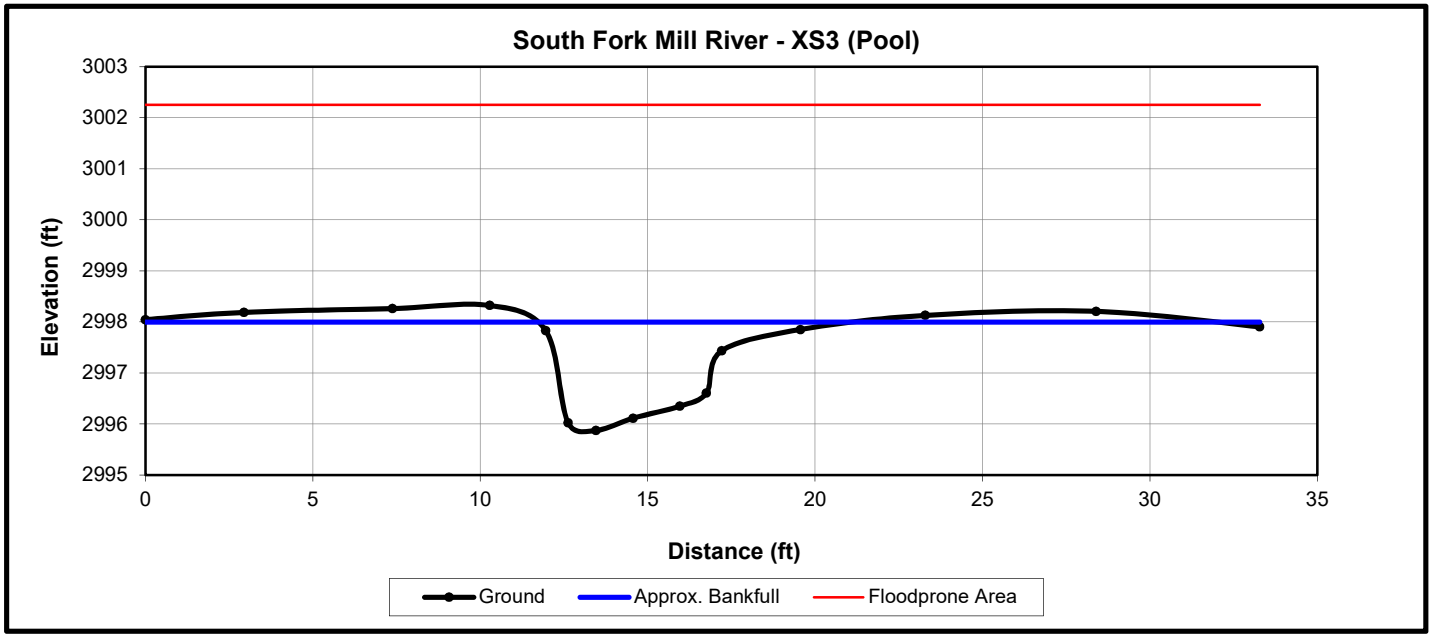

Upstream

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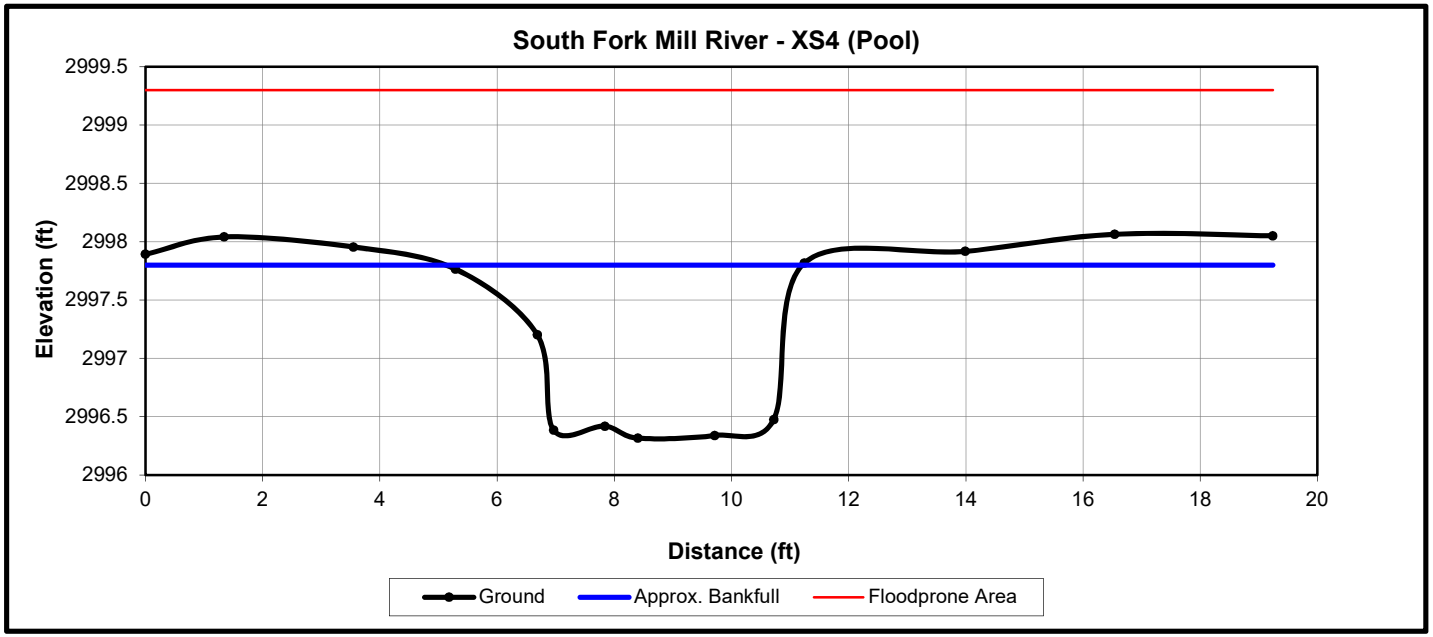


Appendix C – Site Protection Instrument

SITE PROTECTION INSTRUMENT

Site Protection Instrument(s) Summary Information

The land required for the construction, management, and stewardship of this mitigation project includes portions of the parcels listed below in Table C1. Environmental Banc & Exchange, LLC (an entity of RES) has obtained a conservation easement from the current landowners for the project area. The easement deed and survey plat will be submitted to DMS and State Property Office (SPO) for approval and will be held by the State of North Carolina. The easement deed will follow the NCDMS Full Delivery Conservation Easement Template dated May 5, 2017 and included in this appendix. Once recorded, the secured easement will allow Environmental Banc & Exchange, LLC to proceed with the project development and protect the mitigation assets in perpetuity. Once finalized, a copy of the land protection instrument(s) will be included in **Appendix C**.

Table C1. Project Parcel and Landowner Information

Owner of Record	PIN	County	Site Protection Instrument	Deed Book and Page Numbers	Acreage Protected
Heather L. Coston	9692-73-8946	Henderson	Conservation Easement	--	6.42 ac

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 Environmental Quality, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environmental Quality Purchase and Services Contract Number _____.

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

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

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

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

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

WHEREAS, the Division of Mitigation Services in the Department of Environmental Quality, 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 on the property to restore, construct, manage, maintain, enhance, protect, and monitor the stream, wetland and any other riparian resources in the Conservation Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

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

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

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

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

IV. ENFORCEMENT AND REMEDIES

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

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

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

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

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

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

V. MISCELLANEOUS

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

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

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

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

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

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

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

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

and

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

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

VI. QUIET ENJOYMENT

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

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

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

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

_____ (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 D – Credit Release Schedule

CREDIT RELEASE SCHEDULE

All credit releases will be based on the total credit generated as reported in the approved final mitigation plan, unless there are major discrepancies and then a mitigation plan addendum will be submitted. 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 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 be restarted 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 in **Table D1** and **Table D2**.

