Briles Site
Randolph County, North Carolina

Stream Restoration Plan

Contract No. EW-02040S
State Project No. 020591001

FILE

Ecosystem Enhancement PROGRAM

NC EEP, 1652 Mail Service Center, Raleigh, NC 27699-1652

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EXECUTIVE SUMMARY

The North Carolina Department of Transportation (NCDOT) initiated the Briles Site Stream Restoration Feasibility Study in April 2003 to evaluate the feasibility of restoring two unnamed tributaries to Jackson Creek (UTJC1 and UTJC2). The purpose of the mitigation project would be to compensate for unavoidable stream and buffer impacts in the Yadkin River Basin. With the creation of the North Carolina Ecosystem Enhancement Program (EEP), this project was shifted to this new agency for completion.

The project site is part of an 87-acre parcel owned by Mr. and Mrs. Kenneth Briles that is located southeast of the intersection of Ross Wood Road and Pleasant Grove Road in Trinity, Randolph County, North Carolina. The primary land uses on the property include rangeland (pasture), a chicken hatchery, and forest. UTJCl is a first order (becomes second order at the confluence with UTJC2) perennial stream that flows south/southeast through the subject property before joining Jackson Creek. UTJC2 originates from a forested area in the northwestern portion of the subject property, and then flows southeast through a horse pasture before connecting with UTJC1. The project reaches are located within the USGS Hydrologic Unit 03040103, in a non-targeted portion of the NC Division of Water Quality (NCDWQ) Priority Sub-basin 03-07-09.

Significant portions of UTJCl and UTJC2 within the project site have been degraded due to poor grazing management and the removal of riparian vegetation. The stream channel in several locations has been straightened to increase the area available for grazing and cultivation.

Coordination with the landowner was conducted to identify current and planned land use requirements associated with the project site. A Rosgen Level III assessment and qualitative stream stability evaluations were conducted to characterize existing stream conditions and determine the potential for restoration. Further, the presence of conditions or characteristics that have the potential to constrain restoration activities on the project site was evaluated.

Reference reach studies of an unnamed tributary to Back Creek, an unnamed tributary to Richland Creek, and an unnamed tributary to Fisher River, all in nearby watersheds were conducted. A rain gage, stream gages and scour chains were installed on UTJC1 in the project site to evaluate flows and sediment transport. From sediment transport modeling, a design shear stress was established for the anticipated gradation of the relocated streambed. Based on the reference reach surveys and sound geomorphic principles, the proposed mitigation stream alignment, profile and typical cross sections were developed.

The stream restoration plan proposes constructing 1,446 feet of meandering channel using a Priority Level II approach. The restoration will establish a bankfull channel with a new floodplain, a channel bed at its existing level in an existing gravel layer, and the cross section dimensions necessary to provide stable flow maintenance and sediment transport. The remaining 362 linear feet of UTJC1 and all of UTJC2 (820 linear feet) will be restored and enhanced using a Priority Level III approach. This strategy would involve restoring the stream generally within the existing stream corridor/belt width through adjustments to the stream dimension and profile. UTJCI will be restored to Rosgen stream types C4 and B4c and UTJC2 will be restored to Rosgen stream types B4c/5c. Multiple stream types are necessary because the valley shape and slope change through the project site. A minimum width 50-foot buffer will be provided on both sides of the proposed channel. This buffer will be enclosed by exclusion fence, have two stable stream crossings, and a re-vegetation plan. This re-vegetation of the conservation easement will consist of shrubs on the stream channel banks and woody plantings on the floodplain within the exclusion fencing.

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1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) initiated the Briles Site Stream Restoration Feasibility Study in April 2003 to evaluate the feasibility of restoring two unnamed tributaries to Jackson Creek (UTJC1 and UTJC2). The purpose of the mitigation project would be to compensate for unavoidable stream and buffer impacts in the Yadkin River Basin. With the creation of the North Carolina Ecosystem Enhancement Program (EEP), this project was shifted to this new agency for completion.

1.1 Project Description

The EEP intends to utilize the Briles Site for a comprehensive restoration of the streams and their woody corridors. This restoration plan presents detailed information regarding the existing site and watershed conditions, the morphological design criteria developed from selected reference reaches, and the project design parameters based upon natural channel restoration methodologies.

1.2 Project Goals and Objectives

The goals and objectives of the Briles Site Stream Restoration Project are to:

- Restore a stable channel morphology that is capable of moving the flows and sediment provided by its watershed;
- Improve water quality and reduce land and riparian vegetation loss resulting from lateral erosion and bed degradation;
  Improve aquatic habitat with bed variability and the use of in-stream structures; and,
- Preserve portions of the drainage that currently function as a stable riverine environment.

2.0 PROJECT SITE LOCATION

2.1 General Description

The project site is part of an 87-acre parcel owned by Mr. and Mrs. Kenneth Briles that is located southeast of the intersection of Ross Wood Road and Pleasant Grove Road in Trinity, Randolph County, North Carolina (Figure 1). UTJC1 is a first order (becomes second order at the confluence with UTJC2) perennial stream that flows south/southeast through the subject property before joining Jackson Creek. UTJC2 originates from a forested area in the northwestern portion of the subject property, and then flows southeast through a horse pasture before connecting with UTJC1.

The primary land uses on the property include rangeland (pasture), a chicken hatchery, and forest. A private residence is also located in the northeast portion of the subject property, along with several other agriculture/livestock related structures.

2.2 USGS and NCDWQ River Basin Designations

The project reaches are located within the USGS Hydrologic Unit 03040103, in a non-targeted portion of the NC Division of Water Quality (NCDWQ) Priority Sub-basin 03-07-09.

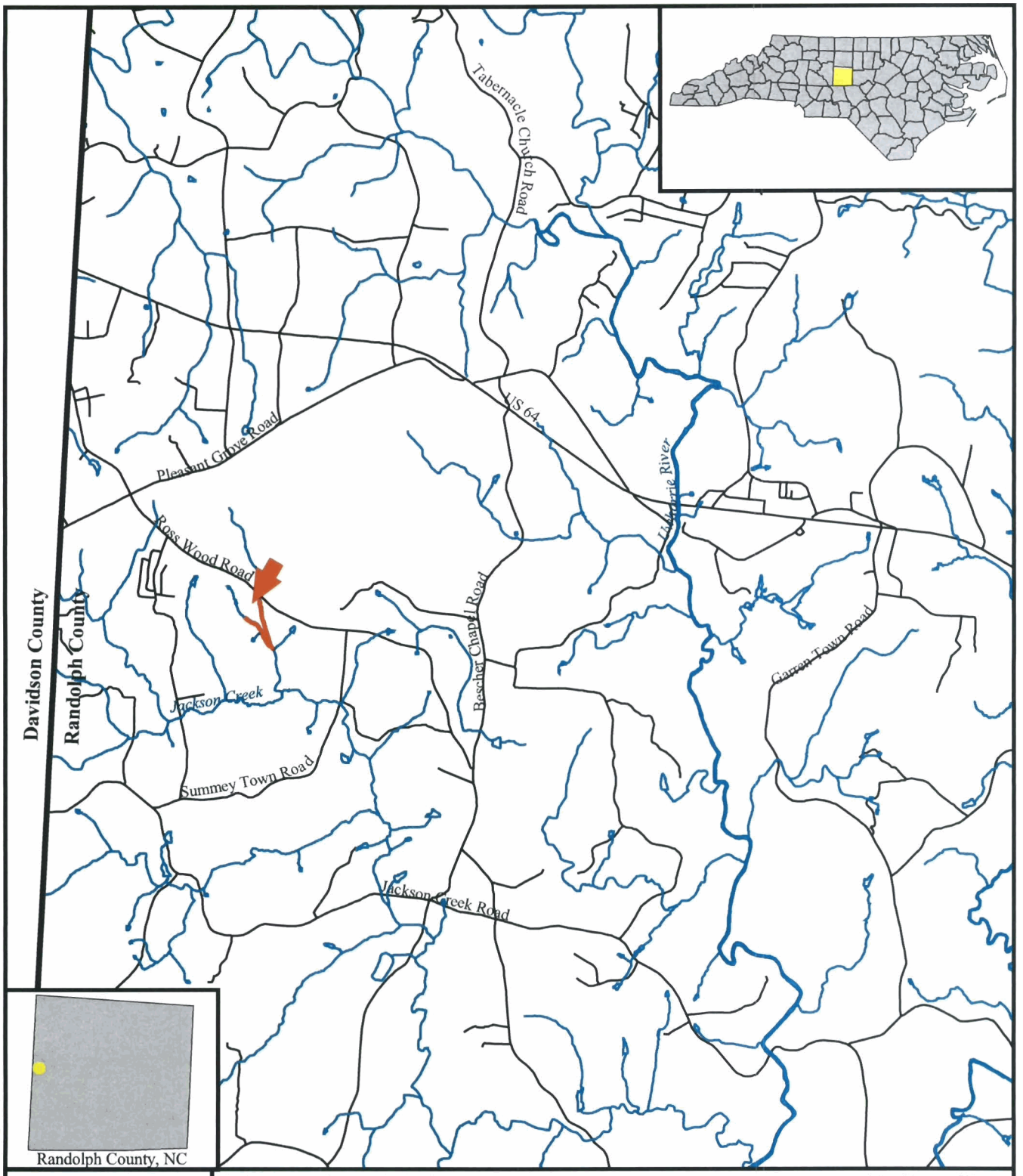

Figure 1. Vicinity Map **Briles Site**

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2.3 NCDWQ Surface Water Classification

The NCDWQ assigns surface waters a classification in order to help protect, maintain, and preserve water quality. Jackson Creek, from its sowce (NCDWQ Stream Index Number 13-2-2), is designated a "C" usage classification (NCDENR, 2002). Therefore, both tributaries in the subject property carry this classification. Class "C" is a baseline water quality classification, intended to protect water resources for fishing, wildlife, fish and aquatic life propagation and survival, agriculture, and secondary recreation. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner. There are no restrictions on watershed development or types of discharges.

3.0 WATERSHED CHARACTERIZATION

3.1 General Description

The project site is located in a rural setting within the Carolina Slate Belt ecoregion of the Piedmont physiographic province. Site topography is characterized as rolling to hilly with elevations ranging from 600 feet above mean sea level (AMSL) to 795 feet AMSL. The elevation change along UTJC1 falls from approximately 640 feet AMSL at the upper part of the site to approximately 630 feet AMSL at the lower end of the project, a longitudinal valley distance of 1,710 feet (0.6 % mean valley slope).

3.2 Drainage Area

The total drainage area of the project reaches (UTJC1 and UTJC2), at the downstream limits, is 0.68 square miles (See Figure 2. Project Watershed). The UTJC1 drainage extends northwest to Pleasant Grove Road. At the point that UTJC1 crosses under Ross Wood Road, the stream drains approximately 0.51 square miles. An additional 0.17 square miles drains to UTJC1 at the point where the project reach terminates. The UTJC2 catchment (0.11 square miles) is included as part of this additional drainage. The soil types of the watershed are presented in Figure 3 (Soils).

3.3 Land Use and Development Potential

An Anderson Level I classification indicates that the contributing drainage area is dominated by forest (72%) land use/land cover (Figure 4. Land Use/Land Cover). The remaining area consists of rangeland (13%), agriculture (12%), and urban (2%) land use. The Citizen Guide to Land Development of Randolph County indicates that the zoning of the Briles Site is under the code LI (light industrial) and RA (residential agricultural). Light industrial zoning is defined as light industrial warehousing, distribution, and sales of large-item products. Residential agricultural zoning is for low-density residential developments and minor subdivisions. Development pressures are low in the areas around the Briles property.

3.4 Historical Resources

Historic aerial photographs were obtained from the Randolph County Natural Resources Conservation Service (NRCS) office to provide an additional tool to assess the existing site conditions. The intent of the review was to understand the chronology of landscape changes and aid in the evaluation of the site and the development of an appropriate restoration strategy. Aerial photographs of the site were obtained for 1937, 1957, and 1966 (Appendix A).

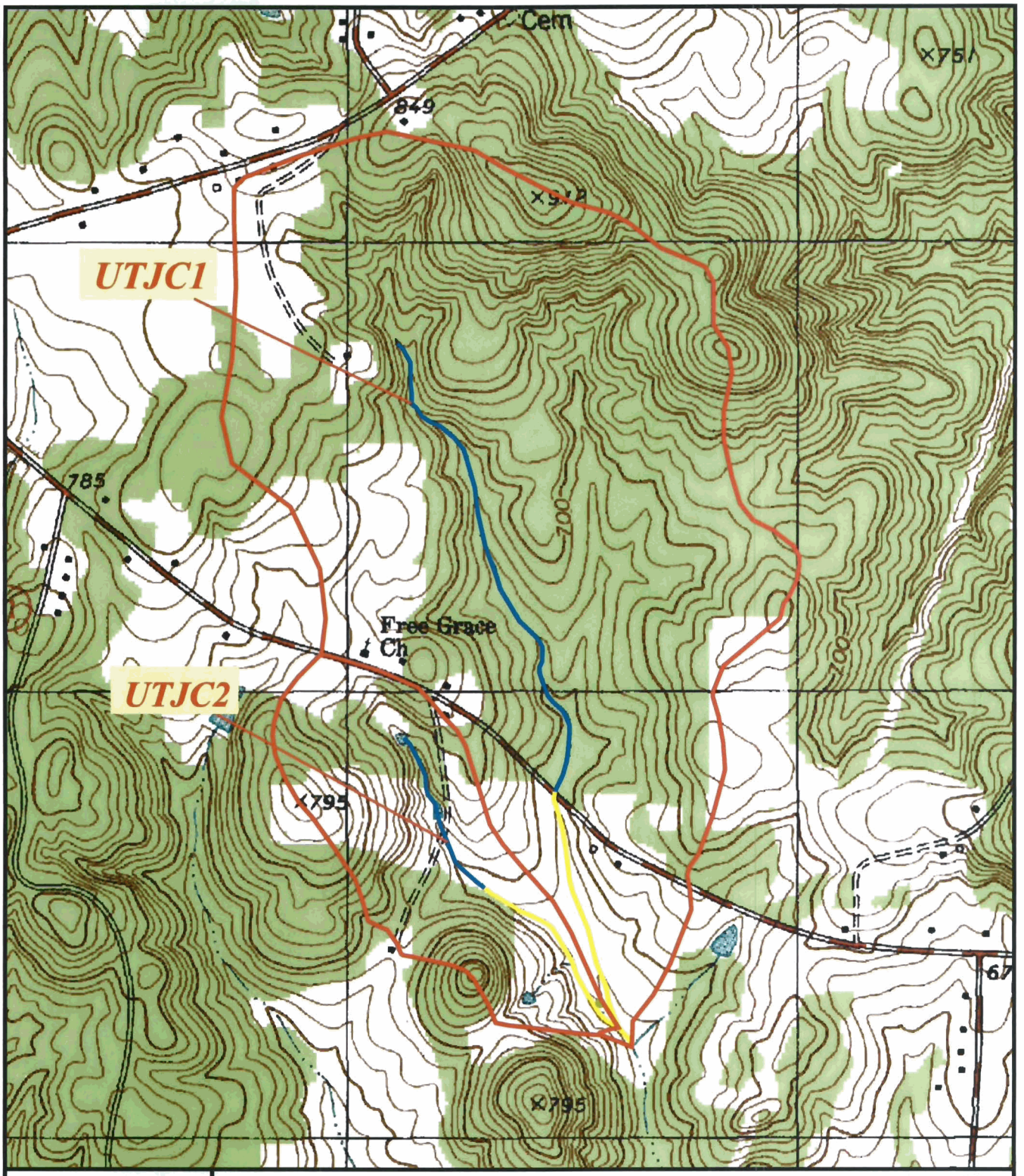

Figure 2. Project Watershed **Briles Site**

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Project Reach
Streams
Drainage Area 0.62 **Sq.** Miles
UTJC1 - **0.51 Sq.** Miles
UTJC2 - 0.11 **Sq.** Miles

N

800 0 800 **Feet**

Source: Denton USGS 7.5' Topographic Quadrangle

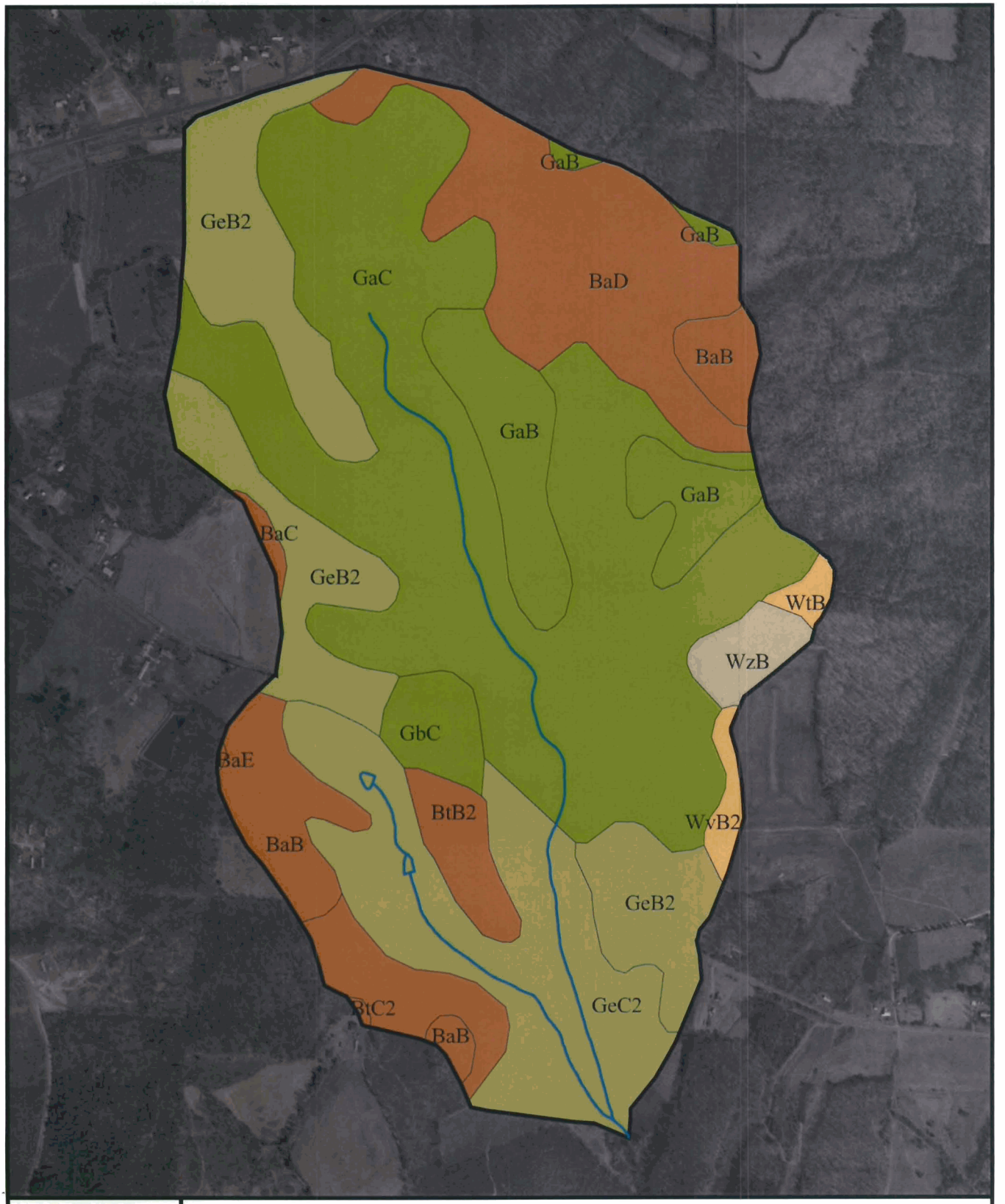

Figure 3. Soils

Briles Site

Soil Types
- Badin-Tatum Complex
- Georgeville Silt Loam
- Georgeville Silty Clay Loam
- Wynott-Enon Complex
- Wynott-Wilkes Poindexer Complex

Streams
Drainage Area

N

400 0 400 Feet

Source: 1998 Aerial Photographs - Randolph County GIS Department

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Figure 3. Land Use/Land Cover **Briles Site**

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Agriculture
Forest
Rangeland
Urban
Water

Project Reach
Streams
Drainage Area

N

400 0 400 Feet

Source: 1998 Aerial Photographs - Randolph County GIS Department

- In the 1937 photograph, the northern portion of the property is forested. This includes the area currently utilized for the chicken houses and the dirt/gravel access road. The surrounding areas consist of agriculture and rangeland (pasture).
  In the 1957 photograph, the forested area in the northern portion of the property has been cleared. No other changes were documented.
  There are no visible changes on the subject property or surrounding areas in the 1966 aerial photograph.

