FINAL MITIGATION PLAN
VALLE CRUCIS MITIGATION SITE

Watauga County, North Carolina

DMS Project ID No. 100205
Full Delivery Contract No. 200104-01
USACE Action ID No. SAW-2021-01272
DWR Project No. 2019-0050 v2
RFP No. 16-20200104 (Issued 12/1/2020)

Watauga River Basin
Cataloging Unit 06010103

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1652

December 2023

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

REPLY TO
ATTENTION OF:

October 10, 2023

Regulatory Division

Re: NCIRT Review and USACE Approval of the NCDMS Valle Crucis Mitigation Site / Watauga County

USACE ID: SAW-2021-01272
NCDMS Project # 100205
NCDWR # 20190050 v.2

Harry Tsomides
North Carolina Division of Mitigation Services
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

Dear Mr. Tsomides:

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 Valle Crucis Draft Mitigation Plan, which closed on August 20, 2023. 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, please note that issues identified as described in the attached comment memo, must be addressed in the Final Mitigation Plan.

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

are aware, unforeseen issues may arise during construction or monitoring of the project that may require maintenance or reconstruction that may lead to reduced credit.

Thank you for your prompt attention to this matter, and if you have any questions regarding this letter, the mitigation plan review process, or the requirements of the Mitigation Rule, please contact Steve Kichefski at steven.l.kichefski@usace.army.mil, or (828) 933-8032.

Sincerely,

Casey M Haywood

Casey Haywood
Mitigation Specialist
for Todd Tugwell,
Mitigation Branch Chief
Regulatory Division

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List

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

REPLY TO
ATTENTION OF:

September 22, 2023

CESAW-RG/Kichefski

MEMORANDUM FOR RECORD

SUBJECT: NCDMS Valle Crucis Mitigation Site - NCIRT Comments during Mitigation Plan Review, Watauga County, NC

PURPOSE: The comments listed below were received from the NCIRT during the 30-day comment period in accordance with Section 332.8(g)(2) of the 2008 Mitigation Rule.

USACE AID#: SAW-2021-01272 30-Day Comment Deadline: July 21, 2023
DWR #: 2019-0050 v.2

Maria Polizzi, NCDWR:

1) Is there a point of diminishing returns for the nutrient reduction model? Additionally, the easement area is larger than the restored riparian buffer area (stream area, previous locations without cattle access and/or previously forested areas should not be included), so the estimated reductions are inflated.

2) Under section 3.5.4, can slopes be shown in percentages? This can be in addition to the current ft./ft. value. Slope percentage is easier (at least for me) to conceptualize when reading through.

3) In Table 16, why does SAM #2 score as medium for water quality when the individual components are scoring as high? Is enhancement necessary if the stream is high scoring?

4) Thank you for showing the locations of NCSAM, NCWAM, and NCDWR stream forms on your existing conditions map. This is helpful.

5) Please update Table 19 to reflect that NLEB is now endangered. Does this change in designation change anything for the project? Is further coordination with USFWS needed?

6) Table 20: It could be worth breaking this down further into sub-reaches where there are significant changes, such as moving from a forested section to a

pasture section, or where mitigation efforts will take on a different form (restoration, vs. enhancement, etc.).

7) Under Section 8.3, Wetland Creation: Will there be enough topsoil to adequately cover the wetland creation areas? There is no soil profile provided for these currently non-wetland areas, so it is difficult to tell how deep the A horizon would be in these locations.

8) Are any random vegetation plots proposed? It would be helpful to have at least a couple random plots.

9) For the UT1 downstream internal bridge crossing, is it possible to have the bridge cross the stream at an angle closer to 90 degrees? Currently, due to the angle, the footer corners appear to be located very close to the top of bank.

10) Will the Log Vane shown on Stream Detail Sheet 8.02 have a footer log?

11) For the Marsh Treatment Areas on Stream Details 8.07, can you limit depth to 14”? Also, I do not see these shown on the plans. Can you point out which plan sheet or station number they are on/at, so that I can find them?

12) For the UT4 bridge crossing, the wetland is over 100 ft. across in this location. Do you think the two 18” HDPE floodplain culverts will be sufficient to handle storm flows? Do you think having additional floodplain culverts on the other side of the bridge would be beneficial to improve flow?

13) On the constructed riffle spec sheet, under Quarried Riffle Substrate Specifications, UT1 is listed twice. I’m guessing one should be UT1 upstream and the other downstream. Please double check this. Also, can you explain why larger reaches are designed with smaller stone and visa-versa? Lastly, please be sure that stone size is appropriate for the stream size, drainage area and general characteristics. Class 1 and 2 rip-rap both have a wide size range, 5-17” and 9-23” respectively, so it could be worth noting a maximum size that can be used to avoid larger stone from being utilized where unintended. This comment is not limited to constructed riffles.

14) Can you provide more details about the understory plantings? What species will be planted and at what planting density? Can you expand on the understory transects?

15) DWR requests a site visit since the current staff were not hired when the initial site visit was held.

16) Section 7.9 states that there will likely be no threat of hydrologic trespass. However, upon examining Figure 5, DWR believes there is a threat to hydrologic trespass. Given the fact that the easement line runs through the area of drained hydric soils in combination with a P1 stream restoration, it is likely that the drained hydric soils may wet up beyond the easement line.

17) DWR recommends that there be 2 wetland monitoring gauges added to the proposed wetland creation areas and one to the wetland re-establishment area. In addition, DWR strongly recommends that at least 2 soil profiles from the wetland creation area be done prior to construction.

18) DWR recommends another understory vegetation transect along UT4.

19) There are a number of log cross vanes proposed for this project in areas which have a lot of slope. DWR would like to be contacted when this project is in construction so staff can witness the installation of some of these structures.

Steve Kichefski & Casey Haywood, USACE:

1) The thorough comments from DMS are appreciated.

2) As confirmation, the PJD concurrence email from the corps is sufficient.

3) Section 1.4- Table 4 does not include reach summary information for UT6. Information for UT6 was also excluded from Section 3.5 Project Site Streams. UT6 is labeled on Figure 8 as PI restoration to tie into UT4. Please update to include UT6 in applicable sections.

4) Section 7.1- Please update the status of the NLEB to endangered on Table 19 and add the Tricolored Bat to the table. The CE documentation in Appendix E should also be updated accordingly. We highly recommend coordinating with USFWS to avoid any potential permitting delays. In general, the USFWS has supported limiting tree removal to winter months (Oct 16-March 31) as stated in your report; however, if TCB is listed, its consultation requirements may change.

5) Section 7.8- During the site visit there was a discussion that one of the crossings (UT4) was sized for subdivision access, but it was not mentioned in the report. If there are still plans for a future subdivision on the property, it should be discussed in this section.

6) Section 7.5- Please indicate the proposed relocation of the powerline on Figure 8. Is it being redirected through the UT4 crossing?

7) Section 7.9 stated that hydrologic trespass was not a concern because any impacts outside the easement are isolated to the property owners; however, we concur with DWR's comment 15 that there is a strong potential for areas outside the easement to wet up. Please continue to work with the landowner(s) to ensure no ditching occurs outside the easement. What is the land use in the field to the right of UT4 outside the easement? Please consider having a buffer between wetlands and the CE boundary on future projects to protect the wetlands from adjacent land use.

8) Are there any concerns with UT4 maintaining a channel in the floodplain where wetland reestablishment is proposed?

9) Section 8.5.1- Please provide more details regarding the understory plantings (species, density, indicator status, etc). Table 21 does not include understory plantings, nor are they included in the design sheet planting plan. The plan provided a species list in Table 11 that included a list of appropriate understory species for the identified community types; however, the only species listed as an understory species that is being planted is silky dogwood. Will additional species be selected based off the information provided in Table 11? Please add a shaded or hatched area to Figure 10 indicating where supplemental planting will occur.

10) Benthic Sampling-
    a. Has preconstruction data been collected yet? If so, please add it to the appendices. Per the 2016 Guidance a reference location should also be sample for comparison purposes.
    b. The calculation for the 2% additional credit does not look accurate. The 2% credit is based on the credit for each tributary, not the entire site. The total additional credit for benthic sampling at 2% for UT1 and UT4 was calculated at 52.935 SMU. Please update accordingly. An option to increase the percent of additional credit, monitoring fish and benthic would increase to 4%, and if including water quality monitoring, additional credit potential increases to 6%.
    c. Section 9- Table 23 indicates that Benthic sampling will occur preconstruction and years 3, 5, & 7, however the monitoring schedule on Table 22 indicates sampling will occur in all years except 4 and 6. Please verify and update.

11) For fixed photo points, please capture all crossings, looking both upstream and downstream. Also, please include a photo point looking upstream and downstream at the top of UT1 where crediting starts (15ft below the pipe) These should be noted in Table 23 as a monitoring component and marked on Figure 11.

12) Wetlands-
    a. Please confirm that all grading within proposed wetland credit areas (outside wetland creation) will be less than 12 inches. Not sure if it was overlooked, but the grading plan could not be located in the document. Please be advised that a pre- and post-construction grading map may be requested at AB to verify grading depths; if there are areas that had grading over 12” that were not approved in the Mitigation plan, credit ratios may need to be adjusted.

b. Section 8.3- While the approach for several wetland areas is similar, if any activities or conditions differ, this would be a good opportunity to discuss the mitigation activities and the anticipated functional uplift (similar to Table 20 for streams). As discussed in the email dated 9/7/2021, there were some wetland enhancement areas within forested portions of the site, in particular on UT1 & 3, where the enhancement activities were not known. For example, what uplift is being provided in the enhancement wetland along UT1 if it's forested? If the uplift is veg, a veg plot needs to be added to monitor performance standards. Another example is the wetland enhancement adjacent to UT4 (GWB), what is the functional uplift here, veg and hydro? Or was the gauge installed to monitor hydrology because there were concerns from the IRT that moving the channel would impact the wetland? Section 3.6 needs to be expanded to include more information on existing wetland conditions. In general, Section 3.6 needs to expand on existing wetland conditions, and Section 3.6 should clearly state the functional improvements being proposed for wetland enhancement (veg, hydro, BMPs, etc). Having this information is important for evaluating the proposed functional uplift of a resource and is used to determine if a 2:1 ratio is justified.
c. Wetlands should be labeled on the figures.
d. Pg 38 states that two reference wetlands were identified near the site that exhibit hydrologic and landscape characteristics similar to the site, was a reference wetland gauge installed at either location?

13) Marsh treatment areas-
a. To confirm, are these marsh treatment features (shown on C8.07) located only in the blue dot areas on Figure 8? Do you anticipate any trees establishing these areas? Are they intended to dry seasonally? Recommend limiting the depth to 14" so pools will dry seasonally to ensure that predatory species do not colonize in the pools. It would be helpful to discuss the marsh treatment areas in the narrative to add more context.
b. It appears that one of the marsh treatment areas is being proposed in an existing wetland. It is understood that this was discussed with the IRT; however, it is not appropriate to place a BMP in a jurisdictional feature.

14) Figure 11 Monitoring plan map-
a. Will a rain gauge be installed at the site? If not, please identify the proposed rainfall data source location and distance from the project site.
b. To make sure the site is adequately represented, please include a random veg transect on each reach proposed for restoration.

c. Please move the wetland reestablishment gauge located at the bottom of UT4 to the opposite side (streamside-right) and add an additional gauge to capture the wetland creation pocket adjacent to the crest gauge. Please see the marked figure for reference.

15) Design sheets need to include the locations of monitoring station locations.

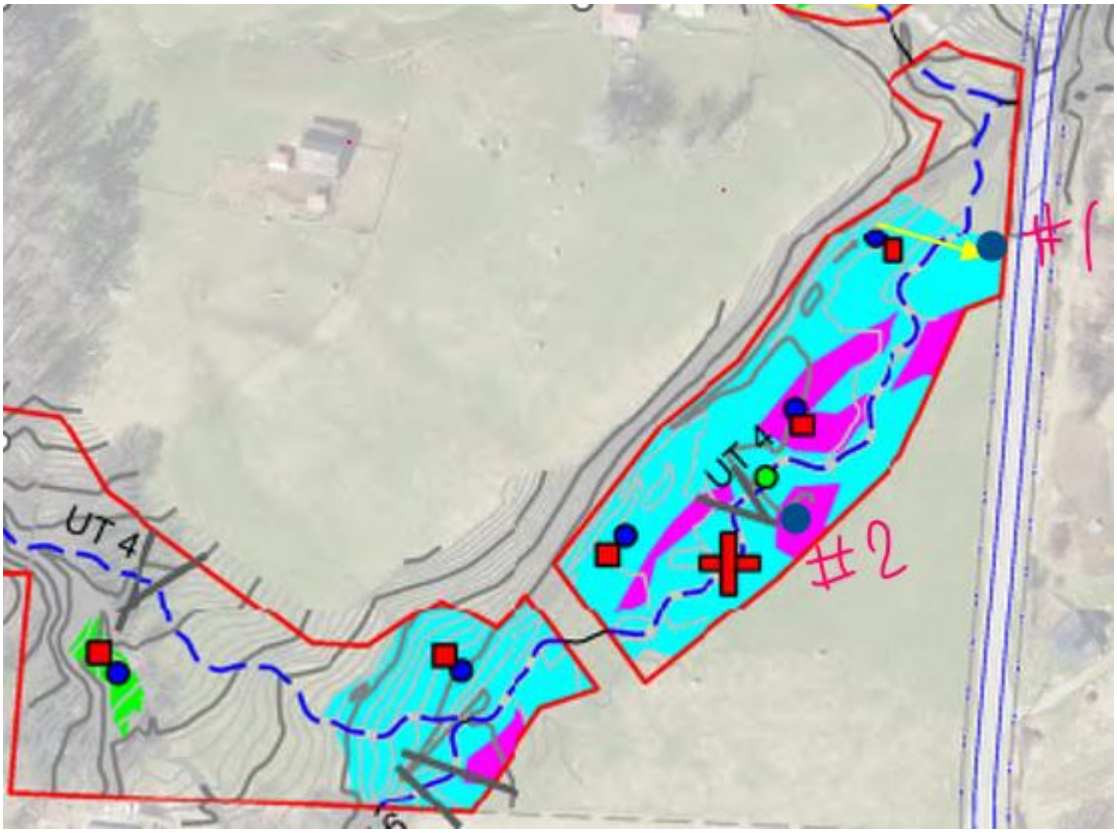
Sincerely,

Casey M Haywood

Casey Haywood
for Steve Kichefski
Mitigation Branch Chief
Regulatory Division

Electronic Copies Furnished:

NCIRT Distribution List


UT 4
UT 4
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#2

Restoration Systems, LLC
1101 Haynes St. Suite 211
Raleigh, North Carolina
Ph: (919) 755-9490
Fx: (919) 755-9492

Response to IRT Comments
Valle Crucis Mitigation Site – Draft Mitigation Plan
Watauga River Basin – CU 06010103– Watauga County
NCDEQ Contract No. 200104-01
DMS ID No. 100205
USACE Action ID No. SAW-2021-01272
DWR Project No. 2019-0050 v2
RFP No. 16-20200104 (Issued 12/01/2020)

Comments Received (Black Text) & Responses (Blue Text)

Maria Polizzi, NCDWR:

1) Is there a point of diminishing returns for the nutrient reduction model? Additionally, the easement area is larger than the restored riparian buffer area (stream area, previous locations without cattle access and/or previously forested areas should not be included), so the estimated reductions are inflated.
Our nutrient reduction model is based on published data from NCDMS (NCDMS 2016). Variables in the model are assumed to be accurate. Although several areas of the easement are wooded, all areas are accessible by livestock and should be suitable for the model.

2) Under section 3.5.4, can slopes be shown in percentages? This can be in addition to the current ft./ft. value. Slope percentage is easier (at least for me) to conceptualize when reading through.
Slope percentages have been added to the discussion.

3) In Table 16, why does SAM #2 score as medium for water quality when the individual components are scoring as high? Is enhancement necessary if the stream is high scoring?
SAM #2 scores medium for water quality stressors because there is the presence of water quality stressors, including Livestock with access to the stream.

4) Thank you for showing the locations of NCSAM, NCWAM, and NCDWR stream forms on your existing conditions map. This is helpful.
No problem.

5) Please update Table 19 to reflect that NLEB is now endangered. Does this change in designation change anything for the project? Is further coordination with USFWS needed?
Confirmation was obtained from Holland Youngman of the Ashville USFWS office that no further coordination is needed.

Northern long-eared bat has been updated to reflect the Federal status of Endangered. Species have been evaluated through the IPaC Determination Keys and have a Biological Conclusion of May Affect, Not Likely to Adversely Affect. No further action is required; however, coordination with USFWS will occur throughout the project.

6) Table 20: It could be worth breaking this down further into sub-reaches where there are significant changes, such as moving from a forested section to pasture section, or where mitigation efforts will take on a different form (restoration, vs. enhancement, etc.).
Table 20 has been updated with the different reaches based on Figure 8 (Proposed Conditions) which corresponds to different mitigation strategies.

7) Under Section 8.3, Wetland Creation: Will there be enough topsoil to adequately cover the wetland creation areas? There is no soil profile provided for these currently non-wetland areas, so it is difficult to tell how deep the A horizon would be in these locations.
Adequate topsoil should be available in these areas.

8) Are any random vegetation plots proposed? It would be helpful to have at least a couple random plots.
Three permanent monumented vegetation plots have been converted to random transects on Figure 11 (Monitoring Plan).

9) For the UT1 downstream internal bridge crossing, is it possible to have the bridge cross the stream at an angle closer to 90 degrees? Currently, due to the angle, the footer corners appear to be located very close to the top of bank.
Due to the approach of the driveway from the NCDOT road and the path of the driveway leaving the stream, it is not possible to turn the crossing more perpendicular to the stream. Our engineers have assessed the crossing for structural integrity and flow passage.

10) Will the Log Vane shown on Stream Detail Sheet 8.02 have a footer log?
Yes. All log vanes will have footer logs unless the diameter at breast height is sufficient (more than two times the stream depth) to serve as footer and header.

11) For the Marsh Treatment Areas on Stream Details 8.07, can you limit depth to 14"? Also, I do not see these shown on the plans. Can you point out which plan sheet or station number they are on/at, so that I can find them?
Marsh treatment areas may necessarily be deeper than 14 inches, depending on where they are located (i.e. in an ephemeral draw). However, these features are not placed in jurisdictional areas and are intended to fill with sediment over time. Marsh treatment areas a depicted on Figure 8 (Proposed Conditions).

12) For the UT4 bridge crossing, the wetland is over 100 ft. across in this location. Do you think the two 18" HDPE floodplain culverts will be sufficient to handle storm flows? Do you think having additional floodplain culverts on the other side of the bridge would be beneficial to improve flow?
Engineers have modeled the bridge and culverts and they should provide adequate passage. If field conditions during construction necetiate additional floodplain culverts, more will be added and detailed in the as-built.

13) On the constructed riffle spec sheet, under Quarried Riffle Substrate Specifications, UT1 is listed twice. I'm guessing one should be UT1 upstream and the other downstream. Please double check this. Also, can you explain why larger reaches are designed with smaller stone and visa-versa? Lastly, please be sure that stone size is appropriate for the stream size, drainage area and general characteristics. Class 1 and 2 rip-rap both have a wide size range, 5-17" and 9- 23" respectively, so it could be worth noting a maximum size that can be used to avoid larger stone from being utilized where unintended. This comment is not limited to constructed riffles.
   - UT 1 is listed twice because there are two different reaches of UT 1 being spec'ed (station 8+58-11+31 and 13+75-18+70).
   - Stone size is variable based on slope rather than drainage area. Frequently the larger drainage area has less slope and will not require larger stone.
   - Understood. The engineers have spec'ed the appropriate stone size for the reach.

14) Can you provide more details about the understory plantings? What species will be planted and at what planting density? Can you expand on the understory transects?
The planting plan has been updated. Understory species were picked based on site conditions and natural communities. The list below contains the species selected and the total number of one-gallon pots available for each species. Please see the updated planting plan on page 7. (Table 1). Species/Totals:

   - Tag alder (*Alnus serrulata*) = 10
   - Red chokeberry *(Aronia arbutifola)* = 90 stems
   - Pawpaw (*Asimina triloba*) = 80 stems
   - Witch hazel (*Hamamelis virginiana*) = 80 stems
   - Hop-hornbeam (*Ostrya virginiana*) = 80 stems
   - Elderberry (*Sambucus nigra*) = 10
   - Basswood (*Tilia americana*) = 70

   Total = 420 stems

15) DWR requests a site visit since the current staff were not hired when the initial site visit was held.
A Site was held on 10/18/2023. Meeting minuets are included in the Mitigation Plan.

16) Section 7.9 states that there will likely be no threat of hydrologic trespass. However, upon examining Figure 5, DWR believes there is a threat to hydrologic trespass. Given the fact that the easement line runs through the area of drained hydric soils in combination with a P1 stream restoration, it is likely that the drained hydric soils may wet up beyond the easement line.
As the landowner of the easement is also the owner of the fields adjacent to the easement, we do not expect any additional wetting (hydrologic trespass) beyond the fee-simple property of the easement. In addition, there is a distinct slope gradient that the easement has been placed upon that will limit hydrologic trespass outside of the easement. Berms, fill dirt, and drain tile will be used as adaptive management should wetting of the pasture occur outside of the easement to stop hydrologic trespass outside of the easement.

17) DWR recommends that there be 2 wetland monitoring gauges added to the proposed wetland creation areas and one to the wetland re-establishment area. In addition, DWR strongly recommends that at least 2 soil profiles from the wetland creation area be done prior to construction.
Two gauges will be added to the wetland creation areas. Soil profiles will be collected in these areas and included in the As-Built Report.

18) DWR recommends another understory vegetation transect along UT4.
Based on discussion in the field at the IRT site visit, alternative understory vegetation monitoring methods will be implemented.

19) There are a number of log cross vanes proposed for this project in areas which have a lot of slope. DWR would like to be contacted when this project is in construction so staff can witness the installation of some of these structures.
Restoration Systems will contact NCDWR once construction is initiated at the Site.

Steve Kichefski & Casey Haywood, USACE:

1) The thorough comments from DMS are appreciated.

2) As confirmation, the PJD concurrence email from the corps is sufficient.
Understood.

3) Section 1.4- Table 4 does not include reach summary information for UT6. Information for UT6 was also excluded from Section 3.5 Project Site Streams. UT6 is labeled on Figure 8 as PI restoration to tie into UT4. Please update to include UT6 in applicable sections.
Table 4 has been updated with information for UT6. In addition, Section 3.5 has been updated with a discussion of UT6.

4) Section 7.1- Please update the status of the NLEB to endangered on Table 19 and add the Tricolored Bat to the table. The CE documentation in Appendix E should also be updated accordingly. We highly recommend coordinating with USFWS to avoid any potential permitting delays. In general, the USFWS has supported limiting tree removal to winter months (Oct 16-March 31) as stated in your report; however, if TCB is listed, its consultation requirements may change.
Section 7.1 has been updated and we have had consultation with Holland Youngman of the Ashville USFWS office which will be included as an appendix.

5) Section 7.8- During the site visit there was a discussion that one of the crossings (UT4) was sized for subdivision access, but it was not mentioned in the report. If there are still plans for a future subdivision on the property, it should be discussed in this section.
There is no plan (current or future) for the development of this property.

6) Section 7.5- Please indicate the proposed relocation of the powerline on Figure 8. Is it being redirected through the UT4 crossing?
Currently, we do not have an exact location of the proposed powerline. However, we have been coordinating with representatives from Blue Ridge Energy to relocate the powerline across UT 4 at the easement break/crossing.

7) Section 7.9 stated that hydrologic trespass was not a concern because any impacts outside the easement are isolated to the property owners; however, we concur with DWR's comment 15 that there is a strong potential for areas outside the easement to wet up. Please continue to work with the landowner(s) to ensure no ditching occurs outside the easement. What is the land use in the field to the right of UT4 outside the easement? Please consider having a buffer between wetlands and the CE boundary on future projects to protect the wetlands from adjacent land use.
   - As the landowner of the easement is also the owner of the fields adjacent to the easement, we do not expect any additional wetting off the property. In addition, there is a distinct slope gradient that the easement has been placed upon that will limit hydrologic trespass outside of the easement.
   - Land use in the fields adjacent to the conservation easement in the area in question is livestock grazing.

8) Are there any concerns with UT4 maintaining a channel in the floodplain where wetland reestablishment is proposed?
We have no concerns for UT 4 maintaining a channel across the floodplain.

9) Section 8.5.1- Please provide more details regarding the understory plantings (species, density, indicator status, etc). Table 21 does not include understory plantings, nor are they included in the design sheet planting plan. The plan provided a species list in Table 11 that included a list of appropriate understory species for the identified community types; however, the only species listed as an understory species that is being planted is silky dogwood. Will additional species be selected based off the information provided in Table 11? Please add a shaded or hatched area to Figure 10 indicating where supplemental planting will occur.
Table 21 was updated to include understory planting information. General areas of understory planting are shown in Figure 10. Final understory planting will be well documented in the As-built Report, which will include precise location of planting.

10) Benthic Sampling-
   - Has preconstruction data been collected yet? If so, please add it to the appendices. Per the 2016 Guidance a reference location should also be sample for comparison purposes.

Reference and Site benthic data has been collected. Additional benthic collections are to be undertaken at the Site to meet the 2016 Guidance.

   - The calculation for the 2% additional credit does not look accurate. The 2% credit is based on the credit for each tributary, not the entire site. The total additional credit for benthic sampling at 2% for UT1 and UT4 was calculated at 52.935 SMU. Please update accordingly. An option to increase the percent of additional credit, monitoring fish and benthic would increase to 4%, and if including water quality monitoring, additional credit potential increases to 6%.

See attached Figure 12 showing new benthic monitoring locations

   - Section 9- Table 23 indicates that Benthic sampling will occur preconstruction and years 3, 5, & 7, however the monitoring schedule on Table 22 indicates sampling will occur in all years except 4 and 6. Please verify and update.

Table 22 has been updated to reflect benthic sampling in years 3, 5, and 7.

11) For fixed photo points, please capture all crossings, looking both upstream and downstream. Also, please include a photo point looking upstream and downstream at the top of UT1 where crediting starts (15ft below the pipe) These should be noted in Table 23 as a monitoring component and marked on Figure 11.
Photo point locations have been added to Table 23 and Figure 11. Table 23 has the following verbiage added. "Photo Points upstream and downstream of all crossings and at pipe in-falls and outfalls to the Site."

12) Wetlands-
    - Please confirm that all grading within proposed wetland credit areas (outside wetland creation) will be less than 12 inches. Not sure if it was overlooked, but the grading plan could not be located in the document. Please be advised that a pre- and post-construction grading map may be requested at AB to verify grading depths; if there are areas that had grading over 12" that were not approved in the Mitigation plan, credit ratios may need to be adjusted.

    No wetland grading (except for creation areas) is proposed at the Site.

    - Section 8.3- While the approach for several wetland areas is similar, if any activities or conditions differ, this would be a good opportunity to discuss the mitigation activities and the anticipated functional uplift (similar to Table 20 for streams). As discussed in the email dated 9/7/2021, there were some wetland enhancement areas within forested portions of the site, in particular on UT1 & 3, where the enhancement activities were not known. For example, what uplift is being provided in the enhancement wetland along UT1 if it's forested? If the uplift is veg, a veg plot needs to be added to monitor performance standards. Another example is the wetland enhancement adjacent to UT4 (GWB), what is the functional uplift here, veg and hydro? Or was the gauge installed to monitor hydrology because there were concerns from the IRT that moving the channel would impact the wetland? Section 3.6 needs to be expanded to include more information on existing wetland conditions. In general, Section 3.6 needs to expand on existing wetland conditions, and Section 3.6 should clearly state the functional improvements being proposed for wetland enhancement (veg, hydro, BMPs, etc). Having this information is important for evaluating the proposed functional uplift of a resource and is used to determine if a 2:1 ratio is justified.

    A section was added (Section 3.6.3 Wetland Impairment and Proposed Uplift) that outlines the existing wetland characteristics the functional uplift, and the proposed activity at each wetland.

    - Wetlands should be labeled on the figures.

    Wetland labels have been added to figures 4, 5, and 8.

    - Pg 38 states that two reference wetlands were identified near the site that exhibit hydrologic and landscape characteristics similar to the site, was a reference wetland gauge installed at either location?

    No reference gauges have been installed. These wetlands are protected and on private property. Permission has not been granted to add groundwater gauges.

13) Marsh treatment areas-
    - To confirm, are these marsh treatment features (shown on C8.07) located only in the blue dot areas on Figure 8? Do you anticipate any trees establishing these areas? Are they intended to dry seasonally? Recommend limiting the depth to 14" so pools will dry seasonally to ensure that predatory species do not colonize in the pools. It would be helpful to discuss the marsh treatment areas in the narrative to add more context.

    Marsh treatment areas are typically less than 14" in depth; however, at the Site they are proposed to be placed in ephemeral draws that may exceed 14". A subsection has been added to Section 8.1.1 (Stream Restoration) that discusses the purpose of Marsh Treatment Areas.

    - It appears that one of the marsh treatment areas is being proposed in an existing wetland. It is understood that this was discussed with the IRT; however, it is not appropriate to place a BMP in a jurisdictional feature.

    Marsh Treatment Areas are not to be constructed in wetland areas. The upstream Marsh treatment area will be constructed at the bottom of an ephemeral draw and not in the wetland feature/

14) Figure 11 Monitoring plan map-
    - Will a rain gauge be installed at the site? If not, please identify the proposed rainfall data source location and distance from the project site.

    A rain gauge is proposed to be installed at the Site. The approximate location of the gauge is depicted on Figure 11 (Monitoring Plan).

- To make sure the site is adequately represented, please include a random veg transect on each reach proposed for restoration.

Random vegetation transects have been added to restoration reaches. Please note that permanent monumented vegetation plots were changed to random transects; however, the 2% planted area has been met.

- Please move the wetland reestablishment gauge located at the bottom of UT4 to the opposite side (streamside-right) and add an additional gauge to capture the wetland creation pocket adjacent to the crest gauge. Please see the marked figure for reference.

One groundwater gauge (depicted as gauge #1) has been moved to the opposite side of UT 4. In addition, three additional groundwater gauges have been added to wetland creation areas.

15) Design sheets need to include the locations of monitoring station locations.
Design Sheets have been updated.

Andrea Leslie, WRC:

1) There will be more than 3 acres of wetland treated. The plan notes a reference wetland type of Swamp Forest-Bog Complex (Table 12, p. 22). However, the planting plan does not specify any sort of wetland planting. It names Montane Alluvial Forest, Acidic Cove Forest, and Stream-side Assemblage. There is no specific planting plan for the wetlands themselves. I'm assuming that they intend to plant the wetlands with the plants in the Montane Alluvial Forest list, but this is incongruent with the reference. I recommend that they develop a better thought-out wetland planting plan.
Hydrology conditions within the wetlands will be evaluated during MY1. Pending the development of hydrology within wetlands, an additional planting based on site conditions and natural communities will be proposed and implemented during MY2.

2) The planting plan includes few understory species. Lower stratum species included are Silky Dogwood, Elderberry, Buttonbush. But these are wet-loving species that you often see along streambanks. I strongly suggest that they reevaluate and add some understory species. This is especially important for the large areas that they've mapped out for 'understory planting' in Figure 10 of Appendix A.
The planting plan has been updated. Understory species were picked based on site conditions and natural communities. The list below contains the species selected and the total number of one-gallon pots available for each species. Please see the updated planting plan on the next page (Table 21 of the Mitigation Plan).

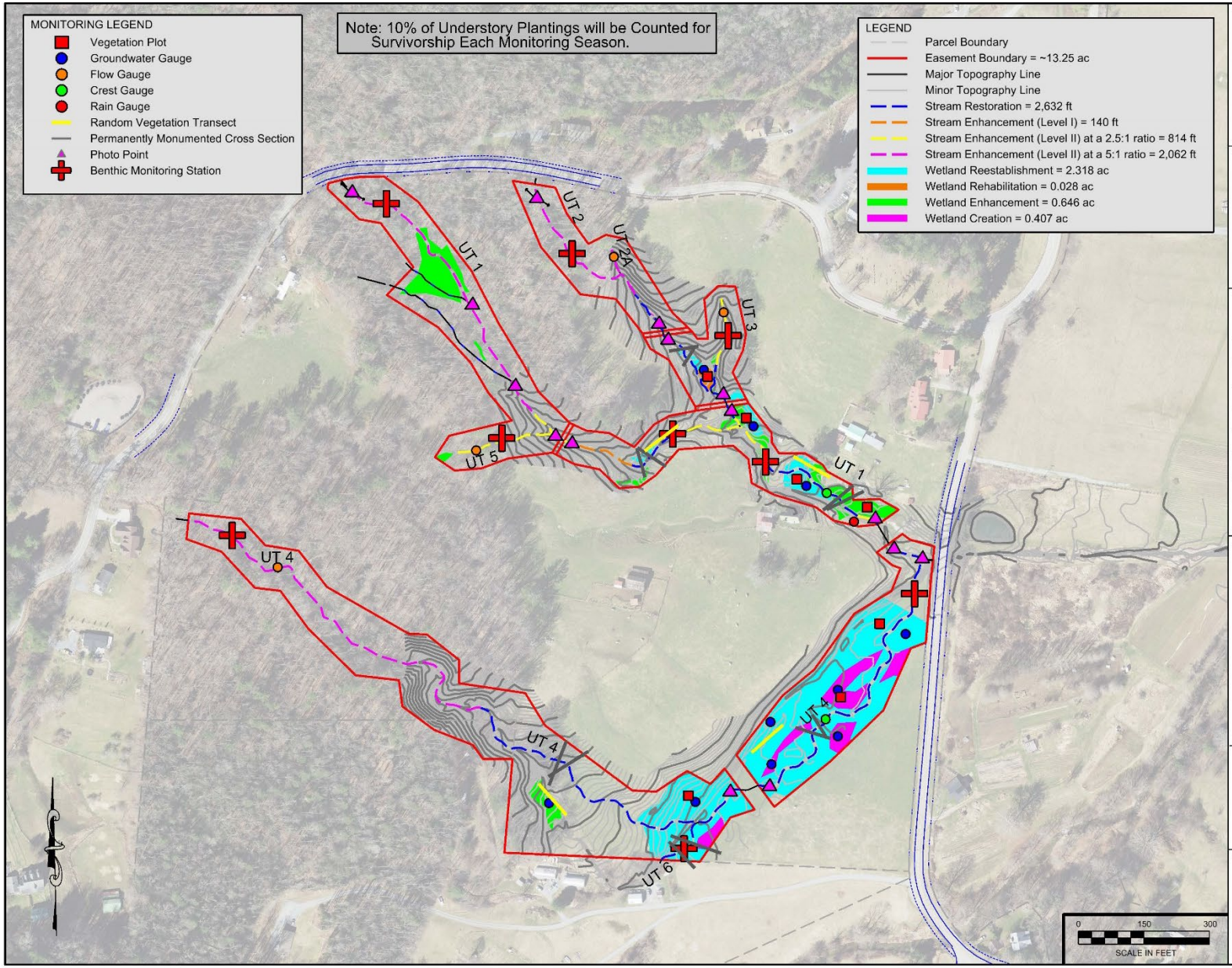
- Tag alder (*Alnus serrulata*) = 10
- Red chokeberry *(Aronia arbutifola)* = 90 stems
- Pawpaw (*Asimina triloba*) = 80 stems
- Witch hazel (*Hamamelis virginiana*) = 80 stems
- Hop-hornbeam (*Ostrya virginiana*) = 80 stems
- Elderberry (*Sambucus nigra*) = 10
- Basswood (*Tilia americana*) = 70

Total = 420 stems

Mitigation Plan Table 21. Planting Plan (Revised)

Vegetation Association		Montane Alluvial Forest*		Acidic Cove Forest*		Sub Canopy-Understory Planting (One Gallon Multi-Year Planting)		Stream-side Assemblage**		TOTAL
Area (acres)		**3.1**		**1.4**		**3.5**		**2.2**		**10.3**
Species	**Indicator Status**	**# planted***	**% of total**	**# planted***	**% of total**	**# Planted******	**% of Total**	**# planted****	**% of total**	**# planted**
Red oak (*Quercus rubra*)	FACU	100	5%	100	10%	0	0%	0	0%	200
White Oak (*Quercus alba*)	FACU	100	5%	100	10%	0	0%	0	0%	200
White pine (*Pinus strobus*)	FACU	100	5%	100	10%	0	0%	0	0%	200
Yellow birch *(Betula alleghaniensis*)	FACU	100	5%	100	10%	0	0%	0	0%	200
Cherry birch (Betula lenta)	FACU	100	5%	100	10%	0	0%	0	0%	200
Black Gum (*Nyssa sylvatica*)	FAC	200	10%	100	10%	0	0%	550	9%	850
Persimmon (*Diosporos virginiana*)	FAC	100	5%	100	10%	0	0%	100	2%	300
Shingle Oak (*Quercus imbricaria*)	FAC	200	10%	100	10%	0	0%	400	7%	700
Tulip poplar (*Liriodendron tulipifera*)	FAC	250	12%	100	10%	0	0%	550	9%	900
American elm (*Ulmus americana*)	FACW	200	10%	100	10%	0	0%	650	11%	950
Hackberry (*Celtis laevigata*)	FACW	200	10%	0	0%	0	0%	600	10%	800
River birch (*Betula nigra*)	FACW	200	10%	0	0%	0	0%	600	10%	800
Sycamore (*Platanus occidentalis*)	FACW	250	12%	0	0%	0	0%	550	9%	800
Tag alder (*Alnus serrulata*)	FACW	0	0%	0	0%	10	2%	500	8%	500
Silky Dogwood (*Cornus amomum*)***	FACW	0	0%	0	0%	0	0%	500	8%	500
Elderberry (*Sambucus nigra*)***	OBL	0	0%	0	0%	10	2%	500	8%	500
Buttonbush (*Cephalanthus occidentalis*)***	OBL	0	0%	0	0%	0	0%	500	8%	500
Red Chokeberry (aronia arbutifolia*)*	FACW	0	0%	0	0%	90	21%	0	0%	70
Pawpaw (*Asimina triloba)*	FAC	0	0%	0	0%	80	20%	0	0%	70
Witch hazel (*Hamamelis virginiana)*	FACU	0	0%	0	0%	80	20%	0	0%	70
Hop-hornbeam (Ostrya virginiana)	FACU	0	0%	0	0%	80	20%	0	0%	70
Basswood (Tilia americana)	FACU	0	0%	0	0%	70	15%	0	0%	70
TOTAL	FACU	**2100**	**100%**	**1000**	**100%**	**420**	**100%**	**6000**	**100%**	**9520**

*Planted at a density of 680 stems/acre
**Planted at a density of 2720 stems/acre
***May be live Staked
****Understory planting at a density of 120 stems/acre



Axiom Environmental, Inc.

RESTORATION SYSTEMS | LLC

NOTES/REVISIONS

Project:

Valle Crucis Mitigation Site
Watauga County
North Carolina

Title:

Monitoring Plan

Scale:	FIGURE NO.
As Shown	11
Date: July 2022	
Project No.: 21-018	

FINAL MITIGATION PLAN
VALLE CRUCIS MITIGATION SITE

Watauga County, North Carolina

DMS Project ID No. 100205
Full Delivery Contract No. 200104-01
USACE Action ID No. SAW-2021-01272
DWR Project No. 2019-0050 v2
RFP No. 16-20200104 (Issued 12/1/2020)

Watauga River Basin
Cataloging Unit 06010103

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
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December 2023

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.

This document was assembled using the June 2017 DMS Stream and Wetland Mitigation Plan Template and Guidance and the October 24, 2016 NC Interagency Review Team Wilmington District Stream and Wetland Compensatory Mitigation Update.

TABLE OF CONTENTS

TABLES

APPENDICES

1 PROJECT INTRODUCTION

The Valle Crucis Mitigation Site (hereafter referred to as the "Site") encompasses 13.25 acres of disturbed forest and livestock pasture along unnamed tributaries (UTs) to Dutch Creek. The Site is located approximately 0.7 mile south of Valle Crucis and 6 miles west of Boone, south of the intersection of NC Highway 194 and Dutch Creek Road (Figures 1 and 2, Appendix A).

1.1 Directions to Site

Directions to the Site from Boone, North Carolina.

- Take NC-105 South out of Boone,
- After 4.8 miles, take a right onto Broadstone Rd,
- After 2.9 miles, turn left onto NC-194 South; travel ~0.8 miles
- After 0.8 miles, turn left onto Dutch Creek Rd,
- The Site is located on both sides of the road.
    - Site Latitude, Longitude
      36.19497 º N, -81.78855º W (WGS84)

1.2 USGS Hydrologic Unit Code and NCDWR River Basin Designation

The Site is located within **Targeted Local Watershed (TLW) 06010103010010** (North Carolina Division of Water Resources [NCDWR] subbasin number 04-02-01). The Site is situated within a **Hydrology Targeted Resource Area (TRA)** due to modifications/stressors in the watershed. Site hydrology drains to Dutch Creek (Stream Index Number 8-12-(0.5)), which has been assigned Best Usage Classifications of **B (Primary Recreation, Fresh Water)** and **Tr (Trout Waters)** (NCDWR 2022). Dutch Creek is not listed on the NCDENR final 2022 303(d) lists (NCDEQ 2022).

1.3 Physiography and Land Use

The Site is in the Blue Ridge portion of the Southern Crystalline Ridges and Mountains ecoregion of North Carolina. Regional physiography is characterized by low to high mountains, gently rounded to steep slopes and narrow valleys, high gradients, bedrock, and boulder-bottomed cool, clear streams (Griffith et al. 2002). Onsite elevations range from a high of 2920 feet National Geodetic Vertical Datum (NGVD) at the upper reaches to a low of approximately 2705 feet NGVD at the Site outfall (USGS Valle Crucis, North Carolina 7.5-minute topographic quadrangle) (Figure 4, Appendix A).

The Site provides water quality functions to watersheds ranging from approximately 0.005 square miles (3.1 acres) on UT2A to 0.26 square miles (167.5 acres) at the Site outfall (Figure 3, Appendix A). The watershed is dominated by forest, agricultural land, and sparse residential development. Impervious surfaces account for less than 2 percent of the upstream watershed land surface.

Land use at the Site is characterized by disturbed forest, active livestock pasture, and sparse residential development (Figure 4, Appendix A). Agriculture pasture is dominated by grasses, and areas that are underlain by hydric soils have been impacted by stream dredging, drain tile installation, livestock trampling, vegetative clearing, agriculture plowing, and other land disturbances associated with land use management. Headwaters of the Site are characterized by areas of disturbed forest and actively grazed by livestock.

Historic photography dating from 1972 to 2010 indicates the Site land use has remained constant. The property was maintained as livestock pasture through the present day, with grasses planted for livestock and regular maintenance.

1.4 Project Components and Structure

The Site encompasses 13.25 acres of disturbed forest and livestock pasture along UTs to Dutch Creek. Currently, the Site includes 5799 linear feet of degraded stream channel (based on the approved PJD), 0.794 acres of degraded wetland, and 2.318 acres of drained or otherwise impacted hydric soil (Figures 4 and 5, Appendix A).

Proposed Site restoration activities include the construction of Cb- and Ce-type stream channel resulting in 2632 linear feet of stream restoration, 140 linear feet of stream enhancement (Level I), 2876 linear feet of stream enhancement (Level II), 2.318 acres of riparian wetland re-establishment, 0.028 acres of riparian wetland rehabilitation, 0.646 acres of riparian wetland enhancement, and 0.407 acres of riparian wetland creation (Table 1).

Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 1-4.

Table 1. Valle Crucis Project Quantities and Credits

Project Segment	Original Mitigation Plan Ft/Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits		Comments
Stream							
UT 1 Reach 1	715	Cold	EII	5.00000	143.000		
UT 1 Reach 2	130	Cold	EII	2.50000	48.000		10 ft easement break not included in credit calculations
UT 1 Reach 3	140	Cold	EI	1.50000	93.333		
UT 1 Reach 4	129	Cold	R	1.00000	129.000		
UT 1 Reach 5	257	Cold	EII	2.50000	102.800		
UT 1 Reach 6	272	Cold	R	1.00000	272.000		
UT 1 Reach 7	34	Cold	EII	2.50000	13.600		
UT 1 Reach 8	168	Cold	R	1.00000	117.000		51 ft easement break not included in credit calculations
UT 2 Reach 1	381	Cold	EII	5.00000	76.200		
UT 2 Reach 2	387	Cold	R	1.00000	367.000		20 ft easement break not included in credit calculations
UT 2 Reach 3	20	Cold	EII	2.50000	8.000		
UT 2A	56	Cold	EII	5.00000	11.200		
UT 3 Reach 1	161	Cold	EII	2.50000	64.400		
UT 3 Reach 2	65	Cold	R	1.00000	65.000		
UT 4 Reach 1	910	Cold	EII	5.00000	182.000		
UT 4 Reach 2	1595	Cold	R	1.00000	1550.000		45 ft easement break not included in credit calculations
UT 5	222	Cold	EII	2.50000	88.800		
UT 6	132	Cold	R	1.00000	132.000		
				Total:	**3463.333**		

Table 1. Valle Crucis Project Quantities and Credits (continued)

Project Segment	Original Mitigation Plan Ft/Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits		Comments
Wetland							
Reestablishment	2.318	R	REE	1.00000	2.318		
Enhancement	0.646	R	E	2.00000	0.323		
Rehabilitation	0.028	R	RH	1.50000	0.019		
Creation	0.407	R	C	3.00000	0.136		
				Total:	**2.796**		

Restoration Level	Stream			Riparian Wetland		Non-riparian wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-riverine		
Restoration	--	--	2632.000	--	--	--	--
Re-establishment	--	--	--	2.318	--	--	--
Rehabilitation	--	--	--	0.019	--	--	--
Enhancement I	--	--	93.333	0.323	--	--	--
Enhancement II	--	--	738.000	--	--	--	--
Creation	--	--	--	0.136			
Benthics 2%	--	--	69.267	--	--	--	--
Totals	--	**--**	**3,532.600**	**2.796**	**--**	**--**	**--**

Table 2. Project Activity and Reporting History

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP#: 16-20200104)	March 2021	April 2021
Institution Date	--	June 8, 2021
Mitigation Plan	December 2022	December 2023
Construction Plans	--	December 2023

Table 3. Project Contacts Table

Role / Firm	Role / Firm
Full Delivery Provider, Planting Contractor, General Contractor Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 Raymond Holz - 919-755-9490	**Engineer** The John R. McAdams Company, Inc. 2905 Meridian Parkway Durham, NC 27713 Rebecca Stubbs - 336-339-1648
Designer Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Kenan Jernigan - 919-215-1693	**Surveyor** k2 Design Group 5688 U.S. Hwy. 70 East Goldsboro, NC 27534 John Rudolph (L-4194) - 919-394-2547

Table 4. Project Attribute Table

Project Information							
Project Name	Valle Crucis Mitigation Site						
Project County	Watauga County, North Carolina						
Project Area (acres)	13.25						
Project Coordinates (latitude & latitude)	36.194906, -81.788509						
Planted Area (acres)	10.3						
Project Watershed Summary Information							
Physiographic Province	Blue Ridge						
Project River Basin	Watauga						
USGS HUC for Project (14-digit)	06010103010010						
NCDWR Sub-basin for Project	04-02-01						
Project Drainage Area (acres)	167.5						
Percentage of Project Drainage Area that is Impervious	<2%						
CGIA Land Use Classification	Managed Herbaceous Cover & Mountain Conifers						
Reach Summary Information							
Parameters	**UT 1**	**UT 2**	**UT 2A**	**UT 3**	**UT 4**	**UT 5**	**UT 6**
Length of reach (linear feet)	1839	800	49	163	2624	229	132
Valley Classification & Confinement	Confined	Confined	Confined	Confined	Confined	Confined	Confined
Drainage Area (acres)	73.4	21.2	3.1	5.5	92.7	3.14	9.5
NCDWR Stream ID Score	24.75 & 40.25	31.5	24.5	33.25	19 & 32.5	32.75	---
Perennial, Intermittent, Ephemeral	Int/Per	Per	Int	Per	Int/Per	Per	Int
NCDWR Water Quality Classification	B, Tr						
Existing Morphological Description (Rosgen 1996)	Cb/g4	Fb4	Cb3	Cg3	Cf4 and C5	Cb4	---
Proposed Stream Classification (Rosgen 1996)	Cb3	Cb3	Cb3	Cb3	Cb3 and Ce3	Cb 4	C 4
Existing Evolutionary Stage (Simon and Hupp 1986)	III	III	II	III	IIII	III	III
Underlying Mapped Soils	Dellwood and Saunook	Dellwood	Dellwood	Dellwood	Dellwood and Saunook	Saunook	Dellwood
Drainage Class	Mod well and well	Mod well	Mod well	Mod well	Mod well and well	Well	Mod well
Hydric Soil Status	Nonhydric	Nonhydric	Nonhydric	Nonhydric	Nonhydric	Nonhydric	Nonhydric
Valley Slope	0.0503	0.0756	0.1974	0.0601	0.0418	0.2165	0.0088
FEMA Classification	NA	NA	NA	NA	AE Floodway	NA	AE Floodway
Native Vegetation Community	Montane Alluvial Forest and Acidic Cove Forest						
Watershed Land Use/Land Cover (Site)	75% agriculture land, 15% disturbed forest, 8% forest, <2% low density residential/impervious surface						
Watershed Land Use/Land Cover (UT to Rockhouse Cr Reference Channel)	95% forest, <1% low density residential/impervious surface						
Percent Composition of Exotic Invasive Vegetation	<5%						

Table 4. Project Attribute Table (continued)

Wetland Summary Information			
Parameters	**Wetlands**		
Wetland acreage	2.338 acre drained/impacted & 0.663 acre degraded		
Wetland Type	Riparian riverine		
Mapped Soil Series	Dellwood, Saunook (Nikwasi inclusions)		
Drainage Class	Poorly drained		
Hydric Soil Status	Hydric		
Source of Hydrology	Groundwater, stream overbank		
Hydrologic Impairment	Incised streams, compacted soils, livestock, drain tile		
Native Vegetation Community	Montane Alluvial Forest and Acidic Cove Forest		
% Composition of Exotic Invasive Vegetation	<5%		
Restoration Method	Hydrologic, vegetative, livestock		
Enhancement Method	Vegetative, livestock		
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States-Section 401	Yes	Yes	Section 401 Certification
Waters of the United States-Section 404	Yes	Yes	Section 404 Permit
Endangered Species Act	Yes	Yes	CE Document (App E)
Historic Preservation Act	Yes	Yes	CE Document (App E)
Coastal Zone Management Act	No	--	NA
FEMA Floodplain Compliance	Yes	Yes	FEMA Coordination (App F)
Essential Fisheries Habitat	No	--	NA

2 WATERSHED APPROACH AND SITE SELECTION

Primary considerations for Site selection included the potential for improvement of water quality within a region of North Carolina under livestock/agricultural pressure. More specifically, considerations included: desired aquatic resource functions; hydrologic conditions; soil characteristics; aquatic habitat diversity; habitat connectivity; compatibility with adjacent land uses; reasonably foreseeable effects the mitigation project will have on ecologically important aquatic and terrestrial resources; and potential development trends and land use changes.

Currently, the proposed Site is characterized by disturbed forest and livestock pasture. A summary of existing Site characteristics in favor of proposed stream and wetland activities includes the following.

- Streams and wetlands are accessible by livestock
- Streams and wetlands subject to drain tile and incision
- Streams and wetlands have been cleared of forest vegetation
- Site receives nonpoint source inputs, including agricultural chemicals and livestock waste
- Wetland soils have been compacted by livestock and agricultural equipment
- Wetland hydrology has been removed by stream channel entrenchment and drain tile

In addition to the opportunity for ecological improvements at the Site, the use of the particular mitigation activities and methods proposed in the Design Approach & Mitigation Work Plan (Section 8.0) are

expected to produce naturalized stream and wetland resources that will be ecologically self-sustaining, requiring minimal long-term management (Long-term Management Plan [Section 11.0]).

The *Watauga River Basin Restoration Priorities 2009* (RBRP) report (NCEEP 2009) documents restoration goals developed for the Watauga River Basin. The RBRP report documents restoration goals for the 06010103 catalog unit, including restoration of impaired waters, protection of high-quality in-stream and riparian habitat through preservation of headwater areas, protection and management of parcels that include rare mountain bogs and high-elevation wetlands, implementation of agriculture BMPs, improved stormwater management, and improved enforcement of sediment/erosion control. Site-specific mitigation goals and objectives have been developed through the use of the North Carolina Stream Assessment Method (NC SAM), the North Carolina Wetland Assessment Method (NC WAM), and Site observations/measurements, which are discussed further in Section 6.0 (Functional Uplift and Project Goals/Objectives).

3 BASELINE AND EXISTING CONDITIONS

3.1 Soils and Land Form

Soils that occur within the Site, according to the *Web Soil Survey* (USDA 2020) are described in Table 5.

Table 5. Web Soil Survey Soils Mapped within the Site

Map Unit Symbol	Map Unit Name (Classification)	Hydric Status	Description
DeB	Dellwood cobbly sandy loam* (*Oxyaquic Humudepts*)	Non-hydric	This series consist of occasionally flooded, moderately well-drained soils found on floodplains; parent material is gravelly and cobbly sandy alluvium. Depth to the restrictive layer is 8-20 inches to strongly contrasting textural stratification. Depth to the water table is 24-48 inches. Slopes are 1-5 percent.
SkC, SoC	Saunook loam* *(Humic Hapludults)*	Non-hydric, may contain hydric inclusions	This series consist of well-drained soils found on coves on mountain slopes, drainageways on mountain slopes, and fans on mountain slopes. Parent material is colluvium derived from igneous and metamorphic rock. Depth to the restrictive layer and the water table is more than 80 inches. Slopes are 8-30 percent.

*Inclusions of Nikwasi soils

The Web Soil Survey (USDA 2020) indicates the Site is mapped as Dellwood soils with Saunook soils in headwater areas and side slopes. Dellwood soils form along streams and are formed from loamy, alluvial sediments. The hydric component of Saunook soils is typically Nikwasi soils (often mapped as a Saunook-Nikwasi Complex). Nikwasi soils form on floodplains consisting of recent alluvium. Detailed soil profiles collected by a licensed soil scientist indicate that hydric soils throughout the Site are Nikwasi series and are characterized by F3 (depleted matrix) hydric soil indicator (Figure 5, Appendix A). The F3 indicator includes soils with 60 percent or more chroma 2 or less within the upper 6 inches or starting within the upper 10 inches of the soil profile.

3.2 Geology

The Site is located within an unconformity in the Grandfather Mountain Window, consisting of Biotite Granitic Gneiss. The Grandfather Mountain Window was formed through sporadic uplift and stream erosion that carved a gap in thrust sheets of the Grandfather Formation overlying the Linville Falls fault, exposing younger rocks below (NCGS 1999). The Precambrian basement exposed in the window near the Site is equivalent to Wilsons Creek Gneiss, which is a nonlayered plutonic rock metamorphized by pressure and head from overlying orogenic layers of the Grandfather Mountain Formation. This layering leads to

tectonic slices, and in-folded remnants of the Grandfather Formation found within the Grandfather Mountain Window.

Several areas of the Site exhibit exposed bedrock; however, contact is confined to valley walls and incised stream channels that will be backfilled. The proposed stream channels will be tied into the bedrock where feasible to hinder headcut migration through the Site. The Site includes alluvial valleys that are characterized by relatively deep deposits; therefore, bedrock is not expected to pose a hindrance to channel excavation. However, if bedrock contact is made during construction, the channel will be adjusted and noted on as-built red-line drawings.

3.3 Sediment Model

Sediment load modeling was performed using methodologies outlined in A Practical Method of Computing Streambank Erosion Rate (Rosgen 2009), along with Estimating Sediment Loads using the Bank Assessment of Non-point Sources Consequences of Sediment (Rosgen 2011). These models provide a quantitative prediction of streambank erosions by calculating the Bank Erosion Hazard Index (BEHI) and Near-Bank Stress (NBS) along each Site reach. The resulting BEHI and NBS values are then compared to streambank erodibility graphs prepared for North Carolina by the NC Stream Restoration Institute and NC Sea Grant.

Streambank characteristics involve measurements of bank height, angles, materials, presence of layers, rooting depth, rooting density, and percent of the bank protected by rocks, logs, roots, or vegetation. Site reaches have been measured for each BEHI and NBS characteristic and predicted lateral erosion rate, height, and length to calculate a cubic volume of sediment contributed by the reach each year. Data forms for the analysis are available upon request, and the data output is presented in Appendix B. Results of the model are presented in Table 6.

Table 6. BEHI and NBS Modeling Summary

Stream Reach	Proposed Mitigation Treatment	Predicted Sediment Contribution (tons/year)
UT 1	Restoration and Enhancement (Level I and II)	6.6
UT 2	Restoration and Enhancement (Leve II)	27.4
UT 2A	Enhancement (Level II)	0
UT 3	Restoration and Enhancement (Level II)	0
UT 4	Restoration and Enhancement (Level II)	12.6
UT 5	Enhancement (Level II)	0
UT 6	Restoration	0
Total Sediment Contribution (tons/year)		**46.6**

Based on this analysis, mitigation of Site streams will reduce streambank erosion and subsequent pollution of receiving waters.

3.4 Nutrient Model

Nutrient modeling was conducted using a method developed by the North Carolina Division of Mitigation Services (NCDMS) (NCDMS 2016) to determine nutrient and fecal coliform reductions from the exclusion of livestock from the buffer.

The equation for nutrient reduction for this model includes the following:

TN reduction (lbs/yr) = 51.04 (lbs/ac/yr) x Area (ac)
TP reduction (lbs/yr) = 4.23 (lbs/ac/yr) x Area (ac)

Where:
TN – total nitrogen;
TP – total phosphorus; and
Area – total area of restored riparian buffers inside of livestock exclusion fences.

Equations for fecal coliform reduction for this model include the following.
Fecal coliform reduction (col) = 2.2 x 10^{11} (col/AU/day) x AU x 0.085

Where:
Col - quantities of Fecal Coliform bacteria
AU - animal unit (1000 lbs of livestock)

Results of the NCDMS analysis indicate approximately 13 acres of the easement is grazed by approximately 20 head of livestock, which contribute 664 lbs/yr of nitrogen, 55 lbs/yr of phosphorus, and 3.74 x 10^{11} col of fecal coliform/day that will be reduced due to exclusion of livestock from the easement area. Fecal coliform values have been based on approximately 20 head of cattle.

3.5 Project Site Streams

Streams targeted for restoration include unnamed tributaries to Dutch Creek, which have been cleared, dredged and straightened, trampled by livestock, eroded vertically and laterally, and receive extensive sediment and nutrient inputs from agriculture activities. Approximately 16 percent of the existing stream channel has been degraded, contributing to sediment export from the Site resulting from mechanical processes from ditching of streams and clearing of vegetation. In addition, streamside wetlands have been cleared and drained by channel downcutting, drain tile, and land uses. Current Site conditions have resulted in degraded water quality, a loss of aquatic habitat, reduced nutrient and sediment retention, and unstable channel characteristics (loss of horizontal flow vectors that maintain pools and an increase in erosive forces to channel bed and banks). Site restoration activities including re-establishing buffers, excluding livestock, and restoring stream channels will restore riffle-pool morphology, aid in energy dissipation, increase aquatic habitat, stabilize channel banks, and greatly reduce sediment loss from channel banks.

Reach Descriptions
Individual reach descriptions are as follows.

UT-1 (upstream wooded area)

- Yellow Buckeye (*Aesculus flava*)
- Tulip Poplar (*Liriodendron tulipifera*)
- Sweet Birch (*Betula lenta*)
- Rhododendron (*Rhododendron maximum*)
- Slippery elm (*Ulmus rubra*)
- American Holly (*Illex opeca*)
- Mountain Maple (*Acer spicatum*)
- Japanese Silt Grass *(Microstegium vimineum)*
- Common Nettle (*Urtica dioica*)
- Jewelweed (*Impatiens capensis*)
- Marsh Blue Violet (*Viola cucullata*)

The stream originates at a culvert under the state road 194 and coalesces where several smaller seeps merge together in a large wetland area.

UT-1 (between wooded area and Dutch Creek Road)

Observed Species

- Eastern Hemlock (*Tsuga canadensis*)
- Pitch Pine (*Pinus rigida*)
- Mountain Maple (*Acer spicatum*)
- Mountain Laurel (*Kalmia latifolia*)
- Bradford Pear (*Pyrus calleryana*)
- Crabapple (*Malus angustifolia*)
- Eastern White Pine (*Pinus strobus*)
- Red Oak (*Quercus rubra*)
- Tulip Poplar (*Liriodendron tulipifera*)
- Rhododendron (*Rhododendron maximum*)
- Black Cherry (*Prunus serotina*)

The bed is 2 to 8 feet in width, and the banks are 0.5 to 6 feet deep. The substrate composition is sand, gravel, and cobble, with some silt and boulders. Cattle actively enter the stream bed, and there is a small amount of deadfall and woody debris in the streambed.

Photo 1: UT-1 Upstream Wooded Area

Photo 2: UT-1 Below Wooded Area

UT-2

Observed Species

- Mountain Maple (*Acer spicatum*)
- Pignut Hickory (*Carya glabra*)
- Rhododendron (*Rhododendron maximum*)
- Slippery elm (*Ulmus rubra*)
- Eastern Hemlock (*Tsuga canadensis*)
- Black Cherry (*Prunus serotina*)
- Sassafras (*Sassafras albidum*)
- Eastern White Pine (*Pinus strobus*)
- Red Oak (*Quercus rubra*)
- Silky Dogwood (*Cornus amomum*)
- American Chestnut (*Castanea dentata*)
- Japanese Silt Grass (*Microstegium vimineum*)
- Jewelweed (*Impatiens capensis*)

The bed is 4 to 8 feet wide, and the banks are incised at 0.5 to 8 feet. Substrate composition includes sand, silt, gravel, and some cobble. Active cattle access is evident, and erosion forces have exposed roots of some larger trees.

Photo 3: UT2

UT-2A

Observed Species

- Mountain Maple (*Acer spicatum*)
- Rhododendron (*Rhododendron maximum*)
- Slippery elm (*Ulmus rubra*)
- Sweet Birch (*Betula lenta*)
- Japanese Silt Grass (*Microstegium vimineum*)
- Common Nettle (*Urtica dioica*)
- Chinese Privet (*Ligustrum sinense*) (very small amount in channel)

UT-2A is contained in a short, steep, and very narrow valley. Active cattle access and the creek originates at a steep headcut immediately below a cattle path above the stream. The bed is 3 to 15 feet wide, and the banks are 4 to 6 feet deep. The substrate composition is sand and gravel. Common nettle is thick at the origin, and there is significant woody debris presence in-channel covering much of the stream.

Photo 4: UT-2A

UT-3

Observed Species

- Mountain Maple (*Acer spicatum*)
- Rhododendron (*Rhododendron maximum*)
- Sweet Birch (*Betula lenta*)
- Tulip Poplar (*Liriodendron tulipifera*)
- Pignut Hickory (*Carya glabra*)
- Sassafras (*Sassafras albidum*)
- Black Gum (*Nyssa sylvatica*)
- Persimmon (*Diospyros virginiana*)
- Jewelweed (*Impatiens capensis*)
- Japanese Silt Grass (*Microstegium vimineum*) - FAC

UT-3 starts at a large headcut below a cattle trail, similar to UT-2A. The bed is 2 to 20 feet in width, and the banks are steep with a depth of 6 to 15 feet. The substrate is composed of sand, silt, and gravel. Seep-like wetlands border both sides of the stream within its steep banks.

Photo 5: UT-3

UT-4 (upstream wooded area)

Observed Species

- Eastern Hemlock (*Tsuga canadensis*)
- Tulip Poplar (*Liriodendron tulipifera*)
- Pignut Hickory (*Carya glabra*)
- Black Cherry (*Prunus serotina*)
- Eastern White Pine (*Pinus strobus*)
- Mountain Maple (*Acer spicatum*)
- Rhododendron (*Rhododendron maximum*)
- Yellow Buckeye (*Aesculus flava*)
- Slippery elm (*Ulmus rubra*)
- Common Nettle (*Urtica dioica*)
- Jewelweed (*Impatiens capensis*)
- Sedges (*Carex spp.*)
- Rose (*Rosa multiflora*)

The uppermost part of UT-4 is contained within a very steep and narrow valley with slopes exceeding 20 feet in depth. The stream channel is 3 to 6 feet in widthwide, and the banks are incised 2 to 6 feet. The substrate composition is mostly sand and gravel with some cobble, silt, and boulders mixed in. Cattle have access to much of the stream channel, and further erosion from fluvial processes is evidenced by large undercuts and exposed roots of mature trees.

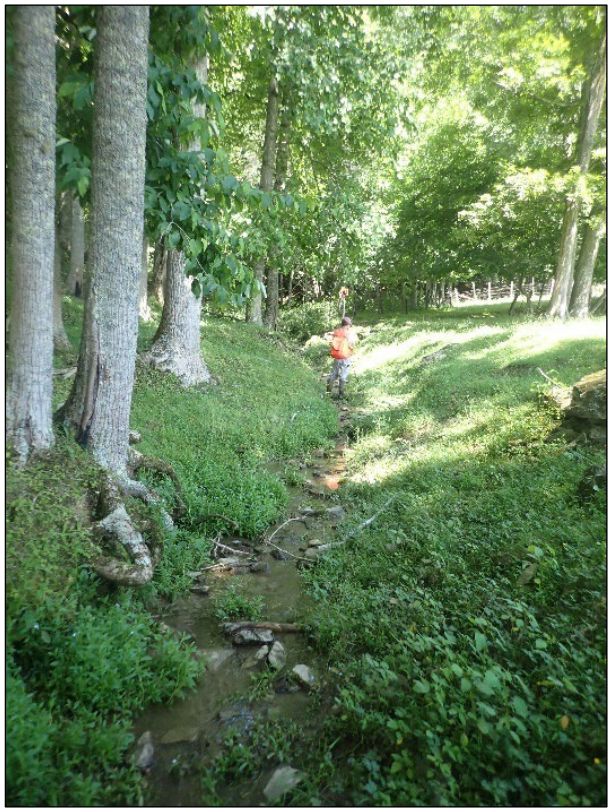

Photo 7: UT-4 (upstream wooded area)

Photo 6: UT-4 (upstream wooded area)

UT-4 (below wooded area)

Observed Species

- Sedges (*Carex spp.*)
- Jewelweed (*Impatiens capensis*)
- Fescue (*Festuca spp.*)
- Princess Tree (*Polonia tomentosa*)

The stream has been dredged, straightened, and pushed to the toe of slope along the margins of a flat open pasture. The channel is 1 to 3 feet wide, and the banks are 0.5 to 3 feet deep.

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Photo 8: UT-4 (below wooded area)

UT-5

Observed Species

- Tulip Poplar (*Liriodendron tulipifera*)
- Rhododendron (*Rhododendron maximum*)
- Eastern White Pine (*Pinus strobus*)
- Mountain Maple (*Acer spicatum*)

The stream originates from a depressional wetland and descends down a steep slope before dropping over a headcut and quickly joining UT-1. The bed is 3 to 6 feet wide, and the banks are 0.5 to 6 feet deep. The substrate composition is mostly sand, gravel, and cobble with some silt.

Photo 9: UT-5

UT 6

Observed Species

- Apple tree (*Malus sp.*)
- Rose (*Rosa multiflora*)
- Red maple (*Acer rubrum*)
- Muscadine (*Vitis rotundifolia*)
- Fescue (*Festuca spp.*)
- Tulip Poplar (*Liriodendron tulipifera)*

UT 6 and UT 4 have been ditched and dredged to merge upstream and off site. Therefore, the size and discharge of UT 6 are inflated. The existing stream is approximately 5 feet in width and 2 feet in depth but will be significantly smaller once UT 4 is rerouted across its proper floodplain. In addition, UT 6 is currently characterized by scrubby vegetation upstream of the pasture fence and fescue below the fence.

Photo 10: UT-6

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3.5.1 Existing Conditions Survey

Site stream dimension, pattern, and profile were measured to characterize existing channel conditions. Locations of existing stream reaches are depicted in Figure 5 (Appendix A). Stream geometry measurements under existing conditions are summarized in Table 7 (Essential Morphology Parameters) and presented in detail in Table B1 (Appendix B).

3.5.2 Channel Classification and Morphology

Stream geometry and substrate data have been evaluated to classify existing stream conditions based on a classification utilizing fluvial geomorphic principles (Rosgen 1996). Existing Site reaches are classified as Cb-, Cg-, Cf-, and Fb-type streams with variable sinuosity. Existing Site reaches are characterized by substrate composed primarily of gravel with varying amounts of cobble, silt, and boulders.

3.5.3 Channel Evolution

Site streams cover multiple stages of the channel evolution model developed by Simon and Hupp (1986). Upstream, wooded reaches that have cobble substrate, have minor disturbance from livestock, and are characterized by a Class I Model (Sinuous, Pre-modified). These reaches are proposed for stream enhancement (Level II). As the channel descends into areas cleared of vegetation, planted with pasture grass, and disturbed by livestock, the channels exhibit Class II and III Models (Channelized and Degradation). These reaches are proposed for stream enhancement (Level I) and restoration. Once these channels have been degraded (downcut), the channels go through a typical evolution of Class IV Model (Degradation and Widening) until the channel is widened enough for aggradation to occur Class V Model (Aggradation and Widening). Ultimately the channel widens sufficiently that a new channel forms in the aggraded material and stabilizes into a Class VI Model (Quasi Equilibrium).

3.5.4 Valley Classification

Site Streams are characterized by two distinct valley types: 1) small stream, headwater, moderately confined to confined, alluvial valleys with approximately 20- to 50-foot floodplain valley widths, and 2) moderately sized, second-order, wide and flat alluvial valley with approximately 100-foot floodplain valley width. Valley slopes are typical for the Mountain region and range from 0.0088 (0.88%) on UT 4 and 0.0503 0.0756 (5.03-7.56%) on the remaining tributaries. Typical streams in this region include B-type step/pool streams in the steeply sloped headwater areas and C- and E-type streams with slightly entrenched, meandering channels with a riffle-pool sequence within wider, flatter valleys.

3.5.5 Discharge

This hydrophysiographic region is characterized by moderate rainfall, with precipitation averaging approximately 65.2 inches yearly (USDA 2005). Drainage basin sizes range from 0.005-square miles on UT 5 and 0.26 square miles at the Site outfall.

The Site's discharge is dominated by a combination of upstream basin catchment, groundwater flow, and precipitation. Based on indicators of bankfull at reference reaches and on-Site, the designed channel will equal the channel size indicated by Mountain regional curves (Harman et al. 2001); this is discussed in Section 5.2 (Bankfull Verification). Based on bankfull studies, the bankfull discharge ranges from 2.3-41.1 cubic feet per second for UT 5 and the Site outfall, respectively.

Table 7. Essential Morphology Parameters

Parameter	Existing			Reference				Proposed		
	UT 1	UT 2	UT4	Cranberry	Stone Mtn	Rock* (up)	Rock* (down)	UT 1	UT 2	UT4
Valley Width (ft)	15-100	6-17	21-100	75	100	16	9.5	15-50	15-50	50-150
Contributing Drainage Area (sq. mi.)	0.11	0.03	0.14	0.70	7.46	0.04	0.07	0.11	0.03	0.14
Channel/Reach Classification	Cb/g 4	Fb 4	C 5	E 4	Cb 3	Eb 4	B 3	Cb 3	Cb 3	Ce 3
Design Discharge Width (ft)	8.6-21.2	4.2-7.8	8.8-17.4	11.8-13.2	27.2-33.0	4.4-5.8	5.1-6.5	7.7-8.9	5.0-5.8	8.3-9.5
Design Discharge Depth (ft)	0.2-0.6	0.3-0.5	0.3-0.7	1.5-1.7	1.4-1.7	0.5-0.6	0.5-0.8	0.6	0.3-0.4	0.6-0.7
Design Discharge Area (ft^2)	4.9	2.1	5.7	20.2	46.0	2.8	3.7	4.9	2.1	5.7
Design Discharge Velocity (ft/s)	4.6	4.3	4.7	5.1	5.9	4.3	4.5	4.6	4.3	4.7
Design Discharge (cfs)	22.3	9.1	26.7	103.5	271.7	12.1	16.5	22.3	9.1	26.7
Water Surface Slope	0.0488	0.0749	0.0087	0.0112	0.0121	0.0123	0.0312	0.0457	0.0687	0.0068
Sinuosity	**1.03**	**1.01**	**1.01**	1.04	1.20	1.43	1.41	**1.10**	**1.10**	**1.10**
Width/Depth Ratio	15-92	8.1-29.3	13.4-53.1	7.0-8.5	16.1-23.8	7.3-11.6	8.1-10.2	12-16	12-16	12-16
Bank Height Ratio	**0.6-1.8**	**1.8-4.8**	**0.7-1.5**	1.0	1.0-1.6	1.0	1.0	**1.0**	**1.0**	**1.0**
Entrenchment Ratio	1.5-11.7	1.2-2.2	2.4-9.6	5.7-6.4	3.0-3.7	2.4-4.2	1.4-1.8	2.0-5.6	3.0-8.6	6.0-15.7
Substrate	**Gravel**	**Gravel**	**Sand**	Gravel	Cobble	Gravel	Cobble	**Cobble**	**Cobble**	**Cobble**

**UT to Rockhouse Creek Reference Reach*

3.6 Project Site Wetlands

Jurisdictional wetlands/hydric soils within the Site were delineated in the field following guidelines outlined in the *Corps of Engineers Wetlands Delineation Manual* and subsequent regional supplements and located using GPS technology with reported submeter accuracy (Environmental Laboratory 1987). A jurisdictional wetland delineation was completed and approved by United States Army Corps of Engineers (USACE) representative Amanda Fuemmeler during a field meeting on August 24, 2021. Documentation of the delineation has been included in Appendix D. Existing jurisdictional wetlands are depicted in light blue Figure 4 (Appendix A).

3.6.1 Hydrological Characterization

Construction activities are expected to reestablish approximately 2.338 acres of drained/impacted riparian hydric soils, rehabilitate 0.032 acres of riparian wetlands, enhance 0.631 acres of cleared riparian wetlands, and create 0.409 acres of riparian wetlands that are in degraded stream channels to be backfilled. Areas of the Site targeted for riparian wetlands will receive hydrological inputs from periodic overbank flooding of restored tributaries, groundwater migration into wetlands, upland/stormwater runoff, and, to a lesser extent, direct precipitation. Hydrological impairment in drained soils has resulted from lateral draw-down of the water table adjacent to existing, incised stream channels.

3.6.2 Soil Characterization

Detailed soil mapping conducted by North Carolina Licensed Soil Scientists (NCLSS) in March 2021 indicate that the Site is currently underlain by hydric soils of the Nikwasi series (Figure 5, Appendix A). Soils have been disturbed by livestock grazing, the clearing vegetation, and pastureland conversion. Hydric soils have been drained by drain tile/ditching, stream diversion, and channel incision. A portion of these soils have been effectively drained; however, seeps and springs (as well as areas of compacted soils) pockmark the area and are expected to have hydrology enhanced by proposed activities.

Onsite hydric soils are grey to gley in color and are predominantly associated with the F3 (Depleted Matrix) hydric soil field indicator. Six detailed soil profiles conducted by NCLSS were collected at the Site. The soil profiles' location is shown in Figure 5, Appendix A, with profile descriptions included in Appendix B. Two representative profiles are included below in Table 8.

Table 8. Representative Soil Profile Descriptions

Location	Mitigation Approach	Depth (inches)	Color	Texture
Soil Profile B (located along UT 2 at its confluence with UT 3(	Rehabilitation	0 - 2	10 YR 2/1	Loam
		2 - 8	10 YR 3/2 10 YR 3/6 mottles	Sandy Clay Loam
		8 – 20	10 YR 4/1 10 YR 4/6 mottles	Sandy Clay Loam
		20+	10 YR 5/1 10 YR 4/6 mottles	Clay Loam

Table 8. Representative Soil Profile Descriptions (continued)

Location	Mitigation Approach	Depth (inches)	Color	Texture
Soil Profile D (in the expansive floodplain adjacent to UT 4 downstream)	Reestablishment	0 – 5	10 YR 4/2	Silt Loam
		5 – 14	10 YR 5/2 10 YR 5/8 mottles	Loam
		14 – 19	10 YR 5/2 10 YR 6/2 mottles 10 YR 5/8 mottles	Sandy Loam
		19+	10 YR 5/2 10 YR 6/2 mottles 10 YR 5/8 mottles	Sandy Clay Loam

3.6.3 Wetland Impairment and Proposed Uplift

Existing Site wetlands and proposed functional uplift at each wetland is provided in the table below. Wetlands are depicted by number (to match the PDJ) on figures 4, 5, and 8. Functional uplift revolves around several activities including livestock removal, vegetative alterations, hydrology alterations, wider buffers, and the addition of marsh treatment areas.

Wetland Number	Existing Condition	Functional Uplift	Activity to Cause Functional Uplift
GWB	Pasture	Vegetation	Remove Livestock and Plant
MWA	Pasture	Vegetation	Remove Livestock and Plant
MWB	Pasture	Vegetation	Remove Livestock and Plant
PWE	Pasture	Vegetation	Remove Livestock and Plant
PWB	Pasture	Vegetation	Remove Livestock and Plant
MCW	Pasture	Vegetation	Remove Livestock and Plant
MWD	Pasture	Vegetation	Remove Livestock and Plant
PWC	Forest	Vegetation	Remove Livestock, understory planting, and wider buffers.
JWA	Forest	Vegetation	Remove Livestock, understory planting, wider buffers, capture ephemeral draws, marsh treatment area installation.
PWD	Forest	Vegetation	Remove Livestock, understory planting, wider buffers, capture ephemeral draws, marsh treatment area installation.

4 REFERENCE STUDIES

4.1 Reference Streams

For this project, four reference reaches were, including the Cranberry, Stone Mountain, UT to Rockhouse Creek (Upstream), and UT to Rockhouse Creek (Downstream). Distinct bankfull indicators were present within the reference stream channels. In addition, dimension, pattern, and profile variables had not been significantly altered or degraded, allowing for the calculation of restoration reach parameters. The Cranberry and Stone Mountain reference reaches were measured in 2007 for a mitigation project that has been successfully closed out. The UT to Rockhouse upstream and downstream reaches are located 11 miles south of the Site in the Wilsons Creek watershed.

4.1.1 Watershed Characterization

Reference streams are in the same physiographic province, geologic unit, and landscape position as the Site. Details of each reference reach are included below.

Table 9. Reference Reach Watershed Characterization

Site	Distance to Reference Reach (mi)	Drainage Area (sq mi)	Physiographic Province	Geologic Unit
Valle Crucis Site	NA	0.005 to 0.26	Southern Crystalline Ridges and Mountains	Ybgg – Granitic gneiss and amphibolite
Cranberry	15.4	0.70	Southern Medasedimentary Mountains	Zlm – Metamorphic rock and greenstone
Stone Mountain	37.5	7.46	Southern Crystalline Ridges and Mountains	Zabg – Gneiss and conglomerate
Rockhouse Upstream	11.2	0.04	Southern Crystalline Ridges and Mountains	Ybgg – Granitic gneiss and amphibolite
Rockhouse Downstream	11.2	0.07	Southern Crystalline Ridges and Mountains	Ybgg – Granitic gneiss and amphibolite

The Cranberry reference reach is an outlier regarding the physiographic province and geologic unit; however, the geology is similar enough to be helpful as a reference reach. It also is a relevant sized stream for the Site, offering similar slopes and discharges. The other reference reaches provide adequate coverage of stream size and environmental setting. Alterations, development, and impervious surfaces within the reference reach watersheds are minimal and mature forest dominates the drainage areas.

4.1.2 Channel Classification

Stream geometry and substrate data have been evaluated to classify the reference reach based on a classification utilizing fluvial geomorphic principles (Rosgen 1996). This classification stratifies streams into comparable groups based on pattern, dimension, profile, and substrate characteristics. The reference reaches are characterized as E-, Cb-, Eb-, and B-type channels similar to the Site.

4.1.3 Discharge

The reference streams have drainage areas ranging from approximately 0.04 to 7.46-square miles and bankfull discharges ranging from 12.1 to 271.7 cubic feet per second based on bankfull indicators.

4.1.4 Channel Morphology

Stream cross-sections and profiles were measured along the reference streams. The stream reaches transport sediment supply while maintaining stable dimension, pattern, and profile. Stream geometry measurements for the reference streams are summarized below and are provided in detail in (Table B1, Appendix B).

Table 10. Reference Channel Morphology

Site	Bankfull Area (ft^2)	Bankfull Width (ft)	Bankfull Depth (ft)	Ent Ratio	Width/ Depth Ratio	Bank Height Ratio	Sinuosity (ft/fr)	Valley Slope (rise/run)	Substrate
Cranberry	20.2	12.5	1.6	6.0	7.8	1.0	1.04	0.0112	Gravel
Stone Mountain	46.0	30.1	1.6	3.4	20.0	1.3	1.20	0.0121	Cobble
Rockhouse Upstream	2.8	5.0	0.6	3.3	9.0	1.0	1.43	0.0123	Gravel
Rockhouse Downstream	3.7	5.8	0.7	1.6	9.2	1.0	1.41	0.0312	Cobble

4.2 Reference Forest Ecosystem

A Reference Forest Ecosystem (RFE) is a forested area to model restoration efforts for soils and vegetation. RFEs should be ecologically stable climax communities and represent the restoration site as it likely existed before human disturbances. Data describing plant community composition and structure should be collected at the RFEs and subsequently applied as reference data to emulate a natural climax community.

The RFE for this project is a combination of onsite, upstream forest communities and the Stone Mountain Reference reach. The RFE supports plant community and landform characteristics that restoration efforts will attempt to emulate. Tree and shrub species identified within the reference forest are outlined in Table 11 and will be used, in addition to other relevant species in appropriate Schafale (2012) community descriptions.

Table 11. Reference Forest Ecosystem

Montane Alluvial Forest			
Canopy Species		**Understory Species**	
Name	**Indicator Status**	**Name**	**Indicator Status**
White pine (*Pinus strobus*)	FACU	Silky dogwood (*Cornus amomum*)	FACW
Hemlock (*Tsuga* sp.)	FACU	Ironwood (*Carpinus caroliniana*)	FAC
Sycamore (*Platanus occidentalis*)	FACW	Spice bush (*Lindera benzoin*)	FAC
Alder (*Alnus serrulata*)	FACW	Great laurel (*Rhododendron maximum*)	FAC
Yellow birch (*Betula alleghaniensis*)	FAC	Ash-leaf maple (*Acer negundo*)	FAC
Sweet birch (*Betula lenta*)	FACU	Strawberry bush (*Euonymous americana*)	FAC
Green ash (*Fraxinus pennsylvanica*)	FACW	Yellow root (*Xanthorhiza simplicissima*)	FACW
Tulip poplar (*Liriodendron tulipifera*)	FACU	Yellow buckeye (*Aesculus flava*)	FACU
River birch (*Betula nigra*)	FACW	Pawpaw (*Asimina triloba*)	FAC
Sugar-berry (*Celtis laevigata*)	FACW		
Shingle oak (*Quercus imbricaria*)	FAC		
Cherry-bark oak (*Quercus pagoda*)	FACW		
Sourwood (*Oxydendron arboretum*)	UPL		
Black tupelo (*Nyssa sylvatica*)	FAC		
Acidic Cove Forest			
Canopy Species		**Understory Species**	
Name	**Indicator Status**	**Name**	**Indicator Status**
White oak (*Quercus alba*)	FACU	Silky dogwood (*Cornus amomum*)	FACW
Hemlock (*Tsuga* sp.)	FACU	Umbrella tree (*Magnolia fraseri*)	FACU
Black cherry (*Prunus serotina*)	FACU	Highland dog hobble (*Leucothoe fontanesiana*)	FACW
Northern red oak (*Quercus rubra*)	FACU	Great laurel (*Rhododendron maximum*)	FAC
Yellow birch (*Betula alleghaniensis*)	FAC	Mountain laurel (*Kalmia latifolia*)	FACU
Sweet birch (*Betula lenta*)	FACU	Yellow buckeye (*Aesculus flava*)	FACU
Red maple (*Acer rubrum*)	FAC		
Tulip poplar (*Liriodendron tulipifera*)	FACU		
Mountain maple (*Acer spicatum*)	FACU		

Montane Alluvial Forest covers river floodplains and consists of a mixture of plants, typically of cove forests and floodplain forests, with which they may share many species. This project includes plants of the small river subtype, distinguished from the large river subtype by being more like cove forests. Given the setting of the lower reach of UT 1 that includes a wide, flat alluvial floodplain, some species of large river subtype have been included in the reference forest list, specifically green ash, ash-leaf maple, sugar-berry, shingle oak, cherry-bark oak, sourwood, and black tupelo.

Acidic Cove Forest includes mesic forests dominated by acid-tolerant mesophytic trees with acid-tolerant undergrowth generally dominated by great laurel and highland dog hobble.

4.3 Freshwater Marsh

Some portions of the Site are expected to be dominated by an open, herbaceous vegetative community characteristic of a Swamp Forest-Bog Complex, as described in Schafale (2012). Overbank flooding appears to occur and may result in extended periods of open water and emergent vegetation.

Table 12. Swamp Forest-Bog Complex Ecosystem

Swamp Forest – Bog Complex	
Canopy/Shrub Species	**Herbaceous Species**
Red maple (*Acer rubrum*)	Cinnamon fern (*Osmunda cinnamomea)*
Eastern hemlock (T*suga canadensis*)	Round-leaf goldenrod (*Solidago patula*)
Sweet birch (*Betula lenta*)	New England aster (*Symphyotrichum novae-angliae*)
Yellow birch (*Betula alleghaniensis*)	Broadleaf cattail (*Typha latifolia*)
Serviceberry (*Amelanchier arborea*)	Broadleaved arrowhead (*Sagittaria latifolia*)
White pine (*Pinus strobus*)	Robin runaway (*Dalibarda repens*)
Tag alder (A*lnus serrulata*)	Whitegrass *(leersia virginica)*
Rosebay rhododendron (*Rhododendron maximum*)	Burr reed (*Sparganium americanum*)
Mountain laurel (*Kalmia latifolia*)	Bulrushes (S*cirpus* spp.)
Silky willow (*Salix sericea*)	Rushes (*Juncus* spp.)
Mountain holly (*Ilex montana*)	Northern long sedge (*Carex folliculata*.)
Swamp rose (*Rosa palustris*)	Nodding sedge (*Carex gynarda*)
	Eastern rough sedge (*Carex scabrata*.)
	Bristly-stalked sedge (*Carex leptalea*)
	Tussock sedge (*Carex stricta*)

5 CHANNEL ASSESSMENTS

5.1 Channel Stability Assessment

Channel degradation or aggradation occurs when hydraulic forces exceed or do not approach the resisting forces in the channel. The amount of degradation or aggradation is a function of the relative magnitude of these forces over time. The flow interaction within the boundary of open channels is only imperfectly understood. Adequate analytical expressions describing this interaction have yet to be developed for conditions in natural channels. Thus, means of characterizing these processes rely heavily upon empirical formulas.

Traditional approaches for characterizing stability can be placed in one of two categories: 1) maximum permissible velocity and 2) tractive force, or stream power and shear stress. The former is advantageous in that velocity can be measured directly. Shear stress and stream power cannot be measured directly and must be computed from various flow parameters. However, stream power and shear stress are generally better measures of fluid force on the channel boundary than velocity.

Stream power and shear stress were estimated for 1) existing degraded Site reaches, 2) the reference reaches, and 3) proposed Site conditions. Average stream velocity and bankfull discharge values were calculated for the existing Site stream reaches, the reference reach, and proposed conditions. Important input values and output results (including stream power, shear stress, and per unit shear power and shear stress) are presented in Table 13.

To maintain the sediment transport functions of a stable stream system, the proposed channel should exhibit stream power and shear stress values so the channel is neither aggrading nor degrading. Results of the analysis indicate the proposed channel reaches are expected to maintain shear stress values of approximately 0.24-2.30 and maximum shear stress values of 0.36 – 3.46 (Table 13).

Table 13. Stream Power (Ω) and Shear Stress (τ) Values

	Bankfull Discharge (ft^3/s)	Water surface Slope (ft/ft)	Total Stream Power (Ω)	Ω/W	Hydraulic Radius	Shear Stress (τ)	Velocity (v)	τ v	τ_{max}
Existing Conditions									
UT1	22.3	0.0488	67.91	5.61	0.81	**2.45**	2.14	5.26	**3.68**
UT2	9.1	0.0749	42.53	6.75	3.45	**16.13**	0.37	5.99	**24.19**
UT4 Upstream	25	0.0741	115.60	9.32	0.40	**1.84**	4.63	8.50	**2.75**
UT4 Downstream	26.7	0.0087	14.49	1.15	1.35	**0.73**	1.46	1.07	**1.10**
Reference Reaches									
Cranberry	103.5	0.0112	72.33	5.79	1.29	**0.90**	5.12	4.61	**1.35**
Stone Mountain	271.7	0.0121	205.14	6.82	1.38	**1.04**	5.91	6.16	**1.56**
Rockhouse Upstream	12.1	0.0123	9.29	1.86	0.45	**0.35**	4.32	1.50	**0.52**
Rockhouse Downstream	16.5	0.0312	32.12	5.54	0.51	**1.00**	4.46	4.46	**1.50**
Proposed Conditions									
UT1	22.3	0.0457	63.59	7.66	0.52	**1.47**	4.55	6.71	**2.21**
UT2	9.1	0.0687	39.01	7.22	0.34	**1.46**	4.33	6.31	**2.19**
UT4 Upstream	25	0.068	106.08	12.19	0.54	**2.30**	4.63	10.67	**3.46**
UT4 Downstream	26.7	0.0546	90.97	10.22	0.56	**0.24**	4.68	8.94	**0.36**

Except for UT 4 downstream, shear stress values of the existing Site streams are slightly elevated. UT 4 downstream is characterized by a wide, flat channel that promotes a reduction of shear stress and stream power. In addition, the lower reach of UT 4 (downstream) has a very low slope. Proposed conditions equilibrate stream power and shear stress throughout the Site and promote sediment transport in UT 4 and reduce erosion in the remainder of the tributaries. Overall, the Site is not subject to overly elevated values for stream power and shear stress; however, the reduction in deep-rooted, stabilizing vegetation and the introduction of livestock along with stream dredging and straightening are the primary cause of erosion in Site streams.

5.2 Bankfull Verification

Discharge estimates for the Site utilize an assumed definition of "bankfull" and the return interval associated with that bankfull discharge. For this study, the bankfull channel is defined as the channel dimensions designed to support the "channel forming" or "dominant" discharge (Gordon et al. 1992).

Current research also estimates a bankfull discharge would be expected to occur approximately every 1.3 to 1.5 years (Rosgen 1996, Leopold 1994).
To determine bankfull discharge, field indicators for bankfull cross-sectional area were measured at each reference reach. The bankfull cross-sectional area measurements from the field were then compared to the bankfull cross-sectional area predicted by the regional curves (Harmen et al. 2001). By plotting each reference cross-sectional area on the regional curves, inferences into the bankfull discharge of each reference Site may be made. Bankfull discharges may be compared to Site cross-sections with identifiable bankfull indicators and regional regression models. Measured bankfull cross-sectional areas/discharges compared to bankfull cross-sectional areas/discharges for each reference site are depicted below.

Table 14. Bankfull Discharge Comparison

Reference Site	Measured A_{bkf}/Q_{bkf}	Predicted A_{bkf}/Q_{bkf}	% of Predicted A_{bkf}/Q_{bkf}
Cranberry	20.2/103.5	17.4/89.2	116.08
Stone Mountain	46.0/271.7	84.9/501.7	54.15
Rockhouse Cr (Upstream)	2.8/12.1	2.6/11.0	109.49
Rockhouse Cr (Downstream)	3.7/16.4	3.8/16.9	97.99

Field indicators of bankfull approximate an average area/discharge of approximately 54 to 116 percent of that predicted by the regional curves. However, the Rockhouse Creek Reference Sites are more closely related to predictions by regional curves and include a narrower range of 97.99 to 109.49 percent.

The USGS regional regression equation for the Blue Ridge region (USGS 2011) indicates that bankfull discharge at a 1.3-1.5 year return interval more closely matches the field indicators for bankfull discharge than the regional curves. Table 15 summarizes all methods analyzed for estimating bankfull discharge.

Table 15. Reference Reach Bankfull Discharge Analysis

Method	Watershed Area (square miles)	Return Interval (years)	Discharge (cfs)
Cranberry Reference Reach			
Mountain Regional Curves (Harman et. al. 2001)	0.70	1.3-1.5	89.2
Blue Ridge Regional Regression Model (USGS 2011)	0.70	1.3-1.5	65-80
Field Indicators of Bankfull (Mountain Regional Curves (Harman et. al. 2001)	0.70	1.3-1.5	103.5
Stone Mountain Reference Reach			
Mountain Regional Curves (Harman et. al. 2001)	7.46	1.3-1.5	501.7
Blue Ridge Regional Regression Model (USGS 2011)	7.46	1.3-1.5	385-410
Field Indicators of Bankfull (Mountain Regional Curves (Harman et. al. 2001)	7.46	1.3-1.5	271.7

Table 15. Reference Reach Bankfull Discharge Analysis (continued)

UT to Rockhouse Creek-(Upstream) Reference Reach			
Mountain Regional Curves (Harman et. al. 2001)	0.04	1.3-1.5	11.0
Blue Ridge Regional Regression Model (USGS 2011)	0.04	1.3-1.5	9 - 11
Field Indicators of Bankfull (Mountain Regional Curves (Harman et. al. 2001)	0.04	1.3-1.5	12.1
UT to Rockhouse Creek-(Downstream) Reference Reach			
Mountain Regional Curves (Harman et. al. 2001)	0.04	1.3-1.5	16.9
Blue Ridge Regional Regression Model (USGS 2011)	0.04	1.3-1.5	14-16
Field Indicators of Bankfull (Mountain Regional Curves (Harman et. al. 2001)	0.04	1.3-1.5	16.5

Based on the above analysis of methods to determine bankfull discharge, proposed conditions at the Site will be based on 94% of the bankfull cross-sectional area predicted by the regional curves.

6 FUNCTIONAL UPLIFT AND PROJECT GOALS/OBJECTIVES

The Site is located within **Targeted Local Watershed (TLW) 06010103010010** and subbasin 04-02-01. The *Watauga River Basin Restoration Priorities* (RBRP) report (NCEEP 2009) documents four significant sources of aquatic habitat degradation and water quality impairment within the Watauga River Basin: 1) livestock grazing with unlimited access to stream banks and channels, 2) clearing of native riparian vegetation from streamside buffer zones, 3) clearing of land for new roads and building particularly in areas of steep slopes, and 4) urban stormwater runoff. Additional water quality, habitat, and hydrologic impacts include timber harvesting, failing septic systems and straight pipe discharges, hydrologic modifications (e.g. channelization, streambank armoring, and building in floodplains), and wastewater treatment plant discharges.

Site-specific mitigation goals and objectives have been academically developed through the use of North Carolina Stream Assessment Method (NC SAM) and North Carolina Wetland Assessment Method (NC WAM) analyses of the existing stream and wetland systems at the Site (NC SFAT 2015 and NC WFAT 2010). NC SAM and NC WAM metrics are not to be used to prove mitigation success; however, these functions have been academically determined as uplift within the Site. Site functional assessment data forms are available in Appendix B. Tables 16 through 18 summarize NC SAM and NC WAM metrics academically targeted for functional uplift and the corresponding mitigation activities proposed to provide functional uplift. Metrics academically targeted to meet the Site's goals, and objectives are depicted in bold.

Table 16. NC SAM Summary

NC SAM Function Class Rating Summary	SAM 1 UT 2	SAM 2* UT 1 (Upstream)	SAM 3 UT 4
(1) HYDROLOGY	**LOW**	HIGH	**LOW**
(2) Baseflow	HIGH	HIGH	HIGH
(2) Flood Flow	**LOW**	HIGH	**LOW**
(3) Streamside Area Attenuation	**LOW**	HIGH	**LOW**
(4) Floodplain Access	**LOW**	HIGH	**LOW**
(4) Wooded Riparian Buffer	**LOW**	HIGH	**LOW**
(4) Microtopography	NA	NA	**LOW**
(3) Stream Stability	**LOW**	HIGH	**LOW**
(4) Channel Stability	**LOW**	HIGH	**LOW**
(4) Sediment Transport	MEDIUM	HIGH	**LOW**
(4) Stream Geomorphology	MEDIUM	HIGH	**LOW**
(1) WATER QUALITY	**LOW**	MEDIUM	**LOW**
(2) Baseflow	HIGH	HIGH	HIGH
(2) Stream-side Area Vegetation	**LOW**	HIGH	**LOW**
(3) Upland Pollutant Filtration	**LOW**	HIGH	**LOW**
(3) Thermoregulation	MEDIUM	HIGH	**LOW**
(2) Indicators of Stressors	YES	YES	YES
(2) Aquatic Life Tolerance	MEDIUM	HIGH	MEDIUM
(1) HABITAT	**LOW**	HIGH	**LOW**
(2) In-stream Habitat	MEDIUM	HIGH	**LOW**
(3) Baseflow	HIGH	HIGH	HIGH
(3) Substrate	MEDIUM	HIGH	**LOW**
(3) Stream Stability	**LOW**	HIGH	**LOW**
(3) In-Stream Habitat	HIGH	HIGH	**LOW**
(2) Stream-side Habitat	**LOW**	HIGH	**LOW**
(3) Stream-side Habitat	**LOW**	HIGH	**LOW**
(3) Thermoregulation	MEDIUM	HIGH	**LOW**
OVERALL	**LOW**	HIGH	**LOW**

**Stream is proposed for Enhancement Level II.*

Based on NC SAM output, all three primary stream functional metrics (Hydrology, Water Quality, and Habitat) and 20 sub-metrics, are under-performing as exhibited by a LOW metric rating (see Figure 4, Appendix A for NC SAM data reaches). LOW-performing metrics are to be academically targeted for functional uplift through mitigation activities.

Table 17. NC WAM Summary

NC WAM Sub-function Rating Summary	WAM 1	WAM 3	WAM 4
Wetland Type	**Bottomland Hardwood Forest**	**Headwater Forest**	**Headwater Forest**
(1) HYDROLOGY	**LOW**	MEDIUM	HIGH
(2) Surface Storage & Retention	**LOW**	**LOW**	HIGH
(2) Sub-surface Storage and Retention	**LOW**	HIGH	HIGH
(1) WATER QUALITY	**LOW**	**LOW**	HIGH
(2) Pathogen change	MEDIUM	**LOW**	HIGH
(2) Particulate Change	**LOW**	**LOW**	MEDIUM
(2) Soluble change	**LOW**	**LOW**	MEDIUM
(2) Physical Change	MEDIUM	**LOW**	HIGH
(1) HABITAT	**LOW**	**LOW**	**LOW**
(2) Physical Structure	**LOW**	**LOW**	MEDIUM
(2) Landscape Patch Structure	**LOW**	HIGH	**LOW**
(2) Vegetative Composition	**LOW**	MEDIUM	MEDIUM
OVERALL	**LOW**	**LOW**	HIGH

NC WAM forms were filled out at three locations in the Site proposed for wetland enhancement: one along the downstream section of UT-1, one in the forested upstream area of UT-1, and one along UT-3.

Table 18 outlines stream and wetland functions identified in NC DMS 2020 guidance that will be targeted for functional uplift, restoration goals, and success criteria.

Table 18. Targeted Functions, Goals, Objectives, and Uplift Evaluation

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain. Remove overburden to reconnect with adjacent wetlands.	Dispersion of high flows on the floodplain, increase in biogeochemical cycling within the system and recharging of riparian wetlands.	Four bankfull events within the monitoring period.	2 Crest gauges (pressure transducers) on UT 1 and UT 4	To be determined
Improve stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Reduced sediment inputs from bank erosion, reduced shear stress, and improved overall hydraulic function.	Bank height ratios remain below 1.2 over the monitoring period. Visual assessments show progression towards stability.	12 Cross section surveys	To be determined

Table 18. Targeted Functions, Goals, Objectives, and Uplift Evaluation (continued)

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zones and plant appropriate species on streambanks.	Reduction in floodplain sediment inputs from runoff, increased bank stability, increased LWD and organic material in streams, increased	The survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7.	10 veg plots	To be determined
Restore and enhance groundwater hydrology to drained or impacted hydric soil areas.	Reduce channel depth in incised stream reaches, remove drain tile, fill drainage ditches, and alleviate soil compaction from agriculture activities.	Particulate and pollution conversion, groundwater storage and reduced downstream flooding, habitat diversification, and vegetative composition conversion.	Groundwater saturation within 12 inches of the soil surface for 12 % of the growing season for reestablishment and improvement of hydrology in rehabilitation areas.	8 groundwater gauges	To be determined

7 SITE DESIGN AND IMPLEMENTATION CONSTRAINTS

The presence of conditions or characteristics that have the potential to hinder restoration activities on the Site was evaluated. The evaluation focused primarily on the presence of hazardous materials, utilities and restrictive easements, rare/threatened/endangered species or critical habitats, and the potential for hydrologic trespass. Existing information regarding Site constraints was acquired and reviewed. In addition, any Site conditions that have the potential to restrict the restoration design and implementation were documented during the field investigation.

No known Site constraints, that may hinder proposed mitigation activities, were identified during field surveys. Potential constraints reviewed include the following.

7.1 Threatened & Endangered Species

A formal Categorical Exclusion (CE) document has been prepared and accepted by the federal highway administration for this project. A part of the CE document included coordination with the United States Fish and Wildlife Service (USFWS) concerning federally protected species that may occur within, or adjacent to the Site. The CE document, including correspondence with the USFWS concerning the species listed in Table 19 below. In addition, an IPaC Biological Analysis has been completed for the project and is included in Appendix E.

Table 19. Endangered Species Act Determinations

Common Name (Scientific Name)	Federal Status	Habitat at Site	Biological Conclusion	Summary
Bog turtle (*Glyptemys muhlenbergii*)	Threatened (S/A)	Yes	Not Applicable	(Threatened due to similarity of appearance)
Gray bat (*Myotis grisescens*)	Endangered	No	May Affect, Not Likely To Adversely Affect	Gray bats often roost in caves, though they are also known to roost in human-made structures like bridges
Green floater (*Lasmigona subviridis*)	Proposed Threatened	No	Excluded from Analysis	Proposed for listing and not protected at this time.
Northern long-eared bat (*Myotis septentrionalis*)	Endangered	Yes	May Affect, Not Likely To Adversely Affect	This species or critical habitat is covered by a IPaC Determination Key
Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered	Yes	Excluded from Analysis	Proposed for listing and not protected at this time.
Virginia big-eared bat (*Corynorhinus townsendii virginianus*)	Endangered	No	May Affect, Not Likely To Adversely Affect	Virginia big-eared bat inhabits caves year-round

Gray Bat

Gray bats were listed as federally endangered in 1976 and occur across the eastern US from western North Carolina to eastern Kansas. Natural caves are the primary roosting habitat, but they are known to use human-made structures like bridges and culverts, and most bats migrate seasonally between maternity and hibernating roosts. Females typically give birth in May or June and juveniles are weaned and begin to fly from June through August. Water is their preferred foraging habitat, and they can range several miles nocturnally to conduct feeding.

Biological Conclusion

The project is anticipated to benefit riparian foraging areas without adverse effects on Gray bats or their habitat. Minimal tree removal is expected to occur for this project. Therefore, the biological conclusion for this species is **May Affect, Not Likely to Adversely Affect.**

Virginia Big-Eared Bat

The Virginia big-eared bat was listed as federally endangered in 1979 and occurs in the southeastern US from Kentucky to North Carolina. These bats utilize caves year-round as roost sites. Populations use cooler caves for hibernation, and females typically use warmer maternity caves to raise their young. Virginia big-eared bats feed on insects, primarily moths, and foraging typically occurs on forest/edge interfaces and riparian corridors. Foraging sites are generally located within a few miles of cave roost sites and consist of primarily forested habitats and a mixture of open fields, cliff lines, rock outcrops, riparian areas, and other water sources.

Biological Conclusion

Although there are current records of a known hibernaculum supporting Virginia big-eared bats within a 7-10 mile radius of the Site, the project is anticipated to have beneficial effects on riparian foraging areas without adverse impacts to Virginia big-eared bats or their habitat. Minimal tree removal is expected to

occur for this project. Therefore, the biological conclusion for this species is **May Affect, Not Likely to Adversely Affect.**

7.2 Cultural Resources

"Cultural resources" refers to prehistoric or historic archaeological sites, structures, or artifact deposits over 50 years old. "Significant" cultural resources are those that are eligible or potentially eligible for inclusion in the National Register of Historic Places. Evaluations of site significance are made with reference to the eligibility criteria of the National Register (36 CFR 60) and in consultation with the North Carolina State Historic Preservation Office (SHPO).

In support of a Categorical Exclusions document, RS contracted TRC Environmental Corporation (TRC) to conduct an archaeological reconnaissance and a systematic Phase I survey for the Site. The survey identified five previously unrecorded archaeological sites that intersect with the project limits of disturbance (LOD) (31WT405-31WT409). Sites 31WT405 and 31WT407 consist of low-density lithic scatters and lack intact subsurface deposits with the potential to contribute new information important for understanding the pre-contact period. TRC recommended that these sites be considered "not eligible" for inclusion in the National Register of Historic Places (NRHP). In a SHPO letter dated November 9, 2021 (Appendix E), SHPO concurred with these recommendations.

During development of the Mitigation Plan and Construction Documents, the limits of disturbance (LOD) were refined. On January 19, 2023, Restoration Systems submitted the updated engineering plans and scope of work. SHPO responded on March 6, 2023 and concluded, *"Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project."* Complete documentation is included in Appendix E.

Within SHPO's letter dated March 6, 2023, they encouraged coordination with the new Valle Crucis Historic Preservation Commission, Jennifer Storie, within the Watauga County Planning Department regarding work requirements within locally designated districts. RS contacted Ms. Storie in late on March 3, 2023, and sent a scoping email which is included in Appendix E. Coordination will continue throughout the project permitting process.

7.3 North Carolina Natural Heritage Elements

A query of the North Carolina Natural Heritage Program (NCNHP) database indicates records for rare species, important natural communities, natural areas, or conservation/managed areas within the proposed project boundary. These include the following documentations.

- Warbling vireo (*Vireo gilvus*) – State Significantly Rare

Within a one-mile radius of the Site, there are multiple listings of species and communities, including the following.

- Eastern hellbender (*Cryptobranchus alleganiensis*) - State Special Concern
- Warbling vireo (*Vireo gilvus*) - State Significantly Rare
- Gray comma (*Polygonia progne*) - State Significantly Rare
- Virginia big-eared bat (*Corynorhinus townsendii virginianus*) – Federally Endangered
- Little brown bat (*Myotis lucifugus*) - State Significantly Rare
- Northern long-eared bat (*Myotis septentrionalis)* – Federally Threatened
- Squarrose peatmoss (*Sphagnum squarrosum)* – State Significantly Rare Peripheral

- Bleeding Heart (*Dicentra eximia*) - State Significantly Rare Peripheral
- American Speedwell (*Veronica americana*) – State Threatened
- Acidic Cove Forest – Natural Community
- Montane Cliff – Natural Community
- Rich Cove Forest – Natural Community
- Spray Cliff – Natural Community
- Dutch Creek Falls – Natural Area
- Valle Mountain – Natural Area
- WAT/Watauga River Aquatic Habitat - Natural Area
- NC Department of Cultural Resources Easement – Managed Area
- NC Land and Water Fund Project – Managed Area
- Valle Mountain Registered Heritage Area – Managed Area
- Blue Ridge Conservancy Easement – Managed Area
- Valle Crucis Scenic Overlook – Managed Area
- NC Agriculture Development and Farmland Preservation Trust Fund Easement – Managed Area
- Conservation Trust for North Carolina Easement – Managed Area

See Appendix E for the full NCNHP database list.

7.4 FEMA

Inspection of the FEMA Flood Insurance Rate Map 3710197000J, Panel 1970, effective December 3, 2009, indicates that Site tributaries are not mapped by FEMA. A portion of the Dutch Creek floodplain, which includes UT 4 is mapped as a Flood Zone AE; however, it is unlikely that the proposed activities will affect flood elevations associated with Dutch Creek. Therefore, this project is not expected to require a "Conditional Letter of Map Revision" (CLOMR). on May 3, 2023 Chris Grubb, Watauga Country Planner/Development Coordinator, that Watauga County will only require a floodplain development permit for the Site. To ensure that there are no permanent impacts to the floodway post-construction, the following note has been added to the erosion control notes (C6.00) and the construction entrance detail (C6.15): "CONTRACTOR TO REMOVE SOIL TO THE DEPTH OF STONE SPECIFIED ON SHEET C6.15 AND FILL TO EXISTING GRADE WITH CLASS 'A' STONE. AFTER CONSTRUCTION THE CONTRACTOR SHALL REMOVE THE STONE AND FILL WITH SOIL TO RESTORE EXISTING GRADE. ENTRANCE IS IN FEMA REGULATED FLOODPLAIN, THEREFORE EXISTING GRADE SHALL BE MAINTAINED DURING AND POST-CONSTRUCTION." Coordination with FEMA will occur throughout the project.

7.5 Utilities

A residential powerline runs parallel to UT 4 within the easement. Mitigation efforts include the removal of the utilities from the easement. Utilities do not represent a constraint to the project.

7.6 Air Transport Facilities

No air transport facilities are located within 5 miles of the Site.

7.7 Easement Breaks

Easement breaks were evaluated as a potential project constraint as they fragment the Site and reduce the potential functional uplift. This project includes only 2 external crossings. As requested during a Site visit with IRT members, the remaining crossings will be internal agricultural crossings. Easement breaks do sufficiently impact the functional uplift at the Site for the IRT to reduce credit.

7.8 Future Development

Future development within and adjacent to the Site has been evaluated, including North Carolina Department of Transportation (NCDOT) Transportation Improvement Program (TIP) projects, Watauga County expansion plans, and community expansion plans.

NCDOT TIP planning, including all projects planned for 2020 to 2029, indicate there are no road construction projects expected within or adjacent to the Site. However, at the upstream and downstream reaches of UT 1 where NCDOT pipes occur near the easement, 15 feet has been left as not credit generating stream so maintenance may occur as necessary. Highway NC 105 (TIP R-2566B) is the closest road expansion project, approximately 2.4 miles to the southeast.

Watauga County has proposed several expansion/corridor plans, including the Blowing Rock Gateway Corridor, Deep Gap Gateway Corridor, and Grandfather Gateway Corridor. These corridor plans are not in the vicinity of the Site and will have no effect on Site watersheds. The county has multiple water and sewer studies and recommendations listed on the Citizens plan for Watauga, none of which occur in the vicinity of the Site. In addition, the county lists preservations areas of unique community identities and heritage. The Valle Crucis Historic District, Mast Farm, Mast General Store, and Valle Crucis Episcopal Mission are listed by Watauga County as areas for protection.

The Valle Crucis community has development plans for a new school on Broadstone Road and a 2021 expansion of a park located at the Mast General Store. No other expansion plans are expected in the vicinity of the Site. Valle Crucis has a Historic District Ordinance that promotes the protection of the community's public health, safety, morals, and general welfare.

Property adjacent to the Site is protected by conservation easements that protect the view-shed and agricultural aspects of the property.

7.9 Hydrologic Trespass

Due to steep slopes and confined valleys at the upper reaches of the Site hydrologic trespass will not be an issue. Wider buffers have been acquired that encompass the entire floodplain for most reaches. In addition, sensitive areas that are flatter in nature (UT 6 and UT 4) have been analyzed with detailed topographic mapping to ascertain the elevation of proposed surface waters and hydric soils to minimize the effects of trespass. Land within the conservation easement was purchased from two landowners (Gail Taylor and Ralph and Rebecca Daughtry). Any impacts outside of the easement would be isolated to property owned by the Taylor and Daughtry families. Both families have been an integral part of the design process. No other properties will have any hydrologic impact.

8 DESIGN APPROACH AND MITIGATION WORK PLAN

8.1 Stream Design

Onsite streams targeted for restoration have endured significant disturbance from land use activities such as land clearing, livestock grazing, straightening and rerouting of channels, ditching within the floodplain, and other anthropogenic maintenance. Site streams will be restored to emulate historical conditions at the Site utilizing parameters from nearby, relatively undisturbed reference streams (see Section 4.1 Reference Streams).

Primary activities designed to restore Site streams include 1) stream restoration, 2) stream enhancement (level II), 3) stream enhancement (level I), 4) wetland reestablishment, 5) wetland rehabilitation, 6) wetland enhancement, 7) wetland creation, and 8) vegetation planting (Figures 8 and 10, Appendix A).

8.1.1 Stream Restoration

Stream restoration efforts are designed to restore a stable stream that approximates hydrodynamics, stream geometry, and local microtopography relative to reference conditions. Restoration at the Site will be a combination of Priority I and II restoration. Bankfull elevations will be raised to meet the adjacent valley floodplain elevation as soon as tie-in elevations are achieved.

Stream restoration is expected to entail 1) channel excavation, 2) channel stabilization, 3) channel diversion, and 4) channel backfill.

In-stream Structures

In-stream structures will be used for grade control, habitat, and to elevate local water surface profiles in the channel, flattening the water energy slope or gradient and directing stream energy into the center of the channel and away from banks. The structures will consist of log cross-vanes or log j-hook vanes; however, at the Engineer's discretion, rock cross-vanes or j-hook vanes may be substituted if dictated by field conditions. In addition, the structures will be placed in relatively straight reaches to provide secondary (perpendicular) flow cells during bankfull events.

Channel Crossings

Landowner constraints will necessitate installing bridged crossings to allow access to portions of the property isolated by stream restoration activities Figure 8 (Appendix A). The crossings will be constructed with suitable-sized spans to allow for stormwater flows, with adjacent floodplain pipes allowing overflow discharge onto the floodplain. Materials will include hydraulically stable rip-rap or suitable rock. The crossings will be large enough to handle anticipated vehicular traffic. Approach grades to the crossings will be at an approximate 10:1 slope and constructed of hard, scour-resistant crushed rock or other permeable material, free of fines.

Three of the bridged crossings will be installed internally within the easement to allow the landowner to access portions of the property that would be isolated by the conservation easement and livestock fencing. The crossings will be 10 feet in width. The crossings are proposed to be bridged and are expected to support an anticipated farm equipment. These crossings are internal within the conservation easement and are subject to restrictions of the easement.

Marsh Treatment Areas

Shallow wetland marsh treatment areas will be excavated in the floodplain to intercept surface waters draining through agricultural areas prior to discharging into the Site. Marsh treatment areas are intended to improve the mitigation project and are not generating mitigation credit. Proposed marsh treatment areas will consist of shallow depressions that will provide treatment and attenuation of initial stormwater pulses. The outfall of each treatment area will be constructed of woody debris or other suitable material that will protect against headcut migration into the constructed depression. It is expected that the treatment areas will fill with sediment and organic matter over time.

8.1.2 Stream Enhancement (Level I)

Stream enhancement (level I) will entail the restoration of stream dimension, installation of habitat and grade control structures, easement fencing, and planting riparian buffers with native forest vegetation to facilitate stream recovery and prevent further stream degradation.

8.1.3 Stream Enhancement (Level II)

Stream enhancement (level II) will entail installing fencing/easement markers and planting riparian buffers with native forest vegetation to facilitate stream recovery and prevent further stream degradation. Stream enhancement (level II) has two distinct mitigation activities: 1) areas that are characterized by relatively mature canopy and have livestock disturbances within the canopy and 2) areas characterized by pasture with little mature canopy.

Mature Canopy Areas – 5:1 Mitigation Ratio

The upper reaches of Site streams are relatively steep and characterized by a mature canopy. Livestock has unrestricted access to these areas; however, the steeply sloped terrain, mature canopy, and rocky substrate minimize livestock's physical impact on the streams. Mitigation is proposed at a 5:1 ratio in these areas. Mitigation activities are to include supplemental understory plantings and herbaceous vegetation, capturing ephemeral drainages entering the Site and directing the discharge to marsh treatment areas (where feasible), including wider buffers adjacent to Site streams (to the sub-watershed boundaries), and removal of livestock from the easement area.

Pasture Areas - 2.5:1 Ratio

The lower reaches of Site streams are relatively flat and characterized by pasture grass. Livestock has unrestricted access to these areas, and the channels are characterized by more significant impacts from hoof shear or other anthropomorphic effects. Mitigation is proposed at a 2.5:1 ratio in these areas. Mitigation activities include planting a vegetative buffer adjacent to the channel and fencing livestock from the easement boundaries. Minor bank stabilization measures will be conducted; however, many of these reaches are book-ended by stream restoration or stream enhancement (Level I) and will likely have more significant work performed in them to tie to the restored reaches above and below.

8.2 Individual Reach Discussions

Mitigation strategies proposed for each reach are presented in Table 20.

Table 20. Individual Reach Descriptions and Functional Uplift

Individual Reach	Mitigation Activities	Functional Uplift Provided for Identified Stressors
UT1 Reach1	• Tie into the upper, offsite reaches and initiate Stream Enhancement II, including fencing livestock from the easement, capturing adjacent ephemeral draws in the easement, and directing flow into marsh treatment areas.	• Nutrients • Fecal Coliform • Peak Flows
UT1 Reach2	• Begin Enhancement II by fencing livestock and planting a vegetative buffer. • Install a 10-foot bridged crossing that will be internal within the easement.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows

Table 20. Individual Reach Descriptions and Functional Uplift (continued)

Individual Reach	Mitigation Activities	Functional Uplift Provided for Identified Stressors
UT1 Reach3	• Tie into the channel bed and initiate Enhancement I channel construction, including installing structures and constructing stream channel in place.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows • Limited Bedform Diversity • Absence of Large Woody Debris
UT1 Reach4	• Below the Enhancement I reach, construct a combination of P1 and P2 Stream Restoration.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows • Habitat Fragmentation • Limited Bedform Diversity • Absence of Large Woody Debris
UT1 Reach5 and 7	• Begin Enhancement II by fencing livestock and planting a vegetative buffer.	• Nutrients • Fecal Coliform • Peak Flows
UT1 Reach6 and 8	• P1 Stream Restoration in the lowest elevation in the valley. • Move the channel away from historic structures. • Install a bridged stream crossing for driveway access.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows • Artificial Barriers • Ditching/Draining • Habitat Fragmentation • Limited Bedform Diversity • Absence of Large Woody Debris
UT2 Reach1	• Tie into the upper, offsite reaches and initiate Stream Enhancement II, including fencing livestock from the easement, and capturing adjacent ephemeral draws in the easement.	• Nutrients • Fecal Coliform • Peak Flows
UT2 Reach2	• Tie to Enhancement reach and initiate P1 Stream Restoration in the lowest elevation within the valley. • Install two 10-foot bridged crossings that will be internal within the easement. • Install grade control/habitat structures. • Hydrate adjacent wetlands by backfilling incised, ditched stream channels. • Remove livestock from the property. • Plant a vegetative buffer within the entire floodplain.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows • Ditching/Draining • Habitat Fragmentation • Limited Bedform Diversity • Absence of Large Woody Debris
UT2 Reach3	• Tie into UT 1 with a short Enhancement II reach. • Remove livestock from the property. • Plant a vegetative buffer within the entire floodplain.	• Nutrients • Fecal Coliform • Peak Flows

Table 20. Individual Reach Descriptions and Functional Uplift (continued)

Individual Reach	Mitigation Activities	Functional Uplift Provided for Identified Stressors
UT 2A	• Tie into existing grade at the stream origin and initiate Stream Enhancement II, including fencing livestock from the easement and capturing adjacent ephemeral draws in the easement. • Remove livestock from the property. • Plant a vegetative buffer within the entire floodplain.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows • Habitat Fragmentation • Limited Bedform Diversity • Absence of Large Woody Debris
UT3 Reach1	• Enhancement II by fencing livestock and planting a vegetative buffer.	• Nutrients • Fecal Coliform • Peak Flows
UT3 Reach2	• Tie to UT 2 with P1 Stream Restoration in the lowest elevation portion of the valley. • Install grade control/habitat structures. • Hydrate adjacent wetlands by backfilling incised, ditched stream channels. • Remove livestock from the easement. • Plant a vegetative buffer within the entire floodplain.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows • Habitat Fragmentation • Limited Bedform Diversity • Absence of Large Woody Debris
UT4 Reach1	• Tie into the upper, offsite reaches and initiate Stream Enhancement II, including fencing livestock from the easement.	• Nutrients • Fecal Coliform • Peak Flows
UT4 Reach2	• Tie into existing grade and step up to P1 Stream Restoration. Then continue P1 Restoration across the lowest portion of the valley. • Locate and remove all drain tiles. • Install a bridged stream crossing outside of the conservation easement. • Continue P1 Stream Restoration until the tie-in with UT 1 • Remove livestock from the easement. • Plant a vegetative buffer within the entire floodplain.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows • Artificial Barriers • Ditching/Draining • Habitat Fragmentation • Limited Bedform Diversity • Absence of Large Woody Debris
UT 5	• Enhancement II by fencing livestock and planting a vegetative buffer. • Remove livestock from the easement. • Plant a vegetative buffer within the entire floodplain.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows • Habitat Fragmentation • Limited Bedform Diversity • Absence of Large Woody Debris

Table 20. Individual Reach Descriptions and Functional Uplift (continued)

Individual Reach	Mitigation Activities	Functional Uplift Provided for Identified Stressors
UT 6	• P1 stream restoration to the confluence with UT 4. • Remove livestock from the easement. • Plant a vegetative buffer within the entire floodplain.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform • Peak Flows • Artificial Barriers • Ditching/Draining • Habitat Fragmentation • Limited Bedform Diversity • Absence of Large Woody Debris

8.3 Wetland Enhancement, Reestablishment, and Rehabilitation

Alternatives for wetland enhancement, reestablishment/rehabilitation are designed to restore a fully functioning wetland system, which will provide surface water storage, nutrient cycling, removal of imported elements and compounds, and will create a variety and abundance of wildlife habitat.

Wetland Enhancement

Wetland enhancement includes areas of existing wetlands (based on the approved PJD) that have been subject to timber harvest, cleared of forest vegetation, and/or are pasture for livestock grazing. These areas will be planted with native forest vegetation or supplementally planted with understory species and will have livestock removed/fenced from the area. Planting and livestock removal will enhance 0.631 acres of existing wetland within the Site boundaries.

Wetland Reestablishment

Portions of the Site underlain by hydric soils have been impacted by stream dredging, drain tile installation, vegetative clearing, agriculture grazing, and other land disturbances associated with land use management. Wetland reestablishment options will focus on the restoration of vegetative communities, the restoration of stream corridors and historic groundwater tables, and the reestablishment of soil structure and microtopographic variations. These activities will result in the reestablishment of approximately 2.338 acres of jurisdictional riparian riverine wetlands.

Wetland Rehabilitation

Wetland Rehabilitation will occur in areas of the Site that are currently jurisdictional; however, they are presently being affected by livestock impacts and groundwater drawdown from ditches and channel incision. Wetland rehabilitation activities will result in approximately 0.032 acres of improved jurisdictional riparian riverine wetlands.

Wetland Creation

Wetland Creation includes two distinct areas of the Site: 1) areas of the channel to be backfilled that are expected to become wetlands and 2) slightly elevated areas in the floodplain that are to be excavated to the depth of the floodplain (or slightly lower) which are expected to develop wetland characteristics, including soils, vegetation, and hydrology.

Areas of the channel to be backfilled have hydric soils adjacent to the impacted channel and exhibit evidence of springs/seeps and/or bank stratigraphy that provide evidence the area will develop wetland hydrology.

The slightly elevated portions of the floodplain are limited to the expansive floodplain adjacent to UT 4. These areas will have topsoil removed before excavation. Once the excavation is complete, the topsoil will broadcast upon the newly excavated surface. All creation areas will have vegetation planted and livestock removed. Wetland Creation activities will result in 0.409 acres of improved jurisdictional riparian riverine wetlands.

8.4 Soil Restoration

Soil grading will occur during stream restoration activities. Topsoil will be stockpiled during construction activities and spread on the soil surface once a critical subgrade has been established. The replaced topsoil will serve as a viable growing medium for community restoration to provide nutrients and aid in the survival of planted species.

8.5 Natural Plant Community Restoration

Restoration of floodplain forests and stream-side habitats allows for the development and expansion of characteristic species across the landscape. Ecotonal changes between community types contribute to the diversity and provide secondary benefits, such as enhanced feeding and nesting opportunities for mammals, birds, amphibians, and other wildlife. Reference Forest Ecosystem (RFE) data, onsite observations, and community descriptions from *Guide To The Natural Communities Of North Carolina, Fourth Approximation* (Schafale 2012) were used to develop the primary plant community associations that will be promoted during community restoration activities.

8.5.1 Planting Plan

Stream-side trees and shrubs include species with high value for sediment stabilization, rapid growth rate, and the ability to withstand hydraulic forces associated with bankfull flow and overbank flood events. Stream-side trees and shrubs will be planted within 15 feet of the channel top of bank throughout the meander belt-width. Shrub elements will be planted along the reconstructed stream banks, concentrated along outer bends. Montane Alluvial Forest (Small River Subtype) is the target community for the lower floodplain portions of the Site with Acidic Cove Forest (Typic Subtype) targeted for headwater portions of the Site. Significant overlap in species for each planting community allows for a broad fringe between the ecological zones.

Table 21 depicts the number of stems and species distribution within each vegetation association (Figure 10, Appendix A). Planting will be performed between December 1 and March 15 to allow plants to stabilize during the dormant period and set roots during the spring season. This table does NOT include the live stakes which will be used along the stream. Stakes may include Ninebark (*Physocarpus opulifolius*), Willow (*Salix* sp.) and Arrowood (*Viburnum dentatum*) as well as species included in Table 21.

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Table 21. Planting Plan

Vegetation Association		Montane Alluvial Forest *		Acidic Cove Forest *		Understory Planting (1-Gal Multi-Yr. planting) ****		Stream-side Assemblage **		TOTAL
Area (acres)		3.1		1.4		3.5		2.2		10.3
Species	Indicator Status	# planted*	% of total	# planted*	% of total	# planted	% of total	# planted**	% of total	# planted
Red oak (*Quercus rubra*)	FACU	100	5%	100	10%	0	0%	0	0%	200
White Oak (*Quercus alba*)	FACU	100	5%	100	10%	0	0%	0	0%	200
White pine (*Pinus strobus*)	FACU	100	5%	100	10%	0	0%	0	0%	200
Yellow birch *(Betula alleghaniensis*)	FACU	100	5%	100	10%	0	0%	0	0%	200
Cherry birch (Betula lenta)	FACU	100	5%	100	10%	0	0%	0	0%	200
Black Gum (*Nyssa sylvatica*)	FAC	200	10%	100	10%	0	0%	550	9%	850
Persimmon (*Diosporos virginiana*)	FAC	100	5%	100	10%	0	0%	100	2%	300
Shingle Oak (*Quercus imbricaria*)	FAC	200	10%	100	10%	0	0%	400	7%	700
Tulip poplar (*Liriodendron tulipifera*)	FAC	250	12%	100	10%	0	0%	550	9%	900
American elm (*Ulmus americana*)	FACW	200	10%	100	10%	0	0%	650	11%	950
Hackberry (*Celtis laevigata*)	FACW	200	10%	0	0%	0	0%	600	10%	800
River birch (*Betula nigra*)	FACW	200	10%	0	0%	0	0%	600	10%	800
Sycamore (*Platanus occidentalis*)	FACW	250	12%	0	0%	0	0%	550	9%	800
Tag alder (*Alnus serrulata*)	FACW	0	0%	0	0%	10	2%	500	8%	500
Silky Dogwood (*Cornus amomum*) ***	FACW	0	0%	0	0%	0	0%	500	8%	500
Elderberry (*Sambucus nigra*) ***	OBL	0	0%	0	0%	10	2%	500	8%	500
Buttonbush (*Cephalanthus occidentalis*)***	OBL	0	0%	0	0%	0	0%	500	8%	500
Red Chokeberry (aronia arbutifolia*)*	FACW	0	0%	0	0%	90	21%	0	0%	70
Pawpaw (*Asimina triloba)*	FAC	0	0%	0	0%	80	20%	0	0%	70
Witch hazel (*Hamamelis virginiana)*	FACU	0	0%	0	0%	80	20%	0	0%	70
Hop-hornbeam (Ostrya virginiana)	FACU	0	0%	0	0%	80	20%	0	0%	70
Basswood (Tilia americana)	FACU	0	0%	0	0%	70	15%	0	0%	70
TOTAL		**2100**	**100%**	**1000**	**100%**	**420**	**100%**	**6000**	**100%**	**9520**

* Planted at a density of 680 stems/acre.
** Planted at a density of 2720 stems/acre.
*** May be live staked.
****Understory planting at a density of 120 stems/acre

Due to floodplain soils being of the Nikwasi series, scattered openings dominated by herbs and shrubs are likely to develop over time. These areas are expected to be less than an acre in size and encompass less than 20% of the Site. As the wetland matures, poorly drained soils will make conditions favorable for species like those described in a Swamp Forest-Bog Complex to thrive. In addition, two reference wetlands have been identified near the Site (one in Banner Elk and one in Julian Price Park). These wetlands are underlain by Nikwasi soils and exhibit hydrologic and landscape characteristics similar to the Site. A rich seed bank of herbaceous species is believed to exist onsite. The proposed seed mix is meant to complement this existing suite of species which will naturally emerge post-construction and provide interim ecological services during the development of the proposed forest community.

Latin	Common Name	Indicator	Latin	Common Name	Indicator
Agrostis alba	Redtop	FACW	*Elymus virginicus*	Virginia Wildrye	FACW
Agrostis hyemalis	Winter bentgrass	FAC	*Eupatorium coelestinum*	Mistflower	FAC
Agrostis stolonifera	Creeping bentgrass	FACW	*Eupatorium perfoliatum*	Boneset	FACW
Bidens aristosa	Bur-marigold	FACW	*Helianthus angustifolius*	Narrowleaved Sunflower	FACW
Carex albolutescens	Greenwhite Sedge	FACW	*Heliopsis helianthoides*	Oxeye sunflower	FACU
Carex lupulina	Hop Sedge	OBL	*Hibiscus moscheutos*	Crimsoneyed rosemallow	OBL
Carex vulpinoidea	Fox Sedge	OBL	*Juncus effusus*	Soft Rush	FACW
Chamaecrista fasciculata	Partridge Pea	FACU	*Lespedeza capitata*	Roundhead Lespedeza	FACU
Chamaecrista nictitans	Sensitive Pea	FACU	*Liatris spicata*	Marsh Blazing Star	FAC
Chrsyanthemum leucanthemum	Oxeye daisy	UPL	*Monarda fistulosa*	Wild bergamot	UPL
Coreopsis lanceolata	Lance-leaved Coreopsis	NI	*Panicum clandestinum*	Deertongue	FAC
Coreopsis tinctoria	Plains Coreopsis	FAC	*Panicum rigidulum*	Redtop Panicgrass	FACW
Cosmos bipinnatus	Cosmos	FACU	*Rudbeckia hirta*	Black eyed Susan	FACU
Desmodium canadense	Showy ticktrefoil	FAC	*Tridens flavus*	Purpletop	FACU
Echinacea purpurea	Coneflower	NI	*Verbena hastata*	Blue vervain	FACW

8.5.2 Nuisance Species Management

Invasive plant species will be observed and controlled mechanically and/or chemically as part of this project. No other nuisance species controls are proposed at this time. Inspections for beaver and other potential nuisance species will occur throughout the monitoring period. Appropriate actions may be taken to ameliorate any negative impacts regarding vegetation development and/or water management on an as-needed basis. The presence of nuisance species will be monitored throughout the monitoring period. Appropriate actions will be taken to ameliorate any negative impacts regarding vegetation development and/or water management on an as-needed basis.

9 MONITORING AND SUCCESS CRITERIA

Monitoring will be conducted by Axiom Environmental, Inc based on the schedule in Table 22. A monitoring summary is outlined in Table 23 (Figure 11, Appendix A). Annual monitoring reports will be submitted to the NCDMS by Restoration Systems no later than December 31 of each monitoring year data is collected.

Table 22. Monitoring Schedule

Resource	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Streams	x	x	x		x		x
Wetlands	x	x	x	x	x	x	x
Vegetation	x	x	x		x		x
Benthic	x	x	x		x		x
Visual Assessment	x	x	x	x	x	x	x
Report Submittal	x	x	x	x	x	x	x

Table 23. Monitoring Summary

Stream Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Stream Profile	Full longitudinal survey	As-built (unless otherwise required)	All restored stream channels	Graphic and tabular data.
Stream Dimension	Cross-sections	Years 1, 2, 3, 5, and 7	Total of 12 cross-sections on restored channels	Graphic and tabular data.
Channel Stability	Visual Assessments	Yearly	All restored stream channels	Areas of concern will be depicted on a plan view figure with a written assessment and photograph of the area included in the report.
		Yearly	Photo Points upstream and downstream of all crossings and at pipe in-falls and outfalls to the Site.	Photographic data.
	Additional Cross-sections	Yearly	Only if instability is documented during monitoring	Graphic and tabular data.
Stream Hydrology	Continuous monitoring of surface water gauges and/or trail camera	Continuous recording through the monitoring period	4 surface water gauges on UT 2A, UT 3, UT 4, and UT 5	Surface water data for each monitoring period
Bankfull Events	Continuous monitoring of surface water gauges and/or trail camera	Continuous recording through the monitoring period	2 surface water gauges on UT 1 and UT 4	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through the monitoring period	All restored stream channels	Visual evidence, photo documentation, and/or rain data.
Benthic Macroinvertebrates	"Qual 4" method described in *Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates, Version 5.0* (NCDWR 2016)	Pre-construction, Years 3, 5, and 7 during the "index period" referenced in *Small Streams Biocriteria Development* (NCDWQ 2009)	Benthic collection stations will be located along UT 1 and UT 4, as depicted on Figure 11 (Appendix A).	Results* will be presented on a site-by-site basis and will include a list of taxa collected, an enumeration of *Ephemeroptera, Plecoptera,* and *Tricopetera* taxa as well as Biotic Index values.

Table 23. Monitoring Summary (continued)

Wetland Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Wetland Restoration	Groundwater gauges	Years 1, 2, 3, 4, 5, 6, and 7 throughout the year, with the growing season defined as April 14-October 25*	9 gauges spread throughout restored and created wetlands	Groundwater and rain data for each monitoring period
Vegetation Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Vegetation establishment and vigor	Permanent vegetation plots 0.0247 acres (100 square meters) in size; *DMS vegetation production tool.*	As-built, Years 1, 2, 3, 5, and 7	7 plots spread across the Site and 4 Understory Vegetation Transects	Species, height, planted vs. volunteer, stems/acre
	Annual random vegetation plots, 0.0247 acres (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	4 as needed to determine vegetation density in a questionable area and 5 Understory Vegetation Transects	Species and height

**Growing season is based on WETS data for the last 30-year period (WETS Station Boone 1 SE, NC).*

Easement integrity will occur annually during typical monitoring activities. Issues of encroachment will be reported and rectified. If encroachment is severe, IRT members will be notified, and Adaptive Management will be approved by the IRT prior to implementation. Prior to Site closeout, a specific Site visit will occur to ensure proper signage and marking for State Properties to accept the easement. Approval from State Properties will be required prior to project closeout.

9.1 Success Criteria

Monitoring and success criteria for stream restoration should relate to project goals and objectives identified from on-site NC SAM and NC WAM data collection. From a mitigation perspective, several goals and objectives are assumed to be functionally elevated by restoration activities without direct measurement. Other goals and objectives will be considered successful upon achieving success criteria. The following summarizes Site success criteria.

Table 24. Success Criteria

Streams
• All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05. • Bank height ratio (BHR) cannot exceed 1.2 at any measured cross-section. • BHR at any measure riffle cross-section should not change by more than 10% from baseline condition during any given monitoring period. • The stream project shall remain stable, and all other performance standards shall be met through four separate bankfull events occurring in separate years during the monitoring years 1-7. • Intermittent streams will demonstrate at least 30-days of consecutive flow.
Wetland Hydrology
• Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 12 percent of the growing season during average climatic conditions.
Vegetation
• Within planted portions of the Site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 5, and a minimum of 210 stems per acre must be present at year 7. • Trees must average 6 feet in height at year 5, and 8 feet in height at year 7 in each plot. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the site; natural recruits not on the planting list may be considered by the IRT on a case-by-case basis.

9.2 Contingency

If stream success criteria are not fulfilled, a mechanism for contingency will be implemented.

9.2.1 Stream Contingency

Stream contingency may include, but may not be limited to, 1) structure repair and/or installation; 2) repair of dimension, pattern, and/or profile variables; and 3) bank stabilization. The method of contingency is expected to be dependent upon stream variables that are not in compliance with success criteria. Primary concerns, which may jeopardize stream success, include 1) structure failure, 2) headcut migration through the Site, and/or 3) bank erosion.

Structure Failure

If structures are compromised, the affected structure will be repaired, maintained, or replaced. Once the structure is repaired or replaced, it must function to stabilize adjacent stream banks and/or maintain grade control within the channel. Structures that remain intact but exhibit flow around, beneath, or through the header/footer will be repaired by excavating a trench on the upstream side of the structure and reinstalling filter fabric in front of the pilings. Structures that have been compromised, resulting in shifting or collapse of a header/footer, will be removed and replaced with a structure suitable for Site flows.

Headcut Migration Through the Site

If a headcut occurs within the Site (identified visually or through measurements [i.e., bank-height ratios exceeding 1.4]), provisions for impeding headcut migration and repairing damage caused by the headcut will be implemented. Headcut migration may be impeded by installing in-stream grade control structures (rip-rap sill and/or log cross-vane weir) and/or restoring stream geometry variables until channel stability is achieved. Channel repairs to stream geometry may include channel backfill with coarse material and stabilizing the material with erosion control matting, vegetative transplants, and/or willow stakes.

Bank Erosion

If severe bank erosion occurs within the Site, resulting in the incision, lateral instability, and/or elevated width-to-depth ratios locally or systemically, contingency measures to reduce bank erosion and the width-to-depth ratio will be implemented. Bank erosion contingency measures may include the installation of log-vane weirs and/or other bank stabilization measures. If the resultant bank erosion induces shoot cutoffs or channel abandonment, a channel may be excavated to reduce shear stress to stable values.

Beaver and other Invasive Species

Indications of beaver establishment will be monitored throughout the 7-year monitoring period. If beavers are identified on the Site, the dam's location will be depicted on CCPV mapping, and the beaver will be trapped during the following fall/winter. Once the beaver has been trapped, the dam will be removed. Removal of the dam is expected to occur by hand to minimize disturbance to the adjacent mitigation areas.

When invasive species controls are required by the IRT, species such as multiflora rose (*Rosa multiflora*), Russian olive (*Eleagnus angustifolium*), Chinese privet (*Ligustrum sinense*), and tree of heaven (*Ailanthus altissima*) will be treated by cutting and directly treating the stump with Garlon 4A (or other similar materials) to minimize re-sprouting. Appropriate actions to ameliorate any negative impacts regarding vegetation development and/or water management will occur on an as-needed basis. Additional monitoring or other contingency measures will be determined by consultation with the IRT.

Road/Culvert Maintenance

Observation of road crossings/culverts will occur during regular monitoring visits conducted at the Site. Culverts will be monitored and photographed primarily for blockage; however, it will also be noted if erosion occurs. Roadbeds, culverts, and crossings will be monitored for the seven-year monitoring period to ensure that no additional sediment deposition is occurring within the Site. Once the seven-year monitoring period has expired, maintenance of the crossing will be the responsibility of the landowner.

Development/Logging

The Site is located in a region that is not expected to experience extensive development. In addition, the Site encompasses a significant portion of the headwater watershed, which should protect the Site from erosion resulting from development and/or logging.

9.2.2 Wetland Contingency

Hydrological contingency will require consultation with hydrologists and regulatory agencies if wetland hydrology enhancement is not achieved. Floodplain surface modifications, including the construction of ephemeral pools, are likely to increase the floodplain area in support of jurisdictional wetlands. Recommendations for a contingency to establish wetland hydrology will be implemented and monitored until Hydrology Success Criteria are achieved. IRT consultation and approval will be necessary if future earthwork is proposed. In addition, if the depth of ephemeral pools exceeds 1 foot, the credit ratio may be changed to reflect wetland creation.

9.2.3 Vegetation Contingency

Supplemental planting may be performed with tree species approved by regulatory agencies if vegetation success criteria are not achieved. Supplemental planting will be performed as needed until vegetation success criteria are achieved.

In addition to the species listed in Table 21, regionally appropriate species might be used in the event of nursery shortages or poor survival due to inherent site conditions. Those species include the following: *Acer negundo, Aesculus flava, Amelanchier arborea, Asimina triloba, Betula lenta, Carpinus caroliniana, Carya glabra, Celtis occidentalis, Fraxinus americana, Illex opeca, Magnolia fraseri, Malus angustifolia, Prunus serotina, Quercus coccinea, Quercus falcata, Quercus michauxii, Quercus montana, Quercus shumardii, Tilia americana, Ulmus rubra*, and *Xanthorhiza simplicissima*.

9.3 Compatibility with Project Goals

Table 25 outlines the compatibility of the Site's performance criteria described above to Site goals and objectives that will be utilized to evaluate if Site goals and objectives are achieved.

Table 25. Compatibility of Performance Criteria to Project Goals and Objectives

Goals	Objectives	Success Criteria
(1) HYDROLOGY		
• Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	• Construct a new channel at historic floodplain elevation to restore overbank flows and restore jurisdictional wetlands • Remove a ditch network that contributes surface waters directly to the channel • Restore overbank flooding by constructing channels at historic floodplain elevation	• BHR not to exceed 1.2 • Document four overbank events in separate monitoring years • Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria
• Restore and enhance groundwater hydrology to drained or impacted hydric soil areas.	• Construct a new channel at historic floodplain elevation to restore overbank flows and restore jurisdictional wetlands • Remove a ditch network that contributes surface waters directly to the channel • Restore/enhance jurisdictional wetlands adjacent to Site streams	• Cross-section measurements indicate a stable channel with an appropriate substrate • Visual documentation of stable channels and structures • BHR not to exceed 1.2 • < 10% change in BHR in any given year • Livestock excluded from the easement • Attain Vegetation Success Criteria
(1) WATER QUALITY		
• Restore and enhance native floodplain and streambank vegetation.	• Remove livestock and reduce agricultural land/inputs • Plant woody riparian buffer • Restore/enhance jurisdictional wetlands adjacent to Site streams	• Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria
(1) HABITAT		
• Improve stability of stream channels.	• Construct channels with a proper pattern, dimension, and longitudinal profile • Remove livestock from the Site • Construct stable channels that do not contribute sediment to downstream receiving waters • Construct stable channels with woody debris available as instream habitat • Plant woody riparian buffer to provide organic matter and shade • Protect riparian buffers with a perpetual conservation easement • Stabilize stream banks • Install in-stream structures	• Cross-section measurements indicate a stable channel with an appropriate substrate • Visual documentation of stable channels and in-stream structures. • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria

10 ADAPTIVE MANAGEMENT PLAN

If the mitigation Site or a specific component of the Site fails to achieve the necessary performance standards as specified in the mitigation plan and 2016 NCIRT guidance, the sponsor shall notify the Division on Mitigation Services (DMS). They, in turn, will inform members of the IRT. The Sponsor and DMS will work with the IRT to develop contingency plans for remedial actions.

During a Site walkthrough conducted on October 18, 2023, the IRT requested an adaptive management plan for hydrologic trespass. Alternatives for adaptive management may include the following.

1) Construct a berm to limit hydrologic trespass outside of the easement.
2) Add drain tile outside of the easement and ensure the drain tile does not encroach into the easement. The drain tile must discharge at the floodplain elevation and outside the easement boundary.
3) Build up the floodplain outside of the easement such hydrologic trespass no longer exists.

11 LONG-TERM MANAGEMENT PLAN

The Site will be transferred to the NCDEQ Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspections of the Site to ensure that restrictions required in the conservation easement are upheld. Funding will be supplied by the responsible party on a yearly basis until such time an endowment is established. The NCDEQ Stewardship Program is developing an endowment system within the non-reverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General 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.