Table D1. Stream Credit Release Schedule

Credit Release Milestone	Release Activity	Interim Release	Total Release
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	10%	60%
4*	Fourth year monitoring report demonstrates performance standards are being met	5%	65% (75%**)
5	Fifth year monitoring report demonstrates performance standards are being met	10%	75% (85%**)
6*	Sixth year monitoring report demonstrates performance standards are being met	5%	80% (90%**)
7	Seventh year monitoring report demonstrates performance standards are being met and project has received closeout approval	10%	90% (100%**)

**Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the IRT.*

***10% reserve of credits to be held back until the bankfull event performance standard has been met.*

Table D2. Wetland Credit Release Schedule

Credit Release Milestone	Release Activity	Interim Release	Total Release
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	15%	65%
4*	Fourth year monitoring report demonstrates performance standards are being met	5%	70%
5	Fifth year monitoring report demonstrates performance standards are being met	15%	85%
6*	Sixth year monitoring report demonstrates performance standards are being met	5%	90%
7	Seventh year monitoring report demonstrates performance standards are being met and project has received closeout approval	10%	100%

**Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the IRT.*

Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan, can be released by DMS without prior written approval of the DE upon satisfactory completion of the following activities:

1) Approval of the final Mitigation Plan.
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property.
3) Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; per the DMS Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and a record drawing has been produced. Record drawings must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.
4) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

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. For stream projects a reserve of 10% of a site's total stream credits shall be released after four bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, 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 E – Financial Assurance

FINANCIAL ASSURANCE

Pursuant to Section IV H and Appendix III of the NCDEQ DMS (formerly Ecosystem Enhancement Program) In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environmental Quality (NCDEQ) has provided the USACE-Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by NCDEQ DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.

Appendix F – Maintenance Plan

MAINTENANCE PLAN

The site will be monitored on a regular basis and a physical inspection will be conducted a minimum of once per year throughout the post construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

F1. Maintenance Plan

Component/Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where stormwater and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head-cutting. Stream maintenance activities will be documented and reported in annual monitoring reports. Stream maintenance will continue through the monitoring period.
Wetland	Routine wetland maintenance and repair activities may include securing of loose coir matting, channel plug maintenance, and supplemental installations of live stakes and other target vegetation within the wetland.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be treated by mechanical and/or chemical methods. Any vegetation requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations. Vegetation maintenance activities will be documented and reported in annual monitoring reports. Vegetation maintenance will continue through the monitoring period.
Site Boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries will be marked with signs identifying the property as a mitigation site, and will include the name of the long-term steward and a contact number. 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. Easement monitoring and staking/signage maintenance will continue in perpetuity as a stewardship activity.
Road Crossing	N/A
Livestock Fencing	Livestock fencing is to be placed outside the easement limits. Maintenance of fencing is the responsibility of the landowner.
Beaver	Routine site visits and monitoring will be used to determine if beaver management is needed. If beaver activity poses a threat to project stability or vegetative success, RES will trap beavers and remove impoundments as needed. All beaver management activities will be documented and included in annual monitoring reports. Beaver monitoring and management will continue through the monitoring period.

Appendix G – DWR Stream ID Forms

NC DWQ Stream Identification Form Version 4.11

Date: 7-31-18	**Project/Site:** Apple Valley	**Latitude:**
Evaluator: BB, MD	**County:** Henderson	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 36.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:* AJ-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 = 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 = 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:

Sketch:

Appendix H – USACE District Assessment Forms and NC WAM

AJ1

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	5
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	4
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	1
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	1
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	1
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	2
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	1
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	3
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	1
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	2
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	1
	15	**Impact by agriculture, livestock, or timber production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	3
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						34

* These characteristics are not assessed in coastal streams.

W1

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#: SAW-2018-01150 NCDWR #: 100063

Project Name	Apple Valley	Date of Evaluation	
Applicant/Owner Name		Wetland Site Name	Apple Valley
Wetland Type	Non-Tidal Freshwater Marsh	Assessor Name/Organization	RES
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Lake Lure
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)	35.416436/-82.36391

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)

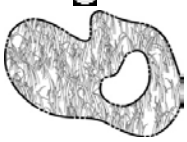
Include both natural debris and man-placed natural debris.

☐ 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

W1

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Apple Valley	Date	
Wetland Type	Non-Tidal Freshwater Marsh	Assessor Name/Organization	RES

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

W2

Wetland Site Name Apple Valley | **Date** 7-31-2018

Wetland Type Bottomland Hardwood Forest | **Assessor Name/Organization** RES

Level III Ecoregion Blue Ridge Mountains | **Nearest Named Water Body** Lake Lure

River Basin French Broad | **USGS 8-Digit Catalogue Unit** 06010105

☐ Yes ☉ No **Precipitation within 48 hrs?** | **Latitude/Longitude (deci-degrees)** 35.416436/-82.36391

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 (select all that apply to the assessment area)

- ☐ Anadromous fish
- ☑ Federally protected species or State endangered or threatened species
- ☐ NCDWQ 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. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. 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 ditch 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 (answer for non-marsh wetlands only)
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

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

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

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric

7a. Is assessment area within 50 feet of a tributary or other open water?

☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.

Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☐ 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 metric (evaluate for riparian wetlands 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 areas (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

Answer for assessment area dominant landform.

- [x] 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

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

- [ ] A Sediment deposition is not excessive, but at approximately natural levels.
- [x] 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)

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.

- [ ] A No artificial edge within 150 feet in all directions
- [x] B No artificial edge within 150 feet in four (4) to seven (7) directions
- [ ] C An artificial edge occurs within 150 feet in more than four (4) directions or assessment area is clear-cut

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.
- [x] 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. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). 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

☐ 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

☐ 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

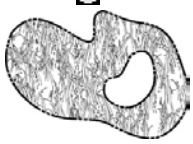
Include both natural debris and man-placed natural debris.

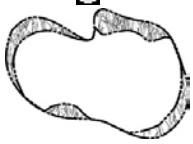
☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

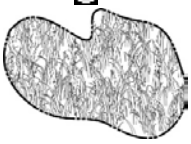
21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

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 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.

☐ 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

W2

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Apple Valley	Date	7-31-2018
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	RES

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

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**LOW**
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	Conditon	**LOW**

Overall Wetland Rating **LOW**

Appendix I – Wetland JD Forms and Maps

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action ID: **SAW-2018-01150** County: **Henderson** U.S.G.S. Quad: **Bat Cave**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner: **Resource Environmental Solutions / Attn.: Jeremy Schmid**
Address: **302 Jefferson Street, Suite 110**
Raleigh, NC 27605
Telephone Number: **919-345-3034**

Size (acres): **4**
Nearest Waterway: **UT Clear Creek**
River Basin/ HUC: **Upper French Broad (06010105)**

Nearest Town: **Hendersonville**
Coordinates: **35.41803 N, 82.36327 W**

Location description: **The project site is located on a portion of a larger 17 acre tract of land (PIN 9692-73-8946) at 2926 Old Clear Creek Road, approximately 500 feet southeast of the intersection of Dalton Farm Road and Old Clear Creek Road, in Hendersonville, 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 November 1, 2018, and are as approximately depicted on the attached Potential Wetland or Non-Wetland Waters of the U.S. Map for the Apple Valley Mitigation Site (dated September 1, 2018) submitted by Resource Environmental Solutions.

E. Attention USDA Program Participants

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

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

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

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

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

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

Corps Regulatory Official: _____

David Brown

Issue Date of JD: **November 9, 2018** Expiration Date: N/A Preliminary JD

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

Copy furnished:
William James Coston, 2926 Old Clear Creek Road, Hendersonville, NC 28792

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NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: **Resource Environmental Solutions / Attn.: Jeremy Schmid**	File Number: **SAW-2018-01150**	Date: **November 9, 2018**

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

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

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

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

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

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

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

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

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

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

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT
REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)
ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:	
If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division,** **Attn: David Brown** **151 Patton Avenue, Room 208** **Asheville, North Carolina 28801-5006** **828-271-7980, ext. 4232**	If you only have questions regarding the appeal process you may also contact: Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137
RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.	

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

For appeals on Initial Proffered Permits send this form to:

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

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

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

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

BACKGROUND INFORMATION

A. **REPORT COMPLETION DATE FOR PRELIMINARY JD:** November 9, 2018

B. **NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:**
Resource Environmental Solutions / Attn.: Jeremy Schmid
302 Jefferson Street, Suite 110
Raleigh, NC 27605

C. **DISTRICT OFFICE, FILE NAME, AND NUMBER:**
CESAW-RG-A, 2018-01150, NCDMS ILF Apple Valley Mitigation Site

D. **PROJECT LOCATION(S) AND BACKGROUND INFORMATION:**
The project site is located on a portion of a larger 17 acre tract of land (PIN 9692-73-8946) at 2926 Old Clear Creek Road, approximately 500 feet southeast of the intersection of Dalton Farm Road and Old Clear Creek Road, in Hendersonville, Henderson County, North Carolina.