There were no significant changes in the stream pattern or valley in any of the historic aerial photographs. Therefore, any alterations to the stream channel occurred prior to 1937. Further, no evidence of land disturbing activities was documented on the subject property during this period.

3.5 Cultural and Archaeological Resources

To evaluate the presence of significant cultural resources on the subject property and the potential that the proposed project would impact them, KCI requested a formal review at the North Carolina Department of Cultural Resources, State Historic Preservation Office (SHPO). No historic preservation sites nor sites of archeological importance were noted on the Briles Property (See Appendix B).

3.6 Effect on Natural Resources (RTE)

Rare, Threatened, or Endangered Species (RTE)
KCI reviewed topographic quadrangles at the North Carolina Natural Heritage Program (NCNHP) in April 2003 to identify the presence of rare species, critical habitats, and priority natural areas on the project site and to determine the potential impact of the proposed project on these resources. This review did not indicate the potential presence of protected species or suitable habitats within the project area.

A formal review by the NCNHP was requested on May 7, 2003. In their Findings Letter, the NCNHP indicated no record of these occurrences within a one-half mile radius of the project site. In addition to the NCNHP review, a field investigation did not identify any protected species or suitable habitats within the project area.

Wetlands
A review of the Denton, North Carolina National Wetland Inventory (NWI) Map identified no wetlands within the project study area; however one wetland area was identified during the feasibility assessment.

The approximate boundaries of an existing wetland area (WET1) were mapped using non-survey grade Global Positioning System (GPS). WET1 is approximately 0.36 acres and is located southwest of the confluence of UTJC1 and UTJC2. Soils were classified as a Wehadkee variant with redoximorphic features occurring between six (6") and fifteen inches (15"). Water was ponded at the surface and additional hydrologic inputs were occurring from seeps on the western periphery of WET1. Broad-leaved arrowhead (Sagitaria *latifolia)*, soft rush *(Juncus effuses)*, tag alder *(Alnus* serrulata), silky willow *(Salix* sericea), Lurid sedge *(Carex* lurida), broad-leaved cattail *(Typha latifolia)*, and multiflora rose (Rosa *multiflora)* were identified in WET1. (See Appendix Ba).

The WET1 area will be preserved as part of the Briles Site restoration project. It is enclosed within the boundaries of the conservation easement. No construction work will be performed in this sensitive area.

4.0 EXISTING CONDITIONS ASSESSMENT

A site field assessment was conducted in April 2003 to document existing conditions and evaluate the potential for stream and riparian buffer restoration. Observations and collected data are described below, illustrated in Figure 5 Existing Conditions and documented in site photographs (Appendix C). The site was revisited from April to December, 2004 several times to take further measurements, to install a rain gage and stream gages, to sample the stream bed, and several times to collect hydrology data from the instruments.

4.1 General Site Description

The Briles Site consists of two unnamed tributaries to Jackson Creek (UTJC1 and UTJC2). UTJC1 is a first order perennial stream that flows onto the project site through two culverts under Ross Wood Road at the northern property boundary. The upstream portion of UTJCl can characterized as an over wide, degraded reach with extensive bank erosion as a result of poor grazing management and the absence of riparian vegetation. The stream was classifies as an incised "E4" or "G4c" type throughout this reach.

Approximately 500 feet downstream, the channel pattern and dimension changes. UTJC1 begins to meander for approximately three wavelengths with the low flow channel becoming narrower and the banks sloping gently into a small floodplain feature and then into the adjacent terrace. The stream flows through a wire fence and a small rock dam before continuing in a southeast direction through a constriction under a concrete/steel bridge crossing. Livestock cannot access UTJCI below the concrete bridge crossing. Subsequently, the bank conditions improve somewhat with increased vegetative cover. The reach immediately below the bridge has been straightened and is incised. Bed degradation and toe erosion are present and several bedrock outcrops were noted throughout this reach.

A pond, approximately 0.8 acres in size, exists adjacent to the right (west) bank of UTJCl in the middle section of the project reach. The landowner stated that the pond was excavated in 1998. The pond berm (core) slopes toward the right (west) side of UTJC1. It appears that spoil material from the pond excavation was permanently stockpiled on the terrace adjacent to the right stream bank. In addition, a small berm parallels UTJCI along the left (east) stream bank. This berm is evident in the surveyed cross sections. The stream classifies as an incised "E4" type in this reach.

The channel begins to transition below the confluence with UTJC2. It becomes wider with additional flood-prone area above the bankfull elevation (low bench). Woody vegetation is sporadically located on the stream banks throughout this segment. The stream has several small debris jams and a small lateral inflow enters from the left (east) side of UTJCI. The low bench that was prominent in the upper part of this reach shifts into near vertical banks of a wider channel downstream of the confluence. This adjustment extends to the end of the project reach, which is marked by the remnants of a stonewall dam.

UTJC2 is a smaller, steeper stream beginning in the northwest portion of the subject property. The stream flows in a southeast direction for approximately 840 feet before joining UTJCI. UTJC2 exhibits characteristics typical of a "B5c" stream type. "B5c" streams are moderately entrenched and sinuous (> 1.2) with width-to depth ratios greater than twelve (12). This stream type is generally stable when dense riparian area is present, however past utilization by livestock and the absence of vegetation has led to instability throughout the middle and lower portions of the reach.


Two 36" Reinforced Concrete Pipes
UTJC1 Start
UTJC1 Cross Section 1
Stone Wall in West Bank
UTJC1 Cross Section 2
Heavy Livestock Traffic
Ross Wood Road
UTJC1 Cross Section 3
10' x 3.5' Concrete Bridge
UTJC2 Start
36" Reinforced Concrete Pipe
UTJC1 Cross Section 4
UTJC2 Cross Section 1
Instream Rock Feature
12" Plastic Overflow Pipe for Pond
Confluence with UTJC1, End UTJC2
UTJC2 Cross Section 2
UTJC1 Cross Section 5
Remnants of a Stone Wall Dam Cross the Stream
UTJC1 End
Briles Site Restoration Plan
Figure 5. Existing Conditions Map
oject Reach
Streams
Lateral Input
Fence
Cross Section Locations
Parcel Boundaries
Pond
Existing Wetland/Potential Mitigation Area (WET 1)
Animal Waste Storage Area
Seep
Debris Jam
Bedrock Outcrop
Large Tree
Water Facility
N
100 0 100 Feet
Source: 1998 Aerial Photographs - Randolph County GIS Department

4.2 Geology and Soils

Local geology consists of metamorphic rocks of the Carolina Slate Belt. These include interbedded metasandstone, metaconglomerate and metavolcanic rock. The geology dates back to the Cenozoic Era.

Predominant soil types located within the project watershed include Georgeville silt loam (GaB, GaC, GbC), Georgeville silty clay loam (GeB2, GeC2), and various soils from the Badin-Tatum complex (BaB, BaC, BaD, BaE, BtB2, BtC2). ***Badin-Tatum complex*** soils consist of strongly sloping *Badin* soils and *Tatum* soils on uplands. These soils formed in residuum from Carolina slates and other fine-grained rocks, and are moderately deep to deep and well-drained. ***Georgeville silty clay loam*** soils are gently sloping, very deep, well-drained, eroded soils found on uplands. These soils formed in residuum from Carolina slates.

Lesser areas of Wynott-Enon complex (WtB, WvB2) and Wynott-Wilkes Poindexter complex (WzB) were indicated in the eastern portion of the watershed. A Chewacla variant was identified at the several boring locations along the project reach, to the west of both UTJC1 and UTJC2.

4.3 Existing Riparian Buffer and Natural Communities

The existing riparian area is predominantly in pasture or crop. These areas are largely devoid of natural habitat communities. Several mature trees line the channel in the lower portion of UTJC1 (below Station 24+50). It is the intent of the restoration project to salvage any valuable trees that may provide immediate shade to the restored channel.

4.4 Existing Stream Characteristics

4.4.1 Morphological Description

A Rosgen Level III assessment was conducted to gather existing stream dimension, pattern, and profile data and determine the potential for restoration. Channel cross-sections and bed materials were surveyed at seven representative locations, five along UTJC1 and two along UTJC2. Data developed from these surveys are summarized below (Table 1) with detailed data provided in Appendix D.

Table 1. Summary of Existing Channel Morphology.

LOCATION / PARAMETER	UTJC1 XS-1	UTJC1 XS-2	UTJC1 XS-3	UTJC1 XS-4	UTJC1 XS-5	UTJC2 XS-1	UTJC2 XS-2
A_{bkf} (sq ft)	15.1	18	18.4	18.8	18.8	3.7	3.8
W_{bkf} (ft)	11.3	12	28.8	8.5	22.9	8.4	8.3
W_{fpa} (ft)	19.9	56.7	32	32	37.3	21.1	16.6
d_{mbkf} (ft)	1.3	1.5	0.50	2.2	0.8	0.4	0.5
D_{bkf} (ft)	1.7	1.9	1.47	2.8	2.2	1.0	1.0
W/D ratio	8.4	8	66.4	3.8	27.9	18.9	18.3
Entrenchment Ratio	1.8	4.7	3.0	3.8	1.6	2.5	2.0
Bank Height Ratio	1.9	1.9	1.0	1.8	-	-	-
Local W. S. Slope	0.006	0.004	0.003*	0.007	0.004**	0.014	0.010
D_{50} (mm)	5	2.5	0.9*	10.8	10.3	0.1	0.1
Stream Type	G4c	E4	C4/5	E4	B4c	B5c	B5c

*Values have been influenced by rock sill/debris jam at fence line.
**Several debris jams and rock outcrop/step features influence the measured slope.

4.4.2 Stability Assessment

Qualitative stability assessments of the existing stream conditions were developed based upon measured stream dimensional characteristics (i.e., entrenchment ratio, bank height ratio) and visual observations. Conceptual channel evolution models are used to describe the sequential changes a stream undergoes after disturbance and predict its most probable stable endpoint (stream type). The channel stage assessment utilized the channel evolution model (CEM) presented by Simon (1989) to briefly characterize the active processes occurring in the subject stream and how they relate to the stability of the channel.

UTJC1 exhibits characteristics of four separate stages in the CEM. The section of UTJC1 extending 500 feet from the upstream project limits is in Stage IV (degradation and widening). Bed degradation is evident throughout the reach (bank height ratios exceed 1.5). Bank erosion potential (and subsequent widening) is high as a result of stream banks denude of vegetation and rooting strength, in conjunction with pressures from livestock access to the creek. Some large trees stabilize localized sections of stream bank, however a general lack of riparian vegetation exists throughout this reach.

A short meandering section follows for approximately 200 feet, down to a wire fence/concrete bridge. UTJC1 is in Stage VI (quasi-equilibrium) of the CEM. The streambed is stabilized by a small rock dam immediately downstream, which is acting as grade control. Sediment deposition during the recession of high flows is building benches at the bankfull elevation. With the addition of a forested riparian buffer, the maintenance of grade control downstream, and the exclusion of livestock, this section of stream should stabilize under current watershed conditions.

UTJC1 transitions to Stage III (degradation) of the CEM below the concrete bridge (extending approximately 680 feet). The stream has cut to bedrock in several locations. The basal cleanout along with some rotational failures indicates that a shift to Stage IV (degradation and widening) is likely in these areas. The channel remains in its current modified condition due to extensive bank vegetation, as well as the exclusion of livestock in this reach. A small berm has been constructed adjacent to the left (west) stream bank paralleling the stream. This berm confines flows within the incised channel by increasing the elevation to access a larger flood-prone area by nearly a foot.

The stream is currently in Stages IV and V (aggradation and widening), downstream of the confluence of UTJC1 with UTJC2. Sediment deposition and re-vegetation, associated with Stage V, are causing the formation of a defined low flow channel, below the bankfull elevation. Several debris jams are causing localized erosion and bed scour as flows are directed around/under the blockages into the adjacent banks and streambed. Bedrock controls the profile of several long sections in this reach, in particular the area immediately upstream of the stonewall dam at the end of the project reach. Cross-sectional adjustments with some re-profiling and the planting of a forested riparian buffer will greatly enhance the condition of UTJC1, in this lower reach.

UTJC2 is relatively uniform in terms of stability after it exits the forested area at the upstream project limits. The channel classifies as a "B5c" stream type. Inherently, this stream type is stable, however UTJC2 has been impacted. The main de-stabilizing factor is grazing management that allowed animals access into the stream. In addition, the pond and berm construction have altered the flood-prone area in the upper portion and the entire reach has limited riparian vegetation. Sections of UTJC2 are in a state of quasi-equilibrium as a result of dense rush/sedge vegetation that lines the channel, as well as the exclusion of livestock in the lower portion of the reach. Minor cross-sectional modifications, livestock fencing, and the incorporation of woody vegetation in the riparian area, when feasible (no planting on pond berm), will enhance UTJC2 and provide long-term stability.

4.5 Constraints

The presence of conditions or characteristics that have the potential to hinder restoration activities on the project site was evaluated. The evaluation focused primarily on the presence of hazardous materials, utilities and restrictive easements, rare/threatened/endangered species (RTE) or critical habitats, cultural resources, and the potential for hydrologic trespass. Existing information regarding project site constraints was acquired and reviewed. In addition, any site conditions that have the potential to restrict the restoration design and implementation were documented during the field investigation. Table 2 summarizes the identified constraints related to the implementation of site restoration activities.

4.5.1 Hazardous Materials

The presence or likely presence of hazardous substances on the subject property and surrounding area under conditions that indicate a past, present or potential release into the ground, groundwater, or surface water was evaluated. The evaluation included a review of public record environmental database information and a visual site inspection.

A report meeting ASTM E1527-00 Standards for records search requirements was obtained summarizing existing federal and state database information regarding known environmental conditions for the subject property and surrounding area. No conditions of environmental concern were identified on the Briles Site or within the specified search radii.

An environmental screening inspection was conducted on the subject and surrounding properties in April 2003. The only documented environmental concern was a chicken litter stockpile. The litter pile is located outside of the proposed restoration limits, however surface runoff from this area could adversely impact water quality in the restored stream. Relocation of the waste storage area and containment measures have been incorporated into the restoration plan as a management activity.

4.5.2 Utilities and Easements

A copy of the current property deed, covering a period of fifteen (15) years, was obtained from the Randolph County Tax Office. A review of the deed indicates that prior to Mr. and Mrs. Kenneth Briles owning the property, Cyana Briles (formerly Ms. Pierce) owned three properties, which were deeded to Kenneth and Cyana Briles. No restrictions or adverse conditions that would preclude a conservation easement in the restoration area were documented in the recorded deed.

4.5.3 Hydrologic Trespass

The proposed project reach is entirely contained within the Briles property. The restoration of the project reach is not anticipated to produce hydrologic trespass conditions on any adjacent properties.

Table 2. Summary of Design Constraints

Fatal Flaw/Constraint	Nature of Constraint	Proposed Resolution
Current Land Use (Specify)	Pasture (livestock grazing), Chicken Hatchery, Forest, Pond	Exclusion fencing as necessary; No hardwood planting on pond embankment.
Adjacent Property Land Use	Forest, Agriculture, Low-Density Residential Development	
Landowner Concerns	Pond Access, Litter Stockpile Relocation	Maintained corridor immediately adjacent to pond for recreation access. Move litter stockpile to the northwest corner of chicken houses.
Deed Restrictions/Easements	50 years of property ownership records were not available.	A certified title search was required prior to the purchase of the conservation easement.
Project Constructibility/Access	None	
Utilities	None	
Structures	Bridge on UTJC1 and culvert crossing on UTJC2	Replace with NRCS Heavy Traffic Use Ford Crossings.
Cultural (Historical/Archaeological)	No occurrences per NCDCR review.	
Rare, Threatened, and Endangered Species	NCNHP Findings Letter indicated no record of occurrences within one-mile radius of the project site	
Natural Features (Soils, Bedrock)	Bedrock outcrops in streambed and banks	Identified bedrock incorporated into the design.
FEMA Regulated Area	Project area within Zone C (area of minimal flooding).	No detailed modeling required.

Table 3. Property Ownership History

Book	Page	Grantee (Buyer)	Grantor (Seller)	Date
1771	546	Kenneth D. Briles and wife, Cyana H. Briles	Energy United Electric Membership Corporation	5/9/02
1487	278	Kenneth D. Briles and wife, Cyana H. Briles	Kenneth Dale Briles and wife, Cyana B. Pierce Briles	1/27/97
1407	1269	Kenneth D. Briles and wife, Cyana B. Pierce Briles	Cyana B. Pierce Briles	10/7/94
1379	1574	Kenneth D. Briles and wife, Cyana B. Briles	Clayton E. Kindley and wife, Thelma A. Kindley	5/25/93
1357	262	Cyana H. Briles and husband, Kenneth D. Briles	Ramon C. Handy	4/08/93
1325	1096	Clayton E. Kindley and wife, Thelma A. Kindley	Klaussner Furniture Industries, Inc.	5/04/92
1260	381	Clayton E. Kindley and wife, Thelma A. Kindley	Klaussner Furniture Industries, Inc.	5/04/92
1260	381	Ramon C. Handy	James B. Boggs and wife, Herman K. McDowell, R., free trader, W. Reid Kearns and wife.	5/11/90

5.0 REFERENCE REACH ANALYSIS

A reference reach is a channel with a stable dimension, pattern, and profile within the particular valley morphology. The reference reach is used to develop dimensionless morphological ratios (based on bankfull stage) that can be extrapolated to disturbed/unstable streams to restore a stream of the same type and disposition as the reference stream (Rosgen, 1998). The selection criteria included a stable reach occurring under similar hydrophysiographic, landform, and watershed land use conditions.

The project site occurs in rolling to hilly terrain of the Carolina Slate Belt ecoregion of the Piedmont physiographic province. The project stream runs through a gently sloping valley (average slope of approximately 0.6%). The project watershed is a small (0.62 square miles), primarily forested watershed with a small percentage of agriculture, pasture, and rural, low-density residential land uses. A reference reach with similar site and watershed conditions was desired.

An Unnamed Tributary to Back Creek (UTBC), a first order rural stream in Randolph County, was selected as a reference reach for the restoration of UTJC. UTBC flows south into Back Creek and drains approximately 0.63 square miles of predominantly forested land.

UTBC is located in the same hydrophysiographic province and has similar valley morphology as the project site. The valley slope (0.7%) is slightly greater than that of UTJC1 (0.6%). Local topography is characterized by rolling hills, which is consistent with landforms found at the Briles Site and throughout the Piedmont province. The reference reach and the project site are also both located in the Carolina Slate Belt.

Approximately 700 linear feet of the UTBC was surveyed (Appendix E contains supporting documentation from the field assessment). UTBC was classified as a "C4" channel type. Refer to Figure 6.

An Unnamed Tributary to Richland Creek (UTRC), a first order rural stream in Moore County, was also selected as a reference reach for the restoration of UTJC1. UTRC flows southeast into Richland Creek and drains approximately 0.90 square miles of predominantly forested land.

UTRC is located in a similar physiographic province and has similar valley morphology as the project site. The valley slope (1.3%) is the same as that of UTJC2 (1.3%). Local topography is characterized by rolling hills, which is consistent with landforms found at the Briles Site and throughout the Piedmont province. The reference reach and the project site are also both located in the Carolina Slate Belt.

Approximately 500 linear feet of the UTRC was surveyed (Appendix E contains supporting documentation from the field assessment). UTRC was classified as a "C4" channel type. Refer to Figure 7.

An Unnamed Tributary to Fisher River (UTFR), a first order rural stream in Surry County, was selected as a reference reach for the restoration of UTJC1 and UTJC2. UTFR flows northeast into Fisher River and drains approximately 0.38 square miles of predominantly forested land

UTFR is located in the same river basin and has similar valley morphology as the project site. The valley slope is slightly greater than the project streams, however the sediment distribution and transport closely match the UTJC conditions. Local topography is characterized by rolling hills, which is consistent with landforms found at the Briles Site and throughout the Piedmont province.

Approximately 300 linear feet of the UTFR was surveyed (Appendix E contains supporting documentation from the field assessment). UTFR was classified as a "B4c" channel type. Refer to Figure 8. The morphological variables for each of the reference reaches are included as part of Table 5 in the Natural Channel Design section of this report.

