

Appendix VI – Landsford Tract PRM Plan

LANDSFORD TRACT
PERMITTEE-RESPONSIBLE MITIGATION PLAN

PROJECT:

PROJECT INSPECTOR
YORK COUNTY, SOUTH CAROLINA

APPLICANT:

SOUTH CAROLINA DEPARTMENT OF COMMERCE

SUBMITTED TO:

UNITED STATES ARMY CORPS OF ENGINEERS
CHARLESTON DISTRICT, REGULATORY

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1.0 Permittee-Responsible Mitigation

The South Carolina Department of Commerce and the Carolina Panthers (collectively hereinafter “Applicant”) are proposing a mixed-use, pedestrian- friendly development community anchored by the Carolina Panthers practice/training facilities and headquarters offices with emphasis on retail/entertainment, employment, research and development, residential dwellings, recreation and open space uses. This development is being referred to as Project Inspector (hereinafter “Impact Site”). Project Inspector is located approximately 3.1 miles northeast of Rock Hill in York County, South Carolina within the Lower Catawba River Watershed, Hydrologic Unit Code (hereinafter “HUC”) 03050103.

Project Inspector will impact waters of the United States, to include streams and wetlands. Based on preliminary estimates, approximately 4,991 linear feet of stream and approximately 0.87 acres of wetland will be impacted. An Individual Permit from the United States Army Corps of Engineers (hereinafter “USACE”) will be required for the proposed impacts to aquatic resources.

Project Inspector will require compensatory mitigation for unavoidable adverse impacts to waters of the United States that result from activities authorized under Sections 401 and 404 of the *Clean Water Act*, and Section 10 of the *Rivers and Harbors Act*, provided such activities have met all applicable requirements and are authorized by the appropriate authority. Specifically, Project Inspector will require approximately 36,420 stream mitigation credits and approximately 9 wetland mitigation credits, based on preliminary estimates. For reasons outlined below in Section 2.0, the Applicant is proposing to implement a permittee-responsible mitigation plan (hereinafter “PRM Plan”) to offset unavoidable adverse impacts to waters of the United States associated with the Individual Permit.

The Applicant is proposing to implement a PRM Plan on a ±484.16-acre parcel located in Chester County, South Carolina (a portion of Parcel Identification Number 162-00-00-001-000) (hereinafter “Landsford Tract”). Streams, wetlands and aquatic resource buffers within the Landsford Tract consisting of approximately 114.6 acres will be permanently protected and enhanced and/or restored (hereinafter “Mitigation Site”) to satisfy the compensatory mitigation requirement associated with the Project Inspector Individual Permit. The Mitigation Site is located at latitude 34.797064° and longitude -80.897325°. Refer to Figure 1 for a vicinity map and to Figure 2 for a location map. Note, the Impact Site is located within HUC 03050103; likewise, the Mitigation Site is located within HUC 03050103. Refer to Figure 3 for an 8-Digit HUC map.

Stream resources located within the Mitigation Site are primarily a combination of 1st and 2nd order relatively permanent waters and non-relatively permanent waters. These stream types are similar to the impacted stream resources. Likewise, wetland resources located within the Mitigation Site are in-kind, meaning of a similar structural and functional type to the impacted aquatic resources.

Proposed mitigation activities described herein will provide watershed benefits by:

- Preserving and/or establishing natural hardwood communities in areas (to include wetlands and upland and riparian buffers) that have historically been managed for forestry;
- Preserving existing and intact aquatic resource communities;
- Preserving land in perpetuity, including land immediately adjacent to the Catawba River, Landsford Canal Forest Legacy Area Wildlife Management Area (hereinafter “WMA”) and Landsford Canal State Park;
- Reducing the land base available for activities detrimental to water quality;

- Limiting encroachments upon terrestrial, aquatic and State protected resources from development and/or forestry;
- Providing land for wildlife, including land immediately adjacent to the Catawba River, Landsford Canal Forest Legacy Area WMA and Landsford Canal State Park;
- Providing shade to surface waters;
- Providing water quality benefits through hyporheic exchange;
- Decreasing on-site erosion and subsequent sedimentation, providing increased filtration of sediments and nutrients, and promoting sediment deposition;
- Providing flood attenuation, promoting the exchange of surface waters, and providing filtration of floodwaters;
- Establishing bankfull stage at floodplain elevations;
- Including bioengineering using natural material and vegetative cover;
- Including instream structures designed to provide grade control and reduce instream energy; and by
- Including instream habitat creation and increasing benthic habitat diversity.

Aquatic resources located within the Mitigation Site, and the mitigation activities described herein as occurring within the Mitigation Site, generate an excess of compensatory mitigation credits than are needed to offset adverse impacts associated with Project Inspector. Thus, the PRM Plan satisfies the compensatory mitigation requirement associated with the Project Inspector Individual Permit. This mitigation and work plan and final credit calculations will be finalized after consultation with the natural resource and regulatory agencies, and this PRM Plan provides an upper bounds of credit potential based on a number of assumptions and factors that may change.

2.0 Available Mitigation Credits

The mitigation plan follows the hierarchy outlined in the 2008 Federal Compensatory Mitigation Rule (CFR 332.3 (b)(2 and 3)) (hereinafter “2008 Compensatory Mitigation Rule”). The hierarchy of mitigation preferences is as follows: (1) first seek suitable mitigation banks, (2) then in-lieu fee programs, and, if those are not available or appropriate, (3) develop a PRM Plan.

Following the USACE Charleston District 2010 *Guidelines for Preparing a Compensatory Mitigation Plan* (hereinafter “2010 mitigation guidelines”) and the 2008 Compensatory Mitigation Rule, the Regulatory In-Lieu Fee and Bank Information Tracking System was used to locate available mitigation bank credits and in-lieu fee program credits in the Lower Catawba watershed. There are no mitigation banks with available credits located in the Lower Catawba 8-Digit HUC. Therefore, the Applicant is proposing a permittee-responsible mitigation plan using a watershed approach for mitigating the project impacts.

3.0 Watershed Approach

The Mitigation Site was selected using a watershed approach. The goal of a watershed approach is to maintain and improve the quality and quantity of aquatic resources through the strategic selection of compensatory mitigation sites. It is preferable to have a mitigation site as close as possible to the proposed impacts. The Mitigation Site is located within the same 8-Digit HUC (03050103) and Level III (Piedmont: 45) and IV Ecoregion (Southern Outer Piedmont: 45b) as the Impact Site (Figure 3).

This section considers watershed needs within the 8-Digit HUC where the Impact Site and Mitigation Site are located. Multiple sources of information, including watershed management plans, local land use plans, property ownership and land use trends were examined to identify the overall aquatic resource needs and to assess the suitability of the selected mitigation site. Additionally, local land trusts and conservation

organizations were consulted to determine their conservation priorities in the watershed and the PRM site was partly selected based on their preferences.

3.1 Watershed Description

3.1.1 Lower Catawba River Basin (8-Digit HUC 03050103)

The Mitigation Site is located in the Lower Catawba River basin (8-Digit HUC 03050103). The basin drains 927 square miles to the section of the Catawba River downstream of Lake Wylie and upstream of Wateree Lake. The lower portion of the Catawba River in this watershed consists of a series of impoundments, including Fishing Creek Reservoir, Great Falls Reservoir, and Cedar Creek Reservoir. Notable tributaries in the basin include Sugar Creek, Twelve Mile Creek, Cane Creek, Rocky Creek, Camp Creek and Beaver Dam Creek. The watershed drains from Mecklenburg County in North Carolina, as well as York, Lancaster, Chester and a small portion of Fairfield County in South Carolina.

The watershed is within the Piedmont United States Environmental Protection Agency (hereinafter “EPA”) Level III Ecoregion (Figure 3). Level IV Ecoregions in the watershed include the Carolina Slate Belt in the eastern third and the Southern Outer Piedmont for the remainder of the watershed (Figure 3). Piedmont stream valleys are typically narrow and divided by rolling or steep hillslopes.

According to the United States Geological Survey (hereinafter “USGS”) National Land Cover Dataset for 2011, approximately 28% of the watershed has been developed. The northern part of the watershed, east of the Catawba River, encompasses much of the Charlotte-Mecklenburg Metropolitan area in North Carolina, which extends into South Carolina. This area of the watershed is highly developed and continues to grow rapidly. The northwest portion of the watershed is also partially developed as the City of Rock Hill, South Carolina is growing as part of the greater Charlotte area. Forest, shrub/scrub and herbaceous vegetation together are the dominant land cover types, constituting 55% of the watershed. Agriculture makes up about 15% of the land cover and approximately 1% of the watershed is wetlands. Although much of the watershed is forested, managed pine plantations are a major land use in the watershed (NRCS 2010).

Recent changes in land cover from 1992 to 2011 were analyzed for the Lower Catawba River basin (8-Digit HUC 03050103). During this 19-year period, the developed area increased for the Lower Catawba River basin, from approximately 14% to 28%. As previously stated, the increase in developed areas during this time period has most likely been the result of expansion from areas such as the Cities of Charlotte, North Carolina and Rock Hill, South Carolina. As well, the “panhandle” of Lancaster County has grown and it is almost completely urbanized (NRCS 2010). Urban areas have the most potential to impact aquatic resources, including the endangered Carolina heelsplitter (*Lasmigona decorata*). The threat of impacts from these urbanized areas are only projected to increase.

3.2 Land Use and Potential for Growth

Land use surrounding the Mitigation Site is predominantly silviculture, rural single-family residential development, recreational and undisturbed forest. Landsford Canal State Park and Landsford Canal Forest Legacy Area WMA are located immediately south of the Mitigation Site and share a property line with the Mitigation Site; the Catawba River is located immediately east of the Mitigation Site and constitutes a property line of the Mitigation Site. The Mitigation Site is a top priority for protection due to its adjacency to these

resources. Further, the Mitigation Site is under threat from development from nearby municipalities such as Rock Hill.

Protecting lands and natural resources within the Mitigation Site will limit any commercial and/or industrial and/or residential and/or silvicultural encroachments, thereby preserving land and aquatic resources within the Lower Catawba River basin. Further, the Mitigation Site provides a unique opportunity to not only improve water quality and protect valuable habitat, but to also provide public benefit through expanding the acreage of a South Carolina Department of Natural Resources (hereinafter "SCDNR") WMA.

3.3 Watershed Needs and Threats

According to the SCDNR *Comprehensive Wildlife Conservation Strategy: 2005 – 2010*, loss and fragmentation of habitat have been identified as a major threat to many of the species listed as threatened and endangered in South Carolina. As a result, SCDNR biologists have identified habitat protection as one of the most important actions to ensure the protection of South Carolina priority species. The location of the Mitigation Site is ideal for land conservation efforts and the preservation and protection of habitat due to its connectivity to diverse terrestrial and aquatic habitats and other protected lands. If left unprotected, the Mitigation Site is in danger of continued loss and/or fragmentation and/or conversion of habitat.

Historically, the Piedmont Ecoregion plant community would have been dominated by oaks (*Quercus spp.*) and hickories (*Carya spp.*), with associated tree species varying by slope and soil moisture. However, a large portion of the forest cover within the Ecoregion is composed of planted pine (*Pinus spp.*) plantation which differs significantly in the diversity of plant and animal life it supports in comparison to native mixed hardwood forests. Erosion and subsequent sedimentation are significant and widespread non-point source pollution problems associated with forestry. The Mitigation Site will establish and/or protect natural hardwood communities in areas that have historically been managed for forestry.

Between the 1780s and the 1980s, South Carolina lost 27% of its wetlands to human activity (Dahl 1990). South Carolina is in the top six states for the most extensive wetlands losses in the United States since the 1970s (Mitsch and Gosselink 1993). Historically, in the Catawba River basin, many riparian areas were modified and hydrologic regimes have been altered due to land use practices.

Further, unintended long-term consequences of poor land use practices in the Piedmont has led to the degradation of stream valleys and aquatic resources. Diminished farmlands were abandoned and left susceptible to erosion, which has altered the geomorphology and hydrology regime (James 2011). Some of the impacts to streams and wetlands include severe erosion, excessive sediment loadings, lack of sufficient woody debris, stream channelization and channel/bank instability.

The Cecil sandy clay loam soil series located within the Mitigation Site is classified as eroded. Erosion within the Mitigation Site is associated with steep to moderate slopes on uplands and is directly associated with forestry. The Mitigation Site will promote the exchange of surface waters and provide filtration of floodwaters within the watershed and will enhance aquatic resource buffers by establishing natural hardwood communities in areas that have historically been managed for forestry. These activities should result in a reduction of on-site erosion.

3.4 Water Quality Issues and Needs

In 2013, the Catawba River was regarded as the fifth most endangered river in the United States and a significant portion of the surface water in the Catawba-Wateree basin does not meet basic water quality standards (Catawba Riverkeeper, 2014). The primary water quality concern in the Lower Catawba River basin (8-Digit HUC 03050103) is fecal coliform (hereinafter “FC”). The South Carolina Department of Health and Environmental Control (hereinafter “SCDHEC”) monitors approximately 75 water quality stations (permanent and random) in the watershed. In North Carolina, the North Carolina Department of Environment and Natural Resources monitors approximately 64 water quality monitoring stations. Four of those water quality monitoring stations in the Lower Catawba River basin (8-Digit HUC 03050103) were on South Carolina’s 2012 Section §303(d) list for impairment due to FC bacteria. However, twenty-one of the deficient stations are being addressed through eight approved FC Total Maximum Daily Loads (hereinafter “TMDL”), issued by the EPA. These South Carolina TMDLs include Camp Creek, Cane Creek, Catawba River Tributary, Catawba River-Rocky Creek, Fishing Creek, Grassy Run Branch, Steele Creek and Waxhaw Creek. As for North Carolina, ten monitoring stations were on the North Carolina 2012 Section §303(d) list for impairment due to FC bacteria and ten of these stations are incorporated in North Carolina’s Irwin, Sugar, Little Sugar and McAppline Creeks TMDL for FC.

Other concerns in the Catawba River basin include biological, nutrients (total phosphorus and total nitrogen), dissolved oxygen and turbidity impairments. Specifically, within South Carolina, twenty-two stations are impaired for total phosphorous, eleven stations have aquatic life impairments for macroinvertebrates, seven stations are impaired for dissolved oxygen, six stations are impaired for total nitrogen, 5 stations are impaired for turbidity, three stations are impaired for copper, and one station is impaired for chlorophyll-a. As of 2012, TMDLs had not been written for these impairments and thus remained impaired on South Carolina’s 2012 303(d) list. In the North Carolina portion of the Catawba River basin, there is one TMDL developed for turbidity and one TMDL developed for dissolved oxygen. Additionally, there are 17 monitoring stations that have aquatic life impairments for macroinvertebrates, five stations are impaired for copper, two stations are impaired for turbidity, one station is impaired for dissolved oxygen, and other stations are impaired for various aquatic life uses.

Altogether, there are a variety of causes for these water quality problems, as the impaired stations are spread throughout the basin. Some primary causes of these impairments are bad development practices and effects of population growth (Catawba Riverkeeper). One area of concern for water quality in the basin is the development around the City of Charlotte, North Carolina. The area is of particular concern because of the expansion throughout the headwaters of the basin, which has the potential to impact water quality (for example, dissolved oxygen demand, FC and sedimentation) downstream throughout the basin. This makes protection and restoration of streams in the headwaters of the basin a priority for maintaining downstream water quality. As well, agricultural and timbering practices are also significant causes of concern in the lower parts of the Catawba River basin (Catawba Riverkeeper).

4.0 Permittee-Responsible Mitigation Plan

4.1 Goals and Objectives

The goal of the Mitigation Site is to preserve, enhance and/or restore streams and wetlands associated with the Catawba River, unnamed tributaries of the Catawba River, and the Lower Catawba River watershed to provide compensatory mitigation for adverse impacts to wetlands, streams and/or other aquatic resources

authorized by the Department of the Army permit associated with Project Inspector. Specific goals of the Mitigation Site include:

- Preserve, enhance and/or restore stream channels and wetlands that connect hydrology and ecology within the Lower Catawba River watershed;
- Enhance impaired stream channels by creating reconnected floodplains at existing bankfull stage;
- Enhance impaired stream channels by implementing bioengineering techniques using natural material and vegetative cover;
- Utilize the natural channel design approach to replace impaired stream channels with stable stream channel geometry suitable for the valley type;
- Raise streambed elevations where appropriate, thereby establishing bankfull stage at, and providing regular access to, the historic floodplain and potentially raising water levels within the immediate adjacent landscape;
- Construct instream structures designed to provide grade control and reduce instream energy;
- Create instream habitat and increase benthic habitat diversity;
- Enhance the hydroperiod of a hydrologically impaired wetland;
- Preserve natural hardwood communities located within aquatic resource buffers;
- Enhance aquatic resource buffers by establishing natural hardwood communities in areas that have been managed for forestry;
- Manage invasive species within aquatic resources and aquatic resource buffers;
- Promote the exchange of surface waters and provide filtration of floodwaters within the Lower Catawba River watershed;
- Convert forestry land use to conservation land use; and
- Permanently protect 114.6 acres of land within the Lower Catawba River watershed and immediately adjacent to the Catawba River, Landsford Canal Forest Legacy Area WMA and Landsford Canal State Park.

Table 1 provides a description of the mitigation activities. Figure 4 depicts the mitigation units for the Mitigation Site.

Table 1. Mitigation Activities

Type of Mitigation	Amount (linear feet or acres)	Mitigation Activity
Unit 1: Stream Preservation Catawba River, UT 2 (Section 4), UT 3 (Section 4), UT 4 and UT 5	5,790	Preserve functional channels
Unit 2: Stream Enhancement UT 1 (Sections 1, 2 and 3), UT 2 (Section 3) and UT 3 (Section 3)	9,314	Enhance hydrology along tributaries; create reconnected floodplains at existing bankfull stage; implement bioengineering techniques using natural material and vegetative cover; promote the exchange of surface waters and provide filtration of floodwaters within the watershed
Unit 3: Stream Restoration UT 1 (Section 4), UT 2 (Section 1), UT 2 (Section 2) and UT 3 (Sections 1 and 2)	4,736	Create stable stream channel geometry suitable for the valley type; raise streambed elevations where appropriate, thereby establishing bankfull stage at, and providing regular access to, the historic floodplain and potentially raising water levels within the immediate adjacent landscape; create instream habitat and increase benthic habitat diversity; promote the exchange of surface waters and provide filtration of floodwaters within the watershed
Unit 4: Wetland Enhancement	2.81	Plug and/or fill a ditch
Wetland Restoration	1.5 – 3 acres (estimated)	Create seasonal pool wetlands within abandoned channels and/or restoration of hydrology and vegetation through stream restoration activities. Note, these areas will be further defined in the Final PRM Plan following detailed soil analysis and stream restoration design.
Aquatic Resource Buffers	Preservation = 51.09 Enhancement = 52.26	Preserve intact native hardwood forest communities within aquatic resource buffers; remove pine from within aquatic resource buffers and plant native hardwood trees; manage invasive species within aquatic resource buffers; establish protected habitat within the watershed

4.2 Site Selection

A detailed discussion of the criteria used to determine the suitability of the property as a mitigation site is provided below. A description of the factors considered, including aquatic habitat diversity, habitat connectivity, relationships to hydrologic sources, land use trends, ecological benefits and compatibility with adjacent land uses is included in this discussion. In general, suitable mitigation sites meet the criteria listed below. Factors considered during the site selection process are included in *italics* following each listed criterion.