State: **NC** County/parish/borough: **Henderson** City: **Hendersonville**
Center coordinates of site (lat/long in degree decimal format): **35.41803 N, 82.36327 W**
Universal Transverse Mercator: **N/A**
Name of nearest waterbody: **UT Clear Creek**

E. **REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):**
☒ Office (Desk) Determination. Date: **November 9, 2018**
☒ Field Determination. Date(s): **November 1, 2018**

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

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

Site Number	Centered Coordinates (decimal degrees)		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
	Latitude	Longitude			
W1	35.41806	-82.36322	0.28 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
W2	35.41967	-82.36346	0.02 ac	☒ Wetland ☐ Non-wetland Waters	☒ Section 404 ☐ Section 10/404
S1 (UT Clear Creek)	35.41649	-82.36412	1,665 lf	☐ Wetland ☒ Non-wetland Waters	☒ Section 404 ☐ Section 10/404

1. The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre- construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant

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

SUPPORTING DATA

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

☒ Maps, plans, plots or plat submitted by or on behalf of preliminary JD requester: **Resources Environmental Solutions & George K. Lankford, LLC**

☒ Data sheets prepared/submitted by or on behalf of preliminary JD requester. **Resources Environmental Solutions & George K. Lankford, LLC**

- ☒ 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: **Bat Cave**

☒ 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 No. 3700969200J, effective date October 2, 2008**

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

☒ Photographs: ☒ Aerial (Name & Date): **Google Earth Pro - Nov. 2016, Oct. 2015, Nov. 2013, Oct. 2010, Jun. 2008, Mar. 2007, 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 a stream channel located at the site and flows into the channel. Wetland hydrology is enhanced with the abutting stream channel via normal down gradient flows and periods of high water.**

The stream on the site is a UT of Clear Creek which 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.

The UT Clear Creek flows into Clear Creek, which flows into Mud Creek. Mud Creek flows into the French Broad River, a traditional navigable river, which 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.

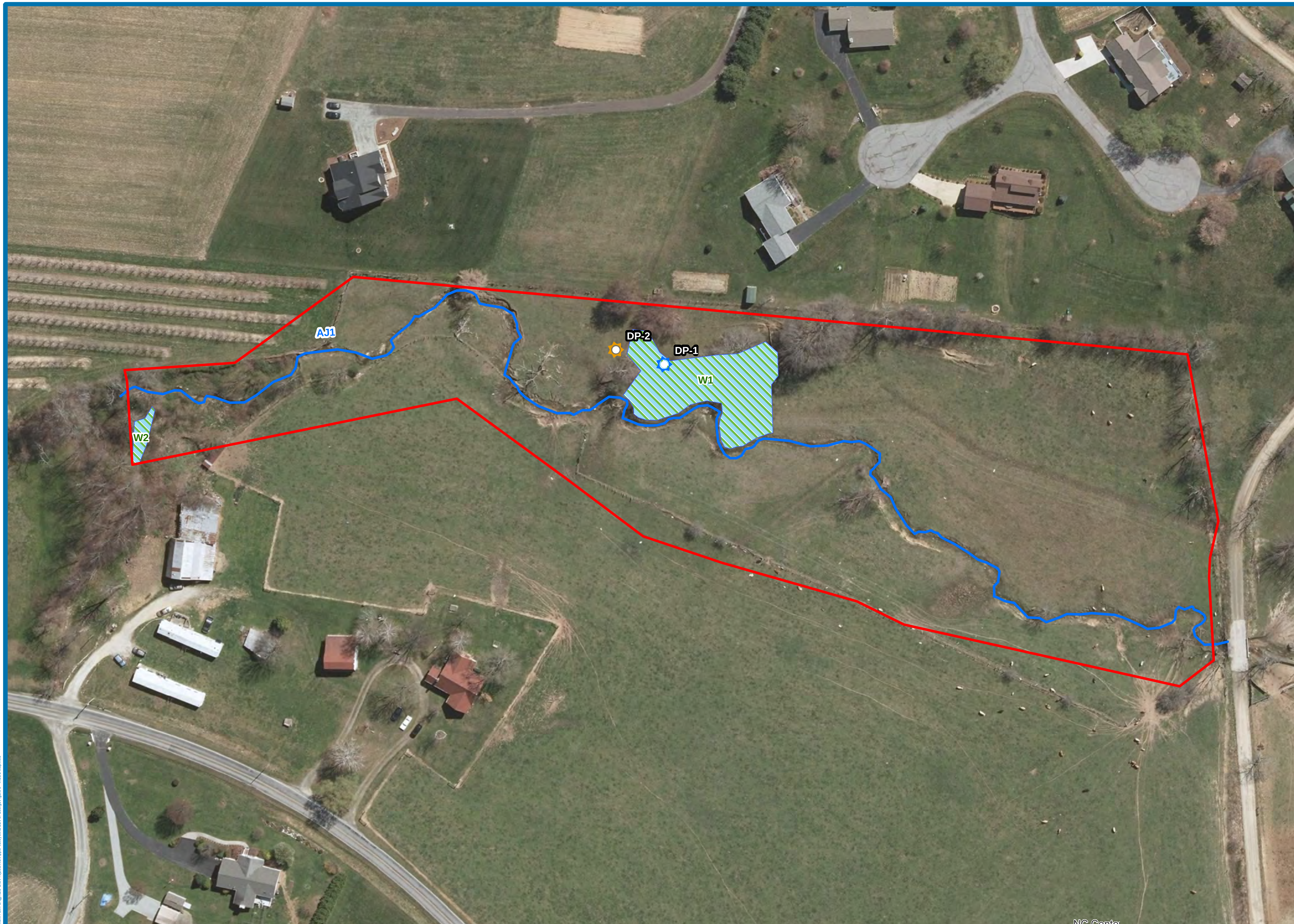
David Brown, November 9, 2018
Signature and date of Regulatory staff member completing preliminary JD

Resource Environmental Solutions
(per Agent Authorization)
Signature and date of person requesting preliminary JD (REQUIRED, unless obtaining the signature is impracticable)

Two copies of this Preliminary JD Form have been provided. Please sign both copies. Keep one signed copy for your record and return a signed copy to the Asheville Regulatory Field Office by mail or e-mail.

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

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



0 50 100
Feet
1 in = 100 feet

Potential Wetland or Non-Wetland Waters of the U.S. Map

Apple Valley Mitigation Site

Henderson County, North Carolina

Date: 8/1/2018	Drawn by: MDD
Revisions: NONE	Checked by: GL

Legend

- Study Area
- Potential Non-Wetland Waters of the US
- Potential Wetland Waters of the US
- Wetland Datapoint
- Upland Datapoint

REFERENCE

1) Horizontal Datum is NAD83 UTM Z15N.

2) Map Projection is NAD_1983_StatePlane_North_Carolina_FIPS_3200_Feet

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Apple Valley Mitigation Site City/County: Henderson Sampling Date: 7/31/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 118 wet

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain terrace Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR N Lat: 35.418123 Long: -82.363181 Datum: WGS 84

Soil Map Unit Name: Codorus loam (Arkaqua) NWI classification:

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

Are Vegetation ☑, Soil ☑, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ 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 ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks:

MLRA 130B Southern Blue Ridge
Soil boring # SB-118
Site heavily impacted by livestock access.