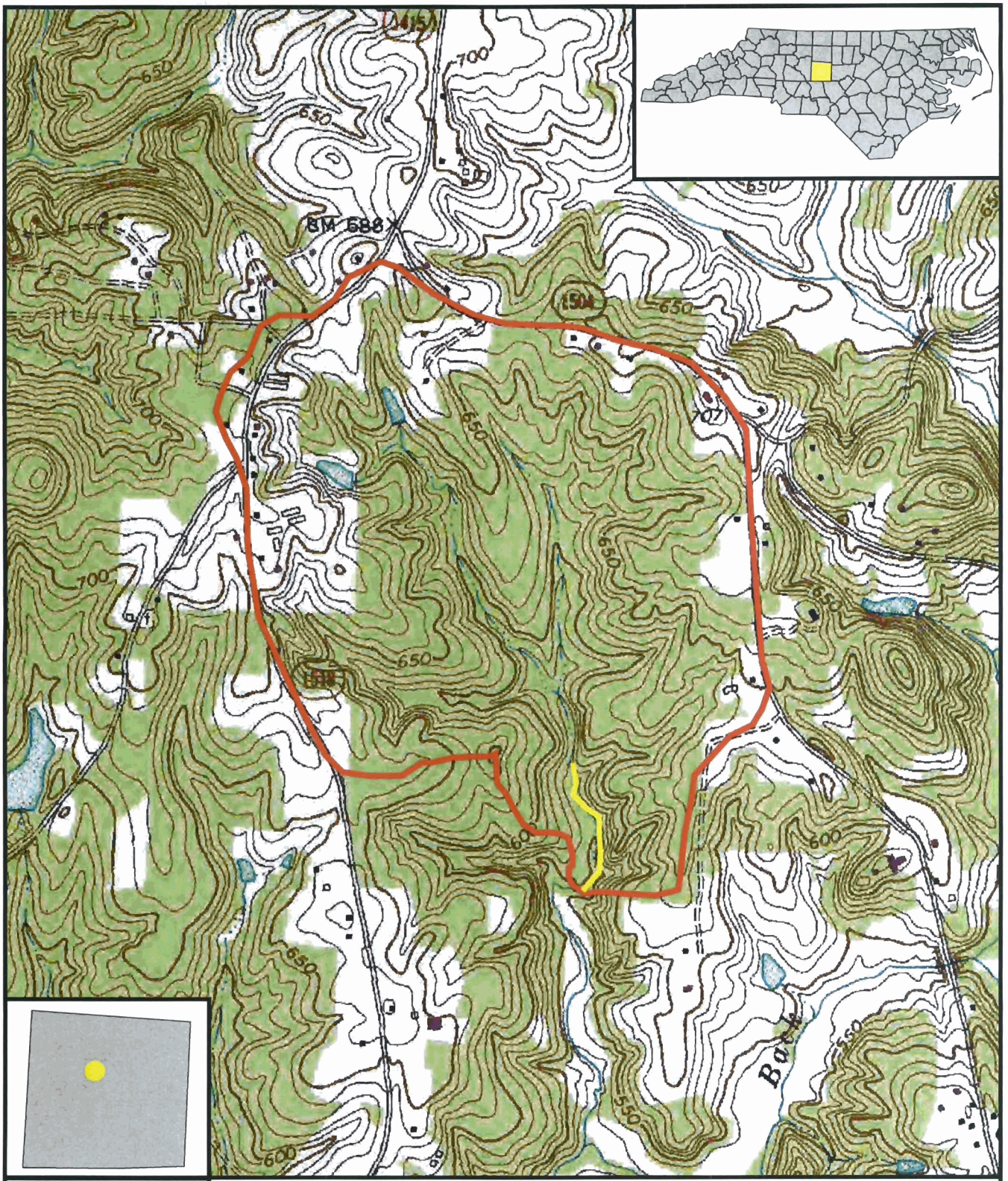


Figure 6. Reference Reach Map **UT to Back Creek**

Reference Reach - UT to Back Creek

Drainage Area 0.63 Sq. Miles

N

1000 0 1000 Feet

Ecosystem Enhancement PROGRAM

Source Randleman USGS 7 5' Topographic Quadrangle

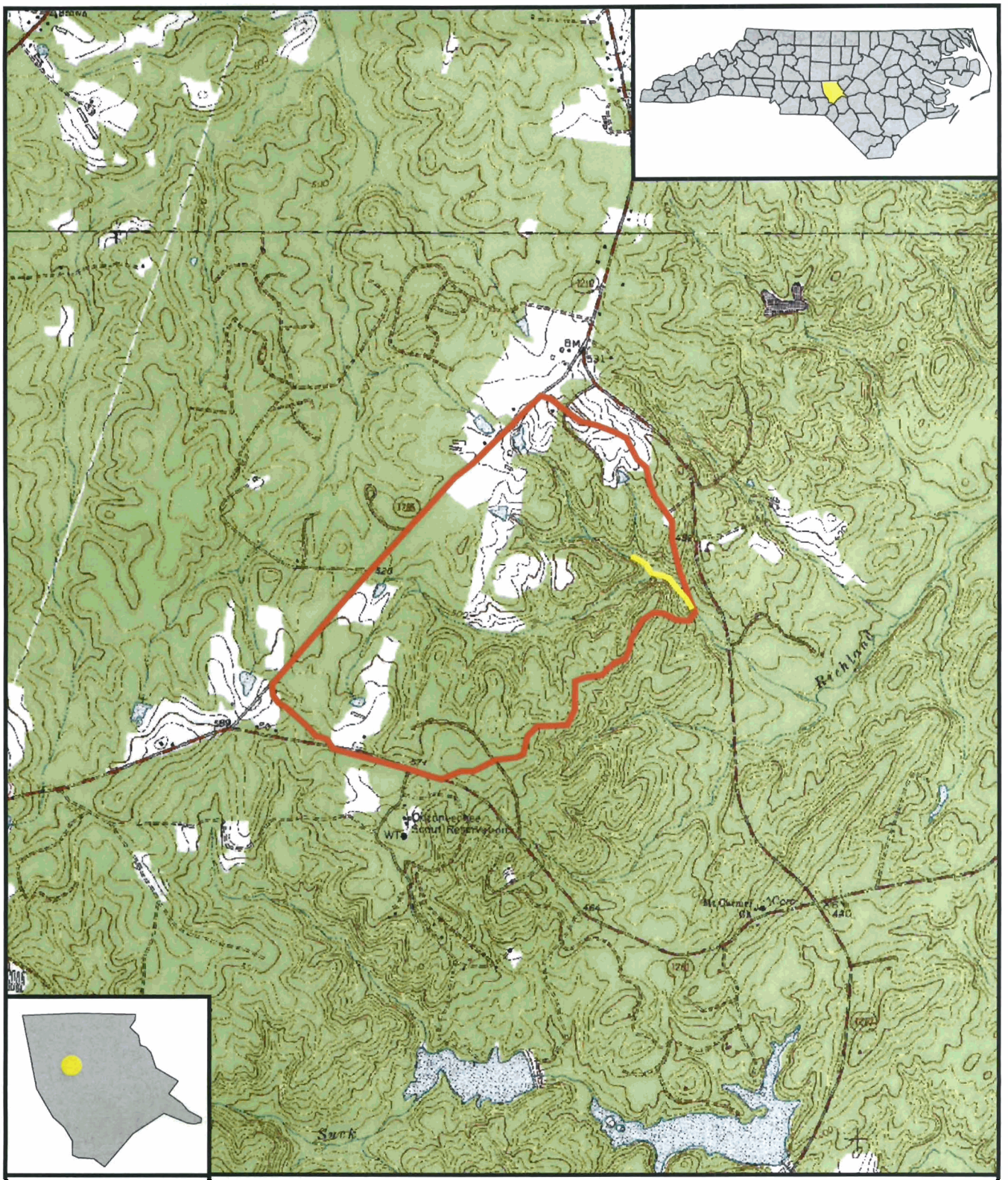


Figure 7. Reference Reach Map **UT to Richland Creek**

Reference Reach - UT to Richland Creek

Drainage Area 0.90 Sq. Miles

N

2000 0 2000 Feet

Source: Zion Grove USGS 7.5' Topographic Quadrangle

Ecosystem Enhancement PROGRAM

Figure 8. Reference Reach Map **UT to Fisher River**

Ecosystem Enhancement PROGRAM

Reference Reach - UT to Fisher River

Drainage Area 0.38 Sq. Miles

N

1000 0 1000 Feet

Source: Bottom USGS 7.5' Topographic Quadrangle

6.0 RESTORATION DESIGN

The restoration design of the UTBC1 and UTJC2 are based, respectively, on Priority Level 2 & 3 and Priority Level 3 approaches, as described in "A Geomorphological Approach to Restoration of Incised Rivers", (Rosgen, 1997). Refer to Figure 8a. For clarity and convenience, definitions of the four restoration priorities are provided in Table 4.

6.1 Stream

The design proposes constructing 1,446 linear feet of meandering channel using a Priority Level II approach. The restoration will establish a bankfull channel with a new floodplain, a channel bed at its existing level in an existing gravel layer, and the cross section dimensions necessary to provide stable flow maintenance and sediment transport. The design bankfull stage will equal the floodplain elevation in the new channel (bank height ratio = 1.0). The establishment of a stable bedform (i.e., riffle-pool sequence, pool spacing) will be addressed in the profiling of the design channel.

The remaining 362 linear feet of UTJC1 and all of UTJC2 (820 linear feet) will be restored and enhanced using a Priority Level III approach. This strategy would involve restoring the stream generally within the existing stream corridor/belt width through adjustments to the stream dimension and profile. The proposed stream dimension, pattern, and profile will be based on the detailed morphological criteria and hydraulic geometry relationships developed from the reference streams, see Table 5. Refer to the attached plan sheet drawings.

In-stream structures will be incorporated to reduce the burden of energy dissipation on the channel geometry. Cross Vanes and Rock Sill Grade Controls (Refer to Plan Sheet 2) will be used to stabilize the restored channel. These structures are designed to reduce bank erosion and the influence of secondary circulation in the near-bank region of stream bends. The structures further promote efficient sediment transport and produce/enhance in-stream habitat. Coir fiber matting will be used to provide temporary stabilization on the newly graded streambanks. The confluence of tributaries with the restored stream will be stabilized with grade control structures where necessary to match the proposed grade of the restored main channel.

The restoration project will also include other non-stream related components:

- Cattle exclusion fencing will be installed along the outer boundary of the restored riparian buffers and a permanent conservation easement will be recorded to protect the site in perpetuity.
- Two stabilized stream crossings will be installed to provide livestock and machinery access to isolated areas. Rock fords (NRCS Heavy Traffic), fenced on either side to exclude livestock from further accessing the waterway, are recommended measures for these crossings.
- The relocation of the chicken litter storage area to an area adjacent to the chicken houses will eliminate runoff into the restored channel.
- The existing channel downstream of the restoration project will be preserved and protected with the conservation easement to the property boundary.
- Offline watering will be provided to the landowner.

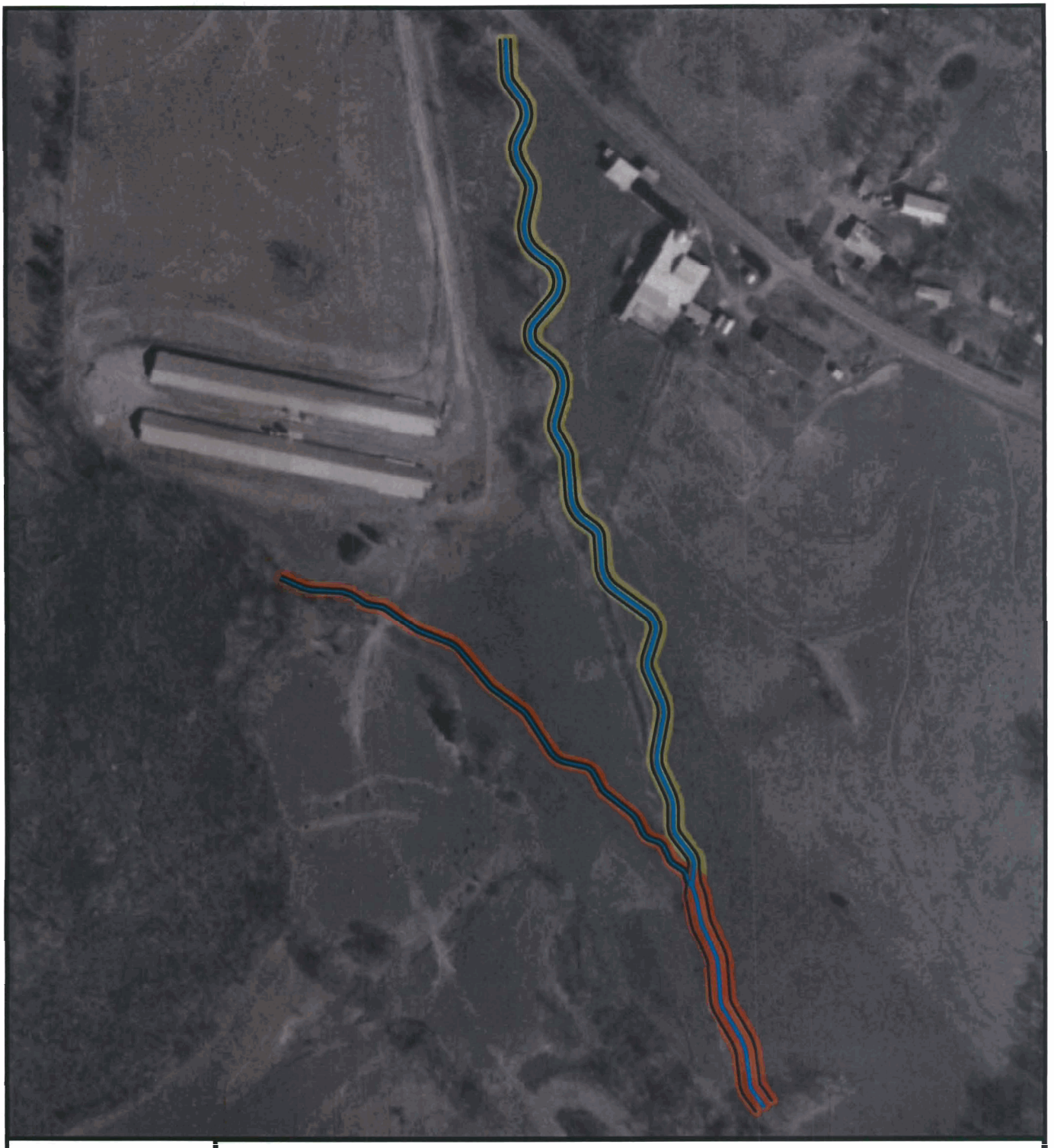


Figure 9. Restoration Type and Extent **Briles Site**

Ecosystem Enhancement Program

Priority Level II - 1,446 linear feet

Priority Level III - 1,182 linear feet

Approximate Proposed Bankfull Limits

Approximate Proposed Thalweg

N

500 250 0 500

Feet

6.2 Riparian Buffers

Native woody and herbaceous species will be used to establish fifty (50) foot wide riparian buffers on both sides of the restored reach. Four hundred thirty-six **(436)** trees per acre (based on an average 10' x 10' spacing) will be planted to achieve a mature survivability of three hundred twenty (320) trees per acre in the riparian zone (DENR, 2001). Plant placement and groupings will be randomized during installation in order to develop a more naturalized appearance in the buffer. Woody vegetation planting will be conducted during dormancy.

Tree and shrub species to be planted may consist of the following:

Trees
American sycamore (Platanus occidentalis)
Tulip poplar (*Liriodendron tulipifera*)
Green ash (*Fraxinus* pennsylvanica)
River birch (Betula nigra)
Cherrybark oak (Quercus pagoda)
Willow oak (Quercus *phellos*)
Water oak (Quercus nigra)

Herbaceous vegetation within the buffer shall consist of a native grass mix that may include: big bluestem (Andropogon gerardii), purple love grass (Eragrostis spectabilis), deertongue (Panicum clandestinurn), gama grass (Tripsacurn *dactyloides*), orchardgrass (Dactylis glomerata), river oats (Chasrnanthium *latifolium*), and Virginia wildrye (*Elymus* virginicus). Rye grain (Secale cereale) or brown top millet (Pennisetum glaucum) will be used for temporary stabilization, depending upon the construction schedule.

On the restored stream banks, live stakes will be used in conjunction with the native herbaceous seed mix to provide natural stabilization. Appropriate species identified for live staking include elderberry (Sambucus canadensis), silky willow (Salix sericea), silky dogwood (*Cornus* amomum), and black willow (Salix nigra).

Table 4. Priority Levels of Incised River Restoration.

Description	Methods	Advantages	Disadvantages
Priority 1 Convert G and/or F stream types to C or E at previous elevation with floodplain.	Re-establish channel on previous floodplain using relic channel or construction of new bankfull discharge channel. Design new channel for dimension, pattern, and profile characteristic of stable form. Fill in existing incised channel or with discontinuous oxbow lakes level with new floodplain elevation.	Re-establishment of floodplain and stable channel: I) reduces bank height and streambank erosion, 2) reduces land loss, 3) raises water table, 4) decreases sediment, 5) improves aquatic and terrestrial habitats, 6) improves land productivity, and 7) improves aesthetics.	I) Floodplain re-establishment could cause flood damage to urban, agricultural, and industrial development. 2) Downstream end of project could require grade control from new to previous channel to prevent head-cutting.
Priority 2 Convert F and/or G stream types to C or E. Re-establishment of floodplain at existing level or higher, but not at original level.	If belt width provides for the minimum meander width ratio for C or E stream types, construct channel in bed of existing channel, convert existing bed to new floodplain. If belt width is too narrow, excavate streambank walls. End-haul material or place in streambed to raise bed elevation and create new floodplain in the deposition.	1) Decreases bank height and streambank erosion, 2) Allows for riparian vegetation to help stabilize banks, 3) Establishes floodplain to help take stress off of channel during flood, 4) Improves aquatic habitat, 5) Prevents wide-scale flooding of original land surface, 6) Reduces sediment, 7) Downstream grade transition for grade control is easier.	I) Does not raise water table back to previous elevation. 2) Shear stress and velocity higher during flood due to narrower floodplain. 3) Upper banks need to be sloped and stabilized to reduce erosion during flood.
Priority 3 Convert to a new stream type without an active floodplain, but containing a floodprone area. Convert G to B stream type, or F to Bc.	Excavation of channel to change stream type involves establishing proper dimension, pattern, and profile. To convert a G to B stream involves an increase in width/depth and entrenchment ratio, shaping upper slopes and stabilizing both bed and banks. A conversion from F to Bc stream type involves a decrease in width/depth ratio and an increase in entrenchment ratio.	I) Reduces the amount of land needed to return the river to a stable fonn. 2) Developments next to river need not be relocated due to flooding potential. 3) Decreases flood stage for same magnitude flood. 4) lmproves aquatic habitat.	I) High cost of materials for bed and streambank stabilization. 2) Does not create the diversity of aquatic habitat. 3) Does not raise water table to previous levels.
Priority 4 Stabilize channel in place.	A long list of stabilization materials and methods have been used to decrease streambed and streambank erosion, including concrete, gabions, boulders, and bioengineering methods.	I) Excavation volumes are reduced. 2) Land needed for restoration is minimal.	1) High cost for stabilization. 2) High risk due to excessive shear stress and velocity. 3) Limited aquatic habitat depending on nature of stabilization methods used.

Source: Rosgen 1997. "A Geomorphological Approach to Restoration of 'Incised Rivers".