12 REFERENCES

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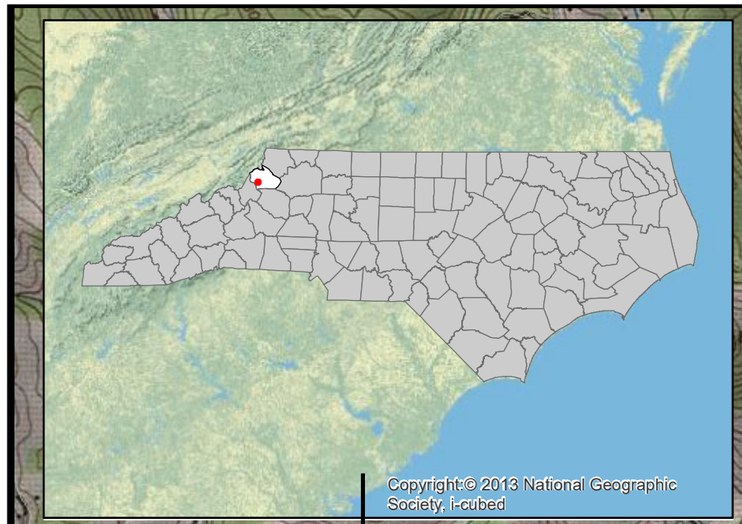
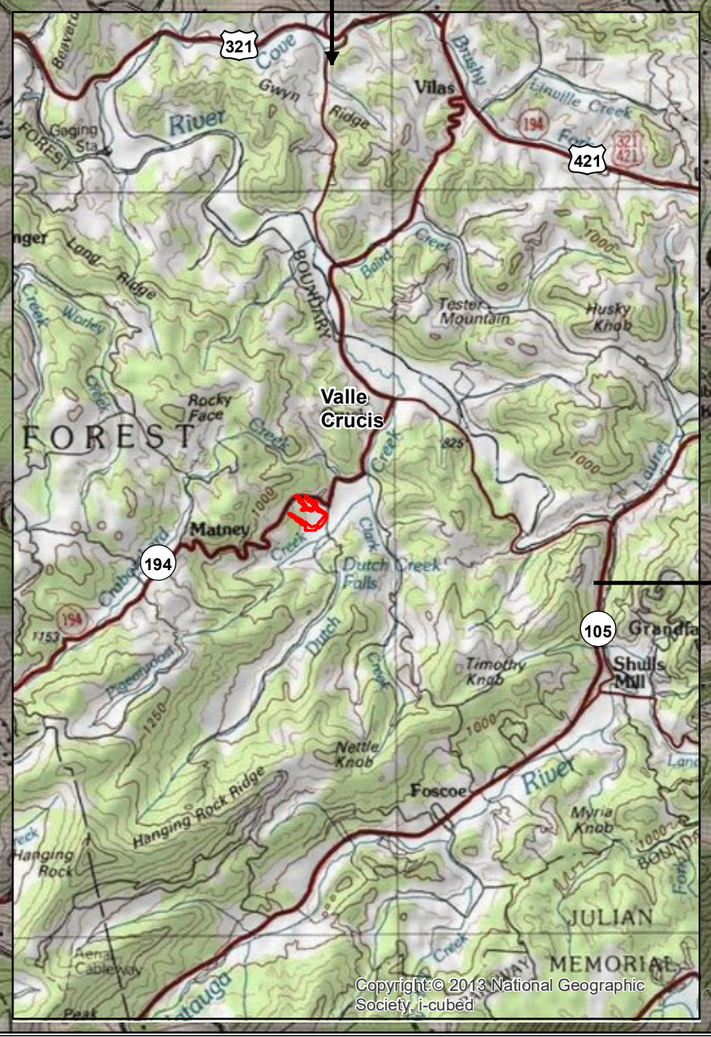
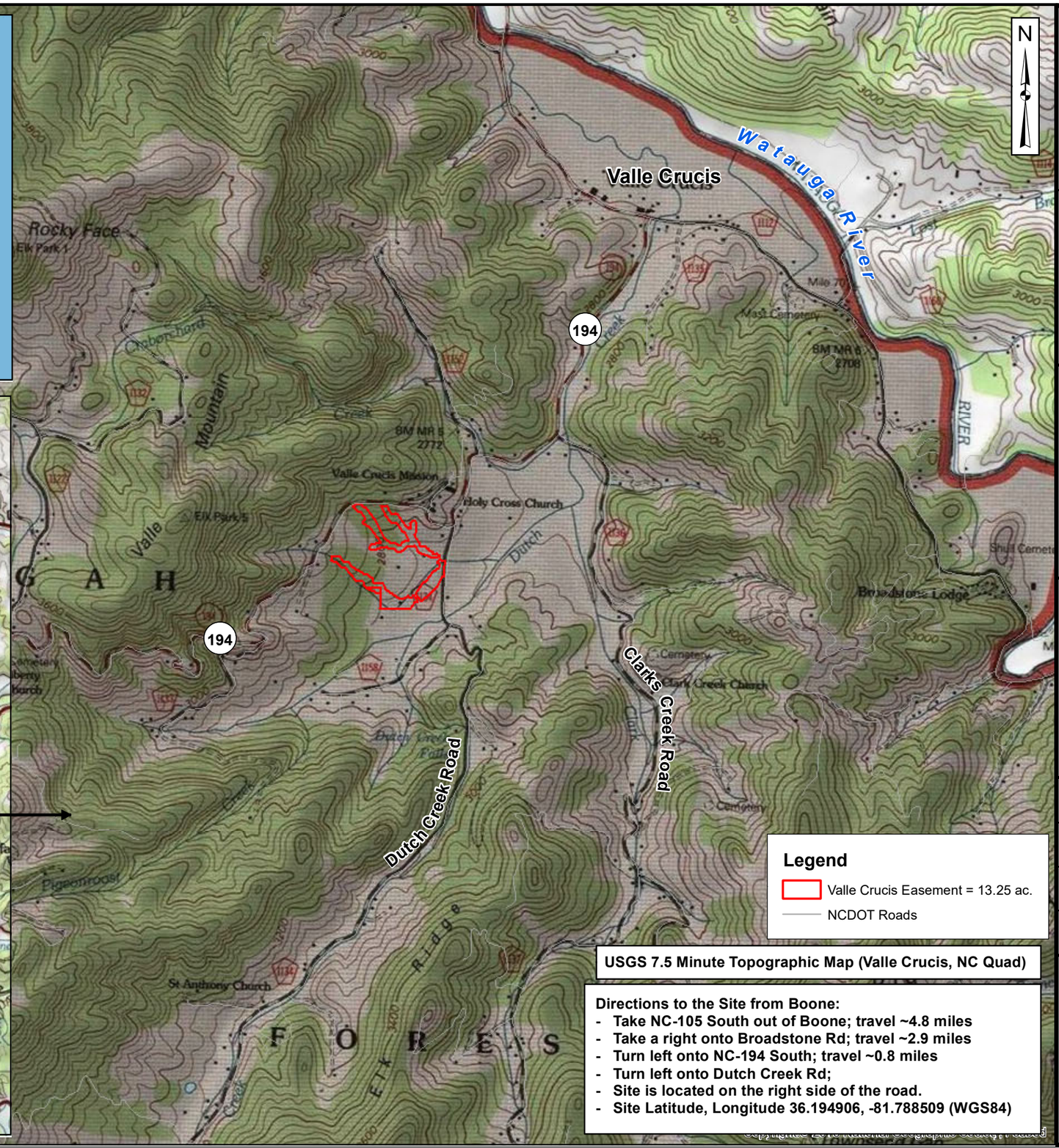
APPENDIX A - FIGURES







Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

SITE LOCATION

Drawn by: KRJ

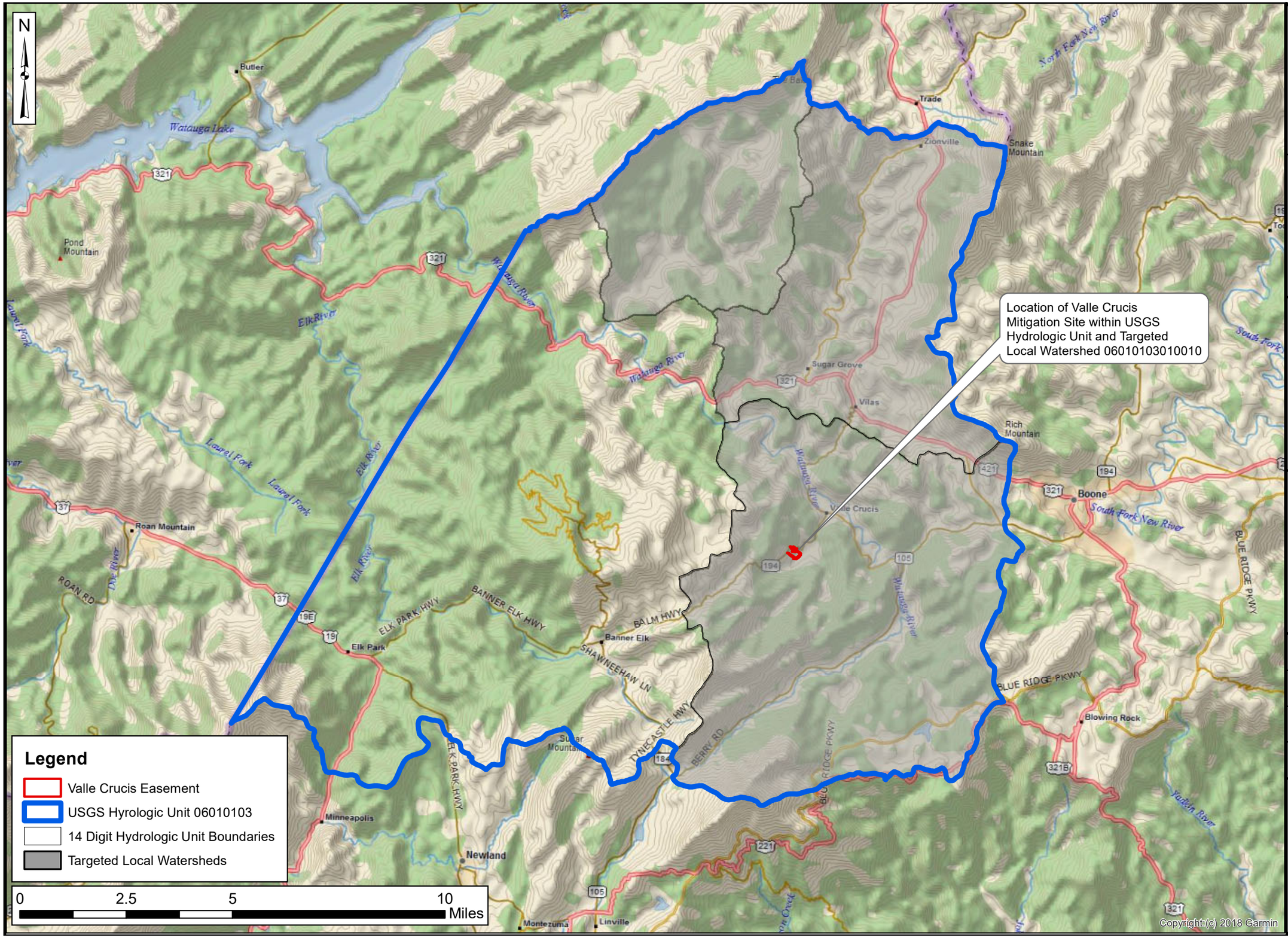
Date: JULY 2022

Scale: 1:100,000

Project No.: 21-018

FIGURE

1



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RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watagua County, NC

Title:

HYDROLOGIC UNIT MAP

Drawn by: KRJ

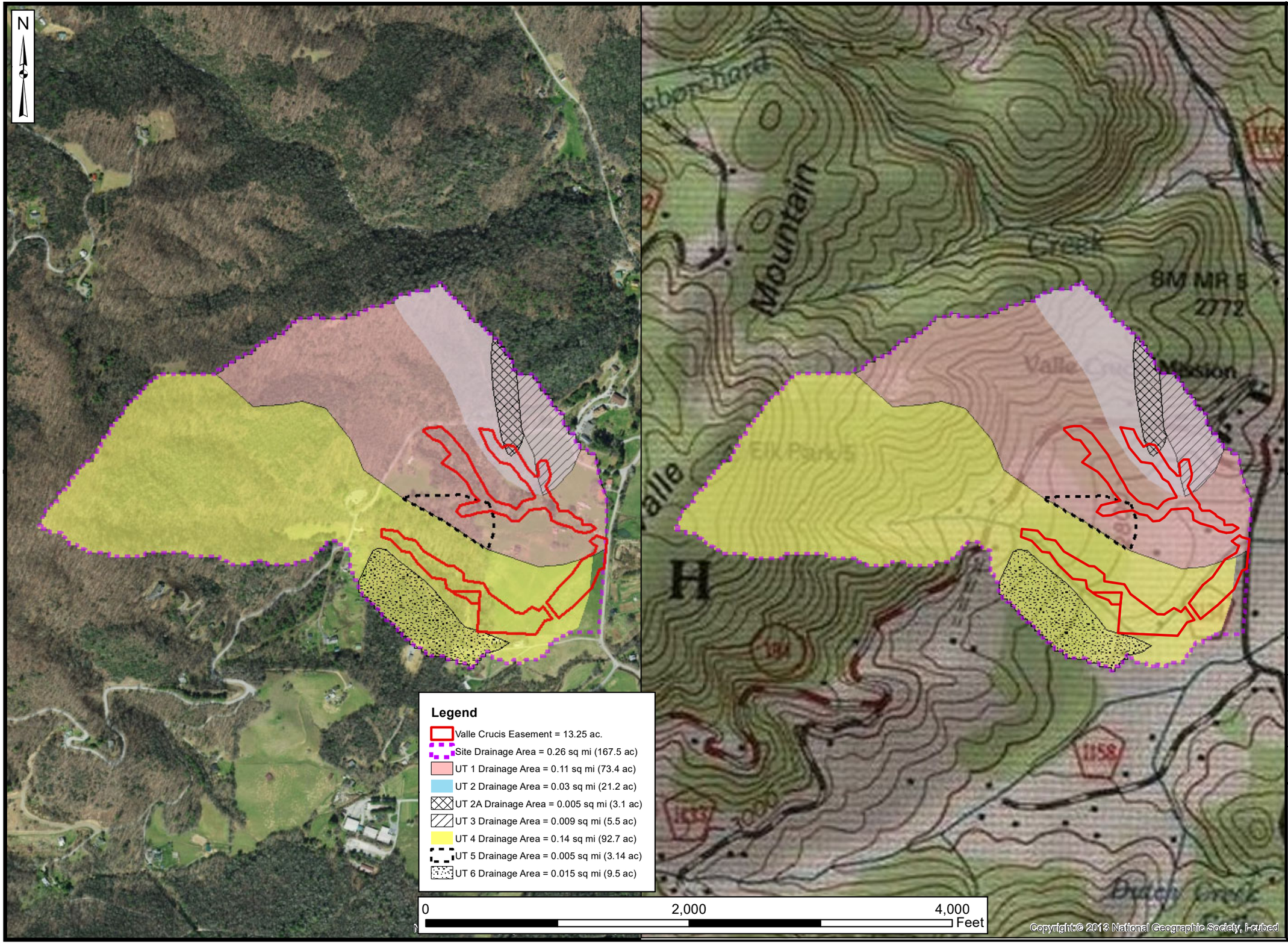
Date: JUN 2021

Scale: 1:135,000

Project No.: 21-018

FIGURE

2



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Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

TOPOGRAPHY AND DRAINAGE AREA

Drawn by: KRJ

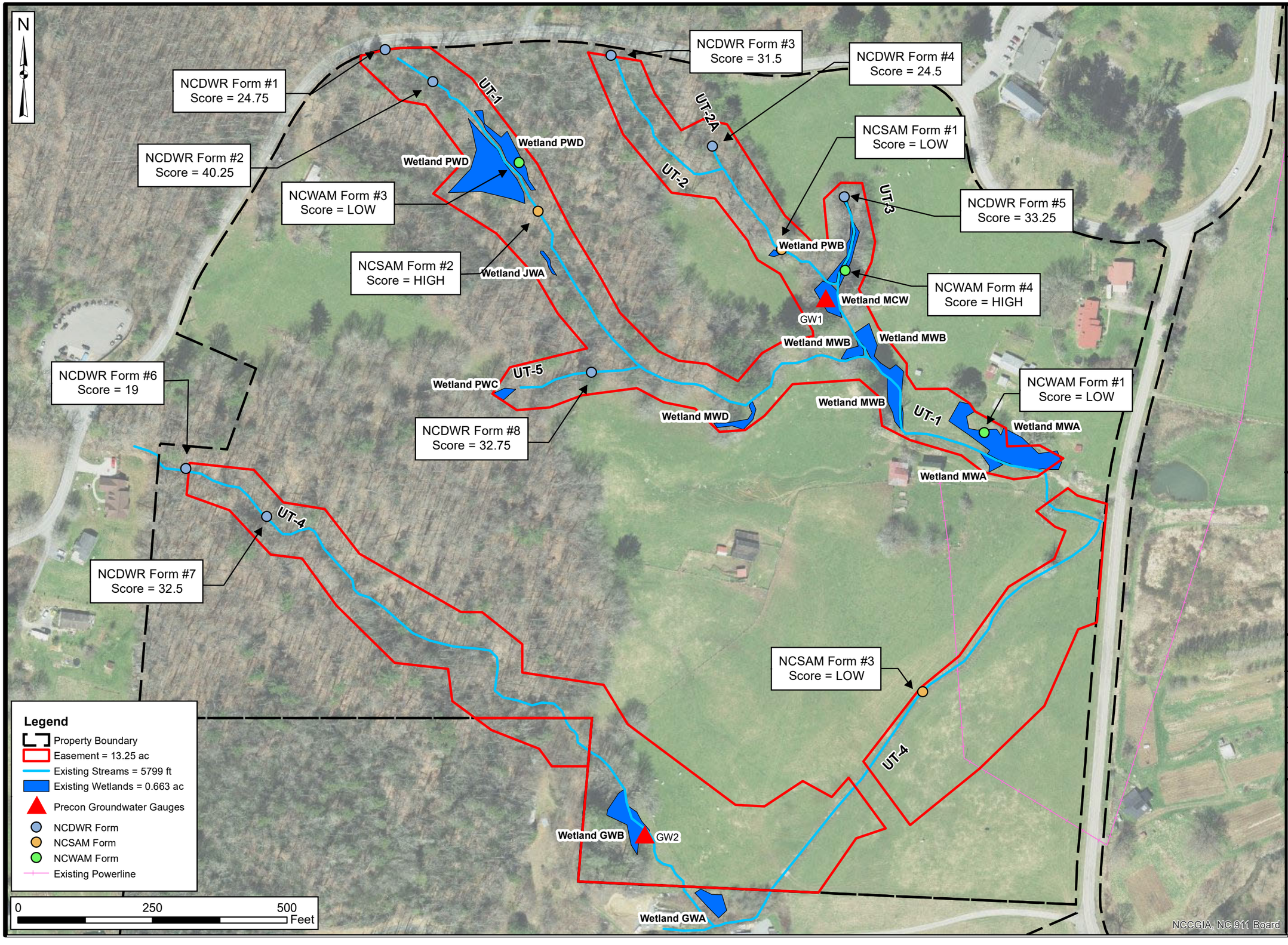
Date: JUIY 2022

Scale: 1:8,000

Project No.: 21-018

FIGURE

3



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VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

EXISTING CONDITIONS

Drawn by: KRJ

Date: JULY 2022

Scale: 1:2000

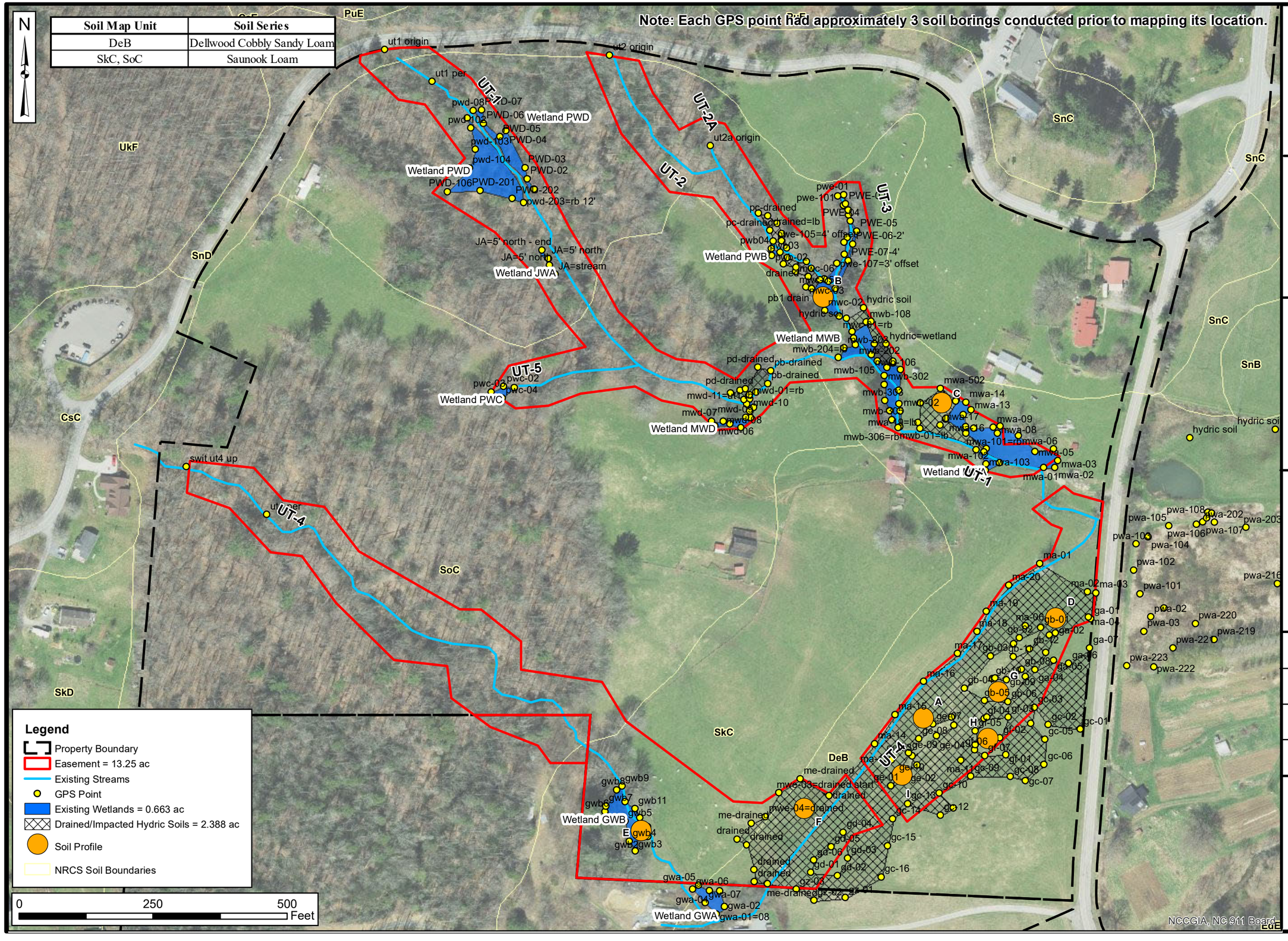
Project No.: 21-018

FIGURE

4

Soil Map Unit	Soil Series
DeB	Dellwood Cobbly Sandy Loam
SkC, SoC	Saunook Loam

Note: Each GPS point had approximately 3 soil borings conducted prior to mapping its location.



Legend

- Property Boundary
- Easement = 13.25 ac
- Existing Streams
- GPS Point
- Existing Wetlands = 0.663 ac
- Drained/Impacted Hydric Soils = 2.388 ac
- Soil Profile
- NRCS Soil Boundaries

0 250 500 Feet

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VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

SOILS

Drawn by: KRJ

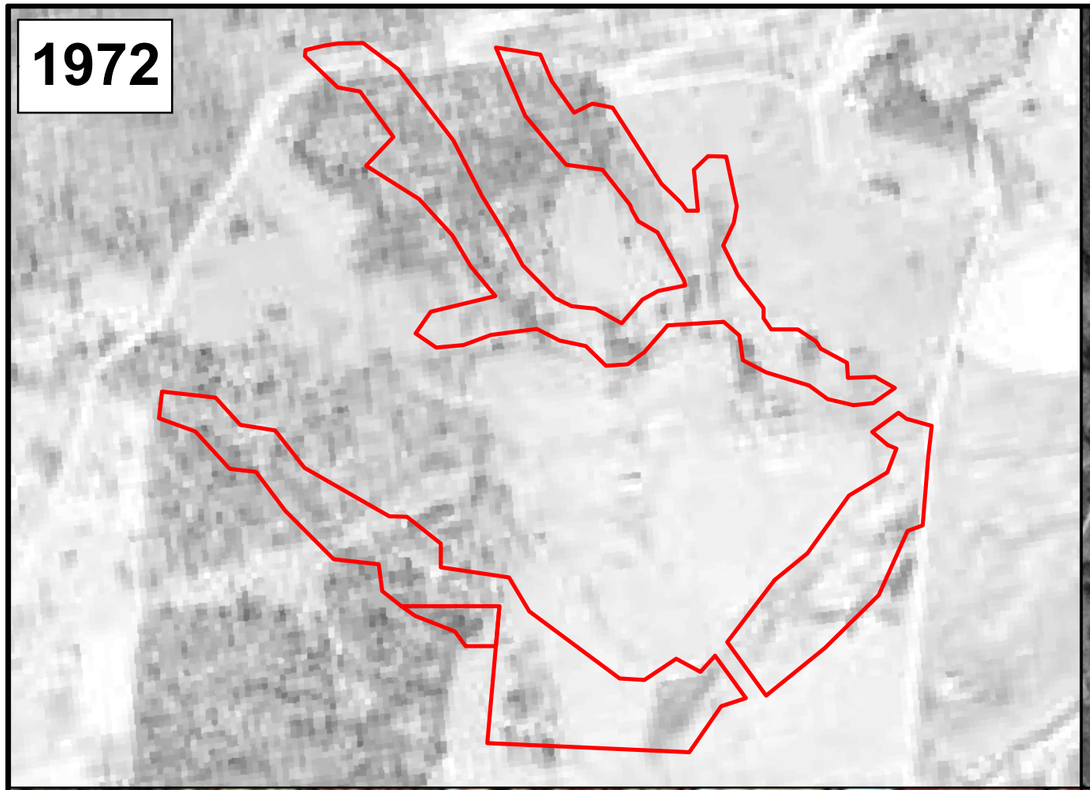
Date: JULY 2022

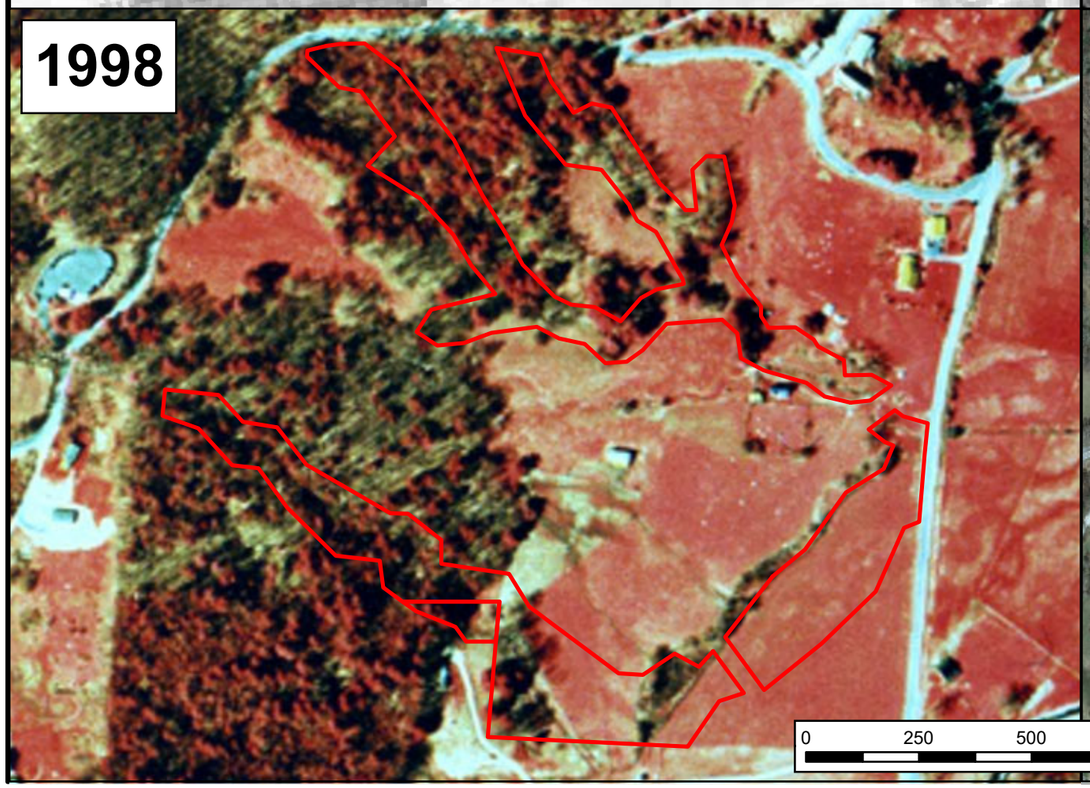
Scale: 1:2000

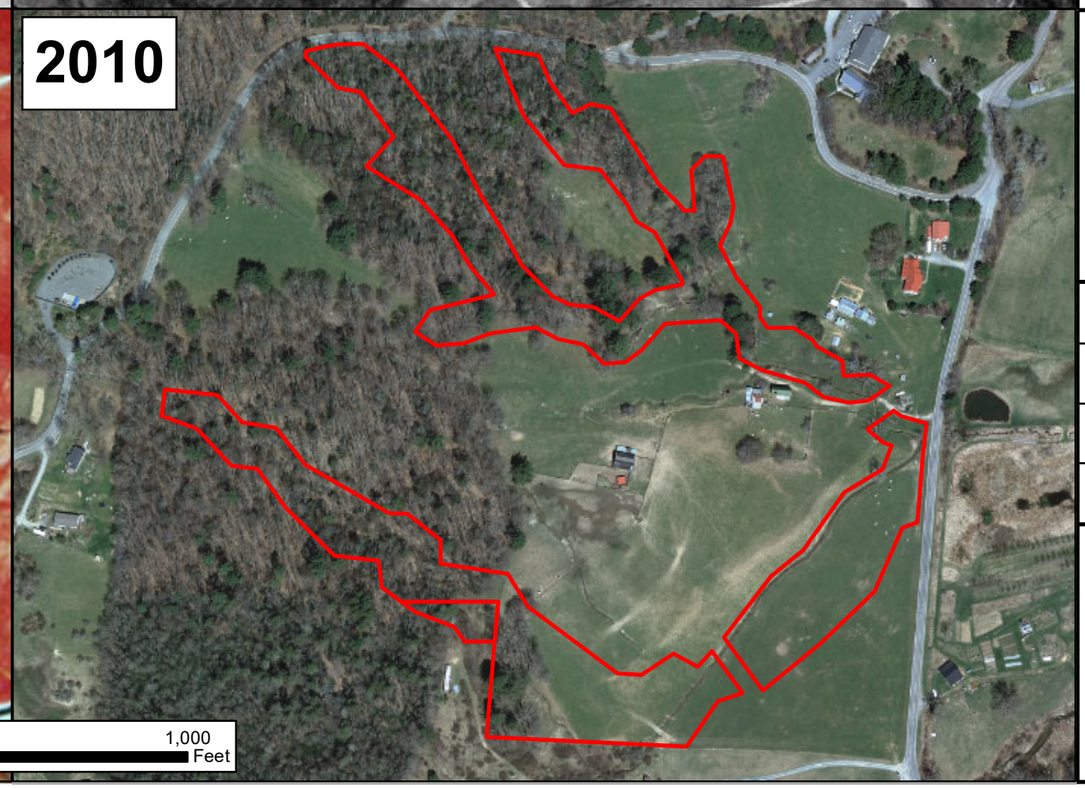
Project No.: 21-018

FIGURE

5







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VALLE CRUCIS STREAM AND WETLAND MITIGATION SITE

Watauga County, NC

Title:

HISTORIC CONDITIONS

Drawn by: KRJ

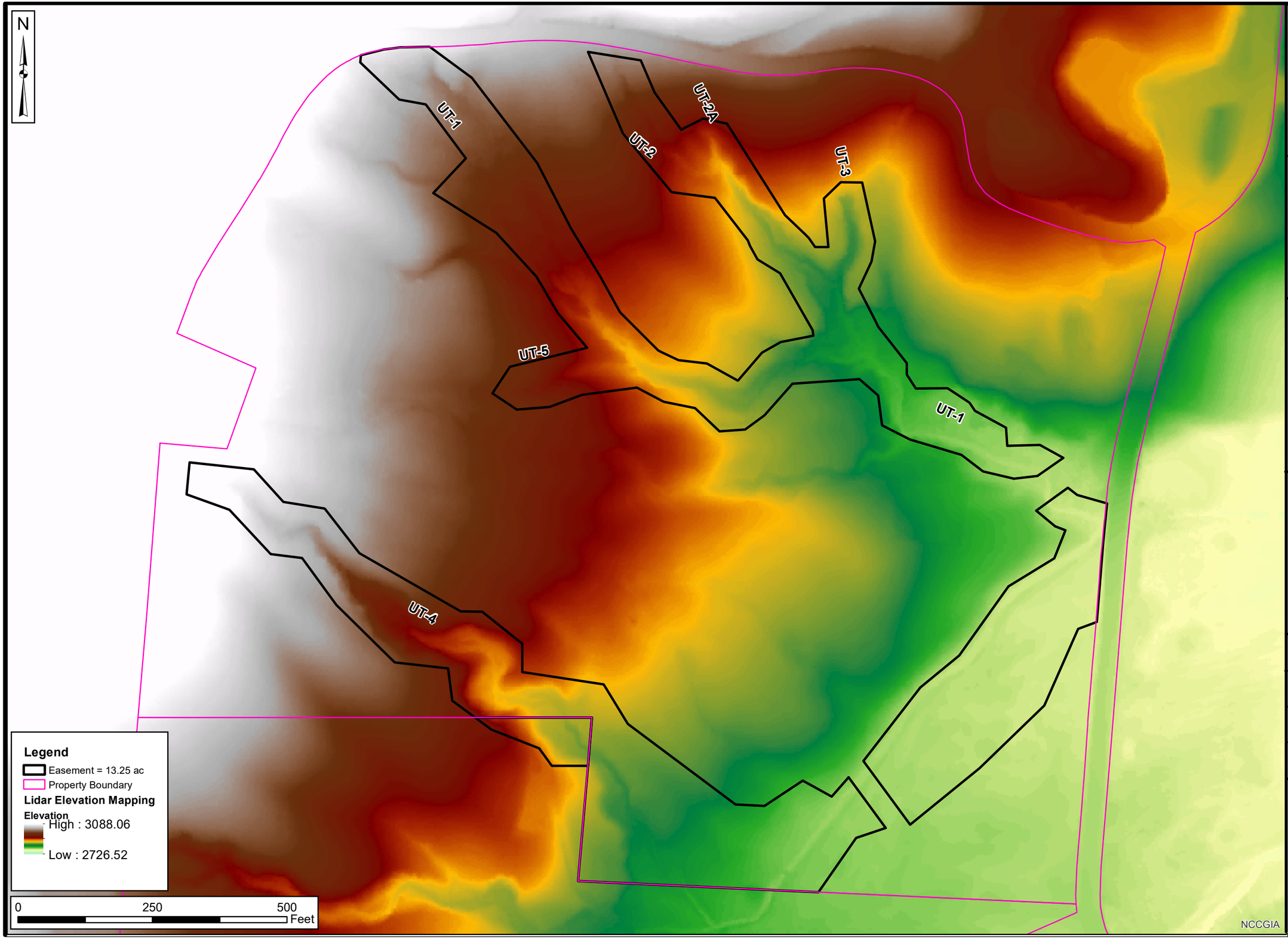
Date: JUL 2021

Scale: 1:4000

Project No.: 21-018

FIGURE

6



Axiom Environmental, Inc.

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Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

LIDAR

Drawn by: KRJ

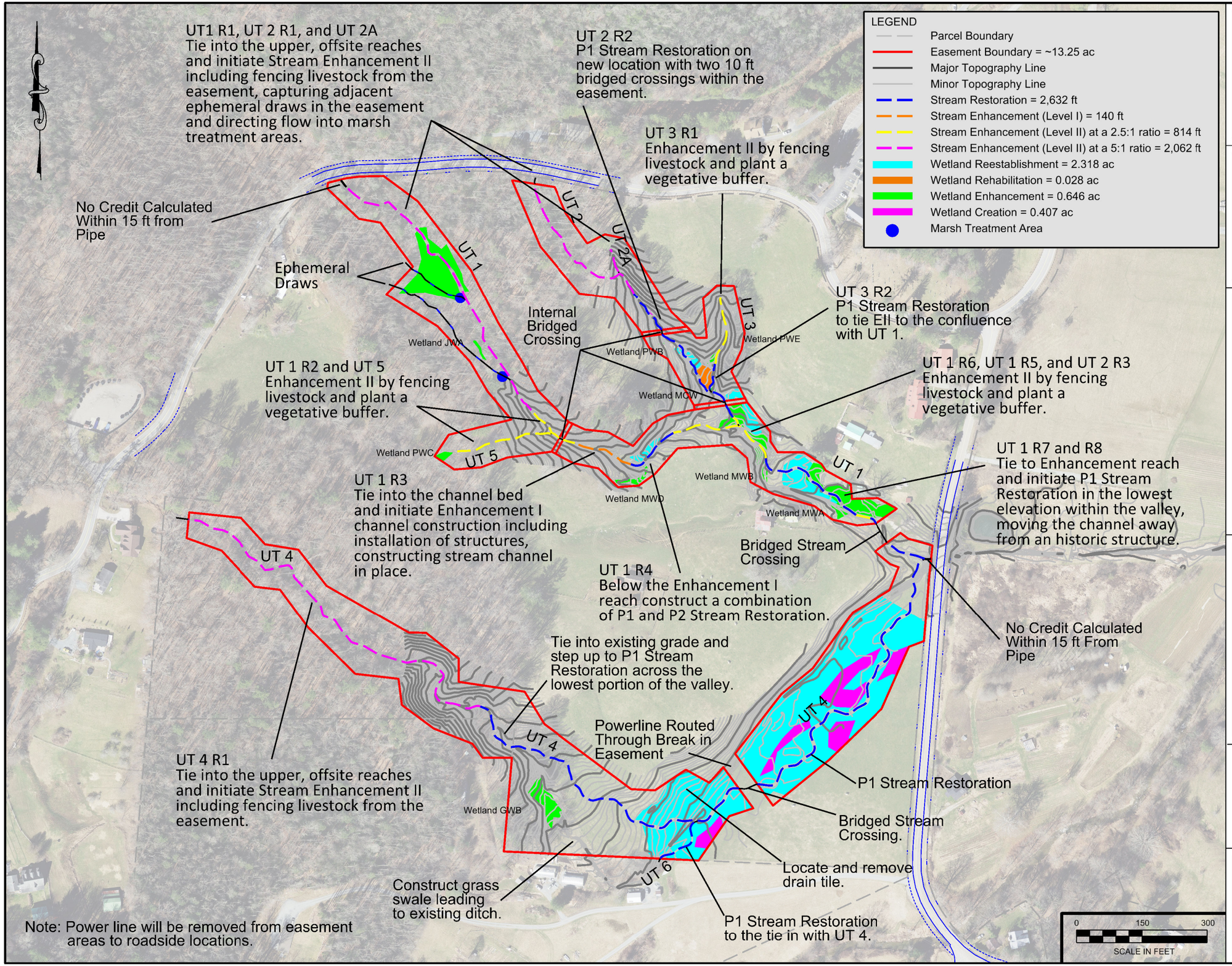
Date: JUN 2021

Scale: 1:3000

Project No.: 21-001

FIGURE

7



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NOTES/REVISIONS

Project:

Valle Crucis Mitigation Site
Watauga County
North Carolina

Title:

Proposed Conditions

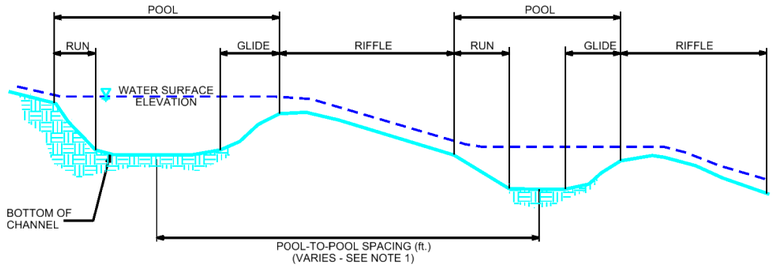
Scale: As Shown

Date: July 2022

Project No.: 21-018

FIGURE NO.

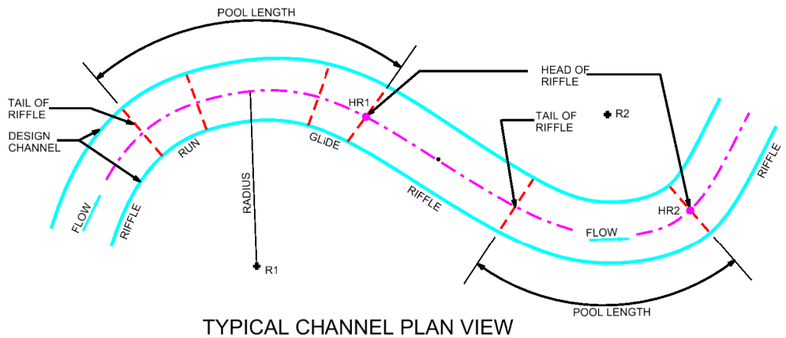
8



TYPICAL CHANNEL PROFILE

NOTES:

1. POOL-TO-POOL SPACING IS MEASURED FROM CENTER OF POOL BEND TO CENTER OF POOL BEND.

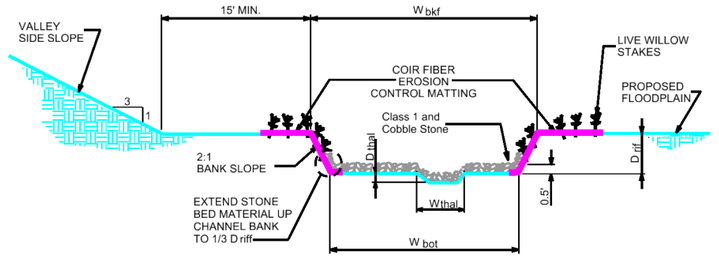


TYPICAL CHANNEL PLAN VIEW

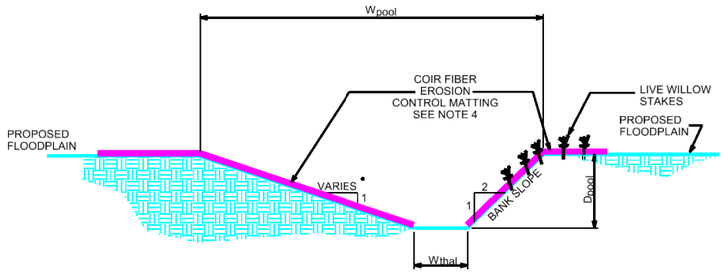
CHANNEL PLAN VIEW NOTES:

1. THE CONTRACTOR SHALL LAYOUT THE CHANNEL ALIGNMENT BY LOCATING THE RADII AND SCRIBING THE CENTER LINE FOR EACH POOL BEND. THE CONNECTING TANGENT SECTIONS SHALL COMPLETE THE LAYOUT OF THE CHANNEL.

2. FIELD ADJUSTMENTS OF THE ALIGNMENT MAY BE REQUIRED TO SAVE TREES OR AVOID OBSTACLES. THE STAKE-OUT SHALL BE APPROVED BY THE CONSTRUCTION MANAGER BEFORE CONSTRUCTION OF THE CHANNEL.



TYPICAL RIFFLE CROSS-SECTION



TYPICAL POOL CROSS-SECTION

CHANNEL CONSTRUCTION NOTES:

1. MATERIAL EXCAVATED FROM CHANNEL AND FLOODPLAIN SHALL BE USED TO BACKFILL EXISTING CHANNEL.

2. BANK PROTECTION SHALL CONSIST OF NATURAL COIR FIBER MATTING.

3. THE CONTRACTOR SHALL SUPPLY BED MATERIAL FOR THE ENTIRE BED LENGTH OF EACH RIFFLE SECTION. THE BED MATERIAL SHALL CONSIST OF A MIX OF CLASS A AND SMALLER STONE.

CROSS-SECTION DIMENSIONS

REACH	Wbkf (ft.)	Wbot (ft.)	Driff (ft.)	Dthal (ft.)	Dpool (ft.)	Wpool (ft.)	Wthal (ft.)
UT 1	8.3	4.7	0.8	0.1	0.9	9.9	1.0
UT 2	5.4	3.0	0.5	0.1	0.6	6.5	1.0
UT 3	4.1	2.1	0.4	0.1	0.5	4.9	1.0
UT 4 Downstream of UT 6	8.7	5.1	0.8	0.1	0.9	10.4	1.0
UT 4 Upstream of UT 6	8.9	5.3	0.8	0.1	1.0	10.7	1.0
UT 6	4.1	2.1	0.4	0.1	0.5	4.9	1.0

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NOTES/REVISIONS

Project:

Valle Crucis Mitigation Site
Watauga County
North Carolina

Title:

PROPOSED DIMENSION, PATTERN, AND PROFILE

Scale: NA

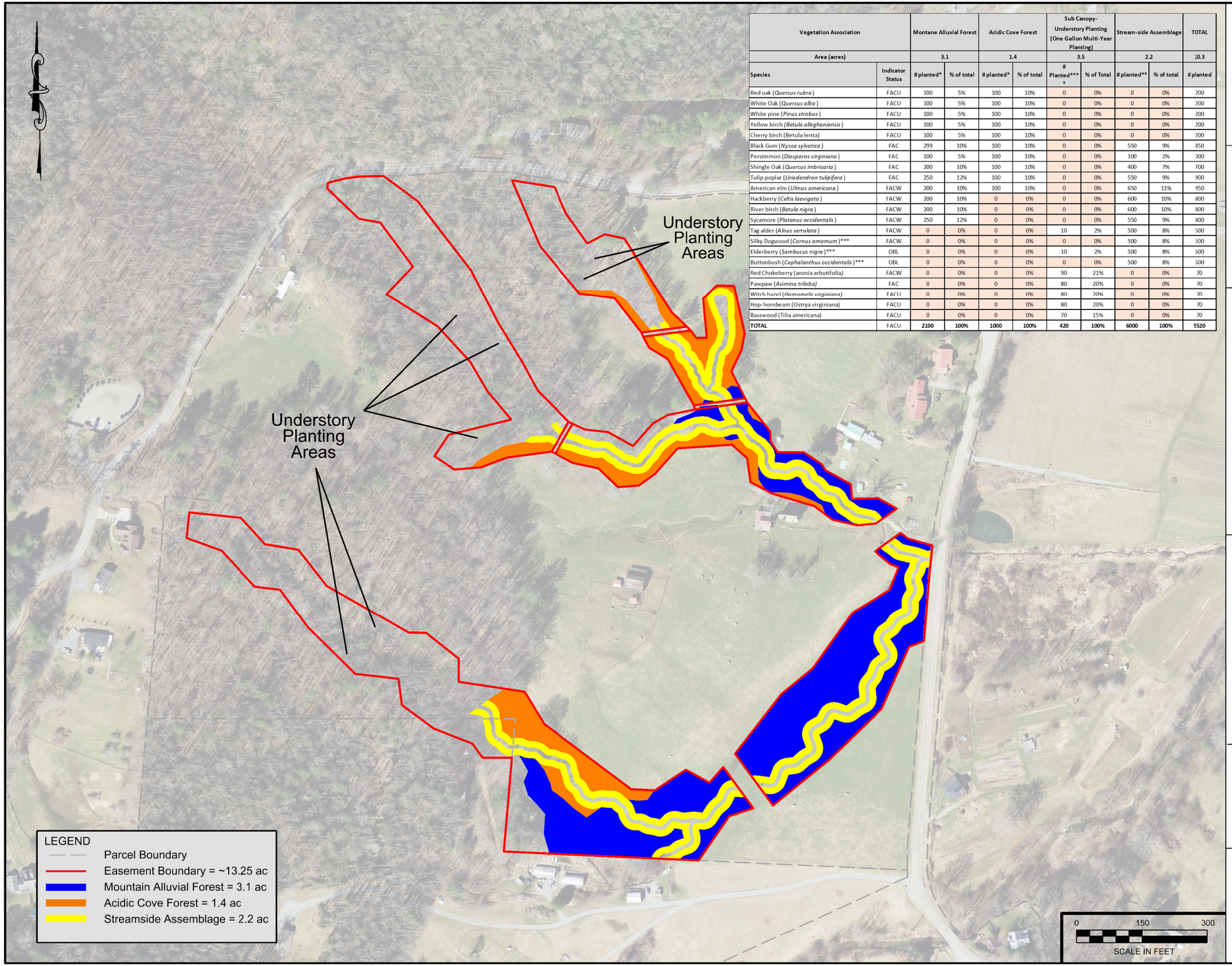
Date: July 2022

Project No.: 21-018

FIGURE NO.

9

Vegetation Association		Montane Alluvial Forest		Acidic Cove Forest		Sub Canopy- Understory Planting (One Gallon Multi-Year Planting)		Stream-side Assemblage		TOTAL
Area (acres)		3.1		1.4		3.5		2.2		10.3
Species	Indicator Status	# planted*	% of total	# planted*	% of total	# Planted***	% of Total	# planted**	% of total	# planted
Red oak (*Quercus rubra*)	FACU	100	5%	100	10%	0	0%	0	0%	200
White Oak (*Quercus alba*)	FACU	100	5%	100	10%	0	0%	0	0%	200
White pine (*Pinus strobus*)	FACU	100	5%	100	10%	0	0%	0	0%	200
Yellow birch (*Betula alleghaniensis*)	FACU	100	5%	100	10%	0	0%	0	0%	200
Cherry birch (Betula lenta)	FACU	100	5%	100	10%	0	0%	0	0%	200
Black Gum (*Nyssa sylvatica*)	FAC	299	10%	100	10%	0	0%	550	9%	850
Persimmon (*Diosporos virginiana*)	FAC	100	5%	100	10%	0	0%	100	2%	300
Shingle Oak (*Quercus imbricaria*)	FAC	200	10%	100	10%	0	0%	400	7%	700
Tulip poplar (*Liriodendron tulipifera*)	FAC	250	12%	100	10%	0	0%	550	9%	900
American elm (*Ulmus americana*)	FACW	200	10%	100	10%	0	0%	650	11%	950
Hackberry (*Celtis laevigata*)	FACW	200	10%	0	0%	0	0%	600	10%	800
River birch (*Betula nigra*)	FACW	200	10%	0	0%	0	0%	600	10%	800
Sycamore (*Platanus occidentalis*)	FACW	250	12%	0	0%	0	0%	550	9%	800
Tag alder (*Alnus serrulata*)	FACW	0	0%	0	0%	10	2%	500	8%	500
Silky Dogwood (*Cornus amomum*)***	FACW	0	0%	0	0%	0	0%	500	8%	500
Elderberry (*Sambucus nigra*)***	OBL	0	0%	0	0%	10	2%	500	8%	500
Buttonbush (*Cephalanthus occidentalis*)***	OBL	0	0%	0	0%	0	0%	500	8%	500
Red Chokeberry (aronia arbutifolia)	FACW	0	0%	0	0%	90	21%	0	0%	70
Pawpaw (*Asimina triloba*)	FAC	0	0%	0	0%	80	20%	0	0%	70
Witch hazel (*Hamamelis virginiana*)	FACU	0	0%	0	0%	80	20%	0	0%	70
Hop-hornbeam (Ostrya virginiana)	FACU	0	0%	0	0%	80	20%	0	0%	70
Basswood (Tilia americana)	FACU	0	0%	0	0%	70	15%	0	0%	70
TOTAL	FACU	**2100**	**100%**	**1000**	**100%**	**420**	**100%**	**6000**	**100%**	**9520**



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RESTORATION SYSTEMS | LLC

NOTES/REVISIONS

Project:

Valle Crucis Mitigation Site
Watauga County
North Carolina

Title:

Planting Plan

Scale: As Shown

Date: July 2022

Project No.: 21-018

FIGURE NO.

10

MONITORING LEGEND

- Vegetation Plot
- Groundwater Gauge
- Flow Gauge
- Crest Gauge
- Rain Gauge
- Random Vegetation Transect
- Permanently Monumented Cross Section
- Photo Point
- Benthic Monitoring Station

Note: 10% of Understory Plantings will be Counted for Survivorship Each Monitoring Season.

LEGEND

- Parcel Boundary
- Easement Boundary = ~13.25 ac
- Major Topography Line
- Minor Topography Line
- Stream Restoration = 2,632 ft
- Stream Enhancement (Level I) = 140 ft
- Stream Enhancement (Level II) at a 2.5:1 ratio = 814 ft
- Stream Enhancement (Level II) at a 5:1 ratio = 2,062 ft
- Wetland Reestablishment = 2.318 ac
- Wetland Rehabilitation = 0.028 ac
- Wetland Enhancement = 0.646 ac
- Wetland Creation = 0.407 ac

UT 1
UT 2
UT 2A
UT 3
UT 4
UT 4
UT 4
UT 5
UT 6
UT 1

0 150 300
SCALE IN FEET

Axiom Environmental, Inc.

RESTORATION SYSTEMS | LLC

NOTES/REVISIONS

Project:

Valle Crucis
Mitigation Site
Watauga County
North Carolina

Title:

Monitoring
Plan

Scale: As Shown

Date: July 2022

Project No.: 21-018

FIGURE NO.

11

Appendix B - Existing Stream & Wetland Data

Table B1. Morphological Stream Characteristics
Figure B1. Cross Section Locations
Existing Stream Cross-section Data
NC SAM Forms
NC WAM Forms
SWIT Forms
BEHI/NBS Data
Soil Boring Logs
Groundwater Gauge Graphs

Table B1. Valle Crucis Site Morphological Stream Characteristics

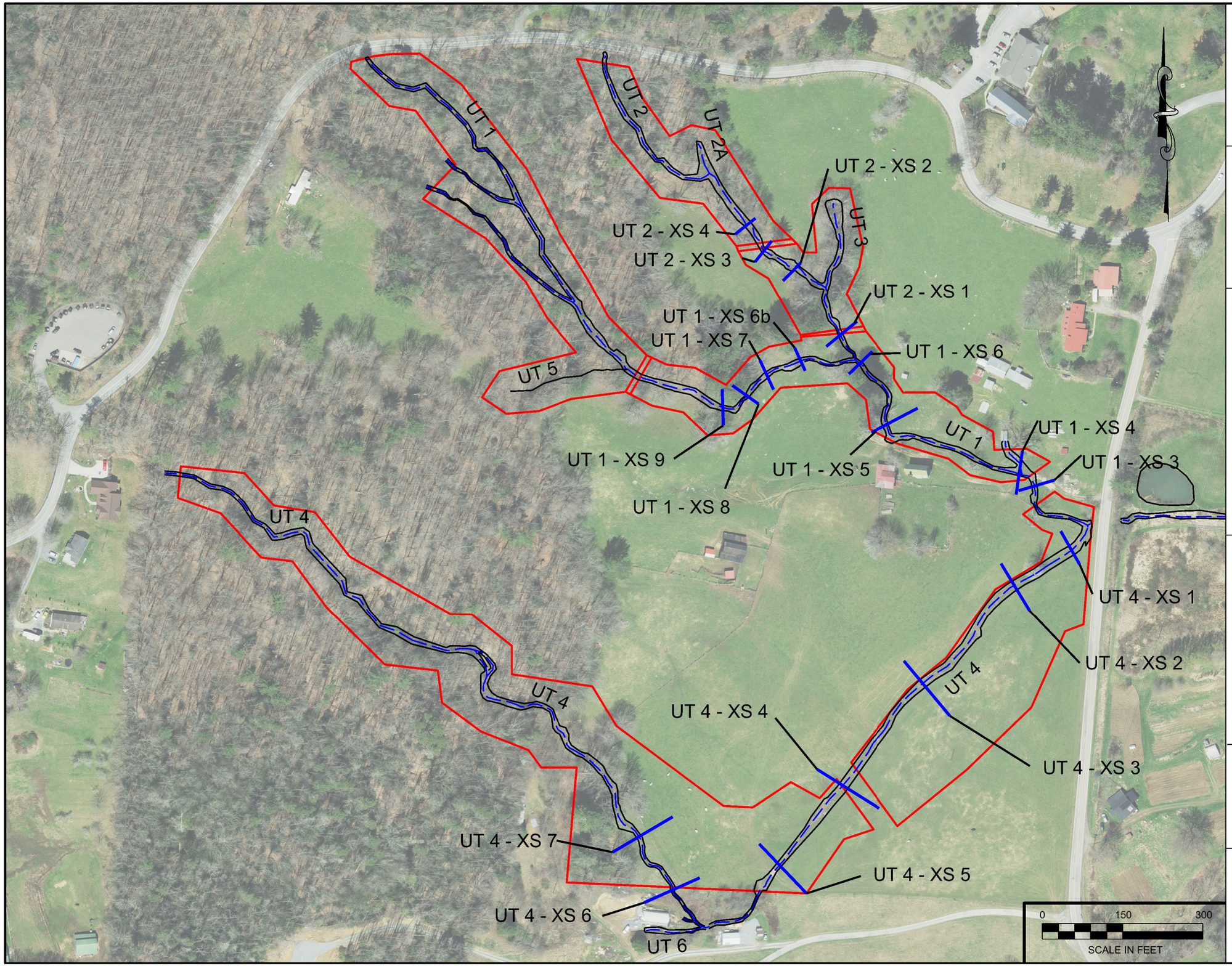
Variables	REFERENCE- CRANBERRY	REFERENCE- STONE MOUNTAIN	REFERENCE- UT TO ROCKHOUSE CREEK (Upstream)	REFERENCE- UT TO ROCKHOUSE CREEK (Downstream)	Existing (UT 1)	Proposed (UT 1)	Existing (UT 2)	Proposed (UT 2)
Stream Type	E 4	Cb 3	Eb 4	B 3	Cb/g 4	Cb 3	Fb 4	Cb 3
Drainage Area (mi^2)	0.70	7.46	0.04	0.07	0.11	0.11	0.03	0.03
Bankfull Discharge (cfs)	103.5	271.7	12.1	16.5	22.3	22.3	9.1	9.1
Dimension Variables								
Bankfull Cross-Sectional Area (A_{bkf})	20.2	46.0	2.8	3.7	4.9	4.9	2.1	2.1
Existing Cross-Sectional Area ($A_{existing}$)	19.9 - 20.4	45.9-46.1	2.5-3.1	2.3-5.0	2.0-10.4	4.9	6.8-24.5	2.1
Bankfull Width (W_{bkf})	Mean: 12.5 Range: 11.8 - 13.2	Mean: 30.1 Range: 27.2 - 33.0	Mean: 5.0 Range: 4.4-5.8	Mean: 5.8 Range: 5.1-6.5	Mean: 12.1 Range: 8.6 to 21.2	Mean: 8.3 Range: 7.7 to 8.9	Mean: 6.3 Range: 4.2 to 7.8	Mean: 5.4 Range: 5.0 to 5.8
Bankfull Mean Depth (D_{bkf})	Mean: 1.6 Range: 1.5 - 1.7	Mean: 1.6 Range: 1.4 - 1.7	Mean: 0.6 Range: 0.5-0.6	Mean: 0.7 Range: 0.5-0.8	Mean: 0.4 Range: 0.2 to 0.6	Mean: 0.6 Range: 0.6 to 0.6	Mean: 0.4 Range: 0.3 to 0.5	Mean: 0.4 Range: 0.4 to 0.4
Bankfull Maximum Depth (D_{max})	Mean: 1.9 Range:	Mean: 2.4 Range: 2.2 - 2.6	Mean: 0.7 Range: 0.7-0.8	Mean: 0.8 Range: 0.7-0.9	Mean: 0.8 Range: 0.6 2.9 0.9	Mean: 0.8 Range: 0.7 to 1.0	Mean: 0.6 Range: 0.5 to 0.8	Mean: 0.5 Range: 0.5 to 0.6
Pool Width (W_{pool})	Mean: 15.7 Range:	Mean: 24.4 Range: 23.8 - 25.0	Mean: 9.3 Range:	Mean: 5.3 Range:	No distinct repetitive pattern of riffles and pools due to staightening activities	Mean: 9.9 Range: 8.3 to 13.3	No distinct repetitive pattern of riffles and pools due to staightening activities	Mean: 6.5 Range: 5.4 to 8.7
Maximum Pool Depth (D_{pool})	Mean: 2.7 Range:	Mean: 2.7 Range: 2.6 - 2.7	Mean: 0.8 Range:	Mean: 1.2 Range:		Mean: 0.9 Range: 0.8 to 1.0		Mean: 0.6 Range: 0.5 to 0.7
Width of Floodprone Area (W_{fpa})	Mean: 75.0 Range:	Mean: 100.0 Range:	Mean: 16.0 Range: 14-20	Mean: 9.5 Range: 7.0-12.0	Mean: 47 Range: 15 to 100	Mean: 25 Range: 15 to 50	Mean: 10 Range: 6 to 17	Mean: 25 Range: 15 to 50
Dimension Ratios								
Entrenchment Ratio (W_{fpa}/W_{bkf})	Mean: 6.0 Range: 5.7 - 6.4	Mean: 3.4 Range: 3.0 - 3.7	Mean: 3.3 Range: 2.4-4.2	Mean: 1.6 Range: 1.4-1.8	Mean: 4.2 Range: 1.5 to 11.7	Mean: 3.0 Range: 2.0 to 5.6	Mean: 1.5 Range: 1.2 to 2.2	Mean: 4.6 Range: 3.0 to 8.6
Width / Depth Ratio (W_{bkf}/D_{bkf})	Mean: 7.8 Range: 7.0 - 8.5	Mean: 20.0 Range: 16.1 - 23.8	Mean: 9.0 Range: 7.3-11.6	Mean: 9.2 Range: 8.1-10.2	Mean: 32.8 Range: 15.0 to 92.0	Mean: 14.0 Range: 12.0 to 16.0	Mean: 20.0 Range: 8.1 to 29.3	Mean: 14.0 Range: 12.0 to 16.0
Max. D_{bkf}/ D_{bkf} Ratio	Mean: 1.2 Range: 1.1 - 1.3	Mean: 1.6 Range: 1.5 - 1.6	Mean: 1.3 Range: 1.2-1.4	Mean: 1.3 Range: 1.1-1.4	Mean: 1.9 Range: 1.2 to 3.0	Mean: 1.3 Range: 1.2 to 1.5	Mean: 1.8 Range: 1.6 to 2.0	Mean: 1.3 Range: 1.2 to 1.5
Low Bank Height / Max. D_{bkf} Ratio	Mean: 1.0 Range:	Mean: 1.3 Range: 1.0 - 1.6	Mean: 1.0 Range:	Mean: 1.0 Range:	Mean: 1.0 Range: 0.6 to 1.8	Mean: 1.0 Range: 1.0 to 1.3	Mean: 3.1 Range: 1.8 to 4.8	Mean: 1.0 Range: 1.0 to 1.3
Maximum Pool Depth / Bankfull Mean Depth (D_{pool}/D_{bkf})	Mean: 1.7 Range: 1.6 - 1.8	Mean: 1.7 Range: 1.6 - 1.9	Mean: 1.3 Range:	Mean: 1.8 Range:	No distinct repetitive pattern of riffles and pools due to staightening activities	Mean: 1.5 Range: 1.3 to 1.7	No distinct repetitive pattern of riffles and pools due to staightening activities	Mean: 1.5 Range: 1.3 to 1.7
Pool Width / Bankfull Width (W_{pool}/W_{bkf})	Mean: 1.3 Range: 1.2 -1.3	Mean: 0.8 Range: 0.7 - 0.9	Mean: 1.9 Range:	Mean: 0.9 Range:		Mean: 1.2 Range: 1.0 to 1.6		Mean: 1.2 Range: 1.0 to 1.6
Pool Area / Bankfull Cross Sectional Area	Mean: 1.4 Range: 1.4 - 1.5	Mean: 0.9 Range: 0.9 - 1.0	Mean: 1.3 Range:	Mean: 1.1 Range:		Mean: 1.3 Range: 1.1 to 1.5		Mean: 1.3 Range: 1.1 to 1.5

Variables	REFERENCE- CRANBERRY	REFERENCE- STONE MOUNTAIN	REFERENCE- UT TO ROCKHOUSE CREEK (Upstream)	REFERENCE- UT TO ROCKHOUSE CREEK (Downstream)	Existing (UT 1)	Proposed (UT 1)	Existing (UT 2)	Proposed (UT 2)
Pattern Variables								
Pool to Pool Spacing (L_{p-p})	Med: 54.8 Range: 37.0 - 82.6	Med: 104.3 Range: 65.2 - 166.7	Med: 19.7 Range: 7.9-30.7	Med: 32.4 Range: 21.5-45.9	No distinct repetitive pattern of riffles and pools due to staightening activities	Med: 33.1 Range: 24.8 to 49.7	No distinct repetitive pattern of riffles and pools	Med: 21.7 Range: 16.3 to 32.5
Meander Length (L_m)	Med: 103.8 Range: 76.6 - 131.0	Med: 199.4 Range: 101.7 - 273.2	Med: 30.2 Range: 22.6-37.5	Med: 43.8 Range: 27.5-65.7		Med: 49.7 Range: 41.4 to 66.3		Med: 32.5 Range: 27.1 to 43.4
Belt Width (W_{belt})	Med: 23.3 Range: 16.0 - 27.6	Med: 46.8 Range: 40.0 - 55.0	Med: 28.1 Range: 19.5-34.4	Med: 22.8 Range: 16.3-34.3		Med: 33.1 Range: 16.6 to 49.7		Med: 16.3 Range: 10.8 to 21.7
Radius of Curvature (R_c)	Med: 47.0 Range: 30.5 - 65.7	Med: 94.5 Range: 62.4 - 312.1	Med: 6.0 Range: 2.7-10.1	Med: 7.9 Range: 2.7-15.9		Med: 24.8 Range: 16.6 to 41.4		Med: 16.3 Range: 10.8 to 27.1
Sinuosity (Sin)	1.04	1.20	1.43	1.41	1.03	1.10	1.01	1.10
Pattern Ratios								
Pool to Pool Spacing/ Bankfull Width (L_{p-p}/W_{bkf})	Med: 4.4 Range: 3.0 - 6.6	Med: 3.5 Range: 2.2 - 5.5	Med: 3.9 Range: 1.6-6.1	Med: 5.6 Range: 3.7-7.9	No distinct repetitive pattern of riffles and pools due to staightening activities	Med: 4.0 Range: 3.0 to 6.0	No distinct repetitive pattern of riffles and pools	Med: 4.0 Range: 3.0 to 6.0
Meander Length/ Bankfull Width (L_m/W_{bkf})	Med: 8.3 Range: 6.1 - 10.5	Med: 6.6 Range: 3.4 - 9.1	Med: 6.0 Range: 4.5-7.5	Med: 7.6 Range: 4.7-11.3		Med: 6.0 Range: 5.0 to 8.0		Med: 6.0 Range: 5.0 to 8.0
Meander Width Ratio (W_{belt}/W_{bkf})	Med: 1.8 Range: 1.3 - 2.2	Med: 1.6 Range: 1.3 - 1.8	Med: 5.6 Range: 3.9-6.9	Med: 3.9 Range: 2.8-5.9		Med: 4.0 Range: 2.0 to 6.0		Med: 3.0 Range: 2.0 to 4.0
Radius of Curvature/ Bankfull Width (Rc/W_{bkf})	Med: 3.8 Range: 2.4 - 5.3	Med: 3.1 Range: 2.1 - 10.4	Med: 1.2 Range: 0.5-2.0	Med: 1.4 Range: 0.5-2.7		Med: 3.0 Range: 2.0 to 5.0		Med: 3.0 Range: 2.0 to 5.0
Profile Variables								
Average Water Surface Slope (S_{ave})	0.0112	0.0121	0.0123	0.0312	0.0488	0.0457	0.0749	0.0687
Valley Slope (S_{valley})	0.0116	0.0131	0.0176	0.0440	0.0503	0.0503	0.0756	0.0756
Riffle Slope (S_{riffle})	Mean: 0.0195 Range: 0.0178 - 0.0225	Mean: 0.0118 Range: 0.0026 - 0.0183	Mean: 0.0224 Range: 0.0050-0.0506	Mean: 0.0359 Range: 0-0.0966	No distinct repetitive pattern of riffles and pools due to channel incision	Mean: 0.0526 Range: 0.0229 to 0.0686	No distinct repetitive pattern of riffles and pools	Mean: 0.0790 Range: 0.0344 to 0.1031
Pool Slope (S_{pool})	Mean: 0.0015 Range: 0.0002 - 0.0036	Mean: 0.0097 Range: 0 - 0.0254	Mean: 0.0000 Range: 0-0.0009	Mean: 0.0084 Range: 0-0.0420		Mean: 0.0046 Range: 0.0000 to 0.0320		Mean: 0.0069 Range: 0.0000 to 0.0481
Run Slope (S_{run})	Mean: 0 Range:	Mean: 0.0085 Range: 0.0030 - 0.0202	Mean: 0.0077 Range: 0.0021-0.0553	Mean: 0.0067 Range: 0-0.0524		Mean: 0.0274 Range: 0.0000 to 0.0915		Mean: 0.0412 Range: 0.0000 to 0.1375
Glide Slope (S_{glide})	Mean: 0.0028 Range: 0.0001 - 0.0054	Mean: 0.0041 Range: 0 - 0.0083	Mean: 0.0026 Range: 0-0.0065	Mean: 0.0032 Range: 0-0.0432		Mean: 0.0050 Range: 0.0000 to 0.0366		Mean: 0.0076 Range: 0.0000 to 0.0550
Profile Ratios								
Riffle Slope/ Water Surface Slope (S_{riffle}/S_{ave})	Mean: 1.74 Range: 1.59 - 2.01	Mean: 0.98 Range: 0.21 - 1.51	Mean: 1.81 Range: 0.40-4.10	Mean: 1.15 Range: 0.00-3.10	No distinct repetitive pattern of riffles and pools due to channel incision	Mean: 1.2 Range: 0.5 to 1.5	No distinct repetitive pattern of riffles and pools	Mean: 1.2 Range: 0.5 to 1.5
Pool Slope/Water Surface Slope (S_{pool}/S_{ave})	Mean: 0.13 Range: 0.02 - 0.32	Mean: 0.80 Range: 0 - 2.10	Mean: 0.00 Range: 0.00-0.07	Mean: 0.27 Range: 0.00-1.35		Mean: 0.10 Range: 0.0 to 0.7		Mean: 0.10 Range: 0.0 to 0.7
Run Slope/Water Surface Slope (S_{run}/S_{ave})	Mean: 0.00 Range:	Mean: 0.70 Range: 0.25 - 1.67	Mean: 0.63 Range: 0.17-4.47	Mean: 0.22 Range: 0.00-1.68		Mean: 0.6 Range: 0.0 to 2.0		Mean: 0.6 Range: 0.0 to 2.0
Glide Slope/Water Surface Slope (S_{glide}/S_{ave})	Mean: 0.25 Range: 0.01 - 0.48	Mean: 0.34 Range: 0 - 0.69	Mean: 0.21 Range: 0.00-0.53	Mean: 0.10 Range: 0.00-1.39		Mean: 0.11 Range: 0.0 to 0.8		Mean: 0.11 Range: 0.0 to 0.8

Table B1 (Continued). Valle Crucis Site Morphological Stream Characteristics

Variables	REFERENCE- CRANBERRY	REFERENCE- STONE MOUNTAIN	REFERENCE- UT TO ROCKHOUSE CREEK (Upstream)	REFERENCE- UT TO ROCKHOUSE CREEK (Downstream)	Existing (UT 4 upstream)	Proposed (UT 4 upstream)	Existing (UT 4 downstream)	Proposed (UT 4 downstream)	Proposed (UT3 and UT6 Connections)
Stream Type	E 4	Cb 3	Eb 4	B 3	Cf 4	Cb 3	C 5	Ce 3	Ce 3
Drainage Area (mi^2)	0.70	7.46	0.04	0.07	0.13	0.13	0.14	0.14	0.01
Bankfull Discharge (cfs)	103.5	271.7	12.1	16.5	25.0	25.0	26.7	26.7	3.4
Dimension Variables									
Bankfull Cross-Sectional Area (A_{bkf})	20.2	46.0	2.8	3.7	5.4	5.4	5.7	5.7	1.2
Existing Cross-Sectional Area ($A_{existing}$)	19.9 - 20.4	45.9-46.1	2.5-3.1	2.3-5.0	2.8-5.4	5.4	2.1-18.3	5.7	1.2
Bankfull Width (W_{bkf})	Mean: 12.5 Range: 11.8 - 13.2	Mean: 30.1 Range: 27.2 - 33.0	Mean: 5.0 Range: 4.4-5.8	Mean: 5.8 Range: 5.1-6.5	Mean: 12.4 Range: 6.4 to 18.3	Mean: 8.7 Range: 8.0 to 9.3	Mean: 12.6 Range: 8.8 to 17.4	Mean: 8.9 Range: 8.3 to 9.5	Mean: 4.1 Range: 3.8 to 4.4
Bankfull Mean Depth (D_{bkf})	Mean: 1.6 Range: 1.5 - 1.7	Mean: 1.6 Range: 1.4 - 1.7	Mean: 0.6 Range: 0.5-0.6	Mean: 0.7 Range: 0.5-0.8	Mean: 0.6 Range: 0.3 to 0.8	Mean: 0.6 Range: 0.6 to 0.7	Mean: 0.5 Range: 0.3 to 0.7	Mean: 0.6 Range: 0.6 to 0.7	Mean: 0.3 Range: 0.3 to 0.3
Bankfull Maximum Depth (D_{max})	Mean: 1.9 Range:	Mean: 2.4 Range: 2.2 - 2.6	Mean: 0.7 Range: 0.7-0.8	Mean: 0.8 Range: 0.7-0.9	Mean: 1.2 Range: 0.8 to 1.5	Mean: 0.8 Range: 0.7 to 1.0	Mean: 1.2 Range: 0.9 to 1.5	Mean: 0.8 Range: 0.8 to 1.0	Mean: 0.4 Range: 0.4 to 0.5
Pool Width (W_{pool})	Mean: 15.7 Range:	Mean: 24.4 Range: 23.8 - 25.0	Mean: 9.3 Range:	Mean: 5.3 Range:	No distinct repetitive pattern of riffles and pools due to staightening activities	Mean: 10.4 Range: 8.7 to 13.9	No distinct repetitive pattern of riffles and pools due to staightening activities	Mean: 10.7 Range: 8.9 to 14.3	Mean: 4.9 Range: 4.1 to 6.6
Maximum Pool Depth (D_{pool})	Mean: 2.7 Range:	Mean: 2.7 Range: 2.6 - 2.7	Mean: 0.8 Range:	Mean: 1.2 Range:		Mean: 0.9 Range: 0.8 to 1.1		Mean: 1.0 Range: 0.8 to 1.1	Mean: 0.4 Range: 0.4 to 0.5
Width of Floodprone Area (W_{fpa})	Mean: 75.0 Range:	Mean: 100.0 Range:	Mean: 16.0 Range: 14-20	Mean: 9.5 Range: 7.0-12.0	Mean: 100 Range: 100.0 to 100	Mean: 25 Range: 15 to 50	Mean: 80 Range: 21 to 100	Mean: 100 Range: 50 to 150	Mean: 50 Range: 25 to 75
Dimension Ratios									
Entrenchment Ratio (W_{fpa}/W_{bkf})	Mean: 6.0 Range: 5.7 - 6.4	Mean: 3.4 Range: 3.0 - 3.7	Mean: 3.3 Range: 2.4-4.2	Mean: 1.6 Range: 1.4-1.8	Mean: 10.6 Range: 5.5 to 15.6	Mean: 2.9 Range: 1.9 to 5.4	Mean: 6.6 Range: 2.4 to 9.6	Mean: 11.2 Range: 6.0 to 15.7	Mean: 12.2 Range: 6.6 to 17.1
Width / Depth Ratio (W_{bkf}/D_{bkf})	Mean: 7.8 Range: 7.0 - 8.5	Mean: 20.0 Range: 16.1 - 23.8	Mean: 9.0 Range: 7.3-11.6	Mean: 9.2 Range: 8.1-10.2	Mean: 35.0 Range: 7.6 to 62.4	Mean: 14.0 Range: 12.0 to 16.0	Mean: 29.5 Range: 13.4 to 53.1	Mean: 14.0 Range: 12.0 to 16.0	Mean: 14.0 Range: 12.0 to 16.0
Max. D_{bkf} / D_{bkf} Ratio	Mean: 1.2 Range: 1.1 - 1.3	Mean: 1.6 Range: 1.5 - 1.6	Mean: 1.3 Range: 1.2-1.4	Mean: 1.3 Range: 1.1-1.4	Mean: 2.3 Range: 1.9 to 2.7	Mean: 1.3 Range: 1.2 to 1.5	Mean: 3.1 Range: 1.4 to 5.0	Mean: 1.3 Range: 1.2 to 1.5	Mean: 1.3 Range: 1.2 to 1.5
Low Bank Height / Max. D_{bkf} Ratio	Mean: 1.0 Range:	Mean: 1.3 Range: 1.0 - 1.6	Mean: 1.0 Range:	Mean: 1.0 Range:	Mean: 1.3 Range: 1.0 to 1.5	Mean: 1.0 Range: 1.0 to 1.3	Mean: 1.1 Range: 0.7 to 1.5	Mean: 1.0 Range: 1.0 to 1.3	Mean: 1.0 Range: 1.0 to 1.3
Maximum Pool Depth / Bankfull Mean Depth (D_{pool}/D_{bkf})	Mean: 1.7 Range: 1.6 - 1.8	Mean: 1.7 Range: 1.6 - 1.9	Mean: 1.3 Range:	Mean: 1.8 Range:	No distinct repetitive pattern of riffles and pools due to staightening activities	Mean: 1.5 Range: 1.3 to 1.7	No distinct repetitive pattern of riffles and pools due to staightening activities	Mean: 1.5 Range: 1.3 to 1.7	Mean: 1.5 Range: 1.3 to 1.7
Pool Width / Bankfull Width (W_{pool}/W_{bkf})	Mean: 1.3 Range: 1.2 -1.3	Mean: 0.8 Range: 0.7 - 0.9	Mean: 1.9 Range:	Mean: 0.9 Range:		Mean: 1.2 Range: 1.0 to 1.6		Mean: 1.2 Range: 1.0 to 1.6	Mean: 1.2 Range: 1.0 to 1.6
Pool Area / Bankfull Cross Sectional Area	Mean: 1.4 Range: 1.4 - 1.5	Mean: 0.9 Range: 0.9 - 1.0	Mean: 1.3 Range:	Mean: 1.1 Range:		Mean: 1.3 Range: 1.1 to 1.5		Mean: 1.3 Range: 1.1 to 1.5	Mean: 1.3 Range: 1.1 to 1.5

Variables	REFERENCE - CRANBERRY	REFERENCE- STONE MOUNTAIN	REFERENCE- UT TO ROCKHOUSE CREEK (Upstream)	REFERENCE- UT TO ROCKHOUSE CREEK (Downstream)	Existing (UT 4 upstream)	Proposed (UT 4 upstream)	Existing (UT 4 downstream)	Proposed (UT 4 downstream)	Proposed (UT3 and UT6 Connections)
Pattern Variables									
Pool to Pool Spacing (L_{p-p})	Med: 54.8 Range: 37.0 - 82.6	Med: 104.3 Range: 65.2 - 166.7	Med: 19.7 Range: 7.9-30.7	Med: 32.4 Range: 21.5-45.9	No distinct repetitive pattern of riffles and pools	Med: 34.8 Range: 26.1 to 52.2	No distinct repetitive pattern of riffles and pools	Med: 35.7 Range: 26.8 to 53.6	Med: 16.4 Range: 12.3 to 24.6
Meander Length (L_m)	Med: 103.8 Range: 76.6 - 131.0	Med: 199.4 Range: 101.7 - 273.2	Med: 30.2 Range: 22.6-37.5	Med: 43.8 Range: 27.5-65.7		Med: 52.2 Range: 43.5 to 69.6		Med: 53.6 Range: 44.7 to 71.5	Med: 24.6 Range: 20.5 to 32.8
Belt Width (W_{belt})	Med: 23.3 Range: 16.0 - 27.6	Med: 46.8 Range: 40.0 - 55.0	Med: 28.1 Range: 19.5-34.4	Med: 22.8 Range: 16.3-34.3		Med: 26.1 Range: 17.4 to 34.8		Med: 26.8 Range: 17.9 to 35.7	Med: 12.3 Range: 8.2 to 16.4
Radius of Curvature (R_c)	Med: 47.0 Range: 30.5 - 65.7	Med: 94.5 Range: 62.4 - 312.1	Med: 6.0 Range: 2.7-10.1	Med: 7.9 Range: 2.7-15.9		Med: 26.1 Range: 17.4 to 43.5		Med: 26.8 Range: 17.9 to 44.7	Med: 12.3 Range: 8.2 to 20.5
Sinuosity (Sin)	1.04	1.20	1.43	1.41	1.01	1.10	1.01	1.30	1.10
Pattern Ratios									
Pool to Pool Spacing/ Bankfull Width (L_{p-p}/W_{bkf})	Med: 4.4 Range: 3.0 - 6.6	Med: 3.5 Range: 2.2 - 5.5	Med: 3.9 Range: 1.6-6.1	Med: 5.6 Range: 3.7-7.9	No distinct repetitive pattern of riffles and pools	Med: 4.0 Range: 3.0 to 6.0	No distinct repetitive pattern of riffles and pools	Med: 4.0 Range: 3.0 to 6.0	Med: 4.0 Range: 3.0 to 6.0
Meander Length/ Bankfull Width (L_m/W_{bkf})	Med: 8.3 Range: 6.1 - 10.5	Med: 6.6 Range: 3.4 - 9.1	Med: 6.0 Range: 4.5-7.5	Med: 7.6 Range: 4.7-11.3		Med: 6.0 Range: 5.0 to 8.0		Med: 6.0 Range: 5.0 to 8.0	Med: 6.0 Range: 5.0 to 8.0
Meander Width Ratio (W_{belt}/W_{bkf})	Med: 1.8 Range: 1.3 - 2.2	Med: 1.6 Range: 1.3 - 1.8	Med: 5.6 Range: 3.9-6.9	Med: 3.9 Range: 2.8-5.9		Med: 3.0 Range: 2.0 to 4.0		Med: 3.0 Range: 2.0 to 4.0	Med: 3.0 Range: 2.0 to 4.0
Radius of Curvature/ Bankfull Width (R_c/W_{bkf})	Med: 3.8 Range: 2.4 - 5.3	Med: 3.1 Range: 2.1 - 10.4	Med: 1.2 Range: 0.5-2.0	Med: 1.4 Range: 0.5-2.7		Med: 3.0 Range: 2.0 to 5.0		Med: 3.0 Range: 2.0 to 5.0	Med: 3.0 Range: 2.0 to 5.0
Profile Variables									
Average Water Surface Slope (S_{ave})	0.0112	0.0121	0.0123	0.0312	0.0741	0.0680	0.0087	0.0068	0.0546
Valley Slope (S_{valley})	0.0116	0.0131	0.0176	0.0440	0.0748	0.0748	0.0088	0.0088	0.0601
Riffle Slope (S_{riffle})	Mean: 0.0195 Range: 0.0178 - 0.0225	Mean: 0.0118 Range: 0.0026 - 0.0183	Mean: 0.0224 Range: 0.0050-0.0506	Mean: 0.0359 Range: 0-0.0966	No distinct repetitive pattern of riffles and pools	Mean: 0.0782 Range: 0.0340 to 0.1020	No distinct repetitive pattern of riffles and pools	Mean: 0.0078 Range: 0.0034 to 0.0102	Mean: 0.0628 Range: 0.0273 to 0.0820
Pool Slope (S_{pool})	Mean: 0.0015 Range: 0.0002 - 0.0036	Mean: 0.0097 Range: 0 - 0.0254	Mean: 0.0000 Range: 0-0.0009	Mean: 0.0084 Range: 0-0.0420		Mean: 0.0068 Range: 0.0000 to 0.0476		Mean: 0.0007 Range: 0.0000 to 0.0047	Mean: 0.0055 Range: 0.0000 to 0.0382
Run Slope (S_{run})	Mean: 0 Range:	Mean: 0.0085 Range: 0.0030 - 0.0202	Mean: 0.0077 Range: 0.0021-0.0553	Mean: 0.0067 Range: 0-0.0524		Mean: 0.0408 Range: 0.0000 to 0.1360		Mean: 0.0041 Range: 0.0000 to 0.0135	Mean: 0.0328 Range: 0.0000 to 0.1093
Glide Slope (S_{glide})	Mean: 0.0028 Range: 0.0001 - 0.0054	Mean: 0.0041 Range: 0 - 0.0083	Mean: 0.0026 Range: 0-0.0065	Mean: 0.0032 Range: 0-0.0432		Mean: 0.0075 Range: 0.0000 to 0.0544		Mean: 0.0007 Range: 0.0000 to 0.0054	Mean: 0.0060 Range: 0.0000 to 0.0437
Profile Ratios									
Riffle Slope/ Water Surface Slope (S_{riffle}/S_{ave})	Mean: 1.74 Range: 1.59 - 2.01	Mean: 0.98 Range: 0.21 - 1.51	Mean: 1.81 Range: 0.40-4.10	Mean: 1.15 Range: 0.00-3.10	No distinct repetitive pattern of riffles and pools	Mean: 1.2 Range: 0.5 to 1.5	No distinct repetitive pattern of riffles and pools	Mean: 1.2 Range: 0.5 to 1.5	Mean: 1.2 Range: 0.5 to 1.5
Pool Slope/Water Surface Slope (S_{pool}/S_{ave})	Mean: 0.13 Range: 0.02 - 0.32	Mean: 0.80 Range: 0 - 2.10	Mean: 0.00 Range: 0.00-0.07	Mean: 0.27 Range: 0.00-1.35		Mean: 0.10 Range: 0.0 to 0.7		Mean: 0.10 Range: 0.0 to 0.7	Mean: 0.10 Range: 0.0 to 0.7
Run Slope/Water Surface Slope (S_{run}/S_{ave})	Mean: 0.00 Range:	Mean: 0.70 Range: 0.25 - 1.67	Mean: 0.63 Range: 0.17-4.47	Mean: 0.22 Range: 0.00-1.68		Mean: 0.6 Range: 0.0 to 2.0		Mean: 0.6 Range: 0.0 to 2.0	Mean: 0.6 Range: 0.0 to 2.0
Glide Slope/Water Surface Slope (S_{glide}/S_{ave})	Mean: 0.25 Range: 0.01 - 0.48	Mean: 0.34 Range: 0 - 0.69	Mean: 0.21 Range: 0.00-0.53	Mean: 0.10 Range: 0.00-1.39		Mean: 0.11 Range: 0.0 to 0.8		Mean: 0.11 Range: 0.0 to 0.8	Mean: 0.11 Range: 0.0 to 0.8



Axiom Environmental, Inc.

RESTORATION SYSTEMS | LLC

NOTES/REVISIONS

Project:

Valle Crucis
Mitigation Site
Watauga County
North Carolina

Title:

Cross Section
Locations

Scale: As Shown

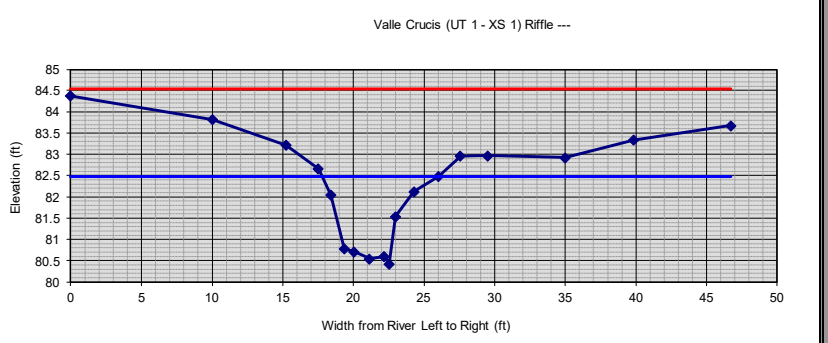
Date: July 2022

Project No.: 21-018

FIGURE NO.

B-1

Cross Section



section: **Valle Crucis (UT 1 - XS 1)**

Riffle

---

description: **Valle Crucis (UT 1 - XS 1)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**115.6302**	84.36981
	☐	**10.03357**	**116.1864**	83.81363
	☐	**15.2374**	**116.7805**	83.21954
	☐	**17.53232**	**117.3381**	82.66192
	☐	**18.41482**	**117.9579**	82.04212
	☐	**19.35595**	**119.2217**	80.77834
	☐	**20.05148**	**119.2872**	80.71275
	☐	**21.16133**	**119.4514**	80.54859
	☐	**22.20191**	**119.4028**	80.59721
	☐	**22.54846**	**119.5754**	80.42461
	☐	**22.9837**	**118.4603**	81.53971
	☐	**24.29833**	**117.8738**	82.12625
	☐	**26.02416**	**117.522**	82.478
	☐	**27.57849**	**117.0394**	82.96055
	☐	**29.51355**	**117.0306**	82.96937
	☐	**35.01321**	**117.0755**	82.92448
	☐	**39.83243**	**116.6626**	83.33741
	☐	**46.73393**	**116.3249**	83.67511
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			

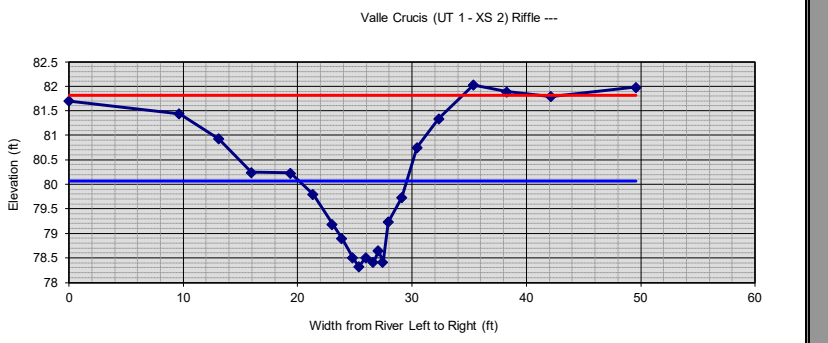
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
117.52	**117.04**	**200.0**		
82.48	82.96			

dimensions			
8.9	x-section area	1.1	d mean
8.2	width	10.0	wet P
2.1	d max	0.9	hyd radi
2.5	bank ht	7.6	w/d ratio
200.0	W flood prone area	24.3	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section: **Valle Crucis (UT 1 - XS 2)**

Riffle

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description: **Valle Crucis (UT 1 - XS 2)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**118.3017**	81.69834
	☐	**9.651026**	**118.56**	81.44
	☐	**13.11849**	**119.0685**	80.93154
	☐	**15.94497**	**119.7525**	80.24749
	☐	**19.35559**	**119.7665**	80.23355
	☐	**21.35444**	**120.2026**	79.79739
	☐	**23.04341**	**120.8125**	79.18754
	☐	**23.86941**	**121.1036**	78.89643
	☐	**24.81883**	**121.4972**	78.50276
	☐	**25.3495**	**121.6782**	78.32181
	☐	**25.96206**	**121.4924**	78.50762
	☐	**26.61276**	**121.5892**	78.41084
	☐	**27.06396**	**121.3528**	78.64718
	☐	**27.45198**	**121.5879**	78.41213
	☐	**27.94043**	**120.7654**	79.23462
	☐	**29.11011**	**120.2696**	79.73038
	☐	**30.46164**	**119.2469**	80.75313
	☐	**32.34681**	**118.6592**	81.34077
	☐	**35.36694**	**117.9736**	82.02642
	☐	**38.27235**	**118.1074**	81.8926
	☐	**42.1338**	**118.207**	81.79297
	☐	**49.58016**	**118.0183**	81.9817
	☐			
	☐			
	☐			

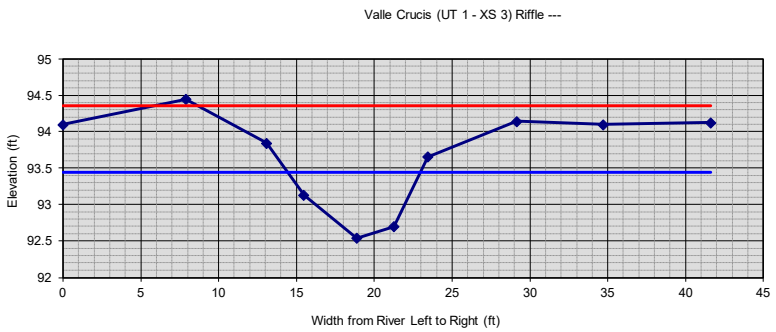
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
119.93	**119.77**	**33.0**		
80.07	80.23			

dimensions			
8.9	x-section area	0.9	d mean
9.5	width	10.6	wet P
1.7	d max	0.8	hyd radi
1.9	bank ht	10.0	w/d ratio
33.0	W flood prone area	3.5	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section: **Valle Crucis (UT 1 - XS 3)**

Riffle

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description: **Valle Crucis (UT 1 - XS 3)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**105.8997**	94.10027
	☐	**7.897245**	**105.5551**	94.44491
	☐	**13.07475**	**106.1577**	93.84228
	☐	**15.49504**	**106.8728**	93.12718
	☐	**18.88492**	**107.46**	92.54001
	☐	**21.27899**	**107.3004**	92.69963
	☐	**23.43789**	**106.3458**	93.65421
	☐	**29.17017**	**105.8563**	94.14369
	☐	**34.72956**	**105.9029**	94.09715
	☐	**41.60796**	**105.8739**	94.12611

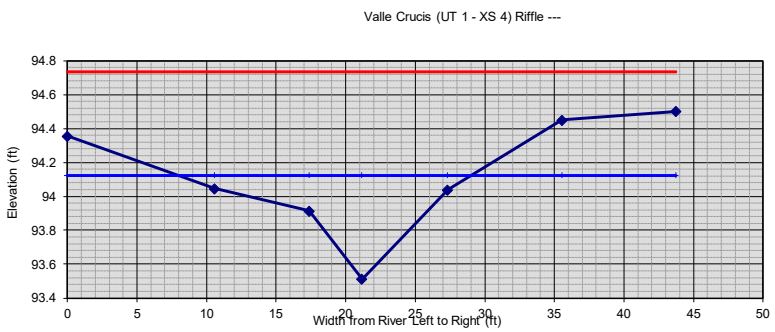
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
106.55	**106.35**	**100.0**		
93.45	93.65			

dimensions			
4.9	x-section area	0.6	d mean
8.6	width	8.8	wet P
0.9	d max	0.6	hyd radi
1.1	bank ht	15.0	w/d ratio
100.0	W flood prone area	11.7	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
0.0	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section: **Valle Crucis (UT 1 - XS 4)**

Riffle

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description: **Valle Crucis (UT 1 - XS 4)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**105.6445**	94.3555
	☐	**10.56373**	**105.9537**	94.04626
	☐	**17.39419**	**106.0855**	93.91454
	☐	**21.16818**	**106.488**	93.51201
	☐	**27.33236**	**105.9611**	94.03888
	☐	**35.5578**	**105.5495**	94.45052
	☐	**43.74269**	**105.4985**	94.50151

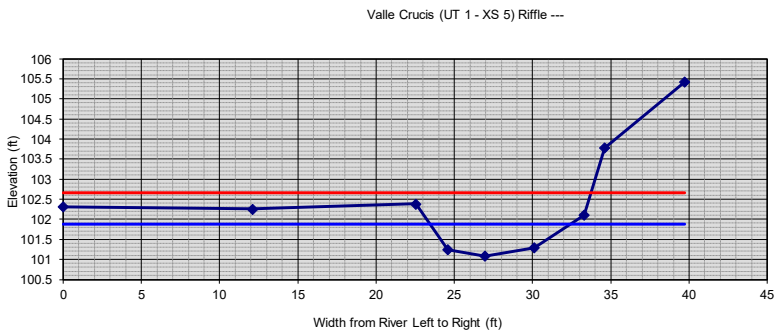
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
105.875	**105.96**	**100.0**		
94.125	94.04			

dimensions			
4.9	x-section area	0.2	d mean
21.2	width	21.2	wet P
0.6	d max	0.2	hyd radi
0.5	bank ht	92.0	w/d ratio
100.0	W flood prone area	4.7	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
0.0	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:	Valle Crucis (UT 1 - XS 5)
	Riffle

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description:	Valle Crucis (UT 1 - XS 5)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	97.69069	102.3093
	☐	12.13561	97.74474	102.2553
	☐	22.55054	97.61443	102.3856
	☐	24.60235	98.76151	101.2385
	☐	26.97186	98.90871	101.0913
	☐	30.10495	98.71332	101.2867
	☐	33.2833	97.89477	102.1052
	☐	34.6185	96.22354	103.7765
	☐	39.70588	94.56808	105.4319
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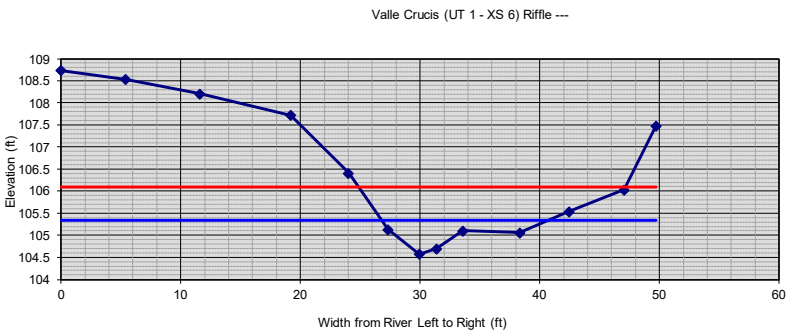
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
98.12	97.61	50.0		
101.88	102.39			

dimensions			
4.9	x-section area	0.5	d mean
9.0	width	9.2	wet P
0.8	d max	0.5	hyd radi
1.3	bank ht	16.3	w/d ratio
50.0	W flood prone area	5.6	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:	Valle Crucis (UT 1 - XS 6)
	Riffle

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description:	Valle Crucis (UT 1 - XS 6)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	91.25394	108.7461
	☐	5.422058	91.46455	108.5355
	☐	11.61555	91.79032	108.2097
	☐	19.20573	92.28239	107.7176
	☐	24.03838	93.59174	106.4083
	☐	27.31222	94.86809	105.1319
	☐	29.94575	95.42614	104.5739
	☐	31.39731	95.30174	104.6983
	☐	33.57583	94.8942	105.1058
	☐	38.35143	94.93814	105.0619
	☐	42.44032	94.4602	105.5398
	☐	47.0362	93.97034	106.0297
	☐	49.7434	92.52168	107.4783
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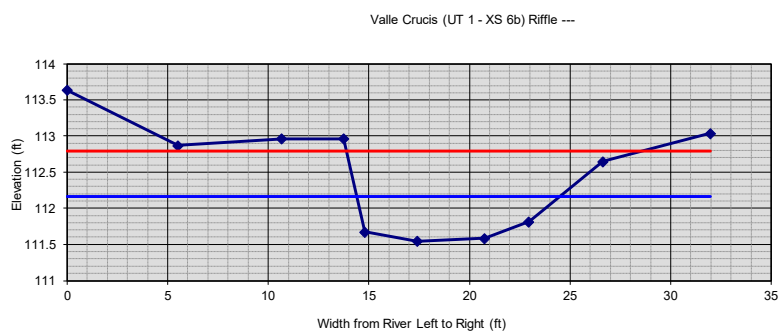
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
94.66	94.89	21.0		
105.34	105.11			

dimensions			
4.9	x-section area	0.3	d mean
14.0	width	14.1	wet P
0.8	d max	0.3	hyd radi
0.5	bank ht	40.0	w/d ratio
21.0	W flood prone area	1.5	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:	Valle Crucis (UT 1 - XS 6b)
	Riffle

	---
description:	Valle Crucis (UT 1 - XS 6b)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	86.36097	113.639
	☐	5.516735	87.133	112.867
	☐	10.68162	87.03748	112.9625
	☐	13.7445	87.03664	112.9634
	☐	14.7911	88.32864	111.6714
	☐	17.42003	88.45184	111.5482
	☐	20.7636	88.4172	111.5828
	☐	22.95792	88.18558	111.8144
	☐	26.6263	87.35322	112.6468
	☐	31.97326	86.96079	113.0392
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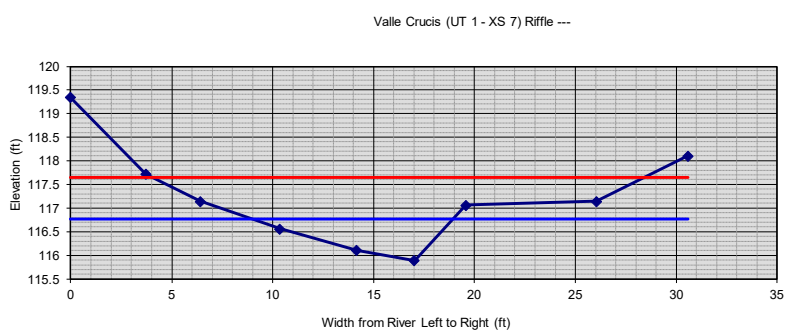
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
87.83	87.35	15.0		
112.17	112.65			

dimensions			
4.9	x-section area	0.5	d mean
10.1	width	10.4	wet P
0.6	d max	0.5	hyd radi
1.1	bank ht	20.9	w/d ratio
15.0	W flood prone area	1.5	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:	Valle Crucis (UT 1 - XS 7)
	Riffle

	---
description:	Valle Crucis (UT 1 - XS 7)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	80.66201	119.338
	☐	3.730896	82.28355	117.7164
	☐	6.411767	82.85405	117.1459
	☐	10.36381	83.439	116.561
	☐	14.17713	83.89004	116.11
	☐	17.02749	84.09967	115.9003
	☐	19.57413	82.93477	117.0652
	☐	26.05696	82.85687	117.1431
	☐	30.60308	81.8965	118.1035

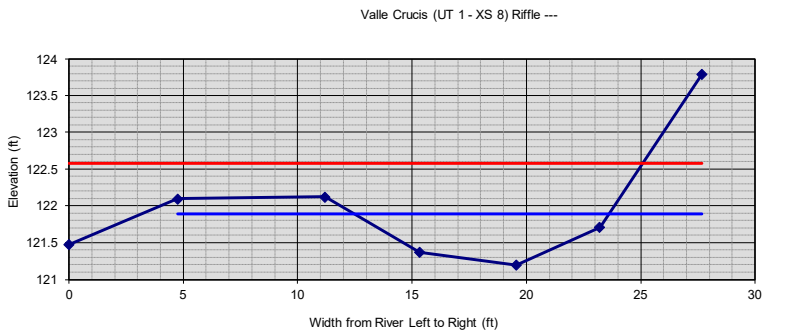
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
83.22	82.93	19.0		
116.78	117.07			

dimensions			
4.9	x-section area	0.5	d mean
10.1	width	10.3	wet P
0.9	d max	0.5	hyd radi
1.2	bank ht	20.6	w/d ratio
19.0	W flood prone area	1.9	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material		
0	measured D84 (mm)	
0.0	relative roughness	0.0 fric. factor
0.000	Manning's n from channel material	

Cross Section



section:	Valle Crucis (UT 1 - XS 8)
	Riffle

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description:	Valle Crucis (UT 1 - XS 8)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	78.52725	121.4727
	☐	4.766475	77.90224	122.0978
	☐	11.19575	77.87546	122.1245
	☐	15.33306	78.63097	121.369
	☐	19.57079	78.80113	121.1989
	☐	23.21146	78.28868	121.7113
	☐	27.68433	76.21158	123.7884

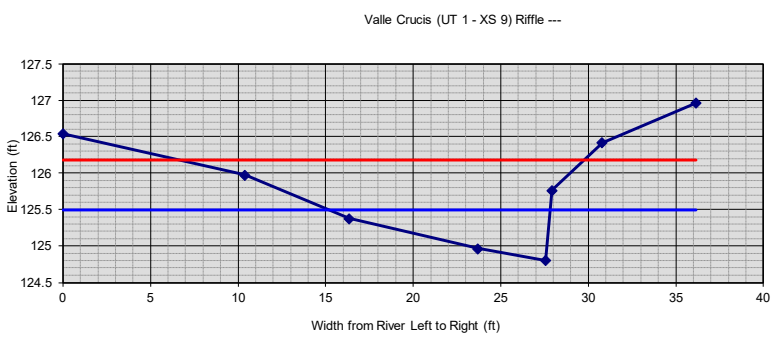
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
78.11	77.88	50.0		
121.89	122.12			

dimensions			
4.9	x-section area	0.4	d mean
11.1	width	11.2	wet P
0.7	d max	0.4	hyd radi
0.9	bank ht	25.1	w/d ratio
50.0	W flood prone area	4.5	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material		
0	measured D84 (mm)	
0.0	relative roughness	0.0 fric. factor
0.000	Manning's n from channel material	

Cross Section



section: **Valle Crucis (UT 1 - XS 9)**

Riffle

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description: **Valle Crucis (UT 1 - XS 9)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**73.458**	126.542
	☐	**10.39152**	**74.02539**	125.9746
	☐	**16.35255**	**74.62341**	125.3766
	☐	**23.71233**	**75.03724**	124.9628
	☐	**27.55403**	**75.1947**	124.8053
	☐	**27.94131**	**74.23609**	125.7639
	☐	**30.8058**	**73.5804**	126.4196
	☐	**36.15337**	**73.03501**	126.965
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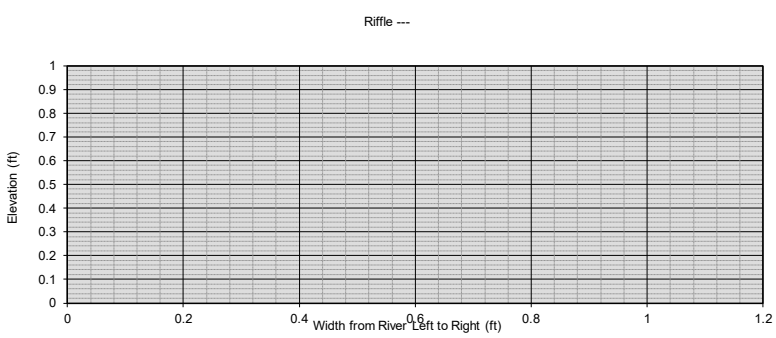
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
74.505	**74.24**	**23.0**		
125.495	125.76			

dimensions			
4.9	x-section area	0.4	d mean
12.7	width	13.1	wet P
0.7	d max	0.4	hyd radi
1.0	bank ht	32.7	w/d ratio
23.0	W flood prone area	1.8	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:

Riffle

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description:

height of instrument (ft):

notes	omit pt.	distance (ft)	FS (ft)	elevation
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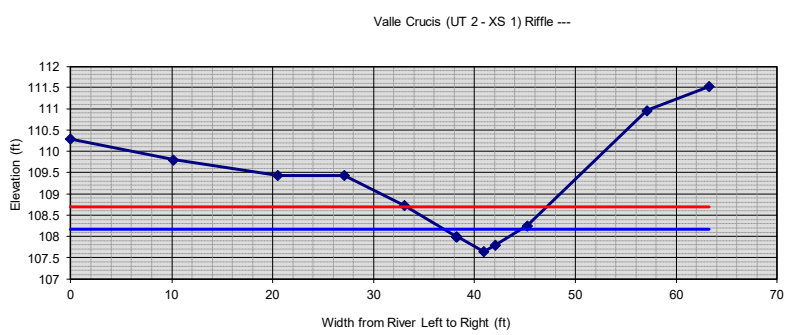
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
0	---			

dimensions			
0.0	x-section area	0.0	d mean
0.0	width	0.0	wet P
0.0	d max	0.0	hyd radi
0.0	bank ht	0.0	w/d ratio
0.0	W flood prone area	0.0	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:	Valle Crucis (UT 2 - XS 1)
	Riffle

	---
description:	Valle Crucis (UT 2 - XS 1)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	89.71136	110.2886
	☐	10.18672	90.20021	109.7998
	☐	20.54328	90.5644	109.4356
	☐	27.09385	90.56726	109.4327
	☐	33.06444	91.27472	108.7253
	☐	38.23225	92.00955	107.9904
	☐	38.29166	91.99881	108.0012
	☐	40.93186	92.34378	107.6562
	☐	42.12183	92.19447	107.8055
	☐	45.24849	91.74312	108.2569
	☐	57.11818	89.04007	110.9599
	☐	63.29474	88.46943	111.5306
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			

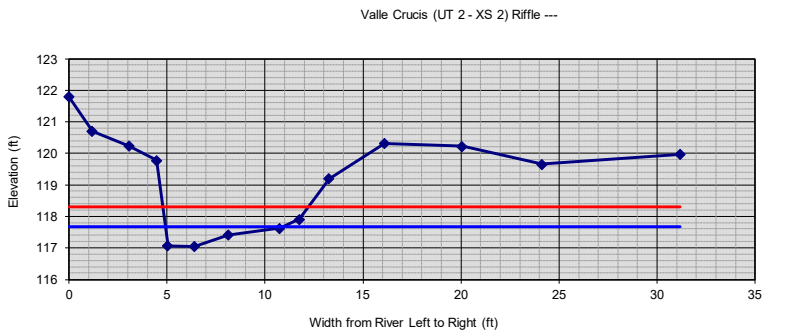
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
91.82	90.57	17.0		
108.18	109.43			

dimensions			
2.1	x-section area	0.3	d mean
7.8	width	7.9	wet P
0.5	d max	0.3	hyd radi
1.8	bank ht	29.3	w/d ratio
17.0	W flood prone area	2.2	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:	Valle Crucis (UT 2 - XS 2)
	Riffle

	---
description:	Valle Crucis (UT 2 - XS 2)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	78.20424	121.7958
	☐	1.198483	79.29443	120.7056
	☐	3.067783	79.76854	120.2315
	☐	4.486204	80.22586	119.7741
	☐	5.053291	82.93679	117.0632
	☐	6.407113	82.95214	117.0479
	☐	8.131135	82.59199	117.408
	☐	10.76705	82.37907	117.6209
	☐	11.75984	82.09433	117.9057
	☐	13.27136	80.80059	119.1994
	☐	16.09889	79.67972	120.3203
	☐	20.05849	79.77756	120.2224
	☐	24.13471	80.3411	119.6589
	☐	31.19034	80.0316	119.9684
	☐			
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	☐			
	☐			

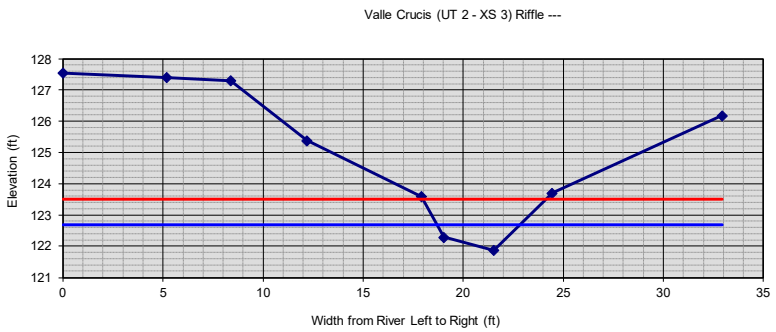
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
82.32	80.8	8.0		
117.68	119.2			

dimensions			
2.1	x-section area	0.3	d mean
6.0	width	6.6	wet P
0.6	d max	0.3	hyd radi
2.2	bank ht	17.4	w/d ratio
8.0	W flood prone area	1.3	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section: **Valle Crucis (UT 2 - XS 3)**

Riffle

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description: **Valle Crucis (UT 2 - XS 3)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**72.43992**	127.5601
	☐	**5.192214**	**72.59195**	127.4081
	☐	**8.388616**	**72.69701**	127.303
	☐	**12.19034**	**74.61336**	125.3866
	☐	**17.92398**	**76.41073**	123.5893
	☐	**19.028**	**77.70933**	122.2907
	☐	**21.52226**	**78.11943**	121.8806
	☐	**24.45752**	**76.2969**	123.7031
	☐	**32.95358**	**73.81408**	126.1859

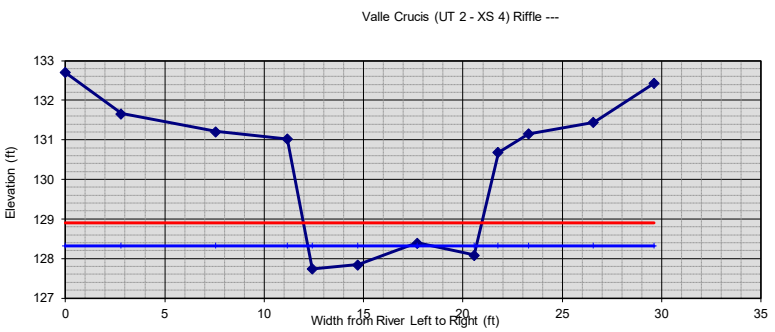
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
77.3	**76.41**	**6.0**		
122.7	123.59			

dimensions			
2.1	x-section area	0.5	d mean
4.2	width	4.6	wet P
0.8	d max	0.5	hyd radi
1.7	bank ht	8.1	w/d ratio
6.0	W flood prone area	1.4	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section: **Valle Crucis (UT 2 - XS 4)**

Riffle

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description: **Valle Crucis (UT 2 - XS 4)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**67.28702**	132.713
	☐	**2.814787**	**68.33195**	131.6681
	☐	**7.575817**	**68.78732**	131.2127
	☐	**11.15985**	**68.97769**	131.0223
	☐	**12.42738**	**72.26087**	127.7391
	☐	**14.72762**	**72.15409**	127.8459
	☐	**17.6946**	**71.60207**	128.3979
	☐	**20.56459**	**71.91195**	128.0881
	☐	**21.77966**	**69.31852**	130.6815
	☐	**23.30421**	**68.84287**	131.1571
	☐	**26.57718**	**68.55296**	131.447
	☐	**29.60767**	**67.57002**	132.43

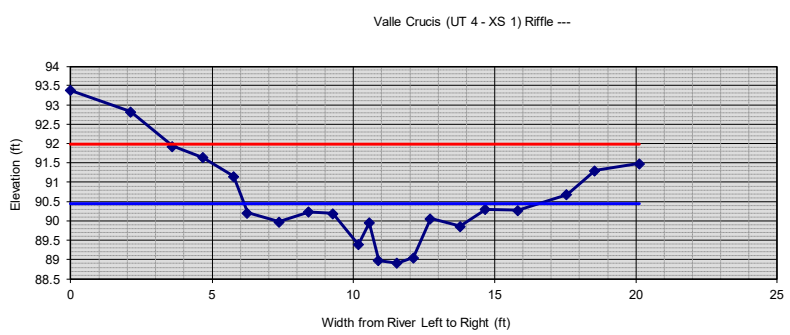
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
71.68	**69.32**	**9.0**		
128.32	130.68			

dimensions			
2.1	x-section area	0.3	d mean
7.3	width	7.9	wet P
0.6	d max	0.3	hyd radi
2.9	bank ht	25.1	w/d ratio
9.0	W flood prone area	1.2	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:	Valle Crucis (UT 4 - XS 1)
	Riffle

	---
description:	Valle Crucis (UT 4 - XS 1)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	106.6212	93.37881
	☐	2.11886	107.1767	92.82329
	☐	3.597348	108.0692	91.93078
	☐	4.676401	108.3587	91.64131
	☐	5.767492	108.846	91.15405
	☐	6.252348	109.7855	90.2145
	☐	7.371027	110.019	89.98096
	☐	8.422964	109.7639	90.23614
	☐	9.268663	109.81	90.19004
	☐	10.17865	110.6084	89.39156
	☐	10.56176	110.0438	89.95617
	☐	10.89434	111.0229	88.97706
	☐	11.54722	111.0848	88.91521
	☐	12.13183	110.9494	89.05061
	☐	12.73104	109.9416	90.05841
	☐	13.7815	110.139	89.86096
	☐	14.68079	109.7008	90.29919
	☐	15.83185	109.7241	90.27591
	☐	17.55936	109.3182	90.68179
	☐	18.55445	108.7003	91.29973
	☐	20.13593	108.5205	91.47945
	☐			
	☐			
	☐			
	☐			

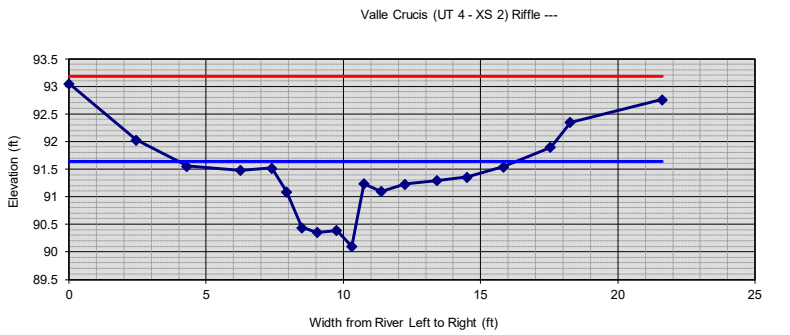
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
109.55	109.7	100.0		
90.45	90.3			

dimensions			
5.7	x-section area	0.5	d mean
10.4	width	12.7	wet P
1.5	d max	0.4	hyd radi
1.4	bank ht	19.2	w/d ratio
100.0	W flood prone area	9.6	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:	Valle Crucis (UT 4 - XS 2)
	Riffle

	---
description:	Valle Crucis (UT 4 - XS 2)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	106.9461	93.05389
	☐	2.448596	107.9673	92.03269
	☐	4.309727	108.4477	91.55234
	☐	6.254352	108.5238	91.4762
	☐	7.394022	108.4835	91.51647
	☐	7.936373	108.9131	91.08689
	☐	8.487766	109.5581	90.44194
	☐	9.056004	109.6463	90.35374
	☐	9.761193	109.6136	90.38638
	☐	10.31559	109.905	90.09498
	☐	10.74972	108.7657	91.23429
	☐	11.38557	108.9017	91.09828
	☐	12.25574	108.7693	91.2307
	☐	13.41196	108.7091	91.29093
	☐	14.52247	108.6448	91.35521
	☐	15.83031	108.4564	91.54358
	☐	17.55136	108.1015	91.89847
	☐	18.27221	107.6495	92.35048
	☐	21.6259	107.2408	92.75915
	☐			
	☐			
	☐			
	☐			
	☐			

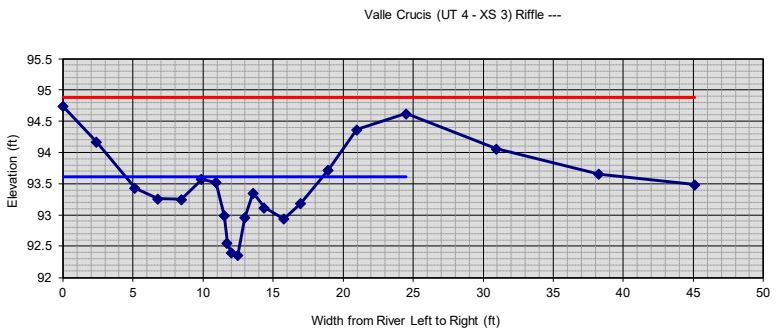
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
108.36	108.77	100.0		
91.64	91.23			

dimensions			
5.7	x-section area	0.5	d mean
12.3	width	13.7	wet P
1.5	d max	0.4	hyd radi
1.1	bank ht	26.8	w/d ratio
100.0	W flood prone area	8.1	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section: **Valle Crucis (UT 4 - XS 3)**

Riffle

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description: **Valle Crucis (UT 4 - XS 3)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**105.2552**	94.74483
	☐	**2.379737**	**105.8289**	94.17112
	☐	**5.147427**	**106.5703**	93.42971
	☐	**6.785025**	**106.7405**	93.2595
	☐	**8.454105**	**106.7501**	93.24988
	☐	**9.909164**	**106.427**	93.573
	☐	**10.93821**	**106.4783**	93.52171
	☐	**11.52589**	**107.0123**	92.98772
	☐	**11.72101**	**107.4536**	92.54642
	☐	**12.03115**	**107.6085**	92.39146
	☐	**12.46856**	**107.6431**	92.35695
	☐	**12.97587**	**107.0448**	92.95518
	☐	**13.58826**	**106.648**	93.35203
	☐	**14.37997**	**106.8831**	93.11694
	☐	**15.76633**	**107.0628**	92.93723
	☐	**16.97154**	**106.8168**	93.18324
	☐	**18.91794**	**106.2833**	93.71673
	☐	**20.96868**	**105.635**	94.36497
	☐	**24.49853**	**105.3793**	94.62072
	☑	**30.9521**	**105.9418**	94.05821
	☑	**38.27237**	**106.3475**	93.65248
	☑	**45.10794**	**106.5171**	93.48287
	☐			
	☐			
	☐			

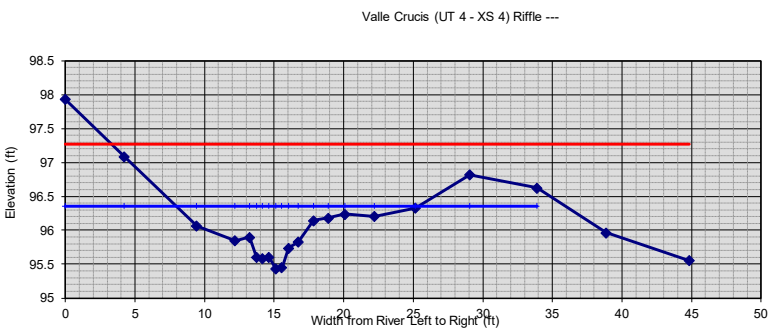
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
106.38	**105.63**	**100.0**		
93.62	94.37			

dimensions			
5.7	x-section area	0.4	d mean
14.1	width	15.3	wet P
1.3	d max	0.4	hyd radi
2.0	bank ht	34.9	w/d ratio
100.0	W flood prone area	7.1	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section: **Valle Crucis (UT 4 - XS 4)**

Riffle

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description: **Valle Crucis (UT 4 - XS 4)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**102.0664**	97.93361
	☐	**4.20974**	**102.9122**	97.08776
	☐	**9.445846**	**103.9352**	96.06482
	☐	**12.20113**	**104.1537**	95.84627
	☐	**13.25469**	**104.0997**	95.90035
	☐	**13.73723**	**104.4005**	95.59948
	☐	**14.16016**	**104.4142**	95.58581
	☐	**14.64804**	**104.4012**	95.59884
	☐	**15.12045**	**104.5655**	95.43454
	☐	**15.56276**	**104.5523**	95.44774
	☐	**16.04176**	**104.2647**	95.73532
	☐	**16.7459**	**104.1704**	95.82958
	☐	**17.8297**	**103.8575**	96.14251
	☐	**18.88925**	**103.8172**	96.18282
	☐	**20.08941**	**103.7638**	96.23625
	☐	**22.19368**	**103.7931**	96.20688
	☐	**25.15486**	**103.671**	96.32897
	☐	**29.05682**	**103.1804**	96.81956
	☐	**33.88164**	**103.3739**	96.62615
	☑	**38.86556**	**104.034**	95.96598
	☑	**44.82745**	**104.4485**	95.55149
	☐			
	☐			
	☐			
	☐			

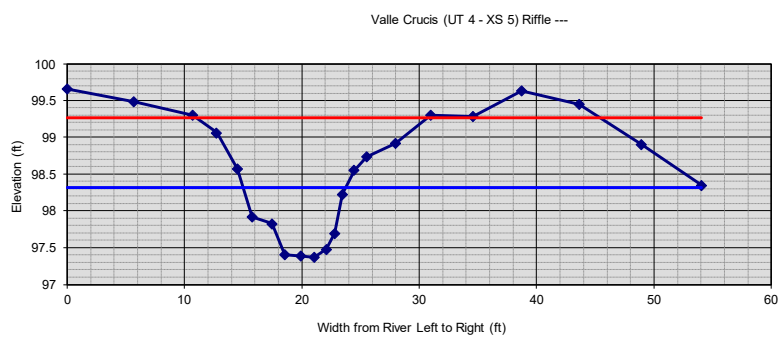
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
103.645	**103.83**	**100.0**		
96.355	96.17			

dimensions			
5.7	x-section area	0.3	d mean
17.4	width	17.7	wet P
0.9	d max	0.3	hyd radi
0.7	bank ht	53.1	w/d ratio
100.0	W flood prone area	5.7	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section: **Valle Crucis (UT 4 - XS 5)**

Riffle

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description: **Valle Crucis (UT 4 - XS 5)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**100.3352**	99.66479
	☐	**5.705109**	**100.5169**	99.48313
	☐	**10.69875**	**100.6987**	99.30126
	☐	**12.7481**	**100.9354**	99.06463
	☐	**14.52947**	**101.4271**	98.57287
	☐	**15.75252**	**102.0832**	97.91684
	☐	**17.45875**	**102.175**	97.825
	☐	**18.5462**	**102.5947**	97.40535
	☐	**19.91321**	**102.6136**	97.38645
	☐	**21.06191**	**102.6322**	97.36777
	☐	**22.08788**	**102.5233**	97.47667
	☐	**22.82366**	**102.3044**	97.69556
	☐	**23.46508**	**101.7751**	98.22493
	☐	**24.47381**	**101.4465**	98.55351
	☐	**25.53815**	**101.2639**	98.73607
	☐	**27.99588**	**101.0814**	98.91863
	☐	**30.99673**	**100.6974**	99.30264
	☐	**34.58338**	**100.7155**	99.28454
	☐	**38.73724**	**100.3669**	99.63312
	☐	**43.62351**	**100.5496**	99.45037
	☐	**48.94342**	**101.1003**	98.8997
	☐	**54.07**	**101.6528**	98.34723
	☐			
	☐			
	☐			

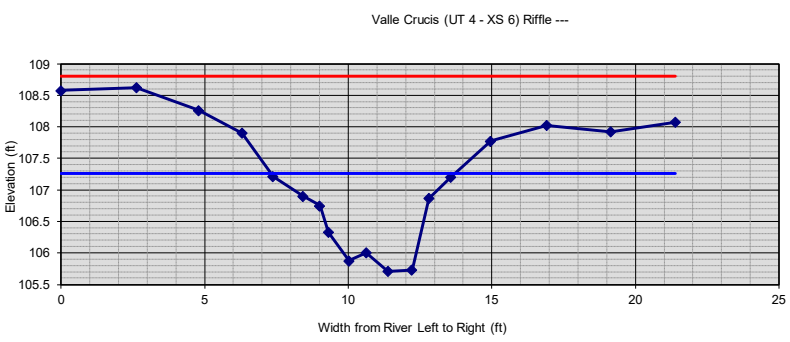
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
101.68	**101.26**	**21.0**		
98.32	98.74			

dimensions			
5.7	x-section area	0.7	d mean
8.8	width	9.2	wet P
1.0	d max	0.6	hyd radi
1.4	bank ht	13.4	w/d ratio
21.0	W flood prone area	2.4	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section: **Valle Crucis (UT 4 - XS 6)**

Riffle

---

description: **Valle Crucis (UT 4 - XS 6)**

height of instrument (ft): **200.00**

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	**0**	**91.42276**	108.5772
	☐	**2.635327**	**91.37076**	108.6292
	☐	**4.78625**	**91.74009**	108.2599
	☐	**6.310806**	**92.09719**	107.9028
	☐	**7.386323**	**92.79098**	107.209
	☐	**8.419739**	**93.09706**	106.9029
	☐	**9.011854**	**93.25038**	106.7496
	☐	**9.304907**	**93.675**	106.325
	☐	**10.03431**	**94.12601**	105.874
	☐	**10.6333**	**93.9955**	106.0045
	☐	**11.37775**	**94.28576**	105.7142
	☐	**12.21941**	**94.27036**	105.7296
	☐	**12.80261**	**93.13438**	106.8656
	☐	**13.57611**	**92.798**	107.202
	☐	**14.96012**	**92.22464**	107.7754
	☐	**16.90441**	**91.9759**	108.0241
	☐	**19.14108**	**92.07997**	107.92
	☐	**21.39047**	**91.92807**	108.0719
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			

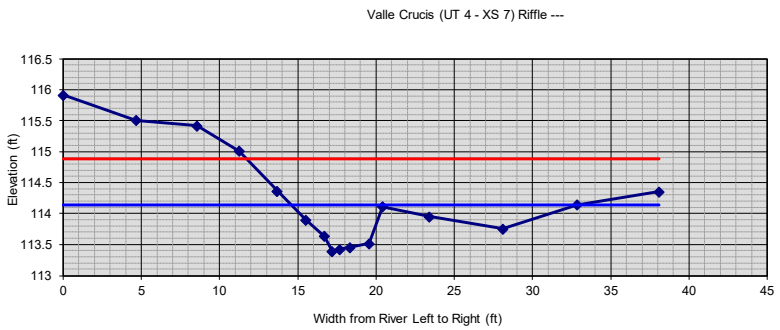
FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
92.74	**93.25**	**100.0**		
107.26	106.75			

dimensions			
5.4	x-section area	0.8	d mean
6.4	width	7.7	wet P
1.5	d max	0.7	hyd radi
1.0	bank ht	7.6	w/d ratio
100.0	W flood prone area	15.6	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

Cross Section



section:	Valle Crucis (UT 4 - XS 7)
	Riffle

	---
description:	Valle Crucis (UT 4 - XS 7)
height of instrument (ft):	200.00

notes	omit pt.	distance (ft)	FS (ft)	elevation
	☐	0	84.08217	115.9178
	☐	4.668231	84.49268	115.5073
	☐	8.55575	84.58219	115.4178
	☐	11.25636	84.98848	115.0115
	☐	13.68957	85.63383	114.3662
	☐	15.52746	86.10122	113.8988
	☐	16.69225	86.36322	113.6368
	☐	17.20517	86.61239	113.3876
	☐	17.68877	86.57832	113.4217
	☐	18.33901	86.54634	113.4537
	☐	19.55548	86.48302	113.517
	☐	20.41892	85.89045	114.1096
	☐	23.4216	86.05065	113.9493
	☐	28.09069	86.24833	113.7517
	☐	32.86445	85.861	114.139
	☐	38.10506	85.64463	114.3554
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			
	☐			

FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
85.86	85.86	100.0		
114.14	114.14			

dimensions			
5.4	x-section area	0.3	d mean
18.3	width	18.6	wet P
0.8	d max	0.3	hyd radi
0.8	bank ht	62.4	w/d ratio
100.0	W flood prone area	5.5	ent ratio

hydraulics	
0.0	velocity (ft/sec)
0.0	discharge rate, Q (cfs)
0.00	shear stress ((lbs/ft sq)
0.00	shear velocity (ft/sec)
0.000	unit stream power (lbs/ft/sec)
0.00	Froude number
0.0	friction factor u/u*
~~0.0~~	threshold grain size (mm)

check from channel material			
0	measured D84 (mm)		
0.0	relative roughness	0.0	fric. factor
0.000	Manning's n from channel material		

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

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

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

PROJECT/SITE INFORMATION:

1. Project name (if any): Valle Crucis SAM 1 (UT 2)
2. Date of evaluation: October 2, 2019
3. Applicant/owner name: Restoration Systems
4. Assessor name/organization: Jernigan/Keith - Axiom
5. County: Watauga
6. Nearest named water body on USGS 7.5-minute quad: Valle Crucis
7. River basin: Watauga
8. Site coordinates (decimal degrees, at lower end of assessment reach): 36.19617, -81.79059

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): SAM 1 (UT 2)
10. Length of assessment reach evaluated (feet): 75
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 4 - 5 ft ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 10
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☒Perennial flow ☐Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

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

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

☐A  (more sinuous stream, flatter valley slope)

☒B  (less sinuous stream, steeper valley slope)

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

ADDITIONAL INFORMATION:

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

☐Section 10 water ☒Classified Trout Waters ☐Water Supply Watershed (☐I ☐II ☐III ☐IV ☐V)
☐Essential Fish Habitat ☐Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters
☐Publicly owned property ☐NCDWR Riparian buffer rule in effect ☐Nutrient Sensitive Waters
☐Anadromous fish ☐303(d) List ☐CAMA Area of Environmental Concern (AEC)
☐Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐Designated Critical Habitat (list species)

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

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

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

2. Evidence of Flow Restriction – assessment reach metric

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

3. Feature Pattern – assessment reach metric

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

4. Feature Longitudinal Profile – assessment reach metric

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

5. Signs of Active Instability – assessment reach metric

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

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

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

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

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

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

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

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

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

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

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

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

Check for Tidal Marsh Streams Only

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

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

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

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

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

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

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

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

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

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

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

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

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☐Other: _____

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

Notes/Sketch:
Deeply incised stream channel between steep terrain and flattening into floodplain.

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Valle Crucis SAM 1 (UT 2)	Date of Assessment	October 2, 2019
Stream Category	Mb1	Assessor Name/Organization	Jernigan/Keith - Axiom

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

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

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

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

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

PROJECT/SITE INFORMATION:

1. Project name (if any): Valle Crucis SAM 2 (UT 1 upstream)
2. Date of evaluation: October 2, 2019
3. Applicant/owner name: Restoration Systems
4. Assessor name/organization: Jernigan/Keith - Axiom
5. County: Watauga
6. Nearest named water body on USGS 7.5-minute quad: Valle Crucis
7. River basin: Watauga
8. Site coordinates (decimal degrees, at lower end of assessment reach): 36.19633, -81.79213

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): SAM 2 (UT 1)
10. Length of assessment reach evaluated (feet): 75
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 2 - 3 ft ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 6 - 10
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☒Perennial flow ☐Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

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

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

☐A  (more sinuous stream, flatter valley slope)

☒B  (less sinuous stream, steeper valley slope)

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

ADDITIONAL INFORMATION:

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

☐Section 10 water ☒Classified Trout Waters ☐Water Supply Watershed (☐I ☐II ☐III ☐IV ☐V)
☐Essential Fish Habitat ☐Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters
☐Publicly owned property ☐NCDWR Riparian buffer rule in effect ☐Nutrient Sensitive Waters
☐Anadromous fish ☐303(d) List ☐CAMA Area of Environmental Concern (AEC)
☐Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐Designated Critical Habitat (list species)

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

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

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

2. Evidence of Flow Restriction – assessment reach metric

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

3. Feature Pattern – assessment reach metric

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

4. Feature Longitudinal Profile – assessment reach metric

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

5. Signs of Active Instability – assessment reach metric

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

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

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

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

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

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

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

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

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

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

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

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

Check for Tidal Marsh Streams Only

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

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

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

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

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☒

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

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

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

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

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

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

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

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☐Other: _____

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

Notes/Sketch:
Stream in woods is very nice and undisturbed with lots of aquatic organisms.

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Valle Crucis SAM 2 (UT 1 upstream)	Date of Assessment	October 2, 2019
Stream Category	Mb1	Assessor Name/Organization	Jernigan/Keith - Axiom

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

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

NC SAM FIELD ASSESSMENT RESULTS
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USACE AID #: NCDWR #:

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

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

PROJECT/SITE INFORMATION:

1. Project name (if any): Valle Crucis SAM 3 (UT 4)
2. Date of evaluation: October 2, 2019
3. Applicant/owner name: Restoration Systems
4. Assessor name/organization: Jernigan/Keith - Axiom
5. County: Watauga
6. Nearest named water body on USGS 7.5-minute quad: Dutch Creek
7. River basin: Watauga
8. Site coordinates (decimal degrees, at lower end of assessment reach): 36.19394, -81.78962

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): SAM 3 (UT 4)
10. Length of assessment reach evaluated (feet): 100
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 1 - 2 ft ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 2 - 4
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☒Perennial flow ☐Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

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

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

☒A  (more sinuous stream, flatter valley slope)

☐B  (less sinuous stream, steeper valley slope)

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

ADDITIONAL INFORMATION:

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

☐Section 10 water ☒Classified Trout Waters ☐Water Supply Watershed (☐I ☐II ☐III ☐IV ☐V)
☐Essential Fish Habitat ☐Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters
☐Publicly owned property ☐NCDWR Riparian buffer rule in effect ☐Nutrient Sensitive Waters
☐Anadromous fish ☐303(d) List ☐CAMA Area of Environmental Concern (AEC)
☐Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐Designated Critical Habitat (list species)

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

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

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

2. Evidence of Flow Restriction – assessment reach metric

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

3. Feature Pattern – assessment reach metric

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

4. Feature Longitudinal Profile – assessment reach metric

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

5. Signs of Active Instability – assessment reach metric

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

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

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

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

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

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

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

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

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

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

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

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

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☐Other: _____

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

Notes/Sketch:

Stream in woods is very nice and undisturbed with lots of aquatic organisms.

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Valle Crucis SAM 3 (UT 4)	Date of Assessment	October 2, 2019
Stream Category	Ma2	Assessor Name/Organization	Jernigan/Keith - Axiom

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

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

NC WAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Valle Crucis	Date of Evaluation	October 2, 2019
Applicant/Owner Name	Restoration Systems	Wetland Site Name	WAM1
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	Radecki/Jernigan/Keith - Axiom
Level III Ecoregion	Blue Ridge Mountains	Nearest Named Water Body	Dutch Creek
River Basin	Watauga	USGS 8-Digit Catalogue Unit	06010103
County	Watauga	NCDWR Region	Asheville
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	36.195178, -81.789166

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

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

Is the assessment area intensively managed? ☒ Yes ☐ No

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

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

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

☒A 0
☐B 1 to 4
☐C 5 to 8

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

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

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

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

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

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

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

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

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

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

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

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

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

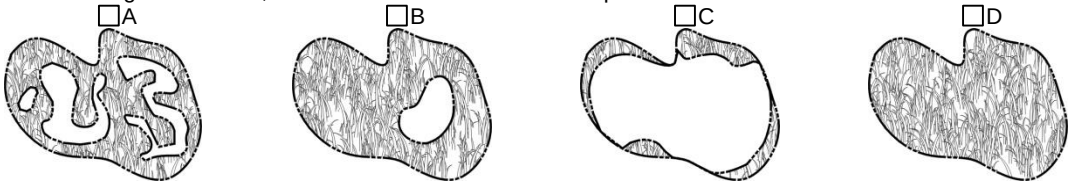
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

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

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

☐A ☐B ☐C ☐D



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

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

Notes
Wetland is between spring house and stream and is very wet in spots. Evidence of cattle in stream and wetland is prevalent.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	WAM1	Date of Assessment	October 2, 2019
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	Radecki/Jernigan/Keith - Axiom

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#: NCDWR #:

Project Name: Valle Crucis
Date of Evaluation: 210617
Applicant/Owner Name: Restoration Systems
Wetland Site Name: WAM-3 PWD
Wetland Type: Headwater Forest
Assessor Name/Organization: Perkinson/Axiom
Level III Ecoregion: Blue Ridge Mountains
Nearest Named Water Body: Dutch Creek
River Basin: Watauga
USGS 8-Digit Catalogue Unit: 06010103
County: Watauga
NCDWR Region: Asheville
○ Yes ◉ No Precipitation within 48 hrs?
Latitude/Longitude (deci-degrees): 36.196574, -81.792256

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

Broad wetland located in a topographic crenulation, abundant groundwater at surface. Wetland and stream is trampled by livestock. A stream enters the upslope portion of wetland but braids within wetland due to livestock impacts, stream reforms below wetland. sparse herbacous vegetation. Wetlands extends outside of project boundary.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	WAM-3 PWD	Date	210617
Wetland Type	Headwater Forest	Assessor Name/Organization	Perkinson/Axiom

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

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**HIGH**
	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 5

USACE AID#: NCDWR #:

Project Name: Valle Crucis
Date of Evaluation: 210617
Applicant/Owner Name: Restoration Systems
Wetland Site Name: WAM-4 PWE
Wetland Type: Headwater Forest
Assessor Name/Organization: Perkinson/Axiom
Level III Ecoregion: Blue Ridge Mountains
Nearest Named Water Body: Dutch Creek
River Basin: Watauga
USGS 8-Digit Catalogue Unit: 06010103
County: Watauga
NCDWR Region: Asheville
○ Yes ◉ No Precipitation within 48 hrs?
Latitude/Longitude (deci-degrees): 36.196073, -81.790183

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

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

Is the assessment area intensively managed? ○ Yes ○ No

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

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

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

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

Is the assessment area on a coastal island? ○ Yes ◉ No

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

Does the assessment area experience overbank flooding during normal rainfall conditions? ◉ Yes ○ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

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

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

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

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

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

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

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

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

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

4b.
- ◉ A Soil ribbon < 1 inch
- ○ B Soil ribbon ≥ 1 inch

4c.
- ◉ A No peat or muck presence
- ○ B A peat or muck presence

5. Discharge into Wetland – opportunity metric

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

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

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

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

7a. Is assessment area within 50 feet of a tributary or other open water?
◉ Yes ○ No If Yes, continue to 7b. If No, skip to Metric 8.

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

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

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

7e. Is tributary or other open water sheltered or exposed?
- ◉ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ○ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

- ( ) A Sediment deposition is not excessive, but at approximately natural levels.
- (●) B Sediment deposition is excessive, but not overwhelming the wetland.
- ( ) C Sediment deposition is excessive and is overwhelming the wetland.

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

- ( ) A 0
- (●) B 1 to 4
- ( ) C 5 to 8

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

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

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

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

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

17a. Is vegetation present?

(●) Yes ( ) No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

( ) A ≥ 25% coverage of vegetation
( ) B < 25% coverage of vegetation

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

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

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

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

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

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

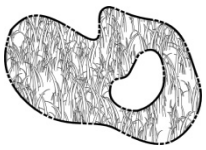
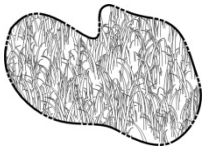
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.

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

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

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

( ) A 
( ) B 
( ) C 
( ) D 

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

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

(●) A Overbank and overland flow are not severely altered in the assessment area.
( ) B Overbank flow is severely altered in the assessment area.
( ) C Overland flow is severely altered in the assessment area.
( ) D Both overbank and overland flow are severely altered in the assessment area.

Notes

Wetland located along Trib-3, has been trampled by cows, impateins capensis is the dominate species. Wetland rates high but is regularly trampled by livestock.

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	WAM-4 PWE	Date	210617
Wetland Type	Headwater Forest	Assessor Name/Organization	Perkinson/Axiom

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **HIGH**

SWIT-1

UT1 up

NC DWQ Stream Identification Form Version 4.11

Date: 6/25/2001	**Project/Site:** Valle Crucis	**Latitude:** 36.197129
Evaluator: AXF/WGL	**County:** Watauga	**Longitude:** -81.793119
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 24.75	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** Valle Crucis *e.g. Quad Name:*

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

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

B. Hydrology (Subtotal = 7.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 10.25)				
18. Fibrous roots in streambed	3	2	(1)	0
19. Rooted upland plants in streambed	3	2	(1)	0
20. Macrobenthos (note diversity and abundance)	0	1	2	(3)
21. Aquatic Mollusks	0	1	2	(3)
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	0.5	1	(1.5)
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = (0.75) OBL = 1.5 Other = 0			

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

Notes:

Sketch:

SWIT-2

UT1 Down

NC DWQ Stream Identification Form Version 4.11

Date: 6/25/2021	Project/Site: Valle Crucis	Latitude: 36.196973
Evaluator: AXE/WGL	County: Watauga	Longitude: -81.792814
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 40.25	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other Valle Crucis *e.g. Quad Name:*

A. Geomorphology (Subtotal = 16.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		Yes = 3	

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

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

C. Biology (Subtotal = 15.75)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	(3)
21. Aquatic Mollusks	0	1	2	(3)
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	0.5	1	(1.5)
24. Amphibians	0	0.5	1	(1.5)
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = (0.75); OBL = 1.5 Other = 0			

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

Notes:

Sketch:

SWIT-3 UT 2 UP

NC DWQ Stream Identification Form Version 4.11

Date: 6/25/2021	**Project/Site:** Valle Crucis	**Latitude:** 36.197132
Evaluator: AXE WGL	**County:** Watauga	**Longitude:** -81.791697
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 31.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** Valle Crucis *e.g. Quad Name:*

A. Geomorphology (Subtotal = 11.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	(1)	2	3
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	(0)	1	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	1	(2)	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		Yes = 3	

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

B. Hydrology (Subtotal = 7.5)				
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 = 12.5)				
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:

SWIT-4

UT 2A

NC DWQ Stream Identification Form Version 4.11

Date: 6/25/2021	**Project/Site:** Valle Crucis	**Latitude:** 36.196684
Evaluator: AXE WGL	**County:** Watauga	**Longitude:** -81.791042
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 24.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:* Valle Crucis

A. Geomorphology (Subtotal = 7.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	(0)	1	2	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	(0)	1	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

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

B. Hydrology (Subtotal = 5.5)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 11.5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	0	1	(2)	3
21. Aquatic Mollusks	0	1	(2)	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	0.5	(1)	1.5
24. Amphibians	0	0.5	(1)	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

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

Notes:

Sketch:

SWIT-5 UT3

NC DWQ Stream Identification Form Version 4.11

Date: 6/25/2021	**Project/Site:** Valle Crucis	**Latitude:** 36.196746
Evaluator: AXE WGL	**County:** Watauga	**Longitude:** -81.790202
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 33.25	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** Valle Crucis *e.g. Quad Name:*

A. Geomorphology (Subtotal = 11.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	(0)	1	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

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

B. Hydrology (Subtotal = 7.5)				
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 = 14.25)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	(3)
21. Aquatic Mollusks	0	1	2	(3)
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	0.5	1	(1.5)
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = (0.75) OBL = 1.5 Other = 0			

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

Notes:

Sketch:

SWIT-6 UT4 Upstream @ Crossing

NC DWQ Stream Identification Form Version 4.11

Date: 6/25/2021	Project/Site: Valle Crucis	Latitude: 36.194966
Evaluator: AXE WGL	County: Watauga	Longitude: -81.7943
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 19	Stream Determination (circle one) Ephemeral (Intermittent) Perennial	Other e.g. Quad Name: Valle Crucis

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

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

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

C. Biology (Subtotal = 5.5)				
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: Evaluation conducted in dry time of year, otherwise evidence of hydrology would increase points.