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 ☐	Depth (inches):
Water Table Present?	Yes ☑	No ☐	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): 0

Wetland Hydrology Present? Yes ☑ 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: 118 wet

Tree Stratum (Plot size: 30" radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer ruburm	30	YES	FAC
2.		-	-
3.		-	-
4.		-	-
5.			
6.			
7.			
8.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.		-	-
2.		-	-
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Herb Stratum (Plot size: 20" radius)			
1. Murdannia keisak	20	YES	OBL
2. Carex lurida	5	NO	OBL
3. Eupatorium perfoliatum	5	NO	FACW
4. Vernonia noveboracensis	5	NO	FACW
5. Boehmeria cylindrica	2	NO	FACW
6. Microstegium vimineum	3	NO	FAC
7.			
8.			
9.			
10.			
11.			
12.			
	40 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- [x] 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)
- [x] 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 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: 118 wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-7	2.5Y 2.5/1	100					L	
7-17	2.5Y 4/1	85	2.5 Y 4/4	10	C	PL	CL	
--	--	--	2.5 Y 3/4	5	C	PL	--	
17-21	2.5Y 2.5/1	100					L	quartz gravel-15%

[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) **(LRR N, MLRA 147, 148)**
- ☐ 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 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 136, 122)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 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 (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ 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** ☐

Remarks:

Auger refusal at -21 -may be large cobble or fractured bedrock.
May meet indicator A12-Thick Dark Surface.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Apple Valley Mitigation Site City/County: Henderson Sampling Date: 7/31/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 119 up

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain terrace Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR N Lat: 35.418311 Long: -82.363115 Datum: WGS 84

Soil Map Unit Name: Codorus loam (Arkaqua) NWI classification:

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

Are Vegetation ☑, Soil ☑, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ 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 ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☐
Hydric Soil Present?	Yes ☐	No ☑	
Wetland Hydrology Present?	Yes ☐	No ☐	

Remarks:

MLRA 130B Southern Blue Ridge
Soil boring # SB-119. Site heavily impacted by livestock access.
Point in on low terrace or shallow berm on floodplain of stream.

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 ☐	Depth (inches):
Water Table Present?	Yes ☑	No ☐	Depth (inches): -31
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches): -28

Wetland Hydrology Present? Yes ☐ No ☑

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

Remarks:

point is approximately 24 inches in elevation above wetland on old terrace feature or berm.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 119 up

Tree Stratum (Plot size: 30" radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer ruburm	20	YES	FAC
2.		-	-
3.		-	-
4.		-	-
5.			
6.			
7.			
8.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.		-	-
2.		-	-
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Herb Stratum (Plot size: 20" radius)			
1. Digitaria serotina	40	YES	FAC
2. Trifolium repens	10	NO	FAC
3. Schedonorus arundinaceus	10	NO	FACU
4.		-	-
5.		-	-
6.		-	-
7.			
8.			
9.			
10.			
11.			
12.			
	60 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	70	x 3 =	210
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	80 (A)		250 (B)

Prevalence Index = B/A = 3.13

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 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.)

Vegetation is managed borderline non-hydric.

SOIL

Sampling Point: 119 up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	2.5Y 3/2	100					SL	
10-28	2.5Y 2.5/1	100					SL	
28-36	2.5Y 3/1	100					SL	

[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) **(LRR N, MLRA 147, 148)**
- ☐ 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 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 136, 122)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 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 (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ 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** ☑

Remarks:

Appendix J – Invasive Species Plan

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. RES will treat invasive species vegetation within the project area and provide remedial action on a case-by-case basis. Common invasive species vegetation, such as Chinese privet (*Ligustrum sinense*), multiflora rose (*Rosa multiflora*), tree-of-heaven (*Ailanthus altissima*), and Japanese honeysuckle (*Lonicera japonica*), will be treated to allow native plants to become established within the conservation easement. Invasive species vegetation will be treated by approved mechanical and/or chemical methods such that the percent composition of exotic/invasive species is less than 5% of the total planted area. Any control methods requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations. If areas of invasive species exist within the easement, they will be monitored yearly as part of the monitoring protocol and treated if necessary. If required, problem areas will continue to be treated until the project easement shows overall trending towards meeting all monitoring requirements.

Appendix K – Approved FHWA Categorical Exclusion Form

Categorical Exclusion Form for Division of Mitigation Services Projects
Version 1.4

Part 1: General Project Information	
Project Name:	Apple Valley
County Name:	Henderson
DMS ID Number:	100063
Project Sponsor:	Resource Environmental Solutions LLC
Project Contact Name:	Brad Breslow
Project Contact Address:	302 Jefferson Street Suite 110, Raleigh, NC 27605
Project Contact E-mail:	bbreslow.res.us
DMS Project Manager:	Harry Tsomides

Project Description

The Apple Valley site is located in the French Broad River Basin within Cataloging Unit 06010105, TLW 06010105030040, and NC Division of Water Resources (DWR) subbasin 04-03-02. The Project's watershed is primarily forested and mixed agricultural land, and has historically served this purpose. Water quality stressors currently affecting the site include livestock production and lack of riparian buffer This project presents the opportunity to provide up to 1,549 cold stream mitigation units and 3.04 riparian wetland mitigation units. These will be derived from 1,549 linear feet of Priority I Restoration and 3.04 acres of riparian wetland restoration.

For Official Use Only

Reviewed By:

11/16/2018 — Harry Tsomides

Date — **DMS Project Manager**

Conditional Approved By:

Date — **For Division Administrator FHWA**

☐ **Check this box if there are outstanding issues**

Final Approval By:

11-16-18 — [signature]

Date — **For Division Administrator FHWA**

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☑ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☑ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☑ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☑ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☑ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☑ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☑ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☑ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☑ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☑ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☑ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☑ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Does the project require the acquisition of real estate?	☑ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☑ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☑ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☑ Yes ☐ No
2. Is the site of religious importance to American Indians?	☐ Yes ☑ No ☐ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☑ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☑ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☑ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☑ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☑ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☑ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☑ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☑ Yes ☐ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☑ No ☐ N/A
4. Is the project "likely to adversely affect" the species and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☑ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?	☐ Yes ☐ No ☑ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☑ N/A

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	☐ Yes ☑ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☑ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☑ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☑ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	☑ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☑ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☑ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted?	☑ Yes ☐ No ☐ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☑ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☑ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☑ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☑ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☑ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☑ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☑ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☑ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☑ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☑ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☑ N/A

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

July 3, 2018

Mrs. Janet Mizzi
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801

Subject: Project Scoping for Apple Valley Mitigation Project in Henderson County

Dear Mrs. Mizzi,

Resource Environmental Solutions (RES) requests review and comment from the United States Fish and Wildlife Service (USFWS) on any possible concerns they may have with regards to the implementation of the Apple Valley Mitigation Project. Please note that this request is in support of the development of the Categorical Exclusion (CE) for the referenced project. The proposed project involves the restoration of 1,466 linear feet of stream and 3.04 acres of wetland. The Site is currently in agricultural use, specifically as pasture.

The USFWS database (updated 28 June 2018) lists nine threatened and endangered species for Henderson County, North Carolina: Carolina northern flying squirrel (*Glaucomys sabrinus coloratus),* Gray bat *(Myotis grisescens),* Northern long-eared bat (NLEB) *(Myotis septentrionalis),* Appalachian elktoe *(Alasmidonta raveneliana),* Bunched arrowhead (*Sagittaria fasciculate),* Mountain sweet pitcher plant (*Sarracenia rubra ssp. Jonesii),* Small whorled pogonia (*Isotria medeoloides),* Swamp pink (*Helonias bullata),* and White irisette (*Sisyrinchium dichotomum).* Potential habitat may exist on-site for dwarf-flowered heartleaf and NLEB. A review of the NC Natural Heritage Program (NHP) GIS database was consulted to determine whether previously cataloged occurrences of protected species were mapped within one mile of the project site. Results from NHP on June 28, 2018, indicated that there were no known occurrences of protected species within a one-mile radius of the project area. Based on initial site investigations, no impacts to federally protected species are anticipated as a result of the proposed project. Additionally, NCDMS will submit the NLEB consultation form as part of the CE process.

Please provide comments on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources from the earthwork and planting of a wetland restoration project on the subject property. A detailed project description along with maps showing the location and approximate limits of the conservation easement are enclosed.

We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at jschmid@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jeremy Schmid | Senior Ecologist

Resource Environmental Solutions, LLC ("RES"), through its wholly owned subsidiary Environmental Banc & Exchange, LLC ("EBX"), presents the following proposal to provide cold stream mitigation and riparian wetland mitigation credits in the French Broad River Basin (Cataloging Unit 06010105, Targeted Local Watershed 06010105030040) in response to RFP #16-007334.