Table 5. Morphological Design Criteria

Variables		Project Site Existing Channel		Reference Reach UT Back Creek	Reference Reach UT Richland Creek	Reference Reach UT Fisher River	Reference Reach Mitchell River HW	Project Site Restored Reach	
		UTJC1	UTJC2					UTJC1	UTJC2
Rosgen Stream Type		G4c, E4, C4/5	B5c	C4	C4	B4c	B4c	C4/B4c	B4c/5c
Drainage Area (mi^2)		0.51	0.11	0.63	0.9	0.38	6.0	0.51/0.62	0.11
Bankfull Width (W_{bkf}) (ft)		*8.5-28.8 (12)	8.3-8.4	10.4-16.1	14.8-27.1 (21)	9.0-10.0	29.2-35.0	15.4/14.3	6.7
Bankfull Mean Depth (d_{bkf}) (ft)		0.5-2.2 (1.3)	0.4-0.5	0.9-1.2	0.8-1.5	1.1-1.2	2.0-2.1	1.1/1.2	0.6
Bankfull Cross Sectional Area (A_{bkf}) (ft^2)		15.1-18.8 (18.4)	3.7-3.8	12.5-14.4	21.2-22.3	10.4-10.7	62.5-68.8	17.0	3.7
Width/depth Ratio (W_{bkf}/d_{bkf})		3.8-66.4 (8.4)	8.3-18.9	11.6-13.4	18.1-18.5	8.0-12.0	13.9-17.5	14.0/12.0	12.0
Maximum Depth (d_{mbkf}) (ft)		1.5-2.8 (1.9)	1.0	1.4-1.7	1.9-2.0	1.3-1.5	2.7-2.8	2.0/1.5-2.5	0.8-1.3
Width of Flood Prone Area (W_{fpa}) (ft)		19.9-60.0 (37.3)	16.6-21.1	150	200	13.1-20.5	44-64	>35/19-32	9-15
Entrenchment Ratio (ER)		1.6-4.7 (3.0)	2.0-2.5	9.3-14.4	7.4-13.5	1.3-2.3	1.3-2.2	>2.2/1.3-2.3	1.3-2.3
Water Surface Slope (S) (ft/ft)		*0.004-0.01	0.01-0.014	0.007	0.012	0.013	0.0084	0.005/0.06	0.01-0.012
Sinuosity (stream length/valley length) (K)		1.02	1.07	> 1.5	1.5	1.2	1.1	1.2/1.1	1.1
Dimension	Pool Depth (ft)	-	-	1.0-1.5	2.4	1.2-1.4	2.7	1.7-2.2/1.4-1.8	0.7-1.0
	Riffle Depth (ft)	1.5-2.8 (1.9)	1.2-2.0	0.9-1.2	0.8-1.5	1.1-1.2	0.9-1.2	1.1/1.2	0.6
	Pool Width (ft)	-	-	10.1-16.0	15.2	8.4-11.6	27	16-17/14-17	6.7-8.0
	Riffle Width (ft)	*8.5-28.8	8.3-8.4	10.4-16.1	14.8-27.1	9.0-9.9	8.7-12.3	15.4	6.7
	Pool XS Area (sf)	-	-	10.4-19.3	36.5	11.6-13.4	72.5	17-24	3.7-5.5
	Riffle XS Area (sf)	15.1-18.8	3.7-3.8	12.5-14.4	21.2-22.3	10.4-10.7	62.5-68.8	17.0	3.7
	Pool Depth/Mean Riffle Depth	-	-	1.1-1.3	2.1	1.0-1.3	1.3-1.4	1.5-2.0/1.2-1.5	1.2-1.5
	Pool Width/Riffle Width	-	-	1-1.1	0.7	0.8-1.3	0.9	1.0-1.1/1.0-1.2	1.0-1.2
	Pool Area/Riffle Area	-	-	0.8-1.1	1.7	1.1-1.3	1.1	1.0-1.5	1.0-1.5
	Max pool depth/d_{bkf}	-	-	1.4-1.6	1.3-2.4	1.9-2.0	2.0-3.5	1.5-2.5/2.0-3.0	2.0-3.0
	Low Bank Height/ d_{mbkf}	1.1-1.8	-	1.0-1.1	1.0-1.1	-	-	1.0/-	-
	Mean Bankfull Velocity (V) (fps)	2.0-4.0	2.4-2.6	4.7	6.3	4.1-4.5	3.2-5.3	3.0-3.8	2.7
	Bankfull Discharge (Q) (cfs)	50-65	9-10	60-65	130-140	42-46	280	50-65	10
Pattern	Meander length (L_m) (ft)	50-100	50-100	70-120	108-148	93-136	140-500	105-170/72-215	33-100
	Radius of Curvature (R_c) (ft)	25-57	28-127	14.5-25.9	16.3-26.8	13-42	70-220	20-50/28-100	13-47
	Belt Width (W_{blt}) (ft)	50	30	135	75	45	100-400	77/70	33
	Meander Width Ratio	1.7-5.9	3.6	10.2-13.0	3.6-5.1	4.5-5.0	3.0-14.0	5.0	5.0
	R_c/ W_{bkf} Ratio	0.87-6.7	3.3-15.3	1.4-1.6	1.0-1.1	1.3-4.4	2.0-7.5	1.5-3.2/2.0-7.0	2.0-7.0
	L_m / W_{bkf} Ratio	1.7-11.8	6-18.1	6.7-7.5	4-10	9-15	4.0-17.1	7-11/5-15	5-15
Profile	Valley Slope	0.006	0.013	0.007-0.008	0.013	0.016	0.009	0.006	0.013
	Average Water Surface Slope	0.004-0.01	0.01-0.014	0.007	0.012	0.013	0.0084	0.005/0.006	0.01-0.012
	Riffle Slope	0.004-0.012	-	0.01-0.04	0.003-0.076	0.01-0.02	0.007-0.027	0.005-0.012	0.01-0.02
	Pool Slope	-	-	0.000-0.001	0.001-0.007	0.000-0.001	0.0-0.003	0.00-0.001	0.00-0.002
	Pool to Pool Spacing	-	-	43.5-181	38-147	30-59	115-400	46-154/28-86	7-22
	Pool Length	-	-	31-108	28-89	3-25	-	15-30	4-10
	Riffle Slope/Avg WS Slope	1.0-3.0		2.8	2.4	1.0-2.2	0.8-3.2	1.0-2.0	1.0-2.0
	Pool Slope/ Avg WS Slope			0.0-0.2	0.08-0.2	0.0	0.01-0.3	0.00-0.2	0.00-0.2
	Pool Length/ W_{bkf}			3.0-6.7	1.9-2.3	0.3-2.5		1.0-2.5	1.0-2.5
	Pool to Pool Spacing/ W_{bkf}			4.2-11.2	2.6-5.4	3.3-6.0	1.5-3.8	3.0-10.0 2.0-6.0	2.0-6.0

• Values influenced by rock sills/debris jams causing backwater conditions.

STATE	STATE CONSTRUCTION PROJECT NO.	SHEET NO.	TOTAL SHEETS
N.C.	020591001	1	14

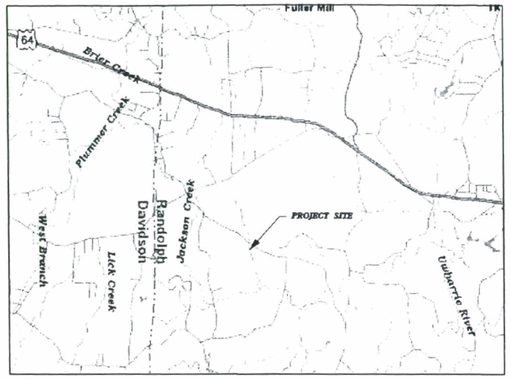
STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

RANDOLPH COUNTY

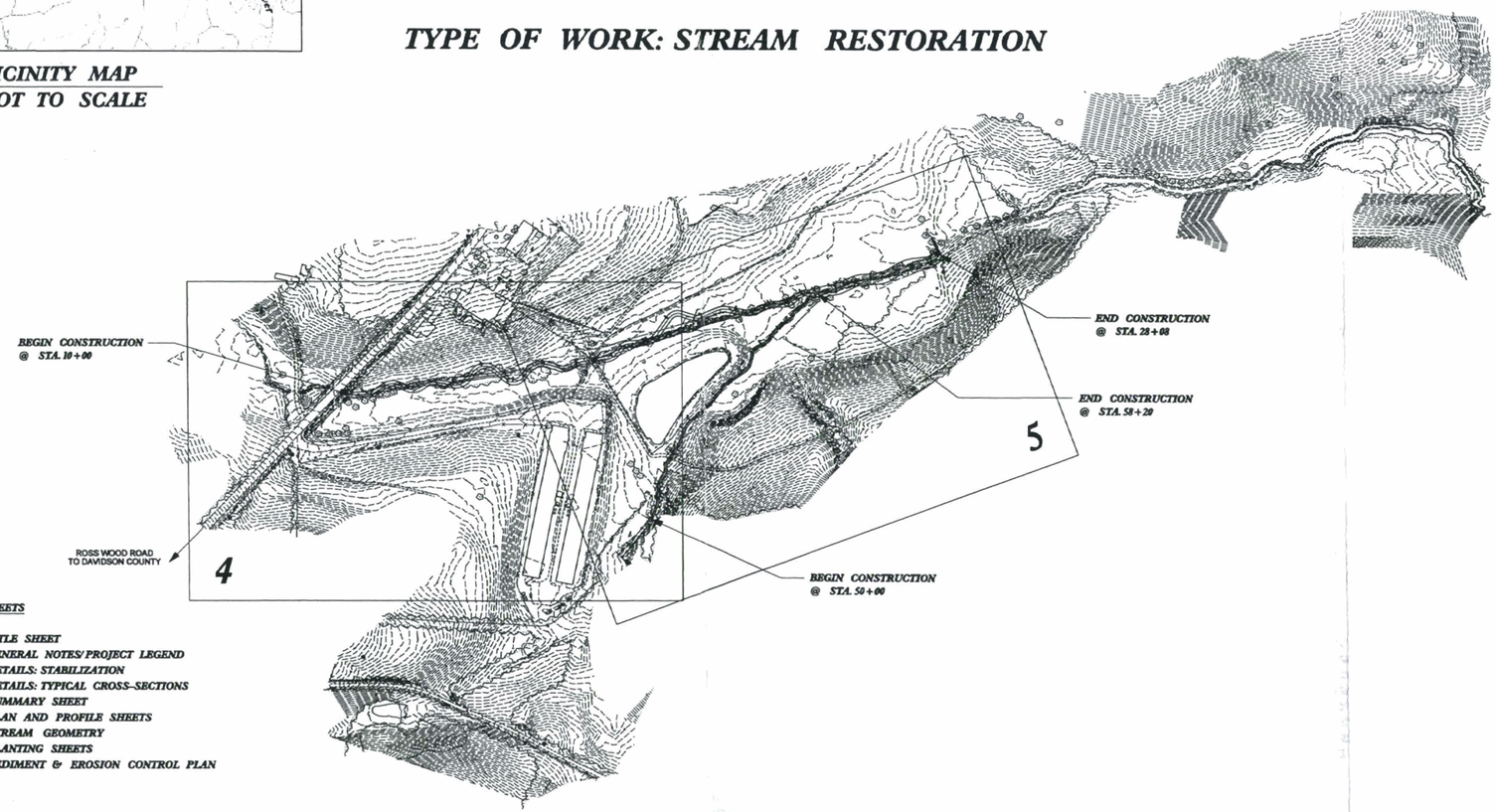
NC GRID NAD '83

LOCATION: UNNAMED TRIBUTARIES TO JACKSON CREEK (BRILES SITE) TRINITY, NORTH CAROLINA

TYPE OF WORK: STREAM RESTORATION



VICINITY MAP
NOT TO SCALE



INDEX OF SHEETS

PROJECT: 020591001

GRAPHIC SCALES

PLANS: –40 –20 0 40 80

PROFILE (HORIZONTAL): –40 –20 0 40 80

PROFILE (VERTICAL): –4 –2 0 4 8

PROJECT LENGTH

STREAM RESTORATION LENGTH = 1,808 FEET

STREAM ENHANCEMENT LENGTH = 820 FEET

Prepared In the Office of:

KCI Associates of North Carolina, P.A.
SUITE 220 LANDMARK CENTER I, 4601 SIX FORKS RD., RALEIGH NC
ENGINEERS • PLANNERS • ECOLOGISTS

LETTING DATE:

JAMES W. BLAKE, PE
PROJECT ENGINEER

GARY M. MRYNCZA, PH
NATURAL CHANNEL DESIGN

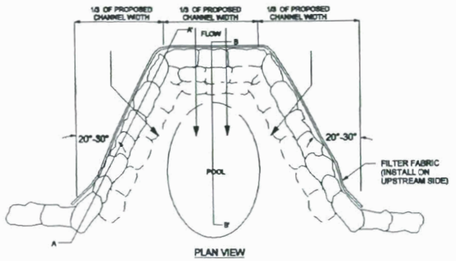
PROJECT ENGINEER

SIGNATURE: ***P.E.***

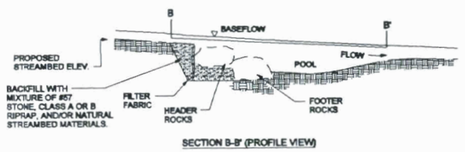
Prepared for:

Ecosystem Enhancement PROGRAM

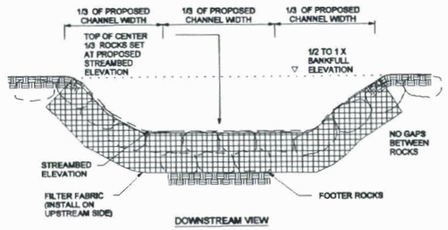
MELONIE ALLEN
NCEEP CONTACT



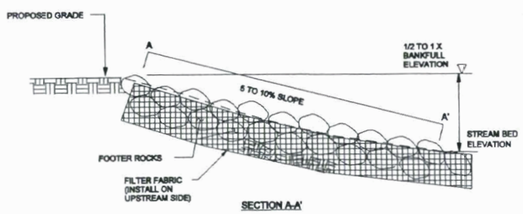
PLAN VIEW



SECTION B-B' (PROFILE VIEW)



DOWNSTREAM VIEW

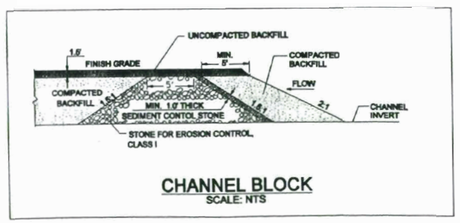


SECTION A-A'

ROCK CROSS VANE

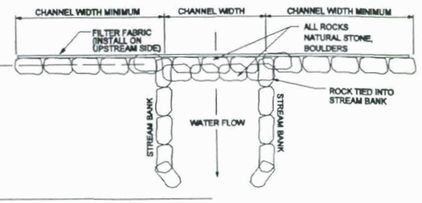
SCALE: NTS

NOTE: ALL ROCKS OR STONES IN THE VANE STRUCTURE ARE STONE, BOULDERS



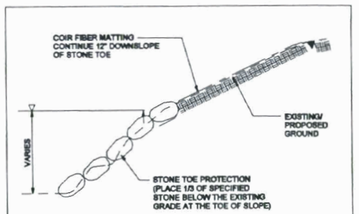
CHANNEL BLOCK

SCALE: NTS



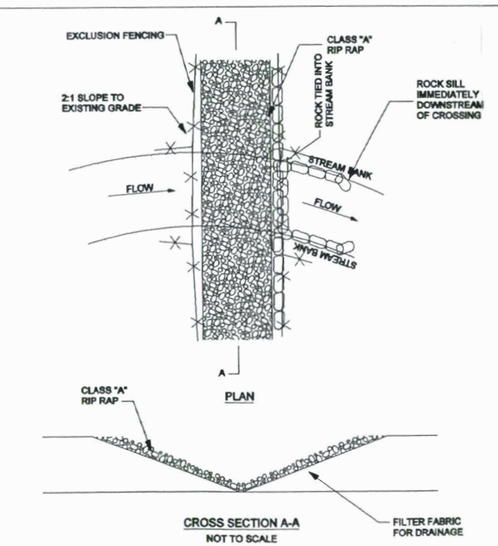
ROCK SILL GRADE CONTROL

SCALE: NTS



STONE TOE STABILIZATION

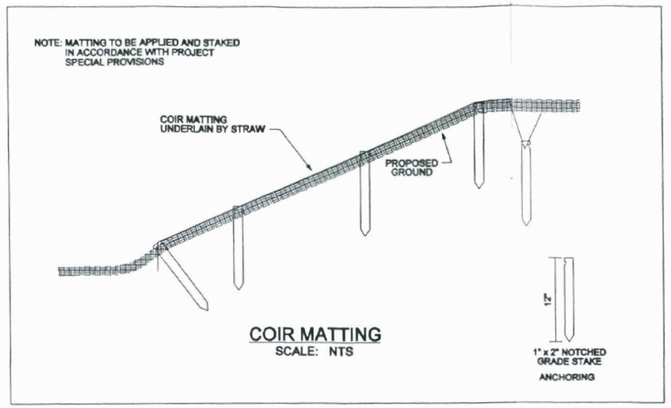
SCALE: NTS



1. A STABILIZED PAD OF CLASS "A" RIP RAP, 18 INCHES THICK, LINED WITH FILTER FABRIC SHALL BE LOCATED WHERE FARM EQUIPMENT AND LIVESTOCK WILL BE CROSSING THE RESTORED STREAM CHANNEL.
2. EXCLUSION FENCING SHALL BE INSTALLED ON ALL APPROACHES TO AND ADJACENT TO THE CROSSING.
3. DIMENSIONS OF THE CROSSING SHALL BE SUFFICIENT TO ACCOMODATE THE LANDOWNERS LARGEST VEHICLE CROSSING THE RESTORED STREAM CHANNEL.
4. THE ENGINEER SHALL DETERMINE AN APPROPRIATE RAMP ANGLE FOR THE STREAM CROSSING ACCORDING TO THE CHANNEL MORPHOLOGY.
5. THE LOCATION OF CROSSINGS ARE DEPICTED IN THE PLANS.

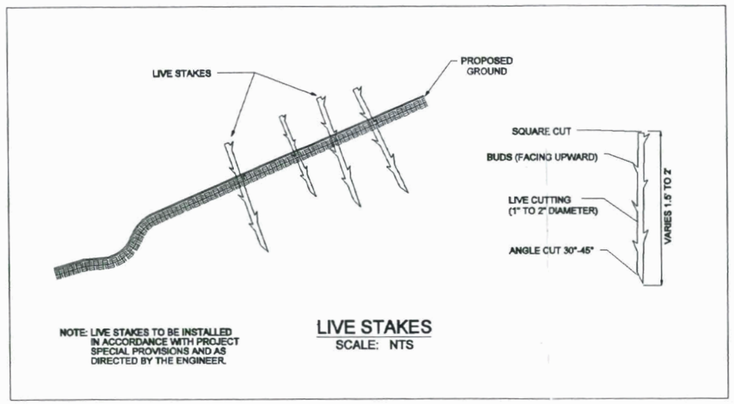
HEAVY DUTY ROCK FORD

PLACE AS SPECIFIED IN THE PLANS AND APPROVED BY THE ENGINEER



COIR MATTING

SCALE: NTS



NOTE: LIVE STAKES TO BE INSTALLED IN ACCORDANCE WITH PROJECT SPECIAL PROVISIONS AND AS DIRECTED BY THE ENGINEER.