Sketch:

SWIT-7

UT 4 Downstream @ Perennial crossing

NC DWQ Stream Identification Form Version 4.11

Date: 6/25/2021	**Project/Site:** Valle Crucis	**Latitude:** 36.194734
Evaluator: AXE / WGL	**County:** Watauga	**Longitude:** -81.793783
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 32.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** Valle Crucis *e.g. Quad Name:*

A. Geomorphology (Subtotal = 14)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	(0)	1	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	1	(2)	3
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

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

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

C. Biology (Subtotal = 10.5)				
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: Caddis flys, amphipods

Sketch:

SWIT-8

HT-5

NC DWQ Stream Identification Form Version 4.11

Date: 6/16/21	Project/Site: Valle Crucis	Latitude: 36.195916
Evaluator: Perkinson/Hoots/Lewis	County: Watauga	Longitude: -81.791765
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 32.75	Stream Determination (circle one) Ephemeral Intermittent (Perennial)	Other Valle Crucis e.g. Quad Name:

A. Geomorphology (Subtotal = 18.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

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

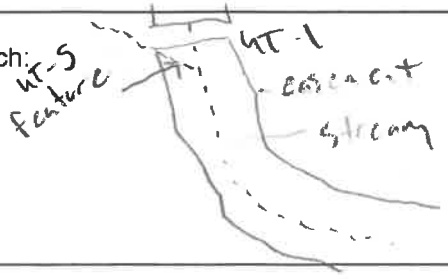
B. Hydrology (Subtotal = 7)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7.75)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	→ 2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians *	0	0.5	(1)	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	(FACW = 0.75); OBL = 1.5 Other = 0			

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

Notes: Caddis, newt, casings

Sketch:



Site		Valle Crucis Mitigation Site						
Stream		UT1			Bank Length		5214	
Observers		AEK/KRJ			Date		16-Mar-21	
	Station	Bank	BEHI	NBS	Erosion Rate	Length	Bank Height	Erosion
1	1064	right	Low	Low	0	1064	1	0.0
2	1212	right	Mod	Low	0.02	148	2	5.9
3	1285	right	Low	Low	0	73	1	0.0
4	1323	right	Low	Low	0	38	1	0.0
5	1427	right	Low	Low	0	104	4	0.0
6	1773	right	Low	Low	0	346	1	0.0
7	1830	right	Mod	Low	0.02	57	3	3.4
8	2388	right	Low	Low	0	558	2.5	0.0
9	2607	right	Mod	Low	0.02	219	3	13.1
10								
11								
12								
13	1064	left	Low	Low	0	1064	1	0.0
14	1212	left	Mod	Low	0.02	148	2	5.9
15	1285	left	Low	Low	0	73	1	0.0
16	1323	left	Very High	Mod	0.8	38	3	91.2
17	1427	left	Low	Low	0	104	1	0.0
18	1773	left	Low	Low	0	346	1	0.0
19	1830	left	Mod	Low	0.02	57	3	3.4
20	2388	left	Low	Low	0	558	2.5	0.0
21	2607	left	Mod	Low	0.02	219	3	13.1
22								
23								
24								
Sum erosion sub-totals for each BEHI/NBS						Total Erosion (ft3/yr)		136.2
Divide total erosion (ft3) by 27						Total Erosion (yd/yr)		5.0
Multiply Total erosion (yard3) by 1.3						Total Erosion (tons/yr)		6.6
Erosion per unit length						Total Erosion (Tons/yr/ft)		0.001

Site		Valle Crucis Mitigation Site						
Stream		UT 2			Bank Length		1374	
Observers		AEK			Date		2-Oct-19	
	Station	Bank	BEHI	NBS	Erosion Rate	Length	Bank Height	Erosion
1	221	right	Low	Low	0	221	1	0.0
2	237	right	Mod	Low	0.02	16	3	1.0
4	314	right	Low	Low	0	77	2	0.0
4	420	right	Low	Low	0	106	4	0.0
5	531	right	Low	Low	0	111	4	0.0
6	596	right	Very High	Mod	0.8	65	3	156.0
7	625	right	High	Low	0.1	29	2	5.8
8	687	right	Low	Low	0	62	1	0.0
9								
10								
11								
12								
13	221	left	Low	Low	0	221	1	0.0
14	237	left	Mod	Low	0.02	16	1	0.3
15	314	left	Low	Low	0	77	2	0.0
16	420	left	Very High	Mod	0.8	106	4	339.2
17	531	left	High	Mod	0.15	111	4	66.6
18	596	left	Low	Low	0	65	1	0.0
19	625	left	Low	Low	0	29	1	0.0
20	687	left	Low	Low	0	62	1	0.0
21								
22								
23								
24								
Sum erosion sub-totals for each BEHI/NBS						Total Erosion (ft3/yr)		568.9
Divide total erosion (ft3) by 27						Total Erosion (yd/yr)		21.1
Multiply Total erosion (yard3) by 1.3						Total Erosion (tons/yr)		27.4
Erosion per unit length						Total Erosion (Tons/yr/ft)		0.020

Site		Valle Crucis Mitigation Site						
Stream		UT 3			Bank Length		440	
Observers		AEK			Date		2-Oct-19	
	Station	Bank	BEHI	NBS	Erosion Rate	Length	Bank Height	Erosion
1	220	right	Low	Low	0	220	1	0.0
2								
3								
4								
5	220	left	Low	Low	0	220	1	0.0
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
Sum erosion sub-totals for each BEHI/NBS						Total Erosion (ft3/yr)		0.0
Divide total erosion (ft3) by 27						Total Erosion (yd/yr)		0.0
Multiply Total erosion (yard3) by 1.3						Total Erosion (tons/yr)		0.0
Erosion per unit length						Total Erosion (Tons/yr/ft)		0.000

Site		Valle Crucis Mitigation Site						
Stream		UT 4			Bank Length		5103	
Observers		AEK			Date		2-Oct-19	
	Station	Bank	BEHI	NBS	Erosion Rate	Length	Bank Height	Erosion
1	673	left	Low	Low	0	673	1	0.0
2	963	left	Low	Low	0	290	1	0.0
3	1221	left	Low	Low	0	258	1	0.0
4	1289	left	Mod	Low	0.02	68	2	2.7
5	1514	left	Low	Low	0	225	3	0.0
6	1568	left	Mod	Low	0.02	54	4	4.32
	2454	left	Low	Low	0	886	1	0
7								
8	673	right	Low	Low	0	673	1	0.0
9	963	right	High	Low	0.1	290	4	116.0
10	1221	right	Low	Low	0	258	1	0.0
11	1289	right	Low	Low	0	68	2	0.0
12	1484	right	Low	Low	0	195	3	0.0
13	1709	right	High	Low	0.1	225	6	135.0
14	1763	right	Mod	Low	0.02	54	4	4.3
15	2649	right	Low	Low	0	886	1	0.0
16								
17								
18								
19								
20								
21								
22								
23								
24								
Sum erosion sub-totals for each BEHI/NBS						Total Erosion (ft3/yr)		262.4
Divide total erosion (ft3) by 27						Total Erosion (yd/yr)		9.7
Multiply Total erosion (yard3) by 1.3						Total Erosion (tons/yr)		12.6
Erosion per unit length						Total Erosion (Tons/yr/ft)		0.002

BEHI/NBS Summary

Stream Reach	Erosion Rate (tons/year)
UT 1	6.6
UT 2	27.4
UT 2A	0.0
UT 3	0.0
UT 4	12.6
UT 5	0.0
UT 6	0.0
Total	**46.6**

AXIOM ENVIRONMENTAL, INC
218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 10/2/2019

Project/Site: Valle Crucis

County, State: Watauga County, NC

Sampling Point/
Coordinates: **Soil Profile A (36.193789, -81.789595)**

Investigator: W. Grant Lewis

Soil Series: Dellwood variant (Nikwasi)

Notes: Location is shown on Figure 5.

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-3	10 YR 6/4	100			sandy loam
3-14	10 YR 5/2	85	10 YR 6/6	15	sandy loam
14+	10YR 4/2	70	10 YR 6/8	25	sandy clay loam
			10 YR 7/1	5	

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

AXIOM ENVIRONMENTAL, INC
218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 8/25/2022

Project/Site: Valle Crucis

County, State: Watauga County, NC

Sampling Point/
Coordinates: **Soil Profile B (36.195928, -81.790304)**

Investigator: W. Grant Lewis

Soil Series: Dellwood variant (Nikwasi)

Notes: Location is shown on Figure 5.

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-2	10 YR 2/1	100			loam
2-8	10 YR 3/2	95	10 YR 3/6	5	sandy clay loam
8-20	10YR 4/1	90	10 YR 4/6	10	sandy clay loam
20+	10YR 5/1	90	10 YR 4/6	10	clay loam

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

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SOIL BORING LOG

Date: 8/25/2022

Project/Site: Valle Crucis

County, State: Watauga County, NC

Sampling Point/
Coordinates: **Soil Profile C (36.195404, -81.789535)**

Investigator: W. Grant Lewis

Soil Series: Dellwood variant (Nikwasi)

Notes: Location is shown on Figure 5.

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-4	10 YR 5/3	80	10 YR 5/8	20	sandy loam
4-12	10 YR 5/2	80	10 YR 4/6	20	sandy clay loam
12-18+	10YR 7/2	70	10 YR 6/8	30	sandy clay

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Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

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SOIL BORING LOG

Date: 8/25/2022

Project/Site: Valle Crucis

County, State: Watauga County, NC

Sampling Point/
Coordinates: **Soil Profile D (36.194319, -81.788775)**

Investigator: W. Grant Lewis

Soil Series: Dellwood variant (Nikwasi)

Notes: Location is shown on Figure 5.

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-5	10 YR 4/2	100			silt loam
5-14	10 YR 5/2	95	10 YR 5/8	5	loam
14-19	10YR 5/2	85	10 YR 6/2	5	sandy loam
			10 YR 5/8	10	
19+	10YR 5/2	85	10 YR 6/2	5	sandy clay loam
			10 YR 5/8	10	

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Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

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SOIL BORING LOG

Date: 8/25/2022

Project/Site: Valle Crucis

County, State: Watauga County, NC

Sampling Point/
Coordinates: **Soil Profile E (36.193171, -81.791359)**

Investigator: W. Grant Lewis

Soil Series: Saunook variant (Nikwasi)

Notes: Location is shown on Figure 5.

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-12	Gley YR 3/2	95	10 YR 4/4	5	sandy clay loam
12+	10 YR 3/2	90	10 YR 3/6	10	gravely sandy loam

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Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

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SOIL BORING LOG

Date: 8/25/2022

Project/Site: Valle Crucis

County, State: Watauga County, NC

Sampling Point/
Coordinates: **Soil Profile F (36.193309, -81.790333)**

Investigator: W. Grant Lewis

Soil Series: Dellwood variant (Nikwasi)

Notes: Location is shown on Figure 5.

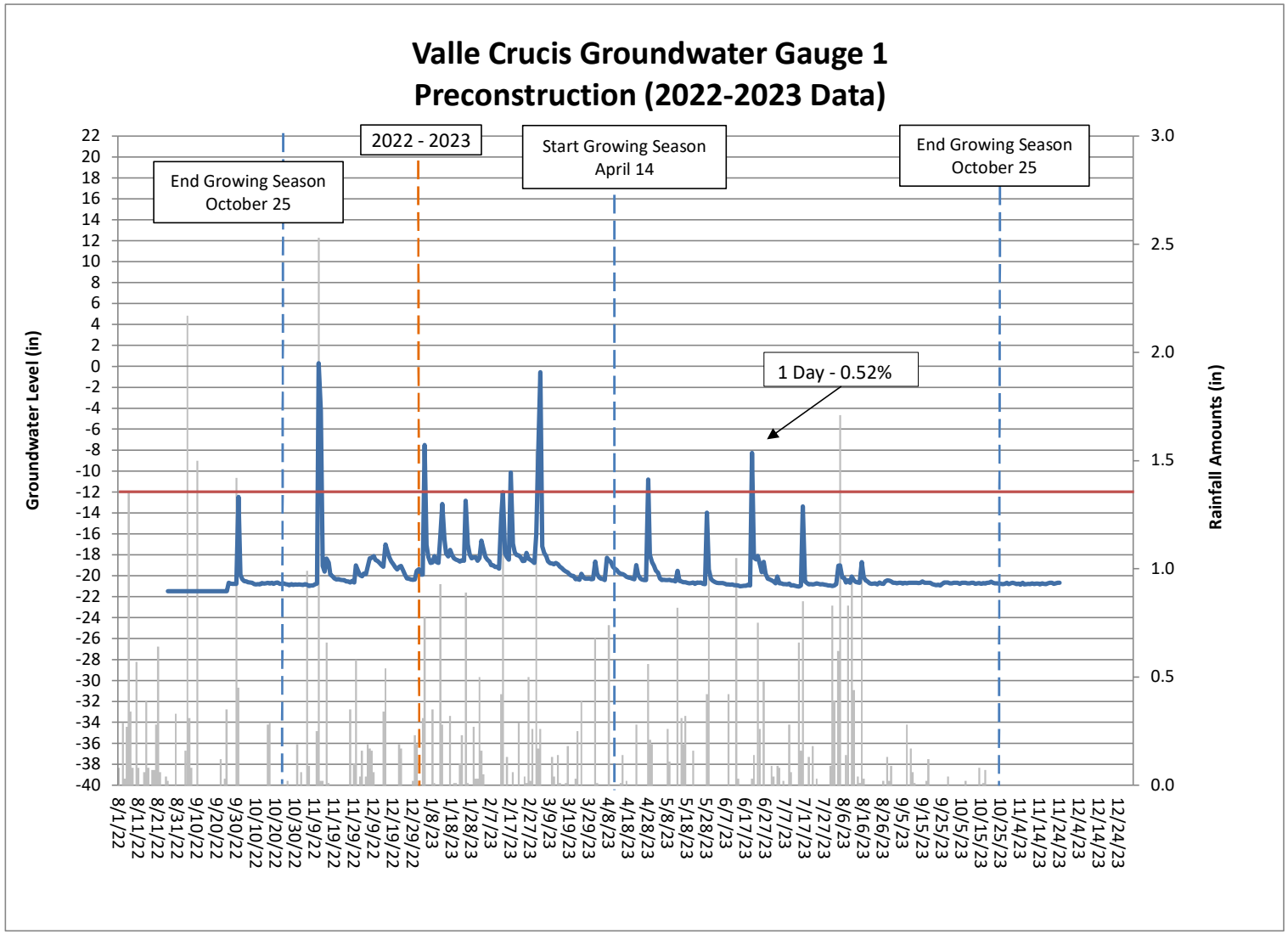
Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-9	10 YR 5/3	70	10 YR 5/6	30	loam
9-18	10 YR 4/2	90	10 YR 3/6	5	silty clay loam
			10 YR 5/8	5	
18+	10 YR 4/2	90	10 YR 3/6	5	clay
			10 YR 5/8	5	

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis


Valle Crucis Groundwater Gauge 1
Preconstruction (2022-2023 Data)
2022 - 2023
Start Growing Season
April 14
End Growing Season
October 25
End Growing Season
October 25
1 Day - 0.52%
Groundwater Level (in)
Rainfall Amounts (in)
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.0
2.5
2.0
1.5
1.0
0.5
0.0
8/1/22
8/11/22
8/21/22
8/31/22
9/10/22
9/20/22
9/30/22
10/10/22
10/20/22
10/30/22
11/9/22
11/19/22
11/29/22
12/9/22
12/19/22
12/29/22
1/8/23
1/18/23
1/28/23
2/7/23
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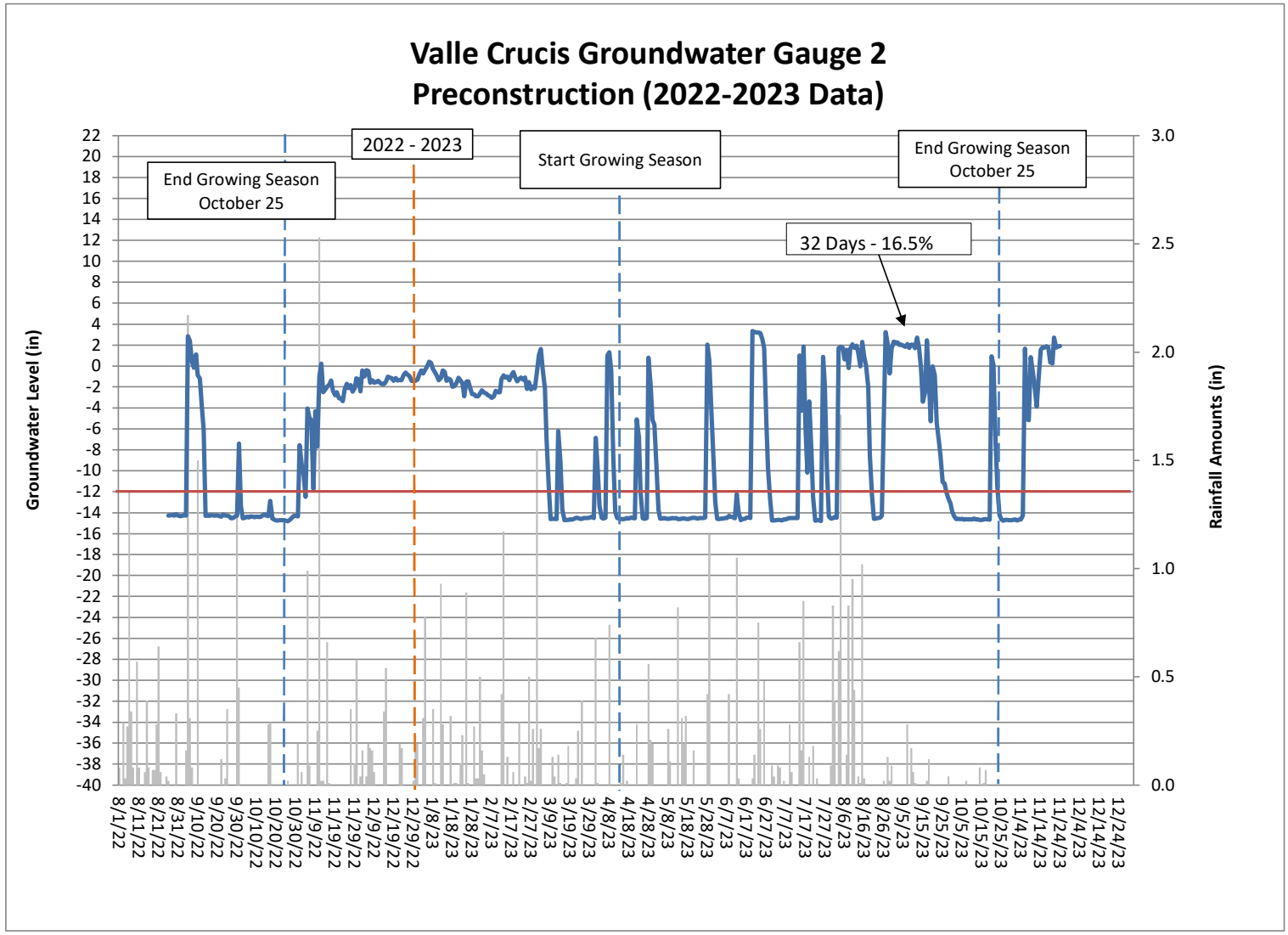
12/24/23


Valle Crucis Groundwater Gauge 2
Preconstruction (2022-2023 Data)
Groundwater Level (in)
Rainfall Amounts (in)
End Growing Season
October 25
2022 - 2023
Start Growing Season
End Growing Season
October 25
32 Days - 16.5%
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
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-30
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-40
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11/14/23
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12/4/23
12/14/23
12/24/23

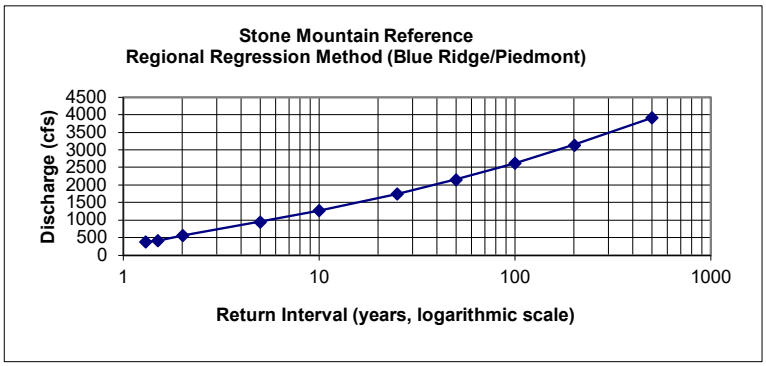
Appendix C - Flood Frequency Analysis Data

Regional Regression Method
Valle Crucis Restoration Studies

Stone Mountain Reference
(DA = 7.5 square miles)
Region: Blue Ridge/Piedmont

Return Interval (years)	Discharge (cfs)
1.3	**385**
1.5	**410**
2	555
5	947
10	1270
25	1750
50	2160
100	2620
200	3140
500	3930

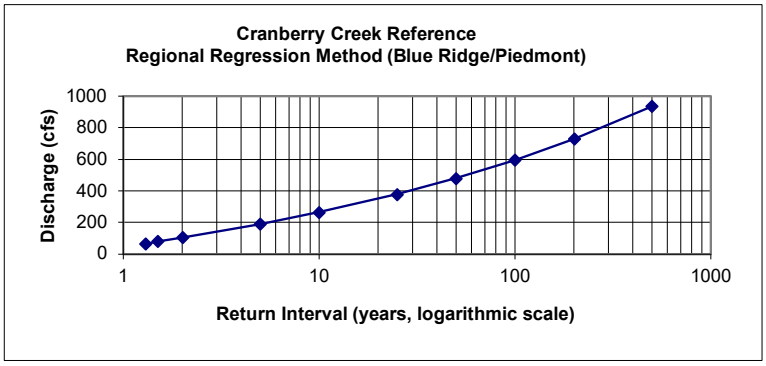
Bold indicates interpolated data.



Cranberry Creek Reference
(DA = 0.7 square mile)
Region: Blue Ridge/Piedmont

Return Interval (years)	Discharge (cfs)
1.3	**65**
1.5	**80**
2	105
5	190
10	264
25	378
50	480
100	596
200	729
500	935

Bold indicates interpolated data.

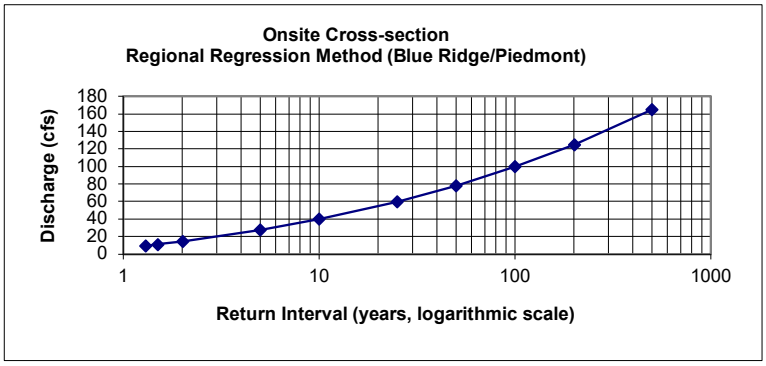


Regional Regression Method
Valle Crucis Restoration Studies

Rockhouse Cr (Upstream)
(DA = 0.04 square miles)
Region: Blue Ridge/Piedmont

Return Interval (years)	Discharge (cfs)
1.3	**9**
1.5	**11**
2	14.1
5	27.4
10	39.7
25	59.7
50	78
100	99.6
200	125
500	165

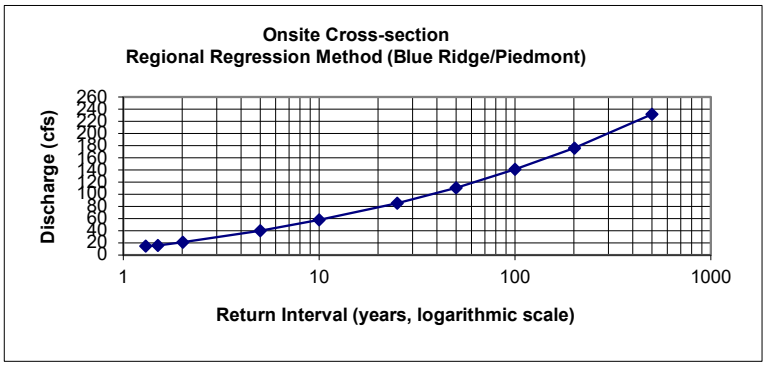
Bold indicates interpolated data.



Rockhouse Cr (Downstream)
(DA = 0.07 square miles)
Region: Blue Ridge/Piedmont

Return Interval (years)	Discharge (cfs)
1.3	**14**
1.5	**16**
2	20.9
5	40
10	57.4
25	85.6
50	111
100	141
200	176
500	232

Bold indicates interpolated data.



Appendix D - Jurisdictional Determination Info

From: Fuemmeler, Amanda J CIV (USA)
To: Grant Lewis; Mason Harris
Subject: Delineation Concurrence for Valle Crucis Mitigation Site AID 2021-01272
Date: Friday, September 3, 2021 8:15:58 AM
Attachments: DelineationConcurrence_ApprovedMap.pdf

On July 12, 2021, we received information from you requesting the Wilmington District, Regulatory Division to review and concur with the boundaries of an aquatic resource delineation on the behalf Restoration Systems LLC for the property located along Dutch Creek Road and NC Hwy 194, in Valle Crucis, Watauga County, NC. Coordinates: 36.194419 -81.789230.

We have reviewed the information provided by you concerning the aquatic resources, and by copy of this e-mail, are confirming that the aquatic resources delineation has been verified by the Corps to be a sufficiently accurate and reliable representation of the location and extent of aquatic resources within the identified review area. The location and extent of these aquatic resources are shown on the map labeled Potential Jurisdictional Features Map and dated August 27, 2021.

Regulatory Guidance Letter (RGL) 16-01 provides guidance for Jurisdictional Determinations (JD) and states "The Corps generally does not issue a JD of any type where no JD has been requested". At this time we are only verifying the delineation. This delineation may be relied upon for use in the permit evaluation process, including determining compensatory mitigation. "This verification does not address nor include any consideration for geographic jurisdiction on aquatic resources and shall not be interpreted as such. This delineation verification is not an Approved Jurisdictional Determination (AJD) and is not an appealable action under the Regulatory Program Administrative Appeal Process (33 CFR Part 331). However, you may request an AJD, which is an appealable action.

If you wish to receive a Preliminary Jurisdictional Determination (PJD), or an Approved Jurisdictional Determination (AJD) please respond accordingly, otherwise nothing further is required and we will not provide any additional documentation.

Amanda Jones
Regulatory Specialist
U.S. Army Corps of Engineers
Asheville Regulatory Field Office
151 Patton Avenue, Room 208
Asheville, NC 28801-5006
828-271-7980 ext. 4225

N

Wetland PWD
PWD-02
UT-1
UT-2
UT-2A
UT-3
Wetland PWB
Wetland PWE
PWE-109
Wetland JWA
UT-5
Wetland MCW
Wetland MWB
Wetland PWC
MWD-08
Wetland MWD
Wetland MWA
MWA-05
UT-4
Pond PA
PWA-203
Wetland PWA
Dutch Creek
UT-1
UT-4
Wetland GWB
UT-6
Wetland GWA
Dutch Creek Rd
194

0 250 500 1,000 Feet

Legend

- Area for Jurisdictional Delineation
- Potential Wetland Water
- Potential Non-Wetland Water (Intermittent)
- Potential Non-Wetland Water (Perennial)
- Potential Surface Water
- Field located GPS Point
- NCWAM Form Location
- NCSAM Form Location
- NCDWR Form Location
- USACE Form Location
- NCDOT Roads

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

POTENTIAL JURISDICTIONAL FEATURES

Drawn by: JMH

Date: 08/27/2021

Scale: 1:3000

Project No.: 21-018

FIGURE

3

Appendix E – NC NHP Letter, Biological Assessment, and Categorical Exclusion Document

NC DEPARTMENT OF
NATURAL AND CULTURAL RESOURCES

Roy Cooper, **Governor**
D. Reid Wilson, **Secretary**
Walter Clark
Director, Division of Land and Water Stewardship

NCNHDE-14389

April 5, 2021

Allison Keith
Axiom Environmental
218 Snow Ave
Raleigh, NC 27603
RE: Valle Crucis; 21-001

Dear Allison Keith:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources for the project referenced above.

A query of the NCNHP database indicates that there are records for rare species, important natural communities, natural areas, and/or conservation/managed areas within the proposed project boundary. These results are presented in the attached 'Documented Occurrences' tables and map.

The attached 'Potential Occurrences' table summarizes rare species and natural communities that have been documented within a one-mile radius of the property boundary. The proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists. Tables of natural areas and conservation/managed areas within a one-mile radius of the project area, if any, are also included in this report.

If a Federally-listed species is documented within the project area or indicated within a one-mile radius of the project area, the NCNHP recommends contacting the US Fish and Wildlife Service (USFWS) for guidance. Contact information for USFWS offices in North Carolina is found here: https://www.fws.gov/offices/Directory/ListOffices.cfm?statecode=37.

Please note that natural heritage element data are maintained for the purposes of conservation planning, project review, and scientific research, and are not intended for use as the primary criteria for regulatory decisions. Information provided by the NCNHP database may not be published without prior written notification to the NCNHP, and the NCNHP must be credited as an information source in these publications. Maps of NCNHP data may not be redistributed without permission.

Also please note that the NC Natural Heritage Program may follow this letter with additional correspondence if a Dedicated Nature Preserve, Registered Heritage Area, Land and Water Fund easement, or an occurrence of a Federally-listed species is documented near the project area.

If you have questions regarding the information provided in this letter or need additional assistance, please contact Rodney A. Butler at rodney.butler@ncdcr.gov or 919-707-8603.

Sincerely,
NC Natural Heritage Program

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Intersecting the Project Area
Valle Crucis
Project No. 21-001
April 5, 2021
NCNHDE-14389

Element Occurrences Documented Within Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Bird	14288	Vireo gilvus	Warbling Vireo	2002-05-03	E	3-Medium	---	Significantly Rare	G5	S2B

No Natural Areas are Documented within the Project Area

Managed Areas Documented Within Project Area*

Managed Area Name	Owner	Owner Type
NC Department of Cultural Resources Easement	NC DNCR, Division of State Historic Sites and Properties	State
NC Land and Water Fund Project	NC DNCR, NC Land and Water Fund	State
Blue Ridge Conservancy Easement	Blue Ridge Conservancy	Private
NC Agricultural Development and Farmland Preservation Trust Fund Easement	NC Department of Agriculture	State

*NOTE: If the proposed project intersects with a conservation/managed area, please contact the landowner directly for additional information. If the project intersects with a Dedicated Nature Preserve (DNP), Registered Natural Heritage Area (RHA), or Federally-listed species, NCNHP staff may provide additional correspondence regarding the project.

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/help. Data query generated on April 5, 2021; source: NCNHP, Q4 January 2021. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Within a One-mile Radius of the Project Area
Valle Crucis
Project No. 21-001
April 5, 2021
NCNHDE-14389

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Amphibian	5337	Cryptobranchus alleganiensis alleganiensis	Eastern Hellbender	2019-10-18	AB	3-Medium	---	Special Concern	G3T2	S3
Bird	14288	Vireo gilvus	Warbling Vireo	2002-05-03	E	3-Medium	---	Significantly Rare	G5	S2B
Butterfly	28790	Polygonia progne	Gray Comma	2008-09-13	E	5-Very Low	---	Significantly Rare	G5	S1
Mammal	37780	Corynorhinus townsendii virginianus	Virginia Big-eared Bat	2013-04-08	E	2-High	Endangered	Endangered	G4T4	S1
Mammal	36102	Myotis lucifugus	Little Brown Bat	2003-07-13	E	3-Medium	---	Significantly Rare	G3	S2
Mammal	34379	Myotis septentrionalis	Northern Long-eared Bat	2003-07-22	E	2-High	Threatened	Threatened	G1G2	S2
Mammal	34378	Myotis septentrionalis	Northern Long-eared Bat	2003-07-08	E	2-High	Threatened	Threatened	G1G2	S2
Moss	3564	Sphagnum squarrosum	Squarrose Peatmoss	1939	H	3-Medium	---	Significantly Rare Peripheral	G5	S1
Natural Community	15191	Acidic Cove Forest (Typic Subtype)	---	2012	C	3-Medium	---	---	G5	S4
Natural Community	3229	Montane Cliff (Acidic Herb Subtype)	---	1999-08-19	C	2-High	---	---	G3G4	S3
Natural Community	19459	Rich Cove Forest (Montane Intermediate Subtype)	---	2010	C	4-Low	---	---	G4	S4
Natural Community	13534	Spray Cliff	---	1999-08-19	BC	2-High	---	---	G2	S2
Vascular Plant	4784	Dicentra eximia	Bleeding Heart	1971-05	H	4-Low	---	Significantly Rare Peripheral	G4	S3
Vascular Plant	1032	Veronica americana	American Speedwell	1966-07	H	4-Low	---	Threatened	G5	S2

Natural Areas Documented Within a One-mile Radius of the Project Area

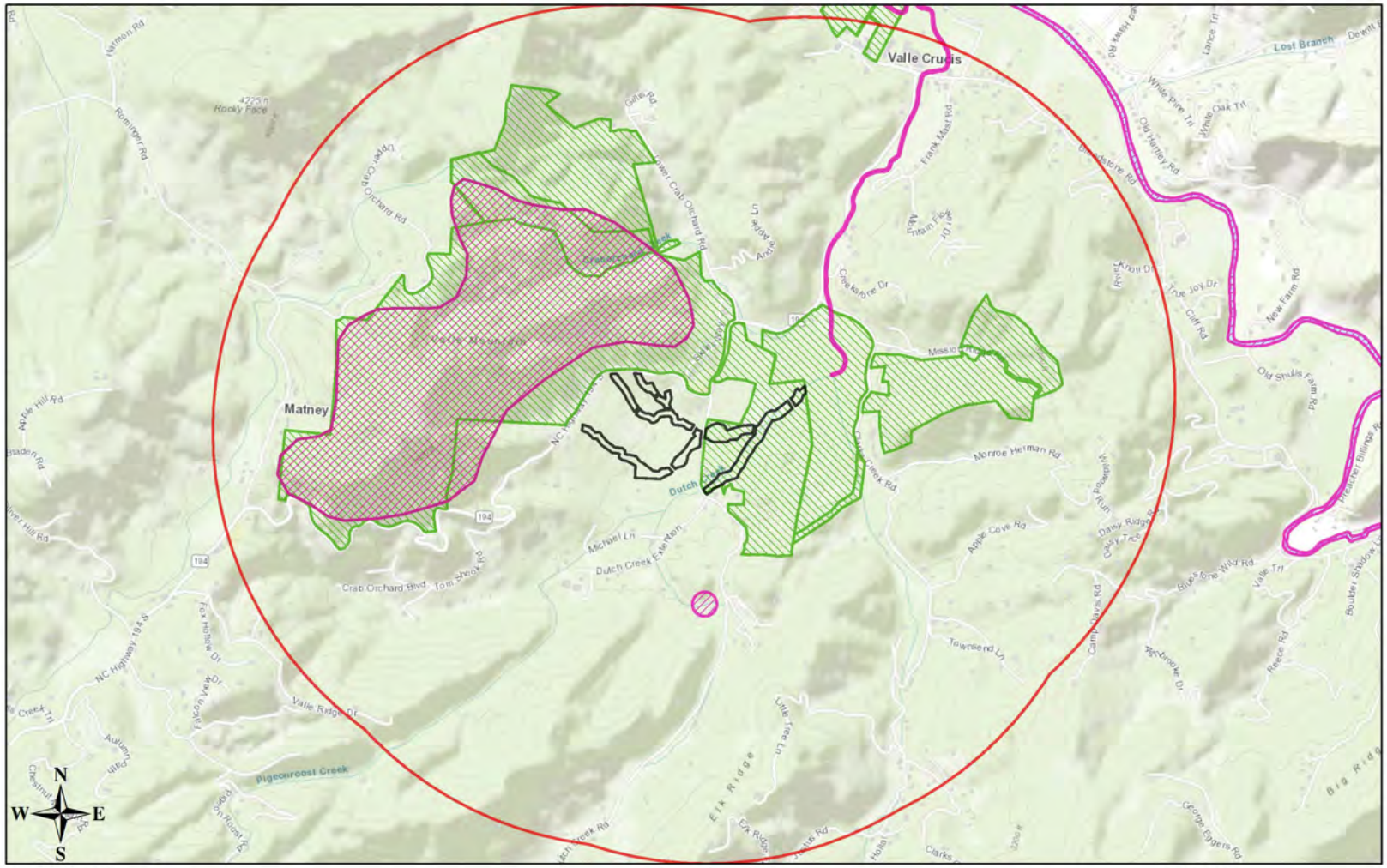
Site Name	Representational Rating	Collective Rating
Dutch Creek Falls	R5 (General)	C4 (Moderate)
Valle Mountain	R2 (Very High)	C5 (General)
WAT/Watauga River Aquatic Habitat	R2 (Very High)	C4 (Moderate)

Managed Areas Documented Within a One-mile Radius of the Project Area

Managed Area Name	Owner	Owner Type
NC Department of Cultural Resources Easement	NC DNCR, Division of State Historic Sites and Properties	State
NC Land and Water Fund Project	NC DNCR, NC Land and Water Fund	State
Valle Mountain Registered Heritage Area	Valle Crucis Conference Center	Private
Blue Ridge Conservancy Preserve	Blue Ridge Conservancy	Private
Valle Crucis Scenic Overlook	NC DNCR, Division of State Historic Sites and Properties	State
Blue Ridge Conservancy Easement	Blue Ridge Conservancy	Private
NC Agricultural Development and Farmland Preservation Trust Fund Easement	NC Department of Agriculture	State
NC Land and Water Fund Project	NC DNCR, NC Land and Water Fund	State
Blue Ridge Conservancy Preserve	Blue Ridge Conservancy	Private
Conservation Trust for North Carolina Easement	Conservation Trust for North Carolina	Private
NC Land and Water Fund Project	NC DNCR, NC Land and Water Fund	State
Blue Ridge Conservancy Easement	Blue Ridge Conservancy	Private

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/help. Data query generated on April 5, 2021; source: NCNHP, Q4 January 2021. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

NCNHDE-14389: Valle Crucis



April 5, 2021

- Project Boundary
- Buffered Project Boundary
- NHP Natural Area (NHNA)
- Managed Area (MAREA)

1:23,601

0 0.2 0.4 0.8 mi

0 0.325 0.65 1.3 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Valle Crucis Stream & Wetland Mitigation Site

Watauga County, North Carolina
NC DMS Contract # 200104-01
DMS/Project # 100205
RFP # 16-20200104
SAW 2021-01272
DWR# 20190050 v2

Task 1b: Categorical Exclusion Document

Prepared for:

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

March 2022

UPDATED MAY 2023

TASK 1 b.) Categorical Exclusion Summary:

Part 1: General Project Information (Attached)

Part 2: All Projects Regulation/Questions

Coastal Zone Management Act

No issue, the project is not located within a CAMA county.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

No issue within project boundaries – attached is a Limited Phase 1 Site Assessment performed by Environmental Data Resources, Inc. dated June 9, 2021.

National Historic Preservation Act (Section 106)

No Issue, the following correspondence is attached:

- June 18, 2021 – JD Hamby of Restoration Systems sent a scoping letter to Renee Gledhill-Earley, the Environmental Review Coordinator at the North Carolina State Historic Preservation Office (SHPO).
- August 25, 2021 – RS received a response from SHPO requesting an archaeological survey be conducted.
- October 13, 2021 – RS consultant TRC Environmental Corporation (TRC) submitted an archaeological survey to SPHO.
- November 9, 2021 – SPHO responded to TRC and concurred with their recommendations, stating, "As no eligible resources will be impacted by the undertaking as proposed, no further archaeological work is recommended prior to the streambank and wetland restoration."
- January 19, 2023 – RS Project Update Letter to SHPO
- March 6, 2023 – SHPO Response; "We have determined that the remaining scope will have no adverse effect on the district or adjacent Valle Crucis Episcopal Mission (WT0018).
- March 3, 2023 – RS Letter to Watauga County Planning Department; no response to date.

Uniform Act

Please see the attached letters sent to the project landowners on September 13, 2021.

Part 3: Ground-Disturbing Activates Regulation/Questions

American Indian Religious Freedom Act (AIRFA)

Not Issue – please see attached letter from:

- October 14, 2021 – Catawba Indian Nation response letter to USACE public notice.
- February 4, 2022 – DEQ-DMS sent letters (via email) to all three (3) applicable Cherokee tribes; Cherokee Nation, Eastern Band of the Cherokee Indians, and United Keetoowah Band of Cherokee Indians in Oklahoma – responses were not received during the requested 30-day review period.
- March 28, 2023 – DEQ-DMS sent letters to the Catawba Indian Nation, Cherokee Nation, Eastern Band of the Cherokee Indians, Muscogee (Creek) Nation, and United Keetoowah Band. Responses received from Catawba Indian Nation (5/3/23), Musogee (Creek) Nation (04/25/23), and United Keetoowah Band (04/27/2023)

Antiquities Act (AA)

Not applicable, the project is not located on Federal land.

Archaeological Resources Protection Act (ARPA)

Not applicable, the project is not located on Federal or Indian lands.

Endangered Species Act (ESA)

Five (5) federally protected species (see attached Species List) occur in Watauga County, NC, with suitable habitat present for four (4) species (Bog Turtle, and the Gray, Northern long-earned, and Virginia big-eared bat). Multiple site surveys were conducted, and the best available science was reviewed, which concluded in a Biological Conclusion of No Effect for all applicable species. The online project review (IPaC) was performed via the USFWS Asheville Field Office Website; the results are included below.

- April 6, 2022 – RS letter to FWS Asheville
- April 29, 2022 – USFWS Response
- May 31, 2022 USFWS Updated Biological Conclusions
- March 24, 2023 – Biological Assessment Report

Executive Order 13007 (Indian Sacred Sites)

Not applicable, the project is not located in a county claimed as "territory" by the Eastern Band of Cherokee Indians.

Farmland Protection Policy Act (FPPA)

- August 25, 2021 – Form AD-1006 was submitted via email to Kristin May, Acting State Soil Scientist, United States Department of Agriculture, Natural Resources Conservation Service.
- August 31, 2021 – Kristin May provided the completed AD-1006 via email. Our correspondence and the completed form are attached.

Fish and Wildlife Coordination Act (FWCA)

The online project review (IPaC) was performed via the USFWS Asheville Field Office Website, included in the document below under the Endangered Species Act section.

- September 2, 2021 – JD Hamby of Restoration Systems sent a scoping letter to Andrea Leslie, NCWRC Habitat Conservation Program Manager and Mountain Coordinator.
- September 20, 2021 – Andrea Leslie provided a response letter with recommendations that will be incorporated into the project's design and construction.

Land & Water Conservation Fund Act (Section 6(f))

Not applicable, the project will not require converting the property to a use other than public, outdoor recreation.

Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)

Not applicable, the project is not located within an estuarine system.

Migratory Bird Treaty Act (MBTA)

No Issue, please see attached Species List from the USFWS.

Wilderness Act

Not applicable, the project is not located within a Wilderness area.

Appendix A

Categorical Exclusion Form for Division of Mitigation Services Projects
Version 2

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Valle Crucis Mitigation Site
County Name:	Watauga
DMS Number:	100205
Project Sponsor:	Restoration Systems, LLC
Project Contact Name:	Raymond Holz
Project Contact Address:	1101 Haynes Street, Ste. 211, Raleigh, NC 27604
Project Contact E-mail:	rholz@restorationsystems.com
DMS Project Manager:	Harry Tsomides

Project Description

The Site occurs within 14-digit Cataloging Unit and Targeted Local Watershed 06010103010010 along cold-water tributaries to Dutch Creek. The Site is located 0.7 mile south of Valle Crucis and 6 miles west of Boone, south of the intersection of NC Highway 194 and Clarks Creek Road (SR 1136). The Site is not located within a Local Watershed Planning area. The Project will provide 3,478.0 stream mitigation units and 2.667 wetland mitigation units.

For Official Use Only

Reviewed By:

6/7/2022 — 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:

6-8-22 — Donald W Brew

Date — **For Division Administrator FHWA**

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

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

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

No issue within project boundaries – attached is a Limited Phase 1 Site Assessment performed by Environmental Data Resources, Inc. dated June 9, 2021.

Valle Crucus
200 Dutch Creek Rd
Banner Elk, NC 28604

Inquiry Number: 6527136.2s
June 08, 2021

The EDR Radius Map™ Report with GeoCheck®

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13), the ASTM Standard Practice for Environmental Site Assessments for Forestland or Rural Property (E 2247-16), the ASTM Standard Practice for Limited Environmental Due Diligence: Transaction Screen Process (E 1528-14) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

200 DUTCH CREEK RD
BANNER ELK, NC 28604

COORDINATES

Latitude (North):	36.1950600 - 36° 11' 42.21''
Longitude (West):	81.7913230 - 81° 47' 28.76''
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	428853.6
UTM Y (Meters):	4005673.0
Elevation:	2780 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	5947555 VALLE CRUCIS, NC
Version Date:	2013

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20140705, 20140704
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
200 DUTCH CREEK RD
BANNER ELK, NC 28604

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL ---------- National Priority List
Proposed NPL ---------- Proposed National Priority List Sites
NPL LIENS ---------- Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL ---------- National Priority List Deletions

Federal CERCLIS list

FEDERAL FACILITY ---------- Federal Facility Site Information listing
SEMS ---------- Superfund Enterprise Management System

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE ---------- Superfund Enterprise Management System Archive

Federal RCRA CORRACTS facilities list

CORRACTS ---------- Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF ---------- RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG ---------- RCRA - Large Quantity Generators
RCRA-SQG ---------- RCRA - Small Quantity Generators
RCRA-VSQG ---------- RCRA - Very Small Quantity Generators (Formerly Conditionally Exempt Small Quantity Generators)

Federal institutional controls / engineering controls registries

LUCIS ---------- Land Use Control Information System

US ENG CONTROLS..... Engineering Controls Sites List
US INST CONTROLS..... Institutional Controls Sites List

Federal ERNS list

ERNS..... Emergency Response Notification System

State- and tribal - equivalent NPL

NC HSDS..... Hazardous Substance Disposal Site

State- and tribal - equivalent CERCLIS

SHWS..... Inactive Hazardous Sites Inventory

State and tribal landfill and/or solid waste disposal site lists

SWF/LF..... List of Solid Waste Facilities
OLI..... Old Landfill Inventory
DEBRIS..... Solid Waste Active Disaster Debris Sites Listing
LCID..... Land-Clearing and Inert Debris (LCID) Landfill Notifications

State and tribal leaking storage tank lists

LAST..... Leaking Aboveground Storage Tanks
LUST..... Regional UST Database
INDIAN LUST..... Leaking Underground Storage Tanks on Indian Land
LUST TRUST..... State Trust Fund Database

State and tribal registered storage tank lists

FEMA UST..... Underground Storage Tank Listing
UST..... Petroleum Underground Storage Tank Database
AST..... AST Database
INDIAN UST..... Underground Storage Tanks on Indian Land

State and tribal institutional control / engineering control registries

INST CONTROL..... No Further Action Sites With Land Use Restrictions Monitoring

State and tribal voluntary cleanup sites

INDIAN VCP..... Voluntary Cleanup Priority Listing
VCP..... Responsible Party Voluntary Action Sites

State and tribal Brownfields sites

BROWNFIELDS..... Brownfields Projects Inventory

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS..... A Listing of Brownfields Sites

EXECUTIVE SUMMARY

Local Lists of Landfill / Solid Waste Disposal Sites

SWRCY ---- Recycling Center Listing
HIST LF ---- Solid Waste Facility Listing
INDIAN ODI ---- Report on the Status of Open Dumps on Indian Lands
ODI ---- Open Dump Inventory
DEBRIS REGION 9 ---- Torres Martinez Reservation Illegal Dump Site Locations
IHS OPEN DUMPS ---- Open Dumps on Indian Land

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL ---- Delisted National Clandestine Laboratory Register
US CDL ---- National Clandestine Laboratory Register

Local Land Records

LIENS 2 ---- CERCLA Lien Information

Records of Emergency Release Reports

HMIRS ---- Hazardous Materials Information Reporting System
SPILLS ---- Spills Incident Listing
IMD ---- Incident Management Database
SPILLS 90 ---- SPILLS 90 data from FirstSearch
SPILLS 80 ---- SPILLS 80 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR ---- RCRA - Non Generators / No Longer Regulated
FUDS ---- Formerly Used Defense Sites
DOD ---- Department of Defense Sites
SCRD DRYCLEANERS ---- State Coalition for Remediation of Drycleaners Listing
US FIN ASSUR ---- Financial Assurance Information
EPA WATCH LIST ---- EPA WATCH LIST
2020 COR ACTION ---- 2020 Corrective Action Program List
TSCA ---- Toxic Substances Control Act
TRIS ---- Toxic Chemical Release Inventory System
SSTS ---- Section 7 Tracking Systems
ROD ---- Records Of Decision
RMP ---- Risk Management Plans
RAATS ---- RCRA Administrative Action Tracking System
PRP ---- Potentially Responsible Parties
PADS ---- PCB Activity Database System
ICIS ---- Integrated Compliance Information System
FTTS ---- FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
MLTS ---- Material Licensing Tracking System
COAL ASH DOE ---- Steam-Electric Plant Operation Data
COAL ASH EPA ---- Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER ---- PCB Transformer Registration Database
RADINFO ---- Radiation Information Database
HIST FTTS ---- FIFRA/TSCA Tracking System Administrative Case Listing
DOT OPS ---- Incident and Accident Data
CONSENT ---- Superfund (CERCLA) Consent Decrees

INDIAN RESERV---- Indian Reservations
FUSRAP---- Formerly Utilized Sites Remedial Action Program
UMTRA---- Uranium Mill Tailings Sites
LEAD SMELTERS---- Lead Smelter Sites
US AIRS---- Aerometric Information Retrieval System Facility Subsystem
US MINES---- Mines Master Index File
ABANDONED MINES---- Abandoned Mines
FINDS---- Facility Index System/Facility Registry System
UXO---- Unexploded Ordnance Sites
DOCKET HWC---- Hazardous Waste Compliance Docket Listing
ECHO---- Enforcement & Compliance History Information
FUELS PROGRAM---- EPA Fuels Program Registered Listing
AIRS---- Air Quality Permit Listing
ASBESTOS---- ASBESTOS
COAL ASH---- Coal Ash Disposal Sites
DRYCLEANERS---- Drycleaning Sites
Financial Assurance---- Financial Assurance Information Listing
NPDES---- NPDES Facility Location Listing
UIC---- Underground Injection Wells Listing
AOP---- Animal Operation Permits Listing
MINES MRDS---- Mineral Resources Data System
CCB---- Coal Ash Structural Fills (CCB) Listing
PCSRP---- Petroleum-Contaminated Soil Remediation Permits
SEPT HAULERS---- Permitted Septage Haulers Listing

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP---- EDR Proprietary Manufactured Gas Plants
EDR Hist Auto---- EDR Exclusive Historical Auto Stations
EDR Hist Cleaner---- EDR Exclusive Historical Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA HWS---- Recovered Government Archive State Hazardous Waste Facilities List
RGA LF---- Recovered Government Archive Solid Waste Facilities List
RGA LUST---- Recovered Government Archive Leaking Underground Storage Tank

SURROUNDING SITES: SEARCH RESULTS

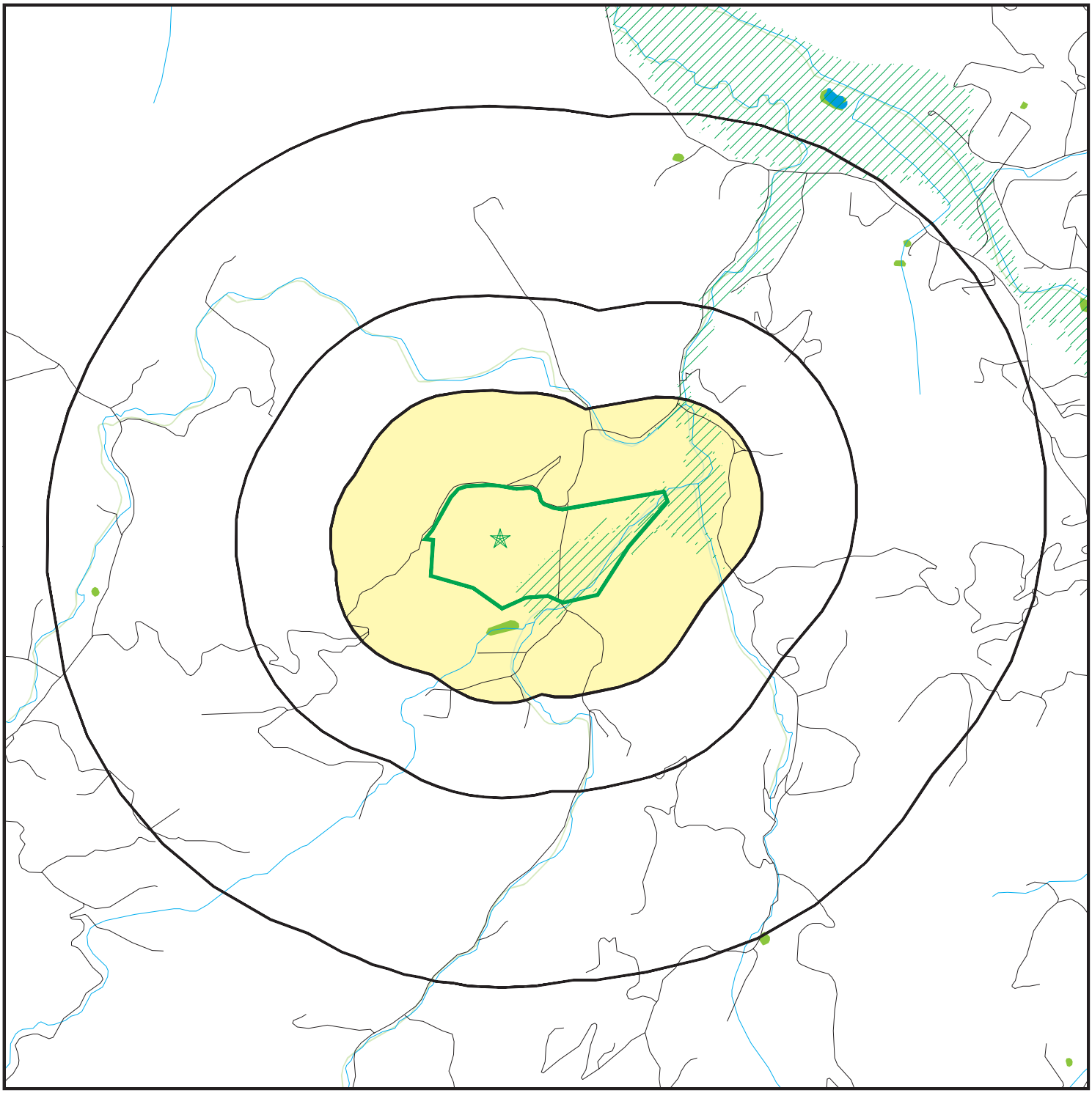
Surrounding sites were not identified.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

There were no unmapped sites in this report.

OVERVIEW MAP - 6527136.2S



Target Property
Sites at elevations higher than or equal to the target property
Sites at elevations lower than the target property
Manufactured Gas Plants
National Priority List Sites
Dept. Defense Sites

0 1/4 1/2 1 Miles

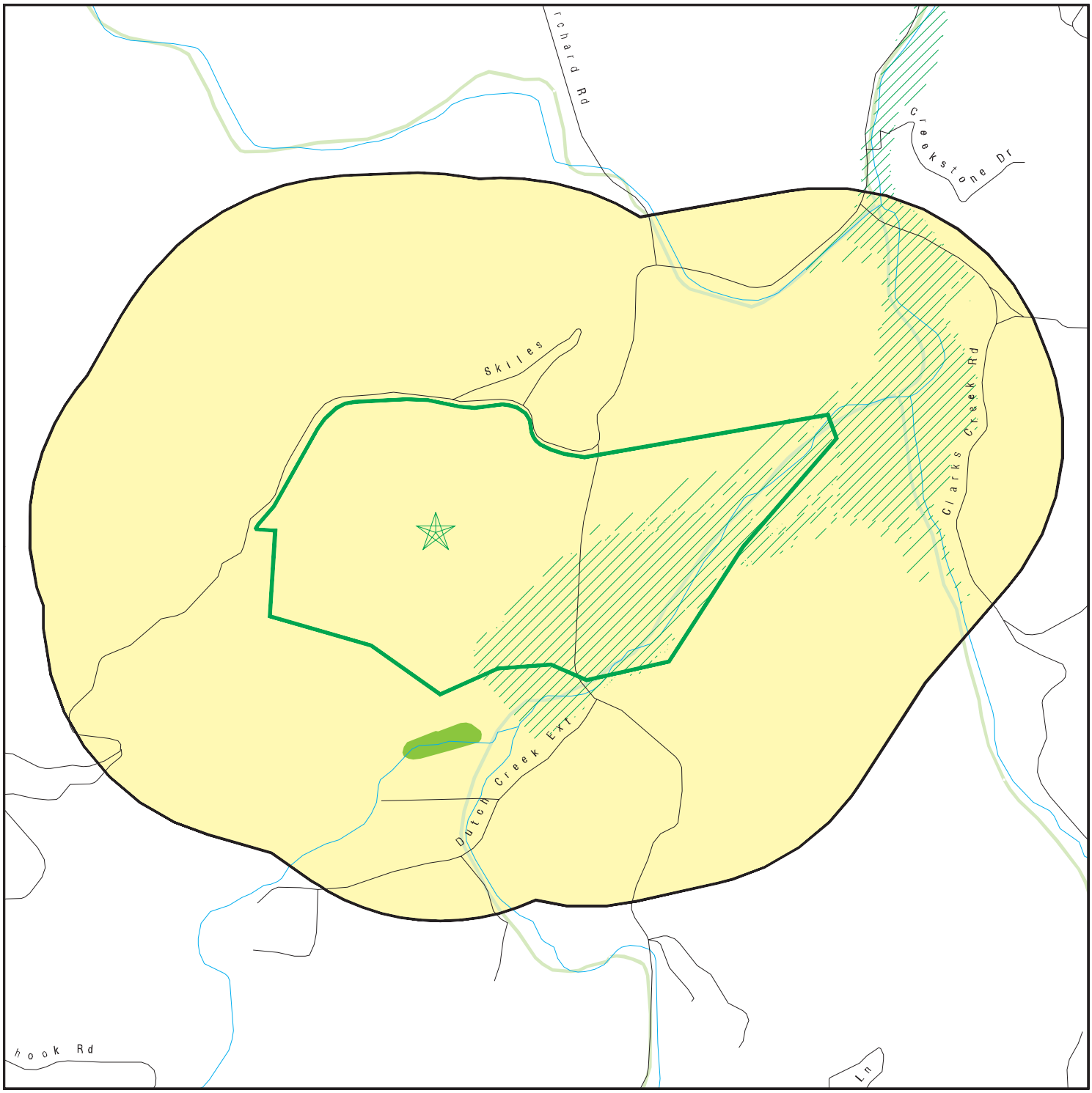
Indian Reservations BIA
Special Flood Hazard Area (1%)
0.2% Annual Chance Flood Hazard
National Wetland Inventory
State Wetlands

Hazardous Substance Disposal Sites

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	Valle Crucus	CLIENT:	Restoration Systems, LLC
ADDRESS:	200 Dutch Creek Rd Banner Elk NC 28604	CONTACT:	JD Hamby
LAT/LONG:	36.19506 / 81.791323	INQUIRY #:	6527136.2s
		DATE:	June 08, 2021 12:51 pm

DETAIL MAP - 6527136.2S



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites

0 1/8 1/4 1/2 Miles

- Indian Reservations BIA
- Special Flood Hazard Area (1%)
- 0.2% Annual Chance Flood Hazard
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Valle Crucus	CLIENT: Restoration Systems, LLC
ADDRESS: 200 Dutch Creek Rd Banner Elk NC 28604	CONTACT: JD Hamby
LAT/LONG: 36.19506 / 81.791323	INQUIRY #: 6527136.2s DATE: June 08, 2021 12:54 pm

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	1.000		0	0	0	0	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site list								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-VSQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROLS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	0.001		0	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
NC HSDS	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.000		0	0	0	0	NR	0
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
OLI	0.500		0	0	0	NR	NR	0
DEBRIS	0.500		0	0	0	NR	NR	0
LCID	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
State and tribal leaking storage tank lists								
LAST	0.500		0	0	0	NR	NR	0
LUST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
LUST TRUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
FEMA UST	0.250		0	0	NR	NR	NR	0
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
INDIAN VCP	0.500		0	0	0	NR	NR	0
VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
SWRCY	0.500		0	0	0	NR	NR	0
HIST LF	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	0.001		0	NR	NR	NR	NR	0
US CDL	0.001		0	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	0.001		0	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	0.001		0	NR	NR	NR	NR	0
SPILLS	0.001		0	NR	NR	NR	NR	0
IMD	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
SPILLS 90	0.001		0	NR	NR	NR	NR	0
SPILLS 80	0.001		0	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	0.001		0	NR	NR	NR	NR	0
EPA WATCH LIST	0.001		0	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	0.001		0	NR	NR	NR	NR	0
TRIS	0.001		0	NR	NR	NR	NR	0
SSTS	0.001		0	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	0.001		0	NR	NR	NR	NR	0
RAATS	0.001		0	NR	NR	NR	NR	0
PRP	0.001		0	NR	NR	NR	NR	0
PADS	0.001		0	NR	NR	NR	NR	0
ICIS	0.001		0	NR	NR	NR	NR	0
FTTS	0.001		0	NR	NR	NR	NR	0
MLTS	0.001		0	NR	NR	NR	NR	0
COAL ASH DOE	0.001		0	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	0.001		0	NR	NR	NR	NR	0
RADINFO	0.001		0	NR	NR	NR	NR	0
HIST FTTS	0.001		0	NR	NR	NR	NR	0
DOT OPS	0.001		0	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	0.001		0	NR	NR	NR	NR	0
US AIRS	0.001		0	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.250		0	0	NR	NR	NR	0
FINDS	0.001		0	NR	NR	NR	NR	0
UXO	1.000		0	0	0	0	NR	0
DOCKET HWC	0.001		0	NR	NR	NR	NR	0
ECHO	0.001		0	NR	NR	NR	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
AIRS	0.001		0	NR	NR	NR	NR	0
ASBESTOS	0.001		0	NR	NR	NR	NR	0
COAL ASH	0.500		0	0	0	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
Financial Assurance	0.001		0	NR	NR	NR	NR	0
NPDES	0.001		0	NR	NR	NR	NR	0
UIC	0.001		0	NR	NR	NR	NR	0
AOP	0.001		0	NR	NR	NR	NR	0
MINES MRDS	0.001		0	NR	NR	NR	NR	0
CCB	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
PCSRP	0.500		0	0	0	NR	NR	0
SEPT HAULERS	0.001		0	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		0	NR	NR	NR	NR	0
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA HWS	0.001		0	NR	NR	NR	NR	0
RGA LF	0.001		0	NR	NR	NR	NR	0
RGA LUST	0.001		0	NR	NR	NR	NR	0
- Totals --		0	0	0	0	0	0	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

MAP FINDINGS

Map ID Direction Distance Elevation	Site	Database(s)	EDR ID Number EPA ID Number

NO SITES FOUND

Count: 0 records. ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
		NO SITES FOUND			

Valle Crucus

200 Dutch Creek Rd

Banner Elk, NC 28604

Inquiry Number: 6527136.5

June 09, 2021

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

06/09/21

Site Name:

Valle Crucus
200 Dutch Creek Rd
Banner Elk, NC 28604
EDR Inquiry # 6527136.5

Client Name:

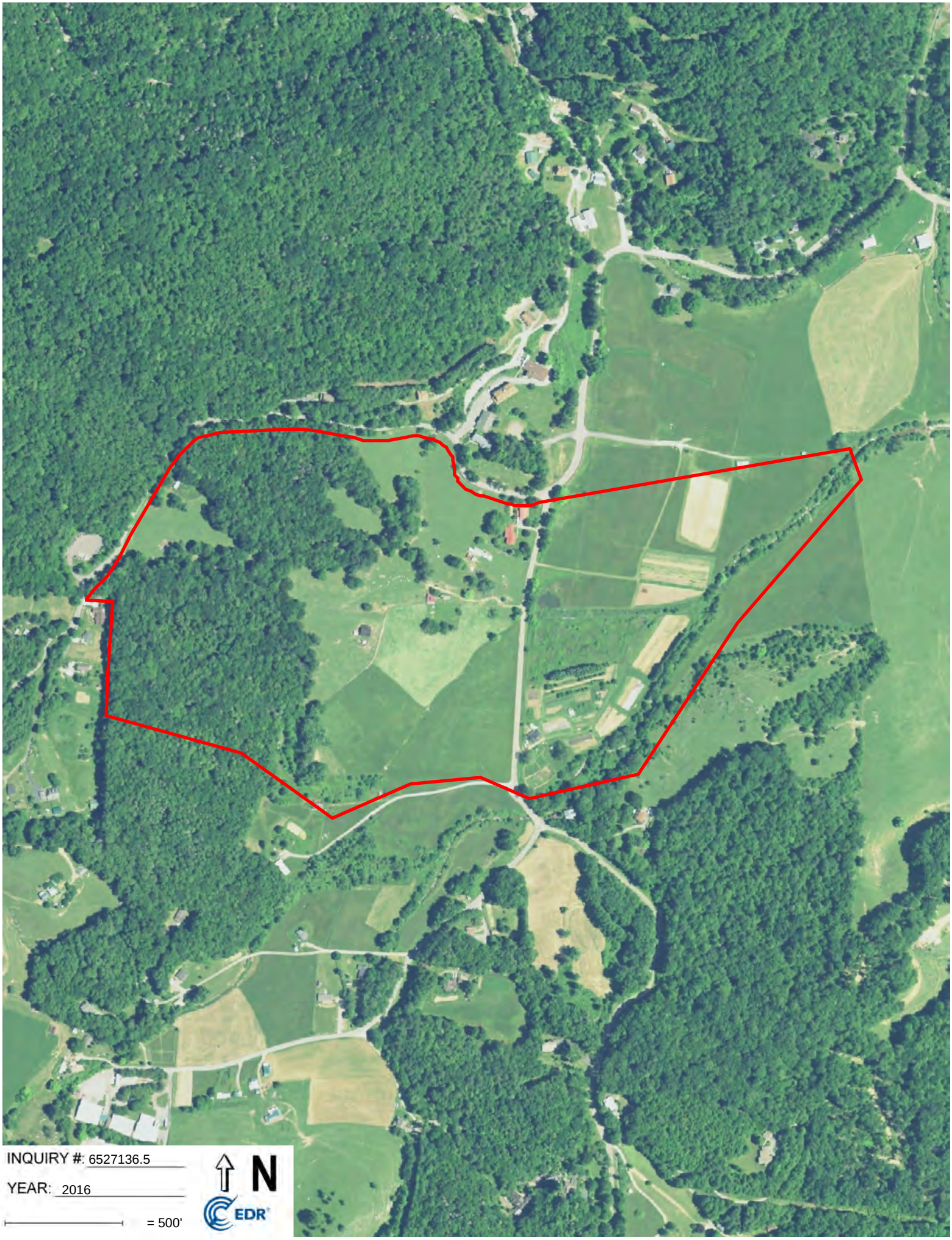
Restoration Systems, LLC
1101 Haynes Street
Raleigh, NC 27604
Contact: JD Hamby

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

Search Results:

Year	Scale	Details	Source
2016	1"=500'	Flight Year: 2016	USDA/NAIP
2012	1"=500'	Flight Year: 2012	USDA/NAIP
2009	1"=500'	Flight Year: 2009	USDA/NAIP
1998	1"=500'	Acquisition Date: January 01, 1998	USGS/DOQQ
1995	1"=500'	Acquisition Date: January 01, 1995	USGS/DOQQ
1986	1"=500'	Flight Date: March 24, 1986	USDA
1984	1"=500'	Flight Date: April 11, 1984	USDA
1976	1"=500'	Flight Date: April 01, 1976	USGS

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.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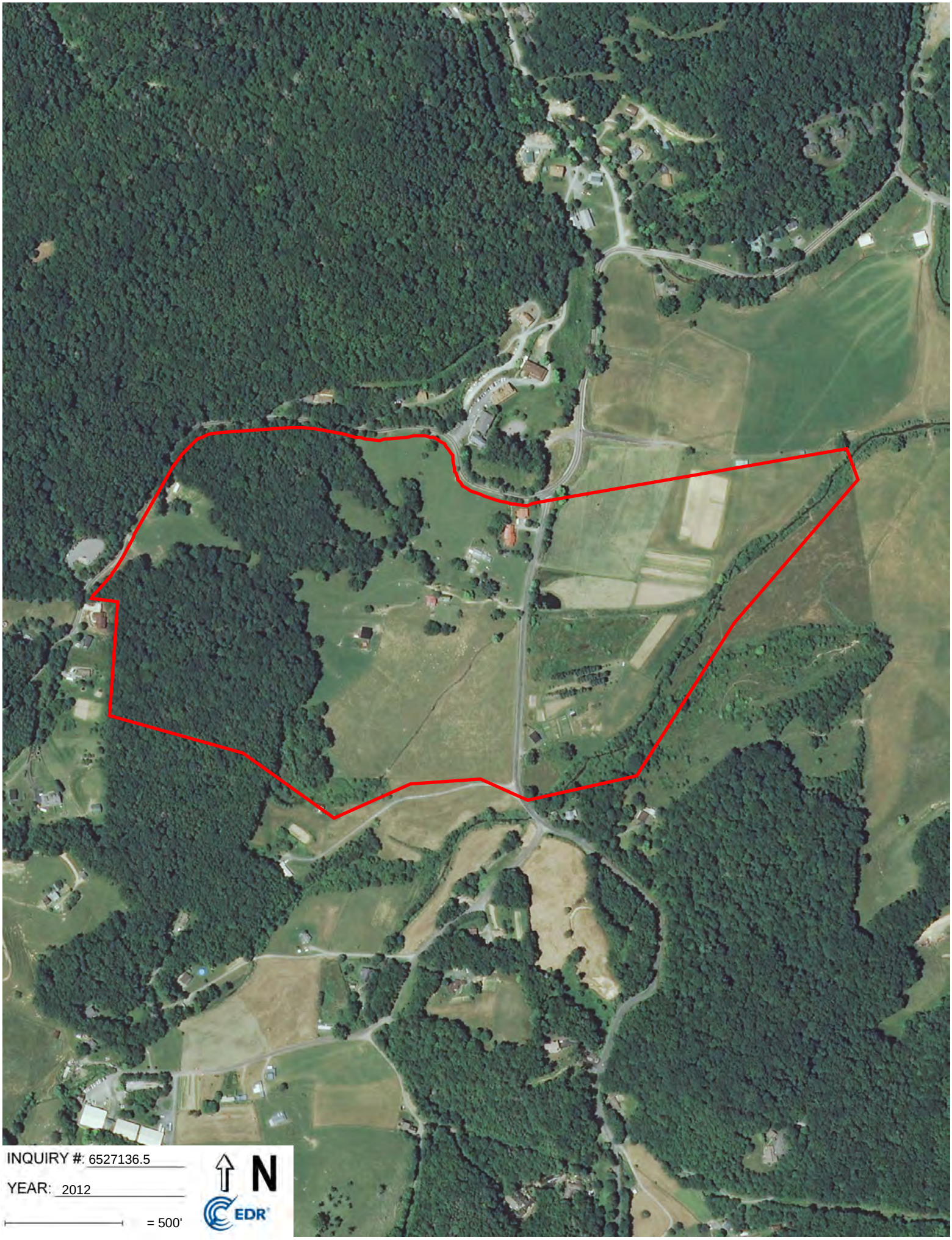
EDR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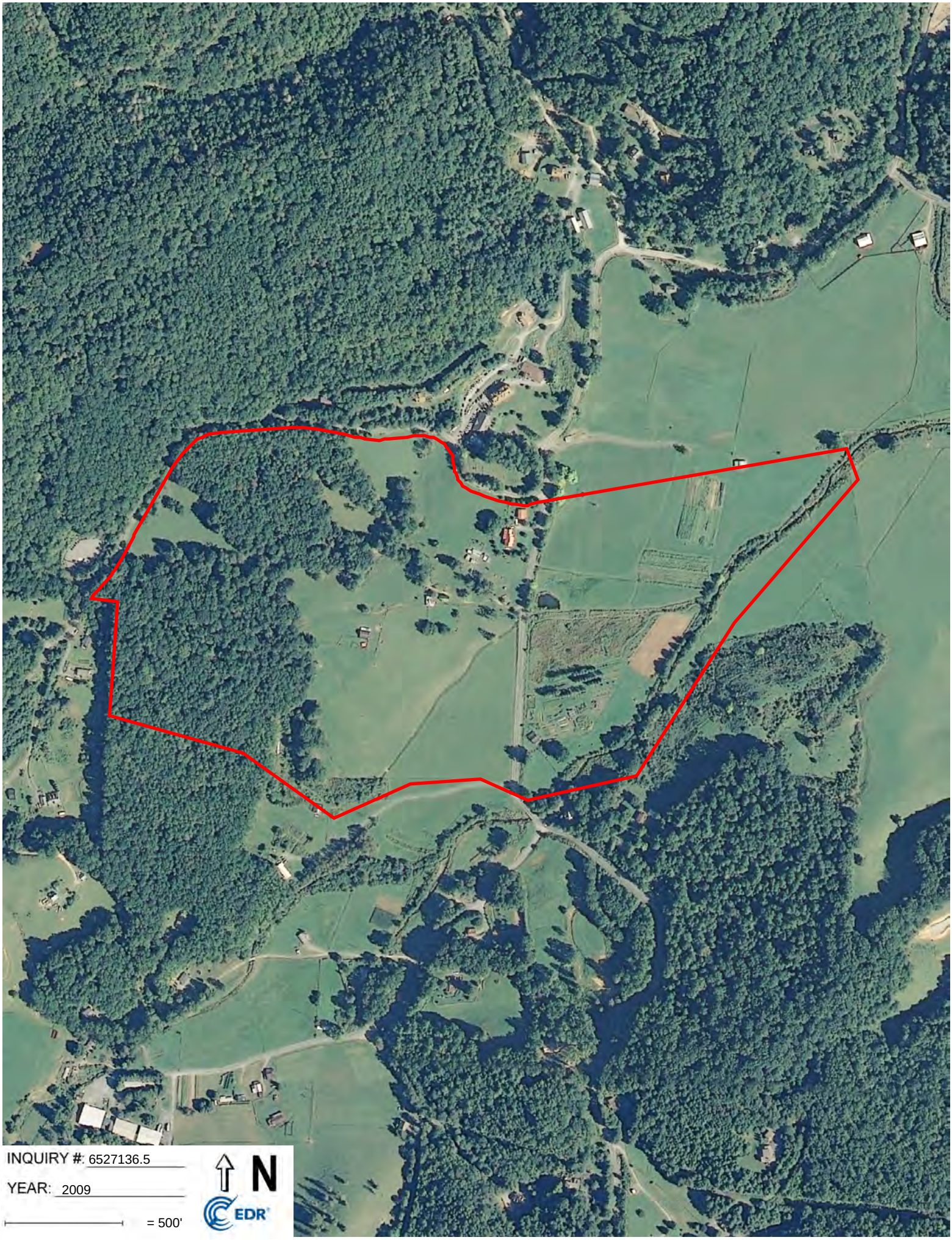
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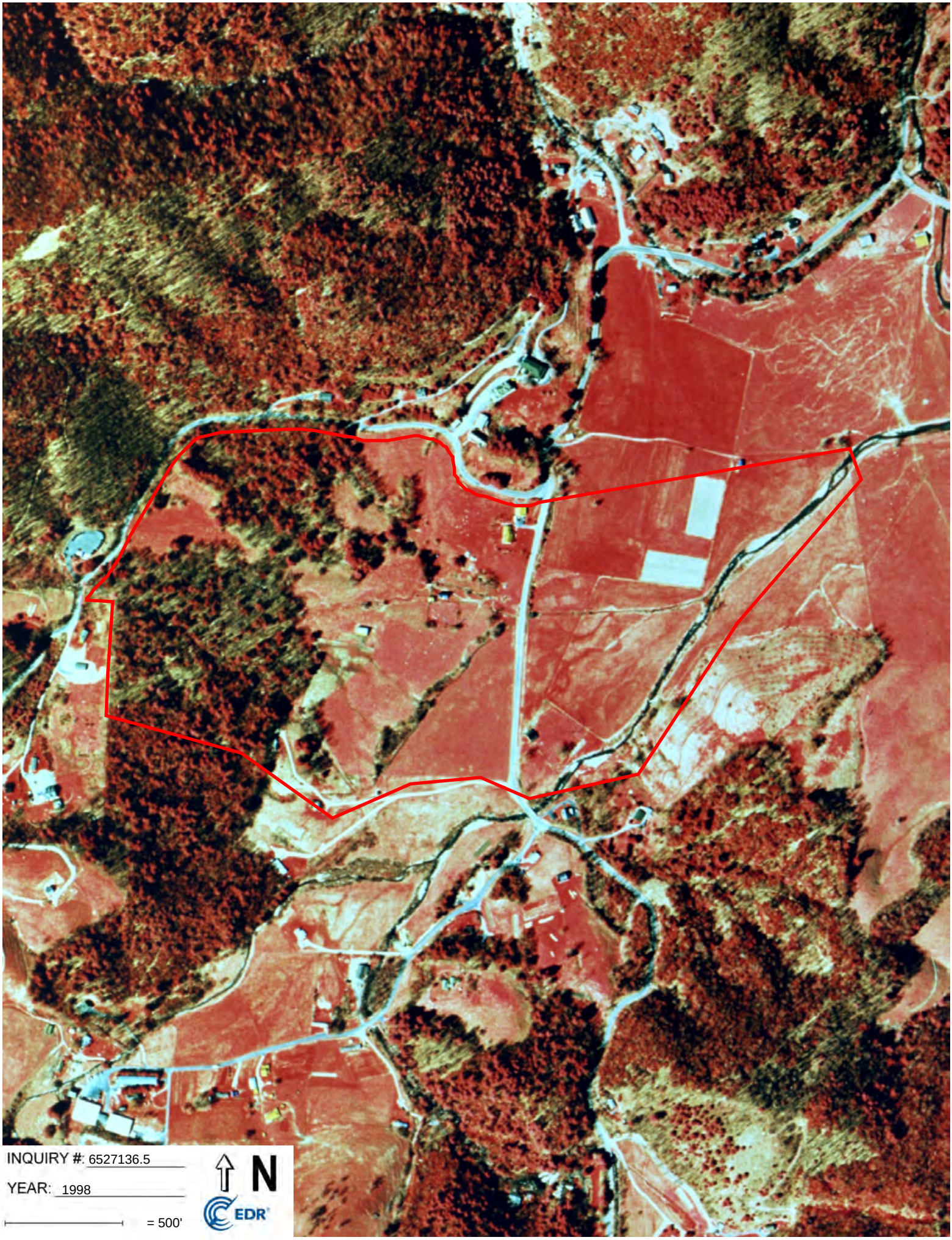
EDR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YEAR: 1976
= 500'
N
EDR

National Historic Preservation Act (Section 106)

No Issue, the following correspondence is attached:

- June 18, 2021 – JD Hamby of Restoration Systems sent a scoping letter to Renee Gledhill-Earley, the Environmental Review Coordinator at the North Carolina State Historic Preservation Office (SHPO).
- August 25, 2021 – RS received a response from SHPO requesting an archaeological survey be conducted.
- October 13, 2021 – RS consultant TRC Environmental Corporation (TRC) submitted an archaeological survey to SPHO.
- November 9, 2021 – SPHO responded to TRC and concurred with their recommendations, stating, "As no eligible resources will be impacted by the undertaking as proposed, no further archaeological work is recommended prior to the streambank and wetland restoration."
- January 19, 2023 – RS Project Update Letter to SHPO
- March 6, 2023 – SHPO Response; "We have determined that the remaining scope will have no adverse effect on the district or adjacent Valle Crucis Episcopal Mission (WT0018).
- March 3, 2023 – RS Letter to Watauga County Planning Department; no response to date.

June 18th, 2021

Renee Gledhill-Earley,
Environmental Review Coordinator
North Carolina State Historic Preservation Office
109 East Jones Street
Raleigh, NC 27699-4617
Sent electronically to Environmental.Review@ncdcr.gov

Re: Valle Crucis Mitigation Project, Watauga County NC

Dear Renee,

The purpose of this letter is to request written concurrence from the State Historic Preservation Office (SHPO) for the Valle Crucis Stream and Wetland Mitigation Project in Watauga County, a Full-Delivery project for the N.C. Davison of Mitigation Services. Please review and comment on any possible issues that might emerge with respect to SHPO from a potential stream restoration project depicted on the attached mapping.

Project Name:	Valle Crucis Mitigation Project
Project Location:	36.195395, -81.789155 (WGS84)
Project Contact:	JD Hamby, Restoration Systems LLC, 1101 Haynes St. Suite 211, Raleigh, NC 27604

Project Description: The project has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Permits from the NC DWR and USACE will be obtained to restore waters of the US. Soil and erosion control permits will also be obtained. The project encompasses 19.2 acres currently used for cattle pasture, maintained forested areas, and hay production. Approximately 8,320 linear feet of stream and 3.4 acres of riparian wetland will be restored.

The term “cultural resources” refers to prehistoric or historic archaeological sites, structures, or artifact deposits over 50 years old. “Significant” cultural resources are those that are eligible or potentially eligible for inclusion in the National Register of Historic Places. Evaluations of site significance are made with reference to the eligibility criteria of the National Register (36 CFR 60) and in consultation with the North Carolina State Historic Preservation Office (SHPO).

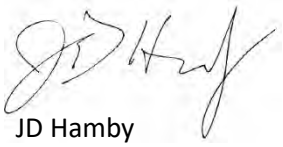
Field visits were conducted in Spring of 2021 to conduct evaluations for presence of structures or features that may be eligible for the National Register of Historic Places. No structures were identified within the Site boundaries that may be eligible for the National Register. One site though, the Edith Taylor House (WT0309) sits within 50 feet of our proposed easement. In addition to field reviews for historically relevant structures, a records search was conducted at the SHPO office to determine if documented occurrences of historic structures or artifacts occur within, or adjacent to the Site. The

SHPO records identify no features within the Site boundaries and twenty-one features within a half mile radius of the Site. A list of all the Site IDs will be attached to this letter.

Typical SHPO coordination will occur prior to construction activities to determine if any significant cultural resources are present; however, no constraints are expected at this time. 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.

Yours truly,

RESTORATION SYSTEMS, LLC



JD Hamby
Project Manager
jhamby@restorationsytems.com
919-755-9490

Attachments – USGS Map, Existing Conditions, Site Lists, Previous SHPO Comment Letter

North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator
Governor Roy Cooper Secretary D. Reid Wilson

August 25, 2021

John Hamby jhamby@restorationsystems.com
Restoration Systems, LLC
1101 Haynes Street, Suite 211
Raleigh, NC 27604

Re: Valle Crucis Stream and Wetland Restoration for Mitigation Bank, Dutch Creek Road, Valle Crucis, Watauga County, ER 18-4206

Dear Mr. Hamby:

Thank you for your email of June 18, 2021, regarding the above-referenced undertaking. We have reviewed the submission and offer the following comments. We apologize for the delay in our response and any inconvenience it may have caused. Please note that while some portions of this restoration were reviewed under a different tracking number, henceforth we will track all correspondence regarding the Valle Crucis mitigation/restoration at this location under ER 18-4206.

Portions of the project situated east of Dutch Creek Road are within the boundaries of the National Register-listed Valle Crucis Historic District and the Valle Crucis Episcopal Mission/Conference Center. Those same portions are also within an easement (ID 16320) held by the NC Department of Natural and Cultural Resources. Portions of the project situated on the west side of Dutch Creek Road are located outside of the boundaries. However, the entire project is within the Valle Crucis Local Historic District.

Due to the nature of the proposed work, the project will have no adverse effect on the historic district and mission property based on the following conditions being implemented.

- Minimize disturbances caused by using machinery during staging and operations. This includes removal of healthy vegetation, situating lay down/prep areas within previously disturbed areas or outside of the district (preferred) and avoiding the use of vehicles or heavy machinery on unpaved ground surfaces if the area is inundated or has recently received heavy rainfall. We recommend that protection mats or plywood be used to protect unpaved surfaces.
- To avoid damaging structures near work areas, use of jersey barriers, hay bales, construction fencing or other methods of bringing attention to the presence and close proximity of the structure will ensure that a safe distance is observed, and potential harm is minimized or avoided entirely.
- Areas impacted by construction activities, should be returned to pre-construction condition upon project completion. Any plans to not return impacted areas within the historic districts or properties to pre-construction condition should be submitted to us for review and comment.
- Photographs of the work completed within the historic district should be submitted to us for review and comment.

- Work should not begin until you have contacted Joseph Furman, Director of the Valle Crucis Historic Preservation Commission at joe.furman@watgov.org or (828) 265-8043 for more information regarding work requirements within locally designated districts. Additionally, survey requirements issued by the Office of State Archaeology must be met (see below).

We strongly recommend that project management consults our free GIS base web-mapping platform, HPOWEB 2.0, to help locate the historic properties listed above and to ensure that the above conditions are met.

- HPOWEB 2.0: https://nc.maps.arcgis.com/apps/webappviewer/index.html?id=79ea671ebdcc45639f0860257d5f5ed7

The area of potential effects (APE) for the proposed streambank mitigation project is located within ½-mile of four archaeological sites that remain unassessed for inclusion in the National Register of Historic Places (31WT77, 31WT78, 31WT137, and 31WT146), and one of these may extend into the project area. Considering the surrounding landforms, hydrology, and density of recorded archaeological sites in the area, there is a high probability for the presence of significant archaeological resources within the project area. We recommend that a systematic archaeological survey be conducted by an experienced archaeologist who meets the Secretary of the Interior professional qualifications prior to the initiation of any ground disturbing activities or introduction of heavy equipment.

The purpose of the archaeological survey should be to locate any archaeological sites and make recommendations regarding their eligibility for listing in the National Register of Historic Places. A list of archaeological consultants, who have conducted or expressed an interest in contract work in North Carolina is available at https://archaeology.ncdcr.gov/archaeological-consultant-list. The archaeologists listed, or any other experienced archaeologist, may be contracted to conduct the recommended survey. ***Please note that our office requests consultation with the Office of State Archaeology Review Archaeologist to discuss the location and appropriate field methodologies prior to the archaeological field investigation.*** You can find the Review Archaeologist for your region at https://archaeology.ncdcr.gov/about/contact.

Two paper copies and one digital copy (PDF) of all resulting archaeological reports, as well as a digital copy (PDF) of the North Carolina Site Form for each site recorded, should be forwarded to the Office of State Archaeology (OSA) through this office for review and comment, as soon as they are available and in advance of any construction or ground disturbing activities. OSA's Archaeological Standards and Guidelines for Background Research, Field Methodologies, Technical Reports, and Curation can be found online at: https://archaeology.ncdcr.gov/osa-guidelines.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579

or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona Bartos, Deputy
State Historic Preservation Officer

cc: Joseph Furman, Valle Crucis HPC joe.furman@watgov.org
Jennifer Cathey, NCDCR HPO jennifer.cathey@ncdcr.gov
Paul Wiesner, NCDENR DMS paul.wiesner@ncdenr.gov
Dylan Clark, NCDCR OSA dylan.clark@ncdcr.gov

705 Dogwood Rd.
Asheville, NC 28806

T 828.230.4812
TRCcompanies.com

13 October 2021

Ms. Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
109 East Jones Street, Room 258
Raleigh, North Carolina 27601

Re: Valle Crucis Stream and Wetland Restoration Project Archaeological Survey, Watauga County (ER 18-4206)

On behalf of Restoration Systems, LLC, enclosed for your review please find hard and digital copies of the draft report for the archaeological survey of the Valle Crucis Stream and Wetland Restoration Project in Watauga County, North Carolina (ER 18-4206). Digital copies of the associated site forms for the identified archaeological sites are also enclosed.

Thank you for your review of this report and your assistance with this project. Please do not hesitate to contact me at (919) 414-3428 or via email at bidol@trccompanies.com should you have any questions or concerns.

Sincerely,

Bruce Idol
Senior Archaeologist

ARCHAEOLOGICAL SURVEY FOR THE VALLE CRUCIS STREAM AND WETLAND RESTORATION PROJECT, WATAUGA COUNTY, NORTH CAROLINA

FINAL REPORT

TRC ENVIRONMENTAL CORPORATION

October 2021

ARCHAEOLOGICAL SURVEY FOR THE VALLE CRUCIS STREAM AND WETLAND RESTORATION PROJECT, WATAUGA COUNTY, NORTH CAROLINA

FINAL REPORT
ER 18-4206

Submitted to:

RESTORATION SYSTEMS, LLC
1101 Haynes Street, Suite 211
Raleigh, North Carolina 27604

By:

TRC ENVIRONMENTAL CORPORATION
705 Dogwood Road
Asheville, North Carolina 28806

Authored by:

Bruce Idol

October 2021

MANAGEMENT SUMMARY

TRC Environmental Corporation (TRC) has completed an archaeological survey for the Valle Crucis Stream and Wetland Restoration Project (Project) in Watauga County, North Carolina. The work was conducted on behalf of Restoration Systems, LLC as part of the permitting requirements for the proposed restoration and enhancement of approximately 7,882 linear feet of stream. The archaeological survey was conducted in accordance with TRC's technical proposal for the Project.

The proposed Limit of Disturbance (LOD) for the restoration work is irregular in shape and encompasses about 20 acres in the Dutch Creek drainage, and includes alluvial and colluvial terraces and adjacent ridge toe slopes on both sides of that stream and its tributaries. The LOD is divided by Dutch Creek Road (SR 1134) into eastern and western halves and is partially bounded by NC 194 on the west side.

This study was conducted to produce information on any significant cultural resources that might be present within the LOD to comply with Section 106 of the National Historic Preservation Act and so that the information could be considered for planning purposes. The survey satisfies the requirements for an intensive archaeological survey as defined by the North Carolina Historic Preservation Office and Office of State Archaeology (HPO/OSA) and complies with the OSA's (2017) *Archaeological Investigation Standards and Guidelines*.

The archaeological fieldwork was directed by Bruce Idol of TRC, occurred from September 13–17, 2021, and required 15 person-days. The fieldwork included a systematic pedestrian reconnaissance of the entire LOD and systematic shovel testing at 20-m intervals across all parts of the LOD except for visible wetland areas, areas of greater than 15% slope, or isolated areas of erosion or disturbance; supplemental shovel tests were excavated at 10-m intervals to delineate finds. A total of 207 shovel tests were excavated within the Project LOD.

The survey identified five archaeological sites within the LOD (31WT405–31WT409) (Table i.1). Portions of three sites within the LOD (31WT405, 31WT407, and 31WT408) appear to lack research potential, and those parts of those sites are recommended not eligible for the National Register of Historic Places (NRHP). All three sites may extend outside the LOD, however, and the NRHP eligibility of the parts of the sites outside the LOD is considered unassessed. Additional subsurface survey to further evaluate the parts of those sites outside the LOD might be necessary if any project changes were to result in an expansion of the LOD at those site locations. Site 31WT405 is a low-density precontact period lithic scatter situated on an alluvial terrace north of a second order tributary of Dutch Creek; it may extend outside of the LOD to the north. Site 31WT407 is a low-density precontact period lithic scatter situated on a ridge toe west of Dutch Creek Road; it appears to extend outside of the LOD to the east. Site 31WT408 is a low-density Euro-American artifact scatter associated with the late nineteenth to early twentieth century Taylor farmstead and the Edith Taylor House (HPO resource WT0309, which is located within the Valle Crucis Local Historic District). The associated house and outbuildings are all located outside of the LOD for the Project. Sites 31WT405, 31WT407, and 31WT408 did not contain any intact or meaningfully patterned deposits within the LOD, and no further archaeological investigations are recommended at these sites for the Project as currently defined.

The other two sites (31WT406 and 31WT409) are dispersed low-density lithic scatters or isolated artifact finds that contain nondiagnostic lithic components. These sites have been evaluated in their entirety, and lack the integrity, artifact density, and/or site clarity (the potential to distinguish among different occupations) that would allow them to produce substantial information concerning the precontact period occupations in the area. These sites appear to lack research potential and are recommended not eligible for the NRHP under all four criteria. No further archaeological investigations are recommended at these sites.

In summary, no further archaeological investigations are recommended for the Valle Crucis Stream and Wetland Restoration Project as presently defined. Additional subsurface survey to further evaluate the parts of sites 31WT405, 31WT407, and 31WT408 outside the LOD might be necessary if any project changes were to result in an expansion of the LOD at those site locations.

Table i.1. Archaeological Sites Identified by the Valle Crucis Stream and Wetland Restoration Survey.

Site	Component	NRHP Eligibility Recommendation
31WT405	Precontact: nondiagnostic lithic	Not eligible (within LOD)
31WT406	Precontact: nondiagnostic lithic	Not eligible
31WT407	Precontact: nondiagnostic lithic	Not eligible (within LOD)
31WT408	Postcontact: late 19th to early 20th century	Not eligible (within LOD)
31WT409	Precontact: nondiagnostic lithic	Not eligible

ACKNOWLEDGMENTS

The author would like to thank Mr. Worth Creech, Mr. Ray Holz, and Mr. J.D. Hamby of Restoration Systems, LLC, the Valle Crucis Conference Center, and members of the Gail Taylor family for facilitating the fieldwork.

For TRC, Tasha Benyshek served as Principal Investigator. Bruce Idol directed the survey and was assisted by Wade Dozier and Jeff Johnson. The artifacts were processed by Brenda Magouirk-Nelson and analyzed by Belinda Cox. John Kesler photographed the artifact plates, Belinda Cox produced the graphics, and the report was copyedited by Heather Millis.

CONTENTS

APPENDIX 2: Postcontact Artifact Catalog

FIGURES

TABLES

1. INTRODUCTION

This report documents the results of archaeological survey for the Valle Crucis Stream and Wetland Restoration Project in Watauga County, North Carolina (Figure 1.1). The work was conducted on behalf of Restoration Systems, LLC as part of the permitting requirements for the proposed restoration and enhancement of approximately 7,882 linear feet of stream. The proposed Limits of Disturbance (LOD) for the restoration work encompass about 20 acres in the Dutch Creek drainage and include alluvial and colluvial terraces and adjacent ridge toe slopes on both sides of that stream and its tributaries. The fieldwork was directed by Bruce Idol of TRC and occurred from September 13–17, 2021.

This study was conducted to produce information on any significant cultural resources that might be present in the LOD to comply with Section 106 of the National Historic Preservation Act and so that the information could be considered for planning purposes. The survey satisfies the requirements for an intensive archaeological survey as defined by the North Carolina Historic Preservation Office and Office of State Archaeology (HPO/OSA) and complies with the OSA's (2017) *Archaeological Investigation Standards and Guidelines*.

The remainder of this report contains the detailed results of this research. Chapters 2 and 3 provide environmental and cultural contexts for the area, followed by Chapter 4, which details the research goals and methods. Chapter 5 presents the results. Chapter 6 contains a summary and recommendations and is followed by a list of references cited in the text. Appendices 1 and 2 are the artifact catalogs. Digital archaeological site forms have been submitted under separate cover.

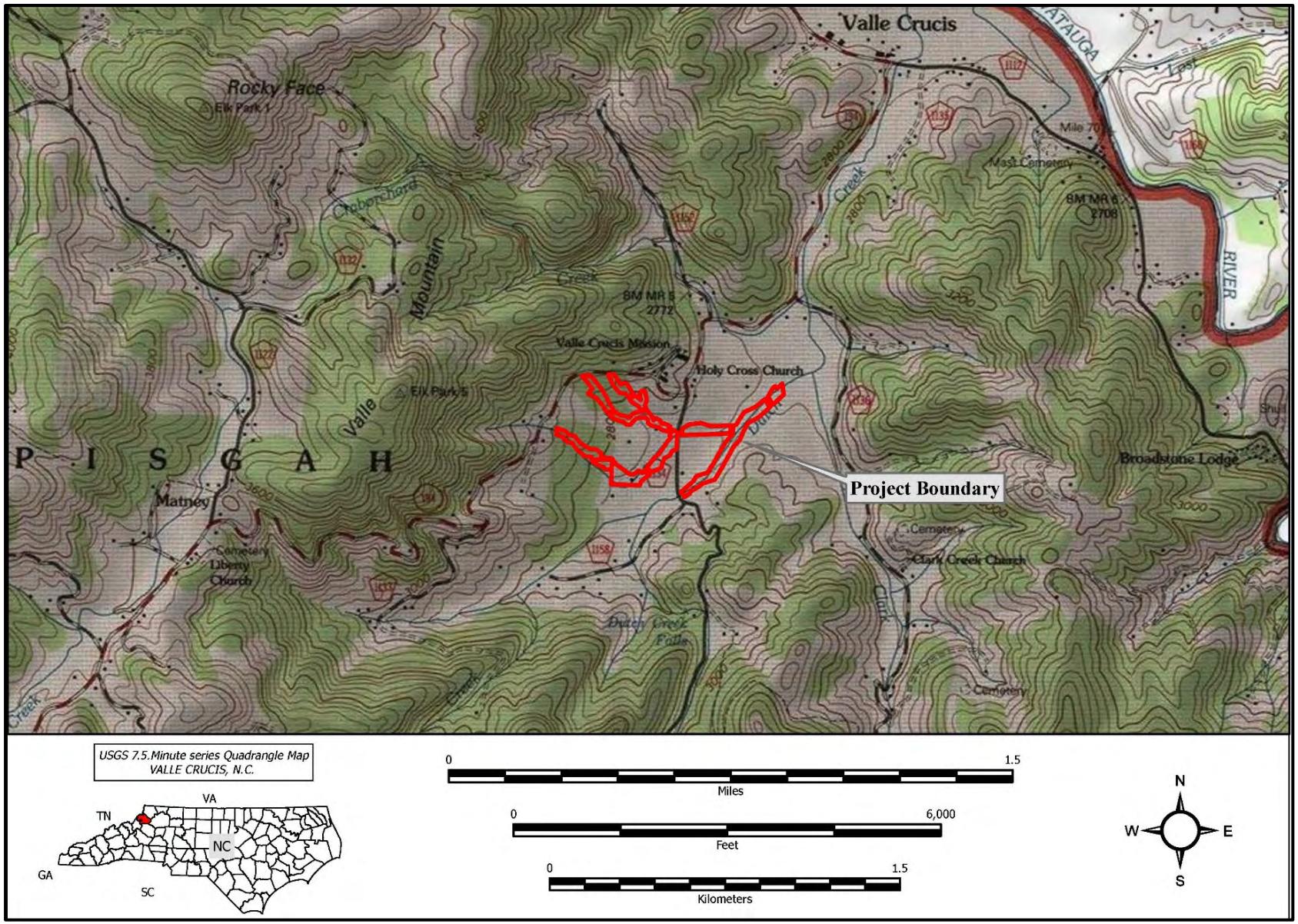


Figure 1.1. Location of the Valle Crucis Stream and Wetland Restoration Project in northwestern North Carolina.

2. ENVIRONMENTAL SETTING

PROJECT SETTING

The Project is situated in a broad intermontane valley drained by Dutch Creek and its tributaries, in the Valle Crucis community in Watauga County. The Project LOD is bisected by Dutch Creek Road (SR 1134) into east and west halves and is partially bounded by NC 194 on the west side (see Figure 1.1). The Project LOD is irregular in shape and encompasses portions of ridge toes and alluvial and colluvial terraces along Dutch Creek, a second order branch situated east of Dutch Creek Road, and two first order headwater branches located west of that road. Part of the LOD is wooded, and the remainder is situated in agricultural fields and pasture (Figures 2.1–2.8). Portions of the low alluvial terraces west of Dutch Creek Road contain seasonal wetlands that result from the obliteration of natural stream channels by a combination of soil erosion and churning by cattle. The Project area east of Dutch Road is situated in agricultural fields and wooded areas lining Dutch Creek; the east half is situated in pasture, including heavily wooded pasturage.

PHYSIOGRAPHY, GEOLOGY, SOILS, AND HYDROLOGY

The study area is situated in the Blue Ridge Mountain physiographic region and the Blue Ridge geological belt, and lies within the Southern Crystalline Ridges and Mountains Level IV ecoregion, which is characterized by floristically diverse forested slopes, high gradients, and rugged terrain on primarily metamorphic bedrock (Griffith et al. 2002). The topography of the region is characterized by high plateaus intermingled with mountains (Mathis 2005:12). Elevations in Watauga County range from 1,400 to 5,900 feet above mean sea level (AMSL), and the county has the highest average elevation of any county east of the Mississippi River (Mathis 2005:13). Elevations within the Project LOD range from about 2,720 feet to 2,940 feet AMSL.

Soils mapped in the LOD include Dellwood cobbly sandy loam, occasionally flooded, on 1–5% slopes (DeB), Saunook cobbly loam, central mountains, on 8–15% slopes (SkC), and Saunook loam (central mountains, very stony) on 8–15% slopes (SoC) and 15–30% slopes (SnD) (Table 2.1). Dellwood series soils are very deep, moderately well drained, and found on floodplains in mountain stream valleys (Mathis 2005:181). Dellwood soils are formed in gravelly and cobbly sandy alluvium, and are characterized by a dark brown or dark yellowish brown A horizon of cobbly sandy loam, very gravelly loamy sand, or extremely gravelly coarse sand, which overlies a dark yellowish brown C horizon composed of extremely gravelly, coarse sand (Mathis 2005:181; USDA NRCS 2020). Dellwood soils occasionally incorporate small areas of poorly drained soils (USDA NRCS 2020). Dellwood cobbly loam (DeB) is associated with fast-moving streams and occasional violent flooding, as it is the first floodplain soil formed from the mountain headwaters (Mathis 2005:80). Saunook series soils are found on coves, drainageways, colluvial fans, and benches in the low to intermediate mountains (Mathis 2005:197–198; USDA NRCS 2020). These are very deep, well-drained soils formed in colluvium derived from material weathered from felsic to mafic, igneous, or high-grade metamorphic rock (Mathis 2005:198). A typical pedon for this series involves a dark brown loam Ap horizon that overlies a Bt1 horizon composed of brown loam (Mathis 2005:197; USDA NRCS 2020). Edneytown series soils are very deep, well drained, moderately permeable soils found on ridges and sides slopes in the mountains (USDA NRCS 2020). These soils are formed in residuum weathered from felsic to mafic, igneous and high-grade metamorphic rocks and are characterized by a very dark grayish brown to brown A-E horizon of sandy loam, which overlies a strong brown Bt horizon composed of sandy clay loam (Mathis 2005:85; USDA NRCS 2020).

Figure 2.1. Shovel testing in agricultural field on north side of Dutch Creek, facing northeast.

Figure 2.2. Agricultural fields north of small tributary east of Dutch Creek Road, facing west.

Figure 2.3. Agricultural field on south side of Dutch Creek, facing northeast.

Figure 2.4. LOD on south side of Dutch Creek near Dutch Creek Road, facing southwest.

Figure 2.5. Pasture west of Dutch Creek Road, facing southwest.

Figure 2.6. Pasture west of Edith Taylor House (WT0309) along small stream, facing northwest.

Figure 2.7. Eroded stream channel in wooded pasture, facing northwest.

Figure 2.8. Bouldery area in wooded pasture, facing northwest.

Table 2.1. Soils within the Project Area.

Map Unit Symbol	Soil Type	Estimated Acreage	Percent of Survey Area
DeB	Dellwood cobbly sandy loam 1–5% slopes	15.1	75.1%
EdE	Edneytown loam, 30–50% slopes	0.1	0.3%
SkC	Saunook cobbly loam, central mountains, 8–15% slopes	1.5	7.5%
SnD	Saunook loam, central mountains, 15–30% slopes	0.0	0.1%
SoC	Saunook loam, central mountains, 8–15% slopes, very stony	3.4	17.0%

The project area is drained by Dutch Creek and two unnamed tributaries that originate on the mountain slopes west of Dutch Creek Road and join Dutch Creek east of that road. Dutch Creek flows northeast from the Project area and is joined by similar streams before reaching its confluence with the Watauga River northwest of Valle Crucis in its lower valley section (Figure 2.9). The Watauga River flows northwest-west from the area into and through its Watauga Lake impoundment in Johnson County, Tennessee, and from there flows northwest to join the South Fork Holston River at Boone Lake near Kingsport. The South Fork Holston becomes the Holston River near Mount Carmel and joins the Tennessee River at Knoxville. The Tennessee River flows west and south into Alabama and then turns north back into Tennessee, continuing north into Kentucky and eventually joining the Ohio River. The Ohio River flows west into the Mississippi River, which empties into the Gulf of Mexico to the south.

MODERN CLIMATE

The modern climate of Watauga County is characterized by mild summers and occasionally cold winters, which vary considerably with elevation and exposure. As historically recorded in Blowing Rock, temperatures are generally moderate and usually do not exceed 80°F in the summer or drop below 10°F in the winter. Average summer temperature is about 74°F, with winter temperatures averaging 31°F. The county averages about 160 frost-free days each year, and snowfall is occasionally heavy. Precipitation is consistent throughout the year, with an average annual precipitation of 65 inches in Blowing Rock, with much of this falling during the growing season (Mathis 2005:14).

FLORA AND FAUNA

The study area is in the Broad Basins Level IV ecoregion; as defined by Griffith et al. (2002:14), this environment consists of intermountain basins with low mountains, rolling foothills, and moderately broad mountain valleys. Streams are moderate gradient and contain cobbles and boulders, while rivers are low to moderate gradient with sand and bedrock substrates. The ecoregion includes Appalachian oak forests and, at higher elevations, northern hardwoods forest. Common tree species include a variety of oaks and pines, as well as silverbell (*Helesia tetraptera*), hemlock (*Tsuga canadensis*), tulip poplar (*Liriondendron tulipifera*), basswood (*Tilia americana*), buckeye (*Aesculus flava*), yellow birch (*Betula alleghaniensis*), and beech (*Fagus grandifolia*).

The Project area also falls in Braun's (1950) Southern Appalachians section of the Oak-Chestnut Forest region. Prior to the 1920s and the chestnut blight, chestnut (*Castanea dentata*) dominated the region, although such species as tulip poplar (*Liriodendron tulipifera*), ash (*Fraxinus* spp.), hemlock (*Tsuga* spp.), white basswood (*Tilia* spp.), buckeye (*Aesculus* spp.), oak (*Quercus* spp.), red maple (*Acer rubrum*), walnut (*Juglans nigra*), wild cherry (*Prunus serotina*), birch (*Betula* spp.), and beech (*Fagus grandifolia*) could be found in the valleys, coves, and along sheltered mountain slopes (Holmes 1911:38). Little or no primary forest vegetation remains in the region due to the blight, logging, and other human activity (see Braun 1950:199). Presently, oak and pine (*Pinus* spp.) are the most common species, with red maple, locust

(*Gleditsia* spp.), black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), and dogwood (*Cornus* spp.) also common on the intermountain plateau (Orr and Stuart 2000:36–37). In addition to arboreal species, the forests supported a variety of undergrowth species. The latter included several varieties of edible berries, such as blackberries and raspberries (*Rubus* spp.) and huckleberries (*Gaylussacia* spp.), as well as rivercane and numerous other species used for tools, food, and medicinal purposes by both the Cherokee and later Euro-American settlers (Cozzo 2004; Foreman and Mahoney 2018; Hamel and Chiltoskey 1975; Mooney and Olbrechts 1932; Oliver 1989:29).

The varied forests in the area would have supported a substantial and diverse fauna during and prior to Euro-American settlement. Potential game species include white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), elk (*Cervus elaphus*), raccoon (*Procyon lotor*), opossum (*Didelphis marsupialis*), gray squirrel (*Sciurus carolinensis*), and fox squirrel (*Sciurus niger*). Other species present included beaver (*Castor canadensis*), gray fox (*Urocyon cinereoargenteus*), otter (*Lutra canadensis*), muskrat (*Ondatra zibethica*), mink (*Mustela vison*), wolf (*Canis* sp.), panther or mountain lion (*Felis concolor*), and bobcat (*Lynx rufus*) (Shelford 1963). Avian species of possible economic importance included turkey (*Meleagris gallopavo*) and smaller species; other species may have been valuable non-food resources as well. Large streams in the Watauga drainage would have provided a variety of fish, including catfish (Ictaluridae), sunfish (Centrarchidae), largemouth (*Micropterus salmoides*) and smallmouth (*Micropterus dolomieui*) bass, and brook trout (*Salvelinus fontinalis*) (Altman 2006).

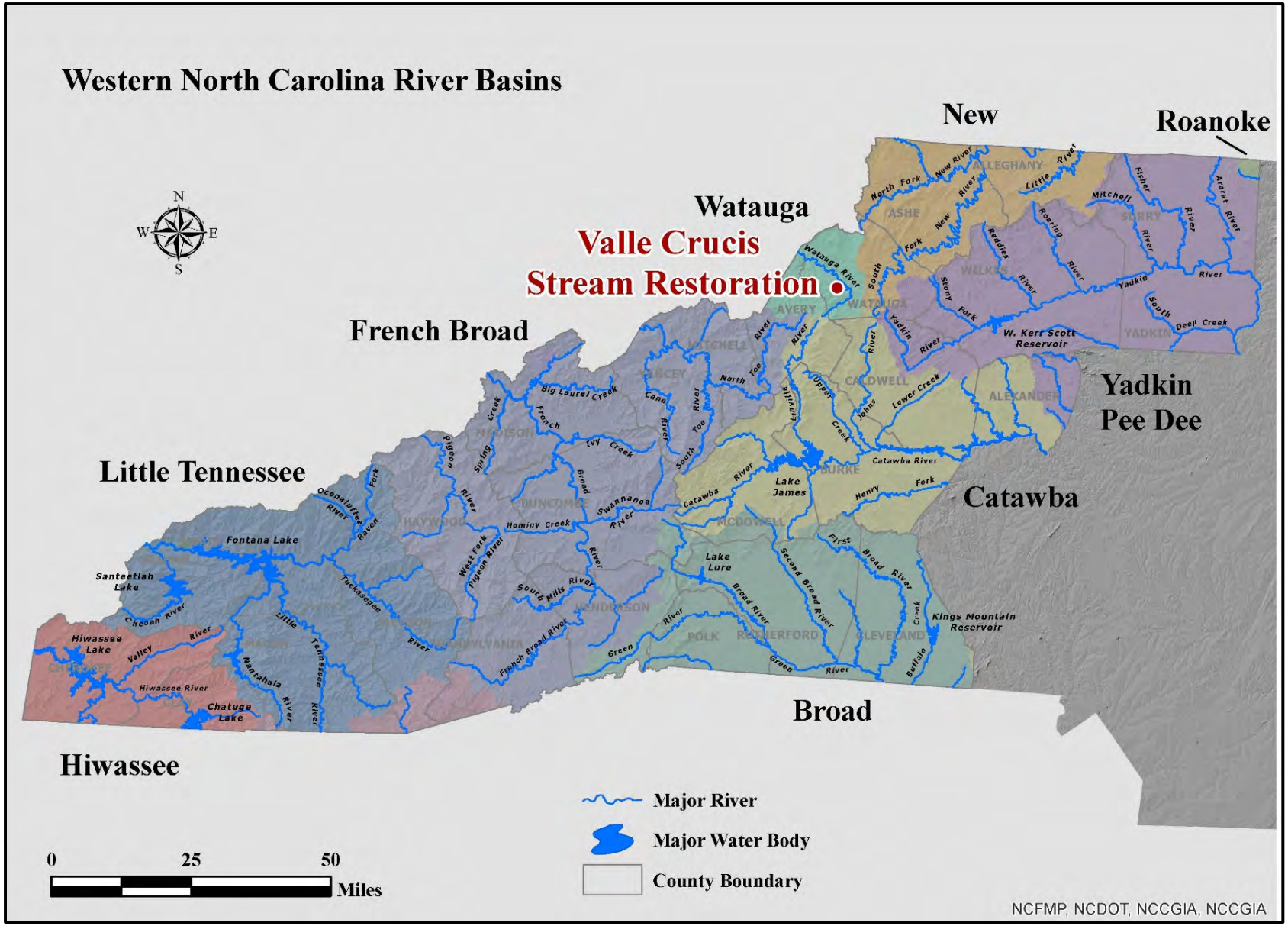


Figure 2.9. The Project area in relation to western North Carolina river basins.

3. CULTURAL BACKGROUND

ARCHAEOLOGICAL OVERVIEW

This chapter presents an overview of the precontact and historic period occupations of Watauga County and western North Carolina. Much of the earlier part of the cultural sequence for the region is based on Coe's (1964) investigations of the precontact cultures of North Carolina, coupled with later research elsewhere in North Carolina (e.g., Daniel 1998; Shumate and Kimball 2006, 2016) and across the mountains in Tennessee (e.g., Davis 1990; Kimball 1985). Information on the later precontact occupations of northwestern North Carolina is derived from a variety of sources, including Purrington (1983), and Whyte (2003, 2020).

The archaeological record of northwestern North Carolina can be divided into three basic time and cultural periods—Paleoindian, Archaic, and Woodland—that relate to both social and technological factors. Several authors (e.g., Dickens 1976:10; Keel 1976:18; Riggs and Rodning 2002; Ward and Davis 1999; Wetmore 2002) divide some or all of these periods into phases, but the chronology for the northwestern counties (Alleghany, Ashe, Avery, and Watauga) is still developing (Table 3.1).

Table 3.1. Generalized Cultural Chronology for Northwestern North Carolina through 1750.

Period	Phase	Chronology
Protohistoric to Historic	Undefined	A.D. 1450–1750
Late Woodland	Undefined (Dan River/Watauga variant?)	A.D. 800–1450
	Undefined	A.D. 600–800
Middle Woodland	Connestee	A.D. 200–600 ↑
	Pigeon	200 B.C.–A.D. 200
Early Woodland	Swannanoa	1000?–200 B.C.
Late Archaic	Otarre	1500–1000 B.C.
	Savannah River	3000–1500 B.C.
Middle Archaic	Guilford	4000–3000 B.C.
	Morrow Mountain	6000–4000 B.C.
	Stanly	6000–5500 B.C.
Early Archaic	LeCroy	7000–6000 B.C.
	Kirk/Palmer	7500–7000 B.C. ↑
	Big Sandy	8000–7500 B.C.
Paleoindian	Undefined (Hardaway-Dalton?)	9000–8000 B.C.
	Clovis	10,500–9000 B.C.
Pre-Paleoindian	Undifferentiated	Unknown

↑ represents overlap into a later period. Adapted from Ward and Davis (1999) and Whyte (2003, 2020).

Paleoindian Period (ca. 10,500–8000 B.C.)

The earliest broadly acknowledged human presence in the continental United States dates to approximately 12,500 B.P., during the Paleoindian period. The most well-known cultural manifestation of this occupation is called Clovis, which is represented by distinctive, fluted projectile points that have been found over a wide geographic area in the United States. But there is also an increasing number of sites that indicate (if not conclusively demonstrate) a pre-Clovis occupation in the Americas; such regional sites include Meadowcroft Rockshelter in Pennsylvania (Adovasio et al. 1990, 1999); Saltville in Virginia (McDonald 2000; Weisner 1996); Cactus Hill in Virginia (McAvoy and McAvoy 1997); Topper in South Carolina (Goodyear and Steffy 2003); and the Sloth Hole and Page-Ladson sites in Jefferson County, Florida (Dunbar 2002, 2006; Hemmings 1999, 2004). Although none of those sites is without controversy, those

and other sites (e.g., Monte Verde in Chile [Meltzer et al. 1997]) have forced archaeologists to revisit their models for how and when people first arrived in the Americas (e.g., Anderson and Gillam 2000).

Most researchers believe that the human occupation of North America began with a migration of people from Asia across the Bering land bridge, which would have been exposed from 20,000 B.P. to perhaps as late as 10,000 B.P. due to lower sea levels associated with the Last Glacial Maximum (Anderson and Gillam 2000; Dixon 1999, 2001; Fladmark 1979; Hoffecker et al. 1993:48; Meltzer 1988, 2004; Smith 1986). Once in North America, the method and timing of migration south into the Americas remain issues of debate. Some researchers have argued that an ice-free corridor allowed for movement into the interior of the continent sometime after 11,000 B.P. (e.g., Haynes 1966, 1969, 1971), while others have suggested that early settlers, once having occupied Beringia, followed a coastal route to colonize the Americas (e.g., Dixon 1999; Faught 2008; Fiedel 2000; Fladmark 1979).

Based on a study of Paleoindian settlement patterns, Anderson and Gillam (2000:43) have developed a comprehensive model concerning the colonization of the Western Hemisphere. The study analyzed paths at a continental scale, to determine which routes would have afforded the least cost to traveling hunter-gatherers. Factors in the model included topographic relief, locations of ice sheets and pluvial lakes, and the location of known Paleoindian archaeological sites. The findings suggest that initial dispersal occurred in coastal and riverine settings and on plains, and that founding populations probably spread and diversified rapidly. The model also implies that now-submerged portions of the continental shelf may have been important for early dispersal, whether by foot or by boat (Erlandson et al. 2005). In eastern North America, this is reflected in the distribution of sites along the Atlantic Coastal Plain and the paucity of sites in the Appalachian Mountains, which were a barrier to mobility.

Diagnostic Paleoindian artifacts include fluted and unfluted lanceolate projectile points (such as Clovis and Cumberland points); flake tools such as endscrapers, gravers, retouched blades, and burins are also found. Almost all of the Paleoindian materials found in the Southeast have come from surface contexts, and as a result few data are available concerning regional subsistence or social organization (Anderson 1990). Hunting of late Pleistocene megafauna is inferred based on evidence from other areas, although direct evidence for use of animals of any kind is rare in the region. Most, if not all, Paleoindian populations probably relied extensively on other animal and plant foods as well. Paleoindian populations were generally highly mobile, and settlements are thought to have included small temporary camps and less common base camps that were occupied by loosely organized bands. Paleoindians selected high-quality lithic materials for tools, and many sites are linked to important source areas (e.g., Smallwood et al. 2018).

Paleoindian projectile points are relatively rare in the North Carolina mountains, reflecting their scarcity in the Appalachians as a whole. An updated 2017 compilation of data on known fluted points from North Carolina revealed only nine specimens from the four contiguous counties of northwestern North Carolina (PIDBA 2017), although this number certainly understates the actual number of finds. The later Paleoindian phase appears to include Dalton (Goodyear 1982) and perhaps Hardaway (Ward 1983) points and related cultures, although both types of artifacts are very rare in the region (Purrington 1983).

Archaic Period (ca. 8000–1000 B.C.)

The Archaic period began with the onset of Holocene, post-glacial climatic conditions in the East and has been subdivided into Early, Middle, and Late subperiods. Diagnostic projectile points are the primary criteria used to identify and date Archaic manifestations. As a whole, the Archaic may be seen as a relatively long and successful foraging adaptation, with subsistence based on hunting, fishing, and the collection of wild plant resources. The period is also marked by a general increase in the density and dispersal of archaeological remains, increased cultural diversity as reflected in more regionally distinct tool forms, and the increased use of locally available lithic raw materials. There is also evidence of long-distance exchange

and regional-scale networks of social interaction, as well as status differentiation. Group size gradually increased during this period, culminating in larger populations by the end of the period (Anderson and Sassaman 2012). While Archaic groups certainly used a variety of materials to fashion utilitarian and other items, lithic artifacts are all that remain on most sites in the Southeast due to the lack of preservation in acidic soils. Architectural evidence is rare, suggesting that most structures were not substantial constructions; the Eastern Woodlands Household Archaeological Database Project lists only 97 potential Archaic period structural remains in the region (White and Steere 2014). An increasing number of Archaic sites have been the focus of intensive excavation in the North Carolina mountains (Benyshek and Webb i.p.; Bissett et al. 2009; Idol 2011b, 2016; Jorgenson et al. 2017; Purrington 1981; Shumate and Kimball 2016), and others have been investigated in eastern Tennessee in the Tellico area (e.g., Chapman 1977, 1981) and in the North Carolina Piedmont (Claggett and Cable 1982; Coe 1964).

Early Archaic (ca. 8000–6000 B.C.). During the Early Archaic period, the mixed coniferous forests present in much of the Southeast were replaced by mixed hardwood communities dominated by oak, hemlock, beech, and maple (Claggett and Cable 1982:212), and a modern faunal assemblage was in place following the extinction of the Pleistocene megafauna. Diagnostic markers of the Early Archaic period in western North Carolina and eastern Tennessee include side notched Big Sandy projectile points and later Palmer-Kirk projectile points (ca. 8000–6800 B.C.). Palmer-Kirk projectile points are fairly common and widespread occurrences in the area but are sparse compared to Middle and Late Archaic types. Bifurcate-based points such as the St. Albans, LeCroy, and Kanawha types (ca. 6900–5800 B.C.) are also found in the area (Kimball 1985). Although these appear to occur more rarely in the mountains than Kirk forms (Kimball 1996; Stanyard 2003), a long-term survey of sites near Asheville (Henry 1992) documented more bifurcate-based points than Kirks, perhaps a reflection of the intensive survey coverage up a smaller tributary (Kimball 1996). Other tools that occur on Early Archaic sites include knives, adzes, end and side scrapers, drills, perforators, and expedient tools (Stanyard 2003).

Low regional population densities and a continued high degree of group mobility are inferred for this subperiod in the mountains, where most known sites are located in high upland areas and over 90% of projectile points found are of non-local chert (Bass 1975). It is also possible, however, that site burial in the floodplains could be largely masking Early Archaic period use of these landforms (see Benyshek 2007a; Benyshek and Webb 2004, 2009, i.p.; Kimball 1991). The nature of more general land use patterns and strategies for technological organization remain the subjects of discussion. To the west in Tennessee, Kimball (1996) has proposed an ongoing change from logistical (relatively more permanent base camps from which a variety of other satellite camps and specialized use sites were accessed) to residential (wholesale moving frequently within zones to map onto resources) mobility patterns during the later Early Archaic period, perhaps as a result of the first signs of warming climatic conditions. Kimball (1996:173) notes that settlement patterns (and thus perhaps foraging strategies) for bifurcate and Kirk groups were different, with more bifurcate sites found on T1 terraces and islands compared to Kirk sites, which are more dispersed on various landforms, suggesting a change in foraging strategy in the later Early Archaic.

Middle Archaic (ca. 6000–4000 B.C.). During the Middle Archaic, the cool, moist conditions of the early Holocene are generally considered to have given way to the warmer, drier climate of the Mid-Holocene Hypsithermal interval, although there is increasing evidence that the Mountains may have seen increased rainfall during this period (e.g., Leigh 2002; Leigh and Webb 2006). Extensive estuarine marshes and riverine swamps began to emerge in coastal regions as sea levels ceased their post-Pleistocene rise by 3000 B.C. The northern hardwoods vegetation matrix in those regions was replaced by an oak-hickory forest, which was in turn replaced by a southern hardwoods-pine forest characterized by the species occupying the region today (Claggett and Cable 1982:212–216; Delcourt and Delcourt 1983, 1985). Subsistence economies became increasingly diversified, particularly evident in the Mid-South and lower Midwest during the Shell Mound Archaic, where riverine settings were chosen more often for occupation (Sassaman 1996).

The Middle Archaic witnessed the first substantial occupation of the Smoky Mountains (Bass 1975:109), and presumably of western North Carolina in general. Site file data indicate a marked increase in site numbers from the Early to the Middle Archaic in the Carolinas and Georgia (Anderson 1996), and Morrow Mountain projectile points increase markedly in frequency when compared to earlier types in western North Carolina (Leftwich 1999). Three subperiods recognized in most of North Carolina are identified by the presence of Stanly (ca. 6000–5000 B.C.), Morrow Mountain (ca. 5000–4200 B.C.), and Guilford (ca. 4200–3500 B.C.) projectile points, following the classic Archaic sequence first identified by Coe (1964), although more recent research demonstrates that additional projectile point forms were used as well (Shumate and Kimball 2016). Archaeologically, the transition from the Early to the Middle Archaic is characterized by the appearance of stemmed rather than notched projectile points and an increased incidence of groundstone tools. Sassaman (2010) suggests that the Morrow Mountain tradition may represent a migration of people from the west in response to global warming, based on the radical differences between Clovis-derived Early Archaic projectile point technology and similarities between Morrow Mountain types and the Cascade phase of the Old Cordilleran tradition. This model is still considered speculative but would help explain the technological discontinuities between the Early and Middle Archaic.

Reliance on locally available quartz and quartzite rather than higher quality non-local chert for stone tools increased in the Appalachian Summit as well as other parts of North Carolina, northern Georgia, and South Carolina. For example, a distributional study shows that over 77% of Middle Archaic projectile points from Mountain counties are made of quartz (McReynolds 2005:23). Atlatl weights make their first appearance in the archaeological record during the Middle Archaic, as do stone net sinkers. The use of a more expedient stone tool technology (see Binford 1977, 1979) predominates during the Middle Archaic (Stanyard 2003).

Based on studies in South Carolina, researchers have suggested that Morrow Mountain peoples were foragers who resided at a location until local resources were depleted (Blanton and Sassaman 1989; Sassaman 1983). This idea is consistent with an archaeological pattern characterized by local raw material utilization, the wide distribution of sites in various landscape settings and their small size, the lack of evidence for long-term occupations, and the absence of discernible substantial trade networks (Stanyard 2003:48–49). Morrow Mountain sites are frequently encountered in the uplands of western North Carolina (e.g., Purrington 1981), on smaller drainages (Yu 2001), and in floodplains of major rivers, and are sometimes buried (e.g., Benyshek and Webb 2004, i.p.; Benyshek 2007a). Bass (1975) found that half of the Middle Archaic sites he analyzed were in the uplands, with the others in valleys and coves.

Late Archaic (ca. 4000–1000 B.C.). Late Archaic sites are common in western North Carolina as elsewhere in the lower Southeast, suggesting region-wide population increase from the Middle Archaic (Anderson 1996). Late Archaic sites in a wide range of environmental zones, although most major settlements were in riverine or estuarine settings (Bass 1975; Ward 1983). The existence of formal base camps occupied seasonally or longer is inferred, together with a range of smaller resource-exploitation sites, such as hunting, fishing, or plant collecting stations (Claggett and Cable 1982; Ward 1983). In particular, many Late Archaic sites in the Smoky Mountains appear to be situated near quartzite sources (Bass 1975:77; Shumate and Kimball 2016). Grinding implements, polished stone tools, and carved soapstone bowls became fairly common, suggesting increased use of plant resources, and possibly changes in subsistence strategies and cooking technologies. Although regional evidence is minimal, the first experiments with horticulture occurred at this time, with the cultivation of plants such as squash (*Cucurbita pepo*), sunflower (*Helianthus* sp.), and *Chenopodium* (Cowan 1985; Ford 1981; Gremillion 2018; Smith 2011).

Soapstone vessels appear to have been most widely used in the eastern United States between 1800 to 1000 B.C. (associated dates range from ca. 4000 B.C. to ca. A.D. 0) (Truncer 2004:505–506). The scarcity of earlier dates and wide gaps in geographical distribution suggest that soapstone bowl manufacture occurred continuously at "low levels of production," or was adopted and then discontinued in some areas (Truncer 2004:497). Although soapstone vessel use appears to have preceded ceramic vessel use in some areas, in

the central Savannah River valley, South Carolina, and northeastern Florida, use of soapstone slabs and pottery precedes soapstone vessel use by up to 1000 years (Elliott et al. 1994; Sassaman 1997; Stanyard 2003:54). Soapstone vessels were apparently used for cooking certain plant or animal foods over a direct heat source (e.g., Kroeber 1925:527), and may not have afforded any advantage over alternative cooking methods.

Another innovation in Late Archaic cooking technology was the use of drilled or perforated soapstone slabs, presumably for use in stone boiling (Anderson et al. 1979; Dagenhardt 1972; Elliott 1981; Trinkley 1974; Wood et al. 1986). These artifacts are abundant at some Late Archaic sites in the Savannah River and Oconee valleys in the Georgia and South Carolina Piedmont to the Fall Zone (Claflin 1931:32; Elliott 1981; Wood et al. 1986), but appear rarely in North Carolina (e.g., Bissett et al. 2009; Idol 2016).

Late Archaic occupations in the Appalachian Summit region are marked by a variety of large- to small-stemmed points. The most prominent and recognizable of these is the Savannah River stemmed, a large, broad-bladed, square stemmed point that appeared ca. 3000 B.C. and lasted to ca. 1500 B.C. Subsequent Late Archaic sites frequently contain slightly smaller stemmed points of the Iddins Undifferentiated stemmed or, perhaps, the Otarre stemmed type (Ward and Davis 1999:71), although these general forms were produced during the Middle Archaic and Early Woodland periods as well and may not be exclusive to the Late Archaic period (Larry Kimball, personal communication 2010). Size reduction of stemmed forms is indicated over the course of the Late Archaic to Early Woodland periods in the region, however (Oliver 1981, 1985). The most common feature type during the Late Archaic is a shallow, rock-filled pit (Chapman 1981; Keel 1976). Toward the end of the Late Archaic, fiber tempered pottery appeared in the coastal regions (Sassaman 1993); although such pottery was found at the Ravensford site in Swain County (Benyshek and Webb 2017; i.p.), it is a rare occurrence in the Appalachian Summit. There is increased evidence for trade during the Late Archaic period, as indicated by the presence of soapstone, slate, and other materials outside their source areas (Chapman 1985).

Woodland Period (ca. 1000 B.C.–A.D. 1450)

The Woodland period began as early as 1000 B.C. and continued until around A.D. 1450. There is no evidence for a distinct Mississippian period such is defined for southwestern North Carolina (Whyte 2003, 2020), and no subsequent protohistoric to historic phase has been defined for the region. Across the eastern Woodlands, the period is marked by the appearance of widespread pottery use, the use of the bow and arrow for hunting and warfare, a greatly increased role for horticulture in subsistence economies, expanded evidence for complex trade and exchange networks, and an elaboration of mortuary ceremonialism, including the appearance of burial mounds (Anderson and Sassaman 2012; Carr and Case 2005; Smith and Yarnell 2009). Northwestern North Carolina largely mirrors patterns documented in the Dan and Upper Yadkin River drainages, accompanied by some local trends in ceramic production.

Early Woodland (ca. 1000–200 B.C.). Initial Woodland occupations are generally thought to reflect a largely unchanged continuation of Late Archaic lifeways coupled with the first widespread introduction of ceramics. The earliest Early Woodland manifestation in the Project region is the Swannanoa phase, which dates ca. 1000–200 B.C. Regional radiocarbon dates for Swannanoa materials include a corrected, uncalibrated date of 2130±40 B.P. (representing a 2-sigma range of 260–100 B.C.) (Benyshek and Webb 2006) and a corrected, uncalibrated date of 2435±25 B.P. (representing a 2-sigma range of 535–435 B.C.) (Benyshek 2020).

The Early Woodland period is characterized by thick, crushed quartz or coarse sand tempered, fabric impressed ceramics; cordmarked, plain, check stamped and simple stamped wares are also thought to date to late in the Early Woodland period (Keel 1976:260–266; Ward and Davis 1999:140–143; Wetmore 2002:254–257). Vessel forms consist of unrestricted conical pots and simple bowls. Eastern Tennessee's

Watts Bar and northern Georgia's Kellogg phases are similar stylistically to Swannanoa materials, as are Vinette ceramics from as far away as eastern New York (Ward and Davis 1999:142).

Early Woodland projectile points consist of smaller stemmed points, the terminal expressions of the large stemmed point tradition, along with large triangular varieties. The latter include the Transylvania and Garden Creek types, which are morphologically equivalent to Badin and Yadkin types in the Piedmont (Keel 1976; Oliver 1985). Although Swannanoa phase site distributions have not been thoroughly documented, it is apparent that the settlement pattern included large floodplain sites along with numerous small upland extractive camps. Direct evidence is lacking at present, but it seems likely that the Early Woodland inhabitants of the region were engaged in at least some degree of horticulture (Ward and Davis 1999:145). Based on evidence at Phipps Bend in eastern Tennessee, deer, elk, and turkey were the animals primarily hunted (Lafferty 1981). To date, no well-defined Early Woodland structure patterns have been identified in the region. The nearest examples of Early Woodland structures include a 10 × 7 meter rounded rectangular structure from the Banks III site (40CF108) in Coffee County, Tennessee, and three poorly-defined structures (two are arcs of posts and one is elliptical) from the Kellogg, Garfield, and Two Run Creek sites in Cherokee and Bartow counties, Georgia (Bacon 1982; Bowen 1989).

Middle Woodland (ca. 200 B.C.–A.D. 600). The Middle Woodland period in western North Carolina is divided into an earlier Pigeon phase (ca. 200 B.C.–A.D. 200) and a later Connestee phase (ca. A.D. 200–600), each associated with distinct ceramic styles. Pigeon phase occupations have been very difficult to isolate however, although a few sites (e.g., Magic Waters [Benyshek 2018)] and 31SW74 [Webb 2002]) have yielded unmixed assemblages. Thus far, the Magic Waters site in Jackson County is the most extensively documented Pigeon phase domestic site, which contained a village delineated by circular structures and associated pit features.

Much more is known about the lifeways, architecture, and subsistence practices of the subsequent Connestee phase. The Connestee phase is characterized by mound construction and intensified long-distance trade, and it is apparent that some western North Carolina groups participated in the Hopewell exchange network (Chapman and Keel 1979; Keel 1976:157; Wetmore 2002:263; Wright 2013, 2019) in which raw materials and finished artifacts were traded over vast areas of eastern North America (Brose and Greber 1979; Carr and Case 2005; Seeman 1979). Regional sites with Middle Woodland components that have been the focus of intensive investigations include Garden Creek in Haywood County (Keel 1976; Wright 2013, 2019), Biltmore Mound in Buncombe County (Kimball and Shumate 2003; Kimball et al. 2004), Ela in Swain County (Wetmore 1989, 1996), Harshaw Bottom in Cherokee County (Robinson 1989), Tuckasegee in Jackson County (Keel 1976), the Tyler-Loughridge site in McDowell County (Robinson 1996), the Cherokee EMS site in Swain County (Benyshek 2007b), the Bent Creek site in Buncombe County (Shumate and Kimball 2006), the Iotla Site at Macon County Airport (Benyshek 2020), the Magic Waters Site in Jackson County (Benyshek 2018), and the Icehouse Bottom site in Monroe County in eastern Tennessee (Chapman 1973; Cridlebaugh 1981).

Bass (1975:81) reports that while over 50% of Middle Woodland sites in his sample occurred on the floodplain, 40% were located above the valley in coves and on benches. Numerous large and small sites dating to this period have been found, suggesting periodic aggregation and dispersion or some kind of settlement dichotomy. By Connestee times, however, sites have been demonstrated to occur most often in the floodplains, and a higher percentage are present on the first rise above the river than in the preceding Pigeon or Swannanoa phases (Wetmore et al. 2000). Across the Southeast, Middle Woodland settlements appear to have varied in size and scale, but people generally lived in dispersed communities and used sites with monumental architecture, such as Garden Creek and the Biltmore Mound site, as central places for social integration and important gatherings (Anderson and Sassaman 2012; Carr and Case 2005).

Horticulture is believed to have become increasingly important during this period, although mast resources remain the most visible dietary contributor. Possible late Middle Woodland cultigens in the region include maygrass (*Phalaris caroliniana*), little barley (*Hordeum pusillum*), sumpweed (*Iva annua*), sunflower (*Helianthus sp*.), maize (*Zea mays*), squash (*Cucurbita* sp.), gourd (*Lagenaria* sp.), and perhaps *Chenopodium* (Benyshek 2007b; Chapman and Crites 1987; Crites 2004; Gremillion 2018; Robinson 1989; Webb 2002). Evidence for the use of animal resources is scarce from Middle Woodland sites in the area, save Biltmore Mound where preservation is excellent. Faunal information from the Connestee phase mound area may not be representative of overall diet and utilization due to the probable ceremonial activities including feasting that took place there, but no information is available from the associated village to date. The assemblage is dominated by terrestrial species (white-tailed deer, turkey, box turtle, raccoon, squirrel) with aquatic resources (fish, mussels) used much less frequently (Whyte 2004).

Diagnostic early Middle Woodland ceramics in western North Carolina include the Pigeon series, which Keel (1976:256–260) defines as including check stamped, simple stamped, plain, brushed, and complicated stamped varieties with crushed quartz temper. Vessel forms include conical jars, hemispherical bowls, and tetrapodal and shouldered jars with flaring/everted rims. Pigeon ceramics are relatively common in the region but are generally found in mixed contexts (Ward and Davis 1999:146), perhaps indicative of stable populations inhabiting the same areas for long periods of time.

Subsequent Middle Woodland ceramics consist of the Connestee series, which are generally thinner, sand tempered wares most often plain or decorated with simple stamped, cordmarked, or brushed surfaces. Crushed quartz temper was added in small amounts. Fabric impressed and check stamped sherds are also included in the series. Plain necks are characteristic, with punctated shoulders rarely occurring (Keel 1976:247–255). Swift Creek ceramics are sometimes found as a minority ware on Middle Woodland sites in the area (Keel 1976:71; Kimball and Shumate 2003; Robinson 1989). Also found, but extremely rare, are Ohio Hopewellian ceramics (both non-local manufacture and locally made copies) and figurines (Keel 1976:118–119; 120–123; Kimball and Shumate 2003). Lithic artifacts characteristic of the late Middle Woodland consist of large triangular and side-notched projectile points (Garden Creek and Connestee triangulars, Pigeon side notched), bar gorgets, and a prismatic blade and polyhedral core technology that was probably ultimately derived from the Hopewellian Midwest (Chapman and Keel 1979:157). Copper is also found on Middle Woodland sites in the area but is rare (Benyshek 2007b; Chapman and Keel 1979; Setzler and Jennings 1941).

Connestee phase populations engaged in mound building, evidenced by such substructure mounds as Garden Creek No. 2 and the Biltmore Mound, and interacted with Hopewellian populations in the Midwest and elsewhere (Keel 1976; Kimball and Shumate 2003; Ward and Davis 1999:151–153; Wright 2013, 2014, 2019). Connestee series sherds are present on some Hopewellian sites, and small numbers of Hopewellian ceramics and bladelets made of chalcedony from Flint Ridge in Ohio are present at the Garden Creek site, at the Biltmore Mound site, and at Icehouse Bottom (Chapman 1973; Chapman and Keel 1979; Kimball and Shumate 2003; Moore 1984). Marine shell was also traded (Kimball et al. 2004). It has been hypothesized that western North Carolina was one source of the mica that was traded and used widely across the East during this period. Recent investigations at the Garden Creek site have recorded two subrectangular enclosures similar to those found in Midwestern Adena and Hopewell contexts; these appear to result from earlier ritual use of the site and further illustrate the extent of the socio-economic ties developed between local and non-local populations during the Middle Woodland period (Wright 2013).

Increasing information concerning Connestee architecture has been developed over the last several decades. At Garden Creek Mound No. 2, at the base of the premound layer, a square structure measuring approximately 6 m across was identified and was attributed to the Connestee occupation (Keel 1976:95, 99). At Ela, at least eight circular structures 7–8 m in diameter were identified as representative of Connestee phase constructions (Wetmore 1989, 1996, 2002). More recent excavations at the Macon County

Airport and Old Elementary School sites have also uncovered Connestee structures, both circular and square to rectangular (Benyshek 2016, 2020; Benyshek and Webb 2009; Steere 2017). These circular and square-with-rounded corner structures are at least superficially similar to shapes found in monumental Hopewell earthworks and may represent another way in which local Southern Appalachian people took part in cultural practices associated with the Hopewell Interaction Sphere (Wright 2013).

Late Woodland (ca. A.D. 800–1450). The Late Woodland period in much of the Southeast saw the emergence of sedentary village life and intensive maize horticulture and the development of complex tribal and chiefdom-level political structures. Certainly, by A.D. 1000, many interior Southeastern groups were producing substantial amounts of maize, which continued into the Mississippian period when wild food resources were supplemental to cultivated ones (Gremillion 2018; Scarry 2003:88–89). This change in agricultural practices coincided with the Medieval Warm Period of ca. A.D. 800 to 1100, which likely made corn agriculture more productive (Anderson 2001). While once largely overlooked for its "good gray cultures," the Late Woodland period is now better understood as a complex time when the broad interaction networks of the Middle Woodland period contracted, and the social landscape was marked by regionalism and increased evidence for warfare (Birch et al. 2016; Cobb and Garrow 1996). The regional diversity of Late Woodland ceramic traditions and use of palisades provide evidence of more inward-looking societies (Birch et al. 2016), while at the same time, a widespread tradition of simple stamped pottery across much of the Southern Appalachian region suggests that indigenous communities played a larger role in the development of the first large Mississippian centers than previously thought (Anderson 2017; Riggs et al. 2015).

As mentioned above, a discrete Mississippian period as defined in the Southeast by increasing intensification of maize horticulture, the establishment of increasingly hierarchical social structures and settlement systems, an increase in ceremonialism expressed architecturally in the construction of flat-topped substructure mounds, and evidence for a shared set of religious and cosmological ideas (see Anderson 2017; Knight 2006; Reilly and Garber 2007), never developed in the high country of northwestern North Carolina. Despite certain similarities in ceramic attributes with the Mississippian Pisgah phase and associated Pisgah series ceramics (largely limited to adjunct decoration on vessel rims), the northwestern part of North Carolina more closely resembles the traditional Woodland patterns documented in the Dan and Upper Yadkin River valleys (Idol 1997; Rogers 1993; Whyte 2003; Woodall 1990, 1999). Although the Late Woodland in the greater Appalachian Summit region has been described as largely invisible (Wetmore 2002), in Watauga and surrounding counties it never dissipated. The absence of Mississippian expression in this and other areas of North Carolina can be attributed to a multitude of factors, including climate considerations, especially in the high elevations in the northwestern part of the state, and also social variables that affected participation in a tribute system driven by agricultural surplus and the circulation of recognizable prestige items. Although middle to late Mississippian (Pisgah phase) villages in southwestern North Carolina were stockaded, so too were a number of the larger Dan River phase settlements in North Carolina and southern Virginia, which do not conform at all to Mississippian patterns.

Robinson et al. (1994, 1996) have argued that the Connestee phase lasted into the Late Woodland period based on work at several sites. One Late Woodland manifestation was identified by Keel and Egloff (1984) at the Cane Creek site in Mitchell County; the distinctive, largely plain-surfaced assemblage from that site is similar to Connestee wares and associated with a single radiocarbon date of 1340±90 B.P. (uncorrected). Similarly, an AMS date from a Buncombe County site in an upland setting (31BN943) produced multiple 2-sigma ranges of Cal A.D. 690 to 900 and A.D. 920 to 950 associated with sand tempered, plain ceramics (Idol 2010).

No Napier or Late Swift Creek ceramics, such have been found at a number of Late Woodland sites in the southwestern part of North Carolina (e.g., Cullowhee Valley School [31JK32] [Ashcraft 1996; Greene 1996:120–121; Moore 1992], Biltmore II [31BN175] [Hall and Baker 1993], 31BN976 (Idol and Webb

2018), Ravensford [31SW78/136] [Benyshek and Webb i.p.; Webb 2002; Wild 1994], Hominy Creek [31BN828] [Paré et al. 2007], Sneed [31JK466] [Benyshek 2008], and Boundary Tree [31SW494] [Idol 2011a]) are noted in the northwestern part of the state.

Late Woodland settlement in northwestern North Carolina is defined by extensive excavations at the Ward site (31WT22) in the Watauga Valley and limited excavation at the Katie Griffith site (31WT330) in the South Fork of the New River Valley (Ayers et al. 1980; Loucks 1982; Purrington 1983; Whyte 2003, 2020). The Ward site excavations documented a small, palisaded village with circular houses and other features, associated with a ceramic assemblage notable for "collared" and punctated rims. This style of rim treatment is a defining characteristic of the Pisgah series as it is defined in southwestern North Carolina, and in fact the earlier researchers all considered the Ward site (and its ceramics) as a Mississippian manifestation (Ayers et al. 1980; Purrington 1983; Senior 1981). Although some vessels are rectilinear stamped in the Pisgah fashion, most vessels are net impressed or plain (or rectilinear stamped over net impressions), and tempered with crushed quartz, biotite schist, or limestone. At the Ward site, Pisgah traits occur on ceramics that otherwise reflect attributes found in the Dan and Yadkin River drainages, and the architectural patterns (circular houses, stockades) are similar to these areas as well. Radiocarbon dates from the Ward site suggest that the primary occupation occurred from ca. A.D. 980–1300 (Whyte 2003:5).

Salvage excavations at the Katie Griffith site (31WT330) uncovered the remains of a burned (apparently circular) structure with an associated midden (Whyte 2003:7). Ceramic artifacts found associated with the structure mainly exhibited net impressed or rectilinear complicated stamped surfaces and crushed quartz or soapstone temper. As at Ward, these exhibited thickened or collared, punctated rims (Whyte 2003:7). Radiocarbon dates associated with the Katie Griffith site suggest a ca. A.D. 1280–1400 occupation (Whyte 2003:11).

Evidence from the Ward and Katie Griffith sites suggests that a typical Late Woodland pattern (similar to those documented in the Dan and Upper Yadkin drainages) prevailed sometime after A.D. 900, and lasted up until A.D. 1450, and was accompanied by replication of Mississippian ceramic decoration (purely adjunct in nature) on locally-made vessels, which otherwise resemble ceramic varieties of the early Dan River series in the Piedmont (Whyte 2003:12–13). Whyte (2003:14–15; see also Anderson 1994; Cobb and Butler 2002; Hally 1994; Rodning 2004; Sullivan 2018) suggests that the absence of sites with evidence for sizeable populations or prolonged habitation after A.D. 1450 is related to shorter and more unpredictable growing seasons resulting from the Little Ice Age after A.D. 1300 (Mann et al. 2009). The inhabitants of northwestern North Carolina during this time would have been especially vulnerable to such climate trends, where growing seasons are sharply delineated by cooler seasonal temperatures in higher elevations.

In contrast to southwestern North Carolina, no subsequent protohistoric to historic Cherokee (i.e., Qualla phase) components have been identified. The archaeological evidence to date suggests that the region lacked any substantial habitation after the Late Woodland period up to the time of European intrusion (Whyte 2003, 2020).

REGIONAL HISTORIC PERIOD OVERVIEW

The first Euro-American intrusion into western North Carolina took place in 1540, when Hernando de Soto's expedition passed through the area. Several different reconstructions of de Soto's route have been proposed, with some early scholars (e.g., Swanton 1985:201–202) suggesting that he crossed Cherokee country by way of the Hiwassee Valley. A later reconstruction (Hudson et al. 1984) proposed that de Soto crossed the Blue Ridge farther to the north at Swannanoa Gap and then continued along the French Broad River into Tennessee; more recently, Beck (1997) and Hudson (1997:193) agreed that the expedition probably followed a more northerly route along the Toe River in the vicinity of Burnsville and Spruce Pine to the southwest. The route through the Swannanoa Gap may have been taken by Juan Pardo, however, who

was a Spanish explorer who traversed much of the same area from 1567–1568 (Beck 1997:167; Hudson 1990:27–46, 1997:193).

Whatever the precise routes of these explorers, it is clear that the ancestral Cherokees' first encounter with Europeans occurred in the mid-16th century (and that the Spanish were unlikely to have traversed the present Project area). These encounters were to have dramatic effects. The introduction of European diseases to which the native populations had little resistance caused a major reduction in Native American population levels and extensive changes in political organization, including the creation of coalescent societies which developed new institutions from deep shared cultural traditions (Ethridge 2006; Kowalewski 2006). Elsewhere in the Southeast, the fragmentation and reformation of political groups resulted in major changes in political organization and the total disappearance of some precontact societies (Ethridge 2006; Smith 1987). Despite substantial disruption, the Cherokee managed to retain control of portions of their core homeland, most notably in the southwestern valleys. The northwestern part of North Carolina was certainly much frequented by Cherokee hunters and it is possible that some small settlements were established in the area of Watauga County.

Moravian Bishop Spangenburg reached the Blue Ridge escarpment near Blowing Rock during his survey in 1752 and appears to have encountered few (if any) European settlers at that time (Arthur 1915:22–26). By 1769, a small and dispersed Euro-American settlement (the Watauga settlement) had been established; these groups later negotiated a settlement with the Cherokees to settle on the property and formed an autonomous government (Cockrell 2006; Hughes 1995:13). In 1779 the first land grant application in Watauga County was filed by David Hicks and Benjamin Ward in the vicinity of Valle Crucis (see Arthur 1915:212–213; De Miranda et al. 2003:34; VanWinkle 2003:5). By 1800 most settlement was concentrated in the Watauga River floodplains, but soon expanded into the coves and ridge slopes (VanWinkle 2003:6). Following Hicks, other families moved to claim prime Lower Valley bottomland before 1800 and achieved local prominence, including the Bairds, Masts, and Shulls (De Miranda et al. 2003:35). Watauga County was formed from parts of Ashe, Caldwell, Wilkes, and Yancey counties in 1849, and Boone was established as the county seat in 1851 (Corbitt 2000:220).

