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

REPLY TO
ATTENTION OF:

31 March, 2014

Regulatory Division

Re: NCIRT Review and USACE Approval of the Owls Den Draft Mitigation Plan; SAW 2013-00717; EEP IMS #95808

Mr. Tim Baumgartner
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Ecosystem Enhancement Program (NCEEP) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Owls Den Draft Mitigation Plan, which closed on 13 March, 2014. 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. However, the minor issues with the Draft as discussed 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 and a summation of the addressed comments. If it is determined that the project does not require a Department of the Army permit, you must still provide a copy of the Final Mitigation Plan, along with a copy of this letter, to the appropriate USACE field office at least 30 days in advance of beginning construction of the project. Please note that this approval does not preclude the inclusion of permit conditions in the permit authorization for the project, particularly if issues mentioned above are not satisfactorily addressed. Additionally, this letter provides initial approval for the Mitigation Plan, but this does not guarantee that the project will generate the requested amount of mitigation credit. As you are aware, unforeseen issues may arise during construction or monitoring of the project that may require maintenance or reconstruction that may lead to reduced credit.

Thank you for your attention to this matter, and if you have any questions regarding this letter, the mitigation plan review process, or the requirements of the Mitigation Rule, please call me at 919-846-2564.

Sincerely,

Digitally signed by CRUMBLEY.TYLER.AUTRY.1007509975
Date: 2014.03.31 09:37:42 -04'00'

Tyler Crumbley
Regulatory Project Manager

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
CESAW-RG/Wicker, H.
CESAW-RG-A/Brown, D.
NCEEP/Wiesner, P.

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

REPLY TO
ATTENTION OF:

CESAW-RG/Crumbley 14 March, 2014

MEMORANDUM FOR RECORD

SUBJECT: Owls Den- NCIRT Comments During 30-day Mitigation Plan Review

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

NCEEP Project Name: Owls Den Stream and Wetland Mitigation Site, Lincoln County, NC

USACE AID#: SAW-2013-00717
NCEEP #: 95808

30-Day Comment Deadline: 13 March, 2014

1. *Eric Kulz, NCDWR, 20 February, 2014*:

    - In the areas of the site slated for wetland reestablishment, the Catena soils reports describe a hydric soil layer beneath "fill". Data from the reports indicate as much as 33 inches of "fill" over the hydric soils. DWR questions whether this is fill or naturally-occurring non-hydric floodplain soils, and if these areas should instead be considered creation rather than reestablishment.

    - The planting plan includes red maple. Red maple is a prolific volunteer species that has naturally established itself at most of the mitigation sites visited. Please omit this species from the planting plan, or at most, reduce it from 15% to 5% of the total planted stems.

2. *Todd Bowers, USEPA, 6 March, 2014*:

    - Overall Wildlands presents a very robust and thorough mitigation plan with an impressive amount of physical, hydrologic and biological baseline data to support the likelihood that this project will be successful. This mitigation plan sets the bar high for other projects of similar complexity.

- Update NCDWQ to reflect change to NCDWR with the exception of citiations.

- Project Goals: There is no goal pertaining to the reestablishment of aquatic fauna such as benthic macroinvertebrates, amphibians, crayfish etc. I'm not suggesting that we put this under the auspices of performance standards (yet) but we need to start including biologics as a specific goal of these types of projects in order to carry out the Clean Water Act's purpose of maintaining the physical, chemical, and biological integrity of waters of the United States. It would be a shame if all this habitat constructed was just to look pretty and nothing was living in it. We should begin to verify that indeed habitat is being utilized for the purpose intended and if we are to state that improving ecological function is a goal then we need to know the fauna side of the ecology is present (or not) in order to verify bona-fide ecological improvement. The biology scores from the stream quality assessment worksheets are rather low and I would like to see an improvement noted in future stream assessments following the restoration.

- Section 13.3 Wetlands: Performance standard should be presented in days of the defined growing season for Lincoln County. Previous mention of this on page 22 defined 8.1 percent of the growing season from March 28 to November 4 (222 days), is 18 days. This is plain language that leaves little room for ambiguity and should be restated on page 50.

- Trees Planted: The assemblage of trees designated for wetland and riparian bare root planting (pages 345-9/Sheets 4.1-5) includes red maple (Acer rubrum) at 15%. I would recommend that if red maple needs to be included (and I don't think it does based on its ability to rapidly volunteer open sites) that its proportion be lessened to no more than 5% of all species planted.

3. *T. Crumbley and T. Tugwell, USACE, 13 March, 2014*:

- Pg. 52; Section 14.2.2 Pattern and Profile: While multiple longitudinal profiles are not required throughout the monitoring period (unless problems noted), at least one should be submitted with the As-Built to verify construction in accordance with the plans.

- This mitigation plan is very thorough and captures all updated Mitigation Plan components including updated monitoring requirements. The District has no further comments at this time.

Digitally signed by CRUMBLEY.TYLER.AUTRY.1007509975
Date: 2014.03.31 09:38:59 -04'00'

/S/

Tyler Crumbley
Regulatory Division

April 17, 2014

Mr. Paul Wiesner
NC Ecosystem Enhancement Program
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

Subject: Response to IRT Comments and Final Mitigation Plan Submittal
Owl's Den Stream and Wetland Mitigation Site, Lincoln County
Catawba River Basin – 03050102
HUC# 03050103 Expanded Service Area
EEP Project ID No. 95808 / USACE Action ID#2010-00717
Contract # 5150

Dear Mr. Wiesner:

On March 14, 2014, Wildlands Engineering (Wildlands) received a Memorandum for Record documenting the IRT's comments during the 30-day comment period for the above-referenced mitigation site. This letter documents our responses to these comments. We are enclosing two (2) copies of the completed Pre-Construction Notice (PCN), six (6) copies of the Final Mitigation Plan (report and plan set) with the Mitigation Plan Approval Letters from IRT and USACE and the IRT Comment Response Letter attached, and one (1) CD of the electronic files for the Final Mitigation Plan and PCN.

We have reviewed the IRT comments documented below and revised the Mitigation Plan as noted.

Eric Kulz, NCDWR, 20 February, 2014:

1. *In the areas of the site slated for wetland reestablishment, the Catena soils reports describe a hydric soil layer beneath "fill". Data from the reports indicate as much as 33 inches of "fill" over the hydric soils. DWR questions whether this is fill or naturally-occurring non-hydric floodplain soils, and if these areas should instead be considered creation rather than reestablishment.*

   We understand the concern about the presence of fill material over hydric soils in wetland re-establishment areas. However, based on our assessment, we are very confident that the material on the surface of the site is mostly fill. The majority of the borings that have large depths of non-hydric material over hydric soils are located on side cast piles placed adjacent to the existing ditches and streams when these ditch and channel features were lowered. It is important to note that the excavation of the ditches also resulted in drawdown of the local water table which affected hydric properties in the higher zones of covered soils (illustrated in Figure 1, below). The borings not located in the side cast material are primarily located at or near the perimeter of the wetland re-establishment zone which is defined by the transition between hydric and upland soils. Hydric soil indicators in these areas are deeper due to what we believe was the original transition to upland soils that was filled over. Table 1 displays all borings with fill depths greater than 20". Each of these boring locations were investigated and fit with the overall understanding of the site history based on the two observations described above. Grading depths to proposed elevations are included in Table 1. Only three boring locations within the wetland re-establishment area are proposed to have fill removed to a depth greater than 12 inches. We believe that these are very isolated locations that were previously wetland areas before being heavily altered by ditching. Based on the above observations, Wildlands believes that these areas should be considered re-establishment as opposed to creation.

Figure 1

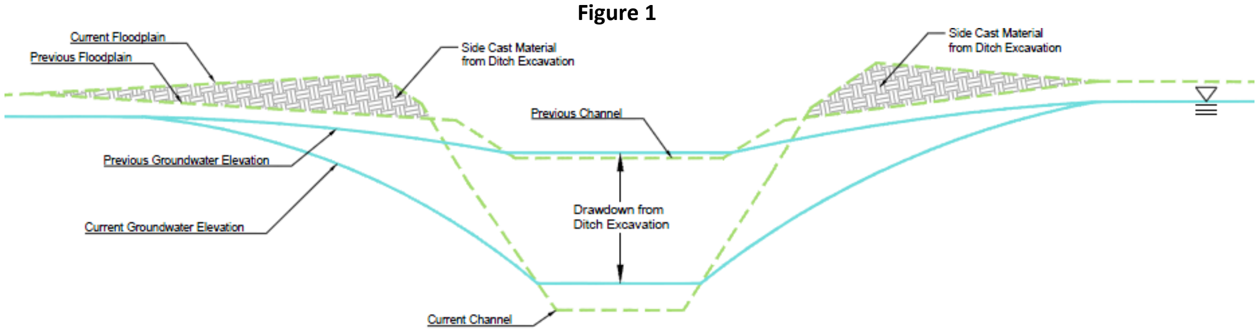


Table 1: Borings with fill values greater than 20 inches

Boring	Fill Depth (inches)	Location (Includes explanation for deep fill values)	Grading Depth (inches)
B147	26	Near re-establishment boundary and topographic rise	5
B143	25	Potentially located in side cast material of ditch north of HC2	6
B139	23	Located in the side cast material of the ditch north of HC2	7
B138	29	Located between two existing ditches, potentially in side cast material or hydrologically altered due to ditching	2
B134	22	Located between two existing ditches, potentially in side cast material or hydrologically altered due to ditching	2
B133	26	Near re-establishment and easement boundary	0
B124	21	Located in the side cast material of the ditch north of HC2	4
B121	25	Located on a topographic high point that is in between two jurisdictional areas	8
B107	22	Located in the side cast material of HC2	8
B103	22	Located in the side cast material of HC1 Reach 1	10
B101	24	Located in the side cast material of HC2	8
B98	31	Located in the side cast material of HC1 Reach 1	+15[b]
B93	23	Located in the side cast material of HC1 Reach 1	8
B91	25	Located in the side cast material of HC1 Reach 1	16
B88	28	Near re-establishment and easement boundary	0
B84	30	Located on a small topographic high point between existing channel and jurisdictional wetland	17
B82	33	Located in the side cast material of HC1 Reach 1	8
B74	22	Located in the side cast material of HC1 Reach 1 and HC2 (near confluence of two channels)	7

Boring	Fill Depth (inches)	Location (Includes explanation for deep fill values)	Grading Depth (inches)
B73	24	Located in the side cast material of HC1 Reach 1	9
B46	24	Located in the side cast material of HC1 Reach 2	6
B43	26	Located in the side cast material of HC1 Reach 2	16
B41	26	Located in the side cast material of HC1 Reach 2	10
B37	35	Near re-establishment boundary and topographic outcrop	0[a]
B30	29	Near re-establishment boundary and topographic outcrop	0[a]

a. These areas are not graded because of their proximity to jurisdictional wetland areas.

b. This boring is located in a small inner berm of the existing channel, filling the existing channel will result in filling of this area.

2. *The planting plan includes red maple. Red maple is a prolific volunteer species that has naturally established itself at most of the mitigation sites visited. Please omit this species from the planting plan, or at most, reduce it from 15% to 5% of the total planted stems.*

   Red maple was reduced to 5% in the riparian and wetland bare root planting zones (Sheets 4.1 - 4.5). Sycamore and green ash species were increased to 25% of the riparian planted stems and 20% of the wetland planted stems.

<u>Todd Bowers, USEPA, 6 March, 2014:</u>

3. *Overall Wildlands presents a very robust and thorough mitigation plan with an impressive amount of physical, hydrologic and biological baseline data to support the likelihood that this project will be successful. This mitigation plan sets the bar high for other projects of similar complexity.*

   We strive to thoroughly evaluate our projects to provide the necessary information to provide the basis for successful designs. Wildlands appreciates the acknowledgment of this effort.

4. *Update NCDWQ to reflect change to NCDWR with the exception of citations.*

   North Carolina Department of Water Quality (NCDWQ) was replaced with North Carolina Department of Water Resources (NCDWR) in all instances of the report with the exception of citations.

5. *Project Goals: There is no goal pertaining to the reestablishment of aquatic fauna such as benthic macroinvertebrates, amphibians, crayfish etc. I'm not suggesting that we put this under the auspices of performance standards (yet) but we need to start including biologics as a specific goal of these types of projects in order to carry out the Clean Water Act's purpose of maintaining the physical, chemical, and biological integrity of waters of the United States. It would be a shame if all this habitat constructed was just to look pretty and nothing was living in it. We should begin to verify that indeed habitat is being utilized for the purpose intended and if we are to state that improving ecological function is a goal then we need to know the fauna side of the*

ecology is present (or not) in order to verify bona-fide ecological improvement. The biology scores from the stream quality assessment worksheets are rather low and I would like to see an improvement noted in future stream assessments following the restoration.

The stream and wetland performance criteria for the project site follow approved performance criteria presented in the EEP Mitigation Plan Template (version 2.2, 6/8/2012) and the EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011). The EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation do not include a monitoring metric related to aquatic fauna. Accordingly, a plan to perform this level of aquatic fauna investigation was not developed. It is a goal of Wildlands' to re-establish aquatic fauna on our projects in concurrence with the ultimate goals of the Clean Water Act. For future projects, Wildlands will consider allocating effort towards monitoring of aquatic fauna under guidance from updated EEP performance standards.

6. *Section 13.3 Wetlands: Performance standard should be presented in days of the defined growing season for Lincoln County. Previous mention of this on page 22 defined 8.1 percent of the growing season from March 28 to November 4 (222 days), is 18 days. This is plain language that leaves little room for ambiguity and should be restated on page 50.*

   Section 13.3 (page 50, first paragraph) has been revised to include the plain language for the performance standard for wetland hydrology in days of the defined growing season for Lincoln County. The revised paragraph reads:

   "The final performance standard for wetland hydrology will be a free groundwater surface within 12 inches of the ground surface for 18 consecutive days (8.1 percent) of the defined 222 day growing season for Lincoln County (March 28 through November 4) under typical precipitation conditions."

7. *Trees Planted: The assemblage of trees designated for wetland and riparian bare root planting (pages 345-9/Sheets 4.1-5) includes red maple (Acer rubrum) at 15%. I would recommend that if red maple needs to be included (and I don't think it does based on its ability to rapidly volunteer open sites) that its proportion be lessened to no more than 5% of all species planted.*

   Red maple was reduced to 5% in the riparian and wetland bare root planting zones (Sheets 4.1 - 4.5). Sycamore and green ash species were increased to 25% of the riparian planted stems and 20% of the wetland planted stems.

<u>T. Crumbley and T. Tugwell, USACE, 13 March, 2014:</u>

8. *Pg. 52; Section 14.2.2 Pattern and Profile: While multiple longitudinal profiles are not required throughout the monitoring period (unless problems noted), at least one should be submitted with the As-Built to verify construction in accordance with the plans.*

   Section 14.2.2 (page 52, second paragraph) has been revised to include the baseline longitudinal profile that will be done as part of the baseline monitoring document and as-built record drawings. The revised paragraph reads:

"To insure accordance with design plans, a longitudinal profile will be performed as part of the baseline monitoring document and as-built record drawings of the project that will be developed within 60 days of the planting completion and monitoring installation on the restored site. Longitudinal profile surveys will not be conducted during the seven (7) year monitoring period unless other indicators during the annual monitoring indicate a trend toward vertical and lateral instability. Monitoring will follow standards as described in the EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011) and the 2003 USACE and NCDWR Stream Mitigation Guidance for the necessary reaches."

Table 19 on pages 50-51 includes Note 1 that "Longitudinal profile will be collected during as-built baseline monitoring survey."

9. *This mitigation plan is very thorough and captures all updated Mitigation Plan components including updated monitoring requirements. The District has no further comments at this time.*

   To ensure project success, Wildlands strives for Mitigation Plans to be as detailed and accurate as possible. The recognition of this effort is appreciated.

In addition to the changes made based on the comments above, Figures 9 and 11 and Sheets 3.0 to 4.5 were edited to show wetland re-establishment throughout the jurisdictional wetland areas, to match the design intent and the credit calculations summarized in Table 14.

If you have any questions, please contact Emily Reinicker at 704-332-7754 x106 or via email at ereinicker@wildlandseng.com.

Sincerely,

Jeff Keaton, PE

Emily G. Reinicker, PE, CFM

Enclosures:
6 copies Final Mitigation Plan with IRT Approval Letter and Comment/ Response Letter
6 copies signed Categorical Exclusion Form
2 copies PCN (includes Categorical Exclusion and Jurisdictional Determination)
1 CD- electronic copies (.pdf) of the Final Mitigation Plan and PCN files

MITIGATION PLAN

Owl's Den Mitigation Site
Lincoln County, NC
DENR Contract No. 005150
EEP ID No. 95808

Catawba River Basin
HUC 03050103 Expanded Service Area

USACE Action ID No. 2010-00717

Prepared for:

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

April 17, 2014

MITIGATION PLAN

Owl's Den Mitigation Site
Lincoln County, NC
DENR Contract No. 005150
EEP ID No. 95808

Catawba River Basin
HUC 03050103 Expanded Service Area

USACE Action ID No. 2010-00717

Prepared for:

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Prepared by:

Wildlands Engineering, Inc.
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Phone – 919-851-9986

April 17, 2014

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) is completing a full-delivery project for the North Carolina Ecosystem Enhancement Program (EEP) to restore 2,453 linear feet (LF) of perennial streams, rehabilitate 2.8 acres of existing wetlands, and re-establish 7.3 acres of wetlands in Lincoln County, NC. The streams proposed for restoration include two unnamed tributaries to Howard's Creek. The project is being completed to provide stream mitigation units (SMUs) and wetland mitigation units (WMUs) in the Catawba River Basin. Buffer restoration will also take place but is not intended for mitigation credit at this time.

The Owl's Den Mitigation site is located within the EEP targeted watershed for the Catawba River Basin Hydrologic Unit Code (HUC) 03050102040040 and NCDWR Subbasin 03-08-35 and is being submitted for mitigation credit in the Catawba River Basin HUC 03050103 within the expanded service area of this HUC. Hydrologic Unit Code (HUC) 03050102040040 was identified as a Targeted Local Watershed (TLW) in EEP's 2007 Catawba River Basin Restoration Priority (RBRP) Plan. The site is located in the Indian and Howards Creek local watershed planning (LWP) area and is identified in the Indian Creek and Howards Creek LWP Project Atlas.

The major goals of the proposed stream and wetland mitigation project are to provide ecological and water quality enhancements to the Catawba River Basin while creating a functional stream and wetland complex on the site, to improve floodplain habitat and ecological function, and to restore a Piedmont Bottomland Forest community as described by Schafale and Weakley (1990). The primary objectives of the Owl's Den Mitigation Site address stressors identified in the LWP and include the following (for more information refer to NC EEP, 2010):

- Correct hydrologic modifications to streams including stream incision and dredging, bank erosion, lowering of the local water table, sedimentation, and loss of riparian buffer and floodplain functions.
- Improve hydrology and function of previously drained and cleared wetlands.
- Re-establish riparian buffer and wetland vegetation communities.
- Reduce excess sediment to downstream waters by stabilizing streams and revegetating site.
- Reduce nutrient loads to downstream waters by improving wetlands and buffers to treat runoff.

Secondary project goals include:

- Improve instream habitat by diversifying the stream bedform and introducing habitat structures and woody debris.
- Reduce agricultural pollution from pesticides and herbicides used on adjacent fields by improving wetlands and buffers to treat runoff.

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).

- NCDENR Ecosystem Enhancement Program In-Lieu Fee Instrument signed and dated July 28, 2010.

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

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 Restoration Project Goals and Objectives

The Owl's Den Mitigation Site (site) is a stream and wetland project located in Lincoln County, northwest of the Town of Lincolnton (Figure 1). The site is located in the Catawba River Basin Hydrologic Unit Code (HUC) 03050102040040 and NCDWR Subbasin 03-08-35 and is being submitted for mitigation credit in the Catawba River Basin HUC 03050103 within the expanded service area of this HUC. The site is within a Targeted Local Watershed (TLW) identified in EEP's 2007 Catawba River Basin Restoration Priority (RBRP) Plan which can be accessed at:

http://portal.ncdenr.org/c/document_library/get_file?uuid=5e2e048d-0bd4-4e0f-8657-bf607eb8930c&groupId=60329

The site is also identified in the Indian Creek and Howards Creek Local Watershed Plan (LWP) Project Atlas. The Indian and Howard's Creek Local Watershed Plan documents can be accessed at:

http://portal.ncdenr.org/web/eep/rbrps/catawba (scroll down on left side to L WP document links)

The LWP includes land use analysis, water quality monitoring, and stakeholder input to identify problems with water quality, habitat, and hydrology for the 114-square mile drainage area. The portion of the Howards Creek watershed in which the project site is located is characterized as primarily agricultural with historic stream and wetland degradation due to agricultural practices.

The Indian and Howards Creek LWP identified stream channelization and dredging, incised channels and unstable stream banks, deforested riparian buffers, drained and cleared wetlands, and nutrient inputs to streams and wetlands as major stressors within this watershed. The LWP Project Atlas identified the Owl's Den Mitigation Site (W-30) as a restoration opportunity with the potential to improve water quality, habitat, and hydrology within the Howards Creek watershed. The site is located within an LWP-identified priority subwatershed (H-9) – prioritized because of its low functional rating (mix of urban/suburban cover and significant agriculture and degraded buffers).

The major goals of the proposed stream and wetland mitigation project are to provide ecological and water quality enhancements to the Catawba River Basin while creating a functional stream and wetland complex, to improve floodplain habitat and ecological function, and to restore a Piedmont Bottomland Forest community as described by Schafale and Weakley (1990). The primary objectives of the Owl's Den Mitigation Site will address stressors identified in the LWP and include the following:

- *Correct hydrologic modifications to streams including stream incision and dredging, bank erosion, lowering of the local water table, sedimentation, and loss of riparian buffer and floodplain functions.* The project will re-connect streams with a stable floodplain using Priority 1 restoration techniques. The Priority 1 restoration will eliminate vertically incised channels on site. Stream banks will be stabilized with grading, in-stream structures, and planting. By stabilizing stream banks on site, sediment loading will be reduced in the receiving watershed.
- *Improve hydrology and function of previously drained and cleared wetlands.* The project will restore hydrologic connections to existing wetlands using Priority 1 stream restoration to raise the local water table and increase overbank flooding. The project will extend

existing wetland zones into adjacent areas and establish wetland vegetation throughout the site.

- *Re-establish wetland hydrology and function in relic wetland areas.* Removal of historic overburden will uncover relic hydric soils and bring local water table elevations closer to the ground surface. Disking and roughening of wetland re-establishment areas will increase retention times and improve natural infiltrative processes.
- *Re-establish riparian buffer and wetland vegetation communities.* A native vegetation community will be planted on the site to revegetate the riparian buffers and wetlands and return the functions associated with these wooded areas.
- *Reduce excess sediment to downstream waters by stabilizing streams and revegetating site.* Stream banks will be stabilized on all project reaches. The site will also be revegetated with a native forest community which prevent erosion and sedimentation from overland runoff of agricultural lands and will filter runoff from adjacent fields.
- *Reduce nutrient inputs to streams and wetlands.* Increased retention times along with re-established vegetation in restored wetland areas will reduce fertilizers used in blackberry and soybean agricultural production before runoff enters the streams.

Secondary project goals include:

- *Improve instream habitat by diversifying the stream bedform and introducing habitat structures and woody debris.* Large woody debris, brush toe meander bends, other woody structures, and native stream bank vegetation will be installed to improve both instream and terrestrial habitat value throughout the riparian corridor.
- *Reduce agricultural pollution from pesticides and herbicides used on adjacent fields by improving wetlands and buffers to treat runoff.* Restored wetland areas will provide treatment for agricultural runoff from blackberry and soy bean fields that are sprayed with pesticides and herbicides.

2.0 Project Site Location and Selection

2.1 Directions to Project Site

The site is located in central Lincoln County, NC, as shown in Figure 1. The site is approximately 3.4 miles northwest of the City of Lincolnton and approximately 23 miles north of the South Carolina state line. The proposed project is located in agricultural production fields, surrounded by agricultural fields and woods.

From Charlotte, NC, take US-85 South approximately 18 miles to US-321 in Gastonia, NC. Take exit 17 for US-321 North and continue approximately 14 miles. Take exit 24 for NC 27 North / NC 150 toward Lincolnton. Continue onto Main Street in downtown Lincolnton, which will go through a roundabout at the Lincoln County Civil Court. Continue on US 27 N/ Main Street by taking the 3rd exit on the roundabout. Main Street becomes Riverside Drive. In approximately 3 miles, turn right onto Rock Dam Road at St. Dorothy's Catholic Church and Kid's Dome. After 0.6 miles, turn right onto Owls Den Road. The entrance to the Owl's Den Farm is on the left in approximately 2 miles.

2.2 Site Selection and Project Components

The site has been selected to provide stream mitigation units (SMUs) and wetland mitigation units (WMUs) in the Catawba River Basin. The site was selected based on the current degraded condition of streams and wetlands and the potential for functional restoration.

The project includes a combination of stream restoration, wetland rehabilitation, and wetland re-establishment. The streams proposed for restoration include HC1 and HC2, as illustrated on Figure 2. The surrounding floodplain is composed of jurisdictional wetlands planned for rehabilitation and relic wetland areas planned for re-establishment.

3.0 Site Protection Instrument

The land required for construction, management, and stewardship of this mitigation project is located on a single parcel owned by one landowner, Owl's Den Farm, LLC, as summarized in Table 1. A template of the site protection instrument is included in Appendix 1. Figure 2 shows the approximate location of the proposed conservation easement.

Table 1. Site Protection Instrument
Owl's Den Mitigation Site

Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage to be Protected
Owl's Den Farm, LLC	83614-13-5713	Lincoln	Conservation Easement	TBD	13.2

All site protection instruments require 60-day advance notification to the Corps and the State prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

4.0 Baseline Information –Project Site and Watershed Summary

Table 2 presents the project information and baseline watershed information. The watershed areas were delineated using 4 foot topographic LIDAR data and are shown on Figure 3.

Table 2. Project and Watershed Information
Owl's Den Mitigation Site

Project County	Lincoln
Project Area (acres)	13.2
Project Coordinates	35°29'33.22"N, 81°18'45.95"W
Physiographic Region	Inner Piedmont Belt
Ecoregion	Southern Piedmont Belt
River Basin	Catawba

USGS HUC (8 digit, 14 digit)	03050102, 03050102040040 (Expanded Service Area for 03050103)
NCDWR Sub-basin	03-08-35

Reaches	HC1	HC2
Drainage Area (acres)	152	27
Drainage Area (square miles)	0.24	0.04
CGIA Land Use Classification		
Developed	<1%[1]	<1%[1]
Forested/Scrubland	7%	4%
Agriculture/Managed Herb.	93%	96%
Watershed Impervious Cover	<1% [1]	<1% [1]

[1] Farm buildings are present within the watershed, however no developed or impervious cover is present within the project watershed per the CGIA Land Use Classification data set.

4.1 Watershed Historical Land Use and Development Trends

Land use within the site's watershed is historically rural and dominated by agriculture and forest and is currently approximately 94% agriculture and 6% forested. A review of historical aerials from 1951, 1973, 1984, 1993, 1998, 2005, 2006, 2008, 2009, and 2010 verified that land use on the site and in the watershed has remained relatively consistent for the past 62 years (historic aerial photos are included in Appendix 2). The site was used as cattle pasture until approximately 2007 when it was switched to agricultural crops. The site is currently used for blackberry and soybean production.

There are no signs of impending land use changes or development pressure evident in the project watershed or the larger Howard's Creek watershed. Mr. Josh Grant, a planner with the Lincoln County Planning and Inspections, reviewed the site and watershed conditions during a telephone interview and confirmed that the historic agricultural and low density residential land uses in the watershed are expected to continue for the foreseeable future (20+ years), with no indications of land use shifts in the long term. No transportation projects, major roadway improvements, or significant development are planned for the area (Grant, 2013). The Conservation Easement will prohibit future development in the immediate riparian zone of the onsite streams.

4.2 Watershed Assessment

On August 8, 2013, Wildlands conducted a watershed assessment to verify current land uses observed from the aerial photography and to identify potential stressors. The project's watershed is relatively small and is mostly contained on the Owl's Den Farm. Watershed streams include two unnamed tributaries to Howards Creek, HC1 and HC2, and some associated farm drainages. During the watershed assessment, observations were conducted on HC1 and HC2 upstream of the project boundary and along farm drainages higher in the watershed. Consistent with the aerial photography, watersheds to HC1 and HC2 upstream of the project site consist of primarily cropland and a small amount of forest. No recent disturbances were noted beyond land tillage associated with agriculture operations. The upstream ends of HC1 and HC2 have small pockets of forest, including a mature Piedmont Bottomland Forest (Schafale & Weakley, 1990) that exists upstream of the project limits of HC1. However, the vast majority the watershed streams have little to no buffer and have been impacted from current or past agricultural activities including straightening and ditching.

Blackberries are the primary production crop of the 75-acre Owl's Den Farm with plants first established in 2008 and the first harvest occurring in 2009. Active farming occurs from late March through early September each year, with harvesting through early October. Fertilizer is applied through the drip irrigation system five days per week, once per day. NPK 4-0-8 or 5-0-20 fertilizer application is formulated based on crop leaf samples. In addition, pesticides and fungicides are applied approximately once per week via an air blast sprayer. Herbicides are applied approximately one time per month during active farming (Rudsell, 2013).

Standard agricultural practices such as application of fertilizers and pesticides can potentially introduce excess nutrients such as nitrogen and other pollutants into surface water and groundwater. The location of project reaches and wetland areas make them susceptible to water quality impacts from the adjacent agricultural practices.

Upstream of the project area, HC1 is a stable, well vegetated channel flowing through floodplain wetlands. A few farm ditches above the project convey runoff from the surrounding fields into the project area. The majority of these ditches were well vegetated with minor areas of erosion contributing sediment. Based on watershed conditions observed during the assessment, it appears that the project streams have low sediment supply primarily due to stable, well-vegetated drainages higher in the watershed.

The USEPA's STEPL pollutant loading watershed model was used to estimate sediment load delivered to the project area from the watershed. The model uses the revised Universal Soil Loss Equation (RUSLE), rainfall data for the county, watershed stream conditions, and land use data to estimate sediment load from the watershed. Due to the lack of tilling needed for the established blackberry bushes, the soil erosion rates contributed by this particular agricultural practice are relatively low. Several ditches flow through the watershed area to the site, but the relatively small size of these ditches does not contribute much sediment volume due to ditch bank erosion. The model estimates that the watershed supplies 12 tons of sediment per year to the project area.

4.3 Physiography, Geology, and Soils

The Owl's Den Mitigation site is located in the Inner Piedmont Belt of the Piedmont physiographic province. The Piedmont is characterized by gently rolling, well-rounded hills with long low ridges, with elevations ranging anywhere from 300 to 1500 feet above sea level. The Inner Piedmont consists of metamorphosed igneous and sedimentary rock including gneiss and schist that has been intruded by younger granitic rocks (NCGS, 2013). The underlying geology of the proposed restoration site is mapped as late Proterozoic to Cambrian age (900 to

500 million years in age) amphibolite and biotite gneiss (CZab) (NCGS, 1985). This unit is described as interlayered beds of hornblende gneiss, metagabbro, mica schist, and granitic rock. No areas of shallow bedrock were observed on site during the existing conditions assessment work.

Soil mapping units are based on the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey of Lincoln County. Soils in the project area floodplain are mapped as Chewacla loam, Helena sandy clay loam, Riverview loam, and Worsham fine sandy loam. These soils are described below in Table 5.3. A soils map is provided in Figure 4.

Table 3. Floodplain Soil Types and Descriptions
Owl's Den Mitigation Site

Soil Name	Location	Description
Chewacla loam	Mapped along the upper and middle portion of HC1 and lower half of HC2.	Chewacla soils are found in Piedmont river valleys. They are somewhat poorly-drained alluvial soils with a seasonal high water table of 6-24 inches. This soil unit is frequently flooded or ponded.
Helena sandy clay loam	A small area is mapped in the eastern floodplain of HC1 and HC2.	Helena soils are typically found on broad ridges and toeslopes. They are very deep, moderately well-drained soils with low permeability. This soil is not typically flooded or ponded.
Riverview loam	Mapped along the lower floodplain of HC1 near the confluence with Howards Creek.	Riverview soils are found in floodplains. They are well-drained soils with low to moderate permeability. The soil is occasionally flooded for brief periods during the winter and spring.
Worsham fine sandy loam	Mapped within the northern third of the project area including the upper portion of HC2.	Worsham soils are found in depressions, at the heads of drains, and at the base of slopes. They are poorly-drained soils consisting of loamy alluvium derived from granite, gneiss, or schist. This soil is not frequently flooded or ponded, but has a seasonal high water table of 0-12 inches.

Source: Lincoln County Soil Survey, USDA-NRCS, http://efotg.nrcs.usda.gov

4.4 Valley Classification

The Owl's Den project area is located in the Inner Piedmont Belt and the surrounding fluvial landforms are typical of this region. The valley topography has a gentle to moderate slope south towards Howards Creek. A majority of the valley is within the floodplain of Howards Creek and as a result, is broad and flat. A dendritic drainage pattern exists as drainages cut through the larger floodplain working their way towards Howards Creek. The valley is alluvial, but the streams are low-gradient and have a low sediment supply and are not actively adjusting. The surrounding fluvial and morphological landforms fit most closely to a VT VII, Fluvial-Dissected valley, according to the Rosgen valley classification system (Rosgen, 2013).

4.5 Surface Water Classification and Water Quality

On May 23 and 24, 2013, Wildlands investigated on-site jurisdictional waters of the U.S. using the U.S. Army Corps of Engineers (USACE) Routine On-Site Determination Method. This method is defined in the 1987 Corps of Engineers Wetlands Delineation Manual and subsequent Eastern Mountain and Piedmont Regional Supplement. Determination methods included stream classification utilizing the NCDWR Stream Identification Form and the USACE Stream Quality Assessment Worksheet. Potential jurisdictional wetland areas as well as typical upland areas were classified using the USACE Wetland Determination Data Form.

The results of the on-site field investigation indicate that there are two jurisdictional stream channels located within the proposed project area which are unnamed tributaries to Howards Creek (HC1 and HC2). Both on-site channels were determined to be perennial by Wildlands personnel. The USACE conducted a site walk on September 9, 2013, and issued a jurisdictional verification on September 23, 2013, (Action ID 2010-00717) which is included in Appendix 3.

Eight jurisdictional wetland areas were identified within the proposed project area (Wetlands A – H) and are located adjacent to HC1 and HC2, as shown in Figure 2. Appendix 3 contains a figure showing the overview of the site assessment data points. Wetland Determination Data Forms representative of on-site jurisdictional wetlands as well as non-jurisdictional upland areas have been enclosed in Appendix 3 (DP1-DP13). Site photographs are included in Appendix 4.

The North Carolina Division of Water Resources (NCDWR) assigns best usage classifications to State Waters that reflect water quality conditions and potential resource usage. The project drains to Howards Creek Branch (DWQ Index No. 11-129-4) which has been classified as Class C waters for aquatic life and secondary recreation.

5.0 Baseline Information – Reach Summary

On-site existing conditions assessments were conducted by Wildlands between April and July 2013. The locations of the project reaches and surveyed cross sections are shown in Figure 6. Existing geomorphic survey data is included in Appendix 5. Table 4 presents the reach summary information.

Table 4. Reach Summary Information
Owl's Den Mitigation Site

	HC1 Reach 1	HC1 Reach 2	HC2
Restored Length (LF)	815	940	698
Valley Type	VT VII	VT VII	VT VII
Valley Slope (feet/ foot)	0.0061	0.0075	0.0059
Drainage Area (acres)	62	152	27
Drainage Area (square miles)	0.10	0.24	0.04
NCDWR stream ID score	31.5	37.5	31.5

	HC1 Reach 1	HC1 Reach 2	HC2
Perennial or Intermittent	P	P	P
NCDWR Classification	C	C	C
Rosgen Classification of Pre-Project Reach	Modified G5c[1]	Modified C5[1]	Modified G6c[1]
Simon Evolutionary Stage	IV	IV	IV
FEMA classification	AE[2]	AE[2]	AE[2]

1. The Rosgen classification system is for natural streams. These channels have been heavily manipulated by man and therefore the Rosgen classification system is not applicable. These classifications are provided for illustrative purposes only.

2. The project site reaches do not have regulated floodplain mapping, but are located within the Howard's Creek floodplain.

5.1 Existing Stream and Vegetation Condition

HC1 is broken into two separate reaches for assessment and design. HC1 Reach 1 enters the site from a forested wetland complex west of the site and flows east until the confluence with HC2. HC1 Reach 2 begins at the confluence of HC1 Reach 1 and HC2 and flows south/southeast until the confluence with Howards Creek. HC1 Reach 1 has been channelized to provide drainage for surrounding cropland. Impacts to the stream include straightening, widening, and a lack of stabilizing riparian vegetation. The adjacent floodplain has been cleared for agricultural use. The right floodplain is currently being farmed for soybeans. The left floodplain is maintained open field not used for agriculture due to occasional flooding conditions which are not conducive to crop production. A narrow riparian corridor of trees and shrubs exists along the stream banks but is dominated by invasive Chinese privet (*Ligustrum sinense*). Canopy species include box elder (*Acer negundo*), river birch (*Betula nigra*), tag alder (*Alnus serrulata*), American sycamore (*Platanus occidentalis*), red maple (*Acer ruburm*), and shagbark hickory (*Carya ovate*). Beyond the narrow buffer the left floodplain is dominated by herbaceous species including common blackberry (*Rubus argutus*), soft stem rush (*Juncus effuses*), smooth sumac (*Rhus glabra*), spiny amaranth (*Amaranthus spinosus*), American pokeweed (*Phytolacca americana*), Johnson grass (*Sorghum halepense*), multiflora rose (*Rosa multiflora*), curlydock (*Rumex crispus*), wingstem (*Verbesina alternifolia*), Pennyslvania smartweed (*Polygonum pensylvanica*), dogfennel (*Eupatorium capillifolium*), and various grass species (*Festuca* spp.).

Similar to HC1 Reach 1, HC1 Reach 2 has been straightened, widened, and deepened, and the channel is disconnected from its historic floodplain. Bank scour is occurring in meander bends and at constrictions in the channel. The adjacent floodplain is maintained for agricultural purposes. The right floodplain is currently farmed for soybeans while the left is maintained open field. The majority of HC1 Reach 2 lacks a tree canopy to provide shade and moderate water temperatures. The lower third of the reach has a narrow riparian corridor consisting of mature trees and shrubs similar to those along HC1 Reach 1.

HC2 originates from a wetland complex and groundwater seep, flowing south to its confluence with HC1. Available historic aerial photos dating to 1951 show HC1 close to its current location and receiving runoff from adjacent hillsides which appear to already be in agricultural production of some variety (Appendix 2). HC2 has been heavily manipulated historically and the stream is very straight with a uniform bed lacking bedform diversity. Like HC1, the riparian zone is actively maintained and the channel banks are vegetated with herbaceous species and a few shrubs.

5.2 Stream Geomorphology

Geomorphic assessments were conducted for each project reach. Data collection included surveying representative cross sections and longitudinal profiles, conducting reach-wide pebble counts, and bed material sampling. Collected data is included in Appendix 5.

The streams exist in an unnatural condition due to historic and ongoing manipulation, maintenance, and agricultural activities; therefore, reliable bankfull features were difficult to identify. The effective discharge was estimated using methods outlined Section 5.5; this effective discharge was routed through the surveyed cross sections to quantify existing condition bankfull dimensions for descriptive purposes. Existing geomorphic conditions for each reach included in the project are summarized below in Table 5 and the reaches are mapped on Figure 6.

Table 5. Existing Stream Conditions
Owl's Den Mitigation Site

	Notation	Units	HC1 Reach 1		HC1 Reach 2		HC2	
			Min	Max	Min	Max	Min	Max
stream type			Modified G5c[1]		Modified C5[1]		Modified G6c[1]	
drainage area	DA	sq mi	0.10		0.24		0.04	
bankfull discharge	Q	cfs	8		14		5	
bankfull cross-sectional area	A_{bkf}	SF	2.7	7.2	7.9	9.7	2.9	3.5
average velocity during bankfull event	v_{bkf}	fps	1.3	1.6	1.5	1.8	1.4	1.7
Cross-Section								
width at bankfull	w_{bkf}	feet	8.9	10.4	5.4	12.7	5.4	8.9
maximum depth at bankfull	d_{max}	feet	0.9	1.3	1.0	2.4	0.8	0.9
mean depth at bankfull	d_{bkf}	feet	0.5	0.8	0.8	1.5	0.4	0.5
bankfull width to depth ratio	w_{bkf}/d_{bkf}		10.9	19.1	3.7	16.6	10.0	22.3
low bank height		feet	2.0	2.5	2.6	5.8	2.7	3.8

	Notation	Units	HC1 Reach 1		HC1 Reach 2		HC2	
			Min	Max	Min	Max	Min	Max
bank height ratio	BHR		1.9	2.2	1.7	5.1	3.3	4.1
floodprone area width	w_{fpa}	feet	11	25	15	181	9	14
entrenchment ratio	ER		1.1	2.8	1.2	16.1	1.6	
Slope								
valley slope	S_{valley}	feet/ foot	0.0061		0.0075		0.0059[2]	
channel slope	$S_{channel}$	feet/ foot	0.0034		0.0030		0.0068[2]	
Profile								
riffle slope	S_{riffle}	feet/ foot	0.0094		0.00045	0.0053	0.0046	0.012
riffle slope ratio	$S_{riffle}/S_{channel}$		2.76		0.15	1.77	0.67	1.76
pool slope	S_{pool}	feet/ foot	0	0.0001	0.00054		0.0018	0.0055
pool slope ratio	$S_{pool}/S_{channel}$		0	0.026	0.18		0.26	0.81
pool-to-pool spacing	L_{p-p}	feet	83	165	100	215	90	148
pool spacing ratio	L_{p-p}/w_{bkf}		10	16	15	16.8	16.7	16.6
pool cross-sectional area	A_{pool}	SF	7.2		13.5		N/A[3]	
pool area ratio	A_{pool}/A_{bkf}		1.0		1.7		N/A[3]	
maximum pool depth	d_{pool}	feet	1.3		1.3		N/A[3]	
pool depth ratio	d_{pool}/d_{bkf}		1.0		1.3		N/A[3]	
pool width at bankfull	w_{pool}	feet	8.2		12.8		N/A[3]	
pool width ratio	w_{pool}/w_{bkf}		0.8		2.4		N/A[3]	
Pattern								
sinuosity	K		1.00		1.01		1.01	
belt width	w_{blt}	feet	N/A	N/A	N/A	N/A	N/A	N/A
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	N/A	N/A	N/A	N/A
meander length	L_m	feet	N/A	N/A	N/A	N/A	N/A	N/A
meander length ratio	L_m/w_{bkf}		N/A	N/A	N/A	N/A	N/A	N/A
radius of curvature	R_c	feet	N/A	N/A	N/A	N/A	N/A	N/A
radius of curvature ratio	R_c/w_{bkf}		N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
Particle Size Distribution from Reach Wide Grab Sample								
d_{50} Description			fine sand				silt/clay	
	d_{16}	mm	0.0062				0.0018	
	d_{35}	mm	0.089				0.012	
	d_{50}	mm	0.206				0.047	
	d_{84}	mm	0.790				0.259	

	Notation	Units	HC1 Reach 1		HC1 Reach 2		HC2	
			Min	Max	Min	Max	Min	Max
	d_{95}	mm	1.5				0.430	
	d_{100}	mm	4.8				4.8	

Notes:
1. The Rosgen classification system is for natural streams. These channels have been heavily manipulated by man and therefore the Rosgen classification system is not applicable. These classifications are provided for illustrative purposes only.
2. Channels become more incised in downstream direction, causing channel slope to be steeper than valley slope.
3. Pool to pool spacing and pool slope were taken from profile, no pool cross section was taken on HC2.
4. Existing streams have no pattern due to channel straightening and manipulation.

Channelization usually includes straightening and deepening of streams and is one of the major causes of channel down-cutting or incision (Simon, 1989; Simon and Rinaldi, 2006). Based on Simon's model termed the Channel Evolution Model for Incised Rivers (1989), alluvial streams typically follow a sequential series of evolutionary stages as they respond and ultimately recover from impacts due to channelization or major changes to hydrologic and sediment regime. Pre-disturbance is considered Stage I – Equilibrium. Stage II – Channelization – occurs when the stream is either directly channelized by man through ditching or channelization occurs as an indirect result of hydrologic or sediment regime changes in the watershed. These actions take the stream out of equilibrium and alluvial channels will incise and degrade in response to the excess stream energy associated with Stage II. This incision process is Stage III – Degradation. As the bottom of the channel continues to erode and stream banks are undercut, the banks will begin to fail and the channel widens as it degrades. This next stage is classified as Stage IV – Degradation and Widening. Eventually, the stream slope will decrease enough that the stream stops incising but continues to widen through alternate bank erosion and aggradation (Stage V – Aggradation and Widening). At Stage V, new bankfull features begin to establish at a lower position relative to the old valley floor, and the stream continues to widen its new floodplain through alternate bank erosion until it eventually returns to a state of quasi-equilibrium (Stage VI). Lateral adjustment processes (migration) are often associated with Stages IV and V.

HC1 and HC2 are maintained as agricultural ditches with historic removal of the vegetated buffer. The site was an active cattle farm through 2007. Since 2007 when cattle were removed, the vegetation surrounding the ditches has been annually maintained and the ditched wetland complex provides drainage from the current blackberry farm irrigation system. The straightened and altered channels are best described as Stage II. The system shows no signs of re-establishing stable floodplain features of its own. Due to the low observed sediment supply from these watersheds, the sediment accumulation necessary to reform a stable channel at a lower elevation may take a very long time.

Restoration has been selected as the appropriate treatment approach in order to establish a stable cross-section, pattern, and profile rather than stabilizing a poorly functioning channel in place or allowing a stable channel system to form at a lower elevation over time. Raising the channels with a Priority 1 restoration approach will re-connect the currently disconnected channels with adjacent floodplain wetlands to restore an integrated stream-wetland habitat complex.

5.3 Channel Stability Assessment

Wildlands utilized a modified version of the Rapid Assessment of Channel Stability as described in Hydrologic Engineering Circular HEC-20 (Lagasse, 2001). The method is semi-quantitative and incorporates thirteen stability indicators that are evaluated in the field. In a 2007 publication, the Federal Highway Administration (FHWA) updated the method for HEC-20 by modifying the metrics included in the assessment and incorporating a stream type determination. The result is an assessment method that can be rapidly applied on a variety of stream types in different physiographic settings with a range of bed and bank materials.

The Channel Stability Assessment protocol was designed to evaluate 13 parameters: watershed land use, status of flow, channel pattern, entrenchment/channel confinement, bed substrate material, bar development, presence of obstructions and debris jams, bank soil texture and coherence, average bank angle, bank vegetation, bank cutting, mass wasting/bank failure, and upstream distance to bridge. Each parameter is individually rated on a scale of Excellent, Good, Fair, or Poor per FHWA guidelines. Lower scores are indicative of increased stability. Ratings are as follows:

- Excellent (1-3 points)
- Good (4-6 points)
- Fair (7-9 points)
- Poor (10-12 points)

Once all parameters are scored, the overall stability of the stream is then classified with similar scoring adjectives (Excellent, Good, Fair, or Poor). The adjectives assigned to the streams are as follows:

- Excellent (< 41)
- Good (41 to less than 70)
- Fair (70 to less than 98)
- Poor (98 or higher)

As the protocol was designed to assess stream channel stability near bridges, two minor modifications were made to the methodology to make it more applicable to project specific conditions. The first modification involved adjusting the scoring so that naturally meandering streams score lower (better condition) than straight and/or engineered channels. Because straight, engineered channels are hydraulically efficient and necessary for bridge protection, they score low (excellent to good rating) with the original methodology. Secondly, the last assessment parameter – upstream distance to bridge – was removed from the protocol because it relates directly to the potential effects of instability on a bridge and should not influence stability ratings for the streams assessed for this project. The final scores and corresponding ratings were based on the twelve remaining parameters.

The HEC-20 manual also describes both lateral and vertical components of overall channel stability which can be separated with this assessment methodology. Some of the 13 parameters described above relate specifically to either vertical or horizontal stability. When all parameter scores for the vertical category or all parameter scores for the horizontal category are summed and normalized by the total possible scores for their respective categories, a vertical or horizontal fraction is produced. These fractions may then be compared to one another determine if the channel is more vertically or horizontally unstable.

The assessment results for the streams on the Owl's Den Site indicate that all of the streams rated in the second to the lowest category – fair. Parameters that scored poorly include watershed characteristics, bed material, bar development, and bank angle. For HC1, the lateral fraction was slightly greater than the vertical fraction. This indicates that lateral instability is a greater problem for this channel than vertical instability. For HC2, the vertical fraction was greater than the lateral fraction, indicating that vertical instability and incision is a greater threat than lateral instability. Total scores, stability ratings, and vertical and horizontal fractions are provided in Table 6.

Table 6. Existing Conditions Channel Stability Assessment Results
Owl's Den Mitigation Site

Parameter	HC1 Reach 1	HC1 Reach 2	HC2
1. Watershed characteristics	10	10	11
2. Flow habit	5	6	5
3. Channel pattern	7	7	8
4. Entrenchment	7	8	7
5. Bed material	8	10	10
6. Bar development	10	10	10
7. Obstructions	4	5	3
8. Bank soil texture and coherence	3	3	3
9. Average bank slope angle	8	7	10
10. Bank protection	8	8	8
11. Bank cutting	5	4	5
12. Mass wasting or bank failure	4	4	3
Score	79	82	83
Rating	Fair	Fair	Fair
Lateral Fraction	0.57	0.65	0.48
Vertical Fraction	0.50	0.64	0.53

5.4 Design Discharge Development

Several methods were used to develop bankfull discharge estimates of the project reaches. The resulting values were compared and best professional judgment was used to determine the specific design discharge for each project reach.

The methods to estimate discharge included:

1. The published North Carolina rural Piedmont drainage area – discharge relationships (Harman, et al., 1999) shown on Figure 8;
2. The recently completed provisional North Carolina rural Piedmont/ Mountain drainage area- discharge relationships (Walker, unpublished) also shown on Figure 8;

3. Drainage area-discharge relationships developed from reference reaches selected for this project;
4. Regional flood frequency analysis developed for this project;
5. USGS flood frequency equations for rural watersheds in the North Carolina Piedmont region (Weaver, et al., 2009);
6. Discharge estimates of existing channels at top of bank to estimate an upper limit discharge;
7. Site specific observations.

5.4.1 NC Rural Piedmont Regional Curve Predictions

The published NC rural Piedmont curve was used to estimate discharge based on drainage area using regional relationships (Harman, et al., 1999). Figure 8 illustrates the NC Piedmont curve along with other data used for these analyses.

5.4.2 Provisional Updated NC Piedmont/Mountain Regional Curve Predictions

The draft updated curve for rural Piedmont and mountain stream channels was used to estimate discharge based on drainage area using regional relationships (Walker, unpublished). Experience indicates that the original NC Curves often over-predict bankfull discharge for smaller stream systems. The original rural curve was developed using both gaged and ungaged sites. The methods used to develop discharge estimations for the ungaged sites are believed to have over-estimated the points on the discharge curve (Walker, 2013). In addition, some of the gaged sites used in the original rural curve may have been somewhat incised, with bank height ratios up to 1.5. This enlargement may have contributed to larger discharge values used in development of the curve (Harman, 2013). The updated curves appear to be a better predictor of bankfull parameters for many streams. This updated curve is also plotted on Figure 8.

5.4.3 Drainage Area- Discharge Relationships from Reference Reaches

Reference reaches for this project included three sites utilized for discharge reference data. The three sites surveyed as discharge references are Unnamed Tributary (UT) to Lyle Creek with a drainage area of 0.25 square miles, UT to the Catawba River with a drainage area of 1.6 square miles, and the Vile Preserve Reach with a drainage area of 1.1 square miles. These data were used as a comparison to the bankfull discharge estimations derived from regional discharge relationships described above. Bankfull features were surveyed at each site and Manning's equation was used to estimate a discharge corresponding to the bankfull stage of each. These estimates of bankfull discharge were plotted on Figure 8 for comparison to regional curves and other methods of estimating discharge. The reference reach discharge estimates plot near or below the other data sets. One of these points plots below the lower 95% confidence interval of the published regional curves. The other two points appear to plot below the published regional curve and appear to be similar to the unpublished updated regional curve trend. More information about reference reaches and their geomorphology is provided in Section 8.0 of this report.

5.4.4 *Regional Flood Frequency Analysis*

Five USGS stream gage sites were identified within reasonable proximity of the project site for use in development of a project specific regional flood frequency analysis. Data from these gages were used to develop a regional flood frequency curve as described by Dalrymple (1960). The gages used were:

- 2142000 – Lower Little River near All Healing Springs , NC (drainage area 28.2 square miles);
- 2143000 – Henry Fork near Henry River, NC (drainage area 83.2 square miles);
- 2152100 – First Broad River near Casar, NC (drainage area 60.5 square miles);
- 2143500 – Indian Creek near Laboratory, NC (drainage area 69.2 square miles); and
- 214269560 – Killian Creek near Mariposa, NC (drainage area 36.4 square miles).

The five gages passed the homogeneity test. While each of these gages represents a larger drainage area than the project reaches, ranges of discharge for 1.2, 1.5, and 1.8-year events were similar in magnitude to values developed from other various sources. As a result, the discharge data obtained from the regional flood frequency analysis for these three recurrence interval events were considered and incorporated in design discharge determination.

5.4.5 *USGS Flood Frequency Equations for Rural Watersheds in the Piedmont*

USGS flood frequency equations for rural watersheds in the North Carolina Piedmont Region 1 (USGS, 2009) were used to estimate peak discharges for each reach for floods with a recurrence interval of 2, 5, 10, and 25 years.

5.4.6 *Discharge Analysis of Existing Channel Top of Bank*

Manning's equation was used to calculate the discharge in each of the project reaches for the channel-filling flow at existing tops of the banks. These values provide an upper limit on the possible range of design discharges but are likely larger than bankfull flow.

5.4.7 *Site Specific Considerations*

Wildlands has worked on several stream and wetland complexes on mitigation sites previously. The hydrology in these diverse systems differs from the hydrology in a stream only scenario. An increased amount of storage capacity is available in floodplains of the project streams during large events. In addition, part of the wetland reestablishment is restoring a natural flooding regime to the system which relies heavily on floodplain connection. Available wetland storage capacity and the desired floodplain inundation were considered when estimating design discharge for the site reaches.

5.4.8 *Design Discharge Selection*

In consideration of each of these discharge estimates, low baseflow characteristics, size of contributing watersheds, desired restoration of a natural flooding regime, and experience designing stream and wetland complexes, Wildlands selected the design discharge values in the lower range that can be supported by available data. Design values were selected most similar to the provisional updated Walker curve predictions and to the reference reach estimates. Table 7 summarizes the results of each of the discharge analyses described in this section and the final selected design discharge for each of the project reaches.

Table 7. Design Discharge Analysis Summary
Owl's Den Mitigation Site

Discharge Estimation Method	HC1 Reach 1	HC1 Reach 2	HC2
Drainage Area (square miles)	0.10	0.24	0.04
NC Piedmont Regional Curve (cfs)	16	32	9
Draft Walker NC Regional Curve (cfs)	9	18	5
Reference Reach Analysis (cfs)	8	13	5
Regional Flood Frequency Analysis 1.2-year event (cfs)	4	8	2
Regional Flood Frequency Analysis 1.5-year event (cfs)	5	11	2
Regional Flood Frequency Analysis 1.8-year event (cfs)	6	14	3
USGS Rural Regression Extrapolation 2-year event (cfs)	35	62	20
USGS Rural Regression Extrapolation 5-year event (cfs)	68	120	41
USGS Rural Regression Extrapolation 10-year event (cfs)	94	164	57
Existing Condition Top of Bank Upper Range Max (cfs)	44	52	74
Design Discharge (cfs)	**8**	**14**	**5**

6.0 Baseline Information – Wetland Summary

Table 8 presents the baseline wetland information.

Table 8. Wetland Summary Information
Owl's Den Mitigation Site

	Wetland A	Wetland B	Wetland C	Wetland D
Size of Wetland (acres)	0.44	0.13	1.08	0.81
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Chewacla and Worsham	Chewacla and Worsham	Worsham	Chewacla, Helena, and Worsham
Drainage Class	Poorly drained	Poorly drained	Poorly drained	Moderately well drained to poorly drained
Soil Hydric Series	Chewacla and Worsham	Chewacla and Worsham	Worsham	Chewacla, Helena, and Worsham
Source of Hydrology	Groundwater, overbank flooding	Groundwater, overbank flooding	Groundwater, overbank flooding	Groundwater, overbank flooding
Hydrologic Impairment	Ditching	Ditching	Ditching	Ditching
Native vegetation community	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest
% exotic invasive vegetation	0%	0%	0%	0%
	Wetland E	**Wetland F**	**Wetland G**	**Wetland H**
Size of Wetland (acres)	0.13	0.01	0.13	0.15
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Chewacla	Chewacla and Riverview	Chewacla	Chewacla and Worsham
Drainage Class	Poorly drained	Well to poorly drained	Poorly drained	Poorly drained

Soil Hydric Series	Chewacla	Chewacla and Riverview	Chewacla	Chewacla and Worsham
Source of Hydrology	Groundwater, overbank flooding	Groundwater, overbank flooding	Groundwater, overbank flooding	Groundwater, overbank flooding
Hydrologic Impairment	Ditching	Ditching	Ditching	Ditching
Native vegetation community	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest
% exotic invasive vegetation	20%	0%	0%	0%

6.1 Jurisdictional Wetlands

On April 23 and 24, 2013, Wildlands delineated jurisdictional waters of the U.S. within the project easement area. Potential jurisdictional areas were delineated using the USACE Routine On-Site Determination Method. This method is defined by the 1987 Corps of Engineers Wetlands Delineation Manual and subsequent Eastern Mountain and Piedmont Regional Supplement. The results of the on-site jurisdictional determination indicate that there are eight jurisdictional wetlands located within the project easement. These wetlands (Wetland A – H) range in size from 0.01 to 1.08 acres (see Table 8) and are located within maintained agricultural fields (Figure 6). The wetlands exhibited pockets of inundation typically less than three inches deep, saturation within the upper 12 inches of the soil profile, water stained leaves, drainage patterns, and low-chroma soils (10YR 5/2 to 7.5YR 4/1) with distinct mottles (10YR 5/6 to 5YR 4/6). Vegetation within the wetlands has been heavily managed, resulting in a dominant herbaceous strata layer with little to no trees. Routine On-Site Data Forms have been included in Appendix 3.

Based on an adjacent reference area (discussed in Section 8.2), it was determined that these jurisdictional features historically functioned as Headwater Forest prior to their conversion to agricultural fields. The North Carolina Wetland Assessment Method (NCWAM) was used to evaluate the level of hydrologic function, water quality, and habitat condition for each wetland on the site. The majority of on-site wetlands scored out as low functioning systems when compared to reference conditions due to the heavy agricultural impacts over several decades along and aggressive vegetation management. Low-scoring functional parameters include the effects of ditching and soil compaction on surface and subsurface storage, reduced aquatic and terrestrial habitat quality, and poor connection to adjacent natural habitats. NCWAM Wetland Rating Sheets representative of these jurisdictional wetland areas are enclosed in Appendix 3.

6.2 Hydrologic Characterization

In order to develop a wetland restoration design for the Owl's Den Site, an analysis of the existing and proposed conditions for groundwater hydrology was necessary. DrainMod (version 6.1) was used to model existing and proposed groundwater hydrology at the site. DrainMod simulates water table depth over time and produces statistics describing long term water table characteristics and an annual water budget. DrainMod was selected for this application because it is a well-documented modeling tool for assessing wetland hydrology (NCSU, 2010) and is commonly used in wetland creation and restoration projects. For more information on DrainMod and its application to high water table soils see Skaggs (1980).

6.2.1 Groundwater Modeling

For the Owl's Den wetlands, four total models were developed and calibrated to represent the existing and proposed conditions at four different groundwater monitoring gage locations across the site. The locations of the monitoring wells are shown in Figure 6. Resulting model output was used to validate the wetland restoration plan and to develop a water budget for the site. The modeling procedures are described below.

Data Collection

DrainMod models are built using site hydrology, soil, climate, and crop data. Prior to building the models, an on-site soils investigation was done to confirm areas of potentially hydric soils. Further explanation of the site soils can be found in Section 6.3 of this report. Temperature data were obtained from nearby weather station Lincolnton 4W (Station 314996). Precipitation data for the 2013 model year was obtained from Vale Ag 2SW (Station 318906), and historical precipitation data was obtained from Lincolnton 4W (Station 314996). The Lincolnton 4W and Vale Ag 2SW stations are operated by the National Oceanic and Atmospheric Administration (NOAA) National Weather Service. The data sets for these stations were obtained from the National Climatic Data Center (NCDC) from January 1958 through July 2013. These data were used to calibrate the models and perform the long term simulations. Information to develop model inputs for crops currently grown onsite was obtained through site observations.

Existing Conditions Base Model Set up and Calibration

Six groundwater monitoring gages were installed on the site as (Figure 6). After analysis of the site and gage data, Wildlands created models to represent four of the gages (gage 2, 3, 5, and 6). The models were developed using the conventional drainage option with the hydrologic analysis of wetlands feature incorporated to best simulate the drainage of the site. Each of the four gages was installed in April 2013 and recorded groundwater depth twice per day with In-situ Level TROLL® 100 or 300 pressure transducers. The period from April through Late July 2013 was used as the calibration period for the groundwater models.

The first step in developing the model was to prepare input files from various data sources. A baseline soil input file was developed using published soil survey data collected for the mapped soils found on-site (NRCS, 2011). The soil files were refined by adjusting certain parameters for each of the mapped soils using in-situ soil profiles and characterizations. Temperature and precipitation data from nearby weather stations, described above, were used to produce weather input files for each model.

After the necessary input files for the existing models were created, the project settings were adjusted for this application and then calibration runs for each model were conducted. To calibrate the model, soil parameters not measured in the field were adjusted within the limits typically encountered under similar soil and geomorphic conditions. In addition, the effective drain spacing in the model drainage design parameters for groundwater gages 5 and 6 were adjusted. Adjusting the effective drain spacing is a recommended calibration method for modeling gages with irregular drainage spacing – when a ditch or channel exists on only one adjacent side (Northcott, 2001; Skaggs, 2012). A consistent factor of the spacing was used to calibrate existing models to ensure consistency when evaluating the long term proposed models and ensure a conservative estimate of wetland hydrology. After calibration of each of the models was complete, the calibrated models were used as the basis for the proposed conditions models. Plots showing the calibration results are included in Appendix 6.

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

Proposed Conditions Model Setup

The proposed conditions models were developed based on the calibrated existing conditions models to predict whether wetland criteria would be met over a long period of historical climate data. Proposed plans for the site include realigning the streams to increase sinuosity and raising the stream bed inverts. In addition, existing ditches that currently help drain the site will be filled. Grading is proposed on a majority of the site excluding areas which are defined as jurisdictional wetlands. The proposed grading will decrease the surface elevation of the existing site to bring hydric soils within the top 12 inches of the soil. Cut depth is limited to approximately 12 inches throughout the site. The proposed wetland areas will be disked and planted with native wetland plants.

Settings for the proposed conditions model were altered to reflect these changes to the site. To account for changes to stream alignments, the ditch spacing values in the models were altered. Proposed grading and raised channel beds related to stream restoration were modeled by reducing depths from the soil surface to the draining channels for the modeled wells. Changes in the vegetation on the site were simulated by altering the rooting depth of plants on the site from shallow depths for pasture grasses to consistent deeper values for hardwood tree species. Surface storage values were increased at all gages to account for proposed disking to the site. Once the proposed conditions models were developed, each model was run for a 55-year period from January 1958 through December 2012 using temperature and precipitation data from the Lincolnton 4W NOAA weather station.

Modeling Results and Conclusions

DrainMod was used to compare calibrated existing conditions models with proposed conditions scenarios to determine the effect of proposed practices on local hydrology.

Each gage location was evaluated to establish how often annual wetland criteria would be met over the 55-year simulation period. Wetland criteria are defined as free water within 12 inches of the ground surface for a specified consecutive percent of the growing season.

The model run simulations indicate that groundwater gages 2 and 3 (Figure 6), located on the northern side of the site and surrounded by existing jurisdictional wetland areas, function very similarly. Model results show high water tables in these areas with frequent inundation in the top 12 inches of the soil. Existing farm drainages adjacent to gages 2 and 3 are being filled. Filling the adjacent drainages will reduce the drawdown near the gages and raise the overall water table in this area. Expansion and improvement of existing jurisdictional areas will occur as a result of the improved hydrology. The model results support the proposed design by showing increased inundation periods for the areas where ditched drainage channels are being filled.

Groundwater gages 5 and 6 are located farther south on the site and are farther from existing jurisdictional areas (Figure 6). Model run simulations utilizing the proposed design conditions for these gages showed a significant increase in inundation within the top 12 inches of soil for the modeled period. Increases in inundation in these areas are attributed to design changes incorporated into the long term model based on the stream restoration design. Model results supported that decreased channel depths and increased drainage spacing due to stream restoration would increase inundation near the surface of these areas.

Model simulations were then analyzed to predict the success of the groundwater hydrology function on the site. The wetland performance standard evaluated is that the water table must be within 12 inches of the ground surface at each gage for a minimum of 8.1% (18 consecutive days) of the growing season (March 28 through November 4).

The modeling results show that all gages would meet the performance standard most years if the site is restored by raising the stream bed, removing the existing on-site ditches, and implementing grading to lower ground surface. Table 9 presents model results and depicts the number of years out of the 55-year monitoring period that each gage is expected to meet the performance standard and the target hydroperiod.

Table 9. Modeling Results Showing Expected Performance by Gage Location Owl's Den Mitigation Site

Gage ID	Number of Years Meeting Performance Standard (8.5%)	Performance Standard Success Rate
2	47	85%
3	54	98%
5	40	73%
6	45	82%

6.2.2 Surface Water Modeling at Restoration Site

Surface water runoff contributions are minimal for groundwater gages 2 and 6 therefore the wetland models were simulated as precipitation only contributions. Groundwater gages 3 and 5 receive some overland flow from the adjacent hill slope. To account for the additional water input into the system, the surface water contributing area runoff utility in DrainMod was utilized. Contributing areas for groundwater gages 3 and 5 were determined as 0.4 acres and 3.7 acres, respectively.

The site will also benefit from overbank flooding as a result of the raised stream beds and modified stream dimensions. Restoring the natural flooding regime of the site through channel restoration will increase periods of inundation at groundwater gages 5 and 6 especially. DrainMod is unable to account for overbank flooding; as a result groundwater gages 5 and 6 show slightly lower performance standard success rates.

6.2.3 Hydrologic Budget for the Restoration Site

DrainMod computes daily water balance information and outputs summaries that describe the loss pathways for rainfall over the model simulation period. Tables 10a – 10d summarize the average annual amount of rainfall, infiltration, drainage, runoff, and evapotranspiration estimated for the four modeled locations onsite. Infiltration represents the amount of water that percolates into the soil. Drainage is the loss of infiltrated water that travels through the soil profile and is discharged to the drainage ditches or to underlying aquifers. Runoff is water that flows overland and reaches the drainage ditches before infiltration. Evapotranspiration is water that is lost by the direct evaporation of water from the soil or through the transpiration of plants. From the water balance results provided in the tables it can be seen that, in all cases, evapotranspiration is larger in the proposed condition when compared to the existing condition. Runoff is lower from proposed conditions as compared to existing conditions. The reduction of the runoff by creating surface storage through site modification increases infiltration into the system. As a result of increased saturated soil conditions due to runoff reductions and increased infiltration, wetland criteria are met by the proposed models during most modeled years with the same precipitation inputs as the existing conditions models.

Table 10a. Summary Water Balance for Gage 2
Owl's Den Mitigation Site

Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)
Precipitation	119.7	100%	119.7	100%
Runon	0.00	0%	0.0	0%
Precip + Runon	119.7	100%	119.7	100%
Infiltration	107.5	90%	112.0	94%
Evapotranspiration	79.6	67%	86.4	72%
Drainage	27.9	23%	25.6	21%
Runoff	12.2	10%	7.6	6%

Table 10b. Summary Water Balance for Gage 3
Owl's Den Mitigation Site

Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)
Precipitation	119.7	67%	119.7	67%
Runon	58.9	33%	58.9	33%
Precip + Runon	178.5	100%	178.5	100%
Infiltration	90.6	51%	103.0	58%
Evapotranspiration	62.5	35%	71.5	40%
Drainage	13.4	8%	21.0	12%
Runoff	87.9	49%	75.5	42%

Table 10c. Summary Water Balance for Gage 5
Owl's Den Mitigation Site

Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)
Precipitation	119.7	52%	119.7	52%
Runon	108.7	48%	108.7	48%
Precip + Runon	228.3	100%	228.3	100%
Infiltration	114.1	50%	116.8	51%
Evapotranspiration	79.0	35%	87.9	39%
Drainage	35.3	16%	28.9	13%
Runoff	114.2	50%	111.5	49%

Table 10d. Summary Water Balance for Gage 6
Owl's Den Mitigation Site

Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)
Precipitation	119.7	100%	119.7	100%
Runon	0.00	0%	0.0	0%
Precip + Runon	119.7	100%	119.7	100.0%
Infiltration	103.0	86%	114.7	95.0%
Evapotranspiration	88.8	74%	91.4	76.4%
Drainage	14.3	12%	23.4	19.5%
Runoff	16.7	14%	5.0	4.2%

6.3 Soil Characterization

A preliminary investigation of the existing soils within the project area was performed by a licensed soil scientist (LSS) on October 11, 2012. Fifty-three (53) soil cores were analyzed at locations across the site to provide data to refine NRCS soils mapping units and establish areas suitable for wetland restoration. Soil texture, Munsell chart hue, chroma and value, and hydric soil characteristics were recorded for each core. The LSS took an additional one hundred twenty four (124) soil cores on an approximate 50-foot grid across the site on June 12, 2013, to measure the depth to hydric indicators to aid in developing a wetland grading plan. Figures and data from the two investigations are included in Appendix 6.

6.3.1 Taxonomic Classification

Four soils are mapped within the boundaries of the wetland project area in the NRCS Soil Survey (NRCS, 2013). The site is predominantly mapped as Chewacla (ChA) loam in the southern half and Worsham (WoA) fine sandy loam in the northern half. Two additional soil units Helena (HeB) sandy loam and Riverview (RvA) loam are mapped on the edges of the site. Analysis of the soil core samples collected from the project site along with consideration of site topography indicated that soil classifications at 15 out of the 156 soil boring locations agreed with the mapped soil units. Soil borings also indicated that mapped hydric soils have been buried by fill material placed over a majority of the site. Portions of the fill material have developed enough hydric indicators to classify as hydric.