LIVE STAKES

SCALE: NTS

REVISIONS

STNL	DESCRIPTION	DATE	APPROVED

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

BRILES PROPERTY - UT TO JACKSON CREEK
STREAM RESTORATION PROJECT
TRINITY, RANDOLPH COUNTY, NORTH CAROLINA
STATION 10+00 TO STATION 28+08 & 50+00 TO 58+20

DATE: DECEMBER, 2005
SCALE: NTS

DETAILS: STABILIZATION

SHEET 2 OF 9

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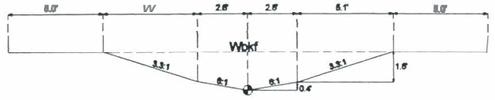
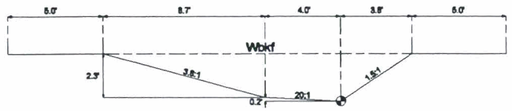
UNNAMED TRIBUTARY TO JACKSON CREEK REACH 1 (UTJCI)
TYPICAL CROSS-SECTIONS - "C4" TYPE
STATION 10+00 TO 24+46
RIFFLE & POOL



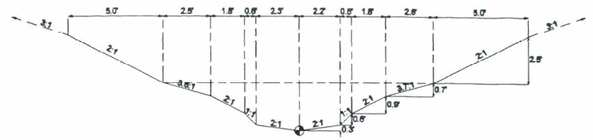
TYPICAL RIFFLE



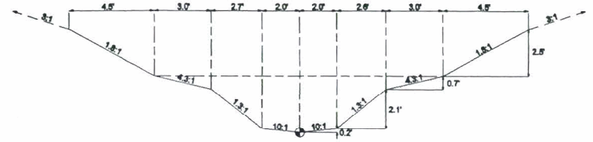
TYPICAL POOL

- THALWEG LOCATION

UNNAMED TRIBUTARY TO JACKSON CREEK REACH 1 (UTJC1)
TYPICAL CROSS-SECTIONS - "B4c" TYPE
STATION 24+46 TO 28+08
RIFFLE & POOL



TYPICAL RIFFLE

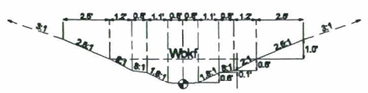


TYPICAL POOL

- THALWEG LOCATION

UNNAMED TRIBUTARY TO JACKSON CREEK REACH 2 (UTJC2)
TYPICAL CROSS-SECTIONS
RIFFLE & POOL

TYPICAL RIFFLE



TYPICAL POOL

- THALWEG LOCATION

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

Ecosystem Enhancement Program

KC ASSOCIATES OF NORTH CAROLINA
ENGINEERS • PLANNERS • SURVEYORS
460 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

EQUES PROPERTY - UT TO JACKSON CREEK
STREAM RESTORATION PROJECT
TRINITY, RANDOLPH COUNTY, NORTH CAROLINA
STATION 10+00 TO STATION 28+08 & 50+00 TO 58+20

DATE: DECEMBER, 2005
SCALE: 1" = 40'

DETAILS:
TYPICAL XS

SHEET 2A OF 9

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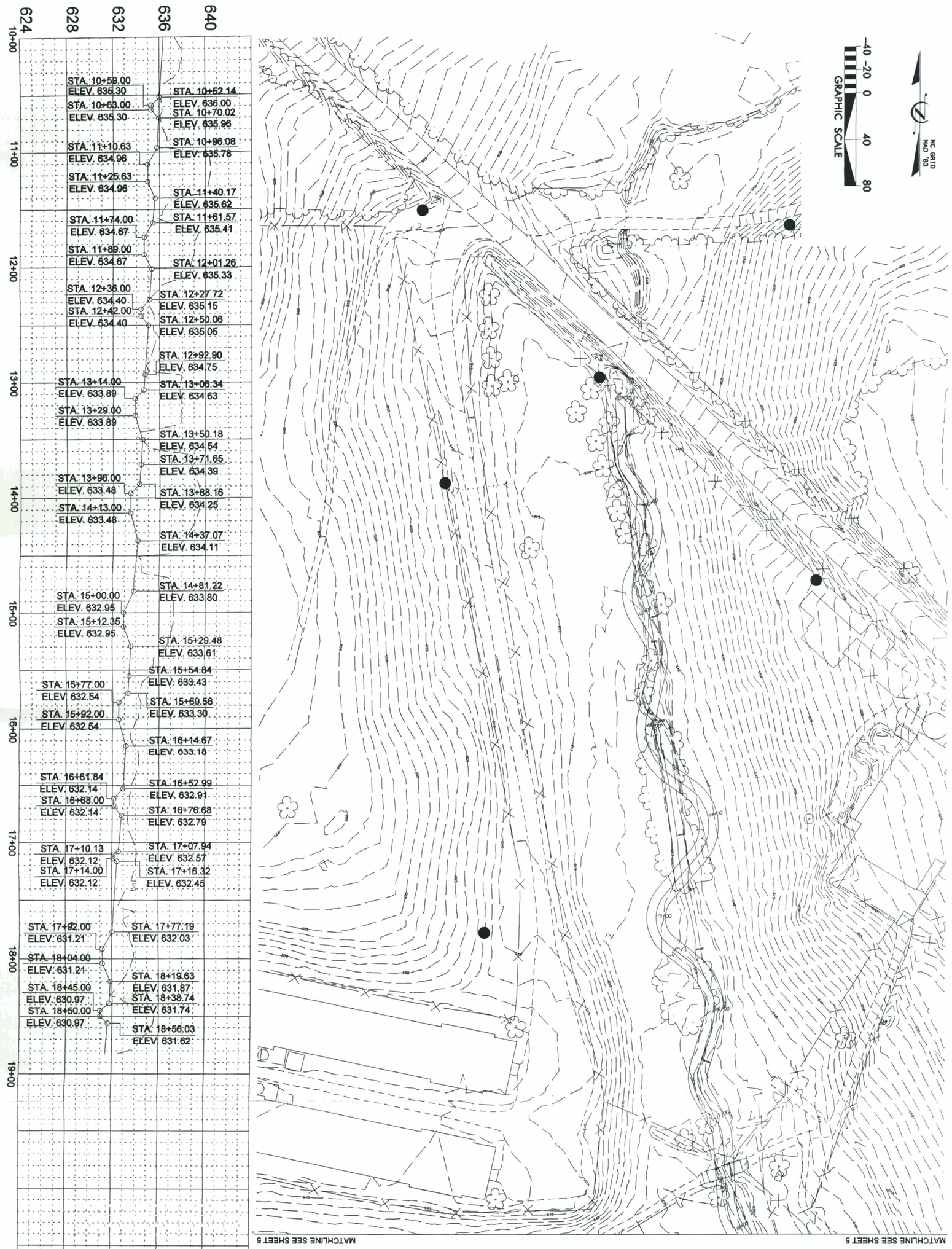

SHEET 4 OF 9

PLAN AND PROFILE

DATE: DECEMBER
SCALE: 1" = 40'

BRILES PROPERTY - UT TO JACKSON CREEK STREAM RESTORATION PROJECT

TRINITY, RANDOLPH COUNTY, NORTH CAROLINA

STATION 10+00 TO STATION 28+08 & 50+00 TO 58+20

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

Ecosystem Enhancement Program

SYM.	DESCRIPTION	DATE	APPROVED

REVISIONS

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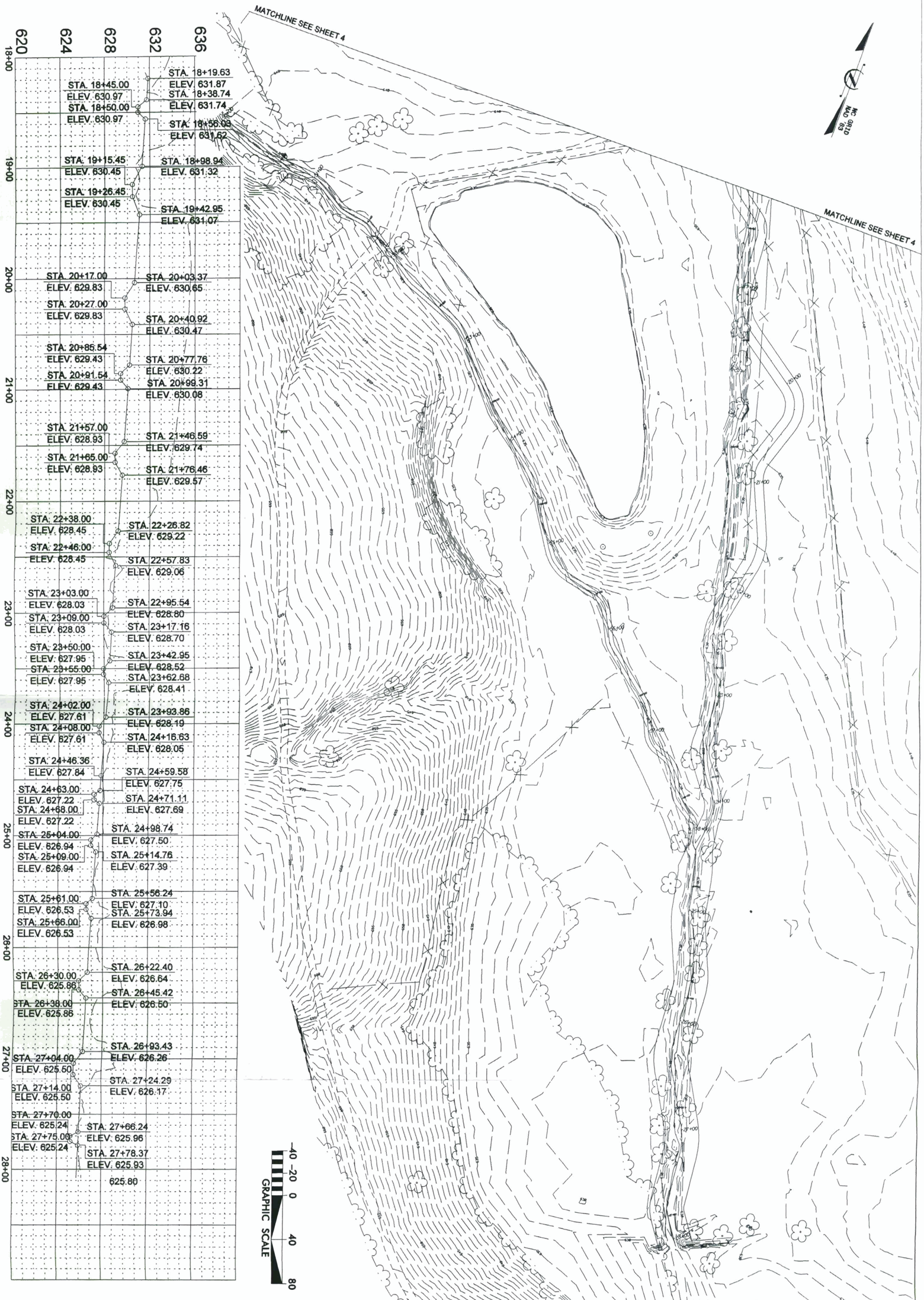

PLAN AND PROFILE

SHEET 5 OF 9

DATE: DECEMBER, 2005

SCALE: 1"=40'

BRILES PROPERTY - UT TO JACKSON CREEK STREAM RESTORATION PROJECT

TRINITY, RANDOLPH COUNTY, NORTH CAROLINA

STATION 10+00 TO STATION 28+08 & 50+00 TO 58+20

KCI ASSOCIATES OF NC

ENGINEERS • PLANNERS • SCIENTISTS

4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

Ecosystem Enhancement Program

SYM.	DESCRIPTION	DATE	APPROVED

REVISIONS

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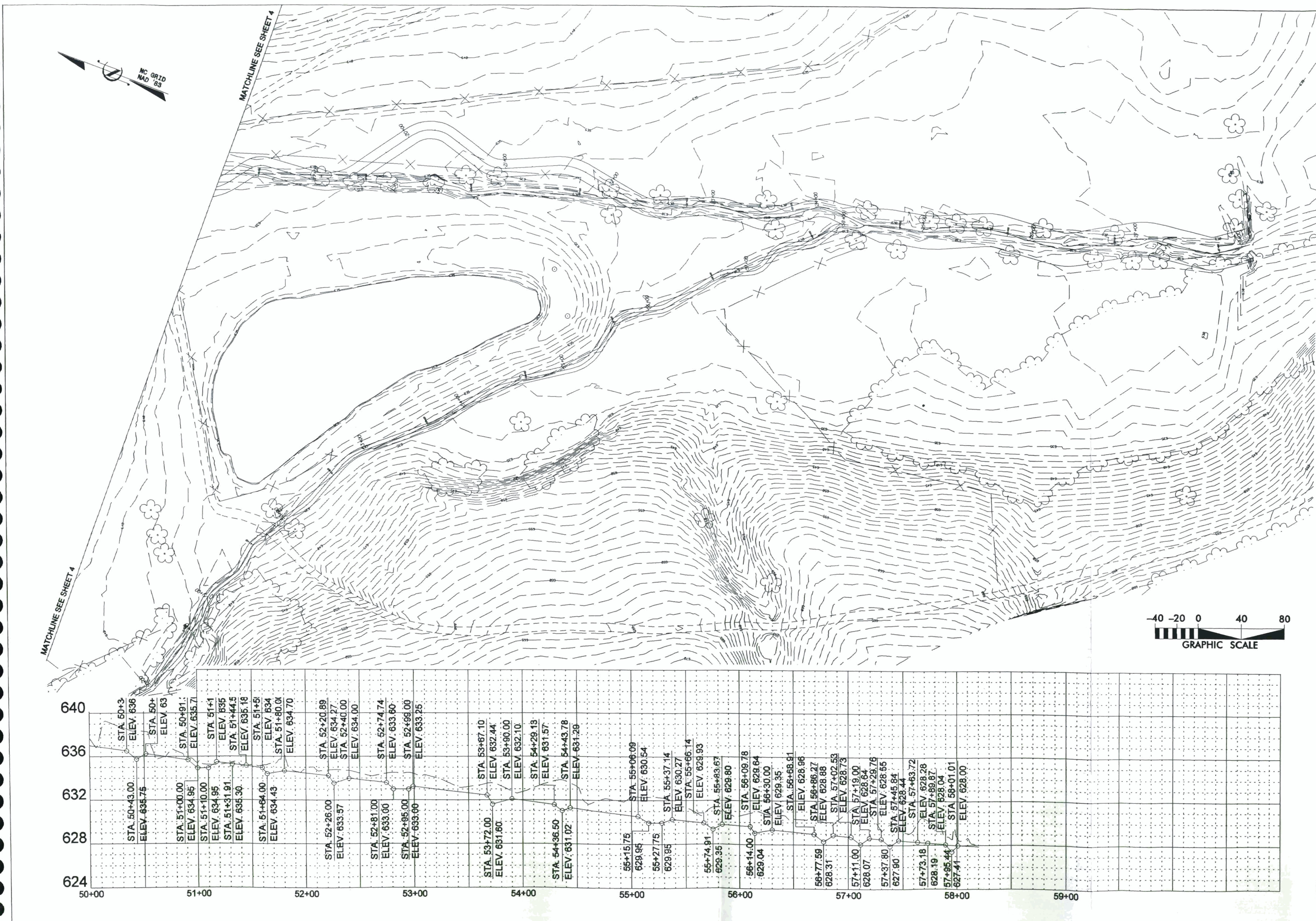

REVISIONS

Ecosystem Enhancement PROGRAM

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

BRILES PROPERTY - UT TO JACKSON CREEK STREAM RESTORATION PROJECT

TRINITY, RANDOLPH COUNTY, NORTH CAROLINA

STATION 10+00 TO STATION 28+08 & 50+00 TO 58+20

DATE: DECEMBER, 2005
SCALE: 1" = 40'

PLAN AND PROFILE

SHEET 5A OF 9

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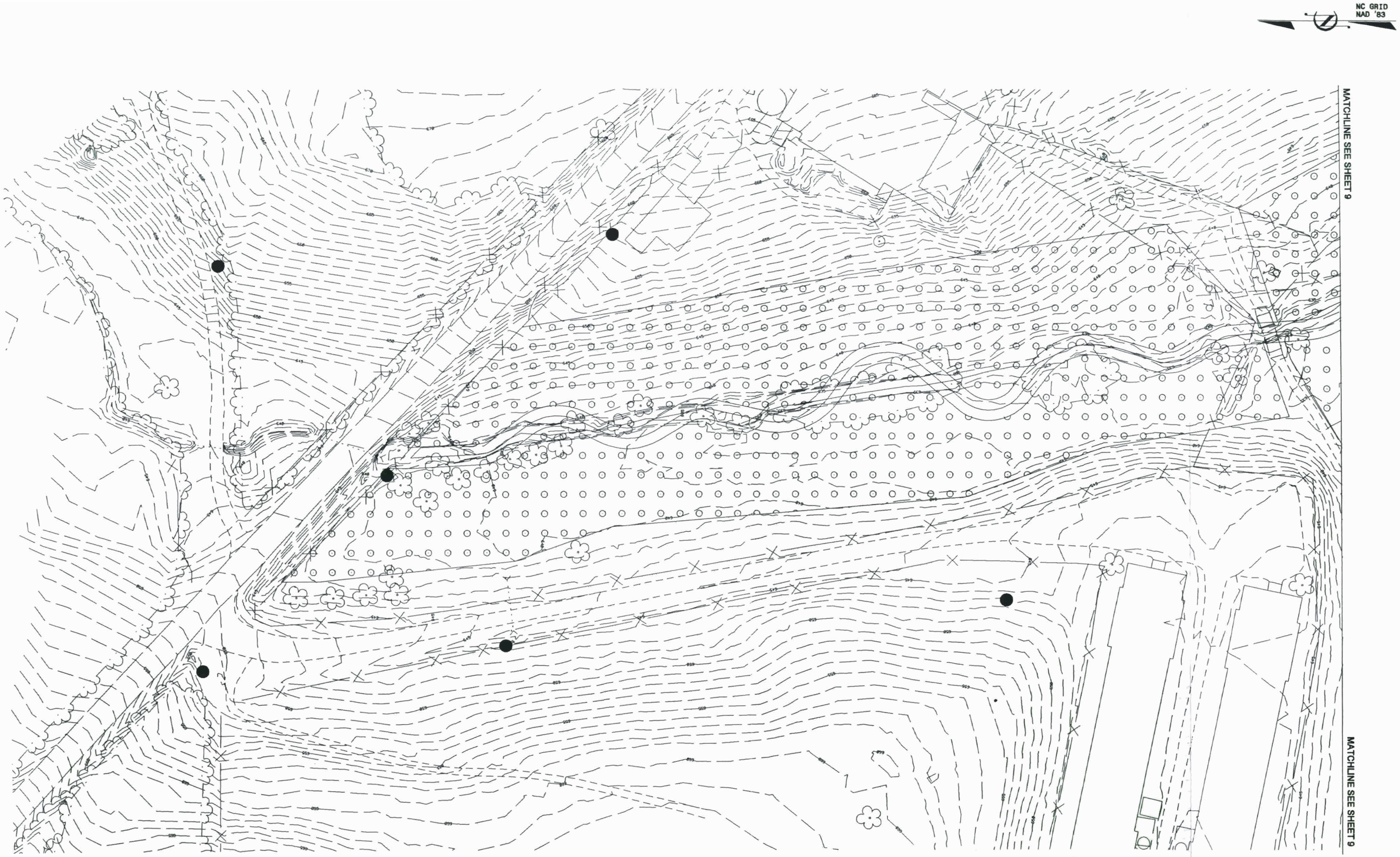
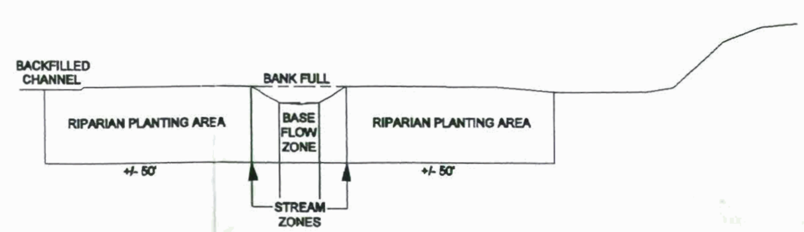


RIPARIAN BUFFER - HARDWOOD PLANTING ZONE -



TYPICAL PLANTING ZONES
NOT TO SCALE

-40 -20 0 40 80
GRAPHIC SCALE

REVISIONS

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

BRILES PROPERTY - UT TO JACKSON CREEK
STREAM RESTORATION PROJECT
TRINITY, RANDOLPH COUNTY, NORTH CAROLINA
STATION 10+00 TO STATION 28+08 & 50+00 TO 58+20

DATE: DECEMBER, 2005
SCALE: 1" = 40'

PLANTING PLAN

SHEET 8 OF 9

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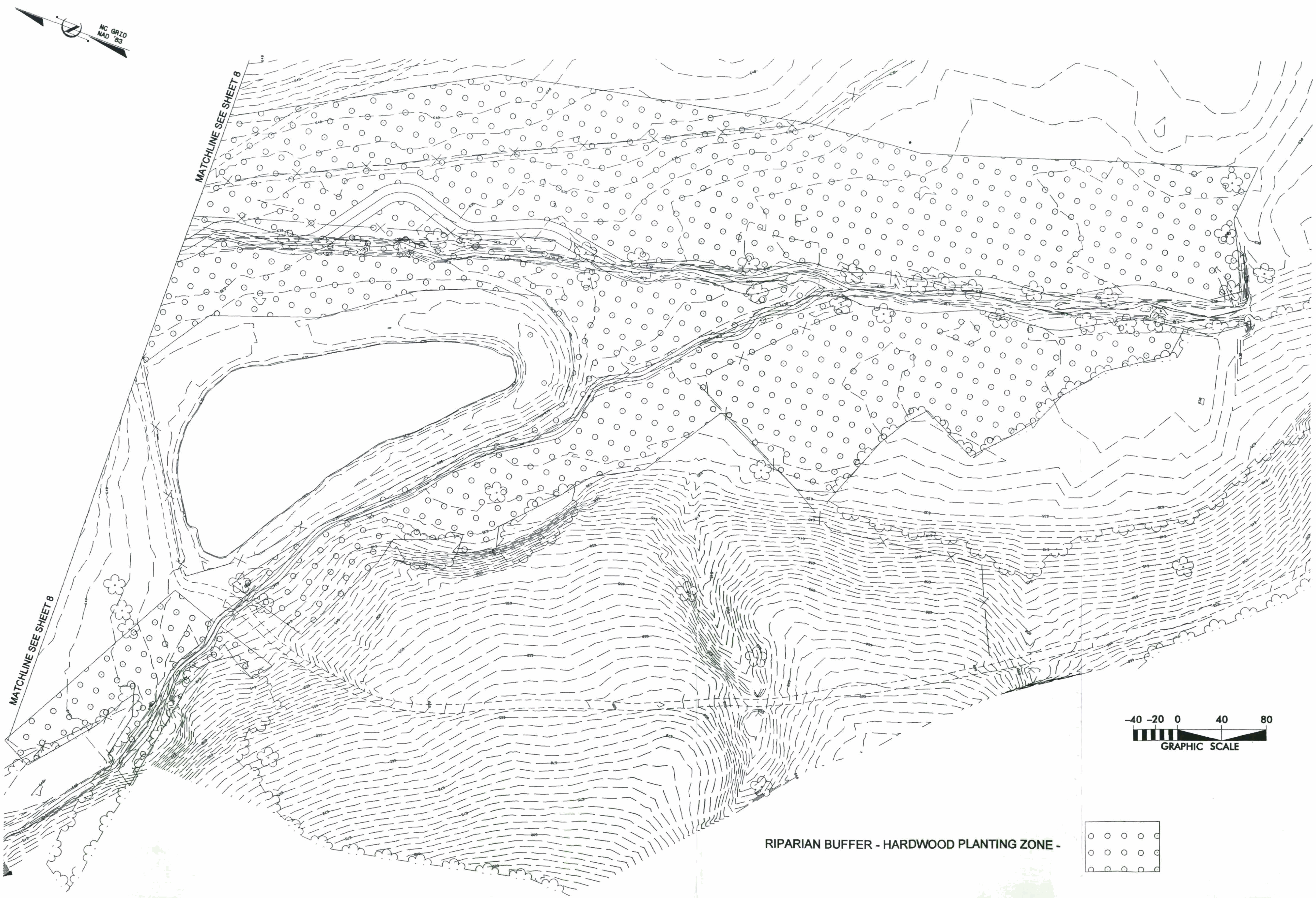

REVISIONS

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

BRILES PROPERTY - UT TO JACKSON CREEK STREAM RESTORATION PROJECT

TRINITY, RANDOLPH COUNTY, NORTH CAROLINA

STATION 10+00 TO STATION 28+08 & 50+00 TO 58+20

DATE: DECEMBER, 2005
SCALE: 1" = 40'

PLANTING PLAN

SHEET 9 OF 9

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7.0 SEDIMENT TRANSPORT ANALYSIS

A stable channel is able to move the sediment supplied by its watershed without aggrading or degrading. This ability is evaluated through two parameters: competency and capacity. Competency is the channel's ability to move particles of a certain size, expressed as units of Pascals (Pa) or lbs/ft^2. Capacity is the channel's ability to move a specific volume of sediment (sediment discharge). Sediment discharge is the amount of sediment moving through a cross section over a specified period of time, expressed in dimensionless parameters or as mass or weight units of kg/sec or lbs/sec.