Some settlement was present by the 1770s in the upper and lower valley sections known today as Valle Crucis (De Miranda et al. 2003:3), although according to one source, only the Andrew Townsend family resided in the upper valley in 1842 (Arthur 1915:213). In 1842 the Bishop of the Episcopal Diocese of North Carolina, Levi Silliman Ives, visited the "upper settlement" (Upper Valley) area, which he named Valle Crucis for a Cistercian monastery in Wales, although others noted that the name also appropriately described the cross-like configuration formed by the juncture of Dutch, Clarks, and Lower Crab Orchard creeks (Cooper 1890:16; VanWinkle 2003:14). Between 1844 and 1846, the first buildings were constructed at the new mission school, which opened in 1845 (VanWinkle 2003:14), and a post office was established at the Episcopal Mission (De Miranda et al. 2003:3, 36). The Mission was plagued by financial and leadership problems during this time and the property was sold in 1852 and the buildings allowed to deteriorate (De Miranda et al. 2003:37). In 1851–1852 the northern section of NC 194 was established as the Caldwell and Watauga Turnpike, connecting Valle Crucis with Lenoir in Caldwell County to the east and Tennessee to the west, as well as other communities in the county (Arthur 1915:214; De Miranda et al. 2003:3, 37). The southern section of NC 194 that extends from its intersection with Broadstone Road through the upper valley was built from 1891–1892 as the Valle Crucis, Shawneehaw and Elk Park Turnpike, which linked Vallie Crucis with the East Tennessee & Western North Carolina Railroad at Elk Park (De Miranda et al. 2003:3, 38–39).

In the 1890s, the Episcopal Mission was reestablished on land donated by C.D. Taylor, and construction of the new Mission House began in 1896 (De Miranda et al. 2003:39). In 1903, a school for Grades 1–12 was established on 525 acres acquired from James P. Taylor and included trade and agricultural education in addition to academics for boys and girls (Arthur 1915:254; De Miranda et al. 2003:39–40; Richardson

1992:5–6, 11–13). The school and its employment opportunities have been important to the Valle Crucis community, and a working farm established during the early years continues to function today.

PREVIOUS ARCHAEOLOGICAL RESEARCH

Western North Carolina has been the subject of archaeological research for over a century, and most trends in the history of North American archaeology are reflected in the region. As early as the 1880s, workers from the Valentine Museum in Richmond investigated several mound sites in the region (Dickens 1976:7), and other early investigations were carried out by the Osbornes (Keel 1976). The museum's work was primarily oriented toward recovering artifacts, although in some cases the resulting data have been useful in addressing present-day research questions (e.g., Dickens 1976:91). Also in the 1880s, researchers from the Smithsonian Institution's Bureau of Ethnology excavated sites in Buncombe and Henderson counties as part of their investigations into the origin of the "Mound Builders" (Thomas 1894). That research was instrumental in demonstrating that the mounds in western North Carolina and elsewhere had in fact been built by American Indians and were not the products of a mysterious, vanished race.

Early twentieth century work in western North Carolina continued to focus on mound explorations. Between 1915 and 1919, George Heye and associates excavated at the Garden Creek site in Haywood County and at other nearby sites (Harrington 1922; Heye 1919; Heye et al. 1918). Although that work was designed to gather artifacts for Heye's Museum of the American Indian in New York, it did provide some data on the antiquity of the Cherokees in the region (Dickens 1976:7–8). Subsequent work in 1933 and 1934 by the Smithsonian Institution at the Peachtree Mound and Village in Cherokee County was also designed to investigate the relationship between the Cherokees and precontact cultures in the area (Setzler and Jennings 1941). Also in the 1930s, George MacPherson (1936a, 1936b) and Hiram Wilburn conducted surveys of numerous sites in Great Smoky Mountains National Park. Although many of their data were to be incorporated into later research (Bass 1975), at the time their work had little impact on the understanding of the region's prehistory.

The 1940s and 1950s witnessed relatively little research in the Appalachian Summit region, and intensive, systematic work did not begin until 1964, when the University of North Carolina instituted the Cherokee Archaeological Project. This project lasted until 1971 and included large-scale surveys as well as excavations of late precontact and historic Cherokee sites (Purrington 1983:98–99). Data from this project have been reported in several theses, dissertations, and other publications (e.g., Dickens 1976; Egloff 1967; Keel 1976), and provide much of the background information on the Appalachian Summit region. Excavations at the Ward site (31WT22) in Watauga County on the Watauga River, near its confluence with Cove Creek, began in 1972 and continued until 1990 (Ayers et al. 1980; Ward and Davis 1999:21). That work resulted in the documentation of precontact period occupations from ca. A.D. 1000 to the early 1300s at a small village enclosed by a circular palisade. During this time, reconnaissance surveys were conducted in Watauga County along the Watauga River and in the New River drainage (e.g., Holland 1969; Purrington 1975; Robertson and Robertson 1978).

Beginning in the 1970s, the establishment of Federal cultural resources legislation and management procedures resulted in an increasing number of archaeological projects, primarily surveys, in Watauga County and the rest of western North Carolina, for transportation improvements (Glover 2002; Hargrove 1989; Mintz and O'Connell 1995; O'Connell 1997a, 1997b; Padgett 1998; Seibel et al. 2001) and related activities (Webb and Nelson 2012), other infrastructure improvements (Ayers 1984; Jenkins and Southerlin 2001; Sander and Southerlin 2001; Whyte 2012), and stream restoration projects (Kimball 2015; Whyte 2001). The Kimball project (Kimball 2015) was conducted in the lower portion of the Dutch Creek drainage (about 1.5 km northeast of the current project's LOD), near the confluence with the Watauga; the survey included examination of a ca. 6-acre area and did not identify any archaeological sites. Kimball's study suggested that precontact period occupation was largely restricted to the higher terraces (i.e., more stable

landforms) immediately adjacent to the Valle Crucis floodplain, rather than the floodplain itself (Kimball 2012:2).

4. RESEARCH GOALS AND METHODS

RESEARCH OBJECTIVES

The goal of the survey was to systematically gather data on any archaeological resources present within the Valle Crucis Stream and Wetland Restoration Project. If significant resources were encountered, the archaeological field data were to be combined with information obtained in the background research to address the nature of the precontact, contact, and/or post-contact period occupations of the area.

RESEARCH METHODS

Background Research

Background literature review was conducted to gather information on any known cultural resources on and adjacent to the Project area and included examination of the following materials:

- Architectural surveys and National Register files at the North Carolina State Historic Preservation Office in Asheville;
- Archaeological site files, reports, and data on file at the North Carolina Office of State Archaeology in Asheville; and
- Maps and other data available online, at the UNC Research Laboratories of Archaeology, in the UNC-Chapel Hill North Carolina Collection, and in TRC's collection.

Field Methods

The archaeological survey complied with all pertinent state and federal regulations, including the North Carolina Office of State Archaeology's (OSA) *Archaeological Investigation Standards and Guidelines* (OSA 2017). The field survey was conducted by a team of three, consisting of the Field Director and two Archaeological Technicians.

The fieldwork included a systematic pedestrian walkover of the entire LOD and systematic subsurface shovel testing at 20-m intervals across all parts of the LOD except for visible wetland areas, areas of greater than 15% slope, or isolated areas of erosion or disturbance; supplemental shovel tests were also excavated at 10-m intervals to delineate finds.

Each shovel test measured at least 30 to 35 cm in diameter and was excavated to sterile or hydric subsoil, or to impervious rock. All removed soil (excluding obvious fill) was screened through ¼-inch mesh for uniform artifact recovery. Each shovel test was described in terms of depth, soil texture, Munsell soil color, and artifact recovery. All shovel test locations were recorded using a hand-held Trimble Geo7X Global Positioning System (GPS) in NAD 83 coordinates and drawn on the Project map.

Laboratory Methods

All artifacts were returned to the TRC Asheville facility for processing. Upon arrival in the laboratory, all artifact and sample bags were checked against provenience data from field records prior to processing. Artifacts were washed and air-dried, then sorted for analysis. The following laboratory methods were employed.

Precontact Ceramic Analysis. No precontact period ceramic sherds were encountered by the survey.

Lithic Artifact Analysis. Lithic artifacts were first sorted into general categories, including chipped stone tool and debitage.

*Tool*s. Lithic tools were described according to form, type (when possible), and raw material.

Debitage. Debitage fragments are the byproduct of lithic tool manufacture. Counts, weight, raw material, and size category were recorded for debitage fragments.

Raw Material Identification. Raw stone materials were identified based on macroscopic characteristics. Categories recognized in the assemblage include chert (including the Knox variety), chalcedony, quartz, and quartzite.

Postcontact Artifacts Analysis. Postcontact artifacts were classified where possible according to published artifact descriptions. Glass items were classified according to function or shape and color. Rim and base fragments were identified. Any additional detail evident was noted, such as embossing or labeling. Ceramic artifacts were classified according to type (i.e. stoneware, whiteware), and any decoration present was described. Other postcontact period artifacts recovered were classified by form, composition, and function wherever possible. Metal objects were classified by function where possible.

Curation

All artifacts, field notes, photographs, and other Project materials are temporarily stored at the TRC facility in Asheville, North Carolina. At the conclusion of the Project, the recovered artifacts will be returned to the landowners.

NRHP Eligibility Evaluation

The NRHP eligibility of the archaeological sites encountered by the Project was considered in light of the NRHP *Eligibility Criteria* as outlined in 36 CFR 60.4 (USDOI 1997). The NRHP Eligibility Criteria state:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association.
>
> (a). That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b). That are associated with the lives of persons significant in our past; or
>
> (c). That embody the distinctive characteristics of a type, period, or method of construction; or that represent the work of a master, or that possess high artistic values; or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d). That have yielded, or may be likely to yield, information important in prehistory or history.

Several factors were considered in assessing site significance and research potential under Criterion D, including artifact variety and quantity, site clarity and integrity, and environmental context (Glassow 1977).

5. RESULTS

PREVIOUSLY IDENTIFIED RESOURCES

Archaeological Sites

Review of files and records at the Office of State Archaeology (OSA) indicated that there have been no systematic surveys and there are no previously recorded sites within or adjacent to the Valle Crucis Stream and Wetland Restoration Project. There are seven previously recorded archaeological sites within a one-mile radius of the Project, however (Table 5.1). All of these were recorded during the early 1970s, during a county-wide reconnaissance survey conducted by Appalachian State University. The seven sites have not been assessed for NRHP eligibility. The closest previously recorded site to the current Project LOD is 31WT77, which appears to be associated with a ridge toe that is elevated above the broad terrace.

Table 5.1. Previously Recorded Archaeological Sites within One Mile of the Project.

Site No.	Description	NRHP Status	Reference
31WT77	Precontact: Early Archaic, Middle Archaic, Late Archaic; Early Woodland, Middle Woodland, Late Woodland; Postcontact: not specified	Unassessed	*ASU* 1978; Purrington 1975
31WT78	Precontact: Middle Archaic, Late Archaic, Middle Woodland, Late Woodland	Unassessed	*ASU* 1978; Purrington 1975
31WT136	Precontact: ceramic	Unassessed	*ASU* 1978; Purrington 1975
31WT137	Precontact: Middle Woodland	Unassessed	*ASU* 1978; Purrington 1975
31WT144	Precontact: Late Woodland?	Unassessed	*ASU* 1978; Purrington 1975
31WT146	Precontact: nondiagnostic lithic	Unassessed	*ASU* 1978; Purrington 1975
31WT254	Precontact: nondiagnostic lithic	Unassessed	*ASU* 1978

* reference in italics is a site form

Historic Structures

According to the NC HPO database, one historic structure is recorded immediately adjacent to the Project LOD. This is the Edith Taylor House, WT0309, which is within the Valle Crucis Local Historic District. Archaeological site 31WT408, recorded during the Project survey, is associated with this historic resource. WT0309 has not been assessed for NRHP eligibility and is outside of the two NRHP listed districts: Valle Crucis Historic District (WT0015) and Valle Crucis Episcopal Mission (WT0018).

Cemeteries

There are no cemeteries depicted within or adjacent to the Project LOD on historic maps (see below) or listed in available databases (e.g., https://www.findagrave.com/cemetery-browse/USA/North-Carolina/xxxxx-County?id=county_1707; http://www.ncgenweb.us/watauga/cemeteries.htm); the nearest such cemetery is associated with Holy Cross Episcopal Church and is situated approximately 130 m to the north on NC 194.

HISTORY AND MAP DEPICTIONS OF THE PROJECT AREA

The Project area and the Watauga drainage are outside the areas of intensive late precontact to contact period (i.e., A.D. 1500 to 1750) Native American settlements located to the west and east, and are within an area that was formerly ceded to the United States by the Cherokee Nation in 1791 (Royce 1884). No eighteenth or nineteenth century maps that show the Project area in any detail were identified during the research. As the area had already passed out of Cherokee control by the 1830s, it is not included on the early nineteenth century U.S. Army maps.

The earliest USGS topographic map of the area is the 1893 Cranberry NC-TN (1:125,000) topographic map (USGS 1893), which shows no structures in the Project vicinity (but shows the predecessors of Dutch Creek Road and the turnpike that runs southeast-northwest, now NC 194 (Figure 5.1). The 1899 version of that map (USGS 1899) shows more detail, including a new unimproved road entering the area from the west at Craborchard Creek, as well as a farmstead complex that appears to correspond with the Edith Taylor House and its associated auxiliary buildings (Figure 5.2). The 1928 soils map (Davis et al. et al. 1928) (Figure 5.3) and the 1936 USGS Valle Crucis planimetric quadrangle (the first 1:24,000 scale USGS map of the area) show a similar pattern of development (Figure 5.4), and largely reflect the present conditions (Figure 5.5).

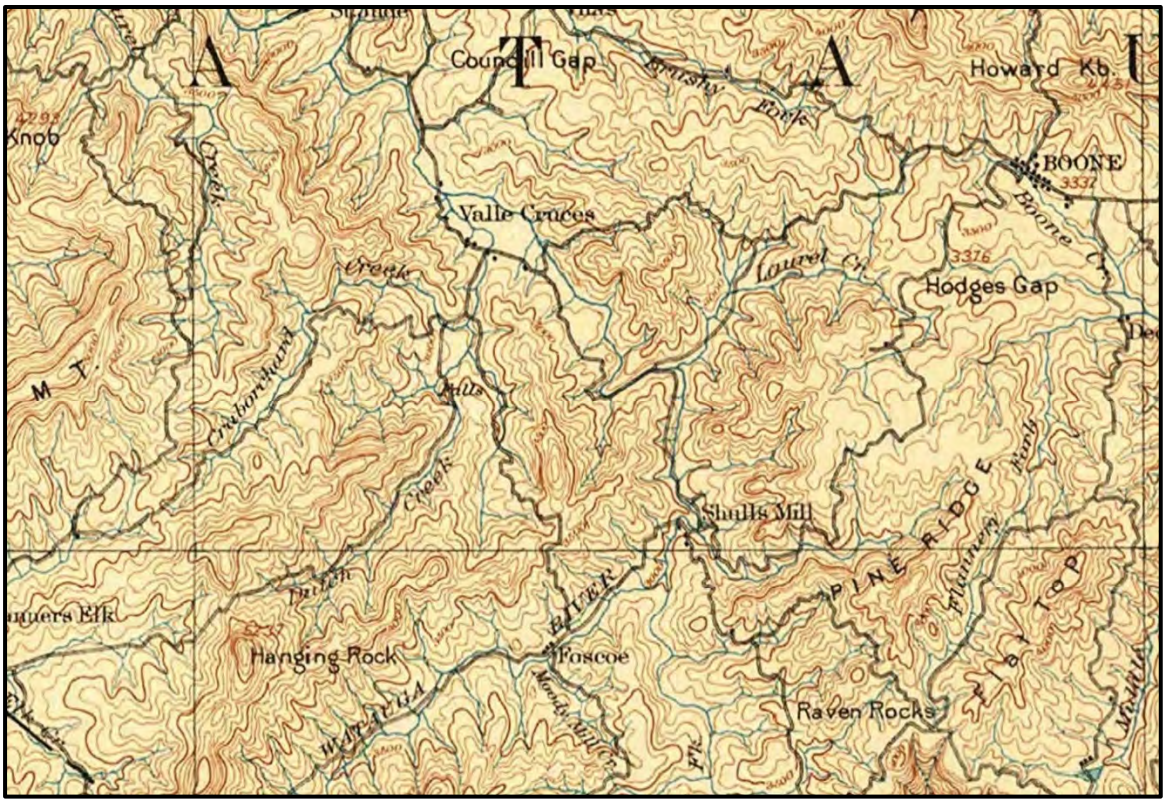


Figure 5.1. The Project vicinity as shown on the 1893 Cranberry NC-TN 1:125,000-scale topographic quadrangle.

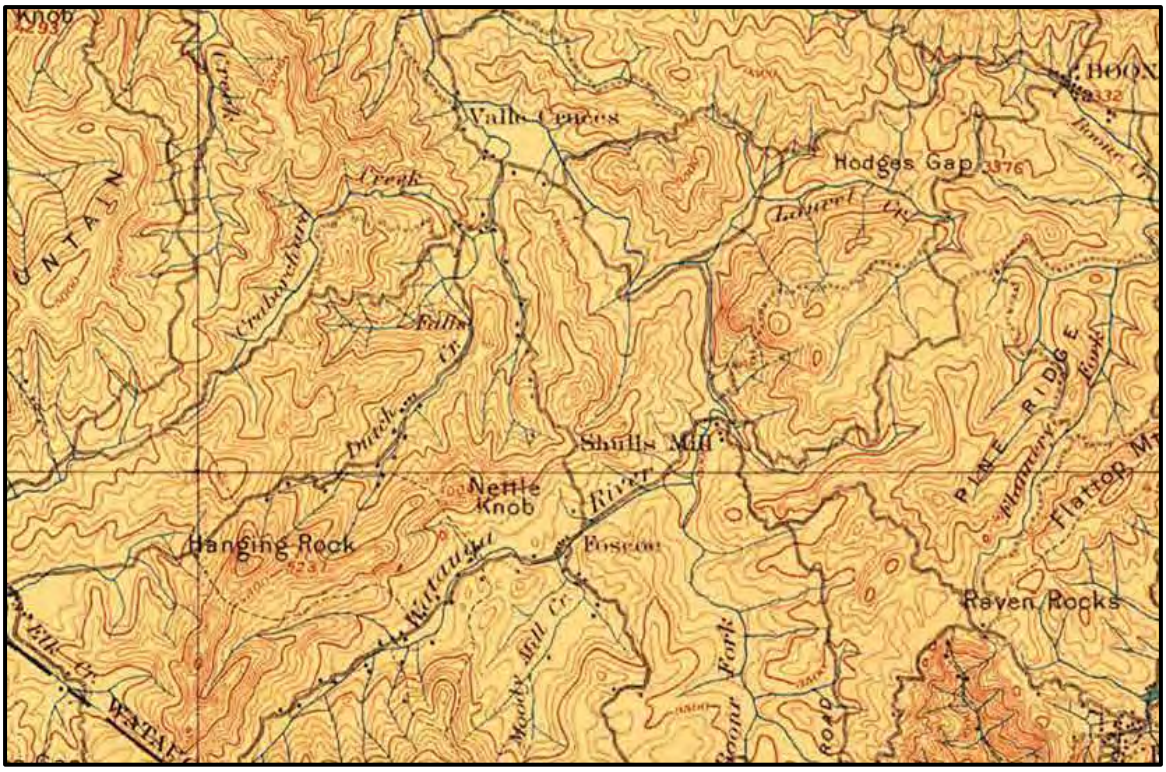


Figure 5.2. The Project vicinity as shown on the 1899 Cranberry NC-TN 1:125,000-scale topographic quadrangle.

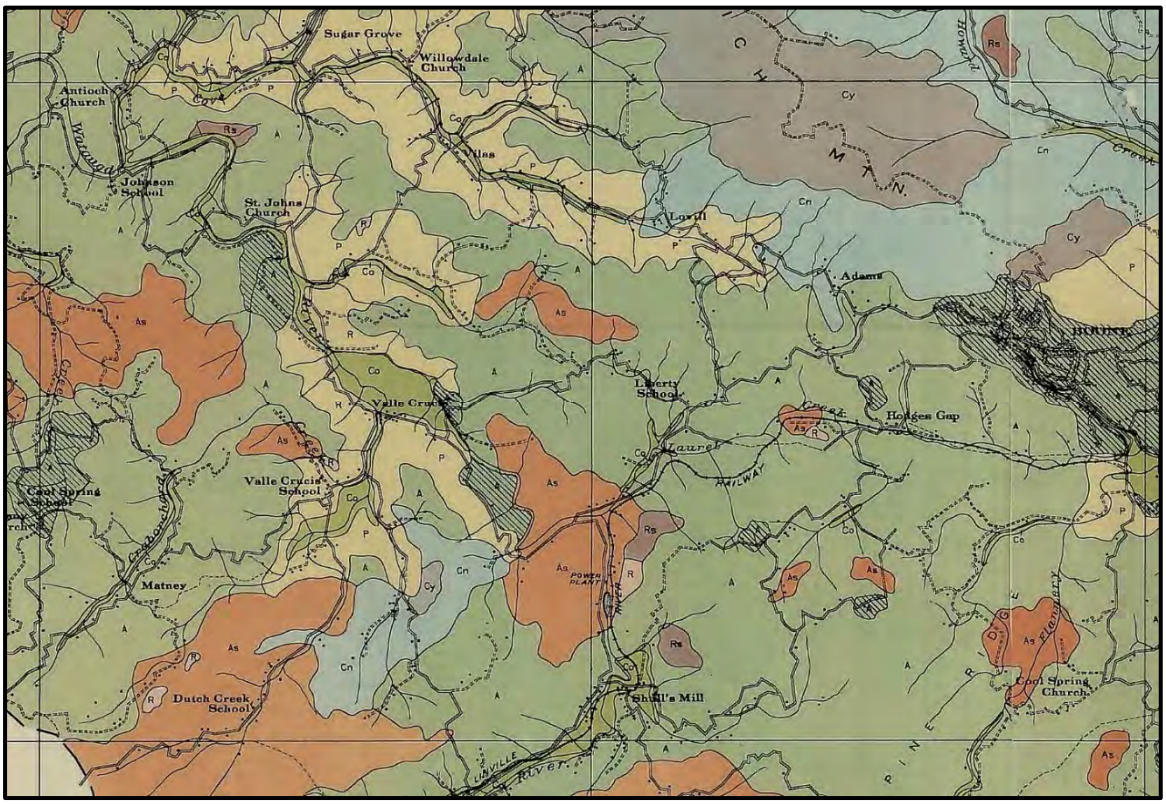


Figure 5.3. The Project vicinity as shown on the 1928 Watauga County soils map (Davis et al. 1928).

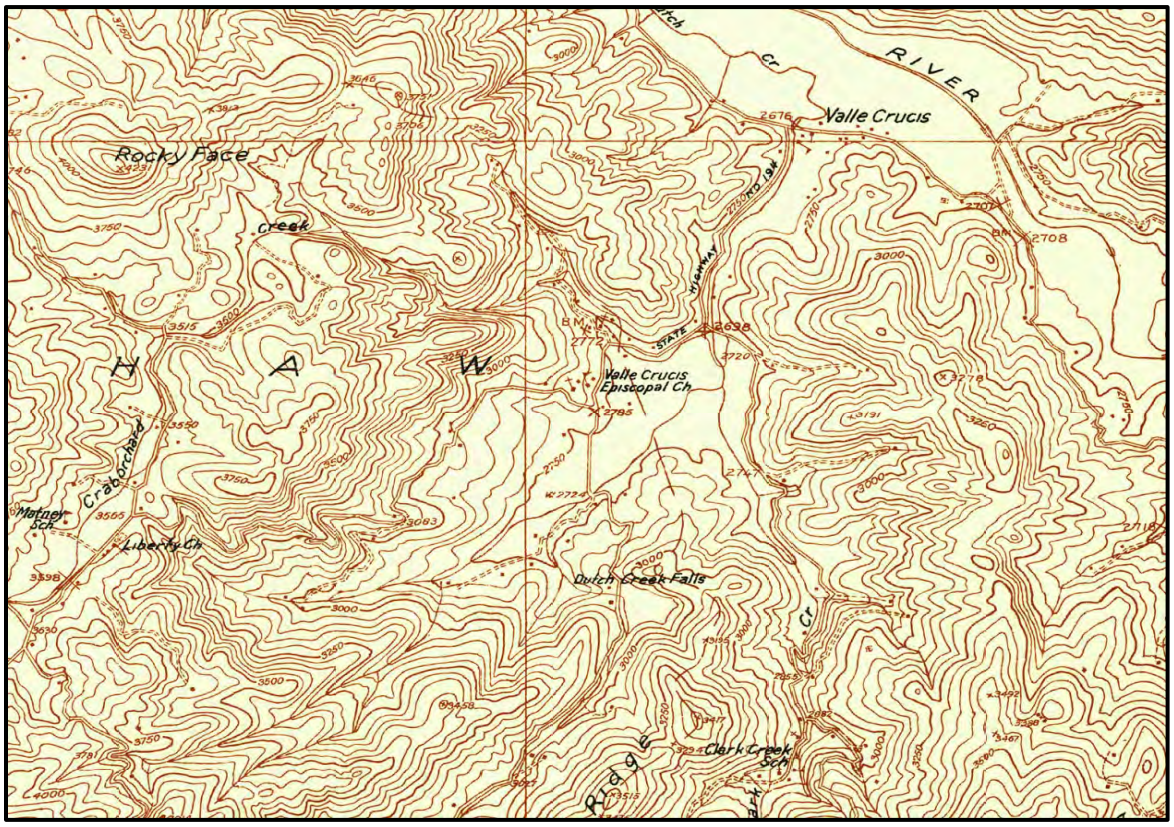


Figure 5.4. The Project vicinity as shown on the 1934 USGS planimetric quadrangle.

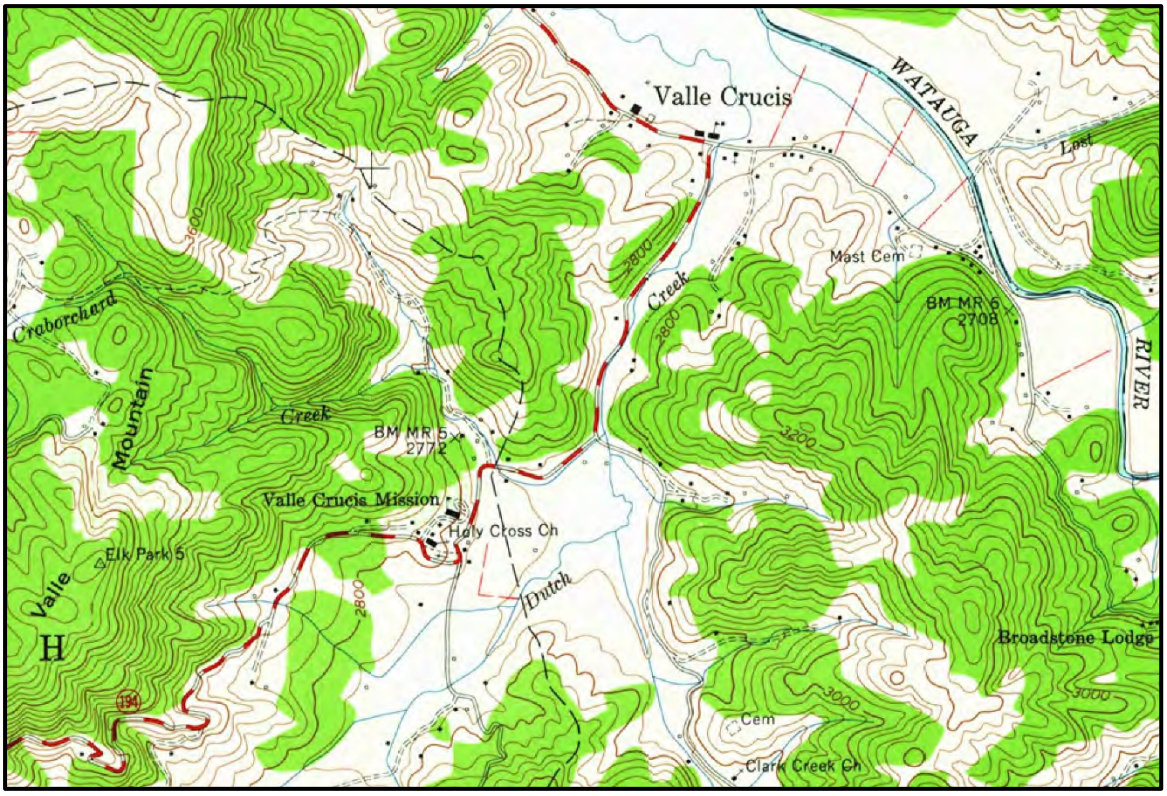


Figure 5.5. The Project vicinity as shown on the 1960 USGS topographic quadrangle.

FIELD SURVEY RESULTS

The Valle Crucis Stream and Wetland Restoration Project archaeological survey included excavation of a total of 207 shovel tests, including tests excavated at 20-m intervals along survey transects as well as 10-m interval site delineation tests. The shovel test transects were oriented with the LOD and its constituent landforms.

The survey identified five new archaeological sites (31WT405–31WT409) (Table 5.2; Figures 5.6 and 5.7). Two of these resources (31WT407 and 31WT408) were not totally defined by the survey and potentially extend outside the LOD; the remaining three sites appear to be totally delineated within the LOD. Site 31WT408 is associated with the Edith Taylor House, which is recorded in the NC HPO database as WT0309.

Table 5.2. Valle Crucis Stream and Wetland Restoration Project Archaeological Sites.

		Shovel Tests			Artifacts				NRHP
Site #	Component(s)	Total*	Pre.	Hist.	Cer.	Lith.	Hist.	Total	Recommendation
31WT405	Precontact: nondiagnostic lithic	15	2	0	0	2	0	2	Not Eligible (within LOD)
31WT406	Precontact: nondiagnostic lithic	6	3	0	0	5	0	5	Not Eligible
31WT407	Precontact: nondiagnostic lithic	22	6	0	0	9	0	9	Not Eligible (within LOD)
31WT408	Postcontact: late 19th to early 20th century	16	0	5	0	0	21	21	Not Eligible (within LOD)
31WT409	Precontact: nondiagnostic lithic	1	1	0	0	1	0	1	Not Eligible

* includes all shovel tests within 20 m of positive tests and not separated from the site by wetlands

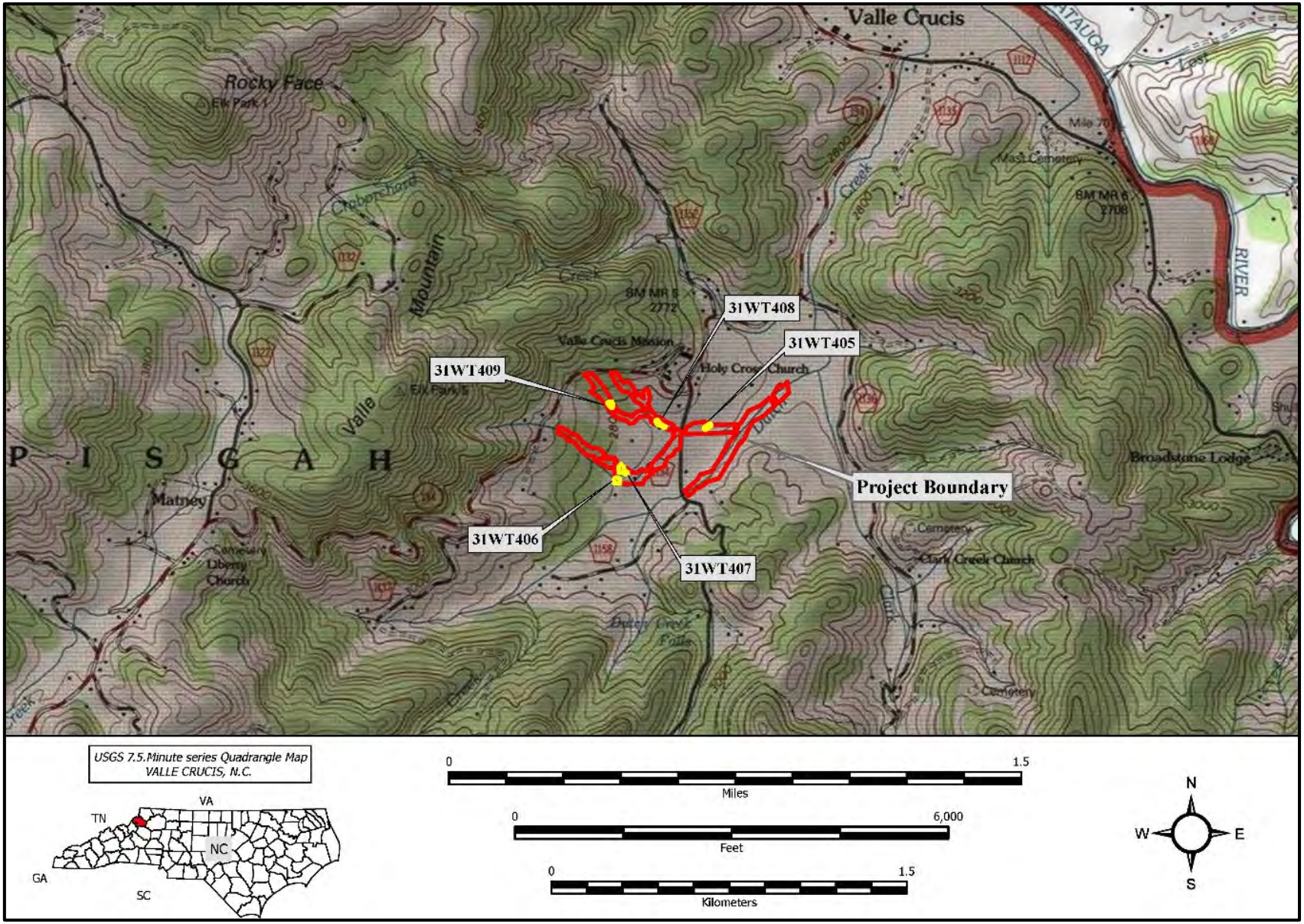


Figure 5.6. Valle Crucis Stream and Wetland Restoration Project archaeological sites.

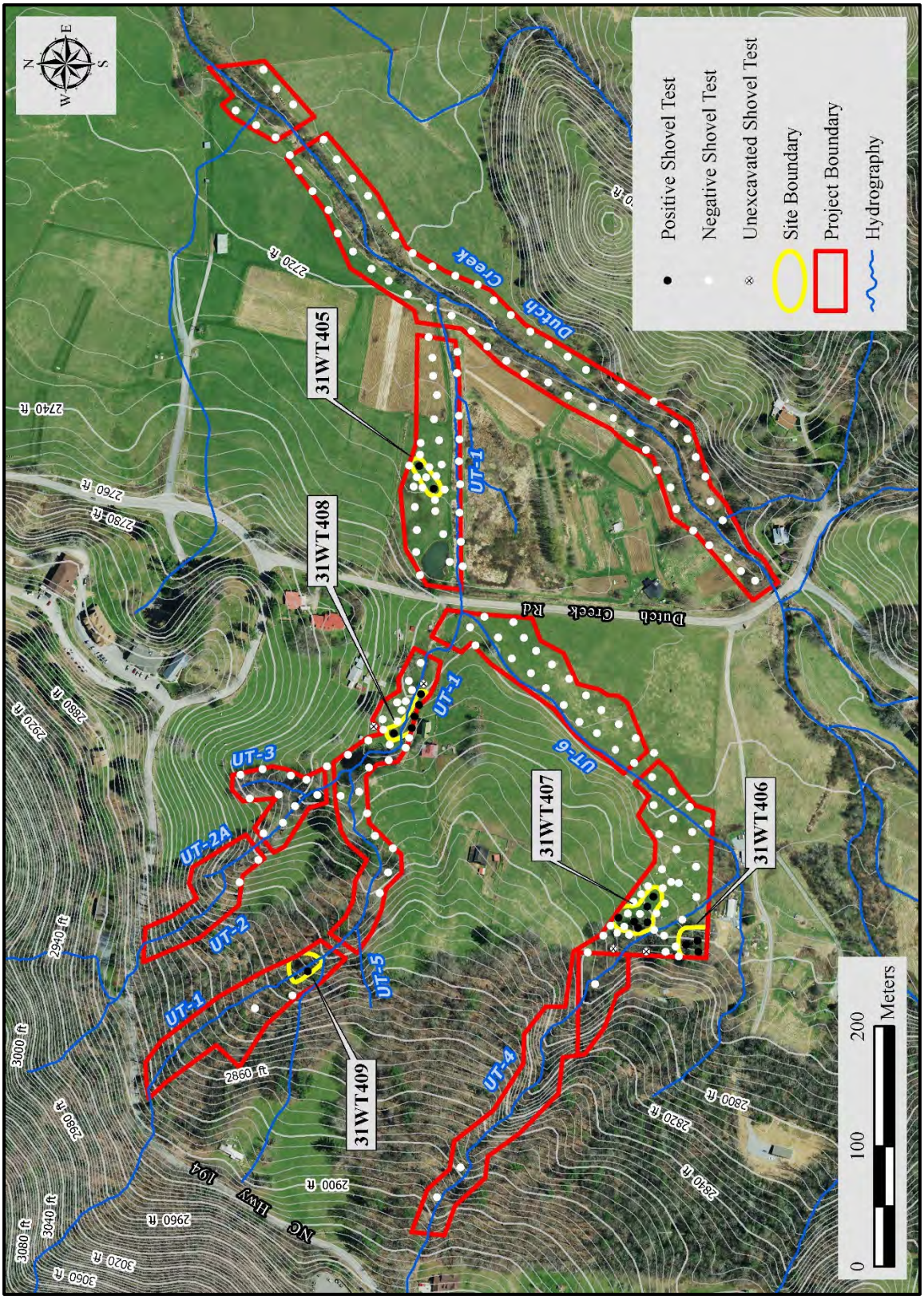


Figure 5.7. Aerial map showing shovel tests and archaeological sites.

31WT405

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	20 m N-S × 20 m W-E*
UTMs (NAD 83):	E429208 N4005872
Landform:	Stream Confluence
Elevation:	ca. 2,728 ft AMSL
Soil Type(s):	Dellwood cobbly sandy loam, 1–5% slopes, occasionally flooded (DeB)
Recommendation:	Not Eligible within LOD (all four NRHP criteria); Unassessed outside LOD

*Site measurements based on artifact distribution within the LOD; site may extend outside the LOD to the north.

Description. Site 31WT405 is a precontact period site situated on the level alluvial terrace north of a second order tributary of Dutch Creek, east of Dutch Creek Road, in an agricultural field (Figures 5.8–5.11). The site measures 20 m north-south by 20 m east-west within the LOD but may extend outside the LOD to the north. Previously recorded site 31WT77 is located approximately 100 m to the north but appears to be associated with a separate landform.

The soils at 31WT405 are mapped as Dellwood cobbly sandy loam, 1–5% slopes (DeB) (USDA NRCS 2020). Soil sequences varied but reflected the turbulent nature of the alluvial deposition across the terrace. All of the shovel tests encountered a 27 to 39 cm thick brown (10YR 4/3) gravel and cobble-filled loamy sand Ap horizon. Some of the tests also encountered an intermediate, less cobbly stratum between the plowzone and the C horizon at depths between 27 to 47 cmbs, which consisted of brown (10YR 4/3) or grayish brown sandy clay loam. The plowzone (or the intermediate stratum where present) overlay a yellowish brown (10YR 5/4) or grayish brown (2.5Y 5/2) sandy clay loam C horizon, that occasionally contained abundant gravels and cobbles. The coarse bottom stratum contained redoximorphic features typical of hydric or poorly drained soils. This A/C soil horizon sequence (and excessively cobbly soil conditions) is consistent with the published descriptions of the mapped soil type.

Shovel Tests. Fifteen shovel tests were excavated at 10- and 20-m intervals across the area (including all transect and delineation tests situated within 20 m), and two of these generated a total of two lithic artifacts (Figure 5.11). The two positive shovel tests each produced one artifact from the plowzone.

Artifacts. Both lithic artifacts were recovered from the plowzone in shovel tests at 31WT405 and include one fragmentary small stemmed projectile point made of black, Knox-variety chert (Figure 5.12a), and a piece of unmodified lithic debitage of the same material. The projectile point is not considered diagnostic of any particular precontact period component.

Summary and Recommendations. Site 31WT405 is a precontact period site situated on the level terrace north of a Dutch Creek tributary. Shovel tests generated a fragmentary projectile point made of Knox chert, which is not considered diagnostic of any particular component, and a piece of unmodified debitage of the same raw material. The extremely low artifact density at 31WT405 suggests that no intensive habitation or activities occurred within the LOD. Based on these data, site 31WT405, as expressed within the LOD, represents a low density, precontact period artifact deposit characteristic of many in western North Carolina and lacks evidence of meaningful artifact concentrations that would suggest the presence of associated features or any other intact aspects of site structure and integrity. The portion of the site within the LOD has little potential to provide substantial information on the prehistory of the area and is recommended not eligible for the NRHP under Criterion D; this part of the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

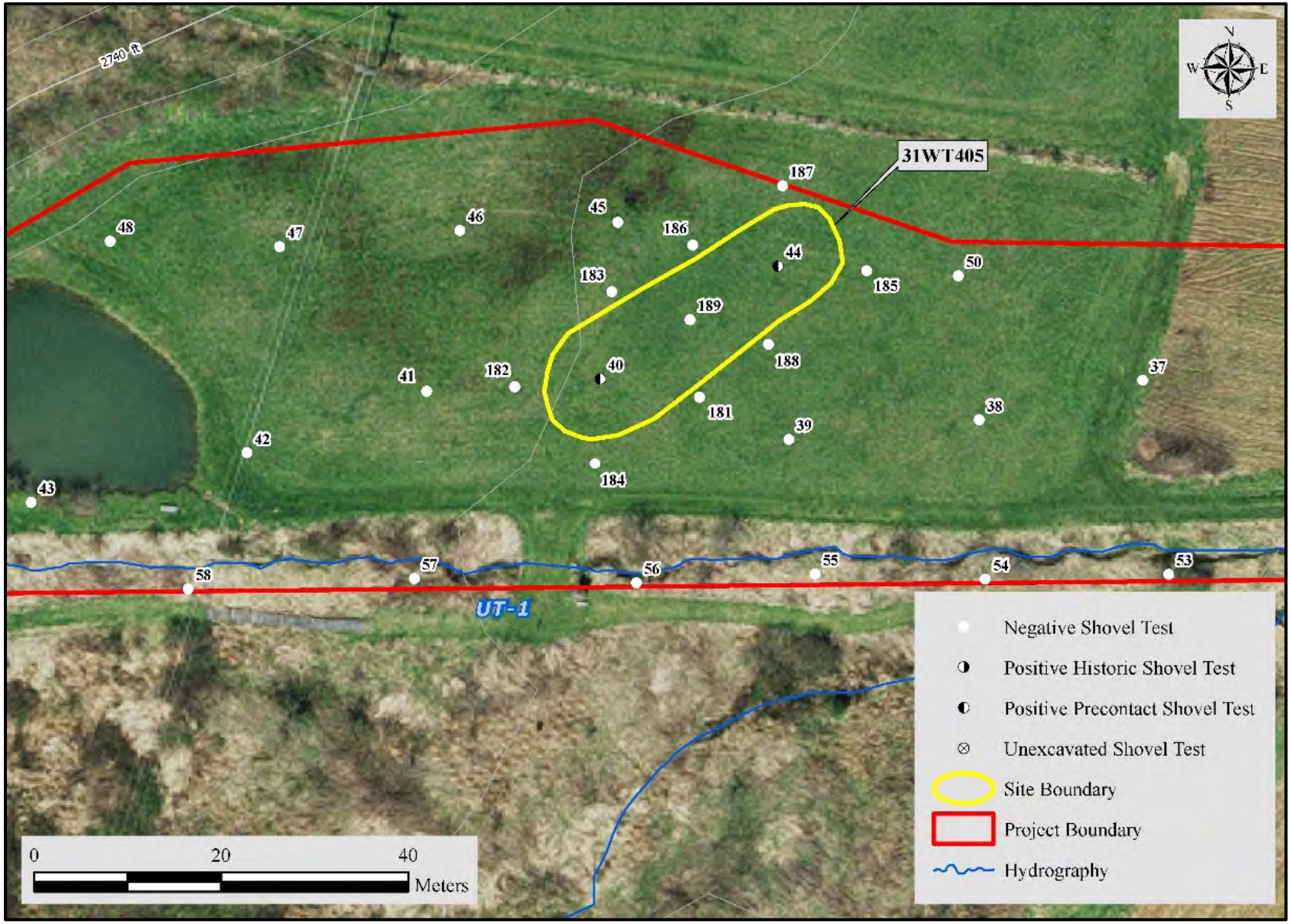


Figure 5.8. Map of 31WT405.

Figure 5.9. Site 31WT405, facing west.

Figure 5.10. Site 31WT405, facing south.

Figure 5.11. Shovel Test 40 at 31WT405.

Figure 5.12. Selected precontact artifacts from 31WT405 and 31WT406. 31WT405: a) chert small stemmed PPK, ST 40; 31WT406: b) lanceolate PPK/biface, ST 125

31WT406

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	20 m E-W × 20 m N-S
UTMs (NAD 83):	E428837 N4005645
Landform:	Bench
Elevation:	ca. 2,762 ft AMSL
Soil Type(s):	Saunook cobbly loam, central mountains, 8–15% slopes (SkC)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31WT406 is a precontact nondiagnostic lithic site found on a broad bench immediately west of a first order branch and is situated in a wooded section of pasture (Figures 5.13–5.15; see Figures 5.6 and 5.7). The site is defined by the LOD and slope to the south and west, by the stream and its associated seasonal wetlands to the east, and by a negative shovel test and slope to the north. Although it is not bounded by consecutive negative tests, the site appears to be effectively bounded within the LOD by the topography. Site 31WT406 is separated from 31WT407 by the intervening stream channel and exhibits markedly different soil characteristics.

The soils at 31WT406 are mapped as Saunook cobbly loam, 8–15% slopes (SkC) (USDA NRCS 2020). Shovel tests on the southeastern edge of the landform encountered deep colluvial soils, which consist from top to bottom of a 13 to 15 cm thick, cobbly A horizon of brown (10YR 5/3 to 10YR 4/3) silt loam overlying brownish yellow (10YR 6/6) silt loam. This extends to depths of 63 to 75 cmbs and was underlain by yellow (10YR 7/6) silty clay loam (Figure 5.15). In contrast, soils in the northern and western portions of the landform were much shallower and were characterized by a brown (10YR 4/3) A or Ap horizon that was up to 28 cm thick, overlying a brownish yellow (10YR 6/8) compact clay loam B horizon.

Shovel Tests. Six shovel tests were excavated across the area (including all transect and delineation tests situated within 20 m) at 10- and 20-m intervals (some areas were eroded to the B horizon or effectively blocked by debris); three of these produced precontact period lithic artifacts from the A/Ap horizon.

Artifacts. The assemblage includes a fragmentary, lanceolate, late-stage biface or projectile point preform made of quartz (see Figure 5.12b), three pieces of unmodified debitage (two chert, one quartzite), and an unmodified cobble (that appears to have been transported to the site from a near-stream environment, and not part of the colluvial load). None of these is temporally diagnostic.

Summary and Recommendations. Site 31WT406 is a nondiagnostic lithic site on an upland landform with localized deep colluvial soils. All of the associated artifacts were found in the upper A/Ap horizon, however. This site is unlikely to provide any significant or new information concerning precontact occupations in the area and is recommended not eligible for the NRHP under Criterion D; the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

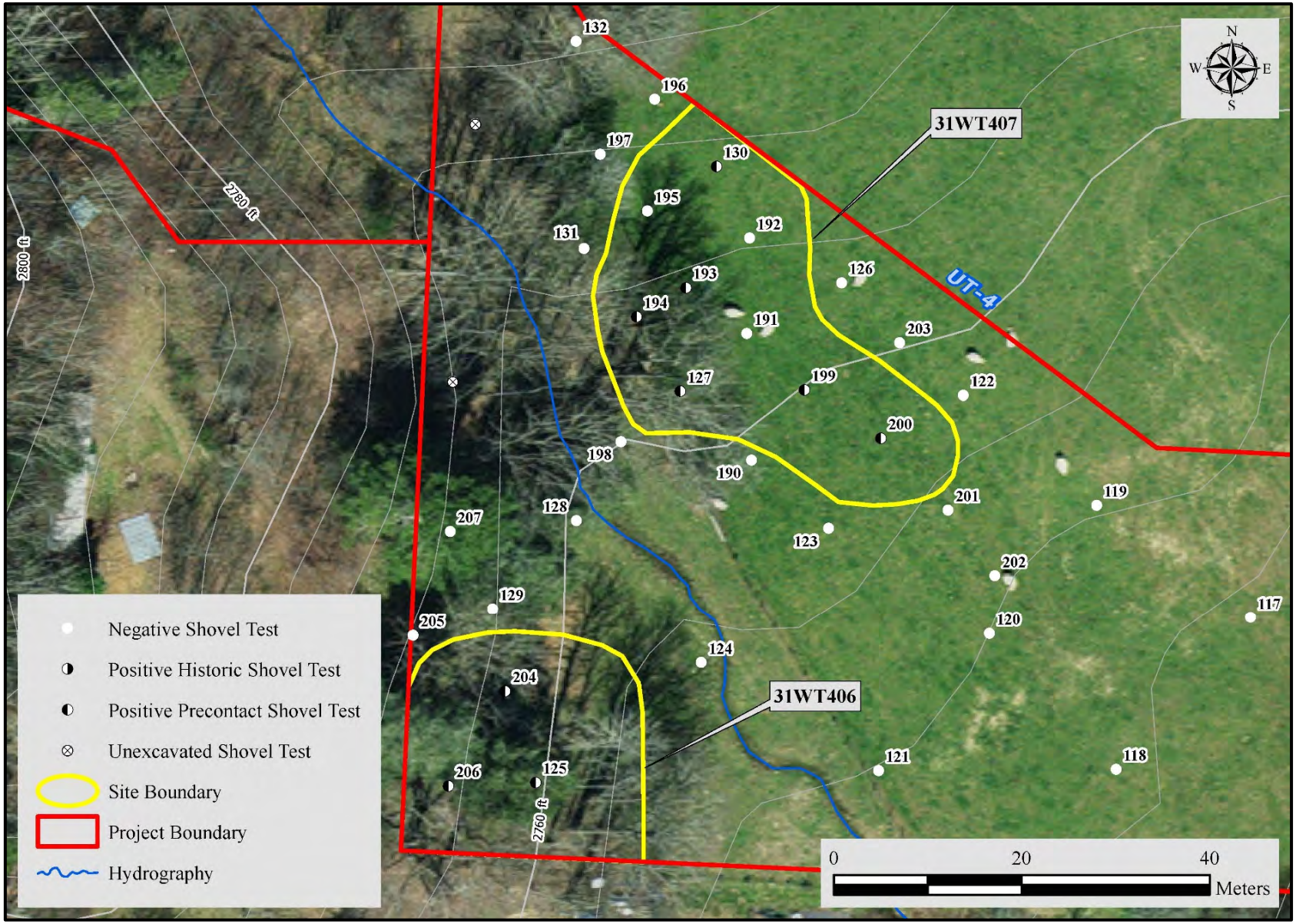


Figure 5.13. Map of 31WT406 and 31WT407.

Figure 5.14. Site 31WT406, facing north.

Figure 5.15. Shovel Test 204 at 31WT406.

31WT407

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	20 m+ NE-SW × 40 m NW-SE (approximate)
UTMs (NAD 83):	E428852 N4005645
Landform:	Ridge toe
Elevation:	ca. 2,762 ft AMSL
Soil Type(s):	Saunook cobbly loam, central mountains, 8–15% slopes (SkC)
Recommendation:	Not Eligible within LOD (all four NRHP criteria); Unassessed outside LOD

*Site measurements based on artifact distribution within the LOD; site may extend outside LOD to the east.

Description. Site 31WT407 is a precontact period site located on a descending ridge toe east of an unnamed first order tributary of Dutch Creek; it is situated in pasture and straddles a fence line (Figures 5.16 and 5.17; see Figures 5.6, 5.7, and 5.13). The site boundaries are defined to the west by the stream channel and to the south and north by negative shovel tests, but the site likely extends outside the LOD to the east.

The soils at 31WT407 are mapped as Saunook cobbly loam, central mountains, 8–15% slopes (SkC). Soil profiles documented in shovel tests consisted of a 12–35 cm thick Ap horizon of brown (10YR 4/3) or dark yellowish brown (10YR 4/4) sandy loam, which conformably overlies a yellowish brown (10YR 5/4) or strong brown (7.5YR 4/6) compact sandy clay loam B horizon. The B horizon was gravelly and contained occasional small cobbles. Redoximorphic soil features characteristic of hydric conditions were noted in the B (or C) horizon in the southernmost shovel test.

Shovel Tests. Six of the 22 shovel tests excavated across the area (including all transect and delineation tests situated within 20 m) produced a total of nine precontact period artifacts, all from the Ap horizon.

Artifacts. Nine nondiagnostic lithic artifacts were recovered from shovel tests at 31WT407. These are all unmodified pieces of lithic debitage and consist of three chalcedony, three chert, two quartzite, and one quartz.

Summary and Recommendations. Site 31WT407 is a low-density precontact period artifact scatter located on a sloped ridge toe adjacent to a first order stream (the stream separates 31WT407 from 31WT406 located to the west). Shovel tests produced no diagnostic artifacts, and the representative artifacts were dispersed, confined to the Ap horizon, and suggest ephemeral occupation. Consequently, the portion of 31WT407 within the LOD is unlikely to provide any significant or new information concerning precontact occupations in the area and is recommended not eligible for the NRHP under Criterion D; this part of the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

The portion of 31WT407 that extends outside the LOD to the east is considered unassessed for NRHP eligibility, however, and additional site delineation and assessment would be required should the LOD be expanded in that direction.

Figure 5.16. Site 31WT407, facing northeast.

Figure 5.17. Shovel Test 192 at 31WT407.

31WT408

Component(s):	Postcontact: late 19th century to early 20th century
Site Dimensions:	30 m + N-S × 50 m + E-W
UTMs (NAD 83):	E429019 N4005885
Landform:	Stream Confluence; Ridge Toe Slope; Floodplain
Elevation:	ca. 2,744 ft AMSL
Soil Type(s):	Dellwood cobbly sandy loam, 1–5% slopes, occasionally flooded (DeB)
Recommendation:	Not Eligible within LOD (all four NRHP criteria); Unassessed outside LOD

*Site measurements based on artifact distribution within the LOD; site likely extends outside LOD to the north and south.

Description. Site 31WT408 is a postcontact site situated at the base of a toe slope south of a first-order stream and on an alluvial terrace north of that stream, west of Dutch Creek Road, and is situated in pasture (Figures 5.18–5.22; see Figures 5.6 and 5.7). The site extends to the LOD limits on the north and south, but is bounded to the east by hydric wetland areas and to the west by negative tests, the active stream channel, and upland slope. Site 31WT408 is associated with the Edith Taylor House, recorded in the HPO database as WT0309. WT309 has not been evaluated for NRHP eligibility but is situated inside the Valle Crucis Local Historic District (https://www.arcgis.com/apps/webappviewer/index.html). The Edith Taylor House is outside of the LOD limits, as are a few outbuildings that appear to be of roughly contemporary construction, including a barn/shed situated just west of the house, an outhouse west of the house, an outlying barn to the southwest, and a small storage shed located north of the stream. Historic map data indicates that the house and associated outbuildings were constructed sometime after 1895 and before 1899 (USGS 1895, 1899). Other auxiliary buildings located north of the stream (including a springhouse) appear to be of much later construction.

The soils at 31WT408 are mapped as Dellwood cobbly sandy loam, 1–5% slopes (DeB); the mapped distribution encompasses both the low alluvial terrace areas (including seasonally inundated areas) and the sharply elevated area to the south where the house is located (USDA NRCS 2020). Shovel tests along the edge of the high terrace between the access road and sloped bank, south of the stream branch (e.g., STs 157–158 and 171–173) encountered a 25–32 cm thick brown (10YR 4/3) cobble and gravel-filled Ap horizon overlying yellowish brown (10YR 5/8) sandy clay loam. The Bt horizon in this area contained tabular rock in the upper part. ST 156, located on the lower terrace west of the stream near seasonal wetlands, encountered a 14 cm thick yellowish brown (10YR 5/4) sandy loam A or Ap horizon overlying a yellowish brown (10YR 5/8), sandy clay loam, gravelly B horizon. Most shovel tests on the low terrace east of the stream (STs 174–177 and 179) mainly encountered a dark grayish brown, hydric A/Ap horizon overlying wet, gleyed soils. ST 178, in contrast, encountered a 13 cm thick top stratum of brown (10YR 4/3) sandy loam overlying yellowish brown (10YR 5/4) sandy loam to a depth of 38 cmbs, where impenetrable rock was encountered.

Shovel Tests. Twenty-one postcontact artifacts were recovered from five of 16 shovel tests excavated at 10- and 20-m intervals (including all transect and delineation tests situated within 20 m). Most artifacts were found within the A or Ap horizon. Two artifacts were found below the upper A horizon in ST 178; the nature of the underlying stratum at that location is not clear, but it does not represent a buried A horizon or other similar context.

Artifacts. The 31WT408 assemblage includes four ceramic artifacts, two pieces of glass, 12 architectural-related artifacts, and three pieces of coal (Table 5.3; Figure 5.23). The ceramic artifacts include an undecorated whiteware sherd that represents a plate or bowl rim (Figure 5.23c), two brown, alkaline glazed stoneware sherds (Figure 5.23d–e), and a piece of terra cotta. The other historic artifacts include two cut nails (Figure 5.23a–b), a piece of thin, melted clear glass that likely represents lamp glass, a piece of clear

bottle or jar glass, two unidentified nails, eight small, eroded brick fragments, and three pieces of coal. Whiteware was developed and in use by 1830 but continued to be manufactured into the twentieth century (Miller 1991:5). Alkaline glazed stoneware was used in the United States as early as 1810 but also continued to be manufactured into the twentieth century (Greer 1981). Cut nails were first manufactured around 1790 and were used in construction throughout the nineteenth century (Adams 2002; Edwards and Wells 1993; Nelson 1968:6).

Table 5.3. Postcontact (Historic Period) Artifacts from 31WT408.

Description	Count
Kitchen Group	
Stoneware, alkaline glazed	2
Whiteware, undecorated	1
Clear UD glass	1
Group Subtotal	*4*
Architectural Group	
Brick fragment	8
Nail, cut	2
Nail, unidentified	2
Group Subtotal	*12*
Miscellaneous	
UD (terra cotta)	1
UD (lamp glass?)	1
Coal	3
Group Subtotal	*5*
Total	**21**

The postcontact artifacts are attributable to the occupation of the late nineteenth to early twentieth century Edith Taylor House located on the high terrace south of the stream. Examination of historic maps indicates that some or all of the structures at this location were constructed sometime between 1895 and 1899. It is not clear when the house was last occupied (it, along with some of the auxiliary buildings, appears to be currently used for storage), but architectural improvements and the construction of later buildings suggest that the occupation persisted to the mid-twentieth century if not for some time after that, and some of the existing buildings appear to be incorporated into the functioning Taylor family farmstead at present. The limited artifact assemblage is consistent with late nineteenth to twentieth century occupation.

Summary and Recommendations. Site 31WT408 is a late nineteenth to early twentieth century site situated on a ridge toe slope south of a small stream and on the low floodplain terrace on the north side of the stream. The historic component is represented by a few Euro-American artifacts, and no intact deposits were encountered.

Based on these data, site 31WT408 represents a low density postcontact period artifact scatter that is attributable to the late nineteenth to twentieth century Taylor farmstead and HPO resource WT0309 (Edith Taylor House). Shovel tests encountered a few dispersed artifacts associated with domestic occupation but did not encounter intact deposits within the LOD or any substantial artifact concentrations that would suggest the presence of associated features or any other intact aspects of site structure and integrity. The portion of the site within the LOD has no potential to provide substantial information on the historic occupation of the Taylor farmstead and is recommended not eligible for the NRHP under Criterion D; this part of the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria. Any portion of 31WT408 that may extend outside the LOD to the south or north is considered unassessed for NRHP eligibility, however, and additional site delineation and assessment would be required should the LOD be expanded in those directions.

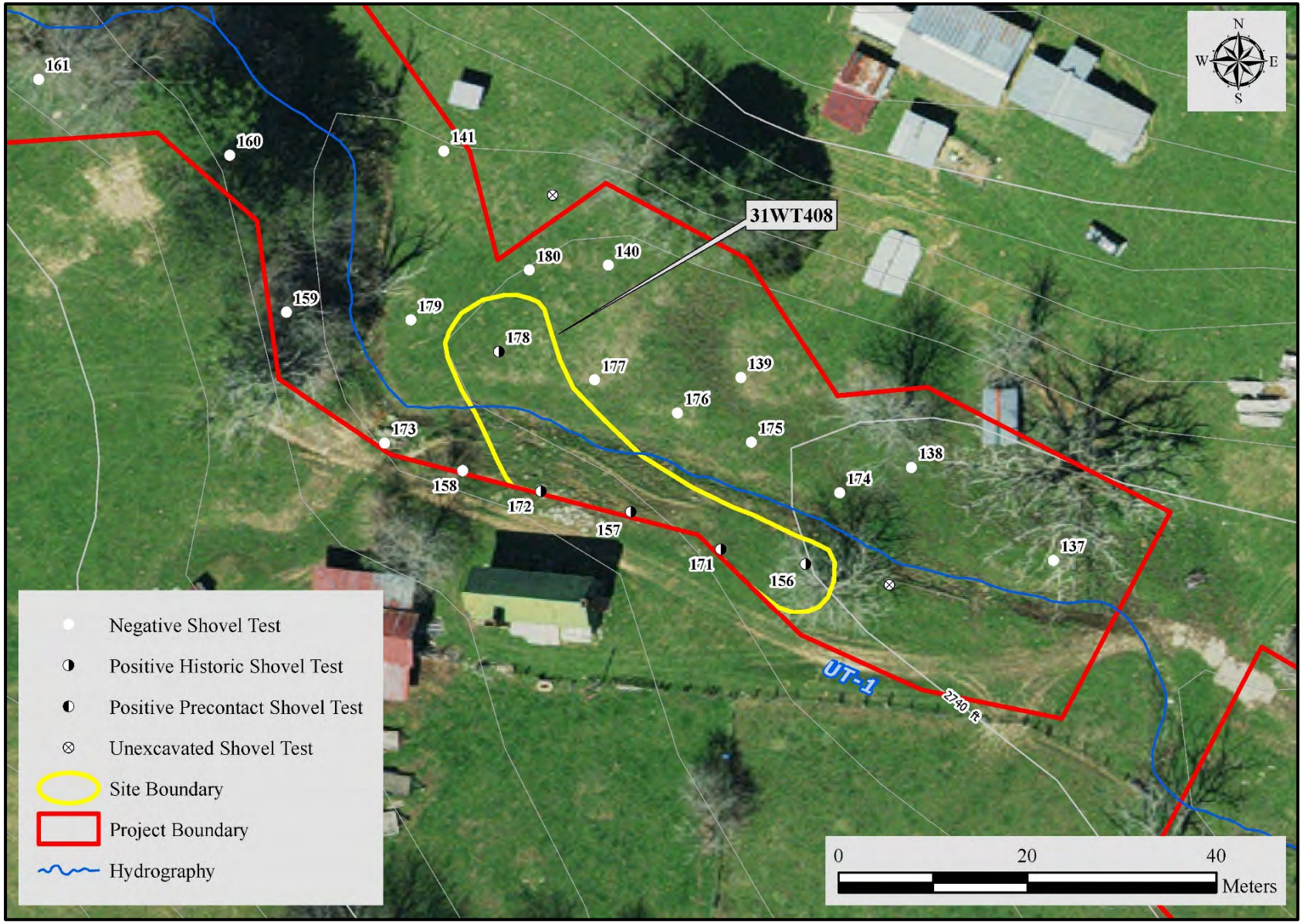


Figure 5.18. Map of 31WT408.

Figure 5.19. Site 31WT408 and Edith Taylor House (WT0309), facing west.

Figure 5.20. Site 31WT408 and Edith Taylor House (WT0309), facing south.

Figure 5.21. Site 31WT408 showing low terrace area, facing west.

Figure 5.22. Shovel Test 157 at 31WT408.

Figure 5.23. Selected postcontact (historic period) artifacts from 31WT408. a–b) cut nails, ST 172; c) undecorated whiteware, ST 157; d–e) alkaline glazed stoneware, ST 178

31WT409

Component(s):	Precontact: nondiagnostic lithic
Site Dimensions:	10 m N-S × 10 m E-W
UTMs (NAD 83):	E428805 N4005969
Landform:	Stream Confluence; Bench
Elevation:	ca. 2,810 ft AMSL
Soil Type(s):	Dellwood cobbly sandy loam, 1–5% slopes, occasionally flooded (DeB)
Recommendation:	Not Eligible (all four NRHP criteria)

Description. Site 31WT409 is represented by an isolated nondiagnostic lithic artifact that was recovered on a bench remnant that is flanked by boulder and cobble-strewn, deeply incised stream channels; the site is situated in heavily wooded pasture (Figures 5.24–5.26; see Figures 5.6 and 5.7). The site is bounded by the braided stream channel, broken, boulder-covered terrain, and steep slope.

The soils at 31WT409 are mapped as Dellwood cobbly sandy loam, 1–5% slopes (DeB), an alluvial-type soil (USDA NRCS 2020). The setting of the site is difficult to reconcile with the mapped soil type; the setting and soil conditions more closely resemble one of the Saunook varieties, such as Saunook cobbly loam, central mountains, 8–15% slopes (SkC), or Saunook loam (central mountains, very stony), associated with 8–15% slopes (SoC). Soils encountered in the single shovel test were excessively rocky and consisted of a 13 cm thick very dark brown (10YR 2/2) silt loam Oi to A horizon overlying yellowish brown (10YR 5/4) gravelly sandy clay loam.

Shovel Tests. One lithic artifact was recovered from the shovel test excavated on the small landform. The artifact was found in the shallow A horizon.

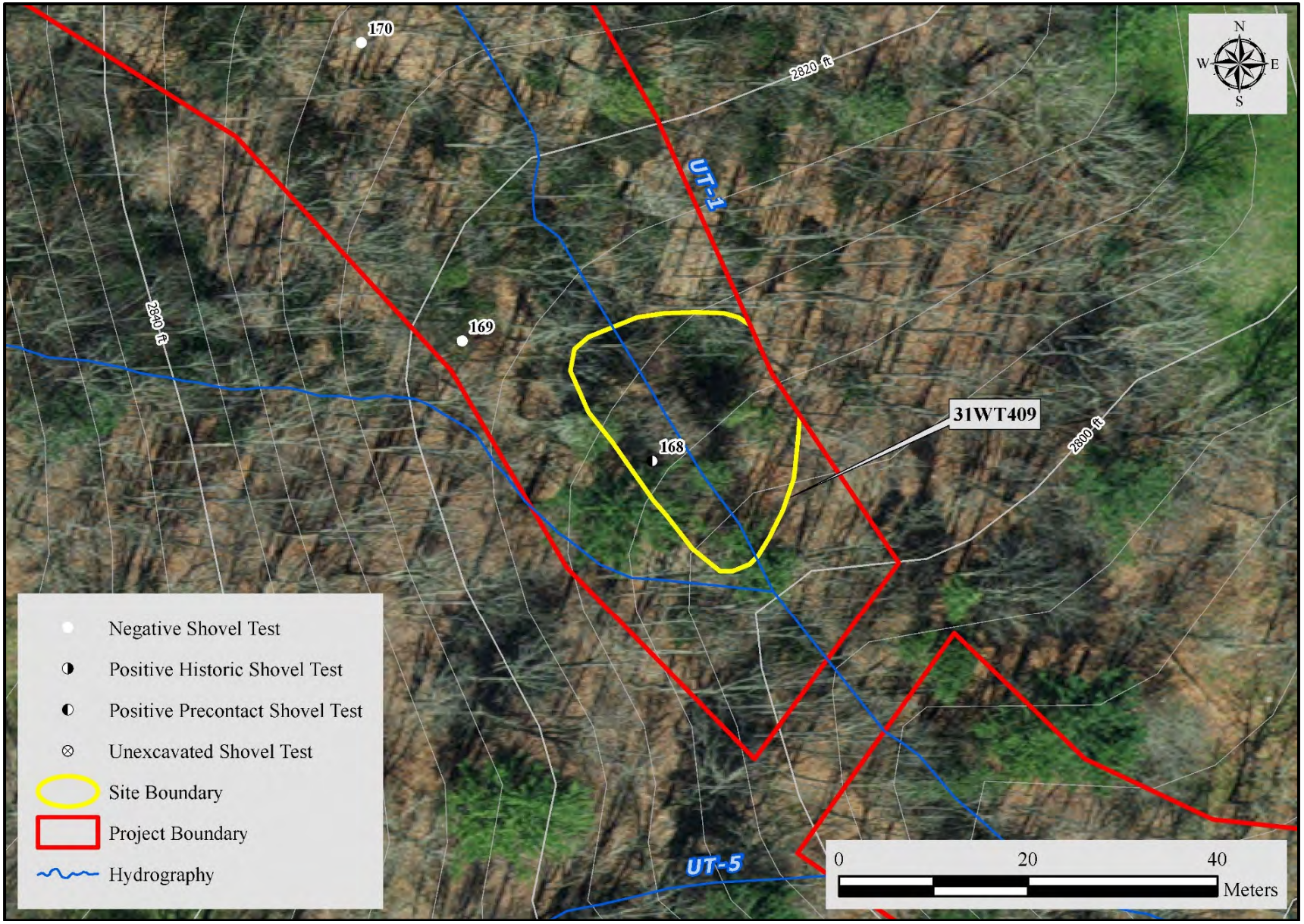


Figure 5.24. Map of 31WT409.

Figure 5.25. Site 31WT409, facing northwest.

Figure 5.26. Shovel Test 168 at 31WT409.

Artifacts. The single artifact from 31WT409 is a nondiagnostic quartzite debitage fragment. Surface inspection across the eroded landform and examination of the eroded stream banks encountered no similar materials or other artifacts.

Summary and Recommendations. Site 31WT409 is a nondiagnostic lithic site on an apparent bench remnant and is represented by an isolated piece of unmodified debitage from the Oi or A horizon. Given its setting, it is possible that the artifact was redeposited from either alluvial or colluvial processes. This site is unlikely to provide any significant or new information concerning precontact occupations in the area and is recommended not eligible for the NRHP under Criterion D; the site also appears to lack the characteristics necessary for eligibility under the other NRHP criteria.

6. SUMMARY AND RECOMMENDATIONS

TRC has completed an archaeological survey of the Valle Crucis Stream and Wetland Restoration Project in Watauga County, North Carolina. The work was conducted on behalf of Restoration Systems, LLC, as part of the permitting requirements for the proposed restoration and enhancement of approximately 7,882 linear feet of stream. This work took place in accordance with TRC's technical proposal for the Project. The proposed LOD for the restoration work is irregular in shape and encompasses about 20 acres in the Dutch Creek drainage and includes alluvial and colluvial terraces on both sides of that creek and its tributaries, and adjacent ridge toe slopes. The LOD is divided by Dutch Creek Road (SR 1134) into east and west halves and is partially bounded by NC 194 on the west side.

The archaeological fieldwork was directed by Bruce Idol of TRC, occurred from September 13–17, 2021, and required 15 person-days. The fieldwork included a systematic pedestrian reconnaissance of the entire LOD and systematic shovel testing at 20-m intervals across all parts of the LOD except for visible temporary wetland areas, areas of greater than 15% slope, or isolated areas of erosion or disturbance; supplemental shovel tests were excavated at 10-m intervals to delineate finds. A total of 207 shovel tests were excavated.

The survey identified five archaeological sites within the LOD (31WT405–31WT409) (Table 6.1). Portions of three sites within the LOD (31WT405, 31WT407, and 31WT408) appear to lack research potential, and those parts of those sites are recommended not eligible for the NRHP. These sites extend outside the LOD, however, and the NRHP eligibility of the parts of the sites outside the LOD is considered unassessed. Additional subsurface survey to further evaluate the parts of those sites outside the LOD might be necessary if any project changes were to result in an expansion of the LOD at those site locations. Site 31WT405 is a low-density precontact period lithic scatter situated on an alluvial terrace north of a second order tributary of Dutch Creek; it may extend outside of the LOD to the north. Site 31WT407 is a low-density precontact period lithic scatter situated on a ridge toe west of Dutch Creek Road; it appears to extend outside of the LOD to the east. Site 31WT408 is a low-density Euro-American artifact scatter associated with the late nineteenth to early twentieth century Taylor farmstead and the Edith Taylor House (HPO resource WT0309, which is located within the Valle Crucis Local Historic District). The associated house and outbuildings are all located outside of the LOD for the Project. Sites 31WT405, 31WT407, and 31WT408 do not contain any intact or meaningfully patterned deposits within the LOD, and no further archaeological investigations are recommended at these sites for the Project as currently defined.

The other two sites (31WT406 and 31WT409) are dispersed low-density lithic scatters or isolated artifact finds that contain nondiagnostic lithic components. These sites have been evaluated in their entirety, and appear to lack the integrity, artifact density, and/or site clarity (the potential to distinguish among different occupations) that would allow them to produce substantial information concerning the precontact period occupations in the area. These sites appear to lack research potential and are recommended not eligible for the NRHP under all four criteria as expressed within the LOD. No further archaeological investigations are recommended at these sites for the Project as currently defined.

In summary, no further archaeological investigations are recommended at the Valle Crucis Stream and Wetland Restoration Project as presently defined. Additional subsurface survey to further evaluate the parts of sites 31WT405, 31WT407, and 31WT408 outside the LOD might be necessary if any project changes were to result in an expansion of the LOD at those site locations.

Table 6.1. Archaeological Sites Identified by the Valle Crucis Stream and Wetland Restoration Survey.

Site	Component	NRHP Eligibility Recommendation
31WT405	Precontact: nondiagnostic lithic	Not eligible (within LOD)
31WT406	Precontact: nondiagnostic lithic	Not eligible
31WT407	Precontact: nondiagnostic lithic	Not eligible (within LOD)
31WT408	Postcontact: late 19th to early 20th century	Not eligible (within LOD)
31WT409	Precontact: nondiagnostic lithic	Not eligible

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APPENDIX 1: PRECONTACT ARTIFACT CATALOG

Site	Bag#	Uni#	ST	Strat	Horizon	Depth (cmbs)	ArtType	RawMat	Cortex?	ToolType	Count	Wt (g)	Comments
31WT405	1	LT1	40	I		0-16	LTFL	Che	N	PPK-Stemmed	1	2.8	prox frag; non-diagnostic, UD Small-Stemmed
31WT405	2	L1	44	I	Ap	19-39	LDEB	Che	N		1	0.3	
31WT407	3	L1	127	II		12-32	LDEB	Che	Y		1	0.7	
31WT407	4	L1	130	I	Ap	0-23	LDEB	Qzite	N		1	0.3	
31WT406	5	LT1	125	I	Ap	0-15	LTFL	Qz	N	Preform-Lanc	1	11.7	missing most of one edge
31WT409	8	L1	168	I		0-13	LDEB	Qzite	N		1	0.5	
31WT407	14	L1	199	I	Ap	0-24	LDEB	Che	N		1	0.4	
31WT407	15	L1	193	I		0-30	LDEB	Qzite	N		1	0.2	
31WT407	16	L1	194	I	A	0-9	LDEB	Chal	Y		1	1.5	
31WT407	16	L2	194	I	A	0-9	LDEB	Qz	N		1	0.5	
31WT407	16	L3	194	I	A	0-9	LDEB	Chal	N		2	42.1	
31WT407	17	L1	200	I	Ap	0-28	LDEB	Che	Y		1	1.8	
31WT406	18	L1	204	I	A	0-13	LDEB	Qzite	N		1	0.4	
31WT406	19	L1	206	I	A	0-20	LDEB	Che	N		2	0.3	
31WT406	19	-	206	I	A	0-20	LFCR	Qzite	-		1	25.1	discarded

APPENDIX 2: POSTCONTACT ARTIFACT CATALOG

Site	Bag#	Uni#	ST	Strat	Horizon	Depth (cmbs)	ArtType	Material	Color	Count	Comments	Component
31WT408	6	H1	156	I	A	0-14	BRIK	brick frag		2	v sm frags	
31WT408	7	H1	157	I	Ap	0-22	CERM	whiteware		1	partial rim frag of plate or bowl	
31WT408	7	H2	157	I	Ap	0-22	GLAS	curved	clear	1	2-pc refit	
31WT408	7	H3	157	I	Ap	0-22	CERM	terra cotta		1	one intact surface	
31WT408	7	H4	157	I	Ap	0-22	BRIK	brick frag		1	v sm frag	
31WT408	9	H1	171	I	Ap	0-32	COAL	coal frag		3		
31WT408	9	H2	171	I	Ap	0-32	BRIK	brick frag		3	v sm frags	
31WT408	10	H1	172	I	Ap	0-22	GLAS	curved	clear/melted	1	v thin- likely lamp glass	
31WT408	10	H2	172	I	Ap	0-22	METL	cut nail		2		late 18th–late 19th cent
31WT408	10	H3	172	I	Ap	0-22	METL	uid nail		2	cut or wire nails; one v corroded	
31WT408	10	H4	172	I	Ap	0-22	BRIK	brick frag		2	v sm frags	
31WT408	11	H1	178	II	Ap	13-38	CERM	stoneware		2	brown alkaline-glazed	late 19th cent?

North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary D. Reid Wilson

Office of Archives and History
Deputy Secretary, Darin J. Waters, Ph.D.

November 9, 2021

Bruce Idol bidol@trccompanies.com
TRC Environmental Corporation
705 Dogwood Road
Asheville, NC 28806

Re: Archaeological Survey for the Valle Crucis Stream and Wetland Restoration Project, Watauga County, ER 18-4206

Dear Mr. Idol

Thank you for your letter of October 13, 2021, transmitting the draft report for above-referenced project. We have reviewed the report and offer the following comments:

TRC Environmental Corporation conducted archaeological reconnaissance and a systematic Phase I survey for the Valle Crucis Stream and Wetland Restoration project. The survey identified five previously unrecorded archaeological sites that intersect with the project limits of disturbance (LOD) (31WT405-31WT409). Sites 31WT405 and 31WT407 consist of low-density lithic scatters and lack intact subsurface deposits with potential to contribute new information important for understanding the precontact period. TRC recommends that these sites be considered not eligible for inclusion in the National Register of Historic Places (NRHP). No further archaeological investigation is recommended at these sites prior to construction. We concur with these recommendations. Since portions of both sites do extend beyond the current project LOD and those have not been fully assessed, it may be necessary to conduct additional shovel testing if the LOD expands in the future to include these areas.

Sites 31WT406 and 31WT409 were both delineated completely within the project area. They consist of isolated non-diagnostic lithic artifacts without research potential. As such, TRC recommends that these sites be considered not eligible for inclusion in the NRHP, and no further work is required prior to ground disturbance. We concur with these recommendations.

Site 31WT408 consists of a low-density artifact scatter associated with the late 19th and early 20th century Edith Taylor House and Farmstead (WT0309) located within the Valle Crucis historic district. The standing architecture is located outside the project LOD, and the few artifacts recovered in this survey lack the integrity and meaningful patterns necessary to contribute to the historic district's NRHP eligibility. As no eligible resources will be impacted by the undertaking as proposed, no further archaeological work is recommended prior to the streambank and wetland restoration. Based on the information provided, we concur with these recommendations.

The report meets the Office of State Archaeology's *Archaeological Investigation Standards and Guidelines for Background Research, Field Methodologies, Technical Reports, and Curation* and those of the Secretary of the Interior.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona Bartos, Deputy
State Historic Preservation Officer

cc: JD Hamby, Restoration Systems, LLC jhamby@restorationsystems.com
Casey Haywood, USACE Casey.M.Haywood@usace.army.mil

Ray Holz

From: Ray Holz
Sent: Thursday, January 19, 2023 3:16 PM
To: environmental.review@ncdcr.gov
Subject: ER 18-4206 / Watauga County / Valle Crucis Stream and Wetland Restoration / NCDMS Full Delivery Project No. 100205
Attachments: 01. Valle Crucis_Archaeological Survery Update_2023-01-19_.pdf; 02. Valle Crucis_Restoraiton Plan Figures_.pdf; 2022-11-22_Valle Crucis 60% CDs_.pdf

Dear NCDCR-SHPO,

Regarding Project ID ER 18-4206, Restora. on Systems (RS) has finalized the stream and wetland restoration plan, including construction drawings. Attached (Figure 1) is an updated overview figure which details the updates to the project's footprint, including the limits of disturbance (LOD) for construction activities. In general, the project's LOD has shrunk. However, the area did expand; thus, we request a review by SHPO and direction on whether additional shovel tests are required in the expanded area.

Primary updates include:

- The proposed project footprint east of Dutch Creek Road is no longer a part of the project and is not a part of our permit application to the US Army Corps of Engineers, NC DWQ, and the County Land Quality.
- Expanded areas include construction entrances and haul roads.
- Proposed excavation within the LOD is isolated to the stream restoration, stream enhancement level 1, and stream enhancement level 2 - stream bank stabilization areas (color-coded on the attached maps). In addition, the construction of agricultural path crossings.

Construction work to be completed within the expanded areas includes adding fill material for stream crossings, constructing an agricultural soil path, and channel excavation within stream restoration reaches – see Figure 2.

If thought beneficial, I am happy to set up a virtual meeting wherein we can review the project and proposed construction activities.

Attachments include

1.) Overview figure – 1st LOD vs. final LOD and references to the Project's Construction Drawings sheets – for example, Sheet C6.05.
2.) Project Restoration Figures
3.) Project Construction Drawings

If you have any questions or if I may be of assistance, please do not hesitate to contact me directly.

Sincerely,
Raymond Holz
rholz@restorationsystems.com
(919) 604-9314

----- ------ ------
Raymond J. Holz | Restoration Systems, LLC
1101 Haynes St. Suite 211 | Raleigh, NC 27604
tel: 919.334.9122 | cell: 919.604.9314 | fax: 919.755.9492
email: rholz@restorationsystems.com

Stream Mitigation Work

- Stream Restoration - Active Construction
- Stream Enhancmet L1 - Active Construction
- Stream Enhancement L2 - Stream Bank Stabilization
- Stream Enhancement L2 - Cattle Exclusion and Planting

Legend

- Subject Project Parcels
- Final and Recorded Conservation Easement Boundary: 13.25

2022-12: Revised Limits of Disturbance (LOD): 8.79

- LOD - Ground Disturbing Activities: 8.51
- LOD - Construction Entrance and Staging: 0.28

Feet: 0 75 150 300 450 600

- 2021-10: TRC Enviromental Corp. Archaeological Survey Area, 20.03
- 2021-10: TRC Enviromental Corp. - Archaeological Study

2021-10: TRC Enviromental Corp. - Shovel

- Negative
- Positive Historic
- Positive Precontact
- Unexcavated Shovel Test

NC HWY 194 S

DUTCH CREEK RD

31WT409
REDUCED LIMITS OF DISTURBANCE
WITHIN THIS AREA

2021-10 TRC Env. Corp. Final Report Findings
Isolated non-diagnostic lithic artifacts without reasearch potential.

No grading to occure - haul road for materials
Sheet C6.05

No grading to occure - haul road for planting materials
Sheet C6.05

Stream restoration (fill, no cut) haul road for planting materials, & construction of agricutural stream crossing
Sheet C5.04 and C6.08

Stream restoration (fill, no cut) haul road for planting materials, & construction of agricutural stream crossing
Sheet C5.05 and C6.09

Stream restoration (fill, no cut) haul road for planting materials, & construction of agricutural stream crossing
Sheet C5.03 and C6.07

31WT405
NO LONGER WITHIN PROJECT

2021-10 TRC Env. Corp. Final Report Findings
Low-density lithic scatter and lack of intact subsurface deposits.

31WT408
NO CHANGE TO LIMITS OF DISTURBANCE
WITHIN THIS AREA

2021-10 TRC Env. Corp. Final Report Findings: Low-density artifact scatter associated with Edith Taylor House and Farmstead (WT0309) – lack of integrity and meaningful patterns.

NCHPO - Edith Taylor House (WT0309)
Located Outside of the Mitigation Project

Slope grading for new agricultural soil/dirt road.
0.50 - 3 feet of cut -
Sheet C5.13 & C6.12

Portion of Project proposed east of Dutch Creek Road is no longer being consided, and will not be part of the stream and wetland mitigation project

31WT407
NO CHANGE TO LIMITS OF DISTURBANCE
WITHIN THIS AREA

2021-10 TRC Env. Corp. Final Report Findings
Low-density lithic scatters and lack of intact subsurface deposits.

31WT406
REDUCED LIMITS OF DISTURBANCE
WITHIN THIS AREA

2021-10 TRC Env. Corp. Final Report Findings
Isolated non-diagnostic lithic artifacts without reasearch potential.

112 l. ft. of stream restoration - outside limits of disturbance (LOD)
Excavation between 1 and 2 feet.
Sheet C5.10

Cross Hatch: LOD - Construction Entrance and Staging: 0.28 Acres
No excavation to occur
Sheet C6.14

100 l. ft. of stream restoration - outside limits of disturbance (LOD)
Excavation between 1 and 2 feet.
Sheet C5.09

Fill for new stream crossing
Sheet C5.13

RESTORATION SYSTEMS | LLC

Prepared for:

NC DEQ
Division of Enviromental Quality

Division of Mitigation Services

Project:

VALLE CRUCIS STREAM & WETLAND MITIGATION SITE

Watauga County

Title:

OVERVIEW MAP

ARCHAEOLOGICAL SURVEY

Imagery: 2018 NC OneMap

Drawn by: RJH

Date: DEC 2022

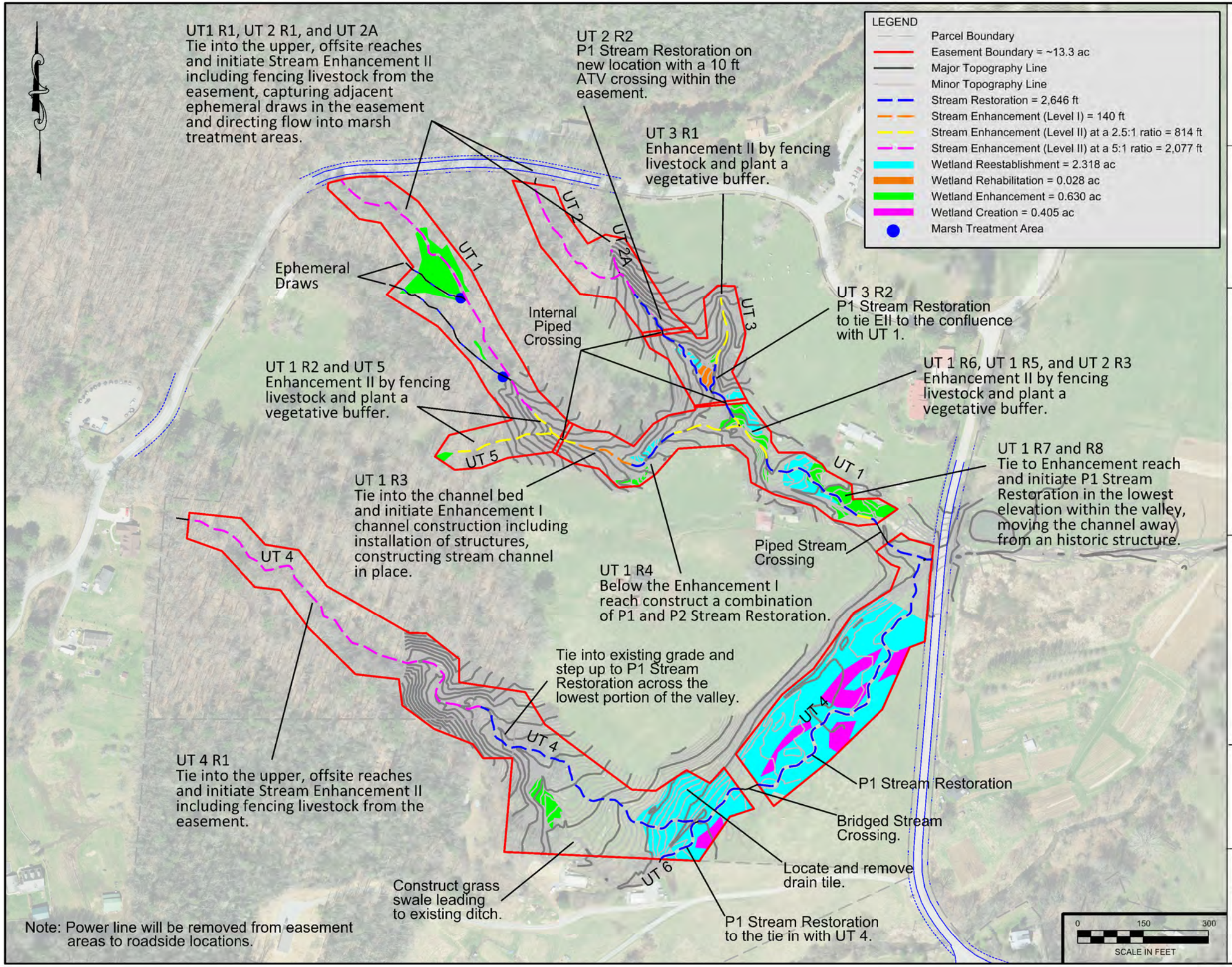
Scale: 1:8,500

Project No.: DMS ID 100205

FIGURE

1

N



Axiom Environmental, Inc.

RESTORATION SYSTEMS | LLC

NOTES/REVISIONS

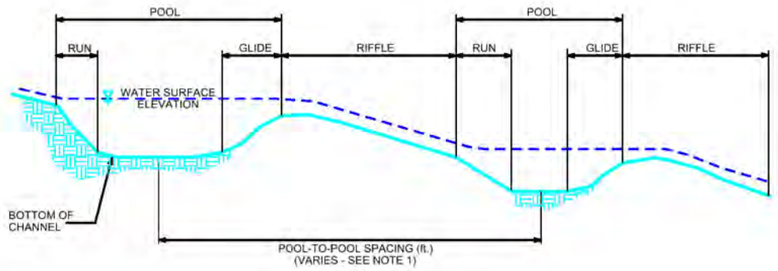
Project:

Valle Crucis Mitigation Site
Watauga County
North Carolina

Title:

Proposed Conditions

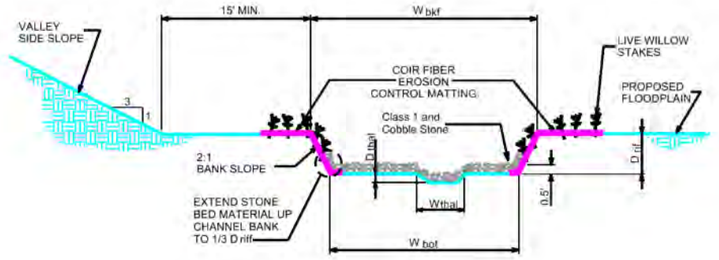
Scale:	FIGURE NO.
As Shown	8
Date: July 2022	
Project No.: 21-018	



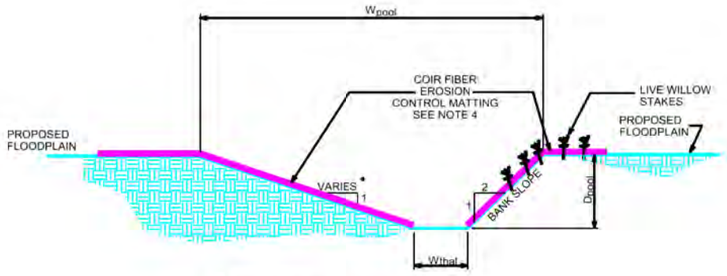
TYPICAL CHANNEL PROFILE

NOTES:

1. POOL-TO-POOL SPACING IS MEASURED FROM CENTER OF POOL BEND TO CENTER OF POOL BEND.



TYPICAL RIFFLE CROSS-SECTION



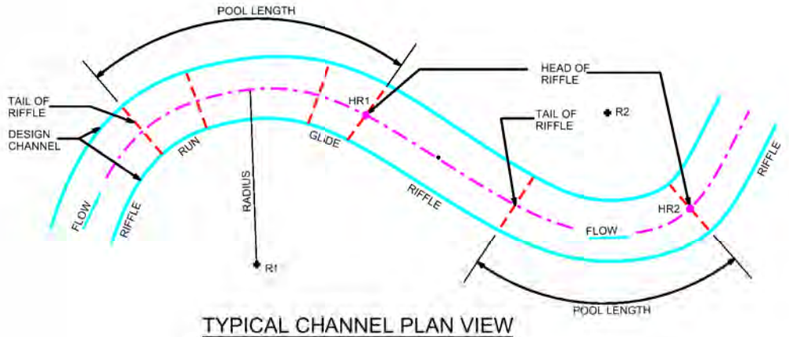
TYPICAL POOL CROSS-SECTION

CHANNEL CONSTRUCTION NOTES:

1. MATERIAL EXCAVATED FROM CHANNEL AND FLOODPLAIN SHALL BE USED TO BACKFILL EXISTING CHANNEL.

2. BANK PROTECTION SHALL CONSIST OF NATURAL COIR FIBER MATTING.

3. THE CONTRACTOR SHALL SUPPLY BED MATERIAL FOR THE ENTIRE BED LENGTH OF EACH RIFFLE SECTION. THE BED MATERIAL SHALL CONSIST OF A MIX OF CLASS A AND SMALLER STONE.



TYPICAL CHANNEL PLAN VIEW

CHANNEL PLAN VIEW NOTES:

1. THE CONTRACTOR SHALL LAYOUT THE CHANNEL ALIGNMENT BY LOCATING THE RADII AND SCRIBING THE CENTER LINE FOR EACH POOL BEND. THE CONNECTING TANGENT SECTIONS SHALL COMPLETE THE LAYOUT OF THE CHANNEL.

2. FIELD ADJUSTMENTS OF THE ALIGNMENT MAY BE REQUIRED TO SAVE TREES OR AVOID OBSTACLES. THE STAKE-OUT SHALL BE APPROVED BY THE CONSTRUCTION MANAGER BEFORE CONSTRUCTION OF THE CHANNEL.

CROSS-SECTION DIMENSIONS

REACH	Wbkf (ft.)	Wbot (ft.)	Driff (ft.)	Dthal (ft.)	Dpool (ft.)	Wpool (ft.)	Wthal (ft.)
UT 1	8.3	4.7	0.8	0.1	0.9	9.9	1.0
UT 2	5.4	3.0	0.5	0.1	0.6	6.5	1.0
UT 3	4.1	2.1	0.4	0.1	0.5	4.9	1.0
UT 4 Downstream of UT 6	8.7	5.1	0.8	0.1	0.9	10.4	1.0
UT 4 Upstream of UT 6	8.9	5.3	0.8	0.1	1.0	10.7	1.0
UT 6	4.1	2.1	0.4	0.1	0.5	4.9	1.0

Axiom Environmental, Inc.

RESTORATION SYSTEMS | LLC

NOTES/REVISIONS

Project:

Valle Crucis Mitigation Site
Watauga County
North Carolina

Title:

PROPOSED DIMENSION, PATTERN, AND PROFILE

Scale: NA

Date: July 2022

Project No.: 21-018

FIGURE NO.

9

Vegetation Association		Montane Alluvial Forest*		Acidic Cove Forest*		Understory Planting Areas		Stream-side Assemblage**		TOTAL
Area (acres)		3.1		1.4		3.6		2.2		13.3
Species	Indicator Status	# planted*	% of total	# planted*	% of total	# planted*	% of total	# planted**	% of total	# planted
Basswood (*Tilia americana*)	FACU	100	2%	200	6%					300
Cherry birch (*Betula lenta*)	FACU	100	2%	400	13%			500	7%	1000
Eastern hemlock (*Tsuga canadensis*)	FACU	100	2%	100	3%					200
Red oak (*Quercus rubra*)	FACU			300	9%					300
White Ash (*Fraxinus americana*)	FACU	100	2%	300	9%					400
White Oak (*Quercus alba*)	FACU	100	2%	400	13%					500
White pine (*Pinus strobus*)	FACU	100	2%	400	13%					500
Yellow birch (*Betula alleghaniensis*)	FACU	100	2%	300	9%			500	7%	900
Black Gum (*Nyssa sylvatica*)	FAC	600	10%	100	3%			500	7%	1200
Persimmon (*Diospyros virginiana*)	FAC	200	3%	300	9%					500
Scarlet Oak (*Quercus imbricaria*)	FAC	200	3%	100	3%					300
Shadbush (*Amelanchier arborea*)	FAC	100	2%					400	6%	500
Tulip poplar (*Liriodendron tulipifera*)	FAC	600	10%	200	6%			500	7%	1300
American elm (*Ulmus americana*)	FACW	600	10%	100	3%			500	7%	1200
Hackberry (*Celtis laevigata*)	FACW	600	10%					500	7%	1100
River birch (*Betula nigra*)	FACW	600	10%					500	7%	1100
Swamp Chestnut Oak (*Quercus michauxii*)	FACW	600	10%					400	6%	1000
Sycamore (*Platanus occidentalis*)	FACW	600	10%					500	7%	1100
Tag alder (*Alnus serrulata*)	FACW	300	5%					400	6%	700
Silky Dogwood (*Cornus amomum*)***	FACW	200	3%					400	6%	600
Black willow (*Salix nigra*)***	OBL	300	5%					400	6%	700
Elderberry (*Sambucus nigra*)***	OBL							400	6%	400
Buttonbush (*Cephalanthus occidentalis*)***	OBL							400	6%	400
	TOTAL	6200	100%	3200	100%			6800	100%	16200

* Planted at a density of 680 stems/acre.

** Planted at a density of 2720 stems/acre.

*** May be live staked

Understory Planting Areas

Understory Planting Areas

LEGEND

- Parcel Boundary
- Easement Boundary = ~13.3 ac
- Mountain Alluvial Forest = 3.3 ac
- Acidic Cove Forest = 1.4 ac
- Streamside Assemblage = 2.2 ac

0 150 300

SCALE IN FEET

Axiom Environmental, Inc.

RESTORATION SYSTEMS | LLC

NOTES/REVISIONS

Project:

Valle Crucis Mitigation Site
Watauga County
North Carolina

Title:

Planting Plan

Scale: As Shown

Date: July 2022

Project No.: 21-018

FIGURE NO.

10

North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Roy Cooper Secretary D. Reid Wilson

March 6, 2023

Ray Holtz rayholtz@restorationsystems.com
Restoration Systems, LLC
1101 Haynes Street, Suite 211
Raleigh, NC 27604

Re: Valle Crucis Stream and Wetland Restoration for Mitigation Bank, Dutch Creek Road, Valle Crucis, Watauga County, ER 18-4206

Dear Mr. Holtz:

Thank you for your email of January 19, 2023, transmitting the updated engineering plans and scope of work. We have reviewed the submission and offer the following comments.

All work within the National Register-listed Valle Crucis Historic District (WT0015) has been removed from the project. We have determined that the remaining scope will have no adverse effect on the district or adjacent Valle Crucis Episcopal Mission (WT0018). However, the remaining project areas are still within the Valle Crucis Local Historic District. We offer the following recommendations for work within the LHD.

- We encourage project management to reach out to the new Valle Crucis Historic Preservation Commission, Jennifer Storie at Jennifer.storie@watgov.org or (828) 265-8043 for more information regarding work requirements within locally designated districts.
- Minimize disturbances caused by using machinery during staging and operations. This includes removal of healthy vegetation, situating lay down/prep areas within previously disturbed areas or outside of the district (preferred) and avoiding the use of vehicles or heavy machinery on unpaved ground surfaces if the area is inundated or has recently received heavy rainfall. We recommend that protection mats or plywood be used to protect unpaved surfaces.
- To avoid damaging structures near work areas, use of jersey barriers, hay bales, construction fencing or other methods of bringing attention to the presence and close proximity of the structure will ensure that a safe distance is observed, and potential harm is minimized or avoided entirely.
- Areas impacted by construction activities, should be returned to pre-construction condition upon project completion.

Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona Bartos, Deputy
State Historic Preservation Officer

cc:

Jennifer Storie, Valle Crucis HPC	Jennifer.storie@watgov.org
Jennifer Cathey, NCDCR HPO	jennifer.cathey@ncdcr.gov
Paul Wiesner, NCDENR DMS	paul.wiesner@ncdenr.gov
Dylan Clark, NCDCR OSA	dylan.clark@ncdcr.gov

Ray Holz

From: Ray Holz
Sent: Friday, March 03, 2023 10:02 AM
To: jennifer.storie@watgov.org
Subject: FW: Valle Crucis Stream and Wetland Restoration / NCDMS Project No. 100205 / On Land owned by G. Taylor & R. Daughtry
Attachments: 01. Valle Crucis Stream and Wetland Restoraiton Site_Historic District Overview_.pdf; 02. Valle Crucis_Restoraiton Plan Figures_.pdf; 2022-11-22_Valle Crucis 60% CDs_.pdf

Jennifer – Thank you for taking a moment to help me with your email address.

As men. oned on the phone, Restoration Systems is working on restoring streams and wetlands on property within the NCHPO's Valle Crucis Local Historic District – see attached location figure. The subject parcels are:

1.) Gal Taylor (PIN: 1970-60-0665)
2.) Daughtry (PIN: 1970-51-4531)

During our initial project scoping process, we engaged the NCHPO, and they requested we coordinate with the Valle Crucis Historic Preservation Commission for information regarding work requirements within locally designated districts. We have finalized our restoration plan, including draft construction documents, and would like your input regarding any requirements we should apply to the project moving forward.

In addition to your review, the US Army Corps of Engineers and NC DWQ will review the restoration plan and construction documents. Upon their review and approval, Restoration Systems will apply for the appropriate 404 and 401 permits and the necessary Watauga County land quality permits.

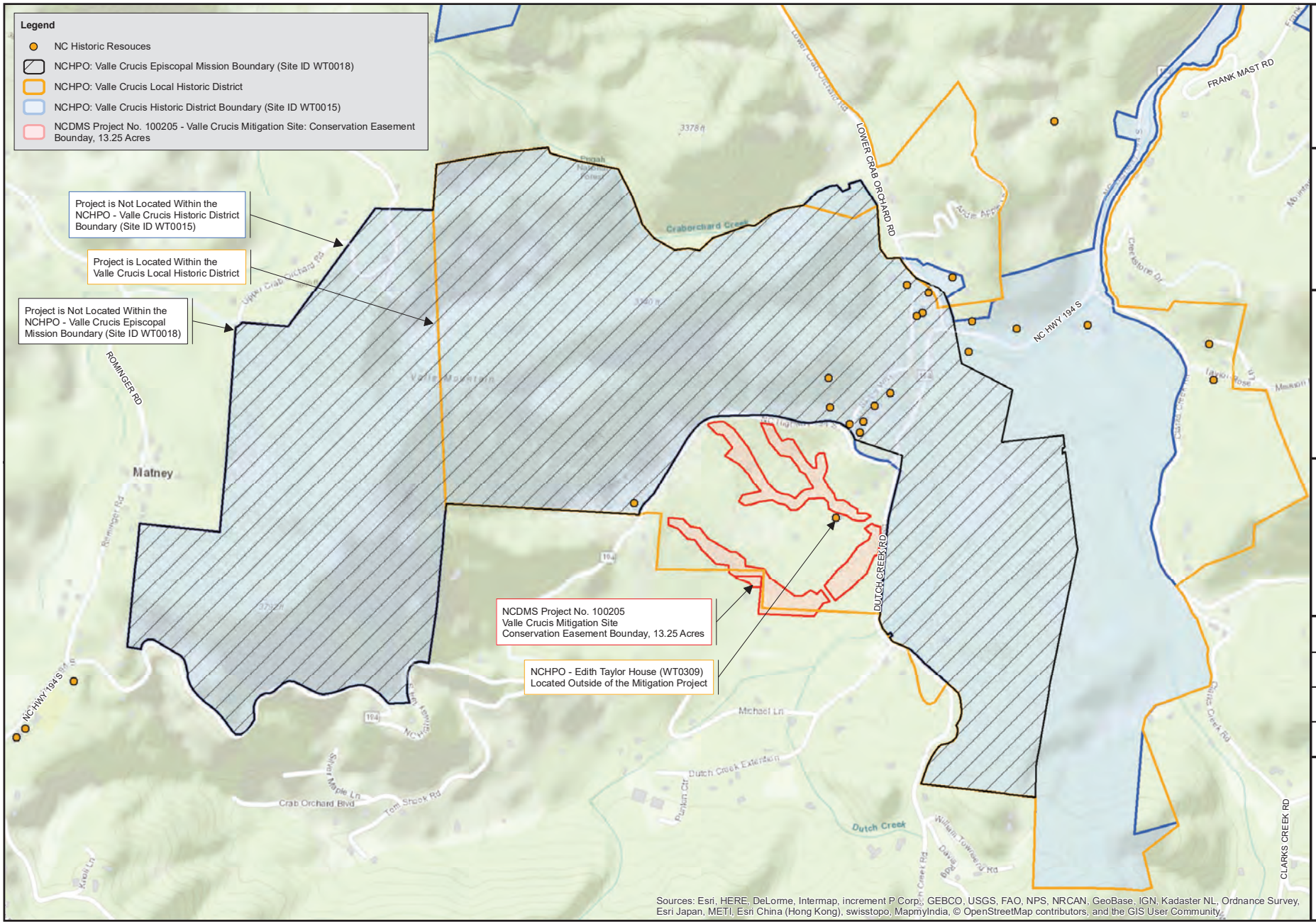
Attachments include

1.) Location Figure - NCHPO: Valle Crucis Local Historic District
2.) Project Restoration Figures
3.) Project Construction Drawings

If thought beneficial, I am happy to set up a virtual meeting wherein we can review the project and proposed construction activities.

Sincerely,
Raymond Holz

Raymond J. Holz | Restoration Systems, LLC
1101 Haynes St. Suite 211 | Raleigh, NC 27604
tel: 919.334.9122 | cell: 919.604.9314 | fax: 919.755.9492
email: rholz@restorationsystems.com



RESTORATION SYSTEMS | LLC

Prepared for:

NC DEQ
Division of Enviromental Quality

Division of Mitigation Services

Project:

VALLE CRUCIS STREAM & WETLAND MITIGATION SITE

Watauga County

Title:

OVERVIEW MAP

HISTORIC DISTRICTS & BOUNDARIES

Imagery: 2018 NC OneMap

Drawn by: RJH

Date: DEC 2022

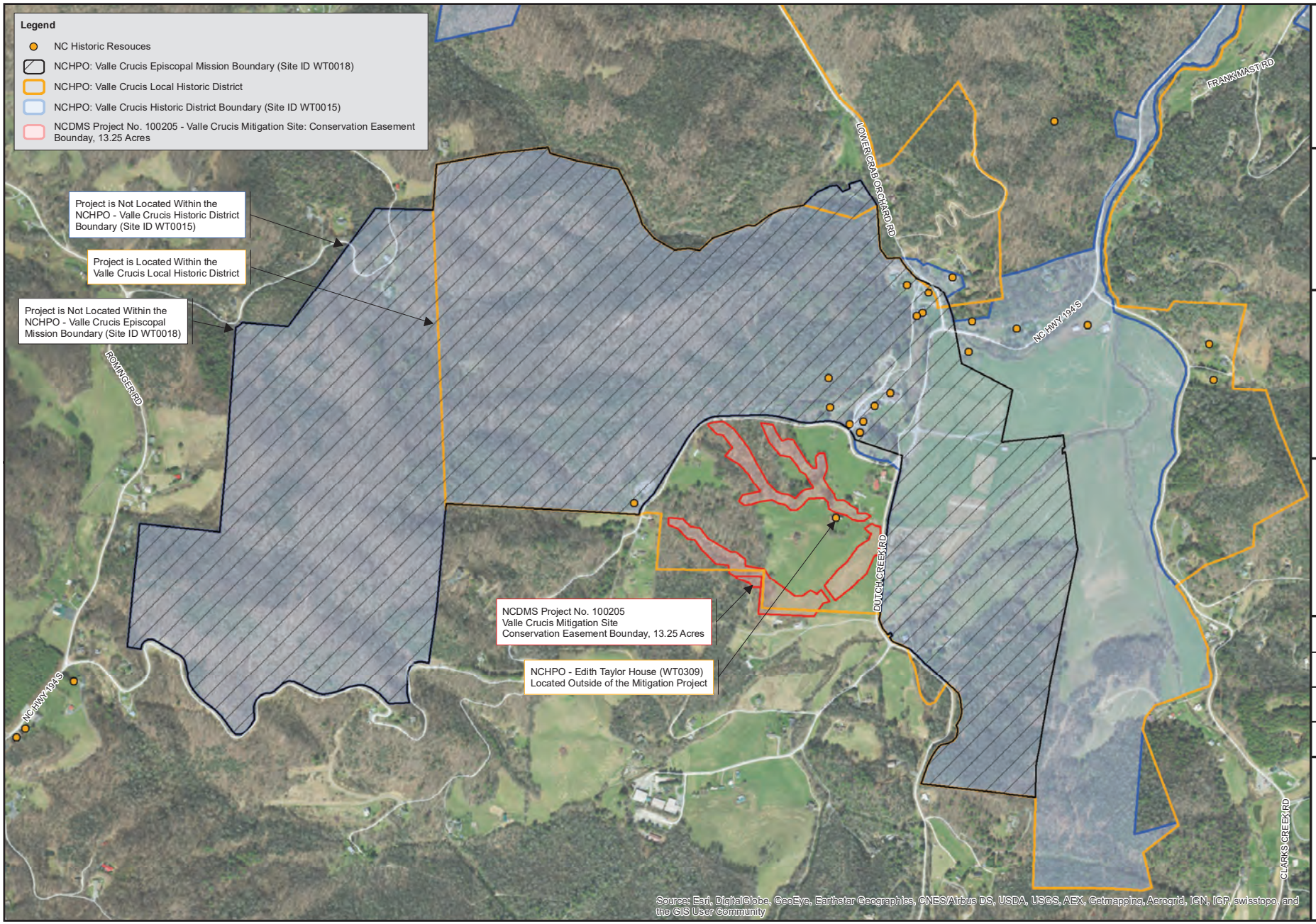
Scale: 1:8,500

Project No.: DMS ID 100205

FIGURE

1

N



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Drawn by: RJH

Date: DEC 2022

Scale: 1:8,500

Project No.: DMS ID 100205

FIGURE

1

N

Uniform Act

Please see the attached letters sent to the project landowners on September 13, 2021.

9/13/2021

Mr Gail Taylor
138 Dutch Creek Rd
Banner Elk, NC 28604

Dear Mr. Taylor:

The purpose of this letter is to notify you that Restoration Systems, LLC, in offering to purchase a section of your property in Watauga County, North Carolina, does not have the power to acquire it by eminent domain. Also, Restoration Systems' offer to purchase your property is based on what we believe to be its fair market value.

If you have any questions, please feel free to call me at 919-755-9490.

Sincerely,

JD Hamby
Project Manager

9/13/2021

Mr & Mrs. Daughtry
346 Dutch Creek Rd
Banner Elk, NC 28604

Dear Mr. & Mrs. Daughtry:

The purpose of this letter is to notify you that Restoration Systems, LLC, in offering to purchase a section of your property in Watauga County, North Carolina, does not have the power to acquire it by eminent domain. Also, Restoration Systems' offer to purchase your property is based on what we believe to be its fair market value.

If you have any questions, please feel free to call me at 919-755-9490.

Sincerely,

JD Hamby
Project Manager

American Indian Religious Freedom Act (AIRFA)

Not Issue – please see attached letter from:

- October 14, 2021 – Catawba Indian Nation response letter to USACE public notice.
- February 4, 2022 – DEQ-DMS sent letters (via email) to all three (3) applicable Cherokee tribes; Cherokee Nation, Eastern Band of the Cherokee Indians, and United Keetoowah Band of Cherokee Indians in Oklahoma – responses were not received during the requested 30-day review period.
- March 28, 2023 – DEQ-DMS sent letters to the Catawba Indian Nation, Cherokee Nation, Eastern Band of the Cherokee Indians, Muscogee (Creek) Nation, and United Keetoowah Band. Responses received from Catawba Indian Nation (5/3/23), Muscogee (Creek) Nation (04/25/23), and United Keetoowah Band (04/27/2023)

Catawba Indian Nation
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, South Carolina 29730

Office 803-328-2427
Fax 803-328-5791

October 14, 2021

Attention: Casey Haywood
Wilmington District Corps of Engineers
3331 Heritage Trade Drive, Suite 105

Re. THPO #	TCNS #	Project Description
2021-56-7		Addition of a 19.2 acre mitigation site – Valle Crucis Mitigation Site 2021-01272

Dear Ms. Haywood,

The Catawba have no immediate concerns with regard to traditional cultural properties, sacred sites or Native American archaeological sites within the boundaries of the proposed project areas. **However, the Catawba are to be notified if Native American artifacts and / or human remains are located during the ground disturbance phase of this project.**

If you have questions please contact Caitlin Rogers at 803-328-2427 ext. 226, or e-mail Caitlin.Rogers@catawba.com.

Sincerely,

Caitlin Rogers for

Wenonah G. Haire
Tribal Historic Preservation Officer

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MARC RECKTENWALD
Director

NORTH CAROLINA
Environmental Quality

Elizabeth Toombs
Cherokee Nation
Tribal Historic Preservation Office
P.O. Box 948
Tahlequah, OK 74465
elizabeth-toombs@cherokee.org

2/4/2022

Dear Ms. Toombs,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed stream restoration project on the Valle Crucis Mitigation Site (Site). The Federal Highway Administration (FHWA) is the lead federal agency for this proposed mitigation project. A scoping letter was submitted to the State Historic Preservation Office (SHPO) requesting comment on the Valle Crucis Mitigation Site on June 18th, 2021. SHPO responded on August 25th, 2021 and requested an archaeological survey, which was completed in September 2021. The archaeological report was submitted in September 2021. On November 9, 2021 SHPO provided an approval letter which concurred with the archeologists' suggestion that based on their findings, no further action is required. Please refer to attached correspondence for additional details regarding SHPO correspondence and the archaeological report.

A USGS Topographic Map and a proposed project conceptual map showing the project area are enclosed. The topographic figure was prepared from the Valle Crucis 7.5-Minute USGS Topographic Quadrangle. The project location (Latitude and Longitude) is as follows: 36.195395, -81.789155 (WGS84).

The Valle Crucis Mitigation Site is being developed to provide stream mitigation in the Watauga River Basin. The project will include restoration and enhancement of Dutch Creek as well as five unnamed tributaries to Dutch Creek. The area surrounding the streams and channels proposed for stream mitigation is currently maintained for livestock pasture and row crops. The major goals of the stream mitigation project are to provide ecological and water quality enhancements to the Watauga River Basin while creating a functional riparian corridor at the site level. This will be accomplished by excluding livestock from stream channels, restoring and enhancing native floodplain vegetation, improving the stability of stream channels, improving instream habitat, and permanently protecting and preserving the project site through establishing a conservation easement. These actions will reduce

fecal, nutrient, and sediment inputs to project streams, and ultimately to the Watauga River, as well as reconnect instream and terrestrial habitat on the project site.

We ask that you review this site based on the attached information to determine the presence of any known historic properties. We respectfully request a response within 30 days of receipt of this letter/ email in an effort to implement this necessary stream restoration/ mitigation project.

Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

Attachments:
Figure 1: USGS Topographic Map
Figure 2: Proposed Project Conceptual Map
Archaeological Report
SHPO Correspondence

cc: Donnie Brew, FHWA

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MARC RECKTENWALD
Director

NORTH CAROLINA
Environmental Quality

2/4/2022

Russell Townsend
Tribal Historic Preservation Officer
Tribal Historic Preservation Office
Eastern Band of the Cherokee Indians
russtown@nc-cherokee.com

Stephen Yerka
Historic Preservation Specialist
Tribal Historic Preservation Office
Eastern Band of the Cherokee Indians
syerka@nc-cherokee.com

Dear Mr. Townsend and Mr. Yerka,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed stream restoration project on the Valle Crucis Mitigation Site (Site). The Federal Highway Administration (FHWA) is the lead federal agency for this proposed mitigation project. A scoping letter was submitted to the State Historic Preservation Office (SHPO) requesting comment on the Valle Crucis Mitigation Site on June 18th, 2021. SHPO responded on August 25th, 2021 and requested an archaeological survey, which was completed in September 2021. The archaeological report was submitted in September 2021. On November 9, 2021 SHPO provided an approval letter which concurred with the archeologists' suggestion that based on their findings, no further action is required. Please refer to attached correspondence for additional details regarding SHPO correspondence and the archaeological report.

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Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

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ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MARC RECKTENWALD
Director

NORTH CAROLINA
Environmental Quality

2/4/2022

Acee Watt, B.S.B.A
Section 106 Coordinator
Office of Historic Preservation
United Keetoowah Band of Cherokee Indians in Oklahoma
P. O. Box 746
Tahlequah, OK 74465
awatt@ukb-nsn.gov
CC: ukbthpo@ukb-nsn.gov

Good afternoon Acee,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed stream restoration project on the Valle Crucis Mitigation Site (Site). The Federal Highway Administration (FHWA) is the lead federal agency for this proposed mitigation project. A scoping letter was submitted to the State Historic Preservation Office (SHPO) requesting comment on the Valle Crucis Mitigation Site on June 18th, 2021. SHPO responded on August 25th, 2021 and requested an archaeological survey, which was completed in September 2021. The archaeological report was submitted in September 2021. On November 9, 2021 SHPO provided an approval letter which concurred with the archeologists' suggestion that based on their findings, no further action is required. Please refer to attached correspondence for additional details regarding SHPO correspondence and the archaeological report.

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Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
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ROY COOPER
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Director

NORTH CAROLINA
Environmental Quality

3/28/2023

Catawba Indian Nation
Dr. Wenonah Haire & Caitlin Rogers
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, SC 29730

Dear Dr. Haire and Ms. Rogers,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge concerning archaeological or cultural resources associated with this proposed minor amendment to stream and wetland restoration project activities on the Valle Crucis Mitigation Site. During the summer of 2022, FHWA noted that the Catawba Indian Nation should be added to coordination efforts on projects completed by our agency. We are therefore including the Nation with all applicable information at this time.

The Federal Highway Administration (FHWA) is the lead federal agency for this proposed DMS mitigation project and approved a Categorical Exclusion on June 8, 2022, based on the following consultation:

- A scoping letter and archaeological survey/State Historic Preservation Office (SHPO) correspondence were shared with tribal agencies (Cherokee Nation, Eastern Band of Cherokee Indians, and United Keetoowah Band of Cherokee Indians) in February 2022.
- TRC Environmental Corporation (TRC) conducted archaeological reconnaissance and a systematic Phase I survey for the subject project in October of 2021. The survey identified five previously unrecorded archaeological sites that intersect with the project limits of disturbance (LOD) (31WT405-31WT409). SHPO concluded, "As no eligible resources will be impacted by the undertaking as proposed, no further archaeological work is recommended prior to the streambank and wetland restoration. Based on the information provided, we [SHPO] concur with these recommendations."
- All correspondence is attached.

Upon completion of 90% design, the need to make proposed minor amendments (expansion) to the project limits of disturbance was identified. On January 19, 2023, RS sent an updated scope of work, including the final LOD, to SHPO. On March 6, 2023, SHPO responded and stated, "Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project." Communications and documents provided to SHPO and their response are attached.

The attached correspondence includes a USGS Topographic Map showing the project area. The topographic figure was prepared from the USGS 7.5 Minute Topographic Map (Valle Crucis, NC Quad). The project location (Latitude and Longitude) is 36.194906, -81.788509.

The Valle Crucis Mitigation Site is being developed to provide stream and wetland mitigation credit within the Watauga River Basin. The project will include the restoration and enhancement of unnamed tributaries to Dutch Creek. The area surrounding the streams and wetland proposed restoration/enhancement are currently maintained for livestock pasture. The project's primary goals are to provide ecological and water quality improvements to the Watauga River Basin while creating a functional riparian corridor at the site level. This will be accomplished by excluding livestock from stream channels, restoring and enhancing native floodplain vegetation, improving the stability of stream channels, improving instream habitat, and permanently protecting and preserving the project site through establishing a conservation easement. These actions will reduce fecal, nutrient, and sediment inputs to project streams and ultimately to the Watauga River and reconnect instream and terrestrial habitat on the project site.

Please refer to the attached correspondence for additional details regarding the recent SHPO correspondence and the requested expansion of the project disturbance limits. We ask that you review this site based on the attached information to determine the presence of any known historic properties. We respectfully request a response within 30 days of receipt of this letter/email in an effort to implement this necessary stream restoration/mitigation project.

Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

Attachements :

SHPO Correspondence

- June 18, 2021 – JD Hamby of Restoration Systems sent a scoping letter to Renee Gledhill-Earley, the Environmental Review Coordinator at the North Carolina State Historic Preservation Office (SHPO).
- August 25, 2021 – RS received a response from SHPO requesting an archaeological survey be conducted.
- October 13, 2021 – RS consultant TRC Environmental Corporation (TRC) submitted an archaeological survey to SPHO.
- November 9, 2021 – SPHO responded to TRC and concurred with their recommendations, stating, "As no eligible resources will be impacted by the undertaking as proposed, no further archaeological work is recommended prior to the streambank and wetland restoration."
- January 19, 2023 – RS submitted updated engineering plans and scope of work to SHPO.
- March 6, 2023 – SHPO responds, "Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project."

cc: Donnie Brew, FHWA

Catawba Indian Nation
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, South Carolina 29730

Office 803-328-2427
Fax 803-328-5791

May 3, 2023

Attention: Paul Wiesner
North Carolina Department of Environmental Quality
217 West Jones Street
Raleigh, NC 27699

Re. THPO #	TCNS #	Project Description
2023-29-29		Proposed minor amendment to stream and wetland restoration project activities on the Valle Crucis Mitigation Site

Dear Mr. Wiesner,

The Catawba have no immediate concerns with regard to traditional cultural properties, sacred sites or Native American archaeological sites within the boundaries of the proposed project areas. **However, the Catawba are to be notified if Native American artifacts and / or human remains are located during the ground disturbance phase of this project.**

If you have questions please contact Caitlin Rogers at 803-328-2427 ext. 226, or e-mail Caitlin.Rogers@catawba.com.

Sincerely,

Caitlin Rogers for

Wenonah G. Haire
Tribal Historic Preservation Officer

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MARC RECKTENWALD
Director

NORTH CAROLINA
Environmental Quality

Elizabeth Toombs
Cherokee Nation
Tribal Historic Preservation Office
P.O. Box 948
Tahlequah, OK 74465
elizabeth-toombs@cherokee.org

3/28/2023

Dear Ms. Toombs,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge concerning archaeological or cultural resources associated with this proposed minor amendment to stream and wetland restoration project activities on the Valle Crucis Mitigation Site. The details of this project were previously provided to your agency in a letter dated February 4, 2022. The proposed amendment to activities does not run counter to the intent of the project.

The Federal Highway Administration (FHWA) is the lead federal agency for this proposed DMS mitigation project and approved a Categorical Exclusion on June 8, 2022, based on the following consultation:

- A scoping letter and archaeological survey/State Historic Preservation Office (SHPO) correspondence were shared with tribal agencies (Cherokee Nation, Eastern Band of Cherokee Indians, and United Keetoowah Band of Cherokee Indians) in February 2022.
- No response was provided by your agency.

Upon completion of 90% design, the need to make proposed minor amendments (expansion) to the project limits of disturbance was identified. On January 19, 2023, RS sent an updated scope of work, including the final LOD, to SHPO. On March 6, 2023, SHPO responded and stated, "Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project." Communications and documents provided to SHPO and their response are attached.

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Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

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cc: Donnie Brew, FHWA

ROY COOPER
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NORTH CAROLINA
Environmental Quality

Russell Townsend
Tribal Historic Preservation Officer
Tribal Historic Preservation Office
Eastern Band of the Cherokee Indians
russtown@nc-cherokee.com

3/28/2023

Stephen Yerka
Historic Preservation Specialist
Tribal Historic Preservation Office
Eastern Band of the Cherokee Indians
syerka@nc-cherokee.com

Dear Mr. Townsend and Mr. Yerka,
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- January 19, 2023 – RS submitted updated engineering plans and scope of work to SHPO.
- March 6, 2023 – SHPO responds, "Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project."

cc: Donnie Brew, FHWA

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MARC RECKTENWALD
Director

NORTH CAROLINA
Environmental Quality

3/28/2023

Muscogee (Creek) Nation
Tribal Historic Preservation Office
Ms. Corain Lowe-Zepeda &
Ms. LeeAnne Wendt, M.A., RPA
Post Office Box 580
Okmulgee, Oklahoma 74447
Email: section106@mcn-nsn.gov
Cc: lwendt@mcn-nsn.gov

Dear Ms. Lowe-Zepeda and Ms. Wendt,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge concerning archaeological or cultural resources associated with this proposed minor amendment to stream and wetland restoration project activities on the Valle Crucis Mitigation Site. During the summer of 2022, FHWA noted that the Muscogee (Creek) Nation should be added to coordination efforts on projects completed by our agency. We are therefore including the Muscogee (Creek) Nation with all applicable information at this time.

The Federal Highway Administration (FHWA) is the lead federal agency for this proposed DMS mitigation project and approved a Categorical Exclusion on June 8, 2022, based on the following consultation:

- A scoping letter and archaeological survey/State Historic Preservation Office (SHPO) correspondence were shared with tribal agencies (Cherokee Nation, Eastern Band of Cherokee Indians, and United Keetoowah Band of Cherokee Indians) in February 2022.
- TRC Environmental Corporation (TRC) conducted archaeological reconnaissance and a systematic Phase I survey for the subject project in October of 2021. The survey identified five previously unrecorded archaeological sites that intersect with the project limits of disturbance (LOD) (31WT405-31WT409). SHPO concluded, "As no eligible resources will be impacted by the undertaking as proposed, no further archaeological work is recommended prior to the streambank and wetland restoration. Based on the information provided, we [SHPO] concur with these recommendations."
- All correspondence is attached.

Upon completion of 90% design, the need to make proposed minor amendments (expansion) to the project limits of disturbance was identified. On January 19, 2023, RS sent an updated scope of work, including the final LOD, to SHPO. On March 6, 2023, SHPO responded and stated, "Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project." Communications and documents provided to SHPO and their response are attached.

The attached correspondence includes a USGS Topographic Map showing the project area. The topographic figure was prepared from the USGS 7.5 Minute Topographic Map (Valle Crucis, NC Quad). The project location (Latitude and Longitude) is 36.194906, -81.788509.

The Valle Crucis Mitigation Site is being developed to provide stream and wetland mitigation credit within the Watauga River Basin. The project will include the restoration and enhancement of unnamed tributaries to Dutch Creek. The area surrounding the streams and wetland proposed restoration/enhancement are currently maintained for livestock pasture. The project's primary goals are to provide ecological and water quality improvements to the Watauga River Basin while creating a functional riparian corridor at the site level. This will be accomplished by excluding livestock from stream channels, restoring and enhancing native floodplain vegetation, improving the stability of stream channels, improving instream habitat, and permanently protecting and preserving the project site through establishing a conservation easement. These actions will reduce fecal, nutrient, and sediment inputs to project streams and ultimately to the Watauga River and reconnect instream and terrestrial habitat on the project site.

Please refer to the attached correspondence for additional details regarding the recent SHPO correspondence and the requested expansion of the project disturbance limits. We ask that you review this site based on the attached information to determine the presence of any known historic properties. We respectfully request a response within 30 days of receipt of this letter/email in an effort to implement this necessary stream restoration/mitigation project.

Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

Attachements :

SHPO Correspondence

- June 18, 2021 – JD Hamby of Restoration Systems sent a scoping letter to Renee Gledhill-Earley, the Environmental Review Coordinator at the North Carolina State Historic Preservation Office (SHPO).
- August 25, 2021 – RS received a response from SHPO requesting an archaeological survey be conducted.
- October 13, 2021 – RS consultant TRC Environmental Corporation (TRC) submitted an archaeological survey to SPHO.
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cc: Donnie Brew, FHWA

From:	LeeAnne Wendt
To:	Wiesner, Paul; Section106
Cc:	Tsomides, Harry; Raymond Holz; Steve Kichefski; Davis, Erin B CIV USARMY CESAW (USA); Donnie.Brew@dot.gov; Isenhour, Kimberly T CIV USARMY CESAW (USA); Haywood, Casey M CIV USARMY CESAW (USA)
Subject:	[External] Re: Valle Crucis Site - NCDEQ: DMS - Watauga County, North Carolina
Date:	Tuesday, April 25, 2023 2:12:54 PM
Attachments:	image001.png

Paul,

Thank you for contacting the Muscogee (Creek) Nation concerning the Proposed Valle Crucis Stream and Wetland Mitigation Project in Watauga County, North Carolina. This proposed project is located within our Tribes historic area of interest and continues to hold importance for us. It was noted from the information provided that this project will provide in-kind mitigation for unavoidable stream channel and wetland impacts. It encompasses 19.2 acres with approximately 8,320 linear feet of stream and 3.4 acres of riparian wetland. TRC conducted an archaeological survey and identified five previously unrecorded archaeological sites that intersected the project limits of disturbance (31WT405-31WT409). However, none of the sites will be impacted by the project. Due to this, it has been determined that the Muscogee (Creek) Nation believes that there should be *no effects to any known historic properties*. However, due to the historic presence of our people in the project area, if any inadvertent discoveries of cultural material (i.e. artifacts) and/or human remains and/or funerary objects are noted during any required work, we request to be notified as soon as the discovery is made and that appropriate federal agencies are also notified. Additionally, if there are any updates or changes to the proposed project, we request that the information be sent to our office for further review. If you have any questions regarding this, please do not hesitate to contact me.

Regards,
LeeAnne Wendt

LeeAnne Wendt, M.A., RPA
Tribal Archaeologist, Historic and Cultural Preservation Department
The Muscogee Nation
P.O. Box 580 | Okmulgee, OK 74447
T 918.732.7852
F 918.758.0649
lwendt@muscogeenation.com
MuscogeeNation.com

From: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Sent: Tuesday, March 28, 2023 11:59 AM
To: LeeAnne Wendt <lwendt@muscogeenation.com>; Section106

<section106@muscogeenation.com>
Cc: Tsomides, Harry <harry.tsomides@ncdenr.gov>; Raymond Holz <rholz@restorationsystems.com>; Steve Kichefski <Steven.l.kichefski@usace.army.mil>; Davis, Erin B CIV USARMY CESAW (USA) <Erin.B.Davis@usace.army.mil>; Donnie.Brew@dot.gov <donnie.brew@dot.gov>; Isenhour, Kimberly T CIV USARMY CESAW (USA) <Kimberly.T.Isenhour@usace.army.mil>; Haywood, Casey M CIV USARMY CESAW (USA) <Casey.M.Haywood@usace.army.mil>
Subject: Valle Crucis Site - NCDEQ: DMS - Watauga County, North Carolina

Dear Ms. Lowe-Zepeda and Ms. Wendt,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge concerning archaeological or cultural resources associated with this proposed minor amendment to stream and wetland restoration project activities on the Valle Crucis Mitigation Site. During the summer of 2022, FHWA noted that the Muscogee (Creek) Nation should be added to coordination efforts on projects completed by our agency. We are therefore including the Muscogee (Creek) Nation with all applicable information at this time.

Upon completion of 90% design, the need to make proposed minor amendments (expansion) to the project limits of disturbance was identified. On January 19, 2023, RS sent an updated scope of work, including the final LOD, to SHPO. On March 6, 2023, SHPO responded and stated, "Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project." Communications and documents provided to SHPO and their response are attached.

Please refer to the attached correspondence for additional details regarding the recent SHPO correspondence and the requested expansion of the project disturbance limits. We ask that you review this site based on the attached information to determine the presence of any known historic properties. We respectfully request a response within 30 days of receipt of this letter/email in an effort to implement this necessary stream restoration/mitigation project.

Respectfully,

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services
Cell: (828) 273-1673
paul.wiesner@ncdenr.gov

Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

ROY COOPER
Governor
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Secretary
MARC RECKTENWALD
Director

NORTH CAROLINA
Environmental Quality

3/28/2023

Acee Watt
United Keetoowah Band of Cherokee Indians in Oklahoma (UKB) THPO
Section 106 Coordinator
P.O. Box 746
Tahlequah, OK 74465
awatt@ukb-nsn.gov
cc: ukbthpo@ukb-nsn.gov

Dear Acee Watt,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge concerning archaeological or cultural resources associated with this proposed minor amendment to stream and wetland restoration project activities on the Valle Crucis Mitigation Site. The details of this project were previously provided to your agency in a letter dated February 4, 2022. The proposed amendment to activities does not run counter to the intent of the project.

The Federal Highway Administration (FHWA) is the lead federal agency for this proposed DMS mitigation project and approved a Categorical Exclusion on June 8, 2022, based on the following consultation:

- A scoping letter and archaeological survey/State Historic Preservation Office (SHPO) correspondence were shared with tribal agencies (Cherokee Nation, Eastern Band of Cherokee Indians, and United Keetoowah Band of Cherokee Indians) in February 2022.
- No response was provided by your agency.

Upon completion of 90% design, the need to make proposed minor amendments (expansion) to the project limits of disturbance was identified. On January 19, 2023, RS sent an updated scope of work, including the final LOD, to SHPO. On March 6, 2023, SHPO responded and stated, "Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project." Communications and documents provided to SHPO and their response are attached.

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a functional riparian corridor at the site level. This will be accomplished by excluding livestock from stream channels, restoring and enhancing native floodplain vegetation, improving the stability of stream channels, improving instream habitat, and permanently protecting and preserving the project site through establishing a conservation easement. These actions will reduce fecal, nutrient, and sediment inputs to project streams and ultimately to the Watauga River and reconnect instream and terrestrial habitat on the project site.

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Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

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cc: Donnie Brew, FHWA

From: Acee Watt
To: Wiesner, Paul
Subject: [External] RE: Valle Crucis Site - NCDEQ: DMS - Watauga County, North Carolina
Date: Thursday, April 27, 2023 3:01:26 PM
Attachments: image004.png

Good afternoon,

Thank you for consulting with the UKB. We are in concurrence with the report's determination and agreeable to the project amendments and expansion.

All the best,

Acee Watt (he/him)
Tribal Historic Preservation Officer
Office of Historic Preservation
918.871.2852
awatt@ukb-nsn.gov
ukbthpo@ukb-nsn.gov

From: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Sent: Tuesday, March 28, 2023 11:35 AM
To: Acee Watt <awatt@ukb-nsn.gov>; Office of Historic Preservation <ukbthpo@ukb-nsn.gov>
Cc: Tsomides, Harry <harry.tsomides@ncdenr.gov>; Raymond Holz <rholz@restorationsystems.com>; Steve Kichefski <Steven.l.kichefski@usace.army.mil>; Davis, Erin B CIV USARMY CESAW (USA) <Erin.B.Davis@usace.army.mil>; Donnie.Brew@dot.gov; Isenhour, Kimberly T CIV USARMY CESAW (USA) <Kimberly.T.Isenhour@usace.army.mil>; Haywood, Casey M CIV USARMY CESAW (USA) <Casey.M.Haywood@usace.army.mil>
Subject: Valle Crucis Site - NCDEQ: DMS - Watauga County, North Carolina

Good afternoon Acee Watt,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge concerning archaeological or cultural resources associated with this proposed minor amendment to stream and wetland restoration project activities on the Valle Crucis Mitigation Site. The details of this project were previously provided to your agency in a letter dated February 4, 2022. The proposed amendment to activities does not run counter to the intent of the project.

Upon completion of 90% design, the need to make proposed minor amendments (expansion) to the

project limits of disturbance was identified. On January 19, 2023, Restoration Systems (RS) sent an updated scope of work, including the final LOD, to SHPO. On March 6, 2023, SHPO responded and stated, "Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for inclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no additional archaeological investigation be conducted in connection with this project." Communications and documents provided to SHPO and their response are attached.

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Respectfully,

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services
Cell: (828) 273-1673
paul.wiesner@ncdenr.gov

Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

Endangered Species Act (ESA)

Five (5) federally protected species (see attached Species List) occur in Watauga County, NC, with suitable habitat present for four (4) species (Bog Turtle, and the Gray, Northern long-earned, and Virginia big-eared bat). Multiple site surveys were conducted, and the best available science was reviewed, which concluded in a Biological Conclusion of No Effect for all applicable species. The online project review (IPaC) was performed via the USFWS Asheville Field Office Website; the results are included below.

- April 6, 2022 – RS letter to FWS Asheville
- April 29, 2022 – USFWS Response
- May 31, 2022 USFWS Updated Biological Conclusions
- March 24, 2023 – Biological Assessment Report

Restoration Systems, LLC.

1101 Haynes St. Suite 211 Raleigh, North Carolina 27604 919-775-9490

April 6, 2020

Holland Youngman
Fish & Wildlife Biologist
US Fish & Wildlife Services
Asheville Field Office
Submitted electronically to holland_youngman@fws.gov

Re: Valle Crucis Mitigation Site, Watauga County, NC
Federally Protected Species

Dear Ms. Youngman:

Restoration Systems, of Raleigh, NC has been awarded a contract by DMS to provide Stream Mitigation Units and Wetland Mitigation Units at the Valle Crucis Mitigation Site, Watauga County, North Carolina.

One of the earliest tasks to be performed is completion of an environmental screening and preparation/submittal of a Categorical Exclusion (CE) document. This document is specifically required by the Federal Highway Administration (FHWA) to ensure compliance with various federal environmental laws and regulations. DMS must demonstrate that its projects comply with federal mandates as a precondition to FHWA reimbursement of compensatory mitigation costs borne by the North Carolina Department of Transportation to offset its projects' unavoidable impacts to streams and wetlands.

The last outstanding item for the CE and purpose of this letter is to request concurrence from the US Fish & Wildlife Service concerning federally protected species biological conclusions for the Bull Chute Stream & Wetland Mitigation Site. Please review and comment on any possible issues that might emerge with respect to the Fish and Wildlife Coordination Act from the potential mitigation project. This letter provides information about the project including the project location & description, the mitigation plan, and information concerning the presence of suitable habitat for listed species with biological conclusions. Please find attached a USGS map depicting the proposed project's conservation easement boundary.

Project Location & Description

The Site is located approximately 0.7 mile south of Valle Crucis and 6 miles west of Boone, south of the intersection of NC Highway 194 and Clarks Creek Road (SR 1136) (Figure 1, Appendix A). General project information is included in the following table.

Project Background Information

Project Information	
Site	Valle Crucis Stream & Wetland Mitigation Site
County	Watauga
Easement Area	~19.2 acres
Site Coordinates (latitude & latitude)	36.19497, -81.78855
Site Elevations	2705-2920 feet

Site Streams	UTs to Dutch Creek
Physiography & Watershed Information	
Physiographic Province	Blue Ridge
Level IV Ecoregion	Southern Crystalline Ridges & Mountains
River Basin	Watauga
USGS 14-digit HUC	06010103010010
NCDWR Sub-basin	04-02-01
Targeted Local Watershed	Yes
LWP, RWP, TRA*	No, No, Located in a Hydrology TRA
Water Quality Information	
Stream Index Number	8-12-(0.5)
Best Use Classification	B; Tr
303d List	No
Drainage Area & Land Use Information	
Existing Site Land Use	Livestock pasture, forest
Site Drainage Area	4.83 square miles (3,089 acres)
Site Drainage Area Land Use	Livestock pasture, forest, sparse residential
Site Drainage Area Percentage Impervious Surface	<2%

*LWP=Local Watershed Plan, RWP=Regional Watershed Plan, TRA=Targeted Resource Area

Soils

Based on Web Soil Survey mapping (USDA 2021), the Site contains the soil series outlined in the following table. Existing wetlands, which have been disturbed by livestock grazing were mapped by a licensed soil scientist (NC LSS # 1233) on March 16, 2021 as soils of the Nikwasi series (Figure 4, Appendix A). The Natural Resources Conservation service (NRCS) has mapped the Site as Dellwood cobbly sand loam and Saunook loam, both class B hydric soils with inclusions of Nikwasi soils. Soil boring logs are included in Appendix B.

Site Soils

Map Unit Symbol	Map Unit Name (Classification)	Hydric Status	Description
DeB	Dellwood cobbly sandy loam (*Oxyaquic Humudepts*)	Non-hydric, may contain hydric inclusions	This series consist of occasionally flooded, moderately well-drained soils found on floodplains; parent material is gravelly and cobbly sandy alluvium. Depth to the restrictive layer is 8-20 inches to strongly contrasting textural stratification. Depth to the water table is 24-48 inches. Slopes are 1-5 percent.
SkC, SoC	Saunook loam* *(Humic Hapludults)*	Non-hydric, may contain hydric inclusions	This series consist of well-drained soils found on coves on mountain slopes, drainageways on mountain slopes, and fans on mountain slopes. Parent material is colluvium derived from igneous and metamorphic rock. Depth to the restrictive layer and the water table is more than 80 inches. Slopes are 8-30 percent.

*Inclusions of Nikwasi soils

Mitigation Plan

Stream restoration efforts are designed to restore a stable stream that approximates hydrodynamics, stream geometry, and local microtopography relative to reference conditions. Restoration at the Site will be Priority I restoration; therefore, bankfull elevations will be raised to meet the adjacent valley floodplain elevation. Stream restoration is expected to entail 1) channel excavation, 2) channel stabilization, 3) channel diversion, and 4) channel backfill.

In-stream Structures

In-stream structures will be used for grade control, habitat, and to elevate local water surface profiles in the channel, flattening the water energy slope or gradient and directing stream energy into the center of the channel and away from banks. The structures will consist of log cross-vanes or log j-hook vanes; however, at the discretion of the Engineer, rock cross-vanes or rock j-hook vanes may be substituted if dictated by field conditions. In addition, the structures will be placed in relatively straight reaches to provide secondary (perpendicular) flow cells during bankfull events.

Channel Crossing

Landowner constraints will necessitate the installation of six piped channel crossings and one forded crossing within breaks in the easement to allow access to portions of the property isolated by stream restoration activities Figure 6 (Appendix A). Piped crossings will be constructed with suitable sized pipes to allow for stormwater flows, with adjacent floodplain pipes to allow for overflow discharge onto the floodplain. Materials will include hydraulically stable rip-rap or suitable rock. The crossings will be large enough to handle anticipated vehicular traffic. Approach grades to the crossings will be at an approximate 10:1 slope and constructed of hard, scour-resistant crushed rock or other permeable material, which is free of fines. The forded crossing occurs in the downstream reach of Dutch Creek. No construction is proposed at this area, as a functioning forded crossing currently exists.

CWMTF Fund Dutch Creek Stream Restoration Project

A benefit of this project includes the proposed Site easement will abut an existing conservation easement associated with an existing stream restoration project. The Dutch Creek Stream Restoration Project (CWMTF #1999B-402 and SAW #200130760) was funded by CWMTF and built in 2001. The proposed conservation easement for the Site will share a common boundary with the CWMTF conservation easement, this will provide off-site downstream functional uplift as it relates to hydrology, water quality, and habitat.

Stream Enhancement (Level I)

Stream enhancement (level I) will entail restoration of stream dimension, installation of habitat and grade control structures, easement markers, and planting riparian buffers with native forest vegetation to facilitate stream recovery and prevent further degradation of the stream.

Stream Enhancement (Level II @ 2.5:1)

Stream enhancement (level II) will entail minor bank stabilization where required, installation of easement markers, fencing livestock out of the easement, treating invasive species, and planting riparian buffers with native forest vegetation to facilitate stream recovery and prevent further degradation of the stream.

Stream Enhancement (Level II @ 5:1)

Stream enhancement (level II) will occur in the upper reaches of Site tributaries, where livestock have access to the streams and slopes are steep and invasive vegetation thickets are dense. These areas are characterized by cobble substrate, stable stream banks, and are not suitable for typical enhancement (level II) mitigation practices. Livestock will be removed from these reaches and invasive species will be treated within the conservation easement.

Stream Enhancement (Level II @ 7.5:1)

Stream enhancement (level II) will occur along Dutch Creek, a large, fairly stable stream with no woody riparian buffer and a lack of woody stream material. This reach is characterized by cobble substrate and no livestock access and is not suitable for typical enhancement (level II) mitigation practices. Native woody vegetation will be established within a 50-foot buffer, and invasive species, namely fescue, will be treated.

Individual Reach Descriptions

Mitigation activities for each individual stream reach and anticipated functional uplift are summarized in the following table.

Individual Reach Descriptions and Functional Uplift

Reach	Mitigation Activities	Functional Uplift Provided for Identified Stressors
UT-1	• Tie into upstream wooded channels and begin to elevate the stream bed with grade control/habitat structures and contour channel banks to the appropriate dimension. • In the lower reaches move the channel across the floodplain using	• Non-functioning riparian buffer/wetland vegetation • Sediment • Nutrients

	Priority 1 stream restoration on new location and reconnect the stream to the adjacent wetlands and drained hydric soils. • Treat invasive species. • Install three piped channel crossings. • Remove livestock from the property. • Plant a vegetative buffer within the entire floodplain. • Tie into downstream culvert that crosses beneath Dutch Creek Road. • Tie into Dutch Creek with a drop structure.	• Fecal Coliform • Peak Flows • Artificial Barriers • Ditching/Draining • Other (spring house removal) • Limited Bedform Diversity • Absence of Large Woody Debris
UT-2 and UT-2A	• Fence livestock and treat invasive species. • Begin to elevate the stream bed with grade control/habitat structure and contour the channel banks to the appropriate dimension. • Install two piped channel crossings. • Tie into UT 1 at the appropriate elevation. • Plant a vegetative buffer within the entire floodplain.	• Non-functioning riparian buffer/wetland vegetation • Sediment • Nutrients • Fecal Coliform • Peak Flows • Ditching/Draining
UT-3	• Remove livestock from the property. • Plant a vegetative buffer within the entire floodplain. • Treat invasive species.	• Non-functioning riparian buffer/wetland vegetation • Nutrients • Fecal Coliform
UT-4	• Tie into upstream wooded channels and begin to elevate the stream bed with grade control/habitat structures and contour channel banks to the appropriate dimension. • In the lower reaches move the channel across the floodplain using Priority 1 stream restoration on new location and reconnect the stream to the adjacent wetlands. • Remove spoil from the floodplain. • Remove drain tile draining from the floodplain. • Install a marsh treatment area to collect agriculture runoff before it enters Site tributaries.	• Non-functioning riparian buffer/wetland vegetation • Sediment • Nutrients • Fecal Coliform • Peak Flows • Ditching/Draining • Limited Bedform Diversity • Absence of Large Woody Debris
Dutch Creek	• Slope and stabilize heavily eroded banks. • Install log vanes on eroding outer bends to direct scour inducing flows to the center of the channel. • Install habitat for sensitive aquatic species such as trout and hellbender. • Clear debris and ensure proper flow path within stream bed. • Plant a vegetative buffer within the entire floodplain (50 ft from top of bank).	• Sediment • Non-functioning riparian buffer/wetland vegetation • Absence of Large Woody Debris • Connect to downstream CWMTF easement

Wetland Restoration (Reestablishment/Rehabilitation) & Enhancement

Alternatives for wetland reestablishment are designed to restore a fully functioning wetland system, which will provide surface water storage, nutrient cycling, removal of imported elements and compounds, and will create a variety and abundance of wildlife habitat.