All soils mapped on site are listed on the NC Hydric Soil list. Worsham is listed as a hydric "A" soil. Chewacla soils contain hydric inclusions, and when identified as hydric, resemble the Wehadkee series. If soils classified as Chewacla soils contain hydric inclusions, they are typically abundant making the soil easily identified as hydric, which is the case on the Owl's Den site. Helena soils also contain hydric inclusions with periodic episaturation and reduction. Riverview series are typically found in loamy alluvialum floodplains – landscape positions that potentially result in hydric inclusions. The majority of wetland re-establishment is being proposed within the Worhsam and Chewacla soil series boundaries. Wetland re-establishment design is outlined in Section 11.2.

6.3.2 Profile Description

The Chewacla series is described in the NRCS official series description as a floodplain soil that is very deep, somewhat poorly drained found on zero to two percent slopes. The typical texture profile of the Chewacla loam is a fine sandy loam at zero to four inches, a silt loam to clay loam from four to 38 inches, and silt loam to silt clay loam from 38 to 60 inches. The Worsham series is described as a very deep poorly drained soils found on uplands of the piedmont with zero to eight percent slope. The texture profile of the Worsham series is loam to silt loam from zero to eight inches, sandy clay loam from eight to 50 inches, and sandy clay loam from 50 to 70 inches. The Helena series is described as very deep, moderately well-drained series found on slopes of zero to 15 percent. The Helena has a texture profile described as loam from zero to 12 inches, clay loam from 12 to 19 inches, and clay from 19 to 43 inches. The Riverview series contains very deep, well-drained soils on floodplains ranging from zero to 5 percent slope. The texture profile is described as silt loam to very fine sandy loam from zero to six inches, sandy clay loam from six to 39 inches, and sand from 39 to 70 inches.

6.3.3 Hydraulic Conductivity

The Chewacla series has a moderate permeability and consists of somewhat poorly-drained soils. Average saturated hydraulic conductivity for this series is 14 micrometer/sec in the upper 30 inches of the soil. The Helena series is a very deep, moderately well-drained soil with slow permeability. Hydraulic conductivity for this soil averages 13.0 micrometers/sec in the upper 30 inches of the profile. The Worsham series is a very deep, poorly-drained soil type with very slow permeability. Hydraulic conductivity averages 2.9 micrometers/sec in the upper 30 inches of the profile. All three series are considered hydric and typically form in depressions or on floodplains with characteristically low slopes.

6.4 Vegetation Community Type Descriptions and Disturbance History

The existing vegetation communities within the proposed project area are predominately maintained open fields. Based on historical aerials, agriculture has been the predominant land use on this property since 1951. Due to heavy agricultural activities and vegetation management over the past several decades, several major strata are completely absent from this area resulting in a dominant herbaceous layer with little to no mature trees or understory growth. Dominant species in these areas include soft stem rush, shallow sedge, pale touch-me-not (*Impatiens pallida*), green arrow arum (*Peltandra virginica*), strawcolored flatsedge (*Cyperus strigosus*), arrowleaf tearthumb (*Polygonum sagittatum*), Pennsylvania smartweed (*Polygonum pensylvanicum*), and purplestem aster (*Polygonum puniceum).* Sparse tree and sapling species include black willow (*Salix nigra*), green ash (*Fraxinus pennsylvanica*), and river birch.

7.0 Baseline Information - Regulatory Considerations

A Categorical Exclusion has been completed and approved to satisfy federal funding requirements. This package is included in Appendix 7. Table 11 summarizes regulatory considerations for the project.

Table 11. Regulatory Considerations
Owl's Den Mitigation Site

	Applicable?	Resolved?	Supporting Documentation
Waters of the US – Section 404	Yes	PCN prepared	Appendix 3 & 8
Waters of the US – Section 401	Yes	PCN prepared	Appendix 3 & 8
Endangered Species Act	Yes	Yes	Appendix 7
Historic Preservation Act	Yes	Yes	Appendix 7
Coastal Zone Management Act/Coastal Area Management Act	No	N/A	N/A
FEMA Floodplain Compliance	Yes	No impact application to be prepared for local review	Appendix 9
Essential Fisheries Habitat	Yes	Yes	Appendix 7

7.1 401/404

As discussed in Section 4.5, the results of the onsite field investigation indicate that two channels HC1 and HC2 are jurisdictional within the project limits. Additionally there are eight jurisdictional wetland areas (Wetland A - H) located in the proposed project area (Figure 6) totaling 2.88 acres. The project stream and wetlands will be protected under the conservation easement placed on the property. A copy of the Jurisdictional Determination is included in Appendix 3.

Impacts to existing wetland areas related to the site design were avoided to the extent possible, as shown in Figure 9. Small areas of grading will be required on the edge of several wetlands and low-quality wetland ditch features within Wetland C and H will be filled, totaling 0.52 acres cumulative of temporary impacts across the site. This minor grading is considered a temporary impact since, in all cases, hydrology and vegetation will be improved in the wetland areas after grading and site restoration is completed. There are no permanent impacts.

7.2 Endangered and Threatened Species

7.2.1 Site Evaluation Methodology

The Endangered Species Act (ESA) of 1973, amended (16 U.S.C. 1531 et seq.), defines protection for species with the Federal Classification of Threatened (T) or Endangered (E). An “Endangered Species” is defined as “any species which is in danger of extinction throughout all or a significant portion of its range” and a “Threatened Species” is defined as “any species which is likely to become an Endangered Species within the foreseeable future throughout all or a significant portion of its range” (16 U.S.C. 1532).

Wildlands utilized the U.S. Fish and Wildlife Service (USFWS) and North Carolina Natural Heritage Program (NHP) databases in order to identify federally listed Threatened and Endangered plant and animal species for Lincoln County, NC (USFWS, 2008 and NHP, 2009). The Lincoln County listed endangered species include the Michaux’s sumac (*Rhus michaauxii)* and dwarf-flowered heartleaf (*Hexastylis naniflora*).

Table 12. Listed Threatened and Endangered Species in Lincoln County, NC
Owl’s Den Mitigation Site

Species	Federal Status	Habitat
Vascular Plant		
Dwarf-flowered heartleaf (*Hexastylis naniflora*)	T	Along bluffs and adjacent slopes, in boggy areas next to streams and creek heads
Michaux’s sumac (*Rhus michauxii*)	E	Sandy or rocky open woods; highway right-of-ways, roadsides, and edges of maintained clearings
E = Endangered; T=Threatened		

7.2.2 *Threatened and Endangered Species Descriptions*

<u>Michaux's Sumac</u>

Michaux's sumac is a rhizomatous, densely hairy shrub that typically stands 1 meter or less in height. The shrub has compound leaves with evenly serrated, oblong to lanceolate, acuminate leaflets. The species is found in sandy or rocky open areas where disturbance has occurred such as roadsides, powerline clearings, and the edges of maintained clearings.

<u>Dwarf-Flowered Heartleaf</u>

Dwarf-flowered heartleaf is a low-growing evergreen perennial plant. It has heart-shape leaves that are 4 to 5 inches (10.2 to 12.7 centimeters) long, dark green and leathery, supported by long thin leaf stems connecting it to an underground stem. The jug-shaped flowers are usually beige to dark brown or purple and appear from mid-March to early June. The flowers are small and inconspicuous and are found near the base of the leaf stems, often buried beneath the leaf litter. Dwarf-flowered heartleaf grows in acidic soils along bluffs and adjacent slopes, in boggy areas next to streams and creek heads, and along the slopes of nearby hillsides and ravines.

7.2.3 *Biological Conclusion*

A pedestrian survey was conducted on October 11, 2012 to review the site for the dwarf-flowered heartleaf and Michaux's sumac. Michaux's sumac is best suited for open areas resulting from of disturbance. Historically this may have been in the form of fire. Modern day potential habitats include mechanically cleared roadsides, utility right-of-ways, and along the edges of maintained clearings. During the pedestrian survey no individuals, populations, or suitable habitat were observed. On-site habitat was determined to be unsuitable for this species due to heavy vegetation maintenance and low light regimes from an abundance of invasive privet along wooded edges.

Typical habitat for dwarf-flowered heartleaf includes north-facing slopes, bluffs, and boggy areas containing acidic sandy loam soils within deciduous forests. The pedestrian survey revealed that no suitable habitat for dwarf-flowered heartleaf exists within the project limits due to the project's position within a broad flat valley and unsuitable soil conditions. No individual species or populations were observed.

It was determined that the project would result in "no effect" on any of the listed species.

7.2.4 *USFWS and NCWRC Concurrence*

Wildlands requested review and comment from the USFWS on March 26, 2013, regarding the results of the site investigation and the project's potential impacts on threatened or endangered species. NCWRC responded on April 17, 2013 and stated they "do not anticipate the project to result in significant adverse impacts to aquatic and terrestrial wildlife resources." The USFWS has not responded at this time. Since no response was received from the USFWS within a 30-day time frame, it is assumed that the site determination is correct and that no additional, relevant information is available for this site. All correspondence is included in Appendix 7.

7.3 Cultural Resources

7.3.1 Site Evaluation Methodology

The National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470), defines the policy of historic preservation to protect, restore, and reuse districts, sites, structures, and objects significant in American history, architecture, and culture. Section 106 of the NHPA mandates that federal agencies take into account the effect of an undertaking on any property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

7.3.2 SHPO/THPO Concurrence

There are a few existing structures in the project vicinity including a barn and few farm structures located north of the project area. There are no structures within the project area. A letter was sent to the North Carolina State Historic Preservation Office (SHPO) on March 26, 2013, requesting review and comment on cultural resources potentially affected by the project. SHPO responded on April 30, 2013, and stated they were aware of no historic resources that would be affected by the project. All correspondence with SHPO is included in Appendix 7.

7.4 FEMA Floodplain Compliance and Hydrologic Trespass

Howards Creek is mapped in a Zone AE Special Flood Hazard Area (SFHA) on Lincoln County Flood Insurance Rate Map Panel 3604 (Figure 10). Base flood elevations have been defined and non-encroachment limits have been published in the Lincoln County Flood Insurance Study (FIS). HC1 and HC2 do not have designated SFHAs but do lie within the SFHA of Howards Creek. Effective hydraulic modeling for Howards Creek has been obtained from the NC Floodplain Mapping Program. The EEP Floodplain Requirements Checklist is included in Appendix 9. The project will be designed to avoid adverse floodplain impacts within the Howards Creek floodplain or on adjacent parcels.

The only area with potential for increased backwater is at the project headwaters of HC1 Reach 1. As a result of raising stream bed elevations to reconnect the reach with the project floodplain, a small amount of water will be backed up the existing channel. Upstream of the existing HC1 channel is a forested wetland and stream complex that is part of the project parcel. Therefore, there is no potential for hydrologic trespass for the project.

7.5 Site Access and Utilities

The project site is accessible from Owl's Den Road. The project includes one easement crossing which will be excluded from the easement area. The culverted crossing area is not included in the mitigation credit calculation for the site.

An existing electrical utility line is located within the proposed easement area. This existing utility line is proposed to be relocated and buried outside the easement area along the existing farm road. The buried utility will not interfere with the proposed project conservation easement and/or wetland and stream credits on the site.

8.0 Reference Sites

8.1 Reference Streams

Five reference reaches were used to support the design of the project reaches (Figure 7). Reference reaches can be used as a basis for design or, more appropriately, as one source of information on which to base a stream restoration design. Most, if not all, reference reaches identified in the North Carolina Piedmont are in heavily wooded areas and the mature vegetation contributes greatly to their stability. Design parameters for this project were also developed based on the design discharge along with dimensionless ratio values associated with successful restoration designs of streams in the North Carolina Piedmont. Reference reach data for similar streams were obtained from existing data sets and used to verify design parameters. These reference streams were chosen because of similarities to the project streams including drainage area, valley slope and morphology, situation of a small tributary within a larger creek floodplain, and bed material.

Vile Preserve is a perennial stream located in the floodplain of the South Fork Catawba River approximately 5.5 miles north of the project site. The site has a broad forested wetland floodplain. The stream and wetland complex receives runoff from adjacent uplands. The stream is completely connected to the floodplain wetlands with a bank height ratio of 1 and an entrenchment ratio over 30. The reach has a low slope with a sandy substrate and classifies as a Rosgen E5 stream type. The channel dimension, interaction with the floodplain wetland, proximity to the project site, and similar stream substrate make it an applicable reference reach.

UT to Lyle Creek is a perennial stream located in the floodplain of Lyle Creek. Similar to the project reaches, the stream receives drainage from the adjacent wooded uplands. This stream is fully connected to the floodplain with a bank height ratio of 1.0 and an entrenchment ratio of over 2.5. The width-to-depth ratio is 31.7 and the overall channel slope is approximately 0.4%. UT to Lycle Creek has a sinuosity of 1.7. In-stream habitat features within this reach include shallow pools, woody debris, and small sections of tree roots. This channel classifies as a Rosgen C5 stream type (1994).

UT to Catawba River is a perennial stream that flows into the relatively flat Catawba River floodplain from the adjacent steep wooded valley, east of NC Highway 10. The channel is well connected to the floodplain with an entrenchment ratio over 5.8 and a bank height ratio of 1.0. This reach exhibited a sinuosity of 1.3, well-established pools at the outside of channel bends, several well-developed riffles, and habitat features such as woody debris jams, fallen logs across the channel, and root mats along the banks. This stream classifies as a Rosgen E5 stream type.

UT to Lake Wheeler is a perennial, low slope stream that flows into a lake approximately one quarter mile downstream from the reference site and experiences some backwater effects. The stream is very well connected to its floodplain with an entrenchment ratio of 15.7. The stream exhibits a low bankfull width-to-depth ratio of 6.5 and high sinuosity of 1.6. This stream is classified as a Rosgen E4 stream type (Lowther, 2008).

Westbrook Lowlands is a perennial, very low slope stream. The stream flows through a very flat valley similar to the stream site. The stream is well connected to the floodplain with a bank height ratio of 1.0. The stream has a width to depth ratio of 12.0. Westbrook Lowlands is classified as a Rosgen E/C stream type (EBX, 2002).

Geomorphic conditions and dimensionless ratios for all the reference sites are summarized below in Table 13.

Table 13. Summary of Reference Reach Geomorphic Parameters
Owl's Den Mitigation Site

			Vile Preserve Reference Reach		UT to Lyle Creek		UT to Catawba River		UT to Lake Wheeler		Westbrook Lowlands	
Parameter	Notation	Units	min	max	min	max	min	max	min	max	min	max
stream type			E5		C5		E5		E4		E/C5	
drainage area	DA	sq mi	1.09		0.25		1.60		0.40		0.90	
bankfull discharge	Q_{bkf}	cfs	12		14		73		N/A[1]		N/A[3]	
bankfull cross-sectional area	A_{bkf}	SF	4.5	5.3	7.3		20.8		17.4		8.0	
average velocity during bankfull event	v_{bkf}	fps	2.5		1.9		3.5		N/A[2]		N/A[3]	
Cross-Section												
width at bankfull	w_{bkf}	feet	4.5	6.2	15.2		13.8		10.6		9.7	
maximum depth at bankfull	d_{max}	feet	1.4		1.4		2.0		2.2		1.1	
mean depth at bankfull	d_{bkf}	feet	0.9		0.5		1.5		1.6		0.8	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		4.5	7.4	31.7		9.1		6.5		12.0	
depth ratio	d_{max}/d_{bkf}		1.4	1.7	2.8		1.3		1.4		1.4	
bank height ratio	BHR		1.0		1.0		1.0		N/A[2]		1.0	
floodprone area width	w_{fpa}	feet	200+		38+		53		N/A[2]		100+	

			Vile Preserve Reference Reach		UT to Lyle Creek		UT to Catawba River		UT to Lake Wheeler		Westbrook Lowlands	
Parameter	Notation	Units	min	max	min	max	min	max	min	max	min	max
entrenchment ratio	ER		30+		2.5+		5.8+		15.7		2.2+	
Slope												
valley slope	S_{valley}	ft/ft	0.0074		0.0082		0.0060		0.0100		0.0027	
channel slope	$S_{channel}$	ft/ft	0.0069		0.0048		0.005		0.0060		0.0022	
Profile												
riffle slope	S_{riffle}	ft/ft	0.0063		0.0055	0.0597	0.0110	0.0600	0.043		N/A[3]	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9		1.1	12.4	2.5	13.3	7.2		N/A[3]	
pool slope	S_{pool}	ft/ft	0.0048		0.0000	0.0013	0.0012	0.0030	0.0000		0.0005	
pool slope ratio	$S_{pool}/S_{channel}$		0.7		0.0	0.3	0.3	0.7	0.0		0.2	
pool-to-pool spacing	L_{p-p}	feet	44.8		15	28	31	60	42		16	59
pool spacing ratio	L_{p-p}/w_{bkf}		7.2	10.0	1.0	1.8	2.8	5.4	4.0		1.6	6.1
pool cross-sectional area at bankfull	A_{pool}	SF	4.5		6.9		24.5		20.6		N/A[3]	
pool area ratio	A_{pool}/A_{bkf}		0.9	1.0	0.9		1.2		1.2		N/A[3]	
maximum pool depth at bankfull	d_{pool}	feet	1.4		1.7		2.9		1.4		1.5	
pool depth ratio	d_{pool}/d_{bkf}		1.6		3.4		1.9		0.9		1.9	
pool width at bankfull	w_{pool}	feet	4.5		8.6		21.8		15.4		8.0	10.0
pool width ratio	w_{pool}/w_{bkf}		0.7		0.6		1.6		1.5		0.8	1.0
Pattern												
sinuosity	K		1.1		1.7		1.3		1.6		1.2	
belt width	w_{blt}	feet	19		21		55		26	64	14	20
meander width ratio	w_{blt}/w_{bkf}		3.1	4.2	1.3		4.0		6.0	11.0	1.4	2.1
meander length	L_m	feet	29	45	39	44	65	107	40	191	50	
meander length ratio	L_m/w_{bkf}		6.4	7.3	2.6	2.9	4.7	7.8	3.8	18.0	5.2	

			Vile Preserve Reference Reach		UT to Lyle Creek		UT to Catawba River		UT to Lake Wheeler		Westbrook Lowlands	
Parameter	Notation	Units	min	max	min	max	min	max	min	max	min	max
radius of curvature	R_c	feet	27	50	19	32	31	56	8	34	15	27
radius of curvature ratio	R_c/w_{bkf}		4.5	8.1	1.3	2.1	2.2	4.1	0.8	3.2	1.5	2.8
Sediment												
d_{50} Description			Medium Sand[5]		Fine Sand		V. Coarse Sand		V. Fine Gravel		Coarse Sand	
Reach Wide	d_{16}	mm	0.2		-		0.3		N/A[2]		N/A[3]	
	d_{35}	mm	0.3		0.1		0.4		N/A[2]		N/A[3]	
	d_{50}	mm	0.4		0.2		1.8		2.6		0.7	
	d_{84}	mm	0.9		0.5		12.8		N/A[2]		N/A[3]	
	d_{95}	mm	2.0		4.0		25.2		N/A[2]		N/A[3]	
	d_{100}	mm	9.0		8.0		90.0		N/A[2]		N/A[3]	

Notes:

1. N/A[1]: Lowther reported a range of possible discharges from 46.8 to 108.9 cfs based on different Mannings 'n' estimateion techniques (Lowther, 2008).
2. N/A[2]: Data not provided in reference reach report (Lowther, 2008).
3. N/A[3]: Data not provided in Neu-Con Umbrella Wetland and Stream Mitigation Bank Westbrook Lowgrounds Site Specific Mitigation Plan (Environmental Bank and Exchange 2002).
4. N/A[4]: Pavement and subpavement analysis not performed on this reach.
5. [5]Based on a Reach Wide Sample, not a reach wide pebble count.

8.2 Reference Wetlands

A reference wetland was identified within the forested area upstream of HC1 Reach 1 (Figure 6) adjacent to the project site. This area is a mature Piedmont Bottomland Forest (Schafale & Weakley, 1990) that is located within the floodplain of the tributary flowing into HC1 Reach 1. The hydrology of this system is intermittently, temporarily, or seasonally flooded. Unlike the project site, the reference area has not been disturbed by clearing or ditching. As a result, mature vegetation has been established and the natural flooding regime has been preserved. The close proximity of the reference area to the project site provides the best reference information to use in rehabilitating and reestablishing wetlands on the project site. The reference area exhibits similar soil types and very similar topographic form to project site. This area may represent the original condition of the project site prior to disturbances. The vegetation at the reference site will be used as a basis to develop the planting plan for the wetland restoration and creation on the project site. A groundwater monitoring gage was also installed on the reference site to document the reference wetland hydrology (Figure 6). This information will be used to provide a comparison for the reestablished and rehabilitated wetland hydrology throughout the monitoring period.

8.2.1 *Hydrological Characterization*

Climatic conditions of the reference site are the same as those described for the project site. Hydrology is influenced by the high water table, the main channel of the tributary that flows through the site and small braided drainages that flow through the floodplain areas during wet periods. Due to the shallow, unincised condition of the main tributary through the site and drainage from upland areas, high water table conditions are sustained across the active floodplain. A groundwater monitoring well was installed in the reference site and monitoring data were collected from July 24, 2013 through November 2013, recording water level data twice per day. The current recorded data were all within the specified growing season of the site (March 28 -November 4). During the recorded period, 33 consecutive days of saturation existed within the top 12 inches of the soil column. The 33 day duration of saturation is well beyond the 8.1% (18 day) criteria previously defined in Section 6.2.1 (Groundwater Modeling) of this report. These hydrology data support that the reference site has the appropriate hydrologic regime to serve as a reference condition for the project site. The reference gage will continue to record water table depth throughout the post-construction monitoring period. In the event of unusual weather during the post-construction monitoring period, the reference well performance will be used as a check for the mitigation site performance.

8.2.2 *Soil Characterization and Taxonomic Classification*

The soils on the reference site are mapped as Chewacla loam according to the NRCS soil mapping. Chewacla loam is also present in the floodplain areas of the channels to be restored on the project site. Chewalca loam is listed on the NC hydric soil list. Taxonomic classification, profile description, and hydraulic conductivity information are provided in Sections 6.3.1, 6.3.2, and 6.3.3 respectively.

8.3 *Reference Vegetation Community Descriptions*

Historical aerials reveal no recent disturbances to the reference property and no disturbances were observed in the field. The existing vegetation communities are typical of a Bottomland Hardwood Forest and include mature canopy tree species, moderate subcanopy and shrub species, as well as an herbaceous layer. Dominant canopy species include river birch, green ash, sycamore, box elder, and red maple. Understory species include ironwood and spicebush with Chinese privet existing along the outer tree line in the forested buffer. The herbaceous layer within the reference wetland included arrow arum, jewelweed, lizard's tail, and microstegium.

9.0 Determination of Credits

9.1 *Stream Mitigation Credits*

Mitigation credits presented in Table 14 are projections based upon site design. The site is submitted for mitigation credit in the Catawba 03050103 expanded service area. Upon completion of site construction, the project components and credits data will be revised to be consistent with the as-built condition.

9.2 Wetland Mitigation Credits

Mitigation credits presented in Table 14 are projections based upon site design of wetland rehabilitation in established jurisdictional areas and re-establishment in adjacent areas.

A credit ratio of 1.3:1 is proposed for the rehabilitation work on site due to the significant improvement to wetland functions proposed related to hydrology, soils, and vegetation. Hydrology will be restored to wetland areas by raising adjacent stream channels that currently have a draining effect on jurisdictional wetlands. The stream channels will be restored to an appropriate cross section dimension to allow for frequent overbank flooding of riparian wetland areas. Invasive species will be removed and a riparian wetland vegetation community will be established. This vegetation community will support habitat and will also provide shade for cooling of surface water and groundwater recharge sources.

A credit ratio of 1:1 is proposed for re-establishment work on site to recognize the restoration of soils, hydrology, and vegetation to areas that are currently non-jurisdictional. A detailed soil boring grid was used to identify areas of non-hydric overburden that will be removed to uncover wetland soils. This re-establishment work will result in a gain of aquatic resources in both area and function.

In addition to the improvements to and increases in area of the aquatic resources on the site as mentioned in the above paragraphs, the credit ratios proposed are further supported by the water quality treatment that will be provided by the rehabilitated and re-established wetlands. The restored stream-wetland complex at the site will provide treatment for the agricultural runoff from the adjacent agricultural fields that drain to the wetlands. As described in Sections 1.0 and 4.2, active farming contributes nutrients, pesticides, and herbicides to runoff that will be directly treated by the proposed restoration of the stream and wetland complex before it reaches Howard's Creek. This site offers a rare opportunity to improve wetland functions in a location that will directly affect runoff water quality.

Table 14. Determination of Credits
Owl's Den Mitigation Site

Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	2,453	0	9.5	N/A	N/A	N/A	N/A	N/A	N/A

Project Components							
Project Component or Reach ID	Existing Footage / Acreage	Proposed Stationing/Location	Approach (P1, P2, etc.)	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage or Acreage	Mitigation Ratio	Proposed Credit
HC1 Reach 1	609	99+94 to 108+09	P1	Restoration	815 LF	1:1	815 SMU
HC1 Reach 2	994	108+09 to 115+35	P1	Restoration	726 LF	1:1	726 SMU
		115+65 to 117+79	P1	Restoration	214 LF	1:1	214 SMU
HC2	444	200+00 to 206+98	P1	Restoration	698 LF	1:1	698 SMU
Wetland A	0.44 AC	N/A	significant improvement to wetland functions	Rehabilitation	0.44 AC	1.3:1	0.3 WMU
Wetland B	0.13 AC	N/A	significant improvement to wetland functions	Rehabilitation	0.13 AC	1.3:1	0.1 WMU
Wetland C	1.03 AC	N/A	significant improvement to wetland functions	Rehabilitation	1.03 AC	1.3:1	0.8 WMU
Wetland D	0.81 AC	N/A	significant improvement to wetland functions	Rehabilitation	0.81 AC	1.3:1	0.6 WMU
Wetland E	0.13 AC	N/A	significant improvement to wetland functions	Rehabilitation	0.13 AC	1.3:1	0.1 WMU
Wetland G	0.13 AC	N/A	significant improvement to wetland functions	Rehabilitation	0.13 AC	1.3:1	0.1 WMU
Wetland H	0.15 AC	N/A	significant improvement to wetland functions	Rehabilitation	0.15 AC	1.3:1	0.1 WMU

Wetland Re-Establishment Area	7.3 AC	N/A	planting, hydrologic improvement	Re-Establishment	7.3 AC	1:1	7.3 WMU

Component Summation					
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)	Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
Restoration	2,453	N/A	N/A	N/A	N/A
Enhancement	0	N/A	N/A	N/A	N/A
Enhancement I	0	N/A	N/A	N/A	N/A
Enhancement II	0	N/A	N/A	N/A	N/A
Creation	N/A	N/A	N/A	N/A	N/A
Wetland Rehabilitation	N/A	2.8 AC	N/A	N/A	N/A
Wetland Re-Establishment	N/A	7.3 AC	N/A	N/A	N/A
Preservation	N/A	N/A	N/A	N/A	N/A
High Quality Preservation	N/A	N/A	N/A	N/A	N/A

Note: Due to the size (0.01 Acre) and location of Wetland F, no mitigation credit is being claimed for this area.

10.0 Credit Release Schedule

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary DA authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the Interagency Review Team (IRT), will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described as follows:

Table 15A. Credit Release Schedule – Forested Wetlands Credits
Owl's Den Mitigation Site

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance	10%	50%

Monitoring Year	Credit Release Activity	Interim Release	Total Released
	standards are being met		
3	Third year monitoring report demonstrates performance standards are being met	10%	60%
4	Fourth year monitoring report demonstrates performance standards are being met	10%	70%
5	Fifth year monitoring report demonstrates performance standards are being met; Provided that all performance standards are met, the IRT may allow the EEP to discontinue hydrologic monitoring after the fifth year, but vegetation monitoring must continue for an additional two years after the fifth year for a total of seven years.	10%	80%
6	Sixth year monitoring report demonstrates performance standards are being met	10%	90%
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval	10%	100%

Table 15B. Credit Release Schedule – Stream Credits
Owl's Den Mitigation Site

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50% (60%)
3	Third year monitoring report demonstrates performance standards are being met	10%	60% (70%)
4	Fourth year monitoring report demonstrates performance standards are being met	5%	65% (75%)
5	Fifth year monitoring report demonstrates performance standards are being met	10%	75% (85%)
6	Sixth year monitoring report demonstrates performance standards are being met	5%	80% (90%)
7	Seventh year monitoring report demonstrates performance standards are being met and project has received closeout approval	10%	90% (100%)

10.1 Initial Allocation of Released Credits

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

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

10.2 Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 10% of a site's total stream credits shall be released after two bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than two bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the EEP will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

11.0 Project Site Mitigation Plan

11.1 Proposed Stream Design Summary

HC1 and HC2 stream reaches will be restored based on the surrounding landscape, climate, and natural vegetation communities with strong consideration for restoring ecologically beneficial hydrologic conditions in both the streams and the adjacent floodplain wetland resources. Figure 9 illustrates the proposed concept design for the site.

All stream restoration reaches included in the design for this project will be constructed as C/E type streams according to the Rosgen classification system (Rosgen, 1996). C/E streams are meandering streams with well-developed floodplains and gentle average gradients of 2% or less. C/E streams occur within a wide range of valley types and are appropriate for the project landscape. The stream restoration elements of the project will be constructed as Priority 1 restoration. The only exception will be a short transitional zone along HC1 Reach 2 constructed as Priority 2 to tie into Howards Creek at the downstream project limits.

The existing conditions assessment of the onsite streams revealed incised and overly-wide streams that have been historically impacted by agricultural activities. In-stream bedform diversity is extremely poor and the longitudinal profile is dominated by shallow runs. The lack of bedform diversity combined with continued anthropogenic disturbance has resulted in degraded aquatic habitat, altered hydrology (related to loss of floodplain connection and lowered water table), and water quality concerns such as lower dissolved oxygen levels (due to shallow flow with few re-aeration points). A maintained, herbaceous riparian zone does not provide adequate shade to the channel, which can result in higher in-stream temperatures. Additionally, nutrients from fertilizer application on the adjacent farm may be able to runoff to the stream channel more quickly due to the lack of mature buffer vegetation. Direct sun exposure combined with high nutrient levels creates suitable conditions for algal blooms. Algal blooms can further deplete dissolved oxygen as algae die and decompose. Due to historic agricultural impacts and maintenance practices, the onsite streams are not free-formed or self-maintaining. Due to the low observed sediment supply from these watersheds, the sediment accumulation necessary to reform a stable channel at a lower elevation may take a very long time. Intervention with Priority 1 restoration is the appropriate design approach to re-establish a functioning stream-wetland complex on the Owl's Den Mitigation Site.

The stream restoration construction will result in meandering channels sized to convey the design discharge. Flows larger than the design discharge will frequently flood the adjacent floodplain and wetlands. The reconstructed channel banks will be built with stable side slopes, planted with native materials, matted, and seeded for stability. The sinuous plan form of the channel will be built to mimic a natural Piedmont stream.

Generally deeper pools will occur in the outside of the meander bends and shallow runs will dominate the straight sections of channel between meanders. Pools will provide energy dissipation and aquatic habitat. In-stream structures will be constructed primarily of logs and brush and will include constructed shallows, log sills, log vanes, and log J-hooks. These structures will provide grade control and habitat improvements. Sills will be used at key grade control points, including the downstream transition of HC1 near the confluence with Howards Creek.

One existing culvert crossing, excluded from the conservation easement, will remain on HC1 Reach 2. The culvert invert elevations will be reset to coordinate with the proposed design profile and to allow for the pipe invert to be buried for a natural bottom condition.

The morphologic design parameters as shown in Table 16 fall within the ranges specified for C/E streams (Rosgen, 1996). The specific values for the design parameters were selected based on designer experience and judgment and were supported by morphologic data from reference reach data sets. The width to depth ratios range from 13.2 to 17.2. An inner berm feature has been designed on HC1 Reach 2. The inclusion of an inner berm leads to the upper range of the width to depth ratio of 17.2. A width to depth ratio in the 10 to 14 range is the delineating line between the C and E stream type. We expect that over time as vegetation is established, the channels may narrow more toward dimensions characteristic of an E channel. This narrowing over time would not be seen as an indicator of instability in and of itself.

Table 16. Design Morphologic Parameters
Owl's Den Mitigation Site

	Notation	Units	HC1 Reach 1			HC1 Reach 2			HC2		
			Typical Section Values	Min	Max	Typical Section Values	Min	Max	Typical Section Values	Min	Max
stream type			C/E			C/E			C/E		
drainage area	DA	sq mi	0.10			0.24			0.04		
design discharge	Q	cfs	8			14			5		
bankfull cross-sectional area	A_{bkf}	SF	6.2			9.8			3.3		
average velocity during bankfull event	v_{bkf}	fps	1.3			1.4			1.6		
Cross-Section											
width at bankfull	w_{bkf}	feet	9.0			13.0			6.5		
maximum depth at bankfull	d_{max}	feet	1.10			1.20			0.75		
mean depth at bankfull	d_{bkf}	feet	0.7			0.8			0.5		
maximum depth ratio	d_{max}/d_{bkf}		1.6			1.6			1.5		
bankfull width to depth ratio	w_{bkf}/d_{bkf}		13.2			17.2			13.2		
low bank height		feet	1.10			1.20			0.75		
bank height ratio	BHR		1.0			1.0			1.0		
floodprone area width	w_{fpa}	feet		23	46		31	130		35	110
entrenchment ratio	ER			2.6	5.1		2.4	10.0		5.4	16.9
Slope											

	Notation	Units	HC1 Reach 1			HC1 Reach 2			HC2		
			Typical Section Values	Min	Max	Typical Section Values	Min	Max	Typical Section Values	Min	Max
valley slope	S_{valley}	feet/ foot	0.0024[1]			0.0024[1]			0.0058[1]		
channel slope	S_{chnl}	feet/ foot	0.0020			0.0020			0.005		
Profile											
shallow slope	$S_{shallow}$	feet/ foot		0.0022	0.013		0.00222	0.013		0.00528	0.016
shallow slope ratio	$S_{shallow}/S_{chnl}$			1.1	6.7		1.1	5.8		1.1	3.4
pool slope	S_p	feet/ foot		0.000	0.0014		0.000	0.0014		0.000	0.0034
pool slope ratio	S_p/S_{chnl}			0.00	0.70		0.00	0.70		0.00	0.70
pool-to-pool spacing	$L_{p\text{-}p}$	feet		14	90		21	130		10	65
pool spacing ratio	$L_{p\text{-}p}/w_{bkf}$			1.6	10		1.6	10		1.6	10
pool cross-sectional area		SF		7	12		11	20		4	6
pool area ratio				1.1	2.0		1.1	2.0		1.1	2.0
maximum pool depth		feet		1.0	1.4		1.1	1.5		0.7	1.0
pool depth ratio				1.5	2.0		1.5	2.0		1.5	2.0
pool width at bankfull		feet		9.0	10.8		13.0	15.6		6.5	7.8
pool width ratio				1.0	1.2		1.0	1.2		1.0	1.2
Pattern											
sinuosity	K			1.1 - 1.3			1.1 - 1.3			1.1 - 1.3	
belt width	w_{blt}	feet		16.2	37.8		23.4	54.6		11.7	27.3
meander width ratio	w_{blt}/w_{bkf}			1.8	4.2		1.8	4.2		1.8	4.2
meander length	L_m	feet		37.8	65.7		54.6	94.9		27	47.45

	Notation	Units	HC1 Reach 1			HC1 Reach 2			HC2		
			Typical Section Values	Min	Max	Typical Section Values	Min	Max	Typical Section Values	Min	Max
meander length ratio	L_m/w_{bkf}			4.2	7.3		4.2	7.3		4.2	7.3
radius of curvature	R_c	feet		16	41		23	59		12	29
radius of curvature ratio	R_c/ w_{bkf}			1.8	4.5		1.8	4.5		1.8	4.5

1. Valley slope of the site is being adjusted based on proposed grading for wetland re-establishment.

11.2 Proposed Wetland Design Summary

The wetland design on the site will include rehabilitation and re-establishment of wetlands. The wetland design will include grading, raising stream beds, and planting of native vegetation. The rehabilitation design includes raising stream beds and minor grading. Work on re-establishment areas will also include removal of overburden to uncover hydric soils as described below.

Using the information from the hydric soils investigations (Section 6.3), depths of overburden removal to uncover hydric soils were determined for the wetland re-establishment areas on the site. A grading plan was developed to remove the overburden to these depths which range from 0 to 12 inches. Much of the re-establishment zones will require only 4 to 6 inches of cut. Very limited grading is also planned for rehabilitation zones and includes leveling out grades on the site to tie into areas of deeper cut. The overall grading plan was developed with consideration of overburden removal depths, current jurisdictional wetland delineations (Section 6.0), and information obtained from existing and proposed Drainmod groundwater models (Section 6.2.1). Upon completion of grading, wetland zones will be disked to coarsen the soil surface. Irregularities in the soil surface will create localized storage areas for surface water allowing for infiltration of surface water into the soil. The grading plan was designed to minimize impacts to current jurisdictional wetlands.

The stream channels are being restored as low gradient, wide shallow channels which will help reestablish hydrology to the potential wetland areas and restore the natural flooding regime of the system. Previously, the incised channels in the high water table system were acting as drains and removing water from flooding the wetland areas. Raising channel beds will reduce drawdown effects of the channels and raise the water table in these areas thus restoring a balanced wetland and stream complex similar to the reference wetland community outlined in Section 8.2. Increased floodplain inundation and higher water tables near stream channels will improve vegetation in current jurisdictional areas by reducing upland vegetation not suited for wetter soil conditions.

Current invasive vegetation in wetland areas will be removed and a native riparian wetland community based on reference conditions will be established. In graded wetland areas, soil disking and roughening will be done to loosen the soil surface and promote vegetation success. Disking will be done after the completion of grading to prevent over compaction of the soil surface. Current jurisdictional wetland areas will benefit from the removal of invasive vegetation and establishment of a more forested community over time.

The site's stream-wetland complex receives agricultural runoff where active farming contributes nutrient and chemical loads. By creating a wetland and stream complex in the receiving area, the agricultural runoff will be directly treated by the proposed restored wetland and buffer functions. Increasing wetland acreage will increase the treatment capacity of the wetland area. In addition, increased storage times will reduce nutrient and chemical loads that previously directly entered the stream system.

11.3 Target Plant Communities

The target communities for the restored riparian buffer zones and wetland areas will be based on the following:

- Reference conditions from forested areas at the reference reaches used in this project;
- Native trees with proven success in early successional restoration sites;
- Vegetation listed for these community types in Classification of the Natural Communities of North Carolina (Schafale and Weakley,1990); and
- Consultation with native tree suppliers.

Species documented at the reference reach sites are described in Section 8.3.

As a final stage of construction, riparian stream buffers and wetlands will be planted and restored with native trees and herbaceous plants representative of the natural plant community that exists within the project watershed with an emphasis on early successional commercially available species. Individual tree and shrub species will be planted throughout the project easement including stream banks, benches, tops of banks, and floodplain zones. These species will be planted as bare root and live stakes and will provide additional stabilization to the outsides of constructed meander bends and side slopes. Live stakes will be planted on channel banks in tangent sections and outer meander bends. Point bars will not be planted with live stakes. Low growing permanent herbaceous seed will be placed on stream banks, floodplains, and additional disturbed areas within the project easement. Areas disturbed outside the easement will be seeded with pasture grasses. Proposed plant lists are included in the preliminary plan set.

11.4 Sediment Transport Analysis for Proposed Restoration Channels

A sediment transport analysis was performed for the restoration reaches. For gravel bed channels, it is important to analyze both sediment transport competence and capacity. However, in sand bed channels, bed particles are easily mobilized at flows near and often well below bankfull (Knighton, 1998) so competence is assumed and only capacity should be analyzed.

A sediment transport capacity analysis begins with an assessment of the existing watershed and stream channels as well as a determination of expected changes to the watershed during the life of the project. This is necessary to qualitatively understand the sediment supply for the design reaches and to determine what level of transport analysis is needed to properly design the system. In unstable or rapidly changing watersheds or for streams with visual signs of high bedload supply, detailed analysis including field data collection may be necessary to ensure a proper design. A watershed assessment was conducted for this project as described in Sections 4.1 and 4.2 of this document. Historical land use changes within the watershed were analyzed through aerial photo review, the existing conditions were evaluated on the ground, and future land use changes were determined to be minor based on historical trends and communications with a county planner. The watershed was therefore determined to be stable and is expected to remain stable for the foreseeable future. In addition, the existing stream channels on the project site do not show signs of significant deposition or aggradation.

Based on the assessments described above, the project streams currently appear to be supply limited, or in other words, have at least enough capacity to transport the sediment loads supplied to them. In addition, the sediment loads are not expected to change significantly in the future. In this case, an appropriate transport capacity analysis is to compare the capacity of the existing channels to that of the proposed. If the proposed channels have similar or greater capacity to move sediment supply as the existing channels, they will not be expected to aggrade. Excess capacity can be controlled by grade control structures. This method eliminates many of the complexities inherent to monitoring and modeling sediment transport and the lack of precision that is expected.

This analysis was done with the sediment transport capacity module of HEC-RAS. HEC-RAS models were built for existing and proposed conditions of representative sections of all three design reaches. The sediment transport capacity module uses the hydraulic models along with bed material data to estimate capacity. Various capacity equations can be used to analyze a stream reach but should be carefully selected with consideration of channel size and slope, bed material size ranges, channel velocities, and other variables. For this analysis, four equations were used in the models and an average capacity value was calculated for each existing and proposed model. The four equations used were Engelund-Hansen, Larsen (Copeland), MPM, and Toffaleti. For information on these equations please consult the HEC-RAS user' manual (Hydrologic Engineering Center, 2010). These average results for each existing reach and the proposed reach are shown in Table 17.

Table 17. Sediment Transport Capacity of Existing and Proposed Reaches
Owl's Den Mitigation Site

Sediment Transport Capacity		
	Existing (gr/sec)	**Proposed (gr/sec)**
HC 1 Reach 1	11.1	5.6
HC 1 Reach 2	8.5	20.2
HC 2	6.8	7.8

The results in Table 17 indicate that the sediment transport capacity for HC1 Reach 1 will be approximately cut in half from the existing condition to the proposed condition. This is mostly related to a small reduction in channel slope. The project headwaters of HC1 Reach 1 are in a very low gradient, forested wetland and stream system with very little potential for sediment production. Due to the lack of sediment supply to the system, this reduction in capacity is not expected to be significant and aggradation within HC 1 Reach 1 is not anticipated. The results indicate that the capacity of HC1 Reach 2 will more than double for the proposed condition and the capacity of HC 2 will increase slightly. The increase in sediment transport capacity for HC1 Reach 2 and HC 2 indicate that aggradation is not a likely problem for these reaches and any excess stream power will be controlled through grade control to reduce the potential for bed degradation. Grade control structures are described in Section 11.1 above.

12.0 Maintenance Plan

The site shall be monitored on a regular basis and a physical inspection of the site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two (2) years following site construction and may include the following:

Table 18. Maintenance Plan
Owl's Den Mitigation Site

Component/Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank erosion.
Wetlands	Routine wetland maintenance and repair activities may include supplemental installations of target vegetation within the wetland. Areas where storm water and floodplain flows intercept the wetland may also require maintenance to prevent scour.

Component/Feature	Maintenance through project close-out
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis.

13.0 Performance Standards

The stream and wetland performance criteria for the project site will follow approved performance criteria presented in the EEP Mitigation Plan Template (version 2.2, 6/8/2012), the EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011), and the Stream Mitigation Guidelines issued in April 2003 by the USACE and NCDWR. Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. The stream restoration sections of the project will be assigned specific performance criteria components for stream morphology, hydrology, and vegetation. Wetland rehabilitation and re-establishment areas will be assigned specific performance criteria for wetland hydrology and vegetation. Performance criteria will be evaluated throughout the seven year post-construction monitoring. If all performance criteria have been successfully met and two (2) bankfull events have occurred during separate years, Wildlands may propose to terminate stream and/or vegetation monitoring after Year 5, in accordance with the Early Closure Provision in the EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011).

An outline of the performance criteria components follows.

13.1 Streams

13.1.1 Dimension

Shallow cross-sections on the restoration reaches should be stable and should show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Per EEP guidance, bank height ratios shall not exceed 1.2 and entrenchment ratios shall be at least 2.2 for restored channels to be considered stable. All shallow cross-sections should fall within the parameters defined for channels of the appropriate stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg or eroding channel banks. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability. It is important to note that in sand bed channels pools and bed forms (ripples, dunes, etc.) may migrate over time as a natural function of the channel hydraulics. These sorts of bed changes do not constitute a problem or indicate a need for remedial actions.

13.1.2 Pattern and Profile

Visual assessments and photo documentation should indicate that streams are remaining stable and do not indicate a trend toward vertical or lateral instability. As mentioned above, migration of pools and bed forms are expected and do not require remedial action.

13.1.3 Substrate

Because the streams through the project site are dominated by sand and silt-size particles, pebble count and/or bulk sampling procedures would not show a significant change in bed material size or distribution over the monitoring period; therefore, bed material analyses will not be conducted for this project. Channel substrate distribution will not be a component of project success criteria.

13.1.4 Photo Documentation

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

13.1.5 Bankfull Events

Two (2) bankfull flow events must be documented on the restoration and enhancement reaches within the seven-year monitoring period. The two (2) bankfull events must occur in separate years. Stream monitoring will continue until success criteria in the form of two (2) bankfull events in separate years have been documented.

13.2 Vegetation

The final vegetative success criteria will be the survival of 210 planted stems per acre in the planted riparian and wetland areas at the end of the required monitoring period (year seven). The interim measure of vegetative success for the site will be the survival of at least 320 planted stems per acre at the end of the third monitoring year and at least 260 stems per acre at the end of the fifth year of monitoring. Planted vegetation must average 10 feet in height in each plot at the end of the seventh year of monitoring. If this performance standard is met by year five (5) and stem density is trending towards success (i.e., no less than 260 five (5) year old stems/acre), monitoring of vegetation on the site may be terminated provided written approval is provided by the USACE in consultation with the NC Interagency Review Team. The extent of invasive species coverage will also be monitored and controlled as necessary throughout the required monitoring period (year five (5) or seven (7)).

13.3 Wetlands

The final performance standard for wetland hydrology will be a free groundwater surface within 12 inches of the ground surface for 18 consecutive days (8.1 percent) of the defined 222 day growing season for Lincoln County (March 28 through November 4) under typical precipitation conditions. This performance standard was determined through model simulations of post restoration conditions and comparison to reference wetland systems. A detailed discussion of the modeling approach to determining this performance standard as well as definitions and determinations of a target hydroperiod are included in Section 6.2 of this report. If a particular gage does not meet the performance standard for a given monitoring year, rainfall patterns will be analyzed and the hydrograph will be compared to that of the reference wetlands to assess whether atypical weather conditions occurred during the monitoring period.

13.4 Visual Assessments

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

14.0 Monitoring Plan

Using the EEP Baseline Monitoring Plan Template (version 2.0, 10/14/10), a baseline monitoring document and as-built record drawings of the project will be developed within 60 days of the planting completion and monitoring installation on the restored site. Annual monitoring data will be reported using the EEP Monitoring Report template (version 1.5, 6/8/12). The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of EEP databases for analysis, research purposes, and assist in decision making regarding close-out. The monitoring period will extend seven years beyond completion of construction or until performance criteria have been met per the criteria stated in the EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011). All survey will be tied to grid.

14.1 Site Specific Monitoring

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

Table 19. Monitoring Requirements
Owl's Den Mitigation Site

Parameter	Monitoring Feature	Quantity/ Length by Reach					Frequency	Notes
		HC Reach 1	HC1 Reach 2	HC2	Wetland Rehabilitation	Wetland Reestablishment		

Parameter	Monitoring Feature	Quantity/ Length by Reach					Frequency	Notes
		HC Reach 1	HC1 Reach 2	HC2	Wetland Rehabilitation	Wetland Reestablishment		
Dimension	Shallow Cross Sections	2	2	3	N/A	N/A	Year 1, 2, 3, 5 and 7	
	Pool Cross Section	2	2	2	N/A	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	1
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	
Substrate	Reach wide (RW), Shallow (RF) 100 pebble count	N/A	N/A	N/A	N/A	N/A	N/A	
Hydrology	Crest Gage/ Transducer	1		1	N/A	N/A	N/A	2
Hydrology	Groundwater Gages	n/a	n/a	n/a	13		Quarterly	
Vegetation	CVS Level 2	13					Year 1, 2, 3, 5 and 7	
Exotic and nuisance vegetation							Annual	3
Project Boundary							Annual	4
Reference Photos	Photographs	13					Annual	

1. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile will be collected during as-built baseline monitoring survey only, unless observations indicate lack of stability and profile survey is warranted in additional years.
2. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers will be set to record stage once every hour. Device will be inspected and downloaded semi-annually.
3. Locations of exotic and nuisance vegetation will be mapped.
4. Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped.

14.2 Streams

14.2.1 Dimension

In order to monitor the channel dimension, one (1) permanent cross-section will be installed per 20 bankfull widths along the stream restoration reaches, with shallow and pool sections in proportion to EEP guidance. Each cross-section will be permanently marked with pins to establish its location. Cross-section surveys will include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg. If moderate bank erosion is observed within permanent cross-sections during the monitoring period, an array of bank pins will be installed in the permanent cross-section where erosion is occurring for reaches with a bankfull width of greater than three (3) feet. Bank pins will be installed on the outside bend of the cross-section in at least three (3) locations (one (1) in upper third of the pool, one (1) at the permanent cross-section, and one (1) in the lower third of the pool). Bank pins will be monitored by measuring exposed rebar and maintaining pins flush to bank to capture bank erosion progression. Cross-section and bank pin survey (if applicable) will be conducted in monitoring years one (1), two (2), three (3), five (5), and seven (7).

14.2.2 Pattern and Profile

To insure accordance with design plans, a longitudinal profile will be performed as part of the baseline monitoring document and as-built record drawings of the project that will be developed within 60 days of the planting completion and monitoring installation on the restored site. Longitudinal profile surveys will not be conducted during the seven (7) year monitoring period unless other indicators during the annual monitoring indicate a trend toward vertical and lateral instability. Monitoring will follow standards as described in the EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011) and the 2003 USACE and NCDWR Stream Mitigation Guidance for the necessary reaches.

14.2.3 Substrate

Because the streams through the project site are dominated by sand and silt-size particles, pebble count and/or bulk sampling procedures would not show a significant change in bed material size or distribution over the monitoring period; therefore, bed material analyses will not be conducted for this project. Channel substrate distribution will not be a component of project success criteria.

14.2.4 Photo Documentation

Permanent reference photographs will be taken once a year to visually document stability for seven (7) years following construction. Permanent markers will be established and located with GPS equipment so that the same locations and view directions on the site are photographed each year. Photos will be used to monitor restoration and enhancement stream reaches as well as vegetation plots and wetland areas.

Longitudinal reference photos will be established at the tail of shallows approximately every 200 LF along the channel by taking a photo looking upstream and downstream. Permanent cross-section photos looking upstream and downstream and vegetation plot reference photos will be taken at the same time as the stream and vegetation surveys are conducted (Years one (1), two (2), three (3), five (5), and seven (7)). Reference photos will also be taken within wetland areas on an annual basis during the visual site assessment.

The photographer will make every effort to consistently maintain the same area in each photo over time.

14.2.5 Bankfull Events

Bankfull events will be documented using a crest gage or transducer, photographs, and visual assessments such as debris lines. The gages will be installed within a permanent surveyed shallow cross-section on the restored channels. The gages will be checked at each site visit to determine if a bankfull event has occurred. Photographs will be used to document the occurrence of debris lines and sediment deposition.

14.3 Vegetation

Vegetation monitoring plots will be installed and evaluated within the stream and wetland areas to measure the survival of the planted trees. The number of monitoring quadrants required is based on the EEP monitoring guidance documents (version 1.4, 11/7/11). The size of individual quadrants will be 100 square meters for woody tree species and shrubs. Vegetation assessments will be conducted following the Carolina Vegetation Survey (CVS) Level 2 Protocol for Recording Vegetation (2006).

The initial baseline survey will be conducted within 21 days from completion of site planting and used for subsequent monitoring year comparisons. The first annual vegetation monitoring activities will commence at the end of the first growing season, during the month of September. The restoration and enhancement sites will then be evaluated in monitoring years two (2), three (3), five (5), and seven (7) between June 1 and September 31. Species composition, density, and survival rates will be evaluated on an annual basis by plot and for the entire site. Individual plot data will be provided and will include height, density, vigor, damage (if any), and survival. Planted woody stems will be marked annually as needed and given a coordinate, based off of a known origin, so they can be found in succeeding monitoring years. Mortality will be determined from the difference between the previous year's living planted stems and the current year's living planted stems.

14.4 Visual Assessments

Visual assessments will be performed along all stream and wetland areas on a semi-annual basis during the seven (7) year monitoring period. Problem areas will be noted such as channel instability (i.e. lateral and/or vertical instability, in-stream structure failure/instability and/or piping, headcuts), vegetated health (i.e. low stem density, vegetation mortality, invasive species or encroachment), beaver activity, or livestock access. Areas of concern will be mapped and photographed accompanied by a written description in the annual report. Problem areas with be re-evaluated during each subsequent visual assessment. Should remedial actions be required, recommendations will be provided in the annual monitoring report.

15.0 Long-Term Management Plan

Upon approval for close-out by the Interagency Review Team (IRT) the site will be transferred to the NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program. This party shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement or the deed restriction document(s) are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.

The NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program currently houses EEP stewardship endowments within the non-reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statue GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The NCDENR Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation sites. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation.

16.0 Adaptive Management Plan

Upon completion of site construction EEP will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described previously in this document. If, during the course of annual monitoring it is determined the site's ability to achieve site performance standards are jeopardized, EEP will notify the USACE of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Corrective Action Plan is prepared and finalized EEP will:

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

17.0 Financial Assurances

Pursuant to Section IV H and Appendix III of the Ecosystem Enhancement Program's In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the US Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by EEP. This commitment provides financial assurance for all mitigation projects implemented by the program.

18.0 References

Andrews, E. D., 1983. Entrainment of gravel from naturally sorted river bed material, Geological Society of America Bulletin, 94, 1225-1231.

Environmental Bank and Exchange (EBX), 2002. Neu-Con Umbrella Wetland and Stream Mitigation Bank Westbrook Lowgrounds Site Specific Mitigation Plan. Cary, NC

Grant, Joshua, Lincoln County Planner. Personal communication, August 13, 2013.

Harman, Will. Personal communication, April 26, 2013.

Harman, W.H., et al. 1999. Bankfull Hydraulic Geometry Relationships for North Carolina Streams. AWRA Wildland Hydrology Symposium Proceedings. Edited By: D.S. Olsen and J.P. Potyondy. AWRA Summer Symposium. Bozeman, MT.

Interagency Advisory Committee on Water Data, 1981. Guidelines for Determining Flood Flow Frequency. Bulletin 17B. Washington, D.C.

Knighton, David, 1998. Fluvial Forms and Processes. New York, NY: John Wiley & Sons, 383 pp.

Multi-Resolution Land Characteristics Consortium (MRLC), 2001. National Land Cover Database. http://www.mrlc.gov/nlcd.php

Natural Resources Conservation Service (NRCS), 2011. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Natural Resources Conservation Service (NRCS), 2006. Lincoln County Soil Survey. http://soils.usda.gov/survey/online_surveys/north_carolina/

North Carolina Center for Geographic Information and Analysis (NC CGIA), 2001. Landcover GIS layer. http://data.nconemap.com/geoportal/catalog/main/home.page

North Carolina Division of Water Quality (NCDWQ), 2011. Surface Water Classifications. http://portal.ncdenr.org/web/wq/ps/csu/classifications

North Carolina Division of Water Quality (NCDWQ), 2012. North Carolina 303(d) List - Category 5. August 24, 2012. http://portal.ncdenr.org/c/document_library/get_file?uuid=9d45b3b4-d066-4619-82e6-ea8ea0e01930&groupId=38364

North Carolina Ecosystem Enhancement Program (EEP), 2007. Catawba River Basin Restoration Priorities. http://www.nceep.net/services/restplans/RBRPCatawba2007.pdf

North Carolina Geological Survey (NCGS), 1985. Geologic map of North Carolina 1:500,000 scale.

North Carolina Ecosystem Enhancement Program (EEP), 2010. Indian and Howards Creek Local Watershed Plan. www.nceep.net/services/lwps/Indian_Howards_Creek/INDIAN_HOWARD_CREEKS.html

North Carolina Geological Survey (NCGS), 1985. Geologic map of North Carolina 1:500,000 scale. Compiled by Philip M. Brown at el. Raleigh, NC, NCGS.

North Carolina Geological Survey (NCGS), 2013. Mineral Resources. http://www.geology.enr.state.nc.us/Mineral%20resources/mineralresources.html

North Carolina Natural Heritage Program (NHP), 2009. Natural Heritage Element Occurrence Database, Lincoln County, NC. http://149.168.1.196/nhp/county.html

North Carolina State University (NCSU), 2010. DrainMod Related Publications. Accessed July 10, 2013, at: http://www.bae.ncsu.edu/soil_water/drainmod/drainmod_papers.html#wetland

Northcott, W.J., Cooke, R.A., Walker, S.E., Mitchell, J.K., and Hirschi, M.C. 2001. Application of DRAINMOD-N to Fields with Irregular Drainage Systems. Transactions of the American Society of Agricultural Engineers (ASAE). Vol. 44(2): 241-249

Lagasse, P.F., Schall, J.D., Johnson, F., Richardson, E.V., Richardson, J.R., and Chang, F., 2001. Stream Stability at Highway Structures, Second Edition. U.S. Department of Transportation, Report No. FHWA-IP-90-014, HEC-20-ED-2. Washington, DC: Federal Highway Administration, 132 p.

Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.

Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

Rosgen, D.L. 1997. A Geomorphological Approach to Restoration of Incised Rivers. Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision. Center For Computational Hydroscience and Bioengineering, Oxford Campus, University of Mississippi, Pages 12-22.

Rosgen, D.L. 2001. A stream channel stability assessment methodology. Proceedings of the Federal Interagency Sediment Conference, Reno, NV, March 2001.

Rosgen, D.L. 2013. DRAFT Natural Channel Design for River Restoration. Wildland Hydrology, Fort Collins, CO.

Rudsell, Ronnie. Owl's Den Sunnybrook Farm Manager, personal interview. July 29, 2013.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina, 3rd approx. North Carolina Natural Heritage Program, Raleigh, North Carolina.

Simon, A. 1989. A model of channel response in disturbed alluvial channels. Earth Surface Processes and Landforms 14(1):11-26.

Simon, A., Rinaldi, M. 2006. Disturbance, stream incision, and channel evolution: The roles of excess transport capacity and boundary materials in controlling channel response. Geomorphology 79: 361-383.

Simon, A. 2006. Flow energy, time, and evolution of dynamic fluvial systems: implications for stabilization and restoration of unstable systems. In: Proceedings of the 2006 World Environmental and Water Resources Congress (R. Graham, Ed.), May 21-25, 2006, Omaha, Nebraska. CDROM.

Shields, D. F., Copeland, R. R, Klingman, P. C., Doyle, M. W., and Simon, A. 2003. Design for Stream Restoration. Journal of Hydraulic Engineering 129(8): 575-582.

Skaggs, R. W. 1980. DrainMod Reference Report: Methods for design and evaluation of drainage-water management systems for soils with high water tables. U. S. Department of Agriculture, Soil Conservation Service. 329 pp.

Skaggs, R.W., Youssef, M.A., and Chescheir, G.M. 2012. DRAINMOD: Model Use, Calibration, and Validation. Transactions of the American Society of Agricultural and Biological Engineers (ASABE). Vol. 55(4): 1509-1522

U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC), 2010. HEC-RAS River Analysis System User's Manual, Version 4.1. Accessed online at:

http://www.hec.usace.army.mil/software/hec-ras/documentation/HEC-RAS_4.1_Users_Manual.pdf

United States Department of Agriculture (USDA), 2009. Natural Resources Conservation Service, Soil Survey Geographic (SSURGO) database for Lincoln County, North Carolina. http://SoilDataMart.nrcs.usda.gov

United States Department of Transportation, Federal Highway Administration (FHWA), 2006. Assessing Stream Channel Stability at Bridges in Physiographic Regions. Publication no. FHWA-HRT-05-072. McLean, VA.: Federal Highway Administration Office of Infrastructure Research and Development, 147 p.

United States Environmental Protection Agency (EPA), 2010. Spreadsheet Tool for Estimating

Pollutant Load, version 4.1. http://it.tetratech-ffx.com/steplweb/models$docs.htm

United States Fish and Wildlife Service (USFWS), 2008. Endangered Species, Threatened Species, Federal Species of Concern and Candidate Species, Lincoln County, NC. http://www.fws.gov/raleigh/species/cntylist/lincoln.html

United States Geological Survey (USGS), 2009. Magnitude and Frequency of Rural Floods in the Southeastern United States, through 2006: Volume 2, North Carolina. Scientific Investigations Report (SIR) 2009-5158. USGS, Reston, VA.

URS Corporation, 2007. Unnamed Tributary to Cane Creek Restoration Plan. Morrisville, NC.

Walker, Alan, unpublished. NC Rural Mountain and Piedmont Regional Curve.

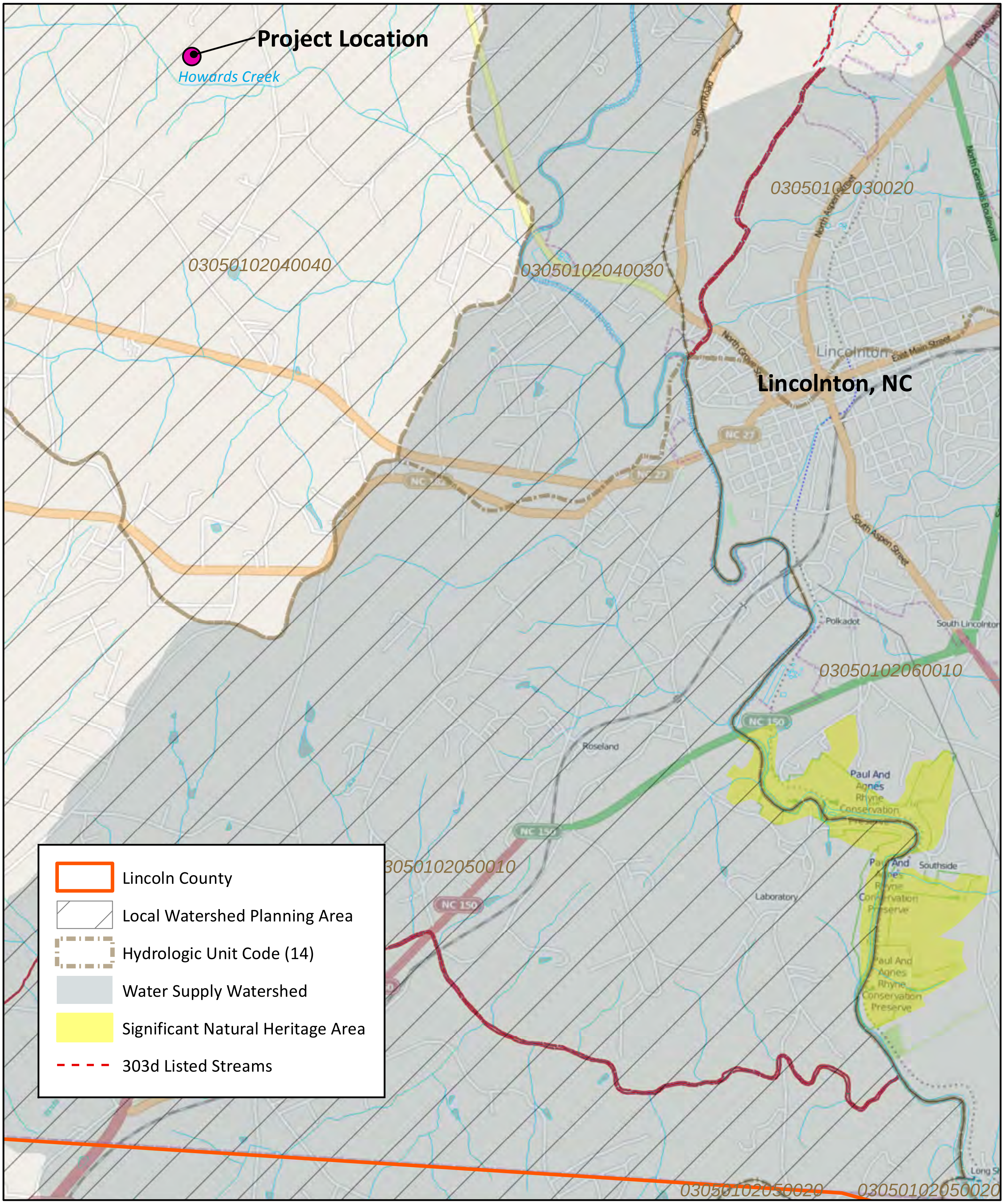
Walker, Alan. Personal communication, April 26, 2013.

Weaver, J.C., et al. 2009. Magnitude and Frequency of Rural Floods in the Southeastern United

States, through 2006: Volume 2, North Carolina. U.S. Geological Survey Scientific

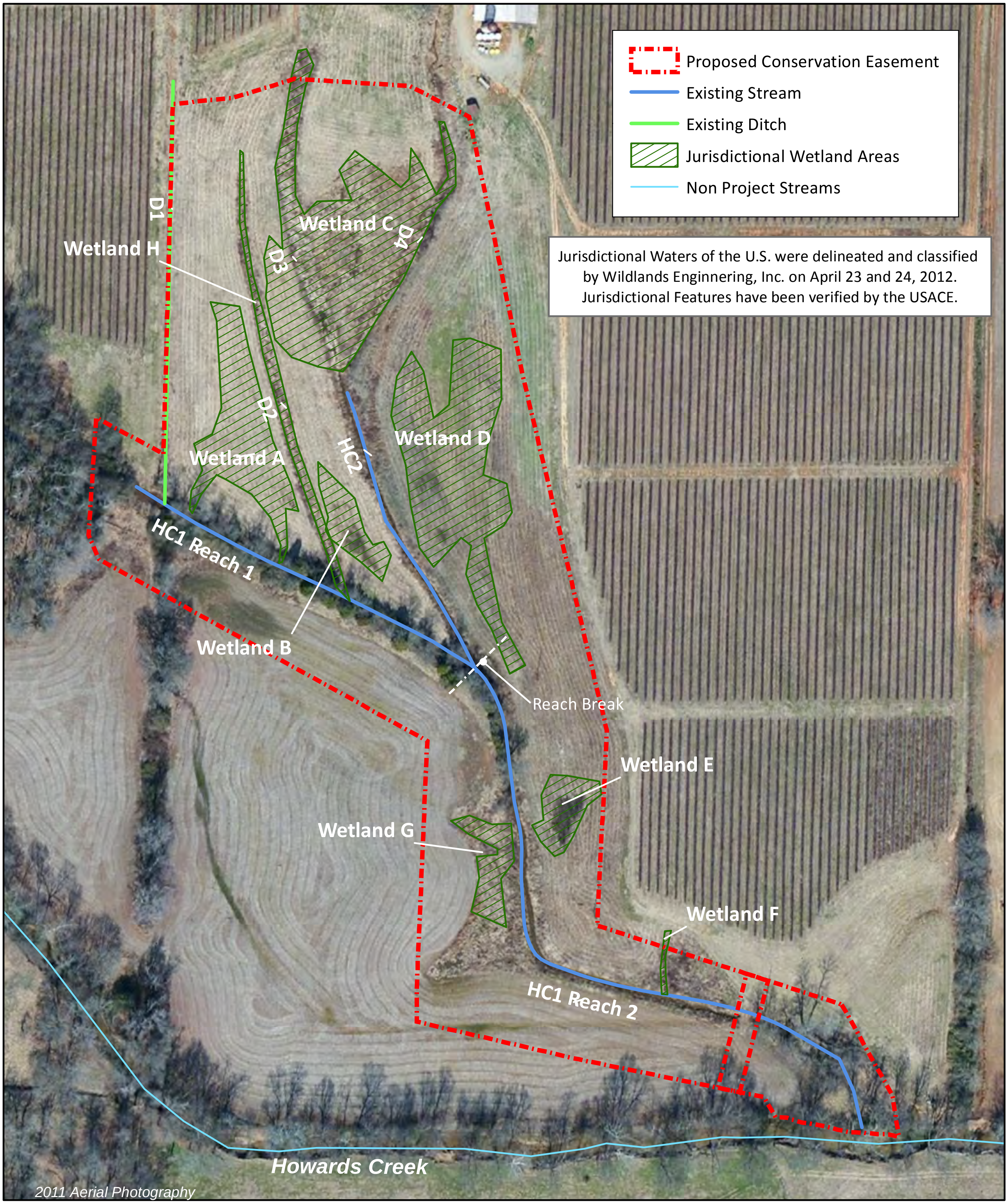
Investigations Report 2009-5158, 111 p.

Wilcock, P., et al., 2009. Sediment Transport Primer: Estimating Bed-Material Transport in Gravel Bed Rivers. Gen. Tech. Rep. RMRS-GTR-226. Fort Collins, Co: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 78 p.