- Property Acreage – Mitigation sites are typically best suited for large parcels of land that contain a large quantity and variety of aquatic resources. *The Mitigation Site is ±114.6 acres. The entire Landsford Tract is proposed for protection and public use through other mechanisms.*
- Property Owners – Sites with one property owner, family, or corporation are ideal to minimize or avoid lengthy coordination with multiple property owners. *The rights necessary to own and operate the Mitigation Site are owned by one entity, which minimizes the extent of property owner*

coordination. The Mitigation Site will eventually be deeded to the SCDNR to be managed as a WMA or State Parks.

- Proximity to Proposed Impact Areas – Mitigation sites should be located within or adjacent to the 8-Digit HUC in which the anticipated impacts are expected to occur. *The Mitigation Site is located within the same 8-Digit HUC and Level III and IV Ecoregion as the Impact Site.*
- Land Use Trends – Sites adjacent to industrial, commercial, or high-density land uses are typically not suitable for mitigation. *Land use surrounding the Mitigation Site is predominantly silviculture, rural single-family residential development, recreational and undisturbed forest. Landsford Canal State Park and Landsford Canal Forest Legacy Area WMA are located immediately south of the Mitigation Site and share a property line with the Mitigation Site.*
- Preservation, Enhancement and Restoration Potential – Suitable mitigation sites typically have a combination of preservation, enhancement and/or restoration of streams and/or wetlands. Properties with historic alterations, such as agricultural ditches or silviculture, are generally the most appropriate for mitigation. *Sections of stream channel suitable for preservation exist on-site. However, the Mitigation Site has historically been used, and is currently being used, for recreation and silviculture. Past land management practices and changes in the watershed have caused significant degradation of on-site streams and hydrologic impairment of the on-site wetland. Therefore, substantial opportunities for ecological uplift through stream and wetland enhancement and restoration activities are present on-site.*
- Ecological Benefit – Mitigation sites typically demonstrate an ecological benefit to the watershed. *Mitigation activities will preserve functional streams, will enhance or restore impaired stream and wetland systems and will establish natural vegetative communities within protected buffers and upland habitat. Several tributaries to the Catawba River are wholly contained within the Mitigation Site and will be enhanced or restored and permanently protected.*
- Habitat Connectivity – Mitigation sites typically demonstrate a connection of aquatic and terrestrial habitat through protection of major wetland complexes, headwater tributaries and wide riparian corridors. *The Mitigation Site is directly connected to already conserved lands.*

The 114.6-acre Mitigation Site is located directly adjacent to Landsford Canal State Park and Landsford Canal Forest Legacy Area WMA to the south and the Catawba River to the east (Figure 2). Input from land trusts and conservation organizations was obtained during the site selection process and it was determined that the Mitigation Site is a top priority for protection due to adjacency to already protected lands and threat from development from nearby municipalities such as Rock Hill. The Mitigation Site provides a unique opportunity to not only improve water quality and protect valuable habitat, but to also provide public benefit through expanding the acreage of a WMA or State Park.

4.2.1 Hydrologic Sources and Water Rights

All on-site tributaries drain to UT 1; UT 1 drains to the Catawba River. For planning purposes, it is assumed that UT 1 (Sections 1 and 2) constitutes a property boundary for a majority of its extent. Therefore, channel alterations and instream work are not being proposed for UT 1 (Sections 1 and 2). Enhancement work being proposed for UT 1 (Sections 1 and 2) generally entails streambank stabilization and/or grading, widening portions of the floodplain at the existing channel elevation and bankfull stage to reduce shear stress, and/or streambank plantings. All proposed enhancement work will occur on-site, along the left streambank. Therefore, proposed mitigation activities will not adversely affect adjacent property owners.

No work is being proposed within the Catawba River, and all remaining on-site tributaries originate on-site and their respective subwatersheds are fully or primarily contained on-site. Therefore, water rights and hydrologic trespass are not affected by the proposed mitigation activities and implementation of the mitigation activities will not adversely affect adjacent property owners.

4.2.2 Protected Species

Historic land use practices have modified vegetation types, habitats and aquatic resources that caused losses of wildlife in the Lower Catawba River basin, as in most of the South Carolina Piedmont. For example, the historic dominant vegetation type in the Southern Piedmont was likely oak and hickory dominated forest. Land use changes and disturbances have altered this forest type, and much of the remaining oak- hickory forest is now pine-dominated forest. A list of wildlife, aquatic and plant species that are federally threatened or endangered in the watershed is found in Table 2.

The Lower Catawba River basin is host to the Carolina heelsplitter, a rare and federally endangered species that is listed as a G1 status by NatureServe, meaning that it is “Critically Imperiled”. Much of the basin in South Carolina and North Carolina is thought to have been part of the mussel species’ historic range. Water quality issues related to land-use change (for example, intense agricultural and silviculture, urban development, wastewater and stormwater discharge), watershed fragmentation by impoundments and eroded sediments have greatly diminished Carolina heelsplitter habitat. The surviving populations are now relegated to small, isolated tributaries where the habitat has not been severely degraded.

Table 2. Federally Threatened or Endangered Species in the Catawba River Basin

Common Name (<i>Latin Name</i>)	Status
WILDLIFE SPECIES	
Arctic peregrine falcon (<i>Falco peregrinus tundrius</i>)	Recovery
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Recovery
Brown pelican (<i>Pelecanus occidentalis</i>)	Recovery
Red-cockaded woodpecker (<i>Picoides borealis</i>)	Endangered
Red wolf (<i>Canis rufus</i>)	Endangered
AQUATIC SPECIES	
Carolina heelsplitter (<i>Lasmigona decorata</i>)	Endangered
PLANT SPECIES	
Black spored quillwort (<i>Isoetes melanospora</i>)	Endangered
Dwarf-flowered heartleaf (<i>Hexastylis naniflora</i>)	Threatened
Georgia aster (<i>Symphyotrichum georgianum</i>)	Candidate
Little amphianthus (<i>Amphianthus pusillus</i>)	Threatened
Schweinitz’s sunflower (<i>Helianthus schweinitzii</i>)	Endangered
Smooth coneflower (<i>Echinacea laevigata</i>)	Endangered

The mitigation activities are anticipated to have no effect on the aforementioned species.

4.3 Site Protection

Upon project approval, a conservation easement will be placed on the Mitigation Site as shown in Figure 4. It is anticipated that Katawba Valley Land Trust will be the easement holder. Following implementation of the mitigation activities and documentation of project success, the Mitigation Site will then be transferred to SCDNR or State Parks, which would assume long-term management and ownership obligations.

4.4 Permittee-Responsible Mitigation Site Baseline Conditions

Preliminary baseline data has been collected to determine the ecological suitability of the Mitigation Site to achieve the goals and objectives outlined in Section 4.1 above. The following presents a detailed description of the baseline conditions at the Mitigation Site.

4.4.1 Ecoregion

The Mitigation Site and the Impact Site are both located within the Piedmont, defined by the EPA as Level III Ecoregion 45. This Ecoregion comprises a transitional area between the mountainous Ecoregions of the Appalachians to the northwest and the relatively flat coastal plain to the southeast (Griffith et al., 2002). The Piedmont Ecoregion is considered to be the non-mountainous portion of the old Appalachians Highlands, consisting of dissected irregular plains and some hills (Griffith et al., 2002). Historically, the area was largely cultivated; however, now much of the region is planted pine or has reverted to successional pine and hardwood woodlands. Historic oak-hickory-pine forests were dominated by Northern White Oak (*Quercus alba*), Southern Red Oak (*Quercus falcata*), Post Oak (*Quercus stellata*), various species of Hickory, Shortleaf Pine (*Pinus echinata*), Loblolly Pine (*Pinus taeda*) and Virginia Pine (*Pinus virginiana*). Soils generally tend to be finer textured than in the adjacent coastal plain Ecoregion.

Manipulation of the landscape for forestry, agriculture and/or recreation is common in the Piedmont Ecoregion. While the altered ecological communities throughout the Piedmont Ecoregion are suitable for stream and wetland restoration and/or enhancement projects, the preservation of existing aquatic communities is also an ecological benefit for the Ecoregion. The preservation, enhancement and restoration of on-site resources will benefit the Ecoregion by providing filtration of sediments and nutrients, flood attenuation, shade to surface waters and riparian corridors for wildlife.

4.4.2 Existing Wetlands and Waters

A delineation and GPS location of wetlands and other waters of the United States (i.e. tributaries) was conducted for the Landsford Tract by Palustrine Group, LLC personnel in accordance with the methodology outlined in the Eastern Mountains and Piedmont Regional Supplement to the 1987 Corps of Engineers Wetland Delineation Manual (hereinafter "Supplement"). The Supplement was used to collect baseline hydrology, vegetation and soils data. The delineation field work was completed on October 14, 2019. Refer to Appendix A for a Request for Corps Jurisdictional Determination (JD) / Delineation package. Delineated aquatic resources are depicted on Figure 5. Based on the delineation and GPS location effort, the Mitigation Site contains an estimated 19,840 linear feet of jurisdictional stream (including 2,714 linear feet of frontage along the Catawba River) and 2.81 acres of jurisdictional wetland located within the Catawba River floodplain. Soil throughout the wetland and Catawba River floodplain are mapped as the Toccoa loam series, an identified hydric soil for Chester County according to Natural Resources Conservation Service records. Soils throughout

the upland vary, but are generally sandier with higher chroma and value.

4.4.3 Topography

LiDAR data was obtained for the Mitigation Site (Figure 6); a USGS topographic map is included as Figure 7. Overall, the Mitigation Site ranges in elevation (according to available LiDAR information) from approximately 613 feet to approximately 446 feet. In general, the overall topography slopes away from the north and west and towards the south and east. Ultimately, all on-site floodplain valleys and associated streams drain east to the Catawba River.

Riparian buffer slopes are generally between 10 – 20% along stream reaches located outside of the Catawba River floodplain. Riparian and upland buffer slopes are generally between 0 – 5% along the Catawba River and stream reaches located within the Catawba River floodplain. The Mitigation Site generally exhibits a 1.3 – 1.4% grade within streams and floodplains.

4.4.4 Stream and Wetland Conditions

Reaches and the wetland are depicted on Figure 4. Refer to Appendix B for representative photographs of stream reaches.

Stream Conditions

Stream Preservation – Catawba River, UT 2 (Section 4), UT 3 (Section 4), UT 4 and UT 5

The Catawba River forms the eastern property and Mitigation Site boundary. The Catawba River is a 3rd+ order perennial relatively permanent water. A 150-foot riparian buffer will be established along the right streambank of the Catawba River. This buffer is currently comprised of approximately 60% mixed upland forest and 40% planted pine.

UT 2 (Section 4) is a 1st order seasonal unnamed tributary which flows into UT 1. This reach is approximately 1 – 2 feet deep on average with an average width of approximately 5 feet. This reach is stable and has a diverse substrate of bedrock, boulders and cobble. This reach consists of approximately 1,540 linear feet of stream channel. A 150-foot riparian buffer currently consisting of a diverse mixed upland forest will be established around this reach.

UT 3 (Section 4) is a 1st order seasonal unnamed tributary which ultimately flows into UT 1. This reach is approximately 0.5 feet deep on average with an average width of approximately 3 feet. This reach is stable. This reach consists of approximately 1,058 linear feet of stream channel. A 150-foot riparian buffer currently consisting of a diverse mixed upland forest will be established around this reach.

UT 4 is a 1st order seasonal unnamed tributary which flows into UT 3. This reach is approximately 0.5 feet deep on average with an average width of approximately 3 feet. This reach is stable. This reach consists of approximately 111 linear feet of stream channel. A 150-foot riparian buffer currently consisting of a diverse mixed upland forest will be established around this reach.

UT 5 is a 1st order seasonal unnamed tributary which flows into UT 3. This reach is approximately 0.5 feet deep on average with an average width of approximately 3 feet. This reach is stable. This reach consists of

approximately 367 linear feet of stream channel. A 150-foot riparian buffer currently consisting of a diverse mixed upland forest will be established around this reach.

Stream Enhancement – UT 1 (Sections 1 and 2), UT 2 (Section 3) and UT 3 (Section 3)

UT 1 (Section 1) is a 2nd order perennial unnamed tributary which flows directly into the Catawba River. This 1,655 linear foot reach is approximately 5 – 7 feet deep on average (from the thalweg to the top of bank) with an average width of approximately 18 feet (from toe of slope to toe of slope). This reach is in the latter stages of channel evolution, having adjusted vertically so that the bed elevation has been lowered and the historic floodplain has been abandoned, and having adjusted laterally resulting in widening and areas of bank instability. Currently, the channel width appears to have stabilized and to have begun to decrease as bank material and sediment build bank toe benches and bars within the over widened floodplain. A 150-foot riparian buffer currently consisting predominantly of a diverse mixed upland forest is located around the left streambank of this reach.

UT 1 (Section 2) is a 1st and 2nd order perennial unnamed tributary which flows directly into the Catawba River. This 4,974 linear foot reach is approximately 6 – 8 feet deep on average (from the thalweg to the top of bank) with an average width of approximately 9 feet (from toe of slope to toe of slope). This reach is in the intermediate stages of channel evolution, having adjusted vertically so that the bed elevation has been lowered and the historic floodplain has been abandoned. It appears that lateral adjustments are currently being made as portions of this reach are experiencing bank instability and failure, bank erosion and scour, undercutting and tree loss. A 150-foot riparian buffer will be established along the left streambank of this reach. This buffer is currently comprised of approximately 30% mixed upland forest and 70% planted pine.

UT 2 (Section 3) is a 1st order perennial unnamed tributary which flows into UT 1. This reach is approximately 2 – 4 feet deep on average with an average width of approximately 9 – 10 feet. The upstream 1,597 linear foot portion of this reach is experiencing moderate bank degradation and tree loss. The downstream 799 linear foot portion of this reach is experiencing moderate bank degradation and appears to be aggrading based on significant sand deposition in this reach. A 150-foot riparian buffer currently consisting predominantly of planted and naturally regenerating pine is located around this reach.

UT 3 (Section 3) is a 1st order seasonal unnamed tributary which ultimately flows into UT 1. This reach is approximately 0.5 – 1 foot deep on average with an average width of approximately 4 feet. Portions of this reach are experiencing minor bank degradation, primarily along streambanks located on the outside of meander bends. This reach consists of approximately 289 linear feet of stream channel. A 150-foot riparian buffer currently consisting of a diverse mixed upland forest will be established around this reach.

Stream Restoration – UT 1 (Sections 3 and 4), UT 2 (Sections 1 and 2) and UT 3 (Sections 1 and 2)

UT 1 (Section 3) is a 1st order perennial unnamed tributary which flows directly into the Catawba River. This reach is incised approximately 6 – 8 feet on average with an average width of approximately 4 – 6 feet. This reach is experiencing significant bank degradation, with banks typically being vertical with minimal vegetative cover. This reach does not have any floodplain access. This reach consists of approximately 10 linear feet of stream channel. A 150-foot riparian buffer currently consisting predominantly of planted and naturally regenerating pine is located around this reach.

UT 1 (Section 4) is a 1st order seasonal unnamed tributary which flows directly into the Catawba River. This

reach is incised approximately 6 – 8 feet on average with an average width of approximately 4 – 5 feet. This reach is experiencing significant bank degradation, with banks typically being vertical with minimal vegetative cover. This reach does not have any floodplain access. This reach originates at an approximate 7 – 8 foot headcut. This reach consists of approximately 1,214 linear feet of stream channel. A 150-foot riparian buffer currently consisting of a diverse mixed upland forest will be established around this reach.

UT 2 (Section 1) is a 1st order perennial unnamed tributary which flows into UT1. This reach is incised approximately 6 – 7 feet on average with an average width of approximately 15 feet. This reach is experiencing significant bank degradation, mass wasting, tree-fall and lateral expansion. This reach consists of approximately 521 linear feet of stream channel. A 150-foot riparian buffer will be established along this reach. This buffer is currently comprised of approximately 40% mixed upland forest and 60% planted pine.

UT 2 (Section 2) is a 1st order perennial unnamed tributary which flows into UT1. This reach is incised approximately 4 – 7 feet on average with an average width of approximately 8 – 10 feet. The upstream 1,097 linear foot portion of this reach is experiencing significant active bank erosion and tree-fall. Banks are typically vertical with minimal vegetative cover. The downstream 931 linear foot portion of this reach is experiencing significant bank degradation, mass wasting, tree-fall and lateral expansion. A 150-foot riparian buffer currently consisting predominantly of planted and naturally regenerating pine is located around this reach.

UT 3 (Section 1) is a 1st order perennial unnamed tributary which flows into UT 1. This reach is incised approximately 4 feet on average with an average width of approximately 4 – 5 feet. This reach is experiencing moderate bank degradation, with banks typically being vertical with minimal vegetative cover. This reach does not have any floodplain access. This reach consists of approximately 28 linear feet of stream channel. A 150-foot riparian buffer currently consisting predominantly of planted and naturally regenerating pine is located around this reach.

UT 3 (Section 2) is a 1st order seasonal unnamed tributary which ultimately flows into UT 1. This reach is incised approximately 4 feet on average with an average width of approximately 4 – 5 feet. This reach is experiencing moderate bank degradation, with banks typically being vertical with minimal vegetative cover. This reach does not have any floodplain access. This reach consists of approximately 935 linear feet of stream channel. A 150-foot riparian buffer currently consisting of a diverse mixed upland forest will be established around this reach.

Low Gradient Stream Assessment Data Sheet Scores

Existing stream conditions were documented using the USACE Charleston District Low Gradient Stream Assessment Data Sheet. Results of the assessment are included in Table 3; the Low Gradient Stream Assessment Data Sheets are included in Appendix C. Reach locations are shown on Figure 4. Refer to Appendix B for representative photographs of on-site stream resources.

Table 3. Existing Stream Conditions

Reach	Mitigation Type	Score	Functional Assessment
Catawba River	Preservation	18.75	Fully Functional
UT 1 (Section 1)	Enhancement	12.5	Partially Impaired
UT 1 (Section 2)	Enhancement	14	Partially Impaired
UT 1 (Section 3)	Restoration	9	Impaired
UT 1 (Section 4)	Restoration	9	Impaired
UT 2 (Section 1)	Restoration	8	Impaired
UT 2 (Section 2) Upper*	Restoration	9	Impaired
UT 2 (Section 2) Lower**	Restoration	10	Impaired
UT 2 (Section 3) Upper*	Enhancement	11.5	Partially Impaired
UT 2 (Section 3) Lower**	Enhancement	12	Partially Impaired
UT 2 (Section 4)	Preservation	16	Fully Functional
UT 3 (Section 1)	Restoration	9.5	Impaired
UT 3 (Section 2)	Restoration	9.5	Impaired
UT 3 (Section 3)	Enhancement	15	Partially Impaired
UT 3 (Section 4)	Preservation	16	Fully Functional
UT 4	Preservation	16	Fully Functional
UT 5	Preservation	16	Fully Functional

*Upper refers to the upstream portion of the reach.