Portions of the Site underlain by hydric soils have been impacted by stream dredging, drain tile installation, livestock trampling, vegetative clearing, agriculture plowing, and other land disturbances associated with land use management. Wetland reestablishment options should focus on the restoration of vegetative communities, restoration of stream corridors and historic groundwater tables, and the reestablishment of soil structure and microtopographic variations. In addition, the construction of (or provisions for) surface water storage depressions (ephemeral pools) will also add an important component to groundwater restoration activities. These activities will result in the reestablishment/rehabilitation/enhancement of approximately 3.4 acres of jurisdictional riparian riverine wetlands.

Riparian Restoration

Restoration of floodplain forest allows for the development and expansion of characteristic species across the landscape. Ecotonal changes between community types contribute to species diversity and provide secondary benefits, such as enhanced feeding and nesting opportunities for mammals, birds, amphibians, and other wildlife.

Revegetating floodplains will provide overall system stability, shade, and wildlife habitat. In addition, viable riparian communities will improve system biogeochemical function by filtering pollutants from overland and shallow subsurface flows and providing organic materials to adjacent stream channels.

Variations in vegetative planting will occur based on topography and hydrologic condition of soils. Vegetative species composition will be based on Reference Forest Ecosystems (RFEs), site-specific features, and community descriptions from *Classification of the Natural Communities of North Carolina* (Schafale and Weakley 1990). Community associations to be utilized include: 1) Piedmont/Low Mountain Alluvial Forest, 2) Dry-Mesic Oak-Hickory Forest, and 3) Streamside Assemblage.

Bare-root seedlings within the Piedmont/Low Mountain Alluvial Forest and Dry-Mesic Oak-Hickory Forest will be planted at a density of approximately 680 stems per acre on 8-foot centers, and in the stream-side assemblage at a density of approximately 2720 stems per acre on 4-foot centers. Planting will be performed between November 15 and March 15 to allow plants to stabilize during the dormant period and set root during the spring season. Potential species planted within the Site may include the following.

Piedmont/Low Mountain Alluvial Forest

1. Sycamore (Platanus occidentalis)
2. American elm (Ulmus americana)
3. Hackberry (Celtis laevigata)
4. Green ash (Fraxinus pennsylvanica)
5. Shagbark hickory (Carya ovata)
6. Willow oak (Quercus phellos)
7. Shumard oak (Quercus shumardii)
8. River birch (Betula nigra)
9. Silky dogwood (Cornus amomum)
10. Pawpaw (Asimina triloba)

Dry-Mesic Oak-Hickory Forest

1. White oak (Quercus alba)
2. Northern red oak (Quercus rubra)
3. Pignut hickory (Carya glabra)
4. Mockernut hickory (Carya alba/tomentosa)
5. Black gum (Nyssa sylvatica var. sylvatica)
6. Flowering dogwood (Cornus florida)
7. Eastern red cedar (Juniperus virginiana)
8. Persimmon (Diospyros virginiana)
9. Ironwood (Carpinus caroliniana)

Stream-Side Assemblage

1. Black willow (Salix nigra)
2. Tag alder (Alnus serrulata)
3. Buttonbush (Cephalanthus occidentalis)

NC Natural Heritage Program
A query of the North Carolina Natural Heritage Program (NCNHP) database indicates there are records for managed areas within the proposed project boundary. Within a one-mile radius of the Site, NCNHP lists several element occurrences including federally-protected species (see the entire report attached).

Federally Protected Species
The US Fish and Wildlife Service's website was reviewed and five federally-protected species are known to occur in Watauga County. A habitat assessment and biological conclusion for each are provided below.

Common Name (Scientific Name)	Federal Status	Habitat at Site	Biological Conclusion	Summary
Bog turtle (*Glyptemys muhlenbergii*)	Threatened (S/A)	Yes	No Effect	Threatened due to similarity of appearance
Gray bat (*Myotis grisencens*)	Endangered	No	No Effect	Gray bats often roost in caves, though they are also known to roost in human-made structures like bridges
Northern long-eared bat (*Myotis septentrionalis*)	Threatened	Yes	No Effect	(See Northern long eared information below)
Virginia big-eared bat (*Corynorhinus townsendii virginianus*)	Endangered	No	No Effect	Virginia big-eared bat inhabits caves year-round
Monarch Butterfly (*Danaus plexippus*)	Candidate	Yes	No Effect	Consultation with U.S. Fish and Wildlife Service under section 7 of the Endangered Species Act is not required for candidate species

Northern Long-Eared Bat
A review of the United States Fish and Wildlife Service (USFWS) Asheville Ecological Services Field Office web page (https://www.fws.gov/asheville/htmls/project_review/NLEB_in_WNC.html) on March 31, 2021 indicates that the Site watershed is outside an area where incidental take may be a special consideration. Further coordination with the USFWS will occur throughout the project in support of this species; however, at this time no additional surveys are expected for the Northern Long Eared Bat.

Should you have any questions or need any additional information, please feel free to contact me at (919) 755-9490.

Sincerely,
Restoration Systems, LLC

JD Hamby
Project Manager

Attachments:
Figure 1. Site Location
NCNHP Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street Suite B
Asheville, North Carolina 28801

April 29, 2022

John "JD" Hamby
Project Manager
Restoration Systems, LLC
1101 Haynes Street, Suite 211
Raleigh, North Carolina 27604

Subject: Scoping Request for Valle Crucis Stream Mitigation Site, North Carolina Division of Mitigation Services (NCDMS) Full-Delivery Project in Watauga County, North Carolina

Dear JD Hamby:

On April 6, 2022, we received your letter (via email) requesting our comments on the subject project. We have reviewed the information that you presented, and the following comments are provided in accordance with the provisions of the National Environmental Policy Act (42 U.S.C.§ 4321 et seq.) (NEPA); the Migratory Bird Treaty Act (MBTA), as amended (16 U.S.C. 703); and section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 - 1543) (Act).

Project Description

According to the information provided, Restoration Systems proposes to conduct a stream mitigation project in in Dutch Creek and unnamed tributaries (UTs) to Dutch Creek near Valle Crucis in Watauga County. The proposed work includes stream restoration and enhancement, wetland restoration and riparian planting with native vegetation, exclusion of livestock from stream and riparian access, and establishment of a conservation easement. The major goals of the project are to provide ecological and water quality enhancements to the Watauga River Basin while creating a functional riparian corridor at the site level. Aerial maps were provided with this information.

Federally Listed Species

An assessment of suitable habitat for three federally listed species was conducted by environmental specialists with Restoration Systems and presented in the scoping letter. The following species and their associated habitats were evaluated:

Common Name	Scientific Name	Federal Status[1]
Gray bat	*Myotis grisescens*	E
Northern long-eared bat, NLEB	*Myotis septentrionalis*	T, PE
Virginia big-eared bat	*Corynorhinus (=Plecotus) townsendii*	E

[1]E = endangered, T = threatened, PE = proposed endangered

In the event suitable habitat is present for any species, we recommend that the proponent conduct species-specific surveys during the appropriate timeframe to ensure that no populations of rare species are

inadvertently affected by the proposed project. **If surveys are not performed, you may assume presence of the species and consult with us under section 7(a)(2).**

Because Virginia big-eared bat, gray bat and NLEB are known or have the potential to occur in the area, these species should be considered in any biological evaluation and/or biological assessment (BE/BA) prepared for this project. A review of the project area reveals current records of Virginia big-eared bat within 0.4 miles of the site and current records of known hibernacula supporting multiple bat species including NLEB and Virginia big-eared bat within a 7-10 mile radius of the project site. Note: Foraging and commuting bats can travel several miles from their roost sites, often utilizing waterbodies and riparian areas for these activities. Guidance on what is included in a complete BE/BA can be found at https://www.fws.gov/office/asheville-ecological-services/asheville-field-office-online-review-process-overview. The scoping letter offers "No Effect" biological conclusions for the species it addresses but does not provide the biological rationale for these determinations. See the following for helpful tips: https://www.fws.gov/story/endangered-species-act-federal-project-review-understanding-effect-determinations.

The scoping request indicates that summer roosting habitat for NLEB may be present in the action area. The 4(d) rule exempts incidental take of NLEB associated with activities that occur greater than 0.25 mi from a known hibernation site, and greater than 150 feet from a known, occupied maternity roost during the pup season (June 1 – July 31). The proposed project occurs at a location where any incidental take that may result from associated activities is exempt under the 4(d) rule. **Please Note:** On March 23, 2022, the U.S. Fish and Wildlife Service (Service) published a proposal to reclassify NLEB as endangered under the Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021). The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome, a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If your project may result in incidental take of NLEB after the new listing goes into effect this will first need to be addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

For this project, if suitable roosting trees are present at the site and will be impacted, we would recommend either tree removal in the winter (October 16 through March 31) or a roost emergence survey of any suitable roost trees one day prior to removal in accordance with the Range-wide Indiana Bat and NLEB Survey Guidelines: https://www.fws.gov/library/collections/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

In addition to the species listed above, the proposed project is in an area that has potential or known occurrence records of at-risk (ARS), candidate (CAN), and/or proposed species, some of which are addressed in the scoping request letter. Below is a list of these species known from Watauga County and for which we would appreciate consideration during project planning:

Common Name	Scientific Name	Status[1]
Golden-winged warbler	*Vermivora chrysoptera*	ARS
Little brown bat	*Myotis lucifugus*	ARS
Monarch butterfly	*Danaus plexippus*	CAN

Southern bog turtle	*Glyptemys muhlenbergii*	ARS, T S/A
Tricolored bat	*Perimyotis subflavus*	ARS

[1]ARS = at-risk species, CAN = candidate species, T S/A = threatened due to similarity of appearance

Southern bog turtle, golden-winged warbler, little brown bat, and tricolored bat are ARS. ARS are not legally protected under the Act and are not subject to any of its provisions, including section 7, unless they are formally proposed or listed as endangered or threatened. We will be making listing determinations on several of these species in the near future. While lead federal agencies are not prohibited from jeopardizing the continued existence of an ARS or proposed species unless the species becomes listed, the prohibition against jeopardy and taking a listed species under section 9 of the Act applies as soon as a listing becomes effective, regardless of the stage of completion of the proposed action. We are including these species in our response to give you advanced notification and request your assistance in protecting them. Although not required, we recommend that the presence/absence of these species be addressed in any BE/BA for this or future projects, depending on your expected completion timeline. Additionally, we encourage you to coordinate projects with the North Carolina Wildlife Resources Commission (NCWRC) on behalf of these species.

Monarch butterfly is a candidate species, and we appreciate the project proponent's consideration of monarch butterfly when evaluating the action area for impacts to federally listed species and their habitats. The species is not subject to section 7 consultation; however, general recommendations for pollinators are provided below and would be protective of monarch butterfly should the project proponent like to implement them as a part of the project.

In accordance with section 7 (a)(2) of the Act and 50 CFR Part 402.01, before any federal authorization/permits or funding can be issued for this project, it is the responsibility of the appropriate federal regulatory/permitting and/or funding agency(ies) to determine whether the project *may affect* any federally endangered or threatened species (listed species) or designated critical habitat. If it is determined that this project *may affect* any listed species or designated critical habitat, the lead federal agency or their designated non-federal representative must initiate section 7 consultation with this office.

Migratory Birds

The MBTA implements four treaties that provide for the international protection of migratory birds. The MBTA prohibits taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior.

For many industries and activities, the Service has developed activity-specific guidance found at the following website: *https://www.fws.gov/birds/management/project-assessment-tools-and-guidance.php*. These guidance documents are designed to help industry and project developers implement measures to reduce activity-specific impacts to migratory birds. These documents provide important background on the applicable laws and policies, helping clarify standards and expectations and/or offering suggested best practices to avoid or minimize negative impacts to birds.

In general, to avoid impacts to migratory birds, we recommend conducting a visual inspection of structures to be demolished or maintained and other migratory bird nesting habitat within the work area during the migratory bird nesting season of March through September. If migratory birds are discovered nesting in the work area, including an existing structure, impacts to the occupied nests should be avoided. If birds are discovered nesting on or in a structure in the years prior to a proposed construction date, the project proponent, in consultation with us, should develop measures to discourage birds from establishing nests by means that will not result in the take of the birds or eggs.

Fish and Wildlife Resource Recommendations

We are also concerned about the potential effects the project could have on other natural resources within and surrounding the proposed project location. We offer the following general recommendations for the benefit of fish and wildlife resources:

- **Eastern Hellbenders.** Records of eastern hellbenders (*Cryptobranchus alleganiensis*) occur directly downstream of project waters in Dutch Creek. This species is state-listed and is not currently afforded legal protection under the Act. However, incorporating proactive conservation measures may preclude the need for listing in the future. We recommend the most protective sediment and erosion control measures that meet the Design Standards in Sensitive Watersheds be used in waters occupied by this species. We also recommend a relocation effort if construction activities are likely to injure or kill eastern hellbenders that may occur on site. We encourage you to coordinate the project and relocation efforts with the NCWRC.
- **Erosion and Sedimentation Control.** Construction activities near streams, rivers, and lakes have the potential to cause water pollution and stream degradation if measures to control site runoff are not properly installed and maintained. In order to effectively reduce erosion and sedimentation impacts, best management practices specific to the extent and type of construction should be designed and installed during land disturbing activities and should be maintained until the project is complete and appropriate stormwater conveyances and vegetation are reestablished on the site.
    - A complete design manual, which provides extensive details and procedures for developing site specific plans to control erosion and sediment and is consistent with the requirements of the North Carolina Sedimentation and Pollution Control Act and Administrative Rules, is available at: *http://portal.ncdenr.org/web/lr/publications*.
    - For maximum benefits to water quality and bank stabilization, riparian areas should be forested; however, if the areas are maintained in grass, they should not be mowed. We recommend planting disturbed areas with native riparian species. We can provide information on potential sources of plant material upon request.
- **Pollinators**. Throughout the site, avoid non-native seed mixes and plants. Instead, sow native seed mixes and plant species that are beneficial to pollinators.
    - Avoid seed mixes and plants that have been pre-treated with insecticides, such as neonictinoids.
    - Taller-growing pollinator plant species should be planted around the periphery of the site and anywhere on the site where mowing can be restricted during the summer months. Taller plants, not mowed during the summer, would provide benefits to pollinators, habitat for ground-nesting/feeding birds, and cover for small mammals.
    - Native low-growing/groundcover species should be planted in areas that need to be maintained. This would provide benefits to pollinators while also minimizing the amount of maintenance, such as mowing and herbicide treatment.
    - Using a seed mix that includes milkweed species (*Asclepias* spp.) is especially beneficial for monarch butterflies. The following website provides additional information and a comprehensive list of native plant species that benefit pollinators: *http://www.xerces.org/pollinator-resource-center/mid-atlantic*. We also offer our assistance with developing seed mixes that can be used in conjunction with fast growing erosion control seed mixes for overall soil stability and pollinator benefits.
    - Additional information regarding plant species, seed mixes, and pollinator habitat requirements can be provided upon request.

We appreciate the opportunity to provide these comments. Please contact Ms. Holland Youngman of our staff at holland_youngman@fws.gov if you have any questions. In any future correspondence concerning this project, please reference our Log Number 22-140.

Sincerely,

- - original signed - -

Janet Mizzi
Field Supervisor

Updated Biological Conclusions/Justifications Post Coordination with the Asheville USFWS Office

Federally Protected Species

The US Fish and Wildlife Service's website was reviewed and five federally-protected species are known to occur in Watauga County. A habitat assessment and biological conclusion for each are provided below.

Common Name (Scientific Name)	Federal Status	Habitat at Site	Biological Conclusion	Summary
Bog turtle (*Glyptemys muhlenbergii*)	Threatened (S/A)	Yes	No Effect	Threatened due to similarity of appearance
Gray bat (*Myotis grisencens*)	Endangered	No	May Affect, Not Likely To Adversely Affect	Gray bats often roost in caves, though they are also known to roost in human-made structures like bridges
Northern long-eared bat (*Myotis septentrionalis*)	Threatened	Yes	May Affect, Not Likely To Adversely Affect	(See Northern long eared information below)
Virginia big-eared bat (*Corynorhinus townsendii virginianus*)	Endangered	No	May Affect, Not Likely To Adversely Affect	Virginia big-eared bat inhabits caves year-round
Monarch Butterfly (*Danaus plexippus*)	Candidate	Yes	No Effect	Consultation with U.S. Fish and Wildlife Service under section 7 of the Endangered Species Act is not required for candidate species

Gray Bat

Gray bats have been listed as federally endangered in 1976 and occur across the eastern US from western North Carolina to eastern Kansas. Natural caves are the primary roosting habitat, but they are known to use human-made structures like bridges and culverts, and most bats migrate seasonally between maternity and hibernating roosts. Water is their preferred foraging habitat, and they can range several miles nocturnally to conduct feeding. Females typically give birth in May or June and juveniles are weaned and begin to fly from June through August.

Biological Conclusion

The project is anticipated to have beneficial effects to riparian foraging areas without adverse effects to Gray bats or their habitat. Minimal tree removal is expected to occur for this project. In addition, any tree removal activities will occur during the winter months (October 16th – March 31st) outside of pupping season. Therefore, this project is expected to **May Affect, Not Likely to Adversely Affect**.

Northern Long-Eared Bat (NLEB)

NLEBs are a federally threatened species which has experienced recent population declines due to white nose syndrome and are expected to be listed as endangered in December 2022. NLEBs typically winter in hibernating caves but are also known to use human structures. They primarily utilize roost trees during the summer; however, some non-reproductive females and particular colonies have been found to use caves, mines, and other anthropogenic structures seasonally. Females give birth to a single pup, usually in May or June, and juveniles can fly within a month after birth. Foraging most often occurs along forested hillsides and ridges, while sometimes along riparian areas, and their diet consists mostly of moths, beetles, and spiders.

A review of the United States Fish and Wildlife Service (USFWS) Asheville Ecological Services Field Office web page (https://www.fws.gov/asheville/htmls/project_review/NLEB_in_WNC.html) on March 31, 2021 indicates that the Site watershed is outside an area where incidental take may be a special consideration. Further coordination with the USFWS will occur throughout the project in support of this species; however, at this time no additional surveys are expected for the Northern long-eared bat.

Biological Conclusion

The project is anticipated to have beneficial effects to riparian foraging areas without adverse effects to Northern long-eared bats or their habitat. Minimal tree removal is expected to occur for this project. In addition, any tree removal activities will occur during the winter months (October 16th – March 31st) outside of pupping season. Therefore, this project is expected to **May Affect, Not Likely to Adversely Affect**.

Virginia Big-Eared Bat

The Virginia big-eared bat was listed as federally endangered in 1979 and occurs in the southeastern US from Kentucky to North Carolina. These bats utilize caves year-round as roost sites. Populations use cooler caves for hibernation and females typically use warmer maternity caves to raise their young. Virginia big-eared bats feed on insects, primarily moths, and foraging typically occurs on forest/edge interfaces and riparian corridors. Foraging sites are generally located within a few miles of cave roost sites and consist of primarily forested habitats and a mixture of open fields, cliff lines, rock outcrops, riparian areas, and other water sources.

Biological Conclusion

Although there are current records of a known hibernacula supporting Virginia big-eared bats within a 7-10 mile radius of the site, the project is anticipated to have beneficial effects to riparian foraging areas without adverse effects to Virginia big-eared bats or their habitat. Minimal tree removal is expected to occur for this project. In addition, any tree removal activities will occur during the winter months (October 16th – March 31st) outside of pupping season. Therefore, this project is expected to **May Affect, Not Likely to Adversely Affect**.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street Suite B
Asheville, North Carolina 28801

May 31, 2022

John "JD" Hamby
Project Manager
Restoration Systems, LLC
1101 Haynes Street, Suite 211
Raleigh, North Carolina 27604

Subject: Updated Biological Conclusions for Valle Crucis Stream Mitigation Site, North Carolina Division of Mitigation Services (NCDMS) Full-Delivery Project in Watauga County, North Carolina

Dear JD Hamby:

On May 17, 2022, we received your letter (via email) requesting our comments on the updated biological conclusions provided for the subject project. We have reviewed the information that you presented, and the following comments are provided in accordance with the provisions of the National Environmental Policy Act (42 U.S.C.§ 4321 et seq.) (NEPA); the Migratory Bird Treaty Act (MBTA), as amended (16 U.S.C. 703); and section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 - 1543) (Act).

Please reference the scoping response letter issued from this office on April 29, 2022 for project description and recommendations provided for federally designated species and for general resource conservation.

Federally Listed Species

An assessment of suitable habitat for three federally listed species was conducted by environmental specialists with Restoration Systems and presented in the original scoping letter and updated letter of May 17, 2022. The following species and their associated habitats were evaluated:

Common Name	Scientific Name	Federal Status[1]
Gray bat	*Myotis grisescens*	E
Northern long-eared bat, NLEB	*Myotis septentrionalis*	T, PE
Virginia big-eared bat	*Corynorhinus (=Plecotus) townsendii*	E

[1]E = endangered, T = threatened, PE = proposed endangered

Your May 17, 2022 letter states that suitable habitat is present within the action area for the above-listed species and that Restoration Systems has committed to conducting tree clearing between October 16 and March 31 on their behalf. Based on the information provided, we would agree with a determination from the lead federal action agency that the proposed work may affect but is not likely to adversely affect gray bat, NLEB and Virginia big-eared bat.

We appreciate the opportunity to provide these comments. Please contact Ms. Holland Youngman of our staff at holland_youngman@fws.gov if you have any questions. In any future correspondence concerning this project, please reference our Log Number 22-140.

Sincerely,

- - original signed - -

Janet Mizzi
Field Supervisor

VALLE CRUCIS STREAM AND WETLAND MITIGATION SITE

BIOLOGICAL ANALYSIS

Prepared using IPaC

Generated by W Grant Lewis (glewis@axiomenvironmental.org)

March 24, 2023

The purpose of this document is to assess the effects of the proposed project and determine whether the project may affect any federally threatened, endangered, proposed, or candidate species. If appropriate for the project, this document may be used as a biological assessment (BA), as it is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536 (c)).

In this document, any data provided by U.S. Fish and Wildlife Service is based on data as of March 22, 2023.

Prepared using IPaC version 6.89.0-rc6

VALLE CRUCIS STREAM AND WETLAND MITIGATION SITE BIOLOGICAL ASSESSMENT

TABLE OF CONTENTS

1 DESCRIPTION OF THE ACTION

1.1 PROJECT NAME

Valle Crucis Stream and Wetland Mitigation Site

1.2 EXECUTIVE SUMMARY

The Valle Crucis stream and wetland restoration project will provide 2631 linear feet of stream restoration, 140 linear feet of stream enhancement (Level I), 2871 linear feet of stream enhancement (Level II), 2.338 acres of riparian wetland re-establishment, 0.032 acres of riparian wetland rehabilitation, 0.631 acres of riparian wetland enhancement, and 0.409 acres of riparian wetland creation. The effect on federally protected species is expected to be temporary and minimal, primarily revolving around deforestation and bat habitat. Bats are declining as a result of White Nose Syndrome and require habitat (roosting, foraging, and pupping) to propagate and survive. Although most of the species around the Site require caves or mines for roosting, some to utilize trees and leaf masses for the previously mentioned habitat. The Valle Crucis project will impact a maximum of 2.3 acres of forest area; however, the impact will be minimize to the maximum amount. In addition, all areas of disturbance will be planted with native forest vegetation, with a total of greater than 10 acres of reforestation. The entire 13 acre parcel will be placed under a permanent conservation easement. Overall, the project will have long-term benefits to these sensitive species.

1.3 EFFECT DETERMINATION SUMMARY

SPECIES (COMMON NAME)	SCIENTIFIC NAME	LISTING STATUS	PRESENT IN ACTION AREA	EFFECT DETERMINATION
Bog Turtle	Glyptemys muhlenbergii	Similarity of Appearance (Threatened)	Not Applicable	Not Applicable
Gray Bat	Myotis grisescens	Endangered	Yes	NLAA
Monarch Butterfly	Danaus plexippus	Candidate	Excluded from analysis	Excluded from analysis
Northern Long-eared Bat	Myotis septentrionalis	Threatened	Yes	NLAA
Tricolored Bat	Perimyotis subflavus	Proposed Endangered	Yes	NLAA
Virginia Big-eared Bat	Corynorhinus (=Plecotus) townsendii virginianus	Endangered	Yes	NLAA

1.4 PROJECT DESCRIPTION

1.4.1 LOCATION

LOCATION
Watauga County, North Carolina

1.4.2 DESCRIPTION OF PROJECT HABITAT

Steep Mountain slopes that transition to a wide floodplain. The entire site is used for cattle pasture. Wooded areas are disturbed below and transition to open pasture in lower elevation areas.

1.4.3 PROJECT PROPONENT INFORMATION

Provide information regarding who is proposing to conduct the project, and their contact information. Please provide details on whether there is a Federal nexus.

REQUESTING AGENCY
State of North Carolina

North Carolina Department of Environmental Quality

FULL NAME
W Grant Lewis

STREET ADDRESS
218 Snow Ave

CITY	STATE	ZIP
Raleigh	NC	27603

PHONE NUMBER	E-MAIL ADDRESS
9192151693	glewis@axiomenvironmental.org

LEAD AGENCY
Department of Transportation

Federal Highway Administration

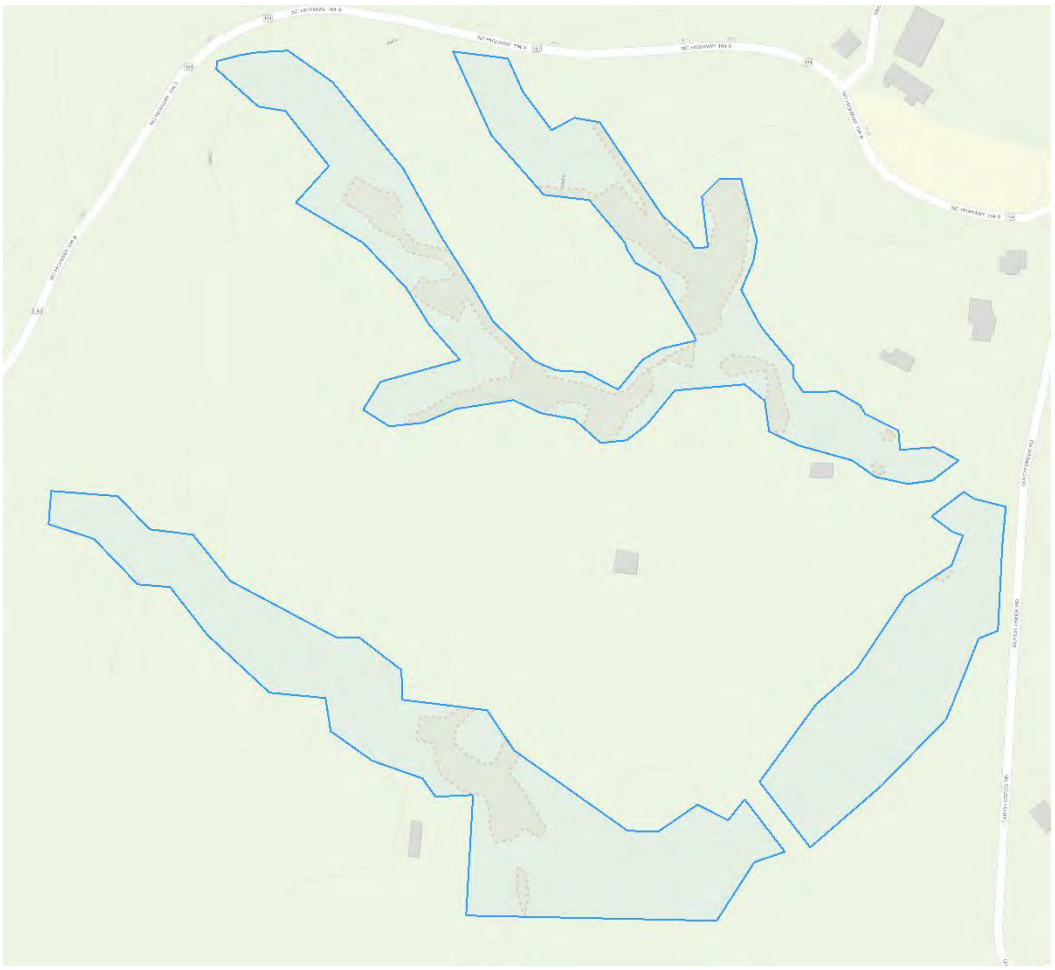
1.4.4 PROJECT PURPOSE

Stream and Wetland Restoration project for the North Carolina Division of Mitigation Services.

1.4.5 PROJECT TYPE AND DECONSTRUCTION

This project is a valle crucis stream and wetland restoration project project.

1.4.5.1 PROJECT MAP



LEGEND

Project footprint

Maximum area of tree clearing: Stream and wetland restoration

1.4.5.2 STREAM AND WETLAND RESTORATION

ACTIVITY START DATE
October 01, 2023

ACTIVITY END DATE
March 14, 2024

STRESSORS

- Decrease in forest

DESCRIPTION
Although forest vegetation will be temporarily affected, the project will increase habitat for aquatic and terrestrial species by converting a ditched an drained cow pasture into a forested (and freshwater marsh) community with restored stream channels. The project will largely result in improved habitat for federally protected species; however, some tree removal (a maximum of 2.3 acres) to access streams and wetland for restoration activities may occur. These areas, as well as all other non-forested areas will be planted with native forest vegetation and placed under a conservation easement.

1.4.6 ANTICIPATED ENVIRONMENTAL STRESSORS

Describe the anticipated effects of your proposed project on the aspects of the land, air and water that will occur due to the activities above. These should be based on the activity deconstructions done in the previous section and will be used to inform the action area.

1.4.6.1 ANIMAL FEATURES

Individuals from the Animalia kingdom, such as raptors, mollusks, and fish. This feature also includes byproducts and remains of animals (e.g., carrion, feathers, scat, etc.), and animal-related structures (e.g., dens, nests, hibernacula, etc.).

1.4.6.2 PLANT FEATURES

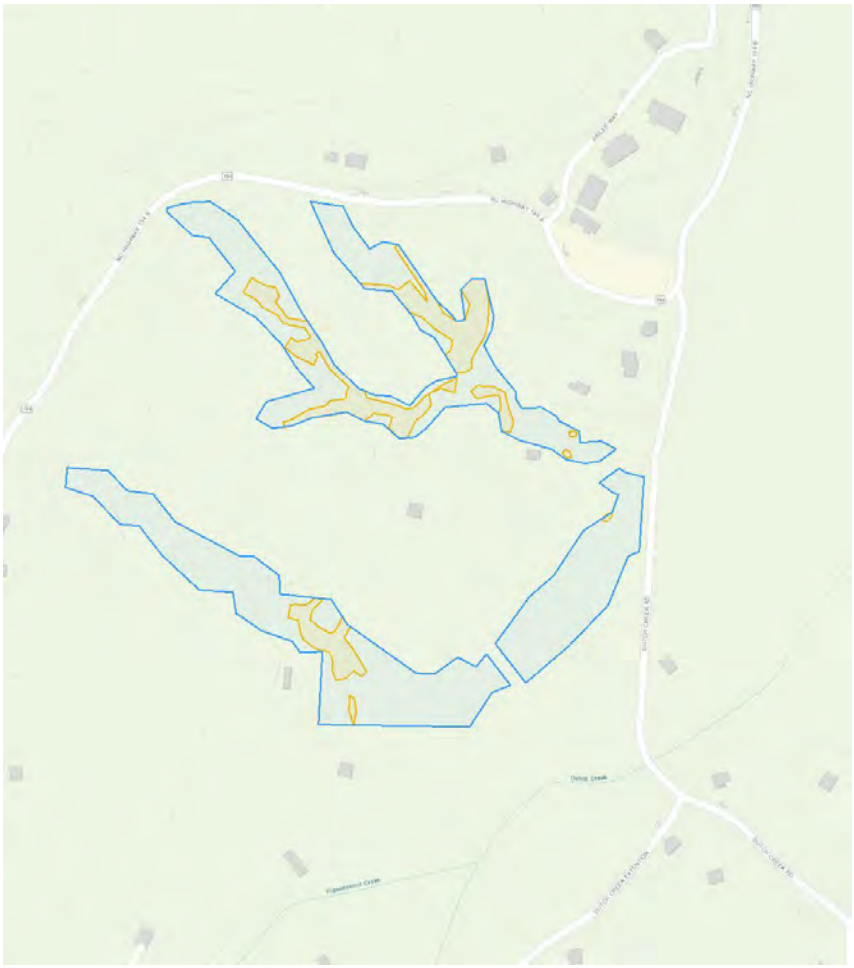
Individuals from the Plantae kingdom, such as trees, shrubs, herbs, grasses, ferns, and mosses. This feature also includes products of plants (e.g., nectar, flowers, seeds, etc.).

1.4.6.2.1 DECREASE IN FOREST

ANTICIPATED MAGNITUDE

A maximum of 2.3 acres of tree removal may occur to access streams and wetlands for restoration purposes. This includes all forest adjacent to construction areas; however, attempts to minimize tree removal will occur.

STRESSOR LOCATION



LEGEND

Project footprint

Stressor location

CONSERVATION MEASURES

- Reforestation
- Aviodance and minimization

STRUCTURES AND ACTIVITIES

- Stream and wetland restoration

1.4.6.3 AQUATIC FEATURES

Bodies of water on the landscape, such as streams, rivers, ponds, wetlands, etc., and their physical characteristics (e.g., depth, current, etc.). This feature includes the groundwater and its characteristics. Water quality attributes (e.g., turbidity, pH, temperature, DO, nutrients, etc.) should be placed in the Environmental Quality Features.

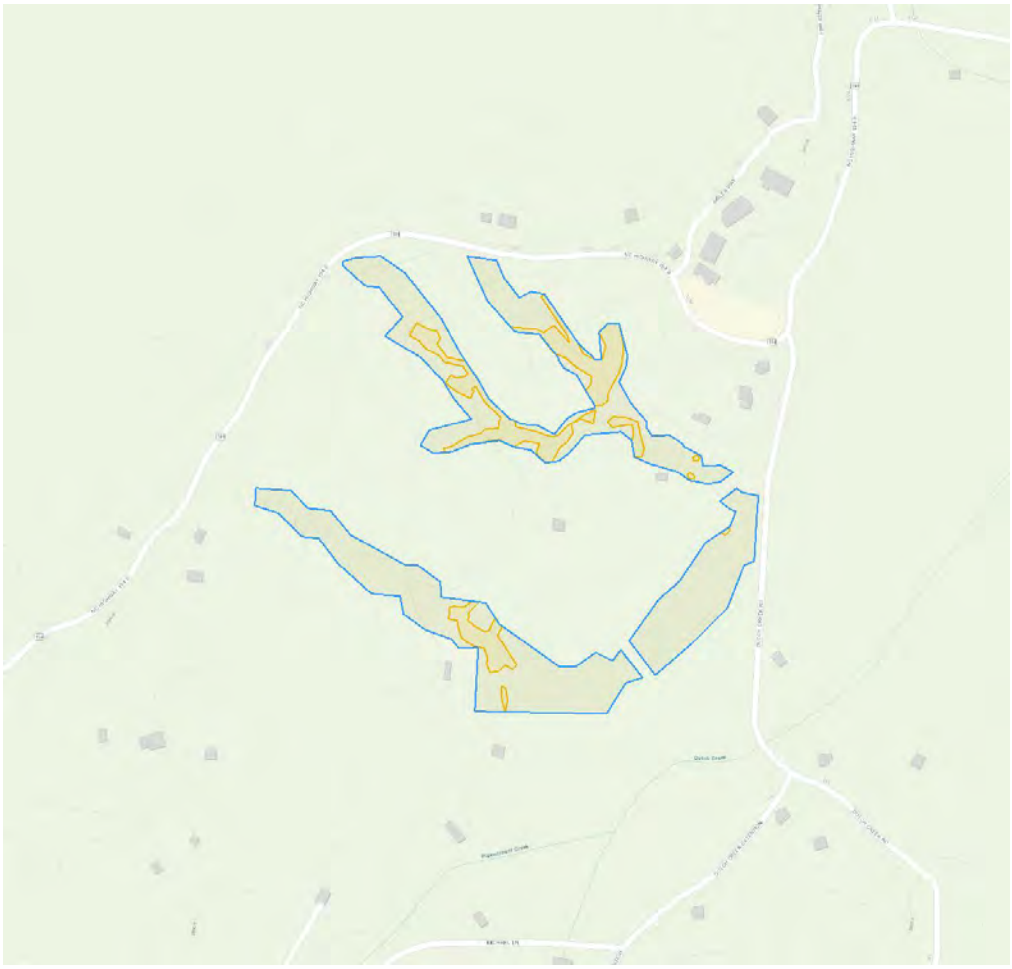
1.4.6.4 LANDFORM (TOPOGRAPHIC) FEATURES

Topographic (landform) features that typically occur naturally on the landscape (e.g., cliffs, terraces, ridges, etc.). This feature does not include aquatic landscape features or man-made structures.

1.4.6.5 MISCELLANEOUS

Miscellaneous should only be used if the created feature does not fit into one of the other categories or if the creator is not sure in which category it should be placed.

1.5 ACTION AREA



LEGEND

Project footprint

Stressor location

1.6 CONSERVATION MEASURES

1.6.1 AVIODANCE AND MINIMIZATION

DESCRIPTION

The Site is approximately 13 acres in size with approximately 8 acres in open pasture and 5 acres in forest vegetation. Currently, a maximum of 2.3 acres of forest may be disturbed to access stream and wetland restoration features. The 2.3 acres will not all be disturbed and will be minimized to the maximum extent feasible. In addition, the majority of forest vegetation will be disturbed in the winter months that will minimize the effect on pupping season.

STRESSORS

- Decrease in forest

RESOURCE NEEDS

- forest (> 4 inch DBH and or leaf masses for roosting and pupping.)
- insects (type: lepidoptera (moths and butterflies), coleoptera (beetles), trichoptera (caddisflies), diptera (flies), spiders, lepidopterous larvae)
- travel corridors (location: between forest patches and type: riparian corridors, wooded paths, hedgerows, fence rows)
- trees (size: > or equal to 3 inch dbh, spatial arrangement: within 1000 feet of forest, structure: cracks, crevices, cavities, exfoliating bark, time of year: april through august, type: dead, nearly dead, living tree with dead parts, and living with appropriate structure)

DIRECT INTERACTIONS

- defoliation

1.6.2 REFORESTATION

DESCRIPTION

A planting plan has been developed that includes planting 10.3 acres with native forest vegetation. Restoration of floodplain forests and stream-side habitats allows for the development and expansion of characteristic species across the landscape. Ecotonal changes between community types contribute to the diversity and provide secondary benefits, such as enhanced feeding and nesting opportunities for mammals, birds, amphibians, and other wildlife. Reference Forest Ecosystem (RFE) data, onsite observations, and community descriptions from *Guide To The Natural Communities Of North Carolina, Fourth Approximation* (Schafale 2012) were used to develop the primary plant community associations that will be promoted during community restoration activities.

Stream-side trees and shrubs include species with high value for sediment stabilization, rapid growth rate, and the ability to withstand hydraulic forces associated with bankfull flow and overbank flood events. Stream-side trees and shrubs will be planted within 15 feet of the channel top of bank throughout the meander belt-width. Shrub elements will be planted along the reconstructed stream banks, concentrated along outer bends. Montane Alluvial Forest (Small River Subtype) is the target community for the lower floodplain portions of the Site with Acidic Cove Forest (Typic Subtype) targeted for headwater portions of the Site. Significant overlap in species for each planting community allows for a broad fringe between the ecological zones. (https://null) Planting will be performed between December 1 and March 15 to allow plants to stabilize during the dormant period and set roots during the spring season.

Due to floodplain soils being of the Nikwasi series, scattered openings dominated by herbs and shrubs are likely to develop over time. These areas are expected to be less than an acre in size and encompass less than 20% of the Site. As the wetland matures, poorly drained soils will make conditions favorable for species like those described in a Swamp Forest-Bog Complex to thrive. In addition, two reference wetlands have been identified near the Site (one in Banner Elk and one in Julian Price Park). These wetlands are underlain by Nikwasi soils and exhibit hydrologic and landscape characteristics similar to the Site. A rich seed bank of herbaceous species is believed to exist onsite. The proposed seed mix is meant to complement this existing suite of species which will naturally emerge post-construction and provide interim ecological services during the development of the proposed forest community.

STRESSORS

- Decrease in forest

RESOURCE NEEDS

- forest (> 4 inch DBH and or leaf masses for roosting and pupping.)
- insects (type: lepidoptera (moths and butterflies), coleoptera (beetles), trichoptera (caddisflies), diptera (flies), spiders, lepidopterous larvae)

- travel corridors (location: between forest patches and type: riparian corridors, wooded paths, hedgerows, fence rows)
- trees (size: > or equal to 3 inch dbh, spatial arrangement: within 1000 feet of forest, structure: cracks, crevices, cavities, exfoliating bark, time of year: april through august, type: dead, nearly dead, living tree with dead parts, and living with appropriate structure)

DIRECT INTERACTIONS

- defoliation

1.7 PRIOR CONSULTATION HISTORY

We have an approved Categorical Exclusion document for these species (accept for the proposed Tricolored Bat). This document has been included with this submission.

1.8 OTHER AGENCY PARTNERS AND INTERESTED PARTIES

This project will be evaluated by an Inter agency Review Team consisting of the US Army Corps of Engineers, NC Division of Water Quality, US Fish and Wildlife Service, NC Wildlife Resource Service, and US Environmental Protection Agency. Through the process other entities will be able to comment including the Eastern Band of the Cherokee, the State Historic Preservation Office, Federal Emergency Management Commission, NC Division of Land Quality, and other local agencies.

1.9 OTHER REPORTS AND HELPFUL INFORMATION

No other additional information is available at this time. A detailed stream and wetland restoration plan is underway and should be submitted to the agencies by late spring 2023.

2 SPECIES EFFECTS ANALYSIS

This section describes, species by species, the effects of the proposed action on listed, proposed, and candidate species, and the habitat on which they depend. In this document, effects are broken down as direct interactions (something happening directly to the species) or indirect interactions (something happening to the environment on which a species depends that could then result in effects to the species).

These interactions encompass effects that occur both during project construction and those which could be ongoing after the project is finished. All effects, however, should be considered, including effects from direct and indirect interactions and cumulative effects.

2.1 GRAY BAT

2.1.1 STATUS OF THE SPECIES

This section should provide information on the species' background, its biology and life history that is relevant to the proposed project within the action area that will inform the effects analysis.

2.1.1.1 LEGAL STATUS

The Gray Bat is federally listed as 'Endangered' and additional information regarding its legal status can be found on the ECOS species profile.

2.1.1.2 RECOVERY PLANS

Available recovery plans for the Gray Bat can be found on the ECOS species profile.

2.1.1.3 LIFE HISTORY INFORMATION

Long, glossy fur, light brown to brown. Ears dark, usually black; longer than in any other myotis; when laid forward extend 1/4 cm (7 mm) beyond nose. Tragus long and thin. Calcar keeled.

IDENTIFIED RESOURCE NEEDS

Hibernacula

Noise: low, with minimal distrubance, temperature: 1-9°c, time of year: september to april, type: caves, and mines with multiple entrances and good air flow

Insects

Type: trichoptera (caddisflies), coleoptera (beetles), lepidoptera (moths and butterflies), plecoptera (stoneflies), ephemeroptera (mayflies), diptera (flies), hemiptera (true bugs)

Open water

Type: streams, rivers, ponds, lakes, reservoirs

Subterranean voids

Temperature: warm, time of year: april to october, type: abandoned mines or warm caves, type: maternity caves, bachelor caves, and dispersal caves

2.1.1.4 CONSERVATION NEEDS

Gray bats were listed as federally endangered in 1976 and occur across the eastern US from western North Carolina to eastern Kansas. Natural caves are the primary roosting habitat, but they are known to use human-made structures like bridges and culverts, and most bats migrate seasonally between maternity and hibernating roosts. Females typically give birth in May or June and juveniles are weaned and begin to fly from June through August. Water is their preferred foraging habitat, and they can range several miles nocturnally to conduct feeding. Biological Conclusion The project is anticipated to benefit riparian foraging areas without adverse effects on Gray bats or their habitat. Minimal tree removal is expected to occur for this project. In addition, any tree removal activities will occur during the winter months (October 16th – March 31st) outside of pupping season. Therefore, the biological conclusion for this species is May Affect, Not Likely to Adversely Affect.

2.1.2 ENVIRONMENTAL BASELINE

*The environmental baseline describes the species' health **within the action area only** at the time of the consultation, and does not include the effects of the action under review. Unlike the species information provided above, the environmental baseline is at the scale of the Action area.*

2.1.2.1 SPECIES PRESENCE AND USE

No roosting habitat is available within the project boundaries. However, foraging habitat my be improved by planting native forest vegetation and protecting with a conservation easement.

2.1.2.2 SPECIES CONSERVATION NEEDS WITHIN THE ACTION AREA

Planting the Site with native forest vegetation and conserving the area with a perpetual easement.

2.1.2.3 HABITAT CONDITION (GENERAL)

INSECTS (TYPE: TRICHOPTERA (CADDISFLIES), COLEOPTERA (BEETLES), LEPIDOPTERA (MOTHS AND BUTTERFLIES), PLECOPTERA (STONEFLIES), EPHEMEROPTERA (MAYFLIES), DIPTERA (FLIES), HEMIPTERA (TRUE BUGS))

Streams at the Site have abundant macrobenthic invertebrates. The stream restoration project will likely increase these resources.

OPEN WATER (TYPE: STREAMS, RIVERS, PONDS, LAKES, RESERVOIRS)

Currently, there are approximately 5799 linear feet of degraded stream at the Site. These are small, intermittent and lower perennial streams.

SUPPORTING DOCUMENTATION

- ValleCrucis_Fig4_Existing
- CE_Document_Valle_Crucis
- TE_Figure

2.1.2.4 INFLUENCES

The primary influence on this species is White Nose Syndrome an to a lesser degree loss of habitat.

2.1.2.5 ADDITIONAL BASELINE INFORMATION

No additional baseline information is available at this time.

2.1.3 EFFECTS OF THE ACTION

This section considers and discusses all effects on the listed species that are caused by the proposed action and are reasonably certain to occur, including the effects of other activities that would not occur but for the proposed action.

2.1.3.1 INDIRECT INTERACTIONS

RESOURCE NEED	STRESSORS	CONSERVATION MEASURES	AMOUNT OF RESOURCE IMPACTED	INDIVIDUALS AFFECTED
Hibernacula (noise: low, with minimal distrubance, temperature: 1-9°c, time of year: september to april, type: caves, and mines with multiple entrances and good air flow)			***This resource is not present in the action area*** There are no caves or mines in the project area.	***There will be no impacts to this resource, so no individuals will be affected.***
Insects (type: trichoptera (caddisflies), coleoptera (beetles), lepidoptera (moths and butterflies), plecoptera (stoneflies), ephemeroptera (mayflies), diptera (flies), hemiptera (true bugs))	No exposure path			***There will be no impacts to this resource, so no individuals will be affected.***

RESOURCE NEED	STRESSORS	CONSERVATION MEASURES	AMOUNT OF RESOURCE IMPACTED	INDIVIDUALS AFFECTED
Open water (type: streams, rivers, ponds, lakes, reservoirs)	No exposure path			***There will be no impacts to this resource, so no individuals will be affected.***
Subterranean voids (temperature: warm, time of year: april to october, type: abandoned mines or warm caves, type: maternity caves, bachelor caves, and dispersal caves)			***This resource is not present in the action area*** Extensive surveys were conducted on the Site. All areas of the Site were walked and reviewed. No habitat (caves, mines, or other habitat) is present.	***There will be no impacts to this resource, so no individuals will be affected.***

2.1.3.2 DIRECT INTERACTIONS

DIRECT IMPACT	CONSERVATION MEASURES	INDIVIDUALS IMPACTED	IMPACT EXPLANATION
Defoliation	Reforestation Aviodance and minimization	Yes	It is not know how many individuals well be effected by defoliation; however, the effect is expected to be minimal and ultimately improved by the project in the long run.

2.1.4 CUMULATIVE EFFECTS

The Site will be placed under a permanent conservation easement and will be protected from further impacts and disturbances.

2.1.5 DISCUSSION AND CONCLUSION

DETERMINATION: NLAA

RELEVANT DOCUMENTATION

- CE_Document_Valle_Crucis

2.2 MONARCH BUTTERFLY

This species has been excluded from analysis in this environmental review document.

JUSTIFICATION FOR EXCLUSION

Suitable habitat for the Monarch Butterfly is complex, but in general breeding areas are virtually all patches of milkweed. The critical conservation feature for North American populations is the overwintering habitats, which North Carolina's winters are too cold for overwintering. North Carolina includes habitat for migratory stopover and the state conservation status is listed as Apparently Secure (S4). The federal status for this species will be monitored during project development as suitable habitat is present at the Parcel.

2.3 NORTHERN LONG-EARED BAT

2.3.1 STATUS OF THE SPECIES

This section should provide information on the species' background, its biology and life history that is relevant to the proposed project within the action area that will inform the effects analysis.

2.3.1.1 LEGAL STATUS

The Northern Long-eared Bat is federally listed as 'Threatened' and additional information regarding its legal status can be found on the ECOS species profile.

2.3.1.2 RECOVERY PLANS

Available recovery plans for the Northern Long-eared Bat can be found on the ECOS species profile.

2.3.1.3 LIFE HISTORY INFORMATION

The northern long-eared bat is a medium-sized bat about 3 to 3.7 inches in length but with a wingspan of 9 to 10 inches. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, Myotis, which are actually bats noted for their small ears (Myotis means mouse-eared). The northern long-eared bat is found across much of the eastern and north central United States and all Canadian provinces from the Atlantic coast west to the southern Northwest Territories and eastern British Columbia. The species range includes 37 states. White-nose syndrome, a fungal disease known to affect bats, is currently the predominant threat to this bat, especially throughout the Northeast where the species has declined by up to 99 percent from pre-white-nose syndrome levels at many hibernation sites. Although the disease has not yet spread throughout the northern long-eared bats entire range (white-nose syndrome is currently found in at least 25 of 37 states where the northern long-eared bat occurs), it continues to spread. Experts expect that where it spreads, it will have the same impact as seen in the Northeast.

IDENTIFIED RESOURCE NEEDS

Hibernacula

Humidity: high, noise: low, with minimal distrubance, temperature: 0-9 degrees celsius, time of year: august through april, type: caves, mines, sewers, and spillways

Insects

Type: lepidoptera (moths and butterflies), coleoptera (beetles), trichoptera (caddisflies), diptera (flies), spiders, lepidopterous larvae

Open water

Type: streams, rivers, ponds, wetlands, lakes, road ruts

Travel corridors

Location: between forest patches and type: riparian corridors, wooded paths, hedgerows, fence rows

Trees

Size: > or equal to 3 inch dbh, spatial arrangement: within 1000 feet of forest, structure: cracks, crevices, cavities, exfoliating bark, time of year: april through august, type: dead, nearly dead, living tree with dead parts, and living with appropriate structure

2.3.1.4 CONSERVATION NEEDS

NLEBs are a federally threatened species that have experienced recent population declines due to white-nose syndrome and are expected to be listed as endangered in December 2022. NLEBs typically winter in hibernating caves but are also known to use human structures. They primarily utilize roost trees during the summer; however, some nonreproductive females and particular colonies have been found to use caves, mines, and other anthropogenic structures seasonally. Females give birth to a single pup, usually in May or June, and juveniles can fly within a month after birth. Foraging most often occurs along forested hillsides and ridges, while sometimes along riparian areas, and their diet consists mostly of moths, beetles, and spiders. A review of the United States Fish and Wildlife Service (USFWS) Asheville Ecological Services Field Office web page (https://www.fws.gov/asheville/htmls/project_review/NLEB_in_WNC.html) on March 31, 2021, indicates that the Site watershed is outside an area where incidental take may be a special consideration. Further coordination with the USFWS will occur throughout the project to support this species; however, no additional surveys are expected for the NLEB.

2.3.2 ENVIRONMENTAL BASELINE

*The environmental baseline describes the species' health **within the action area only** at the time of the consultation, and does not include the effects of the action under review. Unlike the species information provided above, the environmental baseline is at the scale of the Action area.*

2.3.2.1 SPECIES PRESENCE AND USE

NLEBs are a federally threatened species that have experienced recent population declines due to white-nose syndrome and are expected to be listed as endangered in December 2022. NLEBs typically winter in hibernating caves but are also known to use human structures. They primarily utilize roost trees during the summer; however, some nonreproductive females and particular colonies have been found to use caves, mines, and other anthropogenic structures seasonally. Females give birth to a single pup, usually in May or June, and juveniles can fly within a month after birth. Foraging most often occurs along forested hillsides and ridges, while sometimes along riparian areas, and their diet consists mostly of moths, beetles, and spiders. A review of the United States Fish and Wildlife Service (USFWS) Asheville Ecological Services Field Office web page (https://www.fws.gov/asheville/htmls/project_review/NLEB_in_WNC.html) on March 31, 2021, indicates that the Site watershed is outside an area where incidental take may be a special consideration. Further coordination with the USFWS will occur throughout the project to support this species; however, no additional surveys are expected for the NLEB.

RELEVANT DOCUMENTATION

- App_E_NHP_CE_Document_Valle_Crucis

2.3.2.2 SPECIES CONSERVATION NEEDS WITHIN THE ACTION AREA

As there is no roosting habitat in the project area, the only conservation needs is summer roosting in trees. As discussed previously, a maximum of 2.3 acres of trees are expected to be removed. However, the entire conservation easement is expected to be planted with forest vegetation and protected.

2.3.2.3 HABITAT CONDITION (GENERAL)

INSECTS (TYPE: LEPIDOPTERA (MOTHS AND BUTTERFLIES), COLEOPTERA (BEETLES), TRICHOPTERA (CADDISFLIES), DIPTERA (FLIES), SPIDERS, LEPIDOPTEROUS LARVAE)

Aquatic insects occur in streams and wetlands within the Site. Stream restoration activities are expected to provide improved habitat for these species resulting in additional resources.

OPEN WATER (TYPE: STREAMS, RIVERS, PONDS, WETLANDS, LAKES, ROAD RUTS)

Currently, the Site includes 5799 linear feet of degraded stream channel (based on the approved PJD), 0.794 acres of degraded wetland, and 2.318 acres of drained or otherwise impacted hydric soil. Proposed Site restoration activities include the construction of Cb- and Ce-type stream channel resulting in 2631 linear feet of stream restoration, 140 linear feet of stream enhancement (Level I), 2871 linear feet of stream enhancement (Level II), 2.338 acres of riparian wetland re-establishment, 0.032 acres of riparian wetland rehabilitation, 0.631 acres of riparian wetland enhancement, and 0.409 acres of riparian wetland creation.

TRAVEL CORRIDORS (LOCATION: BETWEEN FOREST PATCHES AND TYPE: RIPARIAN CORRIDORS, WOODED PATHS, HEDGEROWS, FENCE ROWS)

The Site includes 13.25 acres of land which includes approximately 8 acres of pasture and 5 acres of forest land.

TREES (SIZE: > OR EQUAL TO 3 INCH DBH, SPATIAL ARRANGEMENT: WITHIN 1000 FEET OF FOREST, STRUCTURE: CRACKS, CREVICES, CAVITIES, EXFOLIATING BARK, TIME OF YEAR: APRIL THROUGH AUGUST, TYPE: DEAD, NEARLY DEAD, LIVING TREE WITH DEAD PARTS, AND LIVING WITH APPROPRIATE STRUCTURE)

The Site is approximately 13 acres with 8 acres of open cow pasture and 5 acres of forest vegetation.

SUPPORTING DOCUMENTATION

- TE_Figure
- ValleCrucis_Fig4_Existing
- CE_Document_Valle_Crucis

2.3.2.4 INFLUENCES

The primary issue affecting this species is White Nose Syndrome, which has decimated the species. No caves or other suitable habitat exists within the Site boundaries and this project should not affect the reproduction, numbers, or distribution of the NLEB.

2.3.2.5 ADDITIONAL BASELINE INFORMATION

No caves or mines that would serve as winter hibernation area occurs in the action area. Summer roosting areas occur in the form of forest vegetation. No surveys for presence or absence have occurred.

2.3.3 EFFECTS OF THE ACTION

This section considers and discusses all effects on the listed species that are caused by the proposed action and are reasonably certain to occur, including the effects of other activities that would not occur but for the proposed action.

2.3.3.1 INDIRECT INTERACTIONS

RESOURCE NEED	STRESSORS	CONSERVATION MEASURES	AMOUNT OF RESOURCE IMPACTED	INDIVIDUALS AFFECTED
Hibernacula (humidity: high, noise: low, with minimal distrubance, temperature: 0-9 degrees celsius, time of year: august through april, type: caves, mines, sewers, and spillways)			***This resource is not present in the action area*** Field Surveys were conducted of the Site.	***There will be no impacts to this resource, so no individuals will be affected.***
Insects (type: lepidoptera (moths and butterflies), coleoptera (beetles), trichoptera (caddisflies), diptera (flies), spiders, lepidopterous larvae)	No exposure path			***There will be no impacts to this resource, so no individuals will be affected.***

RESOURCE NEED	STRESSORS	CONSERVATION MEASURES	AMOUNT OF RESOURCE IMPACTED	INDIVIDUALS AFFECTED
Open water (type: streams, rivers, ponds, wetlands, lakes, road ruts)	No exposure path			***There will be no impacts to this resource, so no individuals will be affected.***
Travel corridors (location: between forest patches and type: riparian corridors, wooded paths, hedgerows, fence rows)	Decrease in forest	Reforestation Aviodance and minimization	A maximum area of 2.3 acres of forest vegetation will be impacted to access stream and wetland restoration areas. These areas will be planted with native forest vegetation and protected with a conservation easement.	No species have been identified at the Site; however, it is expected that flyovers may occur.
Trees (size: > or equal to 3 inch dbh, spatial arrangement: within 1000 feet of forest, structure: cracks, crevices, cavities, exfoliating bark, time of year: april through august, type: dead, nearly dead, living tree with dead parts, and living with appropriate structure)	Decrease in forest	Reforestation Aviodance and minimization	A maximum of 2.3 acres of forest will be impacted by stream and wetland restoration activities; however, these areas will be planted with native forest vegetation and protected with a conservation easement.	It is unknown how many individuals will be affected by defoliation; however, it is expected that flyovers may occur.

2.3.3.2 DIRECT INTERACTIONS

DIRECT IMPACT	CONSERVATION MEASURES	INDIVIDUALS IMPACTED	IMPACT EXPLANATION
Defoliation	Reforestation Aviodance and minimization	Yes	It is not known if any individuals will be effected by defoliation; however, the project is likely to positively impact the species by reforestation efforts and the placement of a conservation easement on the Site.

2.3.4 CUMULATIVE EFFECTS

No known cumulative effects are expected for this species. A temporary impact to forest vegetation that may be used by NLEB is expected at the Site; however, these areas will be replanted with native forest vegetation and protected with a conservation easement. No caves, mines or other winter hibernation habitat will be affected.

2.3.5 DISCUSSION AND CONCLUSION

DETERMINATION: NLAA

RELEVANT DOCUMENTATION

- CE_Document_Valle_Crucis
- TE_Figure

2.4 TRICOLORED BAT

2.4.1 STATUS OF THE SPECIES

This section should provide information on the species' background, its biology and life history that is relevant to the proposed project within the action area that will inform the effects analysis.

2.4.1.1 LEGAL STATUS

The Tricolored Bat is federally listed as 'Proposed Endangered' and additional information regarding its legal status can be found on the ECOS species profile.

2.4.1.2 RECOVERY PLANS

Available recovery plans for the Tricolored Bat can be found on the ECOS species profile.

2.4.1.3 LIFE HISTORY INFORMATION

The tricolored bat is a small insectivorous bat that is distinguished by its unique tricolored fur and often appears yellowish to nearly orange. The once common species is wide ranging across the eastern and central United States and portions of southern Canada, Mexico and Central America. During the winter, tricolored bats are often found in caves and abandoned mines, although in the southern United States, where caves are sparse, tricolored bats are often found roosting in road-associated culverts where they exhibit shorter torpor bouts and forage during warm nights. During the spring, summer, and fall, tricolored bats are found in forested habitats where they roost in trees, primarily among leaves of live or recently dead deciduous hardwood trees, but may also be found in Spanish moss, pine trees, and occasionally human structures. Tricolored bats face extinction due primarily to the rangewide impacts of white-nose syndrome, a deadly disease affecting cave-dwelling bats across the continent. White-nose syndrome has caused estimated declines of more than 90 percent in affected tricolored bat colonies across the majority of the species range. To address the growing threat of white-nose syndrome to the tricolored bat and other bats across North America, the U.S. Fish and Wildlife Service is leading the White-nose Syndrome National Response Team, a coordinated effort of more than 150 non-governmental organizations, institutions, Tribes, and state and federal agencies. Together we are conducting critical white-nose syndrome research and developing management strategies to minimize impacts of the disease and recover affected bat populations. For more information on white-nose syndrome, please see: https://www.whitenosesyndrome.org/ For more information on tricolored bats, please see: https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus

IDENTIFIED RESOURCE NEEDS

Forest

> 4 inch DBH and or leaf masses for roosting and pupping.

2.4.1.4 CONSERVATION NEEDS

During the winter, tricolored bats are found in caves and mines; however, in North Carolina are often found roosting in road culverts. In the spring, summer, and fall they are found in forested habitats where they roost in trees, primarily among leaves.

2.4.2 ENVIRONMENTAL BASELINE

*The environmental baseline describes the species' health **within the action area only** at the time of the consultation, and does not include the effects of the action under review. Unlike the species information provided above, the environmental baseline is at the scale of the Action area.*

2.4.2.1 SPECIES PRESENCE AND USE

During the winter, tricolored bats are found in caves and mines; however, in North Carolina are often found roosting in road culverts. In the spring, summer, and fall they are found in forested habitats where they roost in trees, primarily among leaves.

RELEVANT DOCUMENTATION

- CE_Document_Valle_Crucis
- TE_Figure

2.4.2.2 SPECIES CONSERVATION NEEDS WITHIN THE ACTION AREA

The primary items causing problems for this species is White Nose Syndrome. The action are does not have any mines, caves, or culverts greater than 18 inches. The only conservation need for this species that occurs within the action area is trees for roosting and pupping. The Site includes approximately 13 acres with approximately 8 acres of open livestock pasture and 5 acres of trees. The entire 13 acre easement will be planted with native forest vegetation and protected with a conservation easement.

2.4.2.3 HABITAT CONDITION (GENERAL)

FOREST (> 4 INCH DBH AND OR LEAF MASSES FOR ROOSTING AND PUPPING.)

Of the approximately 13 acres of the Site there are roughly 5 acres of forest vegetation

SUPPORTING DOCUMENTATION

- TE_Figure

2.4.2.4 INFLUENCES

The primary influence on this species is White Nose Syndrome.

2.4.2.5 ADDITIONAL BASELINE INFORMATION

No other baseline information has been collected.

2.4.3 EFFECTS OF THE ACTION

This section considers and discusses all effects on the listed species that are caused by the proposed action and are reasonably certain to occur, including the effects of other activities that would not occur but for the proposed action.

2.4.3.1 INDIRECT INTERACTIONS

RESOURCE NEED	STRESSORS	CONSERVATION MEASURES	AMOUNT OF RESOURCE IMPACTED	INDIVIDUALS AFFECTED
Forest (> 4 inch DBH and or leaf masses for roosting and pupping.)	Decrease in forest	Reforestation Aviodance and minimization	A maximum of 2.3 acres of disturbance to forest areas may occur to access stream and wetland restoration areas. However, these areas will be planted with native forest vegetation and protected by a perpetual conservation easement.	No known individuals of this species will be affected by the project; however, flyovers may occur.

2.4.3.2 DIRECT INTERACTIONS

DIRECT IMPACT	CONSERVATION MEASURES	INDIVIDUALS IMPACTED	IMPACT EXPLANATION
Defoliation	Reforestation Aviodance and minimization	Yes	It is not known if individuals or this species will experience defoliation, or how many individuals occur in the vicinity of the Site; however, the majority of defoliation will occur in the winter time and will have no effect on this species. In addition, forest vegetation will be replanted and protected, resulting in beneficial long term effects on this species.

2.4.4 CUMULATIVE EFFECTS

Of the 13 acres at the Site, a maximum of 2.3 acres of deforestation may occur. These areas will be minimized to the maximum extent during construction of stream and wetland restoration areas. In addition, replanting of these areas will occur and the entire Site will be protected by a permanent conservation easement. These activities will result in long term positive effect for habitat of this species.

2.4.5 DISCUSSION AND CONCLUSION

DETERMINATION: NLAA

COMPENSATION MEASURES
Planting approximately 10 acres of forest vegetation and placing a perpetual conservation easement on the land.

RELEVANT DOCUMENTATION

- CE_Document_Valle_Crucis
- TE_Figure

2.5 VIRGINIA BIG-EARED BAT

2.5.1 STATUS OF THE SPECIES

This section should provide information on the species' background, its biology and life history that is relevant to the proposed project within the action area that will inform the effects analysis.

2.5.1.1 LEGAL STATUS

The Virginia Big-eared Bat is federally listed as 'Endangered' and additional information regarding its legal status can be found on the ECOS species profile.

2.5.1.2 RECOVERY PLANS

Available recovery plans for the Virginia Big-eared Bat can be found on the ECOS species profile.

2.5.1.3 LIFE HISTORY INFORMATION

Plecotus townsendii is a medium-sized bat with forearms measuring 39 to 48 millimeters (mm) long and weighing 7 to 12 grams. Total body length is 98 mm, the tail is 46 mm, and the hind foot is 11 mm long. This bat's long ears (over 2.5 centimeters) and facial glands on either side of the snout are quite distinctive. Fur is light to dark brown depending upon the age of the individual and the subspecies. The only other eastern bat that resembles the Ozark or the Virginia big-eared bat is P. rafinesquii (Rafinesque's big-eared bat). Rafinesque's big-eared bat has toe hairs that extend beyond the end of the toes and the dorsal fur is gray rather than brown. The belly fur of Rafinesque's big-eared bat is white or whitish rather than light brown or buff (Schmidly 1991, Barbour and Davis 1969). The Ozark and Virginia big-eared bats do not have overlapping ranges. Copulation occurs in the fall and winter and the females store the sperm until ovulation in late winter or spring. Gestation takes about 3 months and a single pup is born in May or June. Development is fairly rapid and the young are on their own within 2 months (Barbour and Davis 1969, Schmidly 1991, Kunz and Martin 1982).

IDENTIFIED RESOURCE NEEDS

Cliffs/cliffline

Hibernacula

Noise: low, with minimal distrubance, temperature: winter: <10°c (50.0°f) but infrequently drops below freezing; summer: >15°c (60.0°f), relatively warm and stable, type: caves, mines, sewers, and spillways

Insects

Type: lepidoptera (moths and butterflies), coleoptera (beetles), trichoptera (caddisflies), diptera (flies), spiders, lepidopterous larvae

Open water

Type: streams, rivers, ponds, wetlands, lakes, road ruts

2.5.1.4 CONSERVATION NEEDS

The Virginia big-eared bat was listed as federally endangered in 1979 and occurs in the southeastern US from Kentucky to North Carolina. These bats utilize caves year-round as roost sites. Populations use cooler caves for hibernation, and females typically use warmer maternity caves to raise their young. Virginia big-eared bats feed on insects, primarily moths, and foraging typically occurs on forest/edge interfaces and riparian corridors. Foraging sites are generally located within a few miles of cave roost sites and consist of primarily forested habitats and a mixture of open fields, cliff lines, rock outcrops, riparian areas, and other water sources.

2.5.2 ENVIRONMENTAL BASELINE

*The environmental baseline describes the species' health **within the action area only** at the time of the consultation, and does not include the effects of the action under review. Unlike the species information provided above, the environmental baseline is at the scale of the Action area.*

2.5.2.1 SPECIES PRESENCE AND USE

The Virginia big-eared bat was listed as federally endangered in 1979 and occurs in the southeastern US from Kentucky to North Carolina. These bats utilize caves year-round as roost sites. Populations use cooler caves for hibernation, and females typically use warmer maternity caves to raise their young. Virginia big-eared bats feed on insects, primarily moths, and foraging typically occurs on forest/edge interfaces and riparian corridors. Foraging sites are generally located within a few miles of cave roost sites and consist of primarily forested habitats and a mixture of open fields, cliff lines, rock outcrops, riparian areas, and other water sources. Biological Conclusion Although there are current records of a known hibernaculum supporting Virginia big-eared bats within a 7-10 mile radius of the Site, the project is anticipated to have beneficial effects on riparian foraging areas without adverse impacts to Virginia big-eared bats or their habitat. Minimal tree removal is expected to occur for this project. In addition, any tree removal activities will occur during the winter months (October 16th – March 31st) outside of pupping season. Therefore, the biological conclusion for this species is May Affect, Not Likely to Adversely Affect.

RELEVANT DOCUMENTATION

- CE_Document_Valle_Crucis
- TE_Figure

2.5.2.2 SPECIES CONSERVATION NEEDS WITHIN THE ACTION AREA

Reforestation efforts would be the specific conservation need within our action area.

2.5.2.3 HABITAT CONDITION (GENERAL)

INSECTS (TYPE: LEPIDOPTERA (MOTHS AND BUTTERFLIES), COLEOPTERA (BEETLES), TRICHOPTERA (CADDISFLIES), DIPTERA (FLIES), SPIDERS, LEPIDOPTEROUS LARVAE)

Currently, the Site includes 5799 linear feet of degraded stream channel (based on the approved PJD), 0.794 acres of degraded wetland, and 2.318 acres of drained or otherwise impacted hydric soil. Proposed Site restoration activities include the construction of Cb- and Ce-type stream channel resulting in 2631 linear feet of stream restoration, 140 linear feet of stream enhancement (Level I), 2871 linear feet of stream enhancement (Level II), 2.338 acres of riparian wetland re-establishment, 0.032 acres of riparian wetland rehabilitation, 0.631 acres of riparian wetland enhancement, and 0.409 acres of riparian wetland creation.

OPEN WATER (TYPE: STREAMS, RIVERS, PONDS, WETLANDS, LAKES, ROAD RUTS)

Currently, the Site includes 5799 linear feet of degraded stream channel (based on the approved PJD), 0.794 acres of degraded wetland, and 2.318 acres of drained or otherwise impacted hydric soil. Proposed Site restoration activities include the construction of Cb- and Ce-type stream channel resulting in 2631 linear feet of stream restoration, 140 linear feet of stream enhancement (Level I), 2871 linear feet of stream enhancement (Level II), 2.338 acres of riparian wetland re-establishment, 0.032 acres of riparian wetland rehabilitation, 0.631 acres of riparian wetland enhancement, and 0.409 acres of riparian wetland creation.

SUPPORTING DOCUMENTATION

- CE_Document_Valle_Crucis
- ValleCrucis_Fig4_Existing
- TE_Figure

2.5.2.4 INFLUENCES

The primary influence on this species is White Nose Syndrome.

2.5.2.5 ADDITIONAL BASELINE INFORMATION

No additional baseline information is available at this time.

2.5.3 EFFECTS OF THE ACTION

This section considers and discusses all effects on the listed species that are caused by the proposed action and are reasonably certain to occur, including the effects of other activities that would not occur but for the proposed action.

2.5.3.1 INDIRECT INTERACTIONS

RESOURCE NEED	STRESSORS	CONSERVATION MEASURES	AMOUNT OF RESOURCE IMPACTED	INDIVIDUALS AFFECTED
Cliffs/cliffline			***This resource is not present in the action area*** Onsite studies have been conducted and no cliffs/cliff-lines occur in the project area.	***There will be no impacts to this resource, so no individuals will be affected.***
Hibernacula (noise: low, with minimal distrubance, temperature: winter: <10°c (50.0°f) but infrequently drops below freezing; summer: >15°c (60.0°f), relatively warm and stable, type: caves, mines, sewers, and spillways)			***This resource is not present in the action area*** Field Surveys	***There will be no impacts to this resource, so no individuals will be affected.***
Insects (type: lepidoptera (moths and butterflies), coleoptera (beetles), trichoptera (caddisflies), diptera (flies), spiders, lepidopterous larvae)	Decrease in forest	Reforestation Aviodance and minimization	Stream restoration activities are likely in increase the abundance and habitat for these species.	There are no known individual species in the project area; however, flyovers would be expected to occur.

RESOURCE NEED	STRESSORS	CONSERVATION MEASURES	AMOUNT OF RESOURCE IMPACTED	INDIVIDUALS AFFECTED
Open water (type: streams, rivers, ponds, wetlands, lakes, road ruts)	No exposure path			***There will be no impacts to this resource, so no individuals will be affected.***

2.5.3.2 DIRECT INTERACTIONS

DIRECT IMPACT	CONSERVATION MEASURES	INDIVIDUALS IMPACTED	IMPACT EXPLANATION
Defoliation	Reforestation Aviodance and minimization	Yes	No know individuals of the species occur; however, flyovers would be expected. These species would experience a short term impact from defoliation; however, the species would experience a long-term benefit from project reforestation and conservation.

2.5.4 CUMULATIVE EFFECTS

This species will experience short term effects from defoliation associated with stream and wetland restoration activities. However, the species will experience long-term positive benefits from the project as a whole based on increased aquatic insect occurrence and increased forest area that will be preserved with a perpetual conservation easement.

2.5.5 DISCUSSION AND CONCLUSION

DETERMINATION: NLAA

COMPENSATION MEASURES
The species will experience long-term positive benefits from the project as a whole based on increased aquatic insect occurrence and increased forest area that will be preserved with a perpetual conservation easement.

RELEVANT DOCUMENTATION

- CE_Document_Valle_Crucis
- TE_Figure

3 CRITICAL HABITAT EFFECTS ANALYSIS

No critical habitats intersect with the project action area.

4 SUMMARY DISCUSSION AND CONCLUSION

4.1 SUMMARY DISCUSSION

Ultimately, this project will have positive effects on these sensitive species by the cessation of livestock production, restoration of streams and wetlands, planting forest vegetation, and conserving the property perpetually. Short term impacts to forest vegetation will occur to approximately 2.3 acres of trees; however, the majority of these areas will not be disturbed. All areas that will be disturbed will be replanted with forest vegetation.

No critical habitat occurs within or near the project.

4.2 CONCLUSION

Gray Bat - Biological Conclusion The project is anticipated to benefit riparian foraging areas without adverse effects on Gray bats or their habitat. Minimal tree removal is expected to occur for this project. In addition, any tree removal activities will occur during the winter months (October 16th – March 31st) outside of pupping season. Therefore, the biological conclusion for this species is May Affect, Not Likely to Adversely Affect. Northern Long-Eared Bat (NLEB) - Biological Conclusion The project is anticipated to benefit riparian foraging areas without adverse effects on Northern long-eared bats or their habitat. Minimal tree removal is expected to occur for this project. In addition, any tree removal activities will occur during the winter months (October 16th – March 31st) outside of pupping season. Therefore, the biological conclusion for this species is May Affect, Not Likely to Adversely Affect. Virginia Big-Eared Bat - Biological Conclusion Although there are current records of a known hibernaculum supporting Virginia big-eared bats within a 7-10 mile radius of the Site, the project is anticipated to have beneficial effects on riparian foraging areas without adverse impacts to Virginia big-eared bats or their habitat. Minimal tree removal is expected to occur for this project. In addition, any tree removal activities will occur during the winter months (October 16th – March 31st) outside of pupping season. Therefore, the biological conclusion for this species is May Affect, Not Likely to Adversely Affect.

Tricolored Bat - Biological Conclusion

The project is anticipated to benefit riparian foraging areas without adverse effects on Tricolored bats or their habitat. Minimal tree removal is expected to occur for this project. In addition, any tree removal activities will occur during the winter months (October 16th – March 31st) outside of pupping season. Therefore, the biological conclusion for this species is May Affect, Not Likely to Adversely Affect.

August 25th, 2021

Kristin May
USDA Natural Resources Conservation Service
4407 Bland Road
Suite 117
Raleigh, NC 27609

Re: Valle Crucis Mitigation Site, Watauga County, NC

Restoration Systems, LLC (RS), of Raleigh, NC has been awarded a contract by DMS to provide Stream and Wetland Mitigation Units at the Stinking Quarter Mitigation Site in Guilford County, North Carolina.

One of the earliest tasks to be performed by RS is completion of an environmental screening and preparation/submittal of a Categorical Exclusion (CE) document. This document is specifically required by the Federal Highway Administration (FHWA) to ensure compliance with various federal environmental laws and regulations. DMS must demonstrate that its projects comply with federal mandates as a precondition to FHWA reimbursement of compensatory mitigation costs borne by the North Carolina Department of Transportation to offset its projects' unavoidable impacts to streams and wetlands.

In order for the project to proceed, RS is obligated to coordinate with the NRCS to complete Form AD-1006 in compliance with the Farmland Protection Policy Act on behalf of the FHWA. The purpose of this letter is to request your assistance in completion of the Form.

Project Location & Description
The Site is located within Targeted Local Watershed (TLW) 06010103010010 and subbasin 04-02-01. The Watauga River Basin Restoration Priorities (RBRP) report (NCEEP 2009) documents four significant sources of aquatic habitat degradation and water quality impairment within the Watauga River Basin 1) livestock grazing with unlimited access to stream banks and channels, 2) clearing of native riparian vegetation from streamside buffer zones, 3) clearing of land for new roads and building particularly in areas of steep slopes, and 4) urban stormwater runoff. Additional water quality, habitat, and hydrologic impacts include timber harvesting, failing septic systems and straight pipe discharges, hydrologic modifications (e.g. channelization, streambank armoring, and building in floodplains), and wastewater treatment plant discharges.

Project Information	
Site	Valle Crucis Stream & Wetland Mitigation Site
County	Watauga
Easement Area	~19.2 acres
Site Coordinates (latitude & latitude)	36.19497, -81.78855
Site Elevations	2705-2920 feet
Site Streams	UTs to Dutch Creek
Physiography & Watershed Information	

Physiographic Province	Blue Ridge
Level IV Ecoregion	Southern Crystalline Ridges & Mountains
River Basin	Watauga
USGS 14-digit HUC	06010103010010
NCDWR Sub-basin	04-02-01
Targeted Local Watershed	Yes
LWP, RWP, TRA*	No, No, Located in a Hydrology TRA
Water Quality Information	
Stream Index Number	8-12-(0.5)
Best Use Classification	B; Tr
303d List	No
Drainage Area & Land Use Information	
Existing Site Land Use	Livestock pasture, forest
Site Drainage Area	4.83 square miles (3,089 acres)
Site Drainage Area Land Use	Livestock pasture, forest, sparse residential
Site Drainage Area Percentage Impervious Surface	<2%

Based on Web Soil Survey mapping (USDA 2021), the Site contains the soil series outlined in the following table. Existing wetlands, which have been disturbed by livestock grazing were mapped by a licensed soil scientist (NC LSS # 1233) on March 16, 2021 as soils of the Nikwasi series (Figure 4, Appendix A). The Natural Resources Conservation service (NRCS) has mapped the Site as Dellwood cobbly sandy loam and Saunook loam, both class B hydric soils with inclusions of Nikwasi soils.

Table 4. Site Soils

Map Unit Symbol	Map Unit Name (Classification)	Hydric Status	Description
DeB	Dellwood cobbly sandy loam (*Oxyaquic Humudepts*)	Non-hydric, may contain hydric inclusions	This series consist of occasionally flooded, moderately well-drained soils found on floodplains; parent material is gravelly and cobbly sandy alluvium. Depth to the restrictive layer is 8-20 inches to strongly contrasting textural stratification. Depth to the water table is 24-48 inches. Slopes are 1-5 percent.
SkC, SoC	Saunook loam* *(Humic Hapludults)*	Non-hydric, may contain hydric inclusions	This series consist of well-drained soils found on coves on mountain slopes, drainageways on mountain slopes, and fans on mountain slopes. Parent material is colluvium derived from igneous and metamorphic rock. Depth to the restrictive layer and the water table is more than 80 inches. Slopes are 8-30 percent.

*Inclusions of Nikwasi soils

USDA
United States Department of Agriculture

Natural Resources
Conservation Service

North Carolina
State Office

4407 Bland Rd.
Suite 117
Raleigh
North Carolina 27609
Voice (704) 680-3541
Fax (844) 325-2156

August 31, 2021

JD Hamby
Project Manager
Restoration Systems LLC
1101 Haynes Street, Suite 211
Raleigh, NC 27604

Dear JD Hamby;

The following information is in response to your request soliciting comments regarding the Proposed Valle Crucis Mitigation Site in Watauga County, NC.

Projects are subject to Farmland Protection Policy Act (FPPA) requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency.

For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land. Farmland means prime or unique farmlands as defined in section 1540(c)(1) of the Act or farmland that is determined by the appropriate state or unit of local government agency or agencies with concurrence of the Secretary to be farmland of statewide of local importance.

“Farmland" does not include land already in or committed to urban development or water storage. Farmland ``already in" urban development or water storage includes all such land with a density of 30 structures per 40-acre area. Farmland already in urban development also includes lands identified as ``urbanized area" (UA) on the Census Bureau Map, or as urban area mapped with a ``tint overprint" on the USGS topographical maps, or as ``urban-built-up" on the USDA Important Farmland Maps. See over for more information.

The area in question includes land classified as Prime Farmland. In accordance with the Code of Federal Regulations 7CFR 658, Farmland Protection Policy Act, the CPA-106 was initiated. NRCS Completed Parts II, IV, V of the form and returned for completion by the requesting agency.

If you have any questions, please feel free to call me at (704) 680-3541 office or (704) 754-6734 cell.

Sincerely,

Kristin L May

Kristin L May
Acting State Soil Scientist

cc:
David Tucker, supervisory soil conservationist, NRCS, Jefferson, NC

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 8/24/2021
Name of Project Valle Crucis Mitigation Site	Federal Agency Involved FHWA
Proposed Land Use Stream & Wetland Restoration	County and State Watauga County, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 8/25/2021 / Person Completing Form: Kristin Mav

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☑ NO ☐	Acres Irrigated: None	Average Farm Size: 95
Major Crop(s): Corn	Farmable Land In Govt. Jurisdiction — Acres: 24.44 % 48,961	Amount of Farmland As Defined in FPPA — Acres: 24.44 % 48,961	
Name of Land Evaluation System Used: Watauga Co. LESA	Name of State or Local Site Assessment System: NA	Date Land Evaluation Returned by NRCS: 8/31/2021	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating: Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	19.2			
B. Total Acres To Be Converted Indirectly	.5			
C. Total Acres In Site	19.7			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	0			
B. Total Acres Statewide Important or Local Important Farmland	16.3			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	0.033			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	9.8			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)	43			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)	15			
2. Perimeter In Non-urban Use	(10)	9			
3. Percent Of Site Being Farmed	(20)	15			
4. Protection Provided By State and Local Government	(20)	20			
5. Distance From Urban Built-up Area	(15)	10			
6. Distance To Urban Support Services	(15)	10			
7. Size Of Present Farm Unit Compared To Average	(10)	5			
8. Creation Of Non-farmable Farmland	(10)	1			
9. Availability Of Farm Support Services	(5)	4			
10. On-Farm Investments	(20)	10			
11. Effects Of Conversion On Farm Support Services	(10)	0			
12. Compatibility With Existing Agricultural Use	(10)	1			
TOTAL SITE ASSESSMENT POINTS	160	100	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	43	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	100	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	143	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 - Federal agencies (or Federally funded projects) involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form. For Corridor type projects, the Federal agency shall use form NRCS-CPA-106 in place of form AD-1006. The Land Evaluation and Site Assessment (LESA) process may also be accessed by visiting the FPPA website, http://fppa.nrcs.usda.gov/lesa/.

Step 2 - Originator (Federal Agency) will send one original copy of the form together with appropriate scaled maps indicating location(s)of project site(s), to the Natural Resources Conservation Service (NRCS) local Field Office or USDA Service Center and retain a copy for their files. (NRCS has offices in most counties in the U.S. The USDA Office Information Locator may be found at http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map**,** or the offices can usually be found in the Phone Book under U.S. Government, Department of Agriculture. A list of field offices is available from the NRCS State Conservationist and State Office in each State.)

Step 3 - NRCS will, within 10 working days after receipt of the completed form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland. (When a site visit or land evaluation system design is needed, NRCS will respond within 30 working days.

Step 4 - For sites where farmland covered by the FPPA will be converted by the proposed project, NRCS will complete Parts II, IV and V of the form.

Step 5 - NRCS will return the original copy of the form to the Federal agency involved in the project, and retain a file copy for NRCS records.

Step 6 - The Federal agency involved in the proposed project will complete Parts VI and VII of the form and return the form with the final selected site to the servicing NRCS office.

Step 7 - The Federal agency providing financial or technical assistance to the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

(For Federal Agency)

Part I: When completing the "County and State" questions, list all the local governments that are responsible for local land use controls where site(s) are to be evaluated.

Part III: When completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them or other major change in the ability to use the land for agriculture.
2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities planned build out capacity) that will cause a direct conversion.

Part VI: Do not complete Part VI using the standard format if a State or Local site assessment is used. With local and NRCS assistance, use the local Land Evaluation and Site Assessment (LESA).

1. Assign the maximum points for each site assessment criterion as shown in § 658.5(b) of CFR. In cases of corridor-type project such as transportation, power line and flood control, criteria #5 and #6 will not apply and will, be weighted zero, however, criterion #8 will be weighed a maximum of 25 points and criterion #11 a maximum of 25 points.

2. Federal agencies may assign relative weights among the 12 site assessment criteria other than those shown on the FPPA rule after submitting individual agency FPPA policy for review and comment to NRCS. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total points at 160. For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, convert the site assessment points to a base of 160.
Example: if the Site Assessment maximum is 200 points, and the alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \text{ X } 160 = 144 \text{ points for Site A}$$

For assistance in completing this form or FPPA process, contact the local NRCS Field Office or USDA Service Center.

NRCS employees, consult the FPPA Manual and/or policy for additional instructions to complete the AD-1006 form.

September 2nd, 2021

Andrea Leslie
Mountain Coordinator
Balsam Depot 20830 Great Smoky Mtn. Expy
Waynesville, NC 28786

Re: Valle Crucis Mitigation Project, Watauga County, NC

Dear Ms. Leslie:

The purpose of this letter is to request concurrence from the North Carolina Wildlife Recourse Commission concerning a stream and wetland restoration project located in Robeson County for the N.C. Division of Mitigation Services. The project will restore stream channels and riparian wetlands in cattle pasture and forested areas. Please review and comment on any possible issues that might emerge with respect to the Fish and Wildlife Coordination Act from the potential stream restoration project. Attached is a USGS base map with the projects 20.3 acre footprint identified. The Site occurs within 14-digit Cataloging Unit and Targeted Local Watershed 06010103010010 along cold-water tributaries to Dutch Creek. The Site is located 0.7 mile south of Valle Crucis and 6 miles west of Boone, south of the intersection of NC Highway 194 and Clarks Creek Road (SR 1136). Site land use consists of, disturbed forest and livestock pasture. Site hydrology includes a section of Dutch Creek along with six unnamed tributaries that drain to the cold water creek.

The Site is located in the Blue Ridge portion of the Southern Crystalline Ridge and Mountains ecoregion of North Carolina. A table summarizing the location and characteristics of the site is added below:

Project Information	
Site	Valle Crucis Stream & Wetland Mitigation Site
County	Watauga
Easement Area	~19.2 acres
Site Coordinates (latitude & latitude)	36.19497, -81.78855
Site Elevations	2705-2920 feet
Site Streams	UTs to Dutch Creek
Physiography & Watershed Information	
Physiographic Province	Blue Ridge
Level IV Ecoregion	Southern Crystalline Ridges & Mountains
River Basin	Watauga
USGS 14-digit HUC	06010103010010

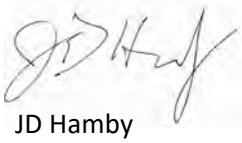
NCDWR Sub-basin	04-02-01
Targeted Local Watershed	Yes
LWP, RWP, TRA*	No, No, Located in a Hydrology TRA
Water Quality Information	
Stream Index Number	8-12-(0.5)
Best Use Classification	B; Tr
303d List	No
Drainage Area & Land Use Information	
Existing Site Land Use	Livestock pasture, forest
Site Drainage Area	4.83 square miles (3,089 acres)
Site Drainage Area Land Use	Livestock pasture, forest, sparse residential
Site Drainage Area Percentage Impervious Surface	<2%

The Site is proposed to include 8,050 feet of combined restored, enhanced, and preserved stream channel along with an undetermined amount of reestablished and enhanced riparian wetlands. Site alterations include the cessation of livestock grazing in the riparian zone and access to stream channel, restoration of wetlands, and planting native, woody vegetation within the entire Site easement. Mitigation outlined in this report will result in net gains in hydrology, water quality, and habitat functions, and are designed to provide 4,180 Stream Mitigation Units and a undetermined amount of Wetland Mitigation Units.

We thank you in advance for your timely response and cooperation. Please feel free to contact the below referenced Project Manager with any questions that you may have concerning the extent of site disturbance associated with this project. If we do not hear from you within 30 days, we will assume you have no comments on the project. Your valuable time and cooperation are much appreciated.

Yours truly,

Restoration Systems, LLC



JD Hamby
Project Manager
jhamby@restorationsytems.com
919-755-9490

Attachments: Location and USGS Map

North Carolina Wildlife Resources Commission

Cameron Ingram, Executive Director

September 20, 2021

Mr. JD Hamby
Restoration Systems
1101 Haynes St. Suite 211
Raleigh, NC 27604

SUBJECT: Valle Crucis Mitigation Project
Watauga County

Dear Mr. Hamby:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) received your September 2, 2021 letter about the proposed stream and wetland restoration on Dutch Creek and unnamed tributaries (UTs) in Watauga County. You requested information and comments on any issues that might emerge from the project with respect to the Fish and Wildlife Coordination Act. Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e) and North Carolina General Statutes (G.S. 113-131 et seq.).

The project will involve restoration, enhancement, and preservation on 8,050 ft of Dutch Creek and UTs, and an unknown amount of wetland reestablishment and enhancement. There are wild Brown Trout and Rainbow Trout in Dutch Creek, and in-channel work should be performed outside of the trout moratorium of October 15 to April 15. In addition, Dutch Creek does support Eastern Hellbender (*Cryptobranchus alleganiensis*, US Federal Species of Concern, NC Special Concern), and it is possible that hellbenders use Dutch Creek within the project area. Depending on the extent of work proposed, we may recommend that special efforts be made to reduce impacts to and improve hellbender habitat. We recommend that Restoration Systems staff reach out to Andrea Leslie at NCWRC (andrea.leslie@ncwildlife.org) during the project design phase to coordinate on issues regarding the Eastern Hellbender.

Please note that there are records of both Northern Long-eared Bat (*Myotis septentrionalis*, US and NC Threatened) and Little Brown Bat (*Myotis lucifugus*, NC Significantly Rare) in the vicinity of the project, as well. Tree removal may need to occur within a certain window; please contact US Fish and Wildlife Service staff for input on this and other measures to minimize impacts to and maximize benefits to these bats.

We recommend that riparian buffers that are to be reestablished be as wide as possible, given site constraints and landowner needs. NCWRC generally recommends a woody buffer of 100 feet on perennial streams to maximize the benefits of buffers, including bank stability, stream shading, treatment of overland runoff, and wildlife habitat. Excellent erosion and sediment control on the project is essential to minimize impacts from the project to hellbender and wild trout.

Given the extent of wetland reestablishment and enhancement, we recommend that the project team find multiple nearby reference sites to determine the most ecologically appropriate wetland types for the site; these may be herbaceous, shrub/scrub, forested, or a mosaic of several types of wetland.

Thank you for the opportunity to review and comment on this project. Please contact me at (828) 400-4223 if you have any questions about these comments or need further assistance.

Sincerely,

Andrea Leslie
Mountain Region Coordinator, Habitat Conservation Program

ec: Lori Williams, NCWRC
Holland Youngman, US Fish and Wildlife Service

Appendix F - FEMA Coordination

From: Chris.Grubb
To: Grant Lewis
Subject: RE: Valle Crucis Stream and Wetland Restoration Site - FEMA Coordination
Date: Monday, August 23, 2021 4:36:34 PM

Grant,
Watauga County is a participating community in the NFIP. Any permitting and flood studies/no rise packages should be permitted through our department.

Chris Grubb, CFM, CZO
Building Inspector III
Planner/Development Coordinator
Watauga County Planning and Inspections
126 Poplar Grove Connector
Suite 201
Boone, NC 28607
(828)265-8043
Chris.grubb@watgov.org

From: Grant Lewis <glewis@axiomenvironmental.org>
Sent: Friday, August 20, 2021 8:50 AM
To: Chris.Grubb <Chris.Grubb@watgov.org>
Subject: Valle Crucis Stream and Wetland Restoration Site - FEMA Coordination

Hello Chris;

I spoke with you yesterday about a stream and wetland restoration project we are proposing near Valle Crucis. Please have a look at the attached information. All I really need is the last page checked and signed.

Please note, we will coordinate with FEMA on this project as part of the permitting process. This checklist is simply a method for initiating the project with the State of North Carolina.

If you have any questions, feel free to reach out and I will answer them as best I can.
Thank you for your time.
Grant

Grant Lewis
Senior Project Manager
Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603
glewis@axiomenvironmental.org

Axiom Environmental, Inc.

Axiom Environmental, Inc.

218 Snow Avenue, Raleigh, North Carolina 27603 919-215-1693

August 19, 2021

Chris Grubb
Watauga County Planning and Inspections
126 Poplar Grove Connector, Suite 201
Boone, NC 28607

Re: Valle Crucis Stream and Wetland mitigation project
Watauga County **21-018**
FEMA Floodplain Requirements Checklist

Dear Mr. Grubb:

The purpose of this letter is to request concurrence from Watauga County concerning a stream and wetland restoration site located in near the Valle Crucis. The Site encompasses approximately 19.2 acres of agriculture land used for livestock production and recreation Dutch Creek and several unnamed tributaries to Dutch Creek. Proposed activities at the Site include the restoration of stream channels and riparian wetlands.

FEMA mapping was reviewed to determine if the project is in a FEMA study area (DFIRM panel number 1970). Based on existing floodplain mapping, the lower reaches of the Site are located within a FEMA mapped zone AE floodway. We request guidance from your organization as to how to move forward with the project.

We thank you in advance for your timely response and cooperation. Please feel free to contact me at the above referenced phone number with any questions that you may have with this project.

Yours truly,

AXIOM ENVIRONMENTAL

W Grant Lewis

W. Grant Lewis
Senior Project Manager

Attachments

Figure 1 Site Location
Figure 2 Hydrologic Unit Map
Figure 3 Topography and Drainage Area
Figure 4 Existing Conditions
Figure 5 LIDAR
Figure 6 Proposed Conditions

EEP 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:	Valle Crucis Mitigation Site
Name if stream or feature:	Dutch Creek and Tributaries
County:	Watauga
Name of river basin:	Watauga
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Watauga
DFIRM panel number for entire site:	1970
Consultant name:	Axiom Environmental, Inc.
Phone number:	919-215-1693
Address:	218 Snow Avenue Raleigh, NC 27603

Design Information

Provide a general description of project (one paragraph). Include project limits on a reference orthophotograph at a scale of 1" = 500". (See Attached)

Summarize stream reaches or wetland areas according to their restoration priority. (See Attached)

Example

Reach	Length	Priority
Example: Reach A	*1000*	*One (Restoration)*
Example: Reach B	*2000*	*Three (Enhancement)*

Floodplain Information

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

☉ Yes ○ No The lower reaches

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

☐ Redelineation

☐ Detailed Study

☐ Limited Detail Study

☐ Approximate Study

☑ Don't know

List flood zone designation:

Check if applies:

☑ AE Zone

- ☉ Floodway
- ○ Non-Encroachment
- ○ None

☐ A Zone

- ○ Local Setbacks Required
- ○ No Local Setbacks Required

If local setbacks are required, list how many feet:

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

○ Yes ☉ No

Land Acquisition (Check)

☐ State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☑ Conservation Easement (Full Delivery Project)

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

Is community/county participating in the NFIP program?

☐ Yes ☒ No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000

Name of Local Floodplain Administrator: Chris Grubb (chris.grubb@watgov.org)
Phone Number: 828-265-8043

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 (CLOMR)

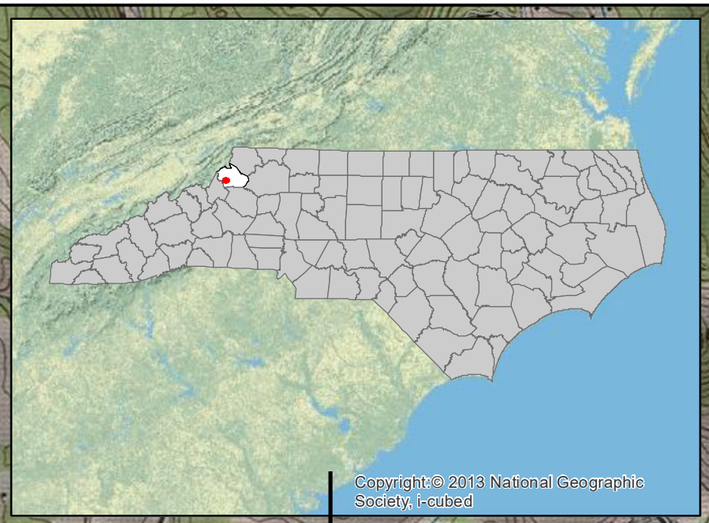
☐ Other Requirements

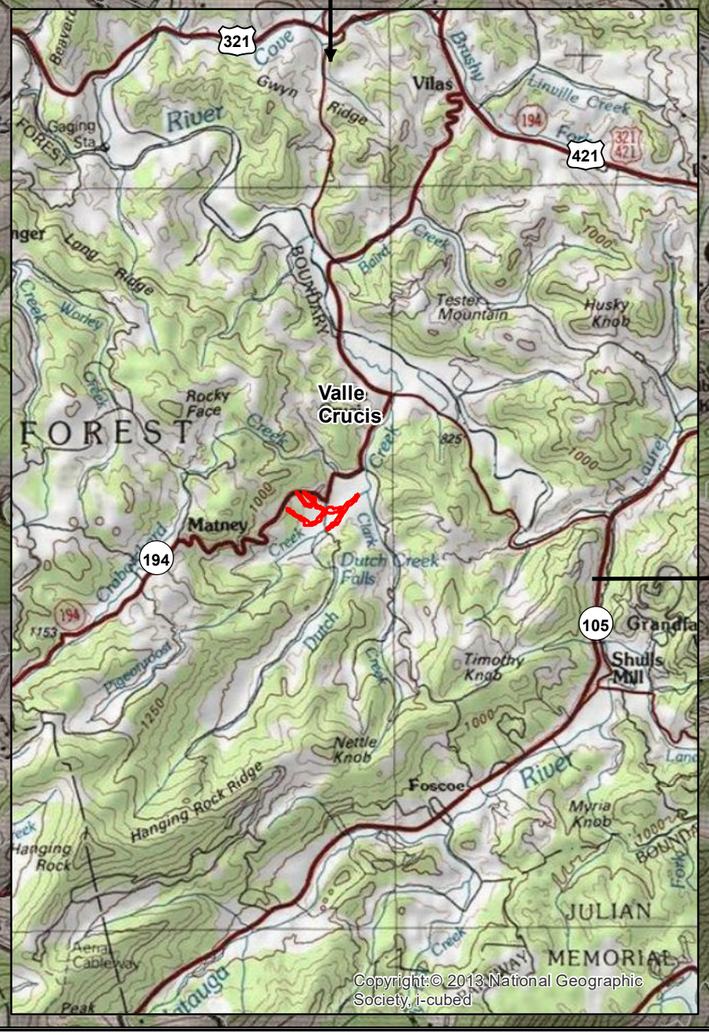
List other requirements:

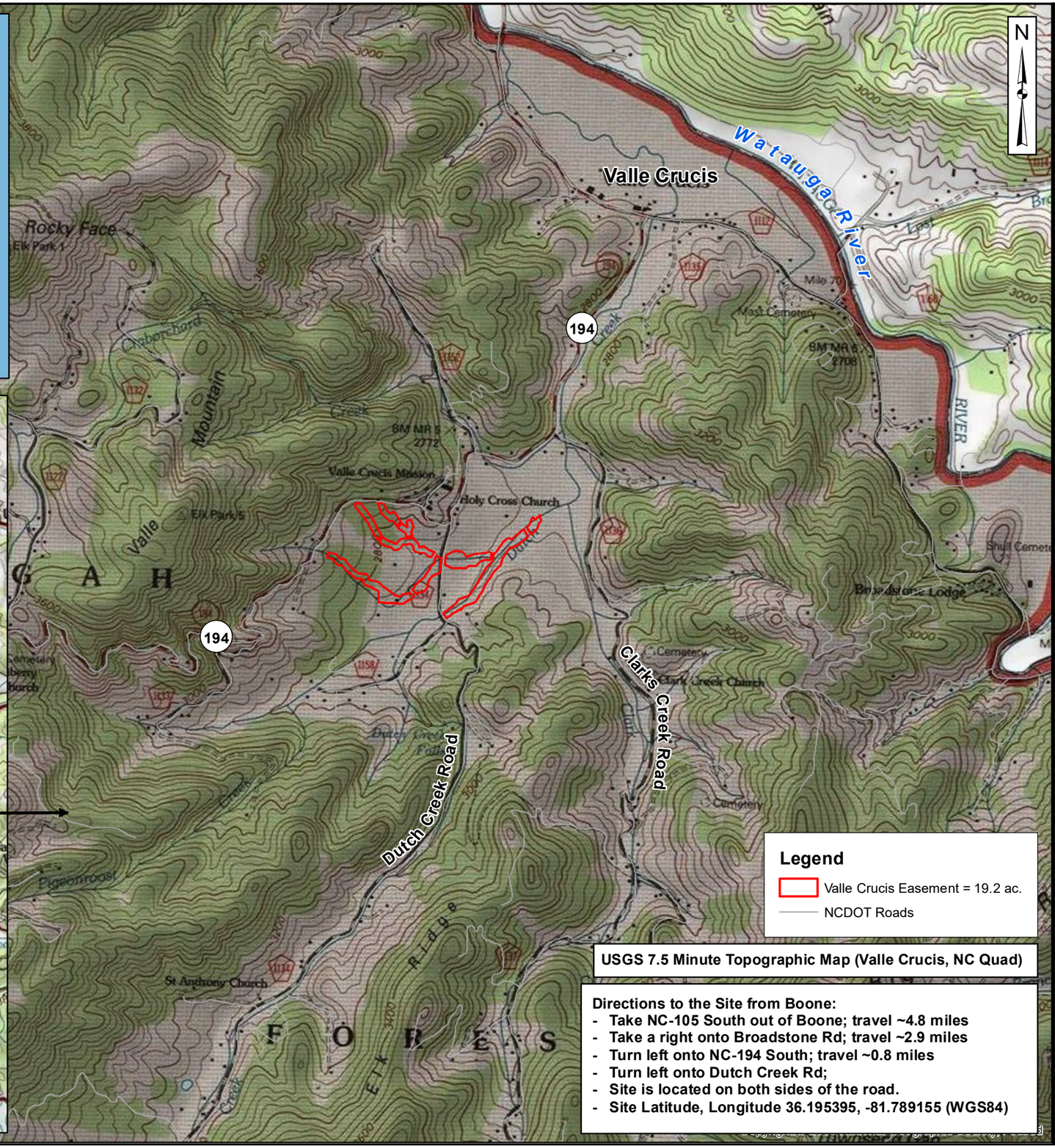
Comments:

Name: W. Grant Lewis Signature: W Grant Lewis

Title: President Date: 8/20/2021







Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

SITE LOCATION

Drawn by: KRJ

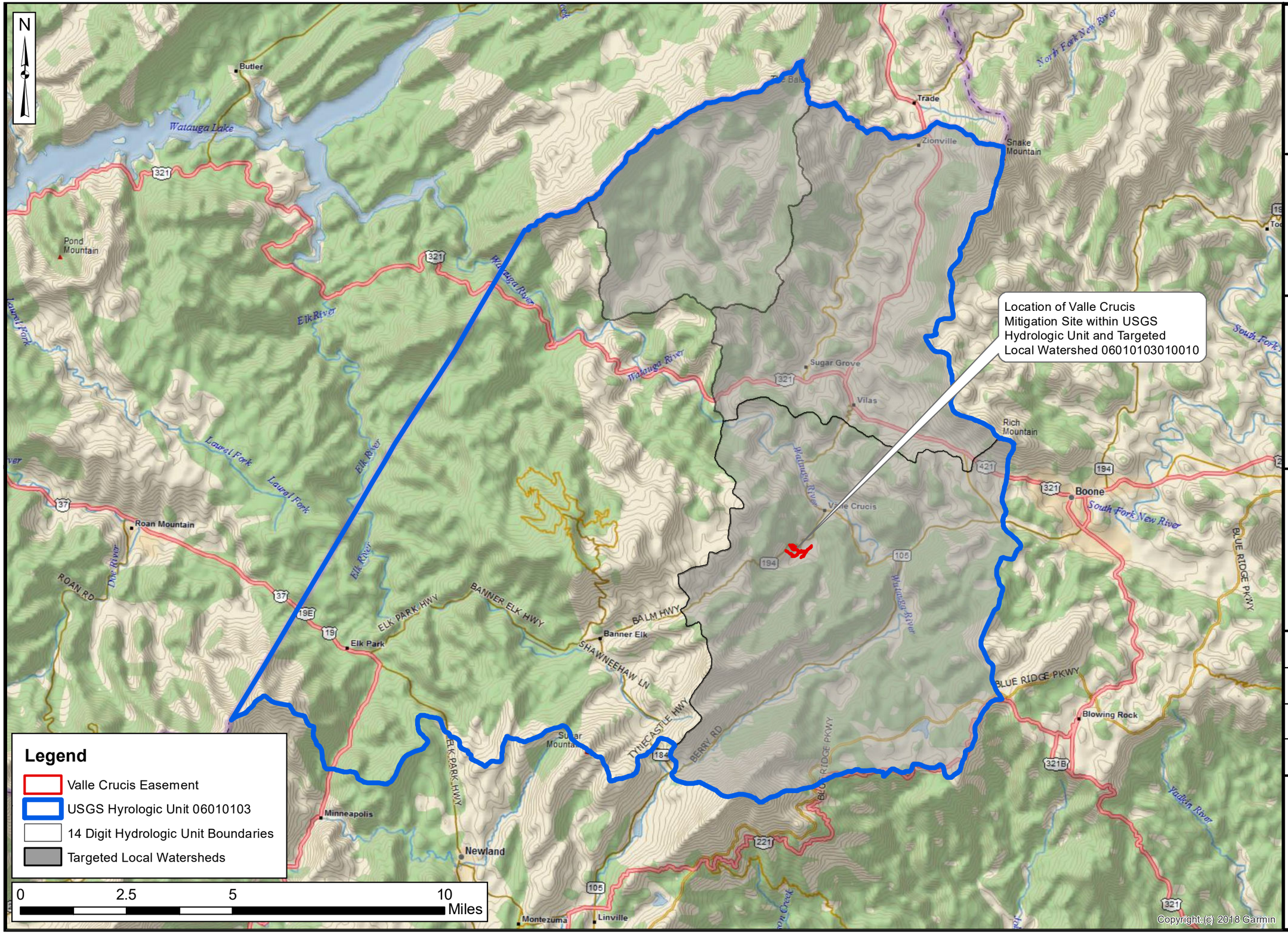
Date: APR 2021

Scale: 1:20,000

Project No.: 21-001

FIGURE

1



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watagua County, NC

Title:

HYDROLOGIC UNIT MAP

Drawn by: KRJ

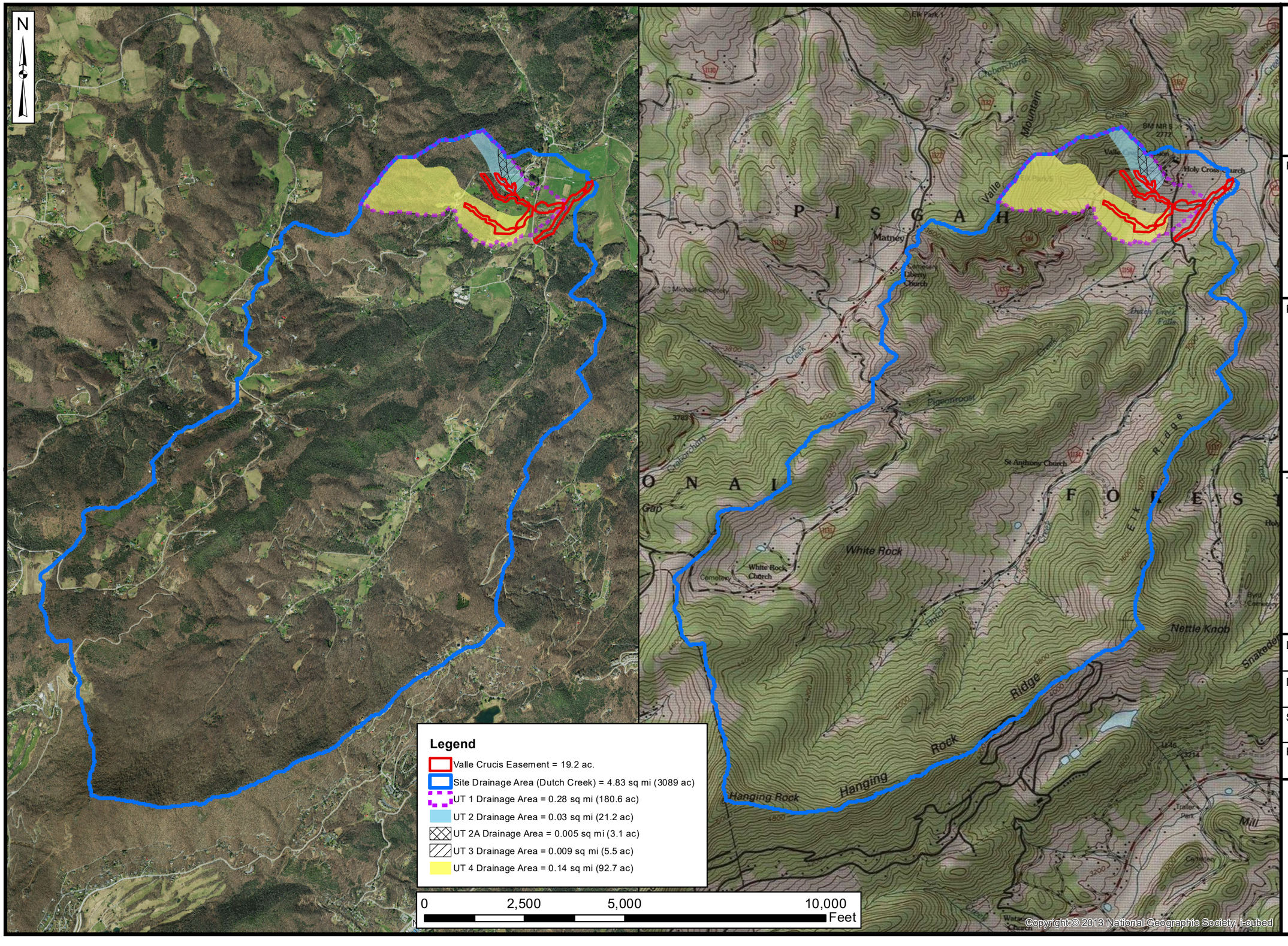
Date: APR 2021

Scale: 1:135,000

Project No.: 21-001

FIGURE

2



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

TOPOGRAPHY AND DRAINAGE AREA

Drawn by: KRJ

Date: APR 2021

Scale: 1:27,000

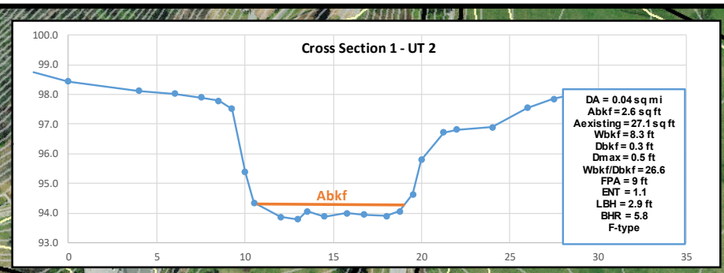
Project No.: 21-001

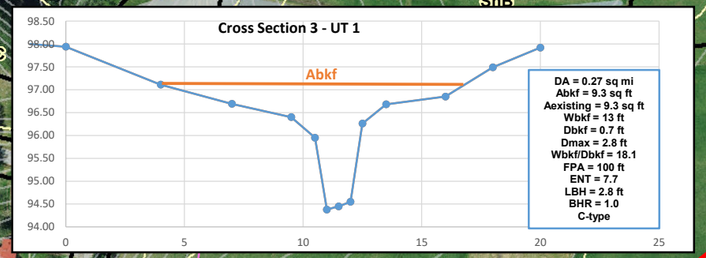
FIGURE

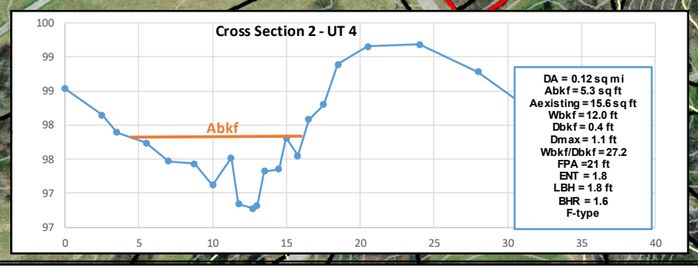
3

N

Soil Map Unit	Soil Series
DeB	Dellwood Cobbly Sandy Loam
SkC, SoC	Saunook Loam







NCSAM Form #5
Score = MEDIUM

NCDWR Form #1
Score = 35

NCSAM Form #1
Score = LOW

NCSAM Form #2
Score = HIGH

XS-1

NCWAM Form #1
Score = LOW

NCSAM Form #4
Score = LOW

XS-3

NCSAM Form #3
Score = LOW

XS-2

Existing Forded
Crossing

UT-1
UT-2A
UT-2
UT-3
UT-1
UT-4

Dutch Creek

PuD
PuE
UkF
SnD
SnB
SnC
CsC
SkD
SoC
SkC
DeB
EdD
EdE
SnC

A
B

Legend

- Watauga County Parcel Boundaries
- Easement = 19.2 ac
- Existing Streams = 8,320 ft
- Existing Wetland = 1.0 ac
- Drained Hydric Soil = 2.4 ac
- Existing Powerline
- Cross Sections
- NCWAM Form Locations
- NCSAM Form Locations
- NCDWR Form Locations
- Soil Profile
- NRCS Soil Boundaries
- 4-foot Contours

0 250 500 1,000 Feet

NC Center for Geographic Information & Analysis

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

EXISTING CONDITIONS AND SOILS

Drawn by: KRJ

Date: MAR 2021

Scale: 1:3000

Project No.: 21-001

FIGURE

4

N

UT-1

UT-2

UT-2A

UT-3

UT-1

UT-1

UT-4

Dutch Creek

Legend

Easement = 19.2 ac

0 250 500 1,000 Feet

NCCGIA

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

LIDAR

Drawn by: KRJ

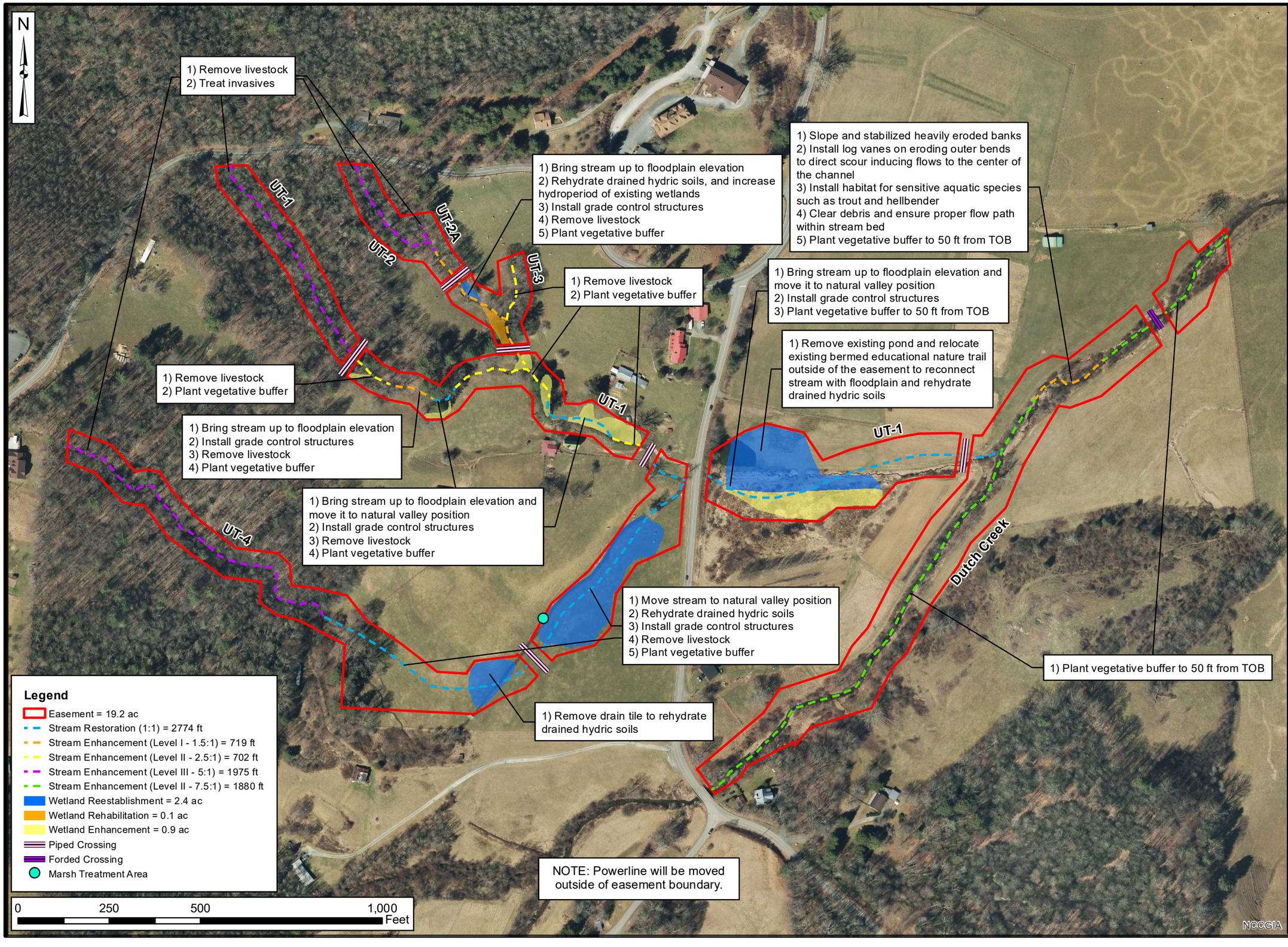
Date: MAR 2021

Scale: 1:3000

Project No.: 21-001

FIGURE

5



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

PROPOSED CONDITIONS

Drawn by: KRJ

Date: MAR 2021

Scale: 1:3000

Project No.: 21-001

FIGURE

6

Appendix G - Financial Assurances

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 H - Site Protection Instrument

LEGEND:

ISS - IRON STAKE SET
ECM - EXISTING CONCRETE MARKER
EIP - EXISTING IRON PIPE
EN - EXISTING NAIL
MNS - MAG NAIL SET
EIS - EXISTING IRON STAKE
EPP - EXISTING PUMP PIPE
EIB - EXISTING IRON BAR
PPS - PUMP PIPE SET
NMC - NON-MONUMENTED CORNER
R/W - RIGHT OF WAY
EOP - EDGE OF PAVEMENT
EFP - EXISTING FENCE POST
CL - CENTERLINE
UP - UTILITY POLE
P.B. - PLAT BOOK
D.B. - DEED BOOK
PG. - PAGE
CMP - CORRUGATED METAL PIPE
CPP - CORRUGATED PLASTIC PIPE
RCP - REINFORCED CORRUGATED PIPE
MW - MONITORING WELL
SG - STREAM GAUGE
O NON-MONUMENTED CORNER
5/8" REBAR 30" IN LENGTH WITH 3-1/4"
● ALUMINUM CAPS ON ALL EASEMENT CORNERS. (SEE GENERAL NOTE No. 5)
———— CONSERVATION EASEMENT LINE
– – – – – TIE DOWN LINE
— — — RIGHT OF WAY LINE OR ADJOINER LINE
——— – ——— EASEMENT LINE
———x——— FENCE LINE
———E——— UTILITY LINE
10' WIDE MAINTENANCE AREA

CERTIFICATE OF OWNERSHIP (PIN: 1970-61-4531):

I (We) hereby certify that I am (we are) the owner(s) of the property (acquired by deed recorded in D.B. 177, PG. 325 and affected by instrument of combination recorded in D.B. 1920, PG. 769), shown and described hereon which is located in the subdivision jurisdiction of Watauga County and that I (we) hereby adopt this plan of Conservation Easement with my (our) free consent, as noted on this plat.

6/6/2022 Rebecca Ann Michael Daughtry
Date Rebecca Ann Michael Daughtry

6/6/2022
Date Ralph Earl Daughtry

CERTIFICATE OF OWNERSHIP (PIN: 1970-60-0665):

I (We) hereby certify that I am (we are) the owner(s) of the property (recombined by instrument recorded in D.B. 1799, PG. 66), shown and described hereon which is located in the subdivision jurisdiction of Watauga County and that I (we) hereby adopt this plan of Conservation Easement with my (our) free consent, as noted on this plat.

6/29/22 Gail Taylor
Date Gail Taylor

DEED REFERENCE(S):

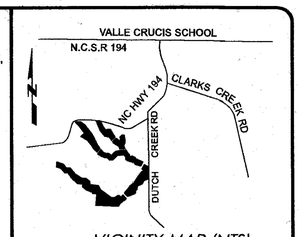
BEING A PORTION OF THE TRACTS RECORDED IN D.B. 197, PG. 766 AND D.B. 1920, PG. 769 OF THE WATAUGA COUNTY REGISTER OF DEEDS.

MAP REFERENCE(S):

P.B. 3, PG. 151
M.B. 18, PG. 41
P.B. 10, PG. 366
M.B. 22, PG. 277
P.B. 11, PG. 241
P.B. 25, PG. 467
M.B. 18, PG. 71

NCDOT REFERENCE(S):

D.B. 1523,PG. 187 (DRAINAGE EASEMENT)



VICINITY MAP (NTS)

CORNER DESCRIPTIONS

CORNER #	DESCRIPTION
(1) THRU (21)	5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. (SEE GENERAL NOTE No. 5)
(22)	0.5" O.D. IRON PIPE 0.6' ABOVE GRADE
(23)	WOODEN FENCE POST
(24) THRU (134)	5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. (SEE GENERAL NOTE No. 5)
(501)	No. 5 REBAR FLUSH WITH GRADE GRADE INSCRIBED WITH "K2 DESIGN CONTROL POINT" SUITABLE FOR GNSS OBSERVATION
(502)	0.5" O.D. IRON PIPE 0.2' ABOVE GRADE
(503)	No. 5 REBAR 1.0' ABOVE GRADE
(504)	No. 5 REBAR 0.4' ABOVE GRADE
(505)	0.5" O.D. IRON PIPE 0.6' ABOVE GRADE
(506)	0.5" O.D. IRON PIPE, LEANING 0.3' ABOVE GRADE

LINE DATA ALONG CONSERVATION EASEMENT AREA 1

LINE	BEARING	DISTANCE
L1	N50°36'23"E	93.44'
L2	N35°32'43"E	157.36'
L3	N58°45'54"E	99.56'
L4	N21°41'21"E	56.36'
L5	N69°13'46"W	20.41'
L6	N50°42'56"W	45.82'
L7	N54°14'01"E	72.56'
L8	S53°00'11"E	21.76'
L9	S74°19'19"E	57.88'
L10	S05°56'31"W	68.58'
L11	S04°38'40"W	152.23'
L12	S66°25'22"W	36.60'
L13	S23°52'14"W	155.28'
L14	S46°01'51"W	167.64'
L15	S50°55'01"W	166.16'
L16	N36°12'08"W	146.91'
L17	N37°52'02"E	172.47'

LINE DATA ALONG CONSERVATION EASEMENT AREAS 2 & 3

LINE	BEARING	DISTANCE
L18	S36°12'08"E	116.56'
L19	S71°47'13"W	58.06'
L20	S34°39'45"W	122.99'
L21	N87°22'18"W	447.87'
L22	N04°56'40"E	214.98'
L23	N04°56'40"E	89.35'
L24	N89°58'56"W	216.91'
L25	N53°34'09"W	53.19'
L26	N07°25'53"W	60.40'
L27	N83°29'40"W	99.60'
L28	N45°26'20"W	151.90'
L29	N36°26'16"W	107.91'
L30	N83°12'40"W	58.75'
L31	N42°44'58"W	112.54'
L32	N76°14'09"W	84.93'
L33	N05°40'56"E	59.19'
L34	S83°57'28"E	119.88'
L35	S42°23'03"E	81.78'
L36	S80°41'30"E	77.35'
L37	S38°02'59"E	105.29'
L38	S60°13'28"E	216.54'
L39	S88°45'17"E	39.94'
L40	S51°40'00"E	95.17'
L41	S00°00'00"E	52.95'
L42	S81°30'05"E	152.72'
L43	S81°27'25"E	86.50'
L44	S53°15'39"E	249.14'
L45	S87°06'30"E	54.75'
L46	N56°18'36"E	85.13'
L47	S60°58'36"E	61.55'
L48	N41°34'03"E	47.85'
L49	N89°59'05"W	67.11'
L50	N36°07'10"W	39.76'
L51	N68°35'13"W	95.11'
L52	N53°34'09"W	37.44'

LINE DATA ALONG CONSERVATION EASEMENT AREA 4

LINE	BEARING	DISTANCE
L53	N76°55'27"W	59.05'
L54	N52°50'19"W	50.79'
L55	N73°31'04"W	99.91'
L56	N62°17'16"W	57.66'
L57	N07°49'33"W	55.46'
L58	N48°38'38"W	46.21'
L59	S86°12'21"W	124.62'
L60	S41°32'05"W	78.52'
L61	S54°14'46"W	45.26'
L62	S85°42'16"W	47.80'
L63	N46°32'53"W	62.48'
L64	N78°03'36"W	59.51'
L65	N62°45'47"W	45.98'
L66	N60°29'08"W	10.00'
L67	S82°26'43"W	102.88'
L68	S69°31'46"W	64.20'
L69	S85°19'25"W	61.07'
L70	N55°59'04"W	54.87'
L71	N33°40'31"E	58.89'
L72	N76°21'25"E	147.32'
L73	N40°04'56"W	84.14'
L74	N30°24'05"W	78.93'
L75	N42°34'48"W	110.31'
L76	N57°48'15"W	138.48'
L77	N43°36'10"E	88.11'
L78	N36°32'00"W	125.41'
L79	N79°47'21"W	49.92'
L80	N46°15'13"W	99.82'
L81	N04°40'40"E	13.49'
L82	N76°11'05"E	43.58'
L83	N82°47'38"E	30.95'
L84	N88°46'25"E	54.74'
L85	S53°27'45"E	97.10'
L86	S37°37'52"E	199.25'
L87	S27°21'50"E	137.17'
L88	S31°23'59"E	105.58'
L89	S28°36'10"E	74.22'
L90	S45°02'09"E	100.86'
L91	S64°47'56"E	10.04'
L92	S64°47'56"E	31.33'
L93	S83°47'04"E	52.92'
L94	S61°01'22"E	65.91'
L95	N41°25'25"E	68.88'
L96	N60°38'40"E	39.77'
L97	N78°46'47"E	61.86'
L98	N08°47'09"W	10.00'
L99	N29°25'01"W	121.95'
L100	N58°49'57"W	49.31'
L101	N29°18'36"W	29.16'
L102	N20°21'09"W	10.30'
L103	N37°57'38"W	100.37'
L104	N82°27'00"W	81.45'
L105	N59°49'52"W	140.93'
L106	N23°10'00"W	164.82'
L107	S80°59'12"E	99.00'
L108	S23°37'46"E	65.09'
L109	S35°28'12"E	85.04'
L110	N63°12'00"E	45.65'
L111	S77°57'17"E	45.46'
L112	S32°33'07"E	200.65'
L113	S46°09'23"E	48.73'
L114	S45°21'25"E	12.70'
L115	S35°59'28"E	20.42'
L116	N89°55'11"E	24.57'
L117	N05°19'43"W	90.78'
L118	N46°12'31"E	43.65'
L119	S88°28'33"E	39.60'
L120	S12°28'24"E	111.78'
L121	S10°32'21"W	37.97'
L122	S24°57'46"W	55.54'
L123	S27°05'57"E	68.95'
L124	S27°05'57"E	10.59'
L125	S38°15'57"E	85.33'
L126A	S00°06'33"E	21.73'
L126B	S33°27'23"E	30.45'
L127	N89°37'46"E	59.16'
L128	S56°36'39"E	49.01'
L129	S33°37'02"E	18.15'
L130	S61°23'08"E	65.41'
L131	S04°18'00"E	33.87'
L132	N88°14'41"E	60.35'
L133	S60°54'03"E	73.39'
L134	S54°47'44"W	58.55'
L135	S84°05'00"W	43.88'

LINE DATA

LINE	BEARING	DISTANCE
L136	S82°15'19"W	45.50'
L137	N34°32'17"W	72.43'
L138	N30°14'23"E	78.95'
L139	S30°14'23"W	79.70'
L140	N82°10'15"E	118.40'
L141	S82°10'15"W	121.73'
L142	N82°39'07"E	104.80'
L143	S82°38'08"W	110.30'

GENERAL NOTES:

1) NO HORIZONTAL CONTROL EXISTS WITHIN 2000 FEET.
2) NOTE: NO ABSTRACT OF TITLE, NOR TITLE COMMITMENT, OR RESULTS OF TITLE SEARCH WERE FURNISHED TO THE SURVEYOR. ALL DOCUMENTS OF RECORD REVIEWED ARE NOTED HEREON (SEE REFERENCES). THERE MAY EXIST OTHER DOCUMENTS OF RECORD THAT MAY AFFECT THIS SURVEYED PARCEL.
3) ALL DISTANCES SHOWN ARE HORIZONTAL GROUND DISTANCES.
4) COORDINATES SHOWN ARE BASED ON LOCALIZED GROUND DISTANCES OTHER THAN ISS (501) SEE DATUM DESCRIPTION.
5) THE CONTRACTOR SHALL SET 5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. SURVEY CAPS SHALL MEET DMS SPECIFICATIONS (BERNTSEN RBD5325, IMPRINTED WITH NC STATE LOGO # B9087 OR EQUIVALENT). AFTER INSTALLATION, CAPS SHALL BE STAMPED WITH THE CORRESPONDING NUMBER FROM THE TABLE OF COORDINATES ON THE SURVEY.
6) ALL FENCES LOCATED IN THE CONSERVATION EASEMENTS WILL BE REMOVED (NOT SHOWN FOR CLARITY).

FEMA FLOOD STATEMENT:

THE PORTION OF THE AREA IS REPRESENTED BY THIS PLAT IS LOCATED IN A FLOOD HAZARD BOUNDARY ACCORDING TO FEMA MAP NUMBER(S) 3710197000J & 3710198000J, ZONE(S) X, AE, & FLOODWAY, DATED: DECEMBER 03, 2009.

CONSERVATION EASEMENT ACREAGE DATA:

CONSERVATION EASEMENT AREA 1	GAIL TAYLOR D.B. 1799 PG. 66, PIN: 1970-60-0665	2.36 ACRES±	12.98 ACRES±
CONSERVATION EASEMENT AREA 2	GAIL TAYLOR D.B. 1799 PG. 66, PIN: 1970-60-0665	4.68 ACRES±	
CONSERVATION EASEMENT AREA 4	GAIL TAYLOR D.B. 1799 PG. 66, PIN: 1970-60-0665	5.84 ACRES±	
CONSERVATION EASEMENT AREA 3	REBECCA ANN MICHAEL DAUGHTRY AND HUSBAND, RALPH EARL DAUGHTRY (D.B. 1920, PG. 769) PIN: 1970-61-4531	0.27 ACRES±	0.27 ACRES±
TOTAL CONSERVATION EASEMENT EXCLUDING ALL ACCESS EASEMENTS AND EXCLUDING ROAD R/W'S BY COORDINATE COMPUTATION			13.25 ACRES±

STATE OF NORTH CAROLINA
COUNTY OF WATAUGA

Filed for registration at_____ M._____ , 2022 in the Register of Deeds

Office. Recorded in P.B. _____ , PG._____.

_____ _____
Register of Deeds By

STATE OF NORTH CAROLINA
COUNTY OF WATAUGA

I, Larry Warren , Review Officer of Watauga County, certify that the map or plat to which this certification is affixed meets all statutory requirements for recording.

6/30/22 Larry Warren
Date Review Officer

SURVEYORS CERTIFICATION(S)

Surveyor's disclaimer: No attempt was made to locate any cemeteries, wetlands, hazardous material sites, underground utilities or any other features above, or below ground other than those shown. However, no visible evidence of cemeteries or utilities, aboveground or otherwise, was observed by the undersigned (other than those shown).

I certify that the survey is of another category such as the recombination of existing parcels, a court-ordered survey, or other exception to the definition of subdivision (conservation easement).

I, JOHN A. RUDOLPH, certify that this plat was drawn under my supervision from an actual survey made under my supervision (deed description recorded in Book SEE , Page REFS , etc.) (other); that the boundaries not surveyed are clearly indicated as drawn from information found in Book____, page____; that the ratio of precision or positional accuracy as calculated is 1/10,000+; that this plat was prepared in accordance with G.S. 47-30 as amended. Witness my original signature, license number and seal this 25th day of May, A.D., 2022.

SEAL OR STAMP

NORTH CAROLINA PROFESSIONAL SEAL L-4194 LAND SURVEYOR JOHN ASHLEY RUDOLPH

L-4194
Professional Land Surveyor License Number

FIRM LICENSE No C-211 K2 DESIGN GROUP, P.A. CORPORATE SEAL 2000 NORTH CAROLINA

DRAWN BY:	FGR
DATE:	05/25/22
DWG. NO.:	RSS528MR21
SURVEYED BY:	J.A.R.

k2 design group
774 S. Beston Road
La Grange, NC 28551
252.582.3097
www.k2designgroup.com

FILED Amy J. Shook
Register of Deeds, Watauga Co, NC
Fee Amt: $42.00

Bk 29 Pg 42 (2)
Recorded: 06/30/2022 at 10:40:54 AM
Doc No: 721906 Kind: PLAT
721906

RESTORATION SYSTEMS, LLC
1101 HAYNES STREET
SUITE 211
RALEIGH, NC 27604

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PLAT IS BASED ON NORTH CAROLINA STATE PLANE COORDINATES ESTABLISHED BY USING THE ONLINE POSITIONING USER SERVICE (OPUS) PROVIDED BY THE NATIONAL GEODETIC SURVEY.

ISS (501) NC GRID COORDINATES NAD 83 (2011)
N=901,103.8244'
E=1,176,853.8011'

THE AVERAGE COMBINED GRID FACTOR USED ON THIS PLAT IS 0.99997684 (GROUND TO GRID). THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM ISS (501) TO ISS (1) IS S 63°26'34" E 72.93 FEET.

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES.

GEOID-2012B CONUS

GNSS RECEIVER - TOPCON HIPER V WITH MINIMUM TIME OF 2+ HOURS COMPLETED ON 09/15/21

THE FOLLOWING BASE STATIONS WERE USED:

PID	DESIGNATION	LATITUDE (m)	LONGITUDE (m)
DL2080	TN18 TDOT DISTRICT 18 CORS ARP	N362157.004	W0821042.248
DF4365	ASUB ASU-BOONE CORS ARP	N361250.844	W0814054.647
DL2082	NCWJ WEST JEFFERSON CORS ARP	N361239.852	W0814644.703

SHEET 1 OF 2

CONSERVATION EASEMENT FOR THE STATE OF NORTH CAROLINA DIVISION OF MITIGATION SERVICES OVER A PORTION OF THE LANDS OF GAIL TAYLOR (D.B. 1799, PG. 66) DMS FILE No. 95-LA-292 AND REBECCA ANN MICHAEL DAUGHTRY AND HUSBAND, RALPH EARL DAUGHTRY (D.B. 1920, PG. 769) DMS FILE No. 95-LA-291 DMS PROJECT ID# 100205 VALLE CRUCIS

SHAWNEEHAW TOWNSHIP WATAUGA COUNTY NORTH CAROLINA

(THE FIELD SURVEY TOOK PLACE DURING SEPTEMBER & OCTOBER 2021)

200 100 0 200 400 600

GRAPHIC SCALE 1" = 200'

STATE OF NORTH CAROLINA
COUNTY OF WATAUGA

Filed for registration at_____ M._____ , 2022 in the Register of Deeds

Office. Recorded in P.B. _____ , PG_____.

_____ _____
Register of Deeds By

LEGEND:

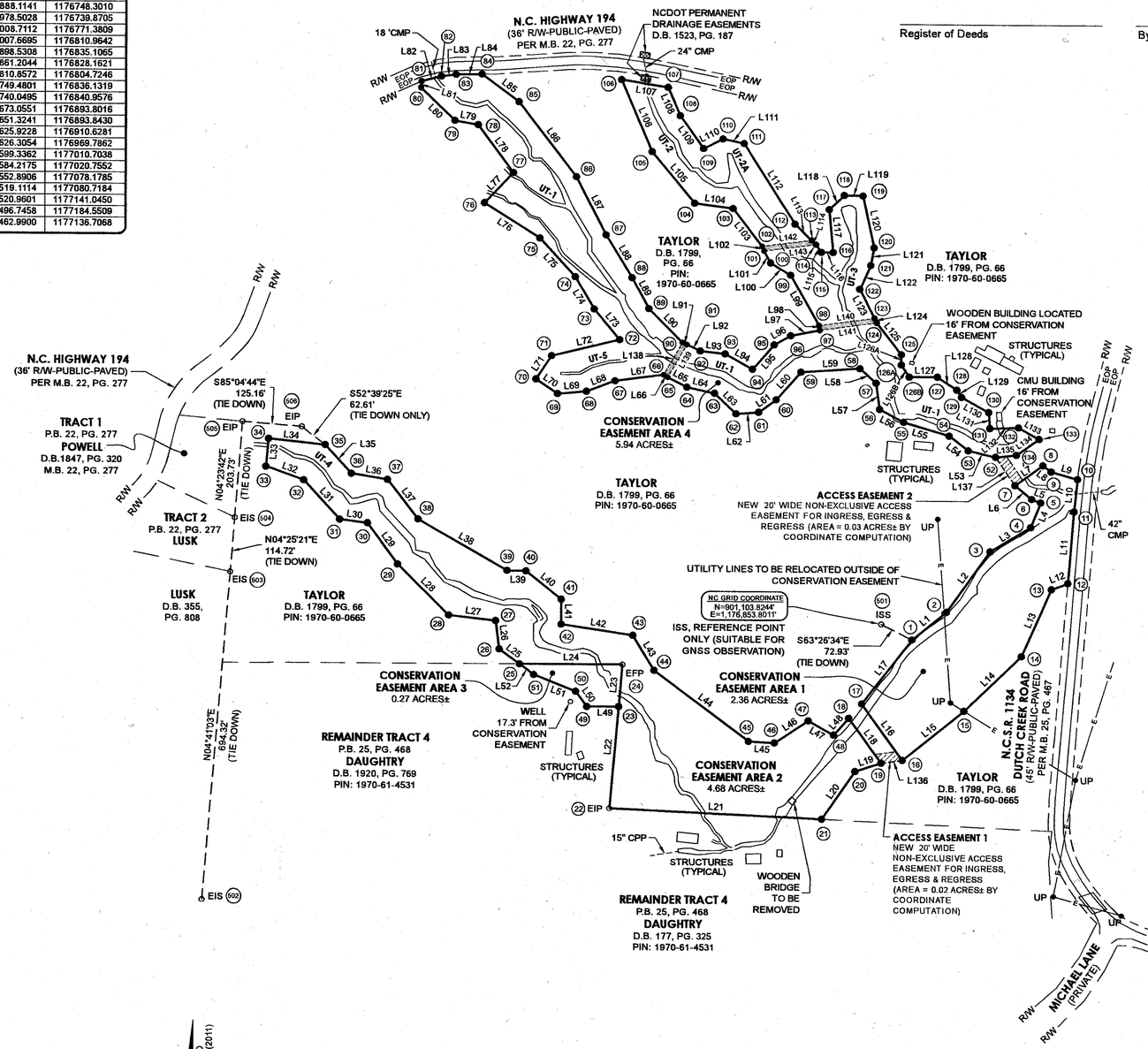
ISS - IRON STAKE SET
ECM - EXISTING CONCRETE MARKER
EIP - EXISTING IRON PIPE
EN - EXISTING NAIL
MNS - MAG NAIL SET
EIS - EXISTING IRON STAKE
EPP - EXISTING PUMP PIPE
EIB - EXISTING IRON BAR
PPS - PUMP PIPE SET
NMC - NON-MONUMENTED CORNER
R/W - RIGHT OF WAY
EOP - EDGE OF PAVEMENT
EFP - EXISTING FENCE POST
CL - CENTERLINE
UP - UTILITY POLE
P.B. - PLAT BOOK
D.B. - DEED BOOK
PG. - PAGE
CMP - CORRUGATED METAL PIPE
CPP - CORRUGATED PLASTIC PIPE
RCP - REINFORCED CORRUGATED PIPE
MW - MONITORING WELL
SG - STREAM GAUGE
○ NON-MONUMENTED CORNER
5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. (SEE GENERAL NOTE No. 5)
CONSERVATION EASEMENT LINE
TIE DOWN LINE
RIGHT OF WAY LINE OR ADJOINER LINE
EASEMENT LINE
FENCE LINE
UTILITY LINE
10' WIDE MAINTENANCE AREA

LOCALIZED PROJECT COORDINATES ALONG CONSERVATION EASEMENTS

POINT	NORTHING	EASTING
1	901071.2198	1176919.0328
2	901130.5186	1176991.2408
3	901258.5528	1177082.7191
4	901310.1795	1177167.8473
5	901362.5494	1177188.6764
6	901369.7885	1177169.5900
7	901398.8006	1177134.1243
8	901441.2080	1177192.9964
9	901428.1112	1177210.3783
10	901412.4711	1177266.1019
11	901344.2560	1177259.0022
12	901192.5232	1177246.6753
13	901179.6583	1177212.4074
14	901037.6570	1177149.5682
15	900921.2664	1177028.9125
16	900816.5146	1176899.9375
17	900935.0652	1176813.1647
18	900904.4432	1176786.0083
19	900810.3834	1176854.8551
20	900792.2362	1176799.7021
21	900691.0763	1176729.7539
22	900711.6151	1176282.3541
23	900925.7996	1176300.8836
24	901014.8221	1176308.5851
25	901014.8891	1176091.6736
26	901046.4774	1176048.8766
27	901106.3732	1176041.0641
28	901117.6579	1175942.1057
29	901224.2403	1175833.8774
30	901311.0568	1175769.7825
31	901318.0013	1175711.4491
32	901400.6402	1175635.0602
33	901429.3609	1175555.1286
34	901488.2584	1175560.9889
35	901475.6402	1175680.1991
36	901415.2348	1175735.3264
37	901402.7235	1175811.6575
38	901319.8085	1175876.5539
39	901212.2760	1176064.5016
40	901211.4079	1176104.4321
41	901152.3801	1176179.0849
42	901099.4287	1176179.0849
43	901076.8593	1176330.1266
44	901003.0746	1176375.2655
45	900854.0429	1176574.9213
46	900851.2806	1176629.6057
47	900898.5028	1176700.4391
48	900868.6417	1176754.2585
49	900925.8176	1176233.7724
50	900957.9357	1176210.3349
51	900962.6579	1176121.7932
52	901458.4666	1177093.0588
53	901471.8268	1177035.5374
54	901502.5070	1176995.0611
55	901530.8544	1176899.2527
56	901557.6695	1176848.2038
57	901612.6174	1176840.6517
58	901643.1488	1176805.9670
59	901634.9023	1176681.6180
60	901576.1234	1176629.5514
61	901549.6804	1176592.8250
62	901546.1002	1176545.1597
63	901589.0690	1176499.8038
64	901601.3805	1176441.5829
65	901622.4234	1176400.7027
66	901627.3502	1176391.9997
67	901613.8244	1176290.0138
68	901591.3724	1176229.8694
69	901586.2877	1176169.0159
70	901616.8828	1176123.5350
71	901665.8890	1176156.1876
72	901700.7379	1176299.3527
73	901765.1129	1176245.1779
74	901833.1903	1176205.2351
75	901914.4185	1176130.5945
76	901988.2032	1176013.4070
77	902052.0053	1176074.1709
78	902152.7704	1175999.5180
79	902161.6201	1175950.3862
80	902230.6407	1175878.2768
81	902244.0867	1175879.3771
82	902254.4923	1175921.6927
83	902258.3747	1175952.3882
84	902259.5464	1176007.1262
85	902201.7385	1176085.1423
86	902043.9301	1176206.8079
87	901922.1120	1176269.8548
88	901831.9915	1176324.8637
89	901766.8329	1176360.3935
90	901695.5560	1176431.7596
91	901691.2815	1176440.8428
92	901677.9430	1176469.1871
93	901672.2139	1176521.7913
94	901640.2843	1176579.4479
95	901691.9336	1176625.0208
96	901711.4311	1176659.6865
97	901723.4671	1176720.3600
98	901751.0144	1176703.6797
99	901839.5127	1176658.8095
100	901865.0322	1176616.6177
101	901890.4631	1176602.3407
102	901900.1229	1176598.7573
103	901979.2598	1176537.0162
104	901989.9612	1176456.2767
105	902098.1836	1176366.0093
106	902249.7176	1176301.1661
107	902234.2072	1176398.9469
108	902174.5724	1176425.0371
109	902105.3154	1176474.3827
110	902125.8987	1176515.1309
111	902116.4127	1176559.5857
112	901947.2843	1176667.5478

LOCALIZED PROJECT COORDINATES ALONG CONSERVATION EASEMENTS

113	901913.5265	1176702.6964
114	901904.6015	1176711.7333
115	901888.0797	1176723.7332
116	901888.1141	1176748.3010
117	901978.5028	1176739.8705
118	902008.7112	1176771.3809
119	902007.6695	1176810.9642
120	901898.5308	1176835.1065
121	901861.2044	1176828.1621
122	901810.8572	1176804.7246
123	901749.4801	1176836.1319
124	901740.0495	1176840.9576
125	901673.0551	1176893.8016
126A	901651.3241	1176893.8430
126B	901625.9228	1176910.6281
127	901626.3054	1176969.7862
128	901589.3362	1177010.7038
129	901584.2175	1177020.7552
130	901552.8906	1177078.1785
131	901519.1114	1177080.7184
132	901520.9601	1177141.0450
133	901496.7458	1177184.5509
134	901462.9900	1177136.7068



LINE DATA ALONG CONSERVATION EASEMENT AREA 1

LINE	BEARING	DISTANCE
L1	N50°36'23"E	93.44'
L2	N35°32'43"E	157.36'
L3	N58°45'54"E	99.56'
L4	N21°41'21"E	56.36'
L5	N69°13'46"W	20.41'
L6	N50°42'56"W	45.82'
L7	N54°14'01"E	72.56'
L8	S53°00'11"E	21.76'
L9	S74°19'19"E	57.88'
L10	S05°56'31"W	68.58'
L11	S04°38'40"W	152.23'
L12	S69°25'22"W	36.60'
L13	S23°52'14"W	155.28'
L14	S46°01'51"W	167.64'
L15	S50°55'01"W	166.16'
L16	N36°12'08"W	146.91'
L17	N37°52'02"E	172.47'

LINE DATA ALONG CONSERVATION EASEMENT AREAS 2 & 3

LINE	BEARING	DISTANCE
L18	S36°12'08"E	116.56'
L19	S71°47'13"W	58.06'
L20	S34°39'45"W	122.99'
L21	N87°22'18"W	447.87'
L22	N04°56'40"E	214.98'
L23	N04°56'40"E	89.35'
L24	N89°58'56"W	216.91'
L25	N53°34'09"W	53.19'
L26	N07°25'53"W	60.40'
L27	N83°29'40"W	99.60'
L28	N45°26'20"W	151.90'
L29	N36°26'16"W	107.91'
L30	N83°12'40"W	58.75'
L31	N42°44'58"W	112.54'
L32	N70°14'09"W	84.93'
L33	N05°40'56"E	59.19'
L34	S83°57'28"E	119.88'
L35	S42°23'03"E	81.78'
L36	S80°41'30"E	77.35'
L37	S38°02'59"E	105.29'
L38	S60°13'28"E	216.54'
L39	S88°45'17"E	39.94'
L40	S51°40'00"E	95.17'
L41	S00°00'00"E	52.95'
L42	S81°30'05"E	152.72'
L43	S31°27'25"E	86.50'
L44	S53°15'39"E	249.14'
L45	S87°06'30"E	54.75'
L46	N58°18'36"E	85.13'
L47	S60°58'36"E	61.55'
L48	N41°34'03"E	47.85'
L49	N89°59'05"W	67.11'
L50	N36°07'10"W	39.76'
L51	N68°35'13"W	95.11'
L52	N53°34'09"W	37.44'

LINE DATA

LINE	BEARING	DISTANCE
L136	S82°15'19"W	45.50'
L137	N34°32'17"W	72.43'
L138	N30°14'23"E	78.95'
L139	S30°14'23"W	79.70'
L140	N82°10'15"E	118.40'
L141	S82°10'15"W	121.73'
L142	N82°39'07"E	104.80'
L143	S82°38'08"W	110.30'

LINE DATA ALONG CONSERVATION EASEMENT AREA 4

LINE	BEARING	DISTANCE
L53	N76°55'27"W	59.05'
L54	N52°50'19"W	50.79'
L55	N73°31'04"W	99.91'
L56	N62°17'16"W	57.66'
L57	N07°49'33"W	55.46'
L58	N48°38'38"W	46.21'
L59	S86°12'21"W	124.62'
L60	S41°32'05"W	78.52'
L61	S54°14'46"W	45.26'
L62	S85°42'16"W	47.80'
L63	N46°32'53"W	62.48'
L64	N78°03'36"W	59.51'
L65	N62°45'47"W	45.98'
L66	N60°29'08"W	10.00'
L67	S82°26'43"W	102.88'
L68	S69°31'46"W	64.20'
L69	S85°13'25"W	61.07'
L70	N65°59'04"W	54.87'
L71	N33°40'31"E	58.89'
L72	N76°21'25"E	147.32'
L73	N40°04'56"W	84.14'
L74	N30°24'05"W	78.93'
L75	N42°34'48"W	110.31'
L76	N57°48'15"W	138.48'
L77	N43°36'10"E	88.11'
L78	N36°32'00"W	125.41'
L79	N79°47'21"W	49.82'
L80	N46°15'13"W	99.82'
L81	N04°40'40"E	13.49'
L82	N76°11'05"E	43.58'
L83	N82°47'38"E	30.95'
L84	N88°46'25"E	54.74'
L85	S53°27'45"E	216.91'
L86	S37°37'52"E	199.26'
L87	S27°21'50"E	137.17'
L88	S31°23'59"E	105.58'
L89	S28°36'10"E	74.22'
L90	S45°02'00"E	100.86'
L91	S64°47'56"E	10.04'
L92	S64°47'56"E	31.33'
L93	S83°47'04"E	52.92'
L94	S61°01'22"E	65.91'
L95	N41°25'25"E	68.88'
L96	N60°38'40"E	39.77'
L97	N78°46'47"E	61.86'
L98	N08°47'09"W	10.00'
L99	N29°29'01"W	121.95'
L100	N58°49'57"W	49.31'
L101	N29°18'36"W	28.16'
L102	N20°21'39"W	10.30'
L103	N37°57'38"W	100.37'
L104	N82°27'00"W	81.45'
L105	N39°49'52"W	140.93'
L106	N23°10'00"W	164.82'
L107	S80°59'12"E	99.00'
L108	S23°37'46"E	65.09'
L109	S35°28'12"E	85.04'
L110	N63°12'00"E	45.65'
L111	S77°57'17"E	45.46'
L112	S32°33'07"E	200.65'
L113	S46°09'23"E	48.73'
L114	S45°21'25"E	12.70'
L115	S35°59'28"E	20.42'
L116	N89°55'11"E	24.57'
L117	N05°19'43"W	90.78'
L118	N46°12'31"E	43.65'
L119	S88°29'33"E	39.60'
L120	S12°28'24"E	111.78'
L121	S10°32'21"W	37.97'
L122	S24°57'46"W	55.54'
L123	S27°05'57"E	68.95'
L124	S27°05'57"E	10.59'
L125	S38°15'57"E	85.33'
L126A	S00°06'33"E	21.73'
L126B	S33°27'23"E	30.45'
L127	N89°37'46"E	59.16'
L128	S56°36'39"E	49.01'
L129	S33°37'02"E	18.15'
L130	S61°23'08"E	65.41'
L131	S04°18'00"E	33.87'
L132	N88°14'41"E	60.35'
L133	S60°54'03"E	73.39'
L134	S54°47'44"W	58.55'
L135	S84°05'00"W	43.88'

SHEET 2 OF 2

CONSERVATION EASEMENT FOR THE STATE OF NORTH CAROLINA DIVISION OF MITIGATION SERVICES OVER A PORTION OF THE LANDS OF GAIL TAYLOR (D.B. 1799, PG. 66) DMS FILE No. 95-LA-292 AND REBECCA ANN MICHAEL DAUGHTRY AND HUSBAND, RALPH EARL DAUGHTRY (D.B. 1920, PG. 769) DMS FILE No. 95-LA-291 DMS PROJECT ID# 100205

VALLE CRUCIS

SHAWNEEHAW TOWNSHIP WATAUGA COUNTY NORTH CAROLINA

(THE FIELD SURVEY TOOK PLACE DURING SEPTEMBER & OCTOBER 2021)

200 100 0 200 400 600

GRAPHIC SCALE 1" = 200'

NORTH CAROLINA PROFESSIONAL SEAL L-4194 LAND SURVEYOR JOHN ASHLEY RUDOLPH

5/23/22

Bk 29 Pg 43

Doc No: 721906 Kind: PLAT

State of North Carolina
County of Watauga

I, Larry Warren, Review Officer of Watauga County, certify that the map or plat to which this certification is affixed meets all statutory requirements for recording.