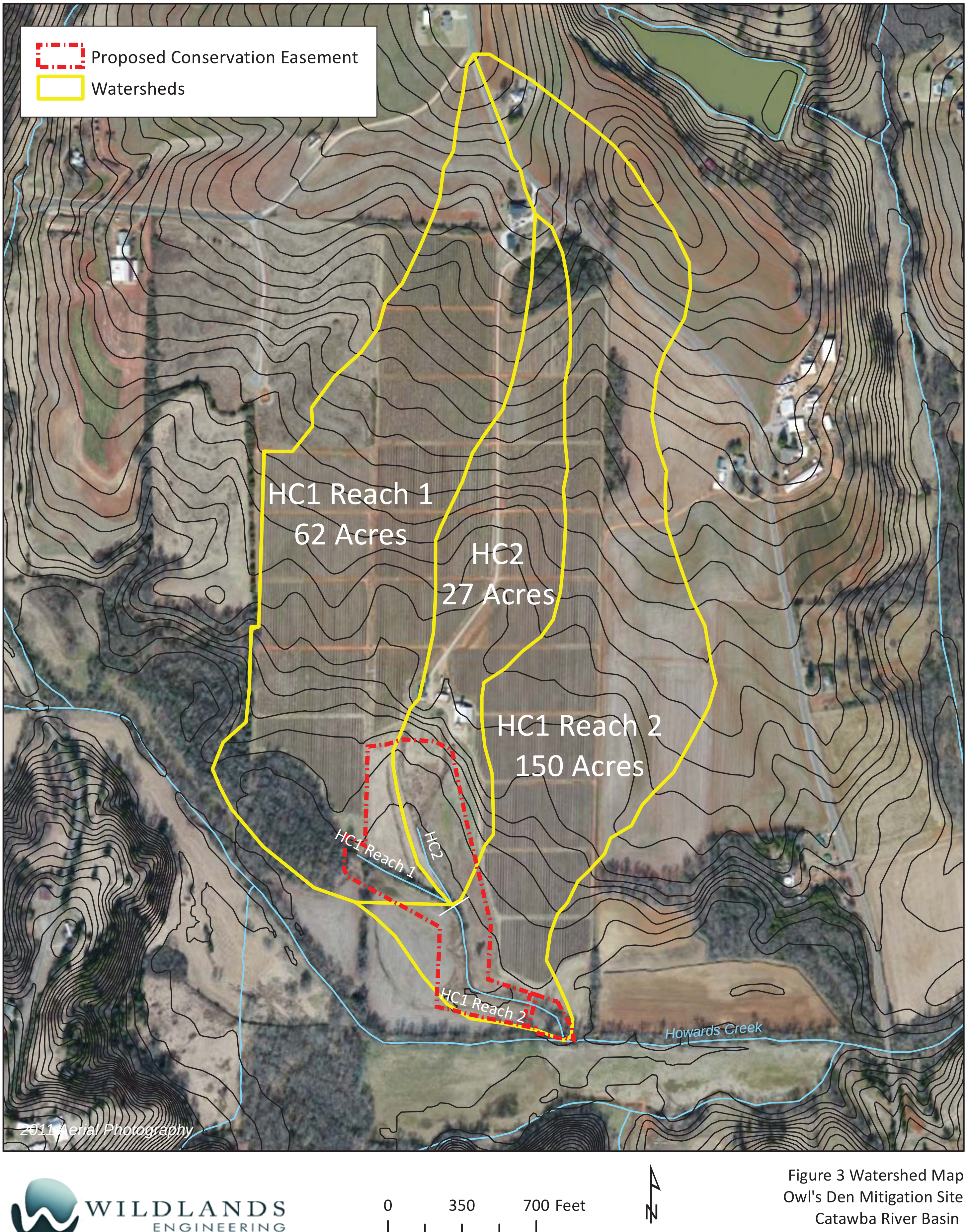
WILDLANDS ENGINEERING

Figure 1 Vicinity Map
Owl's Den Mitigation Site
Cawaba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC



WILDLANDS ENGINEERING

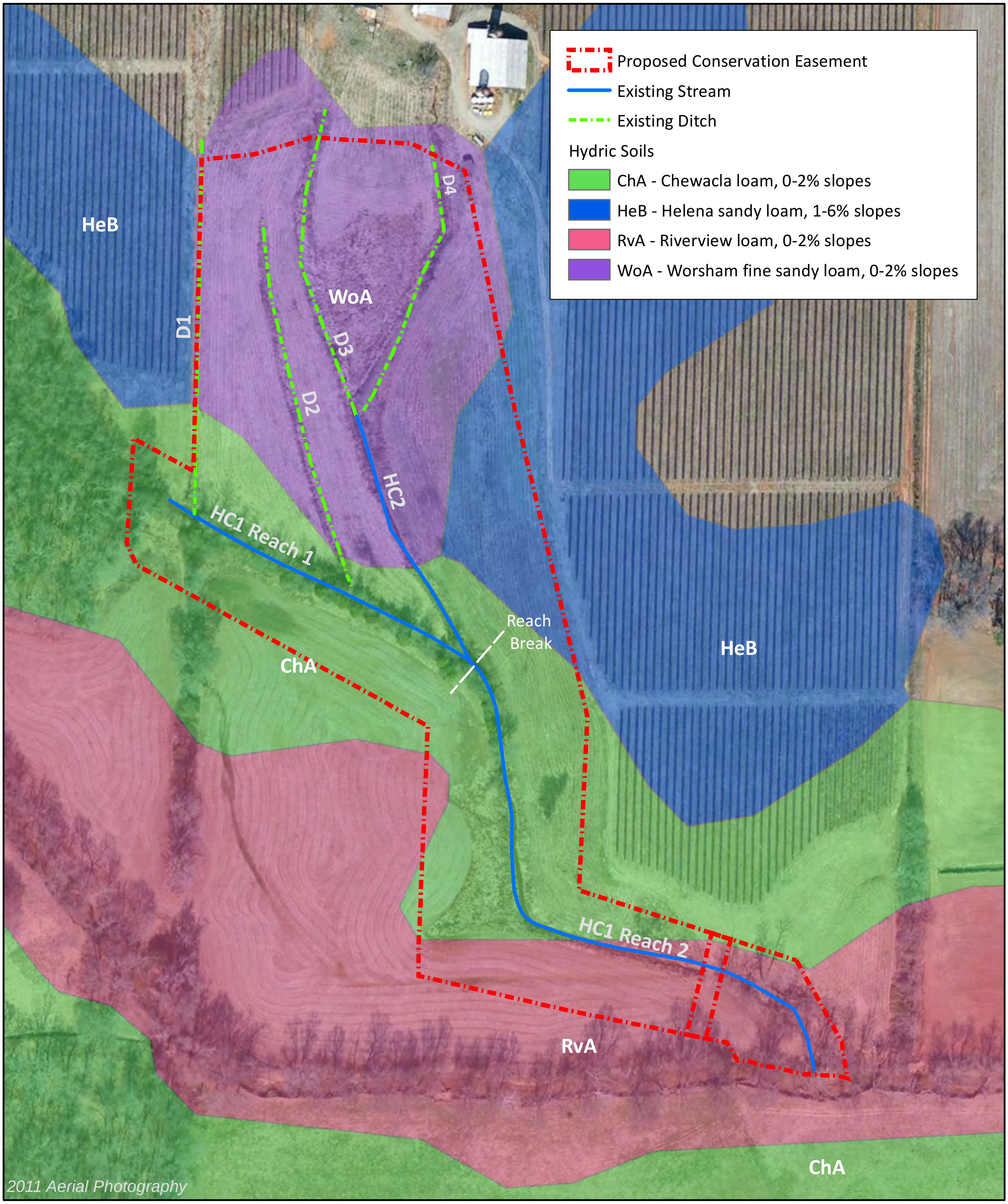
Figure 2 Site Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC



WILDLANDS ENGINEERING

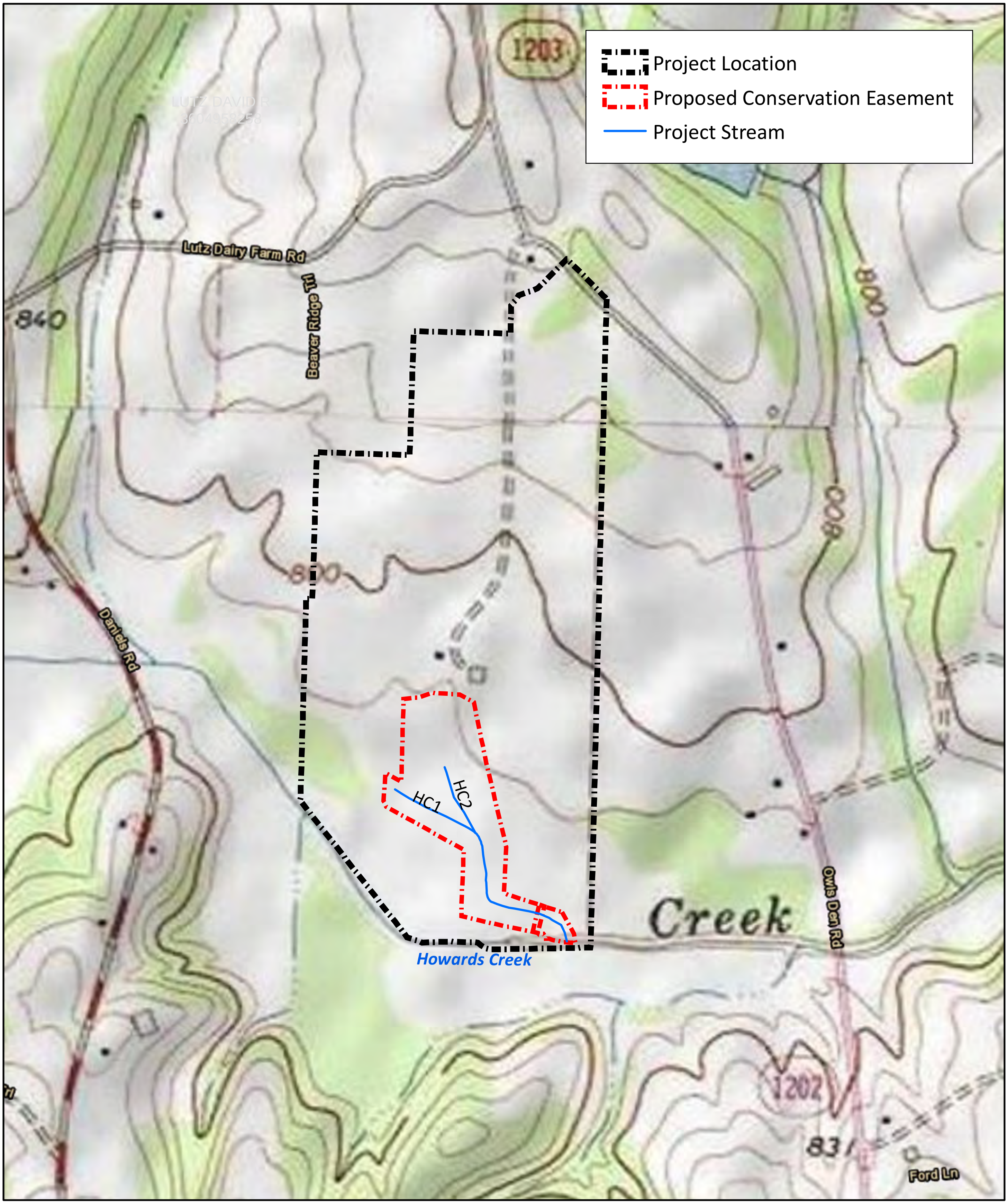
Figure 3 Watershed Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)

Lincoln County, NC



WILDLANDS ENGINEERING

Figure 4 Soils Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC

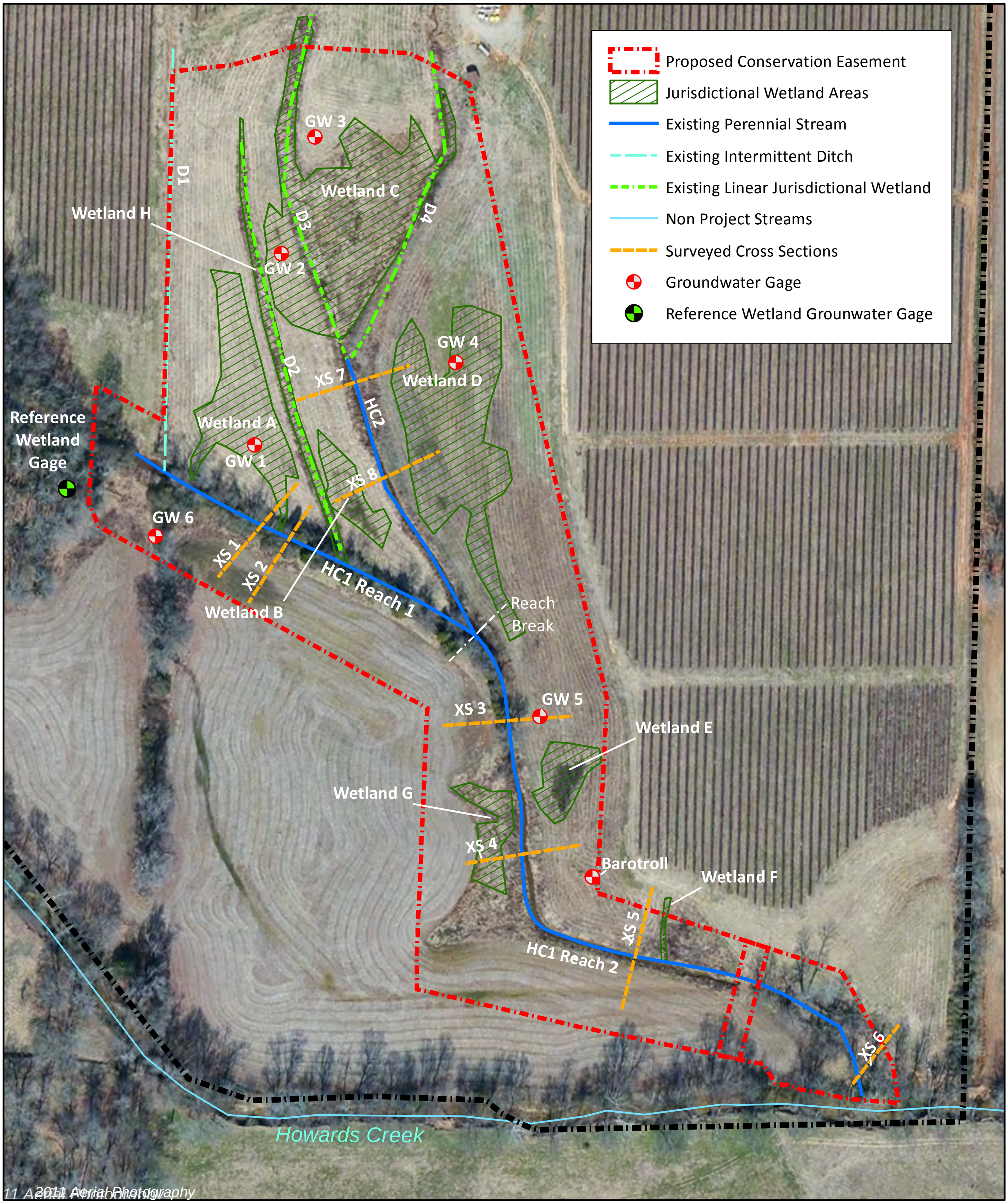


WILDLANDS ENGINEERING

0 500 1,000 Feet

N

Figure 5 USGS Topographic Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 6 Hydrologic Features Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)

Lincoln County, NC

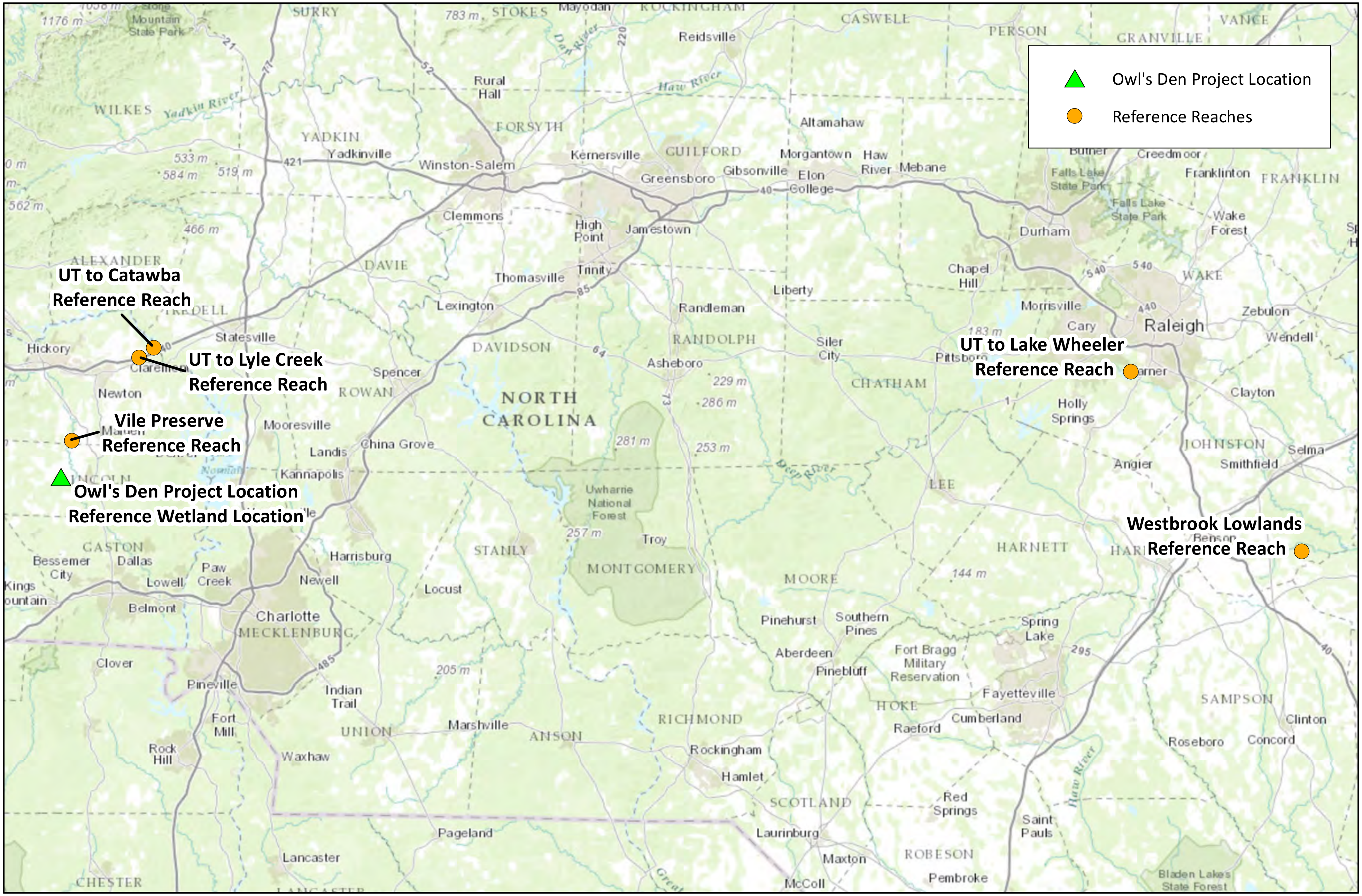
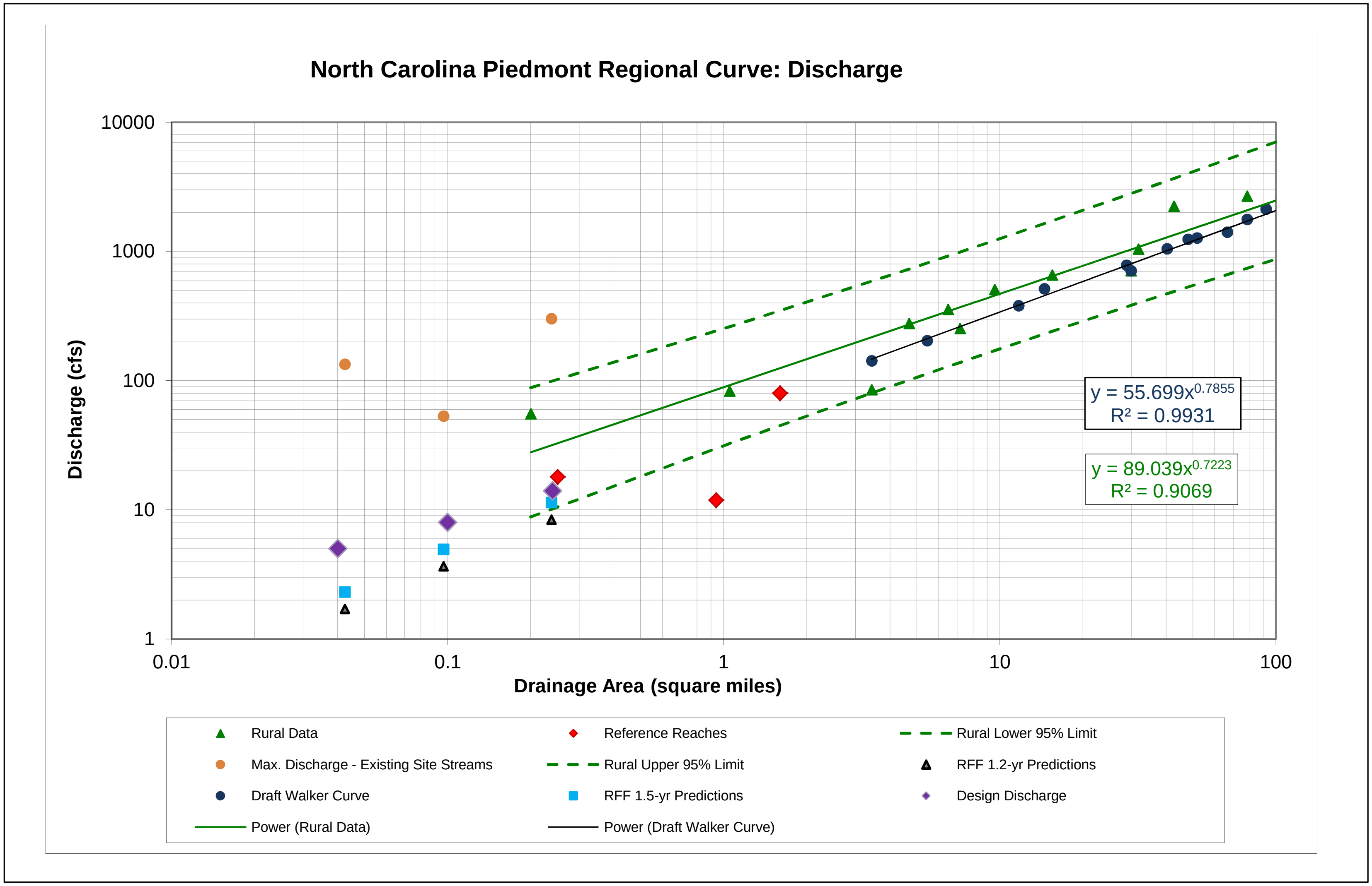


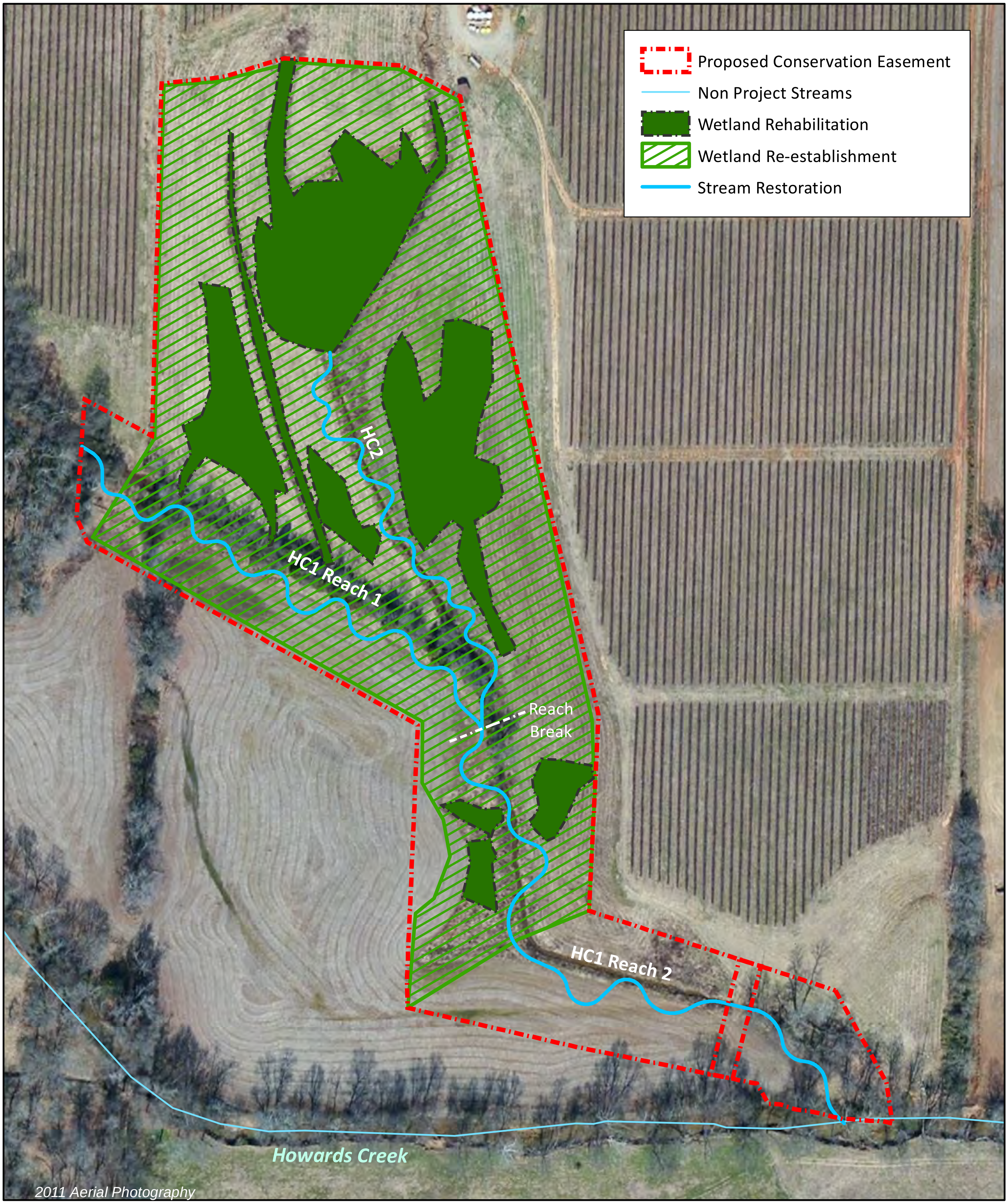
Figure 7 Reference Reach Vicinity Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC

WILDLANDS ENGINEERING



WILDLANDS ENGINEERING

Figure 8 NC Pidemont Regional Curve
with Project Overlay
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC



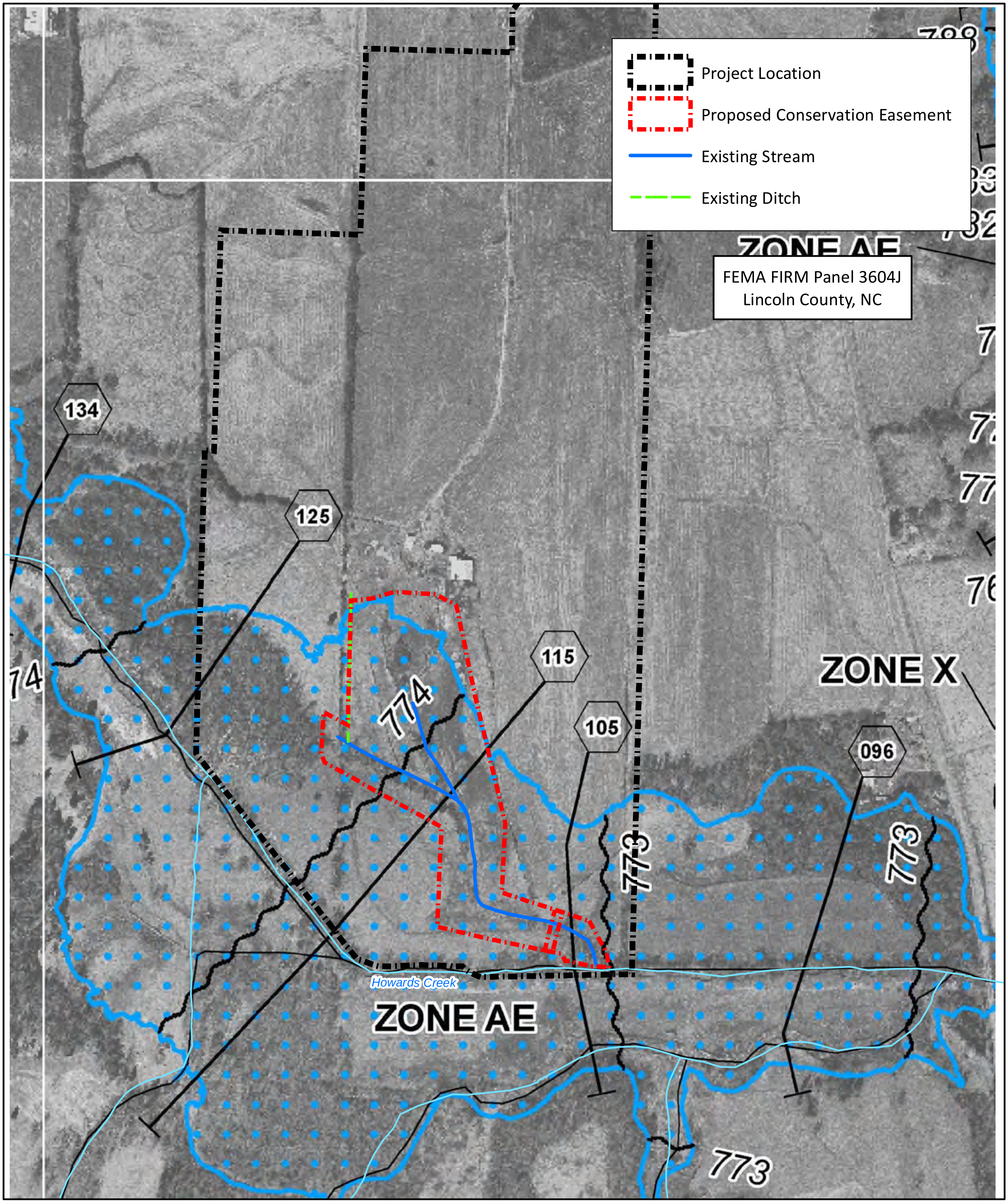
WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 9 Concept Design Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)

Lincoln County, NC

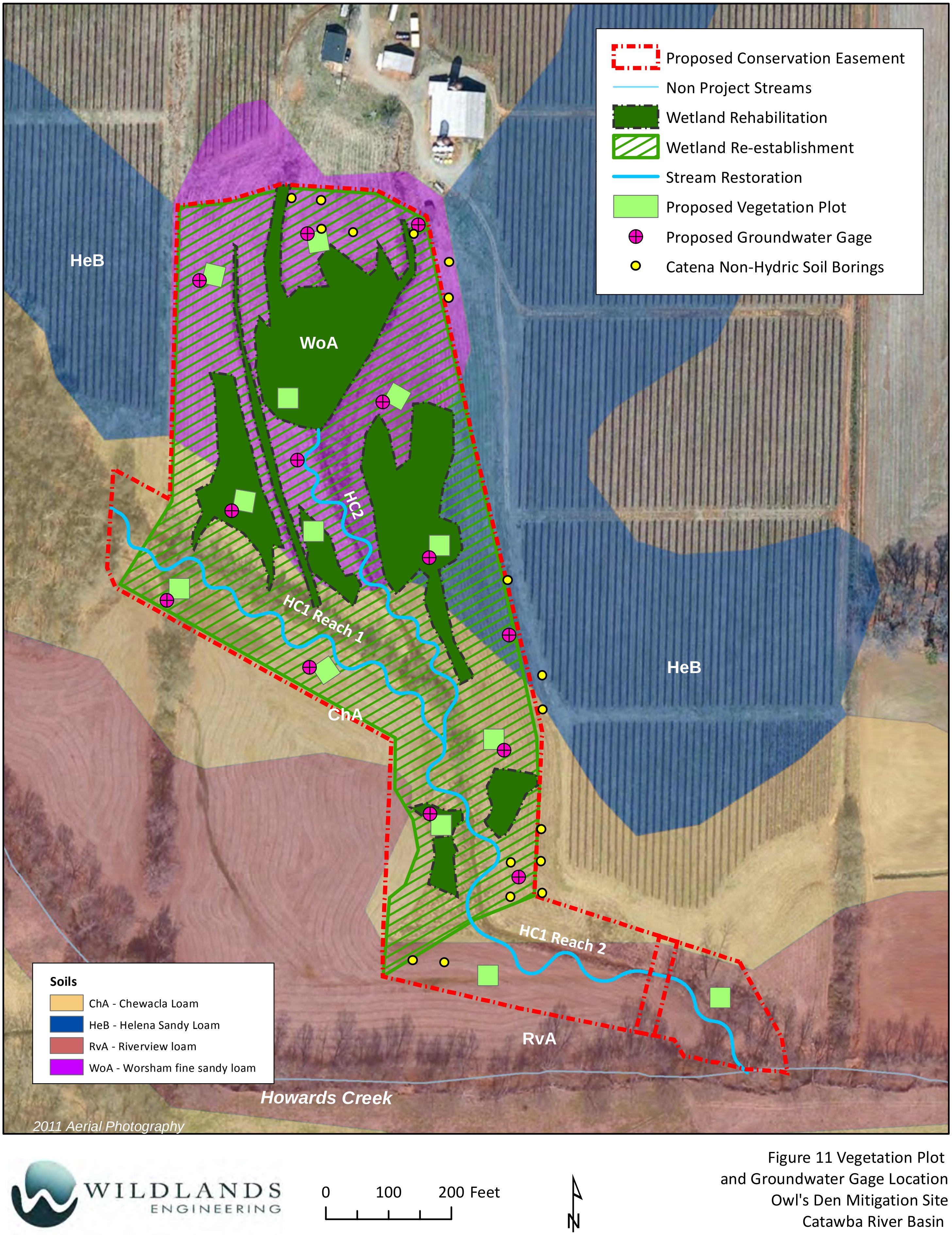


WILDLANDS ENGINEERING

0 250 500 1,000 Feet

N

Figure10 FEMA Flood Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC



WILDLANDS ENGINEERING

Figure 11 Vegetation Plot
and Groundwater Gage Location
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)

Lincoln County, NC

Appendix 1: Site Protection Instrument Template

STATE OF NORTH CAROLINA

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

_______________ COUNTY

SPO File Number:
EEP Project Number:

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

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

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Ecosystem Enhancement Program (formerly known as the Wetlands Restoration Program) within the Department of Environment and Natural Resources for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

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

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

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

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the 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’ 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 Ecosystem Enhancement Program in the Department of Environment and Natural Resources, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

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

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

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

The Conservation Easement Area consists of the following:

Tracts Number ________________ containing a total of _________ **acres** as shown on the plats of survey entitled "Final Plat, Conservation Easement for North Carolina Ecosystem Enhancement Program, Project Name: ___________, SPO File No.__________, EEP Site No. ___________, Property of __________________________," dated ___________, 20__ by *name of surveyor*, PLS Number __________ and recorded in the ______________ County, North Carolina Register of Deeds at **Plat Book _______ Pages __________.**

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

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

I. DURATION OF EASEMENT

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

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

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

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

B. Motorized Vehicle Use. Motorized vehicle use in the Conservation Easement Area is prohibited except within a Crossing Area(s) or Road or Trail as shown on the recorded survey plat **or as specifically allowed within a fence maintenance zone as described in section D or a Road or Trail described in section H**.

The Grantor reserves the right, for himself, his successors and assigns, to operate motorized vehicles within Crossing Area(s) described on the survey recorded in Plat Book **_________**, Page **_______**, of the **_______**County Registry as "reserved stream crossing". Said crossing shall not exceed **____** feet in width, and must be maintained and repaired by Grantor, his successors or assigns to prevent degradation of the Conservation Easement Area.

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 with the following exception:

Notwithstanding the foregoing, if there is a fence within the Conservation Easement Area, the Grantor reserves the right to mow and maintain vegetation within 10 feet of the Conservation Easement boundary ***as shown on the Survey Plat*** and extending along the entire length of the fence. The Grantor, his successors or assigns shall be solely responsible for maintenance of the fence for as long as there is livestock on the Grantor's property adjacent to the Conservation Easement Area.

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 roads, trails, walkways, or paving in the Conservation Easement Area with the following exception:

Only roads and trails located within the Conservation Easement Area prior to completion of the construction of the restoration project and within crossings shown on the recorded survey plat may be maintained by Grantor, successors or assigns to allow for access to the interior of the Property, and must be repaired and maintained to prevent runoff and degradation to the Conservation Easement Area. Such roads and trails shall be covered with pervious materials such as loose gravel or permanent vegetation in order to minimize runoff and prevent sedimentation.

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 N.C. Ecosystem Enhancement Program, whose mailing address is 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

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

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

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

D. Fences. The Grantee, its employees and agents, successors or assigns, shall be permitted to place fencing on the Property within the Conservation Easement Area to restrict livestock access. Although the Grantee is not responsible for fence maintenance, the Grantee reserves the right to maintain, repair or replace the fence at the sole discretion of the Grantee and at the expense of the Grantor, who agrees to indemnify the Grantee for any costs incurred as a result of maintenance, repair or replacement of the fence if such costs are required to protect the Conservation Easement Area from repeated incidents of grazing or other prohibited activities.

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

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

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

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

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

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

V. MISCELLANEOUS

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

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

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

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

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

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

Ecosystem Enhancement Program Manager
State Property Office
1321 Mail Service Center

Raleigh, NC 27699-1321

and

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

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

VI. QUIET ENJOYMENT

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

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

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

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

___________________________________ (SEAL)

NORTH CAROLINA
***COUNTY OF* _________________**

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

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

____
Notary Public

My commission expires:

____

Exhibit A

[INSERT LEGAL DESCRIPTION]

Appendix 2: Historic Aerial Photographs

INQUIRY #: 3557487.5

YEAR: 1951

= 750'

N


INQUIRY #: 3557487.5
YEAR: 1973
= 750'
N


INQUIRY #: 3557487.5
YEAR: 1984
= 500'
N


INQUIRY #: 3557487.5
YEAR: 1993
= 500'
N


INQUIRY #: 3557487.5
YEAR: 1998
= 750'
N


INQUIRY #: 3557487.5
YEAR: 2005
= 500'
N


INQUIRY #: 3557487.5
YEAR: 2006
= 500'
N


INQUIRY #: 3557487.5
YEAR: 2008
= 500'
N


INQUIRY #: 3557487.5
YEAR: 2009
= 500'
N


INQUIRY #: 3557487.5
YEAR: 2010
= 500'
N

Appendix 3: Project Site USACE Routine Wetland Determination Data Forms Jurisdictional Determination

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland A - DP1

Investigator(s): Matt Jenkins, PWS and Ian Eckardt Section, Township, Range: ____

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.494388 Long: W 81.314168 Datum: ____

Soil Map Unit Name: Worsham fine sandy loam (WoA) and Chewacla loam (ChA) NWI classification: ____

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

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

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

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

Hydrophytic Vegetation Present?	Yes ✓	No ___
Hydric Soil Present?	Yes ✓	No ___
Wetland Hydrology Present?	Yes ✓	No ___

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ___

Remarks:

Sampling point located in the floodplain of Howard Creek Tributary 1 (HC1). The vegetation has been routinely managed at the sampling location. Ditching efforts adjacent to the sampling location have likely impacted hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): ___
Water Table Present?	Yes ✓	No ___	Depth (inches): 9"
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12"

Wetland Hydrology Present? Yes ✓ **No** ___

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland A - DP1

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	5	No	OBL
2. Acer negundo	5	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	40	Yes	FACW
2. Cyperus strigosus	35	Yes	FACW
3. Impatiens capensis	15	No	FACW
4. Ranunculus sp.	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	95		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained farm field. Routine maintenance has removed tree strata. Sapling/shrub strata are sparsely scattered within the feature and show evidence of mowing.

SOIL

Sampling Point: Wetland A - DP1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 5/2	90	7.5YR 4/6	10	C	PL	silty loam	
7-12	10YR 3/1	85	7.5YR 4/6	15	C	PL	silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland D - DP2

Investigator(s): Matt Jenkins, PWS and Ian Eckardt Section, Township, Range: ____

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.494012 Long: W 81.312973 Datum: ____

Soil Map Unit Name: Worsham fine sandy loam (WoA), Chewacla loam (ChA), and Helena sandy loam (HeB) NWI classification: ____

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

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

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

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

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

Remarks:

Sampling point located in the floodplain of Howard Creek Tributary 1 (HC1). The vegetation has been routinely managed at the sampling location. Ditching efforts adjacent to the sampling location have likely impacted hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____

Water Table Present? Yes ____ No ✓ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ✓ No ____ Depth (inches): <12"

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

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland D - DP2

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus pennsylvanica	2	No	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	60	Yes	FACW
2. Cyperus strigosus	20	Yes	FACW
3. Impatiens capensis	20	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ✓ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained farm field. Routine maintenance has removed tree strata. Sapling/shrub strata are sparsely scattered within the feature and show evidence of mowing.

SOIL

Sampling Point: Wetland D - DP2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/2	90	7.5YR 4/6	10	C	PL	clayey sand	
4-12	10YR 5/1	80	7.5YR 4/6	20	C	PL	clayey sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP3

Investigator(s): Ian Eckardt Section, Township, Range: ______

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.494806 Long: W 81.313254 Datum: ______

Soil Map Unit Name: Worsham fine sandy loam (WoA) NWI classification: ______

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

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

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

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

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

Remarks:

Sampling point located in the floodplain of Howard Creek Tributary 2 (HC2). The vegetation has been routinely managed at the sampling location.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______

Water Table Present? Yes ___ No ___ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ______

Wetland Hydrology Present? Yes ___ No ✓

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP3

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
		= Total Cover	
Herb Stratum (Plot size: 5')			
1. Ranunculus sp.	40	Yes	FAC
2. Festuca sp.	20	Yes	FAC
3. Rumex crispus	20	Yes	FAC
4. Trifolium repens	20	Yes	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained farm field. Routine maintenance has removed tree and sapling/shrub strata.

SOIL

Sampling Point: Upland - DP3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	7.5YR 4/4	100					clayey loam	
5-12	5YR 4/6	100					clayey loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland E - DP4

Investigator(s): Matt Jenkins, PWS and Ian Eckardt Section, Township, Range: ______

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.493128 Long: W 81.312657 Datum: ______

Soil Map Unit Name: Chewacla loam (ChA) NWI classification: ______

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

Are Vegetation ✓, Soil ___, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

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

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

Hydrophytic Vegetation Present?	Yes ✓	No ___
Hydric Soil Present?	Yes ✓	No ___
Wetland Hydrology Present?	Yes ✓	No ___

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ___

Remarks:

Sampling point located in the floodplain of Howard Creek Tributary 1 (HC1). The vegetation has been routinely managed at the sampling location. Ditching efforts adjacent to the sampling location have likely impacted hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ✓	No ___	Depth (inches): ______
Water Table Present?	Yes ✓	No ___	Depth (inches): 4"
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12"

Wetland Hydrology Present? **Yes** ✓ **No** ___

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland E - DP4

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	35	Yes	FACW
2. Cyperus strigosus	25	Yes	FACW
3. Carex lurida	25	Yes	OBL
4. Murdannia keisak	10	No	OBL
5. Ludwigia sp.	5	No	OBL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ✓ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained farm field. Routine maintenance has removed tree and sapling strata.

SOIL

Sampling Point: Wetland E - DP4

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 5/1	85	10YR 4/8	15	C	PL	clay sand	
3-7	10YR 5/2	85	10YR 5/6	15	C	PL	clay sand	
7-12+	10YR 4/2	90	7.5YR 4/6	10	C	PL	clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
✓ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP5

Investigator(s): Ian Eckardt Section, Township, Range: ______

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.492974 Long: W 81.312512 Datum: ______

Soil Map Unit Name: Chewacla loam NWI classification: ______

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

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

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

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

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

Remarks:

Sampling point located in the floodplain of Howard Creek Tributary 2 (HC2). The vegetation has been routinely managed at the sampling location.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______

Water Table Present? Yes ___ No ___ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ______

Wetland Hydrology Present? Yes ___ No ✓

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP5

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	40	Yes	FACW
2. Eupatorium capillifolium	30	Yes	FACU
3. Cyperus strigosus	30	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained farm field. Routine maintenance has removed tree and sapling/shrub strata.

SOIL

Sampling Point: Upland - DP5

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/3	100					silty loam	
6-15	10YR 4/4	70	7.5YR 4/6	30	C	PL	silty loam	
15+	7.5YR 5/2	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

Hydric soils are buried by greater than a foot of material that doesn't meet any hydric soil indicators.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP6

Investigator(s): Ian Eckardt Section, Township, Range: ______

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.492597 Long: W 81.312062 Datum: ______

Soil Map Unit Name: Chewacla loam (ChA) NWI classification: ______

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

Are Vegetation ✓, Soil ___, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

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

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

Hydrophytic Vegetation Present?	Yes ✓ No ___	Is the Sampled Area within a Wetland?	Yes ___ No ✓
Hydric Soil Present?	Yes ___ No ✓		
Wetland Hydrology Present?	Yes ✓ No ___		

Remarks:

Sampling point located in the floodplain of Howard Creek Tributary 2 (HC2). The vegetation has been routinely managed at the sampling location. Although the area meets vegetation and hydrology criteria the soils don't meet hydric criteria. Ditching efforts have been performed immediately adjacent to the sampling location.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______

Water Table Present? Yes ___ No ___ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ______

Wetland Hydrology Present? Yes ✓ No ___

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP6

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus pennsylvanica	2	No	FACW
2. Prunus serotina	2	No	FACU
3. Acer negundo	2	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Peltandra virginica	20	Yes	OBL
2. Impatiens canpensis	10	No	FACW
3. Polygonum ramossimum	30	Yes	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	60		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ✓ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in an area of regular vegetation maintenance.

SOIL

Sampling Point: Upland - DP6

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	7.5YR 5/4	70	10YR 4/6	30	C	PL	silt clay	
5-12	7.5YR 5/3	70	10YR 4/6	30	C	PL	silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________________

Depth (inches): ________________

Hydric Soil Present? **Yes** ______ **No** ✓

Remarks:

Soils don't meet any hydric soil indicators.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland F - DP7

Investigator(s): Ian Eckardt Section, Township, Range: ______

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.492553 Long: W 81.312200 Datum: ______

Soil Map Unit Name: Chewacla loam (ChA) & Riverview loam (RvA) NWI classification: ______

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

Are Vegetation ✓, Soil ___, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

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

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

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

Remarks:

Sampling point located in a wet, linear drainage adjacent to the crop fields. The vegetation has been routinely managed at the sampling location. The hydrology has been enhanced at the sampling point due to ditching efforts.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ✓ No ___	Depth (inches): 2"	
Water Table Present?	Yes ✓ No ___	Depth (inches): 4"	
Saturation Present? (includes capillary fringe)	Yes ✓ No ___	Depth (inches): <12"	**Wetland Hydrology Present? Yes** ✓ **No** ___

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland F - DP7

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Peltandra virginica	30	Yes	OBL
2. Impatiens capensis	30	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	60		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained farm field. Maintenance has removed tree and sapling strata.

SOIL

Sampling Point: Wetland F - DP7

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/2	100					silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP8

Investigator(s): Ian Eckardt Section, Township, Range: ____

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.493918 Long: W 81.314527 Datum: ____

Soil Map Unit Name: Chewacla loam (ChA) NWI classification: ____

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

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

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

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

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? **Yes** ____ **No** ✓

Remarks:

Sampling point located within an active row crop field. The vegetation and soils are routinely managed at the sampling location. During the site visit a small pocket of standing water was observed in the sampling area. The area meets vegetation and hydrology criteria but the soils don't meet hydric criteria. The soil may be more recent fill material.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ✓	No ____	Depth (inches): 2"
Water Table Present?	Yes ____	No ✓	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ✓	No ____	Depth (inches): <12"

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

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP8

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
		= Total Cover	

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	30	Yes	FACW
2. Ranunculus sardous	10	Yes	FAC
3. Peltandra virginica	5	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40	= Total Cover	

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Upland - DP8

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

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	10YR 4/3	80	5YR 4/6	20	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ **No** ✓

Remarks:

Soils don't meet hydric soil indicators.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland G - DP9

Investigator(s): Ian Eckardt Section, Township, Range: ______

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.493005 Long: W 81.312954 Datum: ______

Soil Map Unit Name: Chewacla (ChA) NWI classification: ______

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

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

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

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

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

Remarks:

Sampling point located in the floodplain of Howard Creek Tributary 1 (HC1). The vegetation is routinely managed at the sampling location.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ✓ No ___	Depth (inches): 1"	
Water Table Present?	Yes ✓ No ___	Depth (inches): 10"	
Saturation Present? (includes capillary fringe)	Yes ✓ No ___	Depth (inches): <12"	**Wetland Hydrology Present? Yes** ✓ **No** ___

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland G - DP9

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus pennsylvanica	5	No	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	30	Yes	FACW
2. Peltandra virginica	30	Yes	OBL
3. Impatiens capensis	10	No	FACW
4. Ludwigia alternifolia	10	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	80		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

Maintenance has removed tree strata.

SOIL Sampling Point: Wetland G - DP9

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5 YR 4/1	90	5YR 4/6	10	C	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ✓ **No** ____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP10

Investigator(s): Ian Eckardt Section, Township, Range: ______

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.492646 Long: W 81.313003 Datum: ______

Soil Map Unit Name: Chewacla loam (ChA) NWI classification: ______

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

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

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

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

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

Remarks:

The vegetation is managed at the sampling location (mechanical cutting). The area has hydrophytic vegetation and hydrology indicators but the soils don't meet hydric criteria.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ✓	No ___	Depth (inches): 1"
Water Table Present?	Yes ✓	No ___	Depth (inches): 10"
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12"

Wetland Hydrology Present? Yes ✓ No ___

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP10

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Fraxinus pennsylvanica	5	Yes	FACW
2. Betula nigra	5	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Herb Stratum (Plot size: 5')			
1. Juncus effusus	30	Yes	FACW
2. Peltandra virginica	30	Yes	OBL
3. Impatiens capensis	10	No	FACW
4. Ludwigia alternifolia	10	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ________

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Upland - DP10

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

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	10YR 4/3	90	5YR 4/6	10	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No ✓

Remarks:

Soils don't meet hydric soil indicators.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP11

Investigator(s): Ian Eckardt Section, Township, Range: ____

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.495556 Long: W 81.313672 Datum: ____

Soil Map Unit Name: Worsham fine sandy loam (WoA) NWI classification: ____

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

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

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

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

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

Remarks:

Sampling point located in the floodplain of Howard Creek Tributary 2 (HC2). The vegetation is routinely managed at the sampling location.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

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

Wetland Hydrology Present? Yes ____ No ✓

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP11

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Festuca sp.	50	Yes	FAC
2. Trifolium repens	20	Yes	FAC
3. Ranunculus sardous	20	Yes	FAC
4. Lamium amplexicaule	10	No	NR
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained farm field. Routine maintenance has removed tree and sapling/shrub strata.

SOIL

Sampling Point: Upland - DP11

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

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	10YR 4/3	100					silt loam	
4-12	7.5YR 4/4	90	7.5 4/6	10	C	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 4/23/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland C - DP12

Investigator(s): Ian Eckardt Section, Township, Range: ______

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.495324 Long: W 81.313532 Datum: ______

Soil Map Unit Name: Worsham fine sandy loam (WoA) NWI classification: ______

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

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ✓ No ___	Depth (inches): 1"	
Water Table Present?	Yes ✓ No ___	Depth (inches): 10"	
Saturation Present? (includes capillary fringe)	Yes ✓ No ___	Depth (inches): <12"	**Wetland Hydrology Present? Yes ✓ No ___**

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland C - DP12

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	50	Yes	OBL
2. Sambucus canadensis	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover	70		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	30	Yes	FACW
2. Carex lurida	15	Yes	FACW
3. Cyperus strigosus	10	Yes	FACW
4. Ludwigia alternifolia	5	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	60		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Wetland C - DP12

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/2	100					sandy loam	
4-9	10YR 3/1	100					sandy loam	
9-12	10YR 3/1	85	7.5YR 3/4	15	C	PL	clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? **Yes** ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Owl's Den Mitigation Site City/County: Lincoln Sampling Date: 9/9/13

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland H - DP13

Investigator(s): Ian Eckardt Section, Township, Range: ______

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

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.494490 Long: W 81.313952 Datum: ______

Soil Map Unit Name: Chewacla loam (ChA) and Worsham fine sandy loam (WoA) NWI classification: ______

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

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

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

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

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

Remarks:

Wetland H is a linear feature located in the floodplain of HC1. Vegetation has been routinely maintained which has removed the tree strata.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ✓	No ___	Depth (inches): 1"
Water Table Present?	Yes ✓	No ___	Depth (inches): 1"
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12"

Wetland Hydrology Present? Yes ✓ **No** ___

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland H - DP13

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover	70		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Polygonum sagittatum	60	Yes	OBL
2. Sagittaria spp.	20	Yes	OBL
3. Typha latifolia	10	No	OBL
4. Peltandra virginica	10	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Wetland H - DP13

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/2	100					silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ✓ **No** ______

Remarks:

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

Wetland Site Name	Owl's Den - Wetland A	**Date**	4/23/2013
Wetland Type	Headwater Forest	**Assessor Name/Organization**	Ian Eckardt
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Howards Creek
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050102
[ ] **Yes** [x] **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.494388/-81.314168

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? [x] Yes [ ] No

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

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [ ] Yes [x] 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	
[x] A	[ ] A	Not severely altered
[ ] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

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

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[x] D	[x] 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
	[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

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

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

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

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☒ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.

☐ ≤ 15-feet wide ☒ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?

☒ Yes ☐ No

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

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

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

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

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

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

10. Indicators of Deposition – assessment area condition metric

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

☒ A Sediment deposition is not excessive, but at approximately natural levels.
☐ 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 <u>or</u> assessment area is clear-cut

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

☐ A No artificial edge within 150 feet in all directions
☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

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

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

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

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

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

17a. Is vegetation present?

[x] 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
	[x] C	[x] C	Canopy sparse or absent
Mid-Story	[ ] A	[ ] A	Dense mid-story/sapling layer
	[ ] B	[ ] B	Moderate density mid-story/sapling layer
	[x] C	[x] C	Mid-story/sapling layer sparse or absent
Shrub	[ ] A	[ ] A	Dense shrub layer
	[ ] B	[ ] B	Moderate density shrub layer
	[x] C	[x] C	Shrub layer sparse or absent
Herb	[x] A	[x] A	Dense herb layer
	[ ] B	[ ] B	Moderate density herb layer
	[ ] C	[ ] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

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

19. Diameter Class Distribution – wetland type condition metric

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

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

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

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

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

[ ] A   [ ] B   [ ] C   [ ] D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- [ ] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
- [x] B Overbank flow is severely altered in the assessment area.
- [ ] C Overland flow is severely altered in the assessment area.
- [ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

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

Wetland Site Name	Owl's Den - Wetland A	Date	4/23/2013
Wetland Type	Headwater Forest	Assessor Name/Organization	Ian Eckardt

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

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

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

Overall Wetland Rating **MEDIUM**

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

Wetland Site Name	Owl's Den - Wetland B	**Date**	4/23/2013
Wetland Type	Headwater Forest	**Assessor Name/Organization**	Ian Eckardt
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Howards Creek
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050102
☐ **Yes** ☒ **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.494130/-81.313664

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

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

Is the assessment area intensively managed? ☒ Yes ☐ No

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

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

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

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

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

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

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

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

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

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

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

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

4. Soil Texture/Structure – assessment area condition metric

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

4a.
- [ ] A Sandy soil
- [x] 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.
- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

4c.
- [x] 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	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[x] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

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

[x] Yes [ ] No If Yes, continue to 7b. If No, skip to Metric 8.

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

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- [ ] A ≥ 50 feet
- [ ] B From 30 to < 50 feet
- [ ] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [x] 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 [x] > 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 [x] No

7e. Is tributary or other open water sheltered or exposed?
- [x] Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

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

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

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

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

10. Indicators of Deposition – assessment area condition metric

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

- [x] 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
[x] I	[x] I	[x] 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
[x] F	[x] F	Wetland type has a poor or no connection to other natural habitats

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

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

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

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

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

- [ ] A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- [ ] 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.
- [x] C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

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

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

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

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

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

	AA	WT	
Mid-Story 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
	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☐ B	Moderate density mid-story/sapling layer
	☒ C	☒ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☐ B	Moderate density shrub layer
	☒ C	☒ C	Shrub layer sparse or absent
Herb	☒ A	☒ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☐ C	☐ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

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

19. Diameter Class Distribution – wetland type condition metric

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

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

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

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

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

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☐ A Overbank and overland flow are not severely altered in the assessment area.
☒ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

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

Wetland Site Name	Owl's Den - Wetland B	Date	4/23/2013
Wetland Type	Headwater Forest	Assessor Name/Organization	Ian Eckardt

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

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

Wetland Site Name	Owl's Den - Wetland C	**Date**	4/23/2013
Wetland Type	Headwater Forest	**Assessor Name/Organization**	Ian Eckardt
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Howards Creek
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050102
☐ **Yes** ☒ **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.495324/-81.313532

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

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

Is the assessment area intensively managed? ☒ Yes ☐ No

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

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

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

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

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

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

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

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

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

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

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

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

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

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

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

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

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

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

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

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

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☒ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

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

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

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

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

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

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

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

10. Indicators of Deposition – assessment area condition metric

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

☒ A Sediment deposition is not excessive, but at approximately natural levels.
☐ 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 <u>or</u> assessment area is clear-cut

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

☐ A No artificial edge within 150 feet in all directions
☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

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

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

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

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

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

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

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

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

18. Snags – wetland type condition metric

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

19. Diameter Class Distribution – wetland type condition metric

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

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

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

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

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

☐A ☐B ☐C ☐D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☐A Overbank <u>and</u> 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 <u>and</u> overland flow are severely altered in the assessment area.

Notes

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

Wetland Site Name	Owl's Den - Wetland C	Date	4/23/2013
Wetland Type	Headwater Forest	Assessor Name/Organization	Ian Eckardt

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

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**HIGH**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

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

Overall Wetland Rating **HIGH**

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

Wetland Site Name Owl's Den - Wetland D | **Date** 4/23/2013

Wetland Type Headwater Forest | **Assessor Name/Organization** Ian Eckardt

Level III Ecoregion Piedmont | **Nearest Named Water Body** Howards Creek

River Basin Catawba | **USGS 8-Digit Catalogue Unit** 03050102

☐ **Yes** ☒ **No** **Precipitation within 48 hrs?** | **Latitude/Longitude (deci-degrees)** 35.494012/-81.312973

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

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

Is the assessment area intensively managed? ☒ Yes ☐ No

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

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

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

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

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

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

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

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

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

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

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

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

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

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

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

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

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

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

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

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

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☐ A ≥ 50 feet
☐ B From 30 to < 50 feet
☒ C From 15 to < 30 feet
☐ D From 5 to < 15 feet
☐ E < 5 feet <u>or</u> 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 <u>and</u> no regular boat traffic.
☐ Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

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

9. **Inundation Duration – assessment area condition metric**
Answer for assessment area dominant landform.
- ☒ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. **Indicators of Deposition – assessment area condition metric**
Consider recent deposition only (no plant growth since deposition).
- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ 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 <u>or</u> assessment area is clear-cut

12. **Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)**
- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

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

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

13b. **Evaluate for marshes only**.
☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. **Edge Effect – wetland type condition metric (skip for all marshes)**
May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.
- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

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

16. **Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)**
- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

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

17a. Is vegetation present?

[x] 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
	[x] C	[x] C	Canopy sparse or absent
Mid-Story	[ ] A	[ ] A	Dense mid-story/sapling layer
	[ ] B	[ ] B	Moderate density mid-story/sapling layer
	[x] C	[x] C	Mid-story/sapling layer sparse or absent
Shrub	[ ] A	[ ] A	Dense shrub layer
	[ ] B	[ ] B	Moderate density shrub layer
	[x] C	[x] C	Shrub layer sparse or absent
Herb	[x] A	[x] A	Dense herb layer
	[ ] B	[ ] B	Moderate density herb layer
	[ ] C	[ ] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

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

19. Diameter Class Distribution – wetland type condition metric

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

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

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

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

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

[ ] A [ ] B [ ] C [ ] D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- [ ] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
- [x] B Overbank flow is severely altered in the assessment area.
- [ ] C Overland flow is severely altered in the assessment area.
- [ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

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

Wetland Site Name	Owl's Den - Wetland D	Date	4/23/2013
Wetland Type	Headwater Forest	Assessor Name/Organization	Ian Eckardt

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

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**MEDIUM**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Physical Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

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

Overall Wetland Rating **MEDIUM**

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

Wetland Site Name Owl's Den - Wetland E **Date** 4/23/2013
Wetland Type Headwater Forest **Assessor Name/Organization** Ian Eckardt
Level III Ecoregion Piedmont **Nearest Named Water Body** Howards Creek
River Basin Catawba **USGS 8-Digit Catalogue Unit** 03050102
☐ **Yes** ☒ **No** **Precipitation within 48 hrs?** **Latitude/Longitude (deci-degrees)** 35.493128/-81.312657

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

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

Is the assessment area intensively managed? ☒ Yes ☐ No

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

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

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

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

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

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

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

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

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

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

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

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

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- [ ] A Sandy soil
- [x] 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.
- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

4c.
- [x] 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	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[x] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> 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
[x] B	[x] B	[x] B	< 10% impervious surfaces
[ ] C	[ ] C	[ ] C	Confined animal operations (or other local, concentrated source of pollutants)
[ ] D	[ ] D	[ ] D	≥ 20% coverage of pasture
[x] E	[x] E	[x] E	≥ 20% coverage of agricultural land (regularly plowed land)
[ ] F	[ ] F	[ ] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of clear-cut land
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

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

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

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- [ ] A ≥ 50 feet
- [ ] B From 30 to < 50 feet
- [x] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [ ] E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
[ ] ≤ 15-feet wide [x] > 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?
[x] Yes [ ] No

7e. Is tributary or other open water sheltered or exposed?
- [x] Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

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

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

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

10. Indicators of Deposition – assessment area condition metric

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

☒ A Sediment deposition is not excessive, but at approximately natural levels.
☐ 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 <u>or</u> assessment area is clear-cut

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

☐ A No artificial edge within 150 feet in all directions
☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

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

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

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

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

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

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

- ☐ A ≥ 25% coverage of vegetation
- ☐ B < 25% coverage of vegetation

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

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

18. Snags – wetland type condition metric

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

19. Diameter Class Distribution – wetland type condition metric

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

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

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

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

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

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- ☐ A Overbank <u>and</u> 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 <u>and</u> overland flow are severely altered in the assessment area.

Notes

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

Wetland Site Name	Owl's Den - Wetland E	Date	4/23/2013
Wetland Type	Headwater Forest	Assessor Name/Organization	Ian Eckardt

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

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

Wetland Site Name	Owl's Den - Wetland F	**Date**	4/23/2013
Wetland Type	Headw ater Forest	**Assessor Name/Organization**	Ian Eckardt
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Howards Creek
River Basin	Cataw ba	**USGS 8-Digit Catalogue Unit**	03050102
[ ] **Yes** [x] **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.492553/-81.312200

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? [x] Yes [ ] No

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

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [ ] Yes [x] 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
[x] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

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

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[x] C	[x] 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
	[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

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

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

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

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☒ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.

☐ ≤ 15-feet wide ☒ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?

☒ Yes ☐ No

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

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

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

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

9. **Inundation Duration – assessment area condition metric**
Answer for assessment area dominant landform.
☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. **Indicators of Deposition – assessment area condition metric**
Consider recent deposition only (no plant growth since deposition).
☒A Sediment deposition is not excessive, but at approximately natural levels.
☐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 <u>or</u> assessment area is clear-cut

12. **Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)**
☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin is < 90% of the full extent of its natural landscape size.

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

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

13b. **Evaluate for marshes only**.
☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. **Edge Effect – wetland type condition metric (skip for all marshes)**
May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.
☐A No artificial edge within 150 feet in all directions
☐B No artificial edge within 150 feet in four (4) to seven (7) directions
☒C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

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

16. **Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)**
☐A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (>50% cover of exotics).

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

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

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

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

18. Snags – wetland type condition metric

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

19. Diameter Class Distribution – wetland type condition metric

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

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

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

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

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

☐A ☐B ☐C ☐D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

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

Wetland Site Name	Owl's Den - Wetland F	Date	4/23/2013
Wetland Type	Headwater Forest	Assessor Name/Organization	Ian Eckardt

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

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

Wetland Site Name	Owl's Den - Wetland G	**Date**	4/23/2013
Wetland Type	Headwater Forest	**Assessor Name/Organization**	Ian Eckardt
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Howards Creek
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050102
[ ] **Yes** [x] **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.493005/-81.312954

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? [x] Yes [ ] No

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

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [ ] Yes [x] 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	
[x] A	[ ] A	Not severely altered
[ ] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

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

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[x] D	[x] 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
	[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

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

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

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

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

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

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

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

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☐ A ≥ 50 feet
☐ B From 30 to < 50 feet
☒ C From 15 to < 30 feet
☐ D From 5 to < 15 feet
☐ E < 5 feet or buffer bypassed by ditches

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

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

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

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

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

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

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

10. Indicators of Deposition – assessment area condition metric

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

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐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 <u>or</u> assessment area is clear-cut

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

☐A No artificial edge within 150 feet in all directions
☐B No artificial edge within 150 feet in four (4) to seven (7) directions
☒C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

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

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

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

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

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

17a. Is vegetation present?

- [x] 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
	[x] C	[x] C	Canopy sparse or absent
Mid-Story	[ ] A	[ ] A	Dense mid-story/sapling layer
	[ ] B	[ ] B	Moderate density mid-story/sapling layer
	[x] C	[x] C	Mid-story/sapling layer sparse or absent
Shrub	[ ] A	[ ] A	Dense shrub layer
	[ ] B	[ ] B	Moderate density shrub layer
	[x] C	[x] C	Shrub layer sparse or absent
Herb	[ ] A	[ ] A	Dense herb layer
	[x] B	[x] B	Moderate density herb layer
	[ ] C	[ ] C	Herb layer sparse or absent

18. **Snags – wetland type condition metric**

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

19. **Diameter Class Distribution – wetland type condition metric**

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

20. **Large Woody Debris – wetland type condition metric**

Include both natural debris and man-placed natural debris.

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

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

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

[ ] A   [ ] B   [ ] C   [ ] D

22. **Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only**]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- [ ] A Overbank and overland flow are not severely altered in the assessment area.
- [x] B Overbank flow is severely altered in the assessment area.
- [ ] C Overland flow is severely altered in the assessment area.
- [ ] D Both overbank and overland flow are severely altered in the assessment area.

Notes

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

Wetland Site Name	Owl's Den - Wetland G	Date	4/23/2013
Wetland Type	Headwater Forest	Assessor Name/Organization	Ian Eckardt

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

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

Wetland Site Name Owl's Den - Wetland H **Date** 9/9/2013
Wetland Type Headwater Forest **Assessor Name/Organization** Ian Eckardt
Level III Ecoregion Piedmont **Nearest Named Water Body** Howards Creek
River Basin Catawba **USGS 8-Digit Catalogue Unit** 03050102
[ ] **Yes** [x] **No** **Precipitation within 48 hrs?** **Latitude/Longitude (deci-degrees)** 35.494490/-81.313952

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? [x] Yes [ ] No

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

What type of natural stream is associated with the wetland, if any? (check all that apply)
[ ] Blackwater
[x] Brownwater
[ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [ ] Yes [x] 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
[x] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

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

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[x] A	[x] 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
[x] B Evidence that maximum depth of inundation is between 1 and 2 feet
[ ] C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

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

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

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

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☒A ≥ 50 feet
☐B From 30 to < 50 feet
☐C From 15 to < 30 feet
☐D From 5 to < 15 feet
☐E < 5 feet or buffer bypassed by ditches

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

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

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

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

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

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

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

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

10. Indicators of Deposition – assessment area condition metric

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

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ 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 <u>or</u> assessment area is clear-cut

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

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

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

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

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

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

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

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

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

18. Snags – wetland type condition metric

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

19. Diameter Class Distribution – wetland type condition metric

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

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

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

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

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

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank <u>and</u> 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 <u>and</u> overland flow are severely altered in the assessment area.

Notes

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

Wetland Site Name	Owl's Den - Wetland H	Date	9/9/2013
Wetland Type	Headwater Forest	Assessor Name/Organization	Ian Eckardt

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Owls Den Mitigation Site - Howards Creek Tributary 1 (HC1) and Wetlands A, B, E, F, G, & H.

State:NC County/parish/borough: Lincoln City: Lincolnton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.493666° **N**, Long. 81.313054° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Howards Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): Catawba River 03050102

- ☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
- ☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

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

- ☐ Office (Desk) Determination. Date:
- ☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

- ☐ Waters subject to the ebb and flow of the tide.
- ☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      - ☐ TNWs, including territorial seas
      - ☐ Wetlands adjacent to TNWs
      - ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      - ☐ Non-RPWs that flow directly or indirectly into TNWs
      - ☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      - ☒ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      - ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      - ☐ Impoundments of jurisdictional waters
      - ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 1,561 linear feet: 12-16width (ft) and/or acres.
      Wetlands: 0.99 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   - ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 150 **acres**
Drainage area: 150 **acres**
Average annual rainfall: 48.22 inches
Average annual snowfall: 6.9 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **2** tributaries before entering TNW.

Project waters are **30 (or more)** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **25-30** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: No.

Identify flow route to TNW[5]: HC1 flows into Howards Creek which then joins the South Fork Catawba River. The South Fork Catawba River flows into the Catawba River (the TNW) in Lake Wylie.

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

Tributary stream order, if known: First.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: HC1 has been highly manipulated by agricultural activities. The channel is straight and has a uniform dimension which suggests it has been channelized to improve drainage for ag.

Tributary properties with respect to top of bank (estimate):
Average width: 14 feet
Average depth: 3 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):

☒ Silts ☒ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: The reach exhibits some bank instability in the form of scour and raw banks..

Presence of run/riffle/pool complexes. Explain: Due to manipulation the reach exhibited a uniform bed with little or no riffle/pool complexes.

Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): 0-2 %

(c) Flow:

Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **1**
Describe flow regime: The channel exhibits baseflow during numerous site visits.
Other information on duration and volume: N/A.

Surface flow is: **Discrete and confined.** Characteristics: Baseflow is easily observed and occupies the entire channel bed.

Subsurface flow: **Unknown**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☒ clear, natural line impressed on the bank ☒ the presence of litter and debris
☒ changes in the character of soil ☒ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☒ scour
☐ sediment deposition ☒ multiple observed or predicted flow events
☐ water staining ☒ abrupt change in plant community
☐ other (list):

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: Iron oxidizing bacteria was common throughout the reach..
Identify specific pollutants, if known: .

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size:0.13acres

Wetland type. Explain:Using the NCWAM key the wetland were determined to be headwater forest wetland.

Wetland quality. Explain:The wetland has been impacted by ag. activites. The vegetation has been routinely maintained which has resulted in the removal of trees. Much of the surrounding land that drains to the wetland is used for blackberry production which requires the use of pesticides and fertiziler.

Project wetlands cross or serve as state boundaries. Explain: N/A.

(b) General Flow Relationship with Non-TNW:

Flow is: **Ephemeral flow**. Explain: During large rainfall events wetland likely discharges surface flow to HC1 .

Surface flow is**: Discrete**

Characteristics: Flow is over floodplain areas from overland flow.

Subsurface flow: **Unknown**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

☐ Directly abutting
☒ Not directly abutting
  ☒ Discrete wetland hydrologic connection. Explain: Wetland B is located in the geomorphic floodplain of HC1.
  ☐ Ecological connection. Explain: .
  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **30 (or more)** river miles from TNW.
Project waters are **25-30** aerial (straight) miles from TNW.
Flow is from: **Wetland to navigable waters.**
Estimate approximate location of wetland as within the **5 - 10-year** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: Wetland B has been regularly impacted and maintained resulting in the removal of the tree strata. In addition the wetland receives drainage from the surrounding blackberry farm which uses fertilizer and pesticides.