RES has entered into contracts to purchase a conservation easement totaling approximately 5.94 acres on a single parcel comprising the Apple Valley Project (Project), in Henderson County, approximately nine miles northeast of Hendersonville and five miles southwest of Chimney Rock Village. The Project will involve the restoration of an unnamed tributary to Clear Creek and adjacent riparian wetlands.

As described in the following technical proposal, the Project will result in significant water quality improvements including:

- Decreased non-point source pollution,
- Decreased in-stream sediment contribution,
- Increased dissolved oxygen concentration, and
- Runoff filtration.

The Project will provide uplift for ecological functions, including:

- Improved wetland and aquatic habitat diversity,
- Invasive species treatment, and
- Wildlife corridor enhancement and preservation.

The Project will restore, enhance, and protect an important aquatic resource and wildlife corridor while also accommodating existing agricultural land uses.

Watershed

The Project is located in the Clear Creek Watershed (06010105030040), a Targeted Local Watershed (TLW), within the Mud Creek Local Watershed Plan (LWP). The Project supports many of the French Broad River Basin Restoration Priorities (RBRP) and LWP goals and presents an opportunity to restore 1,466 linear feet of cold water stream and riparian corridor and restore and enhance 3.04 acres of headwater forest wetland. The proposed Project will provide numerous ecological and water quality benefits within the French Broad River Basin. These benefits are not limited to the project area, but have more far-reaching effects throughout the French Broad River Basin. The Project will provide improvements to water quality, hydrologic function, and habitat.

As stated in the French Broad River RBRP report (2009), the following restoration and protection goals are listed for the watershed:.

1. *Implement wetland and stream restoration projects that reduce sources of sediment and nutrients by restoring riparian buffer vegetation, stabilizing banks, excluding livestock, and restoring natural geomorphology, especially in headwater streams.*

2. *Restore and protect habitat for priority fish, mussel, snail, and crayfish species in the basin.*
3. *Cooperate with land trusts and resource agencies to help leverage federal and state grant funding for watershed restoration and conservation efforts.*
4. Protect high quality habitats, especially those prioritized by the Natural Heritage Program as Significant Natural Heritage Areas.

Stream and Wetland Restoration Approach

A key design consideration for the Project is ensuring the restored channel and wetlands achieve maximum functional uplift while allowing the existing agricultural land uses to continue. All restoration practices will be designed and implemented to accommodate current and future flow conditions.

Historic riparian wetlands adjacent to the unnamed tributary to Clear Creek have been drained and converted to agricultural land for generations. In addition to stream channelization, wetland modifications include drainage ditches, de-forestation, and soil disturbance/fill. The proposed wetland restoration will address these historic land-use impacts through grading, surface roughening, and re-vegetation to restore a functional and diverse alluvial forest community. Restoration of these important ecosystems will improve local water quality, natural habitat, and biodiversity.

Stream restoration efforts will be accomplished through analyses of geomorphic conditions and watershed characteristics. The design approach will apply a combination of analytical and reference reach based design methods that meet objectives commensurate with both ecological and geomorphic improvements. The objective of this approach is to design a geomorphically stable channel that provides maximum functional improvements with minimal intervention. The individual Reach Worksheets provide detailed information for each reach and rationale for proposed work.

The Project's riparian planting design will achieve the following goals: filter existing or potential runoff, provide channel and soil stability, and improve terrestrial wildlife habitat. The first step to developing the vegetation plan will be a comprehensive vegetation and tree survey as a component of the overall data collection. This will identify and map invasive species treatment areas, specimen trees for protection, likely seed sources and successional communities, and potential trees to use for construction materials. RES will perform all invasive exotic vegetation treatment. Treatments may include herbicide applications and/or mechanical control.

From:	Tsomides, Harry
To:	Brad Breslow
Subject:	[EXTERNAL] FW: [External] Apple Valley site DMS_mitigation project_Henderson County_NLEB 4(d) rule consultation
Date:	Monday, November 5, 2018 3:51:02 PM
Attachments:	image001.png NLEB 4(d) rule consultation form Apple Valley Site 11-2-18.pdf

==========

Harry Tsomides
Project Manager
Division of Mitigation Services
NC Department of Environmental Quality

Tel. (828) 545-7057
Harry.Tsomides@ncdenr.gov

5 Ravenscroft Drive
Suite 102
Asheville, NC 28801

From: Brew, Donnie (FHWA) <Donnie.Brew@dot.gov>
Sent: Friday, November 02, 2018 1:36 PM
To: Marella_Buncick@fws.gov
Cc: Tsomides, Harry <harry.tsomides@ncdenr.gov>; jschmid@res.us
Subject: [External] Apple Valley site DMS_mitigation project_Henderson County_NLEB 4(d) rule consultation

Good afternoon Marella,

The purpose of this message is to notify your office that FHWA will use the NLEB streamlined consultation framework for the Apple Valley Mitigation Site in Henderson County, NC.

Attached is a completed NLEB 4(d) Rule Streamlined Consultation form with 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

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.):

Donnie Brew, Donnie.brew@dot.gov, (919)747-7017
Federal Highway Administration

Jeremy Schmid, jschmid@res.us, (919)345-3034
Resource Environmental Solutions

[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.

Project Name: Apple Valley Mitigation Project, DMS Project #: 100063

Project Location (include coordinates if known):
The Project is located in Henderson County approximately 9 miles northeast of Hendersonville, North Carolina (Figure 1). From Hendersonville, proceed east on US-64 W. In approximately 3 miles, turn left on Fruitland Road and proceed until the intersection with Terrys Gap Rd. Continue straight onto Old Clear Creek Road for 3 miles. The Site is located on the right directly across from the intersection of Dalton Farm Road. Coordinates for the site are as follows: 35.417490 N, -82.633506 W.

Basic Project Description (provide narrative below or attach additional information):
The Project is located in the Clear Creek Watershed (06010105030040), a Targeted Local Watershed (TLW), within the Mud Creek Local Watershed Plan (LWP). The Project supports many of the French Broad River Basin Restoration Priorities (RBRP) and LWP goals and presents an opportunity to restore 1,466 linear feet of cold water stream and riparian corridor and restore and enhance 3.04 acres of headwater forest wetland. The proposed Project will provide numerous ecological and water quality benefits within the French Broad River Basin. These benefits are not limited to the project area, but have more far-reaching effects throughout the French Broad River Basin. The Project will provide improvements to water quality, hydrologic function, and habitat.

The Site will include Priority Level I Restoration and wetland restoration. Priority Level I Restoration will incorporate the design of a single-thread meandering channel, with parameters based on data taken from reference sites to be identified later, published empirical relationships, regional curves developed from existing project streams, and NC Regional Curves. Analytical design techniques will also be an important element of the project and will be used to determine the design discharge and to verify the design as a whole.

The goal of the Project is to restore ecological function to the existing stream and riparian corridor by returning the existing streams to a stable condition. This will be accomplished by constructing an E/C type stream with appropriate dimensions and pattern, reconnecting the channel to the floodplain, and backfilling the abandoned channel. In-stream structures such as log sills and brush toes will be installed for vertical stability and to improve habitat. Buffer improvements will filter runoff from agricultural fields, thereby reducing nutrient and sediment loads to the channel. The widening and restoration of the riparian areas will also provide wildlife corridors throughout the project area. Benefits to be accrued from these activities include improved water quality and terrestrial and aquatic habitat.

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	< 3.0 acres	
If known, estimated acres[5] of forest conversion from April 1 to October 31	<3.0 acres	
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: 11-2-18

[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.

From: Stancil, Vann F
To: Jeremy Schmid
Subject: [EXTERNAL] RE: [External] Project Scoping for Apple Valley Mitigation Project in Henderson County
Date: Friday, August 3, 2018 4:24:35 PM

Jeremy, I have reviewed the Apple Valley Mitigation project, located in the Clear Creek watershed, between Puncheon Camp Creek and Cox Creek in Henderson County. I do not anticipate any fish and wildlife issues associated with this project. Thanks for the opportunity to review this.

From: Jeremy Schmid <jschmid@res.us>
Sent: Wednesday, June 27, 2018 2:51 PM
To: Stancil, Vann F <vann.stancil@ncwildlife.org>
Subject: [External] Project Scoping for Apple Valley Mitigation Project in Henderson County

Dear Mr. Stancil,

The Apple Valley Stream and Wetland Mitigation Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable stream and wetland impacts in Henderson County, North Carolina.

