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Stream and Wetland Restoration Plan
Tarlton Site

Cumberland County, North Carolina
Project ID No. 012857003

Prepared for:
NCDENR-Ecosystem Enhancement Program
1652 Mail Service Center
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Ecosystem Enhancement PROGRAM

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1.0 Project Site Identification and Location

1.1 Directions to Project Site

From Raleigh take I-40 east towards Wilmington, NC and exit onto I-95 south. Next exit onto I-95 Business Route S/US-301 south and turn right onto NC-210/NC-24. Turn right onto Ramsey Street, then turn left onto US-401 Bypass/Country Club Drive and the project site is about ½ mile on the right. See **Figure 1**.

1.2 USGS Hydrologic Unit Code and NCDWQ River Basin Designations

The project site is located in the Upper Cape Fear River Watershed (USGS 8-digit Hydrologic Unit 03030004, and NCDWQ River Basin 03-06-15), and is within the Cross Creek Targeted Local Watershed (00050).

1.3 Project Vicinity Map

Figure 1 shows the project site vicinity.

2.0 Watershed Characterization

2.1 Drainage Area

The eastern prong of the project which is named UT to Cross Creek near Rosehill Road has a drainage area of 1.0 square miles. The western prong which is also a UT to Cross Creek has a drainage area of 1.6 square miles.

2.2 Surface Water Classification/Water Quality

The NCDWQ stream index number for the stream segment(s) within the project area is 18-27-2-(1), and is described as "*From source to dam at Country Club Lake*". This description would include both prongs of the unnamed tributaries within the project area. These unnamed tributaries to Cross Creek have a DWQ classification of WS-IV&B. WS-IV waters are used as sources of potable water where a WS-I, II or III classification is not feasible. Class B waters are used for recreation purposes where contact with humans is frequent. These headwater tributaries to Cross Creek are listed as 303(d) listed waters due to impaired biological activity. NCDWQ has indicated the source of the impairment is likely urban runoff.

2.3 Physiography, Geology, and Soils

The project is located within the Coastal Plain physiographic province of North Carolina. Elevation within the project area ranges from 130-146 feet above sea level. The geology of Cumberland County is composed of several layers of unconsolidated sediment underlain by bedrock composed of

volcanic slate. Cumberland County Soil Survey soil mapping of the project area is shown in **Figure 3.**

The restoration site includes the area historically impounded as Country Club Lake. The dam was located just downstream from the confluence of two headwater streams. Since the construction of the dam, the soils within the project area then have been in transition due to saturation and hydrologic change from the impoundment over time. The entire project area has been a depositional area for sediment, which has accumulated in the lake over time and varies in depth throughout the project area. Most of the site is mapped as "water" in the Cumberland County Soil Survey based on the historical limits of Country Club Lake. Upstream and downstream of the lake, the floodplain is mapped as Johnston Loam, a typical hydric floodplain soil of the NC Coastal Plain. Johnston loam is characterized by its mucky upper surface, frequently flooding and very poor drainage.

2.4 Historical Land Use and Development Trends

The project site was historically impounded by a dam built in the 1970s, creating Country Club Lake by impounding about 4,500 feet of two perennial prongs of the stream. The impoundment was breached by a storm on September 15, 1989, rebuilt in June of 1990, and breached again on March 5, 1994 completely draining the lake. After the second failure in 1994 the dam was never rebuilt nor was the failed dam and spillway ever completely removed. Since 1994, the site has been hydrologically influenced by beaver activity with a fluctuating lake level. There are areas of fringe wetlands and open waters within the project area, however, due to the instability of the lake level, these areas are unstable and under a constant change in hydrology. This is apparent by various vegetation communities.

The existing land use for the watershed is listed in the table below.

Table 1. Existing Land Cover of the Entire Watershed

Land Cover	Acreage	Percent Cover
Open Water	32	2 %
Barren	110	7 %
Forested	302	19 %
Urban Residential	980	60 %
Commercial	195	12 %
Total	**1619**	**100%**

Recent development in the project watershed appears to have occurred in the watershed of the eastern prong tributary. This area includes a new residential development upstream of the project area and the development of the commercial corridor along Highway 401 northeast of the project areas. Based on a review of zoning, strategic plans, and proposed major transportation projects, only a portion of the project watershed is expected to change in the future.

Zoning

The project area is zoned by the City of Fayetteville as R10 – Residential District.

Strategic Plan

The City of Fayetteville has adopted a 2005 Strategic Plan that includes Strategic Planning for the City of Fayetteville, the Fayetteville Vision 2020, City of Fayetteville Plan 2005-2010, and the Action Agenda 2005-2006. This plan is intended to encourage responsible growth and allow Fayetteville to become the hub of Eastern North Carolina. It is expected that none of the current projects listed in the Action Agenda 2005-2006 will affect the projects' watershed. The City of Fayetteville is also in the process of developing a comprehensive growth plan through the year 2020, which may facilitate future growth within the project watershed.

Major Transportation Projects.

North Carolina Department of Transportation (NCDOT) is planning an extension of NC-24 (Fayetteville Outer Loop) as part of the Traffic Improvement Program (TIP# X-2). The construction is to take place north of the project watershed. It is anticipated that the completion of the project will encourage future commercial development; however, much of this rapid growth is expected outside of the projects' watershed.

2.5 Endangered/Threatened Species

Federal law under the provisions of Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires that any action likely to adversely affect a federally protected species be subject to review by the U.S. Fish and Wildlife Service. A search of the US Fish and Wildlife Service website (endangered.fws.gov) and the North Carolina Natural Heritage Program website (http://207.4.179.38/nhp/) identified six federally listed species for Cumberland County. The species, their habitats, and status are described below in **Table 2**. A review of the project area and surrounding habitat by KHA biologists determined that the habitat for these listed species is not available within the project area. A no-effect determination letter from the US Fish and Wildlife (dated October 17, 2005) states that the proposed project is not likely to affect listed species or their habitat and that Section 7 (a)(2) have been satisfied. The no-affect determination letter is included as **Appendix 9**.

Table 2. Endangered Species - Cumberland County

Common Name	Scientific Name	Habitat Requirement	State Status	Federal Status	Habitat Present
Red Cockaded Woodpecker	*Picoides borealis*	Old growth pine and pine/hardwood stands	E	E	No
American chaffseed	*Schwalbea Americana*	open, moist pine flatwoods; fire-maintained savannas; and open grass-sedge systems	E	E	No
Michaux's sumac	*Rhus michauxii*	sandy or rocky open woods in basic soils	E-SC	E	No
Southern spicebush	*Lindera melissifolia*	Bottomland hardwood areas, margins of ponds in coastal areas	E	E	No
Rough-leafed loosestrife	*Lysimachia asperulaefolia*	Ecotones between longleaf pine and wetter shrubby areas	E	E	No
American alligator	*Alligator mississippiensis*	Large rivers, lakes, ponds, canals, marshes, swamps, and tidal estuaries	T	T(S/A)	No

Notes:
E- Endangered
E-SC- Endangered Special Concern
T(S/A)- Threatened based on similar appearance to endangered/threatened species
*The state definition for an endangered **plant species** is "any species or higher taxon of plant whose continued existence as a viable component of the State's flora is determined to be in jeopardy" (GS 19B 106: 202.12).*

*The state definition for an endangered **animal species** is "any native or once-native species of wild animal whose continued existence as a viable component of the State's fauna is determined by the Wildlife Resources Commission to be in jeopardy or any species of wild animal determined to be an 'endangered species' pursuant to the Endangered Species Act" (Article 25 of Chapter 113 of the General Statutes; 1987).*

2.6 Cultural Resources

The North Carolina Department of Cultural Resources State Historic Preservation Office (SHPO) conducted a review of the project and it was concluded the project would not affect any historic resources or archeological sites. According to the most recent (2002) NCCGIA database, there are no National Register properties within a 1-mile radius of the study area. A letter from SHPO, dated August 30, 2005, states that they have no comment on the project (Appendix 10).

2.7 Potential Constraints

2.7.1 Property Ownership and Boundary

The conservation easement that consists of the entire parcel owned by Greg Tarlton (Tarlton Site) has been secured by Mid-Atlantic Mitigation. The conservation easement boundary is shown on the Existing Conditions map (**Figure 11**) and the Restoration Plan (**Figure 12**).

2.7.2 Site Access

The site will be accessed for construction using a utility corridor at the south end of the project area. The corridor is located on a parcel at the intersection of Clearwater Dr. and the Highway 401 Bypass. This parcel is also owned by Mr. Tarlton and the utility easement is a sanitary sewer easement belongs to Public Works Commission (PWC) of the City of Fayetteville. Temporary encroachment agreement between Mid-Atlantic Mitigation and the PWC was signed on October 24, 2005 and by Mr. Greg Tarlton on XXX date included in **Appendix 11**. In addition, Mid-Atlantic Mitigation has purchased permanent access easement to the restoration site through a vacant property on Lake Bend Road adjacent to the eastern portion of the project. This property is also owned by Mr. Tarlton and this permanent easement will allow access for monitoring and maintenance following construction. An agreement with Marc Robinson, property owner of the reference site location, upstream of the restoration site on the western prong, was made on XXXX date and is included in **Appendix 12**. This agreement allows for the installation and data collection for the ground water and stream monitoring gages on the reference site and for access for performing the geomorphic surveys.

2.7.3 Utilities

An elevated Fayetteville gravity sanitary sewer line and utility easement crosses the eastern prong approximately 600 feet upstream from the confluence of the eastern and western prongs. This utility easement was removed form the conservation easement. PWC plans to replace the aerial crossing with a pipe crossing inside the easement. Since the pipe is a gravity line the new pipe will also be an aerial crossing and will not influence the hydrologic connection of the project. All future construction and maintenance of this sanitary sewer line will be outside the conservation easement.

2.7.4 FEMA/Hydrologic Trespass

The Federal Emergency Management Association (FEMA) Flood Insurance Rate Map (FIRM), map number 370077 0004 D effective June 15, 1984, shows that the project area is mapped as Zone A3 and Zone A. Zone A represents areas within the 100-year flood; base flood elevations and flood hazard factors not determined. Zone A3 represents areas within the 100-year flood; base flood elevations and flood hazard factors determined. A No-Rise Certification is being submitted to the City of Fayetteville to prove that the project will not increase water surface elevations. A copy of the No-Rise Certification will be submitted to EEP under separate cover once received from the City of Fayetteville

The project will lower flood elevations of smaller events (2, 10, and 25) by removing the beaver impoundment and the debris from the old spillway. In addition, removal of the beaver dams and debris will reduce potential flooding downstream from a dam breach.

3.0 Project Site Streams

The Tarlton Site was impounded by a man-made dam until it ultimately failed in 1994. Since then beavers have been active in maintaining the impoundment. The footprint of the open water area of the lake, and the extent functioning stream channel, has been fluctuating with the level of beaver dam development, periodic dam removal/maintenance, and storm events blowing out the structure. Therefore, the streams within the project area have been in constant adjustment (pattern and profile) and sediment transport capacity, i.e. alternating periods of deposition and incision. As of October 2005, the site consisted of approximately 1,420 linear feet of stream, 5.1 acres of wetland, and 10.3 acres of open water (impounded area from the beaver dams). The jurisdictional determination of wetland and streams within the project area was reviewed in the field and approved by the USACE on October 12, 2005. The delineation map provided to the USACE at the field review and is included in **Appendix 8**.

4.0 Reference Stream

4.1 Watershed Characterization

The reference reach is located upstream of the project area on a segment western prong tributary upstream of the Hillard Drive, providing an appropriate reference for the site's physical characteristics and watershed. The reference location is just upstream of the culvert under Hillard Drive and contains a stable stream-floodplain wetland system. The grade control of the structure provides an appropriate hydrologic reference for the project area outlet grade control as a storm flow constriction appropriate for the hydrology of the project site. The drainage area of the reference reach is 0.8 mi^2.

The reference site was reviewed in the field by the USACE during the field visit on October 12, 2005 and approved a high-quality stream and wetland system

4.2 Channel Classification

The upper western prong reference stream is classified as a Rosgen stream type "C" channel. The reach has an entrenchment ratio of 6.9, a width to depth ratio of 13.9, bank height ratios of 1.1 and a slope of 0.01. The reference stream morphology is included in Restoration Table 1.

4.3 Discharge

The peak flows for the 2-, 10-, 25-, and 100-year storms were modeled for the given drainage areas. These flows were calculated using the North Carolina rural flood-frequency equations for the Sand Hills region (Robert R. Mason, Fuste et al. 2002). The peak flows calculated are summarized in Table 3.

Table 3. Discharge Trends (Sand Hills Region)

Reference	Area	Bankfull	2yr Q	10yr Q	25yr Q	100yr Q

Reach	(ac.)	Discharge (cfs)*	(cfs)	(cfs)	(cfs)	(cfs)
Upper Western Prong	481	14	27	60	80	117

*NC SRI Coastal Plain Rural Regression Curve (DRAFT)

4.5 Channel Morphology

Restoration Table I shows a complete channel morphology data including channel pattern, dimension, and profile for all restoration and project reaches.

4.4 Channel Stability Assessment

The reference stream is located upstream from the culvert grade control structure at Hillard Drive. In addition, the riparian vegetation community has been maintained providing excellent root mass and structure maintaining channel stability. The reference reach was evaluated and surveyed by KHA staff on (August 03, 2005). Channel morphology measurements indicate a stable dimension, pattern, and profile. The USACE staff reviewed the reference stream on October 12, 2005 and approved the site as a high-quality reference for this project (Appendix 8). EEP (Melonie Allen) staff also reviewed the reference during the technical review of the original proposal and agreed that the site was a valid reference. The stream has access to it's' floodplain and the riparian wetland vegetation community is also a reference community.

4.5 Bankfull Verification

Determination of the bankfull elevation is vital to generating meaningful geomorphic values. Field indicators for bankfull were strong for the reference reaches; however, due to the beaver impoundment the site reaches could not be assessed. To verify bankfull elevations, the bankfull area values for the project reaches and reference reaches were checked against the North Carolina Coastal Plain Rural regional curves (Harman, Jennings et al. 1999). The results indicate a general agreement between the three sets (site, references, and regional curve) thus providing a measure of validation.

4.6 Vegetation

The reference stream site contains a stable riparian wetland vegetation community for the project area. Although the site has been affected by urban development, stream stability appears to have been maintained by installation of the culvert at Hillard Drive and protection of the woody vegetation root systems in that area. The maintained equilibrium of hydrology (stream and riparian wetlands) and vegetation is of unique quality within the urban watershed.

The reference site vegetation consists of a number of micro-communities defined by the period and frequency of flooding (i.e. stream levee, floodplain depression, floodplain uplands, toe-of-slope groundwater seep), and shade characteristics (i.e. field edge or semi-closed canopy). Therefore, the reference site provides an excellent spectrum of vegetation diversity for the restoration site.

The over-story vegetation consists of some larger hardwoods, primarily Black Gum, Red Maple, and Tulip Poplar. The mid-story is dense with shrubs typical of a field edge vegetation community as

the reference site is very narrow and surrounded by residential development. The mid-story includes Wax Myrtle, Loblolly Bay, Holly. The under-story and herbaceous vegetation community includes Hazel Alder, Blackberry, Rush, and Woolgrass.

In addition to the reference site, there are areas of riparian and wetland vegetation communities within the restoration site that are remnants of past communities related to the various levels of the Country Club Lake and the subsequent beaver impoundments. In the upper reaches of the site, there are many mature Black Gum trees with buttressed trunks typical of Gum swamps, although the swamp hydrology has been removed. Many of the root systems are exposed as the soil has subsided in these areas. Along the fringe of the current beaver impoundment water surface, there are communities of Tag Alder stands with herbaceous wetland emergent vegetation (*Sciprus spp. Juncus spp.*). In between the current water surface limits and the historical extent of County Club Lake are transitional riparian wetland vegetation communities. These areas vary based on the degree of saturation relative to the topography of the site. Low elevation or depressional areas are typically saturated and dominated by wetland herbaceous vegetation. Periodically flooded areas with somewhat saturated soils are dominated by woody shrubs (i.e. Black Willow, Wax Myrtle, Tag Alder). Higher elevation upland areas are dominated by young pines (Loblolly Pine).

The restoration plan will seek to incorporate existing vegetation communities either through preservation and non-intrusive construction or through transplants where appropriate.

5.0 Project Site Wetlands

5.1 Jurisdictional Wetlands

The project site contains jurisdictional wetlands and open waters, however with the dynamic nature of the site's hydrology (i.e. impoundment, dam failure, and beaver impoundments/water level fluctuations) the water balance and vegetation communities have been unstable. Areas of existing wetlands and remnant area where wetland hydrology has recently been removed will meet jurisdictional wetland criteria, however the project goals are to stabilize these communities and to restore stream-wetland-floodplain hydrodynamics and functions as noted in the reference.

Jurisdictional wetlands were identified and delineated using methodologies prescribed by the United States Corps of Engineers (United States Army Corps of Engineers 1987). The wetland systems were classified based upon the United States Fish and Wildlife Service Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, Carter et al. 1979). The wetland boundaries were mapped to submeter accuracy using a Global Positioning System (GPS) and presented to the USACE in the field on October 12, 2005 (see Appendix 8).

The hydrology of the site, influenced by the beaver impoundments, has defined the jurisdictional boundaries within the project area as reviewed by the USACE in October 2005. The existing water surface impounded by the beaver dam in the remnants of the historic lake (removed in 1994) is classified as PUBHh (Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded). The existing water surface area is regulated as an "open water" community. The transitional areas between the existing water surface edge and the historical lake water's edge, and the upslope headwater areas are defined as PFO1Fh (Palustrine, Forested, Broad-leaved Deciduous, Semi-permanently Flooded, Diked/Impounded). The areas are regulated as forested riparian and/or

emergent wetlands. The wetland areas were delineated by KHA and reviewed in the field by the US Army Corps of Engineers on October 12, 2005.

Wetlands located at the headwaters of the eastern and western prongs within the project boundary are remnants of the Gum-swamp that historically existed in the upper portion of Country Club Lake where the riparian wetland/stream system transitioned to the open water system. Currently, the water level has lowered to the elevation of the beaver impoundments and again functions hydrologically as a riparian wetland community. However, this area is still in transition, although it currently meets wetland criteria for hydrology, soil, and vegetation.

A small headwater riparian is located in a topographic swale near an outlet of a stormwater outfall in the southwestern portion of the project area. The outfall was likely ponded with the historic lake levels, and now with the lower water surface elevation, is the riparian wetland associated with the stream re-establishing downstream from the outfall.

After the restoration of the downstream grade control, water level monitoring gages were installed throughout the project site to evaluate wetland hydrology criteria. **Figure 4** shows the gage locations and **Appendix 2** contains the USACE Wetland Delineation Forms completed for each wetland hydrology monitoring location.

5.2 Hydrological Characterization

5.2.1 Wetland Hydrology Monitoring

The beavers were removed from the project site in September of 2005 by a licensed trapper. This trapper is under contract to continuously monitor the site for their return. The beaver dams/impoundments within the project site were removed in the November of 2005 and the outlet stream grade control was restored at the downstream project limits. This restoration work established the permanent and stable grade control setting groundwater and surface water elevations for the upslope streams and wetlands. Once the area had dewatered sufficiently to access the site, near-surface water table monitoring gages were installed within the project area and reference location between December 2005 and February 2006. The monitoring location gages include a data logger set to collect water table readings on an hourly or daily basis. The monitoring locations are shown in **Figure 4**.

Gage 1 is located in the upper portion of western prong tributary riparian floodplain wetland. The gage is located approximately 45 feet from the toe of slope and approximately 60 feet from the thalweg stream channel. This location is in an area upslope from the beaver impoundment water surface where the stream had established some well defined bed and bank features. Therefore, the source hydrology supporting wetland criteria at this location is likely a combination of overbank flooding from the stream, retained sheet flow from adjacent uplands, and groundwater seepage along the toe-of-slope.

Gage 2 is located downstream from Gage 1 in an area of site that was near to the water surface due to the beaver impoundments. With the removal of the beaver dams and stabilization of the downstream grade control, this area is no longer adjacent to the open water, but is still saturated near the surface. The stream in this area is weakly formed (as compared to upstream at Gage 1) and is adjusting to the modified grade and hydrology as it forms more define bed and bank features. This area will continue to adjust hydrologically through the first growing season as the stream continues

to seek stability and as evapotranspiration increases with the establishment of the vegetation community.

Gage 3 is located in a drainage swale area that was historically flooded within the limits of the lake, but in recent history has established as a riparian wetland along the beaver impoundment fringe and at the outlet of a stormwater outfall that now discharges to a perennial stream channel with the restoration of the downstream grade control. The wetland in this area is topographically slightly upslope from other wetlands within the site but us supported hydrologically by the outfall and tributary and groundwater discharge to the floodplain/stream system.

Gage 4 is located north of the new stream confluence in the transition zone between the historical lake limits and the beaver impoundment water surface. This transition zone is approximately 30 feet in width. The location is dominated by Tag Alder vegetation and has many depressions and shallow channels that appear to be remnants of beaver pathways/channels.

Gage 5 is located adjacent to a remaining portion of the historical dam forming Country Club Lake, approximately 20 feet from the toe-of-slope of dam. The site was previously submnerged and was totally denuded of vegetation at the time of installation. There is no ponded water now with the restoration of the downstream grade control; however, the soil is saturated at the surface. It is likely that the soil will continue to dewater once the growing season begins and the vegetation community is established.

Gage 6 is located along the eastern portion of the site along the eastern prong tributary. The gage is located near a midpoint between the historical extent of the lake and the more recent extent of the beaver impoundment. The vegetation community is dominated by Tag Alder stands in this area, and with the restoration of the downstream grade control, surface water flow is in multiple braided channels through the vegetation. At the time of the gage installation at this location, the soils are saturated at the surface, however there no longer was evidence of ponding.

Gage 7 is located in the headwater area of the site adjacent to the eastern prong tributary. This location is in the area that was historically flooded by the dam, but was not flooded by the beaver impoundments (similar to Gage 1). However, this area appears to have been more heavily influenced with recent beaver dams and may have had a more dynamic hydrologic pattern in the recent past. The location was saturated at the surface, but did not have recent evidence of ponding. It was noted at the time of the gage installation that there is considerable evidence of groundwater seepage along the toe-of-slope.

In addition to the water table monitoring gages, a rain gage was installed near the downstream limit of the project are in the area of the downstream grade control and removed dam. The gage will provide on-site rainfall data for use in evaluation of wetland hydrology criteria.

5.2.2 Stream Monitoring at Restoration Site

Stream water level will be monitored in the restoration site adjacent to Gage 2 as well as in the reference location. The intent of the paired stream-wetland water level gages is to provide some comparison of hydroperiod relationships between the wetland areas adjacent to base flow and seasonal hydrologic conditions. In addition, the paired gages will provide information as to the nature of flooding (frequency and duration) in the stream and associated retention/storage capacity in the adjacent wetland areas. Gage locations are shown in **Figure 4**.

5.2.3 Hydrologic Budget for Restoration Site

Hydrologic budgets for the onsite wetlands will vary based on topographic position (i.e. along toe-of-slope or in the old lake bottom) and relationship to the stream and frequency of flooding. The downstream wetlands will have longer duration flooding events due to the constriction point of the old dam and the restored grade control outlet. The primary hydrologic influence of all wetlands within the project site will be the base flow and groundwater discharge elevation of the restored streams and frequency of flooding in the riparian floodplain. Wetlands located along the fringe of the project area and nearer to the toe-of-slope will have a greater groundwater seepage component in the hydrologic balance.

The water balance for the site will evolve over a period of growing seasons as the site hydrologically (groundwater/surface water interactions) adjusts to the restored grade control elevation at the outlet. In addition, the establishment and successional stages for vegetation communities within the site will evolve as the system is stabilized. It is anticipated that the site will evolve from frequently flooded and ponded to semi-frequently flooded as the vegetation community's capacity to utilize soil water increases over time.

5.3 Soil Characterization

5.3.1 Taxonomic Classification

The NRCS Cumberland County Soil Survey mapping shows the historical extent of Country Club Lake mapped as open water, and the headwater areas are mapped as Johnston mucky loam (Jt) (Figure 3). Johnston mucky loam taxonomic classification is: *Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts.*

5.3.2 Profile Description

Johnston mucky loam is characterized by the mucky A soil horizon that generally varies between two and four feet in depth. The subsoil is typically a loamy to sandy subsoil. Seasonal high water table is zero to twelve inches.

Areas that are within the historic lake footprint area (mapped as water) are similar to the upstream soils mapped as Johnston mucky loam. However, these soils typically have varying depths of sediment which was deposited on the lake bottom. The depth of sediment deposition is greater in the upper portions of the site in the forebay areas where the tributaries entered the historic lake or more recent beaver impoundments. Further downslope in the project area, the depth of sediment decreases and sediment texture becomes more fine (i.e. finer sediments were held in suspension further downstream before being deposited on the lake bottom).

Soil profile descriptions are included with the data forms for the gage installations and are included in the USACE wetland data forms for the monitoring gage locations in **Appendix 7**.

6.0 Reference Wetlands

6.1 Hydrological Characterization

The reference wetland location includes a stable stream section (discussed in Section 4.0) and riparian wetland floodplain approximately 300 linear feet upstream from the culvert at Hillard Drive. Hydrologic indicators show that the wetland area adjacent to the stream is sustained by overbank flow and flood water storage from the stream, as well as from groundwater seepage and surface water sheet flow storage along the toe-of-slope. The culvert provides a grade control for the stream, as well as for groundwater baseflow and seasonal hydroperiod groundwater elevations.

6.2 Soil Characterization

The soils of the reference site are typical of Johnston mucky loam floodplain soils. The reference site is located within the same watershed (just upstream) of the restoration site providing for the similar parent materials and soil water properties.

6.3 Vegetation Characterization

The reference wetland is typical of the Coastal Plain Small Stream Swamp community as described in *Classification of the natural Communities of North Carolina, 3rd Approximation* (Shafale and Weakley, 1990). The site contains a diverse riparian wetland community including, but not limited to, Black Gum, Red Maple, Loblolly Bay, Privet, Sweet Pepperbush, Elderberry, Pokeberry, Smartweed, Sensitive Fern, Northern Chain Fern, Lizard's Tail, Microstegium, Grape Vine, Greenbriar, Blackberry, and False Nettle.

7.0 Project Site Restoration Plan

The objective of this project is to plan, design, and construct a dynamically stable stream/riparian floodplain and bottomland hardwood wetland community providing an ecological lift for the entire site. The restoration approach due to the existing condition and varied historical conditions of the site (lake, dry lake bed, beaver impoundments, etc.) involves "adaptive" management. This approach will be used to restore the site in phases to help bring it to a reference/goal condition.

This plan outlines that adaptive management approach. Although the exact extent and location of work will not be known until the previous phase is completed the ecological goals (based on reference) are known. Therefore, the techniques used to restore the site will be "adapted" but the ultimate ecological goals will be rigid.

This restoration plan outlines the restoration approaches that are anticipated but may be adapted as the site is brought back to the reference/goal ecological functions. This plan also discusses plans for potential issues that could arise during this restoration.

7.1 Restoration Project Goals and Objectives

The Tarlton Stream and Wetland Restoration Project strives to restore and enhance wetland areas, restore a stream and riparian wetland community (including vegetation) in the impounded areas, and

restore ecological function to the site in line with the reference community upstream. The project should also provide some secondary benefits including improved aesthetics, water quantity benefits (peak flow reductions), and community/neighborhood education. The restoration plan was designed with consideration of the following site characteristics:

- Urbanized watershed
- Utilities
- Beaver activities
- Site history

The approach to restoration design is described in the following sections.

General Restoration Approach

The stream restoration approach is a step-wise phased approach process.

Phase I (completed Fall 2005)

A beaver management plan was incorporated to remove all the beavers from the project site. Mid-Atlantic Mitigation secured a contract with a licensed contractor who remove all the beavers from the project site in fall of 2005 and is providing regular inspections of the site to manage any repopulating of the site. Regular inspections will be monthly for the first 6 months then quarterly for 5 years. The removal of the old dam debris (next step) will make it more difficult for the beavers to reestablish a dam at its existing location. The second step was to remove the beaver dams and release the impounded water downstream.

The USACE reviewed the site on October 12, 2005 to evaluate the jurisdictional areas (stream, wetlands, and open waters). They also provided guidance on Section 404 permitting requirements for the restoration efforts. The USACE recommended that the entire project would be permitted under a Nationwide 27 permit. The initial permit would include the grade control and debris removal (Phase I). Then once the site was surveyed and a restoration plan prepared for the remainder of the site, the NWP 27 permit would be modified to include the additional stream and wetland areas. Documentation of the October 2005 USACE field review is included as Appendix 8.

In mid-November 2005, the lake water level was lowered over a 3-5 day period slowly releasing the water downstream to prevent flooding or erosion. In conjunction with removing the beaver dams, the stream section through the area of the historical dam and beaver dams was restored. This restoration establishes a stable grade control, which maintains the elevation of the stream thalweg and the floodplain at the downstream end of the project area. The floodplain elevation was set to hold the grade of the existing lake bottom and to prevent any sediment that was in the old the lake from being washed downstream and to provide a natural pinch point corresponding with existing topography. This pinch point will help further flood the historic lake (proposed riparian wetland) during events above bankfull. This design provides both secondary water quality and quantity benefits. A summary table of the routing of this system is below in Table 4.

Table 4. Peak Discharge Reduction*

Storm Event	Qpeak Without Existing Dam Storage	Qpeak With Existing Dam Storage	Qpeak Reduction
	(cfs)	(cfs)	(%)
2-yr	604	578	4.30%
10-yr	1420	1360	4.23%
25-yr	1946	1869	3.96%
50-yr	2370	2287	3.50%
100-yr	2798	2708	3.22%

**The peak flow reductions shown above are generally 4%.*

Phase II (on-going)

Once the beavers, beaver dams, and impounded water was removed, and the downstream grade control established, the site is undergoing a natural adjustment to stable downstream grade control. The stream segments are seeking hydraulic equilibrium and have begun to re-establish bed and bank features. In addition, the site soils are gradually dewatering allowing the deposited sediments to consolidate and subside. Once the impoundments were removed, the streams were mapped using aerial photogrammetery providing base mapping for the design

The Restoration Plan, and Typical Plan, Profile, and Cross Section are shown in Figures 12 through 15. The Restoration Plan shows the design approach based on ranges of reference morphology. Once the site soils have stabilized through evapotranspiration and subsidence, and the stream has begun to re-establish stream function, the site streams will be evaluated and adjusted (as necessary). This adaptive management approach will allow the streams to naturally seek equilibrium and appropriate dimension, pattern, and profile as the site stabilizes, and the restoration approach will be to determine whether the stream adjustments trend towards the design criteria based on reference morphology. The restoration design will ultimately provide appropriate bank heights and bankfull benches to restore or enhance associated floodplain wetlands. Reference morphology for the restoration design is presented in **Restoration Table I**.

Based on the Restoration Plan shown in Figure 10, the total length of restored stream is 3,220 linear feet, and the total length of enhanced stream is 825 linear feet.

7.1.1 Designed Channel Classification

The eastern and western prongs are designed as Rosgen C5 channels.

7.1.2 Target Wetland Communities/Buffer Communities

The riparian wetland and buffer vegetation community will transition as the system seeks hydrologic equilibrium. The initial planting/seeding of the site will be intended to establish herbaceous cover of exposed bare soils with the expectation that the initial growing season will allow for evapotranspiration to dewater lake bottom sediments. These sediments are currently unconsolidated and buoyant with saturation. It is anticipated that settling and subsidence will occur throughout the initial growing season, first through evaporation and then including transpiration as the herbaceous cover (seeded and natural propagation) establishes. Areas that are not saturated/ponded (i.e. fringe areas and/or headwater wetlands) will be planted with bare root seedlings to establish a bottomland hardwood riparian wetland community.

For areas that are stabilized with seeding only during the initial planting, supplemental containerized plantings will be planted prior to the second growing season. This will allow for the area soils to stabilize and for hydrologic equilibrium representative of the long-term bottomland hardwood riparian community. It is anticipated that these containerized plantings will be able to survive a later planting date since the containerized plants will have an established root system, and the site will be able to provide sufficient water capacity as the site continues to stabilize through the initial growing season.