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☒ Vegetation type/percent cover. Explain:Wetland consists of entirely herbaceous vegetation with a small amount of tree sapling vegetation including FAC, FACW and OBL wetland ratings. .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **5**
Approximately (0.84) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland A - Y	0.44	Wetland G - Y	0.13
Wetland B - N	0.13	Wetland H - Y	0.15
Wetland E - Y	0.13		
Wetland F - Y	0.01		

Summarize overall biological, chemical and physical functions being performed: Features provide water treatment and flood storage.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: Wetland B does not directly abut tributary HC1 but is located in its geomorphic floodplain. Wetland is has the ability to capture and treat water before it enters HC1. Being located in the floodplain of HC1 it can also provide flood storage for out of bank flows from HC1 .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: This channel exhibited average bankfull widths of 12 to 16 feet, well-defined bed and bank, a large amount of iron oxidizing bacteria, and soil-based evidence of a high water (hydric soils). Biological sampling within the channel resulted in a moderate presence of algae and amphibians and a weak presence of fish and crayfish. HC1 to Howards

Creek scored 34 (lower reach) and 41 (upper reach) out of a possible 100 points on the USACE Stream Assessment Form and scored 37.5 and 31.5 out of 61.5 possible points on the NCDWQ Stream Classification Form, indicating perennial status (SCP1 and SCP2).

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):

☒ Tributary waters: **1,561** linear feet**12-16**width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.

☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☒ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **Wetlands A, E, F, G, and H are directly connected to HC1 via direct surface water connections.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: **0.86**acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.

☒ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **0.13**acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☐ Demonstrate that impoundment was created from "waters of the U.S.," or

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or

☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

---

[8] See Footnote # 3.

[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Lincolton West 7.5 Quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Lincoln County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .

---

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

or ☒ Other (Name & Date):see attached report.

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

☐ Applicable/supporting case law: .

☐ Applicable/supporting scientific literature: .

☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Owls Den Mitigation Site - Howards Creek Tributary 2 (HC2) and Wetlands C & D.

State:NC County/parish/borough: Lincoln City: Lincolnton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.493666° **N**, Long. 91.313054° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Howards Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): Catawba 03050102

- [x] Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
- [ ] Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

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

- [ ] Office (Desk) Determination. Date:
- [ ] Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

- [ ] Waters subject to the ebb and flow of the tide.
- [ ] Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
   - [ ] TNWs, including territorial seas
   - [ ] Wetlands adjacent to TNWs
   - [x] Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   - [ ] Non-RPWs that flow directly or indirectly into TNWs
   - [x] Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   - [ ] Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   - [ ] Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   - [ ] Impoundments of jurisdictional waters
   - [ ] Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: 443 linear feet: 16-22width (ft) and/or acres.
   Wetlands: 1.89 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   - [ ] Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .

☐ Wetland fringe. Characteristics: .

☐ Habitat for:

  ☐ Federally Listed species. Explain findings: .

  ☐ Fish/spawn areas. Explain findings: .

  ☐ Other environmentally-sensitive species. Explain findings: .

  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: N/A.

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

☒ Directly abutting

☐ Not directly abutting

  ☐ Discrete wetland hydrologic connection. Explain: .

  ☐ Ecological connection. Explain: .

  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .

☐ Vegetation type/percent cover. Explain: .

☐ Habitat for:

  ☐ Federally Listed species. Explain findings: .

  ☐ Fish/spawn areas. Explain findings: .

  ☐ Other environmentally-sensitive species. Explain findings: .

  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: This channel exhibited average bankfull widths of 16 to 22 feet, well-defined bed and bank, a large amount of iron oxidizing bacteria, and soil-based evidence of a high water table (hydric soils). Biological sampling within the channel resulted in a weak presence of fish and crayfish and a moderate presence of algae and amphibians. HC2 to Howards Creek scored 35 out of a possible 100 points on the USACE Stream Assessment Form and scored 31.5 out of 61.5 possible points on the NCDWQ Stream Classification Form, indicating perennial status (SCP3).

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):

☒ Tributary waters: **443** linear feet **16-22** width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.

☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☒ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **Wetlands C and D are directly connected to HC2 via direct surface water connections.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: **1.89** acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.

☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☐ Demonstrate that impoundment was created from "waters of the U.S.," or

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or

☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

---

[8] See Footnote # 3.

[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Lincolton West 7.5 Quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Lincoln County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action I.D.: **2010-00717** County: **Lincoln** U.S.G.S. Quad: **Lincoln West**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Agent: **Sunny Ridge Farm, Inc.**
Address: **1900 5th Street NW, Winter Haven, Florida 33885**
Telephone No.: **863-207-2817**

Property description:
Size (acres): 12.7 (proposed easement)
Nearest Waterway: UTs to Howards Creek
Coordinates: 35.494388 N, 81.314168 W
Nearest Town: Lincolnton
River Basin: South Fork Catawba
Hydrologic Unit Code: 03050102

Location Description: The site is located within a 119.5 acre tract of land (PIN 3614-13-5713) west Owl's Den Road west of Lincolnton in Lincoln County, North Carolina.

Indicate Which of the Following Apply:

A. Preliminary Determination

_ Based on preliminary information, there may be waters and wetlands on the above described property. We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331).). If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also, you may provide new information for further consideration by the Corps to reevaluate the JD.

B. Approved Determination

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

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

_ We strongly suggest you have the waters and wetlands on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

X The waters and wetlands on your property have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

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

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

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **David Brown** at **828-271-7980**.

C. Basis For Determination

The site contains wetlands as determined by the *1987 Corps of Engineers Wetland Delineation Manual* and the *Interim Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Eastern Mountain and Piedmont Region*. These wetlands are abutting to stream channels located on the property that exhibit indicators of ordinary high water marks and have perennial flow. The stream channels on the property are unnamed tributaries (UT) to Howards Creek, relatively permanent waters (RPW), which flow into Howards Creek (RPW), which flows into the South Fork Catawba River (RPW). The South Fork of the Catawba River flows into the Catawba River, a traditional navigable water (TNW) and a Section 10 water at the Mountain Island Lake dam in Mecklenburg County, NC. The Catawba River joins the Santee Cooper River in South Carolina before entering the Atlantic Ocean. The UTs to Howards Creek, have bed and bank and exhibit indicators of ordinary high water mark.

D. Remarks:

The waters of the U.S., at this site, were verified on-site by the Corps on September 9, 2013. The location of the jurisdictional streams and wetlands are as approximately depicted on the attached *Figure 3, Site Map Owl's Den Mitigation Site,* revised September 10, 2013, and the size to these jurisdictional areas are summarized in the attached *Table 1, Summary of On-Site Jurisdictional Waters*, submitted by Wildlands Engineering, Inc.

E. Attention USDA Program Participants

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

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

Attached to this verification is an approved jurisdictional determination. If you are not in agreement with that approved jurisdictional determination, you can make an administrative appeal under 33 CFR 331. Enclosed you will find a request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

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

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by November 25, 2013.

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

Corps Regulatory Official: David Brown

Issue Date: **September 26, 2013** Expiration Date: **September 26, 2018**

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the Customer Satisfaction Survey located at our website at http://per2.nwp.usace.army.mil/survey.html to complete the survey online.

CF: Wildlands Engineering, Inc., Ian Eckardt, 1430 South Mint Street, Suite 104, Charlotte, NC 28203

NC Ecosystem Enhancement Program, Paul Wiesner, 1652 Mail Service Center, Raleigh, NC 27699-1652

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL			
Applicant: Sunny Ridge Farm, Inc.		File Number: 2010-00717	Date: September 26, 2013
Attached is:			See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
X	APPROVED JURISDICTIONAL DETERMINATION		D
	PRELIMINARY JURISDICTIONAL DETERMINATION		E

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

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

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

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

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

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

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

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

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

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

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

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

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: David Brown, Project Manager 828-271-7980	If you only have questions regarding the appeal process you may also contact: Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

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

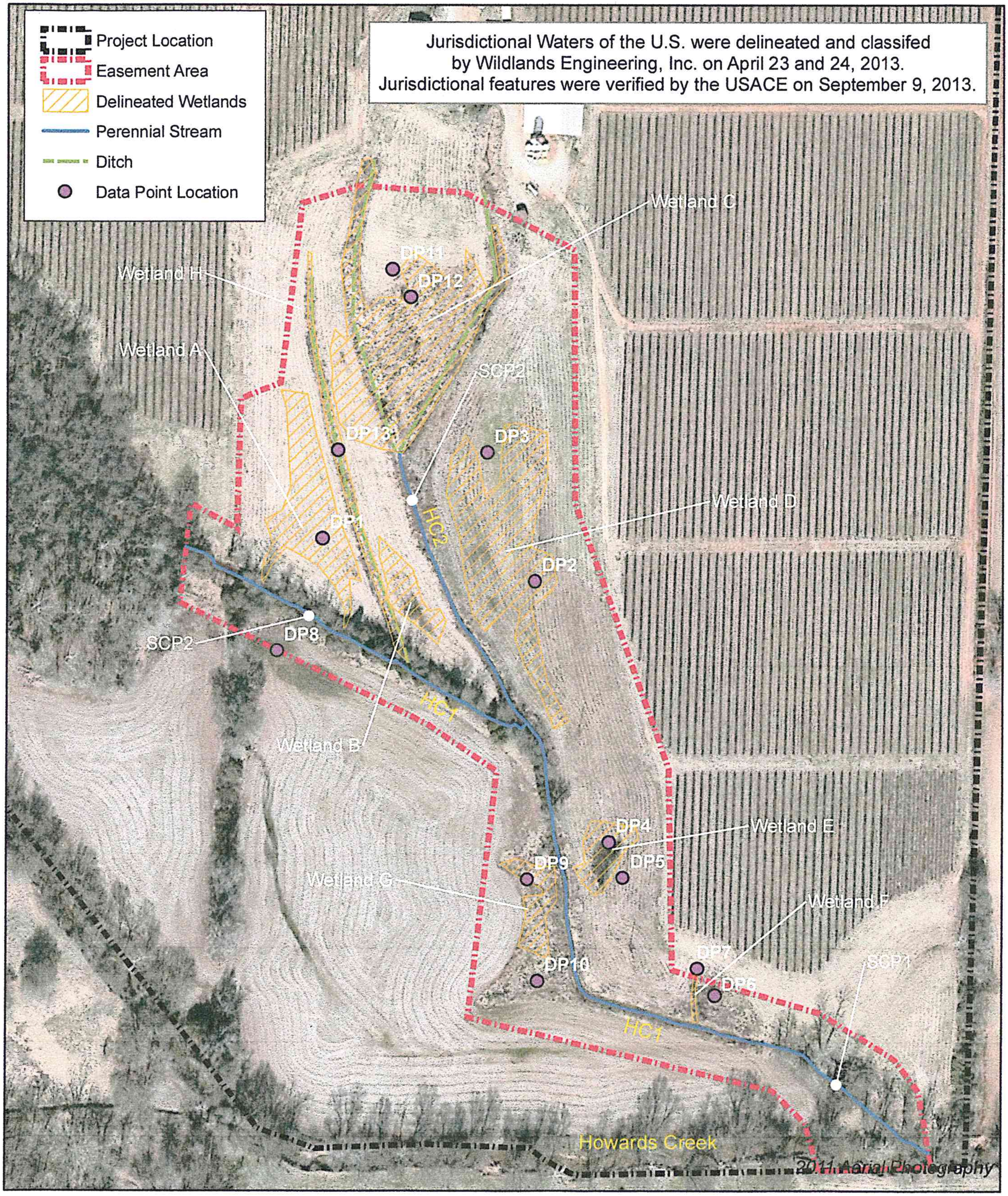
_______________________ Signature of appellant or agent.	Date:	Telephone number:

For appeals on Initial Proffered Permits send this form to:

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

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

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



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 3 Site Map
Owl's Den Mitigation Site
Catawba River Basin
(03050102)
Lincoln County, NC

Table 1. Summary of On-Site Jurisdictional Waters

Jurisdictional Feature	Classification	Length (LF)	Acreage	Watershed (ac)	NCDWQ Stream Scores	USACE Stream Scores
HC1	Perennial RPW	1,561	-	150	31.5/37.5	34/41
HC2	Perennial RPW	443	-	27	31.5	35
Wetland A	Headwater Forest	-	0.44	-	-	-
Wetland B	Headwater Forest	-	0.13	-	-	-
Wetland C	Headwater Forest	-	1.08	-	-	-
Wetland D	Headwater Forest	-	0.81	-	-	-
Wetland E	Headwater Forest	-	0.13	-	-	-
Wetland F	Headwater Forest	-	0.01	-	-	-
Wetland G	Headwater Forest	-	0.13	-	-	-
Wetland H	Headwater Forest	-	0.15	-	-	-

Appendix 4: Site Photographs

	
Reference Wetland (8/8/2013)	Maintained Area (8/8/2013)
	
Maintained Area 2 (8/8/2013)	Evidence of Large Flow (8/8/2013)
	
Ditch Crossing North of Site (8/8/2013)	Rutting From Farm Use (8/8/2013)

Rain gage installed (7/23/2013)

Reference wetland (7/23/2013)

Reference wetland (7/23/2013)

Groundwater Well 6 facing East (7/23/2013)

Groundwater Well 6 facing West (7/23/2013)

Soybean field water tract facing south (7/23/2013)

Southern end of project looking NE (7/23/2013)

From well facing reference area. (7/23/2013)

Facing well, W, ref (5-8-2013)

Confluence facing US (5-8-2013)

Facing downstream near confluence (5-8-2013)

Culvert crossing (5-8-2013)

	
Looking US on culvert (5-8-2013)	Water withdrawl and replacement (5-8-2013)
	
XS6 RB, flag at TOB (5-8-2013)	Pickerel frog or S. Leopard frog, lower reach RB (5-8-2013)
	
Culvert facing DS (5-8-2013)	Facing upstream bend (5-8-2013)

	
Looking DS from wetland G (5-8-2013)	Looking US from wetland G (5-8-2013)
	
Lower reach facing US RB (5-8-2013)	Upstream from culvert (5-8-2013)
	
XS6 DS (5-8-2013)	XS6 US (5-8-2013)

	
XS7 DS (5-8-2013)	XS7 US (5-8-2013)
	
XS8 DS (5-8-2013)	XS8 US (5-8-2013)
	
Wetland 4/25/2013	Wetland 4/25/2013

	
GW @ Wetland 4/25/2013	4/25/2013
	
4/25/2013	XS1 pool DS 4/25/2013
	
XS1 pool US 4/25/2013	XS2 riffl DS 4/25/2013

	
XS 2 riffl US 4/25/2013	XS4 US 4/25/2013
	
XS4 DS 4/25/2013	XS4 "substrate" 4/25/2013
	
XS3 US 4/25/2013	XS3 DS 4/25/2013

	
XS5 US 4/25/2013	XS5 DS 4/25/2013
	
Ditch 4/24/2013	Water withrawl 4/24/2013
	
Weird underground meanders 4/24/2013	Weird underground meanders 4/24/2013

	
Well near ref 4/24/2013	Near wetland G 4/24/2013
	
Wetland G 4/24/2013	4/23/2013
	
4/23/2013	4/23/2013

4/23/2013

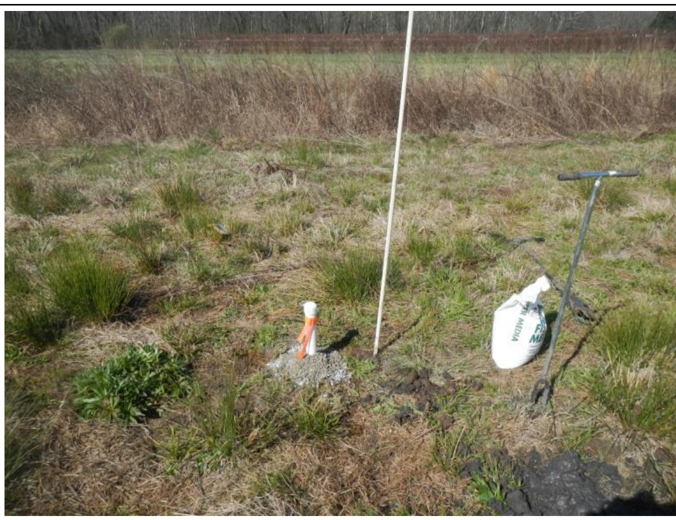
4/23/2013

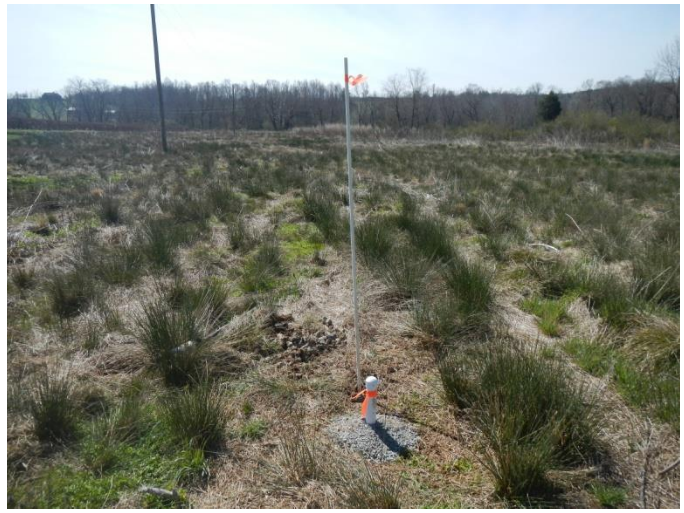
4/23/2013

4/23/2013

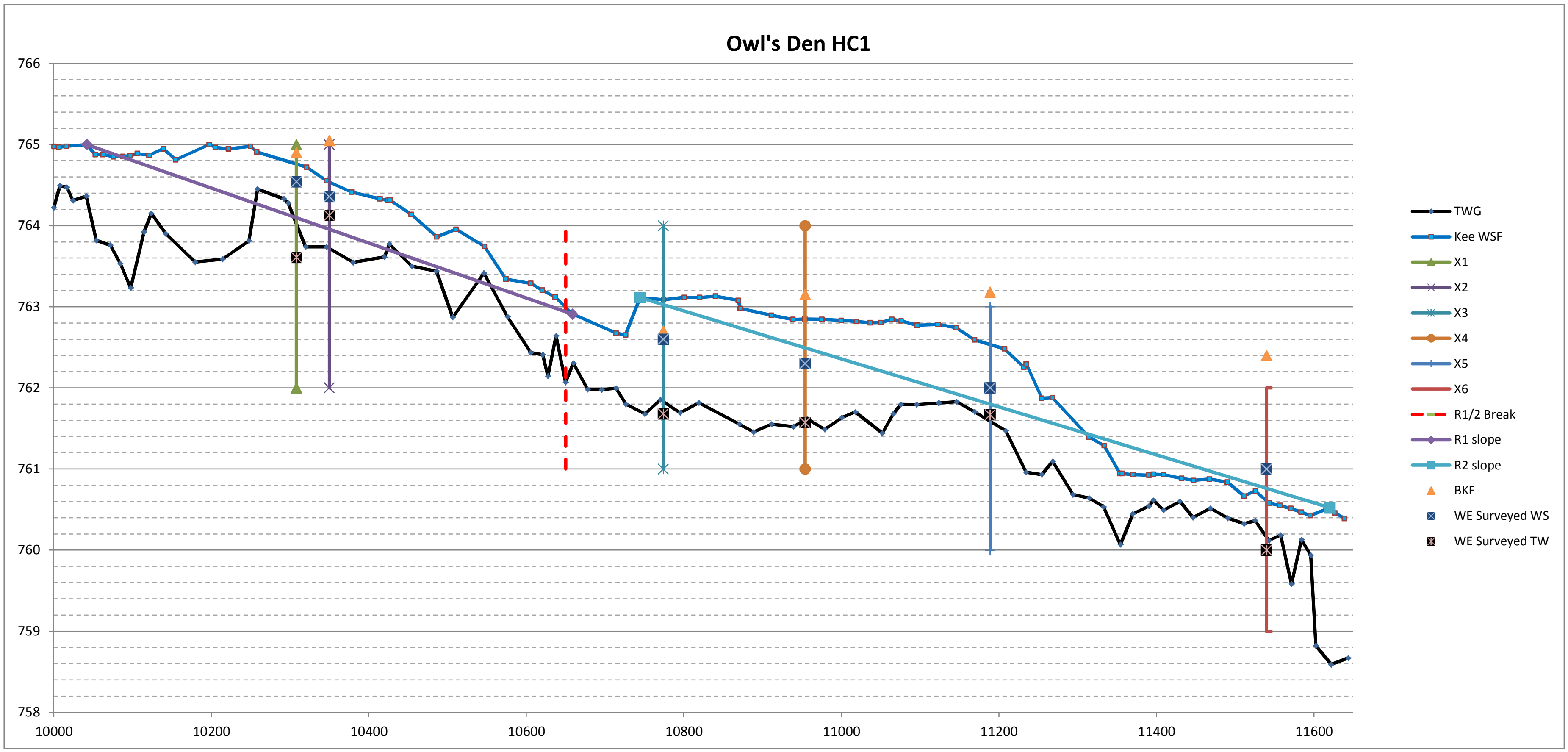
Bees and fertilizer 4/23/2013

4/11/2013

<table>
<tr><td></td><td></td></tr>
<tr><td>4/11/2013</td><td>4/11/2013</td></tr>
<tr><td></td><td></td></tr>
<tr><td>4/11/2013</td><td>4/3/2013</td></tr>
<tr><td></td><td></td></tr>
<tr><td>4/3/2013</td><td>4/3/2013</td></tr>
</table>

	
4/3/2013	4/3/2013
	
4/3/2013	4/3/2013

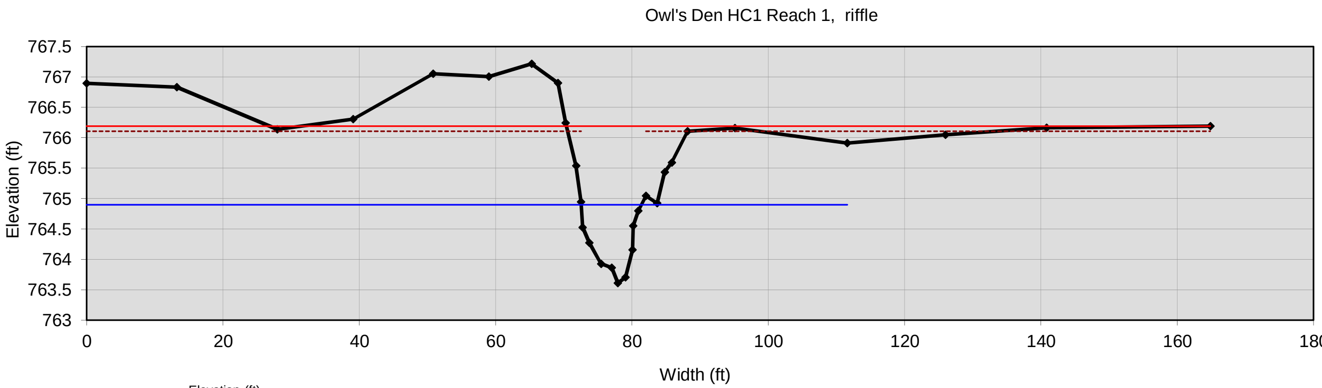
Appendix 5: Existing Geomorphic Survey Data
Reference Reach Data



Owl's Den HC1
766
765
764
763
762
761
760
759
758
10000
10200
10400
10600
10800
11000
11200
11400
11600
TWG
Kee WSF
X1
X2
X3
X4
X5
X6
R1/2 Break
R1 slope
R2 slope
BKF
WE Surveyed WS
WE Surveyed TW

Owl's Den HC1 Reach 1
Existing Cross Sections

Cross Section XS-1



Elevation (ft)

Bankfull Dimensions	
7.2	x-section area (ft.sq.)
8.9	width (ft)
0.8	mean depth (ft)
1.3	max depth (ft)
9.6	wetted parimeter (ft)
0.7	hyd radi (ft)
10.9	width-depth ratio

Flood Dimensions	
24.8	W flood prone area (ft)
2.8	entrenchment ratio
2.5	low bank height (ft)
1.9	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
8	threshold grain size (mm):

Bankfull Flow	
1.6	velocity (ft/s)
11.4	discharge rate (cfs)
0.32	Froude number

Flow Resistance	
0.045	Manning's roughness
0.26	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.34	channel slope (%)
0.16	shear stress (lb/sq.ft.)
0.29	shear velocity (ft/s)
0.27	unit strm power (lb/ft/s)

Cross Section

reference ID: XS-1
longitudinal station: ---
alignment: straight line
feature

Bankfull Stage

elevation: 764.9 ---

Low Bank Height

elevation: 766.105

Flood Prone Area

width fpa: 24.84 99.3

Channel Slope

percent slope: 0.34 0.33

Flow Resistance

Manning's "n": 0.045 ---
D'Arcy - Weisbach "f": ---

Note:

Surveyed WSF

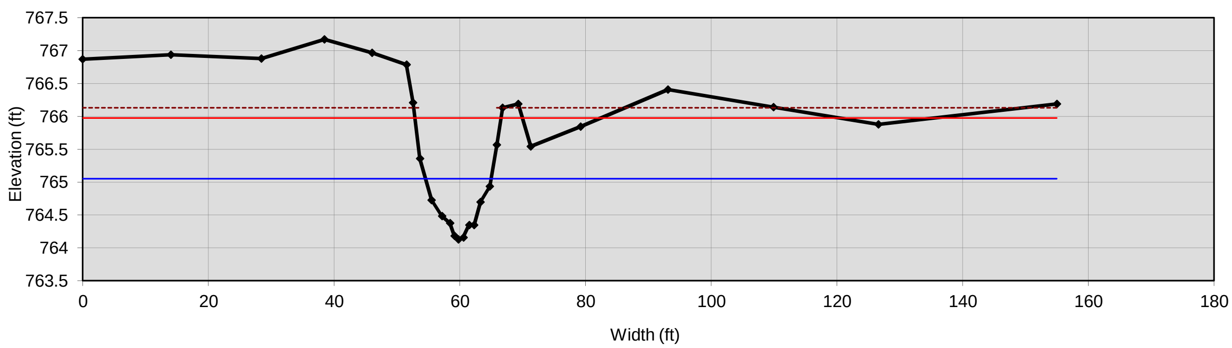
764.54

Bankfull - Surveyed WSF

0.36

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	766.896	☐	(xs1 pool)xs1 pool
		13.24	766.834	☐	(xs1)xs1
		27.98	766.136	☐	(xs1)xs1
		39.11	766.304	☐	(xs1)xs1
		50.86	767.053	☐	(xs1)xs1
		59.01	767.007	☐	(xs1)xs1
		65.29	767.214	☐	(xs1)xs1
		69.17	766.898	☐	(xs1 ltb)xs1 ltb
		70.29	766.243	☐	(xs1)xs1
		71.81	765.54	☐	(xs1)xs1
		72.53	764.944	☐	(xs1)xs1
		72.76	764.527	☐	(xs1 lew)xs1 lew
		73.76	764.27	☐	(xs1)xs1
		75.48	763.928	☐	(xs1)xs1
		77.06	763.863	☐	(xs1)xs1
		77.93	763.608	☐	(xs1)xs1
		79.08	763.704	☐	(xs1)xs1
		80.11	764.157	☐	(xs1)xs1
		80.2	764.551	☐	(xs1 rew)xs1 rew
		80.93	764.797	☐	(xs1)xs1
		82.08	765.043	☐	(xs1)xs1
		83.71	764.923	☐	(xs1)xs1
		84.82	765.435	☐	(xs1)xs1
		85.85	765.593	☐	(xs1 rtb)xs1 rtb
		88.16	766.105	☐	(xs1 rtb)xs1 rtb
		95.13	766.159	☐	(xs1)xs1
		111.6	765.914	☐	(xs1)xs1
		126	766.048	☐	(xs1)xs1
		140.85	766.165	☐	(xs1)xs1
		164.85	766.188	☐	(xs1)xs1
				☐	

Cross Section XS-2



Bankfull Dimensions	
5.7	x-section area (ft.sq.)
10.4	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
10.6	wetted parimeter (ft)
0.5	hyd radi (ft)
19.1	width-depth ratio

Flood Dimensions	
11.3	W flood prone area (ft)
1.1	entrenchment ratio
2.0	low bank height (ft)
2.2	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
6	threshold grain size (mm):

Bankfull Flow	
1.3	velocity (ft/s)
7.2	discharge rate (cfs)
0.31	Froude number

Flow Resistance	
0.045	Manning's roughness
0.29	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.34	channel slope (%)
0.11	shear stress (lb/sq.ft.)
0.24	shear velocity (ft/s)
0.15	unit strm power (lb/ft/s)

Cross Section

reference ID	XS-2	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	765.05	---

Low Bank Height

elevation	766.131

Flood Prone Area

width fpa	11.3	41.3

Channel Slope

percent slope	0.34	0.33

Flow Resistance

Manning's "n"	0.045	---
D'Arcy - Weisbach "f"		---

Note:

Surveyed WSF

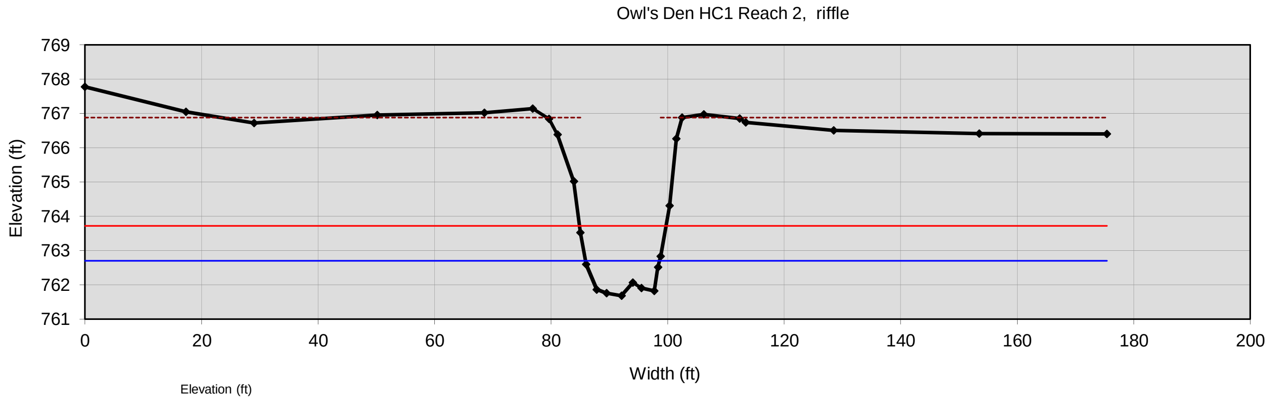
764.36

Bankfull - Surveyed WSF

0.69

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	766.867	☐	(xs2 riffle)xs2 riffle
		14.04	766.934	☐	(xs2)xs2
		28.45	766.876	☐	(xs2)xs2
		38.49	767.171	☐	(xs2)xs2
		46.05	766.963	☐	(xs2)xs2
		51.54	766.786	☐	(xs2 ltb)xs2 ltb
		52.57	766.205	☐	(xs2)xs2
		53.68	765.357	☐	(xs2)xs2
		55.52	764.725	☐	(xs2)xs2
		57.19	764.482	☐	(xs2)xs2
		58.45	764.377	☐	(xs2 lew)xs2 lew
		59.16	764.184	☐	(xs2)xs2
		59.79	764.127	☐	(xs2)xs2
		60.6	764.16	☐	(xs2)xs2
		61.51	764.349	☐	(xs2)xs2
		62.29	764.345	☐	(xs2 rew)xs2 rew
		63.32	764.699	☐	(xs2)xs2
		64.79	764.936	☐	(xs2)xs2
		65.9	765.566	☐	(xs2)xs2
		66.84	766.131	☐	(xs2 rtb)xs2 rtb
		69.32	766.188	☐	(xs2)xs2
		71.31	765.543	☐	(xs2)xs2
		79.26	765.843	☐	(xs2)xs2
		93.15	766.407	☐	(xs2)xs2
		109.91	766.138	☐	(xs2)xs2
		126.62	765.875	☐	(xs2)xs2
		155.01	766.189	☐	(xs2)xs2
		155.01		☐	
		155.01		☐	
		155.01		☐	
		155.01		☐	

Cross Section XS-3



Bankfull Dimensions

9.7	x-section area (ft.sq.)
12.7	width (ft)
0.8	mean depth (ft)
1.0	max depth (ft)
13.3	wetted parimeter (ft)
0.7	hyd radi (ft)
16.6	width-depth ratio

Flood Dimensions

15.3	W flood prone area (ft)
1.2	entrenchment ratio
5.2	low bank height (ft)
5.1	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
7	threshold grain size (mm):

Bankfull Flow

1.5	velocity (ft/s)
14.3	discharge rate (cfs)
0.30	Froude number

Flow Resistance

0.045	Manning's roughness
0.26	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

0.3	channel slope (%)
0.14	shear stress (lb/sq.ft.)
0.27	shear velocity (ft/s)
0.21	unit strm power (lb/ft/s)

Cross Section

reference ID	XS-3	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	762.7	---

Low Bank Height

elevation	766.88	

Flood Prone Area

width fpa	15.33	14.9

Channel Slope

percent slope	0.3	0.26

Flow Resistance

Manning's "n"	0.045	---
D'Arcy - Weisbach "f"		---

Note:

Surveyed WSF (ft)

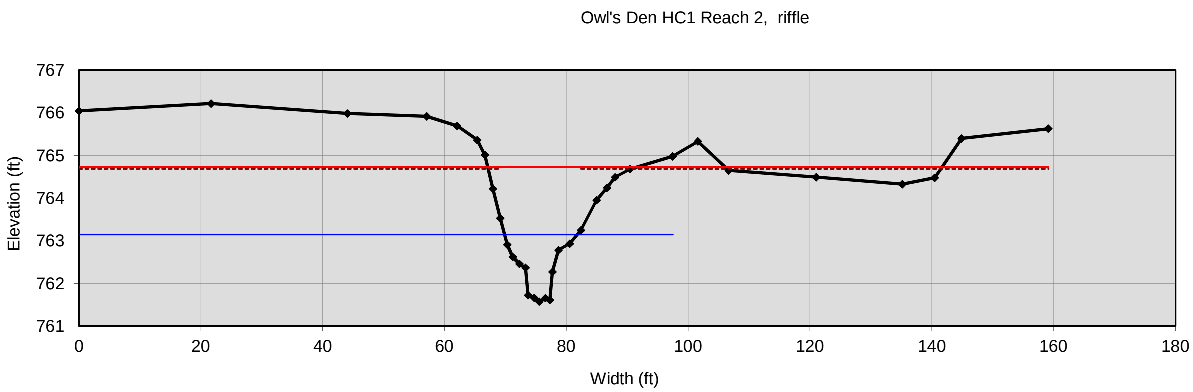
762.6

Bankfull - Surveyed WSF (ft)

0.14

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	767.772	☐	(XS3)XS3
		17.35	767.046	☐	(XS3)XS3
		29.03	766.723	☐	(XS3)XS3
		50.14	766.948	☐	(XS3)XS3
		68.53	767.017	☐	(XS3)XS3
		76.86	767.135	☐	(XS3)XS3
		79.65	766.837	☐	(XS3 LTB)XS3 LTB
		81.1	766.384	☐	(XS3)XS3
		83.9	765.016	☐	(XS3)XS3
		85.02	763.524	☐	(XS3)XS3
		86.03	762.6	☐	(XS3 LEW)XS3 LEW
		87.84	761.865	☐	(XS3)XS3
		89.53	761.753	☐	(XS3)XS3
		92.08	761.68	☐	(XS3)XS3
		94.01	762.063	☐	(XS3)XS3
		95.52	761.91	☐	(XS3)XS3
		97.69	761.826	☐	(XS3)XS3
		98.33	762.513	☐	(XS3 REW)XS3 REW
		98.82	762.836	☐	(XS3)XS3
		100.35	764.308	☐	(XS3)XS3
		101.47	766.259	☐	(XS3)XS3
		102.5	766.882	☐	(XS3 RTB)XS3 RTB
		106.22	766.97	☐	(XS3)XS3
		112.38	766.851	☐	(XS3)XS3
		113.42	766.738	☐	(XS3)XS3
		128.48	766.507	☐	(XS3)XS3
		153.47	766.414	☐	(XS3)XS3
		175.38	766.404	☐	(XS3)XS3
				☐	
				☐	
				☐	
				☐	

Cross Section XS-4



Bankfull Dimensions	
9.5	x-section area (ft.sq.)
11.9	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
12.9	wetted parimeter (ft)
0.7	hyd radi (ft)
15.1	width-depth ratio

Flood Dimensions	
30.8	W flood prone area (ft)
2.6	entrenchment ratio
3.1	low bank height (ft)
2.0	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
7	threshold grain size (mm):

Bankfull Flow	
1.5	velocity (ft/s)
13.9	discharge rate (cfs)
0.30	Froude number

Flow Resistance	
0.045	Manning's roughness
0.26	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.3	channel slope (%)
0.14	shear stress (lb/sq.ft.)
0.27	shear velocity (ft/s)
0.22	unit strm power (lb/ft/s)

Cross Section

reference ID	XS-4	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	763.15	---

Low Bank Height

elevation	764.685

Flood Prone Area

width fpa	30.82	60.0

Channel Slope

percent slope	0.3	0.26

Flow Resistance

Manning's "n"	0.045	---
D'Arcy - Weisbach "f"		---

Note:

Surveyed WSF (ft)

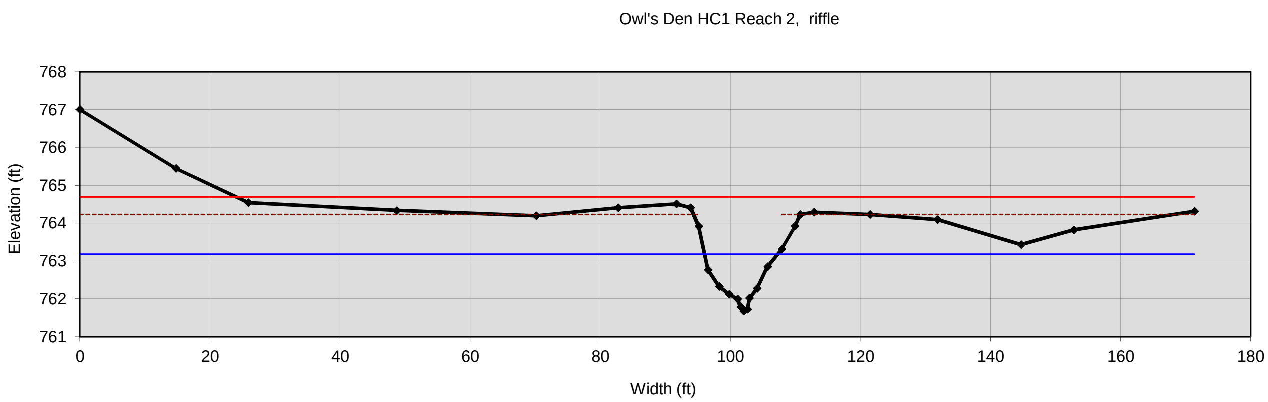
762.3

Bankfull - Surveyed WSF (ft)

0.83

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	766.046	☐	(XS4)XS4
		21.67	766.216	☐	(XS4)XS4
		44.07	765.987	☐	(XS4)XS4
		57.1	765.918	☐	(XS4)XS4
		62.1	765.695	☐	(XS4)XS4
		65.41	765.361	☐	(XS4 LTB)XS4 LTB
		66.66	765.015	☐	(XS4)XS4
		67.94	764.225	☐	(XS4)XS4
		69.18	763.534	☐	(XS4)XS4
		70.33	762.911	☐	(XS4)XS4
		71.2	762.622	☐	(XS4)XS4
		72.34	762.457	☐	(XS4)XS4
		73.31	762.368	☐	XS4 LEW)XS4 LEW
		73.72	761.724	☐	(XS4)XS4
		74.72	761.667	☐	(XS4)XS4
		75.58	761.572	☐	(XS4)XS4
		76.57	761.656	☐	(XS4)XS4
		77.29	761.61	☐	(XS4)XS4
		77.74	762.275	☐	XS4 REW)XS4 REW
		78.73	762.786	☐	(XS4)XS4
		80.56	762.932	☐	(XS4)XS4
		82.4	763.246	☐	(XS4)XS4
		84.98	763.954	☐	(XS4)XS4
		86.71	764.246	☐	(XS4)XS4
		88.02	764.493	☐	(XS4 RTB)XS4 RTB
		90.5	764.685	☐	(XS4)XS4
		97.48	764.983	☐	(XS4)XS4
		101.64	765.33	☐	(XS4)XS4
		106.67	764.652	☐	(XS4)XS4
		121.07	764.493	☐	(XS4)XS4
		135.19	764.331	☐	(XS4)XS4
		140.49	764.479	☐	(XS4)XS4
		144.9	765.4	☐	(XS4)XS4
		159.15	765.63	☐	(XS4)XS4

Cross Section XS-5



Bankfull Dimensions	
9.1	x-section area (ft.sq.)
11.2	width (ft)
0.8	mean depth (ft)
1.5	max depth (ft)
11.8	wetted parimeter (ft)
0.8	hyd radi (ft)
13.8	width-depth ratio

Flood Dimensions	
181.0	W flood prone area (ft)
16.1	entrenchment ratio
2.6	low bank height (ft)
1.7	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
7	threshold grain size (mm):

Bankfull Flow	
1.5	velocity (ft/s)
14.0	discharge rate (cfs)
0.31	Froude number

Flow Resistance	
0.045	Manning's roughness
0.26	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.3	channel slope (%)
0.15	shear stress (lb/sq.ft.)
0.27	shear velocity (ft/s)
0.23	unit strm power (lb/ft/s)

Cross Section

reference ID	XS-5	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	763.18	---

Low Bank Height

elevation	764.223

Flood Prone Area

width fpa	181	147.3

Channel Slope

percent slope	0.3	0.26

Flow Resistance

Manning's "n"	0.045	---
D'Arcy - Weisbach "f"		---

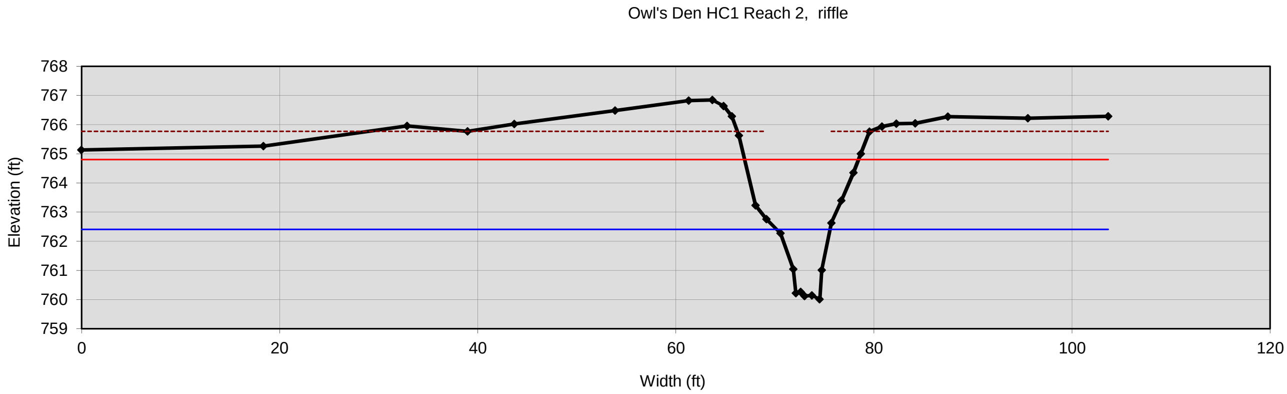
Note:

Surveyed WSF (ft)
762.0

Bankfull - Surveyed WSF (ft)
1.17

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	767	☐	(XS5)XS5
		14.75	765.441	☐	(XS5)XS5
		25.87	764.543	☐	(XS5)XS5
		48.73	764.332	☐	(XS5)XS5
		70.16	764.19	☐	(XS5)XS5
		82.76	764.4	☐	(XS5)XS5
		91.7	764.507	☐	(XS5)XS5
		93.89	764.4	☐	(XS5 LTB)XS5 LTB
		95.14	763.916	☐	(XS5)XS5
		96.58	762.761	☐	(XS5)XS5
		98.3	762.327	☐	(XS5)XS5
		99.83	762.12	☐	(XS5)XS5
		101.09	761.996	☐	(XS5 LEW)XS5 LEW
		101.58	761.779	☐	(XS5)XS5
		102.05	761.67	☐	(XS5)XS5
		102.62	761.721	☐	(XS5)XS5
		102.95	762.023	☐	(XS5 REW)XS5 REW
		104.12	762.271	☐	(XS5)XS5
		105.72	762.85	☐	(XS5)XS5
		107.93	763.315	☐	(XS5)XS5
		109.98	763.925	☐	(XS5)XS5
		110.74	764.223	☐	(XS5 RTB)XS5 RTB
		112.88	764.282	☐	(XS5)XS5
		121.48	764.226	☐	(XS5)XS5
		131.88	764.093	☐	(XS5)XS5
		144.69	763.431	☐	(XS5)XS5
		152.82	763.817	☐	(XS5)XS5
		171.35	764.312	☐	(XS5)XS5
				☐	
				☐	
		0		☐	
		0		☐	

Cross Section XS-6



Bankfull Dimensions

7.9	x-section area (ft.sq.)
5.4	width (ft)
1.5	mean depth (ft)
2.4	max depth (ft)
8.1	wetted parimeter (ft)
1.0	hyd radi (ft)
3.7	width-depth ratio

Flood Dimensions

11.3	W flood prone area (ft)
2.1	entrenchment ratio
5.8	low bank height (ft)
2.4	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
9	threshold grain size (mm):

Bankfull Flow

1.8	velocity (ft/s)
13.9	discharge rate (cfs)
0.32	Froude number

Flow Resistance

0.045	Manning's roughness
0.24	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

0.3	channel slope (%)
0.18	shear stress (lb/sq.ft.)
0.31	shear velocity (ft/s)
0.48	unit strm power (lb/ft/s)

Cross Section

reference ID: XS-6
longitudinal station: ---
alignment: straight line
feature

Bankfull Stage

elevation: 762.4 ---

Low Bank Height

elevation: 765.76

Flood Prone Area

width fpa: 11.3 11.5

Channel Slope

percent slope: 0.3 0.26

Flow Resistance

Manning's "n": 0.045 ---
D'Arcy - Weisbach "f": ---

Note:

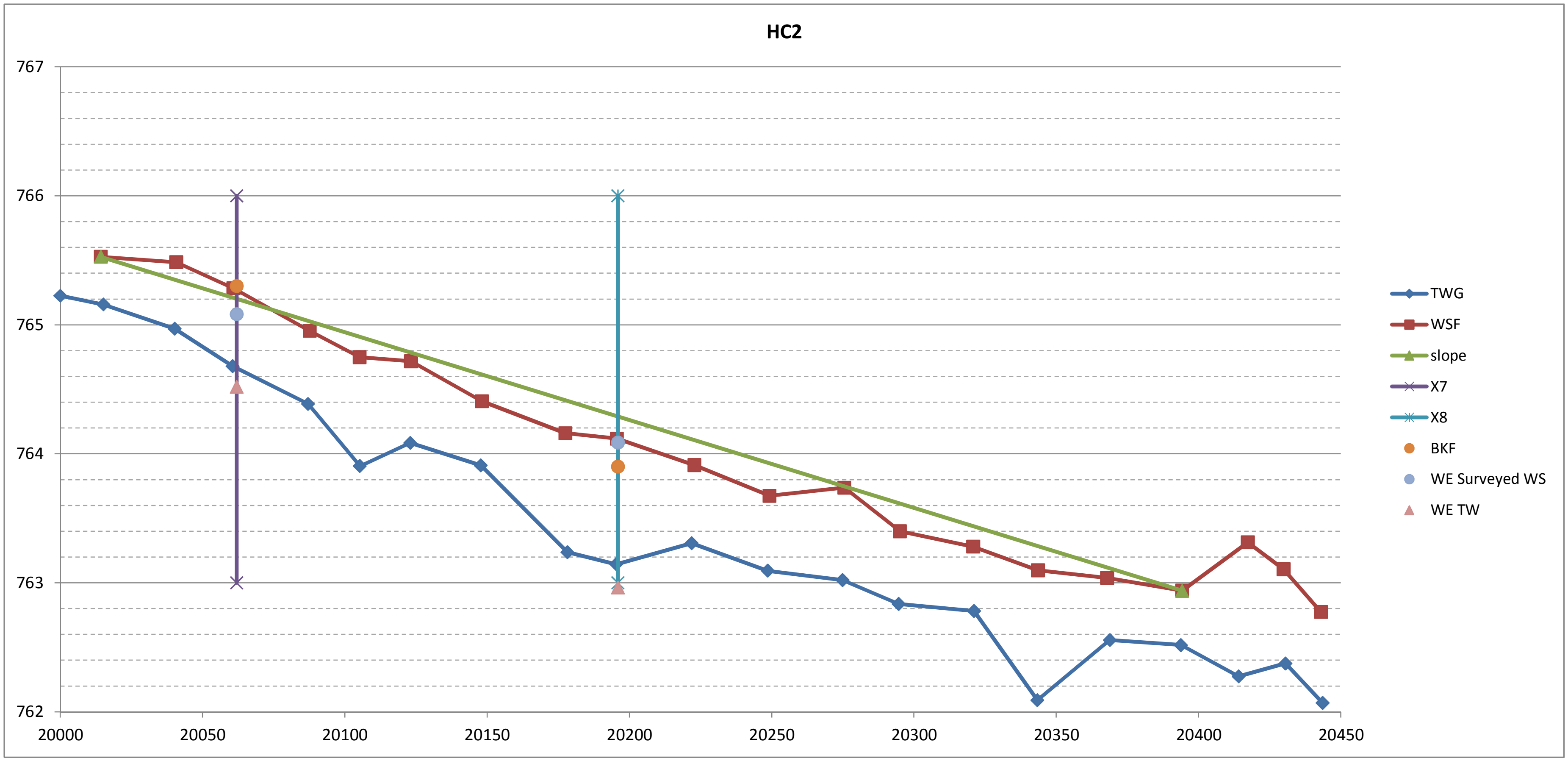
Surveyed WSF (ft)

761.0

Bankfull - Surveyed WSF (ft)

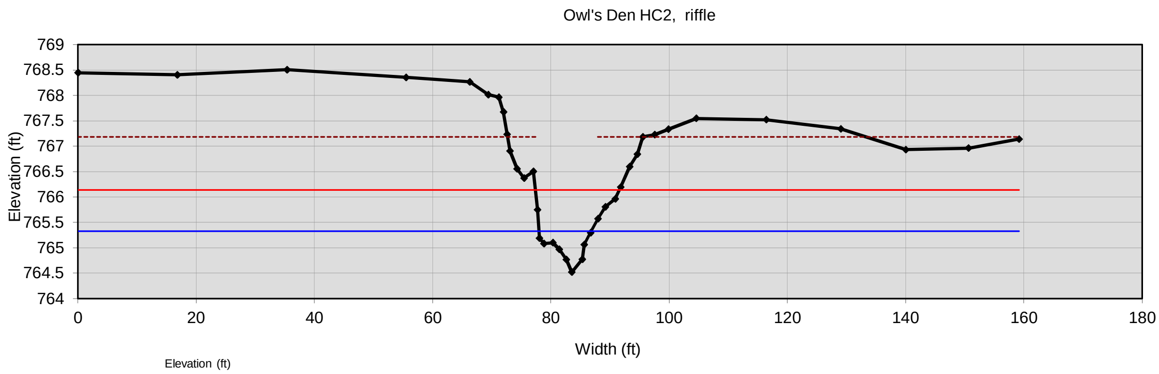
1.37

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	765.124		(XS6)XS6
		18.38	765.264		(XS6)XS6
		32.88	765.955		(XS6)XS6
		38.97	765.76		(XS6)XS6
		43.7	766.02		(XS6)XS6
		53.89	766.476		(XS6)XS6
		61.31	766.819		(XS6)XS6
		63.7	766.845		(XS6)XS6
		64.84	766.636		(XS6 LTB)XS6 LTB
		65.66	766.279		(XS6)XS6
		66.37	765.625		(XS6)XS6
		68.05	763.226		(XS6)XS6
		69.15	762.753		(XS6)XS6
		70.58	762.268		(XS6)XS6
		71.86	761.038		(XS6 LEW)XS6 LEW
		72.13	760.221		(XS6)XS6
		72.61	760.263		(XS6)XS6
		73	760.12		(XS6)XS6
		73.75	760.141		(XS6)XS6
		74.53	760.004		(XS6)XS6
		74.74	761.013		(XS6 REW)XS6 REW
		75.72	762.621		(XS6)XS6
		76.73	763.395		(XS6)XS6
		77.94	764.352		(XS6)XS6
		78.69	764.996		(XS6)XS6
		79.55	765.757		(XS6 RTB)XS6 RTB
		80.81	765.928		(XS6)XS6
		82.27	766.024		(XS6)XS6
		84.17	766.038		(XS6)XS6
		87.48	766.269		(XS6)XS6
		95.55	766.217		(XS6)XS6
		103.65	766.281		(XS6)XS6


HC2
767
766
765
764
763
762
20000
20050
20100
20150
20200
20250
20300
20350
20400
20450
TWG
WSF
slope
X7
X8
BKF
WE Surveyed WS
WE TW

Owl's Den HC2
Existing Cross Section

Cross Section XS-7



Bankfull Dimensions

3.5	x-section area (ft.sq.)
8.9	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
9.2	wetted parimeter (ft)
0.4	hyd radi (ft)
22.3	width-depth ratio

Flood Dimensions

14.2	W flood prone area (ft)
1.6	entrenchment ratio
2.7	low bank height (ft)
3.3	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
8	threshold grain size (mm):

Bankfull Flow

1.4	velocity (ft/s)
5.1	discharge rate (cfs)
0.41	Froude number

Flow Resistance

0.045	Manning's roughness
0.32	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

0.68	channel slope (%)
0.16	shear stress (lb/sq.ft.)
0.29	shear velocity (ft/s)
0.24	unit strm power (lb/ft/s)

Cross Section

reference ID	XS-7	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	765.33	---

Low Bank Height

elevation	767.185

Flood Prone Area

width fpa	14.2	14.2

Channel Slope

percent slope	0.68	0.71

Flow Resistance

Manning's "n"	0.045	---
D'Arcy - Weisbach "f"		---

Note:

Surveyed WSF (ft)

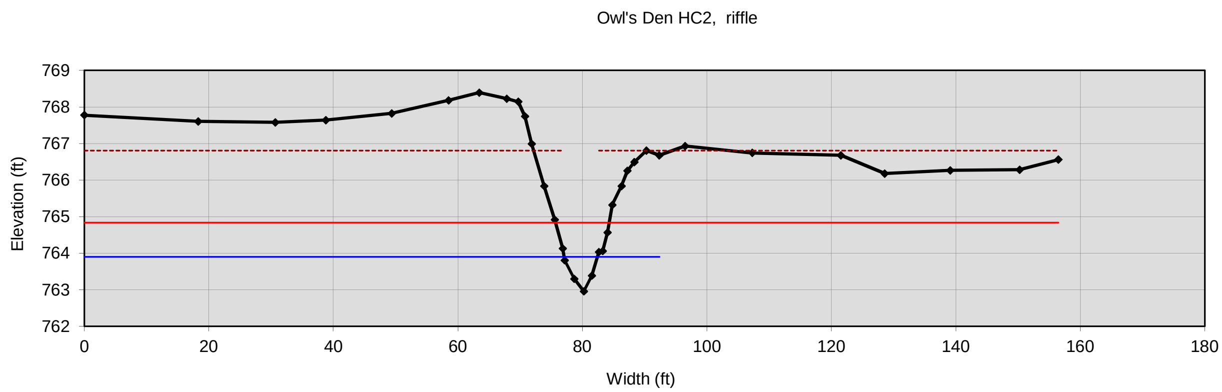
765.083

Bankfull - WSF (ft)

0.2

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	768.445	☐	(XS7)XS7
		16.81	768.405	☐	(XS7)XS7
		35.35	768.507	☐	(XS7)XS7
		55.49	768.354	☐	(XS7)XS7
		66.25	768.268	☐	(XS7)XS7
		69.39	768.014	☐	(XS7)XS7
		71.18	767.965	☐	(XS7 LTB)XS7 LTB
		71.97	767.672	☐	(XS7)XS7
		72.59	767.237	☐	(XS7)XS7
		73.08	766.905	☐	(XS7)XS7
		74.26	766.554	☐	(XS7)XS7
		75.43	766.375	☐	(XS7)XS7
		77.02	766.503	☐	(XS7)XS7
		77.73	765.751	☐	(XS7)XS7
		78.04	765.189	☐	(XS7)XS7
		78.82	765.084	☐	(XS7)XS7
		80.32	765.1	☐	(XS7 LEW)XS7 LEW
		81.4	764.97	☐	(XS7)XS7
		82.61	764.77	☐	(XS7)XS7
		83.53	764.52	☐	(XS7)XS7
		85.33	764.775	☐	(XS7)XS7
		85.63	765.066	☐	(XS7 REW)XS7 REW
		86.69	765.299	☐	(XS7)XS7
		87.96	765.575	☐	(XS7)XS7
		89.19	765.809	☐	(XS7)XS7
		90.88	765.966	☐	(XS7)XS7
		91.79	766.193	☐	(XS7)XS7
		93.3	766.598	☐	(XS7)XS7
		94.63	766.843	☐	(XS7 RTB)XS7 RTB
		95.52	767.185	☐	(XS7)XS7
		97.51	767.226	☐	(XS7)XS7
		99.84	767.332	☐	(XS7)XS7
		104.56	767.546	☐	(XS7)XS7
		116.41	767.521	☐	(XS7)XS7
		129.01	767.341	☐	(XS7)XS7
		140.02	766.932	☐	(XS7)XS7
		150.63	766.962	☐	(XS7)XS7
		159.17	767.14	☐	(XS7)XS7

Cross Section XS-8



Bankfull Dimensions	
2.9	x-section area (ft.sq.)
5.4	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
5.7	wetted parimeter (ft)
0.5	hyd radi (ft)
10.0	width-depth ratio

Flood Dimensions	
8.6	W flood prone area (ft)
1.6	entrenchment ratio
3.8	low bank height (ft)
4.1	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
11	threshold grain size (mm):

Bankfull Flow	
1.7	velocity (ft/s)
5.0	discharge rate (cfs)
0.43	Froude number

Flow Resistance	
0.045	Manning's roughness
0.29	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.68	channel slope (%)
0.21	shear stress (lb/sq.ft.)
0.33	shear velocity (ft/s)
0.4	unit strm power (lb/ft/s)

Cross Section

reference ID	XS-8	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	763.9	---

Low Bank Height

elevation	766.81

Flood Prone Area

width fpa	8.6	8.6

Channel Slope

percent slope	0.68	0.71

Flow Resistance

Manning's "n"	0.045	---
D'Arcy - Weisbach "f"		---

Note:

Surveyed WSF (ft)

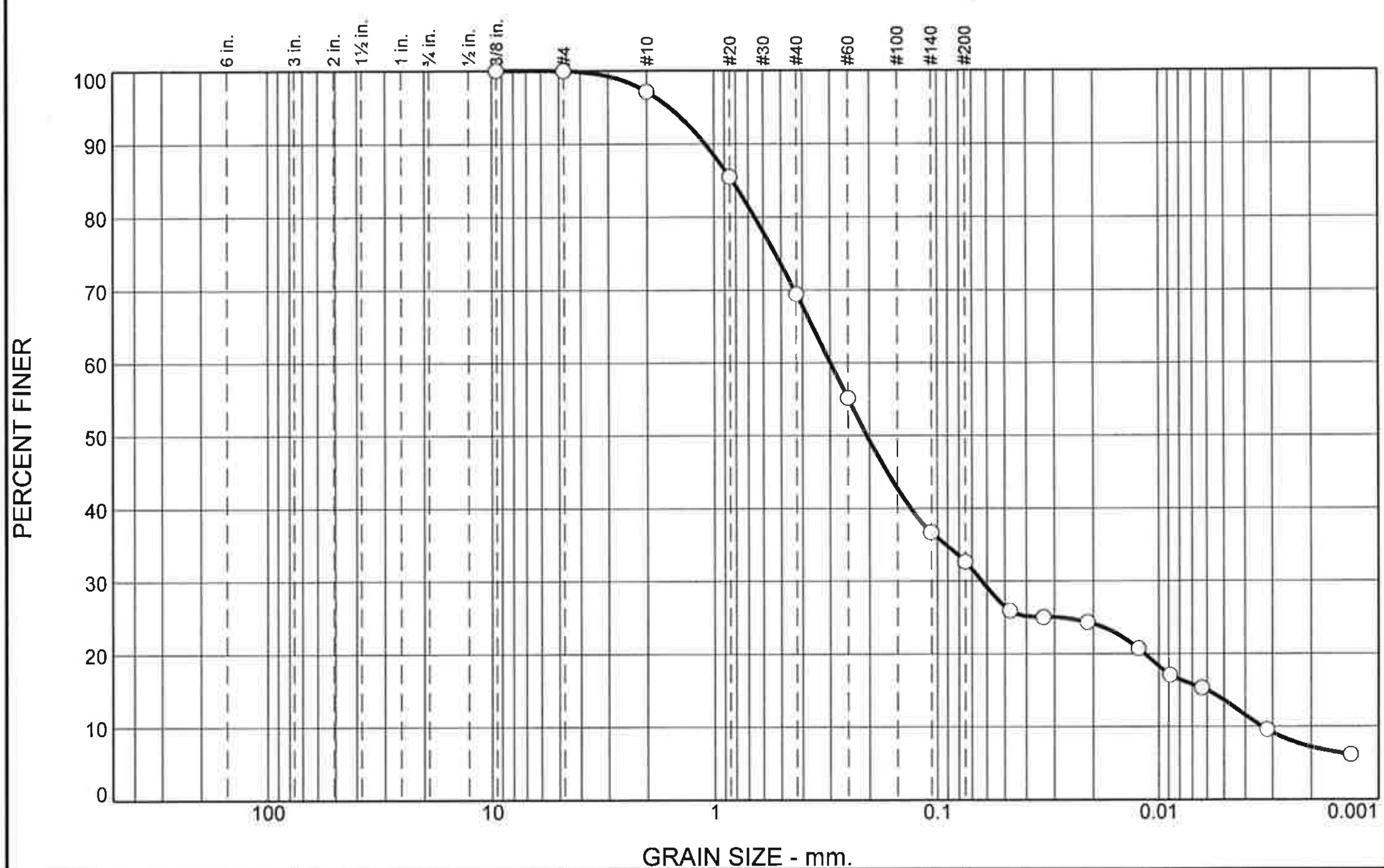
764.0865

Bankfull - WSF (ft)

-0.2

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	767.778	☐	(XS8)XS8
		18.3	767.605	☐	(XS8)XS8
		30.68	767.582	☐	(XS8)XS8
		38.76	767.641	☐	(XS8)XS8
		49.38	767.824	☐	(XS8)XS8
		58.53	768.187	☐	(XS8)XS8
		63.43	768.392	☐	(XS8)XS8
		67.87	768.23	☐	(XS8)XS8
		69.73	768.146	☐	(XS8 LTB)XS8 LTB
		70.78	767.741	☐	(XS8)XS8
		71.85	766.99	☐	(XS8)XS8
		73.88	765.834	☐	(XS8)XS8
		75.57	764.916	☐	(XS8)XS8
		76.84	764.133	☐	(XS8 LEW)XS8 LEW
		77.14	763.812	☐	(XS8)XS8
		78.68	763.3	☐	(XS8)XS8
		80.26	762.962	☐	(XS8)XS8
		81.52	763.388	☐	(XS8)XS8
		82.67	764.04	☐	(XS8 REW)XS8 REW
		83.25	764.063	☐	(XS8)XS8
		84.02	764.572	☐	(XS8)XS8
		84.83	765.323	☐	(XS8)XS8
		86.3	765.841	☐	(XS8)XS8
		87.21	766.254	☐	(XS8)XS8
		88.34	766.496	☐	(XS8)XS8
		90.32	766.811	☐	(XS8 RTB)XS8 RTB
		92.37	766.682	☐	(XS8)XS8
		96.55	766.93	☐	(XS8)XS8
		107.29	766.745	☐	(XS8)XS8
		121.54	766.681	☐	(XS8)XS8
		128.6	766.183	☐	(XS8)XS8
		139.12	766.271	☐	(XS8)XS8
		150.25	766.288	☐	(XS8)XS8
		156.45	766.561	☐	(XS8)XS8

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.9	27.7	36.8	19.0	13.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	100.0		
#10	97.1		
#20	85.5		
#40	69.4		
#60	55.1		
#140	36.7		
#200	32.6		

* (no specification provided)

Material Description

Grey-Brown Clayey Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.0976 D_{85}= 0.8290 D_{60}= 0.2994
D_{50}= 0.2055 D_{30}= 0.0633 D_{15}= 0.0060
D_{10}= 0.0034 C_u= 89.23 C_c= 3.99

Classification

USCS= AASHTO=

Remarks

Location: HC-1 Grab Sample
Sample Number: 5-8-13 IE/AT **Date:** 05-25-13

Summit Engineering

Ft. Mill, South Carolina

Client: Wildlands Engineering Inc.
Project: Owl's Den
Project No: SL-262-11 **Figure**

Tested By: Mimi Hourani

GRAIN SIZE DISTRIBUTION TEST DATA

5/28/2013

Client: Wildlands Engineering Inc.
Project: Owl's Den
Project Number: SL-262-11
Location: HC-1 Grab Sample
Sample Number: 5-8-13 IE/AT
Material Description: Grey-Brown Clayey Silty SAND
Date: 05-25-13
Tested by: Mimi Hourani

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
98.82	0.00	0.00	0.375	0.00	100.0
			#4	0.04	100.0
			#10	2.86	97.1
53.41	0.00	0.00	#20	6.39	85.5
			#40	15.22	69.4
			#60	23.09	55.1
			#140	33.24	36.7
			#200	35.46	32.6

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 97.1
Weight of hydrometer sample = 53.41
Table of composite correction values:

Temp., deg. C:	27.6	25.9	21.8	20.5
Comp. corr.:	-4.0	-4.5	-5.5	-6.0

Meniscus correction only = 1.0
Specific gravity of solids = 2.70
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 - 0.164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
1.00	21.6	20.0	14.4	0.0132	21.0	12.9	0.0472	25.9
2.00	21.6	19.5	13.9	0.0132	20.5	12.9	0.0335	25.0
5.00	21.9	19.0	13.5	0.0131	20.0	13.0	0.0212	24.3
15.00	21.9	17.0	11.5	0.0131	18.0	13.3	0.0124	20.7
30.00	21.8	15.0	9.5	0.0131	16.0	13.7	0.0089	17.1
60.00	21.8	14.0	8.5	0.0131	15.0	13.8	0.0063	15.3
250.00	21.3	11.0	5.3	0.0132	12.0	14.3	0.0032	9.5
1440.00	21.6	9.0	3.4	0.0132	10.0	14.7	0.0013	6.2

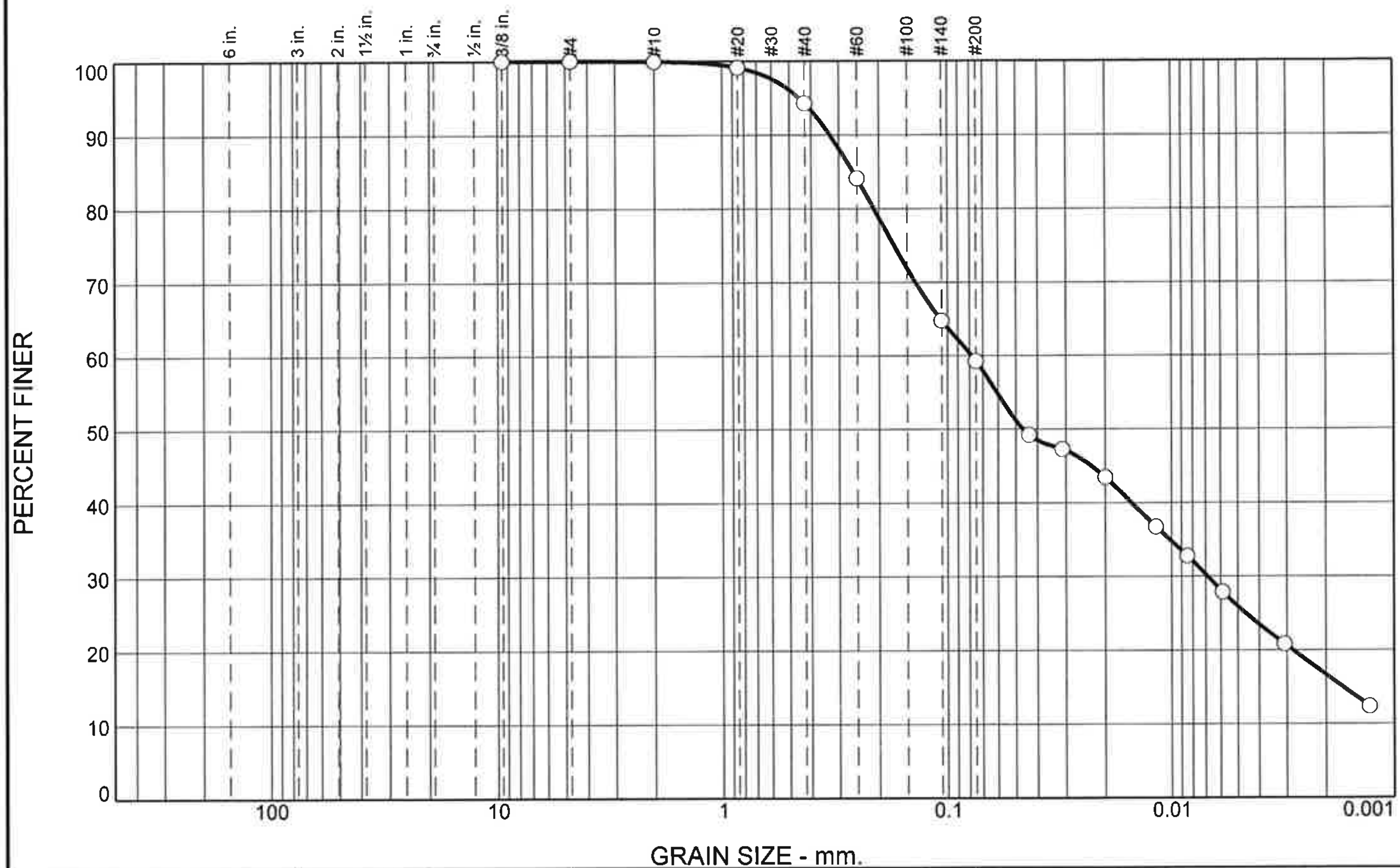
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	2.9	27.7	36.8	67.4	19.0	13.6	32.6

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0034	0.0060	0.0116	0.0633	0.2055	0.2994	0.6543	0.8290	1.0976	1.5937

Fineness Modulus	C_u	C_c
1.30	89.23	3.99

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	5.6	35.1	33.3	25.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	100.0		
#10	99.9		
#20	99.1		
#40	94.3		
#60	84.1		
#140	64.7		
#200	59.2		

* (no specification provided)

Material Description

Grey-Brown Clayey Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3291 D_{85}= 0.2599 D_{60}= 0.0783
D_{50}= 0.0465 D_{30}= 0.0069 D_{15}= 0.0017
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Location: HC-2 Grab Sample @ XS-8
Sample Number: 5-8-13 AT/IE
Date: 05-25-13

Summit Engineering

Ft. Mill, South Carolina

Client: Wildlands Engineering Inc.
Project: Owl's Den
Project No: SL-262-11
Figure