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to fish and wildlife associated with a potential stream and wetland restoration project on the attached site. A detailed project description along with maps showing the location and approximate limits of the conservation easement are attached.

We thank you in advance for your timely response and cooperation. Please feel free to contact me with any questions that you may have concerning the extent of site disturbance associated with this project.

Thanks,

Jeremy Schmid, PWS
Senior Ecologist

RES | res.us
Mobile: 919.345.3034

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

June 26, 2018

Mr. Vann Stancil
Habitat Conservation Biologist
North Carolina Wildlife Resources Commission
215 Jerusalem Church Road
Kenly, NC 27542

Subject: Project Scoping for Apple Valley Mitigation Project in Henderson County

Dear Mr. Stancil,

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to fish and wildlife associated with a potential stream and wetland restoration project on the attached site (USGS site map with approximate property lines and areas of potential ground disturbance are enclosed). The Apple Valley Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable stream impacts. The proposed project involves the restoration of 1,466 linear feet of stream and 3.04 acres of wetland. The Site is currently in agricultural use, specifically as pasture.

A detailed project description along with maps showing the location and approximate limits of the conservation easement are enclosed.

We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at jschmid@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jeremy Schmid | Senior Ecologist

Resource Environmental Solutions, LLC ("RES"), through its wholly owned subsidiary Environmental Banc & Exchange, LLC ("EBX"), presents the following proposal to provide cold stream mitigation and riparian wetland mitigation credits in the French Broad River Basin (Cataloging Unit 06010105, Targeted Local Watershed 06010105030040) in response to RFP #16-007334.

RES has entered into contracts to purchase a conservation easement totaling approximately 5.94 acres on a single parcel comprising the Apple Valley Project (Project), in Henderson County, approximately nine miles northeast of Hendersonville and five miles southwest of Chimney Rock Village. The Project will involve the restoration of an unnamed tributary to Clear Creek and adjacent riparian wetlands.

As described in the following technical proposal, the Project will result in significant water quality improvements including:

- Decreased non-point source pollution,
- Decreased in-stream sediment contribution,
- Increased dissolved oxygen concentration, and
- Runoff filtration.

The Project will provide uplift for ecological functions, including:

- Improved wetland and aquatic habitat diversity,
- Invasive species treatment, and
- Wildlife corridor enhancement and preservation.

The Project will restore, enhance, and protect an important aquatic resource and wildlife corridor while also accommodating existing agricultural land uses.

Watershed

The Project is located in the Clear Creek Watershed (06010105030040), a Targeted Local Watershed (TLW), within the Mud Creek Local Watershed Plan (LWP). The Project supports many of the French Broad River Basin Restoration Priorities (RBRP) and LWP goals and presents an opportunity to restore 1,466 linear feet of cold water stream and riparian corridor and restore and enhance 3.04 acres of headwater forest wetland. The proposed Project will provide numerous ecological and water quality benefits within the French Broad River Basin. These benefits are not limited to the project area, but have more far-reaching effects throughout the French Broad River Basin. The Project will provide improvements to water quality, hydrologic function, and habitat.

As stated in the French Broad River RBRP report (2009), the following restoration and protection goals are listed for the watershed:.

1. *Implement wetland and stream restoration projects that reduce sources of sediment and nutrients by restoring riparian buffer vegetation, stabilizing banks, excluding livestock, and restoring natural geomorphology, especially in headwater streams.*

2. *Restore and protect habitat for priority fish, mussel, snail, and crayfish species in the basin.*
3. *Cooperate with land trusts and resource agencies to help leverage federal and state grant funding for watershed restoration and conservation efforts.*
4. Protect high quality habitats, especially those prioritized by the Natural Heritage Program as Significant Natural Heritage Areas.

Stream and Wetland Restoration Approach

A key design consideration for the Project is ensuring the restored channel and wetlands achieve maximum functional uplift while allowing the existing agricultural land uses to continue. All restoration practices will be designed and implemented to accommodate current and future flow conditions.

Historic riparian wetlands adjacent to the unnamed tributary to Clear Creek have been drained and converted to agricultural land for generations. In addition to stream channelization, wetland modifications include drainage ditches, de-forestation, and soil disturbance/fill. The proposed wetland restoration will address these historic land-use impacts through grading, surface roughening, and re-vegetation to restore a functional and diverse alluvial forest community. Restoration of these important ecosystems will improve local water quality, natural habitat, and biodiversity.

Stream restoration efforts will be accomplished through analyses of geomorphic conditions and watershed characteristics. The design approach will apply a combination of analytical and reference reach based design methods that meet objectives commensurate with both ecological and geomorphic improvements. The objective of this approach is to design a geomorphically stable channel that provides maximum functional improvements with minimal intervention. The individual Reach Worksheets provide detailed information for each reach and rationale for proposed work.

The Project's riparian planting design will achieve the following goals: filter existing or potential runoff, provide channel and soil stability, and improve terrestrial wildlife habitat. The first step to developing the vegetation plan will be a comprehensive vegetation and tree survey as a component of the overall data collection. This will identify and map invasive species treatment areas, specimen trees for protection, likely seed sources and successional communities, and potential trees to use for construction materials. RES will perform all invasive exotic vegetation treatment. Treatments may include herbicide applications and/or mechanical control.

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

July 19, 2018

Jeremy Schmid
Resource Environmental Solutions, LLC
302 Jefferson Street, Suite 110
Raleigh, NC 27605

Re: Apple Valley Mitigation Project, Henderson County, ER 18-1530

Dear Mr. Schmid:

Thank you for your letter of June 26, 2018, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

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

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

June 26, 2018

Renee Gledhill-Earley
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh NC 27699-4617

Subject: Project Scoping for Apple Valley Mitigation Project in Henderson County

Dear Ms. Gledhill-Earley,

The Apple Valley Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable stream and wetland impacts. The proposed project involves the restoration of 1,466 linear feet of stream and 3.04 acres of wetland. The Site is currently in agricultural use, specifically as pasture.

RES requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream and wetland mitigation project on the Apple Valley Site (a USGS site map with approximate limits of conservation easement is attached).

A review of the N.C. State Historic Preservation Office (SHPO) HPOWEB GIS Service database (http://gis.ncdcr.gov/hpoweb/; accessed June 26, 2018) was performed as part of the site due diligence evaluation. The database did not reveal any listed or potentially eligible historic or archeological resources on the proposed properties. The Zeb Dalton House (HN1124) is located within a 0.5-mile radius of the project area. The Project will not threaten or impact this historic location. In addition, the majority of the site has historically been disturbed due to agriculutral practices, specifically pastureland.

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. You may return the comment to my attention at the address below, or via email. Please feel free to contact me at jschmid@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jeremy Schmid | Senior Ecologist

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

September 13, 2018

Michelle Hamilton
Eastern Band of Cherokee Indians
PO Box 455
Cherokee, NC 28719

Subject: Project Scoping for Apple Valley Mitigation Project in Henderson County

Dear Ms. Hamiltion,

The Apple Valley Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable stream and wetland impacts. The proposed project involves the restoration of 1,466 linear feet of stream and 3.04 acres of wetland. The Site is currently in agricultural use, specifically as pasture.

RES requests review and comment on any possible issues that might emerge with respect to Eastern Band of Cherokee Indians tribal resources associated with a potential stream and wetland mitigation project on the Apple Valley Site (a USGS topographic map and conceptual plan map with approximate limits of conservation easement are attached).

We ask that you review this site based on the attached information to determine the presence of any Eastern Band of Cherokee Indians tribal resources associated with the site. We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below, or via email. Please feel free to contact me at jschmid@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jeremy Schmid | Senior Ecologist

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

October 5, 2018

Elizabeth Toombs
Cherokee Nation
PO Box 948
Tahlequah, OK 74465

Subject: Project Scoping for Apple Valley Mitigation Project in Henderson County

Dear Ms. Toombs,

The Apple Valley Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable stream and wetland impacts. The proposed project involves the restoration of 1,466 linear feet of stream and 3.04 acres of wetland. The Site is currently in agricultural use, specifically as pasture.