It is likely that there will be areas or pockets of swamp that will remain through the initial growing season. These areas will be identified after the initial growing season and will likely remain as herbaceous emergent wetland vegetation, or will be planted with supplemental containerized plants as necessary prior to the second growing season.

Figure 16 shows the area within the restoration site that will likely be inundated during the 2-year and 10-year storm events. This is likely to occur since there will be a potion of the historical dam that will remain creating a "pinch point" for the floodplain and will provide for some flood storage within the site. This will benefit the hydrology of the wetland systems throughout the site and will contribute to varying hydroperiods for areas within the site (i.e. wetlands near the downstream portion of the site may have longer periods of flooding and inundation after storm events). The flood areas map also shows the areas most likely to stay saturated for a longer period through the initial growing season due to the topography of the site. **Figure 17** shows the planting plan and **Figure 18** show the vegetation planting notes.

Based on the Restoration Plan shown in **Figure 12**, the total area of restored wetland is 6.8 acres, and the total area of enhanced wetland is 2.4 acres.

7.2 Sediment Transport Analysis

Sediment transport was calculated using HEC-RAS analysis to verify that the designed channel would be capable of transporting the range of sizes of materials in the system based on stream power. The targeted stream power is based on reference data and literature (1.0 – 2.4 ft-lbs s^{-1}).

7.3 HEC-RAS Analysis

7.3.1 No-rise, LOMR, CLOMR

The Federal Emergency Management Association (FEMA) Flood Insurance Rate Map (FIRM), map number 370077 0004 D effective June 15, 1984, shows that the project area is mapped as Zone A3 and Zone A. Zone A represents areas within the 100-year flood; base flood elevations and flood hazard factors not determined. Zone A3 represents areas within the 100-year flood; base flood elevations and flood hazard factors determined. FEMA approval is currently being pursued by Carter Burgess (Raleigh, NC) and a No-Rise Certification is expected which will be forwarded to EEP once obtained.

7.3.2 Hydrologic Trespass

The stream was designed to prevent any hydraulic trespass. The restoration provides a channel that will not cause a rise in water surface elevation during the 1% annual chance storm event when compared to the published FIRM map. The Zone A3 areas were determined in 1981 and the FIRM map was published in 1984, both prior to the dam failing in 1989. The proposed surface water elevations should be lower when compared to the FIRM water surface elevations; therefore, it is anticipated that there will not be any hydrologic trespass.

7.4 Stormwater Best Management Practices

7.4.1 Narrative of Site-Specific Stormwater Concerns

The Tarlton Site watershed is in a state of increasing development. As a result, increased flows from impervious areas are affecting the project site, thus retrofit stormwater BMP's will be utilized at the stormwater outfalls identified during site investigations. Currently, the outlets of the existing stormwater culverts discharge directly into the pond and/or streams untreated, resulting in higher pollutant levels and could also result in increased velocities in the restored stream system if unchanged. Unstable outlets will be modified with level spreaders, pre-formed scour holes or rip rap energy dissapators.

7.4.2 Device Description and Application

Routing the stormwater through a pre-formed scour hole / level spreader type BMP before it is discharged into the stream will treat the runoff, resulting in reduced levels of sediment while significantly reducing the energy at the outlet. See **Figure 13** for level spreader detail.

7.5 Hydrological Modification

7.5.1 Narrative of Modifications

The restoration of the Tarlton site is a hydrologic restoration of the natural surface water-groundwater dynamic and hydroperiod associated with the stream base flow. The existing impoundment has been removed which resulted in the lowering of the water table to the elevation of the restored channel. Hydrologic floodplain and wetland functions will be restored through restoration of the hydrologic dynamics (i.e. groundwater seepage and overbank flood storage rather than an impounded water surface).

7.6 Soil Restoration

7.6.1 Narrative and Soil Preparation and Amendment

The soils within the enhancement areas are hydric due to historical impoundment/inundation and are currently in the active floodplain. In the restoration areas, the soil surface will be overlain with a depositional layer of fine textured pond sediments on top of the typically mucky Johnston soils. The depth of sediment deposition is limited such that soil type will not be a limiting factor for the re-establishment of wetland vegetation communities. Once the site has stabilized and evapotranspiration allows for the soil surface to subside, the site will be evaluated to identify areas

where modification to the soil surface is necessary to meet the intent of the design. It is anticipated that grading by heavy machinery will not be necessary for the establishment of wetland areas and microtopography. Improvements to microtopography will be made through low-intrusive measures as necessary (i.e. manual labor and/or light equipment).

Based on the history of the site and available plant nutrients/organic material, soil amendments will not be applied to the soils.

7.7 Natural Plant Community Restoration

A planting plan was developed consistent with the step-wise process for the restoration. The first step will be to establish an herbaceous cover of areas denuded of vegetation to initiate evapotranspiration process as the site adjusts to the hydrologic modifications. Woody seedlings will be planted along the fringe areas accessible for planting prior to the initial growing season. The second step will be to supplement the initial seedling plantings and natural propagation with larger containerized plants prior to the second growing season.

The intent is to stabilize the site first and then to promote the natural bottomland hardwood floodplain wetland community throughout the site second. The planting plan will use reference plant communities discussed in Section 5.4 as a base to design a planting scheme and develop a vegetation list.

The enhancement areas are existing vegetated floodplain wetlands where enhancement activities will focus more on the hydrologic stability rather than intensive plantings. Long-term management of these areas will include management for nuisance species.

It is anticipated that the fringe areas and upstream floodplain vegetated corridor will provide a significant source of natural propagation of early pioneer species. The phased planting plan will focus on establishing larger species to promote the climax community and limit invasive species propagation.

The Planting Plan is shown in **Figure 17**.

7.7.1 Planting Zones

The phased planting plan includes six targeted zones of distinct vegetative composition and structure.

- Zone 1 – Stream Channel
- Zone 2 – Stream Bank
- Zone 3 – Bottomland Hardwood Wetland
- Zone 4 – Cypress-Gum Swamp
- Zone 5 – Upland Fringe

The zones are shown in **Figure 17** and are described below.

Zone 1 – Stream Channel

The stream channel zone includes the stream channel from base flow to bankfull. The zone features the steepest slopes (3-8%) of the zones and highest saturation levels. This environment dictates the planting of fast-growing, obligate pioneer species to provide stability to areas at or below bankfull.

Zone 2 – Stream Bank

The stream bank zone includes the area from the top of bank outward away from the stream 20 feet. It is an area exposed to regular stream flows and frequent soil deposition. The most stressed areas are located on the outside bends of meanders. The banks will be planted with fast-growing, deep-rooted species that will provide biostabilization and shading to the stream

Zone 3 – Bottomland Hardwood Wetland

The Bottomland Hardwood Wetland zone includes the area beyond Zone 2 but within the active floodplain. This area is generally frequently flooded with seasonal high water tables near the surface, but the area is infrequently inundated or ponded for longer durations. The vegetation is typical of bottomland hardwood forest community.

Zone 4 – Swamp Wetland

Areas located within or adjacent to Zone 3 where there is inundation for longer periods will be more typical of relic oxbow features and/or swamp. Vegetation in this community will be more adapted to survival in long duration inundation environments. This area is typically lower in elevation compared to other areas of the site and will likely require a longer time to stabilize. The initial planting of this area will be herbaceous only and will be supplemented at a later date with containerized plants as necessary.

Zone 5 – Upland Fringe

Upland areas along the fringe of the site and wetland boundaries, as well as in topographic high points will be planted with supplemental plantings prior to the year-two growing season as needed.

7.7.2 Plant Sources

The planting plan utilizes three sources of plants. Two sources—nursery stock and on-site transplants—will be tied directly to the initial planting and will be utilized in numbers to support permit guidelines. The remaining source—recruitment—will be factored into the selection of species in the plant list. The plant list includes a significant portion of species not likely to establish from natural propagation.

Nursery Stock

The planting plan may utilize any of the following nursery stock forms of woody species: bare roots, containerized seedlings, and ball and burlap. Additionally, the planting plan also may use sod or seeds from commercial sources. For the woody forms of vegetation, the planting plan prescribes that they are grown locally under environmental conditions similar to the target environment.

On-Site Transplants

Within the project area, the restoration sites lie near existing communities with favorable species. In the course of constructing a new channel alignment, some individual plants may need to be removed.

The individuals of a target species that are of an appropriate size and age may be transplanted into the restoration area.

Recruitment

With the improvements to existing hydrology and soil conditions, it is expected that the restoration sites will be populated with species from adjacent communities. The restoration sites will be maintained to keep unwanted species at less than 15% of the total population.

7.7.3 Plant Care and Installation

The plantings will be cared for and installed based on guidelines provided in **Figure 18**. When planted properly, bare root seedlings are the most cost-effective and successful plant material. Containerized plantings, live stakes, and other plant materials will be used based on the needs of the planting zone. Larger unprotected trees will be guarded using tree shelters as needed to promote growth.

7.7.4 Plant List

The plant list is provided in **Figure 18** - Vegetation Notes. The plant list is based on the reference stream-wetland system located upstream from the project area. Additional plantings based on recommendations from the North Carolina Stream Restoration Institute (Hall 2001)and the North Carolina Ecosystem Enhancement Program (Smith 2004) will be included to promote diversity within the vegetation community, and supplemental planting of these species will be planted as needed.

7.7.5 Schedule

The planting plan will be implemented in the phased process of seeding and limited seedling planting in year-one and supplemental plantings of containerized plants prior to year-two (as needed). Planting will be scheduled around stream and wetland construction activities and growing season. Special attention will be paid to stabilizing disturbed areas that include newly constructed channels and temporary construction easements. The final vegetation planting will occur after proper site preparation (described below and in Section 7.7.6) during the appropriate season.

7.7.6 Stabilization

Immediately after construction activities, the contractor will seed the stream banks and all disturbed areas with permanent and temporary seed mixes. Permanent seeding will be completed in conjunction with construction with temporary seeding applied per Land Quality Section requirements. Within the stream channel (Zone 1), the contractor will plant pioneer species that provide immediate bank stabilization. The contractor will plant live stakes and bare roots around structure installations and the outside of meander bends to provide an area of high density root mass. Coir fiber matting and live stakes will be used along the reaches of the restored channels to provide stabilization until vegetation can be established.

7.7.7 Site Preparation and On-Site Invasive Species Management

Prior to supplemental planting for year-two, the site will be evaluated for management and removal of invasive plants such as multiflora rose (*Rosa multiflora*), Chinese privet (*Lingustrum sineses*), and

Japanese honeysuckle (*Lonicera japonica*). These efforts should include herbicide use during the spring and a follow-up spraying in early fall to eliminate any fescue that was not killed in the spring. A permanent seed mix can be used after application of the pre-emergent. Woody planting can follow during the dormant season.

7.7.8 Planting Review

After the final planting is complete, the planting supervisor will verify that the site was planted properly though inspection of stem counts and condition. The planting contractor will be responsible for replacing damaged plantings.

8.0 Performance Criteria

8.1 Stream Success Criteria

The stream geometry will be considered successful if the cross-section geometry, profile, and sinuosity are stable or reach a dynamic equilibrium. It is expected that there will be minimal changes in the designed cross sections, profile, and/or substrate composition. Changes that may occur during the monitoring period will be evaluated to determine if they represent a movement toward a more unstable condition (e.g. down cutting, erosion, etc.) or are minor changes that represent an increase in stability (e.g. settling, vegetative changes, coarsening of bed material, etc.).

An initial, though not exclusive, indicator of success will be adherence to design or reference ratios of stream geometry found in the morphological table **(Restoration Table I)** or in comparable and stable reference systems.

Deviation from the design ratios will not necessarily denote failure as it is possible to maintain stability and not stay within the design geometry. Additionally, determination of true bankfull will be difficult until the stream has had adequate flooding events to create strong bankfull indicators. The following key indicators of stability provide a more complete picture of stream stability:

- Stream Type: Maintenance of the design stream type or progression or conversion to stable stream type such as B, C, or E will indicate stability
- Bank Height Ratio: Bank height ratio between 1.0 and 1.1 will indicate flood flows have access to the active floodplain and that higher flows do not apply excessive stresses to stream banks

The nature of the watershed presents challenges to stream restoration. The contributing watersheds lie within a rapidly developing region. The urbanizing watershed's runoff character will continue to change as the nature of the land cover shifts to less permeable surfaces. The hydrograph will shift such that bankfull flooding events will become more frequent and peak discharges will be higher. The cross sections have been designed to account for some shifting in bankfull discharges.

Upstream construction activities driven by land development likely will lead to episodic sediment pulses sent downstream through the stream network. Additionally, erosion of upstream unstable stream banks will persistently contribute sediment to the project reaches. The designer anticipates that the excess sediment will either be routed though the project area or deposited in target areas such as point bars and the floodplain. Minor sedimentation of pools and glides may occur.

8.2 Wetland Success Criteria

The success of wetland enhancement / restoration will be measured by comparing the restored/enhanced wetlands with the upstream reference wetland. Wetland hydrologic functions will be evaluated based on hydroperiod (depth and duration of saturation of the upper surface during the growing season), as well as stream/wetland relationships observed in the reference (i.e. stream water surface at base flow and during storm events related to groundwater elevations and flood storage capacity). Success criteria are summarized in the following sections.

8.2.1 Hydrology

The minimum requirement to judge establishment of wetland hydrology will be adherence to USACE guidelines (United States Army Corps of Engineers 1987) including saturation of the upper surface of the soils for a minimum period of consecutive days during the growing season. Further success of the restoration and enhancement of wetland hydrology will be measured by improvements to the frequency and duration of flood flows, groundwater levels, flood storage, and surface water infiltration. Gages will measure these components and the measurements will be compared to measured reference water table dynamics. In addition, a stream water level gage will be monitored in relation to a wetland gage within the restoration area for comparison to the reference wetland site.

8.2.2 Vegetation

The prevalent vegetation should consist of macrophytes that typically are adapted for life in saturated soil conditions. These species should have the ability to grow, compete, reproduce, and persist in anaerobic soil conditions. A reduction in the percentage of nuisance vegetation in wetlands areas with existing vegetation to less than 15% will indicate enhancement of wetland vegetation. For the restoration areas, study plots showing that the composition and density of vegetation in the restoration areas that compares closely to the reference areas will indicate restoration success for vegetation.

8.2.3 Soil

The site soils are generally hydric due to inundation of much of the site at one time. Therefore, hydrologic indicators will be used to support soil criteria for wetland establishment.

8.3 Vegetation Success Criteria

The initial success of riparian and wetland vegetation planting will be evaluated based on herbaceous cover as the site is stabilized in the initial growing season. After the year-two growing season, success will be gauged by stem counts of planted species. Stem counts of over 320 trees per acres after 3 years, 288 trees per acre after 4 years, and 260 trees per acre after 5 year will be considered successful. Photos taken at established photo points should indicate maturation of riparian vegetation community.

8.4 Schedule / Reporting

The monitoring plan to evaluate the success of the stream restoration project is based on guidance provided by The Stream Mitigation Guidelines disseminated by the United States Corps of Engineers – Wilmington District and recommendation from the Ecosystem Enhancement Program.

Upon completion of the restoration project, an as-built survey will be conducted that documents the following conditions:

- Geomorphology (dimension, pattern, and profile)
- Channel materials
- Channel stability and in-stream structure functionality
- Wetland hydrology
- Vegetation (stream and wetland)

The survey of channel dimension will consist of permanent cross sections placed at approximately two cross sections (one riffle and one pool) per unique stream segment. The cross sections will represent approximately 50% riffles and 50% pools. Annual photographs showing both banks and upstream and downstream views will be taken from permanent, mapped photo points. The survey of the longitudinal profile will represent distinct areas of restoration and will cover a cumulative total of 3,000 linear feet of channel. Newly-constructed meanders will be surveyed to provide pattern measurements. Channel material measurements will be collected by using pebble counts for at least six of the permanent cross sections.

The entire restored length of stream will be investigated for channel stability and in-stream structure functionality. Any evidence of channel instability will be identified, mapped, and photographed. All structures will be inventoried for functionality and photographed.

Wetland hydrology will be measured using groundwater monitoring gages that were installed at the beginning of restoration efforts. The gages will monitor water table elevations on an hourly basis using continuous recorder dataloggers through the monitoring period.

The success of vegetation plantings will be measured through stem counts. Permanent quadrants will be used to sample the riparian buffer and restoration wetlands. The primary quadrant will cover 100 square meters for tree counts. Within the primary quadrant, a 25-square-meter quadrant will be placed to count shrubs, and a 1-meter quadrant will be placed to measure herbaceous coverage. During the counts, the health of the vegetation will be noted. In addition to stem counts, the samples will inventory species to allow for comparison between the reference and restoration wetlands and track the population of the nuisance species. The vegetation survey will occur during the growing season. Permanent photo points will be set up for each quadrant.

The monitoring will occur annually for five years. The monitoring period should include two separate years with bankfull events. Bankfull events will be verified using an installed crest gage that will be inspected during each monitoring visit. If a bankfull event has not been documented by the end of the second year of monitoring, a mandatory quarterly check will be required. If there are not two bankfull events, the monitoring period may be extended at the discretion of the Corps of Engineers, Raleigh Regulatory Field Office Project Manager and the 401-Wetlands Unit. Monitoring reports will be submitted during years 1-5.

9.0 References

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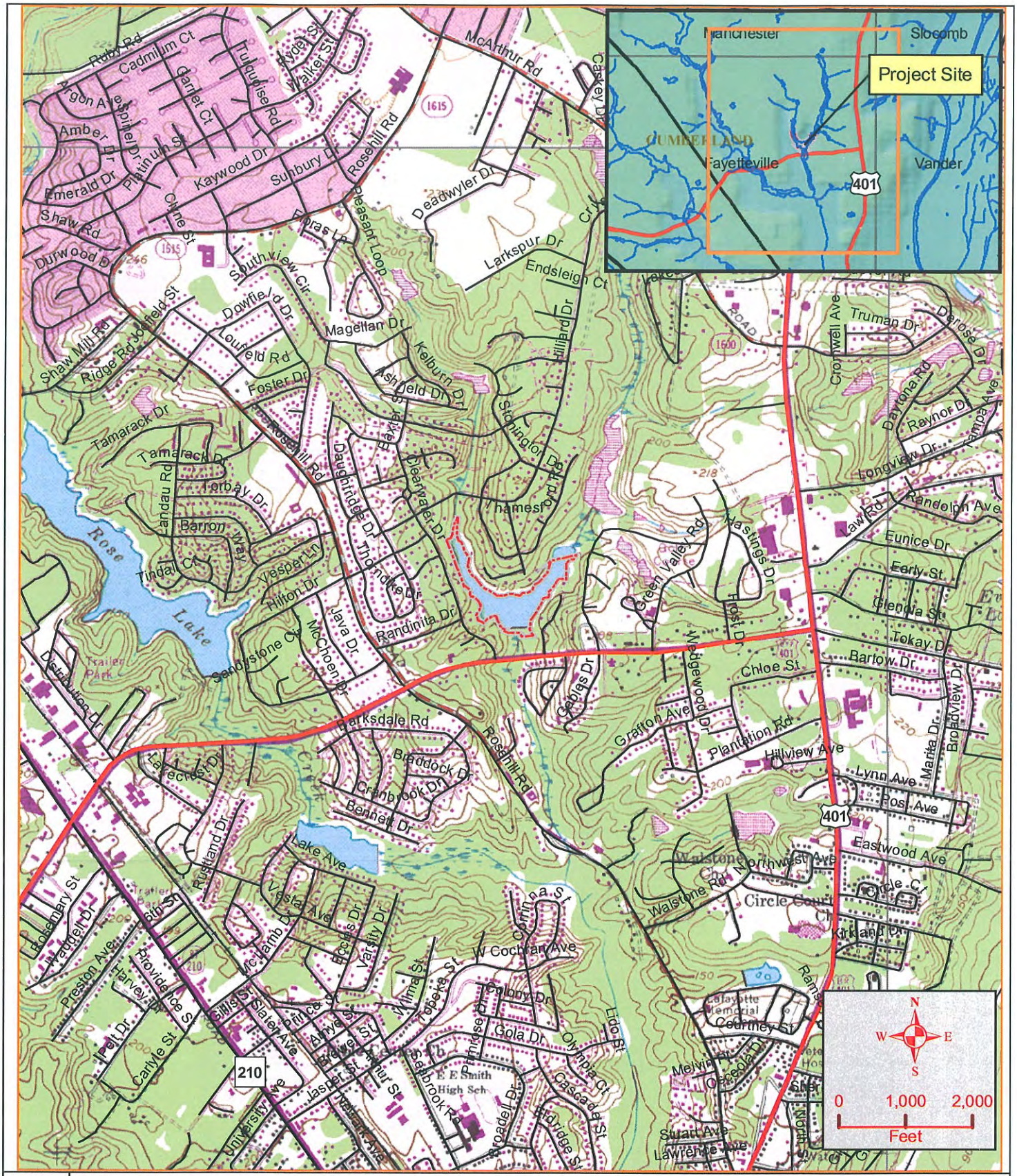
Restoration Table I: MORPHOLOGY CHARACTERISTICS
Tarlton Stream and Wetland Restoration
Cumberland County, North Carolina
Project ID No. 012857003

VARIABLES	Restoration Goals Western Prong	Restoration Goals Eastern Prong	Restoration Goals UT to Western Prong	Reference Reach Upper Western Prong	Reference Reach Johannah Creek (NC CRI)	Reference Reach Little Doe Creek (NC SRI)	Reference Reach Flat Creek (NC SRI)	Coastal Plain Rural Regional Curves (DRAFT)
1. Stream Type (Rosgen)	C5	C5	C5	C5	C5	C5	E	
2. Drainage Area (sq. mile)	0.8 - 1.0	1.5 - 1.6	0.07 - 0.09	0.8	1.0	2.0	7.6	2.6
3. Bankfull Width (W_{bkf})	**Mean:** 6.5 Range: 6.0 – 7.0	**Mean:** 9.0 Range: 8.5 – 9.5	**Mean:** 3.2 Range: 2.5 – 3.5	**Mean:** 6.9 Range:	**Mean:** 10.4 Range:	**Mean:** 19.6 Range:	**Mean:** 22.0 Range:	**Mean:** 15.5 Range:
4. Bankfull Mean depth (d_{bkf})	**Mean:** 0.4 Range: 0.3 – 0.4	**Mean:** 0.5 Range: 0.4 – 0.5	**Mean:** 0.2 Range: 0.1 – 0.3	**Mean:** 0.5 Range:	**Mean:** 0.8 Range:	**Mean:** 1.5 Range:	**Mean:** 2.3 Range:	**Mean:** 1.7 Range:
5. Width/Depth Ratio (W_{bkf}/d_{bkf})	**Mean:** 18.1 Range: 17.0 – 20.7	**Mean:** 18.8 Range: 18.3 – 19.3	**Mean:** 15.8 Range: 14.6 – 17.1	**Mean:** 13.8 Range:	**Mean:** *13.0* Range:	**Mean:** *13.1* Range:	**Mean:** *9.6* Range:	**Mean:** *9.1* Range:
6. Bankfull cross-sectional Area (Abkf)	**Mean:** 3.2 Range: 2.7 – 3.7	**Mean:** 6.1 Range: 5.3 – 6.9	**Mean:** 0.9 Range: 0.5 – 1.1	**Mean:** 3.4 Range:	**Mean:** 8.6 Range:	**Mean:** 29.0 Range:	**Mean:** 51.4 Range:	**Mean:** 27.3 Range:
7. Bankfull Mean Velocity (V_{bkf})	**Mean:** 3.4 Range: 2.6 – 4.2	**Mean:** 2.6 Range: 2.2 – 3.0	**Mean:** 2.2 Range: 1.6 – 4.2	**Mean:** 3.9 Range:	**Mean:** 1.7 Range:	**Mean:** 1.2 Range:	**Mean:** 2.0 Range:	**Mean:** 1.2 Range:
8. Bankfull Discharge, cfs (Q_{bkf})	**Mean:** 10.4 Range: 9.5 – 11.3	**Mean:** 15.4 Range: 15.0 – 15.7	**Mean:** 2.0 Range: 1.8 – 2.1	**Mean:** 13.5 Range:	**Mean:** *14.2* Range:	**Mean:** *34.5* Range:	**Mean:** *105.0* Range:	**Mean:** *32.9* Range:
9. Bankfull Maximum Depth (d_{max})	**Mean:** 0.8 Range: 0.7 – 0.8	**Mean:** 1.0 Range: 0.9 – 1.1	**Mean:** 0.4 Range: 0.3 – 0.5	**Mean:** 1.1 Range: 1.0 – 1.3	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
10. Max d_{max}/d_{bkf} ratio	**Mean:** 2.1 Range: 2.0 – 2.3	**Mean:** 2.1 Range: 2.0 – 2.3	**Mean:** 2.2 Range: 2.0 – 2.3	**Mean:** 2.1 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
11. Low Bank Height to max d_{bkf} ratio	**Mean:** 1.0 Range: 1.0 – 1.2	**Mean:** 1.0 Range: 1.0 – 1.2	**Mean:** 1.0 Range: 1.0 – 1.2	**Mean:** 1.1 Range: 1.0 – 1.2	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
12. Width of Flood Prone Area (W_{fpa})	**Mean:** 150.0 Range: 60.0 – 205.0	**Mean:** 200.0 Range: 145.0 – 245.0	**Mean:** 130.0 Range: 100.0 – 160.0	**Mean:** 47.6 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
13. Entrenchment Ratio (W_{fpa}/W_{bkf})	**Mean:** 23.1 Range: 10.0 – 29.3	**Mean:** 22.2 Range: 17.1 – 25.8	**Mean:** 41.3 Range: 40.8 – 45.7	**Mean:** 6.9 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
14. Meander Length (L_m)	**Mean:** 74.8 Range: 54.0 – 98.0	**Mean:** 103.5 Range: 76.5 – 133.0	**Mean:** 36.2 Range: 22.1 – 49.0	**Mean:** 47.0 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
15. Ratio of Meander Length to Bankfull Width (L_m/W_{bkf})	**Mean:** 11.5 Range: 9.0 – 14.0	**Mean:** 11.5 Range: 9.0 – 14.0	**Mean:** 11.5 Range: 9.0 – 14.0	**Mean:** 6.8 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
16. Radius of Curvature (R_c)	**Mean:** 19.5 Range: 15.0 – 28.0	**Mean:** 27.0 Range: 22.5 – 36.0	**Mean:** 9.5 Range: 7.9 – 12.6	**Mean:** 13.0 Range: 11.0 – 16.0	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
17. Ratio of Radius of Curvature to Bankfull Width (R_c/W_{bkf})	**Mean:** 3.0 Range: 2.5 – 4.0	**Mean:** 3.0 Range: 2.5 – 4.0	**Mean:** 3.0 Range: 2.5 – 4.0	**Mean:** 1.9 Range: 1.6 – 2.3	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
18. Belt Width (W_{blt})	**Mean:** 100.0 Range: 50.0 – 130.0	**Mean:** 150.0 Range: 110.0 – 180.0	**Mean:** 40.0 Range: 30.0 – 50.0	**Mean:** 20.2 Range: 18.0 – 22.2	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
19. Meander Width Ratio (W_{blt}/W_{bkf})	**Mean:** 14.4 Range: 7.1 – 21.7	**Mean:** 16.4 Range: 11.6 – 21.2	**Mean:** 12.7 Range: 8.6 – 20.4	**Mean:** 2.9 Range: 2.6 – 3.2	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
20. Sinuosity (k) (Stream Length / Valley Length)	**Mean:** 1.3 Range: 1.2 – 1.5	**Mean:** 1.3 Range: 1.2 – 1.5	**Mean:** 1.2 Range: 1.2 – 1.5	**Mean:** 1.3 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
21. Valley Slope (Sv_{alley}) (ft/ft)	**Mean:** 0.0055 Range:	**Mean:** 0.0045 Range:	**Mean:** 0.0200 Range:	**Mean:** 0.0079 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
22. Average Stream Slope (S_{avg}) = (S_{valley}/k)	**Mean:** 0.0042 Range: 0.0037 – 0.0046	**Mean:** 0.0035 Range: 0.0023 – 0.0038	**Mean:** 0.0166 Range: 0.0133 – 0.0167	**Mean:** 0.0099 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
23. Riffle Slope (S_{rift})	**Mean:** 0.0074 Range: 0.0063 – 0.0084	**Mean:** 0.0061 Range: 0.0053 – 0.0070	**Mean:** 0.0290 Range: 0.0249 – 0.0332	**Mean:** 0.0135 Range: 0.0036 – 0.0310	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
24. Ratio of Riffle Slope to Avg. Slope (S_{riffle}/S_{avg})	**Mean:** 1.8 Range: 1.5 – 2.0	**Mean:** 1.8 Range: 1.5 – 2.0	**Mean:** 1.8 Range: 1.5 – 2.0	**Mean:** 1.4 Range: 0.4 – 3.1	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
25. Pool Slope (S_{pool})	**Mean:** 0.0017 Range: 0.0008 – 0.0021	**Mean:** 0.0014 Range: 0.0007 – 0.0018	**Mean:** 0.0066 Range: 0.0033 – 0.0083	**Mean:** 0.0035 Range: 0.0020 – 0.0050	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
26. Ratio of Pool Slope to Avg. Slope (S_{pool}/S_{avg})	**Mean:** 0.4 Range: 0.2 – 0.5	**Mean:** 0.4 Range: 0.2 – 0.5	**Mean:** 0.4 Range: 0.2 – 0.5	**Mean:** 0.4 Range: 0.2 – 0.5	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
27. Maximum Pool Depth (d_{pool})	**Mean:** 1.4 **Range:** 0.7 – 1.8	**Mean:** 1.9 **Range:** 1.0 – 2.4	**Mean:** 0.8 **Range:** 0.4 – 1.0	**Mean:** 2.1 **Range:**	**Mean:** -- **Range:**	**Mean:** -- **Range:**	**Mean:** -- **Range:**	**Mean:** -- **Range:**
28. Ratio of Pool Depth to Avg. Depth (d_{pool}/d_{avg})	**Mean:** 4.0 Range: 2.0 – 5.0	**Mean:** 4.0 Range: 2.0 – 5.0	**Mean:** 4.0 Range: 2.0 – 5.0	**Mean:** 4.1 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
29. Pool Width (W_{pool})	**Mean:** 9.8 Range: 6.5 – 11.1	**Mean:** 13.5 Range: 9.0 – 15.3	**Mean:** 4.7 Range: 3.2 – 5.4	**Mean:** 7.2 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
30. Ratio of Pool Width to Bankfull Width (W_{pool}/W_{bkf})	**Mean:** 1.5 Range: 1.0 – 1.7	**Mean:** 1.5 Range: 1.0 – 1.7	**Mean:** 1.5 Range: 1.0 – 1.7	**Mean:** 1.0 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
31. Pool Area (A_{pool})	**Mean:** 8.4 Range: 5.9 – 10.4	**Mean:** 15.9 Range: 11.7 – 19.3	**Mean:** 2.3 Range: 1.1 – 3.1	**Mean:** 8.9 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
32. Ratio of Pool Area to Bankfull Area (A_{pool}/A_{bkf})	**Mean:** 2.6 Range: 2.2 – 2.8	**Mean:** 2.6 Range: 2.2 – 2.8	**Mean:** 2.6 Range: 2.2 – 2.8	**Mean:** 2.6 Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
33. Pool to Pool Spacing (p - p)	**Mean:** 33 Range: 20 – 46	**Mean:** 45 Range: 27 – 63	**Mean:** 16 Range: 9 – 22	**Mean:** 34 Range: 21 – 48	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:
34. Ratio of Pool to Pool Spacing to Bankfull Width (p-p/Wbkf)	**Mean:** 5.0 Range: 3.0 – 7.0	**Mean:** 5.0 Range: 3.0 – 7.0	**Mean:** 5.0 Range: 3.0 – 7.0	**Mean:** 5.0 Range: 3.0 – 7.0	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:	**Mean:** -- Range:

Valid Range: 0.2 – 161.0

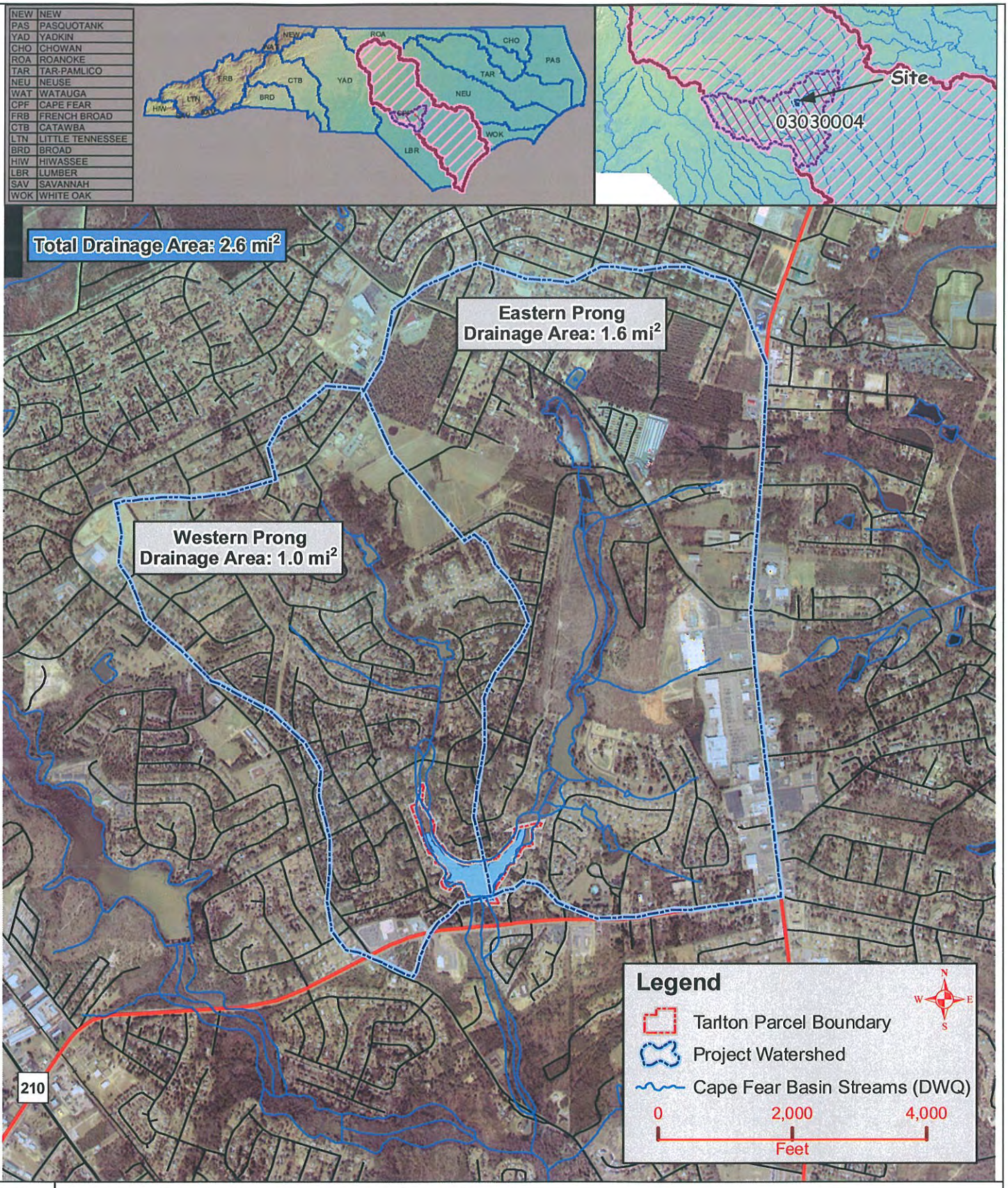
Restoration Table 2: MITIGATION CREDITS
Tarlton Stream and Wetland Restoration
Cumberland County, North Carolina
Project ID No. 012857003

MITIGATION SUMMARY						
MITIGATION TYPE		RESTORATION (1:1)	ENHANCEMENT (1:1.5)	PRESERVATION (1:5)	TOTAL MUs	% RESTORATION
STREAM	LENGTH (FEET)	3,221	826	255	3,823	84%
	MITIGATION UNITS	3,221	551	51		
RIVERINE WETLAND	AREA (ACRES)	6.8	2.4	-	8.0	85%
	MITIGATION	6.8	1.2	-		



Title	Project Site Location Map

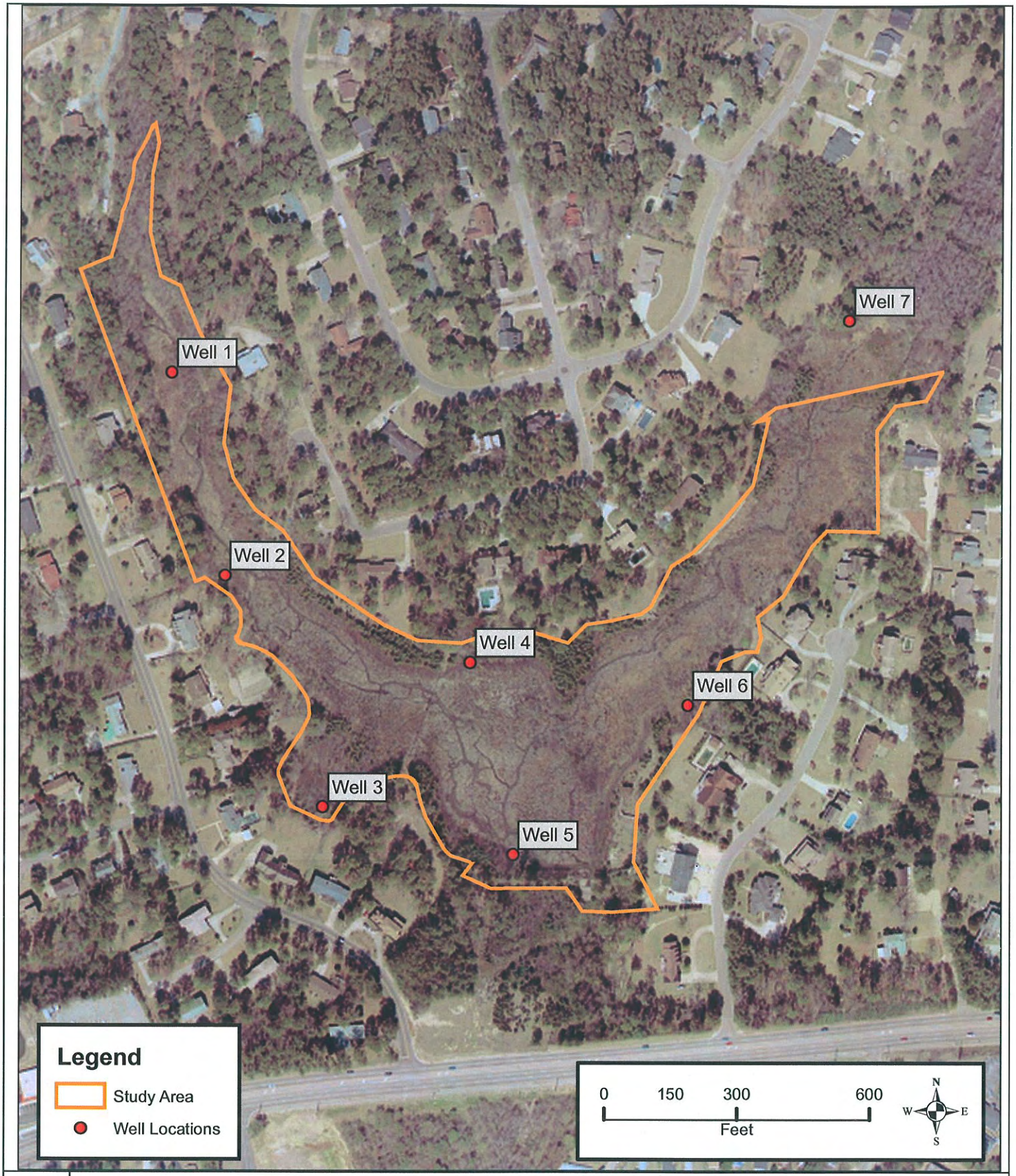
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/24/06	**Project Number** 012857003	**Figure** 1



Title	Project Site Watershed Map (Cumberland County 2001 Aerial)

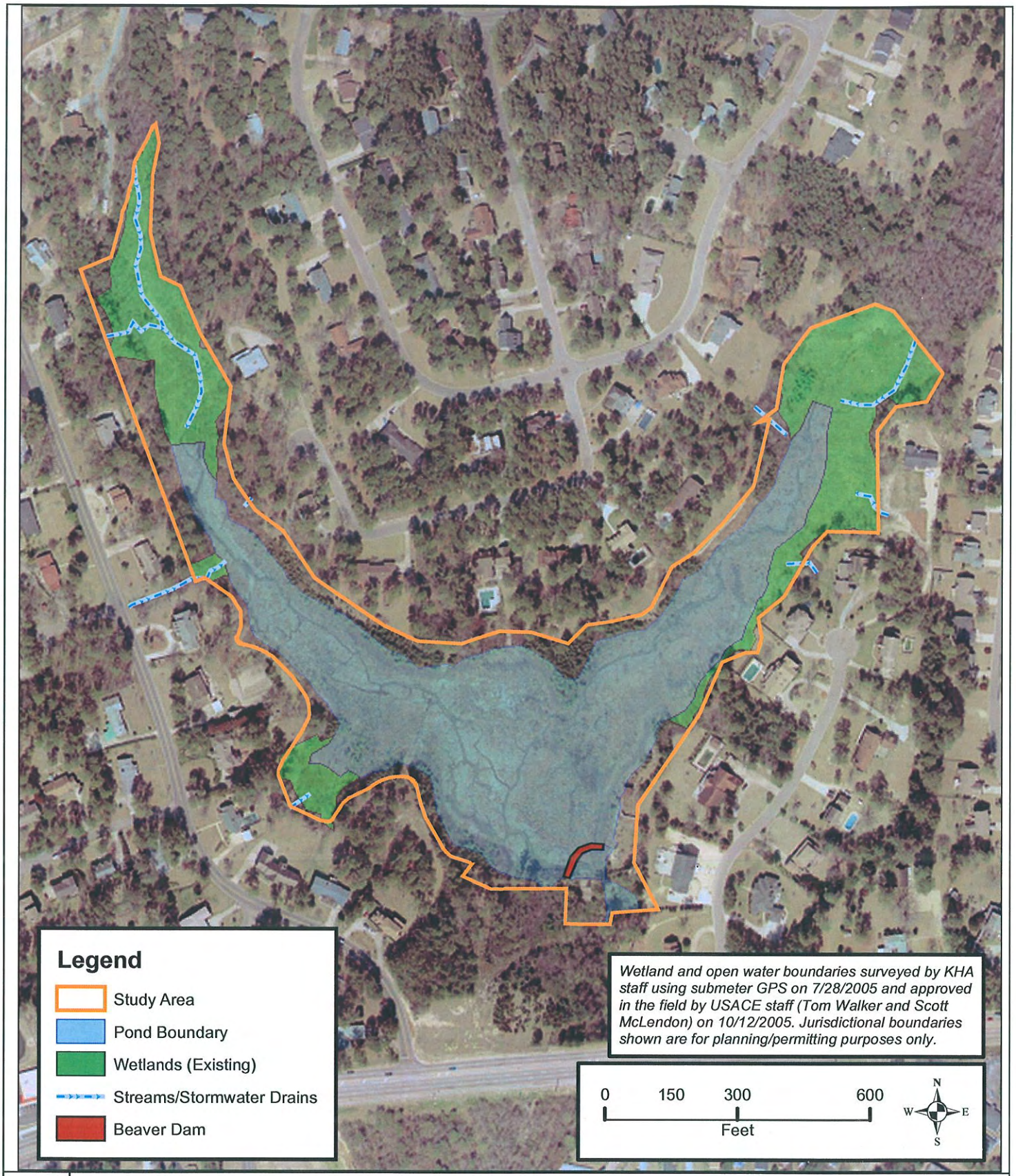
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/24/06	**Project Number** 012857003	**Figure** 2

Title	Project Site NRCS Soil Survey Map		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date	**Project Number**	**Figure**
	2/24/06	012857003	3



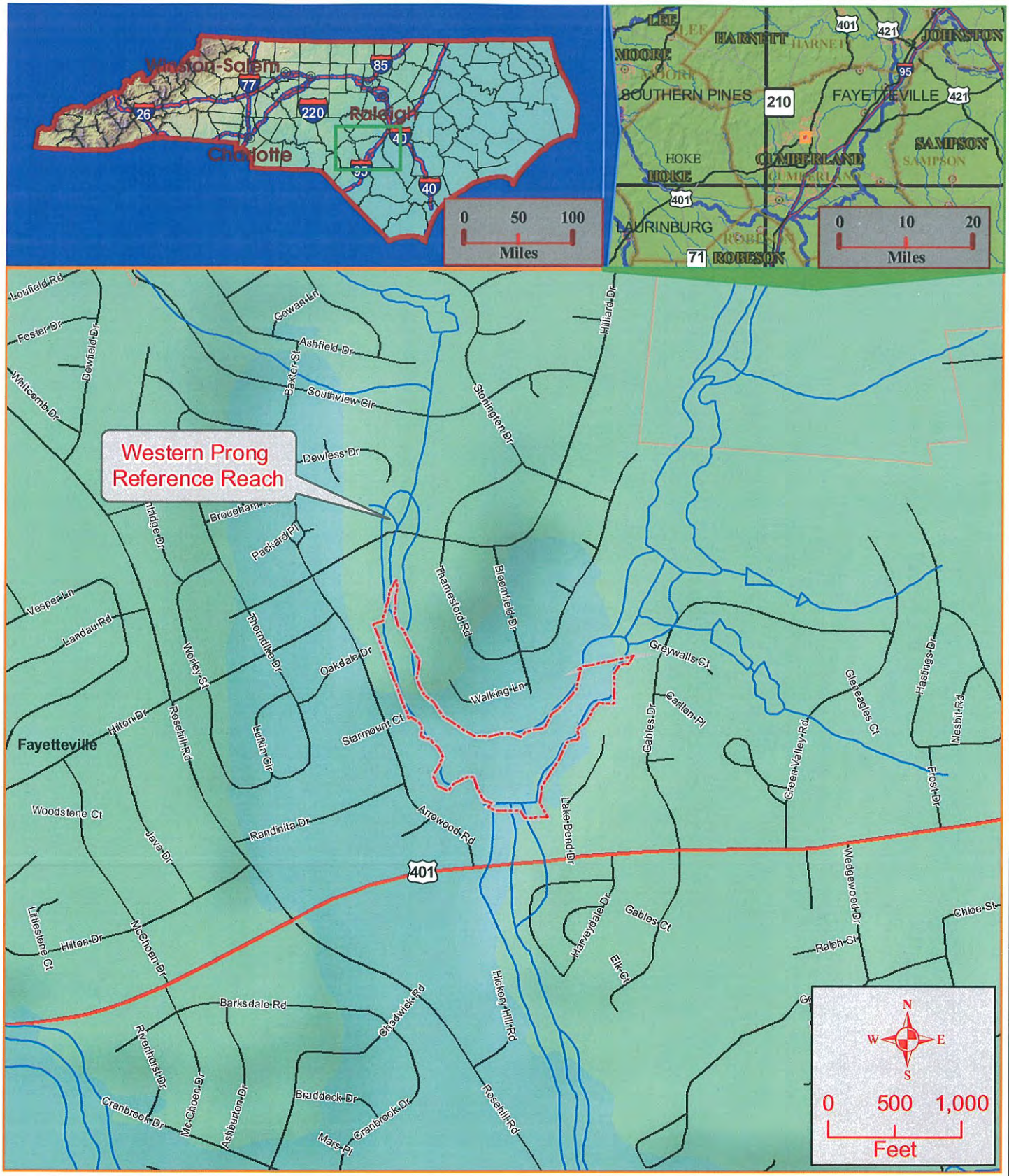
Title	Project Site Hydrological Features Map with Gauge Locations

Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/24/06	**Project Number** 012857003	**Figure** 4

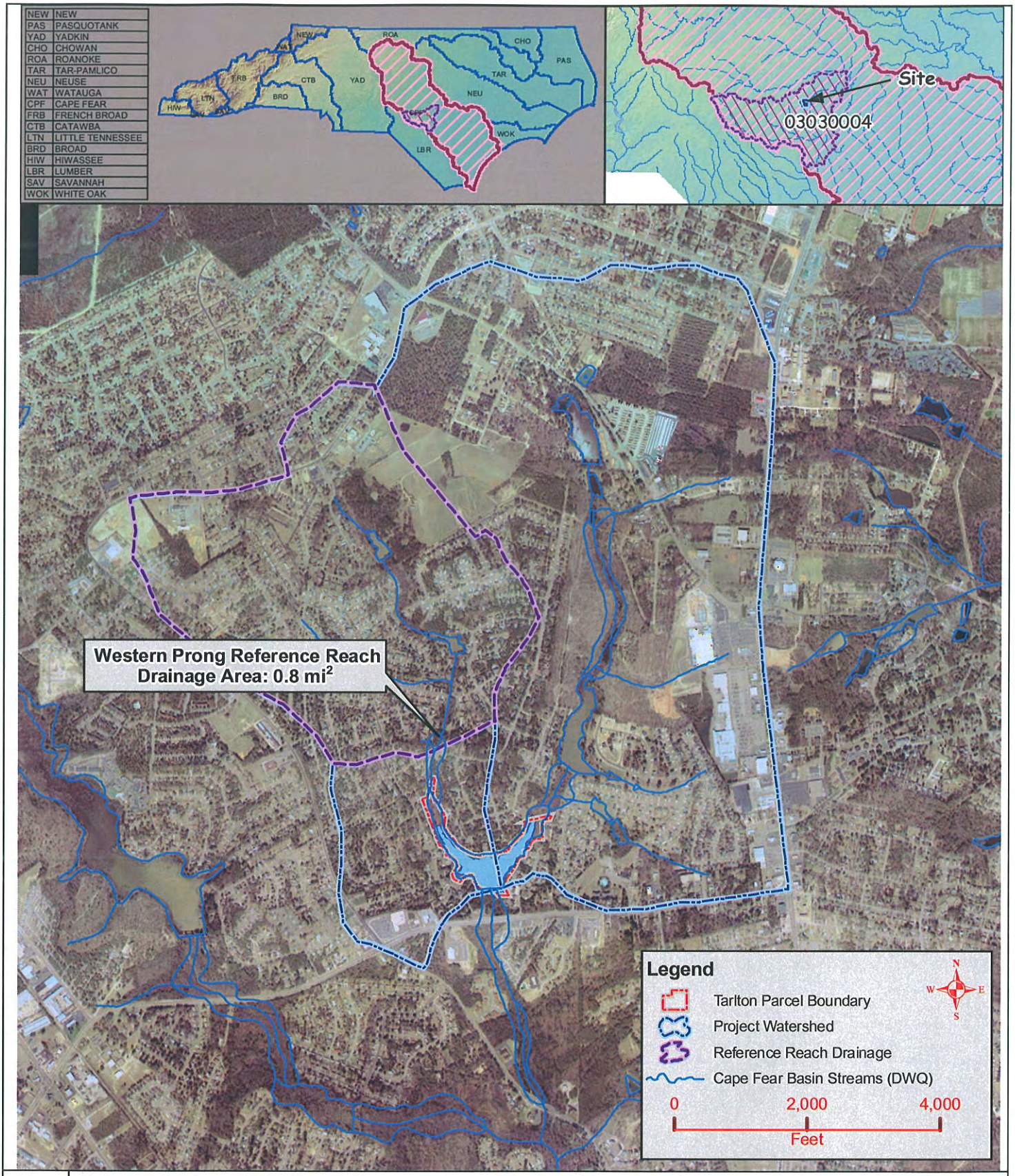


Title	Project Site Wetland Delineation Map

Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date	**Project Number**	**Figure**
	2/24/06	012857003	5

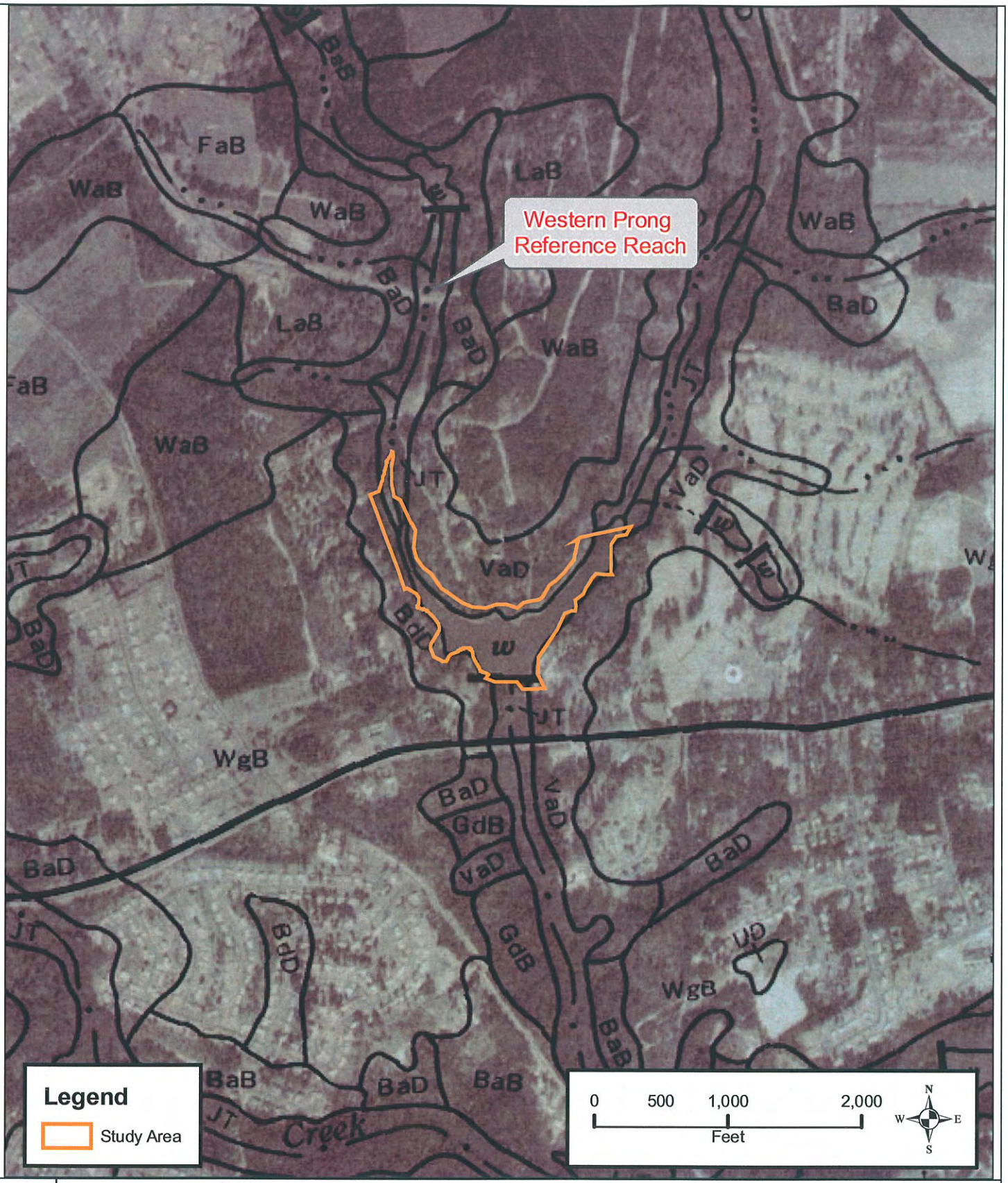


Title	Reference Site Vicinity Map		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date	**Project Number**	**Figure**
	2/24/06	012857003	6



Title	Reference Site Watershed Map

Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/24/06	**Project Number** 012857003	**Figure** 7



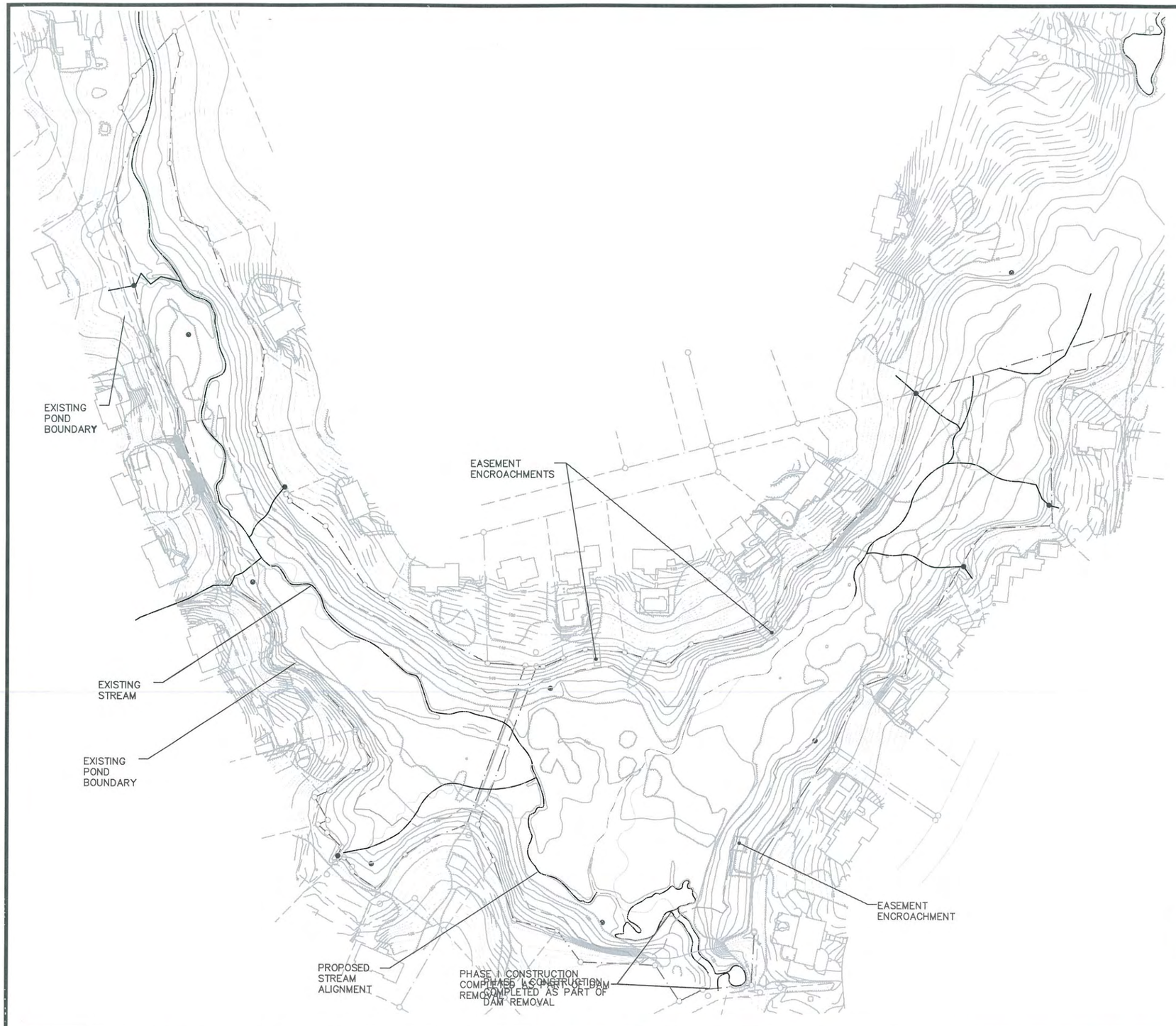
Title	Reference Site NRCS Soil Survey Map		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date	**Project Number**	**Figure**
	2/24/06	012857003	8

Title	Reference Site Wetland Determination Sample Locations with Gauge Locations

Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/24/06	**Project Number** 012857003	**Figure** 9

Title	Reference Site Vegetative Communities Map

Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/24/06	**Project Number** 012857003	**Figure** 10



SITE LEGEND

- FENCE
- WATER
- TREELINE
- SHRUB OR BRUSH
- MAJOR CONTOUR
- MINOR CONTOUR
- PROPERTY BOUNDARY

GRID

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

REV. No.:	REVISIONS:	DATE:	DRAWN BY:	CHECKED BY:

PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
PHONE: (919) 677-2000 FAX: (919) 677-2050

CLIENT: MID-ATLANTIC MITIGATION

TITLE: EXISTING CONDITIONS

SEAL:

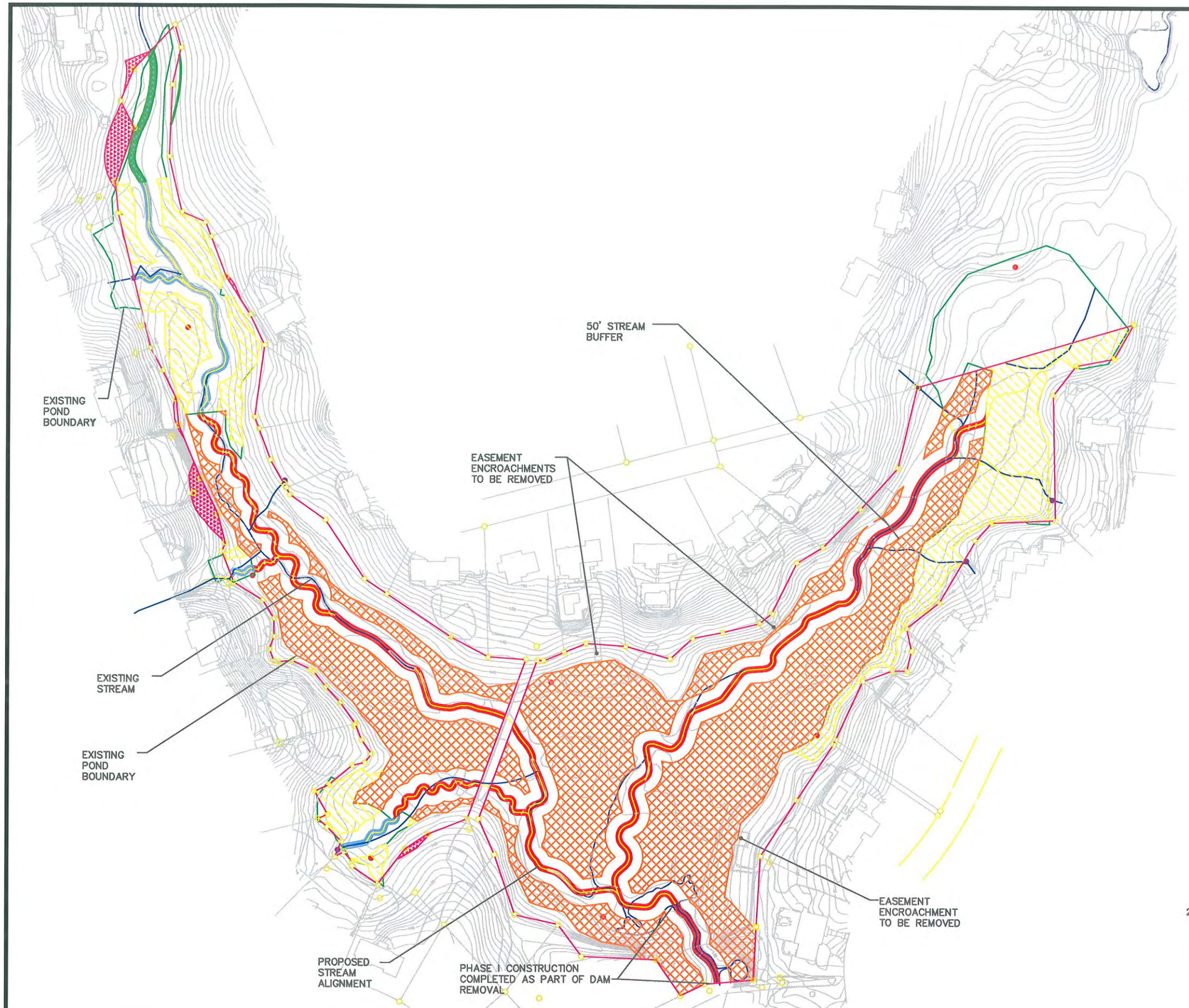
DATE:	02/24/06
HORIZONTAL SCALE:	
VERTICAL SCALE:	
DRAWN BY:	JIK
DESIGNED BY:	JLD
CHECKED BY:	WRW

PROJECT: TARLTON STREAM AND WETLAND RESTORATION
CUMBERLAND COUNTY

ATTACHED REFERENCE FILES:

JOB NUMBER: 012857003

FIGURE NUMBER: 11



MITIGATION SUMMARY						
MITIGATION TYPE		RESTORATION	ENHANCEMENT	PRESERVATION	TOTAL MUs	% RESTORATION
STREAM	LENGTH (FEET)	3,221	826	255	3,823	84%
	MITIGATION UNITS	3,221	551	51		
RIVERINE WETLAND	AREA (ACRES)	6.8	2.4	-	8.0	85%
	MITIGATION	6.8	1.2	-		

NOTE: WETLAND MITIGATION AREAS DO NOT INCLUDE THE ADJACENT 50' STREAM BUFFER AREA THAT SURROUNDS PROPOSED STREAM MITIGATION AREAS.