Review Officer Date 6/30/22

FILED Amy J. Shook
Register of Deeds, Watauga Co, NC
Fee Amt: $26.00
NC Excise Tax: $649.00

Bk 2285 Pg 562 (13)
Recorded: 07/08/2022 at 04:14:39 PM
Doc No: 722193 Kind: DEED

722193

RETURN TO: CLEMENT LAW OFFICE

Excise Tax $649.00
STATE OF NORTH CAROLINA

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

WATAUGA COUNTY

SPO File Number: 95-LA-292
DMS Project Number: 100205

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 8 day of July, 2022, by Gail Taylor, widower ("**Grantor**"), whose mailing address is 138 Dutch Creek Road, Banner Elk, NC 28604, to the State of North Carolina, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Division of Mitigation Services (formerly known as the Ecosystem Enhancement Program and Wetlands Restoration Program) within the Department of Environmental Quality (formerly Department of Environment and Natural Resources), for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between Restoration Systems, LLC, a North Carolina limited liability company, 1101 Hayes Street, Suite 211, Raleigh, NC 27604 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 200104-01.

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

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

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

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

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

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

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in Shawneehaw Township, Watauga County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately 37.50 acres and being conveyed to the Grantor by deed(s) as recorded in **Deed Book 197 at Page 766** and in **Deed Book 1612 at Page 467** of the Watauga County Registry, North Carolina (being the same property as recombined by Instrument of Combination in **Deed Book 1799 at Page 66** of the Watauga 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 Dutch Creek.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement and Right of Access together with an access easement to and from the Conservation Easement Area described below.

The Conservation Easement Area consists of the following:

"Conservation Easement Area 1", containing approximately **2.36 acres**, "Conservation Easement Area 2", containing approximately **4.68 acres**, and "Conservation Easement Area 4", containing approximately **5.94 acres**, containing a total of approximately **12.98 acres**, as shown on plat of survey titled "Conservation Easement for State of North Carolina Division of Mitigation Services over a Portion of the Lands of Gail Taylor (D.B. 1799, Pg. 66), DMS File No. 95-LA-292, and Rebecca Ann Michael Daughtry and Husband, Ralph Earl Daughtry (D.B. 1920, Pg. 769), DMS File No. 95-LA-291, DMS Project ID #100205, Valle Crucis," dated May 25, 2022, by John A. Rudolph, PLS Number L-4194, K2 Design Group, and recorded in the Watauga County, North Carolina Register of Deeds at Plat Book 29, Pages 42-43.

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

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

I. DURATION OF EASEMENT

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

II. ACCESS EASEMENT

Grantor hereby grants and conveys unto Grantee, its employees, agents, successors and assigns, a perpetual, non-exclusive easement for ingress and egress over and upon the Property at all reasonable times and at the locations more particularly described as new, non-exclusive access easements labeled as "Access Easement 1" and "Access Easement 2" on **Exhibit A** ("Access Easement") attached hereto and incorporated herein by this reference, to access the Conservation Easement Area for the purposes set forth herein. This grant of easement shall not vest any rights in the public and shall not be construed as a public dedication of the Access Easement. Grantor covenants, represents and warrants that it is the sole owner of and is seized of the Property in fee simple and has the right to grant and convey this Access Easement.

III. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

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

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

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

C. **Educational Uses.** The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including 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.

IV. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees, agents, successors and assigns, shall have a perpetual Right of Access over and upon the Conservation Easement Area to undertake or engage in any activities necessary to construct, maintain, manage, enhance, repair, restore, protect, monitor and inspect the stream, wetland and any other riparian resources in the Conservation Easement Area for the purposes set forth herein or any long-term management plan for the Conservation Easement Area developed pursuant to this Conservation Easement.

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

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

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

area for the purpose of restricting livestock access. In such cases, the landowner (Grantor) must provide access to the State (Grantee) to make repairs.

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

V. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

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

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

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor,

including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

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

VI. MISCELLANEOUS

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

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

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

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

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

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

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

and

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

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

VII. QUIET ENJOYMENT

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

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

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

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

Gail Taylor (SEAL)

NORTH CAROLINA
COUNTY OF Watauga

I, Jessica W. Harris, a Notary Public in and for the County and State aforesaid, do hereby certify that Gail Taylor, 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 8 day of July, 2022.

Jessica W. Harris
Notary Public

JESSICA W. HARRIS
NOTARY PUBLIC
Watauga County, North Carolina
My Commission Expires July 24, 2023

My commission expires:

July 24, 2023

Exhibit A
Legal Description

Conservation Easement Area 1

BEING ALL OF Conservation Easement Area 1 of the Valle Crucis Site over a portion of the land of Taylor (PIN No 1970-60-0665), lying and being situated in Shawneehaw Township, Watauga County, North Carolina and particularly described as follows (all distances are ground distances unless otherwise noted):

Beginning at an iron stake (Point of Beginning) labeled as Point No. 1 and being a corner on the Conservation Easement Area 1 and being located South 63°26'34" East 72.93' feet from an iron stake (Point No. 501) with N.C. Grid Coordinates N=901,103.8244' E=1,176,853.8011' (NAD '83, 2011).

Thence from the Point of Beginning (Point No.1), North 50°36'31" East 93.44' to an iron stake; thence North 35°32'43" East 157.36' to an iron stake; thence North 58°45'54" East 99.56' to an iron stake; thence North 21°41'21" East 56.36' to an iron stake; thence North 69°13'46" West 20.41' to an iron stake; thence North 50°42'56" West 45.82' to an iron stake; thence North 54°14'01" East 72.56' to an iron stake; thence South 53°00'11" East 21.76' to an iron stake; thence South 74°19'19" East 57.88' to an iron stake; thence South 05°56'31" West 68.58' to an iron stake; thence South 04°38'40" West 152.23' to an iron stake; thence South 69°25'22" West 36.60' to an iron stake; thence South 23°52'14" West 155.28' to an iron stake; thence South 46°01'51" West 167.64' to an iron stake; thence South 50°55'01" West 166.16' to an iron stake; thence North 36°12'08" West 146.91' to an iron stake; thence North 37°52'02" East 172.47' to an iron stake, which is the point of beginning (Point No. 1), having an area of approximately 2.36 acres.

Conservation Easement Area 2

BEING ALL OF Conservation Easement Area 2 of the Valle Crucis Site over a portion of the land of Taylor (PIN No 1970-60-0665), lying and being situated in Shawneehaw Township, Watauga County, North Carolina and particularly described as follows (all distances are ground distances unless otherwise noted):

Beginning at an iron stake (Point of Beginning) labeled as Point No.18 and being a corner on the Conservation Easement Area 2 and being located South 18°46'44" West 210.59' feet from an iron stake (Point No. 501) with N.C. Grid Coordinates N=901,103.8244' E=1,176,853.8011' (NAD '83, 2011).

Thence from the Point of Beginning (Point No. 18), South 36°12'08" East 116.56' to an iron stake; thence South 71°47'13" West 58.06' to an iron stake; thence South 34°39'45" West 122.99' to an iron stake; thence North 87°22'18" West 447.87' to an iron stake; thence North 04°56'40" East 214.98' to an iron stake; thence North 04°56'40" East 89.35' to an iron stake; thence North 89°58'56" West 216.91' to an iron stake; thence North 53°34'09" West 53.19' to an iron stake;

thence North 07°25'53" West 60.40' to an iron stake; thence North 83°29'40" West 99.60' to an iron stake; thence North 45°26'20" West 151.90' to an iron stake; thence North 36°26'16" West 107.91' to an iron stake; thence North 83°12'40" West 58.75' to an iron stake; thence North 42°44'58" West 112.54' to an iron stake; thence North 70°14'09" West 84.93' to an iron stake; thence North 05°40'56" East 59.19' to an iron stake; thence South 83°57'28" East 119.88' to an iron stake; thence South 42°23'03" East 81.78' to an iron stake; thence South 80°41'30" East 77.35' to an iron stake; thence South 38°02'59" East 105.29' to an iron stake; thence South 60°13'28" East 216.54' to an iron stake; thence South 88°45'17" East 39.94' to an iron stake; thence South 51°40'00" East 95.17' to an iron stake; thence South 00°00'00" East 52.95' to an iron stake; thence South 81°30'05" East 152.72' to an iron stake; thence South 31°27'25" East 86.50' to an iron stake; thence South 53°15'39" East 249.14' to an iron stake; thence South 87°06'30" East 54.75' to an iron stake; thence North 56°18'36" East 85.13' to an iron stake; thence South 60°58'36" East 61.55' to an iron stake; thence North 41°34'03" East 47.85' to an iron stake, which is the point of beginning (Point No. 18), having an area of 4.68 approximately acres.

Conservation Easement Area 4

BEING ALL OF Conservation Easement Area 4 of the Valle Crucis Site over a portion of the land of Taylor (PIN No 1970-60-0665), lying and being situated in Shawneehaw Township, Watauga County, North Carolina and particularly described as follows (all distances are ground distances unless otherwise noted):

Beginning at an iron stake (Point of Beginning) labeled as Point No. 52 and being a corner on the Conservation Easement Area 4 and being located North 34°00'19" East 427.80' feet from an iron stake (Point No. 501) with N.C. Grid Coordinates N=901,103.8244'E=1,176,853.8011' (NAD '83, 2011).

Thence from the Point of Beginning (Point No. 52), North 76°55'27" West 59.05' to an iron stake; thence North 52°50'19" West 50.79' to an iron stake; thence North 73°31'04" West 99.91' to an iron stake; thence North 62°17'16" West 57.66' to an iron stake; thence North 07°49'33" West 55.46' to an iron stake; thence North 48°38'38" West 46.21' to an iron stake; thence South 86°12'21" West 124.62' to an iron stake; thence South 41°32'05" West 78.52' to an iron stake; thence South 54°14'46" West 45.26' to an iron stake; thence South 85°42'16" West 47.80' to an iron stake; thence North 46°32'53" West 62.48' to an iron stake; thence North 78°03'36" West 59.51' to an iron stake; thence North 62°45'47" West 45.98' to an iron stake; thence North 60°29'08" West 10.00' to an iron stake; thence South 82°26'43" West 102.88' to an iron stake; thence South 69°31'46" West 64.20' to an iron stake; thence South 85°13'25" West 61.07' to an iron stake; thence North 55°59'04" West 54.87' to an iron stake; thence North 33°40'31" East 58.89' to an iron stake; thence North 76°21'25" East 147.32' to an iron stake; thence North 40°04'56" West 84.14' to an iron stake; thence North 30°24'05" West 78.93' to an iron stake; thence North 42°34'48" West 110.31' to an iron stake; thence North 57°48'15" West 138.48' to an iron stake; thence North 43°36'10" East 88.11' to an iron stake; thence North 36°32'00" West 125.41' to an iron stake; thence North 79°47'21" West 49.92' to an iron stake; thence North 46°15'13" West 99.82' to an iron stake; thence North 04°40'40" East 13.49' to an iron stake; thence North 76°11'05" East 43.58' to an iron stake; thence North 82°47'38" East 30.95' to an iron stake; thence North

88°46'25" East 54.74' to an iron stake; thence South 53°27'45" East 97.10' to an iron stake; thence South 37°37'52" East 199.26' to an iron stake; thence South 27°21'50" East 137.17' to an iron stake; thence South 31°23'59" East 105.58' to an iron stake; thence South 28°36'10" East 74.22' to an iron stake; thence South 45°02'09" East 100.86' to an iron stake; thence South 64°47'56" East 10.04' to an iron stake; thence South 64°47'56" East 31.33' to an iron stake; thence South 83°47'04" East 52.92' to an iron stake; thence South 61°01'22" East 65.91' to an iron stake; thence North 41°25'25" East 68.88' to an iron stake; thence North 60°38'40" East 39.77' to an iron stake; thence North 78°46'47" East 61.86' to an iron stake; thence North 08°47'09" West 10.00' to an iron stake; thence North 29°29'01" West 121.95' to an iron stake; thence North 58°49'57" West 49.31' to an iron stake; thence North 29°18'36" West 29.16' to an iron stake; thence North 20°21'09" West 10.30' to an iron stake; thence North 37°57'38" West 100.37' to an iron stake; thence North 82°27'00" West 81.45' to an iron stake; thence North 39°49'52" West 140.93' to an iron stake; thence North 23°10'00" West 164.82' to an iron stake; thence South 80°59'12" East 99.00' to an iron stake; thence South 23°37'46" East 65.09' to an iron stake; thence South 35°28'12" East 85.04' to an iron stake; thence North 63°12'00" East 45.65' to an iron stake; thence South 77°57'17" East 45.46' to an iron stake; thence South 32°33'07" East 200.65' to an iron stake; thence South 46°09'23" East 48.73' to an iron stake; thence South 45°21'25" East 12.70' to an iron stake; thence South 35°59'28" East 20.42' to an iron stake; thence North 89°55'11" East 24.57' to an iron stake; thence North 05°19'43" West 90.78' to an iron stake; thence North 46°12'31" East 43.65' to an iron stake; thence South 88°29'33" East 39.60' to an iron stake; thence South 12°28'24" East 111.78' to an iron stake; thence South 10°32'21" West 37.97' to an iron stake; thence South 24°57'46" West 55.54' to an iron stake; thence South 27°05'57" East 68.95' to an iron stake; thence South 27°05'57" East 10.59' to an iron stake; thence South 38°15'57" East 85.33' to an iron stake; thence South 00°06'33" East 21.73' to an iron stake; thence South 33°27'23" East 30.45' to an iron stake; thence North 89°37'46" East 59.16' to an iron stake; thence South 56°36'39" East 49.01' to an iron stake; thence South 33°37'02" East 18.15' to an iron stake; thence South 61°23'08" East 65.41' to an iron stake; thence South 04°18'00" East 33.87' to an iron stake; thence North 88°14'41" East 60.35' to an iron stake; thence South 60°54'03" East 49.79' to an iron stake; thence South 54°47'44" West 58.55' to an iron stake; thence South 84°05'00" West 43.88' to an iron stake which is the point of beginning (Point No. 52), having an area of approximately 5.94 acres.

ALL OF THE FOREGOING CONSERVATION EASEMENT AREAS as shown on plat of survey titled "Conservation Easement for State of North Carolina Division of Mitigation Services over a Portion of the Lands of Gail Taylor (D.B. 1799, Pg. 66), DMS File No. 95-LA-292, and Rebecca Ann Michael Daughtry and Husband, Ralph Earl Daughtry (D.B. 1920, Pg. 769), DMS File No. 95-LA-291, DMS Project ID #100205, Valle Crucis," dated May 25, 2022, by John A. Rudolph, PLS Number L-4194, K2 Design Group, and recorded in the Watauga County, North Carolina Register of Deeds at Plat Book 29, Pages 42-43.

AND SUCH CONSERVATION EASEMENT AREAS TOGETHER WITH those certain new non-exclusive access easements labeled as "Access Easement 1" and "Access Easement 2", for ingress, egress, and regress, and as shown and more particularly described on the foregoing described plat of survey recorded in the Watauga County, North Carolina Register of Deeds at Plat Book 29, Pages 42-43.

FILED Amy J. Shook
Register of Deeds, Watauga Co, NC
Fee Amt: $26.00
NC Excise Tax: $11.00

Bk 2285 Pg 575 (11)
Recorded: 07/08/2022 at 04:14:40 PM
Doc No: 722194 Kind: DEED

722194

RETURN TO: CLEMENT LAW OFFICE

Excise Tax $11.00
STATE OF NORTH CAROLINA

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

WATAUGA COUNTY

SPO File Number: 95-LA-291
DMS Project Number: 100205

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 8th day of July, 2022, by Ralph Daughtry and Rebecca Daughtry, husband and wife (collectively, the "**Grantor**"), whose mailing address is 346 Dutch Creek Road, Banner Elk, NC 28604, to the State of North Carolina ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Division of Mitigation Services (formerly known as the Ecosystem Enhancement Program and Wetlands Restoration Program) within the Department of Environmental Quality (formerly Department of Environment and Natural Resources), for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between Restoration Systems, LLC, a North Carolina limited liability company, 1101 Hayes Street, Suite 211, Raleigh, NC 27604, 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 200104-01.

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

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

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

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

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

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

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in Shawneehaw Township, Watauga County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately 14.52 acres and being conveyed to the Grantor by deed as recorded in **Deed Book 0177 at Page 325** of the Watauga County Registry, North Carolina (as affected by Instrument of Combination **Deed Book 1920 at Page 769** of the Watauga 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 Dutch Creek.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement and Right of Access together with an access easement to and from the Conservation Easement Area described below.

The Conservation Easement Area consists of the following:

"Conservation Easement Area 3", containing approximately **0.27 acres**, as shown on plat of survey titled "Conservation Easement for State of North Carolina Division of Mitigation Services over a Portion of the Lands of Gail Taylor (D.B. 1799, Pg. 66), DMS File No. 95-LA-292, and Rebecca Ann Michael Daughtry and Husband, Ralph Earl Daughtry (D.B. 1920, Pg. 769), DMS File No. 95-LA-291, DMS Project ID #100205, Valle Crucis," dated May 25, 2022, by John A. Rudolph, PLS Number L-4194, K2 Design Group, and recorded in the Watauga County, North Carolina Register of Deeds at Plat Book 29, Pages 42-43.

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

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

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the

use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. ACCESS EASEMENT

Grantor hereby grants and conveys unto Grantee, its employees, agents, successors and assigns, a perpetual, non-exclusive easement for ingress and egress over and upon the Property at all reasonable times and at such location as practically necessary to access the Conservation Easement Area for the purposes set forth herein ("Access Easement"). This grant of easement shall not vest any rights in the public and shall not be construed as a public dedication of the Access Easement. Grantor covenants, represents and warrants that it is the sole owner of and is seized of the Property in fee simple and has the right to grant and convey this Access Easement.

III. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

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

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

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

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including 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.

IV. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees, agents, successors and assigns, shall have a perpetual Right of Access over and upon the Conservation Easement Area to undertake or engage in any activities necessary to construct, maintain, manage, enhance, repair, restore, protect, monitor and inspect the stream, wetland and any other riparian resources in the Conservation Easement Area for the purposes set forth herein or any long-term management plan for the Conservation Easement Area developed pursuant to this Conservation Easement.

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

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

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

E. Crossing Area(s). The Grantee is not responsible for maintenance of crossing area(s), however, the Grantee, its employees and agents, successors or assigns, reserve the right to repair

crossing area(s), at its sole discretion and to recover the cost of such repairs from the Grantor if such repairs are needed as a result of activities of the Grantor, his successors or assigns.

V. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

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

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

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

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

VI. MISCELLANEOUS

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

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

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

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

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

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

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

and

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

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

VII. QUIET ENJOYMENT

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

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

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

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

_____ (SEAL)
Ralph Daughtry

_____ (SEAL)
Rebecca Daughtry

NORTH CAROLINA
COUNTY OF WATAUGA

I, Jessica W. Harris, a Notary Public in and for the County and State aforesaid, do hereby certify that Ralph Daughtry and Rebecca Daughtry, 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 8th day of July, 2022.

Jessica W. Harris
Notary Public

JESSICA W. HARRIS
NOTARY PUBLIC
Watauga County, North Carolina
My Commission Expires July 24, 2023

My commission expires:
July 24, 2023

Exhibit A
Legal Description

Conservation Easement Area 3

BEING ALL OF Conservation Easement Area 3 of the Valle Crucis Site over a portion of the land of Daughtry (PIN No 1970-61-4531) lying and being situated in Shawneehaw Township, Watauga County, North Carolina and particularly described as follows (all distances are ground distances unless otherwise noted):

Beginning at an existing wooden fence post (Point of Beginning) labeled as Point No. 24 and being Northeastern most corner of the Conservation Easement Area 3 and being located South 80°43'43" West 552.43' feet from an iron stake (Point No. 501) with N.C. Grid Coordinates N=901,103.8244'E=1,176,853.8011' (NAD '83, 2011).

Thence from the Point of Beginning (Point No. 24), South 04°56'40" West 89.35' to an iron stake; thence North 89°59'05" West 67.11' to an iron stake; thence North 36°07'10" West 39.76' to an iron stake; thence North 68°35'13" West 95.11' to an iron stake; thence North 53°34'09" West 37.44' to an iron stake; thence South 89°58'56" East 216.91' to an existing wooden fence post, which is the point of beginning (Point No. 24), having an area of approximately 0.27 acres.

THE FOREGOING CONSERVATION EASEMENT AREA 3 as shown on plat of survey titled "Conservation Easement for State of North Carolina Division of Mitigation Services over a Portion of the Lands of Gail Taylor (D.B. 1799, Pg. 66), DMS File No. 95-LA-292, and Rebecca Ann Michael Daughtry and Husband, Ralph Earl Daughtry (D.B. 1920, Pg. 769), DMS File No. 95-LA-291, DMS Project ID #100205, Valle Crucis," dated May 25, 2022, by John A. Rudolph, PLS Number L-4194, K2 Design Group, and recorded in the Watauga County, North Carolina Register of Deeds at Plat Book 29, Pages 42-43.

Appendix I - Credit Release Schedule

Credit Release Schedules

The schedules below list the updated credit release schedules for stream and wetland mitigation projects developed by NCDMS in North Carolina:

Credit Release Schedule and Milestones for Wetlands			
Credit Release Milestone	**Release Activity**	**NCDMS**	
		Interim Release	**Total Released**
1	Site Establishment (includes all required criteria stated above)	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates that interim performance standards have been met	10%	40%
4	Year 2 monitoring report demonstrates that interim performance standards have been met	10%	50%
5	Year 3 monitoring report demonstrates that interim performance standards have been met	15%	65%
6*	Year 4 monitoring report demonstrates that interim performance standards have been met	5%	70%
7	Year 5 monitoring report demonstrates that interim performance standards have been met	15%	85%
8*	Year 6 monitoring report demonstrates that interim performance standards have been met	5%	90%
9	Year 7 monitoring report demonstrates that performance standards have been met	10%	100%

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

Credit Release Schedule and Milestones for Streams			
Credit Release Milestone	**Release Activity**	**NCDMS**	
		Interim Release	**Total Released**
1	Site Establishment (includes all required criteria stated above)	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	40%
4	Year 2 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	50%
5	Year 3 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	60%
6*	Year 4 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	65% (75%**)
7	Year 5 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	75% (85%**)
8*	Year 6 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	80% (90%**)
9	Year 7 monitoring report demonstrates that channels are stable, performance standards have been met	10%	90% (100%**)

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

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

Appendix J - Maintenance Plan

Maintenance Plan

The Site shall be monitored regularly, and a physical inspection of the site shall be conducted at least once quarterly 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:

Component/Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include securing 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.
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 controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Beaver	Beaver and associated dams are to be removed as they colonize and until the project is closed.
Site Boundary	Site boundaries shall be identified in the field to ensure a clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by a 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.
Road Crossing	Road crossings within the Site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.

Appendix K - IRT Site Visit Notes

Task 1 a.) Inter-Agency Post Contract Site Visit: Site Visit Notes

As specified within RFP #16-20200104, an on-site meeting with regulatory agencies and DMS staff was conducted on August 25, 2021. Below is a list of attendees and general site visit notes.

Attendees:

USACE:
- Todd Tugwell

NC DWR:
- Erin Davis

Restoration Systems:
- Ray Holz
- JD Hamby

NC DMS:
- Paul Wiesner
- Matthew Reid
- Harry Tsomides

Axiom Environmental:
- Grant Lewis
- Kenan Jernigan
- Mason Harris

Site Visit Notes:

- Overall, the project was well received by the IRT.

- An updated map depicting the results of the approved PJD, detailed soil mapping, updated wetland assets, and stream assets is attached. The updated map shows wetland creation along UT 2 in channel backfill areas instead of wetland re-establishment and wetland creation along channel/pond backfill areas on UT 1 below Dutch Creek Road.

  Revised project assets are summarized below. The mitigation plan will include a detailed justification for ratios, and ratios are subject to change based on the IRT's review of the mitigation plan; including, a detailed soils report (map, photos, boring logs, etc.).

Stream Mitigation	Footage	Ratio			SMUs
Restoration	3346	1	:	1	3346.000
Enhance I	370	1.5	:	1	246.667
Enhance II	736	2.5	:	1	294.400
Enhance II	2013	5	:	1	402.600
Enhance II	1917	7.5	:	1	255.600
				Total	**4545.267**

Wetland Mitigation	Acreage	Ratio			WMUs
Reestablishment	3.426	1	:	1	3.426
Rehabilitation	0.045	1.5	:	1	0.030
Enhancement	0.681	2	:	1	0.341
Creation	0.519	3	:	1	0.173
				Total	**3.797**

- Where possible, the IRT would like to see fewer crossings on UT2. The IRT would prefer those remaining crossings be internal to the easement with easement language protecting crossing uses and maintenance activities.

- Erin expressed an interest in expanded verbiage discussing the potential of future property development (NCDOT TIP projects, county expansion plans, community expansion plans, etc.). In addition, the crossings in the lower reaches of the Site should be planned and located to facilitate future development where possible.

- The IRT indicated that wider buffers, inclusion of ephemeral drainages, marsh treatment areas, and/or other functional uplift justification may be required to warrant a 5:1 ratio for stream enhancement (level II) in the upper wooded reaches of UT 1, 2, 2A, 3, and UT 4.

- The proper Action ID # is SAW 2021-01272. This number was included in the public notice and PJD paperwork.

- Dutch Creek is characterized by a relatively dense stand of invasive species. The IRT discussed the benefit of understory plantings in these areas. Understory plantings may be proposed on a delayed planting schedule (year 2 or 3 of monitoring) and may not need success criteria attached to the activity.

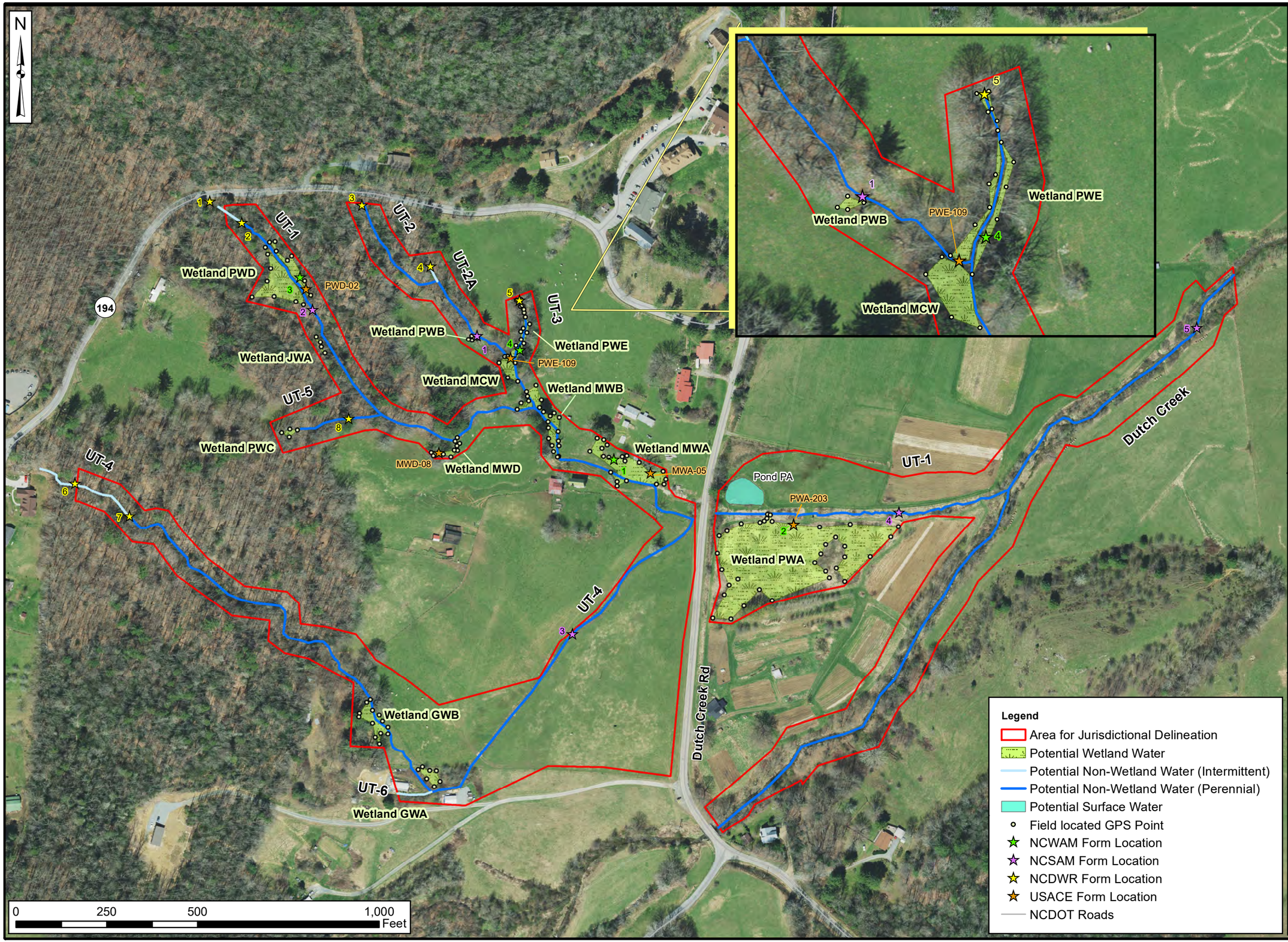
- The IRT agreed that sections of UT 2 (upstream of the confluence with UT 1) are suitable for stream restoration instead of enhancement (level I).

- Where possible, the IRT would like to see the easement boundary extended to capture the crest of slopes to direct stormwater runoff through marsh treatment areas before entering the Site.

- Based on the approved PJD and the stream restoration approach of UT 4, UT-6, which originates and joins UT-4 offsite, will be restored and join UT-4 within the Site's footprint – See attached figures.

- There was discussion regarding the Scenic Byway Easement regarding open land, viewsheds, and project implications regarding tree heights, etc. RS indicated this would be resolved with SHPO and NRCS coordination. It was also mentioned that the response from SHPO was pending and that any potential Phase 1 Assessment would be performed before the Task 1 deliverable. RS will also coordinate all easement-related topics with the USACE attorney Carl Pruitt and Todd Tugwell.

Attachment:
- Figure 3, Final PJD figure per 08/23/2021 Site visit with Amanda Fuemmeler
- Figure 4, Proposed project mitigation approaches per post-contract site visit 08/24/2021



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

POTENTIAL JURISDICTIONAL FEATURES

Drawn by: JMH

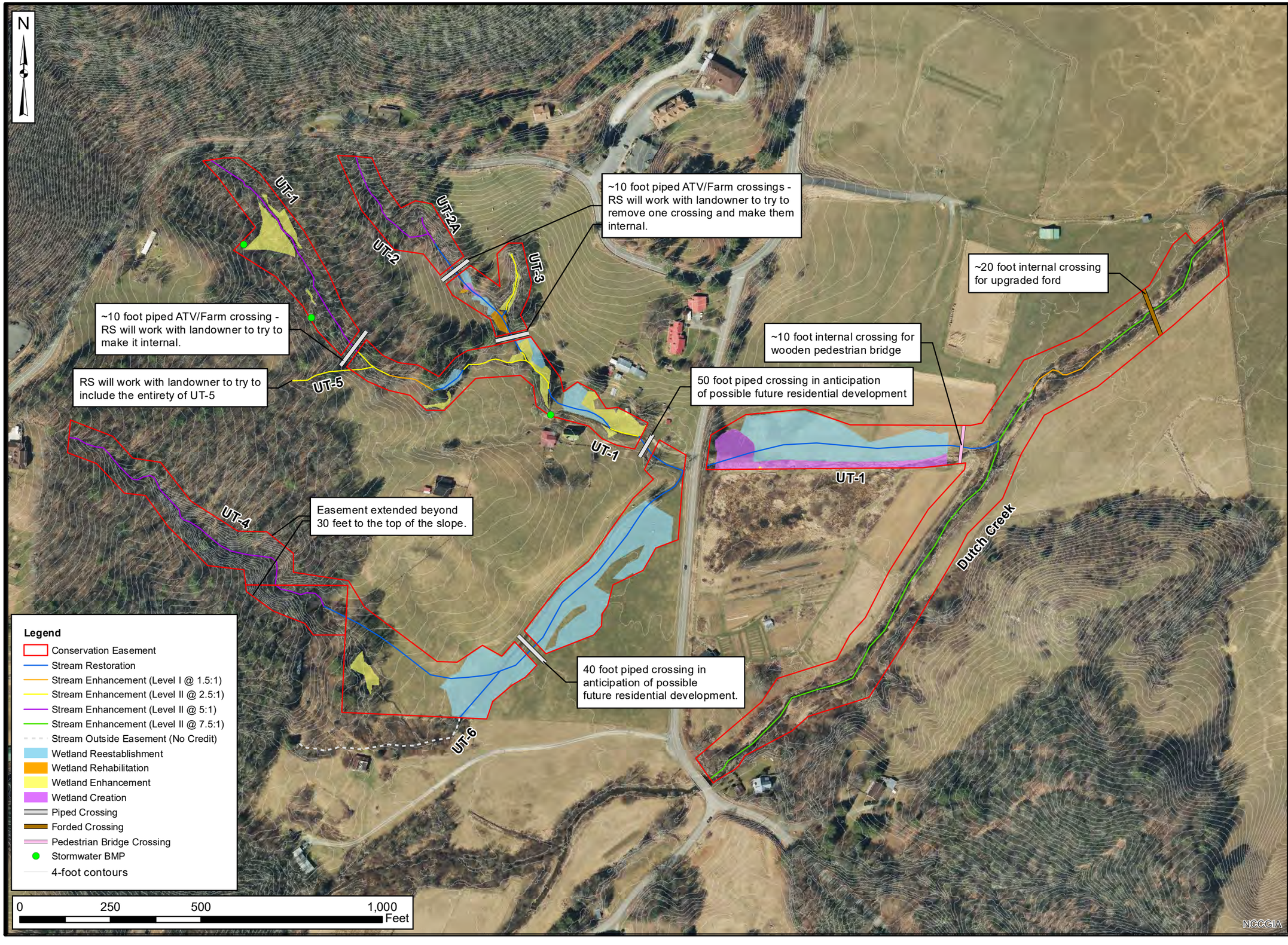
Date: AUG 2021

Scale: 1:3000

Project No.: 21-018

FIGURE

3



Axiom Environmental, Inc.

Prepared for:

RS RESTORATION SYSTEMS | LLC

Project:

VALLE CRUCIS MITIGATION SITE

Watauga County, NC

Title:

POST CONTRACT UPDATES

Drawn by: KRJ

Date: AUG 2021

Scale: 1:3000

Project No.: 21-018

FIGURE

4

From:	Ray Holz
To:	Tugwell, Todd J CIV USARMY CESAW (USA); Wiesner, Paul; Davis, Erin B; Haywood, Casey M CIV (USA); Browning, Kimberly D CIV USARMY CESAW (USA)
Cc:	Reid, Matthew; Tsomides, Harry; John Hamby; Grant Lewis; Kenan Jernigan
Subject:	RE: Valle Crucis Post Contract IRT Site Visit Notes - DMS# 100205 _ SAW 2021-01272
Date:	Tuesday, September 7, 2021 2:04:33 PM

Todd – Thank you for the review. Please see our responses below. We will include this email chain in our copy of the site visit notes.

Best,
RH

----- ------ ------
Raymond J. Holz | Restoration Systems, LLC
1101 Haynes St. Suite 211 | Raleigh, NC 27604
tel: 919.334.9122 | cell: 919.604.9314 | fax: 919.755.9492
email: rholz@restorationsystems.com

-----Original Message-----
From: Tugwell, Todd J CIV USARMY CESAW (USA) <Todd.J.Tugwell@usace.army.mil>
Sent: Friday, September 03, 2021 1:06 PM
To: Wiesner, Paul <paul.wiesner@ncdenr.gov>; Davis, Erin B <erin.davis@ncdenr.gov>; Haywood, Casey M CIV (USA) <Casey.M.Haywood@usace.army.mil>; Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Cc: Reid, Matthew <matthew.reid@ncdenr.gov>; Tsomides, Harry <harry.tsomides@ncdenr.gov>; Ray Holz <rholz@restorationsystems.com>; John Hamby <jhamby@restorationsystems.com>; Lewis, Grant <glewis@axiomenvironmental.org>; Kenan Jernigan <kjernigan@axiomenvironmental.org>
Subject: RE: Valle Crucis Post Contract IRT Site Visit Notes - DMS# 100205 _ SAW 2021-01272

Thanks Paul. Erin and I both reviewed the minutes. This site was a bit more complex that most because there were several changes made to the plan before we reviewed the site (wetland areas, easement boundary shifts, JD issues), and we also discussed a number of other changes on the site. I generally agreed with the meeting points, but there were also other changes/additions to the revised map that was included with the easement that I don't think we discussed in the field. Below are comments/questions that Erin and I had regarding the minutes, I apologize if we covered some of this on site - there were many things discussed that either Erin or I may not have overheard:
1. I want to reiterate that we are not approving the stated ratios in the table at this time because we do not have a supporting mitigation plan to review. Acknowledged and understood. Based on our conversations during the site visit, I believe we have a strong understanding of the IRT's position on ratios and the required functional uplift to achieve specific ratios.

2. There are a number of wetland enhancement areas within forested portions of the site, most notably along UT-1 and UT-3, but I don't think we really discussed how these would be enhanced. They were not shown on the original map, so I guess these were added during the JD (generally the JD is done after our technical review). They are in a currently forested setting and I assume would be proposed at a 2:1 ratio. Is this only based on fencing out the cattle? Fencing cattle out of the

wetland enhancement areas will be the minimum action taken. We understand fencing alone would likely not be enough to generate a 2:1 ratio. While developing the mitigation plan, we will review these areas in detail and provide additional treatment/approaches, as appropriate. These approaches could include understory planting, the establishment of proper herbaceous obligate vegetation, extra upland buffer, and BMPs to diffuse and treat surface flows before entering the jurisdictional wetlands.

3. The original concept map didn't include UT-5 or UT-6, and we don't recall having specific discussions or looking at these reaches. I think UT-6 was briefly mentioned in that it had to be connected to UT-4, but it also appears that the wetland boundaries have changed along UT-6 and UT-4, as have the proposed easement boundaries. This should not have been because of the JD correct? UT-5 was added as a jurisdictional feature during the JD site visit. RS is going to work with the landowner on adding this tributary to the project. The wetland boundaries within the field adjacent to UT-4 were updated to reflect the detailed soil work associated with the JD, i.e., an accurate depiction of drained hydric soils, which had not been completed at the time of our Technical Proposal submittal to DMS. The easement in this area was adjusted to reflect that work and a more accurate property boundary.

4. Enhancement of wetland GWB was added, which currently abuts UT-4. However, the proposal is to relocate UT-4 far away from this wetland. Wouldn't this negatively impact the wetland? GWB was added during Axiom's delineation for the JD. Our current belief is that wetland hydrology results from a toe-of-slope seep similar to the wetland enhancement pocket along UT-1 above the 50-foot crossing, rather than overbank flows associated with UT-4. We do not believe moving UT-4 away from this wetland will negatively impact the wetland and believe removing the drainage effect of UT-4 on the wetland will improve the hydrology. We plan to install a pre-construction wetland gauge in this area to set a baseline hydroperiod. Wetland enhancement will include cattle exclusion and appropriate planting/seeding.

5. I believe we mentioned that the standard performance criteria may not apply to understory planting along Dutch Creek, but monitoring of planted veg would definitely be required. Agreed.

6. Based on the soils we looked at, it's possible that some of the wetland reestablishment along UT-4 and UT-1 that are shown on the revised map may have more than 12" of grading, especially near the pond, which may affect how we would view the approach. This would need to be verified during our review of the grading plan. Acknowledged and understood.

Thanks for the opportunity to comment - this was an especially confusing project due to the complexity, but also because we were looking at a different map due to the timing of the JD.

Todd Tugwell
Mitigation Project Manager
Wilmington District, US Army Corps of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587

(919) 210-6265

We would appreciate your feedback on how we are performing our duties. Our automated Customer Service Survey is located at: https://regulatory.ops.usace.army.mil/customer-service-survey/ Thank you for taking the time to visit this site and complete the survey.

-----Original Message-----
From: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Sent: Wednesday, September 01, 2021 3:37 PM
To: Tugwell, Todd J CIV USARMY CESAW (USA) <Todd.J.Tugwell@usace.army.mil>; Davis, Erin B <erin.davis@ncdenr.gov>; Haywood, Casey M CIV (USA) <Casey.M.Haywood@usace.army.mil>; Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Cc: Reid, Matthew <matthew.reid@ncdenr.gov>; Tsomides, Harry <harry.tsomides@ncdenr.gov>; Raymond Holz <rholz@restorationsystems.com>; John Hamby <jhamby@restorationsystems.com>; Lewis, Grant <glewis@axiomenvironmental.org>; Kenan Jernigan <kjernigan@axiomenvironmental.org>
Subject: [Non-DoD Source] Valle Crucis Post Contract IRT Site Visit Notes - DMS# 100205 _ SAW 2021-01272

Casey, Erin, Kim, Todd;

The meeting minutes and maps from the August 24, 2021 site visit at Valle Crucis are attached for your review.

Please let us know if you have any comments, questions or concerns.

Thanks

Paul Wiesner

Western Regional Supervisor

North Carolina Department of Environmental Quality

Division of Mitigation Services

828-273-1673 Mobile

paul.wiesner@ncdenr.gov <mailto:paul.wiesner@ncdenr.gov>

Western DMS Field Office

5 Ravenscroft Drive

Suite 102

Asheville, N.C. 28801

North Carolina Wildlife Resources Commission

Cameron Ingram, Executive Director

September 20, 2021

Mr. JD Hamby
Restoration Systems
1101 Haynes St. Suite 211
Raleigh, NC 27604

SUBJECT: Valle Crucis Mitigation Project
Watauga County

Dear Mr. Hamby:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) received your September 2, 2021 letter about the proposed stream and wetland restoration on Dutch Creek and unnamed tributaries (UTs) in Watauga County. You requested information and comments on any issues that might emerge from the project with respect to the Fish and Wildlife Coordination Act. Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e) and North Carolina General Statutes (G.S. 113-131 et seq.).

The project will involve restoration, enhancement, and preservation on 8,050 ft of Dutch Creek and UTs, and an unknown amount of wetland reestablishment and enhancement. There are wild Brown Trout and Rainbow Trout in Dutch Creek, and in-channel work should be performed outside of the trout moratorium of October 15 to April 15. In addition, Dutch Creek does support Eastern Hellbender (*Cryptobranchus alleganiensis*, US Federal Species of Concern, NC Special Concern), and it is possible that hellbenders use Dutch Creek within the project area. Depending on the extent of work proposed, we may recommend that special efforts be made to reduce impacts to and improve hellbender habitat. We recommend that Restoration Systems staff reach out to Andrea Leslie at NCWRC (andrea.leslie@ncwildlife.org) during the project design phase to coordinate on issues regarding the Eastern Hellbender.

Please note that there are records of both Northern Long-eared Bat (*Myotis septentrionalis*, US and NC Threatened) and Little Brown Bat (*Myotis lucifugus*, NC Significantly Rare) in the vicinity of the project, as well. Tree removal may need to occur within a certain window; please contact US Fish and Wildlife Service staff for input on this and other measures to minimize impacts to and maximize benefits to these bats.

Mailing Address: Habitat Conservation • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

We recommend that riparian buffers that are to be reestablished be as wide as possible, given site constraints and landowner needs. NCWRC generally recommends a woody buffer of 100 feet on perennial streams to maximize the benefits of buffers, including bank stability, stream shading, treatment of overland runoff, and wildlife habitat. Excellent erosion and sediment control on the project is essential to minimize impacts from the project to hellbender and wild trout.

Given the extent of wetland reestablishment and enhancement, we recommend that the project team find multiple nearby reference sites to determine the most ecologically appropriate wetland types for the site; these may be herbaceous, shrub/scrub, forested, or a mosaic of several types of wetland.

Thank you for the opportunity to review and comment on this project. Please contact me at (828) 400-4223 if you have any questions about these comments or need further assistance.

Sincerely,

Andrea Leslie
Mountain Region Coordinator, Habitat Conservation Program

ec: Lori Williams, NCWRC
Holland Youngman, US Fish and Wildlife Service

Task 1 a.) Inter-Agency Review Team Mitigation Plan Site Visit: Site Visit Notes

Below is a list of attendees and general site visit notes.

Attendees:

USACE:
- Todd Tugwell
- Steve Kichefski

NC DWR:
- Mac Haupt
- Maria Polizzi

Restoration Systems:
- JD Hamby

NC WRC:
- Andrea Leslie

NC DMS:
- Paul Wiesner
- Matthew Reid
- Harry Tsomides

Axiom Environmental:
- Grant Lewis

Site Visit Notes:

UT-4 & adjacent Wetlands:

- Hydrologic Trespass – The IRT expressed concern over hydrologic trespass outside of the easement boundary. They requested a section be added to the Final Mitigation Plan that outlines alternatives to rectify hydrologic trespass. Alternatives may include the following.
  - Construct a berm to limit hydrologic trespass outside of the easement.
  - Add drain tile outside of the easement, as long as the drain tile does not encroach into the easement, and it discharges at the floodplain elevation.
  - Build up the floodplain outside of the easement so that a risk of hydrologic trespass no longer exists.
- The IRT inquired if wetland grading was proposed. With the exception of wetland creation areas, no grading is proposed in wetland credit generating areas.
- Any drain tile currently within the easement will be located and removed.
- The IRT wanted to know where the power line is to be moved (inside or outside the easement). RS indicated that they do not know the exact location of the proposed powerline; however, they do know it will be located in the crossing easement break. The IRT requested a note be added to Figure 8 (Proposed Conditions) that indicates the powerline will be moved to the easement break and will not be inside the easement.

UT-1, UT-2, UT-3, UT-5 & adjacent Wetlands:

- The USACE indicated that wetlands in the woods had ephemeral channels removed from the acreage. As Ephemeral channels are non-jurisdictional features the wetland area should be

enlarged to include these channels. The document and figures have been updated to include wetlands under the ephemeral channels. Marsh Treatment areas will be outside of jurisdictional areas.

- NC DWQ wanted to have photo points added at the marsh treatment areas. Figure 11 (Monitoring Plan) has been updated to include photo points.
- Understory planting is proposed in the upper wooded reaches of the Site that have been browsed by livestock. A phased approach to these plantings include a Year 0 effort with an approved plant list as 1-gallon containerized stock. Additional planting may be requested by the IRT that can be added at the end of year 1 or year 2 monitoring. Species will be picked based on site conditions and natural communities.
- It was generally agreed that understory vegetation transects would not be required. However, the final mitigation plan should call for a 10% count of planted stock (one-gallon pots will be flagged) would be conducted in the wetland enhancement area, and survivorship of planted species would be determined and submitted with each vegetation monitoring report. The final mitigation plan will be updated accordingly.
- Much discussion of wetland enhancement uplift from understory plantings occurred. It was understood that the 10% count of planted stock would occur in the wetland area and no success criteria will be necessary for understory planting. Species were picked based on future site conditions and natural communities, see attached Table 1. The final mitigation plan will be updated accordingly.

General Site Comments:

- Monitoring of benthic macroinvertebrates has been proposed to generate 2% stream credit. The USACE determined that the method of credit calculation was not conducted properly. For a stream to generate 2% from benthic surveys each reach must be surveyed following 2016 guidance. Restoration Systems has produced a map of proposed benthic surveys for approval from the IRT (attached).
- Andrea Leslie agreed to reevaluate the NCWRC trout moratorium on winter construction (Mitigation Plan Appendix E – Categorical Exclusion document) to see if the current project boundary would still be subject to the NCWRC seasonal moratorium on instream construction (Oct 15 to April 15). Further post-visit correspondence with Andrea has confirmed that the moratorium will not be waived.
- The IRT requested approval of the Site Visit notes and Detailed Plan comment response prior to approval of the Site for permitting.
- The full Categorical Exclusion Document and supporting documentation will be included in the final plan as an appendix.
- It was requested that RS find an appropriate reference wetland and place a monitoring gauge.

From: Youngman, Holland J
To: Grant Lewis
Cc: Holz, Raymond
Subject: Re: [EXTERNAL] Valle Crucis T&E IPaC review
Date: Thursday, December 7, 2023 6:41:28 PM

Hi Grant,

Following up from the phone call we had the other day - and to confirm - the preference of this office would be for clearing to be minimized to the maximum extent possible. This is the preferred approach versus clearcutting the site.

In terms of clearing taking place during the bat active season and especially during the pup season for tricolored bat (May 15-July 31), incorporation of the following measures into project commitments would benefit tricolored bat:

- If bats are observed flushing from trees, stop work in that location and notify the Service immediately.
- Conduct clearing activities when ambient air temperature is >50° F. (Bats in torpor in colder temperatures have a harder time coming out of torpor and are therefore less likely to successfully flush and fly away from trees being felled.)
- To the maximum extent possible:
    - Avoid clearing higher quality roost trees, especially oaks. (Maternity colonies are most likely to roost in umbrella-shaped clusters of dead leaves. Oaks and maples tend to have such leaf configurations at the ends of their branches, thus providing good roosting habitat for the species.)
    - Avoid as much clearing as possible during the tricolored bat pup season of May 15 - July 31.

These measures would be protective of tricolored bat and also of little brown bat, for which there are several occurrence records in the vicinity. And, as I know we've already discussed but I'll share again here, should tricolored bat become listed and the effective date occur while clearing activities are taking place in suitable habitat within the active (and especially the pup) season, ESA section 7 consultation will be necessary. Should that come to pass, this office will work with the project proponent and lead federal agency to carry out that consultation process. At this point, we can offer that, given the small scale and minimal amount of clearing associated with the project, jeopardy of tricolored bat is not expected.

Separate from the bat topic but something that came up while speaking with our terrestrial species recovery lead: The wetland on site is described in some of the previous correspondence as being suitable habitat for bog turtle. While section 7 consultation is not required for the southern population of bog turtle due to its federal designation, we still want to make sure that all efforts are being made to avoid any negative impacts to the species. Was the wetland surveyed for bog turtles? Is there any other information to relay regarding the

wetland/bog habitat as it relates to bog turtle? Thanks for anything you can share in that regard that can help us better understand the wetland/bog turtle status on site.

Best,

Holland Youngman
(she/her)
Wildlife Biologist
U.S. Fish and Wildlife Service
Asheville Ecological Services Field Office
160 Zillicoa Street, Asheville, North Carolina, 28801
Cell: 828-575-3920

From: Grant Lewis <glewis@axiomenvironmental.org>
Sent: Thursday, November 30, 2023 8:41 AM
To: Youngman, Holland J <holland_youngman@fws.gov>
Cc: Holz, Raymond <Raymond.Holz@davey.com>
Subject: RE: [EXTERNAL] Valle Crucis T&E IPaC review

Hey Holland;

I just tried to call you so we can clear things up. Email sometimes causes confusion.

Here is the bottom line. Construction of the Site will likely take 3 to 4 months (depending on weather delays or other factors). With the trout moratorium we can't begin construction until April 15th. The 4-month construction timeframe then extends from April 15th until August 15th.

We can clearcut the Site from April 15th until May 15th. Under this scenario, we will clearcut any and all trees within the limits of disturbance.

Alternatively we can selectively cut from April 15th to August 15th. Under this scenario, we will not clearcut the Site, but we will selectively cut trees that are in the way of construction and save any trees that are outside of the path of construction. This scenario will cut significantly fewer trees within the project boundaries.

I hope this clarifies things. Please feel free to call if you still have any questions.

Grant

Grant Lewis
Senior Project Manager
Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603
glewis@axiomenvironmental.org
(919) 215-1693 (cell)

From: Youngman, Holland J <holland_youngman@fws.gov>
Sent: Thursday, November 30, 2023 8:34 AM
To: Grant Lewis <glewis@axiomenvironmental.org>
Cc: Holz, Raymond <Raymond.Holz@davey.com>
Subject: Re: [EXTERNAL] Valle Crucis T&E IPaC review

Thank you, Grant -

I'm still a little unclear on the timeframe and span of time that would be needed for selective clearing (vs. clearcutting).

Is the entire April - July span needed in order to accomplish selective clearing? Ideally, to avoid the PESU bat pup season, no clearing would take place from May 15 - July 31.

Would avoiding clearing during that pup season mean that selective clearing could not occur?

I'm still trying to understand: if there was additional time to clear on the front end - i.e. if clearing could take place from March 15 - May 15 (a hypothetical), would that enable contractors to clear selectively? Or is that too early in the season or too constricted a timeframe to allow for selective clearing?

I hope my questions are making sense. I'm trying to figure out if the pup season can be avoided while still selectively clearing, OR if the choice is between selective clearing vs. clearing during the pup season. If gaining some extra clearing time during the last month of the trout moratorium could enable selective clearing *and* avoidance of the pup season to both occur, that's something our office would be interested in pursuing in a discussion with NCWRC.

Thanks again,

Holland Youngman
(she/her)
Wildlife Biologist
U.S. Fish and Wildlife Service
Asheville Ecological Services Field Office
160 Zillicoa Street, Asheville, North Carolina, 28801
Cell: 828-575-3920

From: Grant Lewis <glewis@axiomenvironmental.org>

Sent: Thursday, November 30, 2023 8:20 AM
To: Youngman, Holland J <holland_youngman@fws.gov>
Cc: Holz, Raymond <Raymond.Holz@davey.com>
Subject: RE: [EXTERNAL] Valle Crucis T&E IPaC review

Hey Holland;

Please see my responses below.

Thanks for looking into this. We are happy to construct this project however you see fit.

Grant

Grant Lewis
Senior Project Manager
Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603
glewis@axiomenvironmental.org
(919) 215-1693 (cell)

From: Youngman, Holland J <holland_youngman@fws.gov>
Sent: Wednesday, November 29, 2023 1:00 PM
To: Grant Lewis <glewis@axiomenvironmental.org>
Cc: Holz, Raymond <Raymond.Holz@davey.com>
Subject: Re: [EXTERNAL] Valle Crucis T&E IPaC review

Hi Grant,

I've thought a little more about this situation and chatted with Rebekah Reid. A few more questions may help to clarify a path.

1. At what time of year will the clearing amount be able to be reduced for this project? I'm trying to better understand the timing associated with tree clearing as it pertains to reducing the amount of clearing necessary. You've mentioned that clearing during the winter months (if not for the trout moratorium) would result in a more clear-cutting approach. Does that mean that clearing in the spring (April? May?) would = significantly less tree clearing?

Clearing in April, May, June, July would = significantly less tree clearing. With the trout moratorium

in place, we would have to clearcut any trees that may be "in the way" of construction between April 15 and May 15 (which we can do). In other words, we would likely cut any trees within the limits of disturbance, or close to the limits of disturbance. If we can cut trees after the trout moratorium and pupping season we can selectively cut trees that are within the path of the restoration project and leave any trees that can be avoided.

2. If there was some flexibility associated with the trout moratorium (i.e. if it could end prior to, say, April) would that allow the contractor to go ahead and get selective clearing done prior to May?

We discussed flexibility with the trout moratorium with NC WRC (Andrea Leslie) at our last meeting at the Site. We followed up with her via email and she indicated that we had no flexibility. I encourage you to reach out to her, but she was not willing to bend when we spoke to her.

What I'm trying to figure out is if there is a way to both minimize the tree clearing (as you indicated would be possible with a later date of clearing) *and* avoid clearing during the tricolored bat pup season of May 15-July 31. If the trout moratorium is what's really crunching the project on time in the spring, I'm willing to discuss options with NCWRC to see if some compromise may be possible. But - before I do that - I want to understand pertinent details regarding the project's construction timeline, contractor schedule, etc.

Alternatively, if the plan is to move forward without any seasonal clearing restrictions, and in the event that tricolored bat is listed and tree clearing is scheduled to occur during the bat active season, reinitiation (and possibly formal consultation) would be necessary.

Please let me know your thoughts so that I can help with a path forward. Thank you,

Holland Youngman
(she/her)
Wildlife Biologist
U.S. Fish and Wildlife Service
Asheville Ecological Services Field Office
160 Zillicoa Street, Asheville, North Carolina, 28801
Cell: 828-575-3920

From: Grant Lewis <glewis@axiomenvironmental.org>
Sent: Monday, November 20, 2023 9:00 AM
To: Youngman, Holland J <holland_youngman@fws.gov>
Cc: Holz, Raymond <Raymond.Holz@davey.com>
Subject: [EXTERNAL] Valle Crucis T&E IPaC review

Hello Holland;

I tried to reach out to you by phone, but I realize you are busy and it's getting into the holiday season. I hope this email and all the project changes are not confusing, but I wanted to keep you in the loop of our approach to Valle Crucis and bats.

As you may know, Valle Crucis is under a trout moratorium and we are not able to work on the project during the winter/early spring months. We found this out after I had already coordinated with you about clearing outside of the pupping season (early spring). What this means is we would have to clear "all" trees in the winter that could possibly affect our construction, which is not a desirable option for the project. I spoke with Rebekah Reid about this problem with a trout moratorium in the winter/spring and bats restricting the remainder of the year. She went through the key with me and we determined a path forward.

We were able to eliminate the N. Long-eared bat through the IPaC determination keys. The Tricolored bat is Proposed for listing, so it affords no protection. The remaining bats do not really have habitat within the easement and foraging habitat should not be affected. This would allow for construction of the Site after the trout moratorium and selectively cut trees without clear cutting the impact areas. This should be a positive affect for the Site and local bat populations.

I have updated the IPaC biological assessment and am attaching it for your review/comment. I also made you a member of the project so you can review the document. Please let me know if this is a reasonable path forward with the project.

Thanks and have a great holiday.

Grant

Grant Lewis
Senior Project Manager
Axiom Environmental, Inc.
218 Snow Avenue
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glewis@axiomenvironmental.org
(919) 215-1693 (cell)

Appendix L - Construction Plans

NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES

CONSTRUCTION DRAWINGS
VALLE CRUCIS MITIGATION SITE
WATAUGA COUNTY, NORTH CAROLINA
DATE: DECEMBER 14, 2023

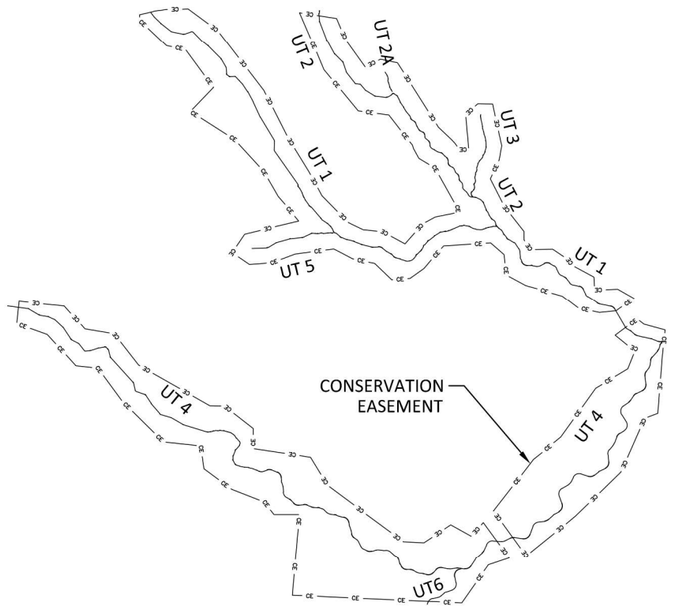
REVISIONS

NO.	DATE	
1	XX.XX.XXXX	NC DEMLR COMMENTS RECEIVED XX.XX.XXXX

SITE DATA TABLE	
RIVER BASIN	WATAUGA
8-DIGIT HUC	06010103
LOCAL WATERSHED 14-DIGIT HUC	06010103010010
TOTAL DISTURBED AREA	8.9 AC
DMS PROJECT ID NO.	100205
FULL DELIVERY CONTRACT NO.	200104-01
USACE ACTION ID NO.	SAW-2021-01272
DWR PROJECT NO.	2019-0050 v2
RFP NO.	16-20200104 (ISSUED 01.12.2020)
COORDINATE SYSTEM	NAD83 NORTH CAROLINA STATE PLANES, US FOOT

MITIGATION SUMMARY

TRIBUTARY	PROPOSED LENGTH
UT1	1,837
UT2	788
UT2A	56
UT3	226
UT4	2,505
UT5	222
UT6	132



SHEET INDEX

GRAPHIC SCALE
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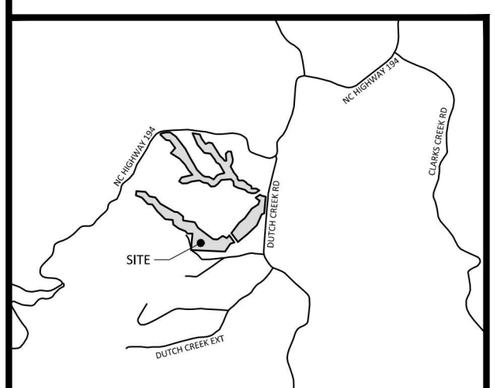
1 inch = 400 ft.



VICINITY MAP
1" = 2000'

RESTORATION LEVEL	STREAM (LF)	STREAM MITIGATION UNITS	RIPARIAN WETLAND (AC)	NON-RIPARIAN WETLAND (AC)	WETLAND MITIGATION UNITS
RESTORATION	2,632	2,632.000	–	–	–
ENHANCEMENT I	140	93.333	–	–	–
ENHANCEMENT II (2.5:1)	814	325.600	–	–	–
ENHANCEMENT II (5:1)	2,062	412.400	–	–	–
REESTABLISHMENT	–	–	2.338	–	2.318
REHABILITATION	–	–	0.028	–	0.019
ENHANCEMENT	–	–	0.646	–	0.323
CREATION	–	–	0.407	–	0.136
TOTALS	5648	3463.333	3.399	0.000	2.796

TOTAL DISTURBED AREA = 8.9 AC.

Rebecca Stubbs
Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, st=North Carolina, email=rstubbs@mcadamsco.com
Date: 2023.12.12 12:12:51 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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Durham, NC 27713

phone 919. 361. 5000
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license number: C-0293, C-187

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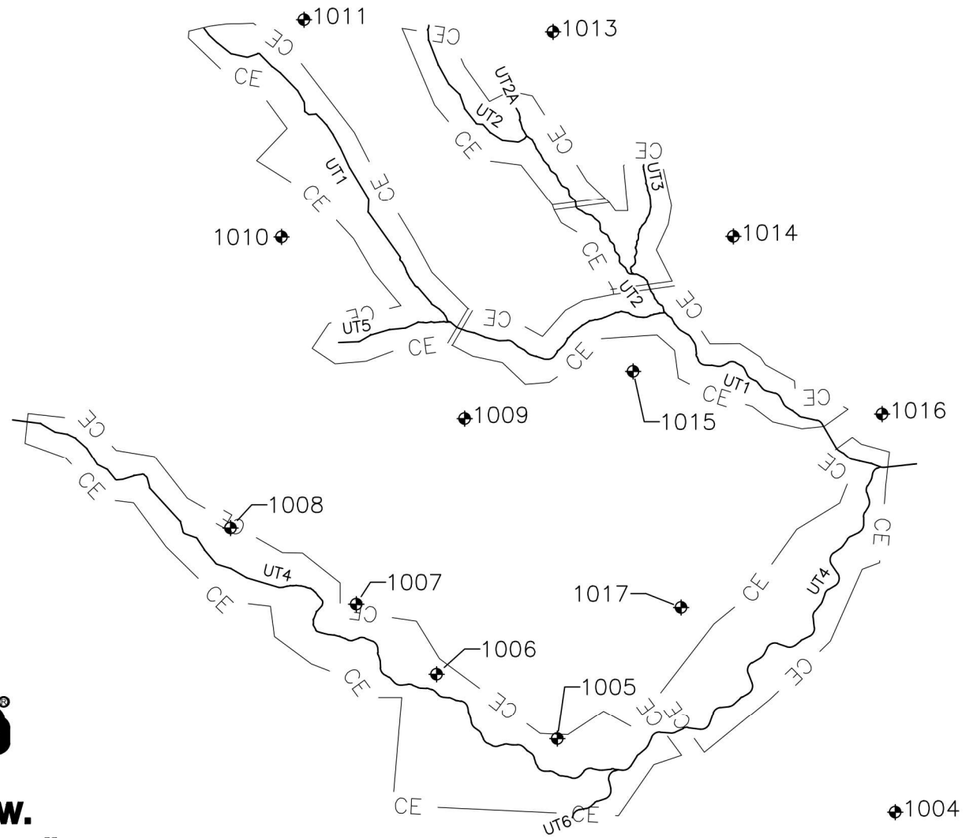
AXIOM ENVIRONMENTAL, INC
218 SNOW AVENUE
RALEIGH, NC 27603
CONTACT: GRANT LEWIS
PHONE: 919.215.1693

CLIENT
RESTORATION SYSTEMS, LLC
1101 HAYNES ST, SUITE 211
RALEIGH, NC 27604
CONTACT: WORTH CREECH
PHONE: 919.389.3888

GENERAL NOTES:

1. COORDINATE SYSTEM: NAD83 NORTH CAROLINA STATE PLANES, US FOOT
2. TOPOGRAPHY AND SPOT ELEVATIONS SHOWN ARE FROM AN ACTUAL FIELD SURVEY COMPLETED BY K2 DESIGN GROUP.
3. PLANIMETRICS, UTILITIES, INVERTS AND BUILDING INFORMATION (SHOWN FOR REFERENCE) WAS COMPLIED FROM AUTOCAD FILES PROVIDED TO MCADAMS FROM OTHERS. MCADAMS MAKES NO WARRANTY ABOUT THE ACCURACY OF THE INFORMATION SHOWN PROVIDED BY OTHERS.
4. PRIOR TO CONSTRUCTION, THE SITE CONTRACTOR SHALL FIELD VERIFY ALL SUBSURFACE INFORMATION IN THE PROJECT AREA TO ENSURE ITS ACCURACY AND DETERMINE ITS ACTUAL FIELD LOCATION.



CONTROL POINT LOCATIONS			
CONTROL POINT	NORTHING	EASTING	ELEVATION
1000	901943.2688	1177709.4418	2747.88
1001	901613.3262	1178144.9836	2720.53
1002	901961.6381	1178208.1293	2721.81
1003	901128.1705	1177775.6316	2727.13
1004	900698.1661	1177277.9395	2735.54
1005	900843.5201	1176608.6685	2750.08
1006	900972.1093	1176369.7416	2768.93
1007	901110.4997	1176210.6649	2801.33
1008	901261.0458	1175961.8091	2847.62
1009	901478.5911	1176425.4465	2805.25
1010	901836.4979	1176062.8171	2851.82
1011	902266.8544	1176107.5687	2885.19
1013	902242.6881	1176600.4372	2857.21
1014	901837.5535	1176957.3110	2782.25
1015	901571.1475	1176759.0091	2761.74
1016	901487.3216	1177251.6379	2740.28
1017	901103.8244	1176853.8011	2755.73

GRAPHIC SCALE
0 150 300 600
1 inch = 300 ft.

811
Know what's below.
Call before you dig.

CONTRACTOR SHALL NOTIFY "NC811" (811) OR (1-800-632-4949) AT LEAST 3 FULL BUSINESS DAYS PRIOR TO BEGINNING CONSTRUCTION OR EXCAVATION TO HAVE EXISTING UTILITIES LOCATED. CONTRACTOR SHALL CONTACT ANY LOCAL UTILITIES THAT PROVIDE THEIR OWN LOCATOR SERVICES INDEPENDENT OF "NC811". REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY.

Rebecca Stubbs
Digitally signed by Rebecca Stubbs
Date: Rebecca Stubbs, c=US, o=North Carolina, cn=Rebecca Stubbs, email=rstubbs@mcadamsco.com
Date: 2023.12.14 12:44:04 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI-1001
FILENAME	AXI-1001-C1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=300'
DATE	12.14.2023

CONSERVATION EASEMENT AND CONTROL POINTS

C1.00

LEGEND AND SYMBOLS

- LD — LIMITS OF DISTURBANCE
- CE — PROPOSED CONSERVATION EASEMENT
- PROPOSED INTERNAL CONSERVATION EASEMENT CROSSING
- PROPERTY LINE
- 250 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING STREAM CENTERLINE
- EXISTING TOP OF BANK
- 250 — PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED STREAM CENTERLINE
- PROPOSED TOP OF BANK
- PROPOSED BED MATERIAL
- PROPOSED DROP STRUCTURE
- PROPOSED LOG CROSS VANE
- PROPOSED LOG VANE
- PROPOSED SILL STEP
- PROPOSED STEP POOL
- X — PROPOSED 5–STRAND BARBED WIRE FENCE
- PROPOSED 2" TUBE 8' STEEL GATE
- PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

- EXISTING WETLAND
- WETLAND ENHANCEMENT
- WETLAND REHABILITATION
- WETLAND RE–ESTABLISHMENT
- WETLAND CREATION

- FEMA STREAM CENTERLINE
- FW — FEMA 100–YEAR FLOODWAY
- 100–YR — FEMA 100–YEAR FLOODPLAIN
- 500–YR — FEMA 500–YEAR FLOODPLAIN

EROSION CONTROL LEGEND AND SYMBOLS

- CONSTRUCTION ENTRANCE
- HAUL ROAD
- STAGING/STOCKPILE AREA
- SF — SILT FENCE
- SILT FENCE OUTLET
- P — PUMP AROUND PUMP
- CHANNEL PLUG

MONITORING LEGEND AND SYMBOLS

- CG — PROPOSED CREST GAUGE
- FG — PROPOSED FLOW GAUGE
- GW — PROPOSED GROUNDWATER GAUGE
- RG — PROPOSED RAIN GAUGE
- PROPOSED PERMANENT CROSS SECTION
- PROPOSED RANDOM VEGETATION TRANSECT
- VP — PROPOSED VEGETATION PLOT
- PROPOSED BENTHIC MONITORING STATION
- PROPOSED PHOTO POINT

Rebecca Stubbs

Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=McAdams, ou=Durham, email=rstubbs@mcadamsco.com
Date: 2023.12.14 12:44:20 -05'00'

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CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

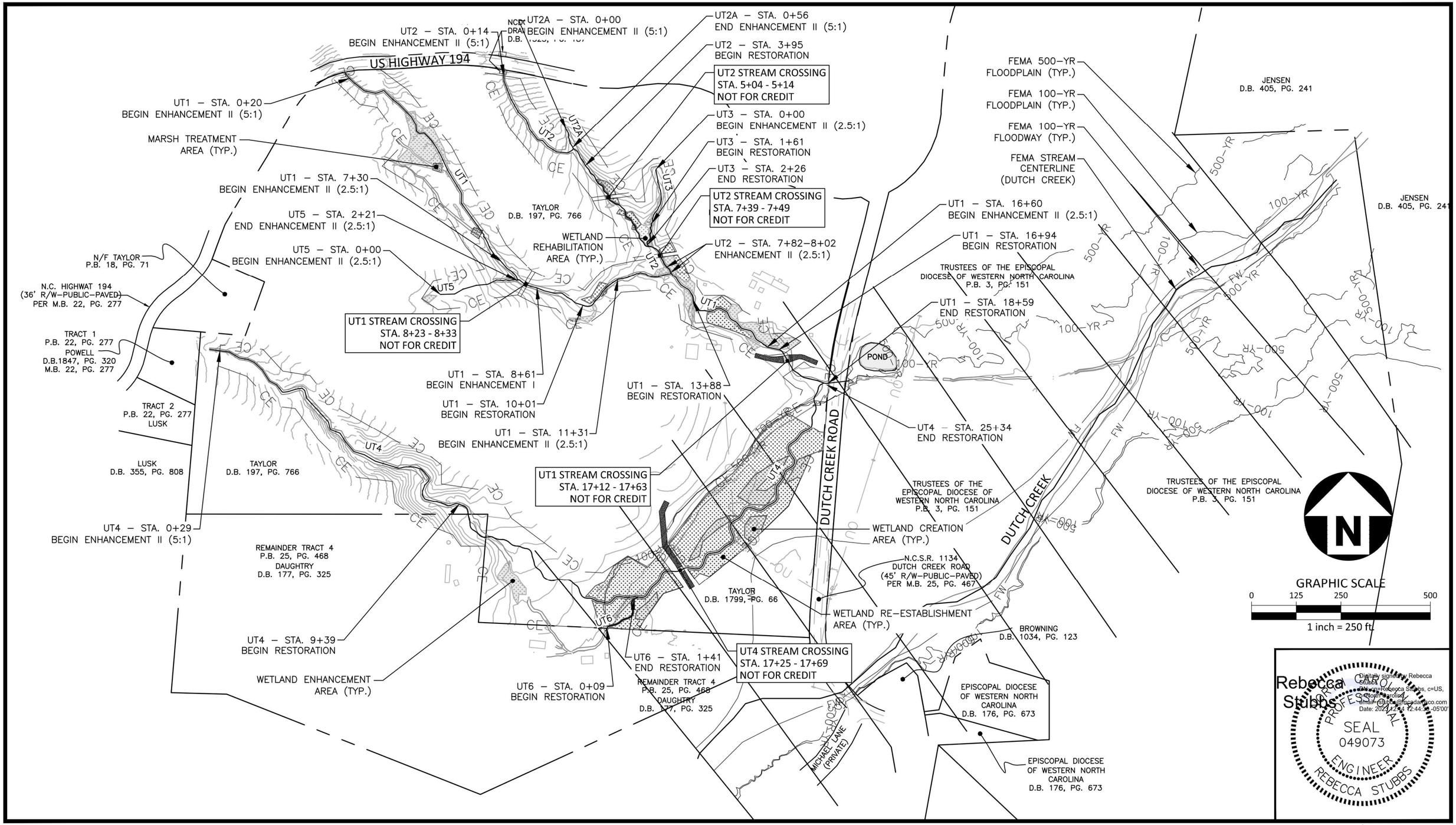
Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI-1001
FILENAME	AXI-1001-C1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	
DATE	12.14.2023

LEGEND AND SYMBOLS

C1.01



Rebecca Stubbs

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI-1001
FILENAME	AXI-1001-C1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=250'
DATE	12.14.2023

PROJECT OVERVIEW

C1.02

GENERAL NOTES:

1. CONTRACTOR SHALL OBTAIN ALL NECESSARY LICENSES AND PERMITS REQUIRED TO COMPLETE THE WORK INCLUDED IN THE CONTRACT DOCUMENTS AT THE CONTRACTOR'S EXPENSE.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THAT THEY AND THEIR SUBCONTRACTOR'S HAVE THE CORRECT/MOST UP-TO-DATE PLANS AVAILABLE.
3. CONTRACTOR SHALL GIVE MINIMUM 72 HOURS NOTICE TO NC DEMLR AND PROJECT ENGINEER PRIOR TO CONSTRUCTION.
4. ALL WORK WITHIN JURISDICTIONAL BOUNDARIES (WETLAND AND STREAMS) SHALL BE PERFORMED IN STRICT ACCORDANCE WITH APPROVED NATIONWIDE PERMIT NO. SAW-XXXX-XXXXX.
5. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION IS MINIMIZED.
6. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING BUFFER VEGETATION AND CONSTRUCTION CORRIDOR TO THE MAXIMUM EXTENT PRACTICAL.
7. THERE MAY BE WETLANDS WITHIN THIS SITE. IT IS THE OWNER'S RESPONSIBILITY TO COMPLETE A JURISDICTIONAL REVIEW FOR ON-SITE WETLANDS AND PERMIT ANY DISTURBANCES PRIOR TO ANY GRADING ACTIVITY.
8. IF THE CONTRACTOR, IN THE COURSE OF WORK, FINDS ANY DISCREPANCIES IN THE PLANS OR NOTES GIVEN BY THE PROJECT ENGINEER, IT SHALL BE HIS/HER DUTY IMMEDIATELY INFORM THE PROJECT ENGINEER, IN WRITING, AND THE PROJECT ENGINEER WILL PROMPTLY VERIFY THE SAME. ANY WORK DONE AFTER SUCH DISCOVERY, UNTIL AUTHORIZED, WILL BE AT THE CONTRACTOR'S RISK.
9. ANY DAMAGE TO PRIVATE PROPERTY AND/OR EXISTING UTILITIES INCURRED DURING CONSTRUCTION ACTIVITIES SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
10. ALL MECHANIZED EQUIPMENT OPERATED NEAR SURFACE WATERS SHALL BE INSPECTED AND MAINTAINED REGULARLY TO PREVENT CONTAMINATION OF SURFACE WATERS FROM FUELS, LUBRICANTS, HYDRAULIC FLUIDS, OR OTHER TOXIC MATERIALS. CONSTRUCTION SHALL BE STAGED IN ORDER TO MINIMIZE THE EXPOSURE OF EQUIPMENT TO SURFACE WATERS TO THE MAXIMUM EXTENT PRACTICABLE. FUELING, LUBRICATION, AND GENERAL EQUIPMENT MAINTENANCE SHALL BE PERFORMED IN A MANNER TO PREVENT, TO THE MAXIMUM EXTENT PRACTICABLE, CONTAMINATION OF SURFACE WATERS BY FUELS AND OILS.
11. HEAVY EQUIPMENT WORKING IN WETLANDS SHALL BE PLACED ON MATS OR OTHER MEASURES SHALL BE TAKEN TO MINIMIZE SOIL DISTURBANCE.
12. FIVE-STRAND BARBED WIRE FENCE TO BE INSTALLED AROUND THE ENTIRE CONSERVATION EASEMENT BOUNDARY. SEE SHEET L2.00 FOR FENCE SPECIFICATIONS.

CONSTRUCTION SEQUENCE:

1. OBTAIN PLAN APPROVAL AND OTHER APPLICABLE PERMITS.
2. OBTAIN AN APPROVED (STAMPED) EROSION & SEDIMENT CONTROL PLAN AND KEEP IT ON-SITE EITHER IN THE INSPECTION BOX, CONSTRUCTION OFFICE, OR WITH THE CONTRACTOR.
3. SCHEDULE AND HOLD AN ON-SITE PRE-CONSTRUCTION CONFERENCE AT LEAST ONE WEEK PRIOR TO BEGINNING ANY LAND-DISTURBING ACTIVITIES. THE CONFERENCE SHOULD BE ATTENDED BY A DEMLR EROSION CONTROL INSPECTOR, THE GENERAL CONTRACTOR, ANY SUBCONTRACTORS, THE ENGINEER, AND A REPRESENTATIVE OF THE OWNER.
4. CONTRACTOR SHALL NOTIFY "NC811" (811) OR (1-800-632-4949) AT LEAST 3 FULL BUSINESS DAYS PRIOR TO BEGINNING CONSTRUCTION OR EXCAVATION TO HAVE EXISTING UTILITIES LOCATED. CONTRACTOR SHALL CONTACT ANY LOCAL UTILITIES THAT PROVIDE THEIR OWN LOCATOR SERVICES INDEPENDENT OF "NC811". REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY.
5. ALL DIMENSIONS AND GRADES SHOWN ON THE PLANS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY DISCREPANCIES EXIST PRIOR TO PROCEEDING WITH CONSTRUCTION, FOR NECESSARY PLAN OR GRADE CHANGES. NO EXTRA COMPENSATION SHALL BE PAID TO THE CONTRACTOR FOR ANY WORK DONE DUE TO DIMENSIONS OR GRADES SHOWN INCORRECTLY ON THESE PLANS IF SUCH NOTIFICATION HAS NOT BEEN GIVEN.
6. ESTABLISH CONSTRUCTION ENTRANCE (SEE DETAIL ON SHEET C6.15) AND STAGING AREAS ACCORDING TO THE EROSION CONTROL PLANS. IF NECESSARY, TEMPORARY DRIVEWAY PERMIT FOR CONSTRUCTION ENTRANCES IN NCDOT RIGHT OF WAY MUST BE PRESENTED AT PRE-CONSTRUCTION MEETING. THE CONTRACTOR SHOULD DOCUMENT, VISUALLY AND IN WRITING, THE EXISITNG CONDITIONS OF ANY PERMANENT SITE ACCESS LOCATIONS AND ACCESS ROUTES TO BE USED DURING CONSTRUCTION.
7. ALL EROSION CONTROL MEASURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NC DEQ EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.
8. INSTALL EROSION CONTROL MEASURES (SILT FENCE, TREE PROTECTION, ETC.) AS SHOWN ON PLANS, CLEARING ONLY AS NECESSARY TO INSTALL THESE DEVICES.
9. STAGING/STOCKPILE AREAS SHOWN ON THE PLANS ARE APPROXIMTE. CONTRACTOR TO FIELD LOCATE STAGING/STOCKPILE AREAS MIN. 50' FROM SURFACE WATERS AS APPROVED BY THE ENGINEER.
10. PARK ALL CONSTRUCTION EQUIPMENT, INCLUDING TRUCKS AND HEAVY EQUIPMENT WITHIN THE LIMITS OF DISTURBANCE.
11. WHEN ACCESS TO A CONSTRUCTION AREA REQUIRES CROSSING A DELINEATED JURISDICTIONAL FEATURE, IMPACTS SHALL BE MINIMIZED BY PLACING A TEMPORARY STREAM/WETLAND CROSSING (LOG MAT) ACROSS THE FEATURE PRIOR TO ACCESSING THE AREA WITH HEAVY EQUIPMENT PER APPROVED PLANS AND SPECIFICATIONS. SEE SHEET C6.16 FOR LOG MAT DETAIL.
12. INSTALL REMAINING EROSION CONTROL MEASURES AS SHOWN ON SHEETS C6.03 - C6.14. CLEAR AND GRUB ONLY AS NECESSARY TO INSTALL THESE DEVICES.
13. BEGIN GRADING ACTIVITIES. IN GENERAL, THE CONTRACTOR SHALL WORK FROM UPSTREAM TO DOWNSTREAM AND CONSTRUCTION IN A LIVE CHANNEL UTILIZE A PUMP-AROUND OR FLOW DIVERSION MEASURE AS SHOWN ON THE PLANS. MAINTAIN AND ADJUST E&SC MEASURES AS GRADING PROGRESSES.
14. CONTRACTOR SHALL EXCAVATE THE PROPOSED CHANNEL AND MODIFY SECTIONS OF THE EXISTING CHANNEL BASED ON THE PROPOSED PROFILE (SHEET C5.00-C5.12) IN SECTIONS NO GREATER THAN 300 LINEAR FEET AT A TIME (EXCEPT WHERE LONGER SECTIONS ARE NECESSARY TO MAINTAIN CONSTRUCTABILITY).
15. AT THE END OF EACH WORKING DAY, THE CONTRACTOR WILL BE RESPONSIBLE FOR THE APPLICATION OF SEED AND STRAW, AS APPLICABLE, TO NEWLY ESTABLISHED STREAMBANKS AND DISTURBED AREAS. EROSION CONTROL MATTING WILL BE INSTALLED ON TOP OF THE SEED AND STRAW IN ACCORDANCE WITH THE EROSION CONTROL CONSTRUCTION SEQUENCE.
16. WORK SECTIONS THAT INVOLVE THE CONSTRUCTION OF A CONFLUENCE OF TWO OR MORE REACHES MAY REQUIRE THE USE OF TWO OR MORE PUMP-AROUND OPERATIONS.
17. GRADING OF SOME PORTIONS OF THE PROPOSED FLOODPLAIN MAY NEED TO BE DELAYED UNTIL AFTER WORK IN SUBSEQUENT SECTIONS HAS BEEN COMPLETED, ESPECIALLY NEAR THE CONFLUENCES. HAUL ROADS AND TEMPORARY SILT FENCE MAY ALSO NEED TO BE REMOVED BEFORE THE PROPOSED FLOODPLAIN CAN BE COMPLETED AND/OR UNUSED EXISTING CHANNEL BE FILLED.
18. AFTER EXCAVATING THE CHANNEL TO DESIGN GRADES, INSTALLING IN-STREAM STRUCTURES, SEED AND MULCH, MATTING, AND TRANSPLANTS, THE NEW CHANNEL CAN RECEIVE FLOW AFTER APPROVAL BY THE ENGINEER.
19. NO WATER SHALL BE TURNED INTO ANY SECTION OF CHANNEL PRIOR TO THE CHANNEL BEING COMPLETELY STABILIZED WITH ALL STRUCTURES INSTALLED.
20. ANY GRADING ACTIVITIES ADJACENT TO THE STREAM CHANNEL SHALL BE COMPLETED PRIOR TO TURNING WATER INTO THE NEW STREAM CHANNEL SEGMENTS. THE CONTRACTOR SHALL NOT GRADE OR ROUGHEN ANY AREAS WHERE EXCAVATION ACTIVITIES HAVE NOT BEEN COMPLETED UNLESS SHOWN ON THE PLANS OR DIRECTED BY THE ENGINEER. NO DISTURBANCE SHALL OCCUR OUTSIDE OF THE LIMITS OF DISTURBANCE.
21. CONTRACTOR SHALL IMPROVE AND CONSTRUCT THE FARM ROADS AND PERMANENT CROSSINGS BY INSTALLING BRIDGES/CULVERTS, STABILIZING SIDE SLOPES, AND MODIFYING THE FARM ROAD BED ACCORDING TO THE PLANS AND SPECIFICATIONS. PERMANENT STREAM CROSSINGS WILL BE INSTALLED WHILE THE WORKING SECTION CONTAINING THE CROSSING HAS BEEN DEWATERED. ADJUST HAUL ROADS AND ASSOCIATED SILT FENCE AS NECESSARY WHEN PERMANENT STREAM CROSSINGS ARE INSTALLED. THE CONTRACTOR MAY PLACE A TEMPORARY STREAM CROSSING (I.E. LOG MAT) IN THE LOCATION OF THE PERMANENT CROSSING PRIOR TO INSTALLATION OF THE PERMANENT STRUCTURE.
22. THE CONTRACTOR SHALL DILIGENTLY AND CONTINUOUSLY MAINTAIN ALL EROSION CONTROL DEVICES AND STRUCTURES.
23. STABILIZE THE SITE AS AREAS ARE BROUGHT TO FINISHED GRADE. AT THE CONCLUSION OF GRADING AND CONSTRUCTION OR IF LAND-DISTURBING ACTIVITY STOPPED FOR MORE THAN 14 CONSECUTIVE CALENDAR DAYS, PERMANENT SEED MIXTURE SHALL BE APPLIED TO DISTRUBED AREAS PER SHEET L5.01.
24. CONTRACTOR SHALL PLANT WOODY VEGETATION AND LIVE STAKES, ACCORDING TO PLANTING DETAILS AND SPECIFICATIONS. THE CONTRACTOR SHALL COMPLETE THE LIVE STAKING AND REFORESTATION (BARE-ROOT PLANTING) PHASE OF THE PROJECT AND APPLY PERMANENT SEEDING AT THE APPROPRIATE TIME OF YEAR.
25. COORDINATE WITH THE EROSION CONTROL INSPECTOR PRIOR TO REMOVAL OF ANY EROSION CONTROL MEASURES.
26. STABILIZE ALL DISTURBED AREAS. REMOVE STAGING AREA AND CONSTRUCTION ENTRANCE.
27. REMOVE ALL EROSION CONTROL MEASURES AND CONTACT NC DEMLR FOR FINAL INSPECTION ONCE PERMANENT VEGETATION HAS BEEN ESTABLISHED.
28. PERMANENT SITE ACCESS LOCATIONS AND ACCESS ROUTES USED DURING CONSTRUCTON SHALL BE RETURNED TO EQUAL OR BETTER CONDITION THAN THEY EXISTED PRIOR TO THE BEGINING OF CONSTRUCTION ACTIVITIES BEFORE DEMOBILIZING FROM THE SITE.
29. DEMOBILIZE ALL EQUIPMENT AND MATERIALS FROM SITE.

CHANNEL CONSTRUCTION (PUMP AROUND):

1. INSTALL PUMP AROUND ALONG 200' TO 300' OF STREAM CHANNEL, OR NO MORE THAN CAN BE CONSTRUCTED IN ONE (1) WORKING DAY (DEWATERING AND PUMP AROUND DETAILS ON SHEET C6.18).
2. RIPRAP APRONS WILL BE CONSTRUCTED TO IMPEDE ANY EROSION OF THE CHANNEL AND STREAM BANKS BY THE WATER DIVERTED FROM THE PUMP-AROUND PROCEDURE.
3. WORK SECTIONS THAT INVOLVE THE CONSTRUCTION OF A CONFLUENCE OR TWO REACHES MAY REQUIRE THE USE OF TWO PUMP-AROUND OPERATIONS.
4. HARVEST MATERIAL FROM THE BOTTOM OF THE EXISTING CHANNEL TO BE PLACED IN THE BOTTOM OF THE PROPOSED CHANNEL. THIS SHALL INCLUDE THE SURFACE MATERIAL AND UP TO ONE (1) FOOT BELOW TO INCLUDE THE HYPORHEIC ZONE. ADDITIONAL RIVER STONE SHALL BE MIXED WITH EXISTING CHANNEL MATERIAL AS NECESSARY.
5. IN-STREAM STRUCTURES WILL BE INSTALLED ACCORDING TO THE DETAILS PRESENTED ON SHEET C8.00-C8.10.
6. FILL EXISTING CHANNEL ON THE SAME WORKING DAY AS COMPLETING THE PROPOSED CHANNEL. IN NO EVENT SHALL THE EXISTING CHANNEL BE FILLED PRIOR TO THE COMPLETE CONSTRUCTION OF THE CORRESPONDING PROPOSED CHANNEL.
7. ANY DEWATERING OPERATIONS DURING CONSTRUCTION SHALL USE A FLOATING INTAKE AND SILT BAG TO MINIMIZE SEDIMENT DISCHARGE. FLOATING INTAKE AND SILT BAG SHALL BE CONTINUOUSLY MONITORED WHILE IN USE FOR SIGNS OF CLOGGING OR MALFUNCTION.
8. ANY EXCAVATED MATERIAL CONTAINING MANMADE MATERIAL IS NOT SUITABLE MATERIAL FOR CHANNEL FILL AND MUST BE DISPOSED OF OFFSITE UNLESS OTHERWISE DIRECTED BY OWNER.
9. IN ANY SECTION WHERE THE NEW CHANNEL ALIGNMENT CROSSES THE EXISTING CHANNEL A CLAY PLUG WILL BE INSTALLED IN THE EXISTING CHANNEL AS PER DETAIL ON SHEET C6.20.
10. THE PROPOSED CHANNEL BANKS SHALL BE STABILIZED WITH EROSION CONTROL MATTING AND TEMPORARY SEEDING UPON COMPLETION OF EACH SECTION AS PER DETAIL ON SHEETS C6.21 AND L5.01.
11. COMPLETE ALL EARTHWORK, STRUCTURE INSTALLATION, AND STABILIZATION IN THE PUMP AROUND AREA.
12. CONTRACTOR SHALL NOTIFY ENGINEER UPON DISCOVERY OF ANY CONSTRAINTS DISCOVERED IN THE CONSTRUCTION OF THE PROPOSED CHANNEL OR STRUCTURE PLACEMENT AND ADJUSTMENTS CAN BE MADE ON SITE.
13. GRADING OF THE PROPOSED FLOODPLAIN MAY NEED TO BE DELAYED UNTIL AFTER WORK IN SUBSEQUENT SECTIONS HAS BEEN COMPLETED, ESPECIALLY NEAR CONFLUENCES. HAUL ROADS AND TEMPORARY SILT FENCE MAY ALSO NEED TO BE REMOVED BEFORE THE PROPOSED FLOODPLAIN CAN BE COMPLETED AND/OR UNUSED EXISTING CHANNEL CAN BE FILLED.

EXISTING CONDITION & DEMOLITION NOTES:

1. THERE SHALL BE NO DEMOLITION ACTIVITIES UNTIL AFTER A PRE-CONSTRUCTION MEETING HAS TAKEN PLACE.
2. ALL MATERIAL TO BE DEMOLISHED SHALL BE REMOVED FROM THE SITE AND DISPOSED OF AT A PERMITTED SITE IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL LAWS.
3. EXISTING UTILITIES AND STRUCTURES SHOWN, BOTH UNDERGROUND AND ABOVE GROUND, ARE BASED ON A FIELD SURVEY AND THE BEST AVAILABLE RECORD DRAWINGS. THE CONTRACTOR SHALL VERIFY FIELD CONDITIONS PRIOR TO BEGINNING RELATED CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.
4. ALL EXISTING FENCING MATERIAL LOCATED INTERNAL TO THE CONSERVATION EASEMENT SHALL BE REMOVED BY THE CONTRACTOR.
5. CONTRACTOR SHALL LOCATE AND REMOVE ALL EXISTING DRAINAGE TILES WITHIN THE CONSERVATION EASEMENT.

SITE PREPARATION: CLEARING & TOPSOIL/SUBSOIL EXCAVATION

1. ALL SHRUBS AND SMALL TREES DESIGNATED BY THE ENGINEER WILL BE SAVED FOR TRANSPLANTING. PLANTS THAT ARE TO BE TRANSPLANTED WILL BE MARKED WITH HIGHLY VISIBLE TAPE.
2. ANY UNUSABLE TREES & BRUSH REMOVED DURING CLEARING & GRUBBING OF SITE SHALL BE CHIPPED ON SITE AND HAULED OFF SITE FOR DISPOSAL.
3. CONTRACTOR SHALL MANAGE EXCAVATED TOPSOIL SEPARATELY FROM EXCAVATED SUBSOIL. EXCAVATED TOPSOIL SHALL BE PLACED WITHIN THE DESIGNATED TEMPORARY STOCKPILE AREAS AWAY FROM THE CHANNEL TO BE FILLED (SEE PLANS). TOPSOIL SHALL BE FREE OF STONES OVER 1" IN DIAMETER, ROOTS, STICKS, RUBBISH, STIFF CLAY, AND EXTRANEOUS MATTER.
4. EXCAVATED SUBSOIL SHALL BE PLACED NEAR THE CHANNEL TO BE FILLED. ONCE THE NEW STREAM IS CONSTRUCTED, SUBSOIL SHALL BE USED TO FILL THE EXISTING CHANNEL FIRST, THEN STOCKPILED TOPSOIL SHALL BE USED FOR THE FINAL 6 INCHES OF FILL TO ACHIEVE DESIGN GRADES AND CREATE A SOIL BASE FOR VEGETATION.
5. CONTRACTOR SHALL HARVEST AND STOCKPILE NATIVE CHANNEL SUBSTRATE (COBBLE, STONE, ETC.) FOR USE IN PROPOSED IN-STREAM STRUCTURES.

Rebecca Stubbs

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NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

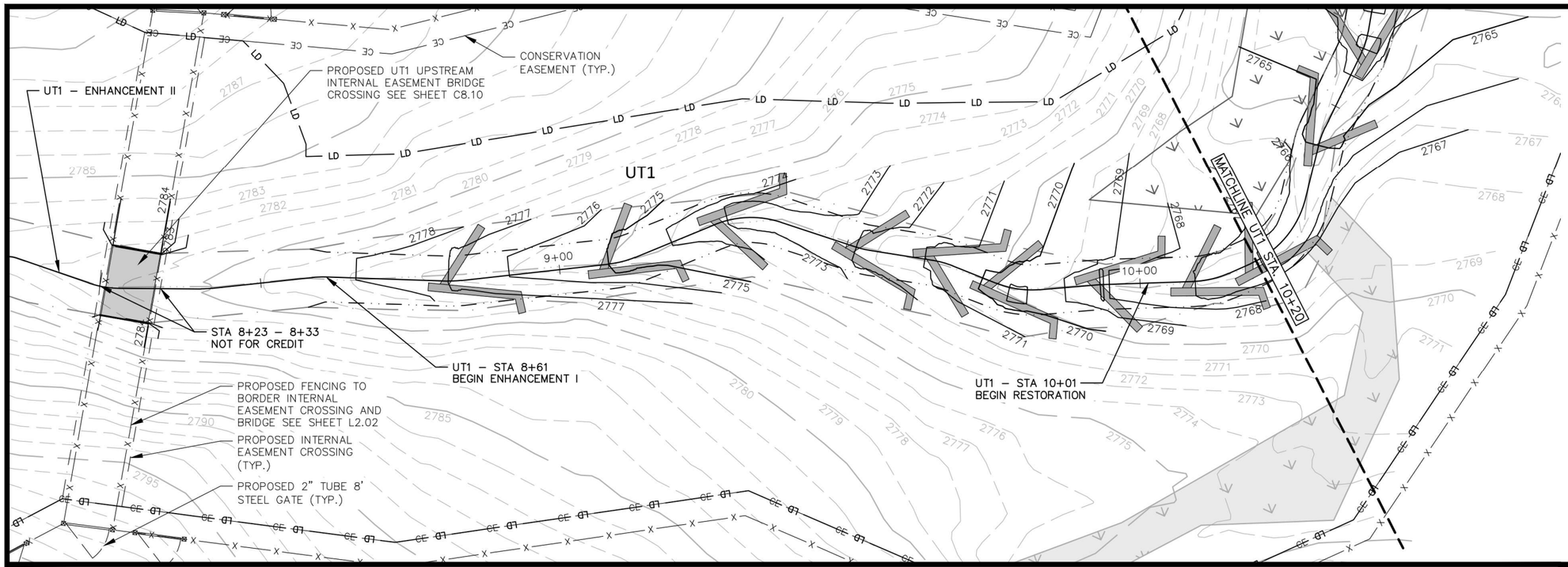
Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI-1001
FILENAME	AXI-1001-C1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	
DATE	12.14.2023

CONSTRUCTION NOTES

C1.03



UT1 STRUCTURE LOCATIONS

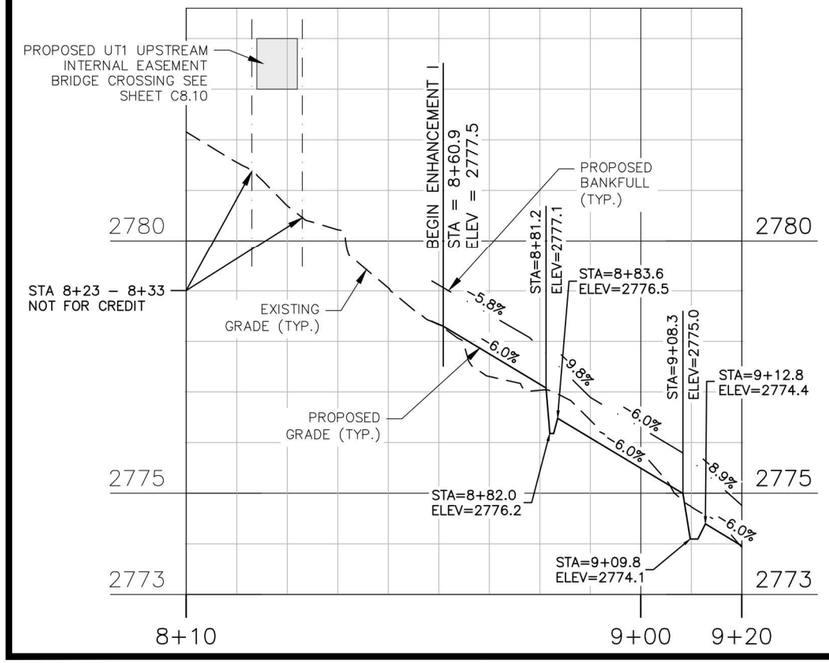
STRUCTURE TYPE	STATION	ELEVATION
SILL STEP	8+81.2	2777.1
SILL STEP	9+08.3	2775.0
SILL STEP	9+27.1	2773.5
SILL STEP	9+51.5	2772.2
SILL STEP	9+64.5	2770.9
SILL STEP	9+75.9	2769.9
SILL STEP	9+93.2	2768.7
SILL STEP	10+08.8	2767.2
SILL STEP	10+19.1	2766.3

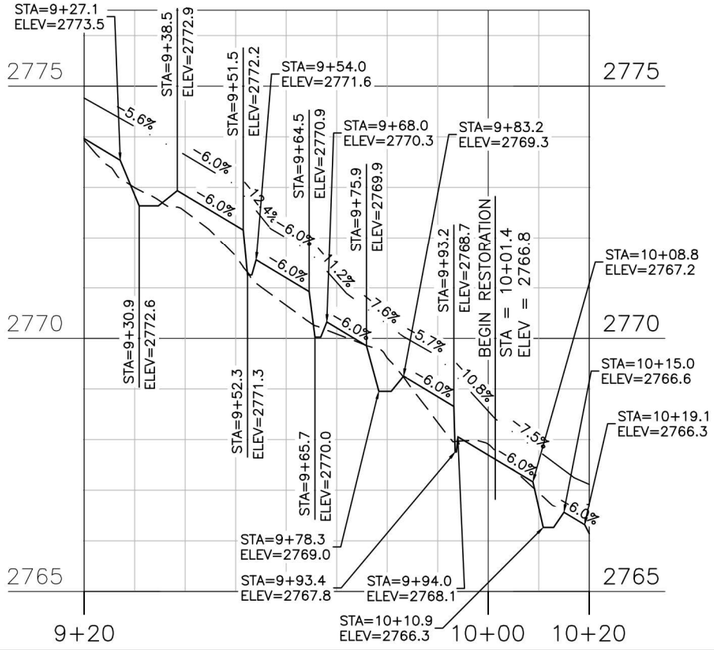
GRAPHIC SCALE

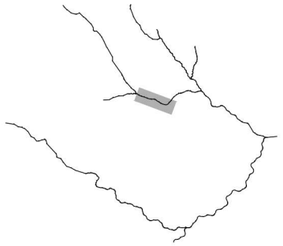
0 10 20 40

1 inch = 20 ft.

TOTAL DISTURBED AREA = 8.9 AC.







VICINITY MAP
1"=1000'

Rebecca Stubbs

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Date: 2023.12.14 12:46:56 -05'00'

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CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

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Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
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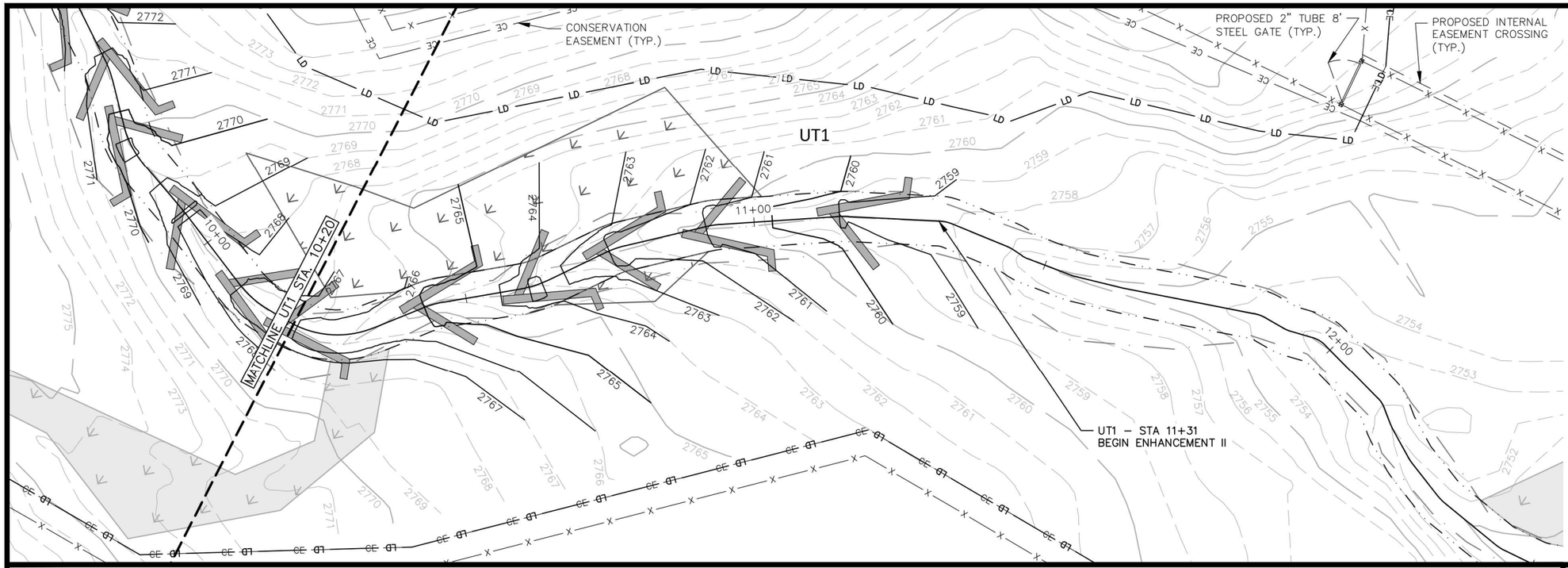
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 20'
DATE	12.14.2023

PLAN AND PROFILE

UT1: STA 8+10-10+20

C5.00



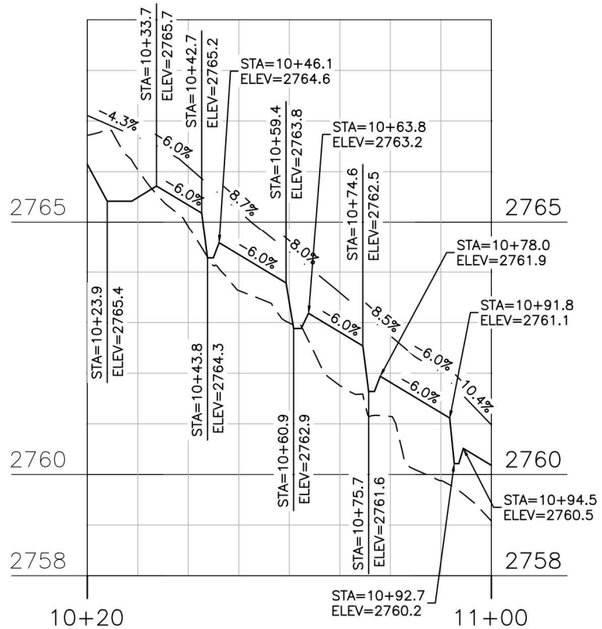
UT1 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
SILL STEP	10+42.7	2765.2
SILL STEP	10+59.4	2763.8
SILL STEP	10+74.6	2762.5
SILL STEP	10+91.8	2761.1
SILL STEP	11+13.9	2759.3

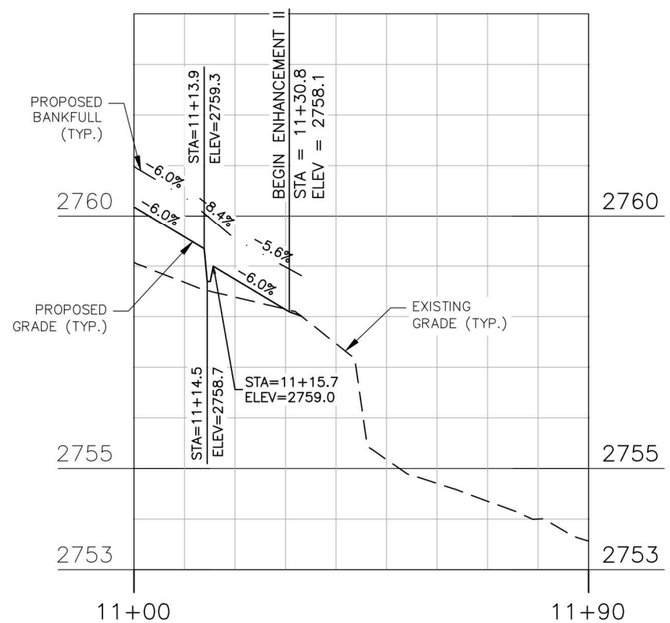
GRAPHIC SCALE

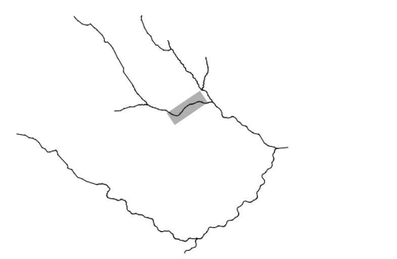
0 10 20 40

1 inch = 20 ft.

TOTAL DISTURBED AREA = 8.9 AC.







VICINITY MAP
1"=1000'

Rebecca Stubbs

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Date: 2023.12.14 12:44:22 -05'00'

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CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION	
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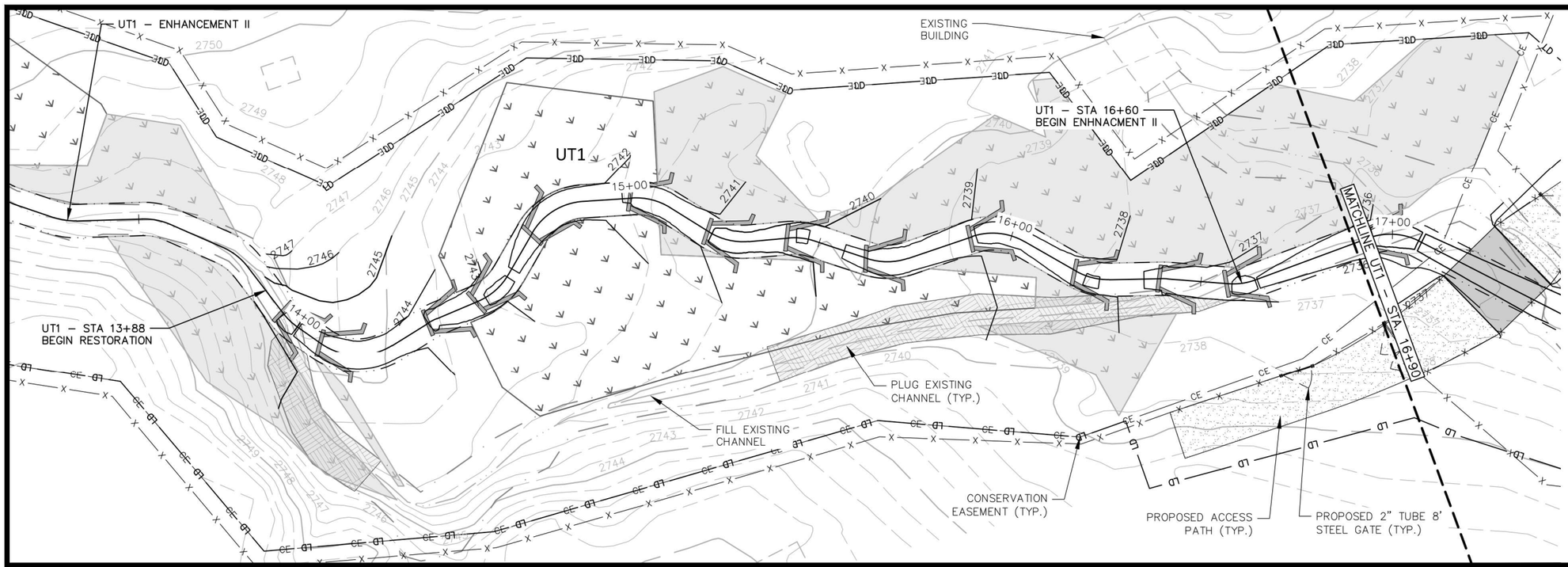
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 20'
DATE	12.14.2023

PLAN AND PROFILE

UT1: STA 10+20 - 11+90

C5.01



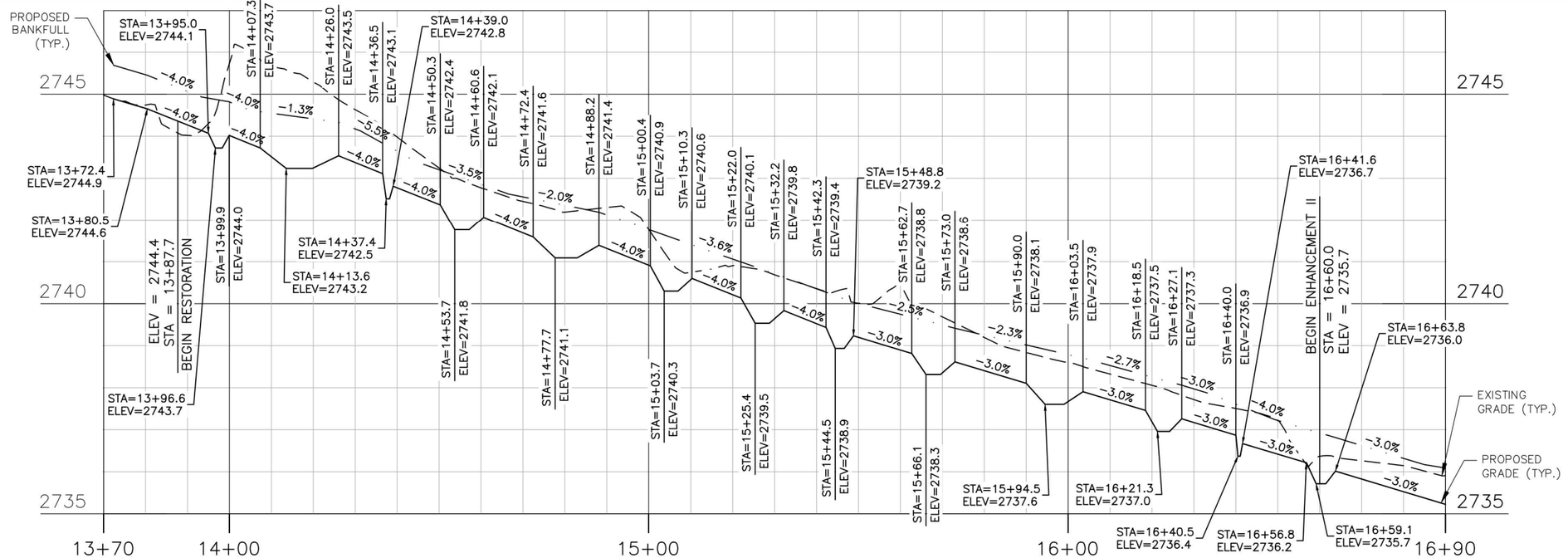
UT1 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
CROSS VANE	13+95.0	2744.1
CROSS VANE	14+07.3	2743.7
CROSS VANE	14+36.5	2743.1
CROSS VANE	14+50.3	2742.4
CROSS VANE	14+72.4	2741.6
CROSS VANE	15+00.4	2740.9
CROSS VANE	15+22.0	2740.1
CROSS VANE	15+42.3	2739.4
CROSS VANE	15+62.7	2738.8
CROSS VANE	15+90.0	2738.1
CROSS VANE	16+18.5	2737.5
CROSS VANE	16+40.0	2736.9
CROSS VANE	16+56.8	2736.2

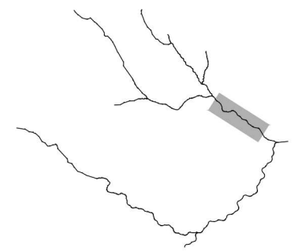
GRAPHIC SCALE

0 15 30 60

1 inch = 30 ft.

TOTAL DISTURBED AREA = 8.9 AC.





VICINITY MAP
1"=1000'

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Date: 2023.12.14 12:48:31 -05'00'

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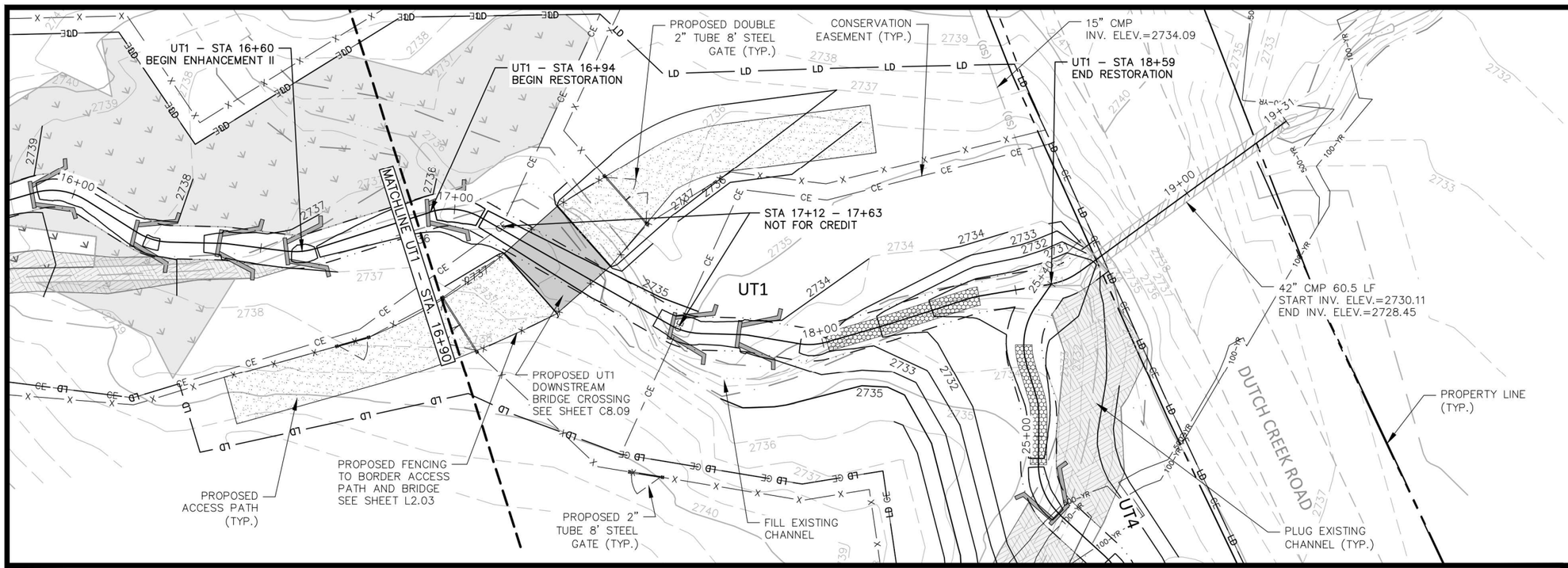
DATE	12.14.2023

PLAN AND PROFILE

UT1: STA 13+70 - 16+90

C5.02



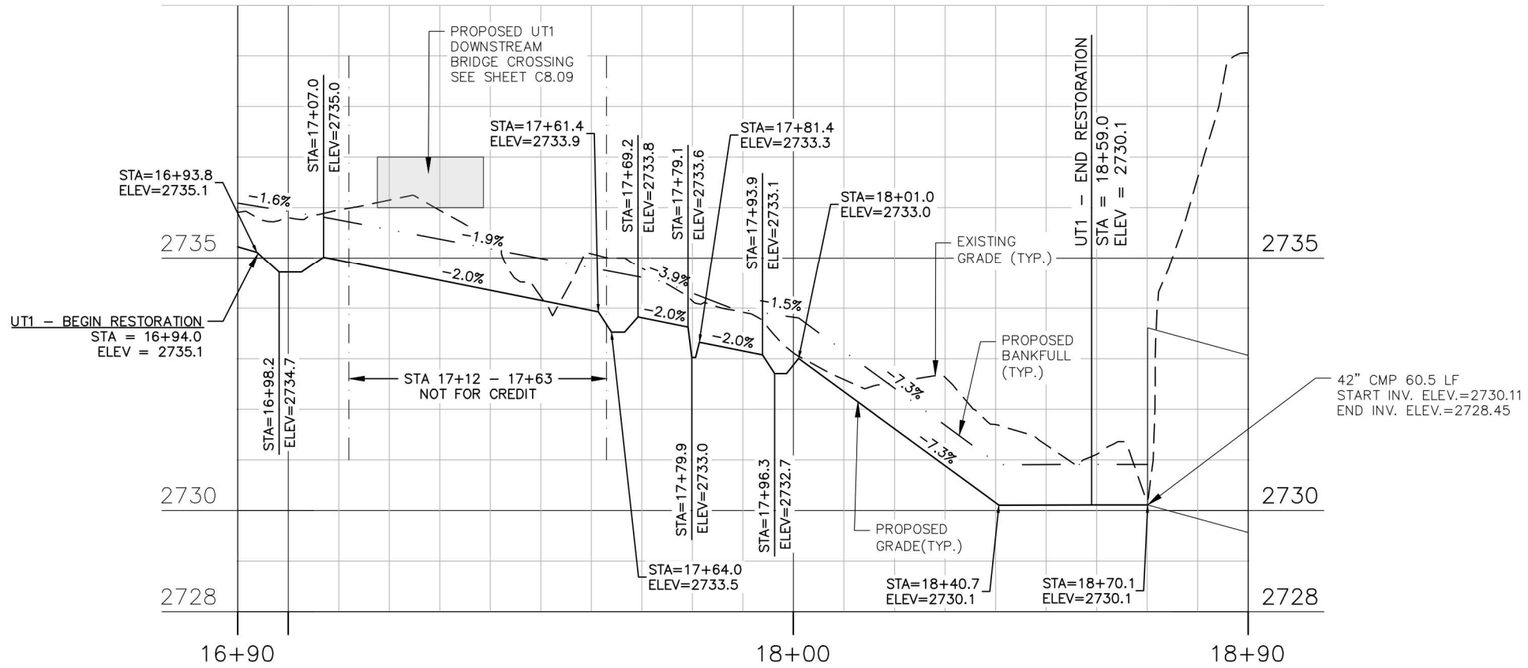
UT1 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
CROSS VANE	16+93.8	2735.1
CROSS VANE	17+61.4	2733.9
CROSS VANE	17+79.1	2733.6
DROP STRUCTURE	18+01.0	2733.0

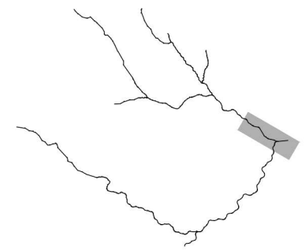
GRAPHIC SCALE

0 15 30 60

1 inch = 30 ft.

TOTAL DISTURBED AREA = 8.9 AC.





VICINITY MAP
1"=1000'

Rebecca Stubbs

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Date: 2024.01.17 12:50:51 -05'00'

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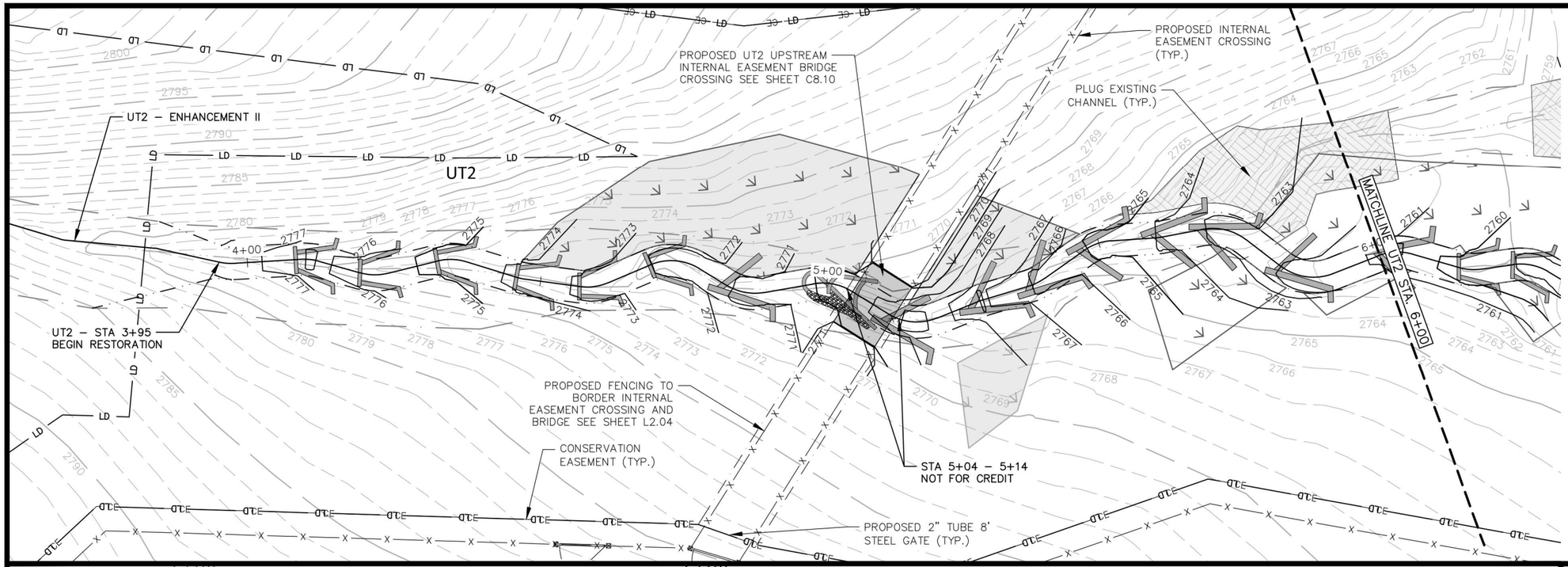
SCALE	1" = 30'
DATE	12.14.2023

PLAN AND PROFILE

UT1: STA 16+90 - 18+90

C5.03



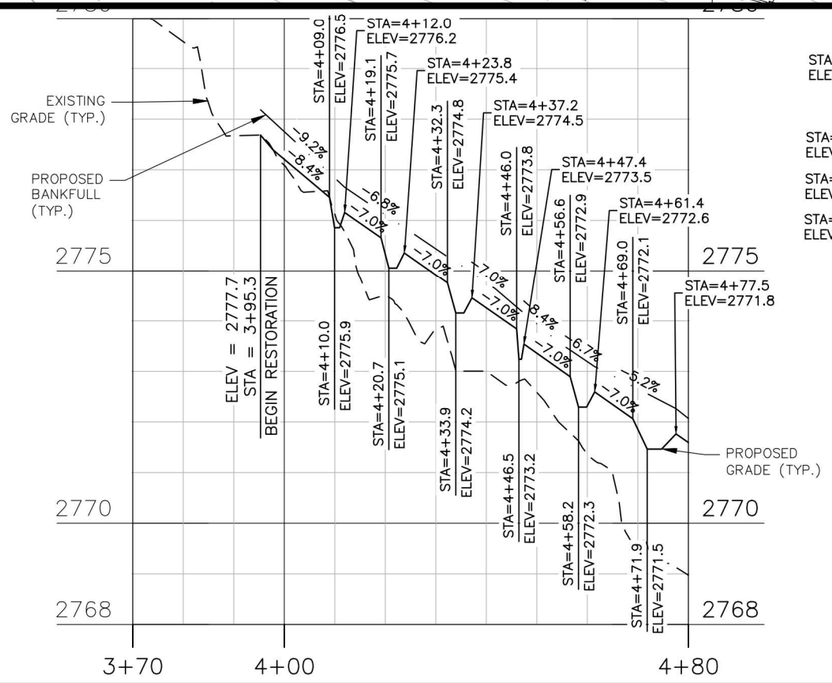
UT2 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
CROSS VANE	4+09.0	2776.5
CROSS VANE	4+19.1	2775.7
CROSS VANE	4+32.3	2774.8
CROSS VANE	4+46.0	2773.8
CROSS VANE	4+56.6	2772.9
CROSS VANE	4+69.0	2772.1
SILL STEP	4+83.0	2771.4
STEP POOL	4+97.8	2770.2
SILL STEP	5+11.6	2768.8
SILL STEP	5+27.5	2767.7
SILL STEP	5+36.2	2766.5
SILL STEP	5+47.2	2765.3
SILL STEP	5+59.5	2764.2
SILL STEP	5+67.6	2763.1
SILL STEP	5+82.4	2762.0
SILL STEP	5+99.8	2760.9

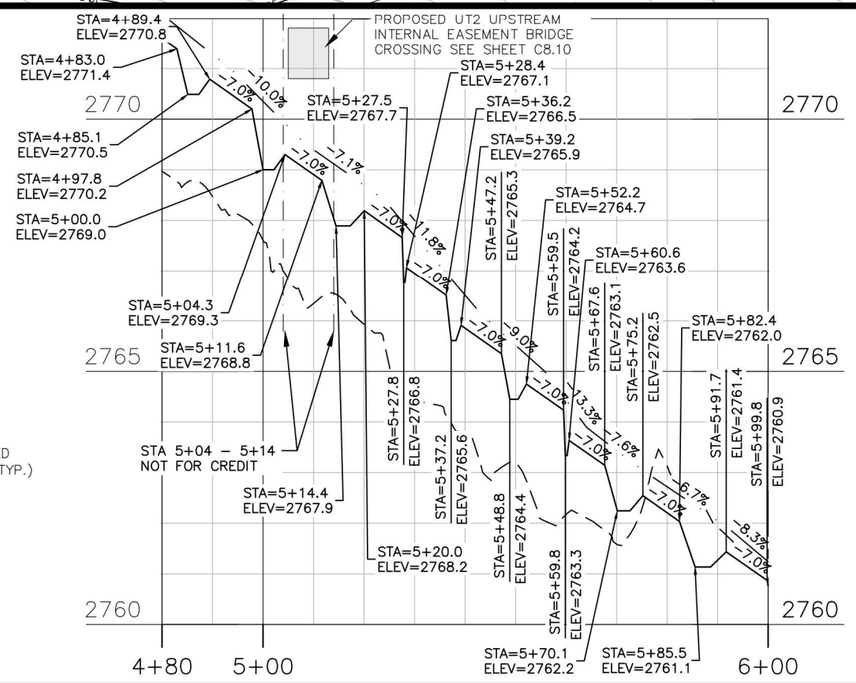
GRAPHIC SCALE

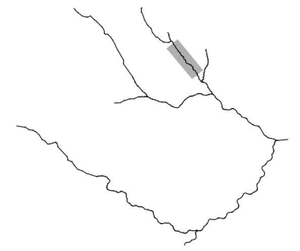
0 10 20 40

1 inch = 20 ft.

TOTAL DISTURBED AREA = 8.9 AC.







VICINITY MAP
1"=1000'

Rebecca Stubbs

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Date: 2023.12.14 12:52:04 -05'00'

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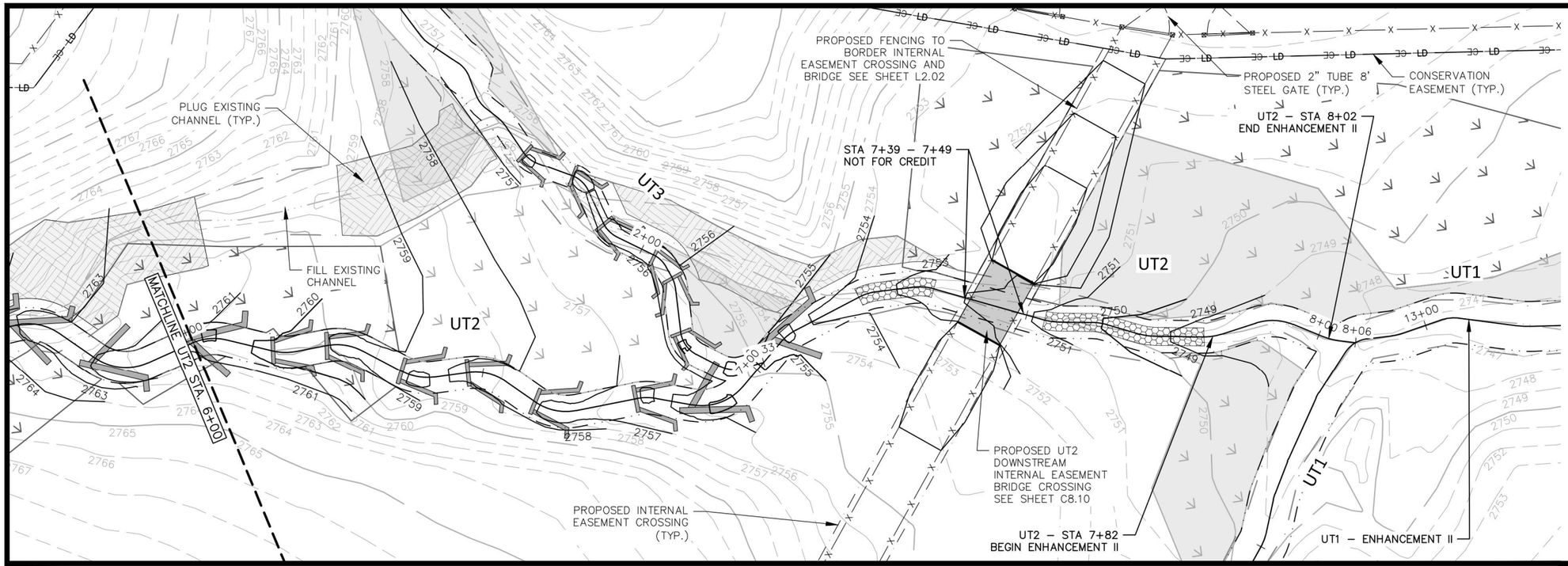
DRAWN BY	CHJ
SCALE	1" = 20'
DATE	12.14.2023

PLAN AND PROFILE

UT2: STA 3+70 - 6+00

C5.04



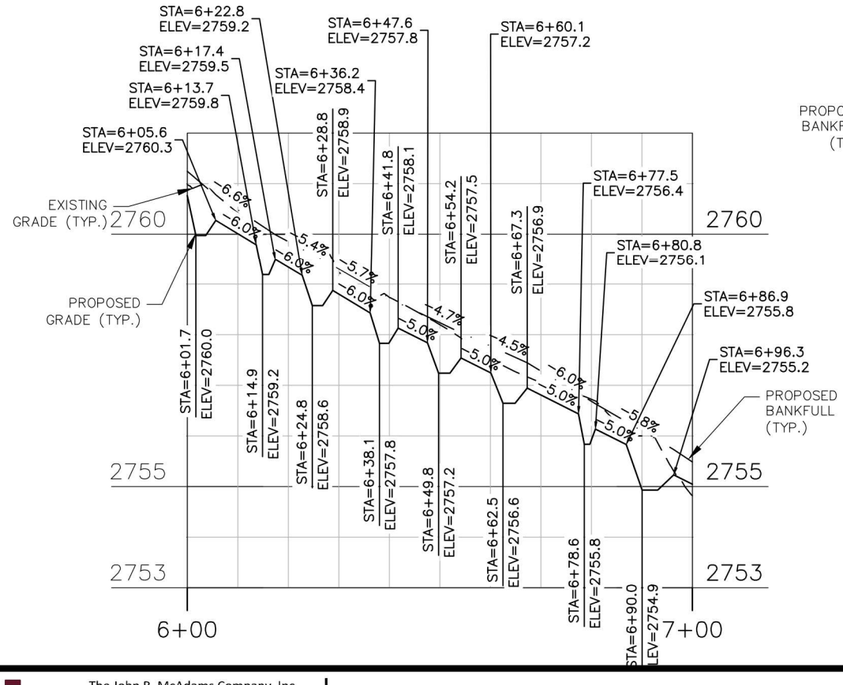
UT2 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
CROSS VANE	6+13.7	2759.8
CROSS VANE	6+22.8	2759.2
CROSS VANE	6+36.2	2758.4
CROSS VANE	6+47.6	2757.8
CROSS VANE	6+60.1	2757.2
CROSS VANE	6+77.5	2756.4
SILL STEP	6+86.9	2755.8
SILL STEP	7+06.0	2754.7
DROP STRUCTURE	7+21.2	2753.6
DROP STRUCTURE	7+55.5	2750.6

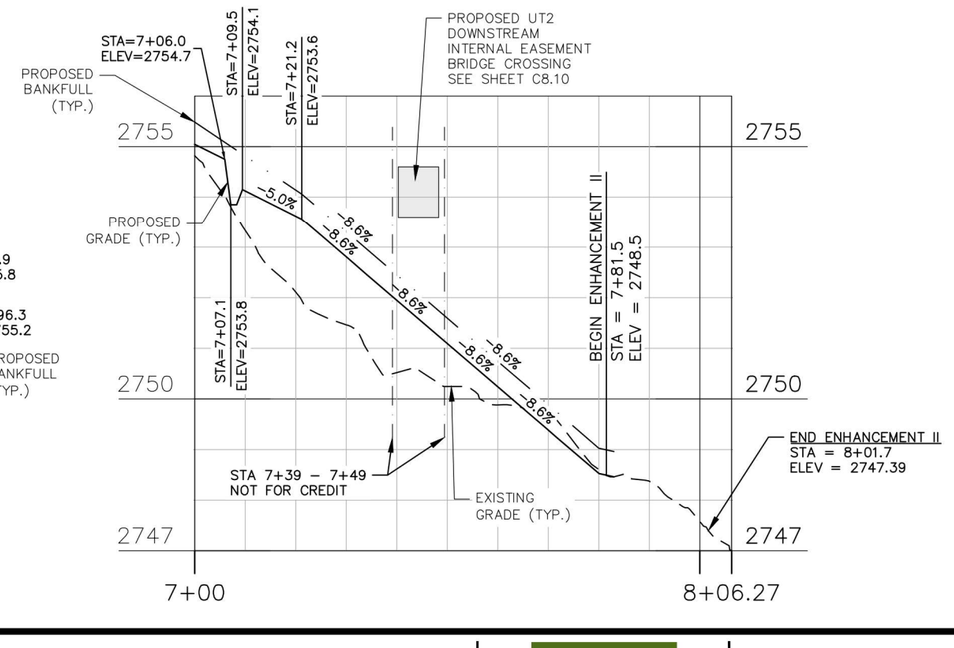
GRAPHIC SCALE

0 10 20 40

1 inch = 20 ft.

TOTAL DISTURBED AREA = 8.9 AC.