Tested By: Mimi Hourani

GRAIN SIZE DISTRIBUTION TEST DATA

5/27/2013

Client: Wildlands Engineering Inc.
Project: Owl's Den
Project Number: SL-262-11
Location: HC-2 Grab Sample @ XS-8
Sample Number: 5-8-13 AT/IE
Material Description: Grey-Brown Clayey Silty SAND
Date: 05-25-13
Tested by: Mimi Hourani

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
97.74	0.00	0.00	0.375	0.00	100.0
			#4	0.00	100.0
			#10	0.08	99.9
51.32	0.00	0.00	#20	0.43	99.1
			#40	2.91	94.3
			#60	8.12	84.1
			#140	18.07	64.7
			#200	20.89	59.2

Hydrometer Test Data

Hydrometer test uses material passing#10
Percent passing #10 based upon complete sample =99.9
Weight of hydrometer sample =51.32
Table of composite correction values:

Temp., deg. C:	27.6	25.9	21.8	20.5
Comp. corr.:	-4.0	-4.5	-5.5	-6.0

Meniscus correction only =1.0
Specific gravity of solids =2.70
Hydrometer type =152H
Hydrometer effective depth equation: L =16.294964 - 0.164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
1.00	22.0	31.0	25.5	0.0131	32.0	11.0	0.0436	49.2
2.00	22.0	30.0	24.5	0.0131	31.0	11.2	0.0311	47.3
5.00	22.0	28.0	22.5	0.0131	29.0	11.5	0.0199	43.4
15.00	22.1	24.5	19.1	0.0131	25.5	12.1	0.0118	36.7
30.00	21.9	22.5	17.0	0.0131	23.5	12.4	0.0085	32.8
65.00	21.7	20.0	14.5	0.0132	21.0	12.9	0.0059	27.8
250.00	21.3	16.5	10.8	0.0132	17.5	13.4	0.0031	20.8
1489.00	21.6	12.0	6.4	0.0132	13.0	14.2	0.0013	12.4

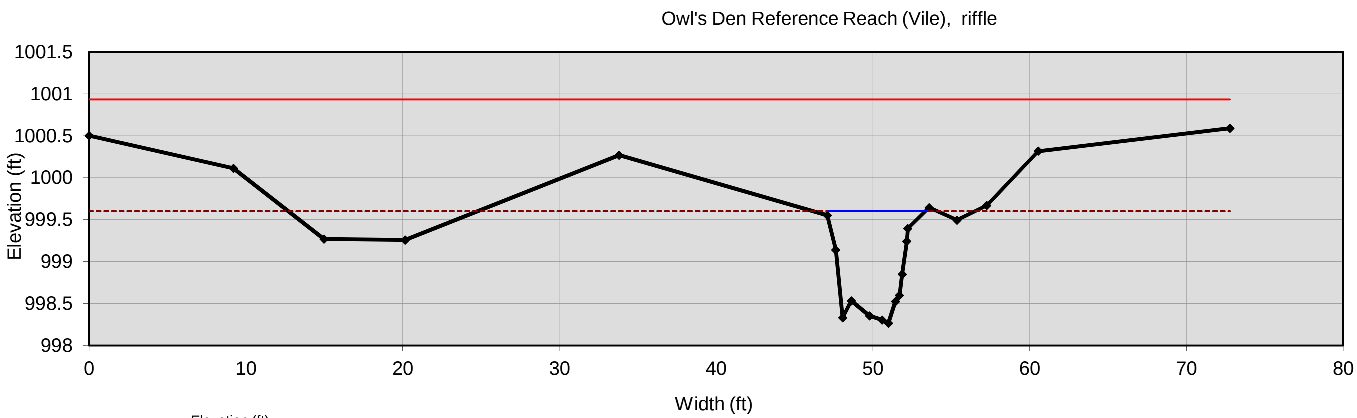
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.1	5.6	35.1	40.8	33.3	25.9	59.2

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0017	0.0028	0.0069	0.0465	0.0783	0.2105	0.2599	0.3291	0.4504

Fineness Modulus
0.43

Cross Section XS-1



Bankfull Dimensions

5.3	x-section area (ft.sq.)
6.2	width (ft)
0.8	mean depth (ft)
1.3	max depth (ft)
7.5	wetted parimeter (ft)
0.7	hyd radi (ft)
7.4	width-depth ratio

Flood Dimensions

200.0	W flood prone area (ft)
32.0	entrenchment ratio
1.3	low bank height (ft)
1.0	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
15	threshold grain size (mm):

Bankfull Flow

2.5	velocity (ft/s)
13.1	discharge rate (cfs)
0.52	Froude number
1.57	Dmax/Davg

Flow Resistance

0.040	Manning's roughness
0.21	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

0.69	channel slope (%)
0.31	shear stress (lb/sq.ft.)
0.40	shear velocity (ft/s)
0.9	unit strm power (lb/ft/s)

Cross Section

reference ID	XS-1	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	999.6	---

Low Bank Height

elevation	999.6

Flood Prone Area

width fpa	200	72.8

Channel Slope

percent slope	0.69	0.68

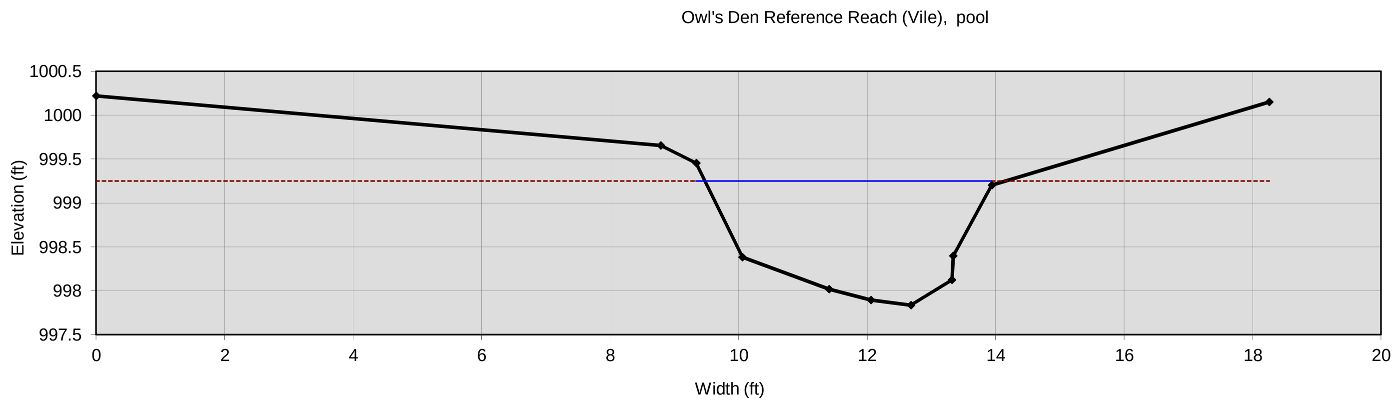
Flow Resistance

Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	1000.503	☑	(XS1 RIFFLE)XS1 RIFFLE
		9.21	1000.113	☑	(XS1)XS1
		14.98	999.27	☑	(XS1)XS1
		20.16	999.259	☑	(XS1)XS1
		33.82	1000.27	☑	(XS1)XS1
		47.09	999.552	☐	(XS1 BKF)XS1 BKF
		47.64	999.141	☐	(XS1)XS1
		48.07	998.332	☐	(XS1 LCH)XS1 LCH
		48.62	998.532	☐	(XS1 WSF)XS1 WSF
		49.79	998.354	☐	(XS1)XS1
		50.59	998.305	☐	(XS1 TWG)XS1 TWG
		50.99	998.266	☐	(XS1)XS1
		51.44	998.527	☐	S1 RCH WSF)XS1 RCH W
		51.69	998.596	☐	(XS1)XS1
		51.87	998.851	☐	(XS1)XS1
		52.16	999.242	☐	(XS1)XS1
		52.22	999.394	☐	(XS1)XS1
		53.58	999.645	☐	(XS1 RTOB)XS1 RTOB
		55.36	999.496	☑	(XS1)XS1
		57.27	999.669	☑	(XS1)XS1
		60.54	1000.317	☑	(XS1)XS1
		72.77	1000.59	☑	(XS1)XS1

Cross Section XS-2



Bankfull Dimensions	
4.5	x-section area (ft.sq.)
4.5	width (ft)
1.0	mean depth (ft)
1.4	max depth (ft)
5.7	wetted parimeter (ft)
0.8	hyd radi (ft)
4.5	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
1.4	low bank height (ft)
1.0	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
17	threshold grain size (mm):

Bankfull Flow	
2.6	velocity (ft/s)
11.8	discharge rate (cfs)
0.52	Froude number
1.41	Dmax/Davg

Flow Resistance	
0.040	Manning's roughness
0.20	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.69	channel slope (%)
0.34	shear stress (lb/sq.ft.)
0.42	shear velocity (ft/s)
1.13	unit strm power (lb/ft/s)

Cross Section

reference ID	XS-2	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	999.25	---

Low Bank Height

elevation	999.25

Flood Prone Area

width fpa		---

Channel Slope

percent slope	0.69	0.68

Flow Resistance

Manning's "n"	0.04	---
D'Arcy - Weisbach "f"		---

Note:

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	1000.219	☑	(XS2 POOL)XS2 POOL
		8.79	999.655	☑	(XS2 POOL)XS2 POOL
		9.34	999.454	☐	(XS2 LTOB)XS2 LTOB
		10.06	998.383	☐	(XS2 LCH)XS2 LCH
		11.41	998.017	☐	(XS2)XS2
		12.06	997.895	☐	(XS2)XS2
		12.68	997.838	☐	(XS2)XS2
		13.32	998.124	☐	(XS2)XS2
		13.34	998.396	☐	(XS2 WSF)XS2 WSF
		13.94	999.204	☐	(XS2 RCH BKF)XS2 RCH BKF
		18.26	1000.148	☑	(XS2 END)XS2 END
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	

Cross Section XS-3

Bankfull Dimensions	
4.5	x-section area (ft.sq.)
5.7	width (ft)
0.8	mean depth (ft)
1.4	max depth (ft)
6.5	wetted parimeter (ft)
0.7	hyd radi (ft)
7.2	width-depth ratio

Flood Dimensions	
200.0	W flood prone area (ft)
35.2	entrenchment ratio
1.4	low bank height (ft)
1.0	low bank height ratio

Materials	
---	D50 (mm)
---	D84 (mm)
15	threshold grain size (mm):

Bankfull Flow	
2.4	velocity (ft/s)
10.8	discharge rate (cfs)
0.51	Froude number
1.72	Dmax/Davg

Flow Resistance	
0.040	Manning's roughness
0.21	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power	
0.69	channel slope (%)
0.30	shear stress (lb/sq.ft.)
0.39	shear velocity (ft/s)
0.82	unit strm power (lb/ft/s)

Cross Section

reference ID: XS-3
longitudinal station: ---
alignment: straight line
feature:

Bankfull Stage

elevation: 999.54 ---

Low Bank Height

elevation: 999.54
+

Flood Prone Area

width fpa: 200 12.1

Channel Slope

percent slope: 0.69 0.68

Flow Resistance

Manning's "n": 0.04 ---
D'Arcy - Weisbach "f": ---

Note:

easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
		0	1000.309	☑	(XS3 RIFFLE)XS3 RIFFLE
		4.09	999.536	☐	(XS3 BKF)XS3 BKF
		4.91	999.211	☐	(XS3)XS3
		5.21	998.922	☐	(XS3)XS3
		5.5	998.377	☐	(XS3)XS3
		6.99	998.181	☐	(XS3)XS3
		7.9	998.507	☐	(XS3 RCH WSF)XS3 RCH WSF
		9.11	999.183	☐	(XS3)XS3
		9.77	999.485	☐	(XS3)XS3
		12.13	999.794	☑	(XS3 END)XS3 END
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	

Appendix 6: HEC-20 Channel Stability Assessment Data
DrainMod Wetland Model Data
The Catena Group Soil Boring Logs and Report

Stream: HC1 Reach 1 (Upper)
Reach:
Date: 8/8/13
Weather: Partly Cloudy 85°
Location: Owl's Den

Observers: I. Eckardt; E. Neuhaus
Project:
Drainage Area:
Stream Type

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	10
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	5
3. Channel pattern	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	7
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	7
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	8
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	10
7. Obstructions, including bedrock outcrops, armor layer, LED jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	4

51

HC1 R1 Upper

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	3
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	8
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	8
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	5
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	4
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score 79

Stream: HCl
Reach: Reach 2 (Lower)
Date: 8/8/13
Weather: Partly Cloudy 90°
Location: → just above farm crossing

Observers: I. Eckwalt / E. Neuhaus
Project:
Drainage Area:
Stream Type

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	10
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	6
3. Channel pattern	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	7
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	8
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	10
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	10
7. Obstructions, including bedrock outcrops, armor layer, LED jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	5

56

HCl R2 Lower

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	3
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	7
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	8
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	4
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	4
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score 82

26

Stream: HC2
Reach:
Date: 8/8/13
Weather: Partly Cloudy
Location: 90'

Observers: I. Eckardt / E. Newhaus
Project:
Drainage Area:
Stream Type

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	11
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	5
3. Channel pattern	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	8
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	7
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	10
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	10
7. Obstructions, including bedrock outcrops, armor layer, LED jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	3

54

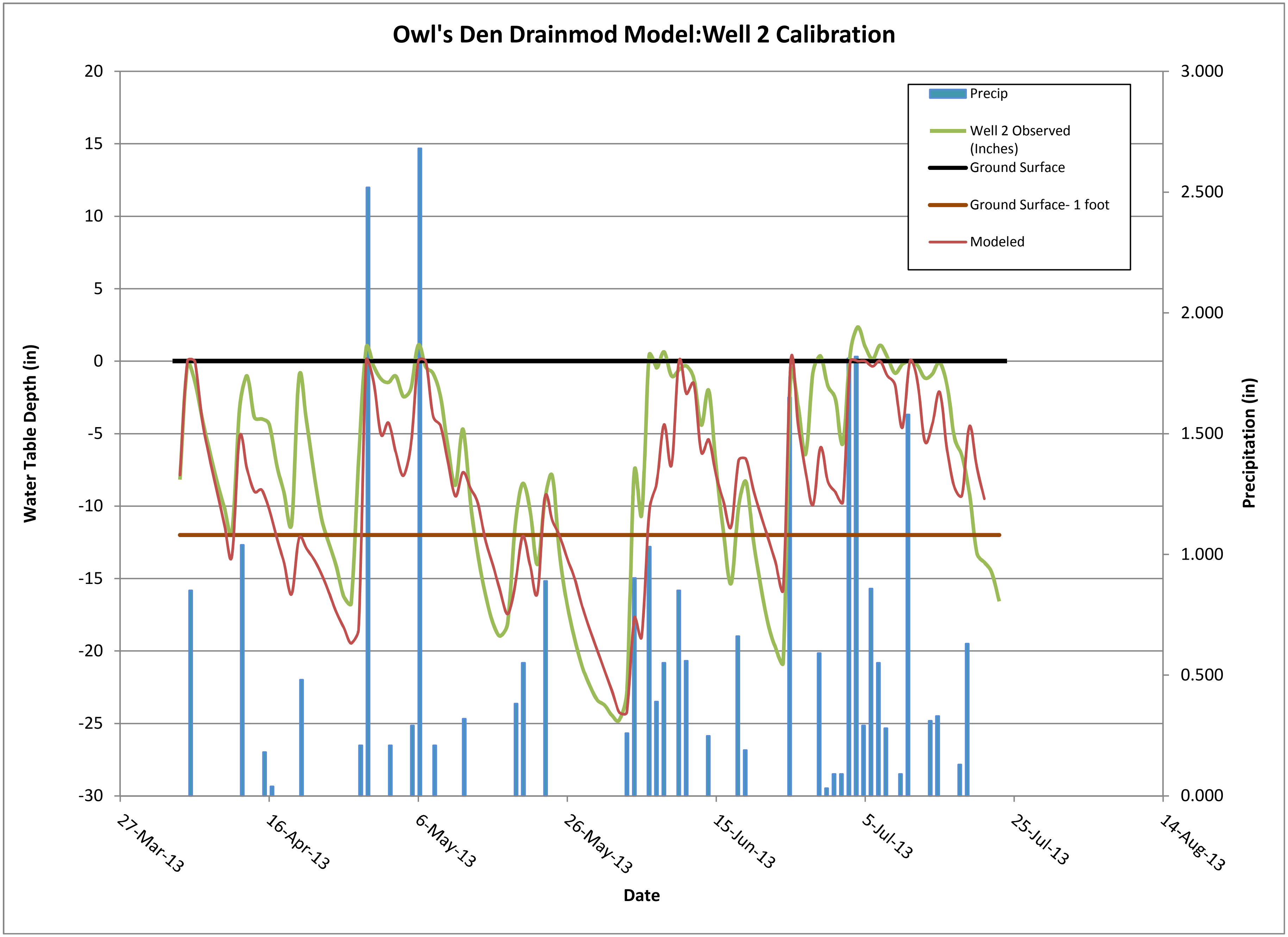
HC2

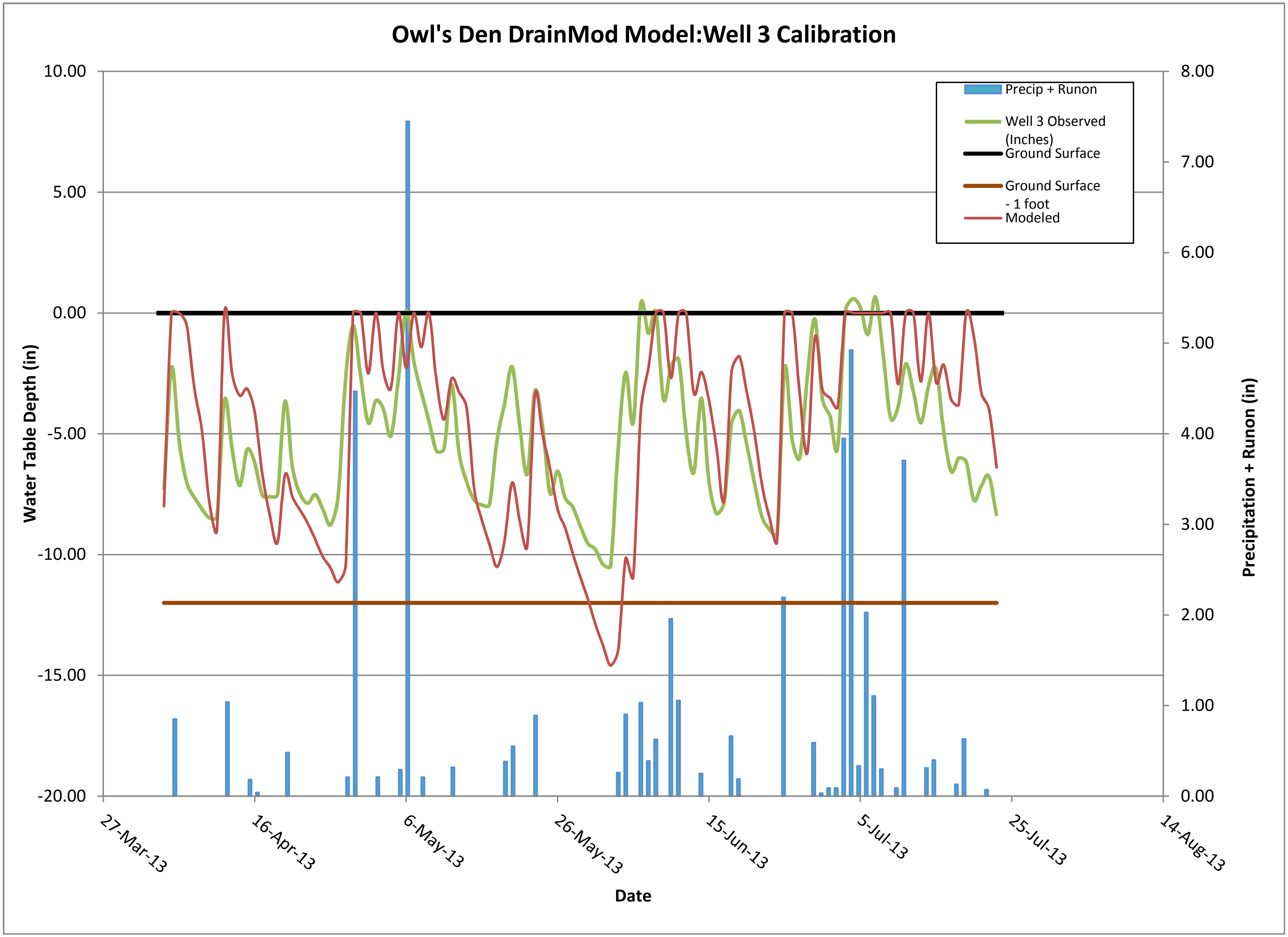
Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	3
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	10
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	8
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	5
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	3
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

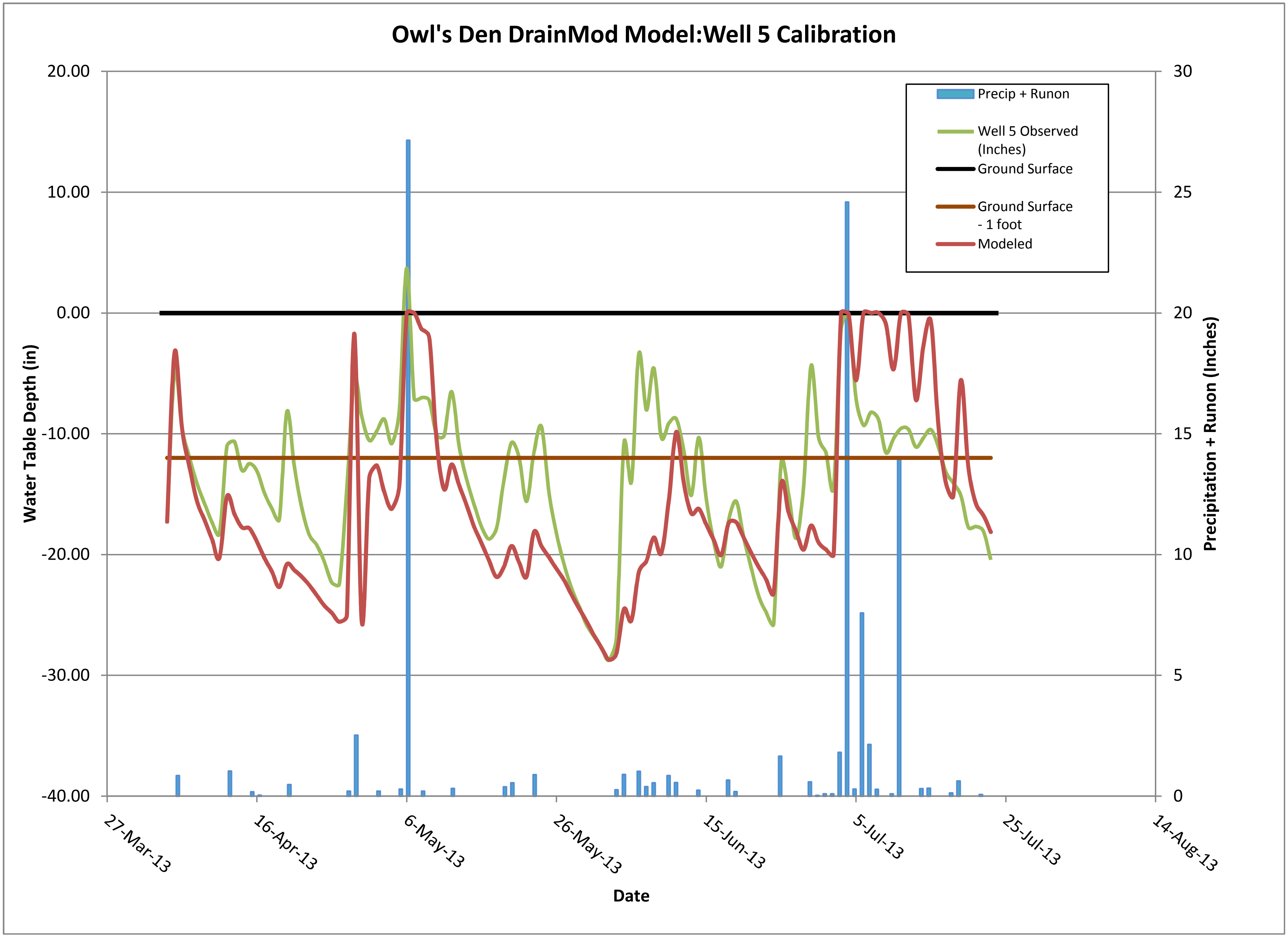
Total Score 83

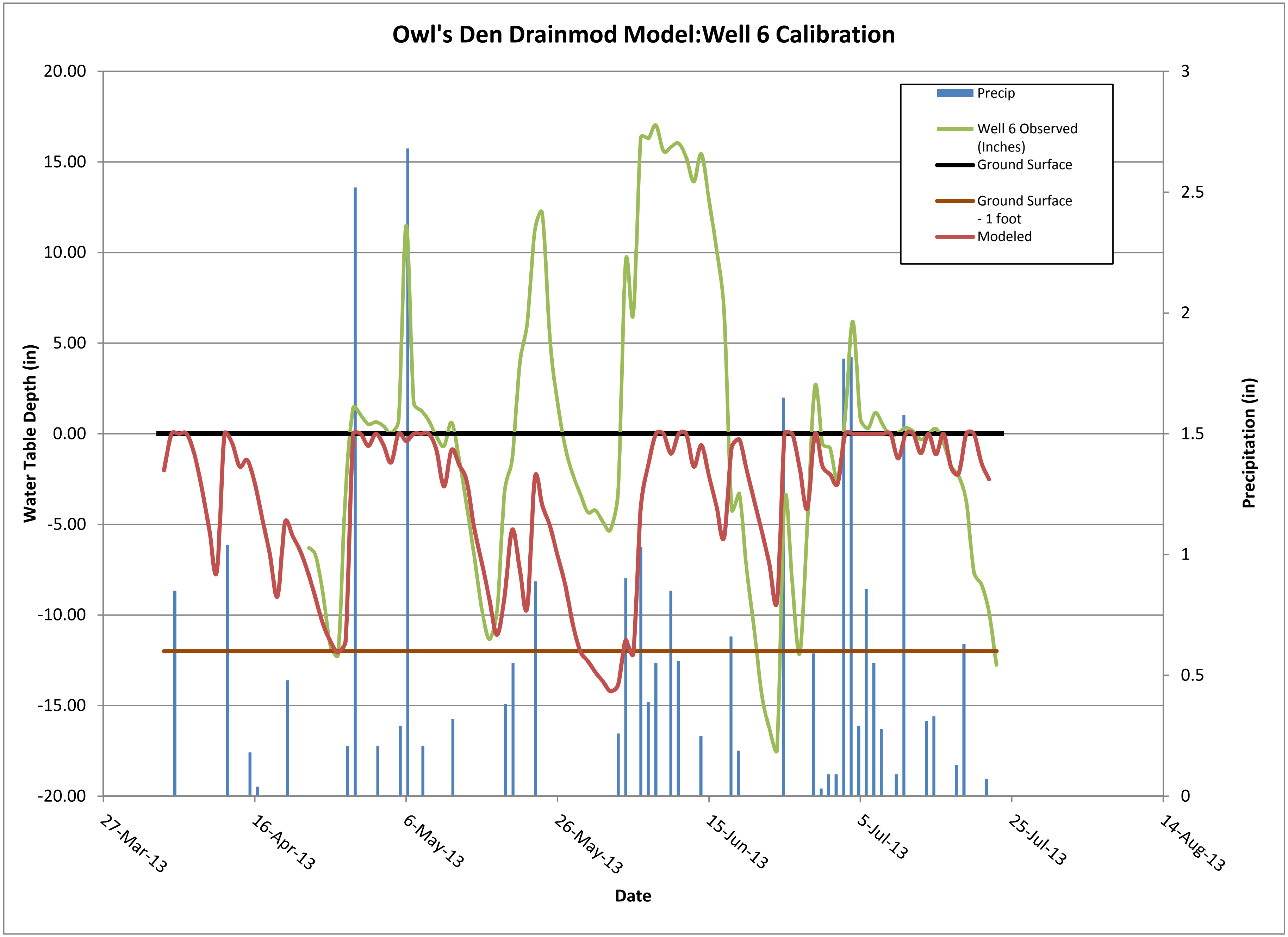
29


Owl's Den Drainmod Model:Well 2 Calibration
Precip
Well 2 Observed (Inches)
Ground Surface
Ground Surface- 1 foot
Modeled
Water Table Depth (in)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
Precipitation (in)
3.000
2.500
2.000
1.500
1.000
0.500
0.000
27-Mar-13
16-Apr-13
6-May-13
26-May-13
15-Jun-13
5-Jul-13
25-Jul-13
14-Aug-13
Date



Owl's Den DrainMod Model:Well 3 Calibration
Water Table Depth (in)
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
Precipitation + Runon (in)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
27-Mar-13
16-Apr-13
6-May-13
26-May-13
15-Jun-13
5-Jul-13
25-Jul-13
14-Aug-13
Date
Precip + Runon
Well 3 Observed (Inches)
Ground Surface
Ground Surface - 1 foot
Modeled


Owl's Den DrainMod Model:Well 5 Calibration
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
Water Table Depth (in)
30
25
20
15
10
5
0
Precipitation + Runon (Inches)
Precip + Runon
Well 5 Observed (Inches)
Ground Surface
Ground Surface - 1 foot
Modeled
27-Mar-13
16-Apr-13
6-May-13
26-May-13
15-Jun-13
5-Jul-13
25-Jul-13
14-Aug-13
Date



Owl's Den Drainmod Model:Well 6 Calibration
Precip
Well 6 Observed (Inches)
Ground Surface
Ground Surface - 1 foot
Modeled
Water Table Depth (in)
Precipitation (in)
Date
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
3
2.5
2
1.5
1
0.5
0
27-Mar-13
16-Apr-13
6-May-13
26-May-13
15-Jun-13
5-Jul-13
25-Jul-13
14-Aug-13

HYDRIC SOIL INVESTIGATION

Owls Den Mitigation Site

Lincoln County, North Carolina

Prepared for:

Wildlands Engineering, Inc.
5605 Chapel Hill Road, Suite 122
Raleigh, NC 27607

Prepared by:

The Catena Group

410-B Millstone Drive
Hillsborough, NC 27278

LICENSED SOIL SCIENTIST
MICHAEL G. WOOD
1219
STATE OF NORTH CAROLINA

June 24, 2013

INTRODUCTION

Wildlands Engineering, Inc. is considering mitigating a section of the Owls Den Farm in the Catawba River Basin (03050101). The site is located along Owl Den Road (SR 1202) in Lincolnton, Lincoln County, NC. The Catena Group, Inc. (Catena) was retained to determine the depth of fill material that was previously observed during a preliminary soil and site investigation performed in October 2012, and describe and classify the soil within an additional area now included in the revised conservation easement.

METHODOLOGY

The field investigation was performed on June 12, 2013. One hundred twenty four (124) hand-turned auger borings were advanced throughout the study area on a fifty foot by fifty foot grid (Figure 1). Each soil boring was classified as hydric, non-hydric, or having fill over a buried hydric soil horizon. The exact location of each soil boring was marked in the field with a red pin flag noting the boring number, classification, and depth of fill material. Hydric soil status was based upon the NRCS Field Indicators of Hydric Soils in the Unities States - A Guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010).

RESULTS

As the October 2012 preliminary evaluation concluded, there is clear evidence of human manipulation throughout the study area. In addition to ditching and/or channelization of streams, fill material has been placed over the majority of the site. Table 1 lists the classification of each soil boring and fill depth when applicable (appended).

Sixteen (16) borings were advanced and evaluated in the additional area located on the south side of the larger channelized stream. Borings were classified and placed into one of four Soil Units cited in the preliminary soil investigation. Except for two borings that were categorized as Soil Unit 2, the rest were categorized as Soil Unit 3. As such, the entire area was considered Soil Unit 3 as noted in Figure 1.

- Soil Unit 3 – Hydric soil that has been buried. Fill material is non-hydric

Soil Unit 3. Soil Unit 3 clearly had fill material deposited as a result of human manipulation, likely for agricultural purposes. The soil beneath the fill was relatively undisturbed other than a compressed soil structure from the added fill. The buried soil had a loam textured surface horizon underlain by either loam, clay loam, or sandy clay loam subsurface horizons and met hydric indicator F3 Depleted Matrix. While there was often evidence of recent reduction and oxidations reactions within the fill, it did not meet any of the hydric indicators.

CONCLUSION

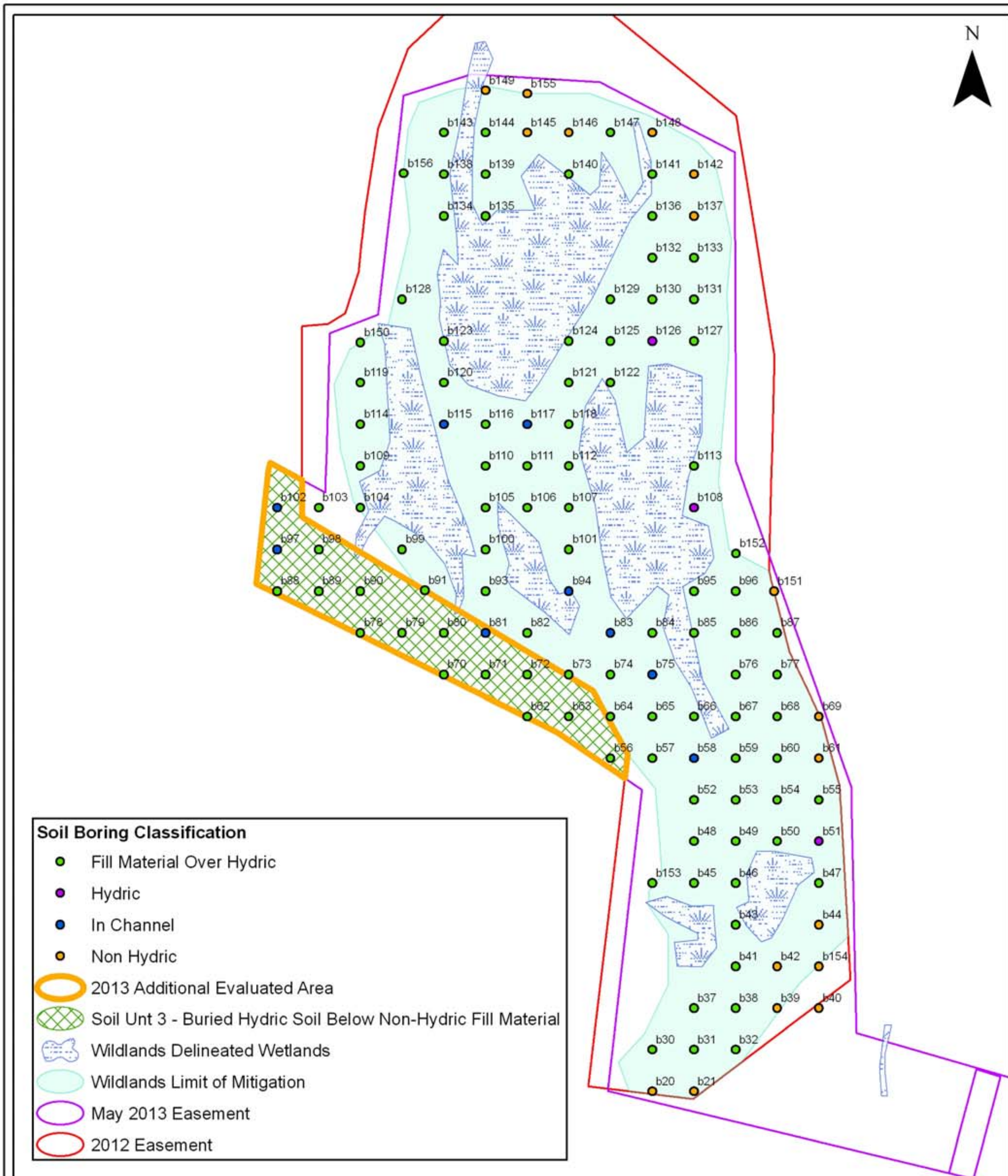
One hundred and twenty four (124) soil borings were advanced throughout the study area. Borings were either determined to be hydric, non-hydric, or having fill material over a buried hydric soil horizon. The depth of fill material was noted at each boring when applicable. The additional evaluated area is categorized as Soil Unit 3, as outlined in the preliminary soil report dated October 2012.

The findings presented herein represent Catena's professional opinion based on our Hydric Soil Investigation and knowledge of the current regulations regarding wetland mitigation in North Carolina and national criteria for determining hydric soil.

Table 1. Classification of each boring and depth of fill material if applicable.

Boring No.	Classification	Boring No.	Classification	Boring No.	Classification	Boring No.	Classification
20	NH	63	Fill-12	95	Fill-8	126	H
21	NH	64	Fill-13	96	Fill-6	127	Fill-14
30	Fill-29	65	Fill-2	97	IC	128	Fill-17
31	Fill-19	66	Fill-16	98	Fill-31	129	Fill-14
32	Fill-23	67	Fill-5	99	Fill-18	130	Fill-8
37	Fill-35	68	Fill-9	100	Fill-13	131	Fill-16
38	Fill-16	69	NH	101	Fill-24	132	Fill-13
39	NH	70	Fill-8	102	IC	133	Fill-26
40	NH	71	Fill-9	103	Fill-22	134	Fill-22
41	Fill-26	72	Fill-9	104	Fill-16	135	Fill-14
42	NH	73	Fill-24	105	Fill-15	136	Fill-14
43	Fill-26	74	Fill-22	106	Fill-16	137	NH
44	NH	75	IC	107	Fill-22	138	Fill-29
45	Fill-8	76	Fill-12	108	H	139	Fill-23
46	Fill-24	77	Fill-9	109	Fill-4	140	Fill-13
47	Fill-7	78	Fill-17	110	Fill-13	141	Fill-18
48	Fill-11	79	Fill-13	111	Fill-17	142	NH
49	Fill-19	80	Fill-8	112	Fill-15	143	Fill-25
50	Fill-11	81	IC	113	Fill-4	144	Fill-19
51	H	82	Fill-33	114	Fill-5	145	NH
52	Fill-14	83	IC	115	IC	146	NH
53	Fill-16	84	Fill-30	116	Fill-9	147	Fill-26
54	Fill-14	85	Fill-11	117	IC	148	NH
55	Fill-3	86	Fill-7	118	Fill-15	149	NH
56	Fill-10	87	Fill-8	119	Fill-11	150	Fill-8
57	Fill-12	88	Fill-28	120	Fill-4	151	NH
58	IC	89	Fill-23	121	Fill-25	152	Fill-7
59	Fill-8	90	Fill-9	122	Fill-9	153	Fill-5
60	Fill-4	91	Fill-25	123	Fill-15	154	NH
61	NH	93	Fill-23	124	Fill-21	155	NH
62	Fill-13	94	IC	125	Fill-14	156	Fill-7

NH – Non-Hydric H – Hydric Fill – Depth of fill in inches IC – In Channel



The Catena Group

Hydric Soil Investigation

Owls Den Mitigation Site

2010 NCDOT Orthophotography

Lincoln County, NC

Date: June 2013

Scale 0 50 100 Feet

Jobl No.: 4163

Figure 1

HYDRIC SOIL INVESTIGATION

Owls Den Mitigation Site

Lincoln County, North Carolina

Prepared for:

Wildlands Engineering, Inc.
5605 Chapel Hill Road, Suite 122
Raleigh, NC 27607

Prepared by:

The Catena Group

410B Millstone Drive
Hillsborough, NC 27278

LICENSED SOIL SCIENTIST
MICHAEL G. WOOD
1219
STATE OF NORTH CAROLINA

October 19, 2012

INTRODUCTION

Wildlands Engineering, Inc. is considering mitigating a section of the Owls Den Farm in the Catawba River Basin (03050101). The site is located along Owls Den Road in Lincolnton, Lincoln County, NC. The Catena Group (Catena) has been retained to perform a detailed soil and site evaluation that describes and classifies the soil throughout the study area and to make a determination as to its hydric status. There were several channelized streams/ditches throughout the study site. The vegetation was herbaceous with some small shrubs, the majority of which had been recently bush hogged.

METHODOLOGY

Prior to performing the evaluation, NRCS soils maps and USGS topographic maps were reviewed. The field investigation was performed on October 11, 2011. Fifty-three hand-turned soil auger borings were advanced throughout the study area (Figure 1). Soil boring locations were located with a GPS Unit with sub-meter accuracy. Hydric soil status is based upon the NRCS Field Indicators of Hydric Soils in the Unities States - A Guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010).

RESULTS

There is clear evidence of human manipulation throughout the study area. In addition to ditching and/or channelization of streams, fill material has been placed over the majority of the site. Aside from the loss of some structure from the weight of the fill, the soil beneath is generally undisturbed, though it was at least partially truncated in a couple borings.

Each soil boring was placed into one of four units:

- Soil Unit 1 – Hydric, relatively undisturbed
- Soil Unit 2 – Hydric soil that has been buried. Fill material has developed enough indicators to classify as hydric.
- Soil Unit 3 – Hydric soil that has been buried. Fill material is non-hydric
- Soil Unit 4 – Non-hydric soil and no evidence of buried hydric soil.

The Soil Units are detailed below and representative soil descriptions using the USDA-NRCS standard nomenclature are appended.

Soil Unit 1 - Hydric Soil. Soils in this area had no fill material and generally had typical diagnostic soil horizons. While it met several hydric soil indicators, the typical one used throughout this area was indicator F3.

F3 Depleted Matrix. A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or 5 cm (6 inches), or

b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface.

This soil typically had a loam textured surface horizon that ranged from 5 to 12 inches with many oxidized rhizoshperes. The subsurface textures generally were clay loam that graded to sandy loam, were gleyed, with a matrix color of chroma 2 or less and common to many concentrations.

Soil Unit 2. Soil Unit 2 clearly had fill material deposited as a result of human manipulation, likely for agricultural purposes. The soil beneath the fill was relatively undisturbed other than a compressed soil structure from the added fill. The buried soil had a loam textured surface horizon underlain by either loam, clay loam, or sandy clay loam subsurface horizons and met hydric indicator F3 Depleted Matrix.

The fill material appears to have been in place long enough that it has developed hydric indicators. While it is possible that some of the fill material was actually hydric in origin (deposited from adjoining wetland or dredge from the ditches), predominantly the fill material was from the surrounding uplands. In all cases, there is clear evidence of active reduction and oxidation reactions of recent origin in all borings. The soil either met indicator F3 Depleted Matrix or F6;

F6 Redox Dark Surface. A layer that is at least 10 cm (4 inches) thick, is entirely within the upper 30 cm (12 inches) of the mineral soil, and has:

a. Matrix value of 3 or less and chorma of 1 or less and 2 percent or more distinct or prominent redox concentration occurring as soft masses or pore lining, or

b. Matirx maule of 3 or less and chroma of 2 or less and 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.

Soil Unit 3. Soil Unit 3 clearly had fill material deposited as a result of human manipulation, likely for agricultural purposes. The soil beneath the fill was relatively undisturbed other than a compressed soil structure from the added fill. The buried soil had a loam textured surface horizon underlain by either loam, clay loam, or sandy clay loam subsurface horizons and met hydric indicator F3 Depleted Matrix.

While there was often evidence of recent reduction and oxidations reactions within the fill, it did not meet any of the hydric indicators.

Soil Unit 4. Some of Soil Unit 4 evidenced fill material, but in all cases neither the fill material nor the original soil met any hydric soil indicators.

CONCLUSION

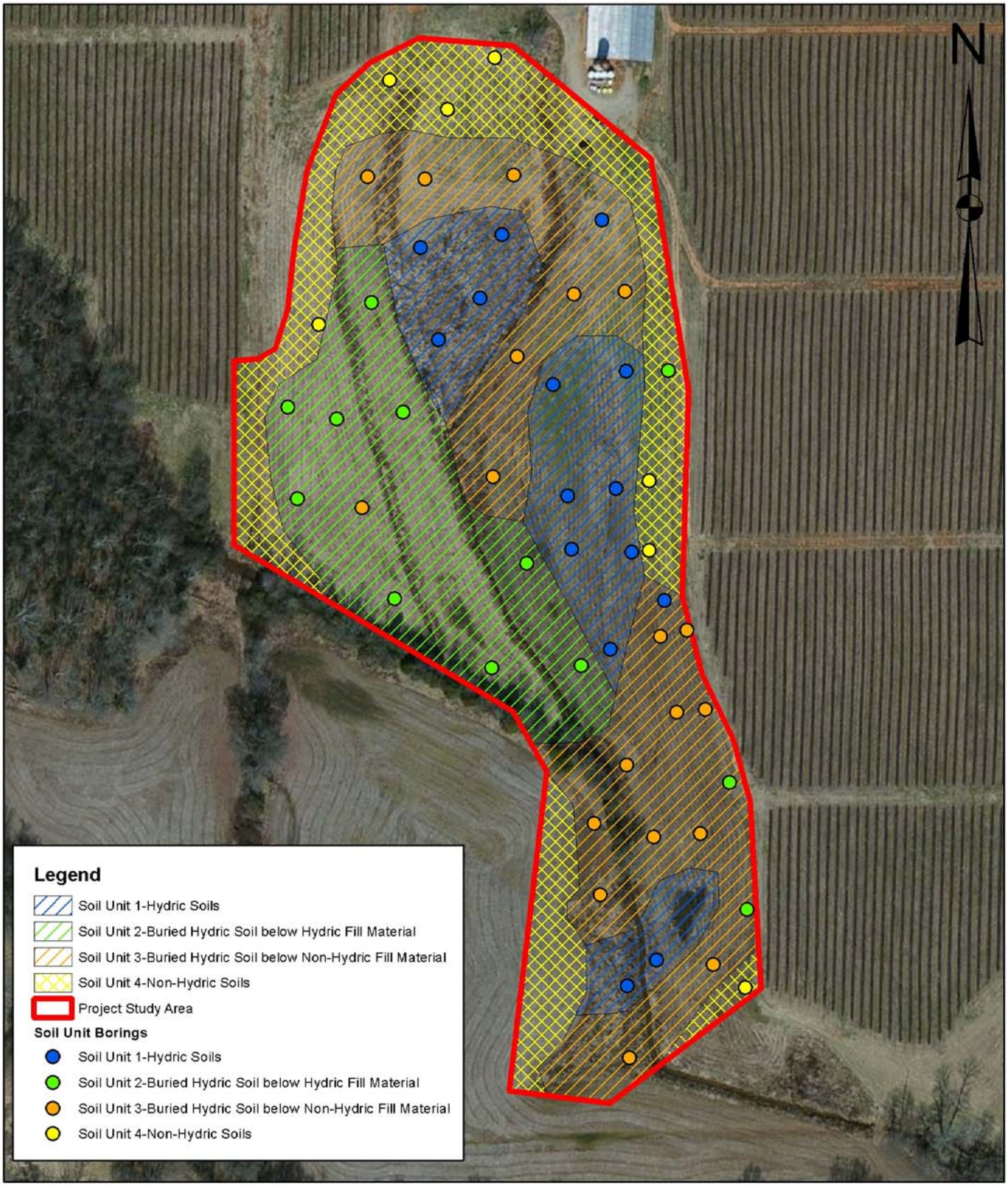
Four Soil Units were identified in the study area:

- Soil Unit 1 – Hydric, relatively undisturbed

- Soil Unit 2 – Hydric soil that has been buried. Fill material has developed enough indicators to classify as hydric.
- Soil Unit 3 – Hydric soil that has been buried. Fill material is non-hydric
- Soil Unit 4 – Non-hydric soil and no evidence of buried hydric soil.

The site hydrology has been altered by ditching and/or channelization of streams and the addition of the fill material. As such, there is ample opportunity for wetland restoration.

The findings presented herein represent Catena's professional opinion based on our Hydric Soil Investigation and knowledge of the current regulations regarding wetland mitigation in North Carolina and national criteria for determining hydric soil.



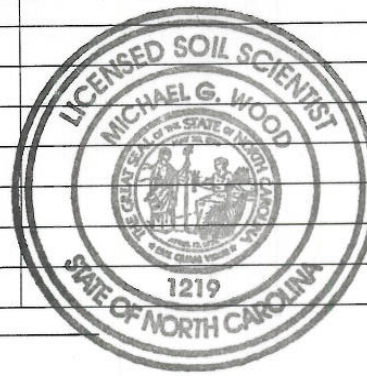
The Catena Group	**Owls Den Mitigation Site** **Lincoln County, NC** **2010 NCDOT Aerial Orthophotography**	Date: October 2012 Scale 0 70 140 Feet Job No.: 4158	Figure 1

SOIL EVALUATION FORM

The Catena Group, Inc
410-B Millstone Drive
Hillsborough, NC 27278
919.732.1300

Property ID: OWLS DEN
Date of Evaluation: 10/11/12
County: LINCOLN
Sheet: 1 of 1

Profile #	Horizon	Horizon Depth (In)	Structure / Texture	Consistence / Mineralogy	Matrix Color	Mottle Colors (Quantity, Size, Contrast, Color)
G1	A_1	3	GR / l	fR / N	7.5YR 2.5/1	c, 1, d, 5YR 5/8
	A2	11	GR / l	fR / N	7.5YR 2.5/1	m, 2, d, 5YR 5/8 c, 1, d, 7.5YR 4/1
	Bwg_1	17	sbk / cl	fi / N	10YR 4/1	m, 2, p, 5YR 5/8 + m, 2, p, 2.5Y 7/4
		21+				common Mn
	Bwg2	24+	sbk / sl	fR / N	10YR 6/2	m, 2, p, 5YR 5/8 + m, 2, d, 2.5Y 7/4
G2	FILL	8	m-sbk / cl	fR / N	10YR 3/1	m, 1-2, d 5YR 5/8
	Ab_1	14	m-GR / l	fR / N	N 3	c, 1, d, 5YR 5/8
	Ab_2	19	m-GR / l	fR / N	7.5YR 4/1	c, 2, d, 5YR 5/8
	Bwb	24+	m-SBK / l	fR / N	10YR 6/2	m, 2, p, 5YR 5/8 + m, 2 d, 2.5Y 7/4
G3	Fill1	5	M-SBK / cl	FR / N	2.5YR 4/6	
	Fill2	9	M-SBK / cl	FR / N	2.5YR 4/6	c, 2, d, 7.5YR 5/2
	Ab	14	M-GR / l	FR / N	7.5YR 4/1	M, 2-1, d 5YR 5/8
	Bgb_1	21	M-SBK / sl	FR / N	10YR 6/3	M, 2, d, 7.5YR 5/6 + m, 2, d, 2.5Y 6/6
	Bgb_2	26+	M-sbk / scl	Fi / N	2.5Y 7/1	m, 2, d, 7.5YR 5/6 + m, 2, d, 2.5Y 6/6
G4	Ap	4	GR / l	FR / N	10YR 3/2	
	Bt_1	12	SBK / CL	FR / N	10YR 4/6	
	Bt_2	24+	SBK / CL	FR / N	10YR 4/6	c, 1, d, 7.5YR 5/6



Evaluated by: M. WOOD, J. ROBERTS

Appendix 7: Categorical Exclusion with Resource Agency Correspondence IRT Correspondence

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Owl's Den Mitigation Site
County Name:	Lincoln County
EEP Number:	#95808
Project Sponsor:	Wildlands Engineering, Inc.
Project Contact Name:	Andrea Eckardt
Project Contact Address:	1430 S. Mint Street, Suite 104, Charlotte, NC 28203
Project Contact E-mail:	aeckardt@wildlandseng.com
EEP Project Manager:	Paul Weisner

Project Description

The Owl's Den Mitigation Site is a stream and wetland mitigation project located in Lincoln County NC northwest of the Town of Lincolnton. The project is located on an unnamed tributary to Howards Creek. The project will provide stream and wetland mitigation units to NCEEP in the Catawba River Basin (03050103). The mitigation project involves a combination of stream and wetland restoration.

For Official Use Only

Reviewed By:

5-16-13

Date

Paul Weisner

EEP Project Manager

Conditional Approved By:

Date

For Division Administrator FHWA

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

Final Approval By:

5-16-13

Date

For Division Administrator FHWA

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

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

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

Owl's Den Mitigation Site

Categorical Exclusion

Summary

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment.

As the Owl's Den Mitigation Site is a full-delivery project; an EDR Radius Map Report with Geocheck was ordered for the site through Environmental Data Resources, Inc on March 26, 2013. The Lincoln County Municipal Solid Waste Landfill was identified in the State and Tribal Landfill and/or Solid Waste Disposal Site Lists as being within the search radius. While the Overview Map in the EDR report incorrectly identified the landfill's location as the "Target Property" of the search, the Lincoln County Solid Waste Division identifies the location of the landfill as 701 Owls Den Road which is over 2,000 feet south of the Owl's Den Mitigation Site and in a different drainage area. Supporting documentation for the physical location of the Lincoln County Landfill, including a map, is located online at http://www.co.lincoln.nc.us/index.aspx?NID=408

Overall, the assessment revealed no evidence of any "recognized environmental conditions" in connection with the target property. The Executive Summary of the EDR report is included in the Appendix. The full report is available if needed.

National Historic Preservation Act (Section 106)

The National Historic Preservation Act declares a national policy of historic preservation to protect, rehabilitate, restore, and reuse districts, sites, buildings, structures, and objects significant in American architecture, history, archaeology, and culture, and Section 106 mandates that federal agencies take into account the effect of an undertaking on a property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

Wildlands Engineering, Inc. (Wildlands) requested review and comment from the State Historic Preservation Office (SHPO) with respect to any archeological and architectural resources related to the Owl's Den Mitigation Site on March 26, 2013. SHPO responded on April 30, 2013 and stated they were aware of no historic resources that would be affected by the project. All correspondence related to Section 106 is included in the Appendix.

Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)

These acts, collectively known as the Uniform Act, provide for uniform and equitable treatment of persons displaced from their homes, businesses, non-profit associations, or farms by federal and federally-assisted programs, and establish uniform and equitable land acquisition policies.

Owl's Den Mitigation Site is a full-delivery project that includes land acquisition. Notification of the fair market value of the project property and the lack of condemnation authority by Wildlands was included in the signed option agreement for the project property. A copy of the relevant section of the option agreement is included in the Appendix.

American Indian Religious Freedom Act (AIRFA)

The American Indian Religious Freedom Act provides for the protection and preservation of places of religious importance to American Indians, Eskimos, and Native Hawaiians.

Wildlands requested review and comment from the Eastern Band of Cherokee Indians Tribal Historic Preservation Office (THPO) with respect to any archeological or religious resources related to the Owl's Den Mitigation Site on March 26, 2013. At this time there has been no response from the THPO. All correspondence related to AIRFA is included in the Appendix.

Endangered Species Act (ESA)

Section 7 of the ESA requires federal agencies, in consultation with and with the assistance of the Secretary of the Interior or of Commerce, as appropriate, to ensure that actions they authorize, fund or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species.

The Lincoln County listed endangered species include the dwarf-flowered heartleaf (*Hexastylis naniflora*) and Michaux's sumac (*Rhus michauxii*). Wildlands requested review and comment from the United States Fish and Wildlife Service (USFWS) on March 26, 2013 in respect to the Owl's Den Mitigation Site and its potential impacts on threatened or endangered species. No response from USFWS has been received at this time. All correspondence with USFWS is included in the Appendix. The USFWS does not currently list any Critical Habitat Designations for any of the Federally-listed species within Lincoln County.

As a result of a pedestrian survey conducted on April 23, 2013, no individual species, critical habitat or suitable habitat were found to exist on the site for the two species. Typical habitat for Michaux's sumac is disturbed, sandy, or rocky open woods with basic soil types and may also include road rights-of-way and edges of artificially maintained clearings. On-Site habitat is not suitable for this species due to heavy vegetation maintenance and low light regimes from an abundance of invasive privet along wooded edges. Typical habitat for dwarf-flowered heartleaf includes north-facing slopes, bluffs, and boggy areas containing acidic sandy loam soils within deciduous forests. No suitable habitat for dwarf-flowered heartleaf exists within the project limits due to the projects geomorphic position within a broad flat valley and unsuitable soil conditions. It was determined that the project would result in "no effect" on any of the listed species.

Farmland Protection Policy Act (FPPA)

The FPPA requires that, before taking or approving any federal action that would result in conversion of farmland, the agency must examine the effects of the action using the criteria set forth in the FPPA, and, if there are adverse effects, must consider alternatives to lessen them.

The Owl's Den Mitigation Site includes the conversion of prime farmland. As such, Form AD-1006 has been completed and submitted to the Natural Resources Conservation Service (NRCS). The completed form and correspondence documenting its submittal is included in the Appendix.

Fish and Wildlife Coordination Act (FWCA)

The FWCA requires consultation with the USFWS and the appropriate state wildlife agency on projects that alter or modify a water body. Reports and recommendations prepared by these agencies document project effects on wildlife and identify measures that may be adopted to prevent loss or damage to wildlife resources.

The Owl's Den Mitigation Site includes stream restoration. Wildlands requested comment on the project from both the USFWS and the North Carolina Wildlife Resources Commission (NCWRC) on March 26, 2013. NCWRC responded on April 17, 2013 and stated they "do not anticipate the project to result in significant adverse impacts to aquatic and terrestrial wildlife resources". The USFWS has not responded at this time. All correspondence with the two agencies is included in the Appendix.

Migratory Bird Treaty Act (MBTA)

The MBTA makes it unlawful for anyone to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird. The indirect killing of birds by destroying their nests and eggs is covered by the MBTA, so construction in nesting areas during nesting seasons can constitute a taking.

Wildlands requested comment on the Owl's Den Mitigation Site from the USFWS in regards to migratory birds on March 26, 2013. USFWS has not responded at this time. All correspondence with USFWS is included in the Appendix.

Owl's Den Mitigation Site

Categorical Exclusion

Appendix

Owls Den Mitigation Site
Owls Den Road
Lincolnton, NC 28092

Inquiry Number: 3557487.2s
March 26, 2013

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION | **PAGE**

GEOCHECK ADDENDUM

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 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

OWLS DEN ROAD
LINCOLNTON, NC 28092

COORDINATES

Latitude (North):	35.4925000 - 35˚ 29' 33.00''
Longitude (West):	81.3126000 - 81˚ 18' 45.36''
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	471646.0
UTM Y (Meters):	3927507.5
Elevation:	763 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	35081-D3 LINCOLNTON WEST, NC
Most Recent Revision:	1996
North Map:	35081-E3 REEPSVILLE, NC
Most Recent Revision:	1970

AERIAL PHOTOGRAPHY IN THIS REPORT

Photo Year:	2010
Source:	USDA

TARGET PROPERTY SEARCH RESULTS

The target property was identified in the following records. For more information on this property see page 7 of the attached EDR Radius Map report:

Site	Database(s)	EPA ID
LINCOLN COUNTY MSWLF (OWLS DEN) OWLS DEN ROAD LINCOLNTON, NC	SWF/LF	N/A

EXECUTIVE SUMMARY

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

CERCLIS - Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY - Federal Facility Site Information listing

Federal CERCLIS NFRAP site List

CERC-NFRAP - CERCLIS No Further Remedial Action Planned

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-CESQG - RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS - Engineering Controls Sites List
US INST CONTROL - Sites with Institutional Controls
LUCIS - Land Use Control Information System

Federal ERNS list

ERNS - Emergency Response Notification System

State- and tribal - equivalent NPL

NC HSDS - Hazardous Substance Disposal Site

EXECUTIVE SUMMARY

State- and tribal - equivalent CERCLIS

SHWS - - - - - - - - - - - - Inactive Hazardous Sites Inventory

State and tribal landfill and/or solid waste disposal site lists

OLI - - - - - - - - - - - - Old Landfill Inventory

State and tribal leaking storage tank lists

LUST - - - - - - - - - - - - Regional UST Database
LUST TRUST - - - - - - - - State Trust Fund Database
LAST - - - - - - - - - - - - Leaking Aboveground Storage Tanks
INDIAN LUST - - - - - - - - Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

UST - - - - - - - - - - - - Petroleum Underground Storage Tank Database
AST - - - - - - - - - - - - AST Database
INDIAN UST - - - - - - - - Underground Storage Tanks on Indian Land
FEMA UST - - - - - - - - - Underground Storage Tank Listing

State and tribal institutional control / engineering control registries

INST CONTROL - - - - - - No Further Action Sites With Land Use Restrictions Monitoring

State and tribal voluntary cleanup sites

VCP - - - - - - - - - - - - Responsible Party Voluntary Action Sites
INDIAN VCP - - - - - - - - Voluntary Cleanup Priority Listing

State and tribal Brownfields sites

BROWNFIELDS - - - - - - - Brownfields Projects Inventory

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS - - - - - A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9 - - - - - Torres Martinez Reservation Illegal Dump Site Locations
ODI - - - - - - - - - - - - Open Dump Inventory
HIST LF - - - - - - - - - - Solid Waste Facility Listing
SWRCY - - - - - - - - - - Recycling Center Listing
INDIAN ODI - - - - - - - - Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL - - - - - - - - - - Clandestine Drug Labs
US HIST CDL - - - - - - - National Clandestine Laboratory Register

EXECUTIVE SUMMARY

Local Land Records

LIENS 2 - - - - CERCLA Lien Information

Records of Emergency Release Reports

HMIRS - - - - Hazardous Materials Information Reporting System
IMD - - - - Incident Management Database

Other Ascertainable Records

RCRA NonGen / NLR - - - - RCRA - Non Generators
DOT OPS - - - - Incident and Accident Data
DOD - - - - Department of Defense Sites
FUDS - - - - Formerly Used Defense Sites
CONSENT - - - - Superfund (CERCLA) Consent Decrees
ROD - - - - Records Of Decision
UMTRA - - - - Uranium Mill Tailings Sites
US MINES - - - - Mines Master Index File
TRIS - - - - Toxic Chemical Release Inventory System
TSCA - - - - Toxic Substances Control Act
FTTS - - - - FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS - - - - FIFRA/TSCA Tracking System Administrative Case Listing
SSTS - - - - Section 7 Tracking Systems
ICIS - - - - Integrated Compliance Information System
PADS - - - - PCB Activity Database System
MLTS - - - - Material Licensing Tracking System
RADINFO - - - - Radiation Information Database
FINDS - - - - Facility Index System/Facility Registry System
RAATS - - - - RCRA Administrative Action Tracking System
RMP - - - - Risk Management Plans
UIC - - - - Underground Injection Wells Listing
DRYCLEANERS - - - - Drycleaning Sites
NPDES - - - - NPDES Facility Location Listing
INDIAN RESERV - - - - Indian Reservations
SCRD DRYCLEANERS - - - - State Coalition for Remediation of Drycleaners Listing
US AIRS - - - - Aerometric Information Retrieval System Facility Subsystem
PRP - - - - Potentially Responsible Parties
2020 COR ACTION - - - - 2020 Corrective Action Program List
EPA WATCH LIST - - - - EPA WATCH LIST
US FIN ASSUR - - - - Financial Assurance Information
PCB TRANSFORMER - - - - PCB Transformer Registration Database
COAL ASH - - - - Coal Ash Disposal Sites
COAL ASH DOE - - - - Steam-Electric Plant Operation Data
COAL ASH EPA - - - - Coal Combustion Residues Surface Impoundments List
Financial Assurance - - - - Financial Assurance Information Listing

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP - - - - EDR Proprietary Manufactured Gas Plants

EXECUTIVE SUMMARY

EDR US Hist Auto Stat - - - - - - - - EDR Exclusive Historic Gas Stations
EDR US Hist Cleaners - - - - - - - - EDR Exclusive Historic Dry Cleaners

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were not identified.

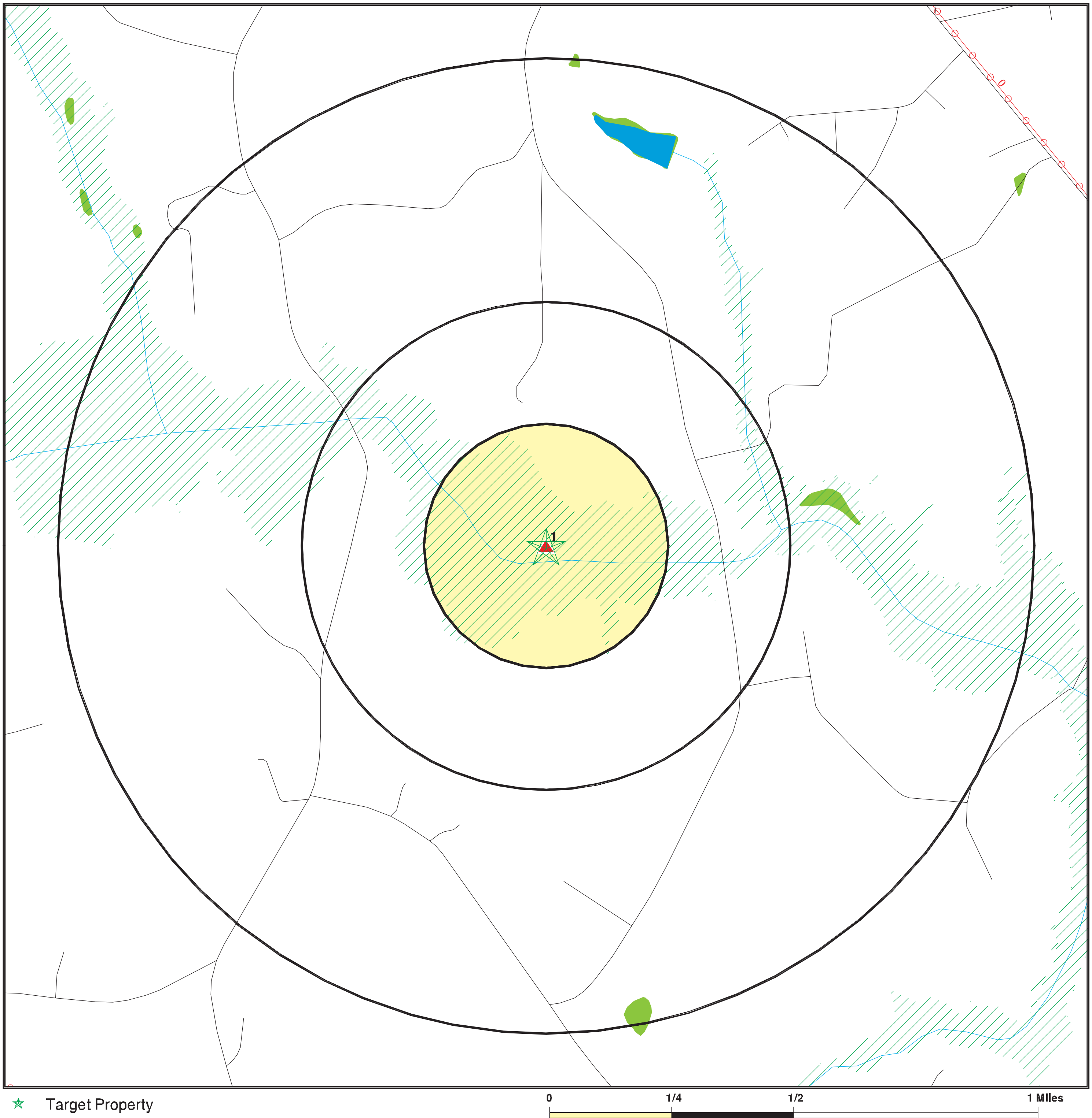
Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 49 records.