RES requests review and comment on any possible issues that might emerge with respect to Cherokee Nation tribal resources associated with a potential stream and wetland mitigation project on the Apple Valley Site (a USGS topographic map and conceptual plan map with approximate limits of conservation easement are attached).

We ask that you review this site based on the attached information to determine the presence of any Cherokee Nation tribal resources associated with the site. We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below, or via email. Please feel free to contact me at jschmid@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jeremy Schmid | Senior Ecologist

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

October 5, 2018

Sheila Bird
Tribal Historic Preservation Office
United Keetoowah Band of Cherokee Indians in Oklahoma
PO Box 746
Tahlequah, OK 74465

Subject: Project Scoping for Apple Valley Mitigation Project in Henderson County

Dear Ms. Bird,

The Apple Valley Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable stream and wetland impacts. The proposed project involves the restoration of 1,466 linear feet of stream and 3.04 acres of wetland. The Site is currently in agricultural use, specifically as pasture.

RES requests review and comment on any possible issues that might emerge with respect to United Keetoowah Band of Cherokee Indians tribal resources associated with a potential stream and wetland mitigation project on the Apple Valley Site (a USGS topographic map and conceptual plan map with approximate limits of conservation easement are attached).

We ask that you review this site based on the attached information to determine the presence of any United Keetoowah Band of Cherokee Indians tribal resources associated with the site. We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below, or via email. Please feel free to contact me at jschmid@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jeremy Schmid | Senior Ecologist

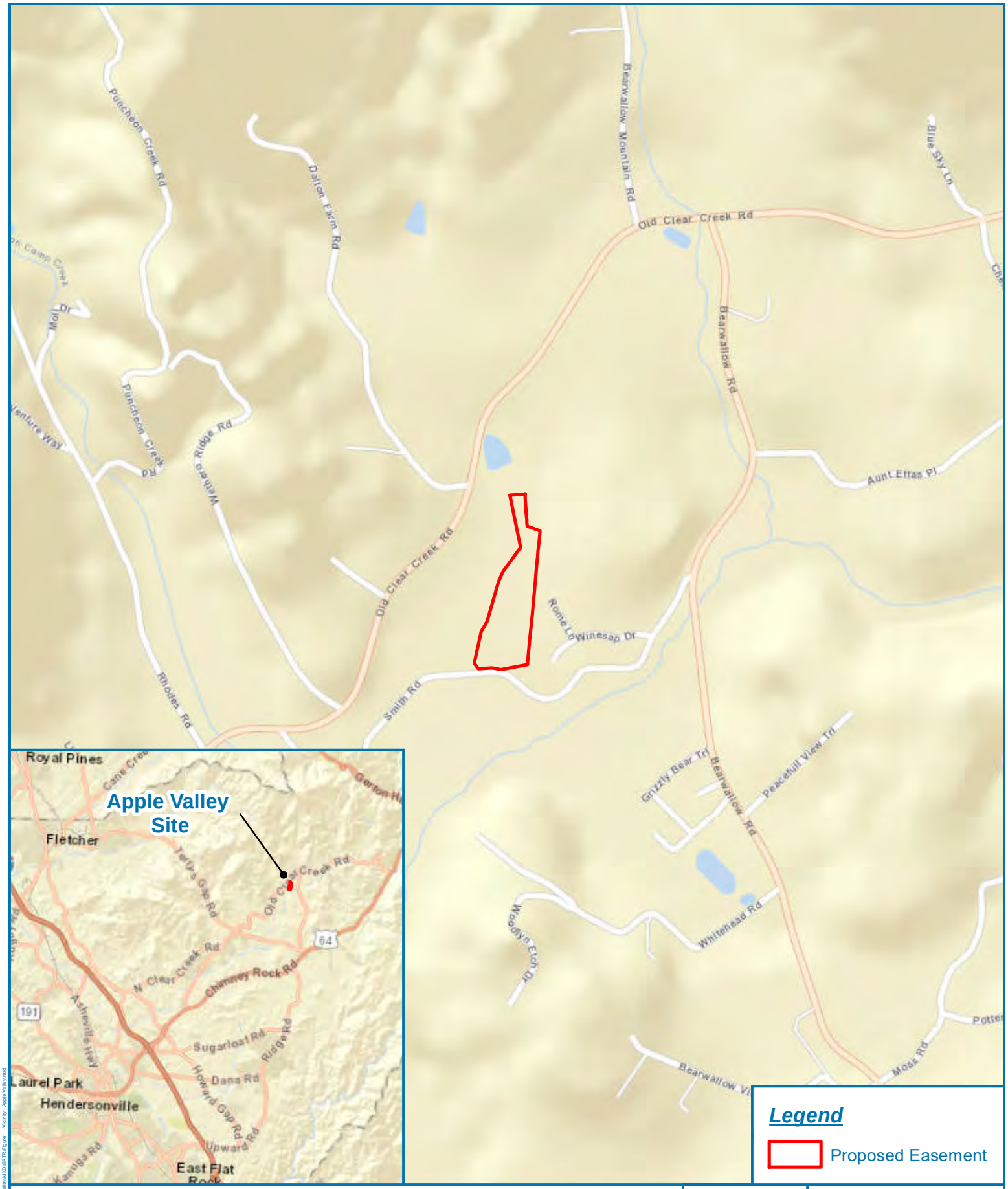


Figure 1 - Vicinity Map

Apple Valley Mitigation Site

Henderson County, North Carolina

Date: 5/30/2018

Drawn by: JLS

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\EIR\Figure 1 - Vicinity - Apple Valley.mxd