VICINITY MAP

1"=1000'

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Date: 2023.12.14 12:52:16 -05'00'

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CHECKED BY	RAS
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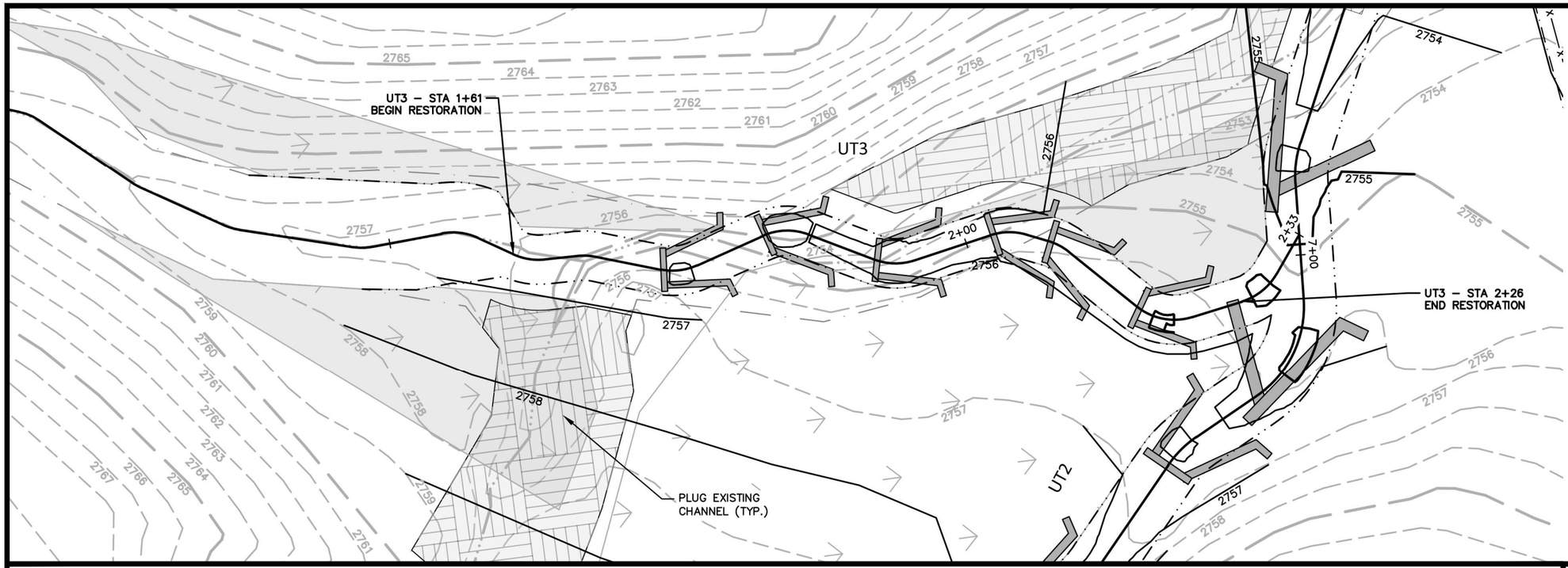
SCALE	1" = 20'
DATE	12.14.2023

PLAN AND PROFILE

UT2: STA 6+00 - 8+06.27

C5.05



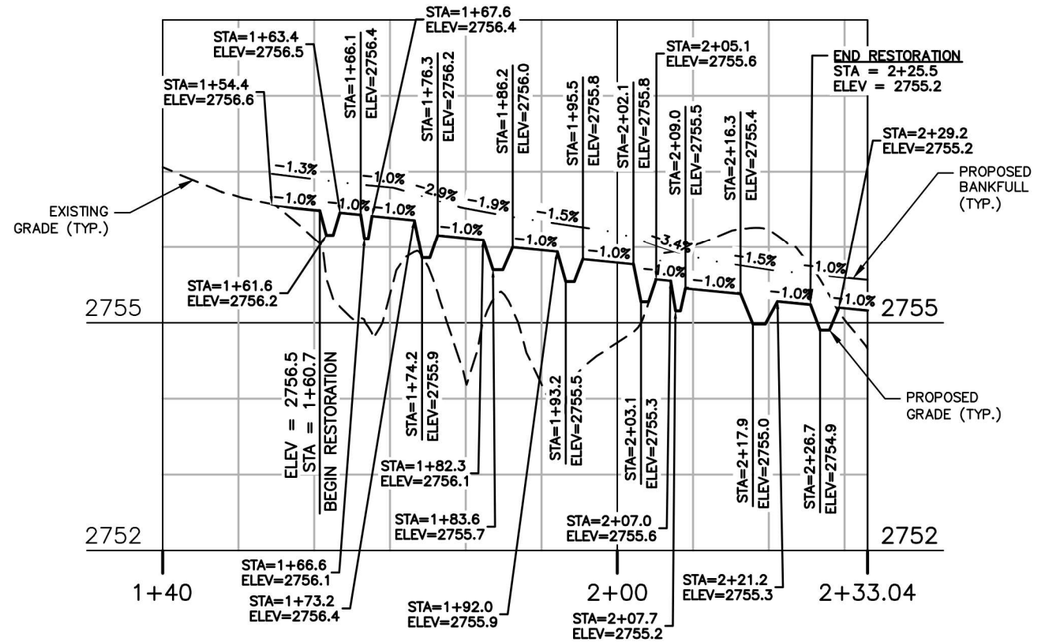
UT3 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
CROSS VANE	1+73.2	2756.4
CROSS VANE	1+82.3	2756.1
CROSS VANE	1+92.1	2755.9
CROSS VANE	2+02.1	2755.8
CROSS VANE	2+07.0	2755.6
CROSS VANE	2+16.3	2755.4

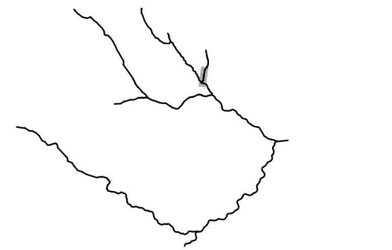
GRAPHIC SCALE

0 5 10 20

1 inch = 10 ft.

TOTAL DISTURBED AREA = 8.9 AC.





VICINITY MAP
1"=1000'

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Date: 2024.01.04 14:52:48 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

MCADAMS

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phone 919. 361. 5000
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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

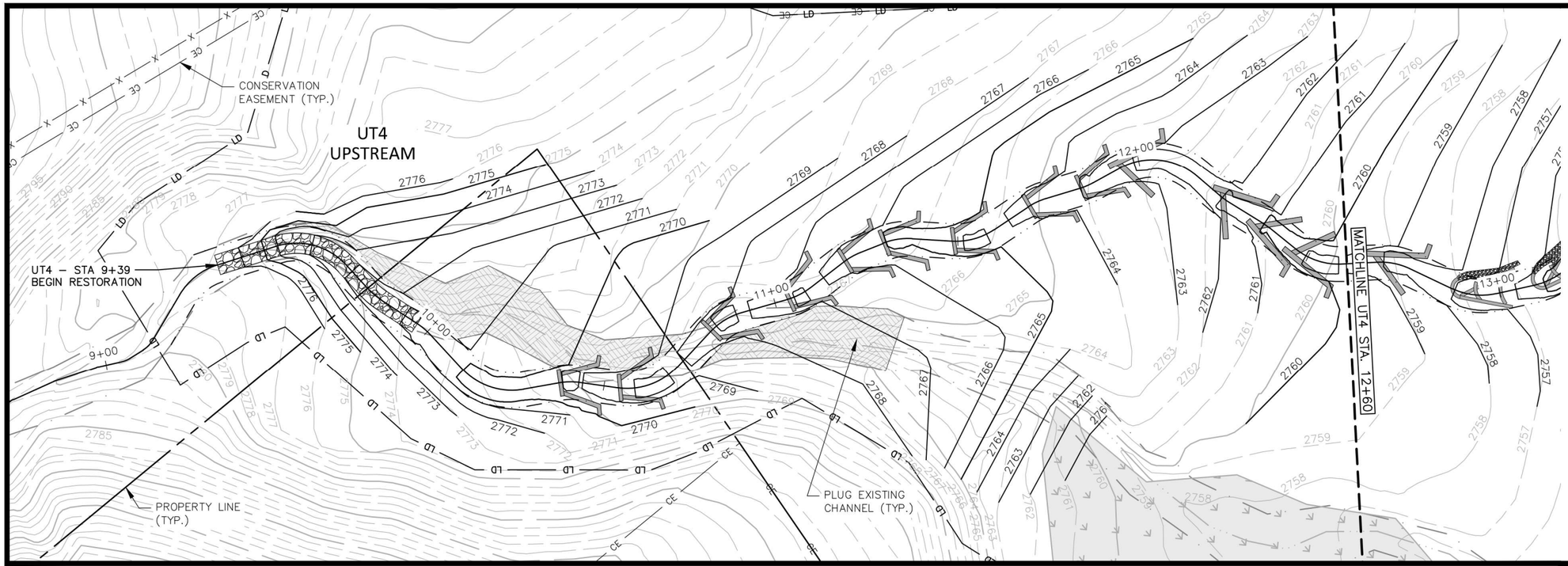
Axiom Environmental, Inc.

PLAN INFORMATION	
PROJECT NO.	AXI1001
FILENAME	AXI-1001-P1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 10'
DATE	12.14.2023

PLAN AND PROFILE

UT3: STA 1+40 - 2+33.04

C5.06



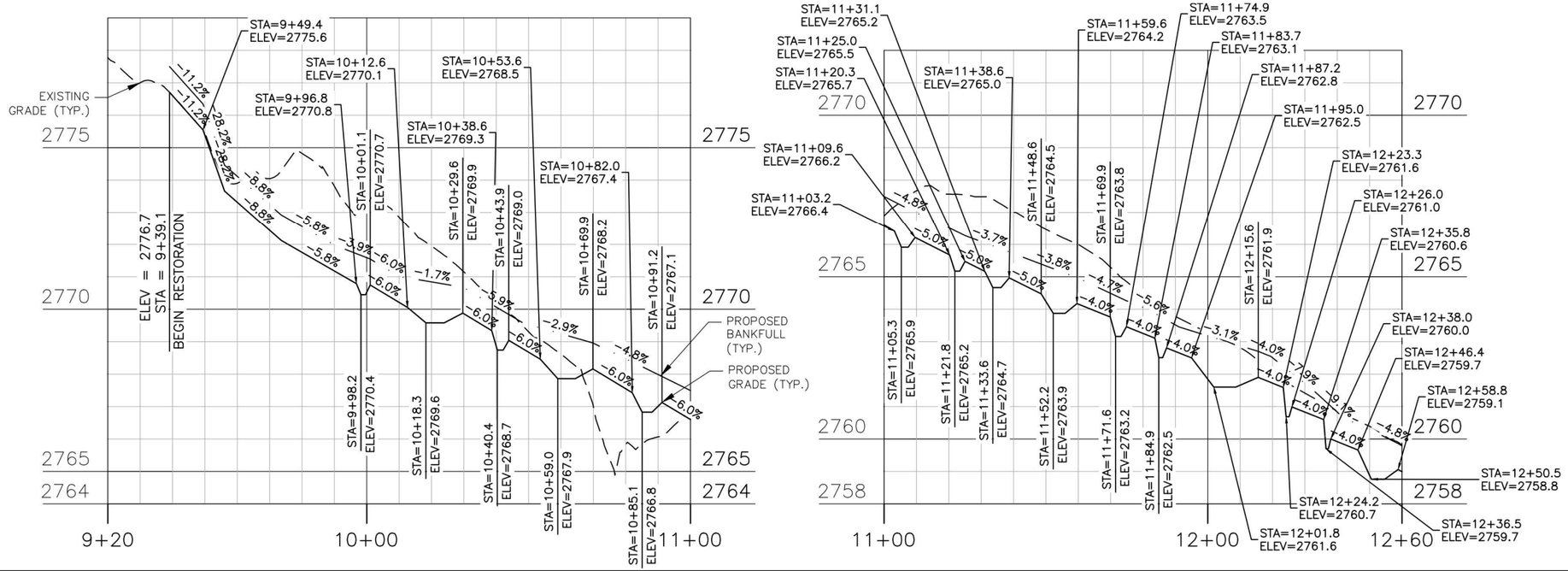
UT4 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
CROSS VANE	10+38.6	2769.3
CROSS VANE	10+53.6	2768.5
CROSS VANE	10+82.0	2767.4
CROSS VANE	11+03.2	2766.4
CROSS VANE	11+20.3	2765.7
CROSS VANE	11+31.1	2765.2
CROSS VANE	11+48.6	2764.5
CROSS VANE	11+69.9	2763.8
CROSS VANE	11+83.7	2763.1
SILL STEP	11+95.0	2762.5
SILL STEP	12+23.3	2761.6
SILL STEP	12+35.8	2760.6
SILL STEP	12+46.4	2759.7

GRAPHIC SCALE

0 15 30 60

1 inch = 30 ft.

TOTAL DISTURBED AREA = 8.9 AC.



VICINITY MAP
1"=1000'

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DN: cn=Rebecca Stubbs, c=US, o=North Carolina, ou=McAdams Co, email=rstubbs@mcadamsco.com
Date: 2023.12.14 14:33:06 -05'00'

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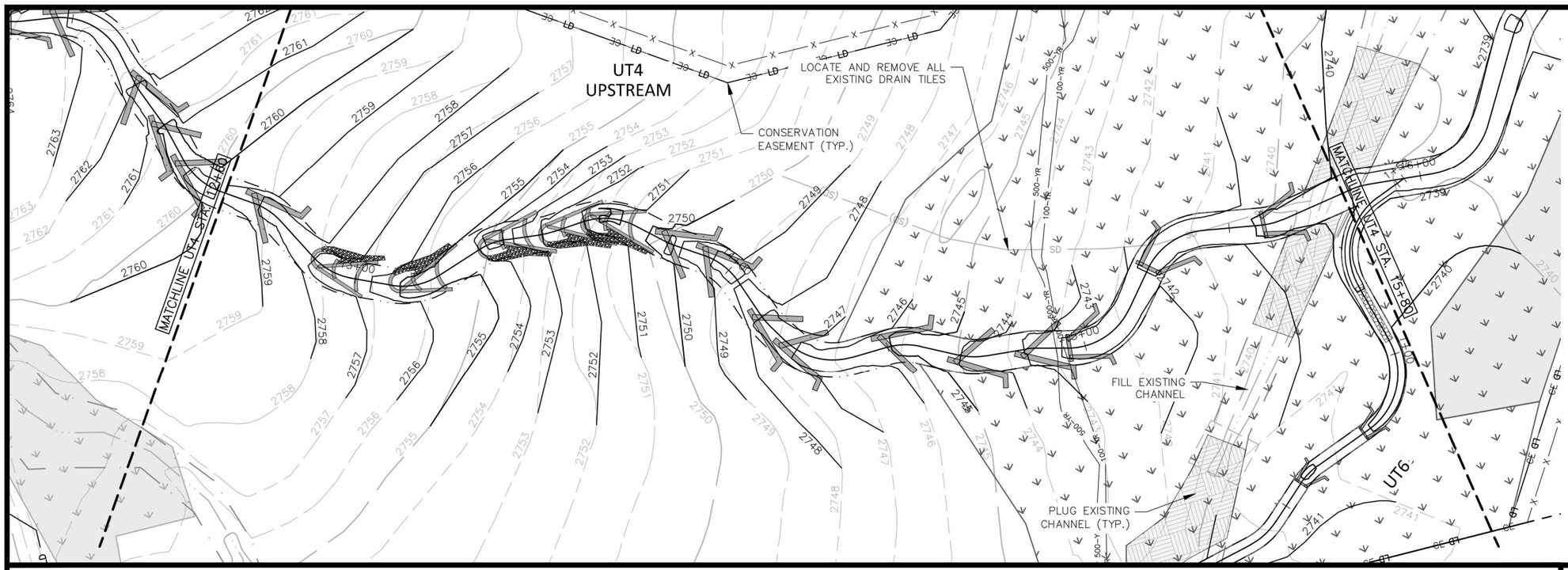
DRAWN BY	CHJ
SCALE	1" = 30'
DATE	12.14.2023

PLAN AND PROFILE

UT4: STA 9+20 - 12+60

C5.07



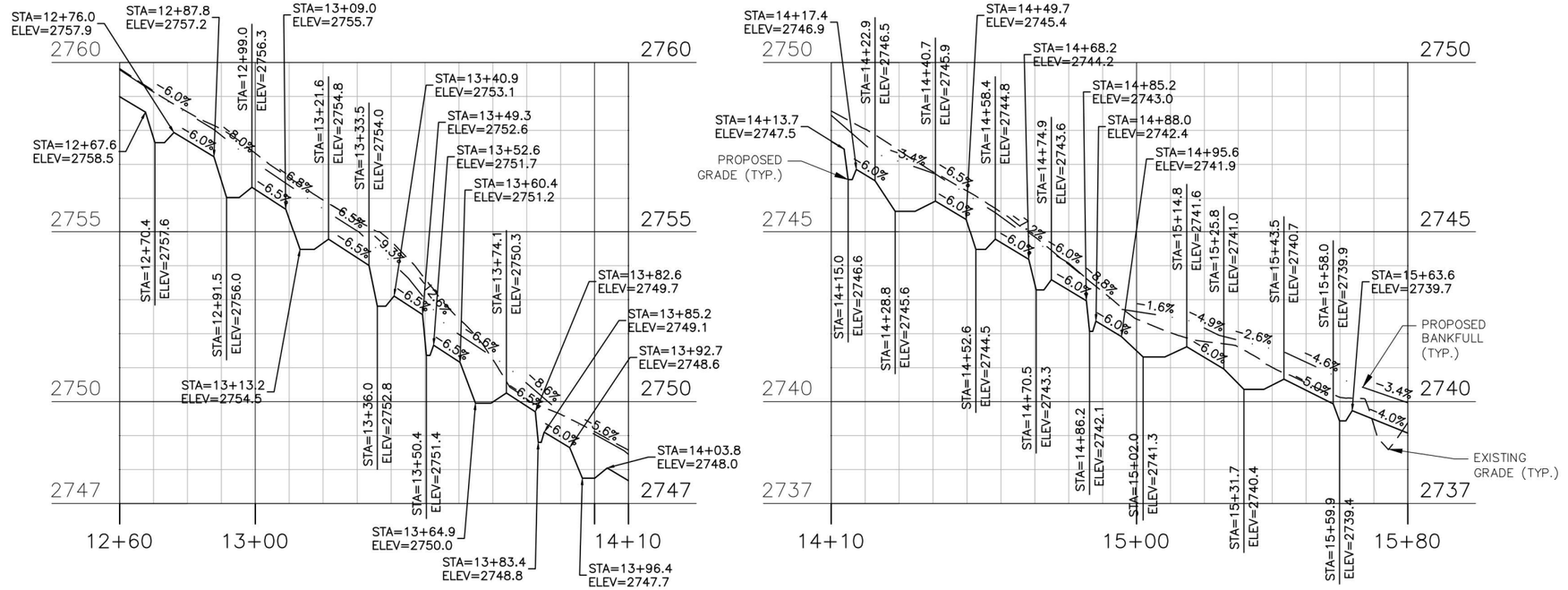
UT4 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
SILL STEP	12+67.6	2758.5
STEP POOL	12+87.8	2757.2
STEP POOL	13+09.0	2755.7
STEP POOL	13+33.5	2754.0
STEP POOL	13+49.3	2752.6
STEP POOL	13+60.4	2751.2
SILL STEP	13+82.6	2749.7
SILL STEP	13+92.7	2748.6
SILL STEP	14+13.7	2747.5
SILL STEP	14+22.9	2746.5
SILL STEP	14+49.7	2745.4
SILL STEP	14+68.3	2744.2
SILL STEP	14+85.2	2743.0
CROSS VANE	14+95.6	2741.9
CROSS VANE	15+25.8	2741.0
CROSS VANE	15+58.1	2739.9

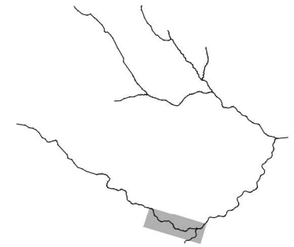
GRAPHIC SCALE

0 15 30 60

1 inch = 30 ft.

TOTAL DISTURBED AREA = 8.9 AC.





VICINITY MAP

1"=1000'

Rebecca Stubbs

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DN: cn=Rebecca Stubbs, c=US, o=North Carolina, email=rstubbs@mcadamsco.com
Date: 2023.12.14 12:53:53 -05'00'

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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PLAN INFORMATION	
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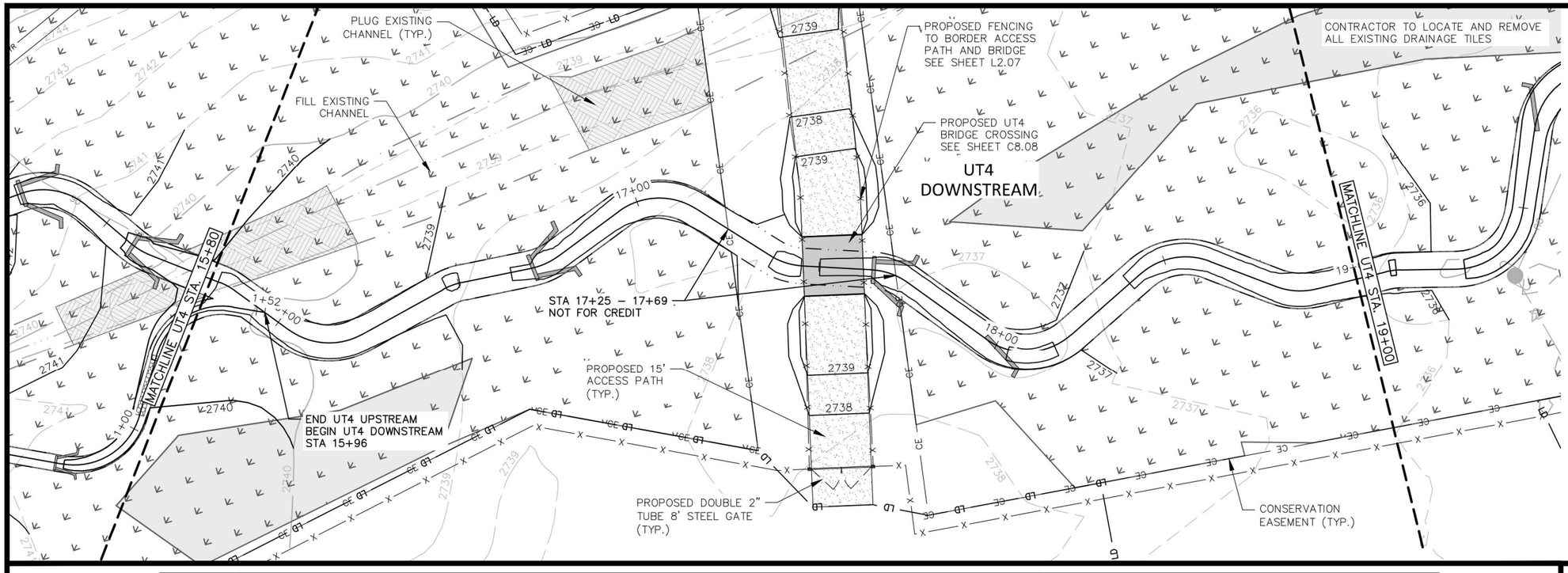
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 30'
DATE	12.14.2023

PLAN AND PROFILE

UT4: STA 12+60 - 15+80

C5.08



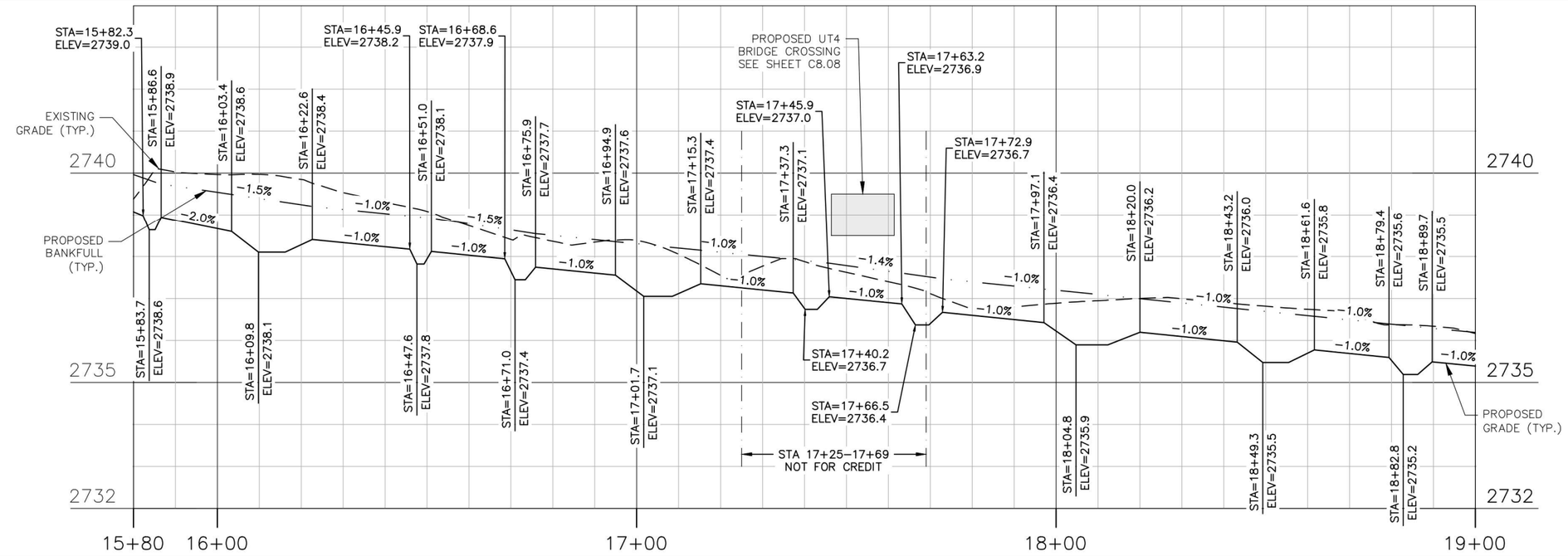
UT4 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
CROSS VANE	16+68.6	2737.9
CROSS VANE	17+63.2	2736.9
LOG VANE	17+97.1	2736.4

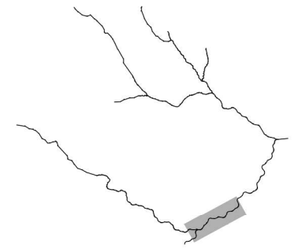
GRAPHIC SCALE

0 15 30 60

1 inch = 30 ft.

TOTAL DISTURBED AREA = 8.9 AC.





VICINITY MAP
1"=1000'

Rebecca Stubbs
Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, st=North Carolina, email=rstubbs@mcadamsco.com
Date: 2023.12.14 14:24:25 -05'00'

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CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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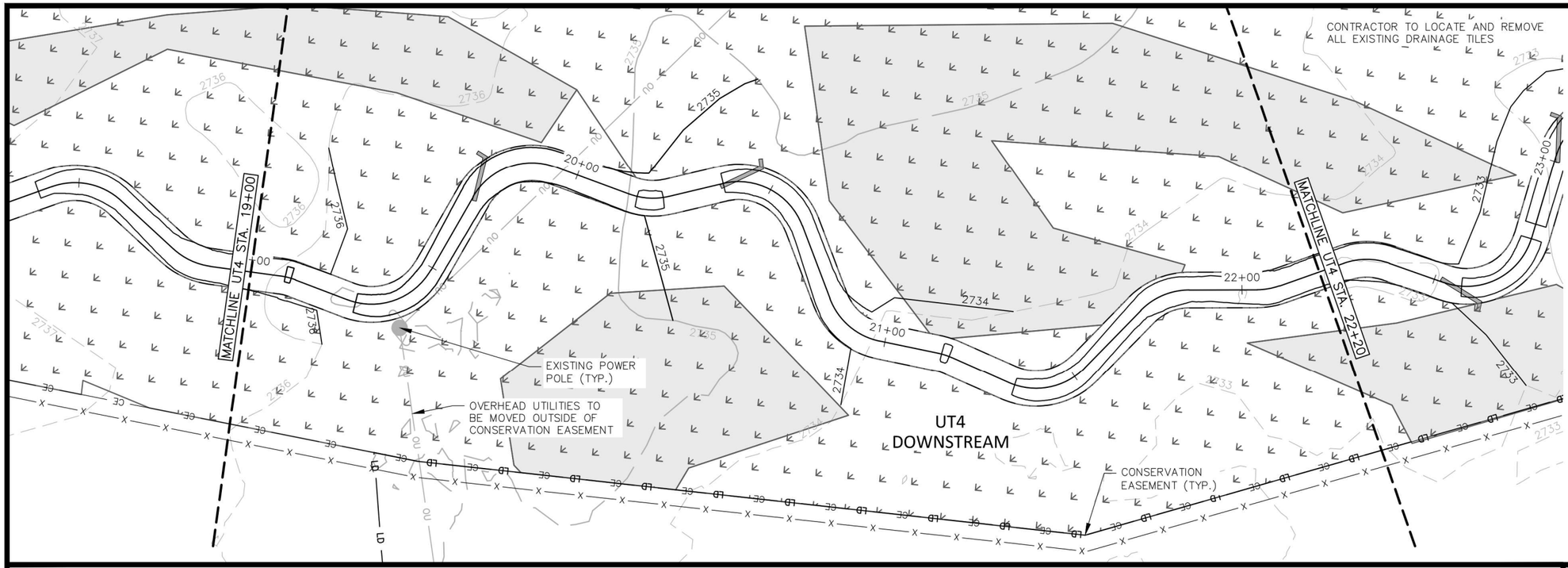
PLAN INFORMATION	
PROJECT NO.	AXI1001
FILENAME	AXI-1001-P1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 30'
DATE	12.14.2023

PLAN AND PROFILE
UT4: STA 15+80 - 19+00

C5.09



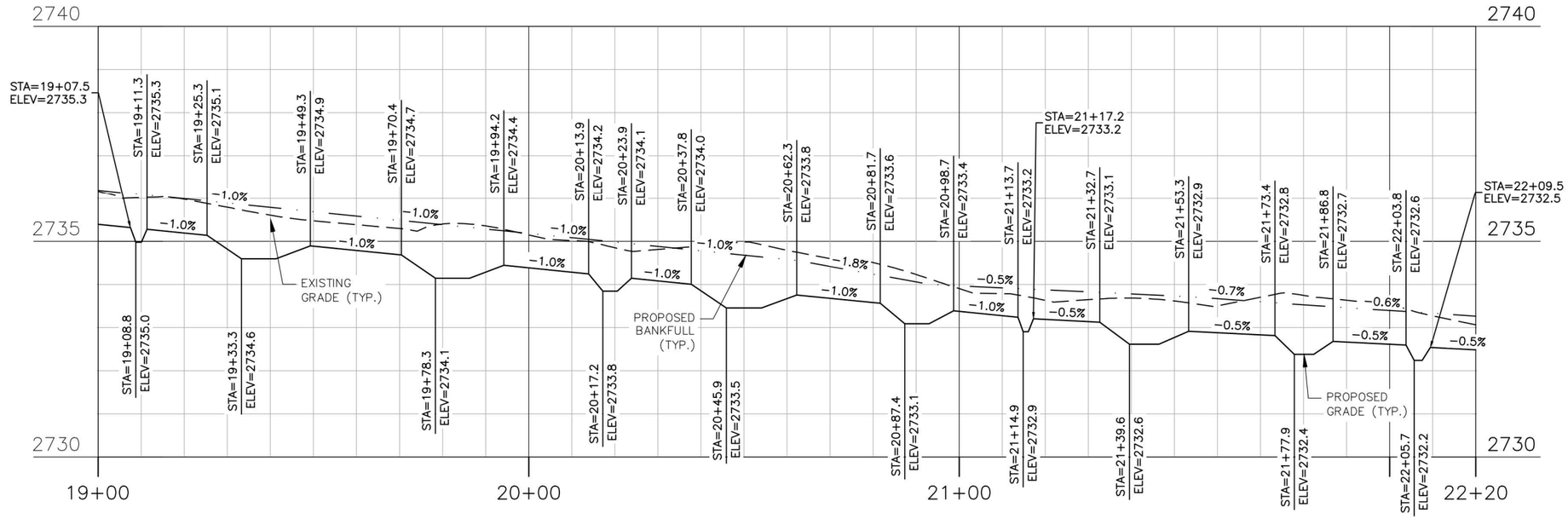
UT4 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
LOG VANE	19+70.4	2734.7
LOG VANE	20+37.8	2734.0

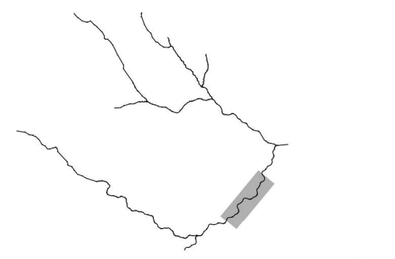
GRAPHIC SCALE

0 15 30 60

1 inch = 30 ft.

TOTAL DISTURBED AREA = 8.9 AC.





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DN: CN=Rebecca Stubbs, c=US, st=North Carolina
Email: rstubbs@mcadamsco.com
Date: 2023.12.14 12:54:12 -05'00'

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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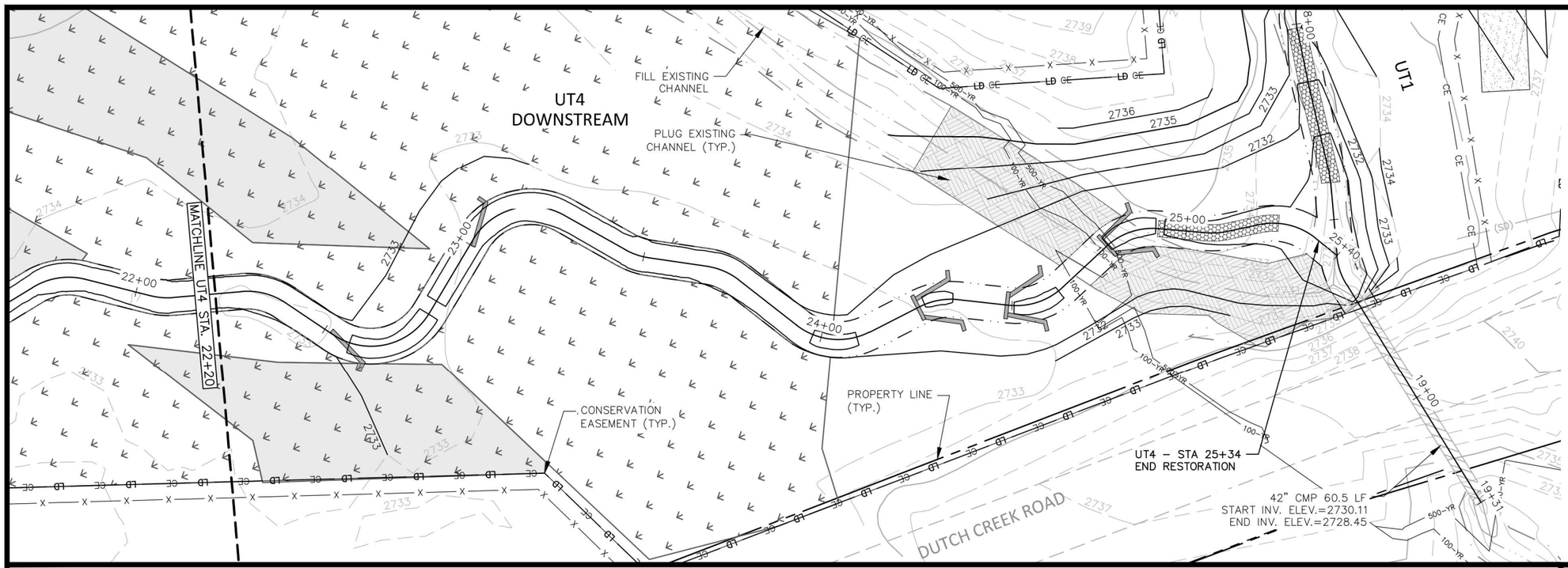
PLAN INFORMATION	
PROJECT NO.	AXI1001
FILENAME	AXI-1001-P1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 30'
DATE	12.14.2023

PLAN AND PROFILE

UT4: STA 19+00 - 22+20

C5.10



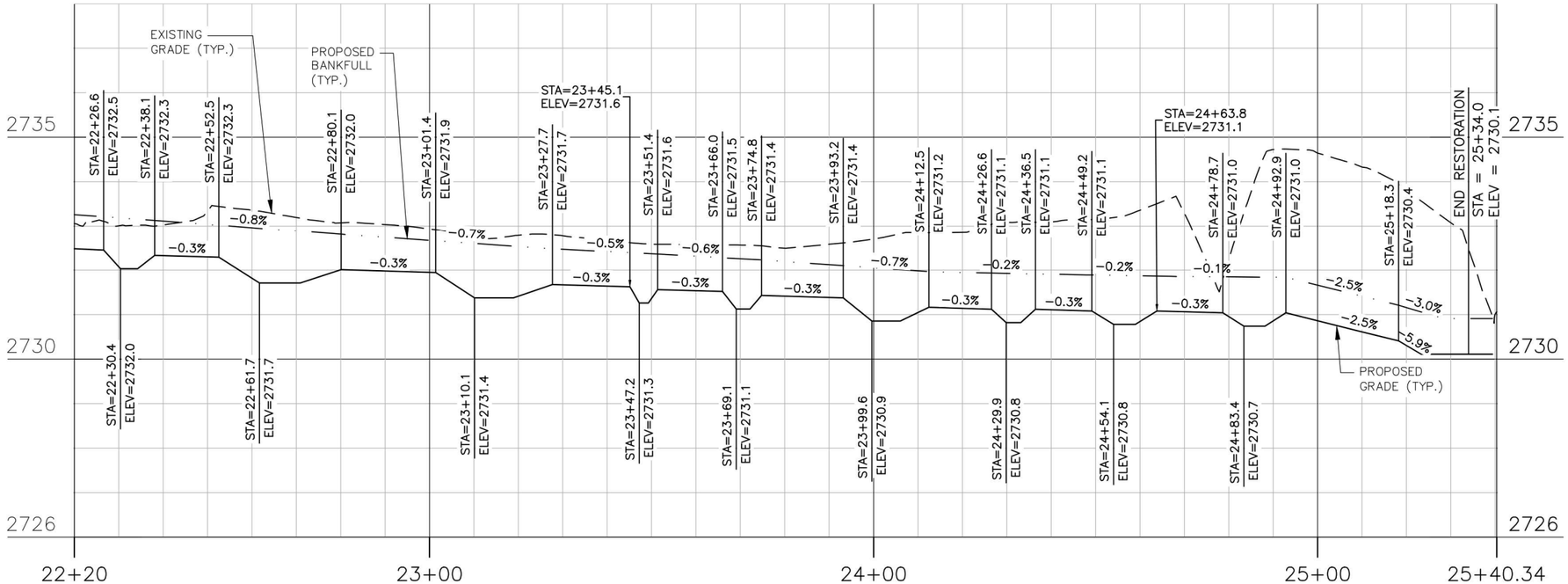
UT4 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
LOG VANE	22+52.5	2732.3
LOG VANE	23+01.4	2731.9
CROSS VANE	24+35.2	2731.1
CROSS VANE	24+59.1	2731.1
CROSS VANE	24+80.8	2731.0
DROP STRUCTURE	24+90.2	2731.0

GRAPHIC SCALE

0 15 30 60

1 inch = 30 ft.

TOTAL DISTURBED AREA = 8.9 AC.



VICINITY MAP

1"=1000'

Rebecca Stubbs

Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=North Carolina
Date: 2024.12.14 12:55:34 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

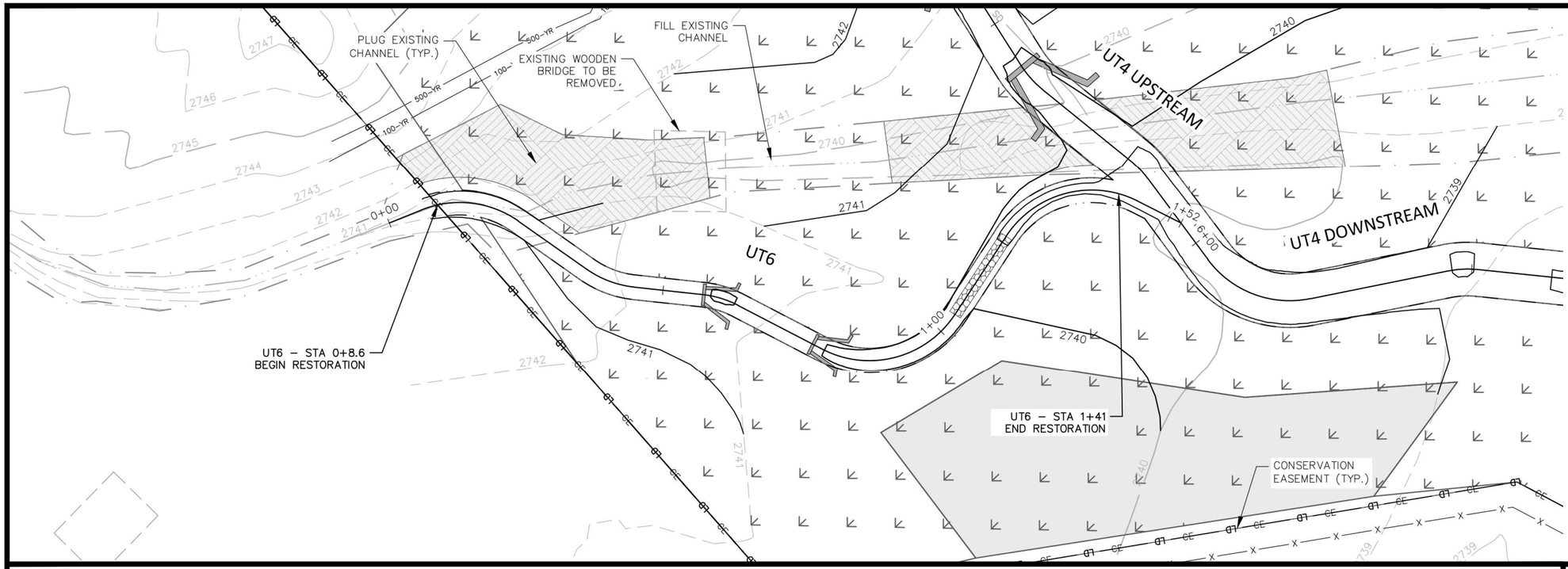
Axiom Environmental, Inc.

PLAN INFORMATION	
PROJECT NO.	AXI1001
FILENAME	AXI-1001-P1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 30'
DATE	12.14.2023

PLAN AND PROFILE

UT4: STA 22+20 - 25+40

C5.11



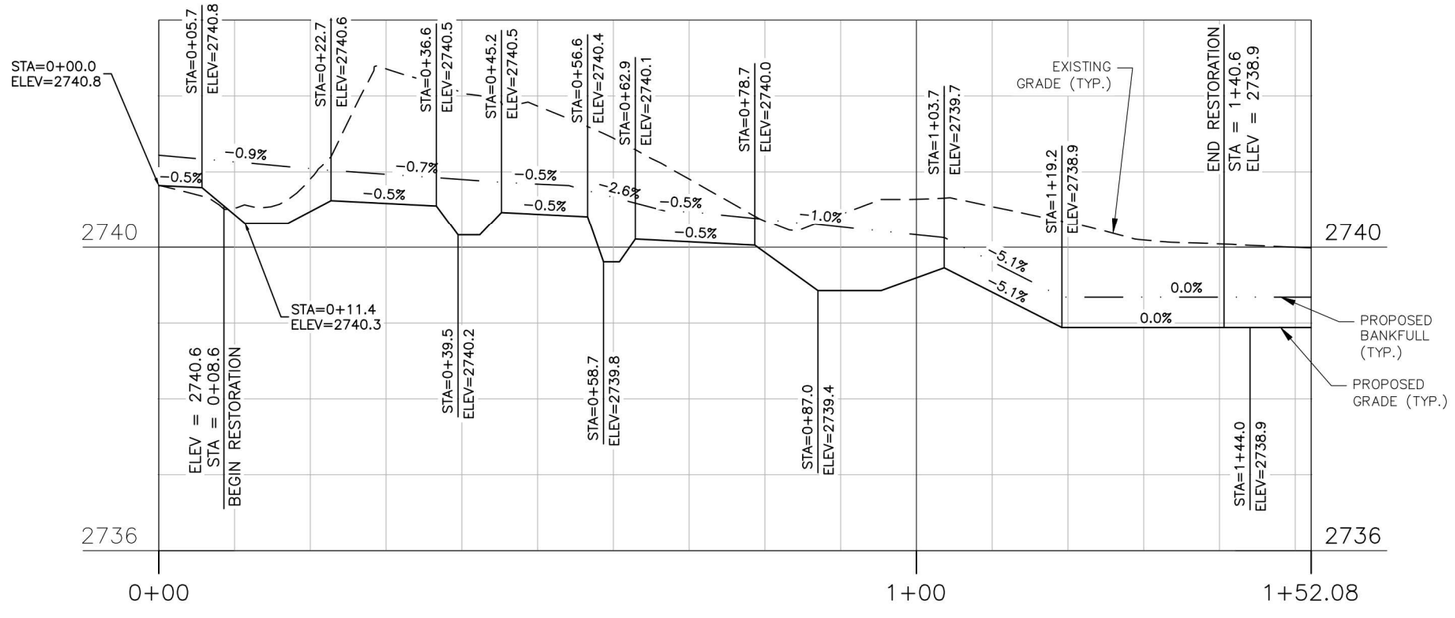
UT6 STRUCTURE LOCATIONS		
STRUCTURE TYPE	STATION	ELEVATION
CROSS VANE	0+56.6	2740.4
CROSS VANE	0+78.7	2740.0
DROP STRUCTURE	1+03.7	2739.7

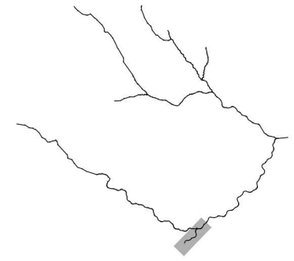
GRAPHIC SCALE

0 10 20 40

1 inch = 20 ft.

TOTAL DISTURBED AREA = 8.9 AC.





VICINITY MAP

1"=1000'

Rebecca Stubbs

Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, st=North Carolina, o=McAdams, ou=Civil, email=rstubbs@mcadamsco.com
Date: 2023.12.14 12:50:00 -05'00'

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CONSTRUCTION DRAWINGS

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FILENAME	AXI-1001-P1
CHECKED BY	RAS
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SCALE	1" = 20'
DATE	12.14.2023

PLAN AND PROFILE

UT6: STA 0+00 - 1+52.08

C5.12

PROPOSED 15' ACCESS PATH 8:1 MAX GRADE (TYP.)

FILL EXISTING CHANNEL

UT4 DOWNSTREAM

PROPOSED 2" TUBE 8' STEEL GATE (TYP.)

CONSERVATION EASEMENT (TYP.)

PROPOSED UT4 BRIDGE CROSSING SEE SHEET C8.08

CONTRACTOR TO GRADE A GRASS LINED TRIANGULAR SWALE. APPLY TEMPORARY AND PERMANENT SEED AND MULCH
TOP WIDTH = 3.0'
DEPTH = 0.5' MAX.
SIDE SLOPE = 3:1 MAX.

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE (TYP.)

PROPOSED FENCING TO BORDER INTERNAL EASEMENT CROSSING AND BRIDGE SEE SHEET L2.07

PLUG EXISTING CHANNEL (TYP.)

GRAPHIC SCALE
0 10 20 40
1 inch = 20 ft.

TOTAL DISTURBED AREA = 8.9 AC.

VICINITY MAP
1"=1000'

Rebecca Stubbs

Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=North Carolina, email=rstubbs@mcadamsco.com
Date: 2023.12.14 12:57:56 -05'00'

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WATAUGA COUNTY, NORTH CAROLINA

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CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 20'
DATE	12.14.2023

ADDITIONAL SITE GRADING

C5.13

EROSION & SEDIMENT CONTROL NOTES:

1. GRADING AND EROSION CONTROL METHODS SHALL ADHERE TO THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY (NC DEQ) DIVISION OF ENERGY, MINERAL, AND LAND RESOURCES (NC DEMLR) STANDARDS AND SPECIFICATIONS. WHERE METHODS DIFFER FROM WATUAGA COUNTY, THE MORE STRINGENT METHOD SHALL BE APPLIED.
2. EROSION AND SEDIMENT CONTROL (E&SC) PERMIT AND A CERTIFICATE OF COVERAGE (COC) MUST BE OBTAINED BEFORE ANY LAND DISTURBANCE ACTIVITIES.
3. WHEN PROJECT IS COMPLETE, THE PERMITEE SHALL VISIT DEQ.NC.GOV/NCG01 TO SUBMIT AN ELECTRONIC NOTICE OF TERMINATION (E-NOT). A $100 ANNUAL GENERAL FEE WILL BE CHARGED UNTIL THE E-NOT HAS BEEN FILLED OUT.
4. E&SC DEVICES MUST BE INSTALLED AND INSPECTED PRIOR TO ANY GRADING ON SITE. THE CONTRACTOR SHALL CALL FOR AN INSPECTION BY NC DEMLR ONCE INITIAL MEASURES ARE IN PLACE.
5. A COPY OF THE APPROVED EROSION CONTROL PLAN MUST BE ON FILE AT THE JOB SITE AT ALL TIMES. FAILURE TO FOLLOW THE APPROVED PLAN SEQUENCE AND DETAILS COULD SUBJECT THE CONTRACTOR TO FINES AND PENALTIES ISSUED BY WATUAGA COUNTY AND NC DEMLR.
6. CONSTRUCTION, MAINTENANCE, AND REMOVAL OF ALL EROSION CONTROL DEVICES ARE THE RESPONSIBILITY OF THE CONTRACTOR UNLESS OTHERWISE NOTED.
7. ANY GRADING BEYOND THE DENUDED LIMITS SHOWN ON THE PLAN IS A VIOLATION OF THE APPROVED EROSION CONTROL PLAN AND IS SUBJECT TO A FINE BY WATUAGA COUNTY AND NC DEMLR.
8. DISTURBANCE OUTSIDE OF THE SITE PROPERTY LIMITS OR PUBLIC R/W SHALL ONLY BE ALLOWED BY SIGNED GRADING AGREEMENTS AND/OR EASEMENTS BETWEEN THE DEVELOPER AND OFFSITE PROPERTY OWNER. NO GRADING SHALL BE DONE OUTSIDE THE LIMITS OF DISTURBANCE WITHOUT A REVISED PLAN.
9. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN SAFE OPEN ACCESS TO ALL ADJACENT PROPERTIES DURING CONSTRUCTION PERIOD FOR IMPROVEMENTS.
10. GRADING MORE THAN ONE ACRE WITHOUT AN APPROVED EROSION CONTROL PLAN IS A VIOLATION OF THE STATE EROSION CONTROL REGULATIONS AND IS SUBJECT TO A FINE.
11. STAGING AREAS, STOCKPILE AREAS, CONSTRUCTION ENTRANCES, AND ACCESS ROAD WILL BE IDENTIFIED AND LOCATED ACCORDING TO THE EROSION CONTROL PLANS AND LANDOWNER. VARIANCES WILL BE ALLOWED ASSUMING BOTH THE CONTRACTOR AND THE ENGINEER VERBALLY AGREE.
12. CONTRACTOR SHALL SEED AND STABILIZE ALL STEEP SLOPES (GREATER THAN 3H:1V) WITHIN 7 DAYS, 10 DAYS FOR MODERATE SLOPES (3H:1V OR LESS) AND WITHIN 14 CALENDAR DAYS EVERYWHERE ELSE ACCORDING TO THE TEMPORARY SEEDING SCHEDULE ON SHEET L5.01.
13. FOR ANY LAND DISTURBING ACTIVITY WHERE GRADING ACTIVITIES HAVE BEEN COMPLETED, TEMPORARY OR PERMANENT GROUND COVER (SHEET L5.01) SUFFICIENT TO RESTRAIN EROSION SHALL BE PROVIDED AS SOON AS PRACTICAL, BUT IN NO CASE LATER THAN SEVEN (7) DAYS AFTER COMPLETING THE WORK. STABILIZATION IS THE BEST FORM OF EROSION CONTROL. TEMPORARY SEEDING IS NECESSARY TO ACHIEVE EROSION CONTROL ON LARGE DENUDED AREAS AND ESPECIALLY WHEN SPECIFICALLY REQUIRED AS PART OF THE CONSTRUCTION SEQUENCE ON THE PLAN.
14. THE EROSION CONTROL INSPECTOR MAY REQUIRE ADDITIONAL FIELD MEASURES AS NECESSARY TO PROVIDE ADEQUATE PROTECTION FROM RECEIVING WATER COURSES.
15. PROTECTION OF EXISTING VEGETATION: AT THE START OF GRADING INVOLVING THE STRIPPING OF TOPSOIL OR LOWERING OF EXISTING GRADE AROUND A TREE, A CLEAN, SHARP, VERTICAL CUT SHALL BE MADE AT THE EDGE OF THE TREE SAVE AREA AT THE SAME TIME AS OTHER EROSION CONTROL MEASURES ARE INSTALLED. THE TREE PROTECTION FENCING SHALL BE INSTALLED ON THE SIDE OF THE CUT FARTHEST AWAY FROM THE TREE TRUNK AND SHALL REMAIN IN PLACE UNTIL ALL CONSTRUCTION IN THE VICINITY OF THE TREES IS COMPLETE. NO STORAGE OF MATERIALS, FILL, OR EQUIPMENT AND NO TRESPASSING SHALL BE ALLOWED WITHIN THE BOUNDARY OF THE PROTECTED AREA AND SHALL BE POSTED ON THE PROTECTION FENCE. A PROTECTION FENCE CONSTRUCTED OF MATERIAL RESISTANT TO DEGRADATION BY SUN, WIND, AND MOISTURE FOR THE DURATION OF THE CONSTRUCTION, SHALL BE INSTALLED AT THE SAME TIME AS THE EROSION CONTROL MEASURES AND SHALL BE IN PLACE UNTIL ALL CONSTRUCTION IN THE VICINITY OF THE TREES IS COMPLETE.
16. INSTALLATION OF ALL PROPOSED E&SC DEVICES AND MAINTENANCE OF THOSE DEVICES IS REQUIRED. THE CONTRACTOR MAY BE ALLOWED, WITH PRIOR APPROVAL FROM THE OWNER, TO COORDINATE CHANGES TO THE PLAN WITH THE E&SC INSPECTOR AND THE ENGINEER.
17. CONTRACTOR SHALL INSPECT AND REPAIR ALL EROSION CONTROL DEVICES AT LEAST ONCE PER WEEK AND AFTER EVERY SIGNIFICANT RAINFALL EVENT. EACH DEVICE IS TO BE MAINTAINED OR REPLACED IF SEDIMENT ACCUMULATION HAS REACHED ONE HALF THE CAPACITY OF THE DEVICE.
9. STAGING/STOCKPILE AREAS SHOWN ON THE PLANS ARE APPROXIMATE. CONTRACTOR TO FIELD LOCATE STAGING/STOCKPILE AREAS MIN. 50' FROM SURFACE WATERS AS APPROVED BY THE ENGINEER.
10. INSTALL SILT FENCE FOR ALL STAGING AND STOCKPILE AREAS (SEE DETAIL ON SHEET C6.17) ANY STOCKPILE AREAS SHALL USE TWO (2) ROWS OF SILT FENCE.
11. CONTRACTOR WILL FIELD LOCATE SILT FENCE OUTLETS AT LOW POINTS IN SILT FENCE AND/OR A MINIMUM OF EVERY 100 LINEAR FEET OF SILT FENCE AS REQUIRED TO PROVIDE RELIEF FROM CONCENTRATED FLOWS. SILT FENCE OUTLETS SHOWN ON THESE PLANS ARE BASED ON THE BEST TOPOGRAPHIC INFORMATION AVAILABLE AT THE TIME OF DESIGN. CONTRACTOR TO FIELD VERIFY AND ADJUST LOCATIONS OF SILT FENCE OUTLETS AND/OR PLACE ADDITIONAL OUTLETS TO INSURE THAT ALL LOW SPOTS ALONG THE SILT FENCE HAVE AN OUTLET.
12. WASHED STONE AND WIRE BACKING SHALL BE USED WITH SILT FENCE WHENEVER SILT FENCE IS PLACE AT THE TOE OF A SLOPE >10' VERTICAL OR ALONG ANY CHANNEL OR WATER COURSE WHERE 50' OF BUFFER IS NOT PROVIDED.
13. ALL DIMENSIONS AND GRADES SHOWN ON THE PLANS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE OWNER IF ANY DISCREPANCIES EXIST PRIOR TO PROCEEDING WITH CONSTRUCTION FOR NECESSARY PLAN OR GRADE CHANGES. NO EXTRA COMPENSATION SHALL BE PAID TO THE CONTRACTOR FOR ANY WORK DONE DUE TO DIMENSIONS OR GRADES SHOWN INCORRECTLY ON THESE PLANS IF SUCH NOTIFICATION HAS NOT BEEN GIVEN.
14. NO DEBRIS SHALL BE TRACKED ONTO PUBLIC RIGHT OF WAY. IF THE SITUATION OCCURS WHERE MUD, ROCKS AND DEBRIS IS TRACKED ONTO PAVEMENT, THE CONTRACTOR SHALL CLEAN THE PAVEMENT AND INSTALL ADDITIONAL MEASURES TO PREVENT FUTURE OCCURRENCES.
15. IF CONCRETE WASHOUTS ARE UTILIZED, THESE AREAS ARE TO BE WITHIN THE LIMITS OF DISTURBANCE AND SHOULD BE LOCATED AT LEAST 50 FT. AWAY FROM STORM DRAIN INLETS AND SURFACE WATER.
16. THE CONSTRUCTION ENTRANCE SHALL BE INSTALLED TO THE DETAIL SPECIFICATIONS ON SHEET C6.15. CONTRACTOR TO REMOVE SOIL TO THE DEPTH OF STONE SPECIFIED AND FILL TO EXISTING GRADE WITH CLASS 'A' STONE. AFTER CONSTRUCTION THE CONTRACTOR SHALL REMOVE THE STONE AND FILL WITH SOIL TO RESTORE EXISTING GRADE. THE ENTRANCE IS IN FEMA REGULATED FLOODPLAIN, THEREFORE EXISTING GRADE SHALL BE MAINTAINED DURING AND POST-CONSTRUCTION.

EROSION & SEDIMENT CONTROL MAINTENANCE PLAN:

1. QUALIFIED PERSONNEL, ON A DAILY BASIS WILL EVALUATE ALL TEMPORARY EROSION AND SEDIMENT CONTROL PRACTICES FOR STABILITY AND OPERATION.
2. INSPECT AND MAINTAIN ALL EROSION CONTROL MEASURES EVERY 7 DAYS AND AFTER EACH SIGNIFICANT RAINFALL (1.0" OR GREATER) AND DOCUMENT WITH INSPECTION REPORTS AND WRITTEN LOGS SHALL BE KEPT.
3. A RAIN GAUGE WILL ALSO BE KEPT ON-SITE AND DAILY RAINFALL AMOUNTS WILL BE RECORDED.
4. ANY REPAIRS NEEDED WILL BE PERFORMED IMMEDIATELY TO MAINTAIN ALL PRACTICES AS DESIGNED.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF TEMPORARY ON-SITE E&SC MEASURES.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING AND FOLLOWING THE APPROVED E&SC PLAN.
7. A COPY OF THE COMBINED SELF-INSPECTION MONITORING FORM CAN BE FOUND ON THE NC DEMLR WEBSITE AT: HTTPS://DEQ.NC.GOV/ABOUT/DIVISIONS/ENERGY-MINERAL-LAND-RESOURCES/EROSION-SEDIMENT-CONTROL/FORMS

Rebecca Stubbs

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NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION	
PROJECT NO.	AXI1001
FILENAME	AXI-1001-EC
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	
DATE	12.14.2023

EROSION CONTROL NOTES

C6.00

GROUND STABILIZATION AND MATERIALS HANDLING PRACTICES FOR COMPLIANCE WITH THE NCG01 CONSTRUCTION GENERAL PERMIT

Implementing the details and specifications on this plan sheet will result in the construction activity being considered compliant with the Ground Stabilization and Materials Handling sections of the NCG01 Construction General Permit (Sections E and F, respectively). The permittee shall comply with the Erosion and Sediment Control plan approved by the delegated authority having jurisdiction. All details and specifications shown on this sheet may not apply depending on site conditions and the delegated authority having jurisdiction.

SECTION E: GROUND STABILIZATION

Required Ground Stabilization Timeframes

Site Area Description	Stabilize within this many calendar days after ceasing land disturbance	Timeframe variations
(a) Perimeter dikes, swales, ditches, and perimeter slopes	7	None
(b) High Quality Water (HQW) Zones	7	None
(c) Slopes steeper than 3:1	7	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed
(d) Slopes 3:1 to 4:1	14	-7 days for slopes greater than 50' in length and with slopes steeper than 4:1 -7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed
(e) Areas with slopes flatter than 4:1	14	-7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed unless there is zero slope

Note: After the permanent cessation of construction activities, any areas with temporary ground stabilization shall be converted to permanent ground stabilization as soon as practicable but in no case longer than 90 calendar days after the last land disturbing activity. Temporary ground stabilization shall be maintained in a manner to render the surface stable against accelerated erosion until permanent ground stabilization is achieved.

GROUND STABILIZATION SPECIFICATION

Stabilize the ground sufficiently so that rain will not dislodge the soil. Use one of the techniques in the table below:

Temporary Stabilization	Permanent Stabilization
• Temporary grass seed covered with straw or other mulches and tackifiers • Hydroseeding • Rolled erosion control products with or without temporary grass seed • Appropriately applied straw or other mulch • Plastic sheeting	• Permanent grass seed covered with straw or other mulches and tackifiers • Geotextile fabrics such as permanent soil reinforcement matting • Hydroseeding • Shrubs or other permanent plantings covered with mulch • Uniform and evenly distributed ground cover sufficient to restrain erosion • Structural methods such as concrete, asphalt or retaining walls • Rolled erosion control products with grass seed

POLYACRYLAMIDES (PAMS) AND FLOCCULANTS

1. Select flocculants that are appropriate for the soils being exposed during construction, selecting from the *NC DWR List of Approved PAMS/Flocculants*.
2. Apply flocculants at or before the inlets to Erosion and Sediment Control Measures.
3. Apply flocculants at the concentrations specified in the *NC DWR List of Approved PAMS/Flocculants* and in accordance with the manufacturer's instructions.
4. Provide ponding area for containment of treated Stormwater before discharging offsite.
5. Store flocculants in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures.

EQUIPMENT AND VEHICLE MAINTENANCE

1. Maintain vehicles and equipment to prevent discharge of fluids.
2. Provide drip pans under any stored equipment.
3. Identify leaks and repair as soon as feasible, or remove leaking equipment from the project.
4. Collect all spent fluids, store in separate containers and properly dispose as hazardous waste (recycle when possible).
5. Remove leaking vehicles and construction equipment from service until the problem has been corrected.
6. Bring used fuels, lubricants, coolants, hydraulic fluids and other petroleum products to a recycling or disposal center that handles these materials.

LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE

1. Never bury or burn waste. Place litter and debris in approved waste containers.
2. Provide a sufficient number and size of waste containers (e.g dumpster, trash receptacle) on site to contain construction and domestic wastes.
3. Locate waste containers at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
4. Locate waste containers on areas that do not receive substantial amounts of runoff from upland areas and does not drain directly to a storm drain, stream or wetland.
5. Cover waste containers at the end of each workday and before storm events or provide secondary containment. Repair or replace damaged waste containers.
6. Anchor all lightweight items in waste containers during times of high winds.
7. Empty waste containers as needed to prevent overflow. Clean up immediately if containers overflow.
8. Dispose waste off-site at an approved disposal facility.
9. On business days, clean up and dispose of waste in designated waste containers.

PAINT AND OTHER LIQUID WASTE

1. Do not dump paint and other liquid waste into storm drains, streams or wetlands.
2. Locate paint washouts at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
3. Contain liquid wastes in a controlled area.
4. Containment must be labeled, sized and placed appropriately for the needs of site.
5. Prevent the discharge of soaps, solvents, detergents and other liquid wastes from construction sites.

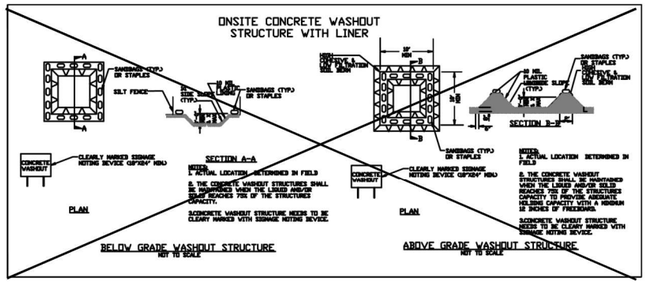
PORTABLE TOILETS

1. Install portable toilets on level ground, at least 50 feet away from storm drains, streams or wetlands unless there is no alternative reasonably available. If 50 foot offset is not attainable, provide relocation of portable toilet behind silt fence or place on a gravel pad and surround with sand bags.
2. Provide staking or anchoring of portable toilets during periods of high winds or in high foot traffic areas.
3. Monitor portable toilets for leaking and properly dispose of any leaked material. Utilize a licensed sanitary waste hauler to remove leaking portable toilets and replace with properly operating unit.

EARTHEN STOCKPILE MANAGEMENT

1. Show stockpile locations on plans. Locate earthen-material stockpile areas at least 50 feet away from storm drain inlets, sediment basins, perimeter sediment controls and surface waters unless it can be shown no other alternatives are reasonably available.
2. Protect stockpile with silt fence installed along toe of slope with a minimum offset of five feet from the toe of stockpile.
3. Provide stable stone access point when feasible.
4. Stabilize stockpile within the timeframes provided on this sheet and in accordance with the approved plan and any additional requirements. Soil stabilization is defined as vegetative, physical or chemical coverage techniques that will restrain accelerated erosion on disturbed soils for temporary or permanent control needs.

NORTH CAROLINA *Environmental Quality*



CONCRETE WASHOUTS

1. Do not discharge concrete or cement slurry from the site.
2. Dispose of, or recycle settled, hardened concrete residue in accordance with local and state solid waste regulations and at an approved facility.
3. Manage washout from mortar mixers in accordance with the above item and in addition place the mixer and associated materials on impervious barrier and within lot perimeter silt fence.
4. Install temporary concrete washouts per local requirements where applicable. If an alternate method or product is to be used, contact your approval authority for review and approval. If local standard details are not available, use one of the two types of temporary concrete washouts provided on this detail.
5. Do not use concrete washouts for dewatering or storing defective curb or sidewalk sections. Stormwater accumulated within the washout may not be pumped into or discharged to the storm drain system or receiving surface waters. Liquid waste must be pumped out and removed from project.
6. Locate washouts at least 50 feet from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. At a minimum, install protection of storm drain inlet(s) closest to the washout which could receive spills or overflow.
7. Locate washouts in an easily accessible area, on level ground and install a stone entrance pad in front of the washout. Additional controls may be required by the approving authority.
8. Install at least one sign directing concrete trucks to the washout within the project limits. Post signage on the washout itself to identify this location.
9. Remove leavings from the washout when at approximately 75% capacity to limit overflow events. Replace the tarp, sand bags or other temporary structural components when no longer functional. When utilizing alternative or proprietary products, follow manufacturer's instructions.
10. At the completion of the concrete work, remove remaining leavings and dispose of in an approved disposal facility. Fill pit, if applicable, and stabilize any disturbance caused by removal of washout.

HERBICIDES, PESTICIDES AND RODENTICIDES

1. Store and apply herbicides, pesticides and rodenticides in accordance with label restrictions.
2. Store herbicides, pesticides and rodenticides in their original containers with the label, which lists directions for use, ingredients and first aid steps in case of accidental poisoning.
3. Do not store herbicides, pesticides and rodenticides in areas where flooding is possible or where they may spill or leak into wells, stormwater drains, ground water or surface water. If a spill occurs, clean area immediately.
4. Do not stockpile these materials onsite.

HAZARDOUS AND TOXIC WASTE

1. Create designated hazardous waste collection areas on-site.
2. Place hazardous waste containers under cover or in secondary containment.
3. Do not store hazardous chemicals, drums or bagged materials directly on the ground.

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NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

NCG01 GROUND STABILIZATION AND MATERIALS HANDLING

EFFECTIVE: 04/01/19

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PLAN INFORMATION

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EROSION CONTROL NOTES

C6.01

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION A: SELF-INSPECTION

Self-inspections are required during normal business hours in accordance with the table below. When adverse weather or site conditions would cause the safety of the inspection personnel to be in jeopardy, the inspection may be delayed until the next business day on which it is safe to perform the inspection. In addition, when a storm event of equal to or greater than 1.0 inch occurs outside of normal business hours, the self-inspection shall be performed upon the commencement of the next business day. Any time when inspections were delayed shall be noted in the Inspection Record.

Inspect	Frequency (during normal business hours)	Inspection records must include:
(1) Rain gauge maintained in good working order	Daily	Daily rainfall amounts. If no daily rain gauge observations are made during weekend or holiday periods, and no individual-day rainfall information is available, record the cumulative rain measurement for those un-attended days (anc this will determine if a site inspection is needed). Days on which no rainfall occurred shall be recorded as "zero." The permittee may use another rain-monitoring device approved by the Division.
(2) E&SC Measures	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the measures inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Indication of whether the measures were operating properly, 5. Description of maintenance needs for the measure, 6. Description, evidence, and date of corrective actions taken.
(3) Stormwater discharge outfalls (SDCs)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the discharge outfalls inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Evidence of indicators of stormwater pollution such as oil sheen, floating or suspended solids or discoloration, 5. Indication of visible sediment leaving the site, 6. Description, evidence, and date of corrective actions taken.
(4) Perimeter of site	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If visible sedimentation is found outside site limits, then a record of the following shall be made: 1. Actions taken to clean up or stabilize the sediment that has left the site limits, 2. Description, evidence, and date of corrective actions taken, and 3. An explanation as to the actions taken to control future releases.
(5) Streams or wetlands onsite or offsite (where accessible)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If the stream or wetland has increased visible sedimentation or a stream has visible increased turbidity from the construction activity, then a record of the following shall be made: 1. Description, evidence and date of corrective actions taken, and 2. Records of the required reports to the appropriate Division Regional Office per Part III, Section C, Item (2)(a) of this permit.
(6) Ground stabilization measures	After each phase of grading	1. The phase of grading (installation of perimeter E&SC measures, clearing and grubbing, installation of storm drainage facilities, completion of all land-disturbing activity, construction or redevelopment, permanent ground cover). 2. Documentation that the required ground stabilization measures have been provided within the required timeframe or an assurance that they will be provided as soon as possible.

NOTE: The rain inspection resets the required 7 calendar day inspection requirement.

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION B: RECORDKEEPING

1. E&SC Plan Documentation

The approved E&SC plan as well as any approved deviation shall be kept on the site. The approved E&SC plan must be kept up-to-date throughout the coverage under this permit. The following items pertaining to the E&SC plan shall be kept on site and available for inspection at all times during normal business hours.

Item to Document	Documentation Requirements
(a) Each E&SC measure has been installed and does not significantly deviate from the locations, dimensions and relative elevations shown on the approved E&SC plan.	Initial and date each E&SC measure on a copy of the approved E&SC plan or complete, date and sign an inspection report that lists each E&SC measure shown on the approved E&SC plan. This documentation is required upon the initial installation of the E&SC measures or if the E&SC measures are modified after initial installation.
(b) A phase of grading has been completed.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate completion of the construction phase.
(c) Ground cover is located and installed in accordance with the approved E&SC plan.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate compliance with approved ground cover specifications.
(d) The maintenance and repair requirements for all E&SC measures have been performed.	Complete, date and sign an inspection report.
(e) Corrective actions have been taken to E&SC measures.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate the completion of the corrective action.

2. Additional Documentation to be Kept on Site

In addition to the E&SC plan documents above, the following items shall be kept on the site and available for inspectors at all times during normal business hours, unless the Division provides a site-specific exemption based on unique site conditions that make this requirement not practical:

(a) This General Permit as well as the Certificate of Coverage, after it is received.

(b) Records of inspections made during the previous twelve months. The permittee shall record the required observations on the Inspection Record Form provided by the Division or a similar inspection form that includes all the required elements. Use of electronically-available records in lieu of the required paper copies will be allowed if shown to provide equal access and utility as the hard-copy records.

3. Documentation to be Retained for Three Years

All data used to complete the e-NOI and all inspection records shall be maintained for a period of three years after project completion and made available upon request. [40 CFR 122.41]

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION C: REPORTING

1. Occurrences that Must be Reported

Permittees shall report the following occurrences:

(a) Visible sediment deposition in a stream or wetland.

(b) Oil spills if:
- They are 25 gallons or more,
- They are less than 25 gallons but cannot be cleaned up within 24 hours,
- They cause sheen on surface waters (regardless of volume), or
- They are within 100 feet of surface waters (regardless of volume).

(c) Releases of hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (Ref: 40 CFR 110.3 and 40 CFR 117.3) or Section 102 of CERCLA (Ref: 40 CFR 302.4) or G.S. 143-215.85.

(d) Anticipated bypasses and unanticipated bypasses.

(e) Noncompliance with the conditions of this permit that may endanger health or the environment.

2. Reporting Timeframes and Other Requirements

After a permittee becomes aware of an occurrence that must be reported, he shall contact the appropriate Division regional office within the timeframes and in accordance with the other requirements listed below. Occurrences outside normal business hours may also be reported to the Department's Environmental Emergency Center personnel at (800) 858-0368.

Occurrence	Reporting Timeframes [After Discovery) and Other Requirements
(a) Visible sediment deposition in a stream or wetland	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days***, a report that contains a description of the sediment and actions taken to address the cause of the deposition. Division staff may waive the requirement for a written report on a case-by-case basis. • If the stream is named on the NC 303(d) list as impaired for sediment-related causes, the permittee may be required to perform additional monitoring, inspections or apply more stringent practices if staff determine that additional requirements are needed to assure compliance with the federal or state impaired-waters conditions.
(b) Oil spills and release of hazardous substances per Item 1(b)-(c) above	• ***Within 24 hours***, an oral or electronic notification. The notification shall include information about the date, time, nature, volume and location of the spill or release.
(c) Anticipated bypasses [40 CFR 122.41(m)(3)]	• ***A report at least ten days before the date of the bypass, if possible***. The report shall include an evaluation of the anticipated quality and effect of the bypass.
(d) Unanticipated bypasses [40 CFR 122.41(m)(3)]	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days,*** a report that includes an evaluation of the quality and effect of the bypass.
(e) Noncompliance with the conditions of this permit that may endanger health or the environment[40 CFR 122.41(l)(7)]	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days***, a report that contains a description of the noncompliance, and its causes; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time noncompliance is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. [40 CFR 122.41(l)(6). • Division staff may waive the requirement for a written report on a case-by-case basis.

PART II, SECTION G, ITEM (4)
DRAW DOWN OF SEDIMENT BASINS FOR MAINTENANCE OR CLOSE OUT

Sediment basins and traps that receive runoff from drainage areas of one acre or more shall use outlet structures that withdraw water from the surface when these devices need to be drawn down for maintenance or close out unless this is infeasible. The circumstances in which it is not feasible to withdraw water from the surface shall be rare (for example, times with extended cold weather). Non-surface withdrawals from sediment basins shall be allowed only when all of the following criteria have been met:

(a) The E&SC plan authority has been provided with documentation of the non-surface withdrawal and the specific time periods or conditions in which it will occur. The non-surface withdrawal shall not commence until the E&SC plan authority has approved these items,
(b) The non-surface withdrawal has been reported as an anticipated bypass in accordance with Part III, Section C, Item (2)(c) and (d) of this permit,
(c) Dewatering discharges are treated with controls to minimize discharges of pollutants from stormwater that is removed from the sediment basin. Examples of appropriate controls include properly sited, designed and maintained dewatering tanks, weir tanks, and filtration systems,
(d) Vegetated, upland areas of the sites or a properly designed stone pad is used to the extent feasible at the outlet of the dewatering treatment devices described in Item (c) above,
(e) Velocity dissipation devices such as check dams, sediment traps, and riprap are provided at the discharge points of all dewatering devices, and
(f) Sediment removed from the dewatering treatment devices described in Item (c) above is disposed of in a manner that does not cause deposition of sediment into waters of the United States.

NORTH CAROLINA *Environmental Quality*

NCG01 SELF-INSPECTION, RECORDKEEPING AND REPORTING

EFFECTIVE: 04/01/19

Rebecca Stubbs

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PLAN INFORMATION

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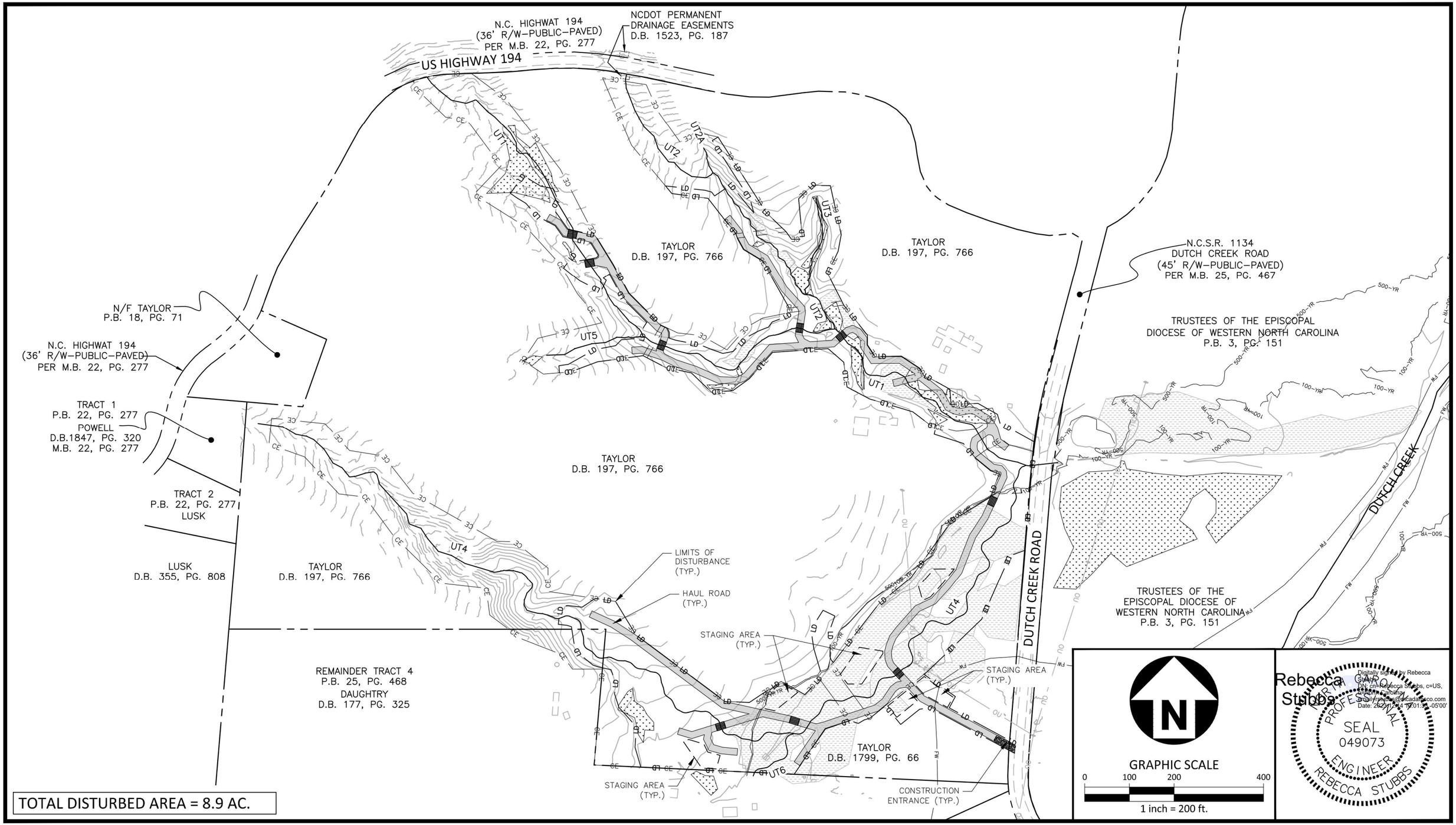
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	
DATE	12.14.2023

EROSION CONTROL NOTES

C6.02



TOTAL DISTURBED AREA = 8.9 AC.

Rebecca Stubbs

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PROJECT NO.	AXI1001
FILENAME	AXI-1001-EC
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SCALE	1" = 200'
DATE	12.14.2023

EROSION CONTROL
OVERALL PLAN

C6.03

TAYLOR
D.B. 197, PG. 766

UT1

3+00
4+00
5+00
6+00
7+00

LIMITS OF DISTURBANCE (TYP.)

MARSH TREATMENT AREA (TYP.)

MATCHLINE UT1 STA. 6+85

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE
0 15 30 60
1 inch = 30 ft.

Rebecca Stubbs
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FILENAME	AXI-1001-EC
CHECKED BY	RAS
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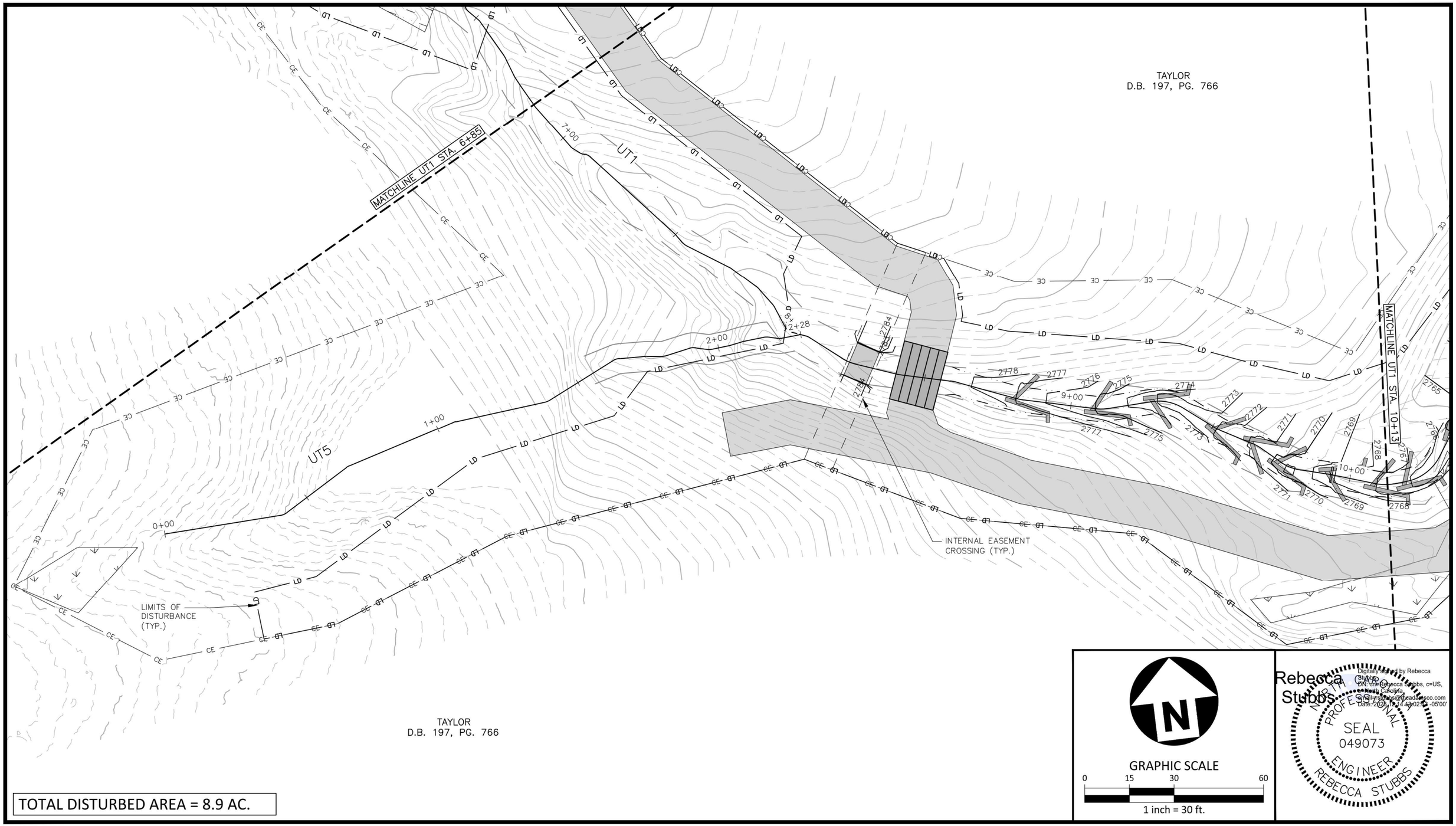
SCALE	1" = 30'
DATE	12.14.2023

EROSION CONTROL PLAN

C6.04



TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE
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1 inch = 30 ft.

Rebecca Stubbs
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DN: cn=Rebecca Stubbs, c=US, o=North Carolina, e=rstubbs@mcadamsco.com
Date: 2023.12.14 13:02:02 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

The John R. McAdams Company, Inc.
2905 Meridian Parkway
Durham, NC 27713

phone 919. 361. 5000
fax 919. 361. 2269
license number: C-0293, C-187

www.mcadamsco.com

VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

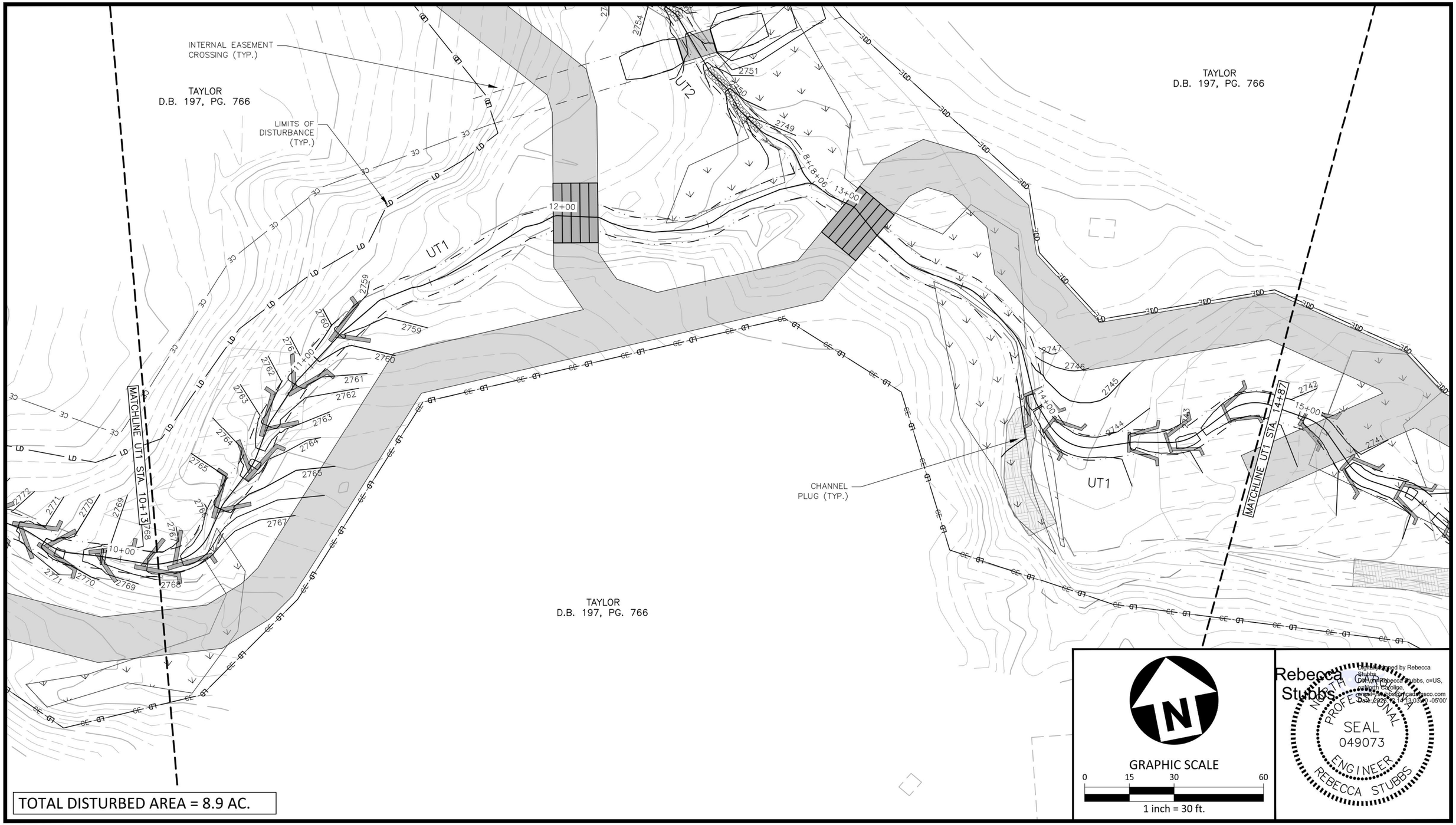
Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-EC
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 30'
DATE	12.14.2023

EROSION CONTROL PLAN

C6.05



Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, st=North Carolina, email=rstubbs@mcadamsco.com
Date: 2023.12.14 13:03:41 -05'00'

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CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

Axiom Environmental, Inc.

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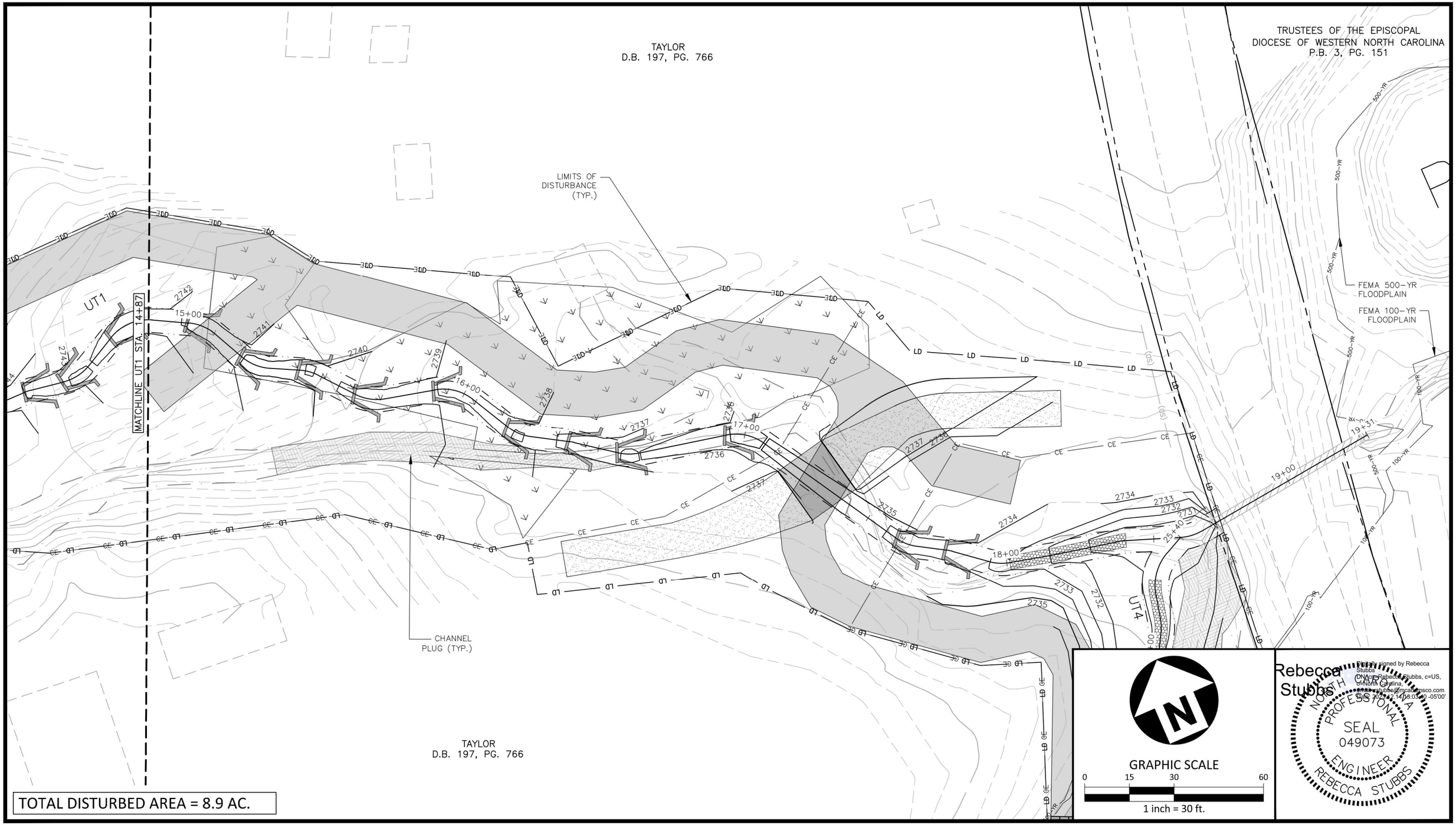
DATE	12.14.2023

EROSION CONTROL PLAN

C6.06



TOTAL DISTURBED AREA = 8.9 AC.

Rebecca Stubbs

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DN: cn=Rebecca Stubbs, c=US, st=North Carolina, e=rstubbs@mcadamsco.com
Date: 2023.12.14 08:03:40 -05'00'

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EROSION CONTROL PLAN

C6.07

TAYLOR
D.B. 197, PG. 766

UT3

UT2A

UT2

0+00

0+61

1+00

2+00

3+00

4+00

5+00

6+00

MATCHLINE UT2 STA. 4+57

INTERNAL EASEMENT CROSSING (TYP.)

CHANNEL PLUG (TYP.)

LIMITS OF DISTURBANCE (TYP.)

2777 2776 2775 2774 2773 2772 2771 2765 2764 2763 2759

TAYLOR
D.B. 197, PG. 766

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE
0 15 30 60
1 inch = 30 ft.

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DN: cn=Rebecca Stubbs, c=US, o=North Carolina, email=rstubbs@mcadamsco.com
Date: 2024.12.14 13:04:11 -05'00'

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CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION	
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DATE	12.14.2023

EROSION CONTROL PLAN

C6.08

TAYLOR
D.B. 197, PG. 766

INTERNAL EASEMENT CROSSING (TYP.)

LIMITS OF DISTURBANCE (TYP.)

CHANNEL PLUG (TYP.)

MATCHLINE UT2 STA. 4+57

UT3

UT2

UT1

TAYLOR
D.B. 197, PG. 766

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE
0 15 30 60
1 inch = 30 ft.

Rebecca Stubbs
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Date: 2023.12.14 13:04:45 -05'00'

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PLAN INFORMATION

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EROSION CONTROL PLAN

C6.09

TAYLOR
D.B. 197, PG. 766

LIMITS OF DISTURBANCE (TYP.)

CHANNEL PLUG (TYP.)

UT4

MATCHLINE UT4 STA. 12+66

REMAINDER TRACT 4
P.B. 25, PG. 468
DAUGHTRY
D.B. 177, PG. 325

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE
0 15 30 60
1 inch = 30 ft.

Rebecca Stubbs
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DN: cn=Rebecca Stubbs, c=US, o=North Carolina, email=rstubbs@mcadamsco.com
Date: 2023.12.14 13:05:20 -05'00'

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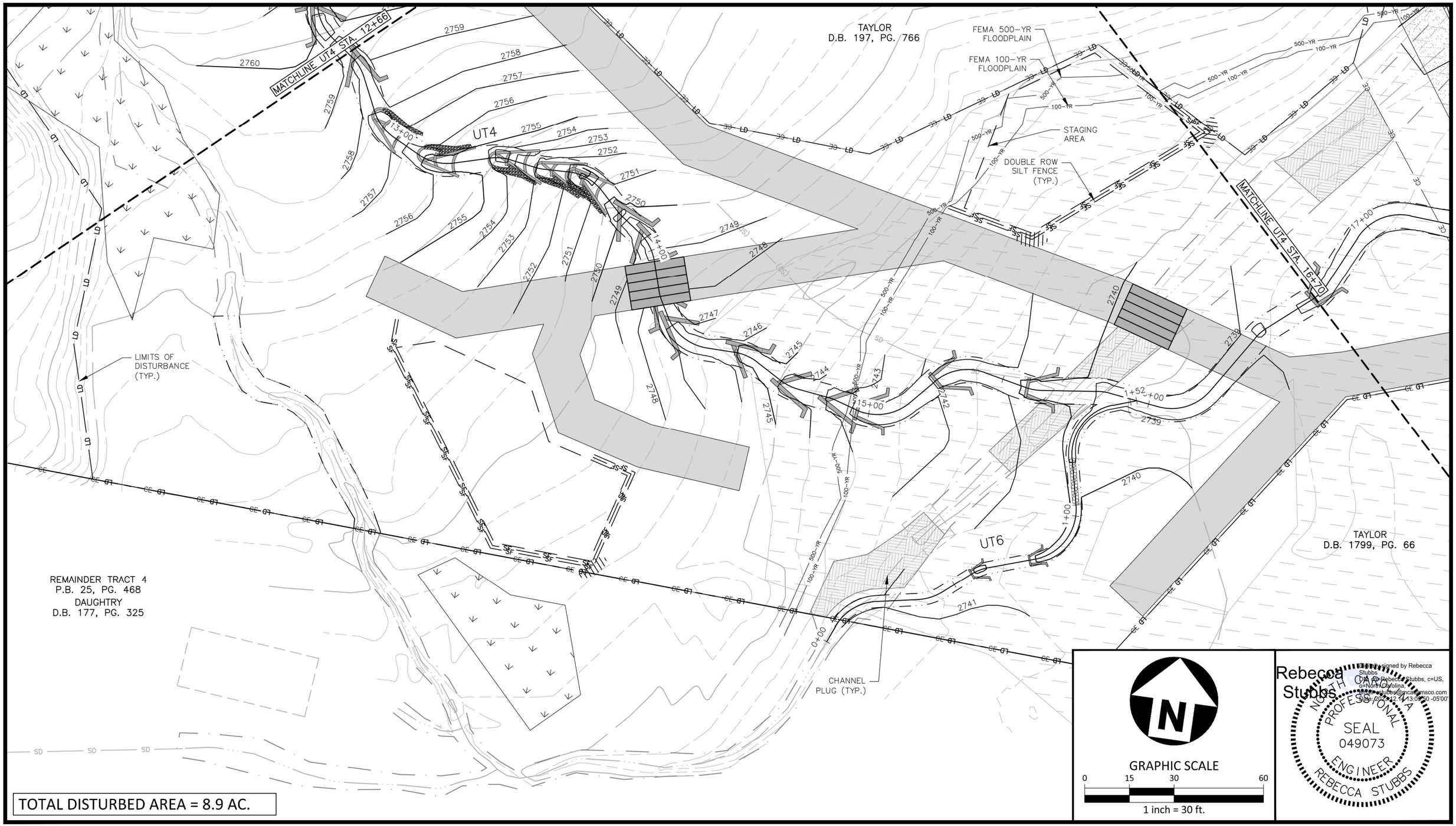
EROSION CONTROL PLAN

C6.10



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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

Axiom Environmental, Inc.

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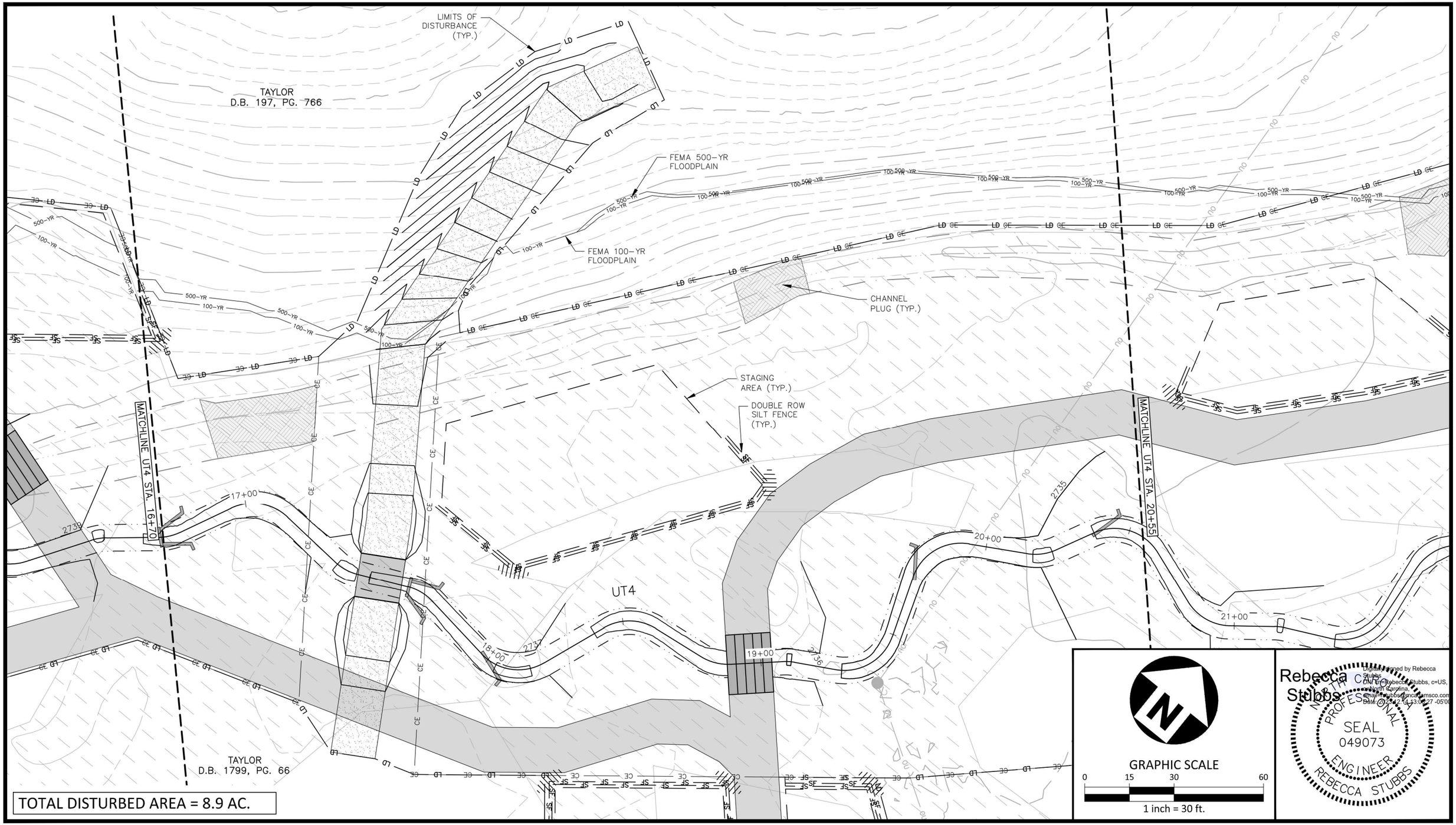
DATE	12.14.2023

EROSION CONTROL PLAN

C6.11



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Date: 2024.02.14 13:06:27 -05'00'

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CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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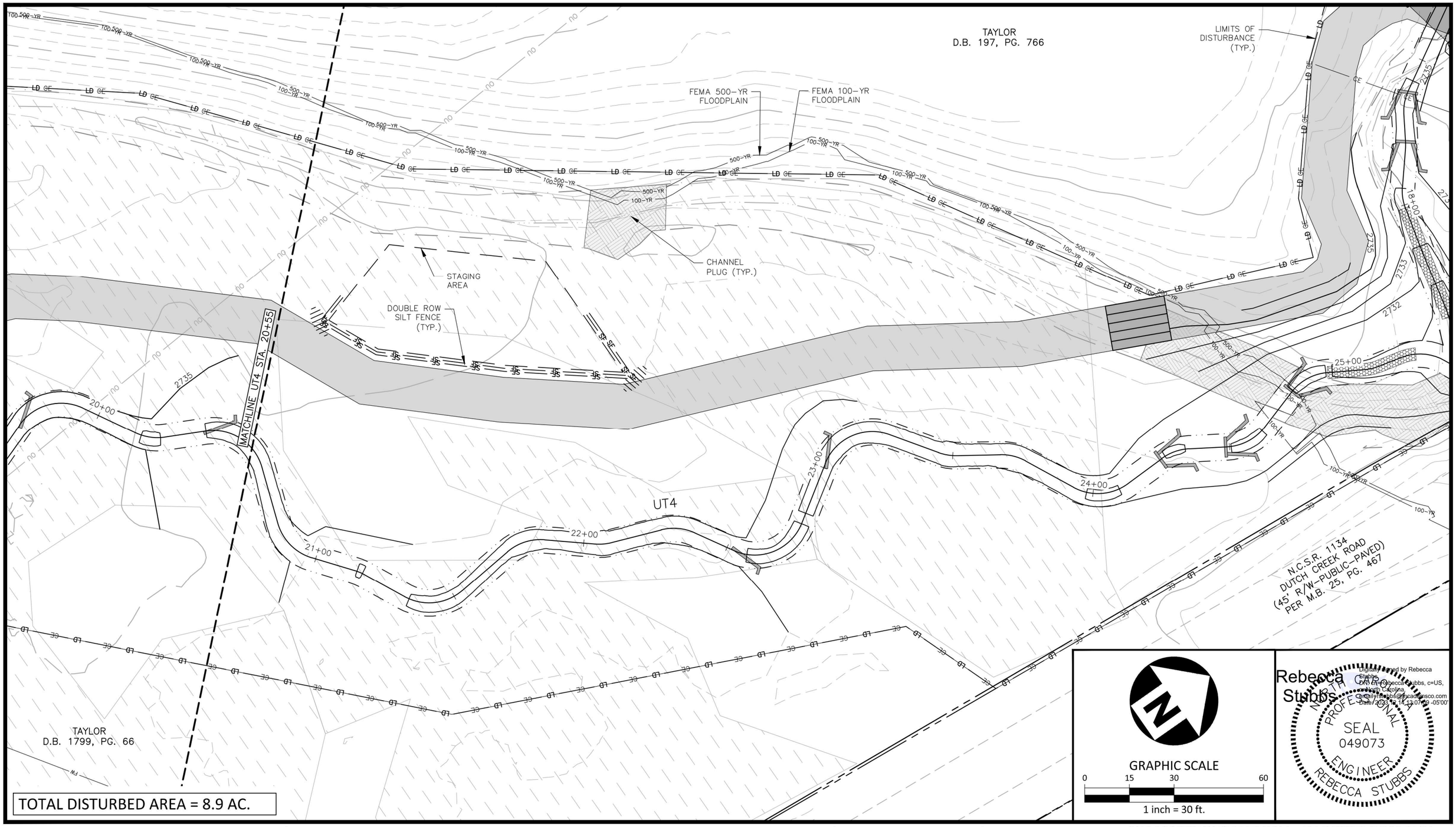
EROSION CONTROL PLAN

C6.12



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Date: 2023.12.14 13:07:09 -05'00'

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CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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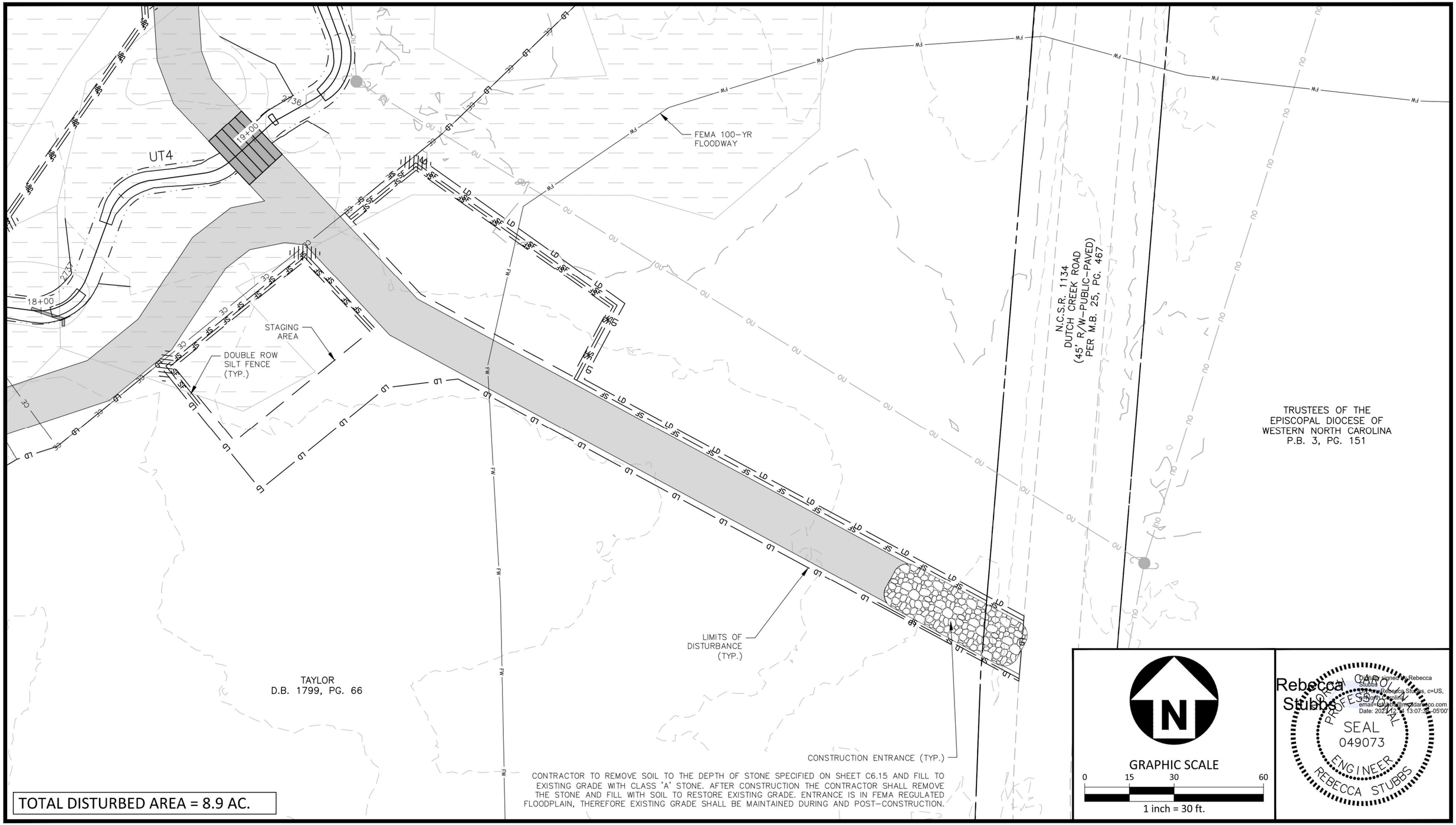
PLAN INFORMATION	
PROJECT NO.	AXI1001
FILENAME	AXI-1001-EC
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 30'
DATE	12.14.2023

EROSION CONTROL PLAN

C6.13



CONTRACTOR TO REMOVE SOIL TO THE DEPTH OF STONE SPECIFIED ON SHEET C6.15 AND FILL TO EXISTING GRADE WITH CLASS 'A' STONE. AFTER CONSTRUCTION THE CONTRACTOR SHALL REMOVE THE STONE AND FILL WITH SOIL TO RESTORE EXISTING GRADE. ENTRANCE IS IN FEMA REGULATED FLOODPLAIN, THEREFORE EXISTING GRADE SHALL BE MAINTAINED DURING AND POST-CONSTRUCTION.

TOTAL DISTURBED AREA = 8.9 AC.

Rebecca Stubbs
Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=McAdams, email=rstubbs@mcadamsco.com
Date: 2023.12.14 13:07:35-05'00'

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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PLAN INFORMATION	
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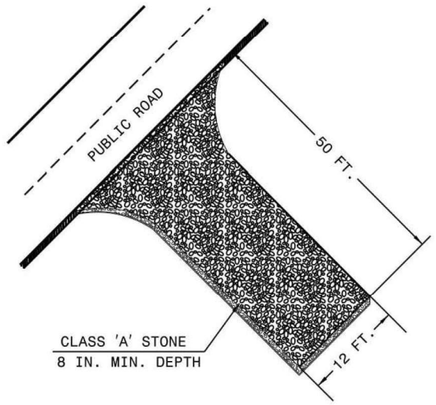
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1" = 30'
DATE	12.14.2023

EROSION CONTROL PLAN

C6.14

NOTE:
1. INSTALL SILT FENCE OR STRAW WATTLES ALONG CONSTRUCTION ENTRANCES TO PREVENT SEDIMENT RUNOFF INTO ROADSIDE DITCH.
2. CONTRACTOR TO REMOVE SOIL TO THE DEPTH OF STONE SPECIFIED ON SHEET C6.15 AND FILL TO EXISTING GRADE WITH CLASS 'A' STONE. AFTER CONSTRUCTION THE CONTRACTOR SHALL REMOVE THE STONE AND FILL WITH SOIL TO RESTORE EXISTING GRADE. ENTRANCE IS IN FEMA REGULATED FLOODPLAIN, THEREFORE EXISTING GRADE SHALL BE MAINTAINED DURING AND POST-CONSTRUCTION.



NOTES

1. PROVIDE TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS.
2. LOCATE ENTRANCES TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOPDRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. LOCATE GRAVEL CONSTRUCTION ENTRANCE AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. PROVIDE FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE.
6. NUMBER AND LOCATION OF CONSTRUCTION ENTRANCES TO BE DETERMINED BY THE ENGINEER.
7. USE CLASS 'A' STONE OR OTHER COARSE AGGREGATE APPROVED BY THE ENGINEER.
8. INSTALL CONSTRUCTION ENTRANCES IN A WAY TO PREVENT VEHICLES FROM BYPASSING CONSTRUCTION ENTRANCE LEAVING PROJECT SITE.

NOTE: PLACE GEOTEXTILE FOR DRAINAGE BENEATH STONE

1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR
GRAVEL CONSTRUCTION ENTRANCE

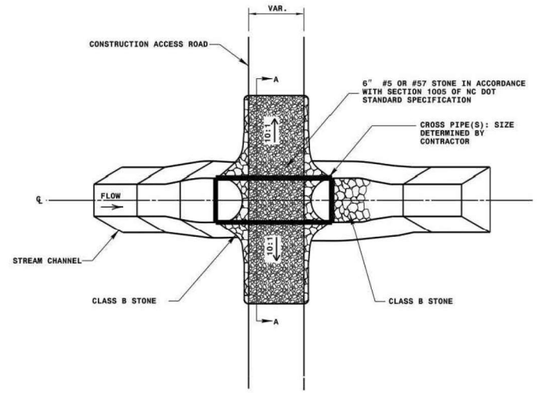
SHEET 1 OF 1
1607.01

CONSTRUCTION ENTRANCE
N.T.S.

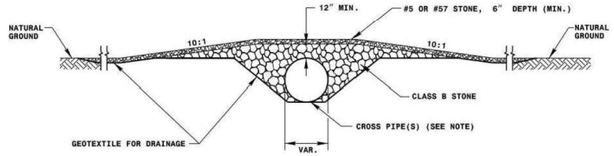
MAINTENANCE

1. 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.
2. AFTER EACH RAINFALL, INSPECT ANY STRUCTURE USED TO TRAP SEDIMENT AND CLEAN IT OUT AS NECESSARY.
3. IMMEDIATELY REMOVE ALL OBJECTIONABLE MATERIALS SPILLED, WASHED, OR TRACKED ONTO PUBLIC ROADWAYS.

NOTE:
LOG MATS MAY BE USED IN PLACE OF TEMPORARY CULVERT STREAM CORSSINGS WHERE APPROPRIATE.



PLAN VIEW



SECTION A-A
NOT TO SCALE

NOTES

PIPE(S) FOR TEMPORARY STREAM CROSSING SHALL BE DESIGNED TO PASS THE PEAK OR BANKFULL FLOW, WHICHEVER IS LESS, FROM A 2-YEAR PEAK STORM, WITHOUT OVER TOPPING.

1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR
TEMPORARY STREAM CROSSING

SHEET 1 OF 1
1645.01

TEMPORARY STREAM CROSSING
N.T.S.

MAINTENANCE

1. INSPECT TEMPORARY STREAM CROSSINGS AFTER RUNOFF-PRODUCING RAINS TO CHECK FOR BLOCKAGE IN CHANNEL, EROSION OF ABUTMENTS, CHANNEL SCOUR, RIPRAP DISPLACEMENT, OR PIPING. MAKE ALL REPAIRS IMMEDIATELY TO PREVENT FURTHER DAMAGE TO THE INSTALLATION.

Rebecca Stubbs
Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=North Carolina, email=rstubbs@mcadamsco.com
Date: 2023.12.14 12:08:58 -05'00'

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VALLE CRUCIS MITIGATION SITE
CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

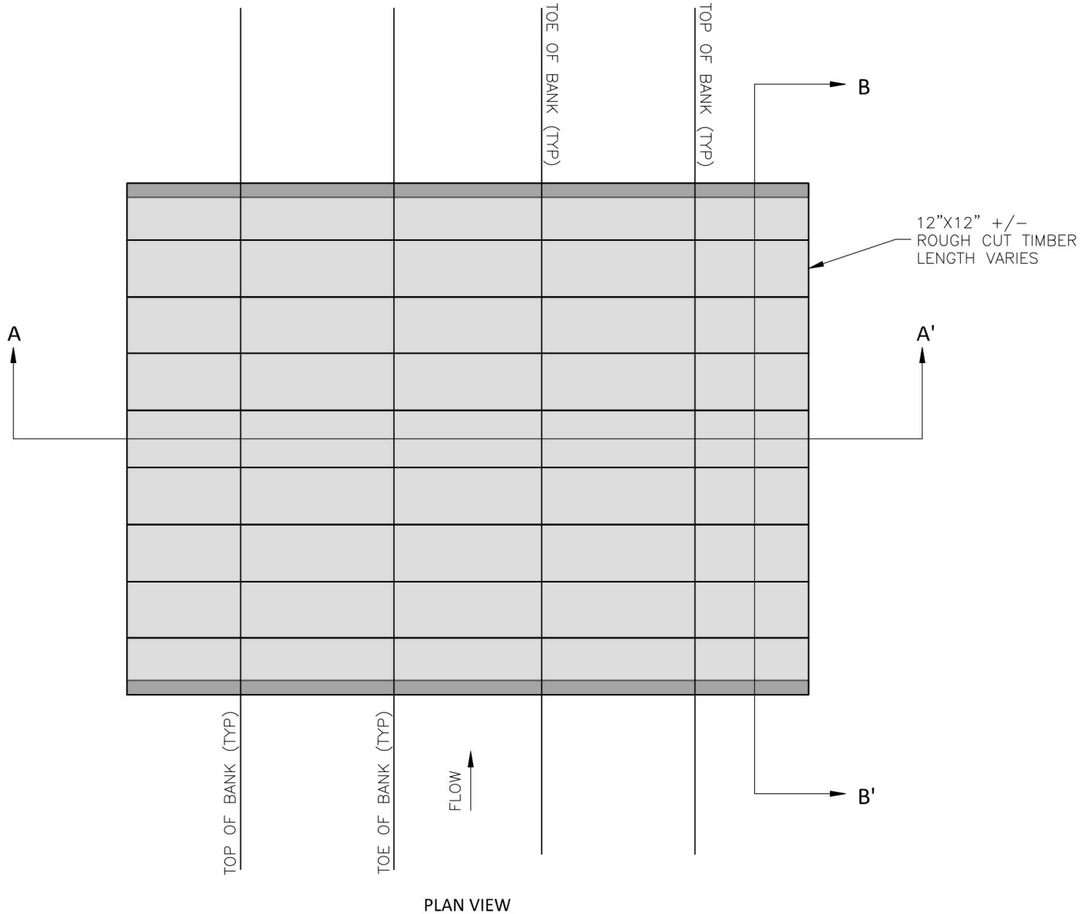
Axiom Environmental, Inc.

PLAN INFORMATION

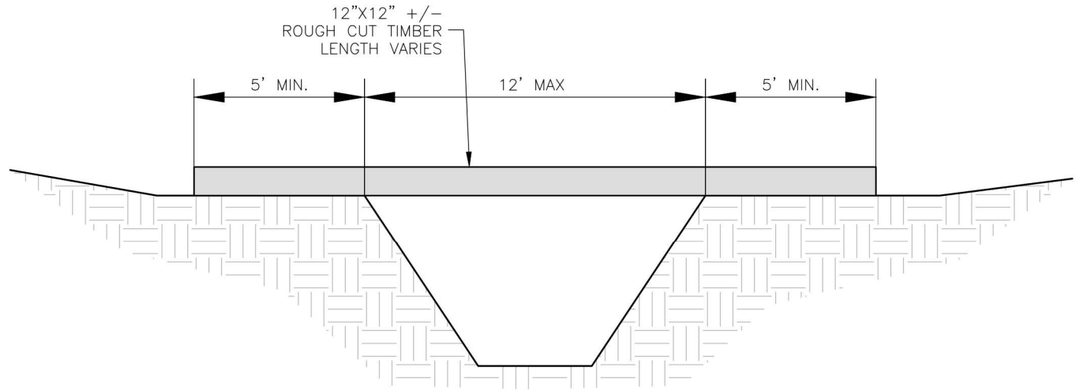
PROJECT NO.	AXI1001
FILENAME	AXI-1001-D1 (EC)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

EROSION CONTROL DETAILS

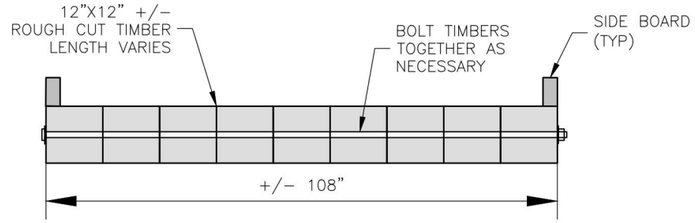
C6.15



PLAN VIEW



SECTION A - A'



SECTION B - B'

MAINTENANCE

1. INSPECT LOG MATS DAILY.
2. CONTRACTOR RESPONSIBLE FOR ENSURING LOG MATS ARE PLACED TO PROVIDE ADEQUATE SUPPORT FOR MACHINERY AND PERSONEL.
3. CONTRACTOR RESPONSIBLE FOR REPLACING OLD OR DAMAGED LOG MATS AS NEEDED.

NOTES:

1. DETAIL PROVIDED FOR INFORMATIONAL PURPOSES. USE OF LOG MAT IS AT THE CONTRACTORS DISCRETION.
2. LOG MATS ARE TO HAVE SOLID DECK AND SIDE BOARDS.
3. USE MULTIPLE LOG MATS WHERE NECESSARY TO ACCOMIDATE EQUIPMENT WIDTH.

LOG MAT

N.T.S.

Rebecca Stubbs

Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=McAdams, email=rstubbs@mcadamsco.com
Date: 2023.12.14 11:09:22 -05'00'

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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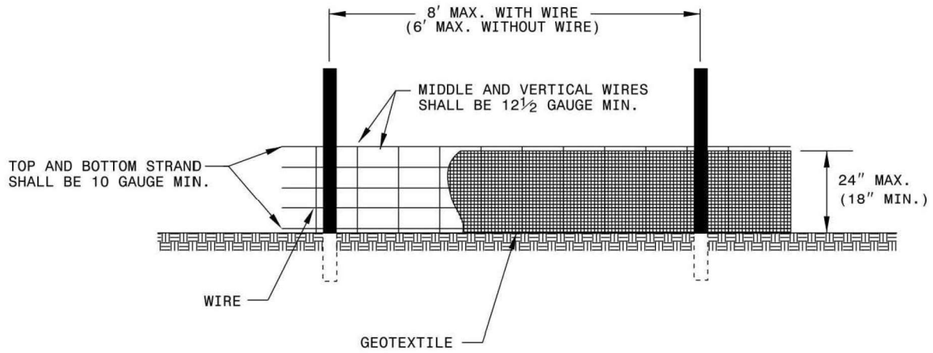
SCALE	NTS
DATE	12.14.2023

EROSION CONTROL DETAILS

C6.16



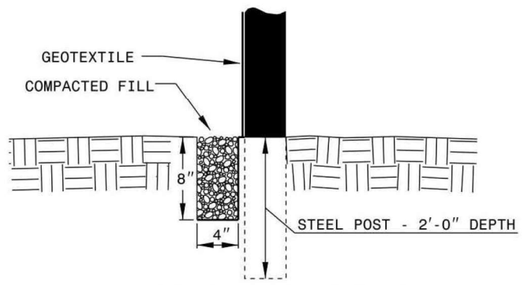
NOTES

USE GEOTEXTILE A MINIMUM OF 36″ IN WIDTH AND FASTEN ADEQUATELY TO THE POSTS AND WIRE AS DIRECTED.

USE WIRE A MINIMUM OF 32″ IN WIDTH AND WITH A MINIMUM OF 5 LINE WIRES WITH 12″ VERTICAL SPACING.

PROVIDE 5′-0″ STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE.

FOR MECHANICAL SLICING METHOD INSTALLATION, GEOTEXTILE SHALL BE A MAXIMUM OF 18″ ABOVE GROUND SURFACE.



EXTENSION OF GEOTEXTILE AND WIRE INTO TRENCH

1-18

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR

TEMPORARY SILT FENCE

SHEET 1 OF 1

1605.01

TEMPORARY SILT FENCE

N.T.S.

MAINTENANCE

1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. 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.
4. 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.

NOTES

USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL STONE.

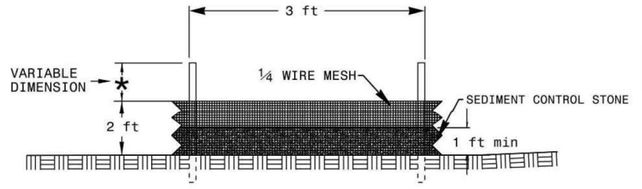
USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH ¼ INCH MESH OPENINGS.

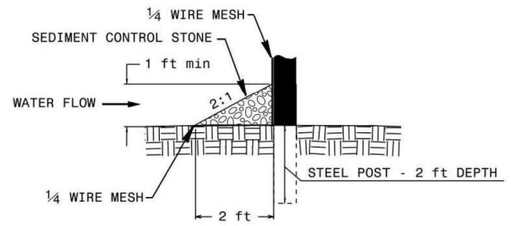
INSTALL 5 FT. SELF FASTENER ANGLE STEEL POST 2 FT. DEEP MINIMUM.

ATTACH HARDWARE CLOTH TO POSTS WITH WIRE STAPLE OR OTHER ACCEPTABLE METHODS.

SPACE POSTS A MAXIMUM OF 3 FT.

FOR INSTALLATION BETWEEN SECTIONS OF SILT FENCE, EXTEND SEDIMENT CONTROL STONE A MINIMUM OF 12″ ON EACH SIDE OF SPECIAL SEDIMENT CONTROL FENCE SECTION.





1-18

STATE OF NORTH CAROLINA
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DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR

SPECIAL SEDIMENT CONTROL FENCE

SHEET 1 OF 1

1606.01

SILT FENCE OUTLET

N.T.S.

MAINTENANCE

1. REMOVE SEDIMENT WHEN HALF OF STONE OUTLET IS COVERED.
2. REPLACE STONE AS NEEDED TO ENSURE DEWATERING.
3. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY
4. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
5. 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.
6. 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.

Rebecca Stubbs

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NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-D1 (EC)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

EROSION CONTROL DETAILS

C6.17

NOTES:

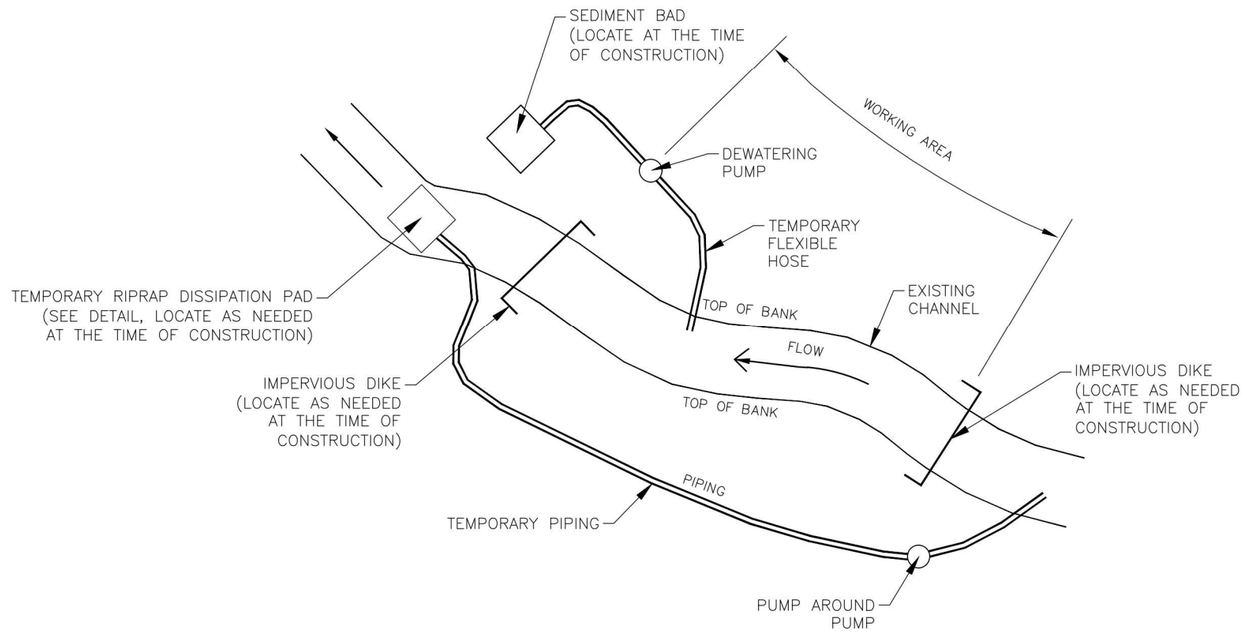
1. EXCAVATION SHALL BE PERFORMED IN ONLY DRY SECTIONS OF CHANNEL UNLESS DRAINAGE AREA EXCEEDS 6 SQUARE MILES.
2. IMPERVIOUS DIKES SHOULD BE USED TO ISOLATE WORK AREAS FROM STREAM FLOW.
3. THE CONTRACTOR SHALL NOT DISTURB MORE AREA THAN CAN BE STABILIZED IN ONE WORKING DAY.
4. EACH PUMP AROUND PUMP SHOULD ADEQUATELY CONVEY BASE FLOW VOLUMES.
5. PUMP AROUND OPERATIONS SHOULD NOT BE UNDERTAKEN IF SIGNIFICANT RAINFALL IS FORECAST IN THE CONSTRUCTION PERIOD.

SEQUENCE OF CONSTRUCTION FOR TYPICAL PUMP AROUND

1. INSTALL SEDIMENT BAG AT THE DOWNSTREAM END OF THE DESIGNATED PROJECT WORKING AREA.
2. THE CONTRACTOR WILL INSTALL THE PUMP AROUND PUMP AND THE THE TEMPORARY PIPING THAT WILL CONVEY THE BASE FLOW FROM UPSTREAM OF THE WORK SITE TO THE SEDIMENT BAG.
3. INSTALL UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. INSTALL THE DOWNSTREAM IMPERVIOUS DIKE AND 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 FLOW INTO A SEDIMENT BAG.
5. THE CONTRACTOR WILL PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLAN AND FOLLOWING THE GENERAL CONSTRUCTION SEQUENCE.
6. THE CONTRACTOR WILL EXCAVATE ANY ACCUMULATED SEDIMENT AND DEWATER BEFORE REMOVAL OF THE IMPERVIOUS DIKE. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE/PIPING STARTING WITH THE DOWNSTREAM DIKE FIRST.
7. ONCE THE WORKING AREA IS COMPLETED, REMOVE THE STILLING BASINS AND STABILIZE DISTURBED AREAS TO SPECIFICATIONS AS SHOWN ON PLANS.

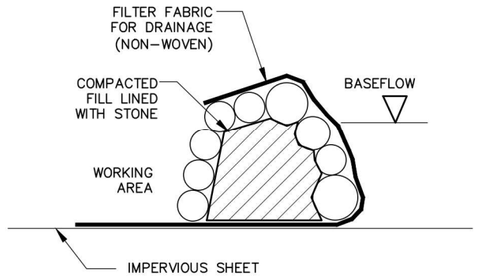
MAINTENANCE

1. INSPECT PUMPS AND HOSES DAILY FOR FOR APPROPRIATE FUNCTION.
2. INSPECT PUMPS FOR LEAKING OF OIL OR GAS. REPAIR PUMPS IMMEDIATELY IF SIGNS OF LEAKING ARE PRESENT.
3. MAINTAIN ALL OTHER COMPONENTS OF THE PUMP AROUND OPERATION AS DIRECTED IN THE CORRESPONDING DETAILS.



TYPICAL PUMP AROUND SETUP

N.T.S.



IMPERVIOUS DIKE DETAIL
(PROFILE VIEW)

Rebecca Stubbs

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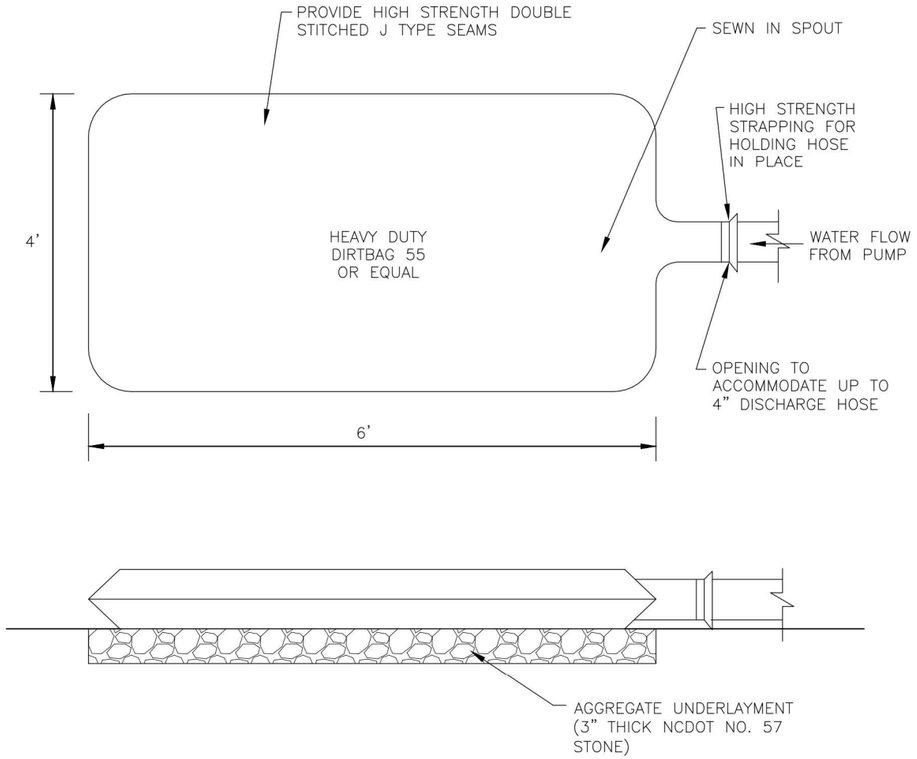
EROSION CONTROL DETAILS

C6.18



NOTES

1. THE DEWATERING BAG SHALL BE MADE OF NON–WOVEN GEOTEXTILE WITH A MIN. SURFACE AREA OF 225 SQUARE FEET PER SIDE.
2. ALL STRUCTURAL SEAMS SHALL BE SEWN WITH A DOUBLE STITCH USING A DOUBLE NEEDLE MACHINE WITH HIGH STRENGTH THREAD.
3. THE SEAM STRENGTH SHALL WITHSTAND 100 LB/IN USING ASTM D–4884 TEST METHOD.
4. THE GEOTEXTILE FABRIC SHALL BE 10 OZ NON–WOVEN FABRIC.
5. DISCHARGE FROM THE DEWATERING BAG SHALL BE DIRECTED SUCH THAT PRE–DISTURBANCE HYDROLOGY IS NOT CHANGED.
6. TRANSPORT AND PLACE DEWATERING BAGS WITH CARE TO PREVENT RIPPING OR TEARING THE FABRIC.
7. AVOID INSTALLING ON STEEP SLOPES AS THE BAG MAY ROLL, CAUSING FAILURE.
8. INSERT THE DISCHARGE HOSE A MINIMUM OF 1–FOOT INSIDE THE DEWATERING BAG. DO NOT INSERT MORE THAN ONE DISCHARGE HOSE INTO THE DEWATERING BAG.
9. AVOID USE OF EXCESSIVE FLOW RATES OR OVERFILLING THE DEWATERING BAG. THIS MAY CAUSE THE BAG TO RUPTURE OR CAUSE FAILURE TO THE HOSE TO BAG CONNECTION.

MAINTENANCE

1. FOLLOW ALL MANUFACTURER RECOMMENDATIONS FOR INSPECTION AND MAINTENANCE GUIDELINES. REPLACE DEWATERING BAGS WHEN TRAPPED SEDIMENT HAS ACCUMULATED TO 50% OF THE BAG CAPACITY OR IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
2. DEWATERING BAGS ARE FULL WHEN THEY NO LONGER EFFICIENTLY FILTER SEDIMENT OR PASS WATER AT A REASONABLE RATE.

SEDIMENT FILTER BAG DETAIL

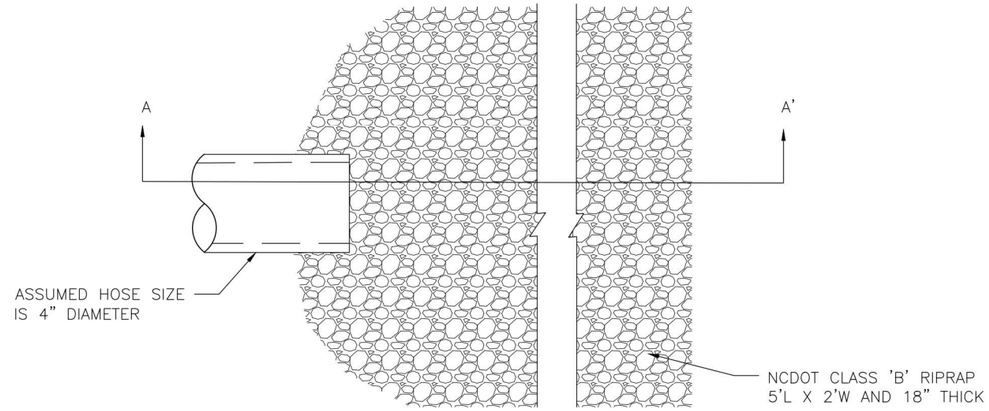
N.T.S.

NOTES

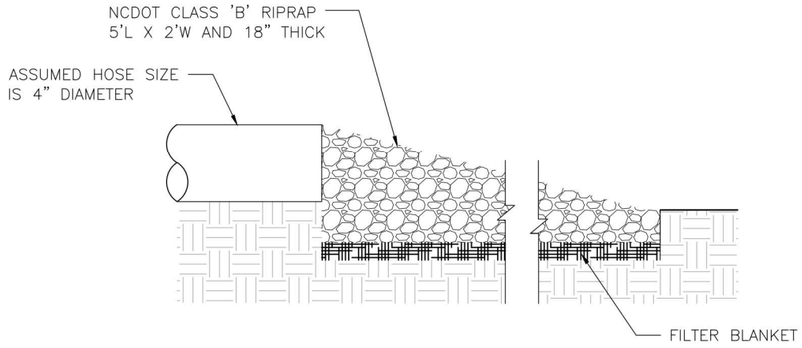
1. IN WELL–DEFINED CHANNEL, EXTEND THE RIPRAP APRON UP THE CHANNEL BANKS TO AN ELEVATION OF 6" ABOVE THE MAXIMUM TAILWATER DEPTH OR TO THE TOP OF BANK WHICHEVER IS LESS.
2. A FILTER BLANKET AND NON–WOVEN GEOTEXTILE FABRIC SHOULD BE INSTALLED BETWEEN THE RIPRAP AND SOIL FOUNDATION. FILTER BLANKET SHALL CONSIST OF MINIMUM 4" THICK LAYER OF STONE (NCDOT #57) UNDERLAIN WITH NON–WOVEN GEOTEXTILE FABRIC.

MAINTENANCE

1. INSPECT DISSIPATION PAD DAILY FOR APPROPRIATE FUNCTION.
2. LENGTHEN, WIDEN, AND/OR FURTHER STABILIZE THE DISSIPTION PAD IF SIGNS OF EROSION ARE EVIDENT DOWNSTREAM.
3. IF NECESSARY RELOCATE THE HOSE OUTELT AND DISSIPATION PAD TO PREVENT DOWNSTREAM EROSION.



PLAN VIEW



SECTION A–A'

TEMPORARY RIPRAP DISSIPATION PAD

N.T.S.

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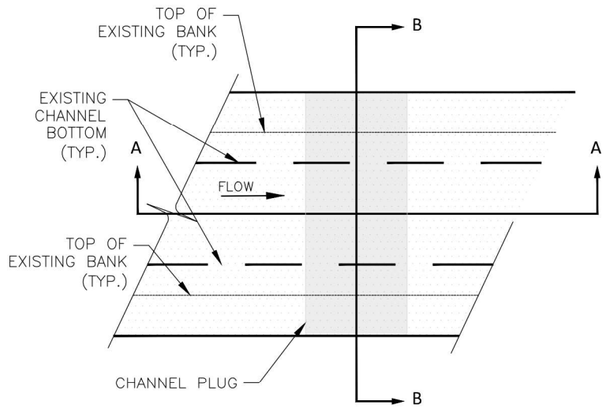
EROSION CONTROL DETAILS

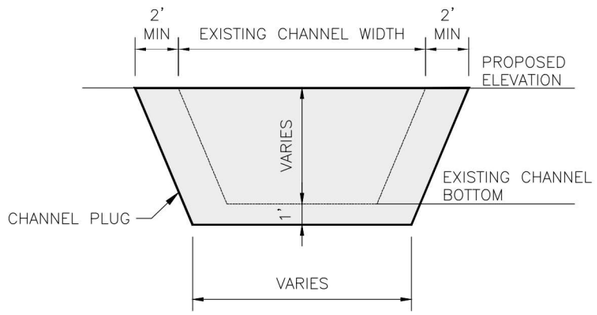
C6.19

CHANNEL PLUG NOTES:

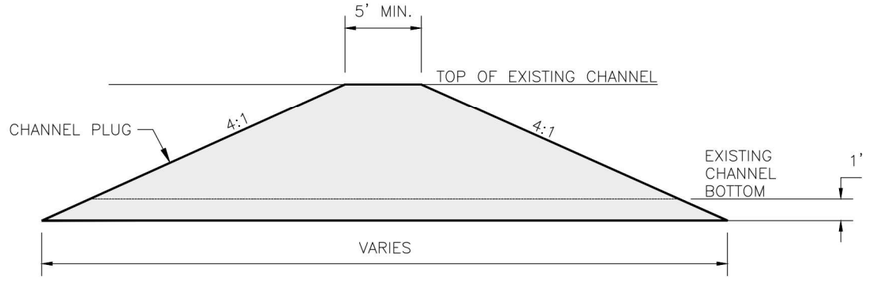
1. CHANNEL PLUGS TO BE LOCATED AS SHOWN ON PLAN SHEETS C5.00 THROUGH C5.15 AND AT OTHER LOCATIONS AS DIRECTED BY THE CONSTRUCTION MANAGER.
2. CHANNEL PLUG MATERIAL SHALL BE CLAY SOIL HARVESTED ON SITE OR BROUGHT INTO THE SITE AS WELL AS MATERIAL USED IN REMOVED ROCK CHECK DAMS IF SUITABLE.
3. CHANNEL MATERIAL SHALL BE FREE OF ALL VISIBLE ORGANIC DEBRIS SUCH AS ROOTS AND LIMBS. SOILS WITH ORGANIC MATTER CONTENT EXCEEDING 5% BY WEIGHT SHALL NOT BE USED.
4. ROCKS AND STONES WITH A DIAMETER GREATER THAN 3 INCHES (IN ANY DIRECTION) SHALL BE REMOVED FROM FILL PRIOR TO COMPACTION.
5. FILL MATERIAL PLACED AT DENSITIES LOWER THAN SPECIFIED MINIMUM DENSITIES OR AT MOISTURE CONTENTS OUTSIDE THE SPECIFIED RANGES OR OTHERWISE NOT CONFORMING TO THE SPECIFIED REQUIREMENTS SHALL BE REMOVED AND REWORKED AND REPLACED WITH ACCEPTABLE MATERIALS.
6. TOPSOIL SHALL BE PLACED ON TOP OF THE SOIL LIFTS IN THE SAME MANOR AS THE REST OF THE GRADED CONSTRUCTION SITE
7. CHANNEL PLUGS WILL BE PLANTED ACCORDING TO THE PLANTING PLAN ON SHEETS L5.00-L5.02.
8. MINIMUM CHANNEL PLUG LENGTH TO BE 20 LINEAR FEET.



PLAN VIEW



SECTION B-B'



SECTION A-A'

IMPERVIOUS CHANNEL PLUG DETAILS

N.T.S.

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EROSION CONTROL DETAILS

C6.20

NOTES:

1. AN EROSION CONTROL BLANKET SHALL BE USED TO STABILIZE THE NEWLY CONSTRUCTED CHANNEL FROM THE TOP OF BANK TO TOE OF SLOPE AND SHALL BE 100% BIODEGRADABLE.
2. THE CHANNEL SIDE SLOPES SHALL BE FINE GRADED, SEEDED, FERTILIZED, AND LIMED PRIOR TO INSTALLING THE EROSION CONTROL BLANKET. REMOVE ROOTS, TWIGS, AND OTHER DEBRIS WHICH WOULD CAUSE BULGES IN THE MATTING AS WELL AS PREVENT THE MATTING FROM BEING LAID FLUSH TO THE FINISHED SURFACE.
3. KEY-IN EDGES OF MATTING A MINIMUM OF 6 INCHES INTO FINISHED GRADE. LAY MATTING SHINGLED DOWNSTREAM TO UPSTREAM, OVERLAPPING AT EDGES A MINIMUM OF 1 FOOT.
4. INSTALL STAKES TO ENSURE GOOD GROUND CONTACT OF THE MATTING TO WITHSTAND MEDIUM TO HIGH FLOWS. STAKES SHALL BE 100% BIODEGRADABLE AND INSTALLED PER THE MANUFACTURER'S SPECIFICATIONS INCLUDING, BUT NOT LIMITED TO, THE MANUFACTURER'S RECOMMENDED DENSITY AND PATTERN.
5. KEY-IN EDGES OF MATTING A MINIMUM OF 6 INCHES, PARTICULARLY NEAR RESTORATION STRUCTURES, BOULDERS, LOGS, ETC. CHECK MATTING FOR LOOSE ENDS, FLAPS, OR OTHER WEAKNESSES OR DAMAGE WHICH MAY CAUSE IT TO BECOME LOOSE UNDER FLOW CONDITIONS.
6. MATTING SHALL BE PLACED ON ALL GRADED STREAM BANKS.
7. FIELD ADJUSTMENTS TO MATTING LOCATION MAY BE MADE AT THE DISCRETION OF THE DESIGNER.
8. THE EROSION CONTROL BLANKET SHALL CONSIST OF A MACHINE-PRODUCED BLANKET MADE OF COCONUT FIBER AND BE EQUIVALENT OR BETTER THAN THE FOLLOWING SPECIFICATION. SOIL STABILIZATION MATTING WHICH USES PLASTICS, METALS, OR OTHER MAN-MADE MATERIALS IN THE CONSTRUCTION OF THE MATERIAL WILL NOT BE PERMITTED.

WEIGHT = 13.6 OZ/SY

TENSILE STRENGTH DRY (ASTM D 4595) = 780 LBS/FT MACHINE DIRECTION
744 LBS/FT CROSS DIRECTION

TENSILE STRENGTH WET (ASTM D 4595) = 672 LBS/FT MACHINE DIRECTION
648 LBS/FT CROSS DIRECTION

ELONGATION FAILURE WET (ASTM D 4595) = 30% MACHINE DIRECTION
28% CROSS DIRECTION

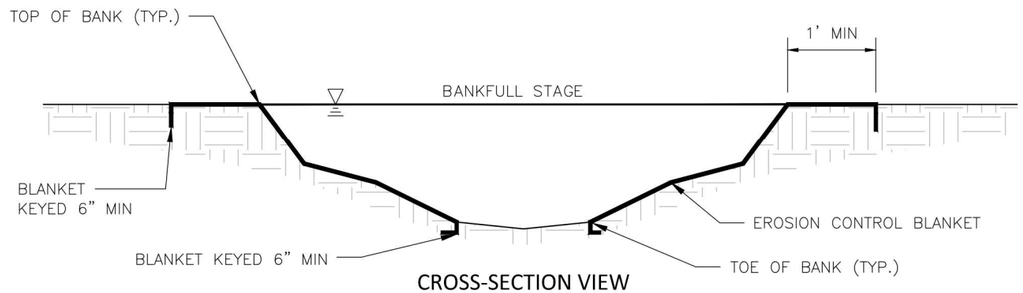
OPEN AREA = 65%

RECOMMENDED SHEAR STRESS = 3LBS/SQ.FT.