7.1 Competency

Whenever there is any stream flow, there will always be sediment movement. However, there is a threshold level of bedload sediment movement that will result in a noticeable change in the channel bed. The flow associated with this threshold movement is the reference condition that all sediment transport models are based upon. In natural streambeds there are particles of a wide range of sizes. At low, but significant flow levels, only the smallest particles will be moving, with the larger particles resisting the flow of the stream. This is the condition of partial sediment transport. As the stream flow increases, eventually every particle on the streambed will show threshold movement, this is the condition of full sediment transport.

Some streams will routinely reach full sediment transport, such as sand streams, and models such as Ackers & White (1973) are used for these conditions. Some streams will rarely move even the median size particle on the bed (D_{50}), such as cobble-boulder streams, and models such as Andrews (1983, 1994) are used for these conditions. There is a wide range of sand-gravel-cobble streams that have the flow conditions necessary to significantly move particles greater than the D_{50}, but do not reach the full sediment transport condition. This condition is present at the stream channel on the Briles Site, and the model used was Wilcock-Crowe (2003). The Wilcock-Crowe model is actually a "sediment capacity" model; however, a capacity model contains an entrainment predictor.

Entrainment is the condition that initiates the movement of a selected particle size in the presence of a mix grade channel bed. If the largest particle that moves during a bankfull event can be identified, then the flow conditions that produced this movement can be determined and this flow condition (the channel competency) is used in the design of the restored stream channel. The preferred method of determining this particle size and flow condition is by direct measurement. Direct measurement at bankfull flow with both a flow meter and a sediment sampler is both difficult and extremely unlikely in remote locations. On the other hand, a rain gage and stream gages can be installed to measure the stream channel's response to rain events and, in the channel bed, scour chains installed to measure the depth of scour during these events. The bed material above the scour chain can be collected and sieved to determine the material sizes in transport for a known recorded flow event.

The indirect scour chain method was attempted at the Briles Site. In addition, the channel was sampled by the pebble count method at several sites for trend analysis and at one scour chain site (#2), the surface and subsurface sediment samples were sieved to compare to the scour chain data. It was determined during this analysis that the UTJC streambed has been compacted and after several months of observations (and two large discharge events), the scour chains never recorded a sediment transport event. One other bar location was sampled with the intent of conducting detailed analysis of the sediment data to determine if a design shear stress could be calculated from the Wilcock-Crowe (2003) models.

There are two ways to model streams; first to consider only the largest particle observed in motion (Andrews, 1983) and second to consider all of the bed material observed to be in motion (Andrews, 1994). If the stream channel has a bed of sediment in balance with its flow, then there should be a natural armour layer on the surface, with the subsurface an indication on the annual bedload. An attempt to find a sediment transport

balance between the entire surface and subsurface samples was not effective. The surface and subsurface had been effectively mixed. Next, there was an attempt to determine if the subsurface could predict the surface D_{50}. The results were also inconclusive due to the disturbed nature of the bed materials.

In balanced streams, a point bar sample at the "1/3, 1/3" location can be an indicator of annual sediment transport. The bar samples compared well with the subsurface sampling and modeling. This model produced an average shear stress condition that would be used in stream design to move the largest particles expected to be in the sediment transport over the expected gradation of the stream channel.

This shear stress was used for the design riffle cross-sections and channel gradient using the equation:

$$\tau = \gamma R s$$

Where: τ = shear stress (lbs/ft^2)
γ = specific gravity of water (62.4 lbs/ft^3)
R = hydraulic radius (ft)
s = average water slope (ft/ft)

The target shear stress value (converted to a shear-velocity) for the design cross-sections was u* = 0.05 m/s. Sediment transport and hydrograph data are provided in Appendix F.

7.2 Capacity

A sediment transport capacity analysis was not conducted on the Briles Site, where UTJC1 functions as a transport reach. Transport reaches are supply limited and will flush their beds at the end of storms. An effective sediment transport model cannot be based on the flushed channel bed because it will not predict the movement of the fine materials that make up the bulk of the bedload transport.

8.0 FLOODING ANALYSIS

The Unnamed Tributaries to Jackson Creek (UTJCI & UTJC2) in Randolph County are not located in a Federal Emergency Management Agency (FEMA) Detailed Flood Study Zone. It is the intent of the restoration design to maintain the 100-year flood elevation at or below the current stages following restoration.

9.0 MONITORING AND EVALUATION

Monitoring shall consist of the collection and analysis of stream stability and riparian/stream bank vegetation survivability data to support the evaluation of the project in meeting established restoration objectives. Specifically, project success will be assessed utilizing measurements of stream dimension, pattern, and profile, site photographs, and vegetation sampling. The monitoring report will be submitted to the EEP according to the description in Content, Format and Data Requirements for EEP Monitoring Reports, Version 1.1 – (9116/05).

9.1 Duration

The first scheduled monitoring will be conducted at the end of the first full growing season following project completion. Monitoring shall subsequently be conducted annually for a total period of five (5) years.

9.2 Reporting

Monitoring reports will be prepared and submitted after all monitoring tasks for each monitoring event are completed. Each report will provide the new monitoring data and compare the new data against previous findings. Data tables, cross sections, profiles, photographs and other graphics will be included in the report as necessary. Each report will include a discussion of any significant deviations from the as-built survey and previous annual measurements, as well as evaluations as to whether the changes indicate a stabilizing or de-stabilizing condition.

9.3 Stream Stability

The purpose of monitoring is to evaluate the stability of the restored stream. Following the procedures established in the USDA Forest Service Manual, ***Stream Channel Reference Sites*** (Harrelson, et.al, 1994) and the methodologies utilized in the Rosgen stream assessment and classification system (Rosgen, 1994 and 1996), data collected will consist of detailed dimension and pattern measurements, a longitudinal profile, and bed materials sampling. Width/depth ratio, entrenchment ratio, low bank height ratio, sinuosity, meander width ratio, radius of curvature (on newly constructed meanders during 1st year monitoring only), pool-to-pool spacing as well as the average, riffle and pool water slopes will be calculated from the collected data. Pebble count data will be plotted by size distribution in order to assess the D50 and D84 size class.

9.3.1 Dimension

Six permanent cross-sections on UTJC1 and four permanent cross sections on UTJC2 will be established and used to evaluate stream dimension. Half of the cross-sections for each reach will be riffles and the other half will be pools. Permanent monuments will be established by either conventional survey or GPS. The cross-section surveys shall provide a detailed measurement of the stream and banks, to include points on the adjacent floodplain, at the top of bank, bankfull, at all breaks in slope, and thalweg. Subsequently, width/depth ratios, entrenchment ratios and bank height ratios will be calculated for each cross-section.

Cross-section measurements should show little change from the as-built cross-sections. If changes do occur, they will be evaluated to determine whether they are minor adjustments associated with settling and increased stability or whether they indicate movement toward an unstable condition.

9.3.2 Pattern

Measurements associated with the restored channel pattern will include belt width, meander length, and radius of curvature.

9.3.3 Profile

A longitudinal profile of the entire restored channel will be surveyed. Measurements will include slopes (average, pool, riffle), as well as calculations of pool-to-pool spacing. Annual measurements should indicate stable bedform features with little change from the as-built survey. The pools should maintain their depth with lower water surface slopes, while the riffles should remain shallower and steeper.

9.3.4 Bed Materials

Pebble counts will be conducted at each rifle cross-section, as well as across the overall study reach (based upon percentage of riffles and pools) for the purpose of classification and to evaluate sediment transport.

9.4 Photograph Reference Points

Photograph reference points (PRP) will be established to assist in characterizing the site and to allow qualitative evaluation of the site conditions. The location of each photo point will be permanently marked in the field and the bearing/orientation documented to allow for repeated use.

9.4.1 Cross-section Photograph Reference Points

A photograph will be taken at each permanent cross section. The survey tape will be centered in each photograph and the water line will be located near the lower edge. Effort will be made to consistently show the same area in annual photographs.

9.4.2 Longitudinal Photograph Reference Points

Ten (10) permanent points will be established longitudinally throughout the project site to allow further photo-documentation of the restored stream channel condition.

9.4.3 Additional Photograph Locations

Additional PRPs will be located, as needed, to document the condition of specific in-stream structures such as cross vanes, as well as infrastructure associated with the stream such as utility and road crossings.

9.5 Bank and Riparian Vegetation Monitoring

The success of the bank and riparian buffer plantings will be evaluated using 16 (5% of total buffer area) ten by ten meter (10m x 10m) vegetative sampling plots. The corners of each monitoring plot will be permanently marked in the field. The monitoring will consist of a physical inventory within each plot and a subsequent statistical analysis in order to determine the following: composition and number of surviving species, and total number of stems per acre. Additionally, a photograph will be taken of each plot that will be replicated each monitoring year. Riparian vegetation must meet a minimum survival success rate of 320 stems/acre after five years. If monitoring indicates that the specified survival rate is not being met, appropriate corrective actions will be developed, to include invasive species control, the removal of dead/dying plants and replanting.

REFERENCES

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Harrelson, C.C., C.L. Rawlins, and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. General Technical Report RM-245. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

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NCDENR. "Water Quality Stream Classification for Streams in North Carolina." Water Quality Section (http://h2o.enr.state.nc.us/bims/reports/basinsandwaterbodies). September 2002.

NCGS. 1985. Geologic Map of North Carolina

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

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

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Rosgen, D.L. 1998. The Reference Reach – a Blueprint for Natural Channel Design. Proceedings of the Wetland Engineering and River Restoration Conference, Denver, CO, ASCE.

Rosgen, D.L. 2001. "Natural Channel Design Methodology (40 Steps)." Natural Channel Design and River Restoration Short Course, Pagosa Springs, CO – October 2001.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina, 3rd Approximation. North Carolina Natural Heritage Program, NCDEHNR, Division of Parks and Recreation. Raleigh, NC.

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

USDA. 1971. Soil Survey for Randolph County, North Carolina. Natural Resource Conservation Service.

Wilcock, P.R. and Crowe, J.C. (2003). "Surface-Based Transport Model for Mixed-Size Sediment", *Journal of Hydraulic Engineering,* ASCE, 129(2), pp 120-128.

Appendix A

Historic Aerial Photographs

Briles Site Restoration Plan - 1937 Aerial Photograph

Site location highlighted in red.

A

N

Not to Scale

Ecosystem Enhancement PROGRAM

Ecosystem Enhancement PROGRAM

Briles Site Restoration Plan- 1957 Aerial Photograph

Site location highlighted in red.

N

Not to Scale

Ecosystem Enhancement PROGRAM

Briles Site Restoration Plan- 1966 Aerial Photograph

Site location highlighted in red.

N

Not to Scale

Appendix B

Cultural Resources Review

Review Form
Potential Restoration Sites

1. Applicant Information:

Preparer/Company April Helms/KCI Associates

Address: 4601 Six Forks Rd, Ste 220, NC 27609

Phone/Fax/E-mail: 783-9214/783-9266
ahelms@kci.com

For North Carolina HPO Use Only

II. Site Information: (Attach copy of USGS map or photocopy of quad on reverse; include 1 and 2 mile radius around site)

Wetland Restoration (Stream Restoration) Applicant's Identification # Briles Site 1202040DMP

Other: _____

Address: 1782 Rosswood Road, Trinity, 27370

County: Randolph Quad Name: Denton

III. Identification of Historic Properties:

List sites by site number and Status: NR = National Register listed; SL = Study List; DOE = Determination of Eligibility; LID = Local Designation; UA = Unassessed

Archeology

# of recorded sites in immediate area of site: Ø

Architecture

# of recorded sites within 1 mile radius: Ø

IV. Additional Information or investigation needed:

No Survey

No Testing of sites _____

__Photo Reconnaissance

__Balloon Test

Recommended by or on: Jesse 3/9/05
(Office of State Archaeology)

Recommended by or on:
(Sunny & Planning Branch)

V. Recommendations/Final Determination:

__Recommendations for additional work am shown above.

✓ The proposed restoration site will not affect historic properties in the area of potential effect.

Renee Gledhill-Earley

Renee Gledhill-Earley, Environmental Review Coordinator

3/10/05 Date

December 2001

Appendix Ba

Wetland Data Sheets

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Briles Site – UT to Jackson Creek Applicant / Owner: KCI Associates of NC. P.A. Investigator: Gary Mryncza	Date: 5/112003 **County:** Randolph State: NC
Do normal circumstances exist on the site? **Yes**____ **No** X Is the site significantly disturbed (Atypical situation)? **Yes** X No____ Is the area a potential problem area? **Yes**____ **No** X (explain on reverse if needed)	Community ID:____ Transect ID:____ Plot ID: Boring #1

VEGETATION

Dominant Plant Swcles	Stratum	Indicator	Dominant Plant Species	Stratum	indicator
1. *Carex lurida*	3	OBL	9.		
2. *Sanitaria latifolia*	3	OBL	10.		
3. *Juncus effusus*	3	FACW+	11.		
4. *Alnus serrulata*	2	FACW+	12.		
5. *Salix sericea*	2	OBL	13.		
6. *Typha latifolia*	3	OBL	14.		
7. *Rosa multiflora*	2	UPL	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 83%

Remarks:

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

_X_ No Recorded Data Available

Field Observations:

Depth of Surface Water: < 1 (in.)

Depth to Free Water in Pit: ____ (in.)

Depth to Saturated Soil: ____ (in.)

Wetland Hydrology **Indicators**

Primary Indicators:
- ___ Inundated
- _X_ Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators:
- Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks

SOILS

Map Unit Name (Series and Phase): Wehadkee variant **Drainage** Class: Poorly

Taxonomy (Subgroup): Fluvaquentic Endoaquepts **Confirm Mapped Type? Yes** No X

Profile Description:

Depth (Inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0 - 6"	A_1	2.5Y5	10YR 514 f2d		sicl – cl
			10YR 312 c1f		1-2mm - Mn concretions
6-15"	AB	10YR 5/2	2.5Y 514 c2d		sicl – cl
			5YR 414 f1p		Redox features
15-22"	BW_1		10YR 514		sicl – cl
			2.5YR 513		Redox features
			5YR 4/4		
			10YR 3/1		
22-24"	Cg_1	2.5Y 412	5YR 514 f2p		sil-sicl redox features
24 - 32"	Cg_2	5Y 412			sil
32-35"	Cg_3	5Y 4/1			sil
35-36"	Cg_4	5Y 411			sil

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- X Gleyed or Low-Chroma Colors
- X Concretions
- High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- X Listed On Local Hydric Soils List
- X Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes X	No ___	Is the Sampling Point	
Wetland Hydrology Present?	Yes X	No ___	Within a Wetland?	Yes X No ___
Hydric Soils Present?	Yes X	No ___		

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Briles Site – UT to Jackson Creek
Applicant / Owner: KCI Associates of NC. P.A.
Investigator: Gary Mryncza

Date: 5/112003
County: Randolph
State: NC

Do normal circumstances exist on the site? Yes ____ No X
Is the site significantly disturbed (Atypical situation)? Yes X No ____
Is the area a potential problem area? Yes ____ No X
(explain on reverse if needed)

Community ID: ____
Transect ID: ____
Plot ID: Boring #2

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. *Juniperus virginiana*	1	FACU-
2. *Quercus alba*	1	FACU
3. *Juncus effusus*	3	FACW+
4. *Alnus serrulata*	2	FACW+
5. *Rosa multiflora*	2	*UPL*
6.		
7.		
8.		

Dominant Plant Species	Stratum	Indicator
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). *40%*

Remarks:

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

X No Recorded Data Available

Field Observations:

Depth of Surface Water: _____ (in.)

Depth to Free Water in Pit: 21 (in.)

Depth to Saturated Soil: _____ (in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators:
- Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Chewacla variant **Drainage Class:** Moderate – Well

Taxonomy (Subgroup): Fluvaauentic Dystrudepts **Confirm Mapped Type? Y e s No** X

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0 – 4"	A_1	10YR 513	10YR 412 f1f		scl
4 – 6"	A_2	10YR 4/4			scl
6 – 12"	BW	10YR 414			scl
12 – 18"	BW2	10YR 4/4			sl
18 – 21"	BW3	10YR 4/3			scl
21 –25"	BW4	10YR 4/3	10YR 312 c2f		scl
25 – 30"	Bg_1	10YR 512	10YR 413 c2f		cl
			10YR 312 c2f		
30 – 32"	BC	10YR 414	10YR 5/2 c2d		cl
32 – 36"	C	10YR 414	10YR 512 c2d		cl

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors

- Concretions
- High Organic Content in Surface Layer in Sandy Soils
- Organic Streaking in Sandy Soils
- Listed On Local Hydric Soils List
- Listed on National Hydric Soils List
- Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes ___	No X	Is the Sampling Point	
Wetland Hydrology Present?	Yes ___	No X	Within a Wetland?	Yes ___ No X
Hydric Soils Present?	Yes ___	No X		

Remarks:

Appendix C

Site Photographs

Photograph Index for UTJC1

Briles Site

Project Reach
Streams
Pond
Photograph Location and Direction

A

200 0 200 Feet

Source: 1998 Aerial Photographs - Randolph County GIS Department

Ecosystem Enhancement Program

Photograph 1 – Two 36':' RCPs mark the upstream extent of the project reach (Station 10+00, looking upstream).

Photograph 2 – A fence line and wire cross the stream at Station 10+24.

Photograph 3 – View of a low water crossing at Station 10+46. The crossing is used by livestock and to pass farm machinery. This crossing acts as a grade control, preventing bed degradation in this area.

Photograph 4 – Three-inch (3") drain enters the stream from the west bank at Station 10+80.

Photograph 5 – View of four large trees that stabilize the right bank from Station 11+27 to Station 11+47.