Site Name	Database(s)
HICKORY LEATHER CO INC	RCRA-CESQG, FINDS, US AIRS
H & S PROCESSORS INC	CERC-NFRAP, PRP
ASF INTERMODALS	LAST
MAIDEN HWY ACCIDENT SPILL	LAST
BOB’S TIRE SERVICE	LAST
FOOD COUNTRY 10088	UST, Financial Assurance
FURNACE ROAD ABANDONED DRUMS	SHWS
TEXTILE PIECE & DYEING CO	SHWS, IMD, LUST TRUST, UST
HWY 1405 AND 321 INTERSECTION	SHWS, IMD
TREND LINE FURNITURE CORP.	SHWS
VERMONT AMERICAN CORPORATION	SHWS
H & S PROCESSORS, INC.	SHWS, IMD
SOUTHSIDE DRIVE INCIDENT	SHWS, IMD
HULL SERVICE STATION/PHILLIPS 66	CERC-NFRAP
D.O.T. HIGHWAY 150	IMD, LUST
BOB’S SUPERETTE	IMD, LUST
TERRY’S SUPERETTE (FTF)	IMD, LUST, UST
BOB’S SUPERETTE	LUST TRUST
RIVERSIDE SUPERETTE	LUST TRUST
ELMORE’S EXPRESS	LUST TRUST
CONCRETE SUPPLY CO.	UST
G.T. GILBERT SERVICE	UST
WISE LAWNMOWER CO.. INC.	UST
PEIDMONT BAIT & TACKLE	UST
WEST SIDE MARKET	UST
JONES EXXON	IMD, UST
321 MINI MART	UST
RHYNE GROC.	UST
SUNRISE FURNITURE	UST
SONOCO PRODUCTS COMPANY	UST
TOMMY SHRUM PLBG. & SEPTIC TA	UST
FINGERS GROCERY	UST
CRONLAND LUMBER COMPANY	UST
ABERNETHY CONSTRUCTION CO.	UST
J & P TRUCKING. INC.	UST
BEAM LBR CO INC	UST
HOUSER’S GROCERY	UST
BOB DEDMON	UST
NILES TALLENT TRUCKING CO.	UST
CATHERINE R. RHONEY	UST
C AND R GROCERIES	UST
CAT SQUARE AMOCO	UST
STOP N SHOP	UST
SHULFORD JUNKYARD	RCRA-LQG
SAIN & HEAVNER TRUCKING CO INC	RCRA NonGen / NLR, FINDS
SHUFORD JUNKYARD	RCRA NonGen / NLR, FINDS
THE TIMKEN CO.	IMD
RINCKS EXXON # 2448	IMD
DUKE POWER CO.-COVE HAVEN MARI	IMD

OVERVIEW MAP - 3557487.2s



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

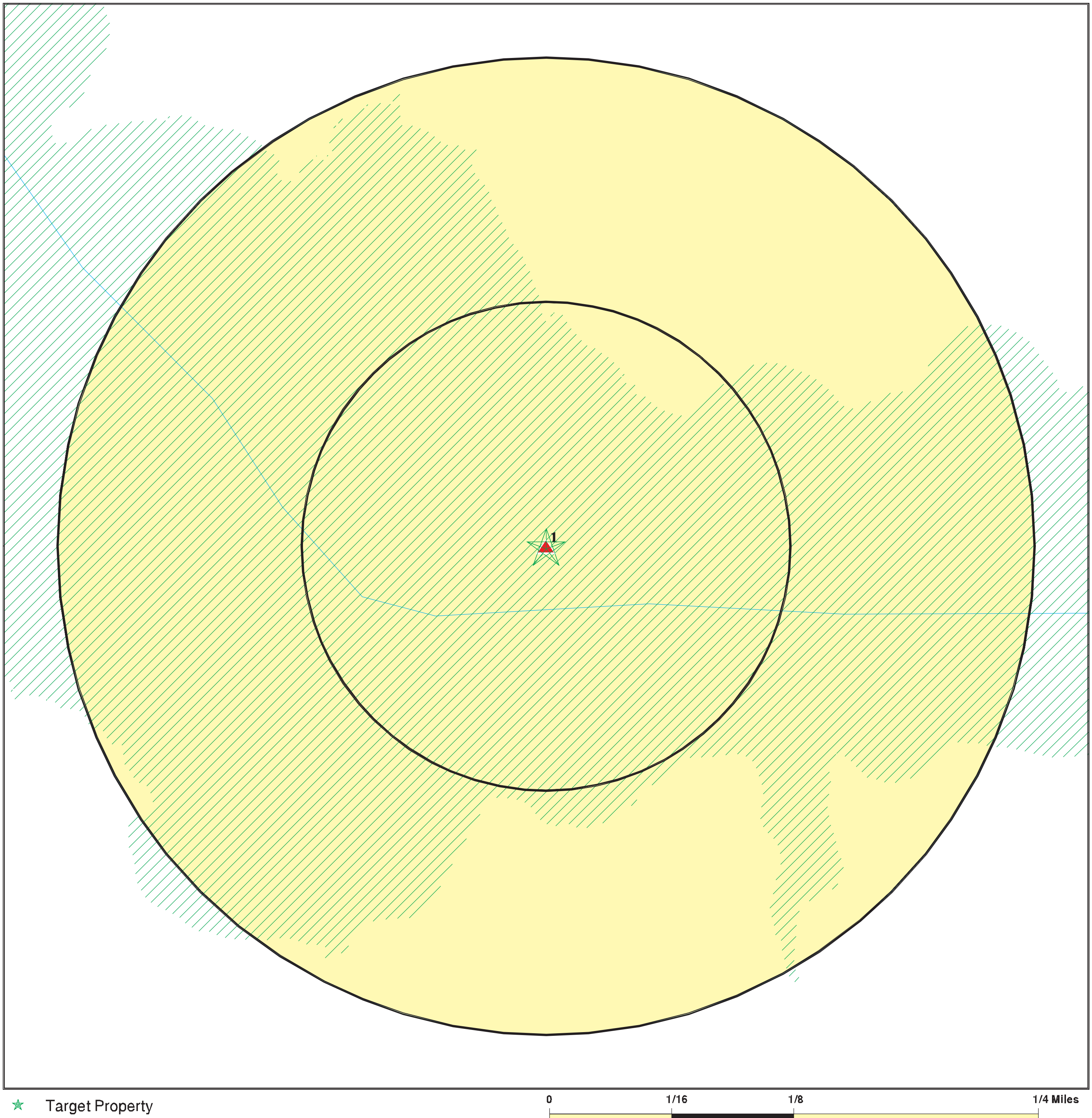
Indian Reservations BIA
Power transmission lines
Oil & Gas pipelines from USGS
100-year flood zone
500-year flood zone
National Wetland Inventory
State Wetlands

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: Owls Den Mitigation Site ADDRESS: Owls Den Road Lincolnton NC 28092 LAT/LONG: 35.4925 / 81.3126	CLIENT: Wildlands Eng, Inc. CONTACT: Andrea Eckardt INQUIRY #: 3557487.2s DATE: March 26, 2013 2:20 pm

DETAIL MAP - 3557487.2s



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- 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: Owls Den Mitigation Site	CLIENT: Wildlands Eng, Inc.
ADDRESS: Owls Den Road	CONTACT: Andrea Eckardt
Lincolnton NC 28092	INQUIRY #: 3557487.2s
LAT/LONG: 35.4925 / 81.3126	DATE: March 26, 2013 2:21 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	TP		NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS	0.500		0	0	0	NR	NR	0
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP	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-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
LUCIS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
NC HSDS	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.000		0	0	0	0	NR	0
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500	1	0	0	0	NR	NR	1
OLI	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	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
LUST TRUST	0.500		0	0	0	NR	NR	0
LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
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
FEMA UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
HIST LF	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	TP		NR	NR	NR	NR	NR	0
US HIST CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
IMD	0.500		0	0	0	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
DOD	1.000		0	0	0	0	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
FUDS	1.000		0	0	0	0	NR	0
CONSENT	1.000		0	0	0	0	NR	0
ROD	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
COAL ASH	0.500		0	0	0	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
EDR MGP	1.000		0	0	0	0	NR	0
EDR US Hist Auto Stat	0.250		0	0	NR	NR	NR	0
EDR US Hist Cleaners	0.250		0	0	NR	NR	NR	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

Map ID Direction Distance Elevation	Site	Database(s)	EDR ID Number EPA ID Number
1 **Target** **Property**	**LINCOLN COUNTY MSWLF (OWLS DEN)** **OWLS DEN ROAD** **LINCOLNTON, NC**	**SWF/LF**	**S109164057** **N/A**

Actual:
763 ft.

LF:

Permit Num:	5502-MSWLF-
Waste:	MSW
Activity:	LF
Contact Name:	Mark Bivins
Contact Telephone:	704.732.9030
Facility Status:	InactiveClosed

WILDLANDS
ENGINEERING

March 26, 2013

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

Subject: EEP Stream mitigation project in Lincoln County, NC
Owls Den Mitigation Site

Dear Ms. Gledhill-Earley,

The Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream and wetland restoration project on the attached site (USGS site map with approximate areas of potential ground disturbance is enclosed).

The Owls Den site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Several sections of channel have been identified as significantly degraded. The site has historically been disturbed due to agricultural purposes, specifically for active blackberry and soybean production. No architectural structures or archaeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

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

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner
aeckardt@wildlandseng.com

North Carolina Department of Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

April 30, 2013

Andrea Eckardt
Wildlands Engineering
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Re: Owls Den Mitigation Site, Lincoln County, ER 13-0710

Dear Ms. Eckardt:

Thank you for your letter of March 26, 2013, concerning the above project.

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

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address**: 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax**: (919) 807-6570/807-6599

2.7.5 Indemnification. Optionor agrees to indemnify, protect, defend with legal counsel acceptable to the other party, and hold Optionee and Optionee' employees, general partners, directors, officers, affiliates, subsidiaries, agents and representatives harmless from and against any and all losses, claims, demands, damages, costs and expenses of whatever nature, including, without limitation, attorneys' fees, relating to or arising out of a breach of Optionor's representations and warranties set forth in this Sections 2.7.1 through 2.7.4; provided, however, that the covenants contained in this Section 2.7.5 shall have no force or effect if the representations and warranties set forth in Section 2.7.1 through 2.7.4 were true in all material respects on the Effective Date. The covenants contained in this Section 2.7.5 shall survive the Closing.

ARTICLE 3

MISCELLANEOUS

3.1 Liquidated Damages. Optionee recognizes that the Option Property will be removed by Optionor from the market during the existence of this agreement. If the purchase of the Conservation Easement is not consummated because of Optionee's default, the parties have determined and agreed that the actual amount of damages that would be suffered by Optionor as a result of any such default would be very difficult or impracticable to determine as of the date of this Agreement. As a result, the parties have agreed that the Option Consideration and Additional Option Consideration paid by Optionee to Optionor as of the date of Optionee's default is sufficient to cover any estimated damages that may be incurred by Optionor. For these reasons, the parties agree that if the purchase of the Conservation Easement is not consummated because of Optionee's default, Optionor shall be entitled to retain the Option Consideration and Additional Option Consideration paid by Optionee as of the date of Optionee's default as its sole remedy, and Optionor waives any and all right to seek other rights or remedies against Optionee, including without limitation, specific performance. Nothing set forth in this Section 3.1 shall preclude any action under any indemnification, defense or hold harmless provision in this Agreement, nor for the award of attorney's fees and costs in conjunction with any action relating to this Agreement.

3.2 Notices. All notices required to or permitted to be given pursuant to this Agreement shall be in writing, shall be given only in accordance with the provisions of this Section, shall be addressed to the parties in the manner set forth below, and shall be conclusively deemed to have been properly delivered: (a) upon receipt when hand delivered during normal business hours; (b) upon receipt when sent by facsimile or email prior to 5:00 p.m. of a given business day; provided, however, that notices given by facsimile shall not be effective unless the sending party's machine provides written confirmation of successful delivery thereof; (c) upon the day of delivery if the notice has been deposited in a authorized receptacle of the United States Postal Service as first-class, registered or certified mail, postage prepaid, with a return receipt requested; or (d) one (1) business day after the notice has been deposited with either FedEx or United Parcel Service to be delivered by overnight delivery. The addresses of the parties to receive notices are as follows:

TO OPTIONEE:
Wildlands Engineering, Inc.
1430 S. Mint Street, Suite 104
Charlotte, North Carolina 28203
Attention: Robert W. Bugg
eMail: rbugg@wildlandsinc.com

TO OPTIONOR:
SunnyRidge Farm, Inc.
PO Box 3036
Winter Haven, FL 33885
Attention: Lucius M. Dyal, Jr.
eMail: jake.dyal@dole.com

Notice of change of address shall be given by written notice in the manner described in this Paragraph.

3.3 Assignment. Neither Party shall have the right to assign this Agreement without the consent of the other Party. No assignment shall be effective, however, unless the assignee has delivered a written assumption of their obligations under this Agreement.

3.4 Value of Conservation Easement; No Power of Eminent Domain. In accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Optionee hereby notifies Optionor that: (i)

Optionee believes that the fair market value of the Conservation Easement is an amount equal to the Purchase Price; and (ii) Optionee does not have the power of eminent domain.

3.5 Waivers. No waiver of any breach of any covenant or provision herein contained shall be deemed a waiver of any preceding or succeeding breach thereof, or of any other covenant or provision herein contained.

3.6 Survival of Obligations. Notwithstanding any provision of this Agreement, the covenants, representations, warranties, hold harmless, defense and indemnification obligations made by each party herein shall survive the Closing.

3.7 Successors and Assigns. This Agreement shall be binding upon and shall inure to the benefit of the successors and permitted assigns of the parties hereto.

3.8 Attorneys' Fees. If either party commences an action against the other to interpret or enforce any of the terms of this Agreement or because of the breach by the other party of any of the terms hereof, the losing party shall pay to the prevailing party reasonable attorneys' fees, costs and expenses and court costs and other costs of action incurred in connection with the prosecution or defense of such action, whether or not the action is prosecuted to a final judgment.

3.9 Memorandum of Option. Concurrently with the execution of this Agreement, Optionee and Optionor agree to execute, acknowledge and record a **"Memorandum of Agreement,"** which shall be in the form attached hereto as Exhibit C. Optionor and Optionee shall record the Memorandum of Agreement against the Option Property in the Official Records of Lincoln County within thirty (30) days after the Effective Date of this Agreement.Entire Agreement. This Agreement (including all exhibits attached hereto) is the final expression of, and contains the entire agreement between, the parties with respect to the subject matter hereof and supersedes all prior understandings with respect thereto. This Agreement may not be modified, changed, supplemented, superseded, canceled or terminated, nor may any obligations hereunder be waived, except by written instrument signed by the party to be charged or by its agent duly authorized in writing or as otherwise expressly permitted herein. Notwithstanding any rule or maxim of construction to the contrary, any ambiguity or uncertainty shall not be construed against either Optionor Optionee based upon authorship of any of the provisions hereof.

3.10 Time of Essence. Optionor and Optionee hereby acknowledge and agree that time is strictly of the essence with respect to each and every term, condition, obligation and provision hereof and that failure to timely perform any of the terms, conditions, obligations or provisions hereof by either party shall constitute a material breach of and a non-curable default under this Agreement by the party so failing to perform.

3.11 Governing Law. The parties hereto acknowledge that this Agreement has been negotiated and entered into in the State of North Carolina. The parties hereto expressly agree that this Agreement shall be governed by, interpreted under, and construed and enforced in accordance with the laws of the State of North Carolina.

3.12 Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which, together, shall constitute one and the same instrument.

3.13 Exhibits. The Exhibits referenced in this Agreement are incorporated herein by this reference.

3.15 Additional Provisions. A) In the event that Optionee, in Optionee's sole discretion, determines that the existing power lines as shown on Exhibit A must be relocated outside of the Easement Area, Optionee, at Optionee's sole cost and expense shall pay for and coordinate the relocation of said power lines just outside of the Easement Area along the grass road from the farm buildings to the irrigation pump station. Any new power lines, related equipment and poles must be of equal or better quality workmanship and materials than the existing power lines. B) Optionee, at Optionee's sole cost and expense shall pay for and coordinate the relocation of a culvert crossing to the location as indicated on Exhibit A. New culvert must be of equal or better quality workmanship and materials than the existing culvert.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the dates set forth below.

OPTIONEE:	OPTIONOR:
WILDLANDS ENGINEERING, INC., a North Carolina corporation	**SunnyRidge Farm, Inc.**, a Florida corporation
By:	By:
Its: President	Its: Vice President
Date: Oct 24, 2012	Date: October 24, 2012
	By:
	Its:
	Date:

LIST OF EXHIBITS

Exhibit A	-	Exhibit of Conservation Area (Option Property)
Exhibit B	-	Conservation Easement
Exhibit C	-	Memorandum of Agreement

WILDLANDS
ENGINEERING

March 26, 2013

Tyler Howe, Tribal Historic Preservation Specialist
Eastern Band of Cherokee Indians
Tribal Historic Preservation Office
PO Box 455
Cherokee, NC 28719

Subject: EEP stream and wetland mitigation project in Lincoln County.
Owls Den Mitigation Project

Dear Mr. Howe,

The Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or religious resources associated with a potential wetland and stream restoration project on the attached site (a USGS site map using the Lincolnton West, NC 7.5 Minute Topographic Quadrangle is enclosed). The figure shows the area of potential ground disturbance. A similar letter has been sent to the North Carolina State Preservation Office for compliance with Section 106 of the Historic Preservation Act.

The Owls Den Mitigation site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Several sections of channel have been identified as significantly degraded. No architectural structures or archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. The majority of the site has historically been disturbed due to agricultural purposes such as tilling, most recently for soybean and blackberry farming.

We ask that you review this site based on the attached information to determine if you know of any existing resources that we need to know about. In addition, please let us know the level your future involvement with this project needs to be (if any).

We thank you in advance for your timely response and cooperation. Please feel free to contact the EEP Project Manager (Donnie Brew, 919-747-7017) with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner

March 26, 2013

Marella Buncick
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801

Subject: **Owls Den Mitigation Site**
Lincoln County, North Carolina

Dear Ms. Buncick,

The Owls Den Mitigation Site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Several sections of stream channels throughout the site have been identified as significantly degraded as a result of past agricultural activities, specifically tilling.

We have already obtained an updated species list for Lincoln County from your web site (http://www.fws.gov/raleigh/species/cntylist/). The threatened or endangered species for the county are: the Dwarf-flowered heartleaf (*Hexastaylis naniflora*) and Michaux's sumac (*Rhus michauxii*). We are requesting that you please provide any known information for each species in the county. The USFWS will be contacted if suitable habitat for any listed species is found or if we determine that the project may affect one or more federally listed species or designated critical habitat.

Please provide comments on any possible issues that might emerge with respect to endangered species, migratory birds or other trust resources from the construction of a stream and wetland restoration project on the subject property. A USGS map showing the approximate area of potential ground disturbance is enclosed. The figure was prepared from the Lincolnton West, 7.5-Minute USGS Topographic Quadrangle.

If we have not heard from you in 30 days we will assume that you do not have any comments regarding associated laws and that you do not have any information relevant to this project at the current time.

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

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner

Attachment:
USGS Topographic Map

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 3/26/13
Name Of Project Owls Den Mitigation Site	Federal Agency Involved FHWA - NCEEP
Proposed Land Use Stream and Wetland Restoration	County And State Lincoln County, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 3/26/13

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 0	Average Farm Size 93
Major Crop*(s)* Hay, Corn, Soybeans, Wheat	Farmable Land In Govt. Jurisdiction Acres: 172,645 % 88		Amount Of Farmland As Defined in FPPA Acres: 149,479 % 76	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System		Date Land Evaluation Returned By NRCS 3/29/13	

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	12.8			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	12.8	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	7.9			
B. Total Acres Statewide And Local Important Farmland	0.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.0			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	94.0			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	57	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Nonurban Use	15	14			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	3			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	15			
6. Distance To Urban Support Services	15	10			
7. Size Of Present Farm Unit Compared To Average	10	10			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	5			
10. On-Farm Investments	20	10			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	97	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	57	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	97	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	154	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

Andrea Eckardt

From:	Andrea Eckardt
Sent:	Tuesday, April 30, 2013 4:49 PM
To:	'Clary, Kent - NRCS, Waynesville, NC'
Subject:	RE: AD1006 - Lincoln County - Owls Den Mitigation Site
Attachments:	AD1006 Owls Den Final.pdf

Kent
Attached is the completed AD1006 form for your files.

Thanks so much for your help.

Andrea

Andrea S. Eckardt
Wildlands Engineering, Inc.
704-332-7754 ext 101

From: Clary, Kent - NRCS, Waynesville, NC [mailto:Kent.Clary@nc.usda.gov]
Sent: Friday, March 29, 2013 3:34 PM
To: Andrea Eckardt
Subject: RE: AD1006 - Lincoln County - Owls Den Mitigation Site

Andrea,

See attached. Let me know if you need anything else.
Kent

From: Andrea Eckardt [mailto:aeckardt@wildlandseng.com]
Sent: Tuesday, March 26, 2013 3:05 PM
To: Clary, Kent - NRCS, Waynesville, NC
Subject: AD1006 - Lincoln County - Owls Den Mitigation Site

Kent-
Attached is the AD1006 Form, USGS Topographic Map and Soils Map for the Owls Den Mitigation Site.
This is a stream and wetland mitigation site located in Lincoln County.
I've filled out Parts I and III of the form at this point.

The soils breakdown in the project area is as follows:

- Chewacla (ChA) - 4.9 acres
- Worsham fine sandy loam (WoA) - 4.9 acres
- Riverview loam (RvA) - 1.6 acres
- Helena sandy loam (HeB) - 1.4 acres

Let me know if you need any additional information from me to complete the form.

Thanks for your help.

Andrea

Andrea Spangler Eckardt

Senior Environmental Planner
Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203
704-332-7754 ext 101
www.wildlandseng.com

WILDLANDS
ENGINEERING

March 26, 2013

Shannon Deaton
North Carolina Wildlife Resource Commission
Division of Inland Fisheries
1721 Mail Service Center
Raleigh, NC 27699

Subject: **Owls Den Mitigation Site**
Lincoln County, North Carolina

Dear Ms. Deaton,

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with a potential stream and wetland restoration project on the attached site. A USGS map showing the approximate area of potential ground disturbance is enclosed. The figure was prepared from the Lincolnton West, 7.5-Minute USGS Topographic Quadrangles.

The Owls Den Mitigation Site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. There are two unnamed stream channels located on the site that have been identified as significantly degraded as a result of past agricultural activities, including blackberry and soybean production on the site.

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

Sincerely,
Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner

Attachment:
USGS Topographic Map

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

17 April 2013

Andrea S. Eckardt, Senior Environmental Planner
Wildlands Engineering
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Subject: Owls Den Mitigation Site, Lincoln County, North Carolina.

Dear Ms. Eckardt:

Biologists with the North Carolina Wildlife Resources Commission have reviewed the subject information. 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 proposed project would provide in-kind mitigation for unavoidable stream and wetland impacts. Two unnamed tributaries have been identified as significantly degraded from past agricultural activities including blackberry and soybean production. The project site includes Howards Creek and its unnamed tributaries in the Catawba River basin.

Stream restoration projects often improve water quality and aquatic habitat. Establishing native, forested buffers in riparian areas will help to protect water quality, improve aquatic and terrestrial habitats, and provide a travel corridor for wildlife species. Provided measures are taken to minimize erosion and sedimentation from construction/restoration activities, we do not anticipate the project to result in significant adverse impacts to aquatic and terrestrial wildlife resources.

Thank you for the opportunity to review this proposed project. If we can provide further assistance, please contact our office at (336) 449-7625 or shari.bryant@ncwildlife.org.

Sincerely,

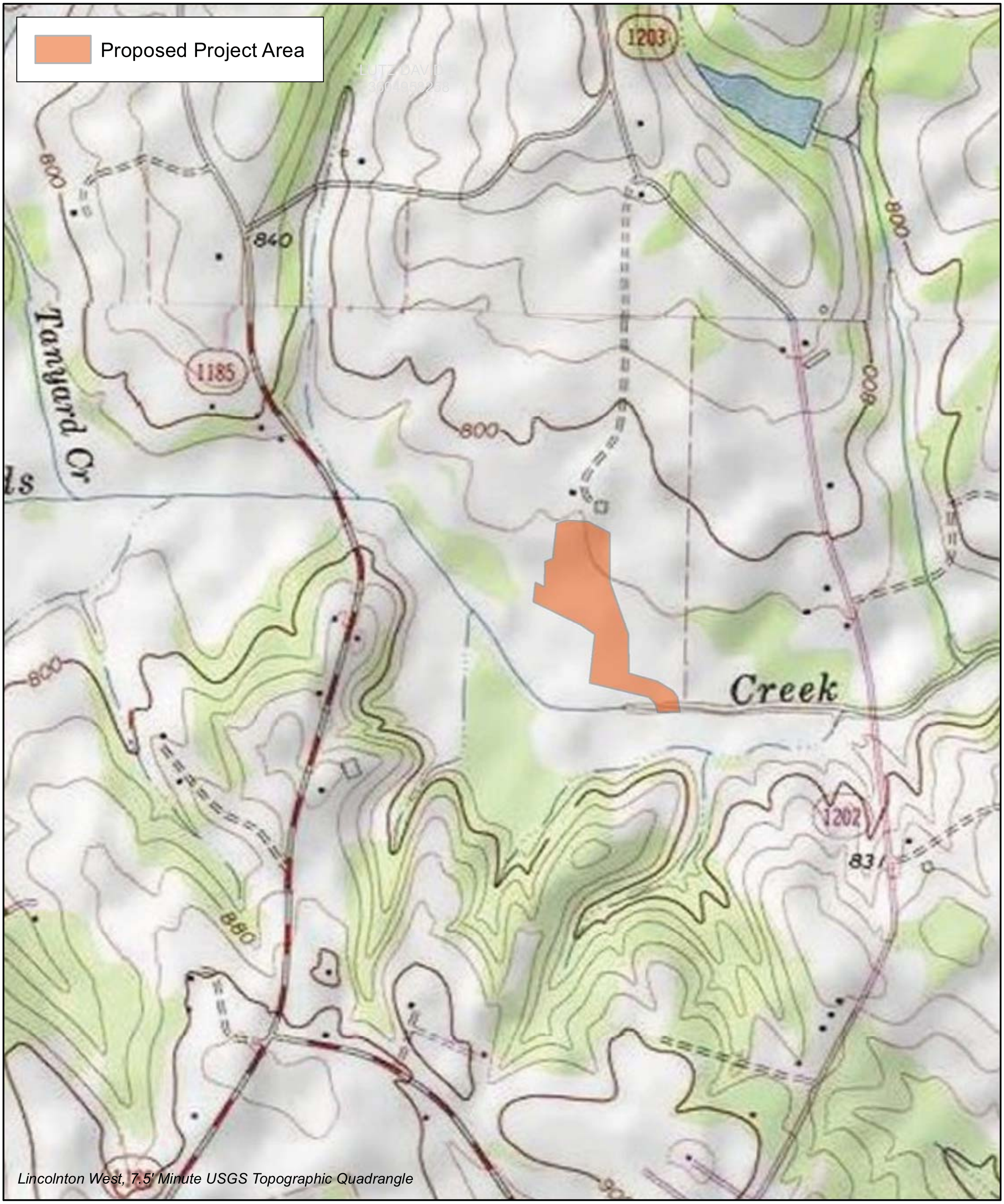
Shari L Bryant

Shari L. Bryant
Piedmont Region Coordinator
Habitat Conservation Program

Owl's Den Mitigation Site

Categorical Exclusion

Figures



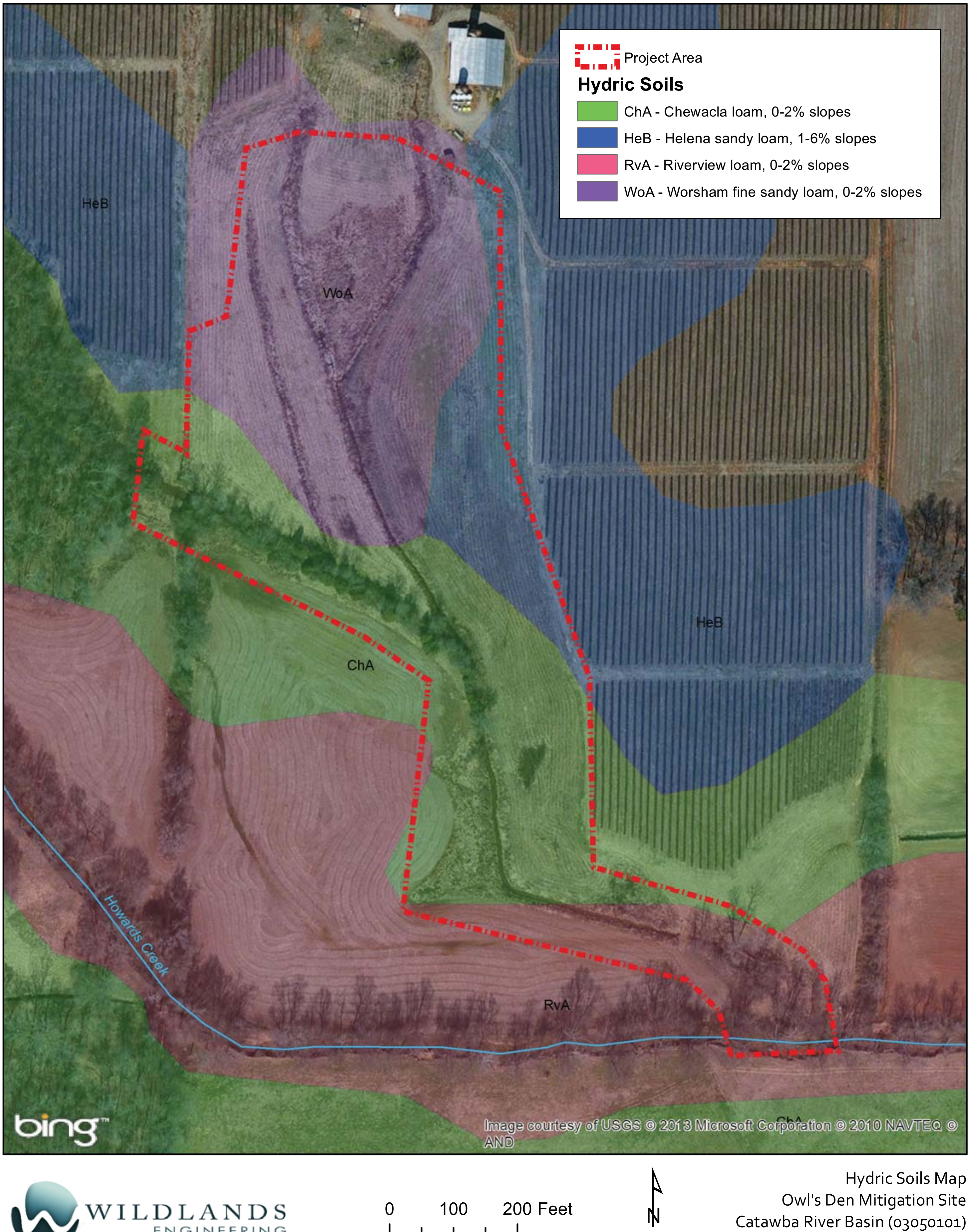
WILDLANDS ENGINEERING

0 500 1,000 Feet

N

Owls Den Mitigation Site
Catawba River Basin (03050101)

Lincoln County, NC



Hydric Soils Map
Owl's Den Mitigation Site
Catawba River Basin (03050101)

Lincoln County, NC

WILDLANDS
ENGINEERING

June 21, 2013

Mr. Alan Johnson
NC Division of Water Quality- Mooresville Regional Office
610 East Center Avenue, Suite 301
Mooresville, NC 28115
sent via e-mail: Alan.Johnson@ncdenr.gov

RE: Owl's Den Mitigation Site
Meeting Minutes of DWQ Site Walk 6/17/2013
Catawba River Basin Cataloging Unit 03050103 Expanded Service Area; Lincoln County, NC

Dear Mr. Johnson,

This letter is a follow up to our site walk on Monday, June 17, 2013. We walked the site and discussed the proposed restoration approaches outlined in Wildlands Engineering's technical proposal for Site Option 1 dated October 26, 2012. The following items were discussed:

1. Discussed IRT site walk 4/11/2013 and provided summary notes from that meeting (attached).
2. Ditches D1-D4 will be graded/ plugged within the project area to turn surface hydrology onto the proposed wetland areas. Active pipe outflow noted near upstream end of Ditch 4, Designer to further investigate and account for outflow in design.
3. Stream cross-section for HC1 and HC2 to remain small to function as stream channels with out-of-bank flooding to hydrate wetlands.
4. DWQ recommends that nutrient loading from upstream agricultural operations be summarized for site.
5. DWQ requests that HC1 and HC2 as stream channels on site be addressed in Mitigation Plan. Designer will discuss formation and initiation of streams in wetland seep landscape.
6. Discussed tie-in of restored HC1 at Howard's Creek. This transition down to elevation of Howard's Creek should not be too steep.
7. DWQ requests that mature trees along HC1 be saved as feasible.

If you have any questions or revisions to these meeting notes, please contact me at ereinicker@wildlandseng.com or 704-332-7754 x106.

Sincerely,

Emily G. Reinicker, PE, CFM
Project Manager

cc: Mr. Paul Wiesner, NC EEP- Paul.Wiesner@ncdenr.gov
5 Ravenscroft Dr., #102, Asheville, NC 28801

April 15, 2013

Mr. Todd Tugwell
Special Projects Manager, Regulatory Division
U.S. Army Corps of Engineers - Wilmington District
11405 Falls of Neuse Road
Wake Forest, NC 27587
sent via e-mail: Todd.Tugwell@usace.army.mil

RE: Owl's Den Mitigation Site
Meeting Minutes of IRT Site Walk 4/11/2013
Catawba River Basin Cataloging Unit 03050103 Expanded Service Area; Lincoln County, NC

Dear Mr. Tugwell,

This letter is a follow up to our site walk with EEP and the Interagency Review Team (IRT) at the Owl's Den Mitigation Site on Thursday, April 11, 2013. The following representatives attended the site walk:

Todd Tugwell, USACE
David Brown, USACE
Mike McDonald, NC EEP
John Hutton, Wildlands Engineering
Matt Jenkins, Wildlands Engineering
Emily Reinicker, Wildlands Engineering

The group walked the site and discussed the proposed restoration approaches outlined in Wildlands Engineering's technical proposal for Site Option 1 dated October 26, 2012. The site was initially identified and mapped as Site W-30 in the Indian and Howards Creek Local Watershed Plan. Particular discussions around stream and wetland jurisdiction and mitigation treatment types included:

1. HC1 and HC2 will be restored as meandering stream channels and will help to restore wetland hydrology in an inter-connected stream-wetland complex.

2. One culverted stream crossing will remain on stream channel HC1, as shown on the concept design figure. This culvert elevation may be raised to work with the proposed Priority 1 restoration design.

3. Downstream of the crossing, HC1 will transition to a Priority 2 restoration to tie into Howards Creek. This P2 design will be a combination of wood and rock step-down structures and an excavated floodplain bench.

4. HC1 tie-in will meander in the right floodplain of the current channel to allow for a full 50-foot buffer between the restored channel and the existing pump station on Howards Creek.

5. A private overhead electric line is located on the site. This line will either be relocated or a 15-foot wide maintenance corridor will be excluded from the project area. USACE voiced a strong preference for the OHE line to be relocated or for project area to be adjusted so that the maintenance corridor is located on the edge of the project area.

6. Discussion of whether HC1 and HC2 were historically stream channels. HC1 emanates from a large wetland complex, with a drainage area of 150 acres. HC2 drains 27 acres of agricultural fields and emanates from a wetland area. USACE agreed with idea that it would make sense to start stream channel designation at wetland headwater area.

7. Viewed area in right floodplain of HC1 southwestern portion of proposed wetland restoration area. USACE will take jurisdiction on this area and these wetlands will qualify for enhancement credit.

8. Viewed area in right floodplain near upstream end of HC1. Wet area in agricultural field may be wetland or qualify for wetland restoration work. This area will be evaluated as part of the project.

9. In the western portion of the proposed wetland work, near installed wetland gage #1, discussed that Zone 1 and Zone 2 areas identified in the proposal with hydric soils will be considered jurisdictional wetlands. However, significant improvement in wetland functions can be achieved. USACE consulted with Eric Kulz (NCDWQ) via telephone, and agreement was made that Rehabilitation credit can be awarded for work in these jurisdictional areas where significant improvement to wetland function will take place. A credit ratio will need to be proposed and justified in the Mitigation Plan document. This credit ratio will be less than a 1:1 restoration credit ratio. Justification will center on benefits provided to the 3 primary wetland parameters of soil, hydrology, and vegetation. Design considerations could include planted trees to retain water and/or temperature buffering via vegetation shade for soils, surface waters, and groundwater. Wildlands to consider specific farm applications and treatment for these fertilizers/ herbicides.

10. USACE requested clear accounting of wetland impacts in Mitigation Plan, specifically wetlands converted to stream channels. Direct offsetting replacement for any conversions should occur on site.

11. USACE recommended instead of Zone 1/2/3 designations in proposal, JD be completed on site. Jurisdictional wetlands will have mitigation type of enhancement or rehabilitation. Non-

jurisdictional areas will have mitigation type of restoration. In areas referred to as Zone 3 in proposal, with non-hydric overburden soils, USACE agreed this overburden could be graded off.

If you have any questions or revisions to these meeting notes, please contact me at ereinicker@wildlandseng.com or 704-332-7754 x106.

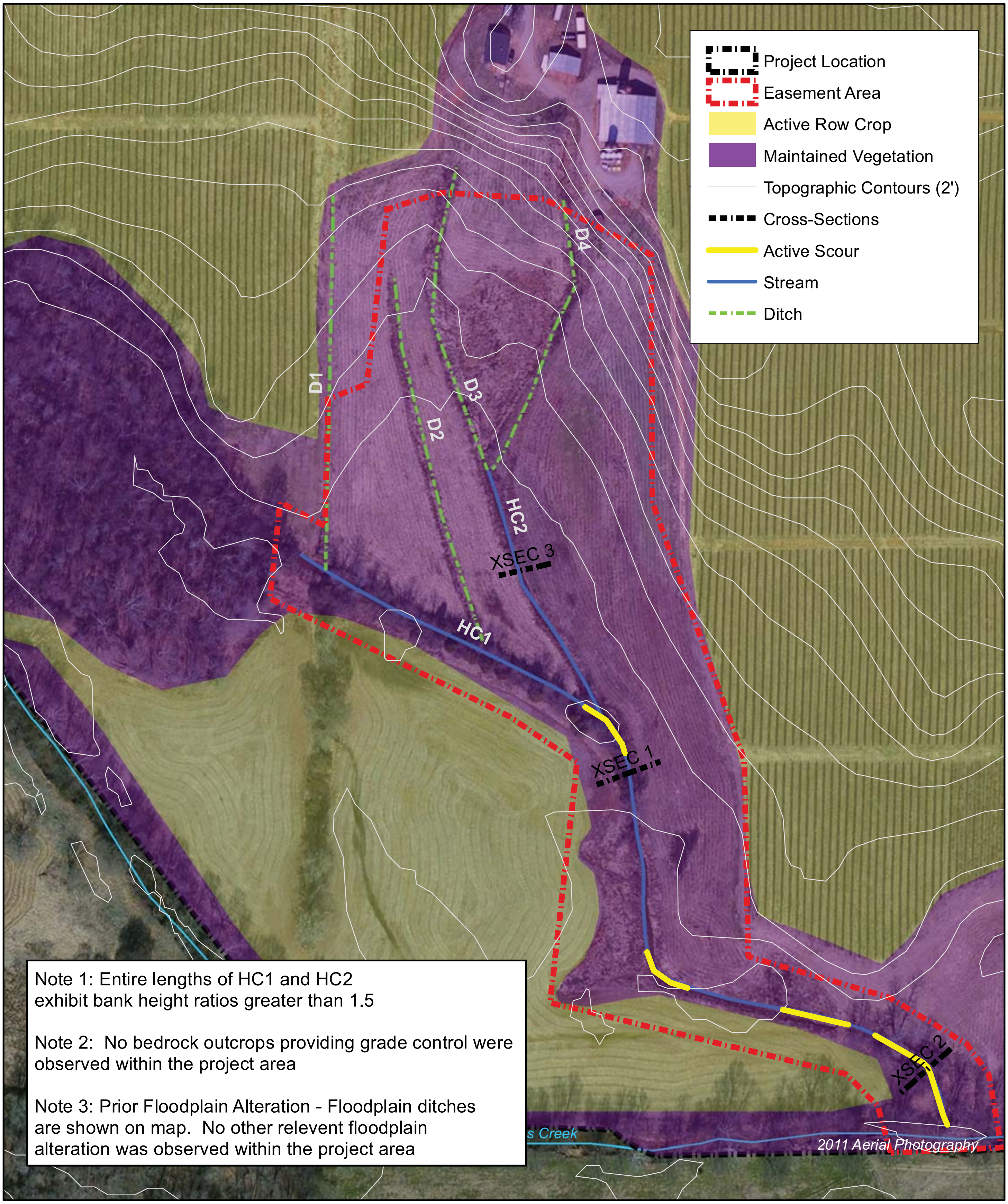
Sincerely,

Emily G. Reinicker, PE, CFM
Project Manager

cc: Mr. David Brown, USACE
151 Patton Avenue, Room 208, Asheville, NC 28801-5006
David.w.brown@usace.army.mil

Mr. Mike McDonald, NC EEP
5 Ravenscroft Dr., #102, Asheville, NC 28801
Mike.McDonald@ncdenr.gov

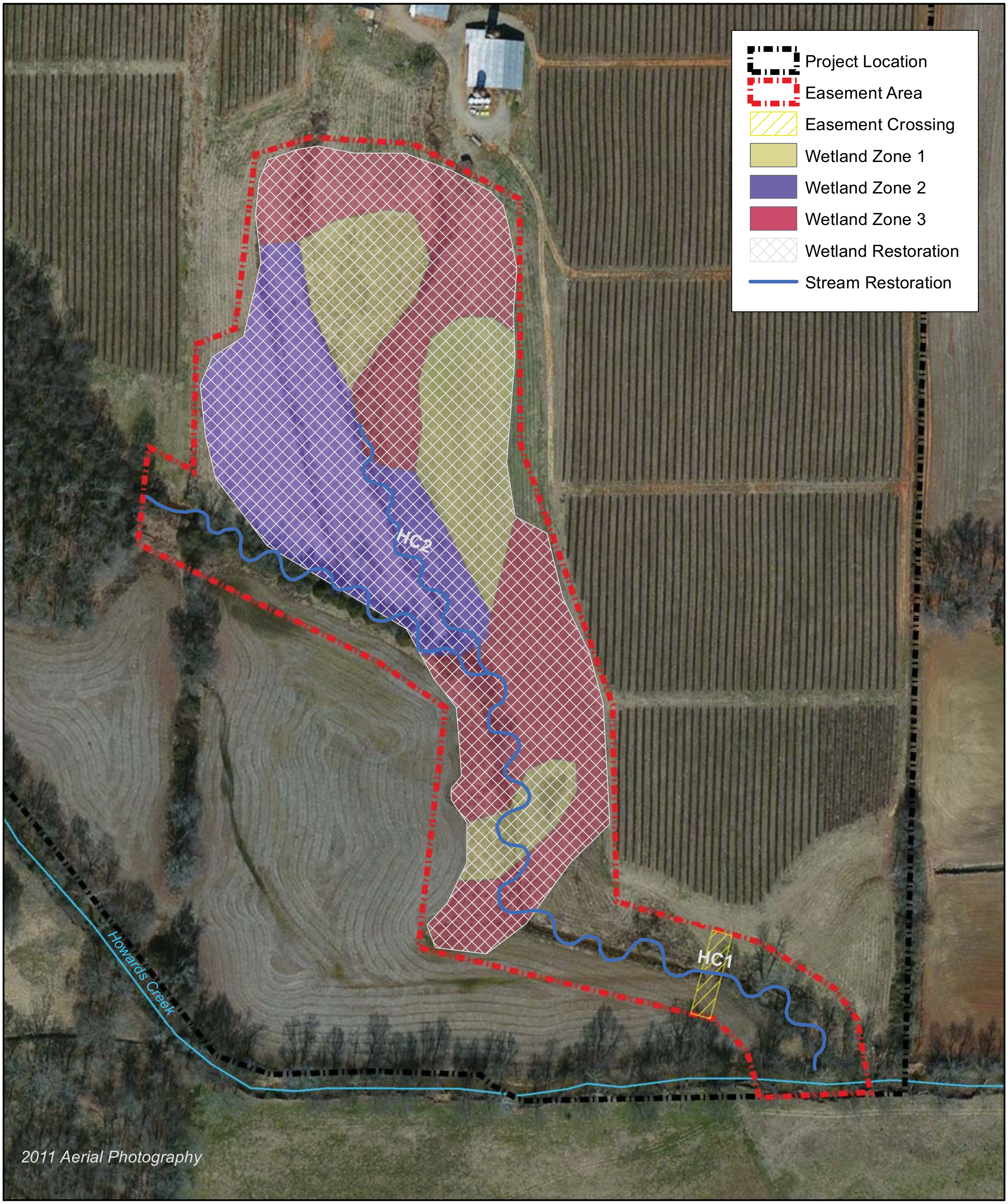
Mr. Paul Wiesner, NC EEP
5 Ravenscroft Dr., #102, Asheville, NC 28801
Paul.Wiesner@ncdenr.gov



0 100 200 Feet

N

Figure 2 Site Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 6 Concept Map - Option 1
Owls Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC

April 15, 2013

Mr. Todd Tugwell
Special Projects Manager, Regulatory Division
U.S. Army Corps of Engineers - Wilmington District
11405 Falls of Neuse Road
Wake Forest, NC 27587
sent via e-mail: Todd.Tugwell@usace.army.mil

RE: Owl's Den Mitigation Site
Meeting Minutes of IRT Site Walk 4/11/2013
Catawba River Basin Cataloging Unit 03050103 Expanded Service Area; Lincoln County, NC

Dear Mr. Tugwell,

This letter is a follow up to our site walk with EEP and the Interagency Review Team (IRT) at the Owl's Den Mitigation Site on Thursday, April 11, 2013. The following representatives attended the site walk:

Todd Tugwell, USACE
David Brown, USACE
Mike McDonald, NC EEP
John Hutton, Wildlands Engineering
Matt Jenkins, Wildlands Engineering
Emily Reinicker, Wildlands Engineering

The group walked the site and discussed the proposed restoration approaches outlined in Wildlands Engineering's technical proposal for Site Option 1 dated October 26, 2012. The site was initially identified and mapped as Site W-30 in the Indian and Howards Creek Local Watershed Plan. Particular discussions around stream and wetland jurisdiction and mitigation treatment types included:

1. HC1 and HC2 will be restored as meandering stream channels and will help to restore wetland hydrology in an inter-connected stream-wetland complex.

2. One culverted stream crossing will remain on stream channel HC1, as shown on the concept design figure. This culvert elevation may be raised to work with the proposed Priority 1 restoration design.

3. Downstream of the crossing, HC1 will transition to a Priority 2 restoration to tie into Howards Creek. This P2 design will be a combination of wood and rock step-down structures and an excavated floodplain bench.

4. HC1 tie-in will meander in the right floodplain of the current channel to allow for a full 50-foot buffer between the restored channel and the existing pump station on Howards Creek.

5. A private overhead electric line is located on the site. This line will either be relocated or a 15-foot wide maintenance corridor will be excluded from the project area. USACE voiced a strong preference for the OHE line to be relocated or for project area to be adjusted so that the maintenance corridor is located on the edge of the project area.

6. Discussion of whether HC1 and HC2 were historically stream channels. HC1 emanates from a large wetland complex, with a drainage area of 150 acres. HC2 drains 27 acres of agricultural fields and emanates from a wetland area. USACE agreed with idea that it would make sense to start stream channel designation at wetland headwater area.

7. Viewed area in right floodplain of HC1 southwestern portion of proposed wetland restoration area. USACE will take jurisdiction on this area and these wetlands will qualify for enhancement credit.

8. Viewed area in right floodplain near upstream end of HC1. Wet area in agricultural field may be wetland or qualify for wetland restoration work. This area will be evaluated as part of the project.

9. In the western portion of the proposed wetland work, near installed wetland gage #1, discussed that Zone 1 and Zone 2 areas identified in the proposal with hydric soils will be considered jurisdictional wetlands. However, significant improvement in wetland functions can be achieved. USACE consulted with Eric Kulz (NCDWQ) via telephone, and agreement was made that Rehabilitation credit can be awarded for work in these jurisdictional areas where significant improvement to wetland function will take place. A credit ratio will need to be proposed and justified in the Mitigation Plan document. This credit ratio will be less than a 1:1 restoration credit ratio. Justification will center on benefits provided to the 3 primary wetland parameters of soil, hydrology, and vegetation. Design considerations could include planted trees to retain water and/or temperature buffering via vegetation shade for soils, surface waters, and groundwater. Wildlands to consider specific farm applications and treatment for these fertilizers/ herbicides.

10. USACE requested clear accounting of wetland impacts in Mitigation Plan, specifically wetlands converted to stream channels. Direct offsetting replacement for any conversions should occur on site.

11. USACE recommended instead of Zone 1/2/3 designations in proposal, JD be completed on site. Jurisdictional wetlands will have mitigation type of enhancement or rehabilitation. Non-

jurisdictional areas will have mitigation type of restoration. In areas referred to as Zone 3 in proposal, with non-hydric overburden soils, USACE agreed this overburden could be graded off.

If you have any questions or revisions to these meeting notes, please contact me at ereinicker@wildlandseng.com or 704-332-7754 x106.

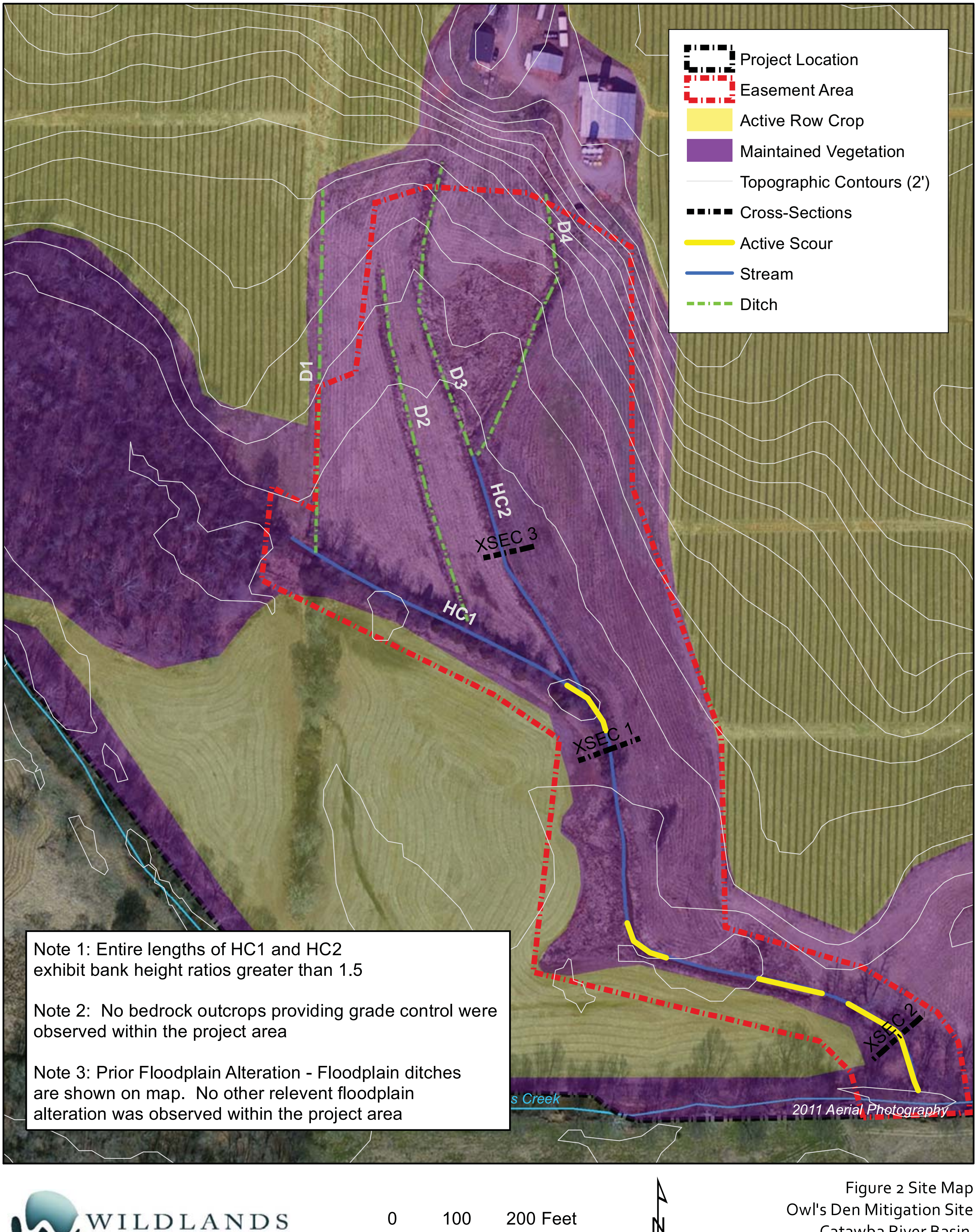
Sincerely,

Emily G. Reinicker, PE, CFM
Project Manager

cc: Mr. David Brown, USACE
151 Patton Avenue, Room 208, Asheville, NC 28801-5006
David.w.brown@usace.army.mil

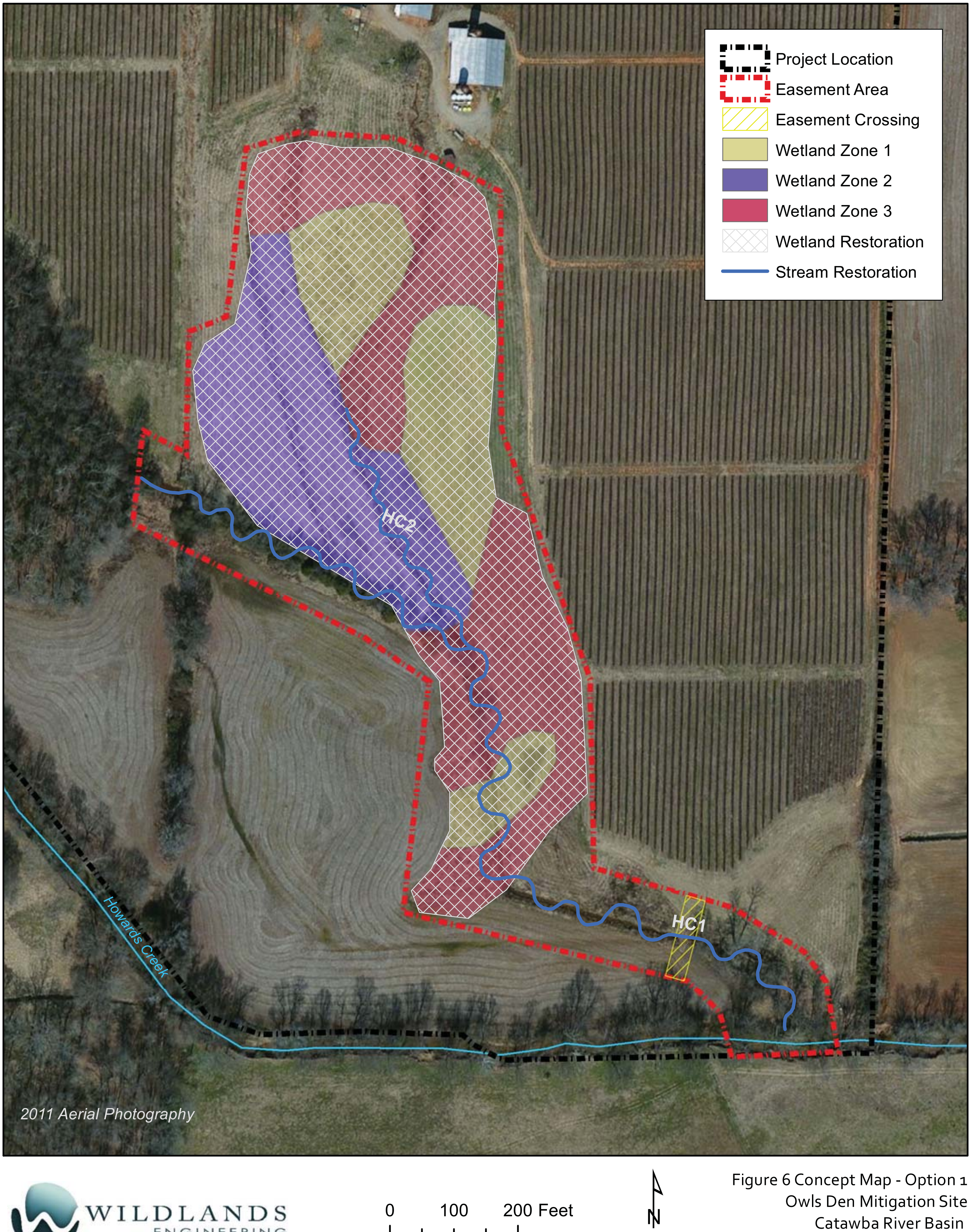
Mr. Mike McDonald, NC EEP
5 Ravenscroft Dr., #102, Asheville, NC 28801
Mike.McDonald@ncdenr.gov

Mr. Paul Wiesner, NC EEP
5 Ravenscroft Dr., #102, Asheville, NC 28801
Paul.Wiesner@ncdenr.gov



WILDLANDS ENGINEERING

Figure 2 Site Map
Owl's Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC



WILDLANDS ENGINEERING

Figure 6 Concept Map - Option 1
Owls Den Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Lincoln County, NC

Appendix 8: Project Site NCDWQ Stream Classification Forms

NC DWQ Stream Identification Form Version 4.11

Date: 10/11/12	Project/Site: Owl's Den	Latitude: 35.492374° N
Evaluator: MLJ	County: Lincoln	Longitude: 81.311691° W
Total Points: 37.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** **Ephemeral Intermittent Perennial**	**Other** SCP1 - HC1 *e.g. Quad Name:* Downstream Reach

A. Geomorphology (Subtotal = 18)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

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

B. Hydrology (Subtotal = 11.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

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

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 10/11/12	Project/Site: Owl's Den	Latitude: 35.494049°N
Evaluator: MLS	County: Lincoln	Longitude: 81.314067°W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 31.5	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other SCP2- HC1 *e.g. Quad Name:* Upstream Reach

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 = 11.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8.5)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

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

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 10/11/12	**Project/Site:** Owl's Den	**Latitude:** 35.494252° N
Evaluator: MLJ	**County:** Lincoln	**Longitude:** 81.313526° W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 31.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:* SCP3 - HC2

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 = 11.5)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8.5)	Absent	Weak	Moderate	Strong
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:

OFFICE USE ONLY: USACE AID#________________________ DWQ #____________________________

SCP 1 – HC1 (lower reach) to Howards Creek

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering, Inc
2. Evaluator's Name: Ian Eckardt
3. Date of Evaluation: 4/24/2013
4. Time of Evaluation: 10:30 AM
5. Name of Stream: HC1 (lower reach) to Howards Creek
6. River Basin: Catawba 03050102
7. Approximate Drainage Area: 150 Acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Lincoln
11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Lincolnton, NC, travel west on NC 27/Main Street for 3 miles (during which Main Street becomes Riverside Drive). Turn right onto Rock Dam Road and continue for 0.6 miles then turn right onto Owls Den Road. The entrance to the Owls Den Sunnyridge farm is approximately 2 miles down the road on the left side.
12. Site Coordinates (if known): N 35.494049°, W 81.314067°
13. Proposed Channel Work (if any): restoration
14. Recent Weather Conditions: No rainfall in previous 48 hours.
15. Site conditions at time of visit: partly sunny, 80°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:_
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 80 % Agricultural 20 % Forested ____% Cleared / Logged ____% Other (_________________)
21. Bankfull Width: 12-16'
22. Bank Height (from bed to top of bank): 3-4'
23. Channel slope down center of stream: X Flat (0 to 2%) ____Gentle (2 to 4%) ____Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: X Straight ____Occasional Bends ____Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 34 **Comments:**___________________________________

Evaluator's Signature Ian Eckardt **Date** 4/24/13

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

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

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#________________________ DWQ #____________________________

SCP 2 – HC1 (upper reach) to Howards Creek

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering, Inc
2. Evaluator's Name: Ian Eckardt
3. Date of Evaluation: 4/24/2013
4. Time of Evaluation: 12:30 AM
5. Name of Stream: HC1 (upper reach) to Howards Creek
6. River Basin: Catawba 03050102
7. Approximate Drainage Area: 50 Acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Lincoln
11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Lincolnton, NC, travel west on NC 27/Main Street for 3 miles (during which Main Street becomes Riverside Drive). Turn right onto Rock Dam Road and continue for 0.6 miles then turn right onto Owls Den Road. The entrance to the Owls Den Sunnyridge farm is approximately 2 miles down the road on the left side.
12. Site Coordinates (if known): N 35.492374°, W 81.311691°
13. Proposed Channel Work (if any): restoration
14. Recent Weather Conditions: No rainfall in previous 48 hours.
15. Site conditions at time of visit: partly sunny, 80°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:_
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 80 % Agricultural 20 % Forested ____% Cleared / Logged ____% Other (__________________)
21. Bankfull Width: 12-16'
22. Bank Height (from bed to top of bank): 2-3'
23. Channel slope down center of stream: X Flat (0 to 2%) ____Gentle (2 to 4%) ____Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: X Straight ____Occasional Bends ____Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 41 **Comments:**

Evaluator's Signature Ian Eckardt **Date** 4/24/13

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	1
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	2
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	4
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	0
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	2
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	2
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	0
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	4
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	3
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				41

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY:	USACE AID#____________________	DWQ #____________________

SCP 3 – HC2 to Howards Creek

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering, Inc
2. Evaluator's Name: Ian Eckardt
3. Date of Evaluation: 4/24/2013
4. Time of Evaluation: 1:30 PM
5. Name of Stream: HC1 (upper reach) to Howards Creek
6. River Basin: Catawba 03050102
7. Approximate Drainage Area: 30 Acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Lincoln
11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Lincolnton, NC, travel west on NC 27/Main Street for 3 miles (during which Main Street becomes Riverside Drive). Turn right onto Rock Dam Road and continue for 0.6 miles then turn right onto Owls Den Road. The entrance to the Owls Den Sunnyridge farm is approximately 2 miles down the road on the left side.
12. Site Coordinates (if known): N 35.494252°, W 81.313526°
13. Proposed Channel Work (if any): restoration
14. Recent Weather Conditions: No rainfall in previous 48 hours.
15. Site conditions at time of visit: partly sunny, 80°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:_
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 90 % Agricultural 10 % Forested ____% Cleared / Logged ____% Other (____________)
21. Bankfull Width: 16 – 22'
22. Bank Height (from bed to top of bank): 2-4'
23. Channel slope down center of stream: X Flat (0 to 2%) ____Gentle (2 to 4%) ____Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: X Straight ____Occasional Bends ____Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 35 **Comments:** Drainage has been heavily impacted by agricultural practices.

Evaluator's Signature Ian Eckardt **Date** 4/24/13

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	3
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	4
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	0
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	1
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	1
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	0
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	2
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				35

* These characteristics are not assessed in coastal streams.

Appendix 9: Floodplain Check List

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:	Owl's Den Mitigation Site
Name if stream or feature:	UT to Howards Creek
County:	Lincoln County
Name of river basin:	Catawba
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Lincoln County
DFIRM panel number for entire site:	3604J
Consultant name:	Wildlands Engineering
Phone number:	704-332-7754
Address:	1430 S. Mint Street, Suite 104 Charlotte, NC 28203

Design Information

Provide a general description of project (one paragraph). Include project limits on a reference orthophotograph at a scale of 1” = 500”.
Summarize stream reaches or wetland areas according to their restoration priority.

Wildlands Engineering, Inc. (Wildlands) is completing a full-delivery project for the North Carolina Ecosystem Enhancement Program (EEP) to restore 2,464 linear feet (LF) of perennial streams, rehabilitate 2.9 acres of existing wetlands, and re-establish 6.9 acres of wetlands in Lincoln County, NC. The streams proposed for restoration include two unnamed tributaries to Howard’s Creek, as shown on Figure 10.

Howards Creek is mapped in a Zone AE Special Flood Hazard Area (SFHA) on Lincoln County Flood Insurance Rate Map Panel 3604. Base flood elevations have been defined and non-encroachment limits have been published in the Lincoln County Flood Insurance Study (FIS). HC1 and HC2 do not have designated SFHAs but do lie within the SFHA of Howards Creek.

Reach	**Length**	**Priority**
HC1 Reach 1	809 LF	One (Restoration)
HC1 Reach 2	947 LF	One (Restoration)
HC2	708 LF	One (Restoration)

Floodplain Information

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

☒ Yes ☐ No

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

☐ Redelineation

☐ Detailed Study

☒ Limited Detail Study

☐ Approximate Study

☐ Don't know

List flood zone designation:

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: Mr. Joshua L. Grant
Phone Number: 704.736.8420

Floodplain Requirements

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

☐ No Action

☑ No Rise

☐ Letter of Map Revision

☐ Conditional Letter of Map Revision

☐ Other Requirements

List other requirements: Local floodplain development permit application to be filed with no-impact certification and flood impact assessment report.

Comments:

Name: Emily G. Reinicker, PE, CFM Signature:

Title: Senior Water Resources Engineer Date: 11/5/2013

Owl's Den Mitigation Site

Catawba River Basin 03050103 Expanded Service Area
Lincoln County, North Caolina
for
North Carolina Ecosystem Enhancement Program

Vicinity Map
Not to Scale

BEFORE YOU DIG!
CALL 1-800-632-4949
N.C. ONE-CALL CENTER
IT'S THE LAW!

PRELIMINARY PLANS
FOR REVIEW
ISSUED APRIL 17, 2013

Sheet Index

Project Directory

Engineering:
Wildlands Engineering, Inc
License No. F-0831
1430 South Mint Street, Suite 104
Charlotte, NC 28203
Emily Reinicker, PE
704-332-7754 x106

Surveying:
Kee Mapping and Survey
111 Central Avenue,
Asheville, NC 28801
Brad Kee, PLS
828-645-8275

Owner:
Ecosystem Enhancement Program
NC Department of Environment and Natural Resources
1652 Mail Service Center
Raleigh, North Carolina 27699-1652
Project Manager: Paul Wiesner

EEP Project ID: 95808

DENR Contract No. 005150

WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

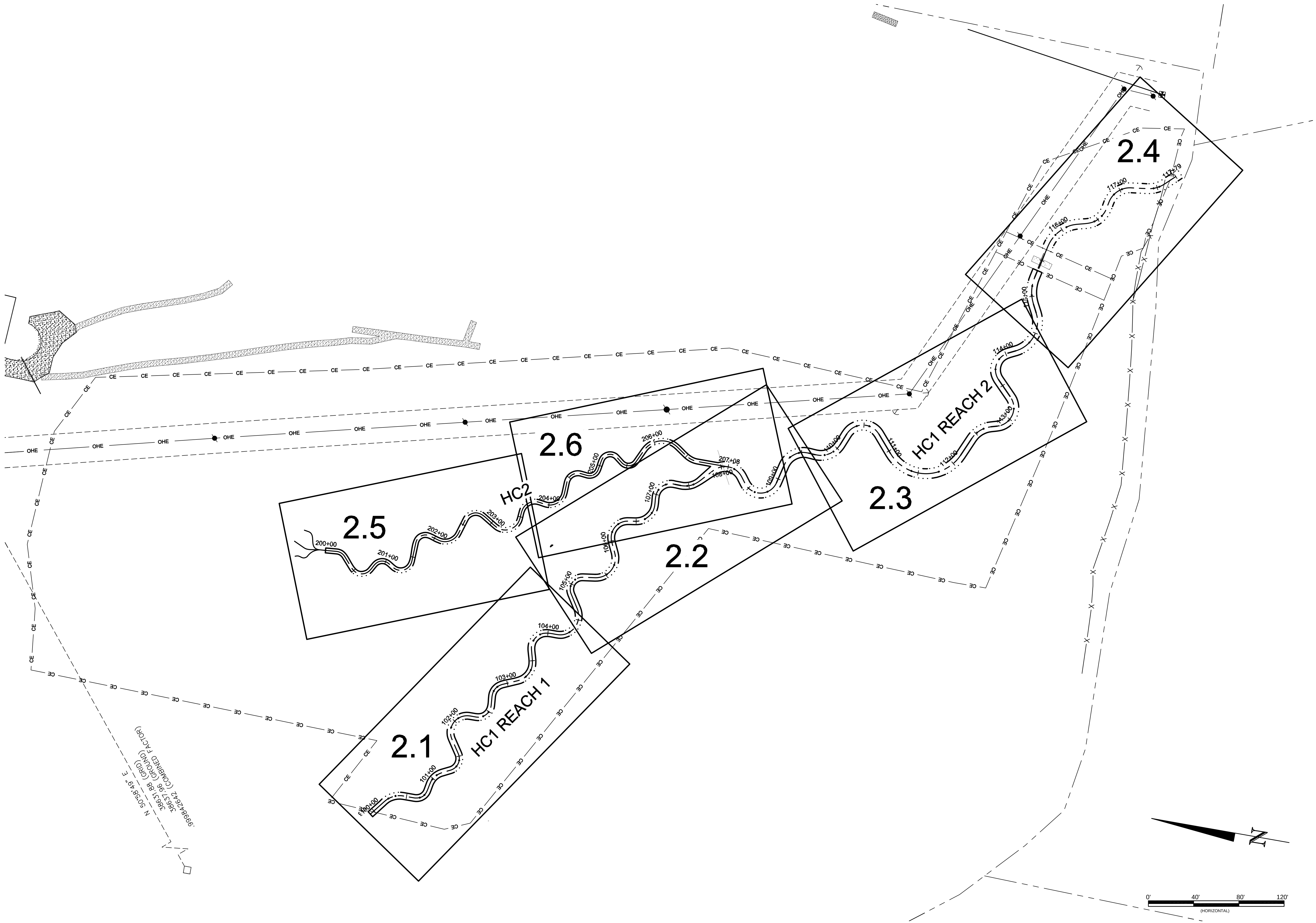
Title Sheet

Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

0.1
Sheet

April 17, 2014



Q:\ActiveProjects\005-02140 Owls Den\Cadd\Plans\02140-Project Overview.dwg

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

Project Overview

Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

Revisions:

0.2

Sheet

Existing Easement

OHE OHE Existing Overhead Power

W W W W Existing Waterline

Existing Property Line

Existing Thalweg

100 Existing Major Contour

Existing Minor Contour

x x Existing Fenceline

Existing Treeline

Existing Tree

Existing Power Pole

Existing Power Pole Guy-wire

W Existing Groundwater Gauge

Proposed Groundwater Gauge

Existing Wetlands

Wetland Restablishment

Wetland Rehabilitation

Existing Farm Road

CE CE Proposed Conservation Easement

10+00 Proposed Thalweg Alignment

Proposed Bankfull

100 Proposed Major Contour

Proposed Minor Contour

Proposed Silt Fence
See Detail 2, Sheet 5.4

x x Existing Fence to be Removed
within Conservation Easement

LOD LOD Proposed Limits of Disturbance

CE/LOD CE/LOD Proposed Limits of Disturbance &
Proposed Conservation Easement

NOTE:
TOPOGRAPHIC MAPPING AND BOUNDARY SURVEY
COMPLETED BY KEE MAPPING AND SURVEY.