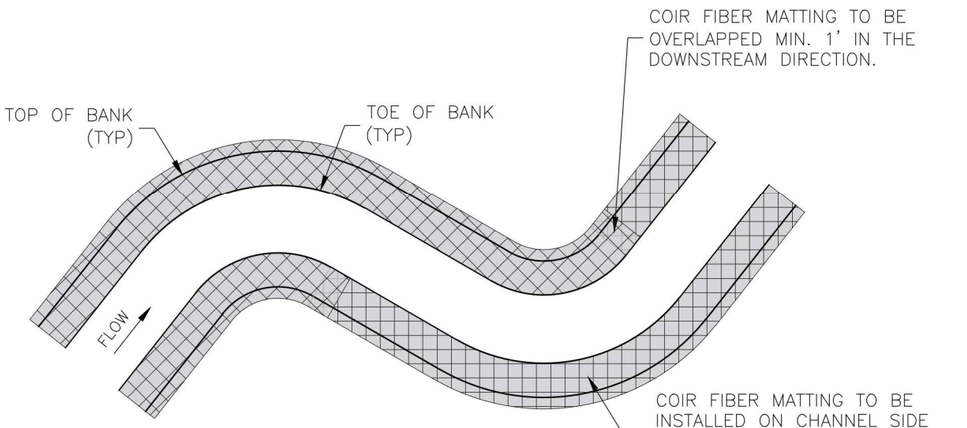
RECOMMENDED FLOW = 8FT/S

RECOMMENDED SLOPE </= 1:1

MINIMUM TWINE COUNT PER FOOT = 15X14



CROSS-SECTION VIEW



PLAN VIEW

EROSION CONTROL BLANKET DETAILS

N.T.S.

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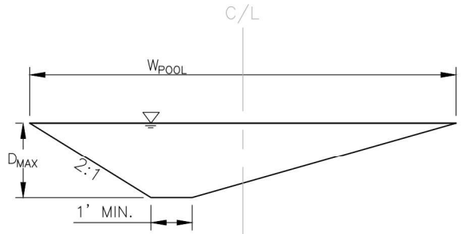
EROSION CONTROL DETAILS

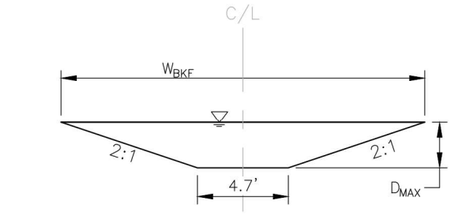
C6.21

TYPICAL POOL CROSS-SECTION ORIENTATION IS FOR A MEANDER BEND TOWARD STREAM RIGHT AND SHALL BE MIRRORED FOR MEANDER BENDS TOWARDS STREAM LEFT



W_{POOL} = 9.9 FT
D_{MAX} = 0.9 FT

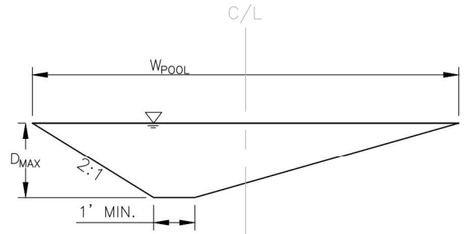
TYPICAL POOL



W_{bkf} = 8.3 FT
D_{MAX} = 0.8 FT
D_{MEAN} = 0.6 FT
A_{bkf} = 4.9 SF

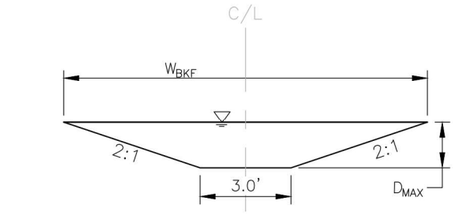
TYPICAL RIFFLE

UT1
N.T.S.



W_{POOL} = 6.5 FT
D_{MAX} = 0.6 FT

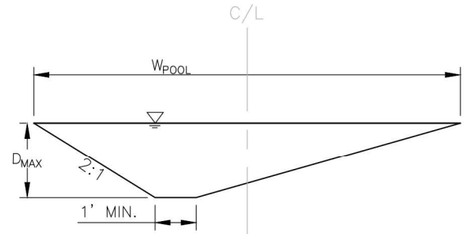
TYPICAL POOL



W_{bkf} = 5.4 FT
D_{MAX} = 0.5 FT
D_{MEAN} = 0.4 FT
A_{bkf} = 2.1 SF

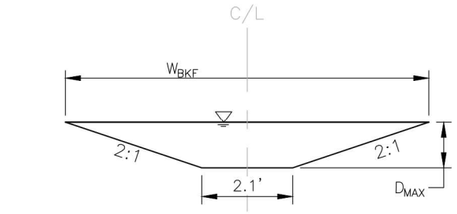
TYPICAL RIFFLE

UT2
N.T.S.



W_{POOL} = 4.9 FT
D_{MAX} = 0.4 FT

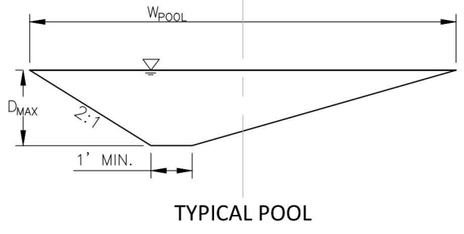
TYPICAL POOL



W_{bkf} = 4.1 FT
D_{MAX} = 0.4 FT
D_{MEAN} = 0.3 FT
A_{bkf} = 1.2 SF

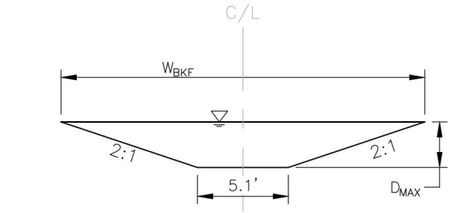
TYPICAL RIFFLE

UT3
N.T.S.



W_{POOL} = 10.4 FT
D_{MAX} = 0.9 FT

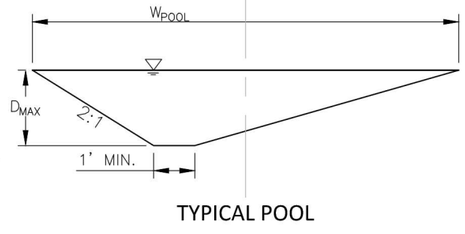
TYPICAL POOL



W_{bkf} = 8.7 FT
D_{MAX} = 0.8 FT
D_{MEAN} = 0.6 FT
A_{bkf} = 5.4 SF

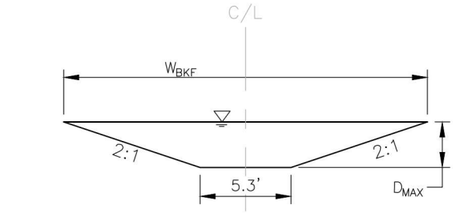
TYPICAL RIFFLE

UT4 UPSTREAM
N.T.S.



W_{POOL} = 10.7 FT
D_{MAX} = 1.0 FT

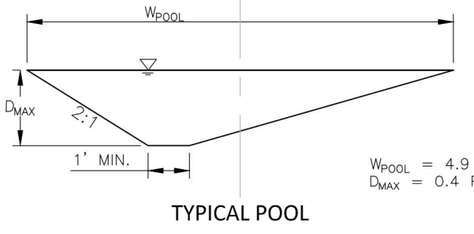
TYPICAL POOL



W_{bkf} = 8.9 FT
D_{MAX} = 0.8 FT
D_{MEAN} = 0.6 FT
A_{bkf} = 5.7 SF

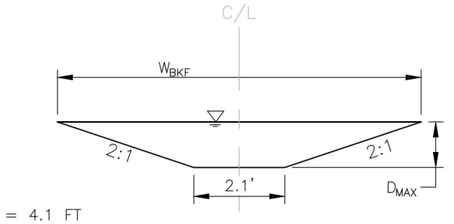
TYPICAL RIFFLE

UT4 DOWNSTREAM
N.T.S.



W_{POOL} = 4.9 FT
D_{MAX} = 0.4 FT

TYPICAL POOL



W_{bkf} = 4.1 FT
D_{MAX} = 0.4 FT
D_{MEAN} = 0.3 FT
A_{bkf} = 1.2 SF

TYPICAL RIFFLE

UT6
N.T.S.

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NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RS RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

C8.00

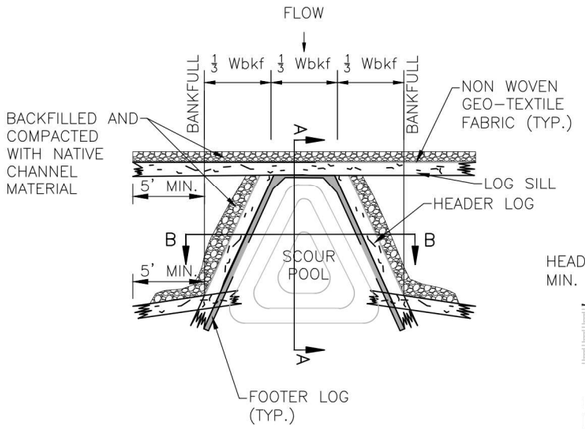
GENERAL NOTES:

1. A LOG CROSS VANE IS A GRADE CONTROL, IN-STREAM STRUCTURE THAT DIRECTS STREAM FLOW AWAY FROM THE STREAM BANKS AND IN TOWARD THE CENTER OF THE CHANNEL.
2. ELEVATION CONTROL POINTS SHALL BE DESIGNATED AT THE UPSTREAM INVERT (CENTER) OF THE CROSS VANE TO ESTABLISH PART OF THE PROFILE. A NOTCH MAY BE CUT INTO THE LOG AT THE INVERT LOCATION. POOL ELEVATION CONTROL POINTS OR EXCAVATION TO A SPECIFIED MAXIMUM POOL DEPTH SHALL BE DESIGNATED TO ESTABLISH THE REMAINING PROFILE. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE INSTALLATION WITHIN THE TOLERANCE SPECIFIED BY THE DESIGNER.
3. THE VANE ARM SHALL BE SLOPED 3-5% AND INTERCEPT THE STREAM BANK AT A HEIGHT EQUAL TO BETWEEN ½ BANKFULL STAGE AND BANKFULL STAGE. ELEVATION CONTROL POINTS MAY BE ESTABLISHED AT THE LEFT AND RIGHT STREAM BANK/VANE ARM INTERCEPT POINTS. THE VANE ARM INTERCEPT LOCATION MAY BE OTHERWISE DESCRIBED BY ITS RELATIONSHIP TO BANKFULL STAGE OR BY THE LENGTH AND SLOPE OF THE VANE ARM. BANKFULL IS NOT NECESSARILY THE TOP OF THE STREAM BANK SLOPE.
4. IF THE PLANS DESIGNATE THE USE OF MULTIPLE LOG CROSS VANES A TABLE OF ALL STATION LOCATIONS AND CONTROL POINT ELEVATIONS SHALL BE PROVIDED IN THIS DETAIL OR PROVIDED ELSEWHERE IN THE PLANS AND REFERENCED HEREIN.
5. TYPICAL RIFFLE AND POOL CROSS SECTIONS SHALL BE PROVIDED ELSEWHERE IN THE PLANS TO ESTABLISH THE DIMENSIONS OF THE CHANNEL GRADING INTO WHICH THE LOG CROSS VANES ARE TO BE INSTALLED.
6. LOGS SHALL BE RELATIVELY STRAIGHT HARDWOOD, RECENTLY HARVESTED AND BE A MINIMUM OF 18" DIAMETER. THE LENGTH SHALL BE SUCH THAT THE LOG IS BURIED INTO THE SOIL OF THE STREAM BANK (ON ONE END) AND STREAM BED (ON THE OTHER END) A MINIMUM DISTANCE AS SPECIFIED BY THE DESIGNER. THE INVERT LOG SHALL BE KEYED INTO THE BANK A MINIMUM 3 FEET PAST TOP OF BANK WIDTH.
7. A SINGLE LOG MAY BE USED IN LIEU OF A HEADER/FOOTER LOG COMBINATION. A DOUBLE FOOTER LOG MAY BE REQUIRED IN SAND BED STREAMS.
8. NON-WOVEN GEOTEXTILE FABRIC OF A TYPE AND SIZE SPECIFIED BY THE DESIGNER SHALL BE USED TO SEAL THE GAPS BETWEEN THE LOG(S) AND THE STREAM BED, UNDER THE COARSE BACKFILL MATERIAL. THERE SHALL BE NO FILTER FABRIC VISIBLE IN THE FINISHED WORK; EDGES SHALL BE FOLDED, TUCKED, OR TRIMMED AS NEEDED.
9. COARSE BACKFILL OF THE LOG CROSS VANE SHALL BE OF A TYPE, SIZE, AND GRADATION AS SPECIFIED BY THE DESIGNER. COARSE BACKFILL SHALL BE PLACED TO A THICKNESS EQUAL TO THE DEPTH OF THE HEADER (AND ANY FOOTER) LOGS AND SHALL EXTEND OUT FROM THE VANE ARMS TO THE STREAM BANK AND UPSTREAM A DISTANCE SPECIFIED BY THE DESIGNER.
10. AS AN OPTION, FLAT-SIDED BOULDERS OF A SIZE (LENGTH, WIDTH, AND THICKNESS) AS SPECIFIED BY THE DESIGNER MAY BE PLACED AS BALLAST ON TOP OF THE STREAM BANK SIDE OF THE EMBEDDED VANE ARMS. DUCK BILL ANCHORS MAY BE USED IN LIEU OF BALLAST BOULDERS.
11. DUCKBILL ANCHORS WITH GALVANIZED CABLE ATTACHED (OF A GAGE ADEQUATE TO SECURE THE SPECIFIED DIAMETER LOG) MAY BE USED TO SECURE LOGS INTO THE STREAM BED AND/OR BANKS TO THE SPECIFIED DEPTH. FLAT SIDED BOULDERS (LENGTH, WIDTH, AND THICKNESS SPECIFIED BY DESIGNER) CAN BE USED IN LIEU OF THE LOG INVERT/DUCKBILL ANCHOR SYSTEM.

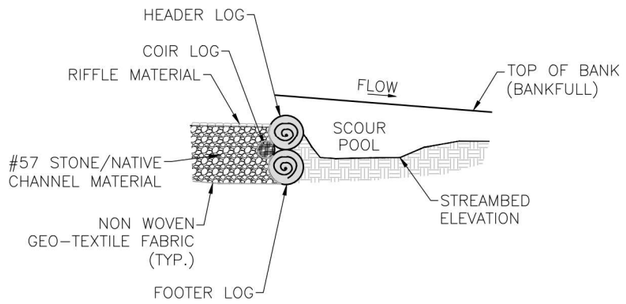
CONSTRUCTION GUIDELINES:

1. THE VANE ARMS OF THE LOG CROSS VANE SHALL BE CONSTRUCTED FIRST, FOLLOWED BY THE LOG INVERT.
2. OVER-EXCAVATE STREAM BED TO A DEPTH EQUAL TO THE TOTAL THICKNESS OF THE HEADER (AND FOOTER IF SPECIFIED) LOGS.
3. PLACE VANE ARM FOOTER LOGS, IF SPECIFIED. THE SLOPE OF THE VANE ARM IS MEASURED ALONG THE VANE ARM WHICH IS INSTALLED AT AN ANGLE TO THE STREAM BANK AND PROFILE.
4. INSTALL VANE ARM HEADER LOG ON TOP OF AND SET SLIGHTLY FORWARD OR BACK FROM THE FOOTER LOG.
5. INSTALL INVERT LOG AND DUCKBILL ANCHOR.
6. NAIL FILTER FABRIC TO THE HEADER LOG USING A GALVANIZED NAIL WITH A PLASTIC CAP. THE SIZE AND GAGE OF NAIL AND NAIL SPACING SHALL BE SPECIFIED BY THE DESIGNER.
7. PLACE COARSE BACKFILL BEHIND LOG(S) ENSURING THAT ANY VOIDS BETWEEN THE LOGS ARE FILLED.
8. IF ANY EROSION CONTROL MATTING IS SPECIFIED FOR USE IN THE VICINITY OF THE VANE ARM INTERCEPT POINTS, ALL MATTING EDGES SHALL BE NEATLY SECURED AROUND THE LOGS.

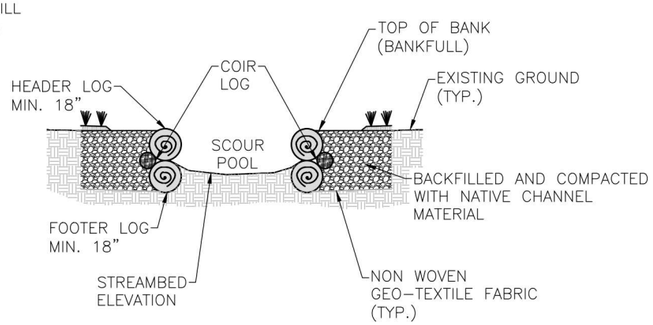
TRIBUTARY	W_{bkf} (FT)
UT1	8.3
UT2	5.4
UT3	4.1
UT4 UPSTREAM	8.7
UT4 DOWNSTREAM	8.9
UT6	4.1



PLAN VIEW



SECTION A - A



SECTION B - B

LOG CROSS VANE DETAIL

N.T.S.

NOTE: GEOTEXTILE FABRIC (NON-WOVEN) SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS.

MECHANICAL PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE	
			MD	CD
GRAB TENSILE STRENGTH	ASTM D 4632	N (lbs)	912 (205)	912 (205)
GRAB TENSILE ELONGATION	ASTM D 4632	%	50	50
TRAPEZOID TEAR STRENGTH	ASTM D 4533	N (lbs)	356 (80)	356 (80)
CBR PUNCTURE STRENGTH	ASTM D 6241	N (lbs)	2225 (500)	
APPARENT OPENING SIZE (AOS)[1]	ASTM D 4751	mm (U.S. SIEVE)	0.18 (80)	
PERMITTIVITY	ASTM D 4491	sec $^{-1}$	1.1	
FLOW RATE	ASTM D 4491	l/min/m² (gal/min/ft²)	3870 (95)	
UV RESISTANCE (AT 500 HOURS)	ASTM D 4355	% STRENGTH RETAINED	70	

[1]ASTM D 4751: AOS IS A MAXIMUM OPENING DIAMETER VALUE

PHYSICAL PROPERTIES	TEST METHOD	UNIT	TYPICAL VALUE	
WEIGHT	ASTM D 5261	g/m² (oz/yd²)	271 (8.0)	
THICKNESS	ASTM D 5199	mm (mils)	1.8 (72)	
ROLL DIMENSIONS (WIDTH X LENGTH)	–	ft	12.5 X 360	15 X 300
ROLL AREA	–	m² (yd²)	418 (500)	
ESTIMATED ROLL WEIGHT	–	kg (lb)	120 (265)	

NON-WOVEN GEOTEXTILE FABRIC MATERIAL SPECIFICATIONS

Rebecca Stubbs

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PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

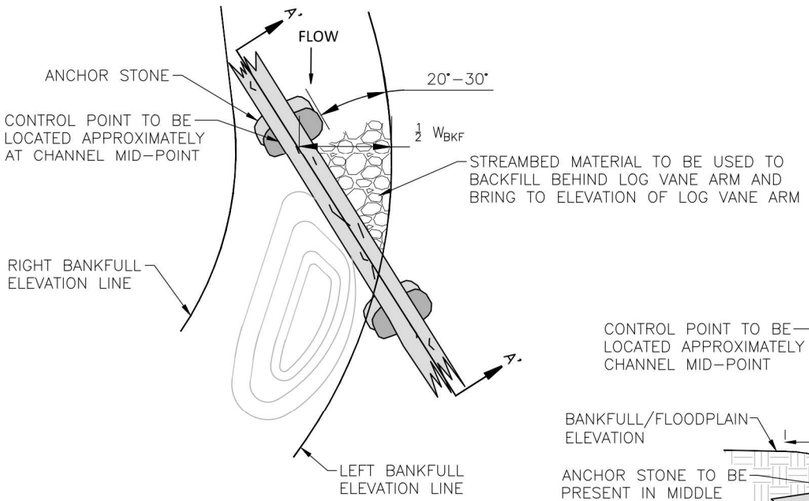
C8.01

GENERAL NOTES

1. LOG VANES WILL BE ANGLED @20-30° FROM STREAM BANK.
2. LOG VANES SHALL BE LARGE ENOUGH TO OCCUPY $\frac{2}{3}$ OF THE POOL MAXIMUM DEPTH.
3. LOG VANE WILL BE SLOPED AT 3-5%.
4. SEED AND SOIL STABILIZATION MATTING WILL BE PLACED ALONG STREAM BANKS FOR STABILIZATION PURPOSES WHERE DISTURBANCES HAS OCCURRED AS A RESULT STRUCTURE INSTALLATION.
5. DESIGN ENGINEER SHALL CONSIDER IMPLEMENTATION OF OTHER STREAM BANK PROTECTION MEASURES IN CONJUNCTION WITH LOG VANE STRUCTURE.

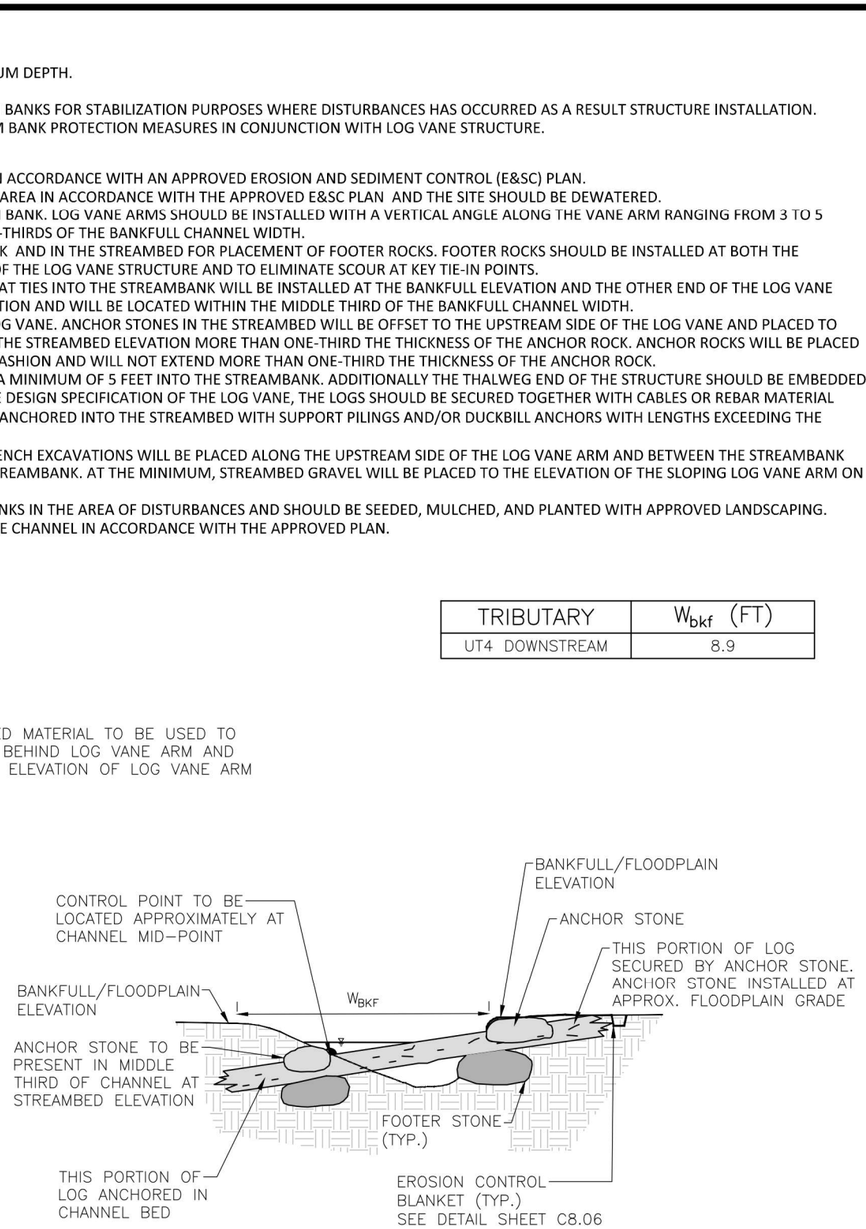
CONSTRUCTION GUIDELINES

1. ALL EROSION AND SEDIMENT CONTROL DEVICES SHOULD BE INSTALLED IN ACCORDANCE WITH AN APPROVED EROSION AND SEDIMENT CONTROL (E&SC) PLAN.
2. FLOW FROM THE STREAM SHOULD BE DIVERTED AWAY FROM THE WORK AREA IN ACCORDANCE WITH THE APPROVED E&SC PLAN AND THE SITE SHOULD BE DEWATERED.
3. LOG VANES SHOULD BE ANGLED 20 TO 30 DEGREES FROM THE UPSTREAM BANK. LOG VANE ARMS SHOULD BE INSTALLED WITH A VERTICAL ANGLE ALONG THE VANE ARM RANGING FROM 3 TO 5 PERCENT. LOG VANES SHOULD SPAN APPROXIMATELY ONE-HALF TO TWO-THIRDS OF THE BANKFULL CHANNEL WIDTH.
4. EXCAVATE THE TRENCH AND PREPARE THE AREA ALONG THE STREAMBANK AND IN THE STREAMBED FOR PLACEMENT OF FOOTER ROCKS. FOOTER ROCKS SHOULD BE INSTALLED AT BOTH THE STREAMBANK AND THALWEG LOCATIONS TO ENSURE PROPER FOOTING OF THE LOG VANE STRUCTURE AND TO ELIMINATE SCOUR AT KEY TIE-IN POINTS.
5. PLACE LOG ONTO THE FOOTER ROCKS SUCH THAT THE LOG VANE ARM THAT TIES INTO THE STREAMBANK WILL BE INSTALLED AT THE BANKFULL ELEVATION AND THE OTHER END OF THE LOG VANE ARM WILL BE EMBEDDED INTO THE STREAMBED AT THE THALWEG ELEVATION AND WILL BE LOCATED WITHIN THE MIDDLE THIRD OF THE BANKFULL CHANNEL WIDTH.
6. ANCHOR ROCKS SHOULD BE INSTALLED ON TOP OF BOTH ENDS OF THE LOG VANE. ANCHOR STONES IN THE STREAMBED WILL BE OFFSET TO THE UPSTREAM SIDE OF THE LOG VANE AND PLACED TO MINIMIZE ROLLING OF ANCHOR STONE AND WILL NOT PROTRUDE FROM THE STREAMBED ELEVATION MORE THAN ONE-THIRD THE THICKNESS OF THE ANCHOR ROCK. ANCHOR ROCKS WILL BE PLACED ALONG THE STREAMBANK POSITION OF THE LOG VANE ARM IN SIMILAR FASHION AND WILL NOT EXTEND MORE THAN ONE-THIRD THE THICKNESS OF THE ANCHOR ROCK.
7. THE LOG VANE ARM THAT TIES INTO THE STREAMBANK SHOULD EXTEND A MINIMUM OF 5 FEET INTO THE STREAMBANK. ADDITIONALLY THE THALWEG END OF THE STRUCTURE SHOULD BE EMBEDDED A MINIMUM OF 3 FEET. WHEN TWO LOGS ARE USED TO ACCOMPLISH THE DESIGN SPECIFICATION OF THE LOG VANE, THE LOGS SHOULD BE SECURED TOGETHER WITH CABLES OR REBAR MATERIAL BASED UPON MANUFACTURING SPECIFICATIONS. LOG VANES SHOULD BE ANCHORED INTO THE STREAMBED WITH SUPPORT PILINGS AND/OR DUCKBILL ANCHORS WITH LENGTHS EXCEEDING THE POTENTIAL OF LONG-TERM BED DEGRADATION AND/OR SCOUR DEPTHS.
8. PLACEMENT OF SALVAGED STREAMBED MATERIAL OBTAINED DURING TRENCH EXCAVATIONS WILL BE PLACED ALONG THE UPSTREAM SIDE OF THE LOG VANE ARM AND BETWEEN THE STREAMBANK TO CREATE A UNIFORM SLOPE BETWEEN THE LOG VANE ARM AND THE STREAMBANK. AT THE MINIMUM, STREAMBED GRAVEL WILL BE PLACED TO THE ELEVATION OF THE SLOPING LOG VANE ARM ON THE UPSTREAM SIDE OF THE LOG VANE.
9. SOIL STABILIZATION MATTING WILL BE INSTALLED ALONG THE STREAMBANKS IN THE AREA OF DISTURBANCES AND SHOULD BE SEEDED, MULCHED, AND PLANTED WITH APPROVED LANDSCAPING.
10. REMOVE THE APPROVED E&SC PLAN DEVICES UPON STABILIZATION OF THE CHANNEL IN ACCORDANCE WITH THE APPROVED PLAN.



PLAN VIEW

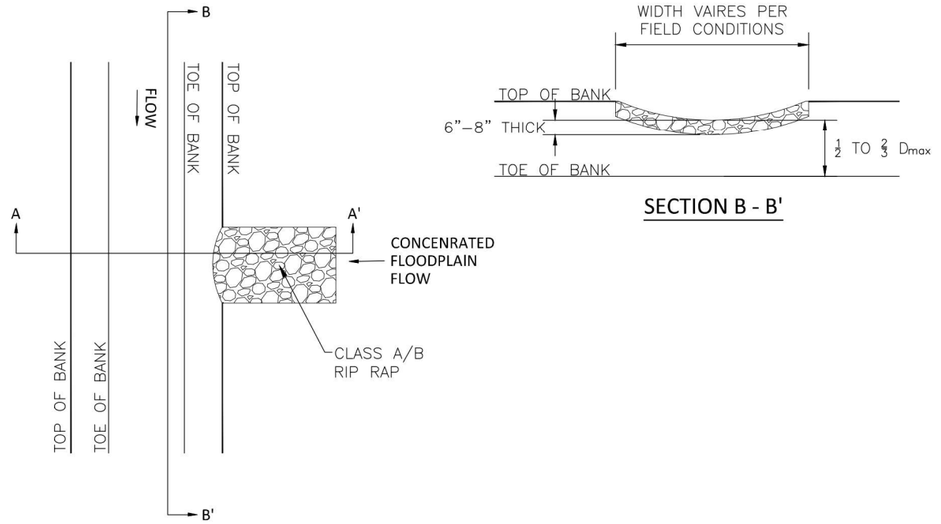
TRIBUTARY	W_{bkf} (FT)
UT4 DOWNSTREAM	8.9



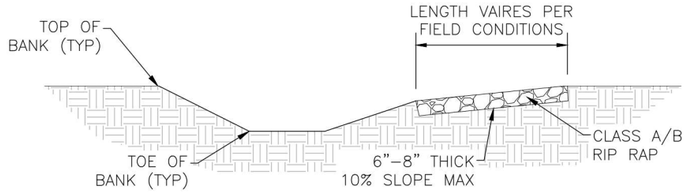
SECTION A' - A'

LOG VANE DETAIL

N.T.S.



SECTION B - B'



SECTION A - A'

ROCK FLOODPLAIN OUTELT

N.T.S.

NOTE:

1. CONSTRUCT ROCK FLOODPLAIN OUTLETS WHERE CONCENTRATED FLOWS IN THE FLOODPLAIN ENTER THE DESIGN CHANNEL.
2. MAKE ADJUSTMENT TO THE LOCATION OF ROCK FLOODPLAIN OUTLETS SHOWN IN THE PLANS BASED ON FIELD CONDITIONS AT THE TIME OF CONSTRUCTION.
3. THE ENGINEER ON SITE MAY MAKE CHANGES TO THE QUANTITY AND LOCATION OF ROCK FLOODPLAIN OUTLETS BASED ON FIELD CONDITIONS AT THE TIME OF CONSTRUCTION.

THIS DETAIL IS PROVIDED FOR INFORMATIONAL PURPOSES. CONTRACTOR SHALL FIELD LOCATE ROCK FLOODPLAIN OUTLET STRUCTURES AS NEEDED BASED ON OBSERVED FLOODPLAIN DRAINAGE PATTERNS DURING CONSTRUCTION.

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PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

C8.02

GENERAL NOTES:

1. A BOULDER OR LOG SILL STEP MAY BE USED ALONE OR IN COMBINATION WITH A CONSTRUCTED RIFFLE. CONTRACTOR TO CONSULT DESIGN ENGINEER FOR FINAL MATERIAL SPECIFICATIONS.
2. AN ELEVATION CONTROL POINT SHALL BE DESIGNATED AT THE CENTER OF THE SILL TO ESTABLISH PART OF THE PROFILE. POOL ELEVATION CONTROL POINTS OR EXCAVATION TO A SPECIFIED MAXIMUM POOL DEPTH SHALL BE DESIGNATED TO ESTABLISH THE REMAINING PROFILE. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE INSTALLATION WITHIN THE TOLERANCE SPECIFIED BY THE DESIGNER.
3. NO PART OF THE SILL SHALL BE PLACED ABOVE THE ELEVATION OF THE STREAM BED.
4. REFER TO THE PLAN-PROFILE FOUND ON SHEETS C5.00 - C5.12 FOR THE STATION LOCATIONS AND CONTROL POINT ELEVATIONS OF EACH BOULDER OR LOG SILL STEP SPECIFIED FOR THE PROJECT.
5. ALL BOULDERS SHALL CONSIST OF ANGULAR, TABULAR, FLAT ROCK WITH MINIMUM OF TWO PARALLEL SIDES, AND HAVE A NATURAL APPEARANCE AND COLOR. ROUNDED EDGES ARE ACCEPTABLE SO LONG AS ROUNDED EDGES ARE NOT BEARING OR SUPPORTING. APPROXIMATE DIMENSIONS OF BOULDERS SHALL MEASURE IN LENGTH, WIDTH, AND HEIGHT SPECIFIED IN THE TABLE BELOW. ALL STONE SHALL BE FREE FROM LAMINATION AND WEAK CLEAVAGES. THE STONE SHOULD NOT DISINTEGRATE SIGNIFICANTLY FROM THE ACTION OF AIR, WATER, OR IN HANDLING AND PLACING. STONE WITH TOOL MARKS, DRILL HOLES, AND OTHER BLASTING EVIDENCE SHALL NOT BE UTILIZED IN EXPOSED LOCATIONS.
6. FILTER FABRIC OF A TYPE AND SIZE SPECIFIED BY THE DESIGNER SHALL BE USED TO SEAL THE GAPS BETWEEN THE BOULDERS AND THE STREAM BED, UNDER THE COARSE BACKFILL MATERIAL. THERE SHALL BE NO FILTER FABRIC VISIBLE IN THE FINISHED WORK; EDGES SHALL BE FOLDED, TUCKED, OR TRIMMED AS NEEDED.
7. BACKFILL ROCK ON THE UPSTREAM SIDE OF THE STRUCTURE SHALL BE NATIVE CHANNEL MATERIAL OR RIVER COBBLE OF EQUIVALENT SIZE AND HAVE AN AVERAGE DIAMETER OF 8". SMALLER AGGREGATE (I.E. NO. #57) OR COBBLE STONES SHALL BE USED TO FILL VOIDS SUCH THAT EACH BOULDER RESTS SOLIDLY ON THE PREVIOUS ROCK LAYER WITH MINIMAL OPPORTUNITY FOR MOVEMENT.

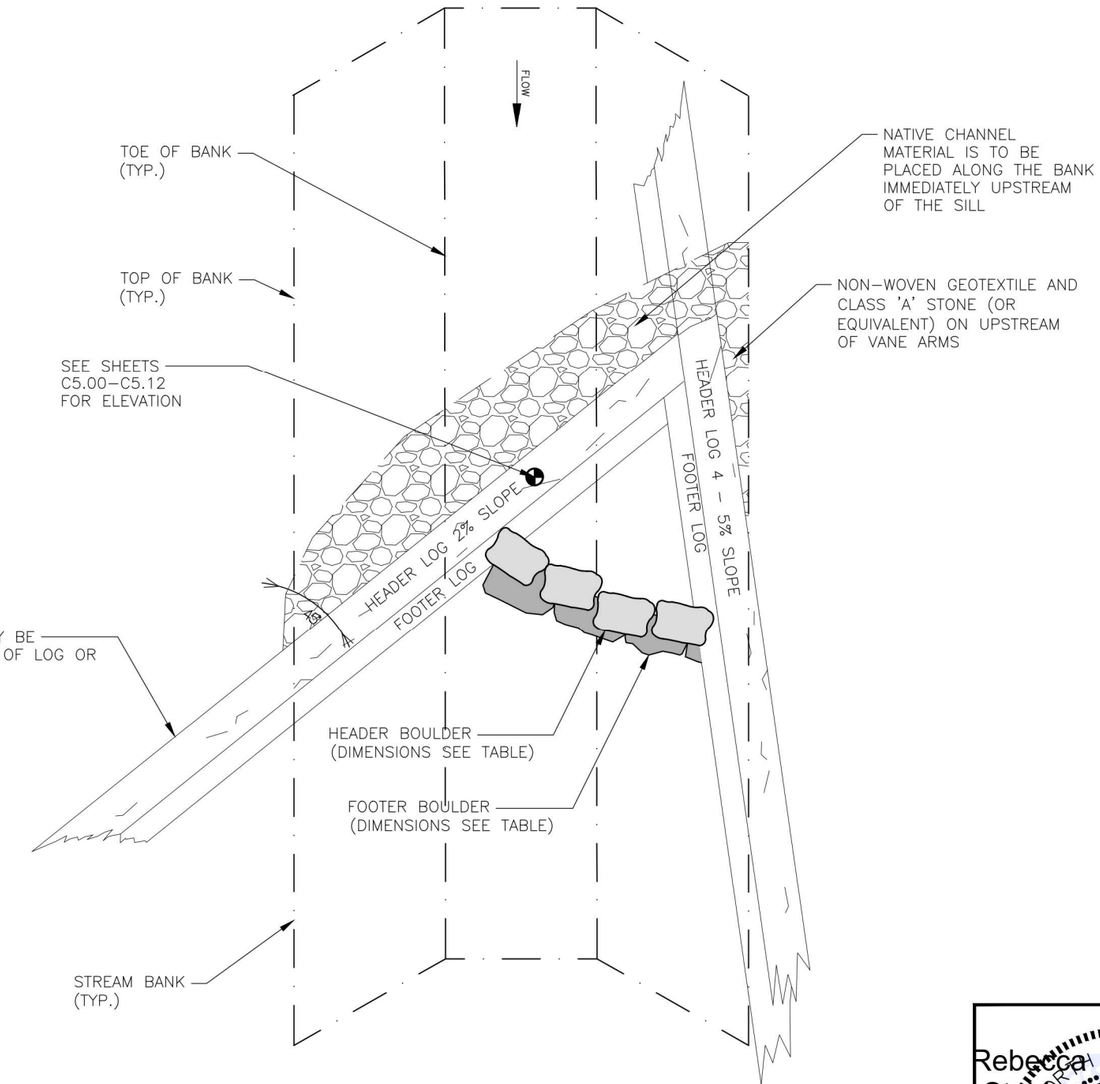
CONSTRUCTION GUIDELINES:

1. STREAM SHALL BE DIVERTED AWAY FROM THE WORK AREA AND THE SITE SHALL BE DEWATERED.
2. EXCAVATE TRENCH FOR FOOTER ROCKS TO THE ELEVATION AND GRADES NECESSARY FOR PLACEMENT OF BOTH FOOTER AND HEADER BOULDER SO THAT THE DESIRED ELEVATION OF THE HEADER BOULDER MEETS THE LINES AND GRADES OF THE STRUCTURE SCHEDULE IN ACCORDANCE WITH THE PLANS AND PROFILES.
3. PLACE FOOTER BOULDERS IN EXCAVATED TRENCH WITH ADJACENT BOULDERS ABUTTING EACH OTHER. FOOTER BOULDERS SHALL BE PLACED NEATLY SO THAT THE HEADER BOULDERS CAN REST SECURELY ON TWO FOOTER BOULDERS. SMALLER ROCK SHALL BE USED TO FILL VOID SPACES SO THAT EACH BOULDER RESTS SOLIDLY ON THE PREVIOUS BOULDER WITH MINIMAL OPPORTUNITY FOR MOVEMENT.
4. BOULDER SILL ROCKS WILL TIE INTO THE CHANNEL BOTTOM ELEVATION AT THE LOCATION OF EACH SILL AND EXTEND INTO THE STREAMBANK A MINIMUM OF 5' UNLESS OTHERWISE SPECIFIED BY THE DESIGNER.
5. PLACE FILTER FABRIC BEHIND BOULDER SILL AND ALONG THE BOTTOM OF THE STREAM BED.
6. PLACE COARSE BACKFILL BEHIND BOULDERS ENSURING THAT ANY VOIDS BETWEEN THE ROCKS ARE FILLED.
7. TRIM ANY EXPOSED FILTER FABRIC AROUND THE SILL INSTALLATION. CHECK PROPER FUNCTION/FLOW PATH BY OBSERVING FLOW OVER STRUCTURE. REPAIR AS NEEDED TO ENSURE PROPER FUNCTION.
8. ENSURE NO LEAKAGE/FLOW UNDER OR AROUND STRUCTURE BY PROPERLY GRADING, SEALING, AND COMPACTING UNDER AND AROUND THE STRUCTURE.
9. EROSION CONTROL BLANKET SHALL BE INSTALLED IN AREAS SHOWN ON THIS DETAIL AND IN COMPLIANCE WITH INSTALLATION INSTRUCTIONS ON THE EROSION CONTROL DETAIL ON SHEET C6.08.

TRIBUTARY	BOTTOM CHANNEL WIDTH (FT)	W_{bkf}(FT)	MIN. SILL LENGTH (FT)
UT1	4.7	8.3	14.0
UT2	3.0	5.4	10.0
UT4 UPSTREAM	5.1	8.7	14.0

TRIBUTARY	BOULDER LENGTH* (FT)	BOULDER WIDTH* (FT)	BOULDER HEIGHT* (IN)
UT1	2.0	1.3	12.0
UT2	2.0	1.3	12.0
UT4 UPSTREAM	2.0	1.3	12.0

*MINIMUM DIMENSIONS SHOWN



SILL STEP DETAIL
N.T.S.

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PLAN INFORMATION

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FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

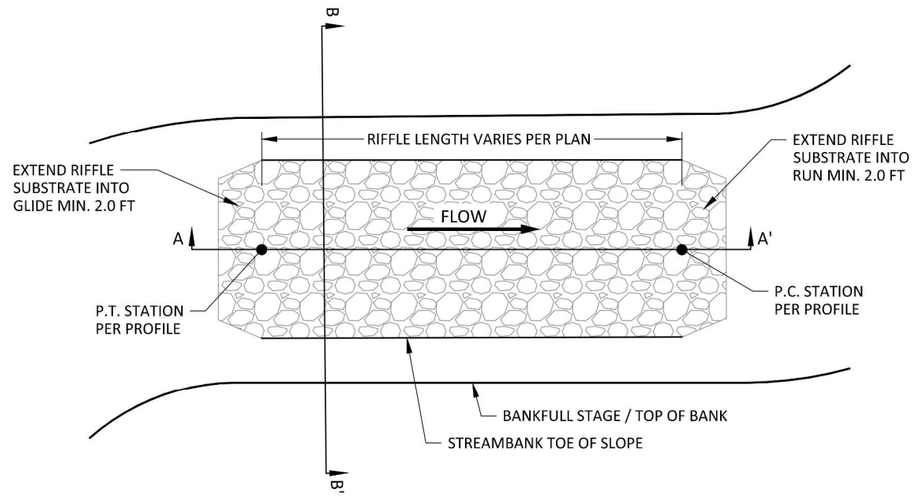
C8.03

GENERAL NOTES:

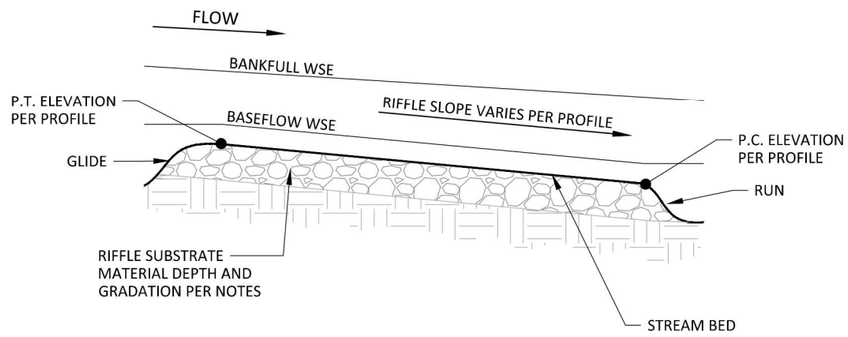
1. RIFFLES SHALL BE CONSTRUCTED OF NATIVE GRAVEL AND COBBLE MATERIAL AVAILABLE ONSITE. THE ENGINEER MUST APPROVE THE USE OF ALL ONSITE NATIVE MATERIAL. WHEN NATIVE SUBSTRATE IS NOT SUFFICIENT FOR COMPLETION OF THE STRUCTURE, QUARRIED STONE SHALL BE USED TO SUPPLEMENT THE RIFFLE MATERIAL ACCORDING TO THE RIFFLE SUBSTRATE SPECIFICATIONS.
2. NATIVE GRAVEL AND COBBLE MATERIAL AVAILABLE ONSITE SHALL BE STOCKPILED AND REUSED AS SURFACE STONE IN THE RIFFLE.
3. FOR INSTALLATION, THE CONTRACTOR SHALL OVER EXCAVATE THE LENGTH OF RIFFLE BACKFILL WITH GRAVEL AND COBBLE MATERIAL TO THE ELEVATIONS SHOWN IN THE PROPOSED PROFILE.
4. RIFFLE MATERIAL SHALL BE PLACED AT A UNIFORM THICKNESS SUCH THAT, IN CROSS-SECTION, ITS LOWEST ELEVATION OCCURS IN THE CENTER OF THE CHANNEL.
5. RIFFLE MATERIAL SHALL BE COMPACTED USING AN EXCAVATOR BUCKET SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.
6. THE SURFACE OF THE STRUCTURE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS-SECTIONS OR ELEVATIONS SHOWN IN THE DRAWINGS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN 0.1 FT OF THE GRADES AND ELEVATIONS INDICATED.
7. RE-DRESSING OF THE CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.
8. SEE TYPICAL RIFFLE CROSS-SECTION FOR DIMENSIONS.
9. SEE QUARRIED RIFFLE SUBSTRATE SPECIFICATIONS TABLE BELOW.

QUARRIED RIFFLE SUBSTRATE SPECIFICATIONS

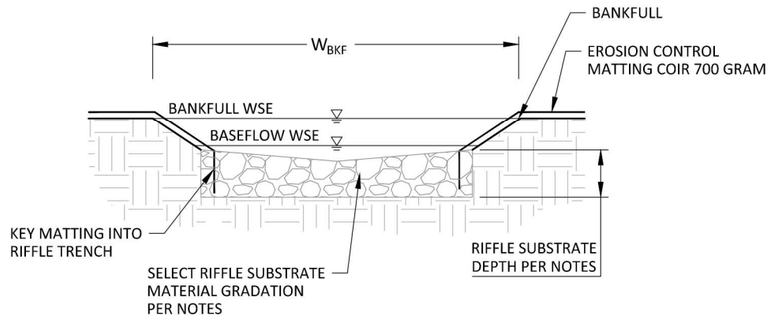
REACH	UT1	UT1	UT2	UT3	UT4 UPSTREAM	UT4 DOWNSTREAM	UT6
START STA (FT)	8+58	13+75	-	-	9+96	15+82	-
END STA (FT)	11+31	18+70	-	-	15+82	25+39	-
ASTM #57	-	-	-	25%	-	25%	50%
NCDOT CLASS A	-	25%	-	75%	-	75%	50%
NCDOT CLASS B	-	75%	-	-	-	-	-
NCDOT CLASS 1	75%	-	75%	-	75%	-	-
NCDOT CLASS 2	25%	-	25%	-	25%	-	-
DEPTH	2.0'	1.5'	2.0'	1.0'	2.0'	1.0'	1.0'



PLAN VIEW



SECTION A - A'



SECTION B - B'

CONSTRUCTED RIFFLE
N.T.S.

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NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE
CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION

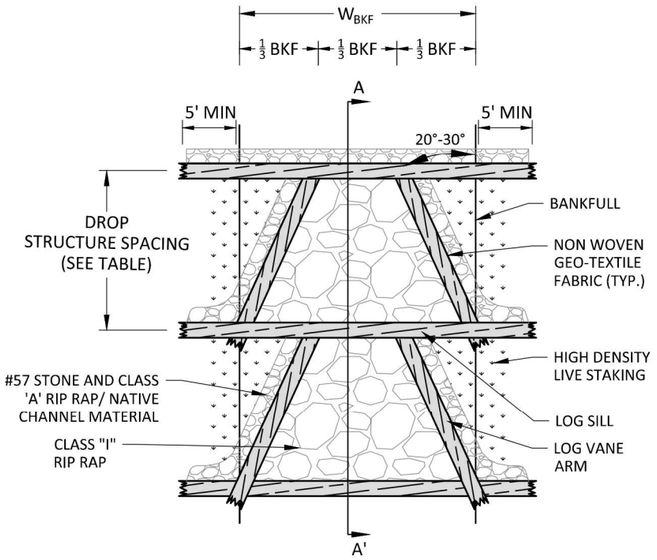
PROJECT NO.	AXI1001
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

C8.04

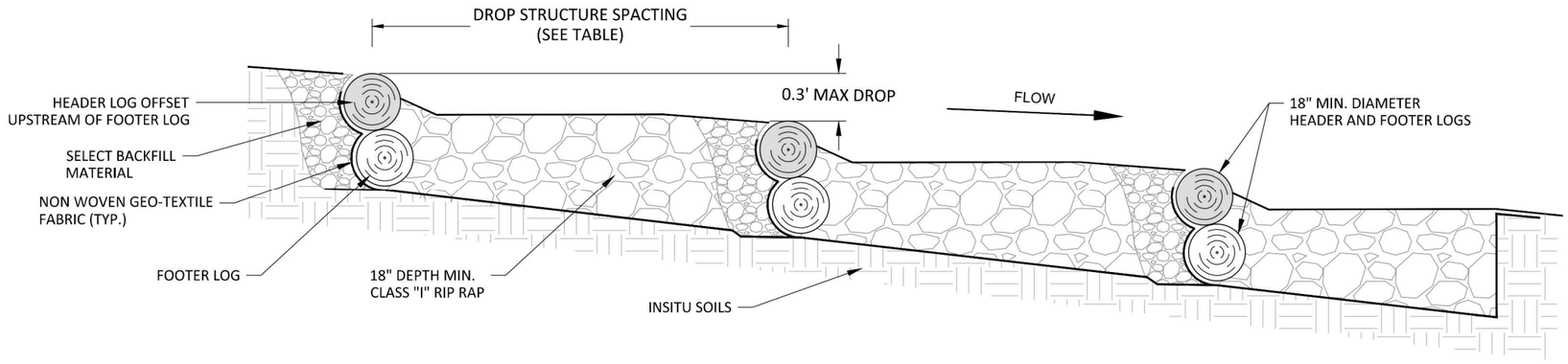
GENERAL NOTES:

1. ALL LOGS USED FOR THE PROPOSED DROP STRUCTURE SHALL BE RELATIVELY STRAIGHT AND HAVE ALL BRANCHES TRIMMED FLUSH. ALL LOGS SHALL BE MIN. 18" IN DIAMETER UNLESS OTHEWISE APPROVED BY THE ENGINEER.
2. DIMENSIONS AND SLOPES OF THE STRUCTURES DESCRIBED IN THE DETAIL MAY BE ADJUSTED BY THE DESIGN ENGINEER TO FIT CONDITIONS ONSITE.
3. HEADER LOGS ARE THE TOP MOST LOGS USED IN EACH LOG STRUCTURE. HEADER LOGS SHALL BE UNDERLAIN BY FOOTER LOGS TO PROVIDE A FOUNDATION AND SCOUR PROTECTION FOR THE HEADER LOGS UNLESS OTHERWISE DIRECTED BY THE ENGINEER. THE HEADER LOG FOR THE VANE ARM SHOULD BE SEEN PROTRUDING FROM THE WATER SURFACE DURING BASE FLOWS.
4. HEADER LOGS SHALL BE OFFSET SLIGHTLY UPSTREAM / BEHIND THE FOOTER LOGS.
5. LOG VANE ARMS SHALL EXTEND UP TO THE OUTSIDE STREAMBANK AT A 1-3% SLOPE. VANE ARMS SHALL KEY INTO THE STREAMBANK AT $\frac{1}{2}$ - $\frac{2}{3}$ THE BANKFULL STAGE (MEASURED AT THE NEXT DOWNSTREAM RIFFLE).
6. CONTRACTOR WILL BE REQUIRED TO FIT LOGS TOGETHER TIGHTLY WITH NO VOIDS/GAPS LARGER THAN 1 INCH. GAPS BETWEEN LOGS SHALL BE MINIMIZED BY FITTING LOGS TOGETHER AND CHINKING WITH STONE APPROVED BY THE ENGINEER.
7. AT THE CONNECTION POINT OF THE LOG VANE ARM AND LOG SILL, BOTH HEADER LOGS SHALL BE NOTCHED TO A DEPTH NO GREATER THAN $\frac{1}{3}$ OF THE LOG DIAMETER. THE NOTCHES SHALL BE CUT SUCH THAT THE HEADER LOGS FIT TIGHTLY TOGETHER.
8. SET STRUCTURE INVERTS AT ELEVATIONS SHOWN ON THE PLAN AND PROFILE SHEETS. STRUCTURES SHALL BE SPACED SO THAT EACH LOG SILL HAS A 0.3' DROP IN ELEVATION. NO ELEVATIONS OF THE LOGS MAY VARY FROM THE PLAN SHEETS WITHOUT DIRECTION FROM THE ENGINEER.
9. NON-WOVEN GEOTEXTILE FABRIC SHALL BE PLACED ON THE UPSTREAM SIDE OF THE STRUCTURE TO PREVENT WASHOUT OF SEDIMENT THROUGH BOULDER GAPS. FILTER FABRIC SHALL EXTEND FROM THE BOTTOM OF THE FOOTER LOG TO THE FINISHED GRADE ELEVATION AND SHALL BE PLACED THE ENTIRE LENGTH OF THE STRUCTURE. SELECT BACKFILL MATERIAL SHALL BE PLACED UPSTREAM OF THE GEOTEXTILE MATERIAL.
10. THE SURFACE OF THIS STRUCTURE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS-SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN 0.1 FT OF THE GRADES AND ELEVATIONS INDICATED.
11. RE-DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.



PLAN VIEW

TRIBUTARY	W_{bkf}(FT)	DROP STRUCTURE SPACING (FT)
UT1	8.3	4.2
UT2	5.4	3.5
UT4 DOWNSTREAM	8.9	12.1
UT6	4.1	5.9



SECTION A - A'

DROP STRUCTURE DETAIL

N.T.S.

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CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

C8.05

GENERAL NOTES:

1. A BOULDER SILL MAY BE USED ALONE OR IN COMBINATION WITH A CONSTRUCTED RIFFLE. CONTRACTOR TO CONSULT DESIGN ENGINEER FOR FINAL MATERIAL SPECIFICATIONS.
2. AN ELEVATION CONTROL POINT SHALL BE DESIGNATED AT THE CENTER OF THE SILL TO ESTABLISH PART OF THE PROFILE. POOL ELEVATION CONTROL POINTS OR EXCAVATION TO A SPECIFIED MAXIMUM POOL DEPTH SHALL BE DESIGNATED TO ESTABLISH THE REMAINING PROFILE. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE INSTALLATION WITHIN THE TOLERANCE SPECIFIED BY THE DESIGNER.
3. NO PART OF THE SILL SHALL BE PLACED ABOVE THE ELEVATION OF THE STREAM BED.
4. REFER TO THE PLAN-PROFILE FOUND ON SHEETS C5.00 THROUGH C5.12 FOR THE STATION LOCATIONS AND CONTROL POINT ELEVATIONS OF EACH BOULDER SILL SPECIFIED FOR THE PROJECT.
5. ALL BOULDERS SHALL CONSIST OF ANGULAR, TABULAR, FLAT ROCK WITH MINIMUM OF TWO PARALLEL SIDES, AND HAVE A NATURAL APPEARANCE AND COLOR. ROUNDED EDGES ARE ACCEPTABLE SO LONG AS ROUNDED EDGES ARE NOT BEARING OR SUPPORTING. APPROXIMATE DIMENSIONS OF BOULDERS SHALL MEASURE IN LENGTH, WIDTH, AND HEIGHT AS SPECIFIED IN THE TABLE BELOW. ALL STONE SHALL BE FREE FROM LAMINATION AND WEAK CLEAVAGES. THE STONE SHOULD NOT DISINTEGRATE SIGNIFICANTLY FROM THE ACTION OF AIR, WATER, OR IN HANDLING AND PLACING. STONE WITH TOOL MARKS, DRILL HOLES, AND OTHER BLASTING EVIDENCE SHALL NOT BE UTILIZED IN EXPOSED LOCATIONS.
6. FILTER FABRIC OF A TYPE AND SIZE SPECIFIED BY THE DESIGNER SHALL BE USED TO SEAL THE GAPS BETWEEN THE BOULDERS AND THE STREAM BED, UNDER THE COARSE BACKFILL MATERIAL. THERE SHALL BE NO FILTER FABRIC VISIBLE IN THE FINISHED WORK; EDGES SHALL BE FOLDED, TUCKED, OR TRIMMED AS NEEDED.
7. BACKFILL ROCK ALONG THE STREAM BANK SHALL BE NATIVE CHANNEL MATERIAL OR RIVER COBBLE OF EQUIVALENT SIZE AND HAVE AN AVERAGE DIAMETER OF 8". SMALLER AGGREGATE (I.E. NO. #57) OR COBBLE STONES SHALL BE USED TO FILL VOIDS SUCH THAT EACH BOULDER RESTS SOLIDLY ON THE PREVIOUS ROCK LAYER WITH MINIMAL OPPORTUNITY FOR MOVEMENT.
8. DETAIL SHOWS TWO STEP POOLS IN SERIES; HOWEVER, NUMBER OF STEP POOLS MAY VARY BY DESIGN. REFERENCE SHEETS C5.00 THROUGH C5.12.

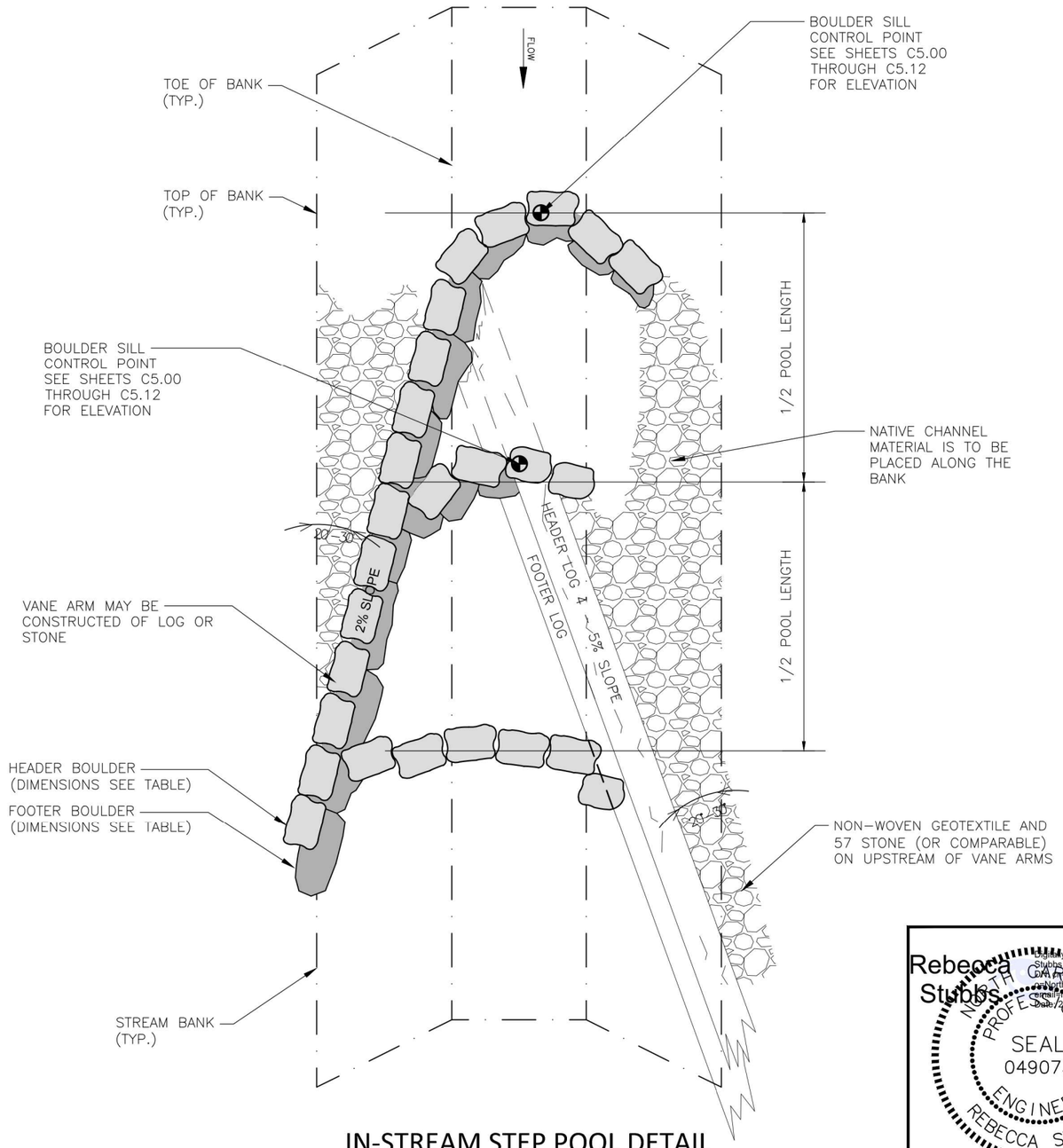
CONSTRUCTION GUIDELINES:

1. STREAM SHALL BE DIVERTED AWAY FROM THE WORK AREA AND THE SITE SHALL BE DEWATERED.
2. EXCAVATE TRENCH FOR FOOTER ROCKS TO THE ELEVATION AND GRADES NECESSARY FOR PLACEMENT OF BOTH FOOTER AND HEADER BOULDER SO THAT THE DESIRED ELEVATION OF THE HEADER BOULDER MEETS THE LINES AND GRADES OF THE STRUCTURE SCHEDULE IN ACCORDANCE WITH THE PLANS AND PROFILES.
3. PLACE FOOTER BOULDERS IN EXCAVATED TRENCH WITH ADJACENT BOULDERS ABUTTING EACH OTHER. FOOTER BOULDERS SHALL BE PLACED NEATLY SO THAT THE HEADER BOULDERS CAN REST SECURELY ON TWO FOOTER BOULDERS. SMALLER ROCK SHALL BE USED TO FILL VOID SPACES SO THAT EACH BOULDER RESTS SOLIDLY ON THE PREVIOUS BOULDER WITH MINIMAL OPPORTUNITY FOR MOVEMENT.
4. BOULDER SILL ROCKS WILL TIE INTO THE CHANNEL BOTTOM ELEVATION AT THE LOCATION OF EACH SILL AND EXTEND INTO THE STREAMBANK A MINIMUM OF 5.0' UNLESS OTHERWISE SPECIFIED BY THE DESIGNER.
5. PLACE FILTER FABRIC BEHIND BOULDER SILL AND ALONG THE BOTTOM OF THE STREAM BED.
6. PLACE COARSE BACKFILL BEHIND BOULDERS ENSURING THAT ANY VOIDS BETWEEN THE ROCKS ARE FILLED.
7. TRIM ANY EXPOSED FILTER FABRIC AROUND THE SILL INSTALLATION. CHECK PROPER FUNCTION/FLOW PATH BY OBSERVING FLOW OVER STRUCTURE. REPAIR AS NEEDED TO ENSURE PROPER FUNCTION.
8. ENSURE NO LEAKAGE/FLOW UNDER OR AROUND STRUCTURE BY PROPERLY GRADING, SEALING, AND COMPACTING UNDER AND AROUND THE STRUCTURE.
9. EROSION CONTROL BLANKET SHALL BE INSTALLED IN AREAS SHOWN ON THIS DETAIL AND IN COMPLIANCE WITH INSTALLATION INSTRUCTIONS ON THE EROSION CONTROL DETAIL ON SHEET C6.21.

TRIBUTARY	BOTTOM CHANNEL WIDTH (FT)	W_{bkf}(FT)	MIN. SILL LENGTH (FT)
UT2	3.0	5.4	13.0
UT4 UPSTREAM	5.1	8.7	16.0

TRIBUTARY	BOULDER LENGTH* (FT)	BOULDER WIDTH* (FT)	BOULDER HEIGHT* (IN)
UT2	2.0	1.3	12.0
UT4 UPSTREAM	2.0	1.3	12.0

*MINIMUM DIMENSIONS SHOWN



IN-STREAM STEP POOL DETAIL

N.T.S.

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CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

C8.06

GENERAL NOTES:

1. WOODY MARSH OUTFALL STRUCTURES SHALL BE CONSTRUCTED OF NATIVE HARDWOOD LOGS, LIMBS, AND GRAVEL MATERIAL AVAILABLE ONSITE. THE ENGINEER MUST APPROVE THE USE OF ALL ONSITE NATIVE MATERIAL. THESE MATERIALS SHALL BE STOCKPILED AND REUSED AS DEBRIS FOR THE STRUCTURE.

5. THE LOG SILL AT THE DOWNSTREAM END OF THE STRUCTURE SHALL BE INSTALLED FIRST. NON-WOVEN GEOTEXTILE FABRIC SHALL BE INSTALLED AND SECURED TO THE UPSTREAM SIDE OF THE LOG SILL.

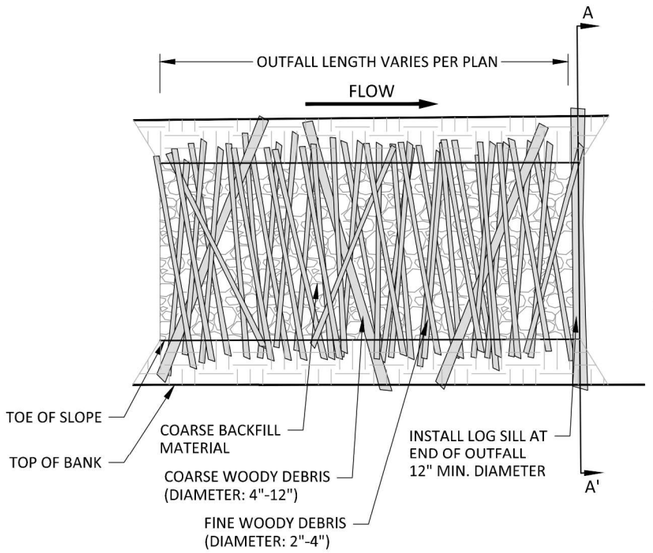
6. FOR INSTALLATION, THE CONTRACTOR SHALL OVER EXCAVATE THE LENGTH AND WIDTH OF OUTFALL TO PLACE COARSE WOODY DEBRIS AND BACKFILL. THE LARGEST WOODY MATERIAL SHALL BE PLACED FIRST. ALL VOIDS SHALL BE FILLED WITH FINE WOODY DEBRIS. ANY REMAINING VOIDS SHALL BE FILLED WITH SELECT COARSE GRAVEL AND SOIL MATERIAL. THE TOP LAYER OF MATERIAL SHALL BE FINE WOODY DEBRIS.

7. LOGS AND LIMBS SHALL BE PLACED PERPENDICULAR TO FLOW AND PLACED IN A CROSSING OR WEAVE PATTERN SUCH THAT LOGS AND LIMBS ARE ANCHORED WITH EACH OTHER.

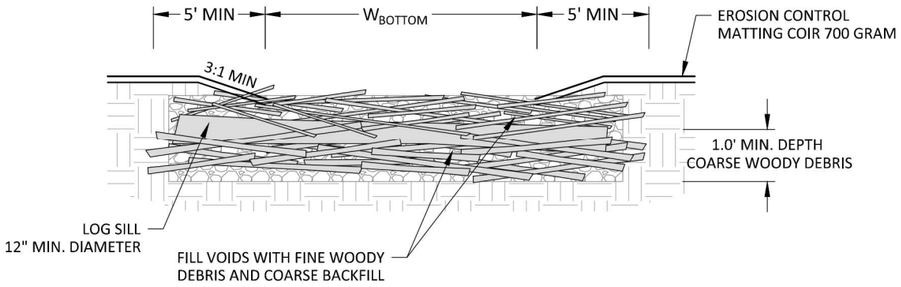
6. DEBRIS MATERIAL SHALL BE COMPACTED USING AN EXCAVATOR BUCKET SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.

3. THE FINISHED SURFACE OF THE STRUCTURE SHALL HAVE 0.5' TO 1.0' OF EXPOSED WOODY DEBRIS.

5. GRADED SURFACES SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS-SECTIONS OR ELEVATIONS SHOWN IN THE DRAWINGS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN 0.1 FT OF THE GRADES AND ELEVATIONS INDICATED.

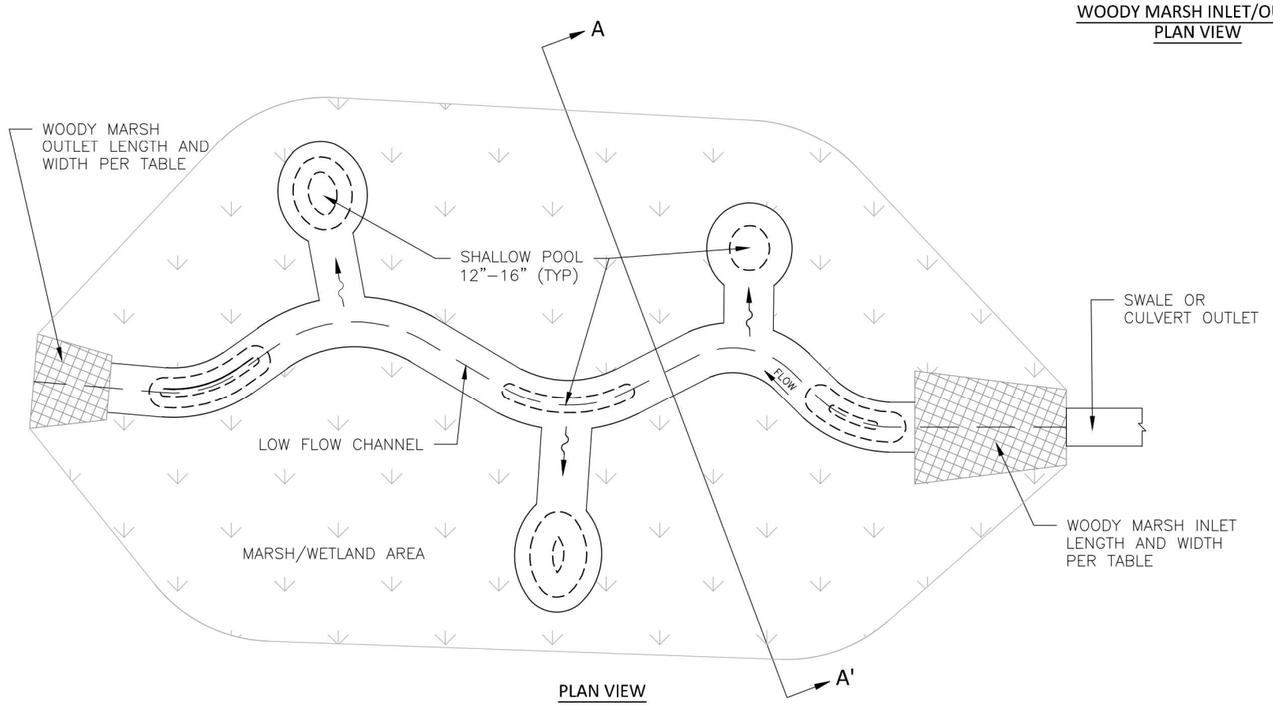


WOODY MARSH INLET/OUTLET
PLAN VIEW

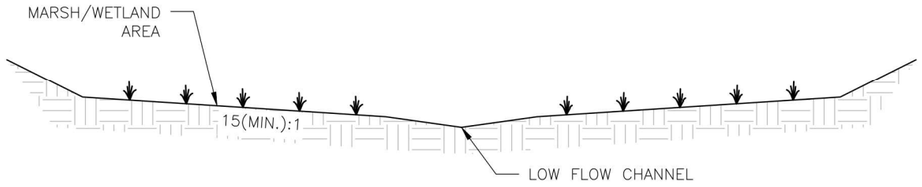


WOODY MARSH INLET/OUTLET
SECTION A-A'

WOODY MARSH INLET/OUTLET SIZES		
LOCATION	LENGTH (FT)	BOTTOM WIDTH (FT)
MARSH TREATMENT AREA 1	12.0	4.5
MARSH TREATMENT AREA 2	12.0	4.5



PLAN VIEW



SECTION A-A'

NOTE:
CONSTRUCT WOODY MARSH INLET/OUTLET TO PROVIDE DIFFUSE FLOW.

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NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

MARSH TREATMENT AREA

N.T.S.

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CONSTRUCTION DRAWINGS
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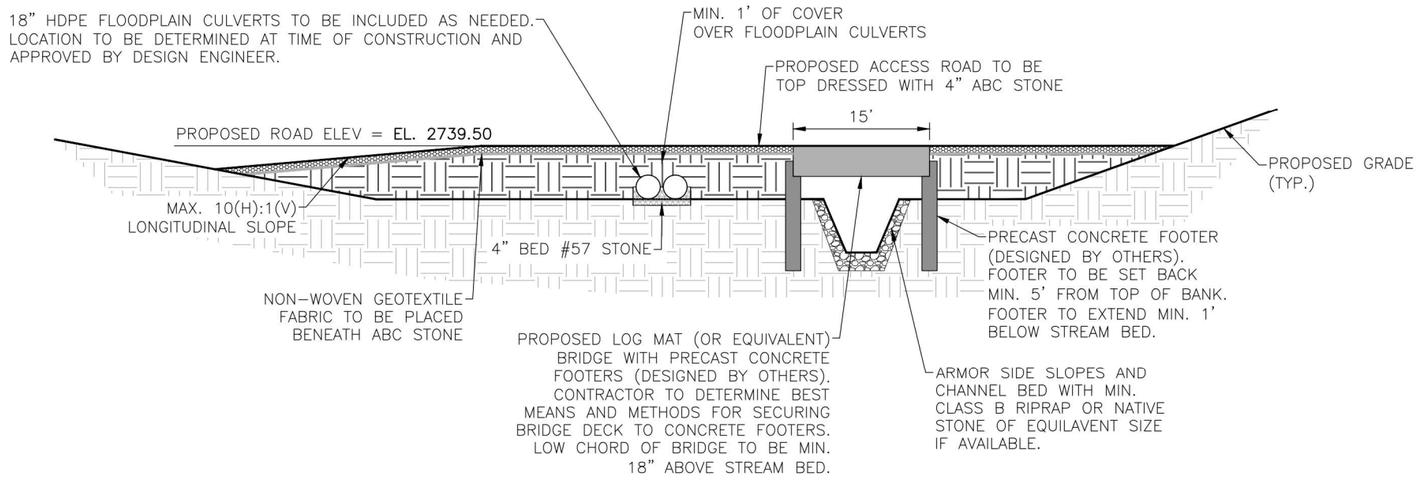
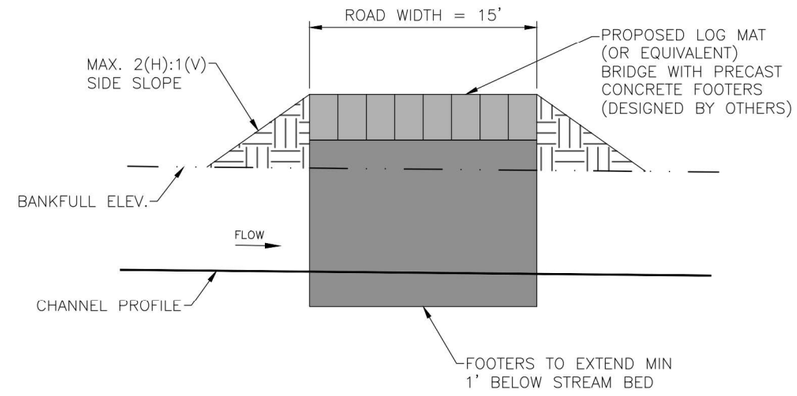
PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

C8.07





UT4 BRIDGE CROSSING

N.T.S.

GENERAL NOTES

1. INSTALL PERMANENT CROSSING WHILE CONSTRUCTION LOCATION HAS BEEN DEWATERED.
2. IF UNABLE TO INSTALL WHILE LOCATION IS DRY, PLACE MATTING ON EXPOSED SOILS.
3. ALL MATERIAL TO BE PLACED AND COMPACTED WITHIN ROAD EMBANKMENT SHALL BE FREE FROM ROOTS, STUMPS, WOOD, STONES GREATER THAN 6", AND FROZEN OR OTHER OBJECTIONABLE MATERIAL.
4. ARMOR CHANNEL BED AND SIDE SLOPES BENEATH THE BRIDGE CROSSING WITH CLASS 'B' RIPRAP OR NATIVE STONE OF EQUIVALENT SIZE IF AVAILABLE, MATCHING THE PROPOSED GRADE.
5. CONTRACTOR IS RESPONSIBLE FOR SECURING THE PROPOSED LOG MAT BRIDGE (OR EQUIVALENT) TO THE PRECAST CONCRETE FOOTERS (DESIGNED BY OTHERS). METHODS FOR SECURING THE BRIDGE DECK TO THE FOOTERS SHALL BE PRESENTED TO THE ON-SITE CONSTRUCTION ADMINISTRATOR FOR APPROVAL PRIOR TO CONSTRUCTION OF THE CROSSING.

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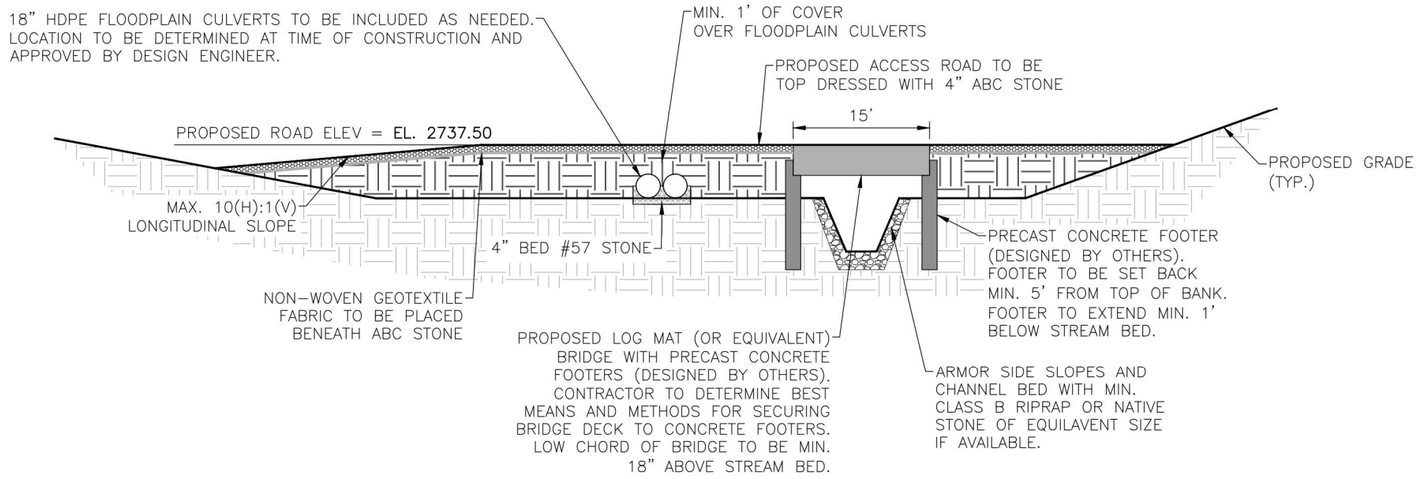
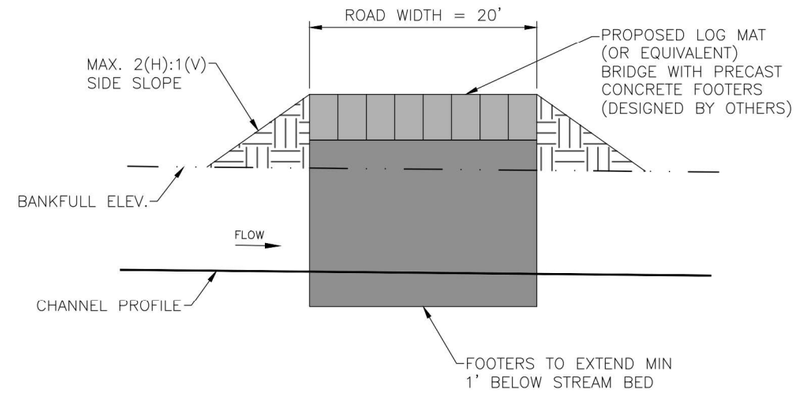
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

C8.08





UT1 DOWNSTREAM BRIDGE CROSSING

N.T.S.

GENERAL NOTES

1. INSTALL PERMANENT CROSSING WHILE CONSTRUCTION LOCATION HAS BEEN DEWATERED.
2. IF UNABLE TO INSTALL WHILE LOCATION IS DRY, PLACE MATTING ON EXPOSED SOILS.
3. ALL MATERIAL TO BE PLACED AND COMPACTED WITHIN ROAD EMBANKMENT SHALL BE FREE FROM ROOTS, STUMPS, WOOD, STONES GREATER THAN 6", AND FROZEN OR OTHER OBJECTIONABLE MATERIAL.
4. ARMOR CHANNEL BED AND SIDE SLOPES BENEATH THE BRIDGE CROSSING WITH CLASS 'B' RIPRAP OR NATIVE STONE OF EQUIVALENT SIZE IF AVAILABLE, MATCHING THE PROPOSED GRADE.
5. CONTRACTOR IS RESPONSIBLE FOR SECURING THE PROPOSED LOG MAT BRIDGE (OR EQUIVALENT) TO THE PRECAST CONCRETE FOOTERS (DESIGNED BY OTHERS). METHODS FOR SECURING THE BRIDGE DECK TO THE FOOTERS SHALL BE PRESENTED TO THE ON-SITE CONSTRUCTION ADMINISTRATOR FOR APPROVAL PRIOR TO CONSTRUCTION OF THE CROSSING.

Rebecca Stubbs

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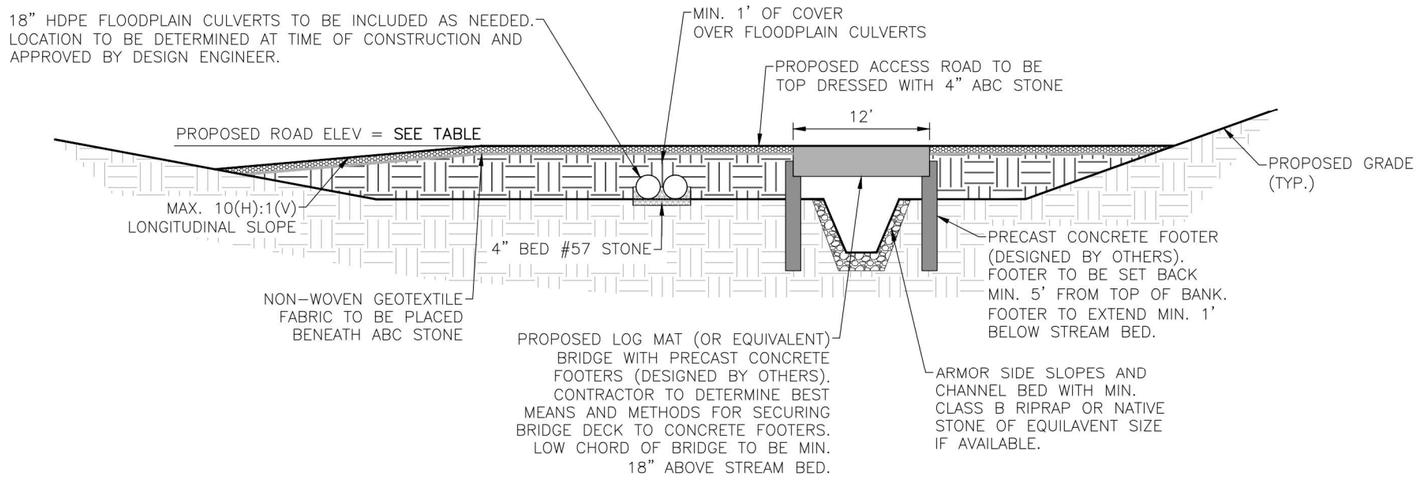
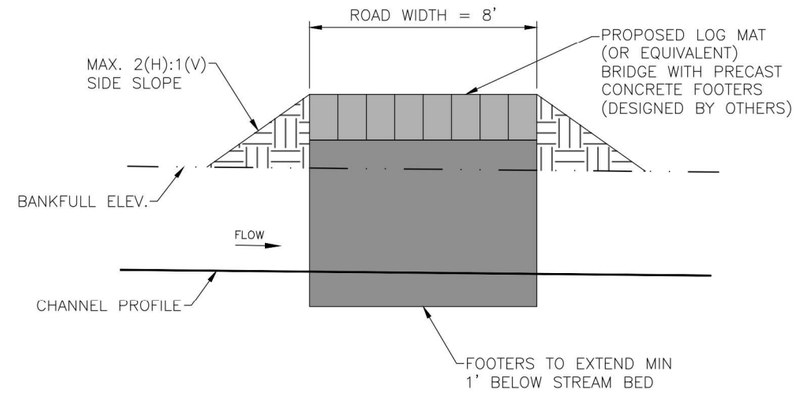
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

C8.09





REACH	PROPOSED ROAD ELEVATION
UT1 UPSTREAM	2784.00
UT2 UPSTREAM	2771.80
UT2 DOWNSTREAM	2754.60

INTERNAL EASEMENT BRIDGE CROSSING

N.T.S.

GENERAL NOTES

1. INSTALL PERMANENT CROSSING WHILE CONSTRUCTION LOCATION HAS BEEN DEWATERED.
2. IF UNABLE TO INSTALL WHILE LOCATION IS DRY, PLACE MATTING ON EXPOSED SOILS.
3. ALL MATERIAL TO BE PLACED AND COMPACTED WITHIN ROAD EMBANKMENT SHALL BE FREE FROM ROOTS, STUMPS, WOOD, STONES GREATER THAN 6", AND FROZEN OR OTHER OBJECTIONABLE MATERIAL.
4. ARMOR CHANNEL BED AND SIDE SLOPES BENEATH THE BRIDGE CROSSING WITH CLASS 'B' RIPRAP OR NATIVE STONE OF EQUIVALENT SIZE IF AVAILABLE, MATCHING THE PROPOSED GRADE.
5. CONTRACTOR IS RESPONSIBLE FOR SECURING THE PROPOSED LOG MAT BRIDGE (OR EQUIVALENT) TO THE PRECAST CONCRETE FOOTERS (DESIGNED BY OTHERS). METHODS FOR SECURING THE BRIDGE DECK TO THE FOOTERS SHALL BE PRESENTED TO THE ON-SITE CONSTRUCTION ADMINISTRATOR FOR APPROVAL PRIOR TO CONSTRUCTION OF THE CROSSING.

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Date: 2023.12.14 12:22:15-05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

MCADAMS

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www.mcadamsco.com

VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

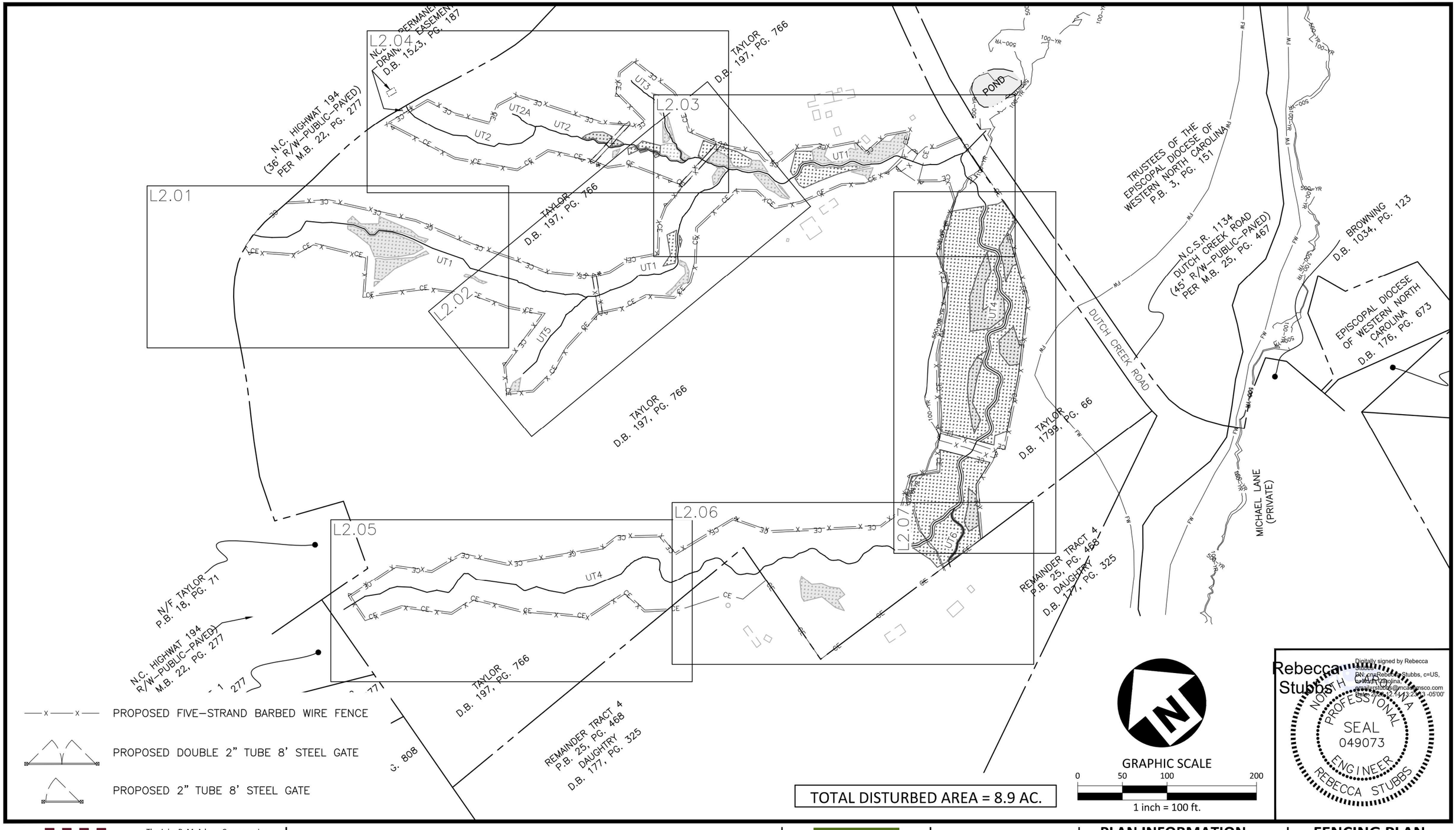
Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-D2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

STREAM DETAILS

C8.10



TOTAL DISTURBED AREA = 8.9 AC.

Rebecca Stubbs

Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=North Carolina, email=rstubbs@mcadamsco.com
Date: 2024.12.14 13:23:13 -05'00'

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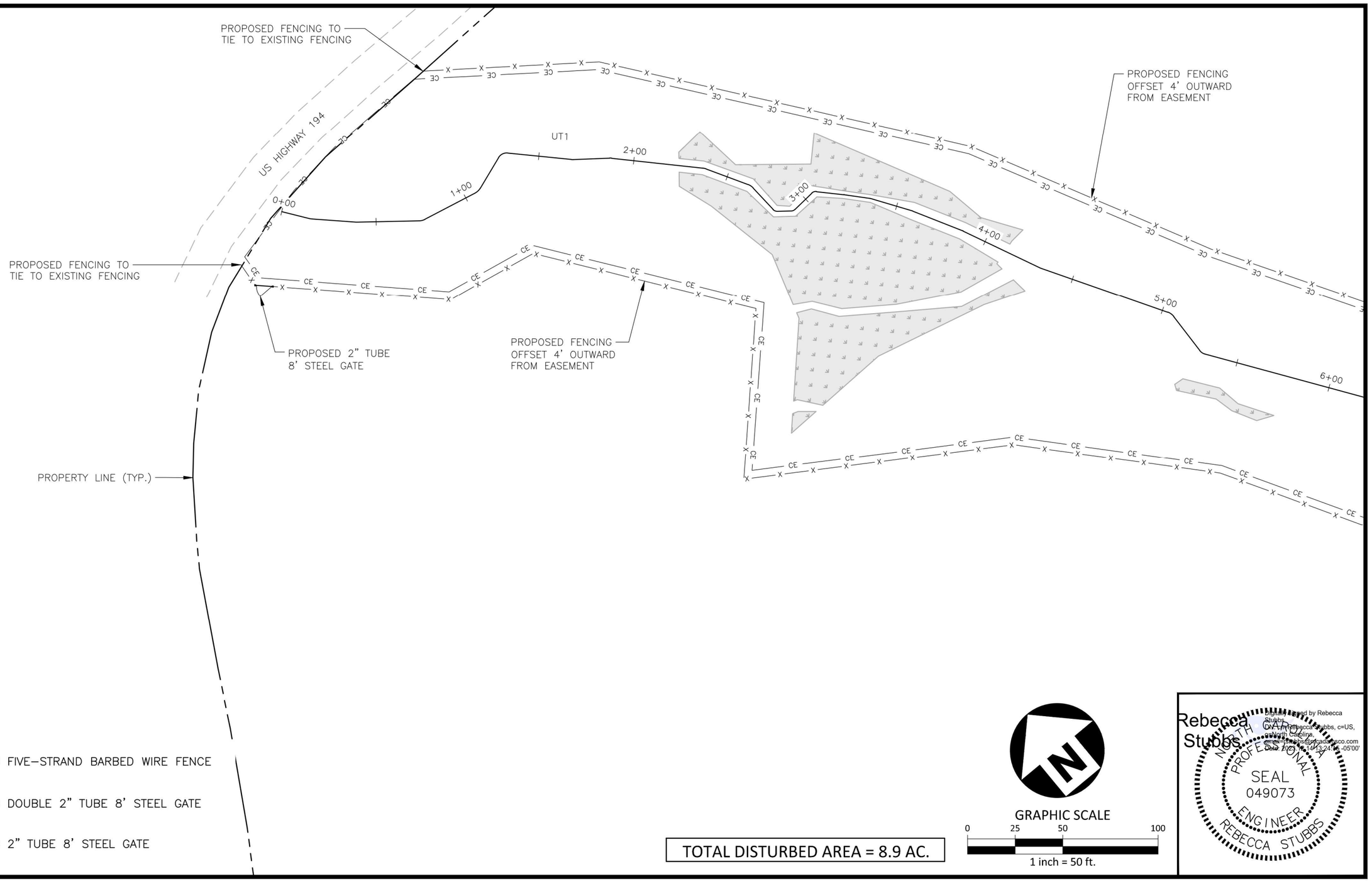
PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-L2 (STREAM)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=100'
DATE	12.14.2023

FENCING PLAN OVERVIEW

L2.00



PROPOSED FIVE–STRAND BARBED WIRE FENCE

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

PROPOSED 2" TUBE 8' STEEL GATE

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE

0 25 50 100

1 inch = 50 ft.

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DN: cn=Rebecca Stubbs, c=US, o=NC, ou=McAdams, email=rstubbs@mcadamsco.com
Date: 2023.12.14 13:24:35 -05'00'

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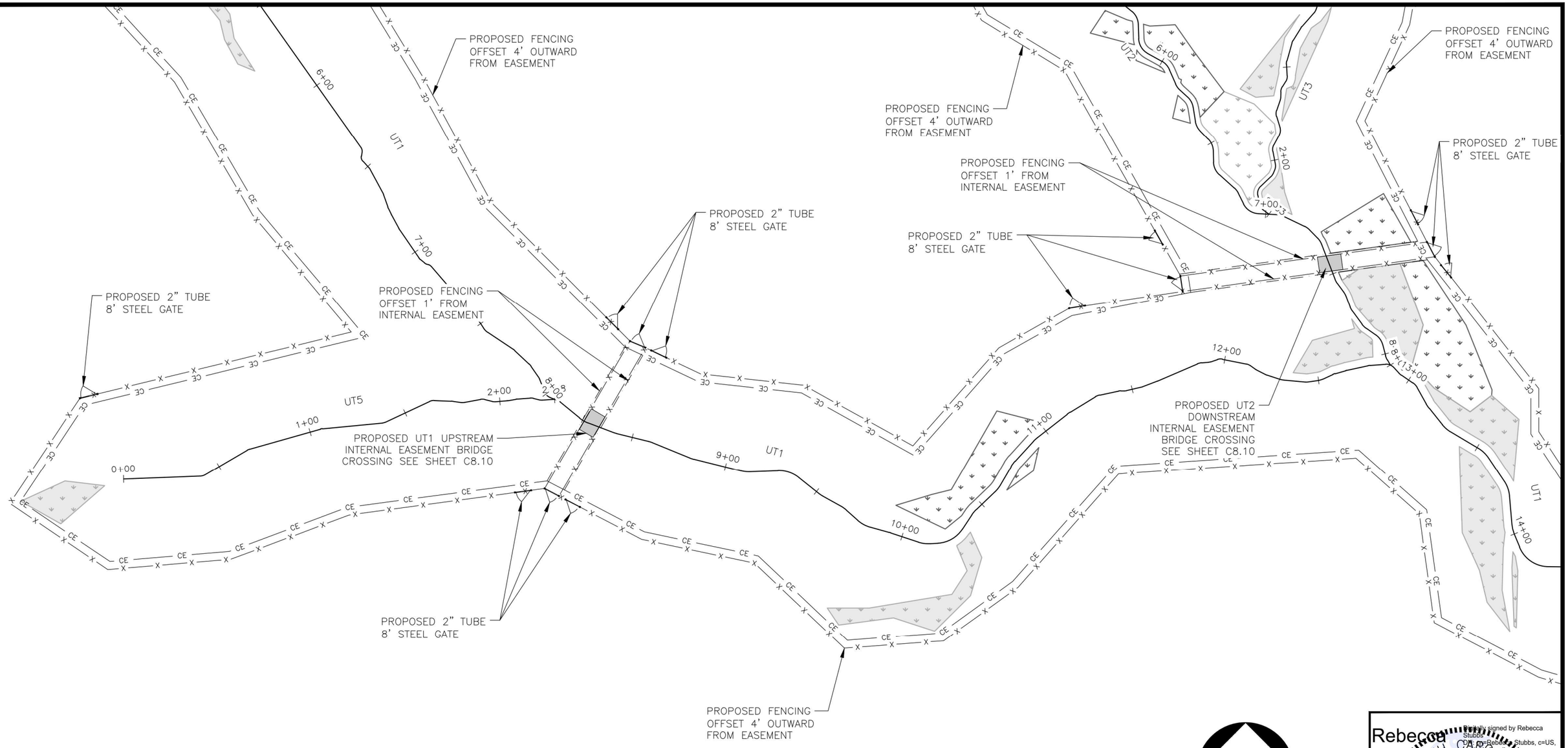
PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-L2 (FENCING)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=50'
DATE	12.14.2023

FENCING PLAN

L2.01



PROPOSED FIVE–STRAND BARBED WIRE FENCE

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

PROPOSED 2" TUBE 8' STEEL GATE

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE

0 25 50 100

1 inch = 50 ft.

Rebecca Stubbs

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DN: cn=Rebecca Stubbs, c=US, st=North Carolina, e=rebecca.stubbs@mcadamsco.com
Date: 2024.12.20 13:22:06 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

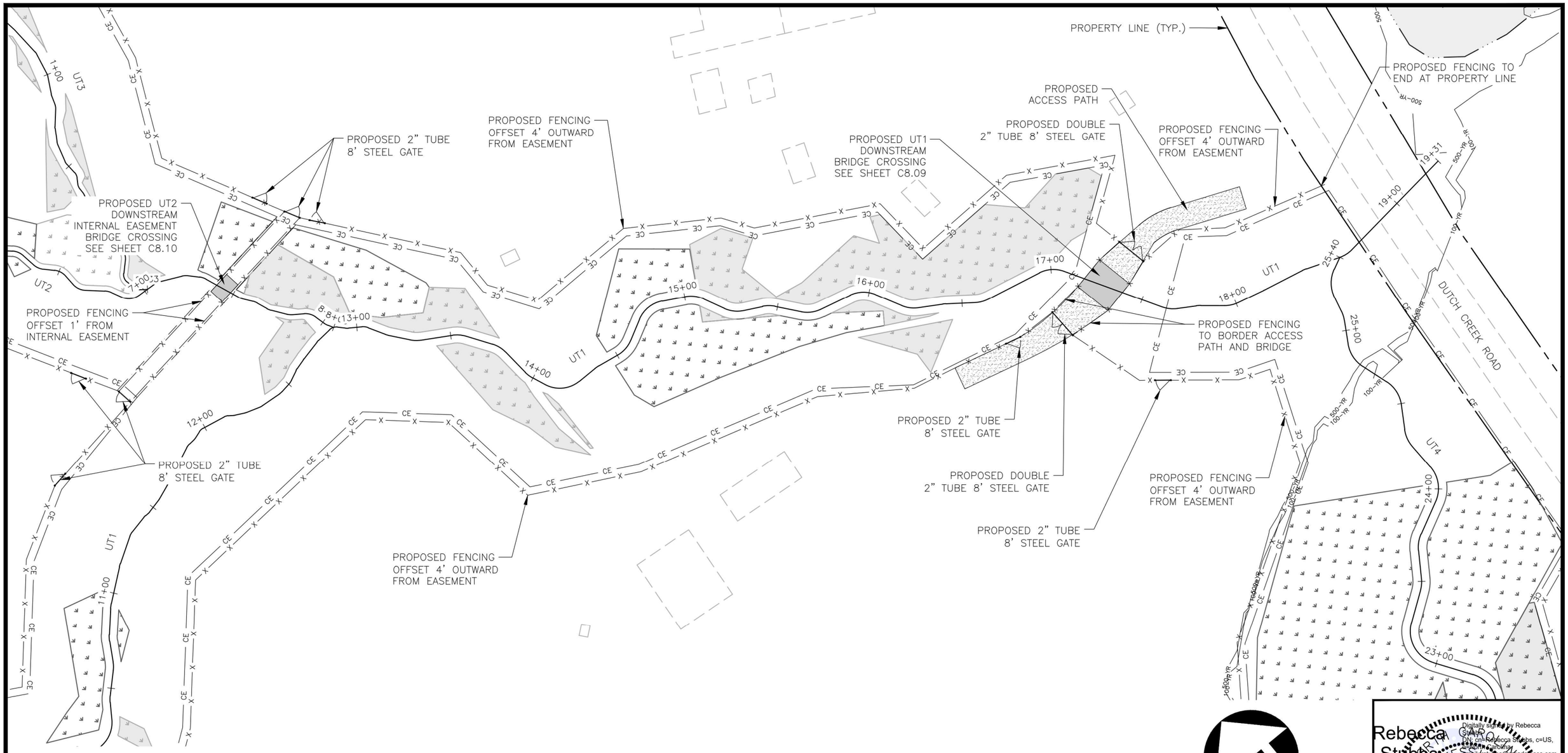
Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AX1-1001-L2 (FENCING)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=50'
DATE	12.14.2023

FENCING PLAN

L2.02



PROPOSED FIVE-STRAND BARBED WIRE FENCE

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

PROPOSED 2" TUBE 8' STEEL GATE

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE

0 25 50 100

1 inch = 50 ft.

Rebecca Stubbs

Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=McAdams, ou=Raleigh, email=rstubbs@mcadamsco.com
Date: 2023.12.14 10:26:52 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

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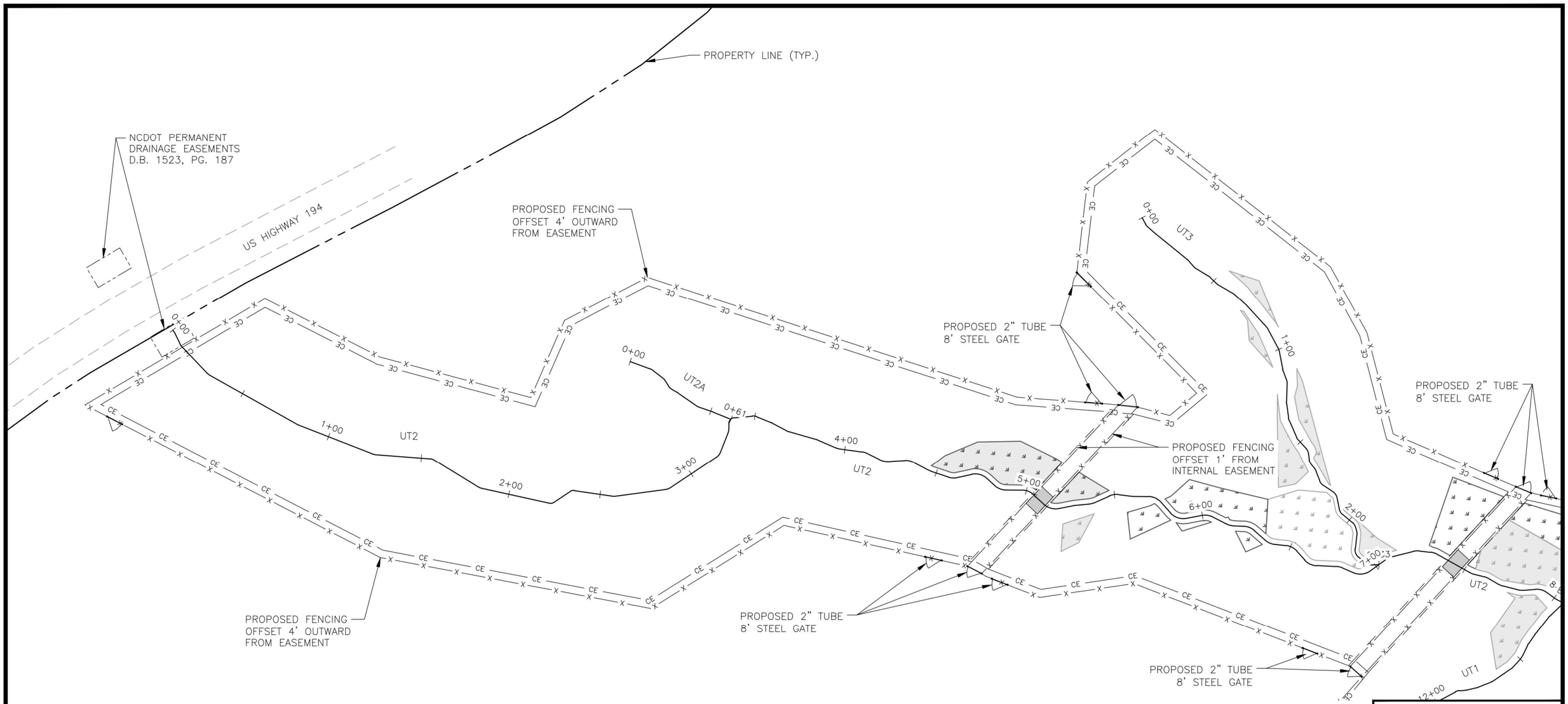
PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-L2 (FENCING)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=50'
DATE	12.14.2023

FENCING PLAN

L2.03



PROPOSED FIVE–STRAND BARBED WIRE FENCE

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

PROPOSED 2" TUBE 8' STEEL GATE

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE

0 25 50 100

1 inch = 50 ft.

Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=North Carolina
email=rstubbs@mcadamsco.com
Date: 2022.12.14 12:27:41 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

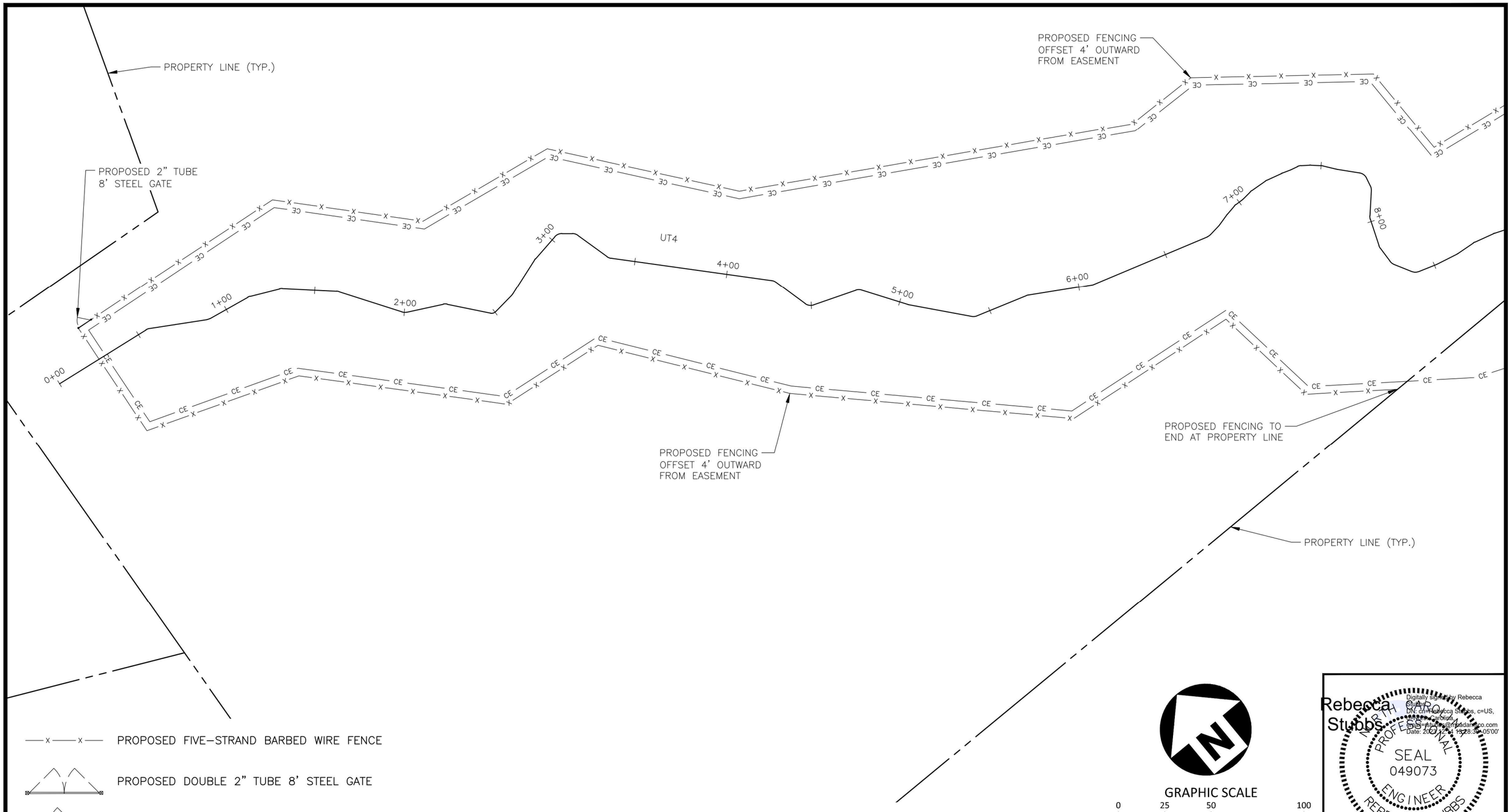
Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-L2 (FENCING)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=50'
DATE	12.14.2023

FENCING PLAN

L2.04



PROPOSED FIVE-STRAND BARBED WIRE FENCE

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

PROPOSED 2" TUBE 8' STEEL GATE

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE

0 25 50 100

1 inch = 50 ft.

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Date: 2023.12.14 13:28:30 -05'00'

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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PLAN INFORMATION

PROJECT NO.	AXI1001
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CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=50'
DATE	12.14.2023

FENCING PLAN

L2.05

PROPOSED 2" TUBE
8' STEEL GATE

PROPOSED FENCING
OFFSET 4' OUTWARD
FROM EASEMENT

PROPERTY LINE (TYP.)

PROPOSED FENCING
OFFSET 4' OUTWARD
FROM EASEMENT

PROPOSED FENCING TO
END AT PROPERTY LINE

UT4

UT6

9+00
10+00
11+00
12+00
13+00
14+00
0+00
1+00
1+52.00
5+00

PROPOSED FIVE-STRAND BARBED WIRE FENCE

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

PROPOSED 2" TUBE 8' STEEL GATE

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE
0 25 50 100
1 inch = 50 ft.

Rebecca Stubbs
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DN: cn=Rebecca Stubbs, c=US, o=McAdams Company, ou=Durham, email=rstubbs@mcadamsco.com
Date: 2023.12.14 13:29:44 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-L2 (FENCING)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=50'
DATE	12.14.2023

FENCING PLAN

L2.06

PROPOSED 2" TUBE 8' STEEL GATE

PROPOSED FENCING OFFSET 4' OUTWARD FROM EASEMENT

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

PROPOSED FENCING OFFSET 4' OUTWARD FROM EASEMENT

PROPOSED 2" TUBE 8' STEEL GATE

PROPOSED FENCING TO BORDER ACCESS PATH AND BRIDGE

PROPOSED 15' ACCESS PATH

PROPOSED UT4 BRIDGE CROSSING SEE SHEET C8.08

UT4

UT6

PROPOSED FENCING TO END AT PROPERTY LINE

PROPOSED FENCING OFFSET 4' OUTWARD FROM EASEMENT

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

PROPOSED FENCING OFFSET 4' OUTWARD FROM EASEMENT

PROPOSED FENCING TO END AT PROPERTY LINE

PROPERTY LINE (TYP.)

PROPERTY LINE (TYP.)

DUTCH CREEK ROAD

PROPOSED FIVE-STRAND BARBED WIRE FENCE

PROPOSED DOUBLE 2" TUBE 8' STEEL GATE

PROPOSED 2" TUBE 8' STEEL GATE

TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE

0 25 50 100

1 inch = 50 ft.

Rebecca Stubbs

Digitally signed by Rebecca Stubbs
DN: cn=Rebecca Stubbs, c=US, o=NC Licensing Board, ou=Axiom Environmental, Inc., email=rstubbs@axiomdatasci.com
Date: 2023.12.14 13:20:39 -05'00'

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

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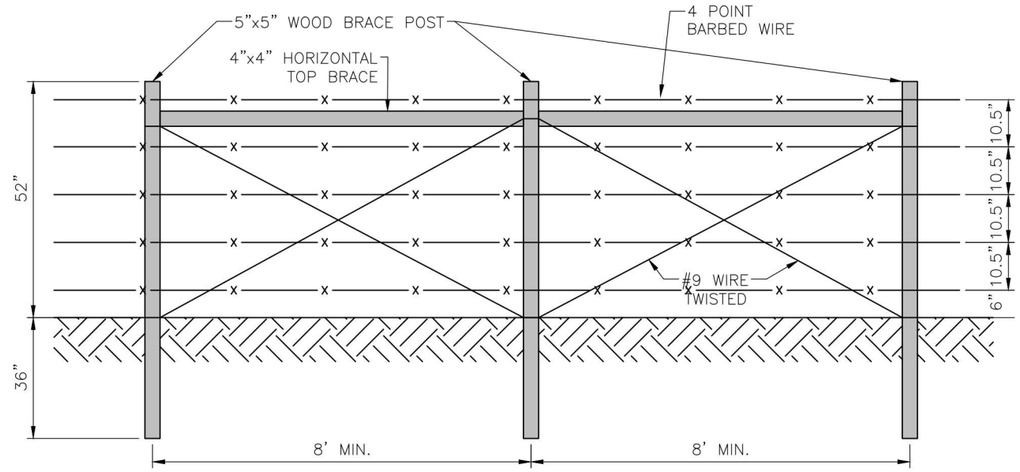
PLAN INFORMATION

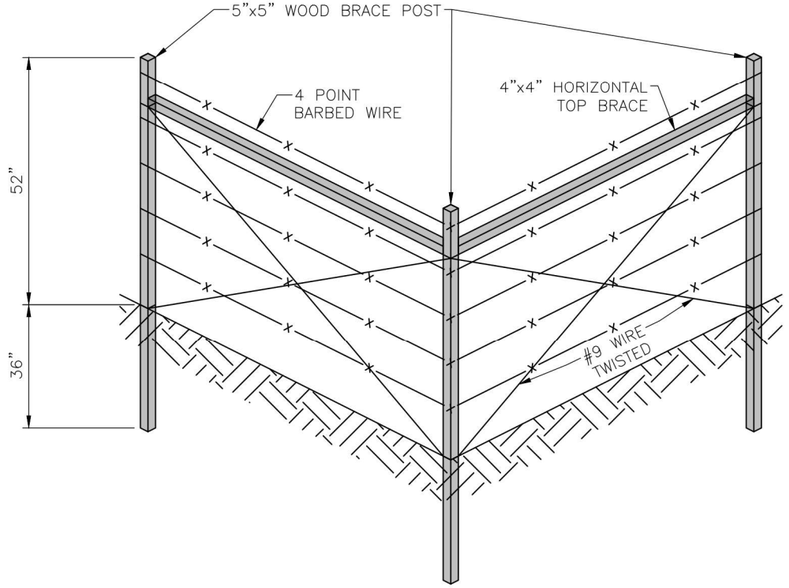
PROJECT NO.	AXI1001
FILENAME	AXI-1001-L2 (FENCING)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=50'
DATE	12.14.2023

FENCING PLAN

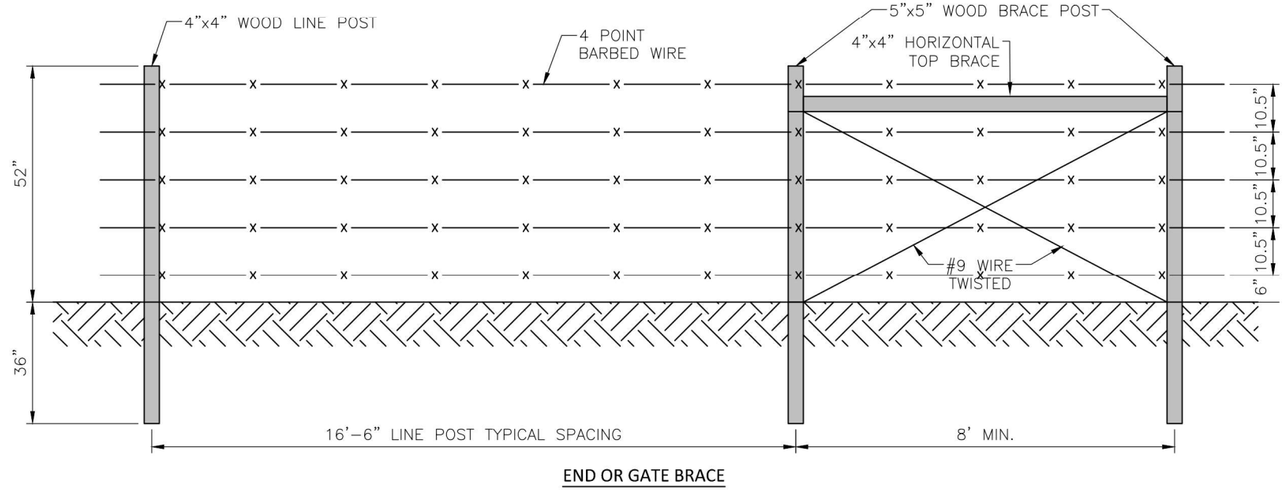
L2.07



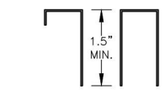
LINE BRACE
MAXIMUM SPACING 300'



CORNER BRACE
FOR CORNERS GREATER THAN 15°



END OR GATE BRACE



STAPLE TYPES
USE ONE #9 STAPLE OR TWO #16 STAPLES AT EACH POINT OF ATTACHMENT

FIVE-STRAND BARBED WIRE FENCING

N.T.S.

Rebecca Stubbs

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Date: 2023.12.14 13:31:27 -05'00'

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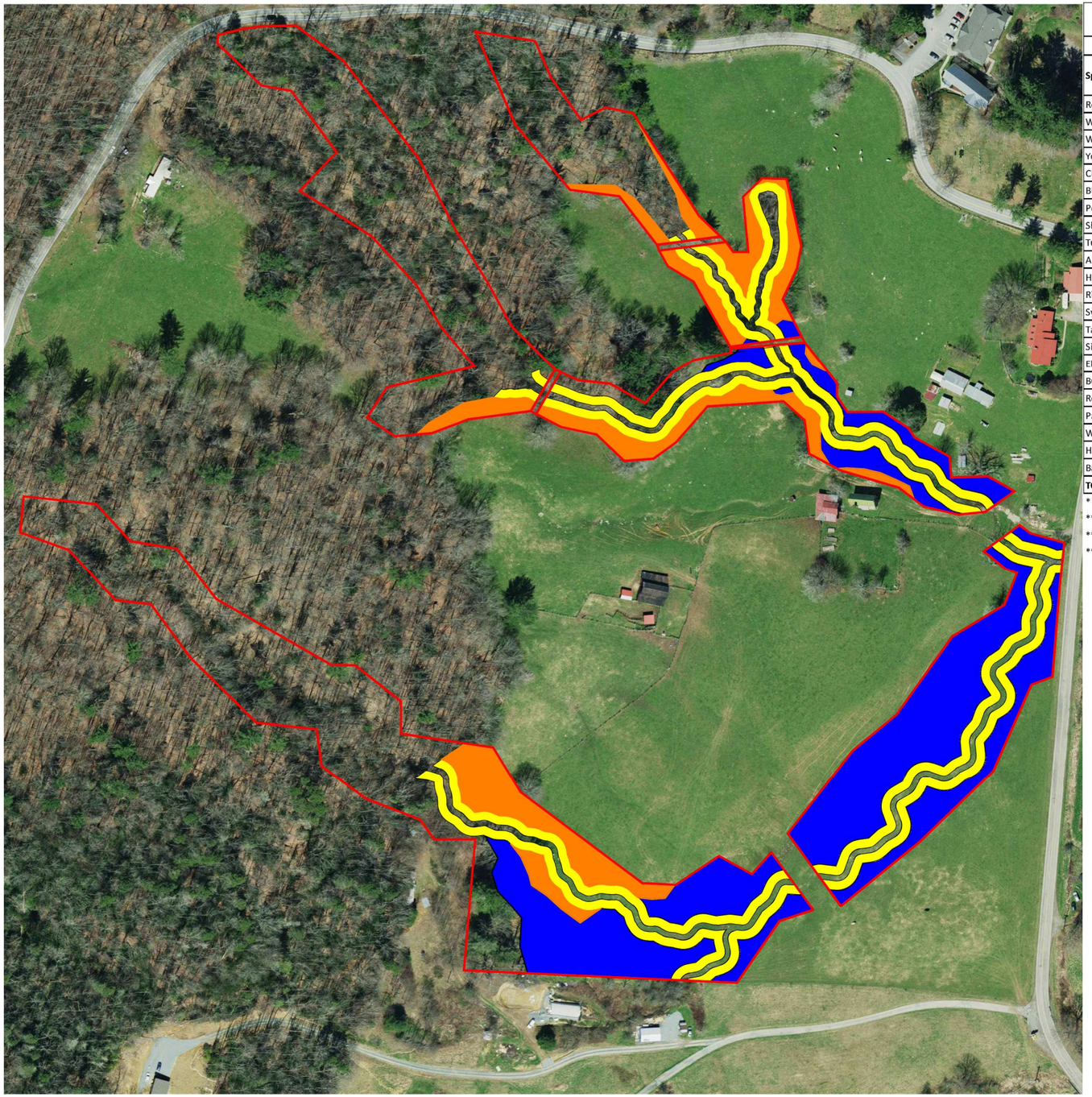
PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-L2 (FENCING)
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	
DATE	12.14.2023

FENCING PLAN

L2.08



Vegetation Association		Montane Alluvial Forest*		Acidic Cove Forest*		Sub Canopy-Understory Planting****		Stream-side Assemblage**		TOTAL
Area (acres)		3.1		1.4		3.5		2.2		10.3
Species	Indicator Status	# planted*	% of total	# planted*	% of total	# planted****	% of total	# planted**	% of total	# planted
Red oak (*Quercus rubra*)	FACU	100	5%	100	10%	0	0%	0	0%	200
White Oak (*Quercus alba*)	FACU	100	5%	100	10%	0	0%	0	0%	200
White pine (*Pinus strobus*)	FACU	100	5%	100	10%	0	0%	0	0%	200
Yellow birch (*Betula alleghaniensis*)	FACU	100	5%	100	10%	0	0%	0	0%	200
Cherry birch (Betula lenta)	FACU	100	5%	100	10%	0	0%	0	0%	200
Black Gum (*Nyssa sylvatica*)	FAC	299	10%	100	10%	0	0%	550	9%	850
Persimmon (*Diosporos virginiana*)	FAC	100	5%	100	10%	0	0%	100	2%	300
Shingle Oak (*Quercus imbricaria*)	FAC	200	10%	100	10%	0	0%	400	7%	700
Tulip poplar (*Liriodendron tulipifera*)	FAC	250	12%	100	10%	0	0%	550	9%	900
American elm (*Ulmus americana*)	FACW	200	10%	100	10%	0	0%	650	11%	950
Hackberry (*Celtis laevigata*)	FACW	200	10%	0	0%	0	0%	600	10%	800
River birch (*Betula nigra*)	FACW	200	10%	0	0%	0	0%	600	10%	800
Sycamore (*Platanus occidentalis*)	FACW	250	12%	0	0%	0	0%	550	9%	800
Tag alder (*Alnus serrulata*)	FACW	0	0%	0	0%	10	2%	500	8%	500
Silky Dogwood (*Cornus amomum*)***	FACW	0	0%	0	0%	0	0%	500	8%	500
Elderberry (*Sambucus nigra*)***	OBL	0	0%	0	0%	10	2%	500	8%	500
Buttonbush (*Cephalanthus occidentalis*)***	OBL	0	0%	0	0%	0	0%	500	8%	500
Red Chokeberry (aronia arbutifolia)	FACW	0	0%	0	0%	90	21%	0	0%	70
Pawpaw (*Asimina triloba*)	FAC	0	0%	0	0%	80	20%	0	0%	70
Witch hazel (*Hamamelis virginiana*)	FACU	0	0%	0	0%	80	20%	0	0%	70
Hop-hornbeam (Ostrya virginiana)	FACU	0	0%	0	0%	80	20%	0	0%	70
Basswood (Tilia americana)	FACU	0	0%	0	0%	70	15%	0	0%	70
TOTAL	FACU	**2100**	**100%**	**1000**	**100%**	**420**	**100%**	**6000**	**100%**	**9520**

* Planted at a density of 680 stems/acre.

** Planted at a density of 2720 stems/acre.

*** May be live staked.

**** 1 gallon, multiyear, interplanting

LEGEND

- Easement Boundary = ~13.3 ac
- Streamside Assemblage = 2.2 ac
- Mountain Alluvial Forest = 3.1 ac
- Acidic Cove Forest = 1.4 ac

N

GRAPHIC SCALE

0 100 200 400

1 inch = 200 ft.

TOTAL DISTURBED AREA = 8.9 AC.

Rebecca Stubbs

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DN: cn=Rebecca Stubbs, c=US, Raleigh, Carolina, email=rstubbs@mcadamsco.com
Date: 2024.2.14 12:32:26 -05'00'

NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS

WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-L1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=200'
DATE	12.14.2023

PLANTING PLAN

L5.00

TEMPORARY SEEDING SCHEDULE:

TEMPORARY SEEDING SHALL BE APPLIED AS NEEDED DURING CONSTRUCTION TO STABILIZE BARE OR DISTURBED AREAS OF SOIL AND AT THE COMPLETION OR ALL GRADING AND EARTHWORK ACTIVITIES WITHIN A PARTICULAR AREA OF THE SITE. PERMANENT SEED MAY BE DISTRIBUTED WITH TEMPORARY SEED UPON THE FINAL APPLICATION OF TEMPORARY SEED.

SEEDING DATE	SEEDING MIXTURE	APPLICATION RATE
AUG 15 - MAY 15	ANNUAL RYE (GRAIN)	30 LBS/AC
AUG 15 - MAY 15	WINTER WHEAT	30 LBS/AC
MAY 15 - AUG 15	GERMAN MILLET	10 LBS/AC
MAY 15 - AUG 15	BROWNTOP MILLET	10 LBS/AC

SEEDING METHODS

1. EVENLY APPLY SEED USING A CYCLONE SEEDER, DRILL, CULTIPACKER SEEDER, OR HYDROSEEDER. THIS MUST BE DONE WITHIN 48 HOURS OF LAND DISTURBING ACTIVITIES.
2. MULCH WITH CLEAN WHEAT STRAW.
3. AFTER SEEDING, APPLY MULCH TO AREAS UNDER HARSH CONDITIONS SUCH AS AREAS THAT HAVE BEEN GRADED, OR THOSE WHICH WILL RECEIVE CONCENTRATED FLOWS. AREAS CONSIDERED TO BE UNDER HARSH CONDITIONS WILL BE CONSIDERED THE AREAS GRADED FOR THE WETLAND VALLEY.
4. RESEED AND MULCH AREAS WHERE SEEDLING EMERGENCE IS LESS THAN 80% COVERAGE, OR WHERE EROSION OCCURS, AS SOON AS POSSIBLE. DO NOT MOW. PROTECT FROM TRAFFIC AS MUCH AS POSSIBLE.

NOTES

1. TEMPORARY ANNUAL SEED SELECTION SHOULD BE BASED ON SEASON OF PROJECT INSTALLATION.
2. A SINGLE SPECIES FOR TEMPORARY COVER IS ACCEPTABLE
3. IN SOME CASES WHERE SEASONS OVERLAP, A MIXTURE OF TWO OR MORE SPECIES MAY BE NECESSARY. HOWEVER, APPLICATION RATES SHOULD NOT EXCEED THE TOTAL RECOMMENDED RATE PER ACRE.
4. TEMPORARY SEED SHOULD BE MIXED AND APPLIED SIMULTANEOUSLY WITH THE PERMANENT SEED MIX IF OPTIMAL PLANTING DATES ALLOW.

PERMANENT SEEDING SCHEDULE:

PLANT MATERIAL SELECTION

1. REFER TO THE TABLES ON THIS SHEET FOR APPROPRIATE SELECTION OF NATIVE PERMANENT SEEDS.
2. PERMANENT SEED MIXTURE SHOULD BE APPLIED USING AN APPLICATION RATE AND METHOD RECOMMENDED BY THE NURSERY AND AT A RATE APPROPRIATE BASED ON FIELD CONDITIONS.

SEEDBED PREPARATION

1. DISTURBED SOILS WITHIN THE RIPARIAN AREAS MUST BE AMENDED TO PROVIDE AN OPTIMUM ENVIRONMENT FOR GERMINATION AND SEEDLING GROWTH.
2. THE pH OF THE SOIL MUST BE SUCH THAT IT IS NOT TOXIC AND NUTRIENTS ARE AVAILABLE.
3. SOIL ANALYSIS SHOULD BE PERFORMED TO DETERMINE NUTRIENT AND LIME NEEDS OF EACH SITE.
4. APPROPRIATE pH LEVELS ARE BETWEEN 5.5 AND 7.0
5. RIPARIAN BUFFERS REGULATED FOR NUTRIENT MANAGEMENT MAY BE LIMITED TO A SINGLE APPLICATION OF FERTILIZER.
6. SUITABLE MECHANICAL MEANS SUCH AS DISKING, RAKING, AND HARROWING MUST BE EMPLOYED TO LOOSEN COMPACTED SOILS PRIOR TO SEEDING.

PLANTING

1. APPLY SEED UNIFORMLY WITH A CYCLONE SEEDER, DROP-TYPE SPREADER, DRILL, OR HYDROSEEDER ON A FIRM, FRIABLE SEEDBED.
2. IN FINE SOILS, SEEDS SHOULD BE DRILLED 0.25-0.5 INCHES. IN COURSE SAND SOILS, SEEDS SHOULD BE PLANTED NO MORE THAN 0.75 INCHES.

MULCH

1. MULCH ALL PLANTING AREAS IMMEDIATELY AFTER SEEDING.
2. IF PLANTING ON STREAMBANKS STEEPER THAN 10% OR OTHER AREAS SUBJECT TO FLOODING, A BIODEGRADABLE ROLLED EROSION CONTROL PRODUCT IS RECOMMENDED TO HOLD SEED AND SOIL IN PLACE.

MAINTENANCE

1. THE RECOMMENDED PERMANENT GRASS SPECIES MAY REQUIRE TWO YEARS FOR ESTABLISHMENT DEPENDING ON SITE CONDITIONS.
2. INSPECT SEEDED AREAS FOR FAILURE AND MAKE NECESSARY REPAIRS, SOIL AMENDMENTS, AND RE-SEEEDINGS.
3. IF WEEDY EXOTIC SPECIES HAVE TAKEN OVER AREAS AFTER THE FIRST GROWING SEASON, THE INVASIVE SPECIES MUST BE ERADICATED TO ALLOW NATIVE SPECIES TO GROW.
4. PERMANENT SEED STOCK SHALL BE MONITORED AND MAINTAINED UNTIL LONG-TERM STABILITY HAS BEEN ESTABLISHED AT THE SITE.

PERMANENT SEEDING MIXTURE - SITEWIDE

Scientific Name	Common Name	Indicator	Scientific Name	Common Name	Indicator
Agrostis alba	Redtop	FACW	*Elymus virginicus*	Virginia Wildrye	FACW
Agrostis hyemalis	Winter bentgrass	FAC	*Eupatorium coelestinum*	Mistflower	FAC
Agrostis stolonifera	Creeping bentgrass	FACW	*Eupatorium perfoliatum*	Boneset	FACW
Bidens aristosa	Bur-marigold	FACW	*Helianthus angustifolius*	Narrowleaved Sunflower	FACW
Carex albolutescens	Greenwhite Sedge	FACW	*Heliopsis helianthoides*	Oxeye sunflower	FACU
Carex lupulina	Hop Sedge	OBL	*Hibiscus moscheutos*	Crimsoneyed rosemallow	OBL
Carex vulpinoidea	Fox Sedge	OBL	*Juncus effusus*	Soft Rush	FACW
Chamaecrista fasciculata	Partridge Pea	FACU	*Lespedeza capitata*	Roundhead Lespedeza	FACU
Chamaecrista nictitans	Sensitive Pea	FACU	*Liatris spicata*	Marsh Blazing Star	FAC
Chrsyanthemum leucanthemum	Oxeye daisy	UPL	*Monarda fistulosa*	Wild bergamot	UPL
Coreopsis lanceolata	Lance-leaved Coreopsis	NI	*Panicum clandestinum*	Deertongue	FAC
Coreopsis tinctoria	Plains Coreopsis	FAC	*Panicum rigidulum*	Redtop Panicgrass	FACW
Cosmos bipinnatus	Cosmos	FACU	*Rudbeckia hirta*	Black eyed Susan	FACU
Desmodium canadense	Showy ticktrefoil	FAC	*Tridens flavus*	Purpletop	FACU
Echinacea purpurea	Coneflower	NI	*Verbena hastata*	Blue vervain	FACW

**Permanent seed will consist of a mixture of the species listed and at a rate appropriate based on field conditions*

Rebecca Stubbs

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NORTH CAROLINA PROFESSIONAL SEAL 049073 ENGINEER REBECCA STUBBS

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VALLE CRUCIS MITIGATION SITE

CONSTRUCTION DRAWINGS
WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

Axiom Environmental, Inc.

PLAN INFORMATION

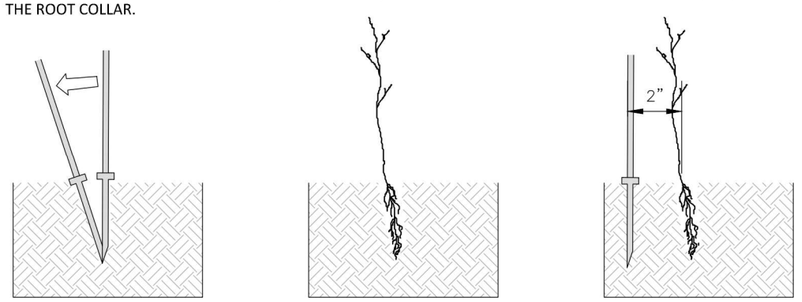
PROJECT NO.	AXI1001
FILENAME	AXI-1001-L1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

PLANTING AND SEEDING TABLES

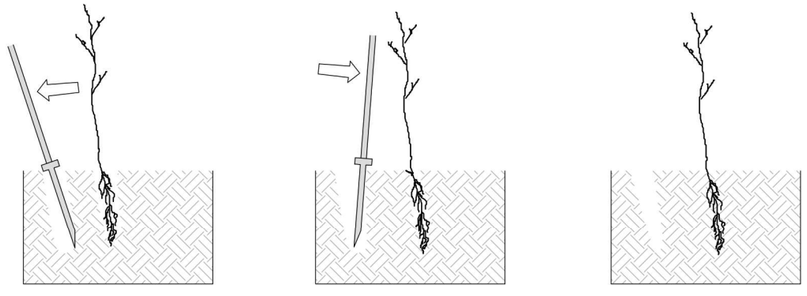
L5.01

NOTES:

1. AREAS NOTED AS BARE ROOT PLANTINGS WITHIN THE PLANTING ZONE SHALL BE PLANTED WITH SPECIES LISTED ON SHEET L5.00.
2. DURING PLANTING, SEEDLINGS SHALL BE KEPT IN A MOIST CANVAS BAG OR SIMILAR CONTAINER TO PREVENT ROOT SYSTEMS FROM DRYING.
3. 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.
4. ALL SEEDLINGS SHALL BE ROOT PRUNED, IF NECESSARY, SO THAT NO ROOTS EXTEND MORE THAN 10 INCHES BELOW THE ROOT COLLAR.



1. INSERT PLANTING BAR 12" INTO THE GROUND 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.



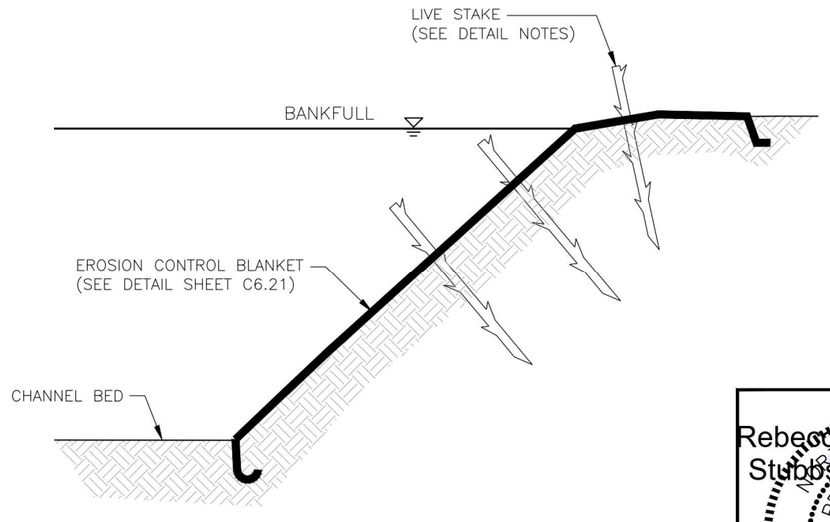
4. PULL HANDLE OF BAR TOWARD PLANTER, FIRMING SOIL AT BOTTOM.
5. PUSH HANDLE FORWARD FIRMING SOIL AT TOP
6. LEAVE COMPACTION HOLE OPEN WATER THOROUGHLY.

BARE ROOT PLANTING DETAIL

N.T.S.

NOTES:

1. AREAS NOTED AS LIVE STAKES WITHIN THE PLANTING ZONE SHALL BE PLANTED WITH SPECIES LISTED ON SHEET L5.00.
2. ONE LIVE STAKE SPECIES PER LIVE STAKE AREA. ALTERNATE SPECIES PER LIVE STAKE AREA.
3. ALL LIVE STAKES SHALL BE DORMANT AT TIME OF ACQUISITION AND PLANTING.
4. LIVE STAKES SHALL BE 1/2-2" IN DIAMETER. LIVE STAKES SHALL ALSO BE 2 - 4 FEET IN LENGTH.
5. DURING PREPARATION, THE BASAL ENDS OF THE LIVE STAKES SHALL BE CLEANLY CUT AT AN ANGLE TO FACILITATE EASY INSERTION INTO THE SOIL, WHILE THE TOPS SHALL BE CUT SQUARE OR BLUNT FOR TAMPING. ALL LIMBS SHALL BE REMOVED FROM THE SIDES OF THE LIVE CUTTING PRIOR TO INSTALLATION.
6. CUTTINGS FOR LIVE STAKES SHALL BE HARVESTED IN A MANNER SUCH THAT THEY ARE CUT, IMMEDIATELY PUT INTO WATER TO BE SOAKED FOR 10 DAYS, AND THEN PLANTED IMMEDIATELY AFTER THE 10 DAYS ARE COMPLETED. CUTTINGS SHALL REMAIN WET UNTIL THEY ARE PLANTED. OUTSIDE STORAGE LOCATIONS SHOULD BE CONTINUALLY SHADED AND PROTECTED FROM WIND AND DIRECT SUNLIGHT.
7. LIVE STAKES SHALL BE TAMPED AT AN ANGLE INTO THE GROUND SURFACE WITH A DEAD BLOW HAMMER, WITH BUDS ORIENTED IN AN UPWARD DIRECTION. STAKES SHOULD BE TAMPED UNTIL APPROXIMATELY 3/4 OF THE STAKE LENGTH IS WITHIN THE GROUND. ANY STAKES THAT ARE SPLIT OR DAMAGED DURING INSTALLATION SHALL BE REMOVED AND REPLACED.
8. THE AREA AROUND EACH LIVE STAKE SHALL BE COMPACTED BY FOOT AFTER THE LIVE STAKE HAS BEEN INSTALLED.
9. ONE TO TWO INCHES SHALL BE CUT CLEANLY OFF OF THE TOP OF EACH LIVE STAKE (WITH LOPPERS) AT AN ANGLE OF APPROXIMATELY 15 DEGREES FOLLOWING INSTALLATION.



LIVE STAKE DETAIL

N.T.S.

Rebecca Stubbs

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WATAUGA COUNTY, NORTH CAROLINA

RESTORATION SYSTEMS | LLC

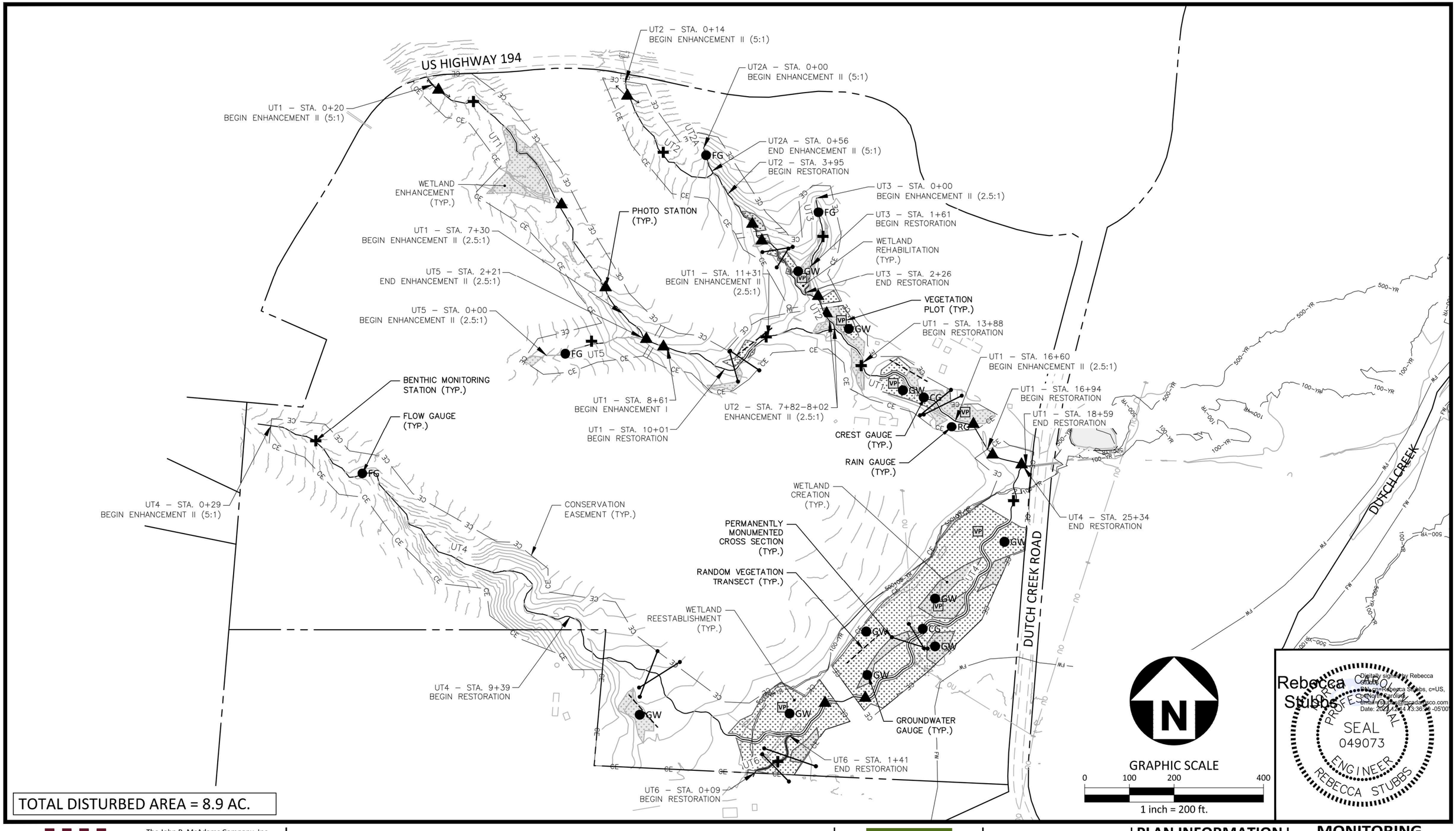
Axiom Environmental, Inc.

PLAN INFORMATION

PROJECT NO.	AXI1001
FILENAME	AXI-1001-L1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	NTS
DATE	12.14.2023

PLANTING DETAILS

L5.02



TOTAL DISTURBED AREA = 8.9 AC.

GRAPHIC SCALE
0 100 200 400
1 inch = 200 ft.

Rebecca Stubbs
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PLAN INFORMATION	
PROJECT NO.	AXI-1001
FILENAME	AXI-1001-M1
CHECKED BY	RAS
DRAWN BY	CHJ
SCALE	1"=200'
DATE	12.14.2023

MONITORING PLAN

M1.00