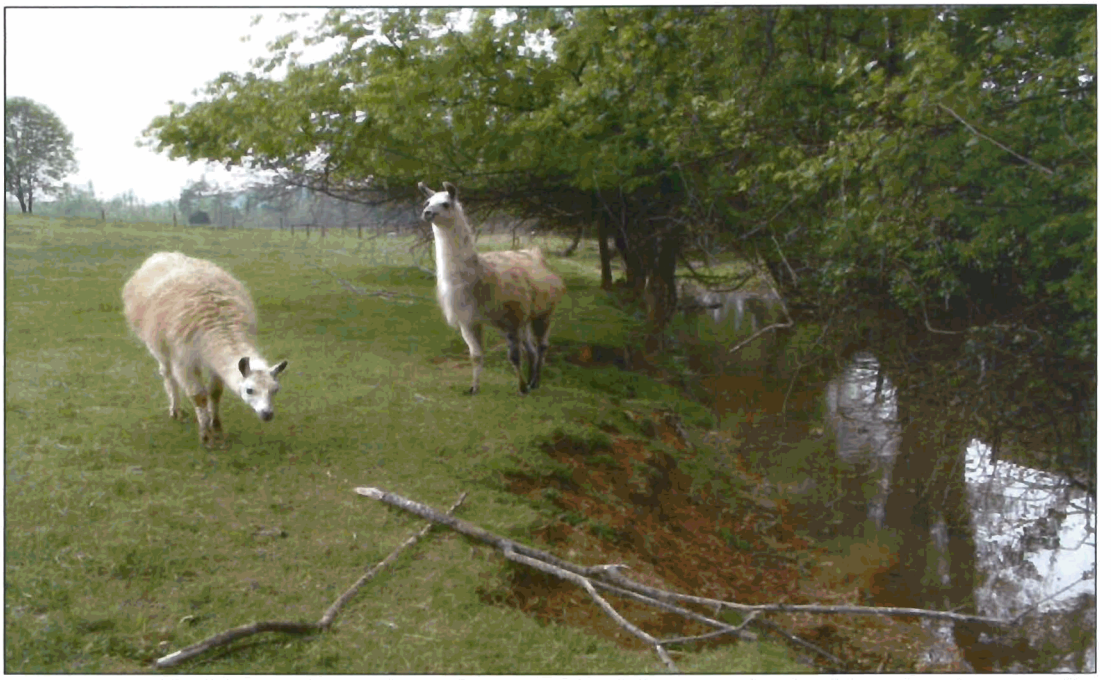
Photograph 6 – Several sections of an imbricated stonewall exist from Stations 11+58 to 11+76, 11+72 to 11+80, and 11+92 to 12+10. Also, note the bedrock outcrop in the foreground.

Photograph 7 – View looking downstream at Cross-section 1 (Station 11+92). Note the **active bank erosion and lack of riparian buffer on both banks.**

Photograph 8 – Short over-widened section near Station 12+60. Note the mid-channel depositional feature with trees. This section has been used as a low water crossing by livestock and farm machinery.

Photograph 9 – Upstream view of a debris jam located at Station 13+05.

Photograph 10 – Downstream view of Cross-section 2 (Station 13+41). Note the eroding banks and absence of riparian buffer.



Photograph 11 –Livestock grazing adjacent to the left stream bank. Note the absence of a riparian buffer in this reach.

Photograph 12 – Downstream view at Station 14+58. Note that the channel dimension changes and the side slopes of the valley become more gentle.

Photograph 13 – View of a meandering pattern for approximately three (3) meander wavelengths from Station 14+58 to Station 16+51. Cross-section 3 at Station 15+96 appears in the center of this photograph.

Photograph 14 – View looking northwest at a potential riparian buffer area adjacent to the east side of UTJC1.

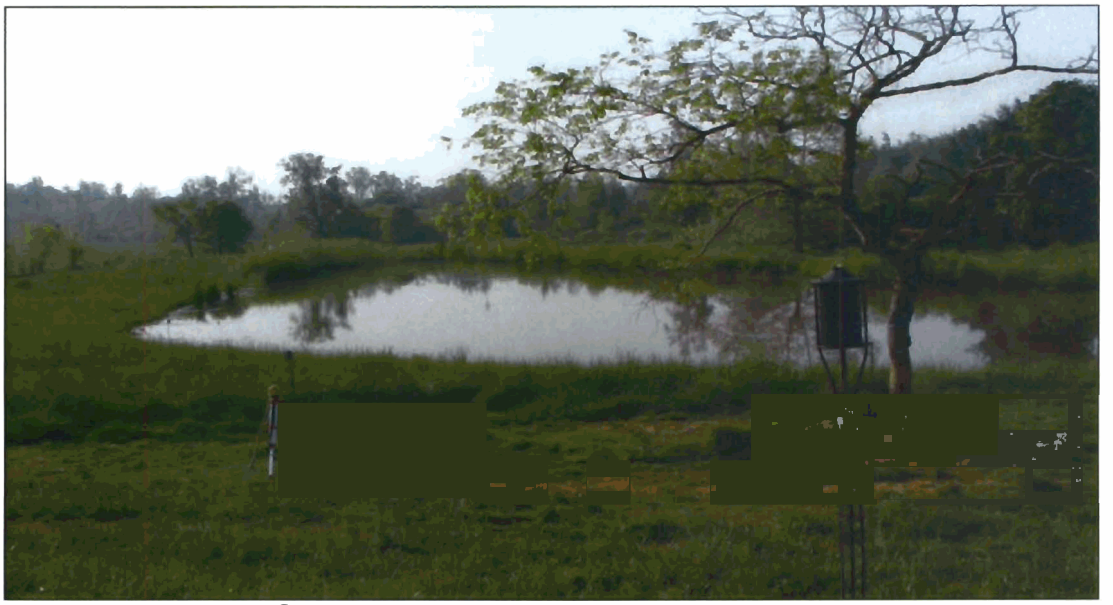
Photograph 15 – View of a fence crossing the stream and a 10'x 3.5' opening under a concrete/steel bridge at Station16+89. Note the debris blockage restricting flow through this reach.

Photograph 16 – Elevated view of Cross-section4 at Station 19+90.

Photograph 17 – View of a gravel lens exposed in the bank in the vicinity of Cross-section 4.

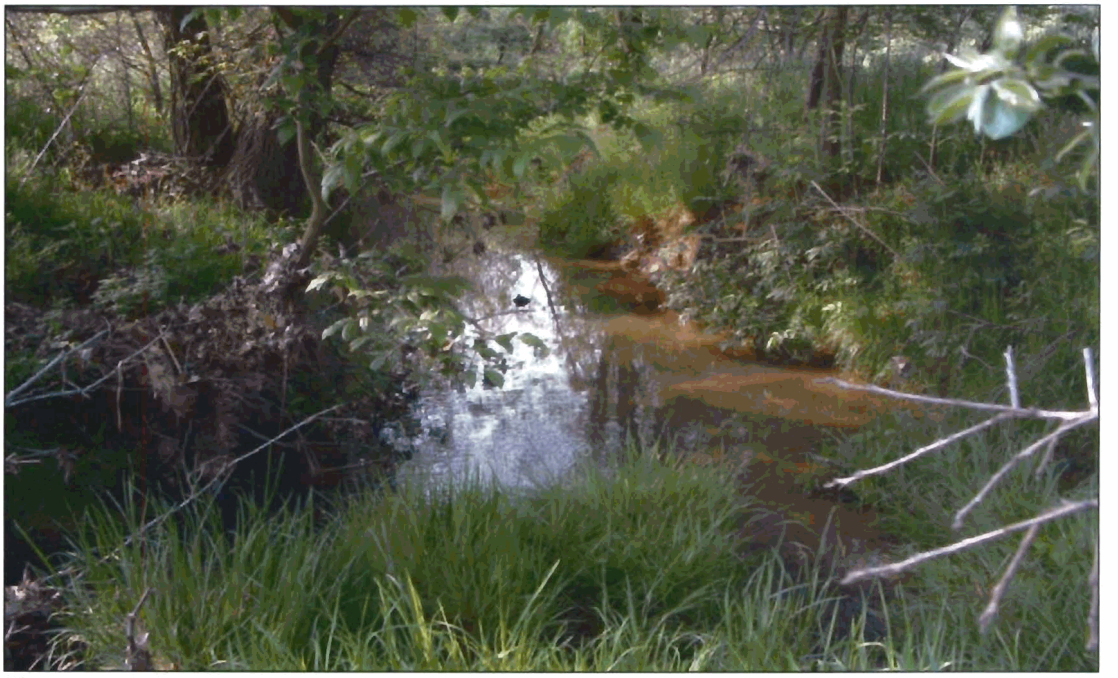
Photograph 18 – Potential restoration/riparian buffer area, adjacent to the east bank of UTJC1 near Station 19+90.

Photograph 19 – A man-made instream rock feature located at Station 21+74.



Photograph 20 – This farm pond (constructed in 1998) is situated between UTJC1 and UTJC2. This photograph was taken looking southeast.

Photograph 21 – View looking to the northwest at the pond elevated between the unnamed tributaries to Jackson Creek. Note the height of the berm along the south side of the pond.



Photograph 22 – Downstream view at the confluence of UTJC2 with UTJC1 (Station 23+72).

Photograph 23 – Multiple debris jams are located at Stations 24+27 and 25+46, in the lower portion of UTJC1.

Photograph 24 – Downstream view of Cross-section 5 located at Station 25+40.

Photograph 25 – View of the remnants of an old stone-walled dam. Bedrock outcrops in the streambed are prevalent both up and downstream of this location. This area is the downstream extent of the Briles Site project reach.

Photograph Index for UTJC2 **Briles Site**

Project Reach
Streams
Pond

Photograph Location and Direction

A

200 0 200 Feet

Ecosystem Enhancement Program

Source: 1998 Aerial Photographs - Randolph County GIS Department

Photograph 1 – This photograph represents the beginning of the project reach on UTJC2 (Station 50+46).

Photograph 2 – View to the southeast through a 25-foot riparian buffer adjacent to the left bank at Station 50+46.

Photograph 3 – Several small debris jams exist in the upper portion of UTJC2. The debris jam in the photo is located at Station 51+00.

Photograph 4 – A lateral bar has formed along the toe of the left bank of UTJC2, at Station 51+75.

Photograph 5 – Potential riparian buffer area adjacent to the east bank of UTJC2.

Photograph 6 – View of the valley side wall adjacent to the right bank of UTJC2. Note the end of the riparian vegetation.

Photograph 7 – Thirty-six inch (36") RCP serves as the primary stream crossing on UTJC2. The structure is located from Station 52+17 to 52+31.

Photograph 8 – View of the same crossing, looking southwest. It is utilized by livestock and for farm machinery.

Photograph 9 – Downstream view from the culvert at Station 52+31. Note the stream flows through a well developed juncus/carex community. Disturbance from livestock access is evident in this photograph.

Photograph 10 – Downstream view of Cross-section 1 at Station 53+55. Note that the left bank is elevated due to spoil from the excavation of the adjacent pond.

Photograph 11 – An extended wet area exists adjacent to the right bank from Station 54+75 to 55+80. Multiple seeps from the valley slope interface with the floodplain to provide surface hydrology to this area.

Photograph 12 – A 12" plastic pipe that serves as the overflow drain from the pond enters the left bank of UTJC2 at Station 54+93.

Photograph 13 – View of the right stream bank located opposite the outlet of the pond ovefflow pipe. Note the evidence of livestock impacts, absence of vegetation, and standing water present.

Photograph 14 – Elevated view of Cross-section 2 at Station 57+33.

Appendix D

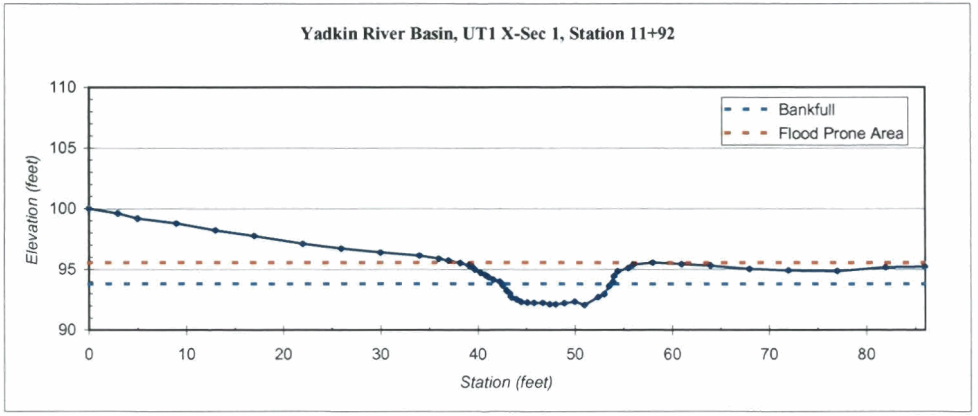
Existing Conditions (Streams)

River Basin:	Yadkin
Watershed:	UT1 X-Sec 1
XS ID	Station 11+92
Drainage Area (sq mi):	0.51
Date:	Verified - July 2004
Field Crew:	G. Mryncza, A. Helms, B. Hayes

Station	Rod Ht.	Elevation
0.0	2.87	100.00
3.0	3.28	99.59
5.0	3.70	99.17
9.0	4.09	98.78
13.0	4.68	98.19
17.0	5.13	97.74
22.0	5.78	97.09
26.0	6.18	96.69
30.0	6.50	96.37
34.0	6.74	96.13
36.0	6.99	95.88
37.0	7.16	95.71
38.2	7.37	95.50
39.1	7.57	95.30
39.5	7.70	95.17
39.7	7.89	94.98
40.3	8.16	94.71
40.8	8.34	94.53
41.1	8.53	94.34
41.6	8.72	94.15
42.3	8.90	93.97
42.6	9.21	93.66
43.0	9.65	93.22
43.3	9.86	93.01
43.4	10.13	92.74
43.5	10.20	92.67
44.0	10.35	92.52
44.5	10.58	92.29
45.1	10.61	92.26
45.8	10.65	92.22
46.7	10.65	92.22
47.4	10.76	92.11
48.0	10.76	92.11
48.9	10.68	92.19
50.0	10.55	92.32
51.0	10.81	92.06
52.4	10.18	92.69
53.0	9.92	92.95
53.5	9.27	93.60
53.9	8.90	93.97
54.0	8.45	94.42
54.4	8.04	94.83
55.5	7.77	95.10
56.0	7.49	95.38
58.0	7.32	95.55
61.0	7.45	95.42
64.0	7.58	95.29
68.0	7.85	95.02
72.0	7.97	94.90
77.0	8.02	94.85
82.0	7.69	95.18
86.0	7.64	95.23

SUMMARY DATA	
Bankfull Elevation:	93.8
Bankfull Cross-Sectional Area:	15.1
Bankfull Width:	11.3
Flood Prone Area Elevation:	95.5
Flood Prone Width:	19.9
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	1.3
W / D Ratio:	8.4
Entrenchment Ratio:	1.8
Bank Height Ratio:	1.9
Slope (ft/ft):	0.006
Discharge (cfs)	54

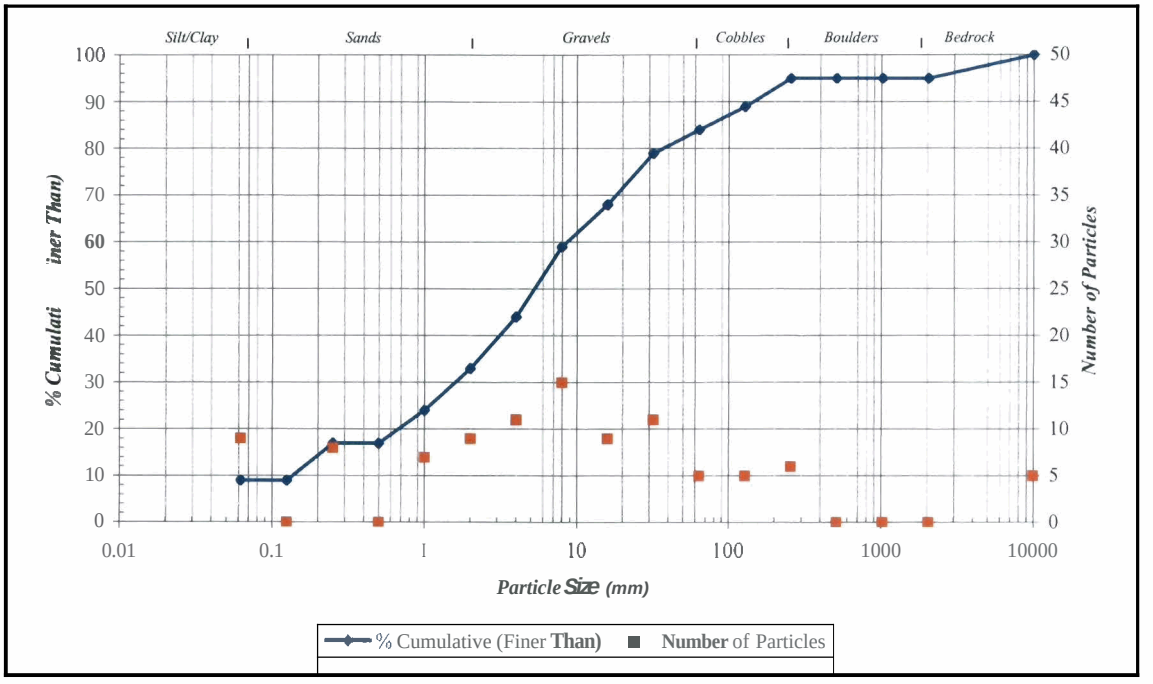
Stream Type:	G4c



Briles Site Restoration Plan
UT1 to Jackson Creek

Stream:	UT1 to Jackson Creek
Location:	UT1 Cross-section#1 (Sta.1+92)
bate:	4/29/2003

Particle		Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	9	9	9
Sand	Very Fine Sand	0.062 < 0.125	0	0	9
	Fine Sand	0.125 < 0.25	8	8	17
	Medium Sand	0.25 < 0.50	0	0	17
	Coarse Sand	0.50 < 1.0	7	7	24
	Very Coarse Sand	1 < 2	9	9	33
Gravel	Very Fine Gravel	2 < 4	11	11	44
	Fine Gravel	4 < 8	15	15	59
	Medium Gravel	8 < 16	9	9	68
	Coarse Gravel	16 < 32	11	11	79
	Very Coarse Gravel	32 < 64	5	5	84
Cbl	Small Cobble	64 < 128	5	5	89
	Large Cobble	128 < 256	6	6	95
Bldr	Small Boulder	256 < 512	0	0	95
	Medium Boulder	512 < 1024	0	0	95
	Large Boulder	1024 < 2048	0	0	95
Bdrk	Bedrock	Bedrock	5	5	100
Totals:			100	100	100



Sue percent less than (mm)				
D16	D35	D50	D84	D95
0.25	1.5	5	15.5	101

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
9	24	51	11	0	5

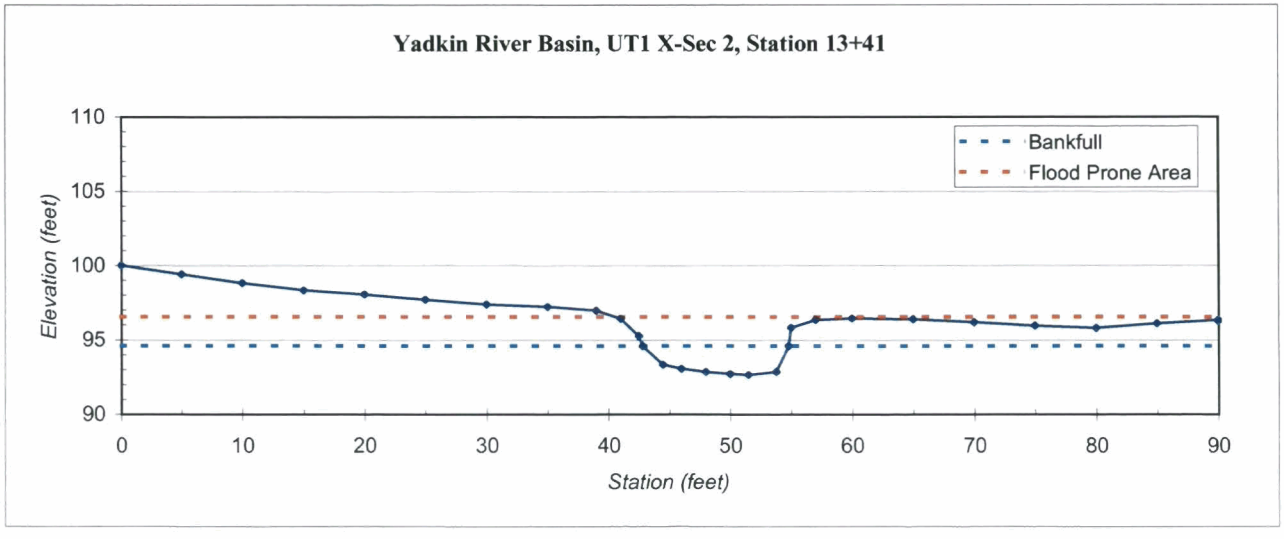
Briles Site Restoration Plan
UT1 to Jackson Creek