**Lower refers to the downstream portion of the reach.

The functional assessment forms were completed for compliance with the USACE Charleston District 2010 mitigation guidelines as well as to provide an indication of the quality and impairment in the streams. According to the 2010 mitigation guidelines, “partially impaired” indicates stability and resilience of the stream reach has been compromised, to a limited degree, through partial loss of one or more of the integrity functions. Systems with partial impairment could recover naturally, particularly if the source of impairment is removed. According to the 2010 mitigation guidelines, “impaired” indicates that there is a moderate loss of stream stability and resilience characterized by loss of at least one integrity function. Recovery is unlikely to occur naturally for impaired stream systems, and further damage is likely unless restoration is undertaken.

Wetland Conditions

Wetland Enhancement

The on-site wetland is comprised of a diverse canopy of hardwood wetland species. However, the hydroperiod of the on-site wetland is being impaired by a ditch that is partially excavated within the wetland and that drains to the Catawba River. Refer to Appendix D for historic aerial photographs depicting the ditch. A 150-foot upland buffer currently consisting predominantly of planted pine is located around the wetland.

4.4.5 Hydrology

Following acceptance of this PRM Plan, water level (i.e. stream) gauges (HOBO Onset loggers or similar) and one groundwater well (HOBO Onset logger or similar) will be installed within stream channels to monitor stream surface water levels and within the on-site wetland to monitor surface and sub-surface water levels, respectively. Water profile measurements will be utilized to develop hydrographs. A rain gauge will be installed on-site as well; rain data will be correlated to stream and wetland data. Refer to Section 4.9.2 for additional details of the Baseline Data Collection Plan.

4.4.6 Water Quality

Following acceptance of this PRM Plan, in-situ water quality measurements will be taken, and turbidity and fecal coliform samples will be collected. Refer to Section 4.9.2 for additional details of the Baseline Data Collection Plan.

4.4.7 Benthic Macroinvertebrates

Following acceptance of this PRM Plan, benthic macroinvertebrates will be collected. Refer to Section 4.9.2 for additional details of the Baseline Data Collection Plan.

4.4.8 Woody Debris

Following acceptance of this PRM Plan, a qualitative evaluation of the frequency and size distribution of woody debris will be conducted. Refer to Section 4.9.2 for additional details of the Baseline Data Collection Plan.

4.5 Determination of Credits

Possible mitigation activities are outlined in Section 4.6. The potential number of credits generated by the mitigation activities is listed in Table 4; the number of credits generated by the mitigation activities is based on the USACE 2010 mitigation guidelines. Mitigation worksheets are included in Appendix E.

Table 4. Potential Credit Production

Mitigation Activity	Credits Generated
Stream Preservation	4,292.9
Stream Enhancement	21,979.7
Stream Restoration	19,409.3
Total Stream Credits	45,681.9
Wetland Enhancement	9.84
Wetland Restoration*	5.70
Total Wetland Credits	15.54

*Note, wetland restoration will be further defined following detailed soil analysis and stream restoration design. Credits are estimated.

Stream compensatory mitigation factors are outlined in Table 5.

Table 5. Stream Compensatory Mitigation Factors

Factor	Catawba River	UT 2 (Section 4), UT 3 (Section 4), UT 4 and UT 5	UT 1 (Section 1)	UT 1 (Section 2)	UT 2 (Section 3)	UT 3 (Section 3)	UT 1 (Section 3), UT 2 (Section 2), and UT 3 (Section 1)	UT 2 (Section 1)	UT 1 (Section 4) and UT 3 (Section 2)
Stream Type	All Other Streams	Non-RPWs	1 st & 2 nd Order RPW	1 st & 2 nd Order RPW	1 st & 2 nd Order RPW	Non-RPW	1 st & 2 nd Order RPWs	1 st & 2 nd Order RPW	Non-RPWs
Priority Category	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Net Improvement	Not Applicable	Not Applicable	Moderate	Moderate	Significant	Moderate	Maximum	Maximum	Maximum
Credit Schedule	Concurrent	Concurrent	Concurrent	Concurrent	Concurrent	Concurrent	Concurrent	Concurrent	Concurrent
Location	8-Digit HUC	8-Digit HUC	8-Digit HUC	8-Digit HUC	8-Digit HUC	8-Digit HUC	8-Digit HUC	8-Digit HUC	8-Digit HUC
Riparian Buffer	150-ft. (2x Minimum) One-Side Only 60% Preservation 40% Enhancement	150-ft. (Minimum) Both Banks Preservation	150-ft. (2x Minimum) One-Side Only 95% Preservation 5% Enhancement	150-ft. (Minimum) One-Side Only 30% Preservation 70% Enhancement	150-ft. (Minimum) Both Banks Enhancement	150-ft. (Minimum) Both Banks Preservation	150-ft. (Minimum) Both Banks Enhancement	150-ft. (2x Minimum) Both Banks 40% Preservation 60% Enhancement	150-ft. (Minimum) Both Banks Preservation

Wetland compensatory mitigation factors are outlined in Table 6.

Table 6. Wetland Compensatory Mitigation Factors

Factor	Enhancement	Restoration (Estimated)
Net Improvement	1.5	2.0
Upland Buffer	150-ft. (3:1 Ratio)	150-ft. (3:1 Ratio)
Credit Schedule	Concurrent	Concurrent
Temporal Loss	0 to 5 Years	10 to 20 Years
Kind	In-Kind	In-Kind
Location	8-Digit HUC	8-Digit HUC

4.6 Mitigation Work Plan

Resources within the Mitigation Site have been divided into mitigation units to address existing conditions, proposed activities and target conditions. The mitigation units included in the Mitigation Site are depicted on Figure 4 and are included in Table 1. Representative photographs of resources and existing impairments are included in Appendix B.

4.6.1 Mitigation Units

The following provides a description of the proposed work that could occur in each mitigation unit and/or stream reach.

Unit 1: Stream Preservation – Catawba River, UT 2 (Section 4), UT 3 (Section 4), UT 4 and UT 5

Catawba River

Stream preservation is proposed for the Catawba River, as it is a fully functional channel with no anthropogenic alterations. A 150-foot riparian buffer (2x's the minimum required buffer) will be established along the right streambank of the Catawba River. This buffer is currently comprised of approximately 60% mixed upland forest and 40% planted pine. The mixed upland forest community will be preserved, whereas planted pine will be removed from within the buffer and the cleared area will be replanted with a diverse mix of native hardwood upland species.

UT 2 (Section 4), UT 3 (Section 4), UT 4 and UT 5

Stream preservation is proposed for UT 2 (Section 4), UT 3 (Section 4), UT 4 and UT 5, as these are fully functional channels with minimal or no anthropogenic impacts. A 150-foot riparian buffer (the minimum required buffer) will be established around these reaches. The buffer currently consists of a diverse mixed upland forest that will be preserved.

Unit 2: Stream Enhancement – UT 1 (Sections 1 and 2), UT 2 (Section 3) and UT 3 (Section 3)

Stream enhancement is being proposed for Unit 2 reaches, as these streams are partially impaired. In general, the impairments include a lack of floodplain access, segments of bank instability and a lack of bank vegetation. Various forms of modification will be used to address these impairments, and may include

removal of woody debris from within the stream channel and/or minor modification of channel dimension and/or profile based on reference reach data. However, it is anticipated that the majority of the enhancement work will entail streambank stabilization and/or grading, widening portions of the floodplain at the existing channel elevation and bankfull stage to reduce shear stress, and/or streambank plantings. Floodplain benches may be excavated along the streambanks of the existing channels at the elevation of the existing bankfull stage. Bioengineering techniques using natural material and vegetative cover may be implemented, and may include any combination of live stakes, brush mattresses, vegetated geogrids and/or soil lifts with plantings and/or brush toe wood. Upon approval of this PRM Plan, survey and analysis of each enhanced stream channel will be completed.

Portions of the riparian buffer consisting of a diverse mix of native hardwoods along UT 1 (Sections 1 and 2) will be preserved, as will the native hardwood riparian buffer along UT 3 (Section 3). Portions of the riparian buffer consisting predominantly of pine along UT 1 (Section 1 and 2) and UT 2 (Section 3) will be enhanced by removing the pine from within the buffer and replanting the cleared areas with a diverse mix of native hardwood upland species.

Unit 3: Stream Restoration – UT 1 (Sections 3 and 4), UT 2 (Sections 1 and 2) and UT 3 (Sections 1 and 2)

Unit 3 stream channels are proposed for restoration of pattern, profile and dimension. Upon approval of this PRM Plan, detailed survey and analysis of each restored stream channel will be completed in an effort to design new channels that transport their water and sediment flows without degrading or aggrading and that are suitable for the valley type. Most of these channels are currently in a state of flux, displaying evidence of significantly entrenched flows and degraded channel banks. Generally, these channels will be restored so that bankfull and higher discharges are able to access adjacent floodplains that, in their current state, are rarely utilized due to channel incision. Excavated material from newly restored channels, as well as adjacent spoil material, will be placed in the abandoned channels or used to raise channel bed elevations. Instream structures designed to provide grade control and reduce instream energy will be constructed, and instream habitat will be created in an effort to increase benthic habitat diversity.

Portions of the riparian buffer consisting of a diverse mix of native hardwoods along UT 2 (Section 1) will be preserved, as will the native hardwood riparian buffer along UT 1 (Section 4) and UT 3 (Section 2). Portions of the riparian buffer consisting predominantly of pine along UT 2 (Section 1), as well as the riparian buffers along UT 1 (Section 3), UT 2 (Section 2) and UT 3 (Section 1), will be enhanced by removing pine from within the buffers and replanting the cleared areas with a diverse mix of native hardwood upland species.

Reference Reach and/or Survey

Every effort will be made to identify an on-site reference reach or reaches to aid with stream enhancement and/or restoration design and metrics. A geomorphic assessment, hydrological modeling and hydraulic analysis will be performed for each identified on-site reference reach. In addition, applicable regional curve data and reference reach ratios will be compiled. This information will be used to establish geomorphic ratios and design metrics for the enhancement and/or restoration reaches, to determine final performance standards, and to facilitate documentation of functional lift for the enhanced and/or restored stream systems.

Unit 4: Wetland Enhancement

The wetland proposed for preservation exhibits hydric soils and hydrophytic vegetation comprised of native wetland hardwood canopy and subcanopy species. However, a ditch is affecting the hydrology of the wetland (refer to Appendix D). The hydroperiod will be naturalized by plugging and/or filling the ditch. Wetland areas disturbed by construction will be planted if needed. A 150-foot upland buffer currently consisting predominantly of planted pine is located around the wetland. The planted pine will be removed and the cleared area will be replanted with a diverse mix of native hardwood upland species.

Seasonal Pool Wetlands

Existing incised channels may be filled with spoil material that is excavated from channel banks and/or from construction of restored channels. Portions of the existing incised channels may not be filled with excavated soil, or may not be completely filled with excavated soil. If an existing incised channel is not filled with excavated soil, then the abandoned channel banks will be graded to a stable slope and natural grade. These areas will be further defined in the Final PRM Plan following detailed soil analysis and stream restoration design. It is anticipated that the abandoned channels will revert to seasonal pools that provide habitat for numerous flora and fauna, and that may eventually exhibit wetland parameters of hydric soil, hydrology and hydrophytic vegetation.

Wetland Restoration

Stream restoration activities may restore historic floodplain wetland hydrology and wetland vegetation within portions of the Mitigation Site. These areas will be further defined in the Final PRM Plan following detailed soil analysis and stream restoration design.

Construction Documents

Prior to commencing work, construction documents will be prepared for the Mitigation Site and mitigation activities. The construction documents may include information on the following:

- Construction methods, timing and sequence;
- Source(s) of water, including connections to existing waters and uplands;
- Methods for establishing the desired plant community and planting details;
- Plans to control invasive plant species;
- Grading and soil management plans;
- Stream channel plan(s), profile(s) and representative cross-section(s);
- Representative details for stream structures;
- Access road plans;
- Coordination with, and approval from, the Federal Emergency Management Agency, if necessary; and
- Erosion control and maintenance of streamflow measures.

During the construction phase of the proposed mitigation activities, appropriate measures will be taken to minimize or avoid impacts to aquatic resources and fauna. Measures may include, but may not be limited to, the following:

- Prior to beginning any land disturbing activity, appropriate erosion and siltation control measures (i.e. silt fences or barriers) must be in place and maintained in a functioning capacity until the area is permanently stabilized.
- Inspections of temporary erosion control measures should occur on a regular basis to safeguard against failures.
- All necessary measures must be taken to prevent oil, tar, trash and other pollutants from entering rivers, creeks, streams, wetlands or other waters.
- Once the project is initiated, it must be carried to completion in an expeditious manner to minimize the period of disturbance to the environment.
- Upon project completion, all disturbed areas must be permanently stabilized with vegetative cover or other erosion control methods as appropriate.

4.6.2 Riparian and Upland Buffer Enhancement

A 150-foot riparian or upland buffer will be placed around all stream reaches and the wetland, respectively. Buffers areas that are being proposed for preservation consist of intact, native, hardwood dominated forest communities. The vegetative community within multiple areas of the buffers has been altered, and either consists of a predominant planted pine overstory or a successional forest community dominated by a naturally recruited pine overstory with a mixed hardwood understory. These portions of the riparian and upland buffers will be improved by removing and/or thinning the pine and planting the areas with native hardwood upland species. Refer to Figure 4 for a depiction of buffer enhancement areas. Native hardwood bare-root seedlings will be planted within the riparian and upland buffers during the dormant season (winter months, outside of the growing season) to maximize survival. Seedlings will be planted on ten-foot by ten-foot spacing at a density of approximately 440 stems per acre. A proposed planting palette will be provided in the Final Mitigation Plan. Prior to planting, site preparation will be performed, and may include herbicide application, root rake and removal (or piling) of woody debris and/or burning. Pine stumps will be left in place; however, it may be necessary to use a shear blade in some areas to increase the chance of seedling survival. Enhancement activities will also include monitoring and managing invasive species within the buffers in a manner that will support the continued functions and values for which the Mitigation Site was established. All timber operations will cease within the buffers. Mitigation activities will enhance aquatic resources and buffers by establishing natural hardwood communities in areas that have historically been converted to other uses.

Reference Upland Vegetative Data

On-site native hardwood upland forest communities will be utilized as reference uplands for developing a proposed planting palette to be provided in the Final PRM Plan. In addition, reference species for riparian and upland buffer plantings may be taken from species known to persist throughout these habitat types in the South Carolina Piedmont.

4.6.3 Access Road

Access to and within the Mitigation Site is necessary for purposes of construction, long-term management and monitoring. Therefore, a gated access road from Landsford Road may be constructed within the Landsford Tract. Note, the constructed access road will not impact the Mitigation Site where mitigation credits are being generated. Site contours and slopes will be considered when determining final road placement and Best Management Practices will be followed. Road placement, construction methods and sediment and erosion control measures will be fully documented in the construction documents. Once constructed, the

access road will be maintained and monitored. Existing roads that provide access within the Landsford Tract will remain, and will be maintained and monitored.

4.6.4 Invasive Species Management

Invasive species threaten the diversity and abundance of native species populations through competition for resources, predation, parasitism, interbreeding with native populations, transmission of diseases and introduction of physical or chemical alterations to the invaded habitat. As a result, invasive species will be monitored and managed during the monitoring period in a manner that will support the continued functions and values for which the Mitigation Site was established. Invasive species management may include prescribed herbicide applications, following label recommendations, and/or stem treatments and/or mechanical cutting or hand labor clearing, as needed. The location and approximate coverage of invasive species will be generally documented during walk-through surveys. Additional actions to control invasive species will be evaluated and prioritized in coordination with the regulatory agencies if needed.

4.7 Maintenance Plan

The following maintenance will be required to ensure the continued viability of the Mitigation Site. Until success has been documented, the regulatory agencies will be notified if any issues develop on the Mitigation Site that requires maintenance. The extent of the issue, measures taken to correct the issue, and whether the issue has been resolved will be documented in an annual monitoring report.

Access Road and Gate

Access to the Mitigation Site is necessary for purposes of long-term management and monitoring. Therefore, as outlined in Section 4.6.3, a gated access road may be constructed within the Landsford Tract. Once constructed, the access road and gate will be maintained and monitored. The condition of the road and gate will be documented in annual monitoring reports. Recommendations will be provided for correcting all identified deficiencies including, but not limited to, repairing or replacing the gate and/or repairing roadway water control features such as broad-based dips, turnouts and turn ups and/or rolling dips. When necessary, recommendations for maintaining the access road and gate will be provided in the long-term management report. Actions specified in the recommendations will not be implemented until approval is received. Vehicular travel (including off-road motorcycles and all-terrain vehicles) within the Landsford Tract will be strictly prohibited except along the proposed access road. No motorized vehicles will be allowed within the Mitigation Site.

Signage

Signs will be posted and maintained at regular intervals along the conservation easement boundary. Posted signs will state that the Mitigation Site is protected by a conservation easement and that vehicular travel (including off-road motorcycles and all-terrain vehicles) is strictly prohibited. Posted signs will be inspected during walk-through assessments. Damaged signs will be repaired or replaced on an as-needed basis.

Hardwood Planting Zones

Volunteer species will be documented in planting zones. Maintenance may include removing or thinning unacceptable volunteers with the use of herbicide treatments and/or small mechanical equipment. Proposed

planting zone, planting methods and palettes, and a list of acceptable volunteer species, will be provided in the Final PRM Plan.

Supplemental Plantings

Potential maintenance measures may include supplemental plantings within planting zones. If a planting area does not meet vegetative performance standards, the reason for plant mortality will be identified and supplemental plantings will be added based on the specified density and palette.

Wildlife Management

On-going site maintenance may include wildlife management (specifically for beavers and hogs). If any beaver, hog or other animal or activity detrimental to mitigation areas is found, an adaptive management plan will be provided that ensures management/removal throughout the monitoring period. All adaptive management activities will be documented and discussed in each monitoring report.

4.8 Performance Standards

Upon approval of this PRM Plan, an effort will be made to identify an on-site reference reach or reaches to aid with stream design and metrics. A geomorphic assessment, hydrological modeling and hydraulic analysis will be performed for each identified on-site reference reach. In addition, applicable regional curve data and reference reach ratios will be compiled. This information will be used to establish geomorphic ratios and design metrics for the enhancement and/or restoration reaches, to determine final performance standards, and to facilitate documentation of functional lift for the enhanced and/or restored stream systems. This information will be detailed and defined in the Final PRM Plan. A general discuss on performance standards follows.

Stream Performance Standards

Stream Dimension

Maintenance of a stable cross-section and the ability for high flows (i.e. bankfull) to access the floodplain over the course of the monitoring period will generally represent success in dimensional stability of restored and/or enhanced stream channels; however, minor changes in dimension may be expected. Key parameters such as cross-sectional area and the channel's width-to-depth ratio may experience natural adjustment as side slope vegetation matures. Riffle sections should generally maintain a bank height ratio approaching 1.0 – 1.2 and entrenchment ratio approaching 2.2 or greater, with some variation in this ratio naturally occurring. Pool sections naturally adjust based on recent flows and time between flows; therefore, more variance on pool section geometry is expected.

Stream Pattern and Profile

Restored and/or enhanced channel profiles should not demonstrate significant, prolonged trends towards degradation or aggradation over a significant portion of a reach. Functional standards such as channel depth, width and width-to-depth ratios may be measured and compared to each monitoring year.

Pattern features (i.e. radius of curvature, belt width, wave length) should show little adjustment over the standard 5-year monitoring period and will be monitored to ensure adjustment is minor prior to close out. It should be noted that potential natural adjustment of channel width (i.e. lowering of channel width) may cause dimensionless ratios of pattern features to deviate slightly from design/as-built conditions.