Proposed Log Sill
See Detail 3, Sheet 5.2

CR-T Proposed Constructed Shallow
See Detail 1, Sheet 5.1

CR-W Proposed Woody Shallow
See Detail 2, Sheet 5.1

CR-J Proposed Jazz Shallow
See Detail 3, Sheet 5.1

CR-B Proposed Brush Shallow
See Detail 4, Sheet 5.1

Proposed Log Vane
See Detail 2, Sheet 5.2

Proposed Construction Entrance,
See Detail 3, Sheet 5.4

Proposed Temporary Stream Crossing,
See Detail 4, Sheet 5.4

Proposed Stockpile Area

Proposed Construction Route
(Haul Road)

Proposed Silt Fence Outlet
See Detail 1, Sheet 5.4

Proposed Sod Mats
See Detail 1, Sheet 5.3

Proposed Brush Toe
See Detail 3, Sheet 5.5

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

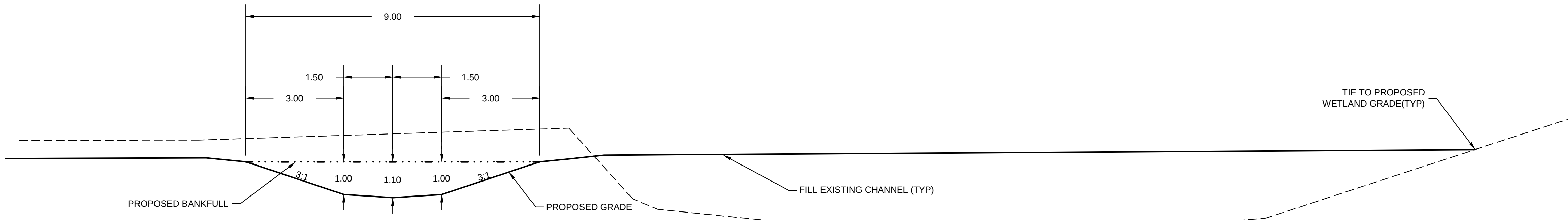
Owl's Den Mitigation Site
Lincoln County, North Carolina

General Notes and Symbols

Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

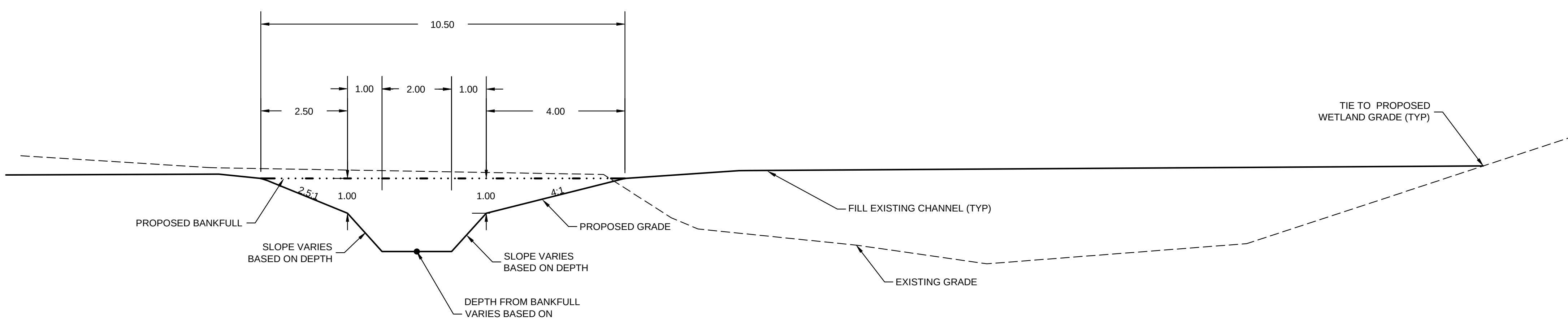
Sheet 0.3



Owl's Den HC1 Reach 1 - Typical Section: Shallow

STA: 100+00 to 108+00

Not to Scale



Owl's Den HC1 Reach 1 - Typical Section: Pool

STA: 100+00 to 108+00

Not to Scale

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

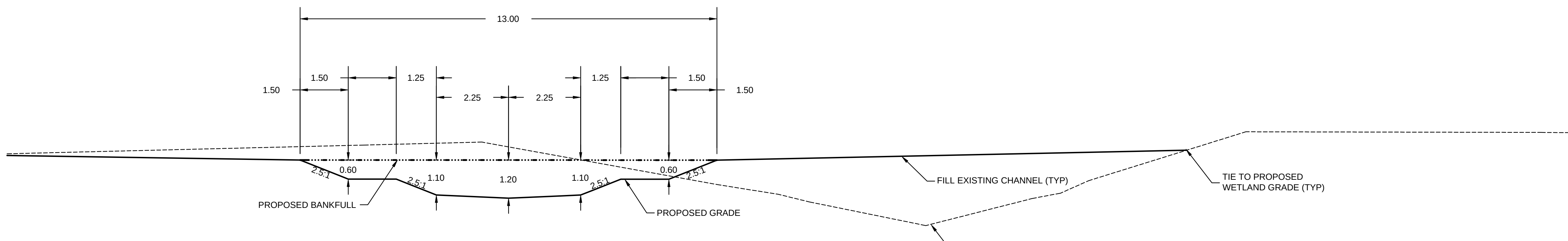
Owl's Den Mitigation Site
Lincoln County, North Carolina

HC1 Reach 1
Typical Sections

Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

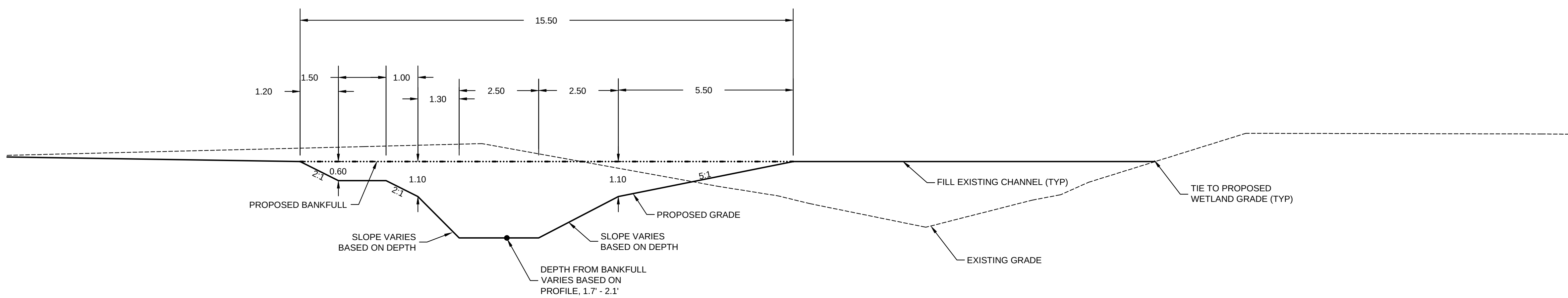
Sheet 1.1



Owl's Den HC1 Reach 2 - Typical Section: Shallow

STA: 108+00 to 117+79

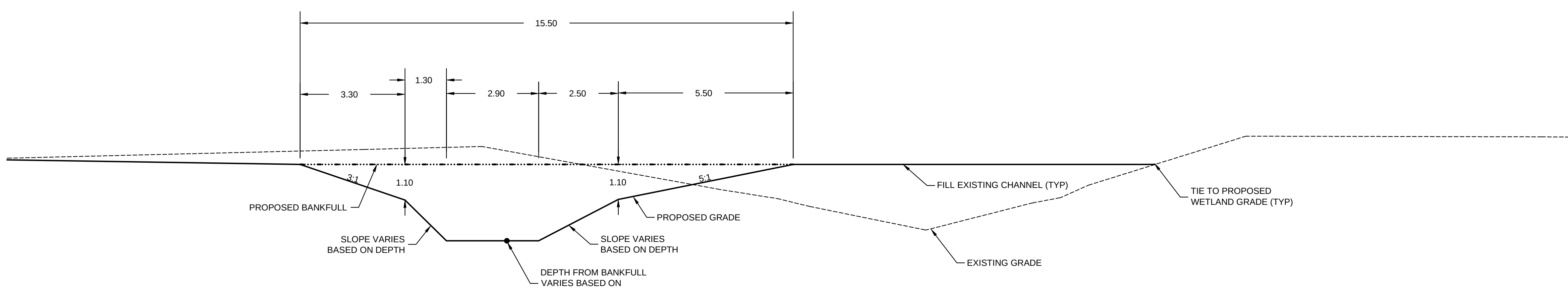
Not to Scale



Owl's Den HC1 Reach 2 - Typical Section: Pool

STA: 108+00 to 117+79

Not to Scale



Owl's Den HC1 Reach 2 - Typical Section: Pools w/ Structures

IMPLEMENTED AT STRUCTURE LOCATIONS: STA: 109+20, 113+00, 113+60

Not to Scale

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

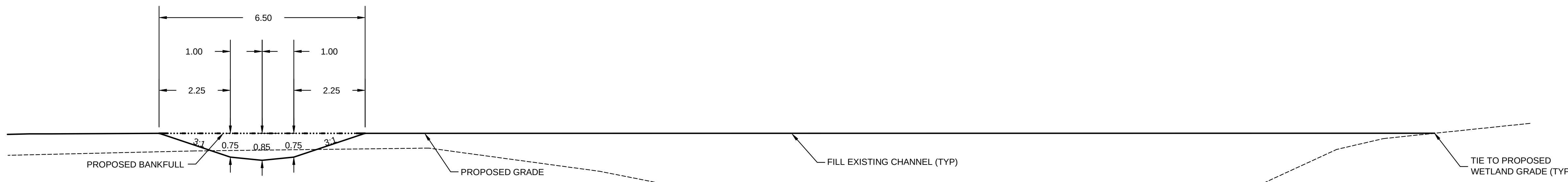
Owl's Den Mitigation Site
Lincoln County, North Carolina

HC1 Reach 2
Typical Sections

Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

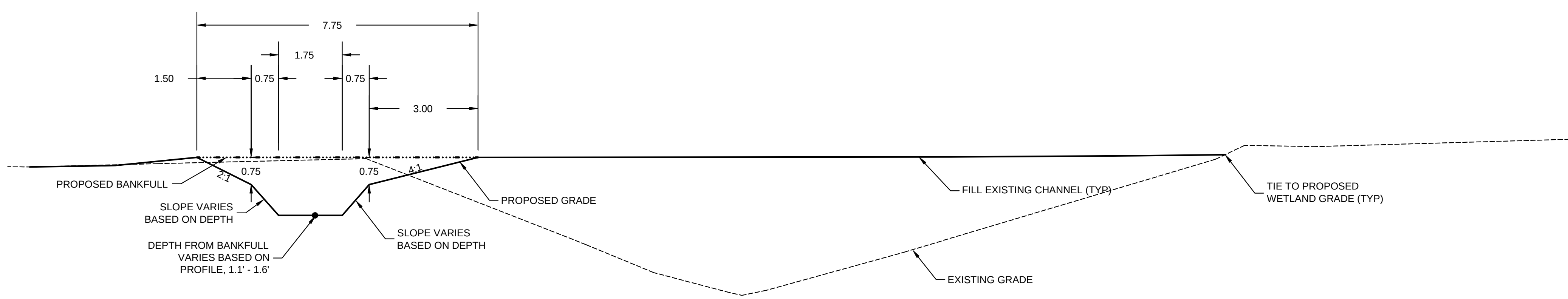
Sheet 1.2



Owl's Den HC2 Reach 1 - Typical Section: Shallow

STA: 200+00 to 207+08

Not to Scale



Owl's Den HC2 Reach 1 - Typical Section: Pool

STA: 200+00 to 207+08

Not to Scale

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

HC2 Reach 1
Typical Sections

Revisions:

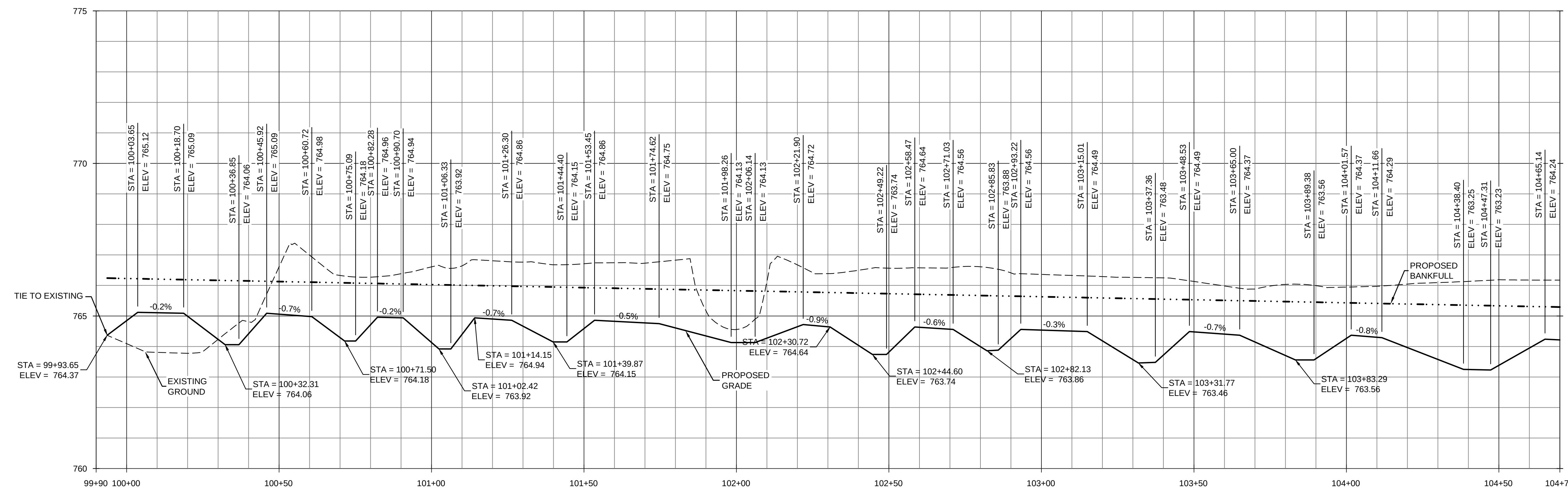
Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 1.3

April 17, 2014

Q:\ActiveProjects\005-02140 Owls Den\CADD\Plans\02140-CoverNotes.dwg

April 17, 2014



WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

HC1
Stream Plan and Profile

Revisions:

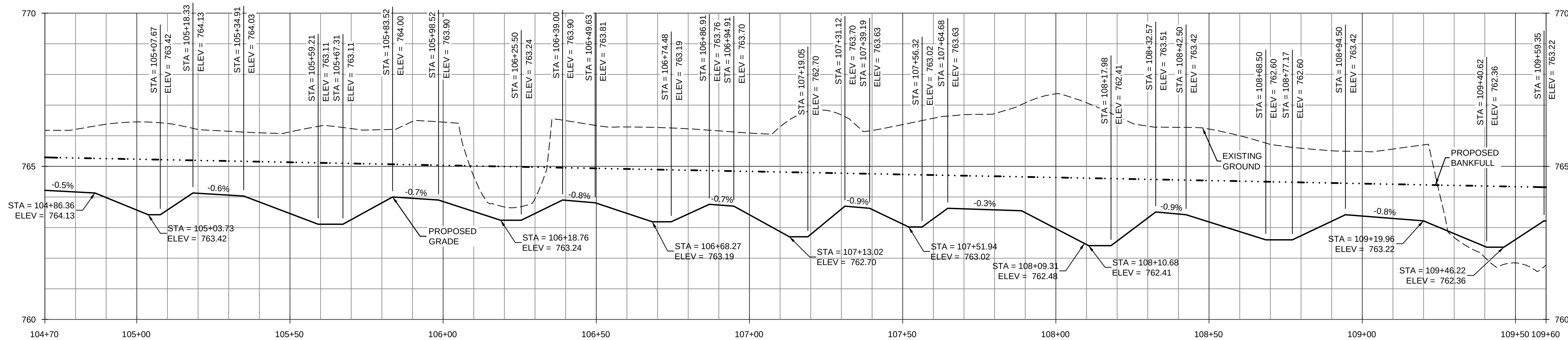
Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

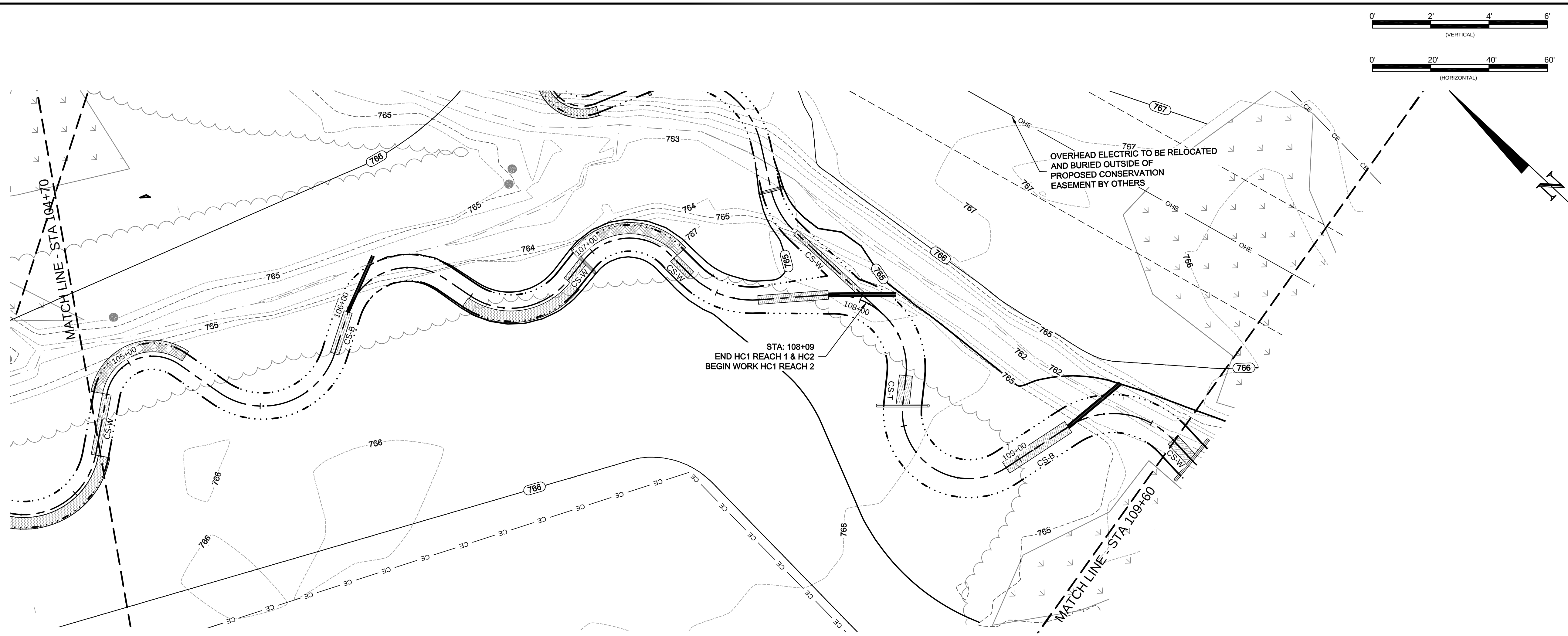
2.1

Sheet

Q:\ActiveProjects\005-02140 Owls Den\CADD\Plans\02140-Profiles.dwg

April 17, 2014





WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

HC1
Stream Plan and Profile

Revisions:

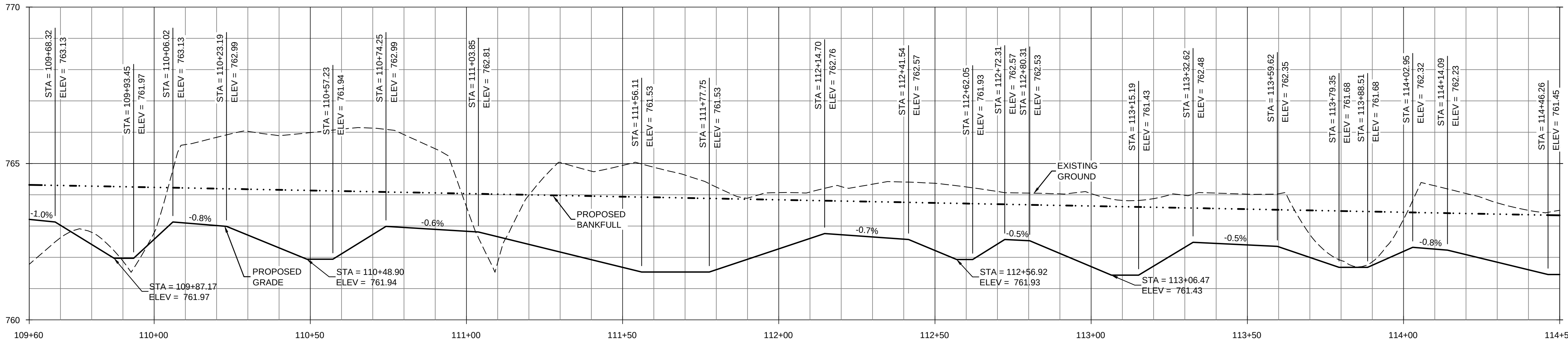
Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	BGR
Drawn By:	EPN
Checked By:	JNK

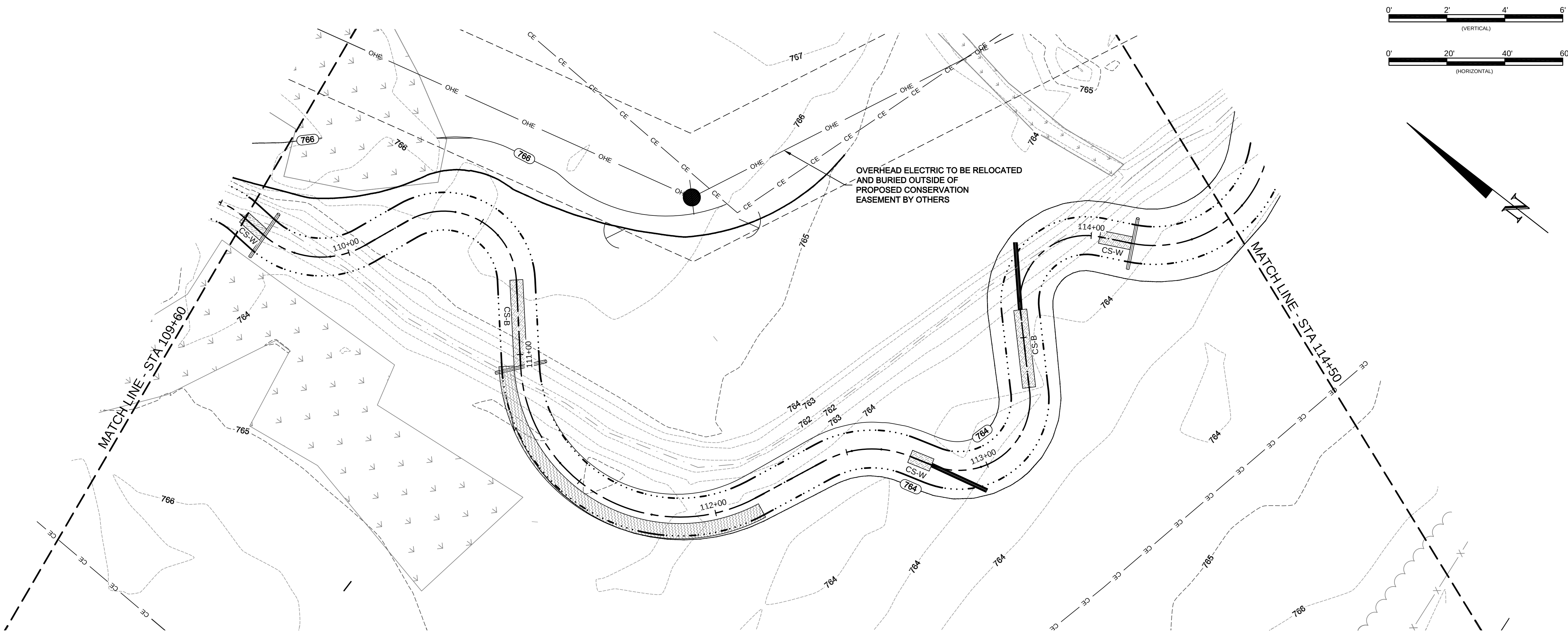
2.2

Sheet

Q:\ActiveProjects\005-02140 Owls Den\Cad\Plans\02140-Profiles.dwg

April 17, 2014





WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

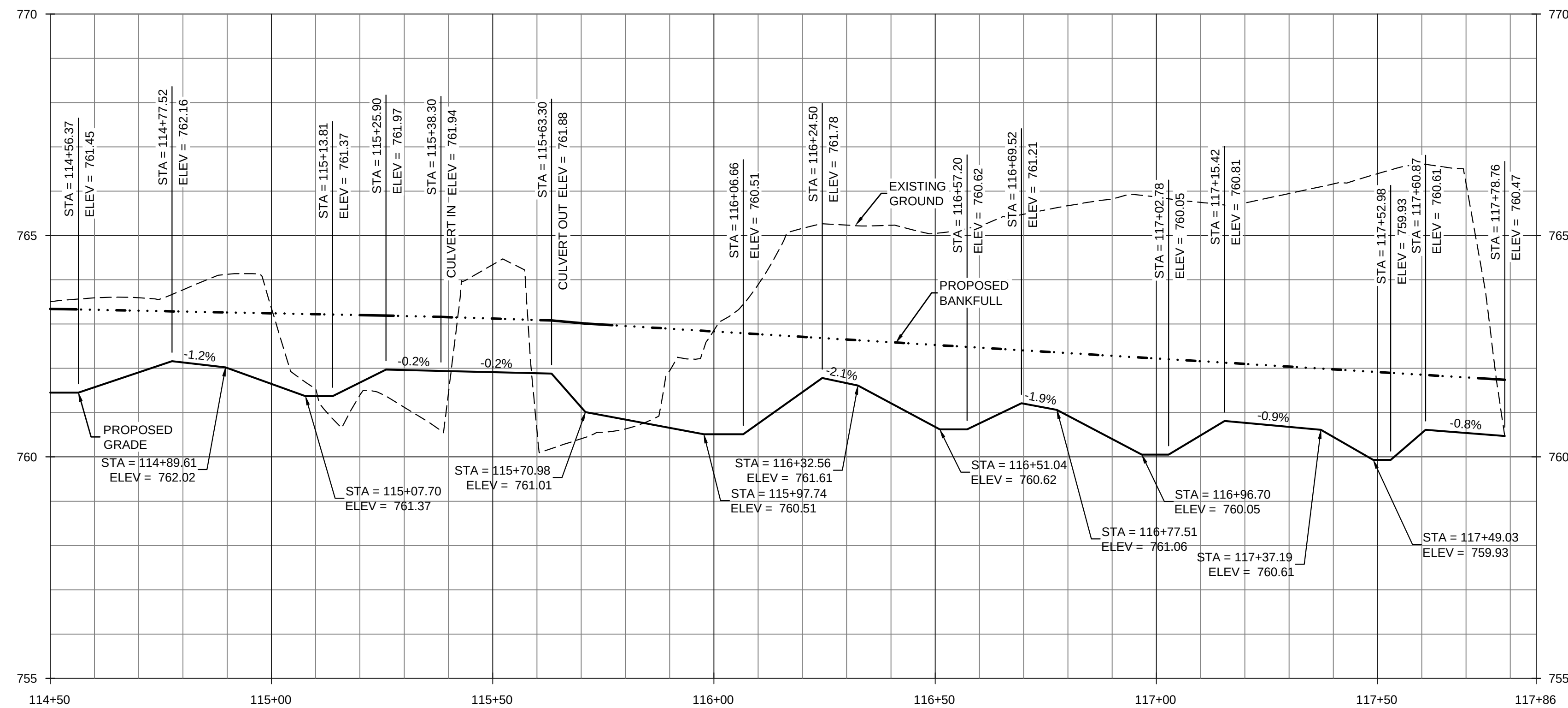
HC1
Stream Plan and Profile

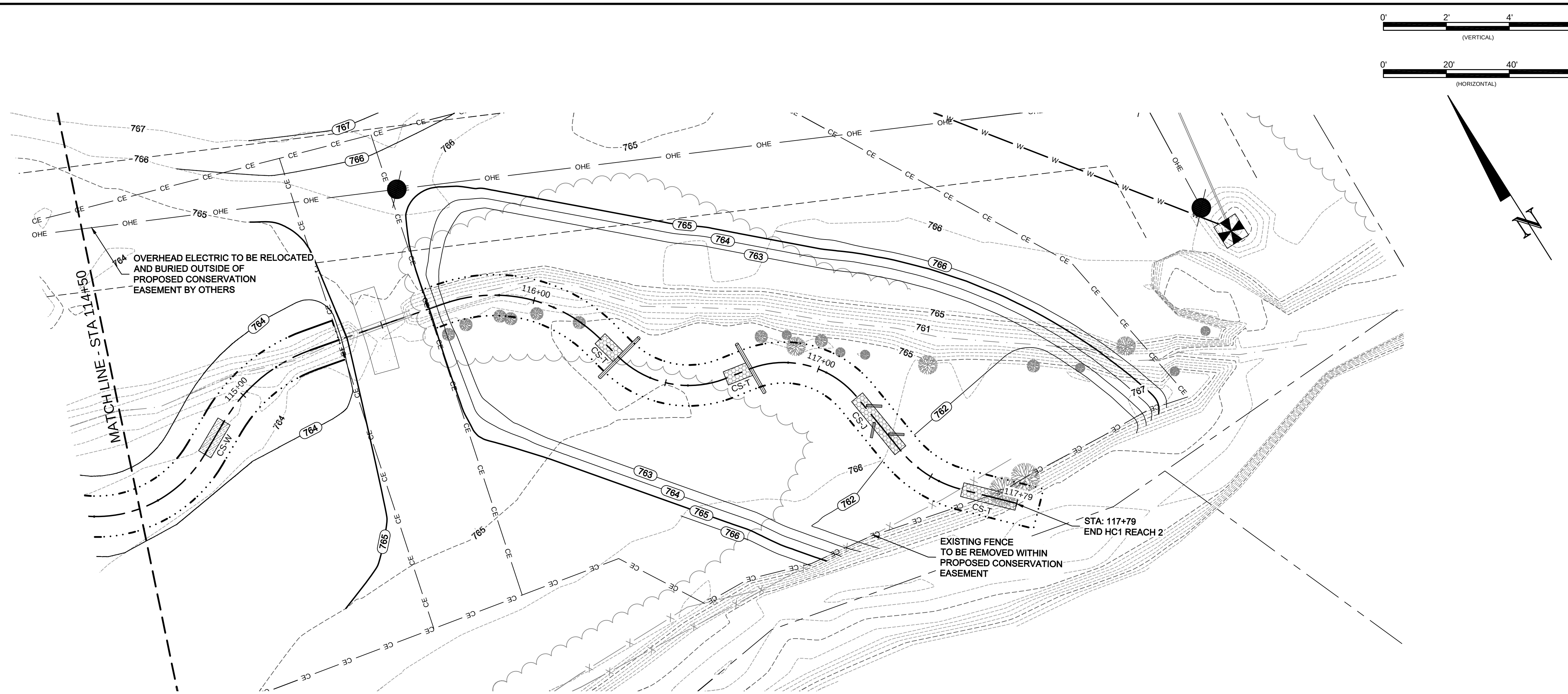
Revisions:

Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

2.3
Sheet

Q:\ActiveProjects\005-02140 Owls Den\Cad\Plans\02140 Profiles.dwg





April 17, 2014

Q:\ActiveProjects\005-02140 Owls Den\CADD\Plans\02140-Profiles.dwg

WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

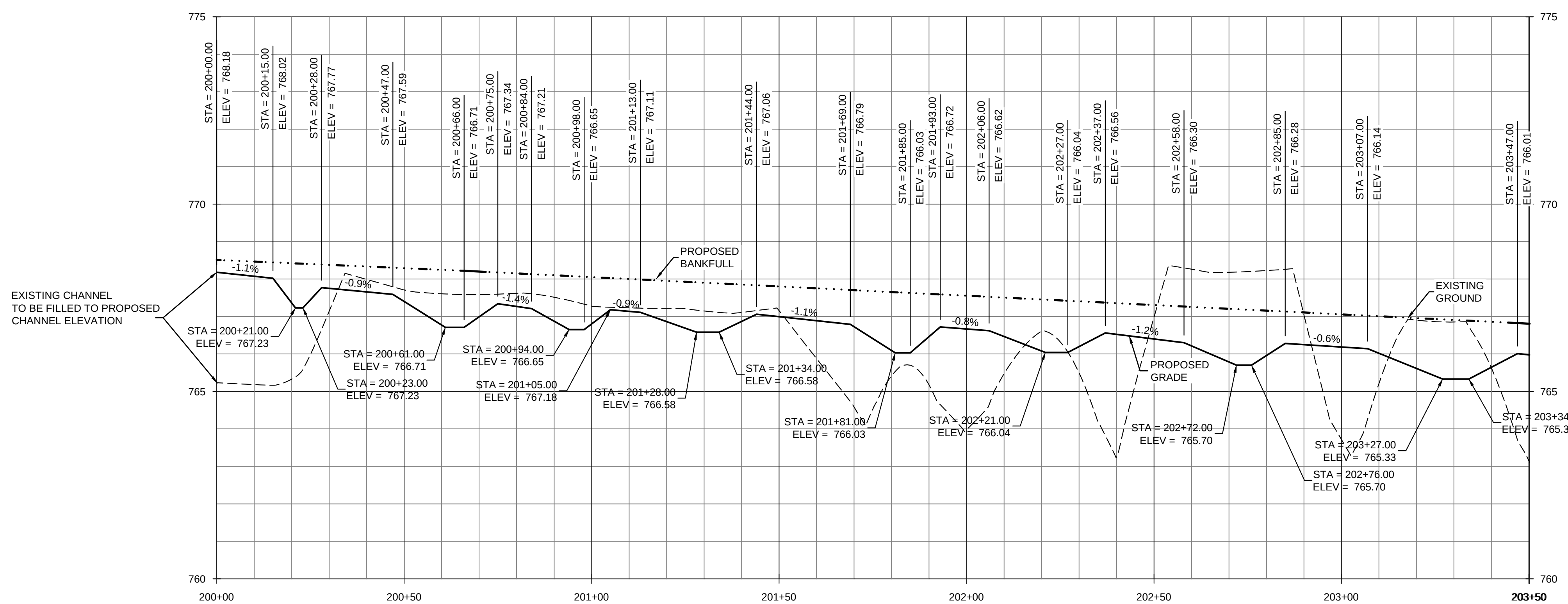
Owl's Den Mitigation Site
Lincoln County, North Carolina

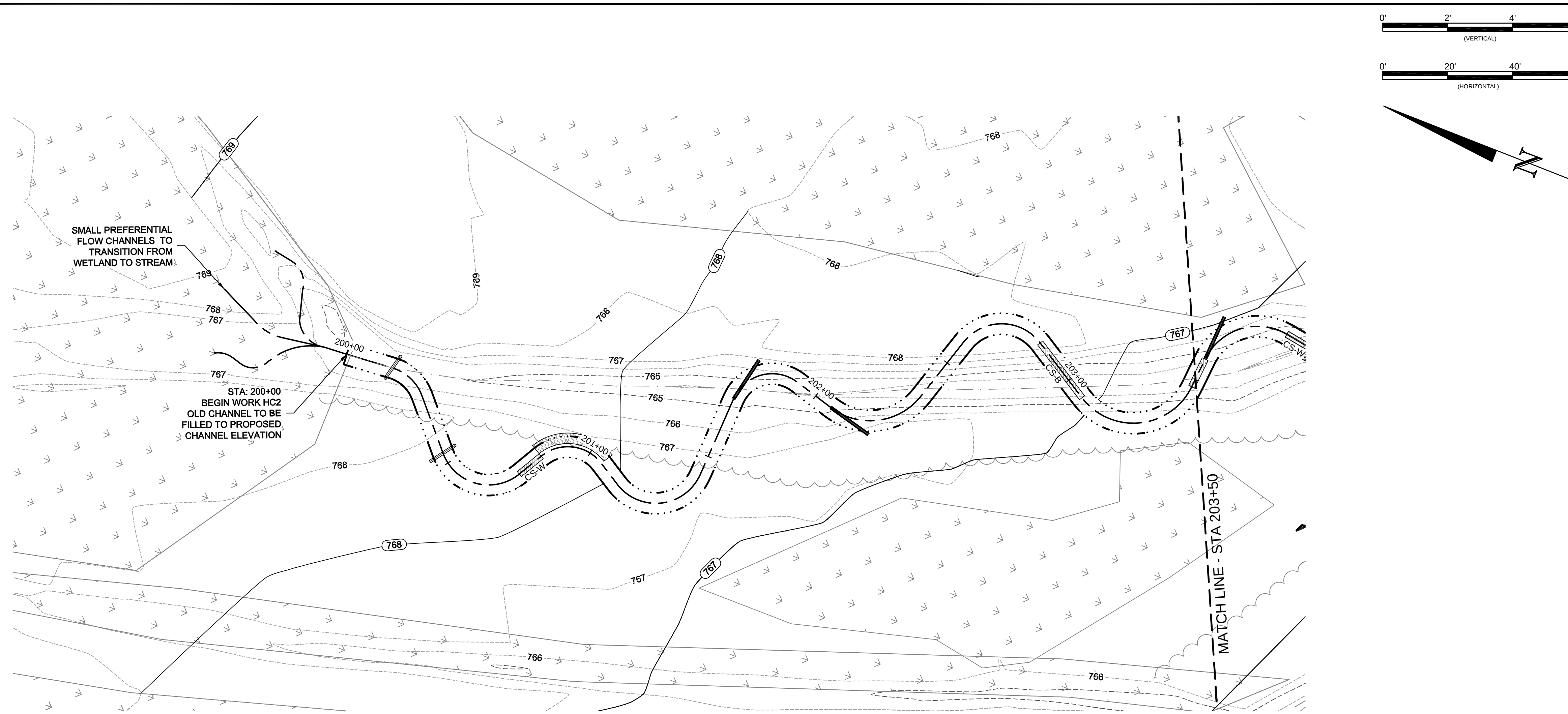
HC1
Stream Plan and Profile

Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 2.4





WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

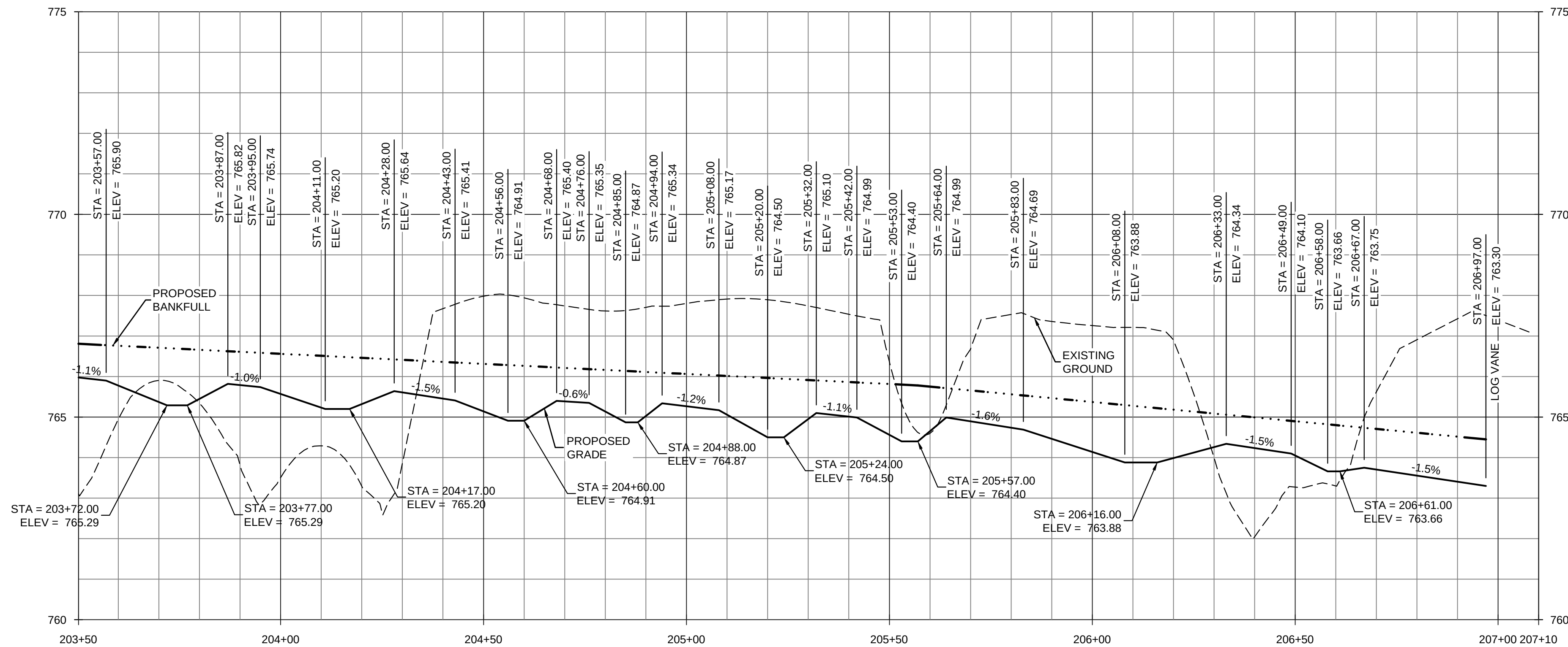
Owl's Den Mitigation Site
Lincoln County, North Carolina

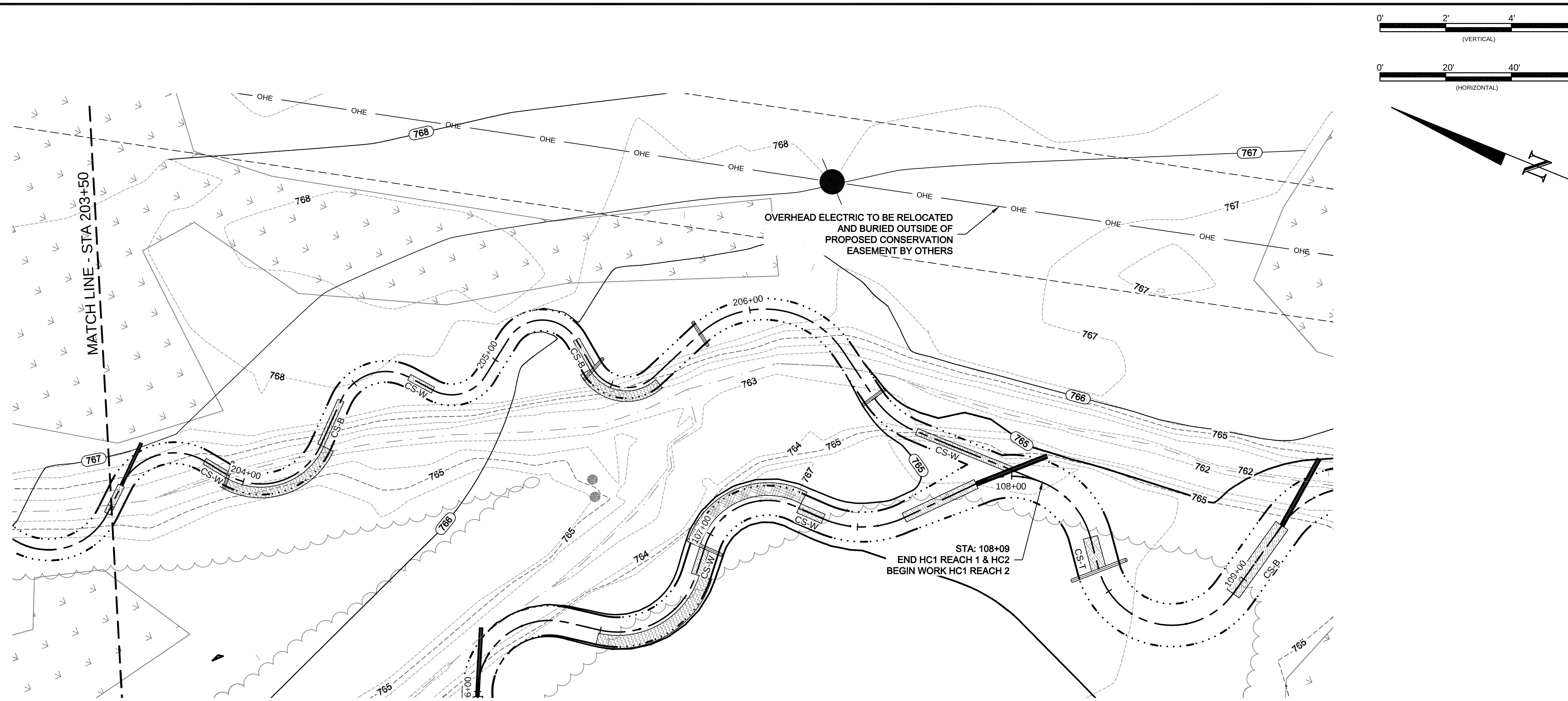
HC2
Stream Plan and Profile

Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 2.5





WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

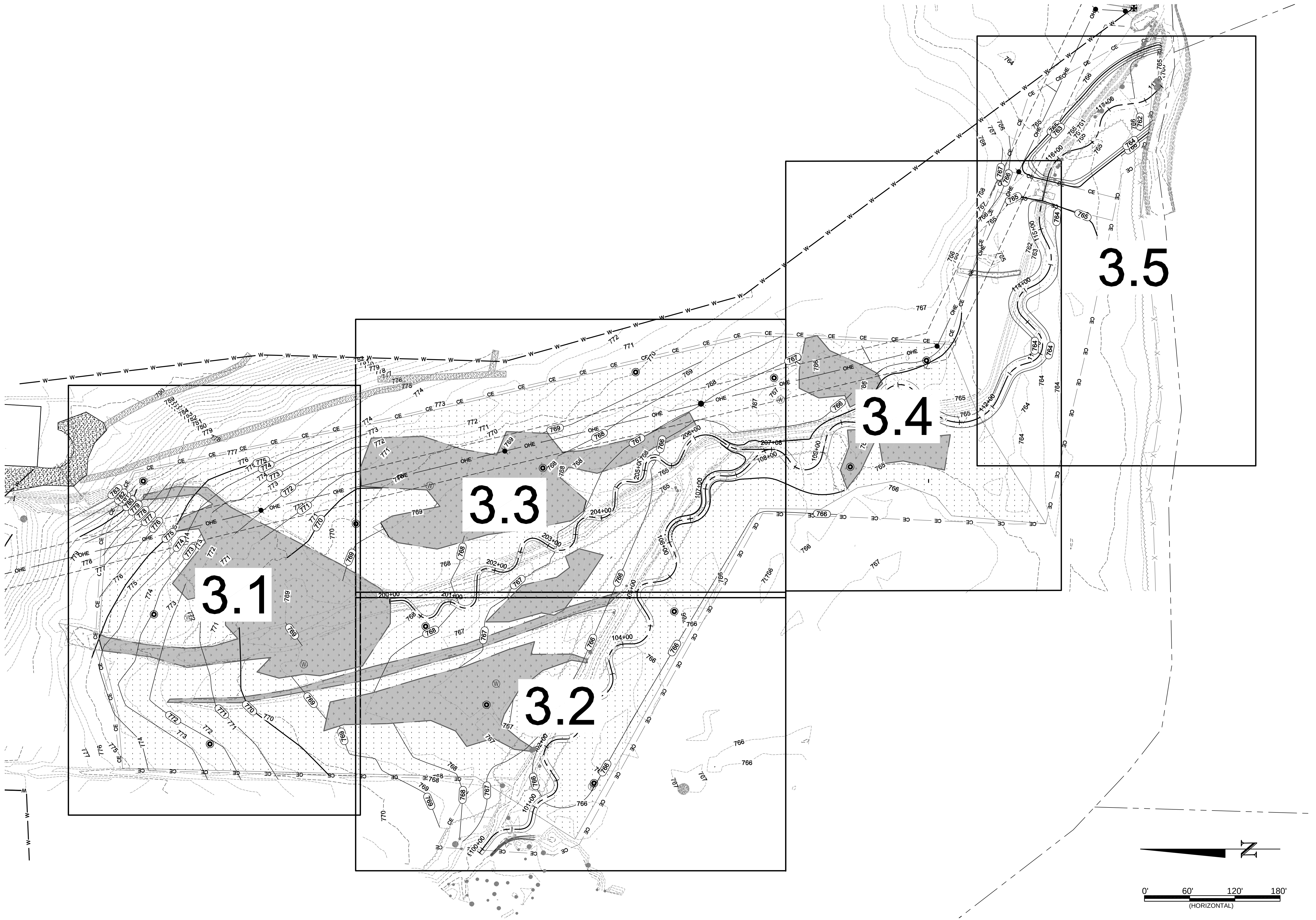
Owl's Den Mitigation Site
Lincoln County, North Carolina

HC2
Stream Plan and Profile

Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 2.6



Owl's Den Mitigation Site

Lincoln County, North Carolina

Wetland Grading Overview & Sheet Key

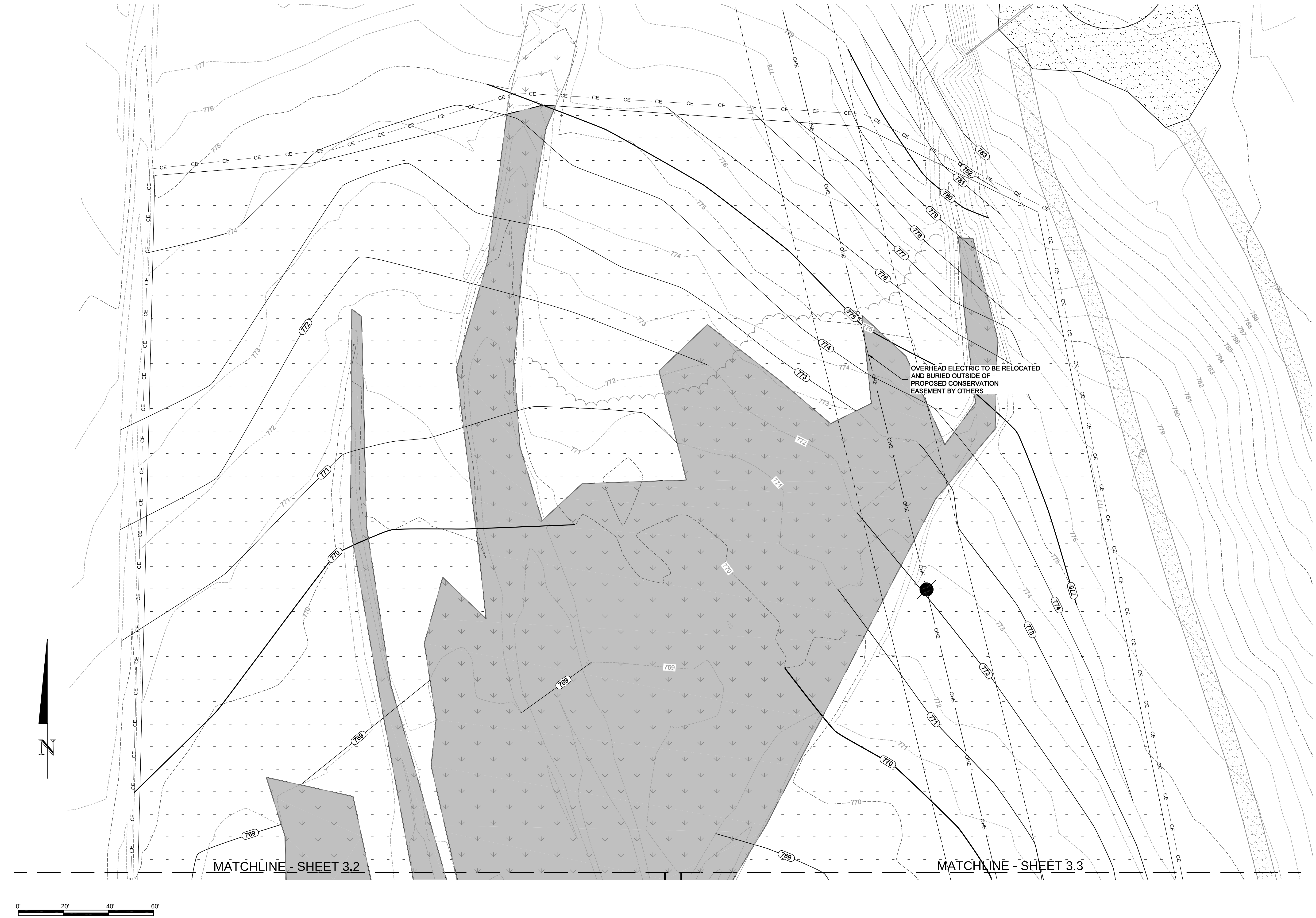
PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

Revisions:

Sheet 3.0



WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

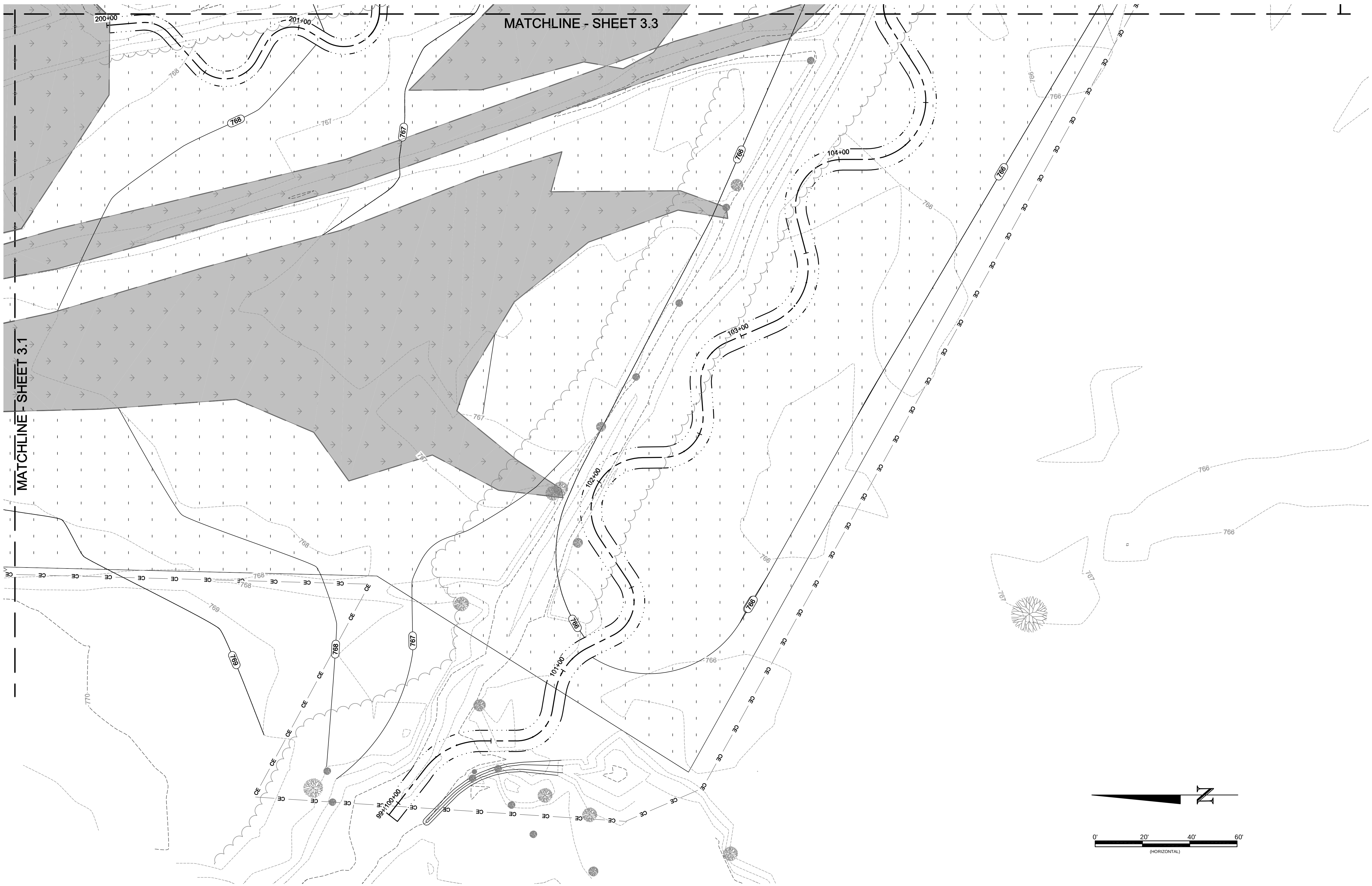
Wetland Grading

Revisions:

Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

3.1

Sheet



WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

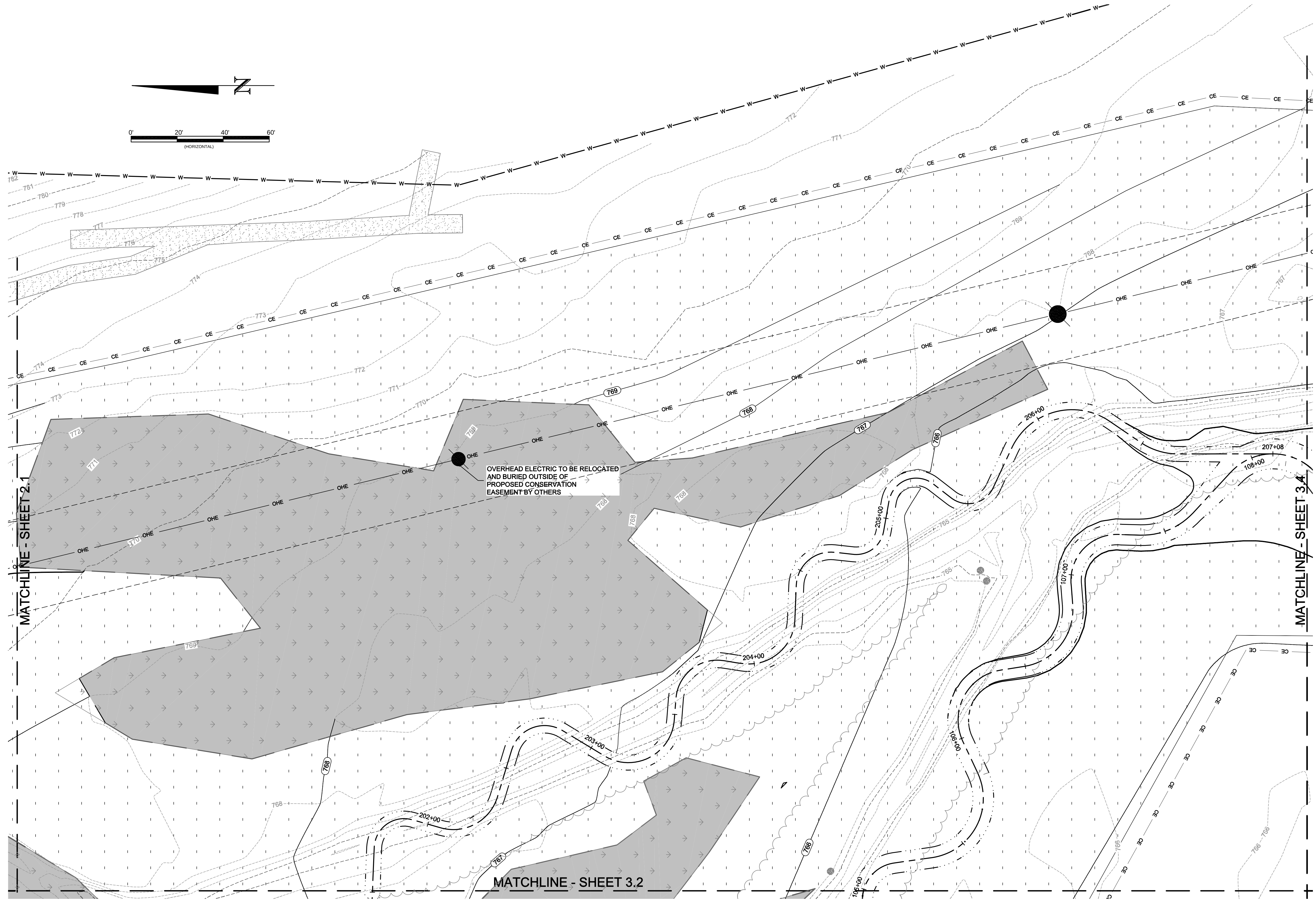
Owl's Den Mitigation Site
Lincoln County, North Carolina

Wetland Grading

Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 3.2



WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

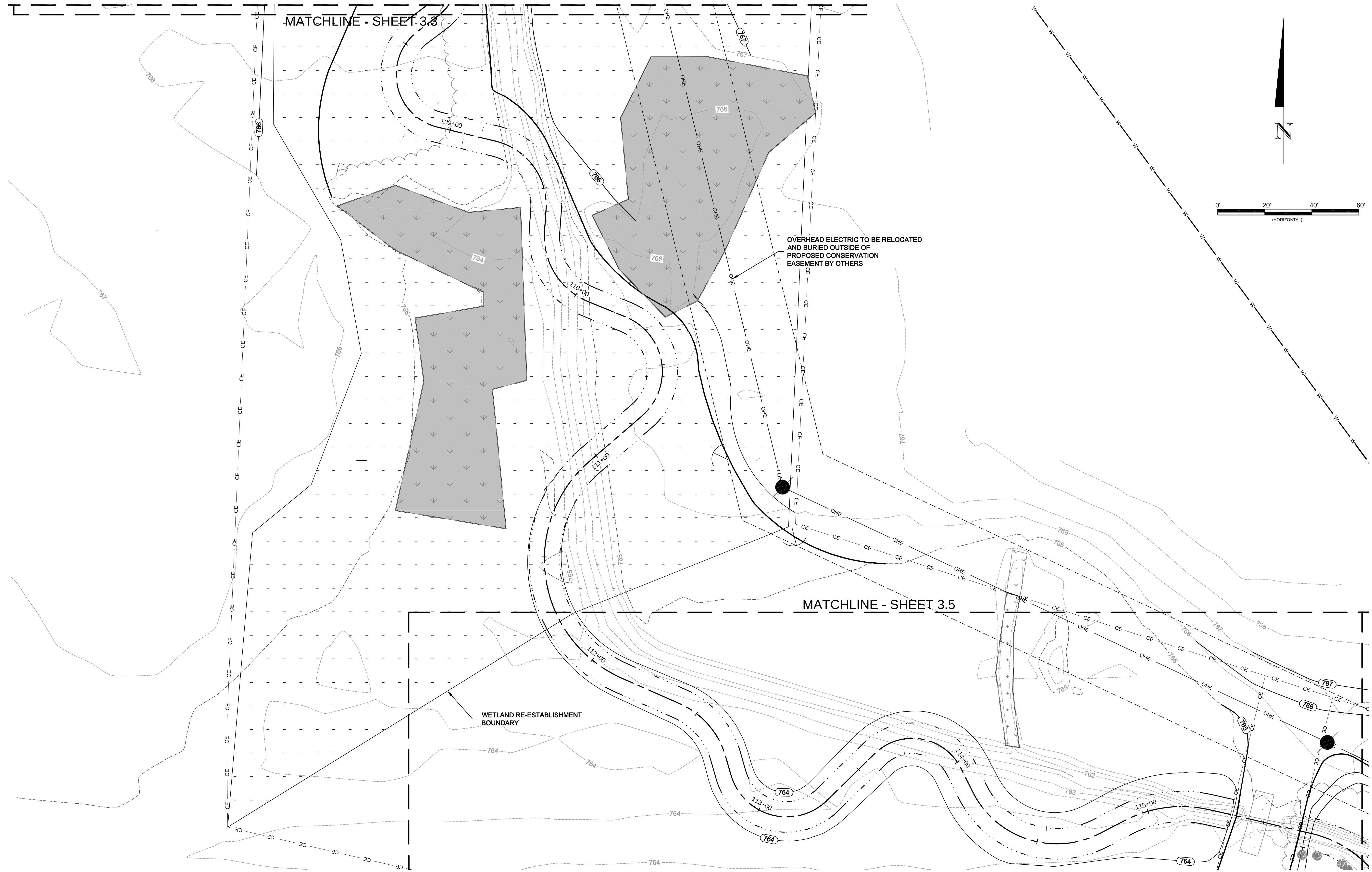
Wetland Grading

Revisions:

Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

3.3

Sheet



WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

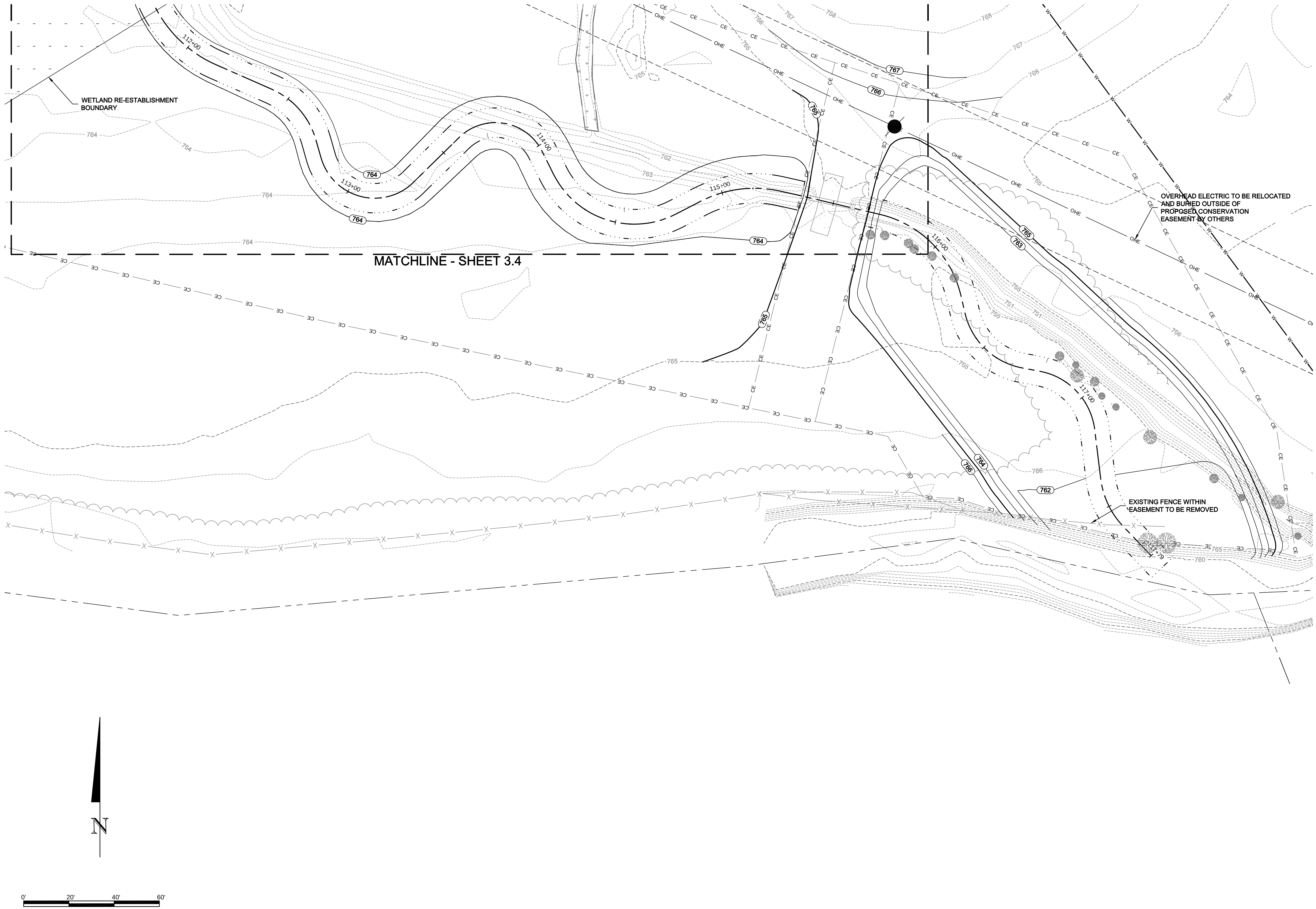
Wetland Grading

Revisions:

Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

3.4

Sheet



WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

Wetland Grading

Revisions:

Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

3.5

Sheet

Approved Date	Scientific Name	Stratum	Common Name	Density (lbs/acre)
Permanent Seeding Pure Live Seed (20 lbs/acre)				
All Year	*Panicum rigidulum*	Herb	Redtop Panicgrass	3
All Year	*Agrostis hyemalis*	Herb	Winter Bentgrass	3
All Year	*Chasmanthium latifolium*	Herb	River Oats	3
All Year	*Rudbeckia subtomentosa*	Herb	Blackeyed Susan	2
All Year	*Coreopsis lanceolata*	Herb	Lanceleaf Coreopsis	2
All Year	*Carex vulpinoidea*	Herb	Fox Sedge	3
All Year	*Panicum clandestinum*	Herb	Deertongue	4

Wetland Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	15%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	15%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	10%

Riparian Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	25%
Quercus phellos	Willow Oak	10%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	25%
Quercus michauxii	Swamp Chestnut Oak	5%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	15%

Live Stake

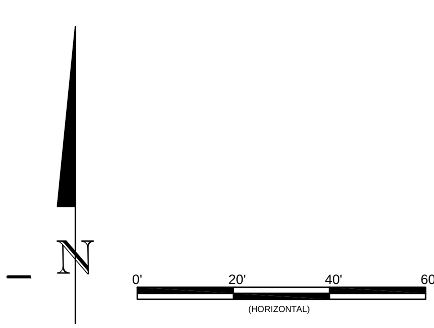
Scientific Name	Common Name	%
Salix serecia	Silky Willow	40%
Cornus amomum	Silky Dogwood	30%
Sambucus canadensis	Elderberry	30%

Stabilization Seeding

Scientific Name	Common Name	lb/acre
Schedonorus phoenix	Tall Fescue	100

NOTE:
"STABLIZATION SEEDING" ARE FOR AREAS OF DISTURBANCE OUTSIDE CONSERVATION EASEMENT.

NOTE:
GROUND STABILIZATION SHALL BE ESTABLISHED WITHIN 7 DAYS OF GRADING COMPLETION FOR SLOPES STEEPER THAN 4:1 AND WITHIN 14 DAYS FOR SLOPES 4:1 OR FLATTER. PERMANENT GROUND COVER SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.



WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

Planting

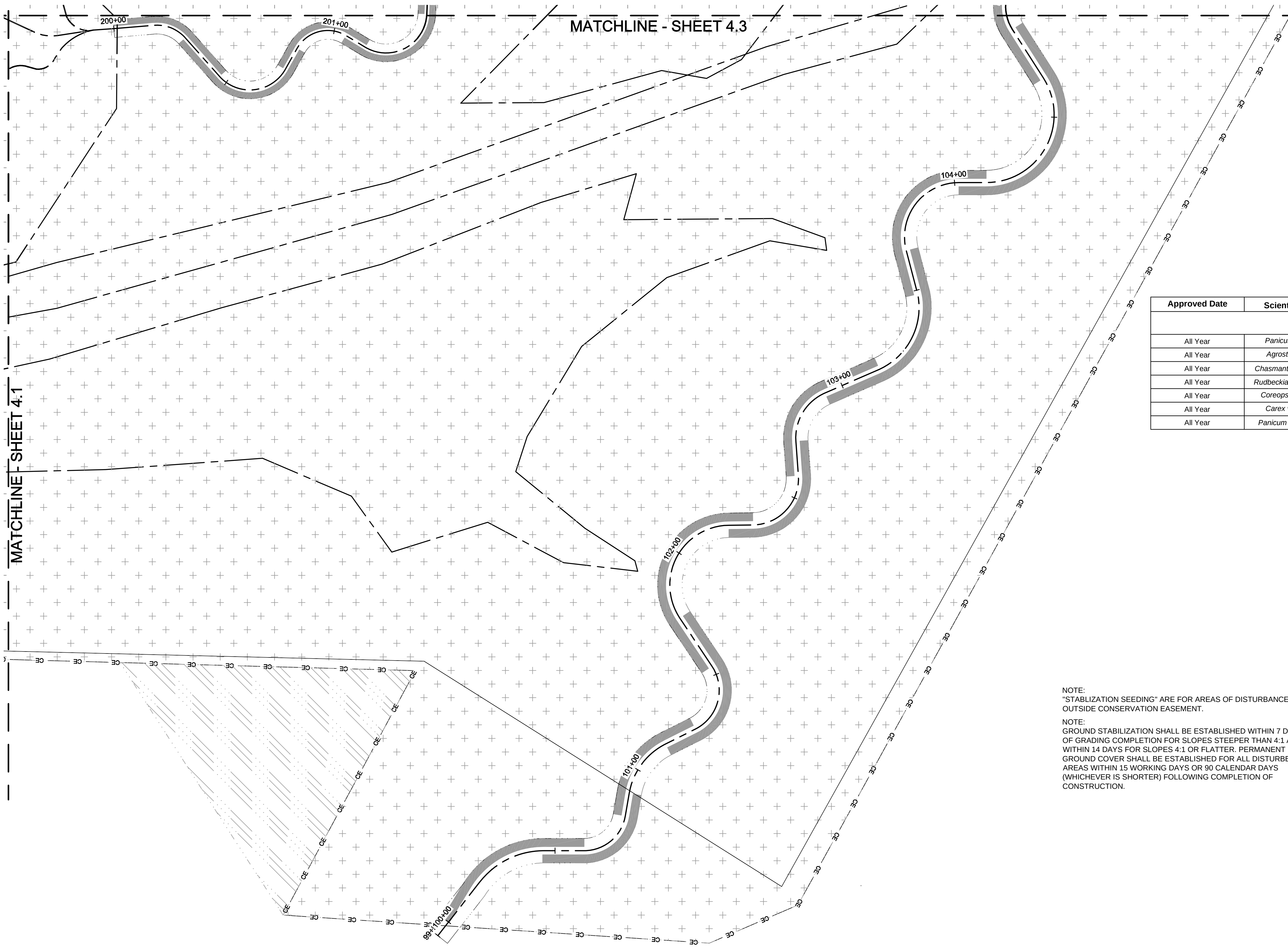
Revisions:
3/31/2014 - Revised riparian bare root and wetland bare root planting assemblages based on IRT comments.