SITE LEGEND

- MAJOR CONTOUR
- MINOR CONTOUR
- PROPERTY BOUNDARY
- WETLAND ENHANCEMENT
- WETLAND RESTORATION
- STREAM RESTORATION
- STREAM ENHANCEMENT
- STREAM PRESERVATION
- BUFFER OUTSIDE PROPERTY BOUNDARY
- ENERGY DISSIPATER AT CULVERT

GRID

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

REV. No.:	REVISION:	DATE:	DRAWN BY:	CHECKED BY:

PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
PHONE: (919) 677-2000 FAX: (919) 677-2050

CLIENT: MID-ATLANTIC MITIGATION

TITLE: RESTORATION PLAN

SEAL:

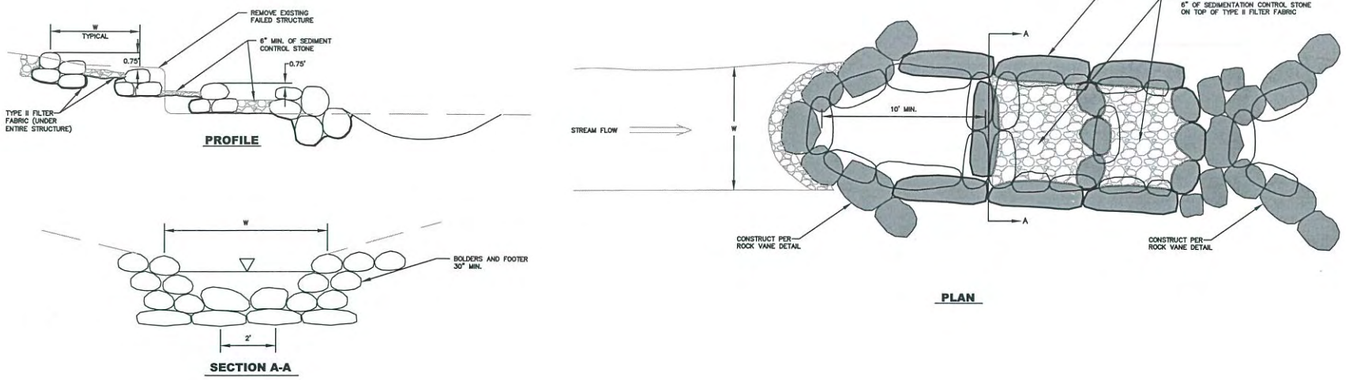
DATE: 02/24/06
HORIZONTAL SCALE:
VERTICAL SCALE:
DRAWN BY: JIK
DESIGNED BY: JLD
CHECKED BY: WRW

PROJECT: TARLTON STREAM AND WETLAND RESTORATION
CUMBERLAND COUNTY

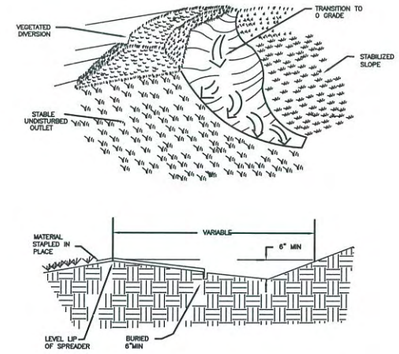
ATTACHED REFERENCE FILES:

JOB NUMBER: 012857003

FIGURE NUMBER: 12



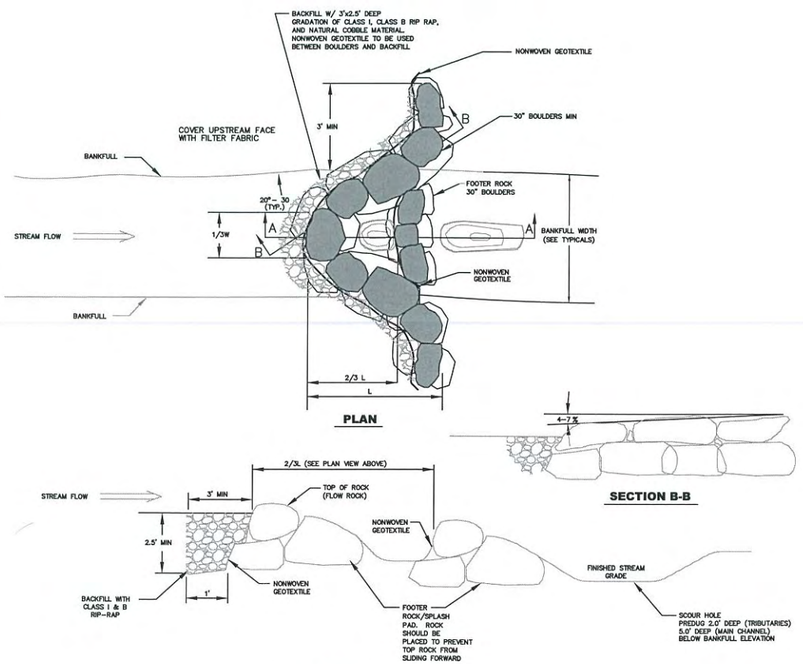
STEP POOL STRUCTURE
NTS



DETAIL OF LEVEL SPREADER CROSS SECTION.

NOTES:
- Level spreader is designed to disperse small volumes of concentrated flow across stable slopes.

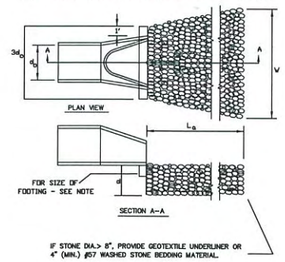
LEVEL SPREADER
NTS



NOTE: CLASS B RIP RAP SHALL BE HAND PLACED TO FILL VOIDS BETWEEN LARGER BOULDERS.

A-VANE
NTS

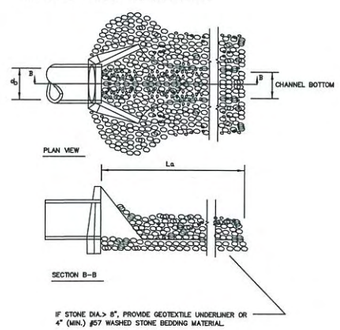
TYPE A
PIPE OUTLET TO FLAT AREA WITH NO DEFINED CHANNEL



NOTES:
(1) d = 1.5 TIMES THE MAXIMUM STONE DIAMETER BUT NOT LESS THAN 6 INCHES.
(2) d t= 1' ABOVE MAXIMUM TAILWATER OR TOP OF CHANNEL BANK (WHICHEVER IS LESS).
(3) La =LENGTH OF RIPRAP APRON.

IF STONE DIA.> 8", PROVIDE GEOTEXTILE UNDERLINER OR 4" (MIN.) #57 WASHED STONE BEDDING MATERIAL.

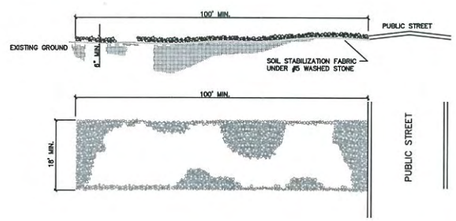
TYPE B
PIPE OUTLET TO WELL- DEFINED CHANNEL



IF STONE DIA.> 8", PROVIDE GEOTEXTILE UNDERLINER OR 4" (MIN.) #57 WASHED STONE BEDDING MATERIAL.

OUTLET PROTECTION
NTS

NOTES:
1. A STABILIZED ENTRANCE PAD OF #5 WASHED STONE OR RAIL ROAD BALLAST SHALL BE LOCATED WHERE TRAFFIC WILL ENTER OR LEAVE THE CONSTRUCTION SITE ONTO A PUBLIC STREET.
2. FILTER FABRIC OR COMPACTED CRUSH AND RUN STONE SHALL BE USED AS A BASE FOR THE CONSTRUCTION ENTRANCE.
3. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC STREETS OR EXISTING PAVEMENT. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS WARRANT AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
4. ANY SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC STREETS MUST BE REMOVED IMMEDIATELY.
5. WHEN APPROPRIATE, WHEELS MUST BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTERING A PUBLIC STREET. WHEN WASHING IS REQUIRED, IT SHALL BE DONE IN AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT BASIN SEE STD. NO. 30.11B.
6. MAINTENANCE REQUIREMENTS PER SECTION 6.06 OF NCDENR'S EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.



TEMPORARY CONSTRUCTION ENTRANCE
NTS

REV. No.	REVISION:	DATE:	DRAWN BY:	CHECKED BY:

PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. BOX 33068 – RALEIGH, NORTH CAROLINA 27636-3068
PHONE: (919) 677-2000 FAX: (919) 677-2050

CLIENT: MID-ATLANTIC MITIGATION

TITLE: DETAILS

SEAL:

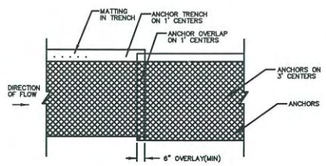
DATE: 02/24/06
HORIZONTAL SCALE:
VERTICAL SCALE:
DRAWN BY: JIK
DESIGNED BY: JLD
CHECKED BY: WRW

PROJECT: TARLTON STREAM AND WETLAND RESTORATION
CUMBERLAND COUNTY

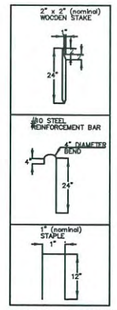
ATTACHED REFERENCE FILES:

JOB NUMBER: 012857003

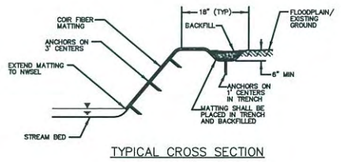
FIGURE NUMBER: 13a



PLAN VIEW



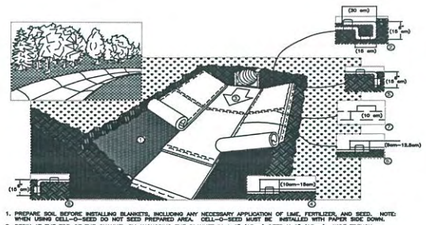
ANCHOR OPTIONS



TYPICAL CROSS SECTION

NOTES:
1. IN AREAS TO BE MATTED, ALL SEEDING, SOIL AMENDMENTS, AND SOIL PREPARATION MUST BE COMPLETED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS PRIOR TO PLACEMENT OF COIR FIBER MATTING.
2. REBAR OR STAPLES MAY BE USED IN PLACE OF WOODEN STAKES AS DIRECTED BY THE ENGINEER.

COIR FIBER MATTING DETAIL
NTS

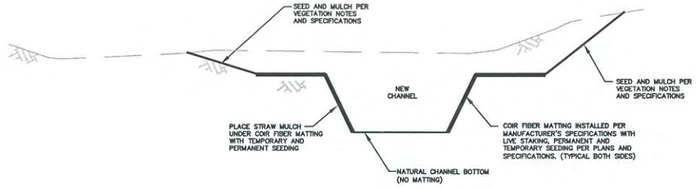


1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL CENTER BLANKET IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE NATURALLY STRETCHED TO CONFORM SMOOTHLY TO THE SOIL SURFACE. NO BLANKETS SHALL BE STRETCHED TIGHT ACROSS CHANNEL CONFIGURATIONS. OPTIONAL DOT STAPLE/STAKE PATTERNS SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. PLACE CONSECUTIVE BLANKETS END OVER END (SHINGLE STYLE) WITH A 4"-6" (10cm-15cm) OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER TO SECURE BLANKETS.
5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. ADJACENT BLANKETS MUST BE OVERLAPPED APPROXIMATELY 2"-5" (5cm-12.5cm) (DEPENDING ON BLANKET TYPE) AND STAPLED. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STRIPE ON THE BLANKET BEING OVERLAPPED.
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT (9m-12m) INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
8. THE TERMINAL END OF THE BLANKETS MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.

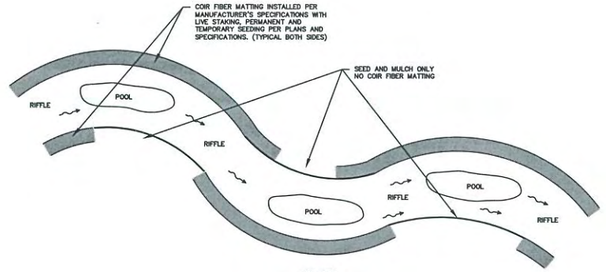
CRITICAL POINTS
A. OVERLAPS AND SEAMS
B. PROJECTED WATER LINE
C. CHANNEL BOTTOM/SIDE SLOPE INTERFACE

NOTE:
* HORIZONTAL STAPLE SPACING SHOULD BE ALTERED AS NECESSARY TO PLACE STAPLES THROUGH EACH OF THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.
** IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 cm) MAY BE NECESSARY TO PROPERLY ANCHOR THE BLANKETS.

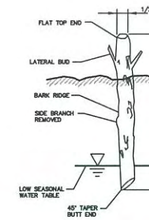
INSTALLATION GUIDE FOR EROSION CONTROL MATTING
NTS



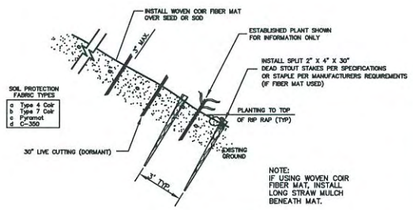
SECTION
NTS



PLAN
NTS

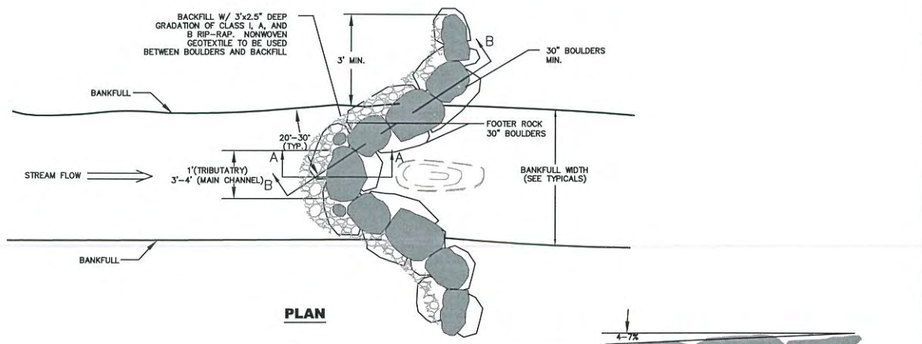


LIVE STAKE DETAIL
NTS

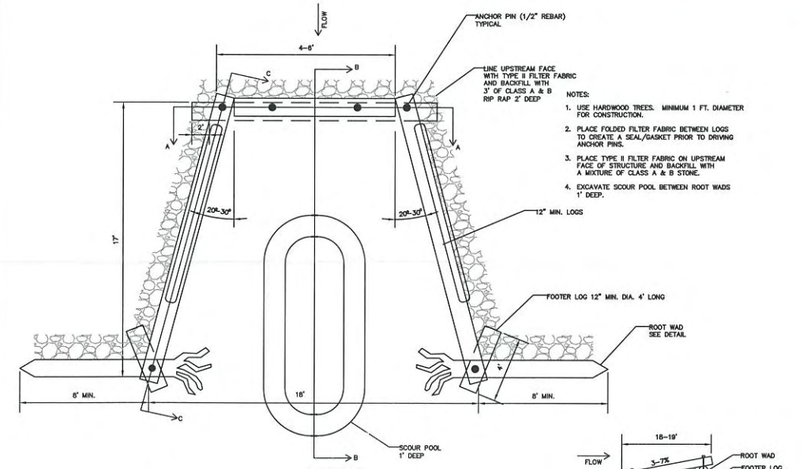


NOTE:
IF USING WOVEN COIR FIBER MAT, INSTALL LONG STRAW MULCH BENEATH MAT.

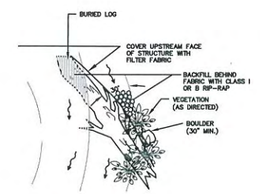
LIVE STAKE (IN EARTH)
NTS



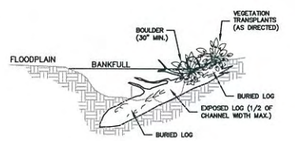
ROCK CROSS VANE
N.T.S.



LOG CROSS VANE DETAIL
NTS



PLAN VIEW



SECTION VIEW

LOG DIAMETER 15"+

LOG VANE STRUCTURE
NTS

REV. No:	REVISION:	DATE:	DRAWN BY:	CHECKED BY:

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PHONE: (919) 677-2000 FAX: (919) 677-2050

CLIENT: MID-ATLANTIC MITIGATION

TITLE: DETAILS

SEAL:

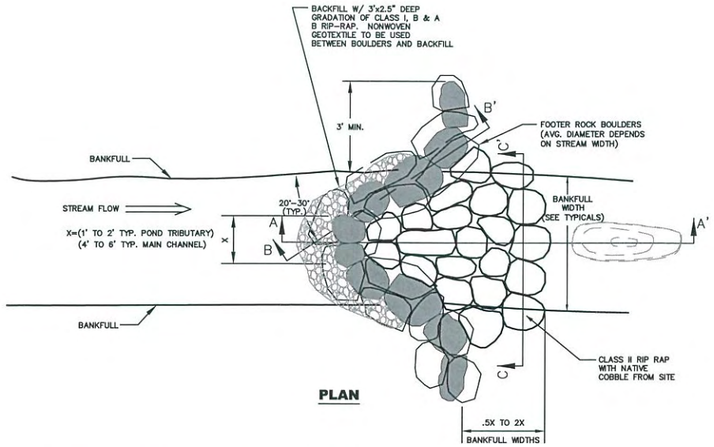
DATE: 02/24/06
HORIZONTAL SCALE:
VERTICAL SCALE:
DRAWN BY: JIK
DESIGNED BY: JLD
CHECKED BY: WRW

PROJECT: TARLTON STREAM AND WETLAND RESTORATION
CUMBERLAND COUNTY

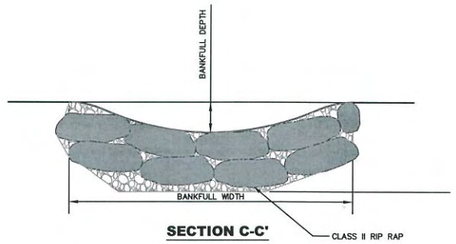
ATTACHED REFERENCE FILES:

JOB NUMBER: 012857003

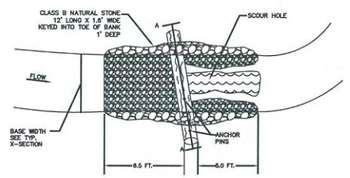
FIGURE NUMBER: 13b



PLAN

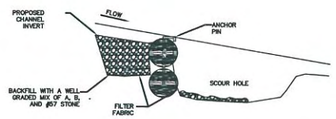


SECTION C-C'

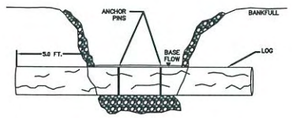


PLAN
N.T.S.

1. USE SYCAMORE OR OTHER ROT RESISTANT LOG. MINIMUM 1 FT. IN DIAMETER, FOR CONSTRUCTION.
2. ANCHOR LOGS AT LEAST 3 FT. INTO THE STREAM BANKS.
3. ARMOR THE BANKS WITH CLASS "B" NATURAL STONE TO STABILIZE.
4. BACKFILL WITH A WELL GRADED MIX OF A, B, AND #57 STONE.
5. EXCAVATE SCOUR HOLE APPROXIMATELY 1-2 FT.
6. TAKE CARE TO AVOID FLOODING OF UPSTREAM RIFFLES BY BACKWATER.
7. HEIGHT OF THE DROP AND WIDTH OF THE LOG MUST NOT CREATE A BARRIER TO FISH MIGRATION.

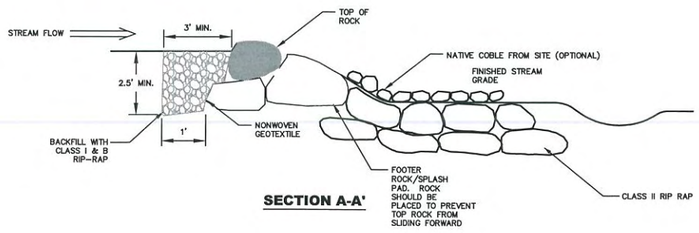


PROFILE
N.T.S.

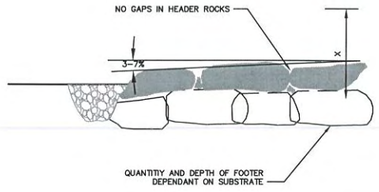


SECTION A-A
N.T.S.

LOG SILL
N.T.S.



SECTION A-A'



SECTION B-B'

CONSTRUCTED RIFFLE
N.T.S.

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CLIENT: MID-ATLANTIC MITIGATION

TITLE: DETAILS

SEAL:

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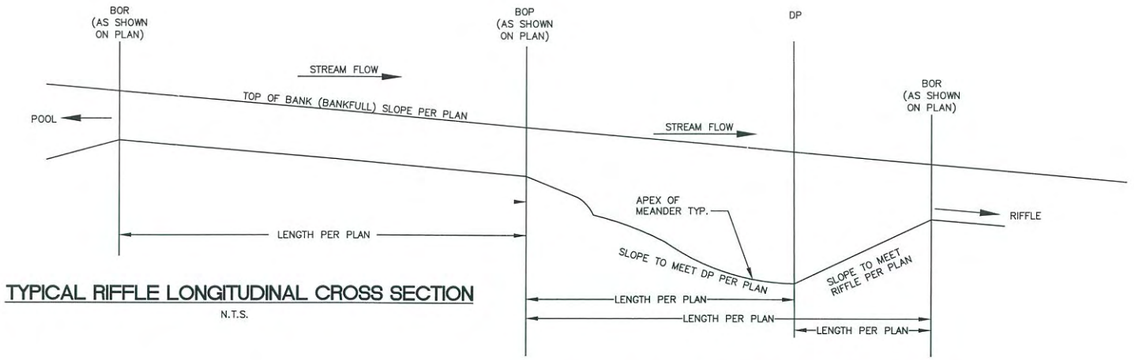
PROJECT: TARLTON STREAM AND WETLAND RESTORATION
CUMBERLAND COUNTY

ATTACHED REFERENCE FILES:

JOB NUMBER: 012857003

FIGURE NUMBER: 13c

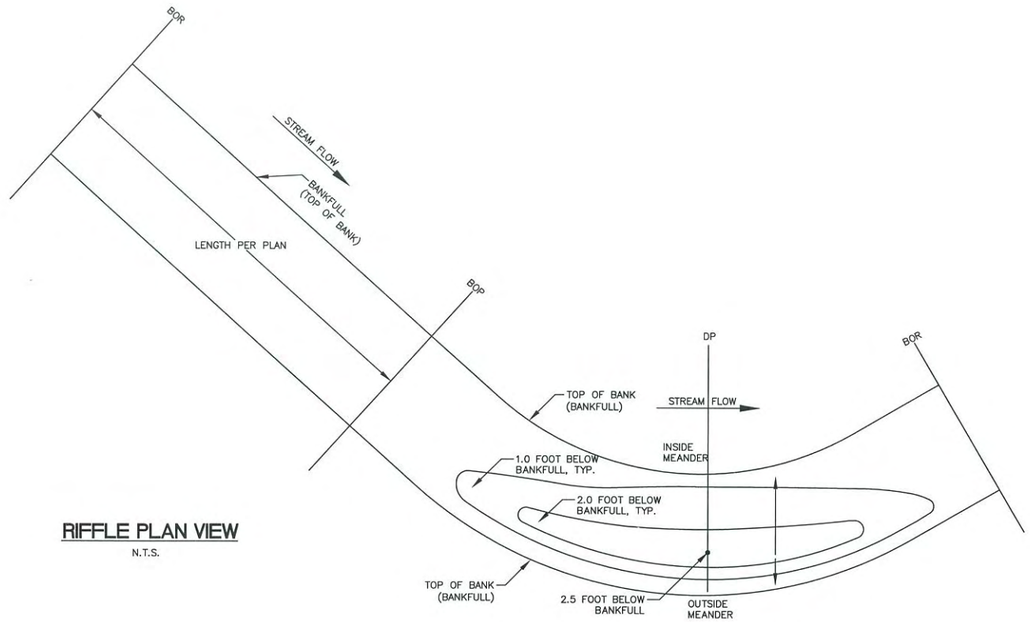


TYPICAL RIFFLE LONGITUDINAL CROSS SECTION

N.T.S.

TYPICAL POOL LONGITUDINAL CROSS SECTION

N.T.S.



RIFFLE PLAN VIEW

N.T.S.

POOL PLAN VIEW

N.T.S.

PROFILE MORPHOLOGY CHARACTERISTICS									
VARIABLES		Restoration Goals Western Prong			Restoration Goals Eastern Prong			Restoration Goals UT to Western Prong	
21.	Valley Slope (Svalley)	**Mean:**	0.0055		**Mean:**	0.0045		**Mean:**	0.0200
	(ft/ft)	Range:			Range:			Range:	
22.	Average Stream Slope	**Mean:**	0.0042		**Mean:**	0.0035		**Mean:**	0.0166
	(Savg) = (Svalley/k)	Range:	0.0037	0.0046	Range:	0.0023	0.0038	Range:	0.0133 0.0167
23.	Riffle Slope	**Mean:**	0.0074		**Mean:**	0.0061		**Mean:**	0.0290
	(Sriff)	Range:	0.0063	0.0084	Range:	0.0053	0.0070	Range:	0.0249 0.0332
24.	Ratio of Riffle Slope to Avg.	**Mean:**	1.8		**Mean:**	1.8		**Mean:**	1.8
	Slope (Sriffle/Savg)	Range:	1.5	2.0	Range:	1.5	2.0	Range:	1.5 2.0
25.	Pool Slope	**Mean:**	0.0017		**Mean:**	0.0014		**Mean:**	0.0066
	(Spool)	Range:	0.0008	0.0021	Range:	0.0007	0.0018	Range:	0.0033 0.0083
26.	Ratio of Pool Slope to Avg.	**Mean:**	0.4		**Mean:**	0.4		**Mean:**	0.4
	Slope (Spool/Savg)	Range:	0.2	0.5	Range:	0.2	0.5	Range:	0.2 0.5
27.	Maximum Pool	**Mean:**	1.4		**Mean:**	1.9		**Mean:**	0.8
	Depth (dpool)	**Range:**	0.7	1.8	**Range:**	1.0	2.4	**Range:**	0.4 1.0
28.	Ratio of Pool Depth to Avg.	**Mean:**	4.0		**Mean:**	4.0		**Mean:**	4.0
	Depth (dpool/davg)	Range:	2.0	5.0	Range:	2.0	5.0	Range:	2.0 5.0
29.	Pool Width	**Mean:**	9.8		**Mean:**	13.5		**Mean:**	4.7
	(Wpool)	Range:	6.5	11.1	Range:	9.0	15.3	Range:	3.2 5.4
30.	Ratio of Pool Width to	**Mean:**	1.5		**Mean:**	1.5		**Mean:**	1.5
	Bankfull Width (Wpool/Wbkf)	Range:	1.0	1.7	Range:	1.0	1.7	Range:	1.0 1.7
31.	Pool Area	**Mean:**	8.4		**Mean:**	15.9		**Mean:**	2.3
	(Apool)	Range:	5.9	10.4	Range:	11.7	19.3	Range:	1.1 3.1
32.	Ratio of Pool Area to	**Mean:**	2.6		**Mean:**	2.6		**Mean:**	2.6
	Bankfull Area (Apool/Abkf)	Range:	2.2	2.8	Range:	2.2	2.8	Range:	2.2 2.8
33.	Pool to Pool Spacing	**Mean:**	33		**Mean:**	45		**Mean:**	16
	(p - p)	Range:	20	46	Range:	27	63	Range:	9 22
34.	Ratio of Pool to Pool Spacing	**Mean:**	5.0		**Mean:**	5.0		**Mean:**	5.0
	to Bankfull Width (p-p/Wbkf)	Range:	3.0	7.0	Range:	3.0	7.0	Range:	3.0 7.0

PLAN VIEW MORPHOLOGY CHARACTERISTICS									
VARIABLES		Restoration Goals Western Prong			Restoration Goals Eastern Prong			Restoration Goals UT to Western Prong	
12.	Width of Flood Prone	**Mean:**	150.0		**Mean:**	200.0		**Mean:**	130.0
	Area (Wfpa)	Range:	60.0	205.0	Range:	145.0	245.0	Range:	100.0 160.0
13.	Entrenchment Ratio	**Mean:**	23.1		**Mean:**	22.2		**Mean:**	41.3
	(Wfpa/Wbkf)	Range:	10.0	29.3	Range:	17.1	25.8	Range:	40.8 45.7
14.	Meander Length	**Mean:**	74.8		**Mean:**	103.5		**Mean:**	36.2
	(Lm)	Range:	54.0	98.0	Range:	76.5	133.0	Range:	22.1 49.0
15.	Ratio of Meander Length to	**Mean:**	11.5		**Mean:**	11.5		**Mean:**	11.5
	Bankfull Width (Lm/Wbkf)	Range:	9.0	14.0	Range:	9.0	14.0	Range:	9.0 14.0
16.	Radius of Curvature	**Mean:**	19.5		**Mean:**	27.0		**Mean:**	9.5
	(Rc)	Range:	15.0	28.0	Range:	22.5	36.0	Range:	7.9 12.6
17.	Ratio of Radius of Curvature	**Mean:**	3.0		**Mean:**	3.0		**Mean:**	3.0
	to Bankfull Width (Rc/Wbkf)	Range:	2.5	4.0	Range:	2.5	4.0	Range:	2.5 4.0
18.	Belt Width	**Mean:**	100.0		**Mean:**	150.0		**Mean:**	40.0
	(Wblt)	Range:	50.0	130.0	Range:	110.0	180.0	Range:	30.0 50.0
19.	Meander Width Ratio	**Mean:**	14.4		**Mean:**	16.4		**Mean:**	12.7
	(Wblt/Wbkf)	Range:	7.1	21.7	Range:	11.6	21.2	Range:	8.6 20.4
20.	Sinuosity (k)	**Mean:**	1.3		**Mean:**	1.3		**Mean:**	1.2
	(Stream Length / Valley Length)	Range:	1.2	1.5	Range:	1.2	1.5	Range:	1.2 1.5

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CLIENT: MID-ATLANTIC MITIGATION

TITLE: TYPICALS

SEAL:

DATE: 02/24/06
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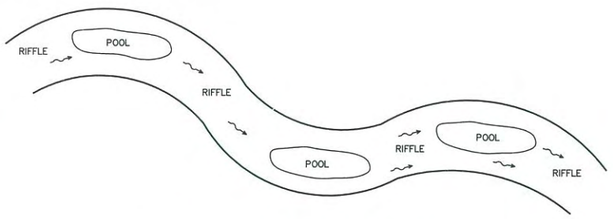
VERTICAL SCALE:
DRAWN BY: JIK
DESIGNED BY: JLD
CHECKED BY: WRW

PROJECT: TARLTON STREAM AND WETLAND RESTORATION
CUMBERLAND COUNTY

ATTACHED REFERENCE FILES:

JOB NUMBER: 012857003

FIGURE NUMBER: 14

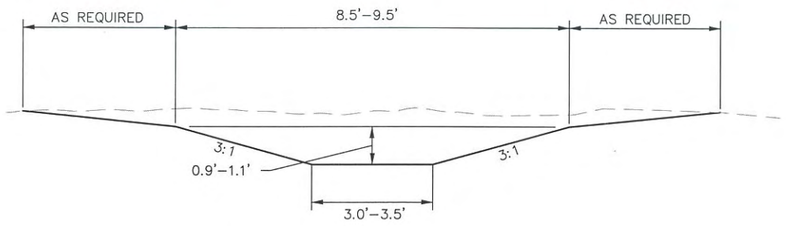


TYPICAL PLAN VIEW SCHEMATIC

NTS

NOTES:

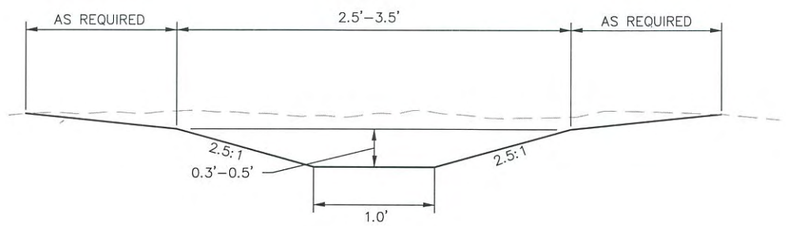
TYPICAL SECTIONS ARE PROVIDED TO GIVE THE GENERAL DIMENSIONS OF THE CHANNEL. FINAL GRADING WILL GIVE THE CHANNEL A MORE "NATURAL" APPEARANCE AND ALLOW A SMOOTH TRANSITION FROM EXISTING CHANNEL TO NEW CHANNEL.