Hydraulics

Restored channels will maintain sufficient flow throughout the monitoring period to display evidence an ordinary high-water mark in accordance with the requirements of RGL 05-05 (December 7, 2005).

Functional (Biological and Chemical)

The goal of chemical and benthic macroinvertebrate monitoring/sampling on restored streams will be to display maintenance or improvement of water quality and benthic metrics compared with existing baseline conditions over the monitoring period. It is stressed however, that mitigative measures at the PRM site cannot control natural or off-site influences that could potentially impact metric results.

Wetland Performance Standards

Wetland Enhancement

The hydrologic wetland enhancement unit (Unit 4) will be monitored pre- and post-construction. Hydrology success will include soil saturation in the root zone for 14 consecutive days during the growing season and marked improvement over baseline. More specifically, mitigation activities will be considered successful if, over the standard 5-year monitoring period, the wetland area shows a 15% hydrologic improvement in degree, duration and/or frequency as compared to baseline data.

Seasonal Pool Wetlands

Any abandoned channels that are converted to seasonal pools will be evaluated during the 5-year monitoring period to document if wetland parameters of hydric soil, hydrology and hydrophytic vegetation develop. If appropriate, performance standards will be developed for these areas and will be defined in the Final PRM Plan.

Wetland Restoration

Stream restoration activities may restore historic floodplain wetland hydrology and wetland vegetation within portions of the Mitigation Site. These areas will be further defined in the Final PRM Plan following detailed soil analysis and stream restoration design. If appropriate, performance standards will be developed for wetland restoration areas and will be defined in the Final PRM Plan.

Riparian and Upland Buffer Enhancement Performance Standards

Proposed riparian and upland buffer enhancement performance standards are outlined in Table 7.

Table 7. Riparian and Upland Buffer Performance Standards

RIPARIAN AND UPLAND BUFFER ENHANCEMENT	Vegetation				
	Monitoring Years 1 – 4	By the 5 th Monitoring Year			
	Consistent increase in height, lateral growth & root collar diameter	Density of 260 trees/ acre	< 1% non- native or invasive species	< 25% of a single species	Trees must average 5'-7' in height
Enhancement (Planting)	✓	✓	✓	✓	✓

When measuring performance of vegetation, desirable volunteer species will be factored into target density. A list of acceptable volunteer species will be provided in the Final PRM Plan.

4.9 Monitoring Requirements

4.9.1 Monitoring Reports

An annual monitoring report will be submitted prior to March 1st of each year for a period of five years. If success has not been achieved after five years, reporting will be continued at an interval to be determined by the regulatory agencies until all performance standards have been met. The report will include a narrative that provides an overview of site conditions and function, maps and photographs to illustrate site conditions, collected data and functional assessments used to provide quantitative and qualitative measures of functions provided by the mitigation project. Photographs will be included with dates and clear labels with the direction from which the photo was taken. Maps will show the location of the Mitigation Site, mitigation units, and the locations of photographic reference points and quadrats. The following components will be included in each monitoring report submitted after construction:

1. Name of party responsible for conducting the monitoring and the date(s) of the inspection.
2. A brief description of the approved mitigation plan and the dates when specific mitigation activities were commenced and/or completed.
3. A paragraph describing whether the Mitigation Site is developing as expected. This summary will be supported by a detailed description of each mitigation unit and an explanation of whether or not each mitigation unit is developing as expected and meeting the necessary performance standards.
4. If one or more mitigation units are not meeting the necessary performance standards, a description of the existing condition will be submitted, the reason(s) that the mitigation unit is not meeting performance standards will be identified, and a proposal to conduct remedial actions and bring the management unit into compliance with the approved mitigation plan will be submitted.
5. Dates of any corrective or maintenance activities conducted since the previous report submission.

The regulatory agencies will review the monitoring report and conduct a site inspection to determine whether or not the mitigation site is meeting the performance standards.

4.9.2 Monitoring Parameters

Baseline Data Collection Plan

Following acceptance of this PRM Plan, detailed baseline data will be collected per the proposed Baseline Data Collection Plan to document existing conditions. The Baseline Data Collection Plan (Figure 8) identifies the physical, chemical and biological data that will be collected to establish the existing degree of impairment on the Mitigation Site. Table 8 summarizes the baseline data that will be collected on the Mitigation Site. Refer to Section 4.4 for additional discussion about baseline conditions.

Table 8. Baseline Data Collection Plan

	Resource Type	Mitigation Type	Gauge or Well	Cross-Section(s) and/or Profile(s)	Vegetative Quadrat	Water Quality	Biological Monitoring	Woody Debris
Reach	Stream Mitigation							
UT 1 (Section 1)	2 nd Order Tributary	Enhancement	X	X				X
UT 1 (Section 2)	1 st and 2 nd Order Tributary	Enhancement	X	X				X
UT 1 (Section 3)	1 st Order Tributary	Restoration	X	X				X
UT 1 (Section 4)	1 st Order Tributary	Restoration		X		X	X	
UT 2 (Section 1)	1 st Order Tributary	Restoration	X	X		X	X	X
UT 2 (Section 2)	1 st Order Tributary	Restoration		X		X	X	
UT 2 (Section 3)	1 st Order Tributary	Enhancement	X	X				X
UT 3 (Section 1)	1 st Order Tributary	Restoration	X	X				X
UT 3 (Section 2)	1 st Order Tributary	Restoration		X		X	X	
UT 3 (Section 3)	1 st Order Tributary	Enhancement	X	X				X
Wetland Unit	Wetland Mitigation							
Unit 4	Palustrine Forested	Enhancement	X					
Riparian and Upland Buffer	Buffer Enhancement							
Enhancement (Planting)	Mixed Forested, Pine Dominated	Enhancement			X			
Preservation	Diverse Mixed Upland Forest	Preservation			X			

Water level (i.e. stream) gauges (HOBO Onset loggers or similar) and a groundwater well (HOBO Onset logger or similar) will be installed to monitor surface and sub-surface water levels associated with on-site streams and the on-site wetland, respectively. Water profile measurements will be utilized to develop hydrographs. A rain gauge will be installed on-site as well; rain data will be correlated to stream and wetland data.

Cross-sections and longitudinal profiles will be surveyed to document existing cross-sectional area and other geomorphic metrics. Cross-sections and longitudinal profiles may be surveyed within on-site preservation reaches if determined suitable for use as a reference for enhancement and/or restoration reaches. A detailed topographic survey of the floodplain associated with the enhancement and/or restoration reaches will be performed, as needed. Slope breaks within close proximity to stream channels will be identified, as well as channel inverts, channel banks and toe of slope, and water depths where present. Collected survey data will be tied to appropriate benchmark locations.

Vegetative monitoring quadrats (10-meter x 10-meter) will be established within the riparian and upland buffer vegetative enhancement areas. Within each quadrat, baseline vegetative monitoring will document species composition, Diameter at Breast Height, and density of all trees; density and/or estimated coverage of all exotic species, and composition and estimated coverage of shrub and herbaceous species (dominant, 10% or greater coverage). Photographs will be taken at two corners of each quadrat, facing towards the interior of the quadrat.

In-situ water quality measurements for pH, conductivity, dissolved oxygen and temperature will be taken with a YSI meter (or similar). Turbidity and fecal coliform will be sampled as well. Samples will be collected two times per year during the pre-construction monitoring period.

Benthic macroinvertebrates will be collected and sampled annually. Macroinvertebrate sampling will be based on the South Carolina Department of Health and Environmental Control's sampling protocol. Macroinvertebrates will be identified to genus, where practicable. Monitoring reports will include biotic indices for each station and a species list.

4.9.3 Monitoring Plan

To evaluate the long-term success of the Mitigation Site, annual monitoring and reporting will be performed for five years. It is anticipated that all performance standards will be met after five years; however, if specific standards are not met after five years, reporting will be continued at an interval to be determined until all performance standards have been met.

Post-construction monitoring will document the same parameters as the baseline data collection plan outlined above in Section 4.9.2 and in Section 4.4. Preservation areas will be monitored through annual inspections. Restoration and/or enhancement areas will be visually inspected bi-annually during the first year after construction, at a minimum. Inspections will occur annually at a minimum for the remainder of the monitoring period.

An as-built survey will be conducted on the enhancement reaches (as needed), on the restoration reaches and where the ditch is plugged and/or filled. The as-built survey will document locations in which elevations have significantly changed. Cross-section data will be collected annually on the stream restoration reaches to document changes in the channels after construction. Longitudinal profiles within restoration reaches will

be surveyed post-construction as needed to document success criteria. Visual inspections of all structures will be conducted twice during the first year of monitoring and annually thereafter. Photographs will be used to document significant or adverse changes.

All stream gauge and groundwater well monitoring locations will remain in the same locations as baseline monitoring to the extent practicable. The loggers will be used to track frequency and duration of flow events and surface and sub-surface water levels. Post-construction water quality data will be collected at the same locations as baseline monitoring at a frequency of four times per year (one sample per season). Post-construction benthic macroinvertebrate sampling will be performed annually using the same locations and methods as outlined in the Baseline Data Collection Plan (Section 4.9.2).

Vegetation quadrats will remain in the same locations as pre-construction. All stems or trees planted within the vegetation quadrats, along with preferred volunteer species, will be tagged, numbered, and species noted. Vegetative monitoring will occur annually between July 1st and leaf drop/end of the growing season. Data collected will include count, height, root collar diameter and lateral growth. The tag number and species will be noted. Presence and location of invasive species will be reported.

4.10 Long-Term Management Plan

The primary goal of the Mitigation Site is to create a self-sustaining natural aquatic system that achieves the intended level of aquatic ecosystem functionality with minimal human intervention, including long-term maintenance. Natural changes to the enhanced and restored streams and vegetative community that occur after all performance standards have been met, other than changes caused by non-native/invasive weeds, are not expected to require remediation. Therefore, the purpose of the Long-Term Management Plan is to (1) monitor the Mitigation Site in order to identify potential problem areas that may jeopardize the capacity of the natural aquatic system to remain self-sustaining, (2) implement reasonable measures with the funding available to maintain the self-sustaining capacity of the natural aquatic system, (3) monitor and minimize human intervention (i.e. trespassing and trash disposal) and (4) maintain access to and within the Mitigation Site for purposes of long-term management and monitoring. This Long-Term Management Plan establishes objectives, priorities and tasks to manage, monitor, maintain and report on the status of streams and wetlands and their associated buffers after all performance standards have been met.

4.10.1 Ownership of the Mitigation Site

The Mitigation Site is currently under contract for purchase. Following site due diligence, the property will be purchased and temporarily held while the mitigation activities are completed. Following implementation of the mitigation activities and documentation of project success, the Mitigation Site will be transferred to the SCDNR or State Parks, which would assume long-term management and ownership obligations.

4.10.2 Identity of Long-Term Manager

Following implementation of the mitigation activities and documentation of project success, the Mitigation Site will be transferred to SCDNR or State Parks, which would assume long-term management and ownership obligations.

4.10.3 Identification of Conservation Easement Holder

A permanent conservation easement modeled after the template provided in Appendix H of the 2010 mitigation guidelines and on the USACE Charleston District's website will serve as the basis for the protection mechanism. A conservation easement will be placed around the streams and wetlands and associated buffers shown in Figure 4. It is anticipated that Katawba Valley Land Trust will be the easementholder.

4.10.4 Funding Mechanism

The Mitigation Site is proposed to be donated to SCDNR or State Parks. Details of the management arrangement are currently being worked out and will be finalized prior to issuance of the Clean Water Act permit. It is not anticipated that a long-term endowment will be required in addition to the donation of the property.

4.11 Adaptive Management

In the event one or more of the mitigation activities fails to achieve the approved performance standards, the USACE will be notified immediately. Adaptive management activities may consist of corrective actions and additional monitoring of the Mitigation Site, implementation of an alternate PRM Plan, or the purchase of mitigation credits from an approved mitigation bank or in-lieu fee program, if available. Failure to actively pursue and implement the approved mitigation plan or to develop and implement an adaptive management plan may be grounds for modification, suspension or revocation of the associated Department of the Army authorization.

4.12 Financial Assurances

Financial assurances will be provided in the form of performance bonds for the mitigation activities. The bonds will assure performance of construction and monitoring work to preserve, enhance and/or restore the aquatic resources. The amounts of the performance bonds will be determined in conjunction with the USACE once the mitigation activities outlined in the PRM Plan have been approved.

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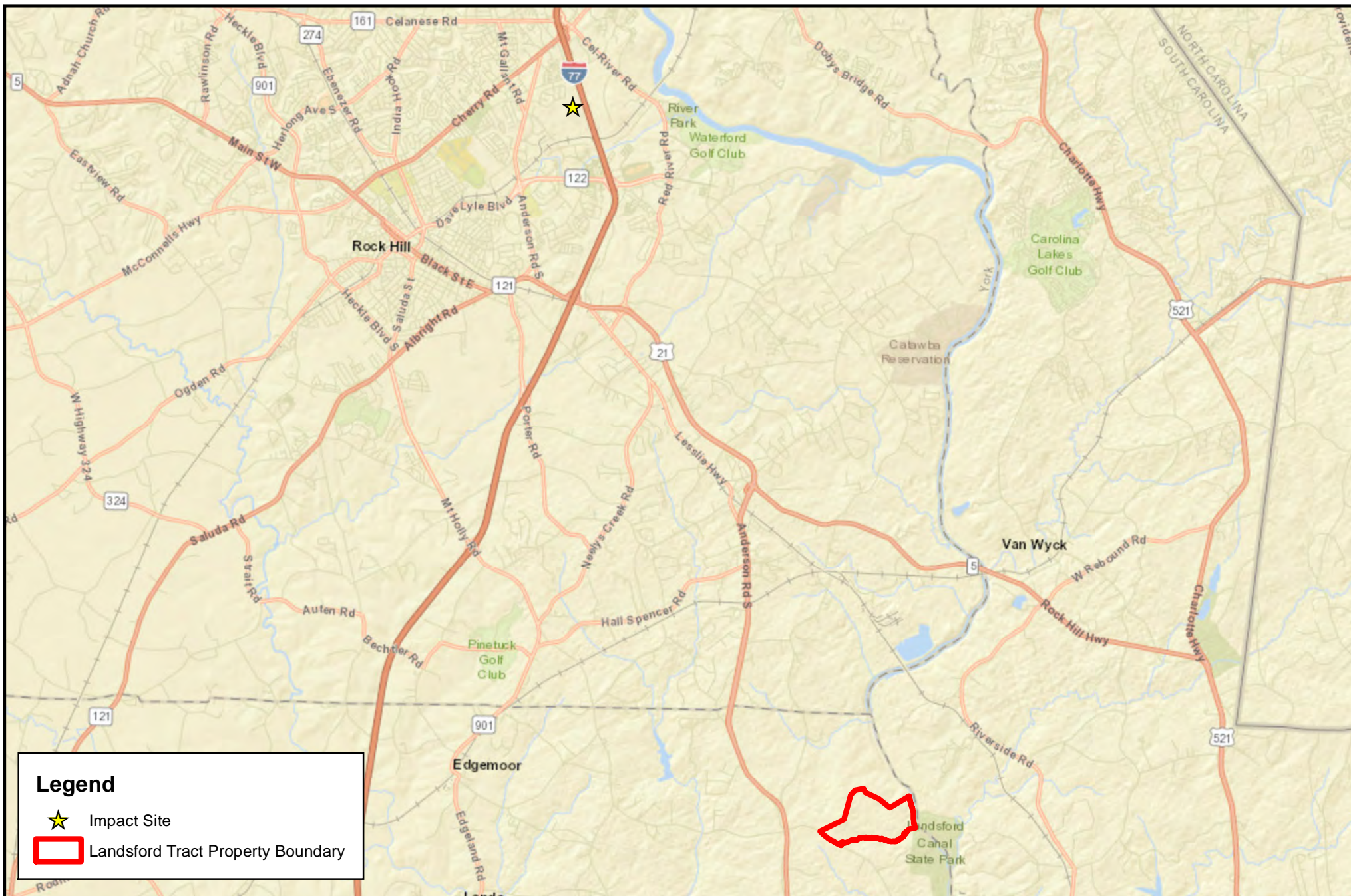
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FIGURES



Landsford Tract

Chester County
South Carolina

1 inch = 2 miles

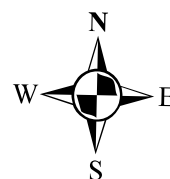
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Figure 1: Vicinity Map

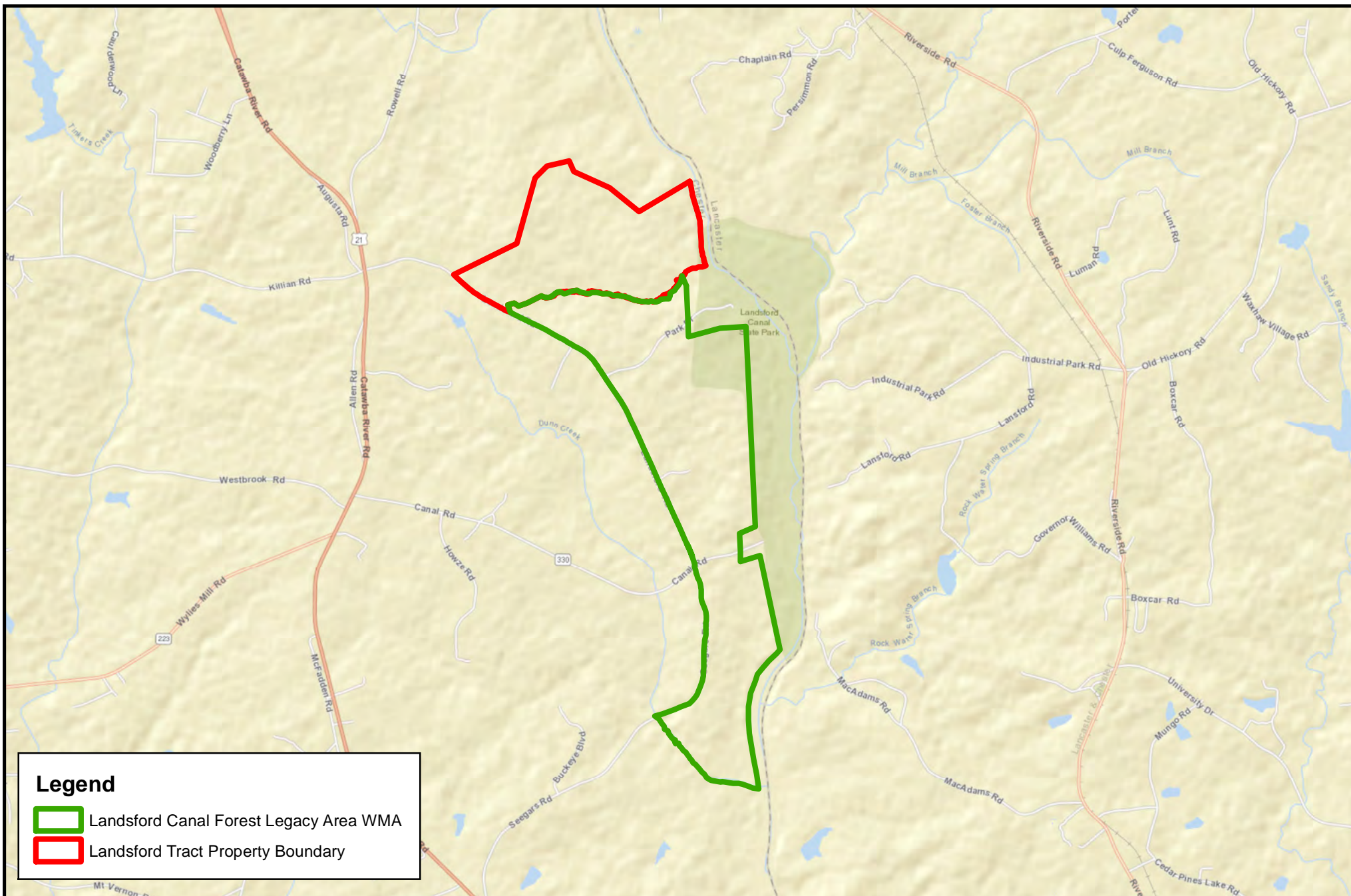
Project Inspector

Sources: ESRI

Date: October 25, 2019



Notes:



Landsford Tract

Chester County
South Carolina

1 inch = 4,000 feet

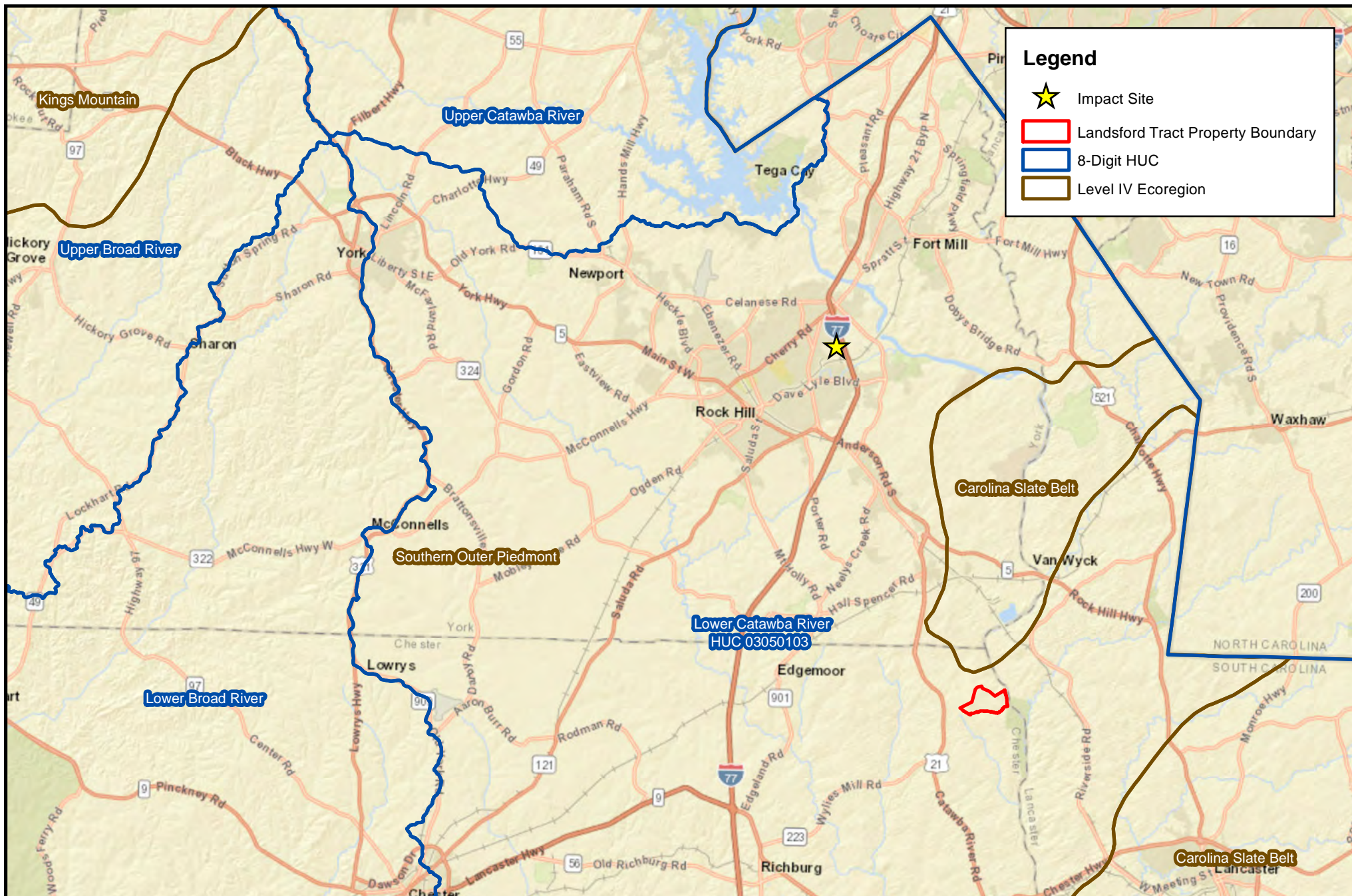
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Figure 2: Location Map

Project Inspector
Sources: ESRI, SCDNR
Date: October 25, 2019



Notes:



Landsford Tract

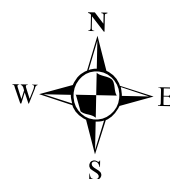
Chester County
South Carolina

1 inch = 4 miles

0 1 2 4 Miles

Figure 3: 8-Digit HUC/ Level IV Ecoregion Map

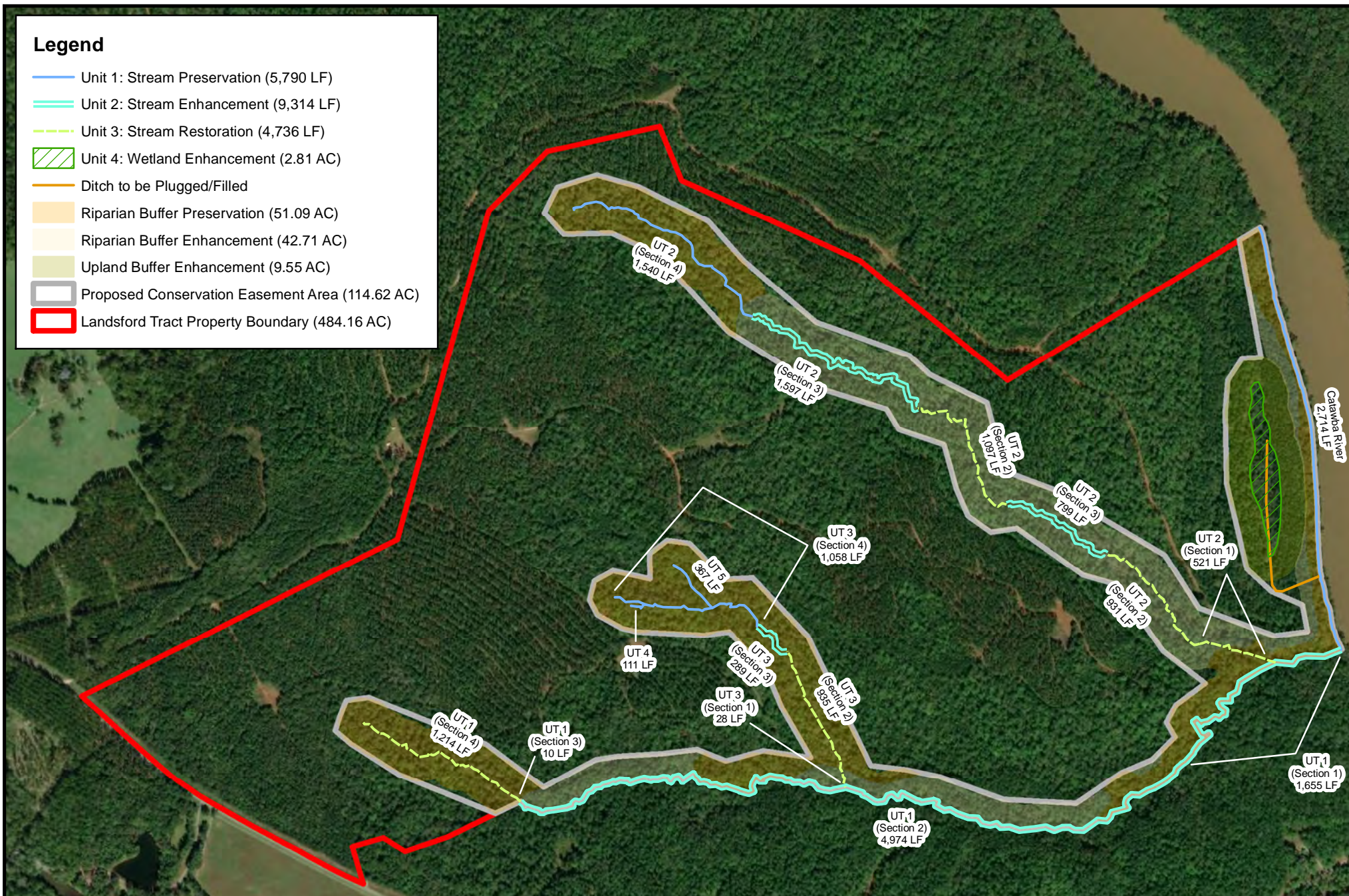
Project Inspector
Sources: ESRI, SCDNR
Date: October 25, 2019



Notes:

Legend

- Unit 1: Stream Preservation (5,790 LF)
- Unit 2: Stream Enhancement (9,314 LF)
- - - Unit 3: Stream Restoration (4,736 LF)
- ▨ Unit 4: Wetland Enhancement (2.81 AC)
- Ditch to be Plugged/Filled
- Riparian Buffer Preservation (51.09 AC)
- Riparian Buffer Enhancement (42.71 AC)
- Upland Buffer Enhancement (9.55 AC)
- Proposed Conservation Easement Area (114.62 AC)
- Landsford Tract Property Boundary (484.16 AC)



Landsford Tract

Chester County
South Carolina

1 inch = 800 feet

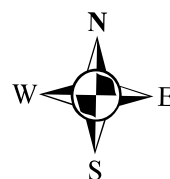
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Figure 4: Mitigation Unit Map

Project Inspector

Sources: ESRI

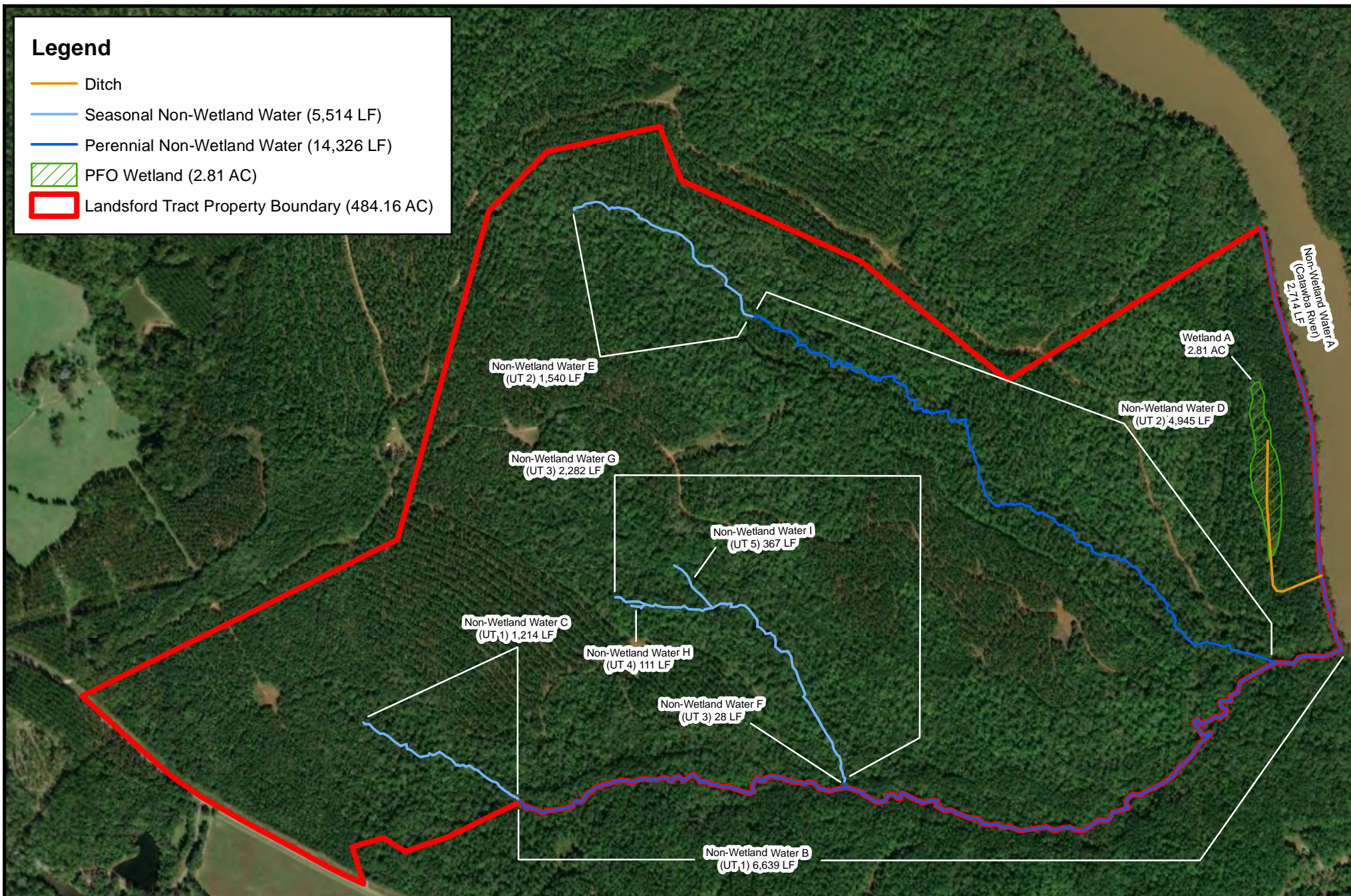
Date: October 25, 2019



Notes: Mitigation Plan subject to change pending additional baseline data collection. UT 1 centerline is the assumed property boundary.

Legend

- Ditch
- Seasonal Non-Wetland Water (5,514 LF)
- Perennial Non-Wetland Water (14,326 LF)
- PFO Wetland (2.81 AC)
- Landsford Tract Property Boundary (484.16 AC)



Landsford Tract

Chester County
South Carolina

1 inch = 800 feet

0 200 400 800 Feet

Figure 5: Waters of the US Map

Project Inspector

Sources: ESRI

Date: October 25, 2019




Notes: Delineation subject to change pending additional baseline data collection.

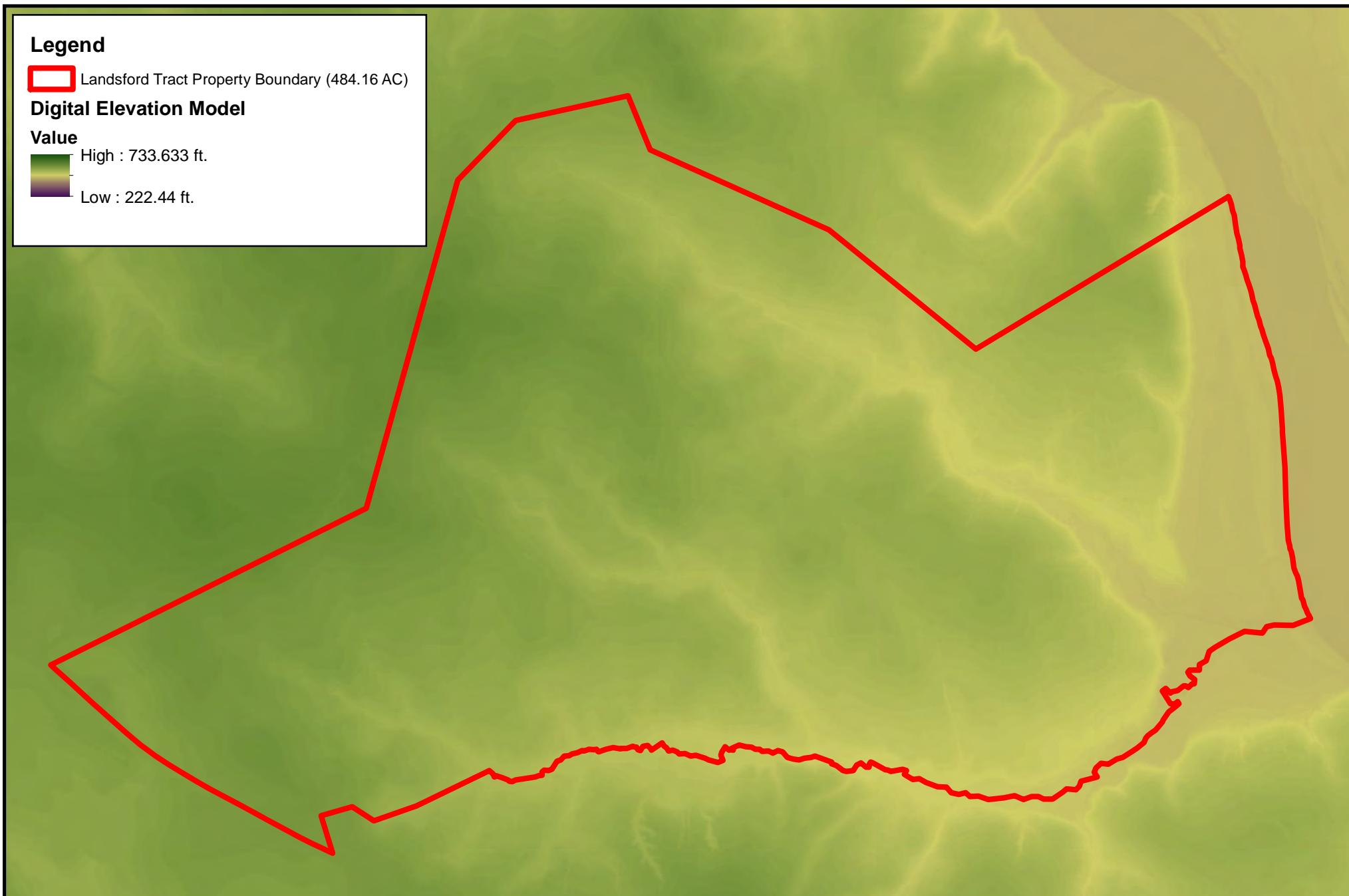
Legend

 Landsford Tract Property Boundary (484.16 AC)

Digital Elevation Model

Value

 High : 733.633 ft.
Low : 222.44 ft.