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 4.1

April 17, 2014
Q:\ActiveProjects\005-02140 Owls Den\Cadd\Plans\02140-Planting Plan.dwg

April 17, 2014



Approved Date	Scientific Name	Stratum	Common Name	Density (lbs/acre)
Permanent Seeding Pure Live Seed (20 lbs/acre)				
All Year	*Panicum rigidulum*	Herb	Redtop Panicgrass	3
All Year	*Agrostis hyemalis*	Herb	Winter Bentgrass	3
All Year	*Chasmanthium latifolium*	Herb	River Oats	3
All Year	*Rudbeckia subtomentosa*	Herb	Blackeyed Susan	2
All Year	*Coreopsis lanceolata*	Herb	Lanceleaf Coreopsis	2
All Year	*Carex vulpinoidea*	Herb	Fox Sedge	3
All Year	*Panicum clandestinum*	Herb	Deertongue	4

Wetland Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	15%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	15%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	10%

Riparian Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	25%
Quercus phellos	Willow Oak	10%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	25%
Quercus michauxii	Swamp Chestnut Oak	5%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	15%

Live Stake

Scientific Name	Common Name	%
Salix serecia	Silky Willow	40%
Cornus amomum	Silky Dogwood	30%
Sambucus canadensis	Elderberry	30%

Stabilization Seeding

Scientific Name	Common Name	lb/acre
Schedonorus phoenix	Tall Fescue	100

NOTE:
"STABLIZATION SEEDING" ARE FOR AREAS OF DISTURBANCE OUTSIDE CONSERVATION EASEMENT.

NOTE:
GROUND STABILIZATION SHALL BE ESTABLISHED WITHIN 7 DAYS OF GRADING COMPLETION FOR SLOPES STEEPER THAN 4:1 AND WITHIN 14 DAYS FOR SLOPES 4:1 OR FLATTER. PERMANENT GROUND COVER SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

Planting

Revisions:
3/31/2014 - Revised riparian bare root and wetland bare root planting assemblages based on IRT comments.

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 4.2

Q:\ActiveProjects\005-02140 Owls Den\Cadd\Plans\02140-Planting Plan.dwg

Approved Date	Scientific Name	Stratum	Common Name	Density (lbs/acre)
Permanent Seeding Pure Live Seed (20 lbs/acre)				
All Year	*Panicum rigidulum*	Herb	Redtop Panicgrass	3
All Year	*Agrostis hyemalis*	Herb	Winter Bentgrass	3
All Year	*Chasmanthium latifolium*	Herb	River Oats	3
All Year	*Rudbeckia subtomentosa*	Herb	Blackeyed Susan	2
All Year	*Coreopsis lanceolata*	Herb	Lanceleaf Coreopsis	2
All Year	*Carex vulpinoidea*	Herb	Fox Sedge	3
All Year	*Panicum clandestinum*	Herb	Deertongue	4

Wetland Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	15%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	15%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	10%

Riparian Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	25%
Quercus phellos	Willow Oak	10%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	25%
Quercus michauxii	Swamp Chestnut Oak	5%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	15%

Live Stake

Scientific Name	Common Name	%
Salix serecia	Silky Willow	40%
Cornus amomum	Silky Dogwood	30%
Sambucus canadensis	Elderberry	30%

Stabilization Seeding

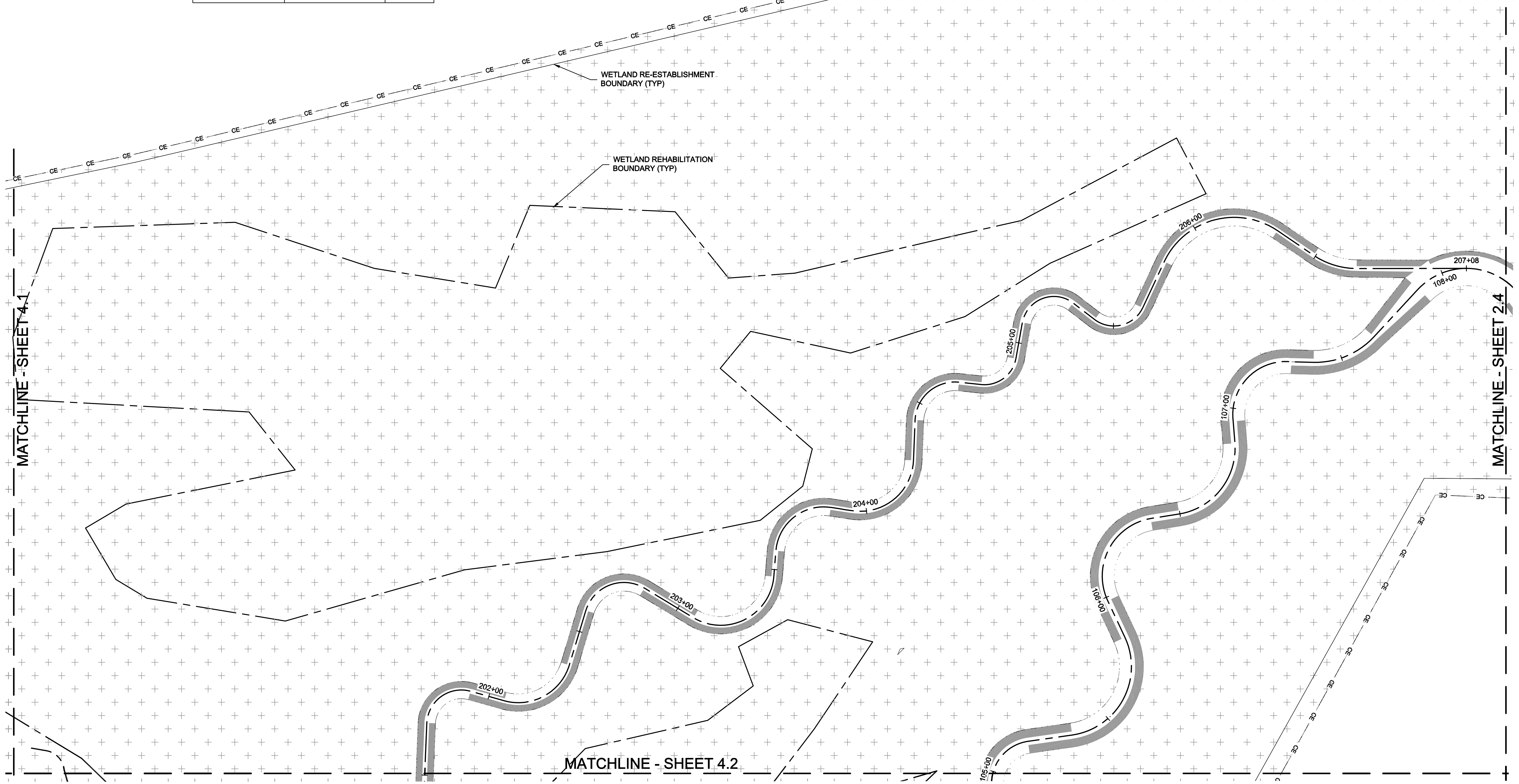
Scientific Name	Common Name	lb/acre
Schedonorus phoenix	Tall Fescue	100

NOTE:
"STABLIZATION SEEDING" ARE FOR AREAS OF DISTURBANCE OUTSIDE CONSERVATION EASEMENT.

NOTE:
GROUND STABILIZATION SHALL BE ESTABLISHED WITHIN 7 DAYS OF GRADING COMPLETION FOR SLOPES STEEPER THAN 4:1 AND WITHIN 14 DAYS FOR SLOPES 4:1 OR FLATTER. PERMANENT GROUND COVER SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.

N

0' 20' 40' 60'
(HORIZONTAL)



April 17, 2014

Q:\ActiveProjects\005-02140 Owls Den\Cadd\Plans\02140-Planting Plan.dwg

WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

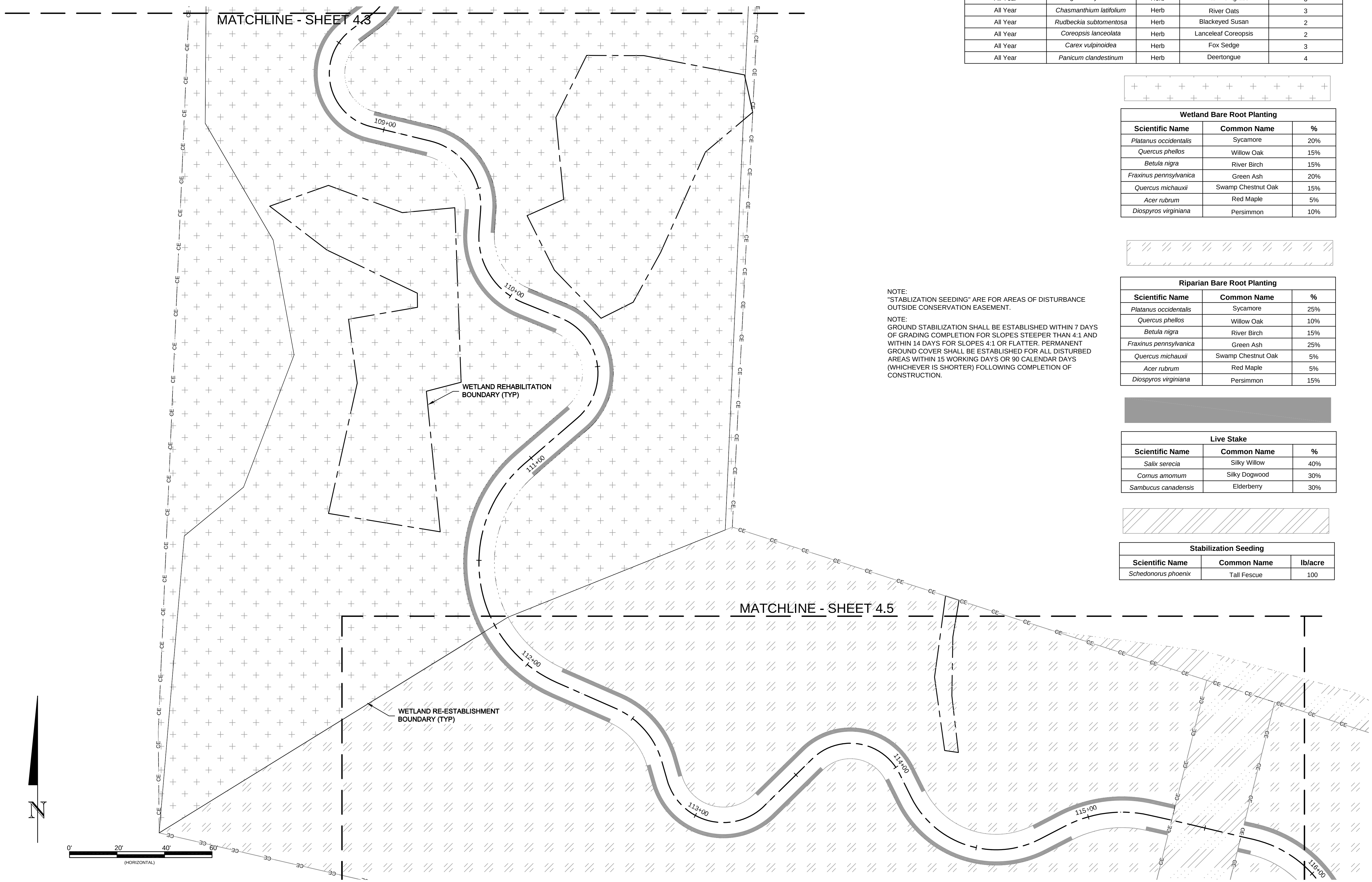
PRELIMINARY DO NOT USE FOR CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina
Planting

Revisions:
3/31/2014 - Revised riparian bare root and wetland bare root planting assemblages based on IRT comments.

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 4.3



Approved Date	Scientific Name	Stratum	Common Name	Density (lbs/acre)
Permanent Seeding Pure Live Seed (20 lbs/acre)				
All Year	*Panicum rigidulum*	Herb	Redtop Panicgrass	3
All Year	*Agrostis hyemalis*	Herb	Winter Bentgrass	3
All Year	*Chasmanthium latifolium*	Herb	River Oats	3
All Year	*Rudbeckia subtomentosa*	Herb	Blackeyed Susan	2
All Year	*Coreopsis lanceolata*	Herb	Lanceleaf Coreopsis	2
All Year	*Carex vulpinoidea*	Herb	Fox Sedge	3
All Year	*Panicum clandestinum*	Herb	Deertongue	4

Wetland Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	15%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	15%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	10%

Riparian Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	25%
Quercus phellos	Willow Oak	10%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	25%
Quercus michauxii	Swamp Chestnut Oak	5%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	15%

Live Stake

Scientific Name	Common Name	%
Salix serecia	Silky Willow	40%
Cornus amomum	Silky Dogwood	30%
Sambucus canadensis	Elderberry	30%

Stabilization Seeding

Scientific Name	Common Name	lb/acre
Schedonorus phoenix	Tall Fescue	100

NOTE:
"STABLIZATION SEEDING" ARE FOR AREAS OF DISTURBANCE OUTSIDE CONSERVATION EASEMENT.

NOTE:
GROUND STABILIZATION SHALL BE ESTABLISHED WITHIN 7 DAYS OF GRADING COMPLETION FOR SLOPES STEEPER THAN 4:1 AND WITHIN 14 DAYS FOR SLOPES 4:1 OR FLATTER. PERMANENT GROUND COVER SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

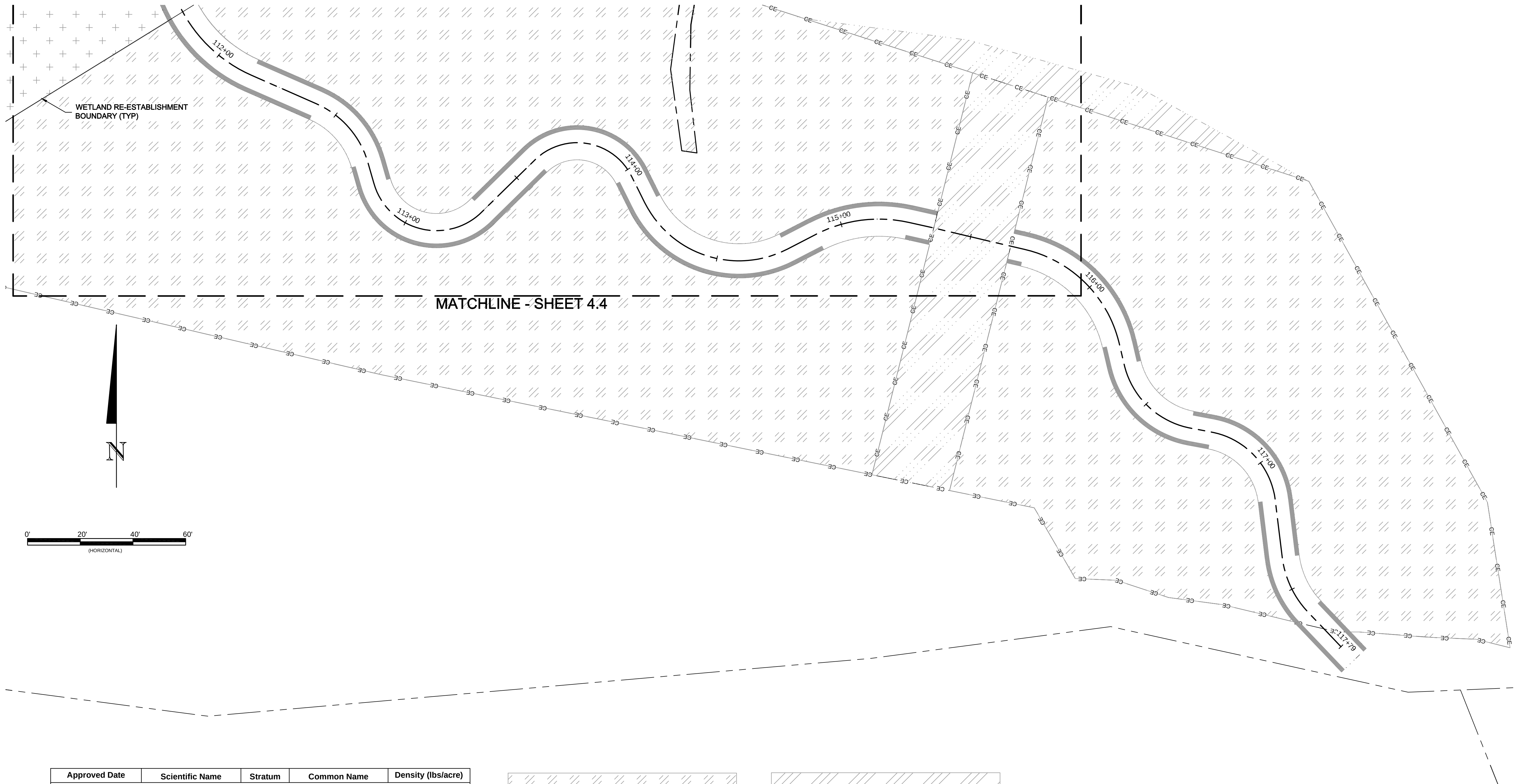
Planting

Revisions:
3/31/2014 - Revised riparian bare root and wetland bare root planting assemblages based on IRT comments.

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 4.4

April 17, 2014
Q:\ActiveProjects\005-02140 Owls Den\Cadd\Plans\02140-Planting Plan.dwg



Approved Date	Scientific Name	Stratum	Common Name	Density (lbs/acre)
Permanent Seeding Pure Live Seed (20 lbs/acre)				
All Year	*Panicum rigidulum*	Herb	Redtop Panicgrass	3
All Year	*Agrostis hyemalis*	Herb	Winter Bentgrass	3
All Year	*Chasmanthium latifolium*	Herb	River Oats	3
All Year	*Rudbeckia subtomentosa*	Herb	Blackeyed Susan	2
All Year	*Coreopsis lanceolata*	Herb	Lanceleaf Coreopsis	2
All Year	*Carex vulpinoidea*	Herb	Fox Sedge	3
All Year	*Panicum clandestinum*	Herb	Deertongue	4

Wetland Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	15%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	15%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	10%

Riparian Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	25%
Quercus phellos	Willow Oak	10%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	25%
Quercus michauxii	Swamp Chestnut Oak	5%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	15%

Live Stake

Scientific Name	Common Name	%
Salix serecia	Silky Willow	40%
Cornus amomum	Silky Dogwood	30%
Sambucus canadensis	Elderberry	30%

Stabilization Seeding

Scientific Name	Common Name	lb/acre
Schedonorus phoenix	Tall Fescue	100

NOTE:
"STABLIZATION SEEDING" ARE FOR AREAS OF DISTURBANCE OUTSIDE CONSERVATION EASEMENT.

NOTE:
GROUND STABILIZATION SHALL BE ESTABLISHED WITHIN 7 DAYS OF GRADING COMPLETION FOR SLOPES STEEPER THAN 4:1 AND WITHIN 14 DAYS FOR SLOPES 4:1 OR FLATTER. PERMANENT GROUND COVER SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

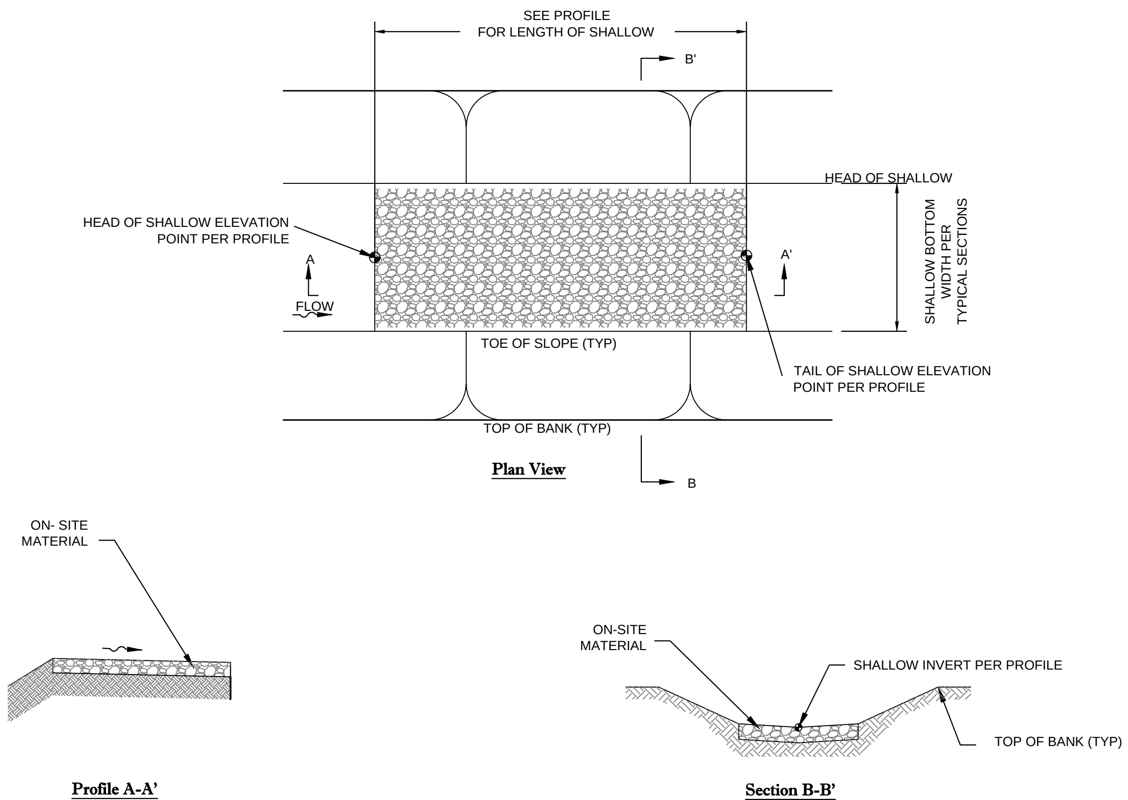
Planting

Revisions:
3/31/2014 - Revised riparian bare root and wetland bare root planting assemblages based on IRT comments.

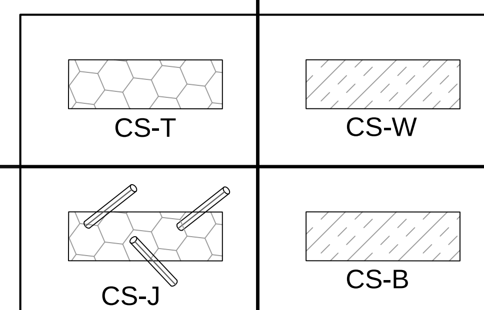
Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

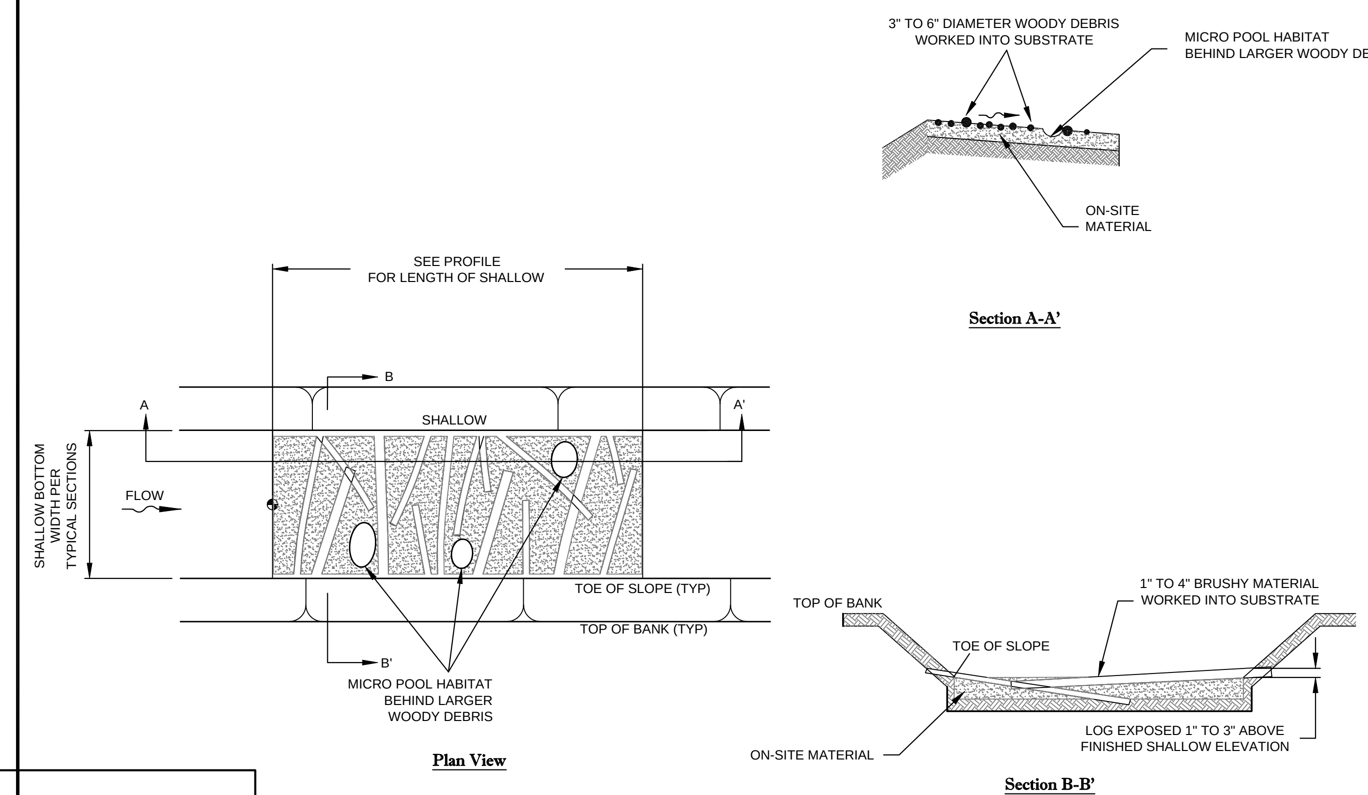
4.5
Sheet

March 7, 2017

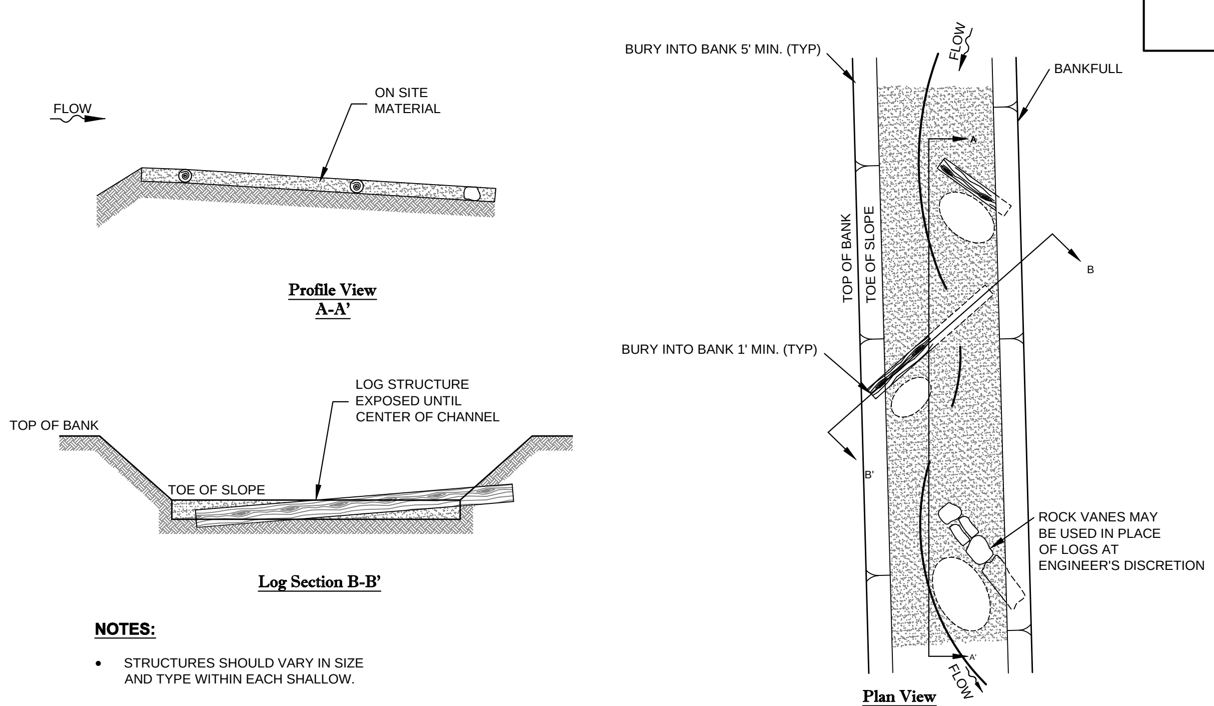


1
5.1
Constructed Shallow
Not to Scale





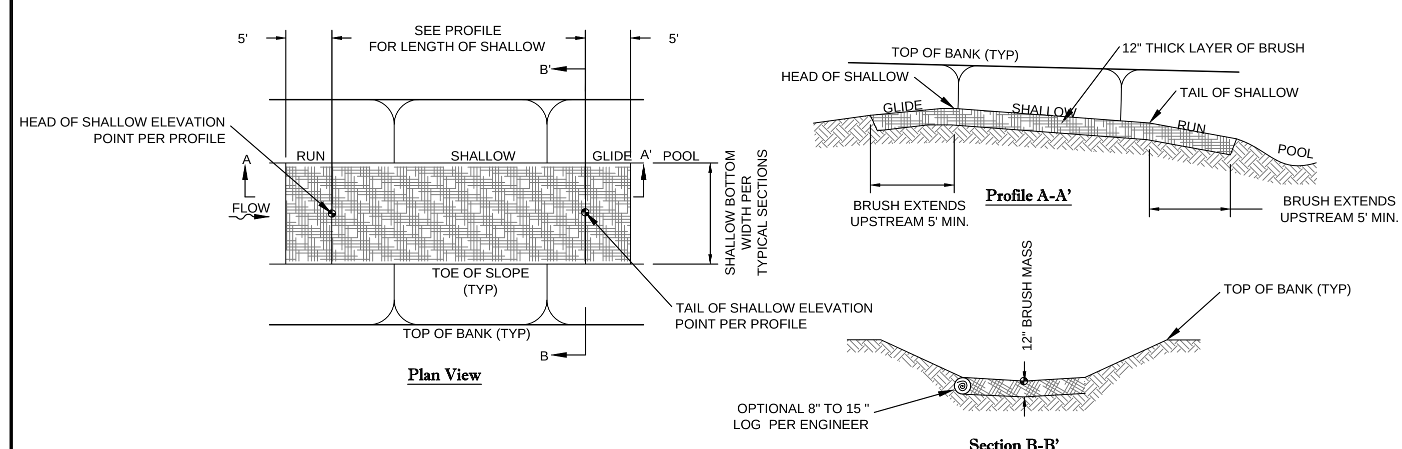
2
5.1
Woody Shallow
Not to Scale



NOTES:

- STRUCTURES SHOULD VARY IN SIZE AND TYPE WITHIN EACH SHALLOW.
- ROCK MAY BE SUBSTITUTED FOR LOGS AT ENGINEER'S DISCRETION.

3
5.1
Jazz Shallow
Not to Scale



4
5.1
Brush Shallow
Not to Scale

WILDLANDS
ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY
DO NOT
USE FOR
CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

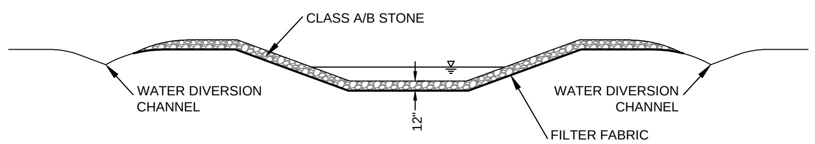
Details

Revisions:

Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

5.1
Sheet

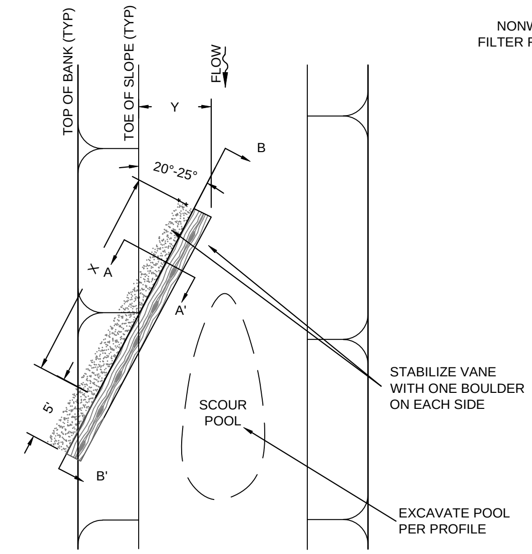
Q:\ActiveProjects\005-02140 Owls Den\Cadd\Plans\02140-Details.dwg



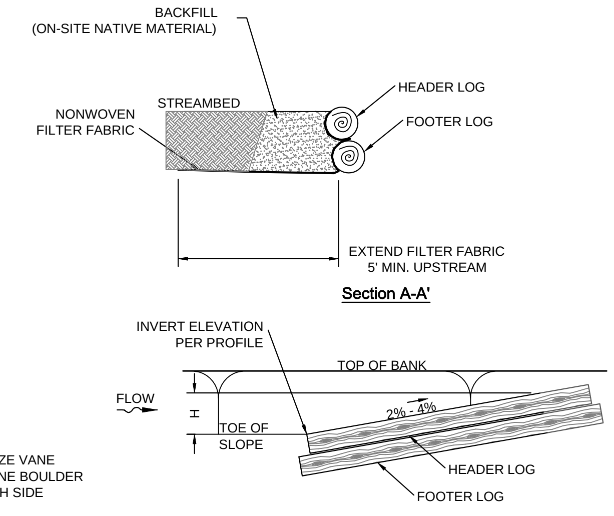
NOTES:

1. FORD CROSSING SHALL BE INSTALLED PERPENDICULAR TO CHANNEL BANKS.
2. MAINTAIN DIVERSION CHANNEL TO INSURE RUNOFF DOES NOT ENTER CHANNEL.
3. CONTRACTOR SHALL DETERMINE APPROPRIATE FORD DIMENSIONS.

1 / 5.2 Temporary Ford Crossing
Not to Scale



Plan View



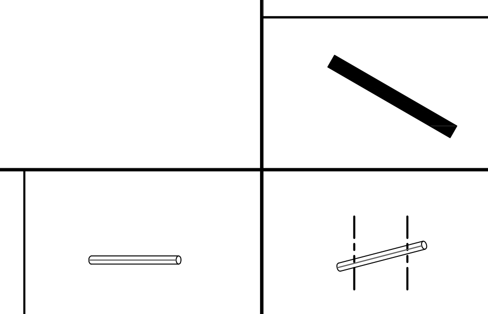
Profile B - B'

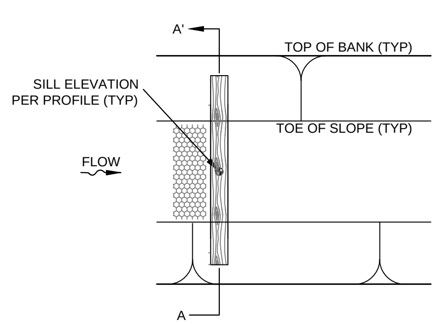
	HC1 Reach 1	HC1 Reach 2	HC2
H	0.7	0.8	0.5
X	15	17	12
Y	1	1.5	0.75

NOTES:

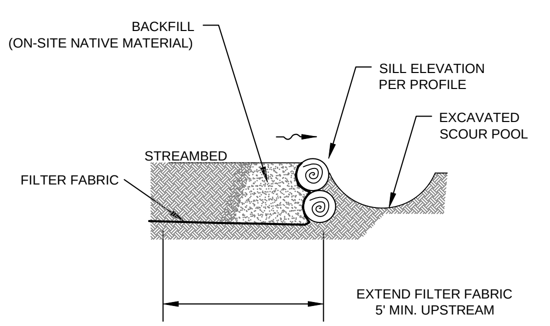
1. LOGS SHALL BE A MINIMUM OF 6" IN DIAMETER.
2. LOGS WITH A 12" OR GREATER DIAMETER DO NOT REQUIRE A FOOTER.
3. LOGS WILL PRIMARILY CONSIST OF HARDWOOD SPECIES.

2 / 5.2 Log Vane
Not to Scale

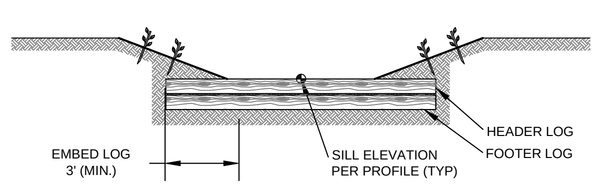




Plan View



Profile View

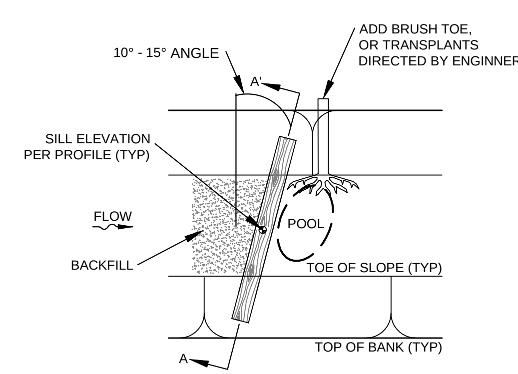


Section A - A'

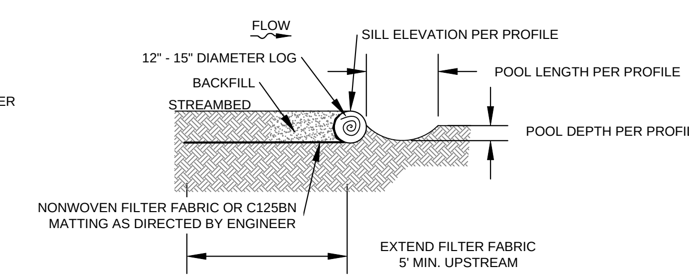
NOTES:

1. LOGS SHALL BE A MINIMUM OF 6" IN DIAMETER.
2. LOGS WITH A 12" OR GREATER DIAMETER DO NOT REQUIRE A FOOTER.
3. LOGS WILL PRIMARILY CONSIST OF HARDWOOD SPECIES.

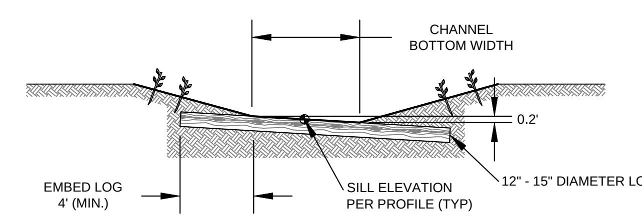
3 / 5.2 Log Sill
Not to Scale



Plan View



Profile View



Section A - A'

NOTES:

1. LOGS SHALL BE A MINIMUM OF 6" IN DIAMETER.
2. LOGS WITH A 12" OR GREATER DIAMETER DO NOT REQUIRE A FOOTER.
3. LOGS WILL PRIMARILY CONSIST OF HARDWOOD SPECIES.

4 / 5.2 Angled Log Drop Structure
Not to Scale

WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

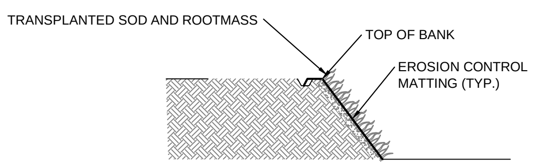
Owl's Den Mitigation Site
Lincoln County, North Carolina

Details

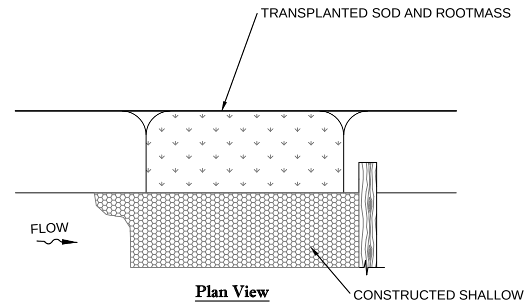
Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 5.2



Section View
Shallow Installation

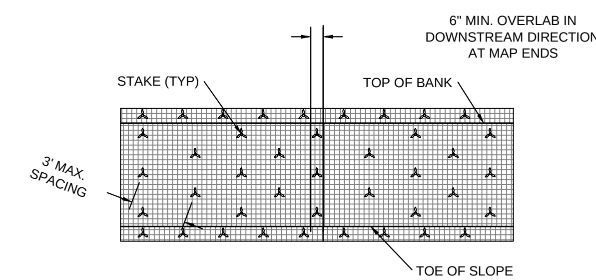


Plan View
Shallow Installation

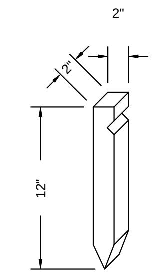
NOTES:

1. PREPARE THE BANK WHERE THE SOD MAT WILL BE TRANSPLANTED BY RAKING & FERTILIZING.
2. EXCAVATE TRANSPLANT SOD MATS WITH A WIDE BUCKET AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE.
3. PLACE TRANSPLANT ON THE BANK TO BE STABILIZED.
4. SECURE WITH SOD STAPLES.
5. FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
6. ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
7. PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.
8. INSTALL EROSION CONTROL MATTING ABOVE TRANSPLANTED SOD MATS.

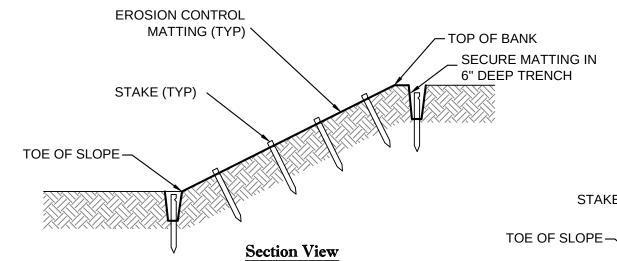
1 / 5.3 **Transplanted Sod Mats**
Not to Scale



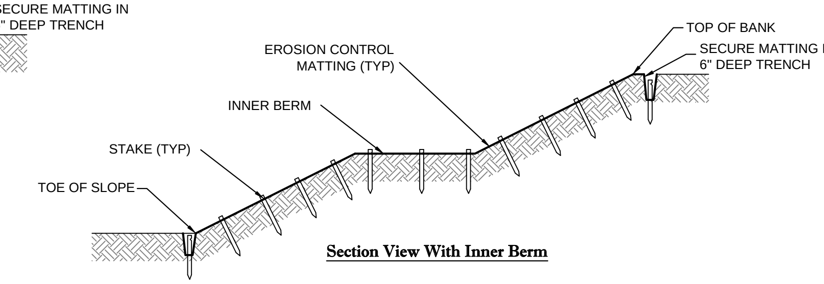
Plan View



Typical Stake

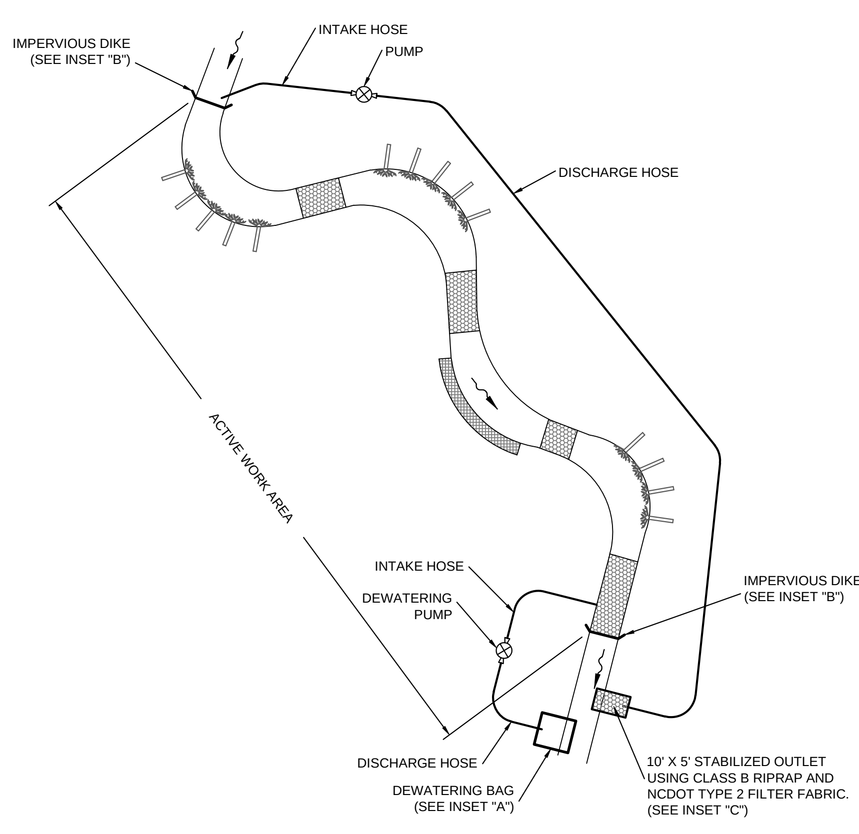


Section View

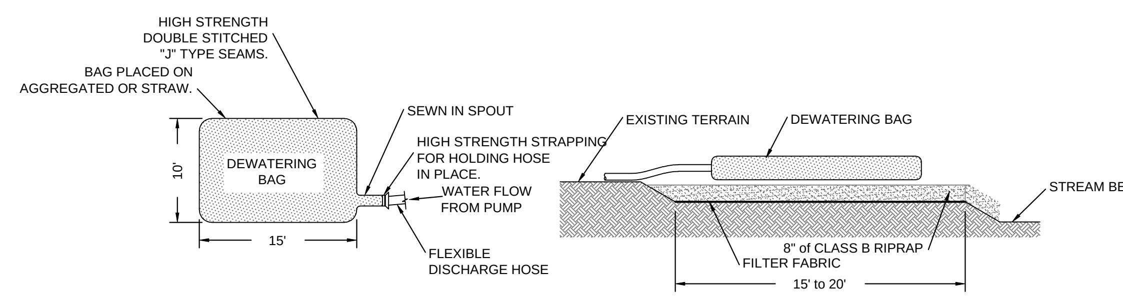


Section View With Inner Berm

1 / 5.3 **Erosion Control Matting**
Not to Scale



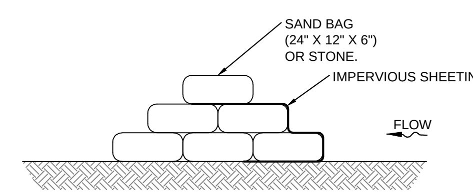
Plan View



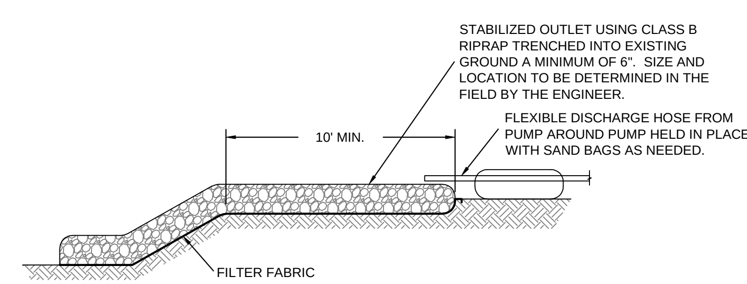
Inset "A"
Dewatering Bag

NOTE:

1. PROVIDE STABILIZED OUTLET TO STREAMBED.



Inset "B"
Impervious Dike



2 / 5.3 **Pump Around System**
Not to Scale

Inset "C"
Stabilized Outlet

WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

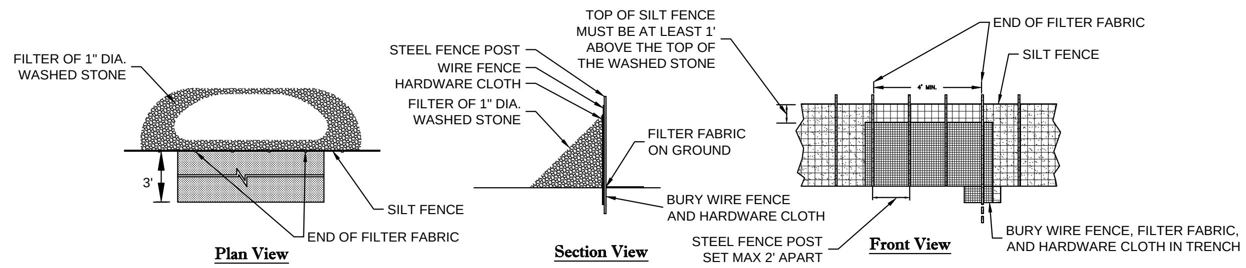
Owl's Den Mitigation Site
Lincoln County, North Carolina

Details

Revisions:

Date:	April 17, 2013
Job Number:	005-02140
Project Engineer:	EGR
Drawn By:	EPN
Checked By:	JNK

Sheet 5.3



INSTALLATION

REFER TO THE PLANS FOR LOCATIONS AND SPECIFICATIONS. DURING INSTALLATION OF THE SILT BARRIER OR SILT FENCE, INSPECT THE INSTALLATION TO DETERMINE IF OUTLETS ARE NEEDED ACCORDING TO THE CRITERIA SET FORTH IN THE SPECIFICATIONS FOR THE BARRIER AND FENCE. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER, ARCHITECT, OR RESPONSIBLE PERSONNEL ON THE SITE FOR ASSISTANCE. EROSION CONTROL PERSONNEL HAVE COPIES OF INSTRUCTIONS AND MAY HAVE PHOTOGRAPHS OF PROPERLY INSTALLED OUTLETS AS AN AID TO INSTALLATION.

IF THE SILT FENCE OUTLET IS NOT INSTALLED CORRECTLY THE FIRST TIME, IT WILL HAVE TO BE REBUILT.

DETERMINE THE EXACT LOCATION ON THE GROUND BEFORE COMPLETING INSTALLATION OF THE SILT FENCE, TAKING INTO CONSIDERATION:

INSTALL THE OUTLET AT THE LOWEST POINT (S) IN THE BARRIER OR FENCE WHERE WATER WILL POND.

INSTALL THE OUTLET WHERE IT IS ACCESSIBLE FOR INSTALLATION, MAINTENANCE, AND REMOVAL.

ALLOW AT LEAST:

15 FEET BETWEEN THE BARRIER OR FENCE AND SINGLE-STORY BUILDINGS.

25 FEET FOR FORK LIFTS BETWEEN THE BARRIER OR FENCE AND MULTIPLE-STORY BUILDINGS.

10 FEET BETWEEN THE BARRIER OR FENCE AND THE TOE OF FILL SLOPES.

PLACE THE OUTLET SO THAT WATER FLOWING THROUGH IT WILL NOT CREATE AN EROSION HAZARD BELOW: AVOID STEEP SLOPES BELOW THE OUTLET AND AREAS WITHOUT PROTECTIVE VEGETATION. USE SLOPE DRAINS IF NECESSARY.

DETERMINE THE LOCATION OF THE OUTLET: FOR A SILT BARRIER, WHEN THE TRENCH IS DUG TO BURY THE BOTTOM OF THE FABRIC BECAUSE THE BARRIER WILL BE OMITTED AT THE OUTLET; FOR A SILT FENCE, WHEN THE WIRE FENCE IS IN PLACE BECAUSE THE FILTER FABRIC WILL BE OMITTED AT THE OUTLET.

REFER TO THE ILLUSTRATIONS OF THE OUTLET IN THE PLAN.

CLEAR STUMPS AND ROOTS FROM THE LOCATION OF THE OUTLET. CLEAR ADEQUATE ACCESS FOR THE EQUIPMENT NEEDED FOR INSTALLATION, MAINTENANCE, AND REMOVAL.

FOR A SILT BARRIER:

JUST BELOW THE GAP IN THE BARRIER, PLACE A LAYER OF FILTER FABRIC ON THE GROUND TO PROTECT THE SOIL FROM EROSION BY OUTFLOW FROM THE OUTLET; PLACE 6 INCHES OF THE UPPER EDGE IN THE TRENCH. STAKE THE REMAINING EDGES OF THE FABRIC TO HOLD IT IN PLACE.

ALONG THE GAP WHERE THE OUTLET WILL GO, PLACE STEEL FENCE POSTS FOR STRENGTH. THE POSTS MUST BE A MAXIMUM OF 2 FEET APART AND DRIVEN INTO SOLID GROUND AT LEAST 18 INCHES.

PLACE HARDWARE CLOTH (WELDED GALVANIZED SCREEN WITH SQUARE 1/4 - 1/2-INCH HOLES) ON THE UPHILL SIDE OF THE POSTS TO HOLD THE WASHED STONE IN PLACE. PUT 6 INCHES OF THE BOTTOM OF THE CLOTH IN THE TRENCH AND FASTEN IT TO THE POSTS WITH LENGTHS OF WIRE.

BURY THE BOTTOM OF THE HARDWARE CLOTH AND THE UPPER EDGE OF THE FILTER FABRIC BELOW THE OUTLET IN THE TRENCH AND COMPACT THE FILL.

PLACE A FILTER OF 1-INCH DIAMETER WASHED STONE ON THE UPHILL SIDE OF THE OUTLET. PILE THE STONE UP TO THE TOP OF THE HARDWARE CLOTH AND OVER THE JOINT BETWEEN THE OUTLET AND THE BARRIER.

FOR A SILT FENCE:

JUST BELOW THE GAP IN THE BARRIER, PLACE A LAYER OF FILTER FABRIC ON THE GROUND TO PROTECT THE SOIL FROM EROSION BY OUTFLOW FROM THE OUTLET; PLACE 6 INCHES OF THE UPPER EDGE IN THE TRENCH. STAKE THE OTHER EDGES OF THE FABRIC TO HOLD IT IN PLACE.

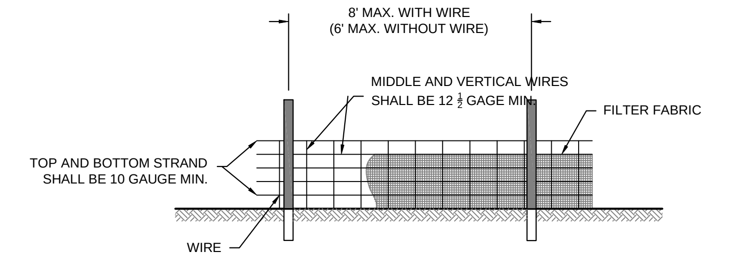
ALONG THE GAP WHERE THE OUTLET WILL GO, PLACE ADDITIONAL STEEL FENCE POSTS FOR STRENGTH. THE POSTS MUST BE A MAXIMUM OF 2 FEET APART AND DRIVEN INTO SOLID GROUND AT LEAST 18 INCHES.

PLACE HARDWARE CLOTH (WELDED GALVANIZED SCREEN WITH SQUARE 1/4 - 1/2-INCH HOLES) ON THE UPHILL SIDE OF THE POSTS TO HOLD THE WASHED STONE IN PLACE. PUT 6 INCHES OF THE BOTTOM OF THE CLOTH IN THE TRENCH AND FASTEN IT TO THE POSTS WITH LENGTHS OF WIRE.

BURY THE BOTTOM OF THE HARDWARE CLOTH, THE UPPER EDGE OF THE FILTER FABRIC BELOW THE OUTLET, AND THE WIRE FENCE IN THE TRENCH AND COMPACT THE FILL.

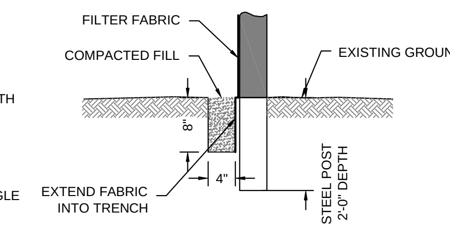
PLACE A FILTER OF 1-INCH DIAMETER WASHED STONE ON THE UPHILL SIDE OF THE OUTLET. PILE THE STONE UP TO THE TOP OF THE HARDWARE CLOTH AND OVER THE JOINT BETWEEN THE OUTLET AND THE SILT FENCE.

1
5.4
Temporary Silt Fence Gravel Outlet
Not to Scale

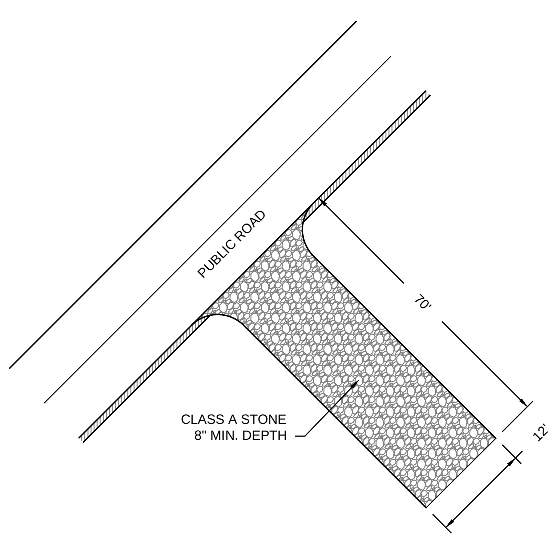


NOTES:

1. USE WIRE A MINIUM OF 32" IN WIDTH AND WITH A MINIMUM OF 6 LINES OF WIRES WITH 12" STAY SPACING.
2. USE FILTER FABRIC A MINIMUM OF 36" IN WIDTH AND FASTEN ADEQUATELY TO THE WIRES AS DIRECTED BY THE ENGINEER.
3. PROVIDE 5' STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE. ANGLE STEEL TYPE.



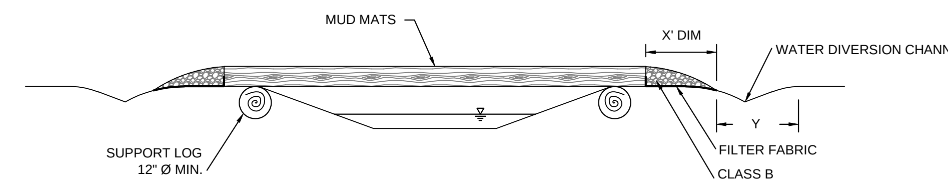
2
5.4
Temporary Silt Fence
Not to Scale



NOTES:

1. PROVIDE TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS.
5. LOCATE CONSTRUCTION ENTRANCE AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. PROVIDE FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE.
6. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOP DRESSING WITH STONE WILL BE NECESSARY.
7. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED IMMEDIATELY.
8. USE CLASS A STONE OR OTHER COARSE AGGREGATE APPROVED BY THE ENGINEER.
9. PLACE FILTER FABRIC BENEATH STONE.

3
5.4
Construction Entrance
Not to Scale



NOTE:

1. CONSTRUCT STREAM CROSSING WHEN FLOW IS AT NORMAL BASEFLOW.
2. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM.
3. INSTALL STREAM CROSSING PERPENDICULAR TO THE FLOW.
4. MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
5. STABILIZE AN ACCESS RAMP OF CLASS B STONE TO THE EDGE OF THE MUD MAT.
6. CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED.

4
5.4
Temporary Stream Crossing - Mud Mat
Not to Scale

T

WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

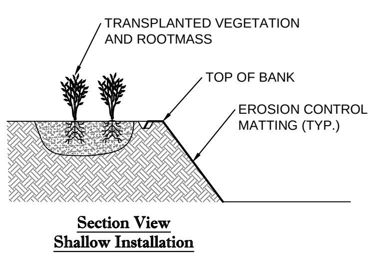
Details

Revisions:

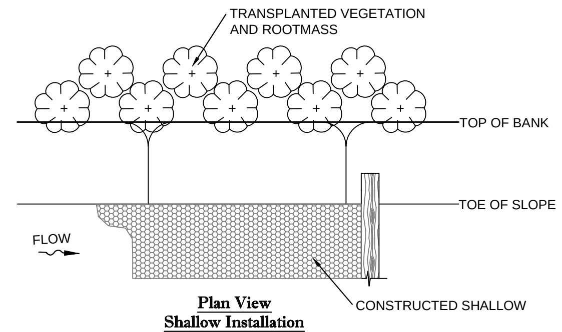
Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

5.4
Sheet

March 7, 2012
Q:\ActiveProjects\005-02140 Owls Den\CadD\Plans\02140-Details.dwg



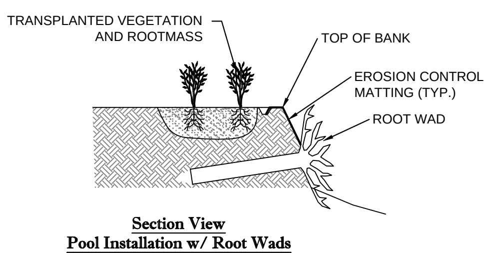
Section View
Shallow Installation



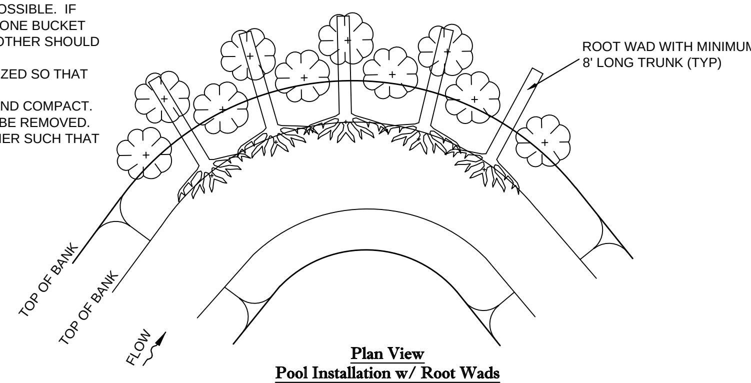
Plan View
Shallow Installation

NOTES:

1. BANK TO BE STABILIZED THAT WILL ACCOMMODATE THE SIZE OF TRANSPLANT TO BE PLACED.
2. EXCAVATE TRANSPLANT. EXCAVATE THE ENTIRE ROOT MASS AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE. IF ENTIRE ROOT MASS CANNOT BE EXCAVATED IN ONE BUCKET LOAD, THE TRANSPLANT IS TOO LARGE AND ANOTHER SHOULD BE SELECTED.
3. PLACE TRANSPLANT IN THE BANK TO BE STABILIZED SO THAT VEGETATION IS ORIENTATED VERTICALLY.
4. FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
5. ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
6. PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.

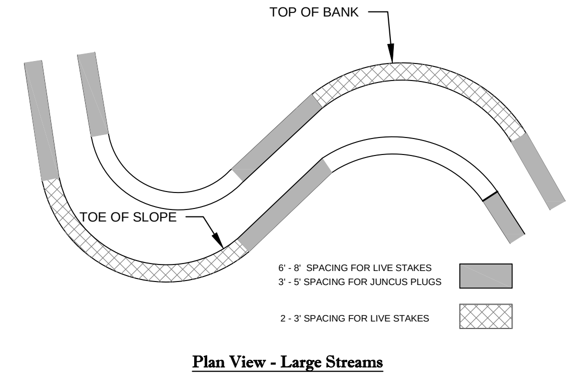


Section View
Pool Installation w/ Root Wads

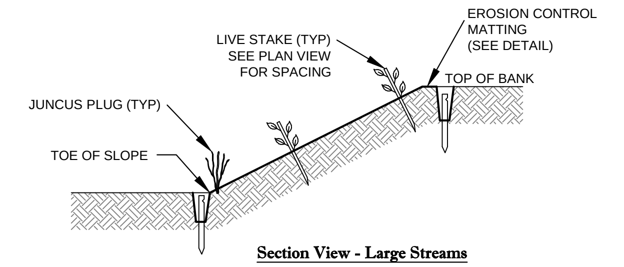


Plan View
Pool Installation w/ Root Wads

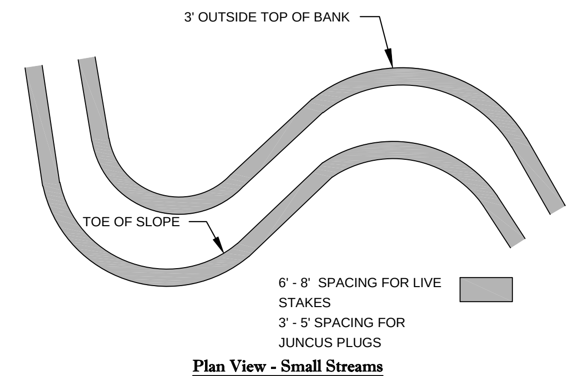
1/5.5 Transplanted Vegetation
Not to Scale



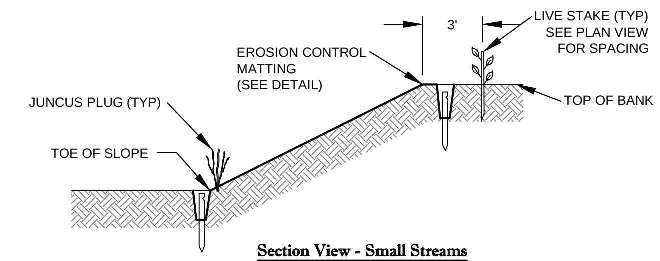
Plan View - Large Streams



Section View - Large Streams



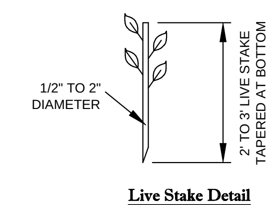
Plan View - Small Streams



Section View - Small Streams

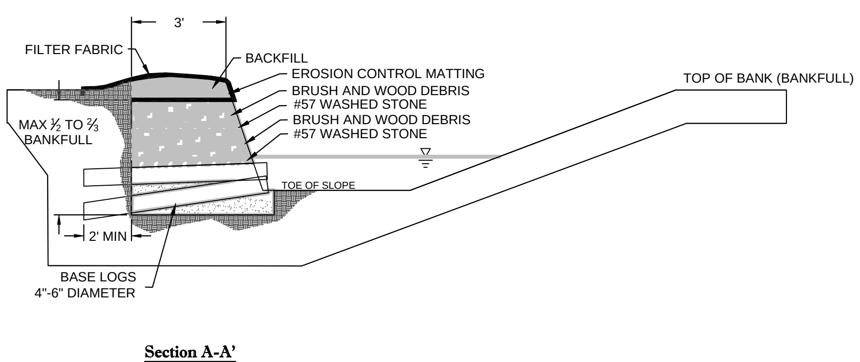
NOTE:

1. LIVE STAKES TO BE PLANTED IN AREAS AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.

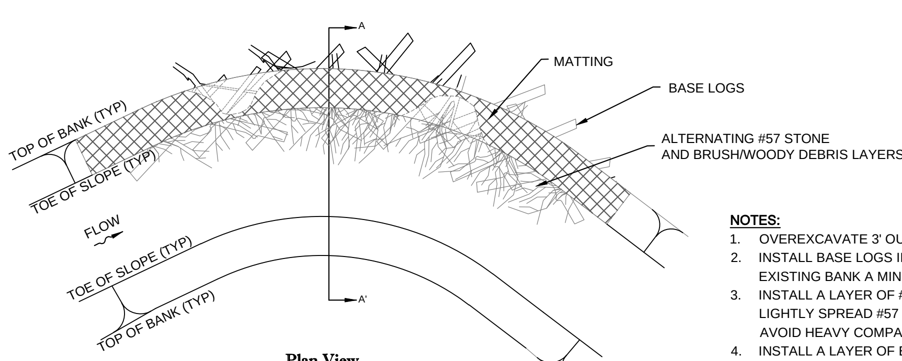


Live Stake Detail

2/5.5 Live Staking & Juncus Plugs
Not to Scale



Section A-A'

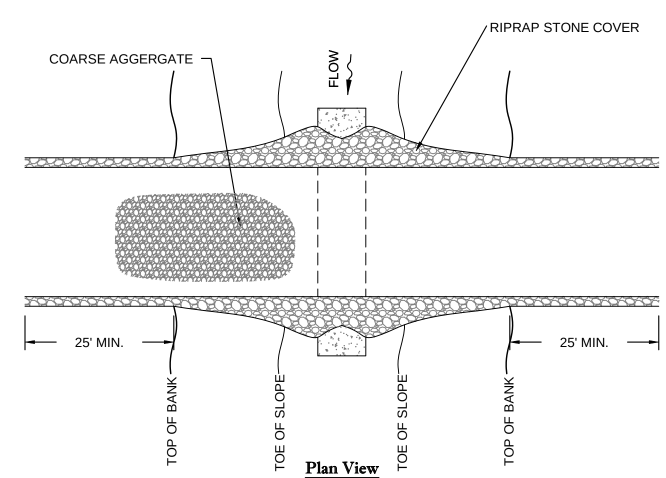


Plan View

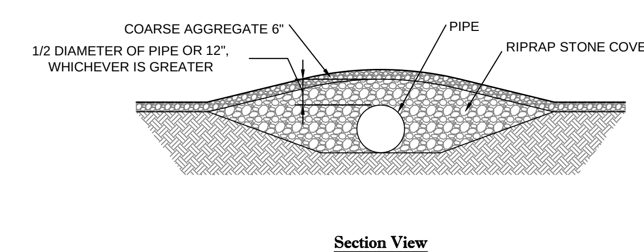
NOTES:

1. OVEREXCAVATE 3' OUTSIDE OF TOP OF BANK (BANKFULL).
2. INSTALL BASE LOGS IN A CRISS CROSS PATTERN, DRIVING THEM INTO THE EXISTING BANK A MINIMUM OF 2'. BASE LOGS SHALL BE 6"-12" DIAMETER.
3. INSTALL A LAYER OF #57 WAHSED STONE ON TOP OF THE BASE LOGS. LIGHTLY SPREAD #57 WASHED STONE TO FILL VOIDS BETWEEN BASE LOGS. AVOID HEAVY COMPACTION TO PREVENT DAMAGE TO THE BASE LOGS.
4. INSTALL A LAYER OF BRUSH/WOODY DEBRIS, WHICH SHALL CONSIST OF SMALL BRANCHES AND ROOTS COLLECTED ON-SITE. LIGHTLY COMPACT BRUSH/WOODY DEBRIS LAYER.
5. BRUSH SHOULD BE ALIGNED SO STEMS ARE ROUGHLY PARALLEL AND IS INSTALLED POINTING SLIGHTLY UPSTREAM.
6. INSTALL ALTERNATING #57 WASHED STONE AND BRUSH/WOODY DEBRIS LAYERS TO ½ TO ¾ BANKFULL HEIGHT.
7. INSTALL EARTH BACKFILL OVER FINAL BRUSH/WOODY LAYER ACCORDING TO TYPICAL SECTION DIMENSIONS.
8. INSTALL EROSION CONTROL MATTING AND BANK STABILIZATION PER PLANS.

3/5.5 Brush Toe
Not to Scale



Plan View



Section View

4/5.5 Permanent Stream Crossing - Culvert
Not to Scale

WILDLANDS ENGINEERING
1430 South Mint Street - Suite 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

Owl's Den Mitigation Site
Lincoln County, North Carolina

Details

Revisions:

Date: April 17, 2013
Job Number: 005-02140
Project Engineer: EGR
Drawn By: EPN
Checked By: JNK

Sheet 5.5

March 7, 2013
Q:\Active Projects\005-02140 Owls Den\Cadd\Plans\02140-Details.dwg