TYPICAL RIFFLE

[RESTORATION GOALS EASTERN PRONG]

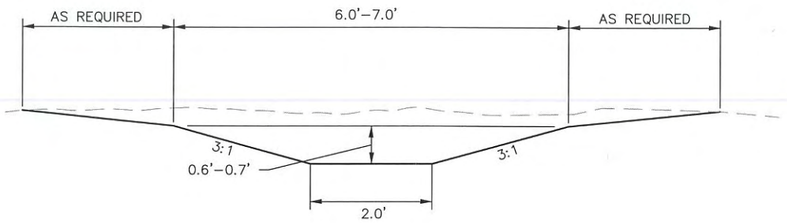
NTS



TYPICAL RIFFLE

[RESTORATION GOALS UT TO WESTERN PRONG]

NTS



TYPICAL RIFFLE

[RESTORATION GOALS WESTERN PRONG]

NTS

CROSS-SECTION MORPHOLOGY CHARACTERISTICS

VARIABLES		Restoration Goals Western Prong			Restoration Goals Eastern Prong			Restoration Goals UT to Western Prong		
3.	Bankfull Width	**Mean:**	6.5		**Mean:**	9.0		**Mean:**	3.2	
	(Wbkf)	Range:	6.0	7.0	Range:	8.5	9.5	Range:	2.5	3.5
4.	Bankfull Mean	**Mean:**	0.4		**Mean:**	0.5		**Mean:**	0.2	
	depth (dbkf)	Range:	0.3	0.4	Range:	0.4	0.5	Range:	0.1	0.3
5.	Width/Depth Ratio	**Mean:**	18.1		**Mean:**	18.8		**Mean:**	15.8	
	(Wbkf/dbkf)	Range:	17.0	20.7	Range:	18.3	19.3	Range:	14.6	17.1
6.	Bankfull cross-sectional	**Mean:**	3.2		**Mean:**	6.1		**Mean:**	0.9	
	Area (Abkf)	Range:	2.7	3.7	Range:	5.3	6.9	Range:	0.5	1.1
7.	Bankfull Mean Velocity	**Mean:**	3.4		**Mean:**	2.6		**Mean:**	2.2	
	(Vbkf)	Range:	2.6	4.2	Range:	2.2	3.0	Range:	1.6	4.2
8.	Bankfull Discharge, cfs	**Mean:**	10.4		**Mean:**	15.4		**Mean:**	2.0	
	(Qbkf)	Range:	9.5	11.3	Range:	15.0	15.7	Range:	1.8	2.1
9.	Bankfull Maximum Depth	**Mean:**	0.8		**Mean:**	1.0		**Mean:**	0.4	
	(dmax)	Range:	0.7	0.8	Range:	0.9	1.1	Range:	0.3	0.5
10.	Max dmax/dbkf	**Mean:**	2.1		**Mean:**	2.1		**Mean:**	2.2	
	ratio	Range:	2.0	2.3	Range:	2.0	2.3	Range:	2.0	2.3
11.	Low Bank Height to max	**Mean:**	1.0		**Mean:**	1.0		**Mean:**	1.0	
	dbkf ratio	Range:	1.0	1.2	Range:	1.0	1.2	Range:	1.0	1.2

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TITLE: TYPICAL CROSS-SECTIONS

SEAL:

DATE: 02/24/06
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VERTICAL SCALE:
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PROJECT: TARLTON STREAM AND WETLAND RESTORATION
CUMBERLAND COUNTY

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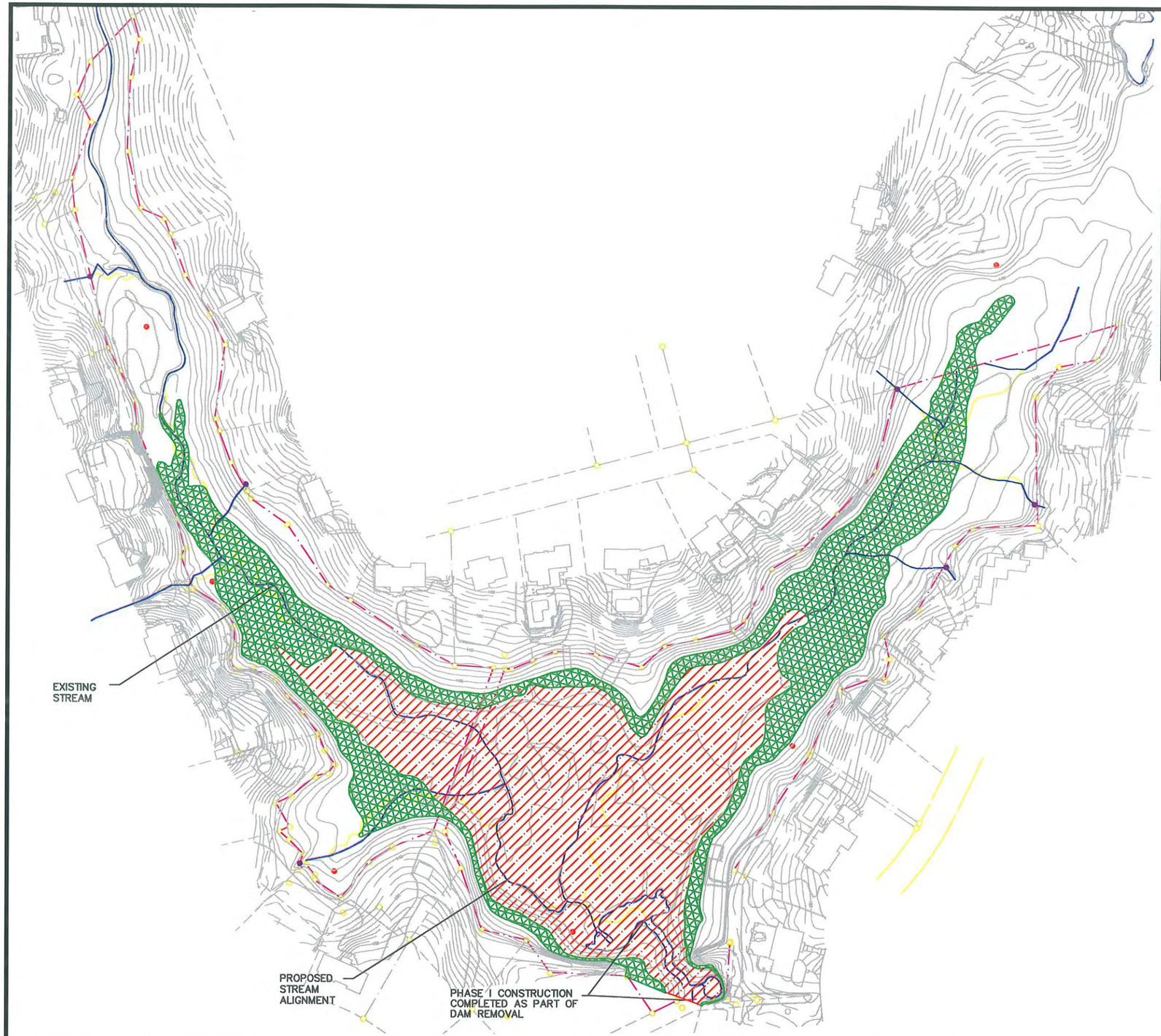
JOB NUMBER: 012857003

FIGURE NUMBER: 15



PEAK DISCHARGE CALCULATIONS			
Storm Event	Qpeak Without Existing Dam Storage	Qpeak With Existing Dam Storage	Qpeak Reduction
	(cfs)	(cfs)	(%)
2-yr	604	578	4.30%
10-yr	1420	1360	4.23%
25-yr	1946	1869	3.96%
50-yr	2370	2287	3.50%
100-yr	2798	2708	3.22%

STAGE STORAGE CALCULATIONS					
Total Storage of Wetland Area: 138 acre-ft					
Top of Dam Elevation: 145.00 ft					
Storm Event	Storm Event Storage Volume	Remaining Wetland Storage	Percent Wetland Storage Remaining	Storm Event Stage Elevation	Remaining Stage to Top of Dam
	(acre-ft)	(acre-ft)	(%)	(ft)	(ft)
2-yr	8	130	94.20%	136.80	8.20
10-yr	17	121	87.68%	138.17	6.83
25-yr	26	112	81.16%	138.82	6.18
50-yr	30	108	78.26%	139.26	5.74
100-yr	36	102	73.91%	139.67	5.33

SITE LEGEND

- WATER
- MAJOR CONTOUR
- MINOR CONTOUR
- PROPERTY BOUNDARY
- 2-YR STORM STAGE
- 10-YR STORM STAGE

GRID

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

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P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
PHONE: (919) 677-2000 FAX: (919) 677-2050

CLIENT: MID-ATLANTIC MITIGATION

TITLE: RESTORATION FLOOD AREAS

SEAL:

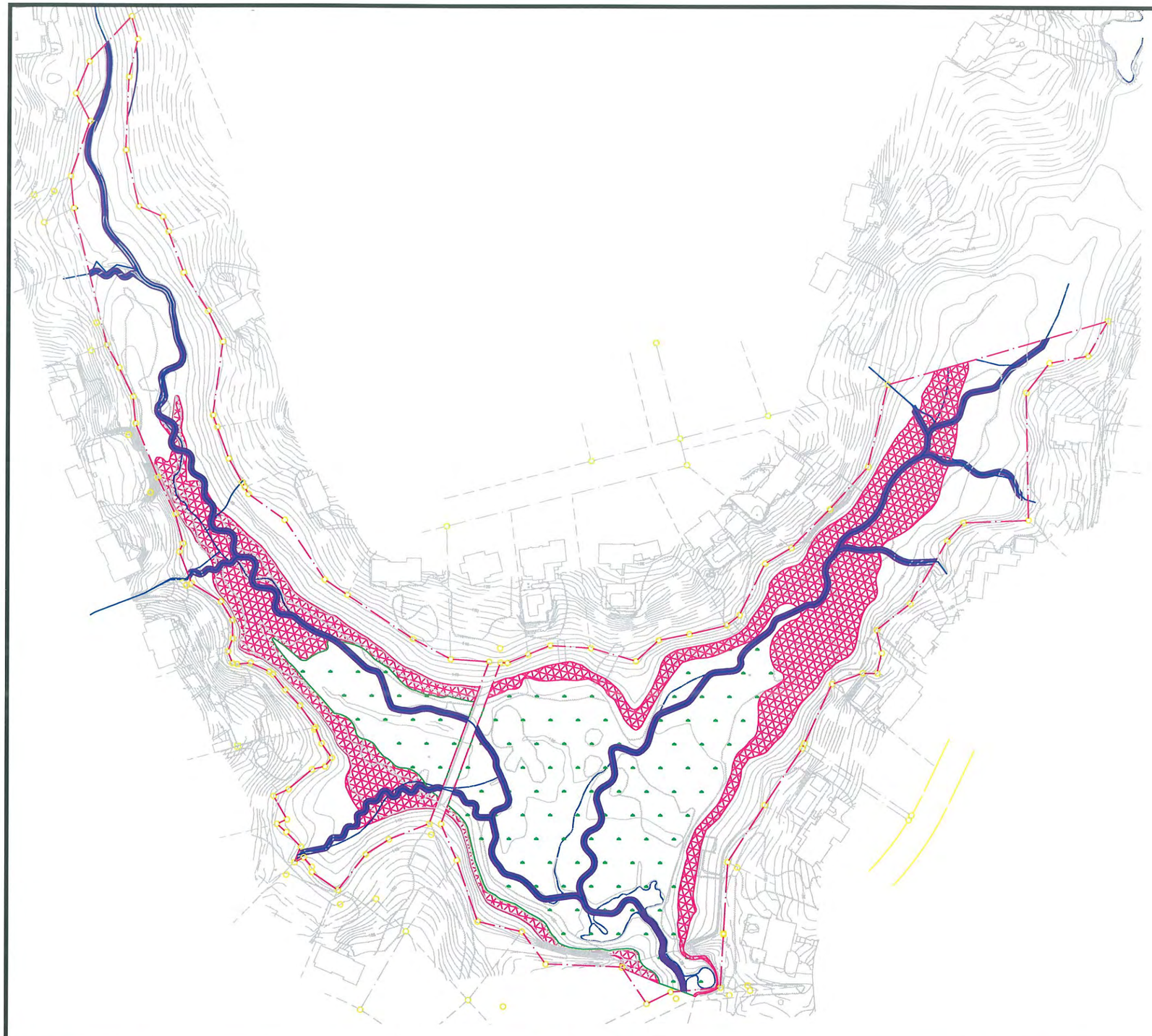
DATE: 02/24/06
HORIZONTAL SCALE:
VERTICAL SCALE:
DRAWN BY: JIK
DESIGNED BY: JLD
CHECKED BY: WRW

PROJECT: TARLTON STREAM AND WETLAND RESTORATION
CUMBERLAND COUNTY

ATTACHED REFERENCE FILES:

JOB NUMBER: 012857003

FIGURE NUMBER: 16



SITE LEGEND

- ZONE 1 - STREAM CHANNEL
- ZONE 2 - STREAM BANK
- ZONE 3 - BOTTOMLAND HARDWOOD WETLANDS
- ZONE 4 - SWAMP WETLAND

NOTE: REMAINING AREA WITHIN CONSERVATION EASEMENT TO BE PLANTED AS AN UPLAND FRINGE AREA

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)

1 inch = 200 ft.

REV. No.:	REVISION:	DATE:	DRAWN BY:	CHECKED BY:

PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
PHONE: (919) 677-2000 FAX: (919) 677-2050

CLIENT: MID-ATLANTIC MITIGATION

TITLE: VEGETATION PLAN

SEAL:

DATE:	02/24/06
HORIZONTAL SCALE:	
VERTICAL SCALE:	
DRAWN BY:	JIK
DESIGNED BY:	JLD
CHECKED BY:	WRW

PROJECT: TARLTON STREAM AND WETLAND RESTORATION
CUMBERLAND COUNTY

ATTACHED REFERENCE FILES:

JOB NUMBER: 012857003

FIGURE NUMBER: 17

Appendix 1

Project Site Photographs

Photograph 1. Existing Conditions: Beaver Dam. Photo taken 1/12/2005.

Photograph 2. Existing Conditions: Open Water. Photo taken 7/28/2005.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/27/06	**Project Number** 012857003	**Page** 1

Photograph 3. Existing Conditions: Aerial photograph of project site. Photo taken 1/12/2006.

Photograph 4. Phase I Completed: Restored section of stream. Photo taken 1/12/2006.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/27/06	**Project Number** 012857003	**Page** 2

Photograph 5. Phase I Completed: Southeast view of restored stream at utility crossing. Photo taken 1/12/2006.

Photograph 6. Existing Conditions: Eastern prong of project site. Photo taken 1/12/2006.

Title	Site Photographs

Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/27/06	**Project Number** 012857003	**Page** 3

Photograph 7. Existing Conditions: Drained Country Club Lake. Photo taken 1/12/2006.

Photograph 8. Existing Conditions: West view of drained Country Club Lake. Photo taken 1/12/2006.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/27/06	**Project Number** 012857003	**Page** 4

Appendix 2

Project Site NCDWQ Stream Classification Forms

NCDWQ Stream Classification Form

Project Name	Tarlton Stream Restoration	River Basin	Cape Fear	County	Cumberland	Evaluator	JLD
DWQ Prj Number	N/A	Nearest Stream	UT near Rosehill Road (Country Club Lake)	Latitude	35.10563	Signature	
Date	8/2/2005	USGS QUAD	Fayetteville, NC, 1987	Longitude	78.895175	Location	SF #1

*PLEASE NOTE: *If evaluator and landowner agree that the feature is a man-made ditch, then use of this form is not necessary. Also, if in the best professional judgement of the evaluator, the feature is a man-made ditch and not a modified natural stream—this rating system should not be used**

Primary Field Indicators

I. Geomorphology	Absent	Weak	Moderate	Strong	Score
1) Is There A Riffle-Pool Sequence?	0	1	2	3	1
2) Is The USDA Texture In Streambed Different From Surrounding Terrain?	0	1	2	3	0
3) Are Natural Levees Present?	0	1	2	3	0
4) Is The Channel Sinuous?	0	1	2	3	1
5) Is There An Active (Or Relic) Floodplain Present?	0	1	2	3	2
6) Is The Channel Braided?	0	1	2	3	1
7) Are Recent Alluvial Deposits Present?	0	1	2	3	2
8) Is There A Bankfull Bench Present?	0	1	2	3	3
9) Is A Continuous Bed & Bank Present?	0	1	2	3	2
(NOTE : If Bed & Bank Caused By Ditching And **WITHOUT** Sinuosity Then Score=0*)*					
10) Is A 2nd Order Or Greater Channel (As Indicated On Topo Map And/Or In Field) Present?	Yes	3	No	0	0
***PRIMARY GEOMORPHOLOGY INDICATOR POINTS*:**					12

II. Hydrology	Absent	Weak	Moderate	Strong	
1) Is There A Groundwater Flow/Discharge Present?	0	1	2	3	0
PRIMARY HYDROLOGY INDICATOR POINTS:					0

III. Biology	Absent	Weak	Moderate	Strong	
1) Are Fibrous Roots Present In Streambed?	3	2	1	0	1
2) Are Rooted Plants Present In Streambed?	3	2	1	0	2
3) Is Periphyton Present?	0	1	2	3	0
4) Are Bivalves Present?	0	1	2	3	0
PRIMARY BIOLOGY INDICATOR POINTS:					3

Secondary Field Indicators:

I. Geomorphology	Absent	Weak	Moderate	Strong	
1) Is There A Head Cut Present In Channel?	0	0.5	1	1.5	0
2) Is There A Grade Control Point In Channel?	0	0.5	1	1.5	1
3) Does Topography Indicate A Natural Drainage Way?	0	0.5	1	1.5	0.5
SECONDARY GEOMORPHOLOGY INDICATOR POINTS:					1.5

II. Hydrology	Absent	Weak	Moderate	Strong	
1) Is This Year's (Or Last's) Leaflitter Present In Streambed?	1.5	1	0.5	0	1.5
2) Is Sediment On Plants (Or Debris) Present?	0	0.5	1	1.5	0
3) Are Wrack Lines Present?	0	0.5	1	1.5	1.5
4) Is Water In Channel *And* >48 Hrs. Since Last Known Rain? (*NOTE: If Ditch Indicated In #9 Above Skip This Step And #5 Below*)	0	0.5	1	1.5	1.5
5) Is There Water In Channel During Dry Conditions Or In Growing Season)?	0	0.5	1	1.5	1.5
6) Are Hydric Soils Present In Sides Of Channel (Or In Headcut)?	Yes	1.5	No	0	1.5
SECONDARY HYDROLOGY INDICATOR POINTS:					7.5

III. Biology		Absent	Weak	Moderate	Strong	
1) Are Fish Present?		0	0.5	1	1.5	0
2) Are Amphibians Present?		0	0.5	1	1.5	0.5
3) Are Aquatic Turtles Present?		0	0.5	1	1.5	0
4) Are Crayfish Present?		0	0.5	1	1.5	0
5) Are Macrobenthos Present?		0	0.5	1	1.5	0
6) Are Iron Oxidizing Bacteria/Fungus Present?		0	0.5	1	1.5	0
7) Is Filamentous Algae Present?		0	0.5	1	1.5	1
8) Are Wetland Plants In Streambed?	SAV	Mostly OBL	Mostly FACW	Mostly FAC	Mostly FACU/UPL	
	2	1	0.75	0.5	0	
(NOTE: If Total Absence Of All Plants In Streambed As Noted Above Skip This Step UNLESS SAV Present*).*						
SECONDARY BIOLOGY INDICATOR POINTS:						1.5

TOTAL POINTS (Primary + Secondary)	(If Greater Than Or Equal To 19 Points The Stream Is At Least Intermittent)	25.5

NCDWQ Stream Classification Form

Project Name	Tarlton Stream Restoration	River Basin	Cape Fear	County	Cumberland	Evaluator	TBC
DWQ Prj Number	N/A	Nearest Stream	UT near Rosehill Road (Country Club Lake)	Latitude	35.106908	Signature	
Date	8/2/2005	USGS QUAD	Fayetteville, NC, 1987	Longitude	78.8962	Location	SF #2

*PLEASE NOTE: *If evaluator and landowner agree that the feature is a man-made ditch, then use of this form is not necessary. Also, if in the best professional judgement of the evaluator, the feature is a man-made ditch and not a modified natural stream—this rating system should not be used**

Primary Field Indicators					
I. Geomorphology	**Absent**	**Weak**	**Moderate**	**Strong**	**Score**
1) Is There A Riffle-Pool Sequence?	0	1	2	3	1
2) Is The USDA Texture In Streambed Different From Surrounding Terrain?	0	1	2	3	1
3) Are Natural Levees Present?	0	1	2	3	0
4) Is The Channel Sinuous?	0	1	2	3	0
5) Is There An Active (Or Relic) Floodplain Present?	0	1	2	3	1
6) Is The Channel Braided?	0	1	2	3	0
7) Are Recent Alluvial Deposits Present?	0	1	2	3	1
8) Is There A Bankfull Bench Present?	0	1	2	3	2
9) Is A Continuous Bed & Bank Present?	0	1	2	3	0
(NOTE : If Bed & Bank Caused By Ditching And **WITHOUT** Sinuosity Then Score=0*)*					
10) Is A 2nd Order Or Greater Channel (As Indicated On Topo Map And/Or In Field) Present?	**Yes**	3	**No**	0	0
***PRIMARY GEOMORPHOLOGY INDICATOR POINTS*:**					6
II. Hydrology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is There A Groundwater Flow/Discharge Present?	0	1	2	3	2
PRIMARY HYDROLOGY INDICATOR POINTS:					2
III. Biology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Are Fibrous Roots Present In Streambed?	3	2	1	0	1
2) Are Rooted Plants Present In Streambed?	3	2	1	0	0
3) Is Periphyton Present?	0	1	2	3	1
4) Are Bivalves Present?	0	1	2	3	0
PRIMARY BIOLOGY INDICATOR POINTS:					2
Secondary Field Indicators:					
I. Geomorphology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is There A Head Cut Present In Channel?	0	0.5	1	1.5	1
2) Is There A Grade Control Point In Channel?	0	0.5	1	1.5	1
3) Does Topography Indicate A Natural Drainage Way?	0	0.5	1	1.5	1
SECONDARY GEOMORPHOLOGY INDICATOR POINTS:					3
II. Hydrology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is This Year's (Or Last's) Leaflitter Present In Streambed?	1.5	1	0.5	0	1
2) Is Sediment On Plants (Or Debris) Present?	0	0.5	1	1.5	0
3) Are Wrack Lines Present?	0	0.5	1	1.5	0.5
4) Is Water In Channel *And* >48 Hrs. Since Last Known Rain? (*NOTE: If Ditch Indicated In #9 Above Skip This Step And #5 Below*)	0	0.5	1	1.5	1
5) Is There Water In Channel During Dry Conditions Or In Growing Season)?	0	0.5	1	1.5	0.5
6) Are Hydric Soils Present In Sides Of Channel (Or In Headcut)?	**Yes**	1.5	**No**	0	1.5
SECONDARY HYDROLOGY INDICATOR POINTS:					4.5
III. Biology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Are Fish Present?	0	0.5	1	1.5	0
2) Are Amphibians Present?	0	0.5	1	1.5	0
3) Are Aquatic Turtles Present?	0	0.5	1	1.5	0
4) Are Crayfish Present?	0	0.5	1	1.5	0.5
5) Are Macrobenthos Present?	0	0.5	1	1.5	0.5
6) Are Iron Oxidizing Bacteria/Fungus Present?	0	0.5	1	1.5	0.5
7) Is Filamentous Algae Present?	0	0.5	1	1.5	0
8) Are Wetland Plants In Streambed? **SAV**	**Mostly OBL**	**Mostly FACW**	**Mostly FAC**	**Mostly FACU/UPL**	
2	1	0.75	0.5	0	0.5
(NOTE: If Total Absence Of All Plants In Streambed As Noted Above Skip This Step UNLESS SAV Present*).*					
SECONDARY BIOLOGY INDICATOR POINTS:					2
TOTAL POINTS (Primary + Secondary)	(If Greater Than Or Equal To 19 Points The Stream Is At Least Intermittent)				19.5

NCDWQ Stream Classification Form

Project Name	Tarlton Stream Restoration	River Basin	Cape Fear	County	Cumberland	Evaluator	JLD
DWQ Prj Number	N/A	Nearest Stream	UT near Rosehill Road (Country Club Lake)	Latitude	35.108516	Signature	
Date	8/2/2005	USGS QUAD	Fayetteville, NC, 1987	Longitude	78.896444	Location	SF #3

*PLEASE NOTE: *If evaluator and landowner agree that the feature is a man-made ditch, then use of this form is not necessary. Also, if in the best professional judgement of the evaluator, the feature is a man-made ditch and not a modified natural stream—this rating system should not be used**

Primary Field Indicators					
I. Geomorphology	**Absent**	**Weak**	**Moderate**	**Strong**	**Score**
1) Is There A Riffle-Pool Sequence?	0	1	2	3	1
2) Is The USDA Texture In Streambed Different From Surrounding Terrain?	0	1	2	3	0
3) Are Natural Levees Present?	0	1	2	3	0
4) Is The Channel Sinuous?	0	1	2	3	1
5) Is There An Active (Or Relic) Floodplain Present?	0	1	2	3	2
6) Is The Channel Braided?	0	1	2	3	0
7) Are Recent Alluvial Deposits Present?	0	1	2	3	2
8) Is There A Bankfull Bench Present?	0	1	2	3	2
9) Is A Continuous Bed & Bank Present?	0	1	2	3	3
(NOTE: If Bed & Bank Caused By Ditching And **WITHOUT** Sinuosity Then Score=0*)*					
10) Is A 2nd Order Or Greater Channel (As Indicated On Topo Map And/Or In Field) Present?	**Yes**	3	**No**	0	0
PRIMARY GEOMORPHOLOGY INDICATOR POINTS:					11
II. Hydrology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is There A Groundwater Flow/Discharge Present?	0	1	2	3	2
PRIMARY HYDROLOGY INDICATOR POINTS:					2
III. Biology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Are Fibrous Roots Present In Streambed?	3	2	1	0	2
2) Are Rooted Plants Present In Streambed?	3	2	1	0	3
3) Is Periphyton Present?	0	1	2	3	0
4) Are Bivalves Present?	0	1	2	3	0
PRIMARY BIOLOGY INDICATOR POINTS:					5
Secondary Field Indicators:					
I. Geomorphology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is There A Head Cut Present In Channel?	0	0.5	1	1.5	0.5
2) Is There A Grade Control Point In Channel?	0	0.5	1	1.5	1
3) Does Topography Indicate A Natural Drainage Way?	0	0.5	1	1.5	1
SECONDARY GEOMORPHOLOGY INDICATOR POINTS:					2.5
II. Hydrology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is This Year's (Or Last's) Leaflitter Present In Streambed?	1.5	1	0.5	0	1.5
2) Is Sediment On Plants (Or Debris) Present?	0	0.5	1	1.5	0.5
3) Are Wrack Lines Present?	0	0.5	1	1.5	1
4) Is Water In Channel *And* >48 Hrs. Since Last Known Rain? (*NOTE: If Ditch Indicated In #9 Above Skip This Step And #5 Below*)	0	0.5	1	1.5	1
5) Is There Water In Channel During Dry Conditions Or In Growing Season)?	0	0.5	1	1.5	1
6) Are Hydric Soils Present In Sides Of Channel (Or In Headcut)?	**Yes**	1.5	**No**	0	1.5
SECONDARY HYDROLOGY INDICATOR POINTS:					6.5
III. Biology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Are Fish Present?	0	0.5	1	1.5	1
2) Are Amphibians Present?	0	0.5	1	1.5	1
3) Are Aquatic Turtles Present?	0	0.5	1	1.5	0
4) Are Crayfish Present?	0	0.5	1	1.5	0
5) Are Macrobenthos Present?	0	0.5	1	1.5	0
6) Are Iron Oxidizing Bacteria/Fungus Present?	0	0.5	1	1.5	0
7) Is Filamentous Algae Present?	0	0.5	1	1.5	0
8) Are Wetland Plants In Streambed? **SAV**	**Mostly OBL**	**Mostly FACW**	**Mostly FAC**	**Mostly FACU/UPL**	
2	1	0.75	0.5	0	0
(NOTE: If Total Absence Of All Plants In Streambed As Noted Above Skip This Step UNLESS SAV Present*).*					
SECONDARY BIOLOGY INDICATOR POINTS:					2
TOTAL POINTS (Primary + Secondary)	(If Greater Than Or Equal To 19 Points The Stream Is At Least Intermittent)				29

NCDWQ Stream Classification Form

Project Name	Tarlton Stream Restoration	River Basin	Cape Fear	County	Cumberland	Evaluator	TBC
DWQ Prj Number	N/A	Nearest Stream	UT near Rosehill Road (Country Club Lake)	Latitude	N/A	Signature	
Date	8/2/2005	USGS QUAD	Fayetteville, NC, 1987	Longitude	N/A	Location	SF #10

*PLEASE NOTE: *If evaluator and landowner agree that the feature is a man-made ditch, then use of this form is not necessary. Also, if in the best professional judgement of the evaluator, the feature is a man-made ditch and not a modified natural stream—this rating system should not be used**