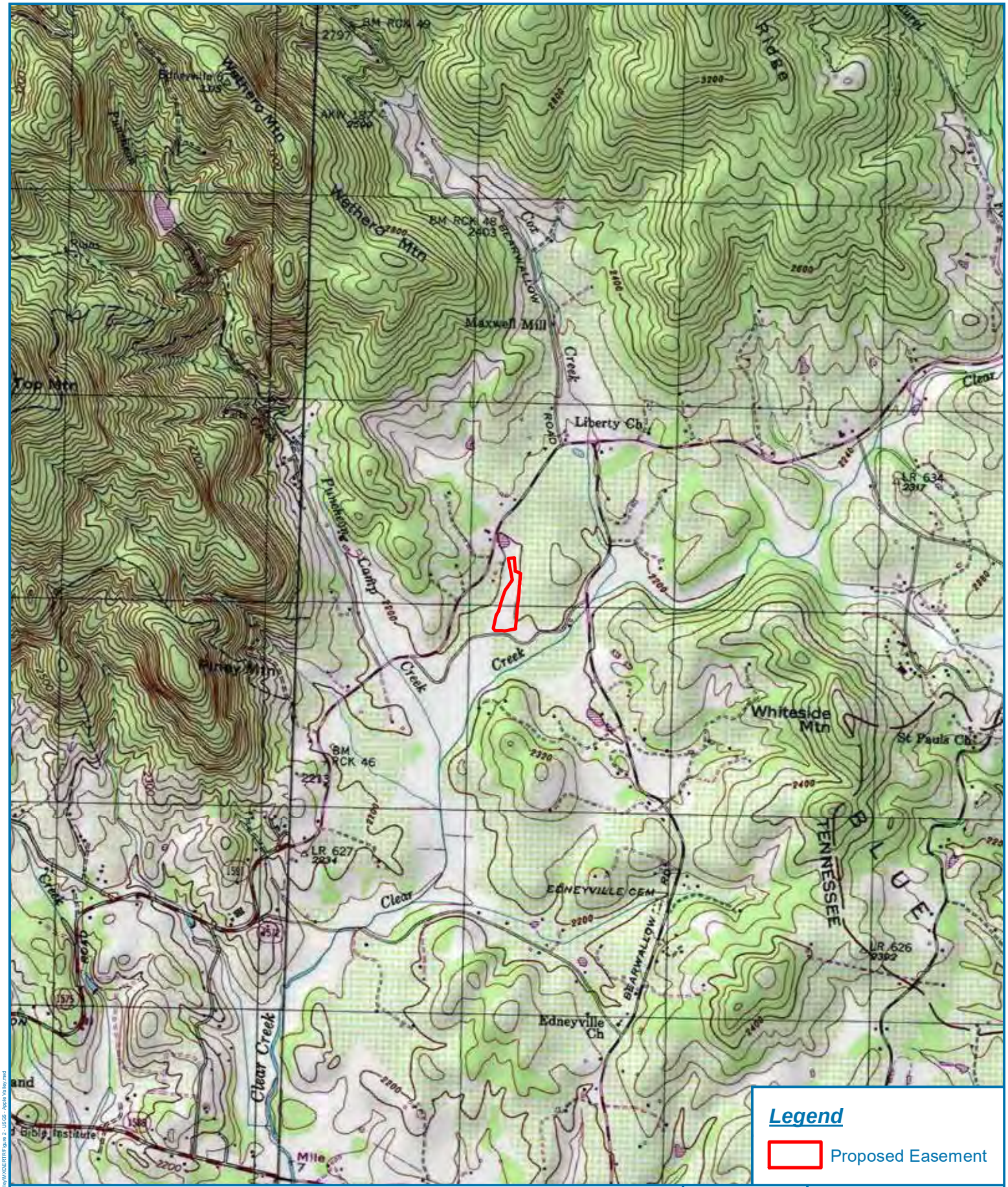


Figure 2 - USGSMap

Apple Valley Mitigation Site

Henderson County, North Carolina

Date: 5/30/2018

Drawn by: JLS

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\EPT\Figure 2 - USGS - Apple Valley.mxd

Figure 3 - Aerial Map

Apple Valley Mitigation Site

Henderson County, North Carolina

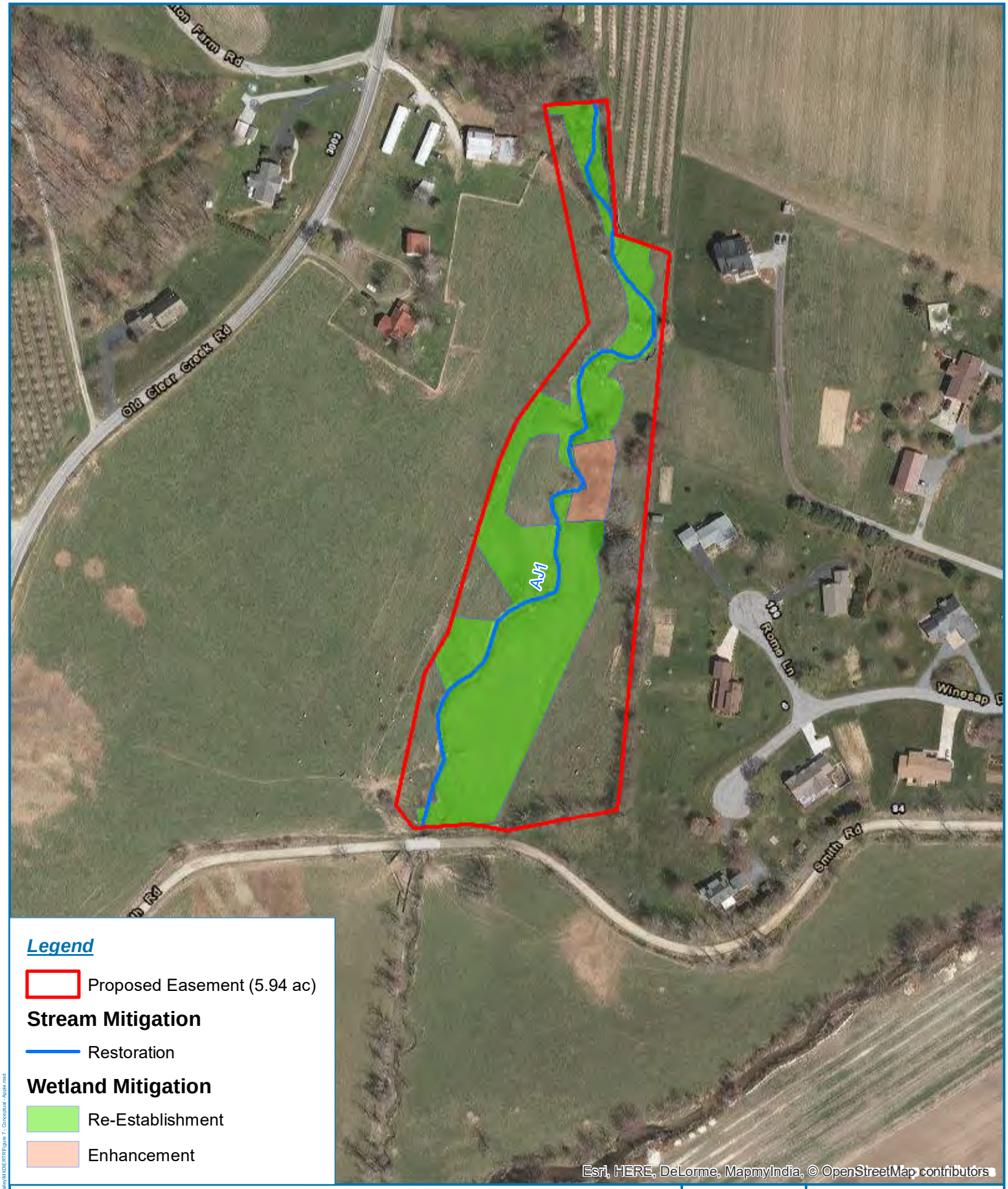
0 200 400

Feet

Date: 6/27/2018

Drawn by: JLS

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\ERTR\Figure 4 - Aerial - Apple Valley.mxd



Legend

Proposed Easement (5.94 ac)

Stream Mitigation

Restoration

Wetland Mitigation

Re-Establishment

Enhancement

N

W E

S

0 100 200

Feet

Figure 4 - Conceptual Map

Apple Valley Mitigation Site

Henderson County, North Carolina

Date: 6/27/2018

Drawn by: ATP

res

Document Path: S:\@RES GIS\Projects\NC\Apple Valley\MXD\EPT\Figure 7 - Conceptual - Apple.mxd

Appendix L – DMS Floodplain Requirements Checklist

EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. State NFIP Engineer), NC Floodplain Mapping Unit (attn. State NFIP Coordinator) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Apple Valley
Name if stream or feature:	Unnamed Tributary to Clear Creek
County:	Henderson County
Name of river basin:	French Broad River Basin
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Henderson County
DFIRM panel number for entire site:	9692 (map number 3700969200J, effective date October 2, 2008)
Consultant name:	Resource Environmental Solutions
Phone number:	(984) 255-9127
Address:	302 Jefferson Street, Suite 110 Raleigh, NC 27605

Design Information

The Apple Valley Project is located within a rural watershed in Henderson County, within the French Broad River Basin and USGS 14-digit HUC 06010105030040. The Project proposes to restore 1,437 linear feet of stream, re-establish 2.755 acres of wetland, enhance 0.288 acres of wetland, and provide water quality benefit for 277 acres of drainage area. The stream and wetland mitigation components are summarized in the table below. The purpose of the Project is to meet water quality improvements addressed in the River Basin Restoration Priorities and improve overall stream and wetland health.

Reach	Length	Mitigation Type
AV1	1,437	Restoration

Wetland	Acreage	Mitigation Type
W1	0.275	Enhancement
W2	0.013	Enhancement
W3	2.755	Re-establishment

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

○ Yes ◉ No

If project is located in a SFHA, check how it was determined:

☐ Redelineation

☐ Detailed Study

☐ Limited Detail Study

☐ Approximate Study

☐ Don't know

List flood zone designation: Zone X (outside 0.2% floodplain)

Check if applies:

☐ AE Zone

- ○ Floodway
- ○ Non-Encroachment
- ◉ None

☐ A Zone

- ○ Local Setbacks Required
- ○ No Local Setbacks Required

If local setbacks are required, list how many feet:

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

○ Yes ◉ No

Land Acquisition (Check)

☐ State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☑ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program?

◉ Yes ○ No Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000)	
Name of Local Floodplain Administrator: Natalie J. Berry, PE Phone Number: (828) 694-6521	

Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

- ☑ No Action
- ☐ No Rise
- ☐ Letter of Map Revision
- ☐ Conditional Letter of Map Revision
- ☐ Other Requirements

List other requirements:

Comments:

Name: Samuel C. Fasking Signature:

Title: Engineer I Date: 05.09.2019