Landsford Tract

Chester County
South Carolina

1 inch = 800 feet

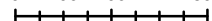
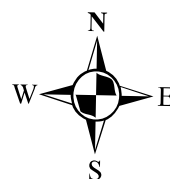
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Figure 6: LiDAR Digital Elevation Model

Project Inspector
Sources: ESRI, SCDNR
Date: October 25, 2019



Notes:

Legend

 Landsford Tract Property Boundary (484.16 AC)



Landsford Tract

Chester County
South Carolina

1 inch = 800 feet

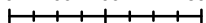
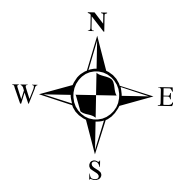
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









Figure 7: USGS Topographic Map

Project Inspector
Sources: ESRI, SCDNR
Date: October 25, 2019



Notes:

Legend

-  Groundwater Well
-  Stream Gauge
-  Rain Gauge
-  Water Quality and Benthic Macroinvertebrate
-  Vegetation Quadrat
-  Unit 1: Stream Preservation (5,790 LF)
-  Unit 2: Stream Enhancement (9,314 LF)
-  Unit 3: Stream Restoration (4,736 LF)
-  Unit 4: Wetland Enhancement (2.81 AC)
-  Ditch to be Plugged/Filled
-  Riparian Buffer Preservation (51.09 AC)
-  Riparian Buffer Enhancement (42.71 AC)
-  Upland Buffer Enhancement (9.55 AC)
-  Proposed Conservation Easement Area (114.62 AC)
-  Landsford Tract Property Boundary (484.16 AC)



Landsford Tract

Chester County
South Carolina

1 inch = 800 feet

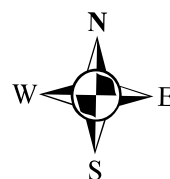
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Figure 8: Baseline Data Collection Plan

Project Inspector

Sources: ESRI

Date: October 25, 2019



Notes: Baseline Data Collection Plan subject to change pending agency approval and further site analysis. Cross-sections and longitudinal profiles not shown and to be collected as needed.

**APPENDIX A: REQUEST FOR CORPS JURISDICTIONAL
DETERMINATION (JD) / DELINEATION**

U.S. Army Corps of Engineers – Charleston District - Regulatory Division
REQUEST FOR CORPS JURISDICTIONAL DETERMINATION (JD) / DELINEATION
(For Jurisdictional Status and Identifying Wetlands and Other Aquatic Resources)

I. PROPERTY AND AGENT INFORMATION

A. Site Details/Location:

Site Name: Landsford Tract Date: October 25, 2019
City/Township/Parish: Catawba County: Chester
Latitude/Longitude: 34.797064/-80.897325 Acreage: ~ 484.16
Tax Map Sequence (TMS) #(s): Portion of 162-00-00-001-000 (survey plat to be provided at a later date)
Property Address(es): Landsford Road, Catawba, SC 29704
☒ Please attach a survey/plat map and vicinity map identifying location and review area for the JD/delineation.
An accurate depiction of the review area must be provided (survey, tax map, or GPS coordinates). Tax maps may only be used if the site includes the entire tax map parcel.

B. Requestor of Jurisdictional Determination/Delineation (if there are multiple property owners, please attach additional pages)

Name: Chris Carter
Company Name (if applicable): Palustrine Group, LLC
Address: P.O. Box 31411, Charleston, SC 29417
Phone: (864) 884-5078 Email: ccarter@palustrinegroup.com
Check one: ☐ I currently own this property
☐ I plan to purchase this property
☒ Other, please explain This tract is being purchased as a permittee-responsible mitigation site.

C. Agent/Environmental Consultant Acting on Behalf of the Requestor (if applicable):

Consultant/Agent Name: _____
Company Name: _____
Address: _____ Phone: _____
Email: _____

II. REASON FOR REQUEST (check all that apply)

- ☐ I intend to construct/develop a project or perform activities on this site which would be designed to avoid all aquatic resources.
- ☐ I intend to construct/develop a project or perform activities on this site which would be designed to avoid all jurisdictional aquatic resources under Corps authority.
- ☐ I intend to construct/develop a project or perform activities on this site which may require authorization from the Corps, and the Jurisdictional Determination would be used to avoid and minimize impacts to jurisdictional aquatic resources and as an initial step in a future permitting process.
- ☐ I intend to construct/develop a project or perform activities on this site which may require authorization from the Corps; this request is accompanied by my permit application and the jurisdictional determination is to be used in the permitting process.
- ☐ I intend to construct/develop a project or perform activities in a navigable water of the U.S. which is subject to the ebb and flow of the tide.
- ☐ A Corps jurisdictional determination is required in order to obtain my local/state authorization.
- ☐ I intend to contest jurisdiction over a particular aquatic resource and the request the Corps to confirm that jurisdiction does/does not exist over the aquatic resource on the parcel.
- ☐ I believe that the site may be comprised entirely of dry land.
- ☒ Other: This tract is being purchased as a permittee-responsible mitigation site.

*Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Program of the U.S. Army Corps of Engineers; Final Rule for 33 CFR Parts 320-332.

Principal Purpose: The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the project area subject to federal jurisdiction under the regulatory authorities referenced above.

Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in the approved jurisdictional determination (AJD), which will be made available to the public on the District's website and on the Headquarters USACE website.

Disclosure: Submission of requested information is voluntary; however, if information is not provided, the request for an jurisdictional determination cannot be evaluated nor can a jurisdictional determination be issued.

III. TYPE OF REQUEST:

- ☐ Approved¹ Jurisdictional Determination (AJD) Only
- ☒ Preliminary² Jurisdictional Determination (PJD) Only
- ☐ Approved Jurisdictional Determination (AJD) with submittal of a Pre-Construction Notification or Department of the Army permit application
- ☐ Preliminary Jurisdictional Determination (PJD) with submittal of a Pre-Construction Notification or Department of the Army permit application
- ☐ Delineation of Wetlands and/or Other Aquatic Resources Only Conducted By Agent/Environmental Consultant with submittal of a Pre-Construction Notification or Department of the Army permit application (No jurisdictional determination requested)
- ☐ I request that the **Corps delineate** the wetlands and/or other aquatic resources that may be present on my property with the attached **Pre-Construction Notification or Department of the Army permit application**
- ☐ I request that the **Corps delineate** the wetlands and/or other aquatic resources that may be present on my property **with an AJD or PJD**
- ☐ **"No Permit Required" (NPR) Letter** as I believe my proposed activity is not regulated³
- ☐ **Unclear** as to which jurisdictional determination I would like to request and require additional information to inform my decision

¹Approved – An AJD is defined in Corps regulations at 33 CFR 331.2. As explained in further detail in RGL 16-01, an AJD is used to indicate that this office has identified the presence or absence of wetlands and/or other aquatic resources on a site, including their accurate location(s) and boundaries, as well as their jurisdictional status. AJDs are valid for 5 years.

²Preliminary – A PJD is defined in Corps regulations at 33 CFR 331.2. As explained in further detail in RGL 16-01, a PJD is used to indicate that this office has identified the approximate location(s) and boundaries of wetlands and/or other aquatic resources on a site that are presumed to be subject to regulatory jurisdiction of the Corps of Engineers. Unlike an AJD, a PJD does not represent a definitive, official determination that there are, or that there are not, jurisdictional aquatic resources on a site, and does not have an expiration date.

³ "No Permit Required" (NPR) Letter– A NPR letter may be provided by the Corps to notify the requestor that an activity will not require a permit (authorization) from the Corps; this letter can only be used if the proposed activity is not a regulated activity, regardless of where the activity may occur. A NPR letter cannot be used to indicate the presence or absence of wetlands and/or other aquatic resources, nor can it be used to determine their jurisdictional status.

IV. LEGAL RIGHT OF ENTRY

By signing below, I am indicating that I have the authority, or am acting as the duly authorized agent of a person or entity with such authority, to and do hereby grant U.S. Army Corps of Engineers personnel right of entry to legally access the property(ies) subject to this request for the purposes of conducting on-site investigations (e.g., digging and refilling shallow holes) and issuing a jurisdictional determination. I acknowledge that my signature is an affirmation that I possess the requisite property rights to request a jurisdictional determination on the properties subject to this request.

P.O. Box 31411, Charleston, SC 29417

Landsford Rd., Catawba, SC 29704/162-00-00-001-000

Mailing Address

Property Address / TMS #(s)

ccarter@palustrinegroup.com

(864) 884-5078

Email Address

Daytime Phone Number

Chris B. Carter

Chris Carter 10/23/2019

*Signature:

Printed Name and Date

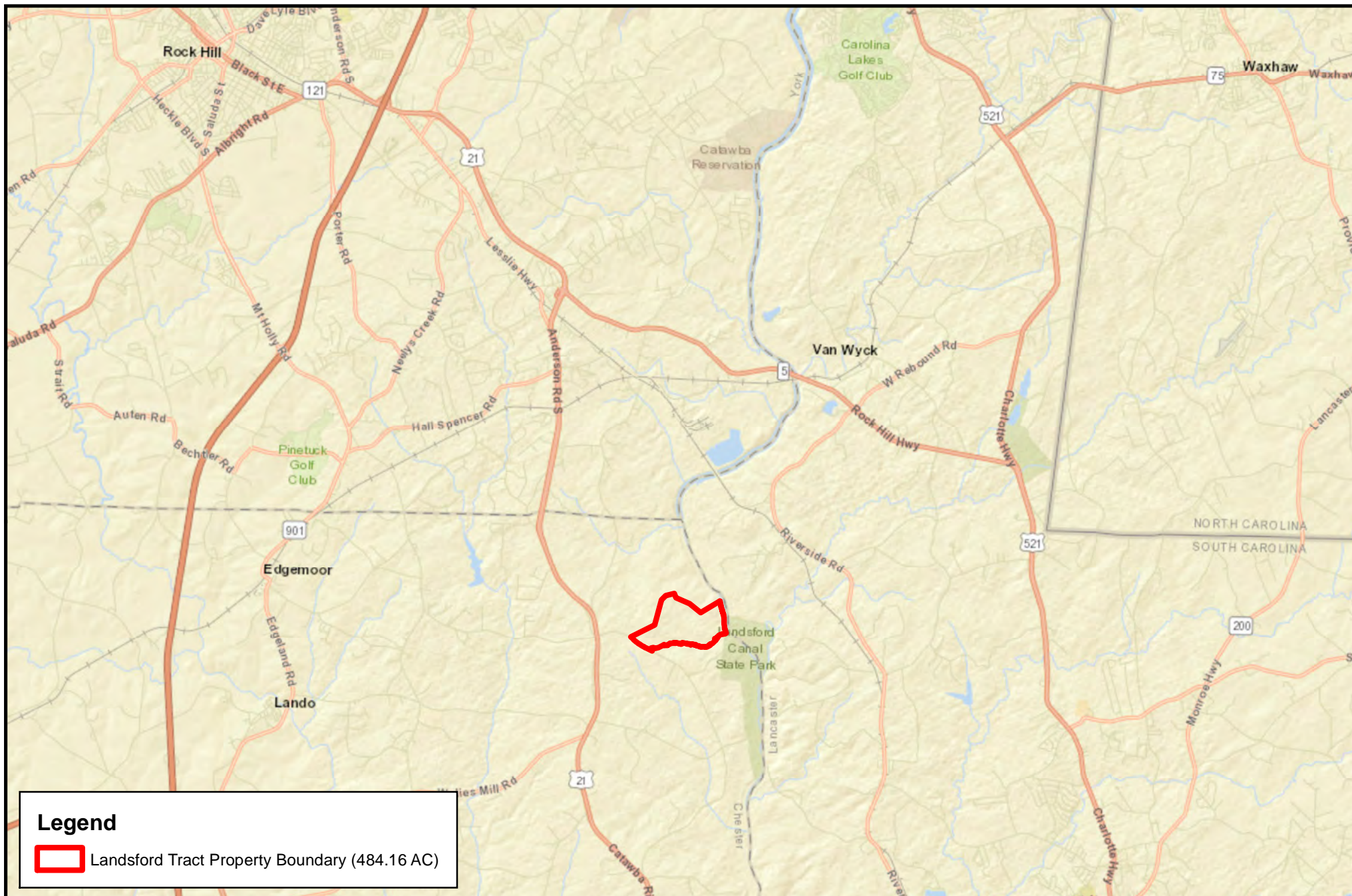
Charleston Office: US Army Corps of Engineers Regulatory Division 69A Hagood Avenue Charleston, SC 29403 (ph) 843-329-8044	Columbia Office: US Army Corps of Engineers Regulatory Office 1835 Assembly Street, Room 865 B-1 Columbia, SC 29201 (ph) 803-253-3444	Conway Office: US Army Corps of Engineers Regulatory Office 1949 Industrial Park Road, Room 140 Conway, SC 29526 (ph) 843-365-4239
--	---	--

*Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Program of the U.S. Army Corps of Engineers; Final Rule for 33 CFR Parts 320-332.

Principal Purpose: The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the project area subject to federal jurisdiction under the regulatory authorities referenced above.

Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in the approved jurisdictional determination (AJD), which will be made available to the public on the District's website and on the Headquarters USACE website.

Disclosure: Submission of requested information is voluntary; however, if information is not provided, the request for an jurisdictional determination cannot be evaluated nor can a jurisdictional determination be issued.



Landsford Tract

Chester County
South Carolina

1 inch = 2 miles

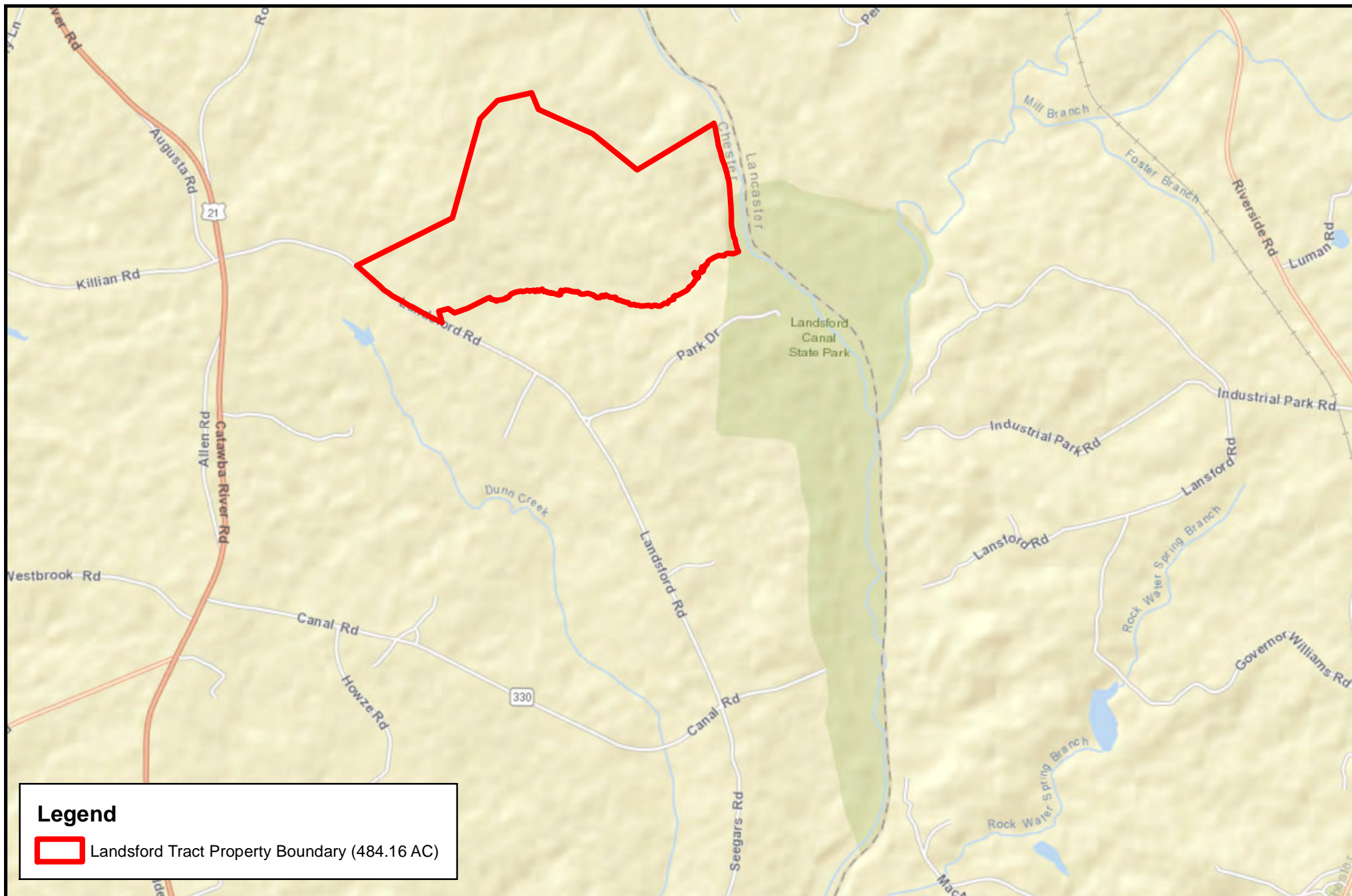
0 0.5 1 2 Miles

Figure 1: Vicinity Map

Sources: ESRI
Date: October 25, 2019



Notes:



Legend

Landsford Tract Property Boundary (484.16 AC)

Landsford Tract

Chester County
South Carolina

1 inch = 0.5 miles

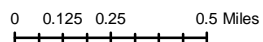
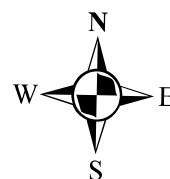


Figure 2: Location Map

Sources: ESRI
Date: October 25, 2019



Notes:

Legend

 Landsford Tract Property Boundary (484.16 AC)



Landsford Tract

Chester County
South Carolina

1 inch = 800 feet

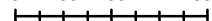
0 200 400 800 Feet


Figure 3: USGS Topographic Map

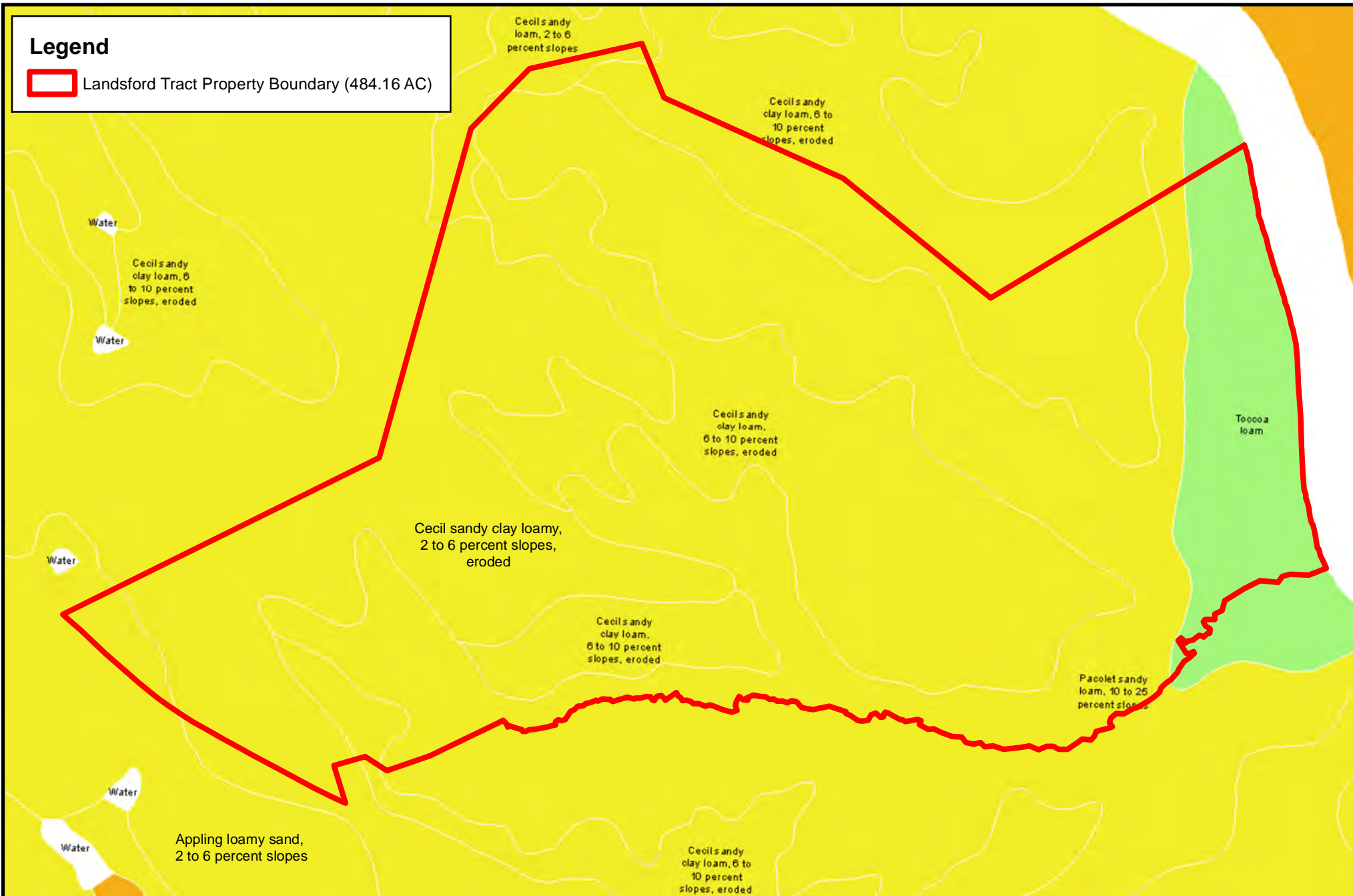
Sources: ESRI, SCDNR
Date: October 25, 2019