Primary Field Indicators					
I. Geomorphology	**Absent**	**Weak**	**Moderate**	**Strong**	**Score**
1) Is There A Riffle-Pool Sequence?	0	1	2	3	1
2) Is The USDA Texture In Streambed Different From Surrounding Terrain?	0	1	2	3	2
3) Are Natural Levees Present?	0	1	2	3	1
4) Is The Channel Sinuous?	0	1	2	3	1
5) Is There An Active (Or Relic) Floodplain Present?	0	1	2	3	1
6) Is The Channel Braided?	0	1	2	3	0
7) Are Recent Alluvial Deposits Present?	0	1	2	3	1
8) Is There A Bankfull Bench Present?	0	1	2	3	1
9) Is A Continuous Bed & Bank Present?	0	1	2	3	3
(NOTE: If Bed & Bank Caused By Ditching And WITHOUT Sinuosity Then Score=0*)*					
10) Is A 2nd Order Or Greater Channel (As Indicated On Topo Map And/Or In Field) Present?	**Yes**	3	**No**	0	0
PRIMARY GEOMORPHOLOGY INDICATOR POINTS:					11
II. Hydrology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is There A Groundwater Flow/Discharge Present?	0	1	2	3	2
PRIMARY HYDROLOGY INDICATOR POINTS:					2
III. Biology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Are Fibrous Roots Present In Streambed?	3	2	1	0	1
2) Are Rooted Plants Present In Streambed?	3	2	1	0	2
3) Is Periphyton Present?	0	1	2	3	1
4) Are Bivalves Present?	0	1	2	3	0
PRIMARY BIOLOGY INDICATOR POINTS:					4
Secondary Field Indicators:					
I. Geomorphology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is There A Head Cut Present In Channel?	0	0.5	1	1.5	1.5
2) Is There A Grade Control Point In Channel?	0	0.5	1	1.5	1
3) Does Topography Indicate A Natural Drainage Way?	0	0.5	1	1.5	0.5
SECONDARY GEOMORPHOLOGY INDICATOR POINTS:					3
II. Hydrology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is This Year's (Or Last's) Leaflitter Present In Streambed?	1.5	1	0.5	0	0.5
2) Is Sediment On Plants (Or Debris) Present?	0	0.5	1	1.5	0.5
3) Are Wrack Lines Present?	0	0.5	1	1.5	0.5
4) Is Water In Channel *And* >48 Hrs. Since Last Known Rain? (*NOTE: If Ditch Indicated In #9 Above Skip This Step And #5 Below*)	0	0.5	1	1.5	1
5) Is There Water In Channel During Dry Conditions Or In Growing Season)?	0	0.5	1	1.5	1
6) Are Hydric Soils Present In Sides Of Channel (Or In Headcut)?	**Yes**	1.5	**No**	0	1.5
SECONDARY HYDROLOGY INDICATOR POINTS:					5
III. Biology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Are Fish Present?	0	0.5	1	1.5	0
2) Are Amphibians Present?	0	0.5	1	1.5	0
3) Are Aquatic Turtles Present?	0	0.5	1	1.5	0
4) Are Crayfish Present?	0	0.5	1	1.5	0
5) Are Macrobenthos Present?	0	0.5	1	1.5	0.5
6) Are Iron Oxidizing Bacteria/Fungus Present?	0	0.5	1	1.5	0.5
7) Is Filamentous Algae Present?	0	0.5	1	1.5	0.5
8) Are Wetland Plants In Streambed? **SAV**	**Mostly OBL**	**Mostly FACW**	**Mostly FAC**	**Mostly FACU/UPL**	
2	1	0.75	0.5	0	0.5
(NOTE: If Total Absence Of All Plants In Streambed As Noted Above Skip This Step UNLESS SAV Present*).*					
SECONDARY BIOLOGY INDICATOR POINTS:					2
TOTAL POINTS (Primary + Secondary)	(If Greater Than Or Equal To 19 Points The Stream Is At Least Intermittent)				27

NCDWQ Stream Classification Form

Project Name	Tarlton Stream Restoration	River Basin	Cape Fear	County	Cumberland	Evaluator	JLD/TBC
DWQ Prj Number	N/A	Nearest Stream	UT near Rosehill Road (Country Club Lake)	Latitude	N/A	Signature	
Date	8/2/2005	USGS QUAD	Fayetteville, NC, 1987	Longitude	N/A	Location	SF #11

*PLEASE NOTE: *If evaluator and landowner agree that the feature is a man-made ditch, then use of this form is not necessary. Also, if in the best professional judgement of the evaluator, the feature is a man-made ditch and not a modified natural stream—this rating system should not be used**

Primary Field Indicators					
I. Geomorphology	**Absent**	**Weak**	**Moderate**	**Strong**	**Score**
1) Is There A Riffle-Pool Sequence?	0	1	2	3	0
2) Is The USDA Texture In Streambed Different From Surrounding Terrain?	0	1	2	3	0
3) Are Natural Levees Present?	0	1	2	3	0
4) Is The Channel Sinuous?	0	1	2	3	1
5) Is There An Active (Or Relic) Floodplain Present?	0	1	2	3	2
6) Is The Channel Braided?	0	1	2	3	0
7) Are Recent Alluvial Deposits Present?	0	1	2	3	0
8) Is There A Bankfull Bench Present?	0	1	2	3	0
9) Is A Continuous Bed & Bank Present?	0	1	2	3	1
(NOTE : If Bed & Bank Caused By Ditching And **WITHOUT** Sinuosity Then Score=0*)*					
10) Is A 2nd Order Or Greater Channel (As Indicated On Topo Map And/Or In Field) Present?	**Yes**	3	**No**	0	0
***PRIMARY GEOMORPHOLOGY INDICATOR POINTS*:**					4
II. Hydrology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is There A Groundwater Flow/Discharge Present?	0	1	2	3	1
PRIMARY HYDROLOGY INDICATOR POINTS:					1
III. Biology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Are Fibrous Roots Present In Streambed?	3	2	1	0	3
2) Are Rooted Plants Present In Streambed?	3	2	1	0	2
3) Is Periphyton Present?	0	1	2	3	0
4) Are Bivalves Present?	0	1	2	3	0
PRIMARY BIOLOGY INDICATOR POINTS:					5
Secondary Field Indicators:					
I. Geomorphology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is There A Head Cut Present In Channel?	0	0.5	1	1.5	0
2) Is There A Grade Control Point In Channel?	0	0.5	1	1.5	0
3) Does Topography Indicate A Natural Drainage Way?	0	0.5	1	1.5	0.5
SECONDARY GEOMORPHOLOGY INDICATOR POINTS:					0.5
II. Hydrology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Is This Year's (Or Last's) Leaflitter Present In Streambed?	1.5	1	0.5	0	1.5
2) Is Sediment On Plants (Or Debris) Present?	0	0.5	1	1.5	0
3) Are Wrack Lines Present?	0	0.5	1	1.5	0
4) Is Water In Channel *And* >48 Hrs. Since Last Known Rain? (*NOTE: If Ditch Indicated In #9 Above Skip This Step And #5 Below*)	0	0.5	1	1.5	1
5) Is There Water In Channel During Dry Conditions Or In Growing Season)?	0	0.5	1	1.5	1
6) Are Hydric Soils Present In Sides Of Channel (Or In Headcut)?	**Yes**	1.5	**No**	0	1.5
SECONDARY HYDROLOGY INDICATOR POINTS:					5
III. Biology	**Absent**	**Weak**	**Moderate**	**Strong**	
1) Are Fish Present?	0	0.5	1	1.5	0
2) Are Amphibians Present?	0	0.5	1	1.5	0
3) Are Aquatic Turtles Present?	0	0.5	1	1.5	0
4) Are Crayfish Present?	0	0.5	1	1.5	0
5) Are Macrobenthos Present?	0	0.5	1	1.5	0
6) Are Iron Oxidizing Bacteria/Fungus Present?	0	0.5	1	1.5	1.5
7) Is Filamentous Algae Present?	0	0.5	1	1.5	0
8) Are Wetland Plants In Streambed? **SAV**	**Mostly OBL**	**Mostly FACW**	**Mostly FAC**	**Mostly FACU/UPL**	
2	1	0.75	0.5	0	
(NOTE: If Total Absence Of All Plants In Streambed As Noted Above Skip This Step UNLESS SAV Present*).*					
SECONDARY BIOLOGY INDICATOR POINTS:					1.5
TOTAL POINTS (Primary + Secondary)	(If Greater Than Or Equal To 19 Points The Stream Is At Least Intermittent)				17

NCDWQ Stream Classification Form

Project Name	Tarlton Stream Restoration	River Basin	Cape Fear	County	Cumberland	Evaluator	TBC
DWQ Prj Number	N/A	Nearest Stream	UT near Rosehill Road (Country Club Lake)	Latitude	N/A	Signature	
Date	8/2/2005	USGS QUAD	Fayetteville, NC, 1987	Longitude	N/A	Location	SF #12

*PLEASE NOTE: *If evaluator and landowner agree that the feature is a man-made ditch, then use of this form is not necessary. Also, if in the best professional judgement of the evaluator, the feature is a man-made ditch and not a modified natural stream—this rating system should not be used**

Primary Field Indicators

I. Geomorphology	Absent	Weak	Moderate	Strong	Score
1) Is There A Riffle-Pool Sequence?	0	1	2	3	2
2) Is The USDA Texture In Streambed Different From Surrounding Terrain?	0	1	2	3	1
3) Are Natural Levees Present?	0	1	2	3	0
4) Is The Channel Sinuous?	0	1	2	3	1
5) Is There An Active (Or Relic) Floodplain Present?	0	1	2	3	1
6) Is The Channel Braided?	0	1	2	3	0
7) Are Recent Alluvial Deposits Present?	0	1	2	3	2
8) Is There A Bankfull Bench Present?	0	1	2	3	1
9) Is A Continuous Bed & Bank Present?	0	1	2	3	3
(NOTE: If Bed & Bank Caused By Ditching And WITHOUT Sinuosity Then Score=0*)*					
10) Is A 2nd Order Or Greater Channel (As Indicated On Topo Map And/Or In Field) Present?	Yes	3	No	0	0
PRIMARY GEOMORPHOLOGY INDICATOR POINTS:					11

II. Hydrology	Absent	Weak	Moderate	Strong	
1) Is There A Groundwater Flow/Discharge Present?	0	1	2	3	1
PRIMARY HYDROLOGY INDICATOR POINTS:					1

III. Biology	Absent	Weak	Moderate	Strong	
1) Are Fibrous Roots Present In Streambed?	3	2	1	0	1
2) Are Rooted Plants Present In Streambed?	3	2	1	0	3
3) Is Periphyton Present?	0	1	2	3	0
4) Are Bivalves Present?	0	1	2	3	0
PRIMARY BIOLOGY INDICATOR POINTS:					4

Secondary Field Indicators:

I. Geomorphology	Absent	Weak	Moderate	Strong	
1) Is There A Head Cut Present In Channel?	0	0.5	1	1.5	0.5
2) Is There A Grade Control Point In Channel?	0	0.5	1	1.5	1
3) Does Topography Indicate A Natural Drainage Way?	0	0.5	1	1.5	0.5
SECONDARY GEOMORPHOLOGY INDICATOR POINTS:					2

II. Hydrology	Absent	Weak	Moderate	Strong	
1) Is This Year's (Or Last's) Leaflitter Present In Streambed?	1.5	1	0.5	0	0.5
2) Is Sediment On Plants (Or Debris) Present?	0	0.5	1	1.5	0.5
3) Are Wrack Lines Present?	0	0.5	1	1.5	0.5
4) Is Water In Channel *And* >48 Hrs. Since Last Known Rain? (*NOTE: If Ditch Indicated In #9 Above Skip This Step And #5 Below*)	0	0.5	1	1.5	1
5) Is There Water In Channel During Dry Conditions Or In Growing Season)?	0	0.5	1	1.5	0.5
6) Are Hydric Soils Present In Sides Of Channel (Or In Headcut)?	Yes	1.5	No	0	0
SECONDARY HYDROLOGY INDICATOR POINTS:					3

III. Biology		Absent	Weak	Moderate	Strong	
1) Are Fish Present?		0	0.5	1	1.5	0
2) Are Amphibians Present?		0	0.5	1	1.5	0
3) Are Aquatic Turtles Present?		0	0.5	1	1.5	0
4) Are Crayfish Present?		0	0.5	1	1.5	0
5) Are Macrobenthos Present?		0	0.5	1	1.5	0
6) Are Iron Oxidizing Bacteria/Fungus Present?		0	0.5	1	1.5	1
7) Is Filamentous Algae Present?		0	0.5	1	1.5	0
8) Are Wetland Plants In Streambed?	SAV	Mostly OBL	Mostly FACW	Mostly FAC	Mostly FACU/UPL	
	2	1	0.75	0.5	0	
(NOTE: If Total Absence Of All Plants In Streambed As Noted Above Skip This Step UNLESS SAV Present*).*						
SECONDARY BIOLOGY INDICATOR POINTS:						1

TOTAL POINTS (Primary + Secondary)	(If Greater Than Or Equal To 19 Points The Stream Is At Least Intermittent)	22

Appendix 3

Reference Site Photographs

Photograph 1. Reference reach upstream of Hillard Drive. Photo taken 1/12/2005.

Title	Reference Site Photographs

Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/24/06	**Project Number** 012857003	**Page** 1

Photograph 2. Reference reach upstream of Hillard Drive. Vegetation is representative of that at the project site. Photo taken 10/27/2004.

Title	Reference Site Photographs

Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/24/06	**Project Number** 012857003	**Page** 2

Appendix 4

Storm Event Stage and Storage Exhibit Data

PEAK DISCHARGE CALCULATIONS			
Storm Event	Qpeak Without Existing Dam Storage	Qpeak With Existing Dam Storage	Qpeak Reduction
	(cfs)	(cfs)	(%)
2-yr	604	578	4.30%
10-yr	1420	1360	4.23%
25-yr	1946	1869	3.96%
50-yr	2370	2287	3.50%
100-yr	2798	2708	3.22%

STAGE STORAGE CALCULATIONS					
	Total Storage of Wetland Area:	138	acre-ft		
	Top of Dam Elevation:	145.00	ft		
Storm Event	Storm Event Storage Volume	Remaining Wetland Storage	Percent Wetland Storage Remaining	Storm Event Stage Elevation	Remaining Stage to Top of Dam
	(acre-ft)	(acre-ft)	(%)	(ft)	(ft)
2-yr	8	130	94.20%	136.80	8.20
10-yr	17	121	87.68%	138.17	6.83
25-yr	26	112	81.16%	138.82	6.18
50-yr	30	108	78.26%	139.26	5.74
100-yr	36	102	73.91%	139.67	5.33

WETLAND VOLUME CALCULATION				
Contour	Contour Area	Incr. Vol.	Accum. Vol.	Stage
(Elev.)	(sq ft)	(cu ft)	(cu ft) S	(ft) Z
134	0.31	0.00	0.00	0
135	1.69	1.00	1.00	135
136	3.93	2.81	3.81	136
137	6.57	5.25	9.06	137
138	9.58	8.08	17.14	138
139	12.23	10.91	28.04	139
140	14.52	13.38	41.42	140
141	16.46	15.49	56.91	141
142	18.17	17.32	74.22	142
143	20.18	19.18	93.40	143
144	22.63	21.41	114.80	144
145	24.57	23.60	138.40	145

Kimley-Horn and Associates, Inc.

Job Tarlton Tract Subject Storage Calculations Sheet No. ____ of ____
Designed by RTL Date 2/16/06 Checked by ____ Date ____ Job No. 012857000

* Storage Calculations computed using Pond Pack a "Haestad Methods" modeling program, which utilitizes the SCS methods of generating hydrographs and the TR-55 methods of calculating time of concentration.

Assumptions and Computations

DRAINAGE AREA COMPOSITION

	AREA	CN*	- HSG B used
OPEN WATER	= 32 ACRES	98	(impervious)
BARREN	= 110 ACRES	61	(open space)
WOODED	= 302 ACRES	55	(Forest land)
URBAN RESIDENTIAL	= 980 ACRES	70	(residential 1/2 acre lot)
COMMERCIAL	= 195 ACRES	92	(Commercial area)
TOTAL	= 1619 ACRES		

* Hydraulic Soil Group was determined using the Comerland county soil map attached. The Drainage are consisted of a large majority of A & B soils. with some C & D soils mixed in around the water features. For this reason a HSG of "B" was chosen to determine the CN values. See attach soil Water Feature table.

Time of Concentration was determined by using the attached Watershe Map. The flow path is mapped out and labeled on this map. Pond Pack was used to calculate the Tc using the TR-55 method. See attached Pond Pack Data for Tc of watershed.

- Shallow Concetrated and Sheet flow was assumed to flow over grassed area. (Unpaved for Shallow, and n=0.15 for Sheet)

- Channelized flow was assumming a 10ft channel bottom with 1 ft of depth. n = 0.08 was used for a clean bottom and brush on sides.

* A cross section of the existing dam was entered into Pond Pack as the outlet control structure. Elevations and distances were taken from survey data.

* Using Pond Pack stage data the associated strage volume used in the wetland was interpolated from the Wetland Volume Calculation Table attached.

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Raleigh

Return Event	Total Depth in	Rainfall Type	RNF ID
2	3.6000	Synthetic Curve	TypeII 24hr
5	4.6500	Synthetic Curve	TypeII 24hr
10	5.3800	Synthetic Curve	TypeII 24hr
25	6.4100	Synthetic Curve	TypeII 24hr
50	7.2100	Synthetic Curve	TypeII 24hr
100	8.0000	Synthetic Curve	TypeII 24hr

Storm Data

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak min	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*OUT 10	JCT	2	144.425		786.00	577.75		
*OUT 10	JCT	5	240.273		783.00	1021.11		
*OUT 10	JCT	10	313.350		783.00	1359.70		
*OUT 10	JCT	25	422.873		780.00	1869.15		
*OUT 10	JCT	50	511.875		780.00	2286.98		
*OUT 10	JCT	100	602.367		780.00	2707.67		
TARLTON DA	AREA	2	144.426		774.00	603.87		
TARLTON DA	AREA	5	240.274		774.00	1067.46		
TARLTON DA	AREA	10	313.349		774.00	1420.21		
TARLTON DA	AREA	25	422.873		774.00	1945.85		
TARLTON DA	AREA	50	511.875		774.00	2370.11		
TARLTON DA	AREA	100	602.367		774.00	2798.79		

Peak Discharge Leaving Wetland AREA (Qout)

Peak Discharge Into Wetland AREA (Qin)

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak min	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
WETLAND AREA IN	POND	2	144.426		774.00	603.87		
WETLAND AREA IN	POND	5	240.274		774.00	1067.46		
WETLAND AREA IN	POND	10	313.349		774.00	1420.21		
WETLAND AREA IN	POND	25	422.873		774.00	1945.85		
WETLAND AREA IN	POND	50	511.875		774.00	2370.11		
WETLAND AREA IN	POND	100	602.367		774.00	2798.79		
WETLAND AREA OUT	POND	2	144.425		786.00	577.75	136.80	7.593
WETLAND AREA OUT	POND	5	240.273		783.00	1021.11	137.66	13.807
WETLAND AREA OUT	POND	10	313.349		783.00	1359.70	138.17	18.575
WETLAND AREA OUT	POND	25	422.873		780.00	1869.15	138.82	25.583
WETLAND AREA OUT	POND	50	511.875		780.00	2286.98	139.26	31.047
WETLAND AREA OUT	POND	100	602.367		780.00	2707.67	139.67	36.375

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 134.00 ft
Increment = .10 ft
Max. Elev.= 145.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Weir-XY Points	W0	--->	TW	134.000	145.000
TW SETUP, DS Channel					

OUTLET STRUCTURE INPUT DATA

Structure ID = W0
Structure Type = Weir-XY Points

# of Openings = 1
WEIR X-Y GROUND POINTS

X, ft	Elev, ft
.00	145.00
217.00	143.00
224.00	141.00
232.00	139.00
278.00	137.00
306.00	135.00
314.00	134.00
334.00	134.00
345.00	135.00
359.00	137.00
366.00	139.00
374.00	141.00
380.00	143.00
419.00	145.00

Lowest Elev. = 134.00 ft

Weir Coeff. = 3.000000

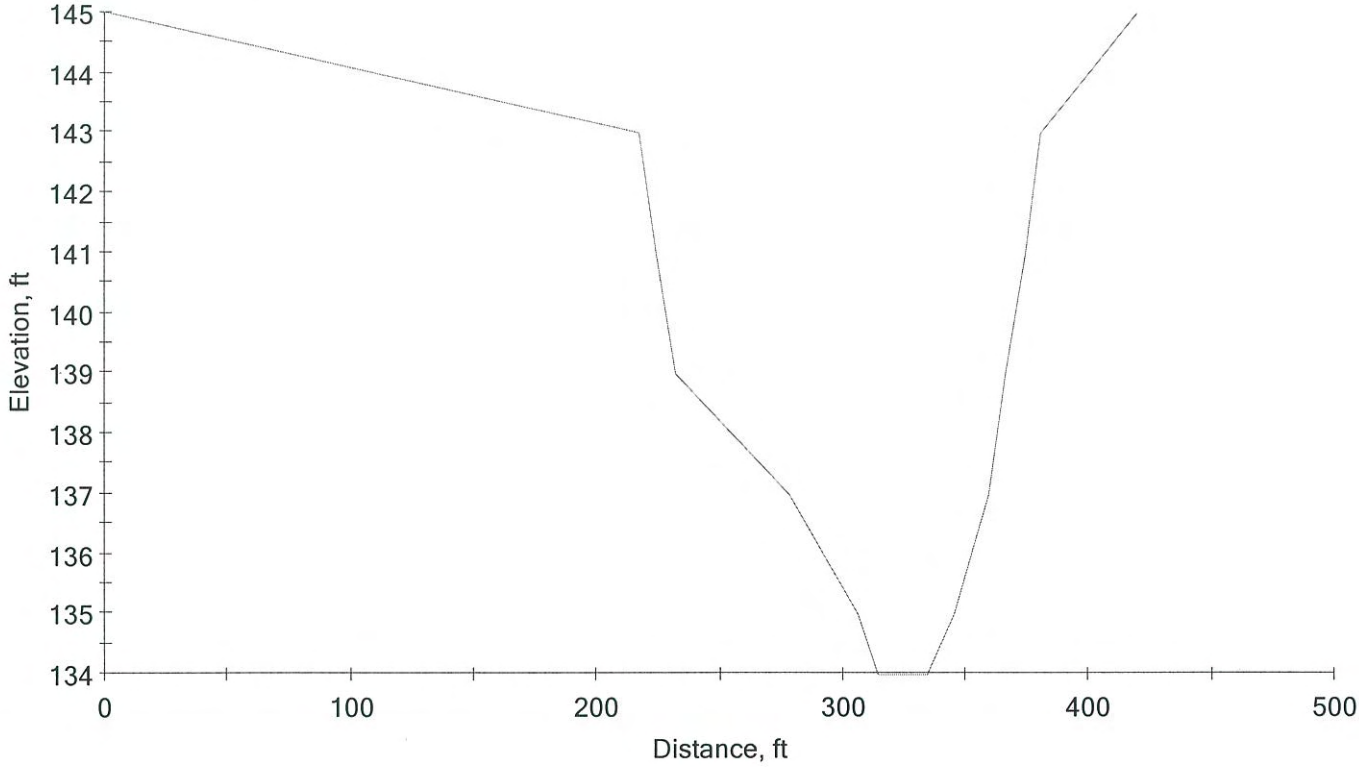
Weir TW effects (Use adjustment equation)

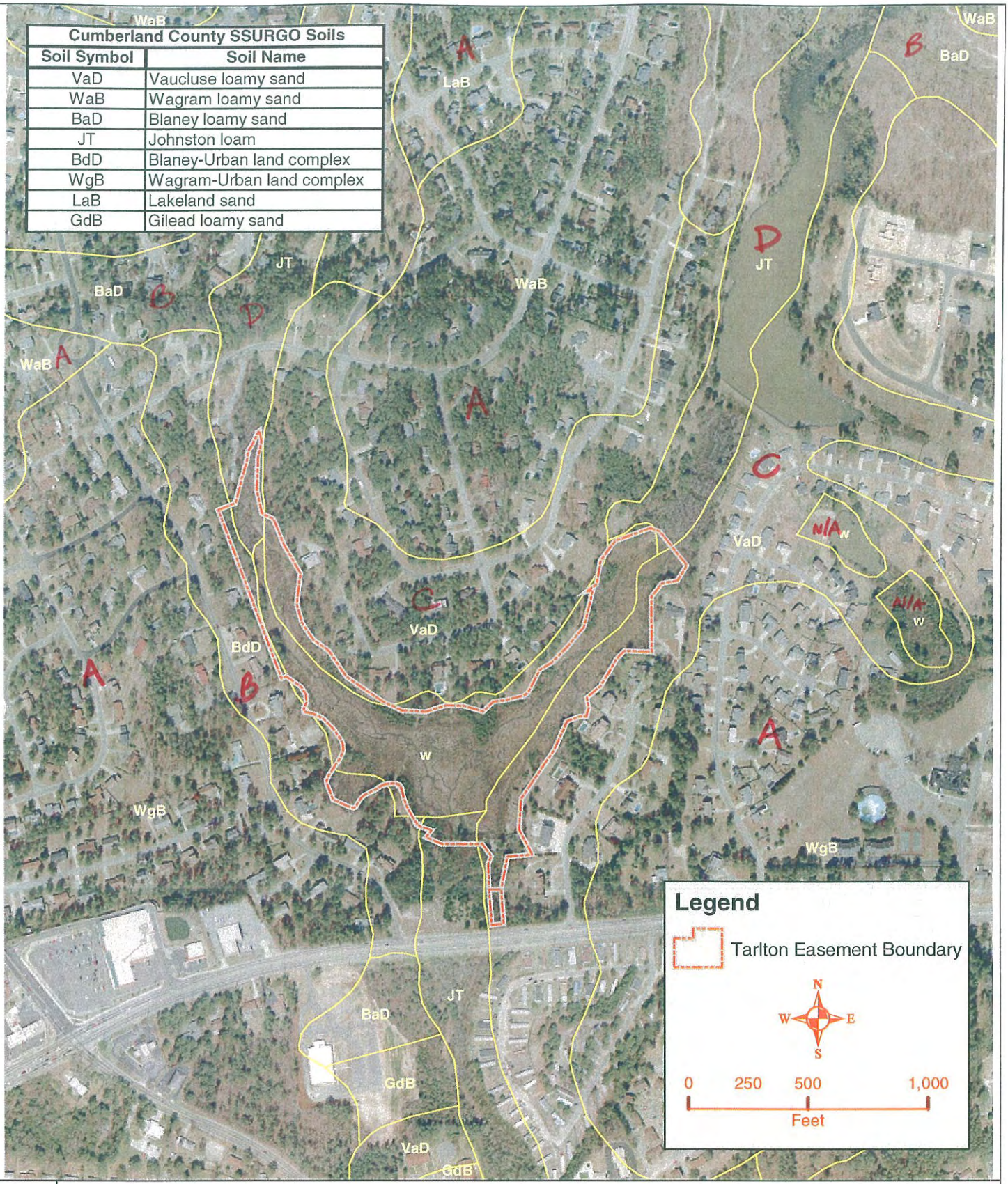
Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

Cross Section
EXISTING DAM





Title	Soils Map (SSURGO - 2001 Aerial)
Project	Tarlton Tract Cumberland County, North Carolina

Prepared For:
Mid-Atlantic Mitigation, LLC

Date	Project Number	Figure
2/21/05	012857000	3

Water Features

Cumberland County, North Carolina

[Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
BaD:										
Blaney	B	---	Jan-Dec			---	---	None	---	None
BdD:										
Blaney	B	---	Jan-Dec			---	---	None	---	None
Urban land	---	---	Jan-Dec			---	---	None	---	None
GdB:										
Gilead	C	---	January	1.5-2.5	2.5-3.5	---	---	None	---	None
			February	1.5-2.5	2.5-3.5	---	---	None	---	None
			March	1.5-2.5	2.5-3.5	---	---	None	---	None
JT:										
Johnston, undrained	D	Negligible	January	0.0	>6.0	0.0-1.0	Long	Frequent	Long	Frequent
			February	0.0	>6.0	0.0-1.0	Long	Frequent	Long	Frequent
			March	0.0	>6.0	0.0-1.0	Long	Frequent	Long	Frequent
			April	0.0	>6.0	0.0-1.0	Long	Frequent	Long	Frequent
			May	0.0	>6.0	0.0-1.0	Long	Frequent	Long	Frequent
			June	0.0	>6.0	0.0-1.0	Long	Frequent	Long	Frequent
			July	---	---	0.0-1.0	Long	Frequent	Long	Frequent
			August	---	---	0.0-1.0	Brief	Frequent	---	None
			September	---	---	0.0-1.0	Brief	Frequent	---	None
			October	---	---	0.0-1.0	Brief	Frequent	---	None
			November	0.0	>6.0	0.0-1.0	Long	Frequent	Long	Frequent
			December	0.0	>6.0	0.0-1.0	Long	Frequent	Long	Frequent
Johnston, drained	D	Negligible	Jan-Dec			---	---	None	---	None

Water Features

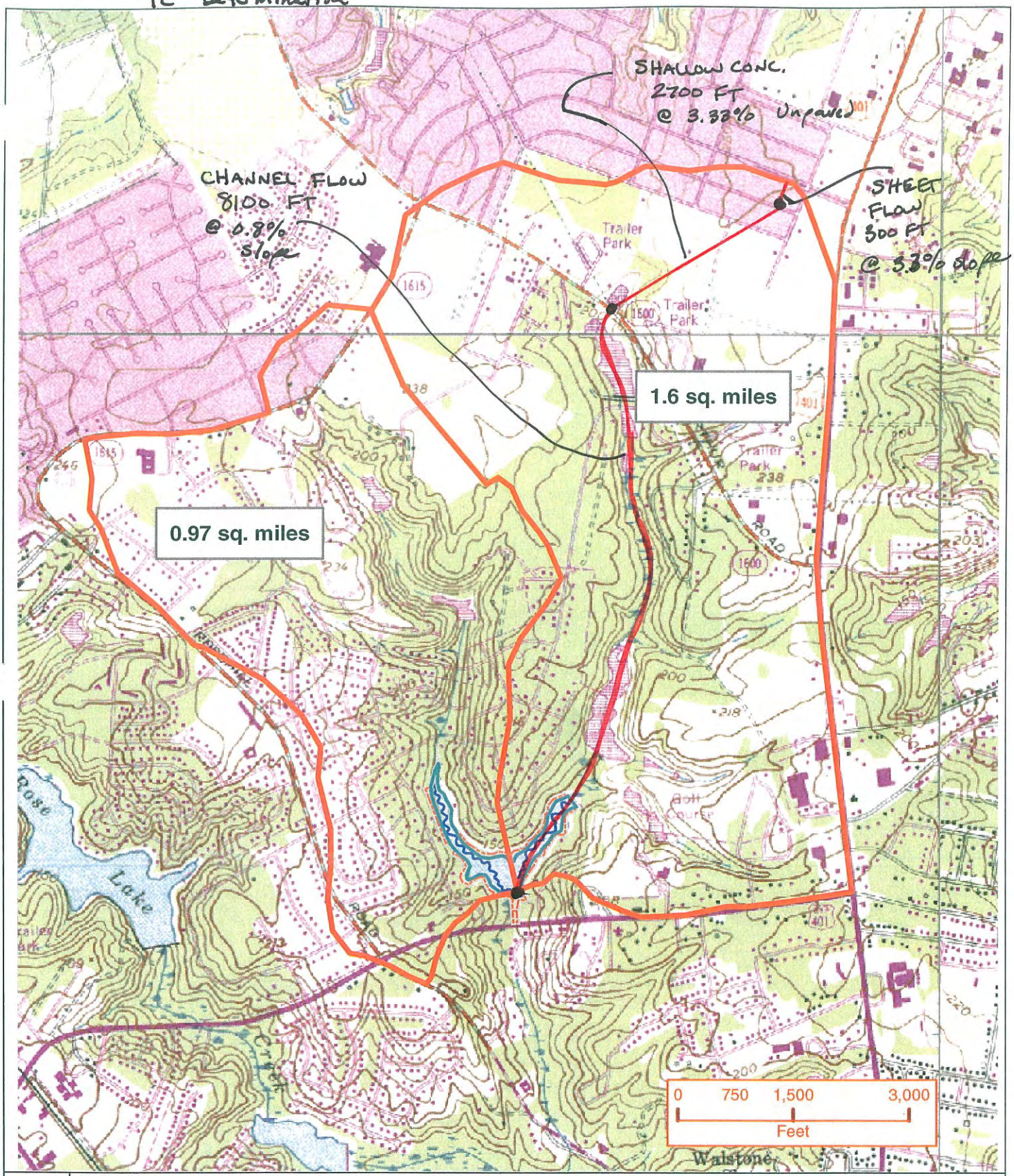
Cumberland County, North Carolina

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
LaB:										
Lakeland	A	---	Jan-Dec			---	---	None	---	None
VaD:										
Vaucluse	C	---	Jan-Dec			---	---	None	---	None
WaB:										
Wagram	A	Low	Jan-Dec			---	---	None	---	None
WgB:										
Wagram	A	---	Jan-Dec			---	---	None	---	None
Urban land	---	---	Jan-Dec			---	---	None	---	None

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	Impervious Adjustment %UC	Adjusted CN
Open Water	98	32.000			98.00
Barren	61	110.000			61.00
Wooded	55	302.000			55.00
Urban Residential	70	980.000			70.00
Commercial	92	195.000			92.00
COMPOSITE AREA & WEIGHTED CN --->		1619.000			69.79 (70) → Composite CN

Tc Determination



Title	Watershed Map (USGS Quad Fayetteville, North Carolina 1981)		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Tract Cumberland County, North Carolina	
	Date	**Project Number**	**Figure**
	2/21/05	012857000	4

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.1500	
Hydraulic Length	300.00	ft
2yr, 24hr P	3.6000	in
Slope	.033000	ft/ft
Avg.Velocity	.27	ft/sec

Segment #1 Time: 18.21 min

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	2700.00	ft
Slope	.033000	ft/ft
Unpaved		
Avg.Velocity	2.93	ft/sec

Segment #2 Time: 15.35 min

Segment #3: Tc: TR-55 Channel

Flow Area	20.0000	sq.ft
Wetted Perimeter	14.00	ft
Hydraulic Radius	1.43	ft
Slope	.010000	ft/ft
Mannings n	.0800	
Hydraulic Length	8100.00	ft
Avg.Velocity	2.36	ft/sec

Segment #3 Time: 57.14 min

==========
Total Tc: 90.71 min
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

==== SCS Channel Flow ==

```
R  = Aq / Wp
V  = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

Tc = (Lf / V) / (3600sec/hr)

Where:  R  = Hydraulic radius
        Aq = Flow area, sq.ft.
        Wp = Wetted perimeter, ft
        V  = Velocity, ft/sec
        Sf = Slope, ft/ft
        n  = Mannings n
        Tc = Time of concentration, hrs
        Lf = Flow length, ft
```

Appendix 5

Monitoring Gage Site Photographs

Photograph 1. Gage Location 1: Located in the upper portion of site. West view, towards the gage and easement boundary along the toe-of-slope. Photo taken 1/17/2006.

Photograph 2. Gage Location 1: East view towards the stream channel, taken from the floodplain toe-of-slope. Photo taken 1/17/2006.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/21/06	**Project Number** 012857003	**Page** 1

Photograph 3. Gage Location 2: East view, taken from near the easement boundary. Photo taken 1/17/2006.

Photograph 4. Gage Location 2: West view of gage location 2. Note concrete bulkhead at easement boundary, delineating historical limits of Country Club Lake. Photo taken 1/17/2006.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/21/06	**Project Number** 012857003	**Page** 2

Photograph 5. Gage Location 2: East view of gage, showing small tributary. Photo taken 1/17/2006.

Photograph 6. Gage Location 3: Northeast view of gage location. Small tributary occurs along the left edge of photo. Photo taken 1/17/2006.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/21/06	**Project Number** 012857003	**Page** 3

Photograph 7. Gage Location 3: Southwest view of gage location 3. Note culvert outlet on right side of photo. Photo taken 1/17/2006.

Photograph 8. Gage Location 4: South view of gage location 4. Note grade control and restoration seen in the distance (across the drained portion of the lake site). Photo taken 1/17/2006.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/21/06	**Project Number** 012857003	**Page** 4

Photograph 9. Gage Location 4: West view of restoration site taken from gage location 4. Note sewer easement crossing across western prong. Photo taken 1/12/2006

Photograph 10. Gage Location 5: Northwestern view of gage location 5. Gage is approximately ~30 feet from remnants of Country Club Lake dam in recently drained portion of the site. Photo taken 1/12/2006.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/21/06	**Project Number** 012857003	**Page** 5

Photograph 11. Gage Location 5: Southeast view from gage location 5. Note grade control and restoration area at downstream end of project area. Photo taken 1/12/2006.

Photograph 12. Gage Location 6: Northwest view of gage location 6, looking towards stream channel. Photo taken 1/17/2006.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/21/06	**Project Number** 012857003	**Page** 6

Photograph 13. Gage Location 6: Southeast view of gage location 6, towards easement boundary. Photo taken 1/17/2006.

Title	Site Photographs		
Prepared For: Mid-Atlantic Mitigation, LLC	**Project**	Tarlton Stream and Wetland Restoration Cumberland County, North Carolina	
	Date 2/21/06	**Project Number** 012857003	**Page** 7

Appendix 6

Monitoring Gage USACE Routine Wetland Determination Forms

DATA FORM

ROUTINE WETLAND DETERMINATION
1987 COE Wetlands Delineation Manual

Project/Site:	Tarlton Stream and Wetland Restoration Project	**Date:**	1/17/2006
Applicant/Owner:	Mid-Atlantic Mitigation, LLC	**County:**	Cumberland
Investigator:	Kimley-Horn and Associates, Inc. (Tommy Cousins, Chad Evenhouse)	**State:**	NC
Do Normal Circumstances exist on this site?	Yes	**Community ID:**	Riparian
Is the site significantly disturbed (Atypical Situation?)	No	**Transect ID:**	
Is the area a potential Problem Area?	No	**Plot ID:**	Monitoring Gage 1

Vegetation

Dominant Plant Species	Stratum	Indicator
1. *Pinus taeda*	T	FAC
2. *Platanus occidentalis*	T	FACW-
3. *Acer rubrum*	T	FAC
4. *Nyssa sylvatica*	T	FAC
5. *Alnus serrulata*	S	FACW
6. *Rubus argutus*	S	FAC
7. *Juncus effusus*	H	FACW+
8. *Microstegium vimineum*	H	FAC+

Dominant Plant Species	Stratum	Indicator
9. *Scirpus cyperinus*	H	OBL
10. *Carex striata*	H	OBL
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FACU): 100

Remarks:

Wetland system is located in the northwest portion of the site. Nearby, mature trees have exposed root systems due to soil subsidence following failure of downstream dam. The monitoring gage is located near the edge of the upstream portion of the historic lake boundary. The vegetation community has a partial canopy cover and is transitioning back to a riparian community.

Hydrology:

RECORDED DATA:

- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other
- [X] No Recorded Data Available

PRIMARY INDICATORS:

- [ ] Inundated
- [X] Saturated in Upper 12 inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [X] Drainage Patterns in Wetlands

FIELD OBSERVATIONS:

Depth to Surface Water:	N/A	(in)
Depth to Free Water in Pit:	2	(in)
Depth to Saturated Soil:	0	(in)

SECONDARY INDICATORS:

- [ ] Oxidized Root Channels in Upper 12 inches
- [X] Water Stained Leaves
- [ ] Local Soil Survey Data
- [ ] Fac-Neutral Test
- [ ] Other

WETLAND HYDROLOGY INDICATORS:

Buttressed trunks and wetland drainage patterns are apparent in area. This system is located along the western prong of the site. Following the failure of the dam, the soil subsided as the water table lowered, exposing bare root systems. Evidence of frequent flooding and ponding in the area. For the month of January, 2006, 0.63 in of precipitation was recorded near this location at the Fort Bragg Water Plant.

DATA FORM

ROUTINE WETLAND DETERMINATION
1987 COE Wetlands Delineation Manual

Project/Site:	Tarlton Stream and Wetland Restoration Project	**Date:**	1/17/2006
Applicant/Owner:	Mid-Atlantic Mitigation, LLC	**County:**	Cumberland
Investigator:	Kimley-Horn and Associates, Inc. (Tommy Cousins, Chad Evenhouse)	**State:**	NC
Do Normal Circumstances exist on this site?	Yes	**Community ID:**	Swamp/Riparian
Is the site significantly disturbed (Atypical Situation?)	No	**Transect ID:**	
Is the area a potential Problem Area?	No	**Plot ID:**	Monitoring Gage 2

Vegetation

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Platanus occidentalis*	T	FACW-	9.		
2. *Liriodendron tulipifera*	T	FAC	10.		
3. *Acer rubrum*	T	FAC	11.		
4. *Salix nigra*	T	OBL	12.		
5. *Alnus serrulata*	S	FACW	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FACU): 100

Remarks:

This data point is located near the edge of the historic lake limit. Dominant plant species are entirely FAC, FACW, or OBL. This system is a blend of swamp and riparian communities.

Hydrology:

RECORDED DATA:

- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other
- [X] No Recorded Data Available

PRIMARY INDICATORS:

- [ ] Inundated
- [X] Saturated in Upper 12 inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [X] Drainage Patterns in Wetlands

FIELD OBSERVATIONS:

Depth to Surface Water:	N/A	(in)
Depth to Free Water in Pit:	2	(in)
Depth to Saturated Soil:	0	(in)

SECONDARY INDICATORS:

- [ ] Oxidized Root Channels in Upper 12 inches
- [X] Water Stained Leaves
- [ ] Local Soil Survey Data
- [ ] Fac-Neutral Test
- [ ] Other

WETLAND HYDROLOGY INDICATORS:

This area has wetland drainage patterns and water stained leaves. The gage is located on a slighly sloping surface with some groundwater seepage. The site was evaluated under normal conditions. 0.63 in of precipitation was recorded at the nearby Fort Bragg Water Plant in January, 2006.

DATA FORM

ROUTINE WETLAND DETERMINATION
1987 COE Wetlands Delineation Manual

Project/Site:	Tarlton Stream and Wetland Restoration Project	**Date:**	7/28/2005
Applicant/Owner:	Mid-Atlantic Mitigation, LLC	**County:**	Cumberland
Investigator:	Kimley-Horn and Associates, Inc. (Chad Evenhouse)	**State:**	NC
Do Normal Circumstances exist on this site?	Yes	**Community ID:**	Riparian
Is the site significantly disturbed (Atypical Situation?)	No	**Transect ID:**	
Is the area a potential Problem Area?	No	**Plot ID:**	Monitoring Gage 3

Vegetation

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Nyssa sylvatica*	T	FAC	9. *Rubus argutus*	S	FAC
2. *Liriodendron tulipifera*	T	FAC	10. *Microstegium vimineum*	H	FAC+
3. *Acer rubrum*	T	FAC	11. *Parthenocissus quinquefolia*	H	FAC
4. *Salix nigra*	T	OBL	12. *Toxicodendron radicans*	H	FAC
5. *Myrica cerifera*	S	FAC+	13. *Saururus cernuus*	H	OBL
6. *Alnus serrulata*	S	FACW	14.		
7. *Sambucus canadensis*	S	FACW-	15.		
8. *Ligustrum sinese*	S	FAC	16.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FACU): 100

Remarks:

This point was recorded in a small topographic swale feature in the western portion of the site at the outlet of a stormwater outfall. This system is adjacent to homes and maintained lawns. A small perennial stream flows from the outlet. The dominant species in this system are 100% FAC, FACW, or OBL. This community is located near the head of the topographic swale near the project site boundary.

Hydrology:

RECORDED DATA:

- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other
- [X] No Recorded Data Available

PRIMARY INDICATORS:

- [ ] Inundated
- [ ] Saturated in Upper 12 inches
- [X] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [X] Drainage Patterns in Wetlands

FIELD OBSERVATIONS:

Depth to Surface Water:	>24	(in)
Depth to Free Water in Pit:	N/A	(in)
Depth to Saturated Soil:	N/A	(in)

SECONDARY INDICATORS:

- [ ] Oxidized Root Channels in Upper 12 inches
- [X] Water Stained Leaves
- [ ] Local Soil Survey Data
- [ ] Fac-Neutral Test
- [ ] Other

WETLAND HYDROLOGY INDICATORS:

Area has wetland drainage patterns and water stained leaves from ponding in depressions and microtopography with evidence of inundation. Located near the edge of the old lake boundary, at the top of a topographic swale associated with stormwater outfall into the stream. Hydrology was observed in July 2005, prior to draining of the lake (as compared to the other sample locations which were collected at the time of gage installation in January 2006). 3.79 inches of rainfall were recorded nearby at the Fort Bragg Water Plant in July, 2005.

DATA FORM

ROUTINE WETLAND DETERMINATION
1987 COE Wetlands Delineation Manual

Project/Site:	Tarlton Stream and Wetland Restoration Project	**Date:**	1/17/2006
Applicant/Owner:	Mid-Atlantic Mitigation, LLC	**County:**	Cumberland
Investigator:	Kimley-Horn and Associates, Inc. (Tommy Cousins, Chad Evenhouse)	**State:**	NC
Do Normal Circumstances exist on this site?	Yes	**Community ID:**	Swamp/Riparian
Is the site significantly disturbed (Atypical Situation?)	No	**Transect ID:**	
Is the area a potential Problem Area?	No	**Plot ID:**	Monitoring Gage 4

Vegetation

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Alnus serrulata*	S	FACW	9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FACU): 100

Remarks:

The location is dominated by Tag Alder thickets along the fringe of the historical lake boundary. Herbaceous vegetation was lacking due to the recent change in water level.

Hydrology:

RECORDED DATA:

- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other
- [X] No Recorded Data Available

PRIMARY INDICATORS:

- [ ] Inundated
- [X] Saturated in Upper 12 inches
- [ ] Water Marks
- [X] Drift Lines
- [ ] Sediment Deposits
- [ ] Drainage Patterns in Wetlands

FIELD OBSERVATIONS:

Depth to Surface Water:	N/A	(in)
Depth to Free Water in Pit:	4	(in)
Depth to Saturated Soil:	0	(in)

SECONDARY INDICATORS:

- [X] Oxidized Root Channels in Upper 12 inches
- [X] Water Stained Leaves
- [ ] Local Soil Survey Data
- [ ] Fac-Neutral Test
- [ ] Other

WETLAND HYDROLOGY INDICATORS:

Drainage patterns, groundwater seepage, ponding in depressions and microtopography, and water stained leaves were all indicators observed at this location. Oxidized root channels occur in the upper 8 inches of the soil profile. Located ~15' from the edge of historical limit of lake water surface. 0.63 in of precipitation was recorded nearby at Fort Bragg Water Plant for January 2006.

DATA FORM

ROUTINE WETLAND DETERMINATION
1987 COE Wetlands Delineation Manual

Project/Site:	Tarlton Stream and Wetland Restoration Project	**Date:**	1/12/2006
Applicant/Owner:	Mid-Atlantic Mitigation, LLC	**County:**	Cumberland
Investigator:	Kimley-Horn and Associates, Inc. (Tommy Cousins, Chad Evenhouse, Laura Lang)	**State:**	NC
Do Normal Circumstances exist on this site?	Yes	**Community ID:**	Swamp/Riparian
Is the site significantly disturbed (Atypical Situation?)	No	**Transect ID:**	
Is the area a potential Problem Area?	No	**Plot ID:**	Monitoring Gage 5

Vegetation

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Salix nigra*	T	OBL	9.		
2. *Alnus serrulata*	S	FACW	10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FACU):

Remarks:

Point was taken in drained lake bed, no vegetation. This system occurs near the old dam for Country Club Lake. Shrub vegetation is approximately 30' away at the area of the previous water surface limit (sand fringe).

Hydrology:

RECORDED DATA:

- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other
- [X] No Recorded Data Available

PRIMARY INDICATORS:

- [ ] Inundated
- [X] Saturated in Upper 12 inches
- [ ] Water Marks
- [X] Drift Lines
- [ ] Sediment Deposits
- [X] Drainage Patterns in Wetlands

FIELD OBSERVATIONS:

Depth to Surface Water:	N/A	(in)
Depth to Free Water in Pit:	4	(in)
Depth to Saturated Soil:	0	(in)

SECONDARY INDICATORS:

- [ ] Oxidized Root Channels in Upper 12 inches
- [X] Water Stained Leaves
- [ ] Local Soil Survey Data
- [ ] Fac-Neutral Test
- [ ] Other

WETLAND HYDROLOGY INDICATORS:

Multiple drainage patterns are evident in this area as the site adjusts to the new grade control downstream. Surface soils are highly saturated and there is evidence that the area still frequently floods/ponds. Site conditions appeared to be normal at the time of the site visit. 0.63 in of precipitation was recorded nearby at the Fort Bragg Water Plant in January 2006.

DATA FORM

ROUTINE WETLAND DETERMINATION
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Project/Site:	Tarlton Stream and Wetland Restoration Project	**Date:**	1/17/2006
Applicant/Owner:	Mid-Atlantic Mitigation, LLC	**County:**	Cumberland
Investigator:	Kimley-Horn and Associates, Inc. (Tommy Cousins, Chad Evenhouse)	**State:**	NC
Do Normal Circumstances exist on this site?	Yes	**Community ID:**	Swamp/Riparian
Is the site significantly disturbed (Atypical Situation?)	No	**Transect ID:**	
Is the area a potential Problem Area?	No	**Plot ID:**	Monitoring Gage 6

Vegetation

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Acer rubrum*	T	FAC	9.		
2. *Betula nigra*	T	FACW	10.		
3. *Alnus serrulata*	S	FACW	11.		
4. *Myrica cerifera*	S	FAC+	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FACU): 100

Remarks:

Shrub dominated transitional vegetation community between the historical limit of water surface of the lake and the more recent limit of water surface of the beaver impoundment. All dominant vegetation at this location is either FAC or FACW. This system occurs between the riparian community observed at monitoring gage 7 and the swamp/riparian community observed at monitoring well 5. The vegetation slightly down slope from the monitoring gage shows signs of frequent inundation.

Hydrology:

RECORDED DATA:

- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other
- [X] No Recorded Data Available

PRIMARY INDICATORS:

- [ ] Inundated
- [X] Saturated in Upper 12 inches
- [X] Water Marks
- [X] Drift Lines
- [ ] Sediment Deposits
- [ ] Drainage Patterns in Wetlands

FIELD OBSERVATIONS:

Depth to Surface Water:	N/A	(in)
Depth to Free Water in Pit:	1	(in)
Depth to Saturated Soil:	0	(in)

SECONDARY INDICATORS:

- [ ] Oxidized Root Channels in Upper 12 inches
- [X] Water Stained Leaves
- [ ] Local Soil Survey Data
- [ ] Fac-Neutral Test
- [ ] Other

WETLAND HYDROLOGY INDICATORS:

This monitoring gage is located on the sloping surface between the historic lake level and the beaver dam lake level. There is significant groundwater seepage in this area. Hydrology indicators including water stained leaves, water marks, ponding, and wetland drainage patterns were observed. Site conditions appeared to be normal at the time of the site visit. 0.63 in of precipitation was recorded nearby at the Fort Bragg Water Plant in January 2006.

DATA FORM

ROUTINE WETLAND DETERMINATION
1987 COE Wetlands Delineation Manual

Project/Site:	Tarlton Stream and Wetland Restoration Project	**Date:**	1/17/2006
Applicant/Owner:	Mid-Atlantic Mitigation, LLC	**County:**	Cumberland
Investigator:	Kimley-Horn and Associates, Inc. (Tommy Cousins, Chad Evenhouse)	**State:**	NC
Do Normal Circumstances exist on this site?	Yes	**Community ID:**	Riparian
Is the site significantly disturbed (Atypical Situation?)	No	**Transect ID:**	
Is the area a potential Problem Area?	No	**Plot ID:**	Monitoring Gage 7

Vegetation

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Acer rubrum*	T	FAC	9.		
2. *Nyssa sylvatica*	T	FAC	10.		
3. *Salix nigra*	T	OBL	11.		
4. *Rubus argutus*	S	FAC	12.		
5. *Sambucus canadensis*	S	FACW-	13.		
6. *Juncus effusus*	H	FACW+	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FACU): 100

Remarks:

This wetland system is located in the upper portion of the site's western prong. 100% of the dominant vegetation that comprises this riparian community is either OBL, FACW, or FAC.

Hydrology:

RECORDED DATA:

- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other
- [X] No Recorded Data Available

PRIMARY INDICATORS:

- [ ] Inundated
- [ ] Saturated in Upper 12 inches
- [X] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [ ] Drainage Patterns in Wetlands

FIELD OBSERVATIONS:

Depth to Surface Water:	N/A	(in)
Depth to Free Water in Pit:	15	(in)
Depth to Saturated Soil:	17	(in)

SECONDARY INDICATORS:

- [ ] Oxidized Root Channels in Upper 12 inches
- [X] Water Stained Leaves
- [ ] Local Soil Survey Data
- [ ] Fac-Neutral Test
- [ ] Other

WETLAND HYDROLOGY INDICATORS:

This point is located ~90' from the stream, in the levee/floodplain area between the stream bank and the toe of slope depression. Site conditions appeared to be normal at the time of the site visit. 0.63 in of precipitation was recorded nearby in January 2006.

Appendix 7

USACE Coordination for Section 404 Water Quality Determination Forms (Documentation of October 12, 2005 field review, Jurisdictional Areas map, and Nationwide Permit)

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1890
WILMINGTON. NORTH CAROLINA 28402-1890

REPLY TO
ATTENTION OF:

October 17, 2005

Regulatory Division

Action ID: AID 200600032

Mr. Richard Mogensen, Director
Mid-Atlantic Mitigation, LLC
9301 Aviation Blvd., Suite CE1
Concord, North Carolina 28027

Dear Mr. Mogensen:

Please reference your August 8, 2005, Pre-construction Notification supplying information on proposed activities associated with the restoration of a stream and wetland complex located on an unnamed tributary of Cross Creek, north of Country Club Drive, Fayetteville, North Carolina. Also reference the October 12, 2005 onsite meeting between myself and Mr. Scott McLendon of the U.S. Army Corps of Engineers (Corps), Messrs. Tommy Cousins and Chad Evenhouse of Kimley-Horn and Associates, Inc. and Mr. Bob Huck of Mid-Atlantic Mitigation, LLC. and information supplied by Mr. Evenhouse subsequent to this meeting.

The Corps has determined, after review of the information supplied by you and Mr. Evenhouse that your project meets the terms and conditions of Nationwide Permit #27 (enclosed). Please be advised that verification of this Nationwide Permit in no way implies that the Corps will accept this project as compensatory mitigation for any past or future permitted impacts. This verification will expire March 18, 2007.

The Corps also reviewed the wetland determination completed by Kimley-Horn and associates and concurs that there are Department of the Army jurisdictional waters, including wetlands within the project area. The Corps also inspected the preliminary jurisdictional delineation completed by Kimley-Horn and agrees that this approximation of the jurisdictional boundary is adequate for planning purposes associated with the proposed restoration activities. This jurisdictional determination will remain valid for 5 years from the date of this letter unless new information warrants revision of the determination before the expiration date or a District Engineer has identified, after public notice and comment, that specific geographic areas with rapidly changing environmental conditions merit re-verification on a more frequent basis.

NATIONWIDE PERMIT 27
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
FINAL NOTICE OF ISSUANCE AND MODIFICATION OF NATIONWIDE PERMITS
FEDERAL REGISTER
AUTHORIZED MARCH 18, 2002

Stream and Wetland Restoration Activities. Activities in waters of the United States associated with the restoration of former waters, the enhancement of degraded tidal and non-tidal wetlands and riparian areas, the creation of tidal and non-tidal wetlands and riparian areas, and the restoration and enhancement of non-tidal streams and non-tidal open water areas as follows:

1. The activity is conducted on:

a. Non-Federal public lands and private lands, in accordance with the terms and conditions of a binding wetland enhancement, restoration, or creation agreement between the landowner and the U.S. Fish and Wildlife Service (FWS) or the Natural Resources Conservation Service (NRCS), The National Marine Fisheries Service (NMF), the National Ocean Service (NOS) or voluntary wetland restoration, enhancement, and creation actions documented by the NRCS pursuant to NRCS regulations; or

b. Reclaimed surface coal mined lands, in accordance with a Surface Mining Control and Reclamation Act permit issued by the Office of Surface Mining or the applicable state agency (the future reversion does not apply to streams or wetlands created, restored, or enhanced as mitigation for the mining impacts, nor naturally due to hydrologic or topographic features, nor for a mitigation bank); or

c. Any other public, private or tribal lands;

2. Notification: For activities on any public or private land that are not described by paragraphs (1)(a) or (1)(b) above, the permittee must notify the District Engineer in accordance with General Condition 13; and

3. Planting of only native plant species should occur on the site.

Activities authorized by this nationwide permit include, to the extent that a Corps permit is required, but are not limited to: the removal of accumulated sediments; the installation, removal, and maintenance of small water control structures, dikes, and berms; the installation of current deflectors; the enhancement, restoration, or creation of riffle and pool stream structure; the placement of in-stream habitat structures; modifications of the stream bed and/or banks to restore or create stream meanders; the backfilling of artificial channels and drainage ditches; the removal of existing drainage structures; the construction of small nesting islands; the construction of open water areas; the construction of oyster habitat over unvegetated bottom in tidal waters; activities
needed to reestablish vegetation, including plowing or discing for seed bed preparation and the planting of appropriate wetland species; mechanized landclearing to remove non-native invasive,

NATIONWIDE PERMIT GENERAL CONDITIONS

The following General Conditions must be followed in order for any authorization by a NWP to be valid:

1. Navigation. No activity may cause more than a minimal adverse effect on navigation.

2. Proper Maintenance. Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.

3. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

4. Aquatic Life Movements. No activity may substantially disrupt the necessary life-cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low flow conditions.

5. Equipment. Heavy equipment working in wetlands must be placed on mats, or other measures must be taken to minimize soil disturbance.

6. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state or tribe in its Section 401 Water Quality Certification and Coastal Zone Management Act consistency determination.

7. Wild and Scenic Rivers. No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designated by Congress as a 'study river" for possible inclusion in the system, while the river is in an official study status; unless the appropriate Federal agency, with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation, or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service).

8. Tribal Rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

9. Water Quality.

a. In certain states and tribal lands an individual 401 Water Quality Certification must be

res/overview/es.html respectively.

12. Historic Properties. No activity that may affect historic properties listed, or eligible for listing, in the National Register of Historic Places is authorized, until the District Engineer has complied with the provisions of 33 CFR part 325, Appendix C. The prospective permittee must notify the District Engineer if the authorized activity may affect any historic properties listed, determined to be eligible, or which the prospective permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the District Engineer that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office and the National Register of Historic Places (see 33 CFR 330.4(g)). For activities that may affect historic properties listed in, or eligible for listing in, the National Register of Historic Places, the notification must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property.

13. Notification.

a. Timing; where required by the terms of the NWP, the prospective permittee must notify the District Engineer with a preconstruction notification (PCN) as early as possible. The District Engineer must determine if the notification is complete within 30 days of the date of receipt and can request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the District Engineer will notify the prospective permittee that the notification is still incomplete and the PCN review process will not commence until all of the requested information has been received by the District Engineer. The prospective permittee shall not begin the activity:

1. Until notified in writing by the District Engineer that the activity may proceed under the NWP with any special conditions imposed by the District or Division Engineer; or

2. If notified in writing by the District or Division Engineer that an Individual Permit is required; or

3. Unless 45 days have passed from the District Engineer's receipt of the complete notification and the prospective permittee has not received written notice from the District or Division Engineer. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

b. Contents of Notification: The notification must be in writing and include the following information:

1. Name, address and telephone numbers of the prospective permittee;

2. Location of the proposed project;

iv. A written description of all land (including, if available, legal descriptions) owned by the prospective permittee and/or the prospective permittee's spouse, within a one mile radius of the parcel, in any form of ownership (including any land owned as a partner, corporation, joint tenant, co-tenant, or as a tenant-by-the-entirety) and any land on which a purchase and sale agreement or other contract for sale or purchase has been executed;

10. For NWP 31 (Maintenance of Existing Flood Control Facilities), the prospective permittee must either notify the District Engineer with a PCN prior to each maintenance activity or submit a five-year (or less) maintenance plan. In addition, the PCN must include all of the following:

i. Sufficient baseline information identifying the approved channel depths and configurations and existing facilities. Minor deviations are authorized, provided the approved flood control protection or drainage is not increased;

ii. A delineation of any affected special aquatic sites, including wetlands; and,

iii. Location of the dredged material disposal site;

11. For NWP 33 (Temporary Construction, Access, and Dewatering), the PCN must also include a restoration plan of reasonable measures to avoid and minimize adverse effects to aquatic resources;

12. For NWPs 39, 43 and 44, the PCN must also include a written statement to the District Engineer explaining how avoidance and minimization for losses of waters of the US were achieved on the project site;

13. For NWP 39 and NWP 42, the PCN must include a compensatory mitigation proposal to offset losses of waters of the US or justification explaining why compensatory mitigation should not be required. For discharges that cause the loss of greater than 300 linear feet of an intermittent stream bed, to be authorized, the District Engineer must determine that the activity complies with the other terms and conditions of the NWP, determine adverse environmental effects are minimal both individually and cumulatively, and waive the limitation on stream impacts in writing before the permittee may proceed;

14. For NWP 40 (Agricultural Activities), the PCN must include a compensatory mitigation proposal to offset losses of waters of the US. This NWP does not authorize the relocation of greater than 300 linear feet of existing serviceable drainage ditches constructed in non-tidal streams unless, for drainage ditches constructed in intermittent nontidal streams, the District Engineer waives this criterion in writing, and the District Engineer has determined that the project complies with all terms and conditions of this NWP, and that any adverse impacts of the project on the aquatic environment are minimal, both individually and cumulatively;

15. For NWP 43 (Stormwater Management Facilities), the PCN must include, for

and determine whether the conceptual or specific proposed mitigation would ensure no more than minimal adverse effects on the aquatic environment. If the net adverse effects of the project on the aquatic environment (after consideration of the compensatory mitigation proposal) are determined by the District Engineer to be minimal, the District Engineer will provide a timely written response to the applicant. The response will state that the project can proceed under the terms and conditions of the NWP.

If the District Engineer determines that the adverse effects of the proposed work are more than minimal, then the District Engineer will notify the applicant either:

1. That the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an Individual Permit;

2. that the project is authorized under the NWP subject to the applicant's submission of a mitigation proposal that would reduce the adverse effects on the aquatic environment to the minimal level; or

3. that the project is authorized under the NWP with specific modifications or conditions. Where the District Engineer determines that mitigation is required to ensure no more than minimal adverse effects occur to the aquatic environment, the activity will be authorized within the 45-day PCN period. The authorization will include the necessary conceptual or specific mitigation or a requirement that the applicant submit a mitigation proposal that would reduce the adverse effects on the aquatic environment to the minimal level. When conceptual mitigation is included, or a mitigation plan is required under item (2) above, no work in waters of the US will occur until the District Engineer has approved a specific mitigation plan.

e. Agency Coordination: The District Engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.