Notes:

Legend

 Landsford Tract Property Boundary (484.16 AC)



Landsford Tract

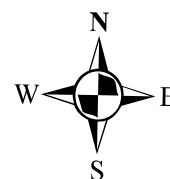
Chester County
South Carolina

1 inch = 800 feet

0 200 400 800 Feet



Figure 4: Soils Map

Sources: ESRI
Date: October 25, 2019



Notes:

Legend

-  NWI Polygon
-  Landsford Tract Property Boundary (484.16 AC)



Landsford Tract

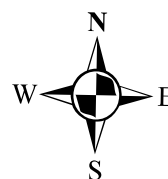
Chester County
South Carolina

1 inch = 800 feet

0 200 400 800 Feet

Figure 5: NWI Map

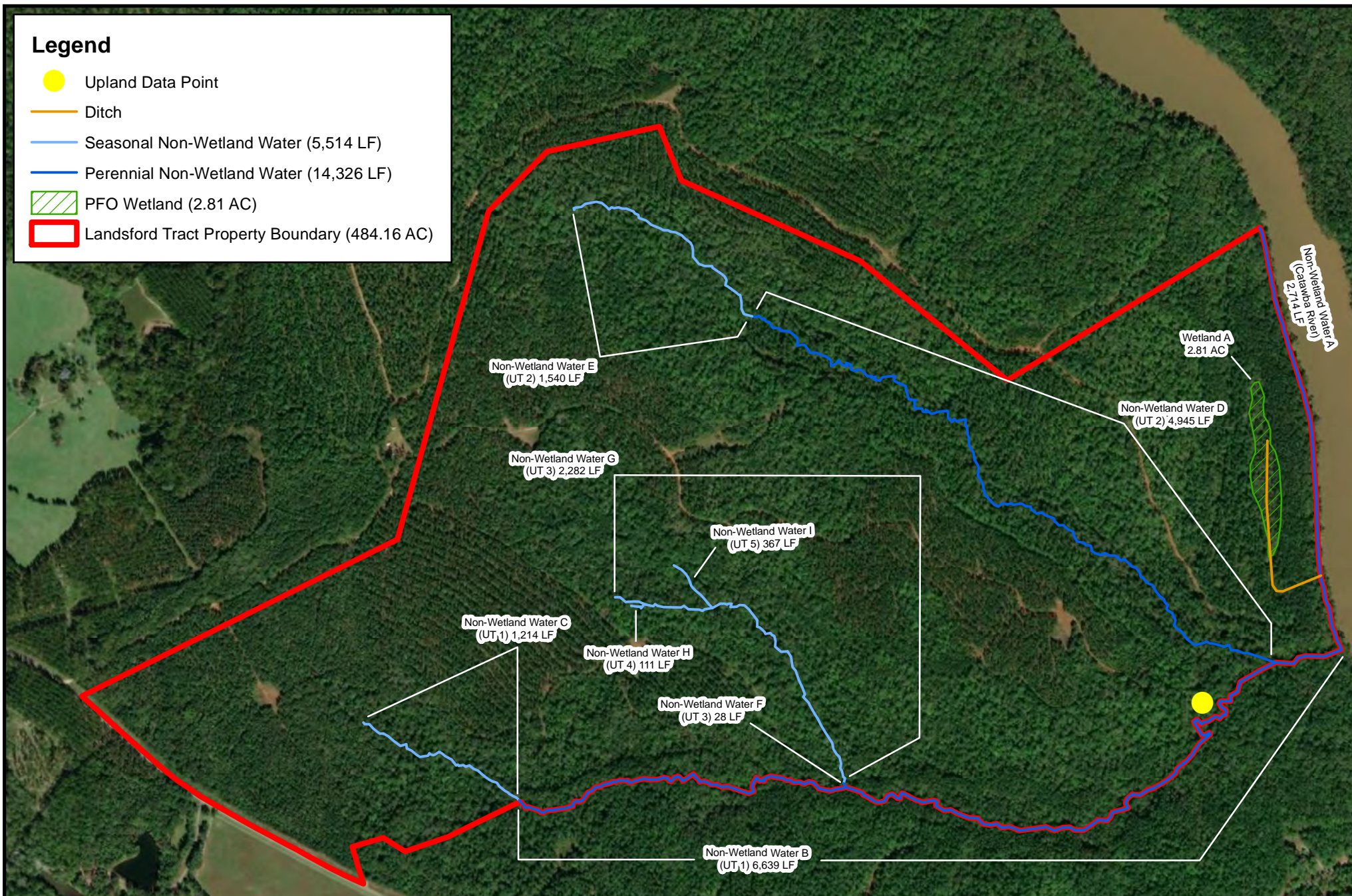
Sources: ESRI, SCDNR
Date: October 25, 2019



Notes:

Legend

- Upland Data Point
- Ditch
- Seasonal Non-Wetland Water (5,514 LF)
- Perennial Non-Wetland Water (14,326 LF)
- ▨ PFO Wetland (2.81 AC)
- ▭ Landsford Tract Property Boundary (484.16 AC)



Landsford Tract

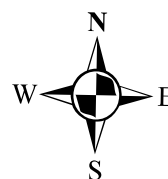
Chester County
South Carolina

1 inch = 800 feet

0 200 400 800 Feet

Figure 6: Delineated Aquatic Features Map

Sources: ESRI
Date: October 25, 2019



Notes: Delineation subject to change pending additional baseline data collection. Non-Wetland Water B (UT 1) centerline is the assumed property boundary.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Landsford Tract City/County: Catawba/Chester Sampling Date: 10/14/2019
 Applicant/Owner: Chris Carter, Palustrine Group, LLC State: SC Sampling Point: UDP
 Investigator(s): Chris Carter Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Abandoned Terrace Local relief (concave, convex, none): None Slope (%): < 1
 Subregion (LRR or MLRA): P/136 Lat: 34.797064 Long: -80.897325 Datum: NAD 83
 Soil Map Unit Name: Pacolet Sandy Loam NWI classification: U42P

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 <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Hydric Soil Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Wetland Hydrology Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Remarks:					

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)		<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____ (includes capillary fringe)		Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

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

Sampling Point: _____

Tree Stratum (Plot size: <u>30-ft. radius</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <u>Liriodendron tulipifera</u>	<u>50</u>	<u>Yes</u>	<u>FACU</u>
2. <u>Pinus taeda</u>	<u>25</u>	<u>Yes</u>	<u>FAC</u>
3. <u>Liquidambar styraciflua</u>	<u>15</u>	<u>No</u>	<u>FAC</u>
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: <u>45</u> 20% of total cover: <u>18</u>			
Sapling Stratum (Plot size: <u>30-ft. radius</u>)			
1. <u>Liquidambar styraciflua</u>	<u>7</u>	<u>Yes</u>	<u>FAC</u>
2. <u>Carya glabra</u>	<u>3</u>	<u>Yes</u>	<u>FACU</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: <u>5</u> 20% of total cover: <u>2</u>			
Shrub Stratum (Plot size: <u>30-ft. radius</u>)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Herb Stratum (Plot size: <u>30-ft. radius</u>)			
1. <u>Microstegium vimineum</u>	<u>95</u>	<u>Yes</u>	<u>FAC</u>
2. <u>Polystichum acrostichoides</u>	<u>5</u>	<u>No</u>	<u>FACU</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: <u>50</u> 20% of total cover: <u>20</u>			
Woody Vine Stratum (Plot size: <u>30-ft. radius</u>)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60 (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 $\leq 3.0^1$

☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation¹ (Explain)

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

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☒ No ☐

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

SOIL

Sampling Point: _____

[illegible]

Photo Page 1



Upland Data Point Landscape Looking Southwest



Upland Data Point Soil

Project

Landsford Tract
Chester County, South Carolina



APPENDIX B: REPRESENTATIVE PHOTOGRAPHS

Photo Page 1



UT 1 (Section 1) looking upstream from UT 2 confluence



Middle Extent of UT 1 (Section 2)

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina



Photo Page 2



Middle Extent of UT 1 (Section 2)



UT 1 (Section 3)

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina



Photo Page 3



UT 1 (Section 4)



UT 2 (Section 1)

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina



Photo Page 4



UT 2 (Section 2)



UT 2 (Section 3)

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina



Photo Page 5



UT 2 (Section 4)



UT 3 (Section 1)

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina



Photo Page 6



UT 3 (Section 2)



UT 3 (Section 3)

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina



Photo Page 7



UT 3 (Section 4)



UT 4

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina



Photo Page 8



UT 5



Catawba River

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina



APPENDIX C: LOW GRADIENT STREAM ASSESSMENT DATA SHEETS

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: Catawba River		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34.797064		Longitude: -80.897325		County: Chester
Date: October 14, 2019		Time: 10:30 AM		Investigator: CC
Stream width: ~ 480'		Stream Depth: Unknown		Length of Stream Reach: 2,714'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Predominantly Mixed Upland Forest		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 18.75 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 1 (Section 1)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34.797064		Longitude: -80.897325		County: Chester
Date: October 14, 2019		Time: 10:45 AM		Investigator: CC
Stream width: ~ 18'		Stream Depth: ~ 5 - 7'		Length of Stream Reach: 1,655'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Predominantly Mixed Upland Forest		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 12.5 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 1 (Section 2)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34.797064		Longitude: -80.897325		County: Chester
Date: October 14, 2019		Time: 11:45 AM		Investigator: CC
Stream width: ~ 9'		Stream Depth: ~ 6 - 8'		Length of Stream Reach: 4,974'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc):Predominantly Silviculture		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80%of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than ½ of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than ½ potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 14 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 1 (Section 3)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34.797064		Longitude: -80.897325		County: Chester
Date: October 14, 2019		Time: 3:30 PM		Investigator: CC
Stream width: ~ 4 - 6'		Stream Depth: ~ 6 - 8'		Length of Stream Reach: 10'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Silviculture		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 9 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 1 (Section 4)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34.797064		Longitude: -80.897325		County: Chester
Date: October 14, 2019		Time: 4:30 PM		Investigator: CC
Stream width: ~ 4 - 5'		Stream Depth: ~ 6 - 8'		Length of Stream Reach: 1,214'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Mixed Upland Forest		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 9 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 2 (Section 1)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34°47'41.911"N		Longitude: 80°53'15.037"W		County: Chester
Date: October 14, 2019		Time: 11:32 AM		Investigator: TC
Stream width: 15'		Stream Depth: 6'		Length of Stream Reach: 521'
Has it rained within the past 48 hours? No			Adjacent land use? (Industrial, agriculture, etc): Predominantly Silviculture	
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than ½ of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than ½ potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 8 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 2 (Section 2) Lower		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34°47'45.805"N		Longitude: 80°53'20.65"W		County: Chester
Date: October 14, 2019		Time: 11:55 AM		Investigator: TC
Stream width: 8'		Stream Depth: 4'		Length of Stream Reach: 931'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Silviculture		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 10 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 2 (Section 2) Upper		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34°47'53.344"N		Longitude: 80°53'33.957"W		County: Chester
Date: October 14, 2019		Time: 1:10 PM		Investigator: TC
Stream width: 10'		Stream Depth: 7'		Length of Stream Reach: 1,097'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Silviculture		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 9 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 2 (Section 3) Lower		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34°47'49.708"N		Longitude: 80°53'27.916"W		County: Chester
Date: October 14, 2019		Time: 12:33 PM		Investigator: TC
Stream width: 9'		Stream Depth: 2.5'		Length of Stream Reach: 799'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Silviculture		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than ½ of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than ½ potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 12 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 2 (Section 3) Upper		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34°47'58.949"N		Longitude: 80°53'44.829"W		County: Chester
Date: October 14, 2019		Time: 1:59 PM		Investigator: TC
Stream width: 10'		Stream Depth: 3.5'		Length of Stream Reach: 1,597'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Silviculture		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 11.5 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 2 (Section 4)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34°48'6.834"N		Longitude: 80°53'56.623"W		County: Chester
Date: October 14, 2019		Time: 2:18 PM		Investigator: TC
Stream width: 5'		Stream Depth: 1.5'		Length of Stream Reach: 1,540'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Mixed Upland Forest		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 16 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 3 (Section 1)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34.797064		Longitude: -80.897325		County: Chester
Date: October 14, 2019		Time: 1:45 PM		Investigator: CC
Stream width: ~ 4 - 5'		Stream Depth: ~ 4'		Length of Stream Reach: 28'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Silviculture		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 9.5 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 3 (Section 2)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34.797064		Longitude: -80.897325		County: Chester
Date: October 14, 2019		Time: 1:30 PM		Investigator: CC
Stream width: ~ 4 - 5'		Stream Depth: ~ 4'		Length of Stream Reach: 935'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Mixed Upland Forest		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 9.5 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 3 (Section 3)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34.797064		Longitude: -80.897325		County: Chester
Date: October 14, 2019		Time: 12:45 PM		Investigator: CC
Stream width: ~ 4'		Stream Depth: ~ 0.5 - 1'		Length of Stream Reach: 289'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Mixed Upland Forest		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1. Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e. logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2. Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3. Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7. Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9. Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10. Riparian Veg Zone Width	Width of riparian zone > 18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 15 NOTES/COMMENTS:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 3 (Section 4)		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34°47'43.831"N		Longitude: 80°53'57.177"W		County: Chester
Date: October 14, 2019		Time: 3:20 PM		Investigator: TC
Stream width: 3'		Stream Depth: 0.5'		Length of Stream Reach: 1,058'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Mixed Upland Forest		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 16 NOTES:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 4		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34°47'43.761"N		Longitude: 80°53'59.306"W		County: Chester
Date: October 14, 2019		Time: 3:46 PM		Investigator: TC
Stream width: 3'		Stream Depth: 0.5'		Length of Stream Reach: 111'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Mixed Upland Forest		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

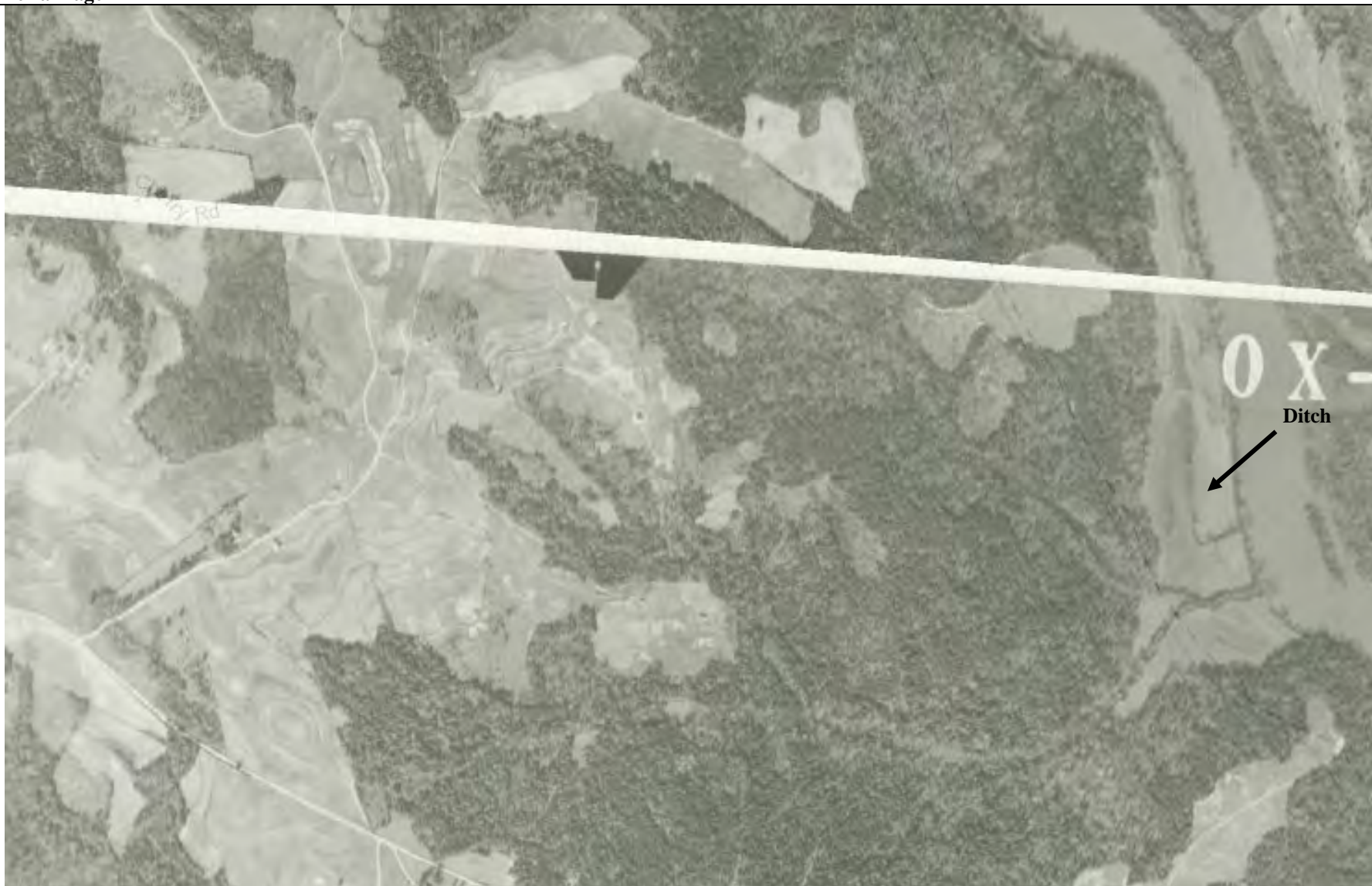
Total Score: 16 NOTES:

LOW GRADIENT STREAM ASSESSMENT DATA SHEET				
Stream Name: UT 5		Basin/Watershed: Lower Catawba River		USGS Quad: Catawba
Latitude: 34.797064		Longitude: -80.897325		County: Chester
Date: October 14, 2019		Time: 2:30 PM		Investigator: CC
Stream width: 3'		Stream Depth: 0.5'		Length of Stream Reach: 367'
Has it rained within the past 48 hours? No		Adjacent land use? (Industrial, agriculture, etc): Mixed Upland Forest		
Habitat	Condition Category			
Parameter	Fully Functional	Partially Impaired	Impaired	Very Impaired
1.Epifaunal Substrate or Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e.logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat lack of habitat is obvious; substrate unstable or lacking.
SCORE	2.0	1.5	1.0	0.5
2.Pool Substrate Characterization	Mix of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan, clay, or bedrock; no root mat or vegetation.
SCORE	2.0	1.5	1.0	0.5
3.Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	2.0	1.5	1.0	0.5
4.Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment. 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	2.0	1.5	1.0	0.5
5.Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	2.0	1.5	1.0	0.5
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (greater than past 20 yr.) may be present, but recent channelization not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.
SCORE	2.0	1.5	1.0	0.5
7.Channel Sinuosity	The bends in the stream increase the stream length 3-4X longer than if it was in a straight line (If braided channel, this parameter is difficult to rate.)	The bends in the stream increase the stream length 2-3X longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	2.0	1.5	1.0	0.5
8.Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosion scars.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
9.Vegetative Protection	>90% of SB surfaces and adjacent riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes. minimal or no evidence of grazing or mowing; almost all plants allowed to grow naturally	70-90% of the SB surfaces covered by native vegetation but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential more than 1/2 of potential plant stubble height remaining	50-70% of SB covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than 1/2 potential plant stubble height remaining.	<50% of SB surfaces covered by vegetation; disruption of SB vegetation is very high; vegetation has been removed to 5 cm. or less in average stubble height.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25
10.Riparian Veg Zone Width	Width of riparian zone>18 meters; human activities (roads, clear-cuts, lawns, crops, parking lots) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	Left Bank 1.0	0.75	0.50	0.25
SCORE	Right Bank 1.0	0.75	0.50	0.25

Total Score: 16 NOTES:

APPENDIX D: HISTORIC AERIAL PHOTOGRAPHS

Historic Aerial Page 1



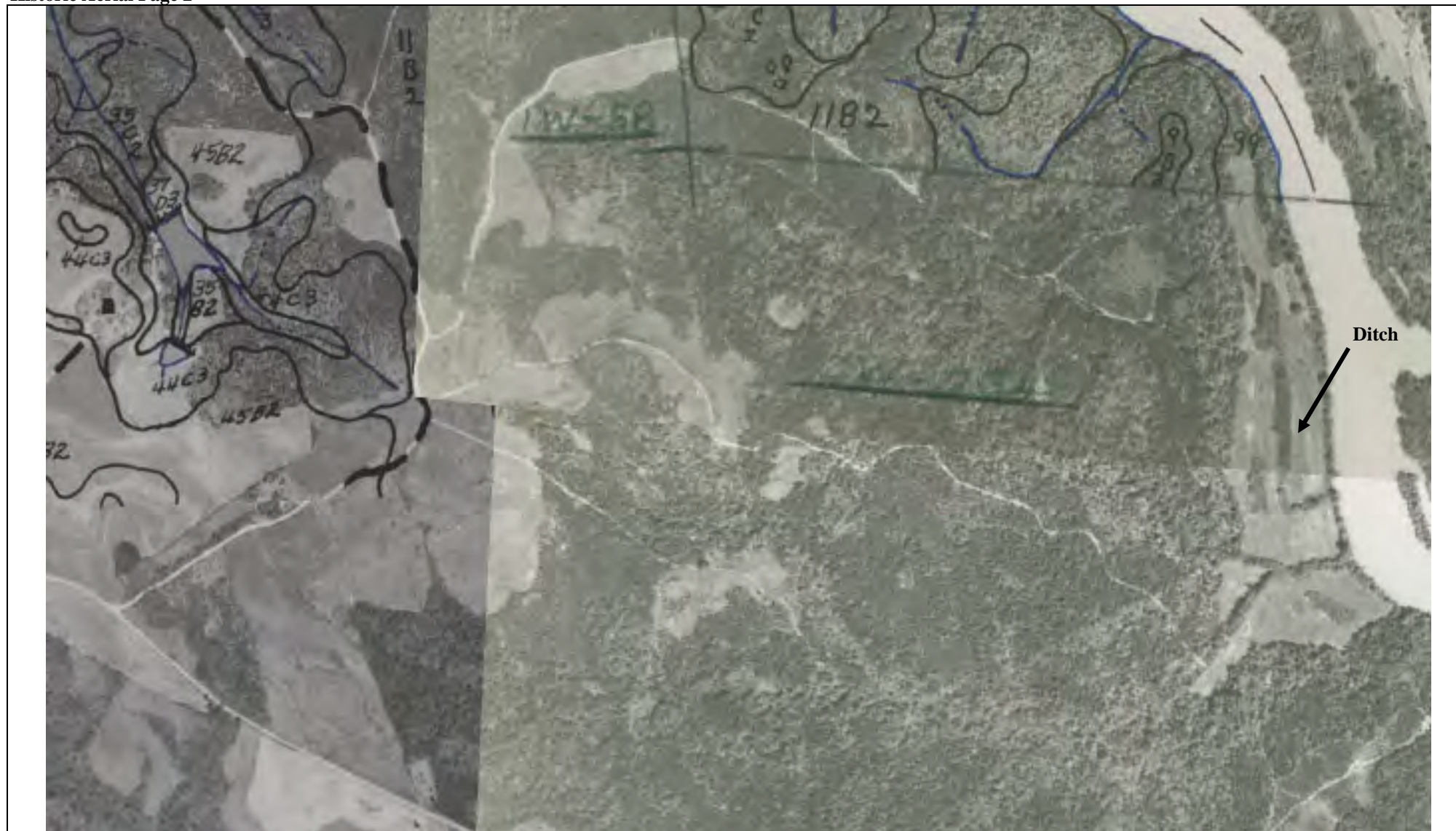
1949 Historic Aerial Photograph

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina

Source: University of South Carolina, Government Information and Maps online depository





1959 Historic Aerial Photograph

Project

Landsford Tract Permittee-Responsible Mitigation Plan
Chester County, South Carolina

Source: University of South Carolina, Government Information and Maps online depository



APPENDIX E: MITIGATION WORKSHEETS

Determination of Stream Credits

Restoration Mitigation Factors and Worksheet

Working Draft, Subject to Change

Last Revised: June 24, 2011

Restoration Mitigation Factors For Linear Systems				
FACTORS	OPTIONS			
Stream Type ¹	Non-RPWs 0.05	1 st and 2 nd Order RPWs 0.4		All Other Streams 0.2
Priority Category	Tertiary 0.05	Secondary 0.2		Primary 0.3
Net Improvement ²	Refer to Net Improvement in Section 2.0 (Definitions), page 4 to calculate NI value			
Credit Schedule	Not Applicable 0	After .02	Concurrent .05	Before 0.1
Location	Case by Case 0	Drainage Basin .02	Adjacent HUC .05	8-Digit HUC 0.1
Riparian Buffer	Calculate Value from the Riparian Buffer Factor in Section 2.0 (Definitions)			

¹ Stream type does not include man-made linear features. These features will be evaluated on a case-by-case basis.

² Net Improvement values are for in-stream work only. For riparian buffer enhancement or preservation choose **Not Applicable** under Net Improvement and calculate buffer values under Riparian Buffer.

Proposed Restoration Mitigation Worksheet for Linear Systems						
FACTOR	Catawba River			UT 2 (Section 4), UT 3 (Section 4), UT 4 and UT 5		
Credit Type	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only
Stream Type			All other streams			Non-RPWs
Priority Category			Primary			Primary
Net Improvement						
Credit Schedule			Concurrent			Concurrent
Location			8-Digit HUC			8-Digit HUC
Riparian Buffer Side A			0.1384			0.10
Riparian Buffer Side B			0			0.10
Sum of Mitigation Factors =			0.7884			0.7
Proposed Linear Feet of Stream =			2714			3076
Proposed Restoration (In-Stream work + Min Buffer) M _a x LL =						
Proposed Preservation (Stream Preservation or Buffers Only) M _b x LL =			2139.7176			2153.2

Total Proposed Stream Restoration Credits =

Total Proposed Buffer Credits =

4292.9176

When calculating credits, if a reach has in-stream work and additional buffers beyond minimum required, do not use grayed areas under additional stream buffers. If proposed work will be stream preservation or buffer enhancement ONLY, use Stream Preservation or buffers only column.

Determination of Stream Credits

Restoration Mitigation Factors and Worksheet

Working Draft, Subject to Change

Last Revised: June 24, 2011

Restoration Mitigation Factors For Linear Systems				
FACTORS	OPTIONS			
Stream Type ¹	Non-RPWs 0.05	1 st and 2 nd Order RPWs 0.4		All Other Streams 0.2
Priority Category	Tertiary 0.05	Secondary 0.2		Primary 0.3
Net Improvement ²	Refer to Net Improvement in Section 2.0 (Definitions), page 4 to calculate NI value			
Credit Schedule	Not Applicable 0	After .02	Concurrent .05	Before 0.1
Location	Case by Case 0	Drainage Basin .02	Adjacent HUC .05	8-Digit HUC 0.1
Riparian Buffer	Calculate Value from the Riparian Buffer Factor in Section 2.0 (Definitions)			

¹ Stream type does not include man-made linear features. These features will be evaluated on a case-by-case basis.

² Net Improvement values are for in-stream work only. For riparian buffer enhancement or preservation choose **Not Applicable** under Net Improvement and calculate buffer values under Riparian Buffer.

Proposed Restoration Mitigation Worksheet for Linear Systems						
FACTOR	UT 1 (Section 1)			UT 1 (Section 2)		
Credit Type	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only
Stream Type	1st & 2nd Order RPW			1st & 2nd Order RPW		
Priority Category	Primary			Primary		
Net Improvement	Moderate			Moderate		
Credit Schedule	Concurrent			Concurrent		
Location	8-Digit HUC			8-Digit HUC		
Riparian Buffer Side A	0.0908			0.1625		
Riparian Buffer Side B	0			0		
Sum of Mitigation Factors =	1.9408			2.0125		
Proposed Linear Feet of Stream =	1655			4974		
Proposed Restoration (In-Stream work + Min Buffer) M _a x LL =	3212.024			10010.175		
Proposed Preservation (Stream Preservation or Buffers Only) M _b x LL =						

Total Proposed Stream Restoration Credits =

13222.199

Total Proposed Buffer Credits =

When calculating credits, if a reach has in-stream work and additional buffers beyond minimum required, do not use grayed areas under additional stream buffers. If proposed work will be stream preservation or buffer enhancement ONLY, use Stream Preservation or buffers only column.

Determination of Stream Credits

Restoration Mitigation Factors and Worksheet

Working Draft, Subject to Change

Last Revised: June 24, 2011

Restoration Mitigation Factors For Linear Systems				
FACTORS	OPTIONS			
Stream Type ¹	Non-RPWs 0.05	1 st and 2 nd Order RPWs 0.4		All Other Streams 0.2
Priority Category	Tertiary 0.05	Secondary 0.2		Primary 0.3
Net Improvement ²	Refer to Net Improvement in Section 2.0 (Definitions), page 4 to calculate NI value			
Credit Schedule	Not Applicable 0	After .02	Concurrent .05	Before 0.1
Location	Case by Case 0	Drainage Basin .02	Adjacent HUC .05	8-Digit HUC 0.1
Riparian Buffer	Calculate Value from the Riparian Buffer Factor in Section 2.0 (Definitions)			

¹ Stream type does not include man-made linear features. These features will be evaluated on a case-by-case basis.

² Net Improvement values are for in-stream work only. For riparian buffer enhancement or preservation choose **Not Applicable** under Net Improvement and calculate buffer values under Riparian Buffer.

Proposed Restoration Mitigation Worksheet for Linear Systems						
FACTOR	UT 2 (Section 3)			UT 3 (Section 3)		
Credit Type	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only
Stream Type	1st & 2nd Order RPW			Non-RPWs		
Priority Category	Primary			Primary		
Net Improvement	Significant			Moderate		
Credit Schedule	Concurrent			Concurrent		
Location	8-Digit HUC			8-Digit HUC		
Riparian Buffer Side A	0.30			0.10		
Riparian Buffer Side B	0.30			0.10		
Sum of Mitigation Factors =	3.45			1.7		
Proposed Linear Feet of Stream =	2396			289		
Proposed Restoration (In-Stream work + Min Buffer) M _a x LL =	8266.2			491.3		
Proposed Preservation (Stream Preservation or Buffers Only) M _b x LL =						

Total Proposed Stream Restoration Credits =

8757.5

Total Proposed Buffer Credits =

When calculating credits, if a reach has in-stream work and additional buffers beyond minimum required, do not use grayed areas under additional stream buffers. If proposed work will be stream preservation or buffer enhancement ONLY, use Stream Preservation or buffers only column.

Determination of Stream Credits

Restoration Mitigation Factors and Worksheet

Working Draft, Subject to Change

Last Revised: June 24, 2011

Restoration Mitigation Factors For Linear Systems				
FACTORS	OPTIONS			
Stream Type ¹	Non-RPWs 0.05	1 st and 2 nd Order RPWs 0.4		All Other Streams 0.2
Priority Category	Tertiary 0.05	Secondary 0.2		Primary 0.3
Net Improvement ²	Refer to Net Improvement in Section 2.0 (Definitions), page 4 to calculate NI value			
Credit Schedule	Not Applicable 0	After .02	Concurrent .05	Before 0.1
Location	Case by Case 0	Drainage Basin .02	Adjacent HUC .05	8-Digit HUC 0.1
Riparian Buffer	Calculate Value from the Riparian Buffer Factor in Section 2.0 (Definitions)			

¹ Stream type does not include man-made linear features. These features will be evaluated on a case-by-case basis.

² Net Improvement values are for in-stream work only. For riparian buffer enhancement or preservation choose **Not Applicable** under Net Improvement and calculate buffer values under Riparian Buffer.

Proposed Restoration Mitigation Worksheet for Linear Systems						
FACTOR	UT 1 (Section 3), UT 2 (Section 2) and UT 3 (Section 1)			UT 2 (Section 1)		
Credit Type	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only
Stream Type	1st & 2nd Order RPW			1st & 2nd Order RPW		
Priority Category	Primary			Primary		
Net Improvement	Maximum			Maximum		
Credit Schedule	Concurrent			Concurrent		
Location	8-Digit HUC			8-Digit HUC		
Riparian Buffer Side A	0.30			0.248		
Riparian Buffer Side B	0.30			0.248		
Sum of Mitigation Factors =	4.45			4.346		
Proposed Linear Feet of Stream =	2066			521		
Proposed Restoration (In-Stream work + Min Buffer) M _a x LL =	9193.7			2264.266		
Proposed Preservation (Stream Preservation or Buffers Only) M _b x LL =						

Total Proposed Stream Restoration Credits =

11457.966

Total Proposed Buffer Credits =

When calculating credits, if a reach has in-stream work and additional buffers beyond minimum required, do not use grayed areas under additional stream buffers. If proposed work will be stream preservation or buffer enhancement ONLY, use Stream Preservation or buffers only column.

Determination of Stream Credits

Restoration Mitigation Factors and Worksheet

Working Draft, Subject to Change

Last Revised: June 24, 2011

Restoration Mitigation Factors For Linear Systems				
FACTORS	OPTIONS			
Stream Type ¹	Non-RPWs 0.05	1 st and 2 nd Order RPWs 0.4		All Other Streams 0.2
Priority Category	Tertiary 0.05	Secondary 0.2		Primary 0.3
Net Improvement ²	Refer to Net Improvement in Section 2.0 (Definitions), page 4 to calculate NI value			
Credit Schedule	Not Applicable 0	After .02	Concurrent .05	Before 0.1
Location	Case by Case 0	Drainage Basin .02	Adjacent HUC .05	8-Digit HUC 0.1
Riparian Buffer	Calculate Value from the Riparian Buffer Factor in Section 2.0 (Definitions)			

¹ Stream type does not include man-made linear features. These features will be evaluated on a case-by-case basis.

² Net Improvement values are for in-stream work only. For riparian buffer enhancement or preservation choose **Not Applicable** under Net Improvement and calculate buffer values under Riparian Buffer.

Proposed Restoration Mitigation Worksheet for Linear Systems						
FACTOR	UT 1 (Section 4) and UT 3 (Section 2)			REACH 2		
Credit Type	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only	In-Stream work with Minimum Buffer	Additional Stream Buffers	Stream Preservation or Buffers Only
Stream Type	Non-RPWs					
Priority Category	Primary					
Net Improvement	Maximum					
Credit Schedule	Concurrent					
Location	8-Digit HUC					
Riparian Buffer Side A	0.10					
Riparian Buffer Side B	0.10					
Sum of Mitigation Factors =	3.7					
Proposed Linear Feet of Stream =	2149					
Proposed Restoration (In-Stream work + Min Buffer) M _a x LL =	7951.3					
Proposed Preservation (Stream Preservation or Buffers Only) M _b x LL =						

Total Proposed Stream Restoration Credits =

7951.3

Total Proposed Buffer Credits =

When calculating credits, if a reach has in-stream work and additional buffers beyond minimum required, do not use grayed areas under additional stream buffers. If proposed work will be stream preservation or buffer enhancement ONLY, use Stream Preservation or buffers only column.

PROPOSED WETLAND MITIGATION TABLE



TIP: Leave cursor over each factor or option below to pop-up helpful information or definitions.

Factors	Options				
Net Improvement	0.0** <----- to -----> 3.0 (see Section 3.0 for examples of potential values)				
Upland Buffer	0.0 <----- to -----> 1.0 (see Section 3.0 for examples of potential values)				
Credit Schedule	Not Applicable 0**	After 0.1	Concurrent 0.3	Before 0.5	
Temporal Loss	Not Applicable 0**	0 to 5 Years - 0.1	5 to 10 Years - 0.2	10 to 20 Years - 0.3	Over 20 Years - 0.4
Kind	Out of Kind 0		In Kind 0.4		
Location	Case by Case 0	Drainage Basin 0.1	Adjacent 8-Digit HUC 0.2	8-Digit HUC 0.4	

** Use this option to calculate credit for Preservation

PROPOSED WETLAND MITIGATION CREDIT WORKSHEET

Complete Proposed Mitigation Credit Worksheet for all Permittee-Responsible Mitigation. This worksheet does not need to be completed if purchasing credits from a mitigation bank.

Factor	Wetland Enhancement	Wetland Restoration (Estimated)	Area 3	Area 4	Area 5
Net Improvement	1.5	2.0			
Upland Buffer	1	1			
Credit Schedule	Concurrent	Concurrent			
Temporal Loss	0 to 5 Years	10 to 20 Years			
Kind	In Kind	In Kind			
Location	8-Digit HUC	8-Digit HUC			
Sum of Factors	3.5	3.8			
Mitigation Area	2.81	1.5			
M x A =	9.835	5.7			

Proposed Wetland Mitigation Credits = Σ (M x A) =

15.535