For activities requiring notification to the District Engineer that result in the loss of greater than \1/2\-acre of waters of the US, the District Engineer will provide immediately (e.g., via facsimile transmission, overnight mail, or other expeditious manner) a copy to the appropriate Federal or state offices (USFWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will then have 10 calendar days from the date the material is transmitted to telephone or fax the District Engineer notice that they intend to provide substantive, site-specific comments. If so contacted by an agency, the District Engineer will wait an additional 15 calendar days before making a decision on the notification. The District Engineer will fully consider agency comments received within the specified time frame, but will provide no response to the resource agency, except as provided below. The District Engineer will indicate in the administrative record associated with each notification that the resource agencies' concerns were considered. As required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act, the District Engineer will provide a response to

19. Mitigation. The District Engineer will consider the factors discussed below when determining the acceptability of appropriate and practicable mitigation necessary to offset adverse effects on the aquatic environment that are more than minimal.

a. The project must be designed and constructed to avoid and minimize adverse effects to waters of the US to the maximum extent practicable at the project site (i.e., on site).

b. Mitigation in all its forms (avoiding, minimizing, rectifying, reducing or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

c. Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland impacts requiring a PCN, unless the District Engineer determines in writing that some other form of mitigation would be more environmentally appropriate and provides a project-specific waiver of this requirement. Consistent with National policy, the District Engineer will establish a preference for restoration of wetlands as compensatory mitigation, with preservation used only in exceptional circumstances.

d. Compensatory mitigation (i.e., replacement or substitution of aquatic resources for those impacted) will not be used to increase the acreage losses allowed by the acreage limits of some of the NWPs. For example, \1/4\-acre of wetlands cannot be created to change a,\3/4\acre loss of wetlands to a \1/2\-acre loss associated with NWP 39 verification. However, \1/2\-acre of created wetlands can be used to reduce the impacts of a \1/2\-acre loss of wetlands to the minimum impact level in order to meet the minimal impact requirement associated with NWPs.

e. To be practicable, the mitigation must be available and capable of being done considering costs, existing technology, and logistics in light of the overall project purposes. Examples of mitigation that may be appropriate and practicable include, but are not limited to: reducing the size of the project; establishing and maintaining wetland or upland vegetated buffers
to protect open waters such as streams; and replacing losses of aquatic resource functions and values by creating, restoring, enhancing, or preserving similar functions and values, preferably in the same watershed.

f. Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the establishment, maintenance, and legal protection (e.g., easements, deed restrictions) of vegetated buffers to open waters. In many cases, vegetated buffers will be the only compensatory mitigation required. Vegetated buffers should consist of native species. The width of the vegetated buffers required will address documented water quality or aquatic habitat loss concerns. Normally, the vegetated buffer .will be 25 to 50 feet wide on each side of the stream, but the District Engineers may require slightly wider vegetated buffers to address documented water quality or habitat loss concerns. Where both wetlands and open waters exist on the project site, the Corps will determine the appropriate compensatory mitigation (e.g., stream buffers or wetlands compensation) based on what is best for the aquatic

23. Waterfowl Breeding Areas. Activities, including structures and work in navigable waters of the US or discharges of dredged or fill material, into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

24. Removal of Temporary Fills. Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

25. Designated Critical Resource Waters. Critical resource waters include, NOAA-designated marine sanctuaries, National Estuarine Research Reserves, National Wild and Scenic Rivers, critical habitat for Federally listed threatened and endangered species, coral reefs, state natural heritage sites, and outstanding national resource waters or other waters officially designated by a state as having particular environmental or ecological significance and identified by the District Engineer after notice and opportunity for public comment. The District Engineer may also designate additional critical resource waters after notice and opportunity for comment.

a. Except as noted below, discharges of dredged or fill material into waters of the US are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, and 44 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters. Discharges of dredged or fill materials into waters of the US may be authorized by the above NWPs in National Wild and Scenic Rivers if the activity complies with General Condition 7. Further, such discharges may be authorized in designated critical habitat for Federally listed threatened or endangered species if the activity complies with General Condition 11 and the USFWS or the NMFS has concurred in a determination of compliance with this condition.

b. For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with General Condition 13, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The District Engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

26. Fills Within 100-Year Floodplains. For purposes of this General Condition, 100-year floodplains will be identified through the existing Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps or FEMA-approved local floodplain maps.

a. Discharges in Floodplain; Below Headwaters. Discharges of dredged or fill material into waters of the US within the mapped 100year floodplain, below headwaters (i.e. five cfs), resulting in permanent above-grade fills, are not authorized by NWPs 39, 40, 42, 43, and 44.

b. Discharges in Floodway; Above Headwaters. Discharges of dredged or fill material into waters of the US within the FEMA or locally mapped floodway, resulting in permanent above-grade fills, are not authorized by NWPs 39, 40, 42, and 44.

c. The permittee must comply with any applicable FEMA-approved state or local floodplain management requirements.

Enhancement: Activities conducted in existing wetlands or other aquatic resources that increase one or more aquatic functions.

Ephemeral Stream: An ephemeral stream has *flowing* water only during and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runnoff from rainfall is the primary source of water for stream flow.

Farm Tract: A unit of contiguous land under one ownership that is operated as a farm or part of a farm.

Flood Fringe: That portion of the 100-year floodplain outside of the floodway (often referred to as "floodway fringe").

Floodway: The area regulated by Federal, state, or local requirements to provide for the discharge of the base flood so the cumulative increase in water surface elevation is no more than a designated amount (not to exceed one foot as set by the National Flood Insurance Program) within the 100-year floodplain.

Independent Utility: A test to determine what constitutes a single and complete project in the Corps regulatory program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Intermittent Stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Loss of waters of the US: Waters of the US that include the filled area and other waters that are permanently adversely affected by flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent above-grade, at-grade, or below-grade fills that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the US is the threshold measurement of the impact to existing waters for determining whether a project may qualify for a NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and values. The loss of stream bed includes the linear feet of stream bed that is filled or excavated. Waters of the US temporarily filled, flooded, excavated, or drained, but restored to preconstruction contours and elevations after construction, are not included in the measurement of loss of waters of the US. Impacts to ephemeral waters are only not included in the acreage or linear foot measurements of loss of waters of the US or loss of stream bed, for the purpose of determining compliance with the threshold limits of the NWPs.

and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater Management Facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and BMPs, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream Channelization: The manipulation of a stream channel to increase the rate of water flow through the stream channel. Manipulation may include deepening, widening, straightening, armoring, or other activities that change the stream cross-section or other aspects of stream channel geometry to increase the rate of water flow through the stream channel. A channelized stream remains a water of the US, despite the modifications to increase the rate of water flow.

Tidal Wetland: A tidal wetland is a wetland (i.e., water of the US) that is inundated by tidal waters. The definitions of a wetland and tidal waters can be found at 33 CFR 328.3(b) and 33 CFR 328.3(f), respectively. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line (i.e., spring high tide line) and are inundated by tidal waters two times per lunar month, during spring high tides.

Vegetated Buffer: A vegetated upland or wetland area next to rivers, streams, lakes, or other open waters, which separates the open water from developed areas, including agricultural land. Vegetated buffers provide a variety of aquatic habitat functions and values (e.g., aquatic habitat for fish and other aquatic organisms, moderation of water temperature changes, and detritus for aquatic food webs) and help improve or maintain local water quality. A vegetated buffer can be established by maintaining an existing vegetated area or planting native trees, shrubs, and herbaceous plants on land next to openwaters. Mowed lawns are not considered vegetated buffers because they provide little or no aquatic habitat functions and values. The establishment and maintenance of vegetated buffers I a method of compensatory mitigation that can be used in conjunction with the restoration, creation, enhancement or preservation of aquatic habitats to ensure that activities authorized by NWPs result in minimal adverse effects to the aquatic environment. (See General Condition 19.)

Vegetated Shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: A waterbody is any area that in a normal year has water flowing or standing above ground to the extent that evidence of an ordinary high water mark is established. Wetlands contiguous to the waterbody are considered part of the waterbody.

4. Prior to the use of any NWP in a "Mountain or Piedmont Bog" of North Carolina, applicants shall comply with Nationwide Permit General Condition 13. In addition, the applicant shall furnish a written statement of compliance with all of the conditions listed of the applicable NWP.

Note: The following wetland community types identified in the N.C. Natural Heritage Program document, "Classification of Natural communities of North Carolina (Michael P. Schafale and Alan S. Weakley, 1990), are subject to this regional condition.

Mountain Bogs	Piedmont Bogs
Swamp Forest-Bog Complex	Upland Depression Swamp Forest
Swamp Forest-Bog Complex (Spruce Subtype)	
Southern Appalachian Bog (Northern Subtype)	
Southern Appalachian Bog (Southern Subtype)	
Southern Appalachian Fen	

5. Prior to the use of any NWP in Mountain Trout Waters within twenty-five (25) designated counties of North Carolina, applicants shall comply with Nationwide General Condition 13. In addition, the applicant shall furnish a written statement of compliance with all of the conditions listed of the applicable NWP. Notification will include a letter of comments and recommendations from the North Carolina Wildlife Resources Commission (NCWRC), the location of work, a delineation of wetlands, a discussion of alternatives to working in the Mountain Trout Waters, why other alternatives were not selected, and a plan to provide compensatory mitigation for all unavoidable adverse impacts to the Mountain Trout Waters. To facilitate coordination with the NCWRC, the proponent may provide a copy of the notification to the NCWRC concurrent with the notification to the District Engineer. The NCWRC will respond both to the proponent and directly to the Corps of Engineers.

The twenty-five (25) designated counties are:

Alleghany	Ashe	Avery	Yancey
Buncombe	Burke	Caldwell	Wilkes
Cherokee	Clay	Graham	Swain
Haywood	Henderson	Jackson	Surry
Macon	Madison	McDowell	Stokes
Mitchell	Polk	Rutherford	
Transylvania	Watauga		

6. Applicants shall notify the NCDENR Shellfish Sanitation Section prior to dredging in or removing sediment from an area closed to shell fishing where the effluent may be released to an area open for shell fishing or swimming in order to avoid contamination of the disposal area and allow a temporary shellfish closure to be made. Any disposal of sand to the beach should occur between November 1 and April 30 when recreational usage is low. Only clean sand should be used and no dredged sand from closed shell fishing areas. If beach disposal was to occur at times other than stated above or if sand from a closed shell fishing area is to be used, a

environment.

NORTH CAROLINA DIVISION OF WATER QUALITY
GENERAL CERTIFICATION CONDITIONS
GC3353

1. Wetland and/or riparian area restoration and creation projects (not including projects that only involve stream restoration or enhancement work described in condition nos. 2 and 3 that are proposed under this General Certification require written application to and approval from the Division of Water Quality except as specified below; Wetland and riparian area restoration and creation projects (not including projects that involve work in or impacts to streams) which are not for compensatory mitigation or compensatory mitigation credit proposed under this General Certification do not require written application to and approval from the Division of Water Quality if they are projects undertaken by the N.C. Wetlands Restoration Program, Clean Water Management Trust Fund, U.S. Natural Resources Conservation Service or Section 319 projects. In these cases, the applicant is required to notify the Division in writing with three copies of project specifications before the impact occurs. If the Division determines that the project would not result in an ecologically viable wetland and riparian area, then the Division shall notify the applicant in writing within 30 days of receipt of the notification. In such cases, the applicant will be required to submit a formal application and pay of the appropriate fee, and DWQ will be required to process the application through normal procedures;

2. Proposed stream restoration projects (as defined and limited below), that do not disturb wetlands and that are not being conducted for compensatory mitigation or compensatory mitigation credit do not require written application to and approval from the Division of Water Quality, and, therefore, do not require payment of an application fee to the Division of Water Quality. Stream restoration is defined as the process of converting an unstable, altered or degraded stream corridor, including adjacent riparian zone and flood prone areas to its natural or referenced, stable conditions considering recent and future watershed conditions. This biological and chemical integrity, including transport of water and sediment is produced by the stream's watershed in order to achieve dynamic equilibrium. The applicant is required to notify the Division in writing with three copies of detailed restoration plans and specifications before the impact occurs. If the Division determines that the project does not meet the above definition of stream restoration, then the Division shall notify the applicant in writing within 30 days of receipt of the application. In such cases, the applicant will be required to submit a formal application and pay of the appropriate fee, and DWQ will be required to process the application through normal procedures;

3. Stream enhancement projects (as defined and limited below), that do not disturb wetlands and that are not being conducted for compensatory mitigation or compensatory mitigation credit and do not include any stream channel relocation, do not require written application to and approval from the Division of Water Quality, and, therefore, do not require payment of an application fee to the Division of Water Quality. Stream enhancement is the process of implementing stream rehabilitation practices in order to improve water quality and/or ecological function. These

(available from the Division of Land Resources at the DENR Regional and Central Offices) shall be designed, installed and maintained properly to assure compliance with the appropriate turbidity water quality standard (50 NTUs in streams and rivers not designated as trout waters by DWQ; 25 NTUs in all saltwater classes and all lakes and reservoirs; 10 NTUs in DWQ-classified trout waters);

8. All sediment and erosion control measures placed in wetlands or waters shall be removed and the original grade restored after the Division of Land Resources or delegated program has released the project;

9. Any riprap shall be of such a size and density so as not to be able to be carried off by wave or current action and consist of clean rock or masonry material free of debris or toxic pollutants. Riprap shall not be installed in the streambed except in specific areas required for velocity control and approved by the Division of Land Resources and Water Quality. However rock vanes, wing deflectors, and similar structures for grade control and bank protection are acceptable;

10. Measures shall be taken to prevent live or fresh concrete from coming into contact with waters of the state until the concrete has hardened;

11. If an environmental document is required, this Certification is not valid until a Finding of No Significant Impact or Record of Decision is issued by the State Clearinghouse;

12. Additional site-specific conditions may be added to projects, which require written concurrence under this Certification in order to ensure compliance with all applicable water quality and effluent standards;

13. Concurrence from DWQ that this Certification applies to an individual project shall expire three years from the date of the cover letter from DWQ or the notification sent to DWQ.

NORTH CAROLINA DIVISION OF COASTAL MANAGEMENT STATE CONSISTENCY

Consistent.

Citations:
2002 Nationwide Permits - Federal Register Notice 15 Jan 2002
2002 Nationwide Permits Corrections - Federal Register Notice 13 Feb 2002
2002 Regional Conditions – Authorized 17 May 2002

FILE COPY

Kimley-Horn
and Associates, Inc.

P.O. Box 33068
Raleigh, North Carolina
27636-3068

October 14, 2005

Mr. Tom Walker
Wilmington Regulatory Field Office
United States Army Corps of Engineers
P.O. Box 1890
Wilmington, NC 28402-1890

Re: Tarlton Site, Cumberland County
Onsite meeting to evaluate jurisdictional areas and to discuss permitting approach.

Dear Mr. Walker:

Thank you for meeting with us onsite at the Tarlton site to discuss the permitting approach and to evaluate the existing condition as we work to move forward with restoration design activities. Below are some bulleted notes from our discussion for your review and comment.

The goals for the meeting were:

- Approval of the Nationwide 33 404 permit for temporary impacts to jurisdictional areas for debris removal activities in the location of the project outlet and beaver dam.
- Approval of the design approach in preparation of a Nationwide 27 for the remainder of stream/wetland restoration activities once the water level has been lowered and a restoration plan more clearly defined.
- Approval of the stream/wetland reference site in the watershed upstream of the culvert at Hilliard Drive.

Discussion:

- Corps - KHA/MAM must provide more detail as to the actual footprint and activities for the proposed NWP 33 area (clearing of the beaver dam and temporary stabilization of the outlet).
    - KHA – KHA prepared a GIS figure for the beaver dam area to be temporarily impacted, as well as typical details of stabilization measures to be used as needed (attached).
- Corps – Is the headcut at the sewer line crossing downstream of the beaver dam to be included in the design?

TEL 919 677 2000
FAX 919 677 2050

We anticipate that dewatering activities will begin the week of October 17, 2005 and stabilization of the outlet will begin the week of October 24, 2005.

If you have any questions or additional comments, please call me at (919) 677-2121, or Will Wilhelm at (919) 677-2150.

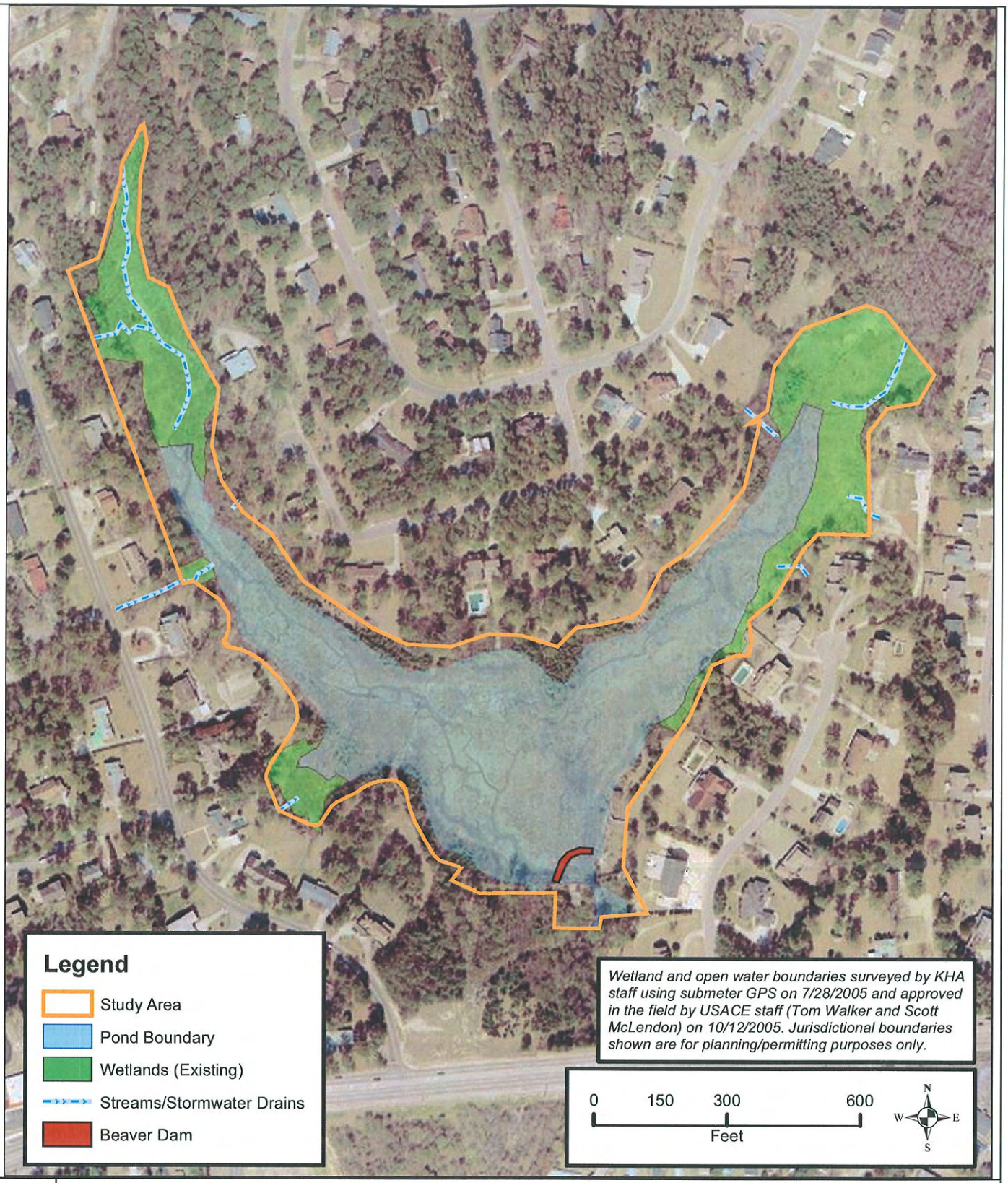
Very truly yours,

KIMLEY-HORN AND ASSOCIATES, INC.

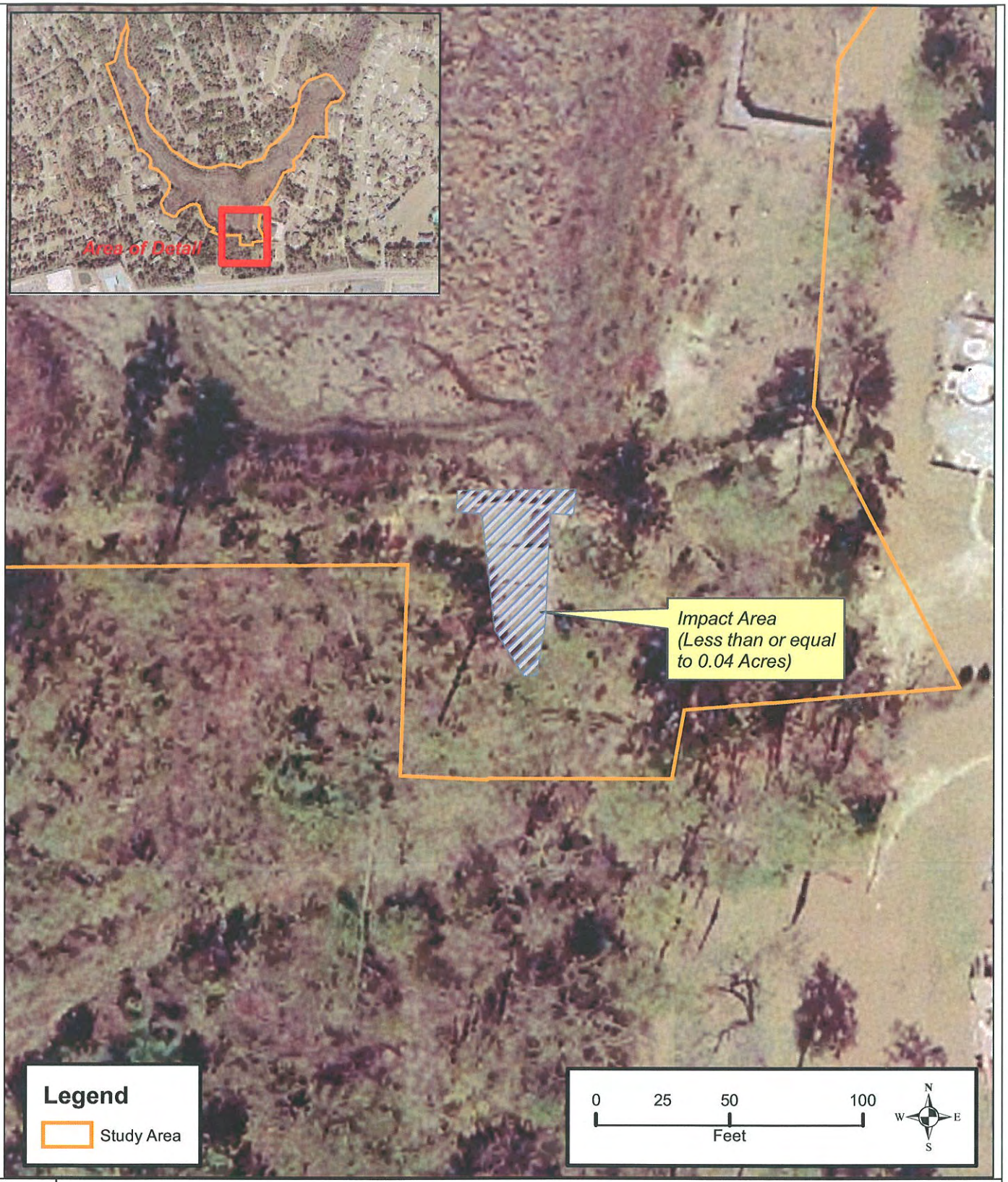
Chad Evenhouse, PWS

Attachments

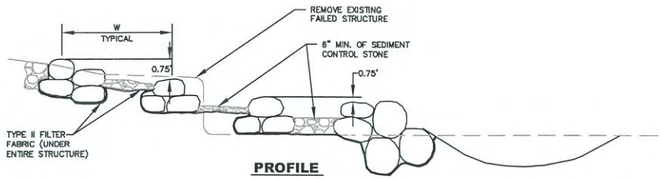
Cc: Richard Mogensen and Bob Huck, Mid-Atlantic Mitigation, L.L.C.
Will Wilhelm, Kimley-Horn and Associates, Inc.



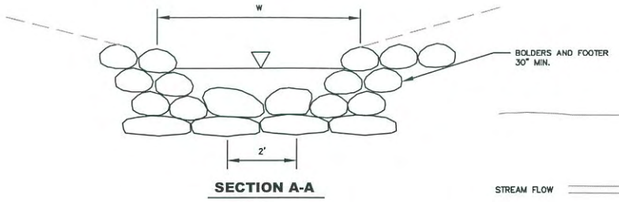
Title	Preliminary Wetlands Map for Planning Purposes (2001 Color Orthophoto)		
Prepared For:	**Project**	Tarlton Mitigation Site Cumberland County, North Carolina	
	Date 10/14/05	**Project Number**	**Figure** 4



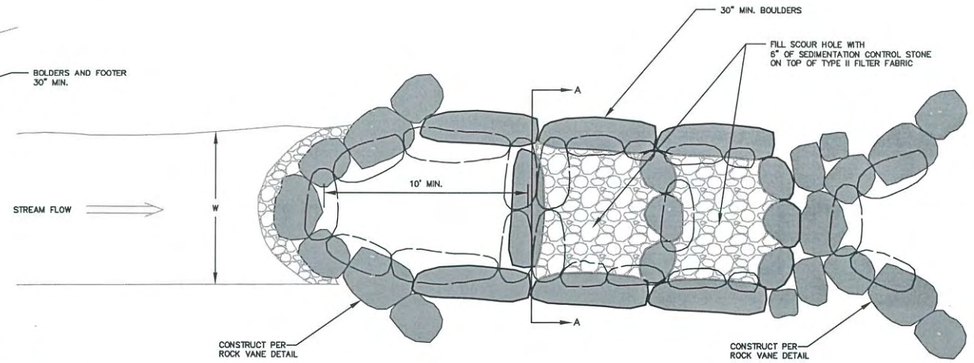
Title	Beaver Dam Impact Area
Prepared For:	**Project**: Tarlton Mitigation Site Cumberland County, North Carolina
	Date: 10/14/05
	Project Number:
	Figure: 5



PROFILE



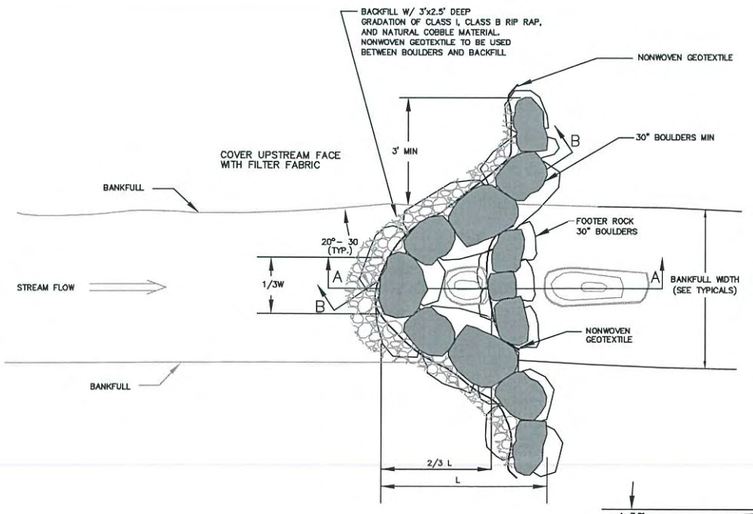
SECTION A-A



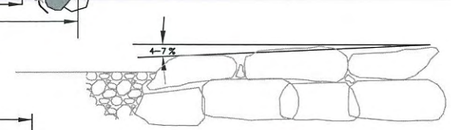
PLAN

STEP POOL STRUCTURE

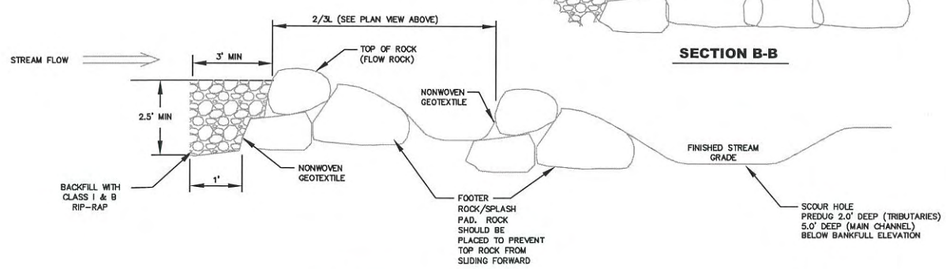
NTS



PLAN



SECTION B-B

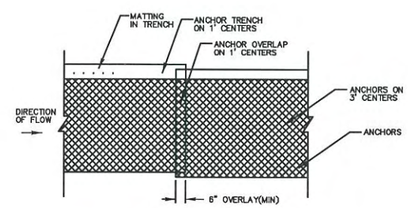


SECTION A-A

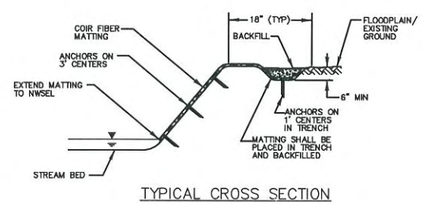
NOTE: CLASS B RIP RAP SHALL BE HAND PLACED TO FILL VOIDS BETWEEN LARGER BOULDERS.

A-VANE

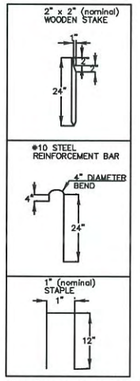
NTS



PLAN VIEW



TYPICAL CROSS SECTION



ANCHOR OPTIONS

NOTES:
1. IN AREAS TO BE MATTED, ALL SEEDING, SOIL AMENDMENTS, AND SOIL PREPARATION MUST BE COMPLETED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS PRIOR TO PLACEMENT OF COIR FIBER MATTING.
2. REBAR OR STAPLES MAY BE USED IN PLACE OF WOODEN STAKES AS DIRECTED BY THE ENGINEER.

COIR FIBER MATTING DETAIL

NOT TO SCALE

REV. No.	REVISION:	DATE:	DRAWN BY:	CHECKED BY:
1	REVISED PER SITE WALK ON 7/27/04	7/30/04	JIK	WW

PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
PHONE: (919) 677-2000 FAX: (919) 677-2050

CLIENT: MID-ATLANTIC MITIGATION EEP

TITLE: STABILIZATION DETAILS

SEAL:

DATE:	10-13-05
HORIZONTAL SCALE:	NTS
VERTICAL SCALE:	NTS
DRAWN BY:	JIK
DESIGNED BY:	CWE
CHECKED BY:	WRW

PROJECT: TARLTON MITIGATION SITE CUMBERLAND COUNTY

ATTACHED REFERENCE FILES:	JOB NUMBER:	SHEET NUMBER:
	012857003	1 of 1

Appendix 8

US Fish and Wildlife No-Effect Determination Letter

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

October 17, 2005

Kimley-Horn and Associates, Inc.
Tommy Cousins
P.O. Box 33068
Raleigh, North Carolina 27636-3068

Re: Tarlton Stream and Wetland Mitigation Site (US401/US401 Bypass), Fayetteville, Cumberland County, NC

Dear Tommy Cousins:

Thank you for your letter, dated August 8, 2005, requesting comments from the U.S. Fish and Wildlife Service on the subject project. Our comments are submitted pursuant to, and in accordance with, provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act).

Based on the information provided and other information available, it appears that the proposed project is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act. We believe that the requirements of section 7(a)(2) of the Act have been satisfied. Please remember that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or, (3) a new species is listed or critical habitat determined that may be affected by the identified action.

Thank you for your cooperation with our agency in protecting federally-listed species. If you have any questions or comments, please contact Mr. David Rabon at (919) 856-4520, extension 16, or via email at david_rabon@fws.gov.

Sincerely,

Pete Benjamin
Ecological Services Supervisor

Appendix 9

State Historic Preservation Office (SHPO) Letter

North Carolina Department of Cultural Resources

State Historic Preservation Office

Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

August 30, 2005

Tommy Cousins
Kimley-Horn and Associates, Inc.
PO Box 33068
Raleigh, NC 27636-3068

Re: Tarlton Stream and Wetland Mitigation Site, US 401/US 401 Bypass, Fayetteville, Cumberland County, ER 05-1837

Dear Mr. Cousins:

Thank you for your letter of August 8, 2005, concerning the above project.

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

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

Peter Sandbeck

Appendix 10

Temporary Encroachment Agreement Letter

PUBLIC WORKS COMMISSION
OF THE CITY OF FAYETTEVILLE
ELECTRIC & WATER UTILITIES

955 OLD WILMINGTON RD
P.O. BOX 1089
FAYETTEVILLE, NORTH CAROLINA 28302-1089
TELEPHONE (AREA CODE 910) 483-1401
FAX (AREA CODE 910) 829-0207

October 20, 2005

RECEIVED
OCT 25 2005
KIMLEY-HORN
ENVIR.

Mr. Will Wilhelm, PE
Project Manager
Kimley-Horn & Associates, Inc.
4601 Charlotte Park Drive, Suite 300
Charlotte, NC 28217

SUBJECT: ***Temporary Encroachment Agreement; Country Club Lake Stream Restoration Project***

Dear Mr. Wilhelm:

In response to your written request dated October 18, 2005 regarding the above, PWC is in agreement to allow Mid-Atlantic Mitigation (MAM) temporary access on, and across PWC Utility easements for this project subject to the conditions of the attached temporary encroachment agreement.

If agreeable, please have Mid-Atlantic sign and return the enclosed duplicate originals to my attention in the self-addressed envelope provided. PWC will return to you a fully executed original.

PWC looks forward to working with you on this project. If you have any questions, please do not hesitate to contact me at (910) 223-4342.

Very truly yours,

PUBLIC WORKS COMMISSION

Jim Autry
Right-of-Way Supervisor

JA:dp

cc: Jody MacDonald
Joe Glass
Rick Davis
Joe Callis
Ike Copeland

Appendix 11

Reference Site Property Owner Agreement Letter