River Basin:	Yadkin
Watershed:	UT1 X-Sec 2
XS ID	Station 13+41
Drainage Area (sq mi):	0.51
Date:	Verified - July 2004
Field Crew:	G. Mryncza, A. Helms, B. Hayes

Station	Rod Ht.	Elevation
0.0	5.76	100.00
5.0	6.36	99.40
10.0	6.95	98.81
15.0	7.43	98.33
20.0	7.69	98.07
25.0	8.04	97.72
30.0	8.36	97.40
35.0	8.54	97.22
39.0	8.78	96.98
41.0	9.32	96.44
42.5	10.48	95.28
42.8	11.15	94.61
44.5	12.43	93.33
46.0	12.68	93.08
48.0	12.88	92.88
50.0	13.04	92.72
51.5	13.09	92.67
53.8	12.88	92.88
54.8	11.15	94.61
55.0	9.94	95.82
57.0	9.40	96.36
60.0	9.31	96.45
65.0	9.36	96.40
70.0	9.57	96.19
75.0	9.80	95.96
80.0	9.96	95.80
85.0	9.66	96.10
90.0	9.40	96.36
90.0	9.48	96.28

SUMMARY DATA	
Bankfull Elevation:	94.6
Bankfull Cross-Sectional Area:	18.0
Bankfull Width:	12.0
Flood Prone Area Elevation:	96.6
Flood Prone Width:	56.7
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.5
W / D Ratio:	8.0
Entrenchment Ratio:	4.7
Bank Height Ratio:	1.9
Slope (ft/ft):	0.004
Discharge (cfs)	54

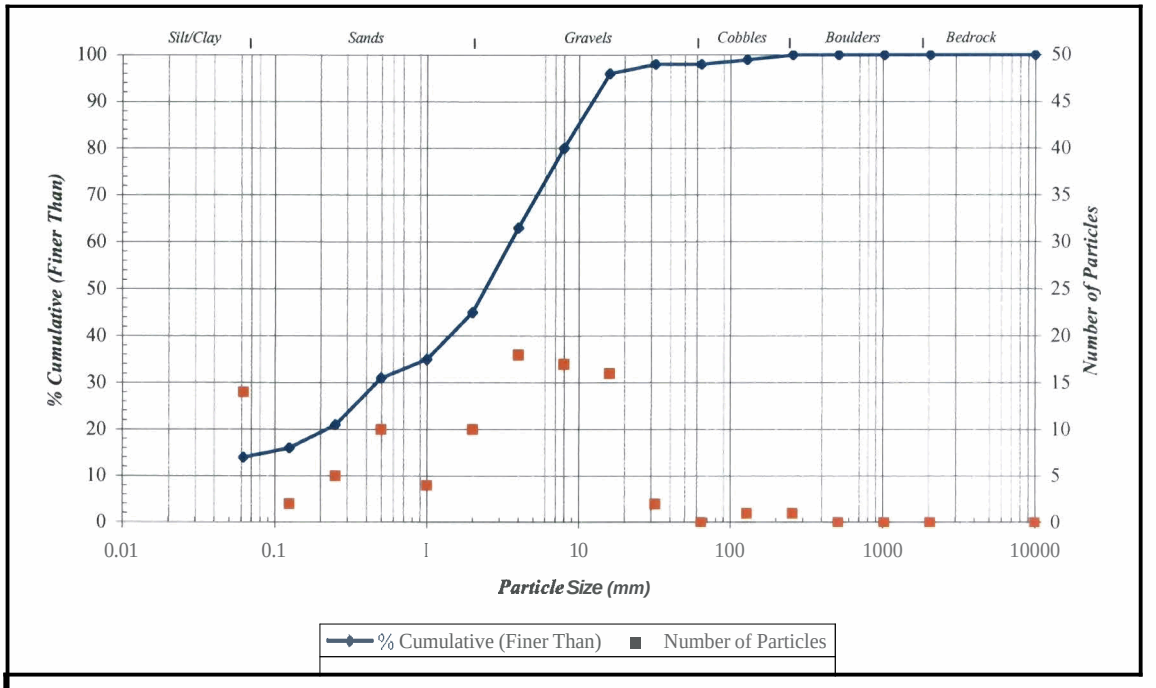
Stream Type:	E4 to G4c



Briles Site Restoration Plan
UT1 to Jackson Creek

Stream:	UT1 to Jackson Creek
Location:	UT1 Cross-section #2 (Sta.3+41)
Date:	4/29/2003

Particle		Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	14	14	14
Sand	Very Fine Sand	0.062 < 0.125	2	2	16
	Fine Sand	0.125 < 0.25	5	5	21
	Medium Sand	0.25 < 0.50	10	10	31
	Coarse Sand	0.50 < 1.0	4	4	35
	Very Coarse Sand	1 < 2	10	10	45
Gravel	Very Fine Gravel	2 < 4	18	18	63
	Fine Gravel	4 < 8	17	17	80
	Medium Gravel	8 < 16	16	16	96
	Coarse Gravel	16 < 32	2	2	98
	Very Coarse Gravel	32 < 64	0	0	98
Cbl	Small Cobble	64 < 128	1	1	99
	Large Cobble	128 < 256	1	1	100
Bldr	Small Boulder	256 < 512	0	0	100
	Medium Boulder	512 < 1024	0	0	100
	Large Boulder	1024 < 2048	0	0	100
Bdrk	Bedrock	Bedrock	0	0	100
Totals:			100	100	100



Sue percent less than (mm)				
D16	D35	D50	D84	D95
0.125	1	2.5	9.7	10.75

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
14	31	53	2	0	0

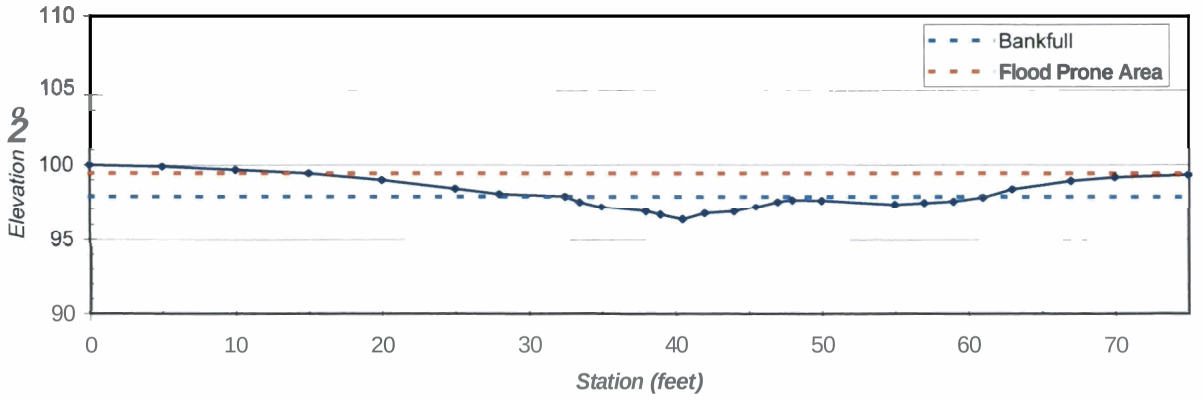
River Basin:	Yadkin
Watershed:	UT1 X-Sec 3
XS ID	Station 15+96
Drainage Area (sq mi):	0.51
Date:	Verified - July 2004
Field Crew:	G. Mryncza, A. Helms, B. Hayes

Station	Rod Ht.	Elevation
0.0	5.40	100.00
5.0	5.51	99.89
10.0	5.73	99.67
15.0	5.95	99.45
20.0	6.40	99.00
25.0	6.96	98.44
28.0	7.34	98.06
32.5	7.50	97.90
33.5	7.89	97.51
35.0	8.24	97.16
38.0	8.53	96.87
39.0	8.73	96.67
40.5	9.04	96.36
42.0	8.65	96.75
44.0	8.53	96.87
45.5	8.24	97.16
47.0	7.87	97.53
48.0	7.75	97.65
50.0	7.79	97.61
55.0	8.04	97.36
57.0	7.95	97.45
59.0	7.85	97.55
61.0	7.57	97.83
63.0	7.00	98.40
67.0	6.45	98.95
70.0	6.21	99.19
75.0	6.06	99.34

SUMMARY DATA	
Bankfull Elevation:	97.9
Bankfull Cross-Sectional Area:	18.4
Bankfull Width:	28.8
Flood Prone Area Elevation:	99.4
Flood Prone Area Width:	80.6
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	0.6
W/D Ratio:	42.9
Entrenchment Ratio:	3.5
Bank Height Ratio:	1.0
Slope (ft/ft):	0.003
Discharge (cfs)	33

Stream Type:	C4/5

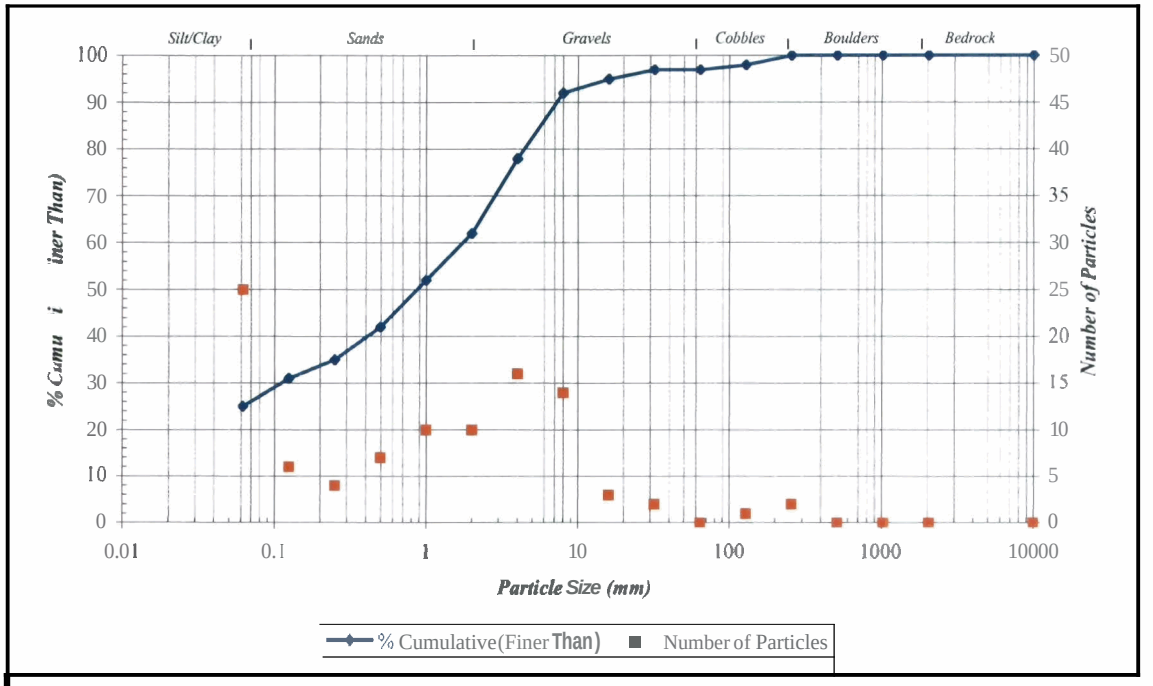
Yadkin River Basin, UT1 X-Sec 3, Station 15+96



Briles Site Restoration Plan
UT1 to Jackson Creek

Stream:	UT1 to Jackson Creek
Location:	UT1 Cross-section #3 (Sta 5+96)
Date:	4/29/2003

Particle		Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	25	25	25
Sand	Very Fine Sand	0.062 < 0.125	6	6	31
	Fine Sand	0.125 < 0.25	4	4	35
	Medium Sand	0.25 < 0.50	7	7	42
	Coarse Sand	0.50 < 1.0	10	10	52
	Very Coarse Sand	1 < 2	10	10	62
Gravel	Very Fine Gravel	2 < 4	16	16	78
	Fine Gravel	4 < 8	14	14	92
	Medium Gravel	8 < 16	3	3	95
	Coarse Gravel	16 < 32	2	2	97
	Very Coarse Gravel	32 < 64	0	0	97
Cbl	Small Cobble	64 < 128	1	1	98
	Large Cobble	128 < 256	2	2	100
Bldr	Small Boulder	256 < 512	0	0	100
	Medium Boulder	512 < 1024	0	0	100
	Large Boulder	1024 < 2048	0	0	100
Bdrk	Bedrock	Bedrock	0	0	100
Totals:			100	100	100



Sue percent less than (mm)				
D16	D35	D50	D84	D95
<0.062	0.06	0.9	5.5	10.75

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
25	37	35	3	0	0

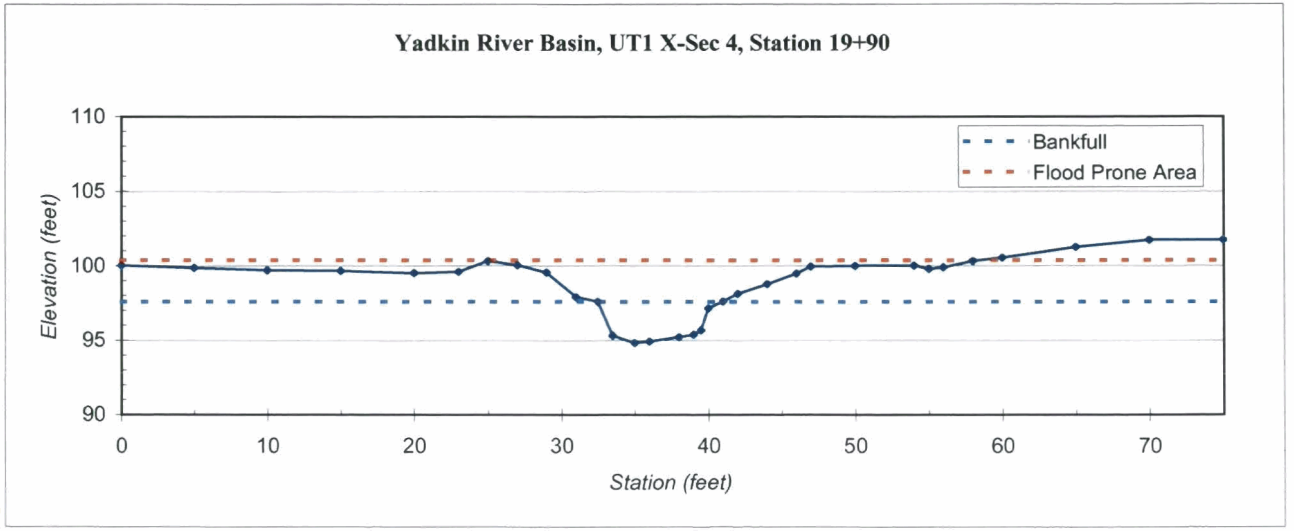
Briles Site Restoration Plan
UT1 to Jackson Creek

River Basin:	Yadkin
Watershed:	UT1 X-Sec 4
XS ID	Station 19+90
Drainage Area (sq mi):	0.51
Date:	Verified - July 2004
Field Crew:	G. Mryncza, A. Helms, B. Hayes

Station	Rod Ht.	Elevation
0.0	5.80	100.00
5.0	5.97	99.83
10.0	6.12	99.68
15.0	6.17	99.63
20.0	6.31	99.49
23.0	6.23	99.57
25.0	5.50	100.30
27.0	5.77	100.03
29.0	6.26	99.54
31.0	7.92	97.88
32.5	8.22	97.58
33.5	10.50	95.30
35.0	11.00	94.80
36.0	10.89	94.91
38.0	10.61	95.19
39.0	10.44	95.36
39.5	10.14	95.66
39.5	10.14	95.66
40.0	8.67	97.13
41.0	8.21	97.59
42.0	7.70	98.10
44.0	7.04	98.76
46.0	6.33	99.47
47.0	5.87	99.93
50.0	5.83	99.97
54.0	5.81	99.99
55.0	6.02	99.78
56.0	5.93	99.87
58.0	5.50	100.30
60.0	5.27	100.53
65.0	4.55	101.25
70.0	4.08	101.72
75.0	4.07	101.73

SUMMARY DATA	
Bankfull Elevation:	97.6
Bankfull Cross-Sectional Area:	18.8
Bankfull Width:	8.5
Flood Prone Area Elevation:	100.4
Flood Prone Width:	32.0
Max Depth at Bankfull:	2.8
Mean Depth at Bankfull:	2.2
W / D Ratio:	3.8
Entrenchment Ratio:	3.8
Bank Height Ratio:	1.8
Slope (ft/ft):	0.007
Discharge (cfs)	63

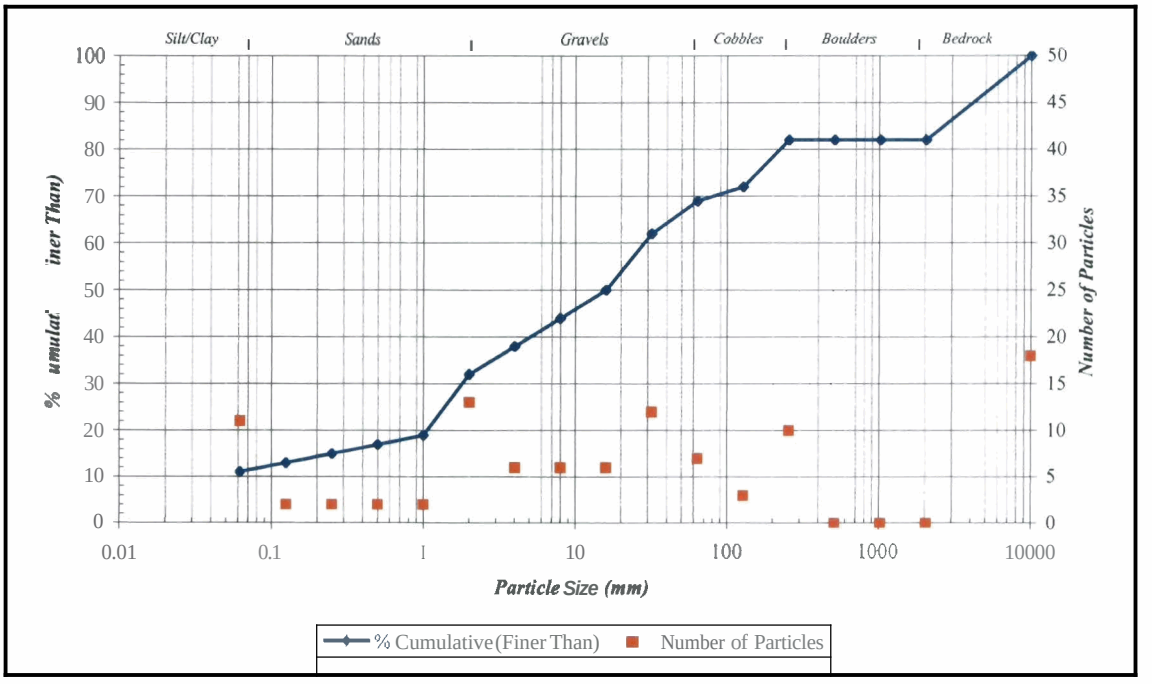
Stream Type:	E4



Briles Site Restoration Plan
UT1 to Jackson Creek

Stream:	UTI to Jackson Creek
Location:	UT1 Cross-section #4 (Sta. 9+90
Date:	4/29/2003

Particle		Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	11	11	11
Sand	Very Fine Sand	0.062 < 0.125	2	2	13
	Fine Sand	0.125 < 0.25	2	2	15
	Medium Sand	0.25 < 0.50	2	2	17
	Coarse Sand	0.50 < 1.0	2	2	19
	Very Coarse Sand	1 < 2	13	13	32
Gravel	Very Fine Gravel	2 < 4	6	6	38
	Fine Gravel	4 < 8	6	6	44
	Medium Gravel	8 < 16	6	6	50
	Coarse Gravel	16 < 32	12	12	62
	Very Coarse Gravel	32 < 64	7	7	69
Cbl	Small Cobble	64 < 128	3	3	72
	Large Cobble	128 < 256	10	10	82
Bldr	Small Boulder	256 < 512	0	0	82
	Medium Boulder	512 < 1024	0	0	82
	Large Boulder	1024 < 2048	0	0	82
Bdrk	Bedrock	Bedrock	18	18	100
Totals:			100	100	100



Sue percent less than (mm)				
D16	D35	D50	D84	D95
0.3	1.5	10.75		

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
11	21	37	13	0	18

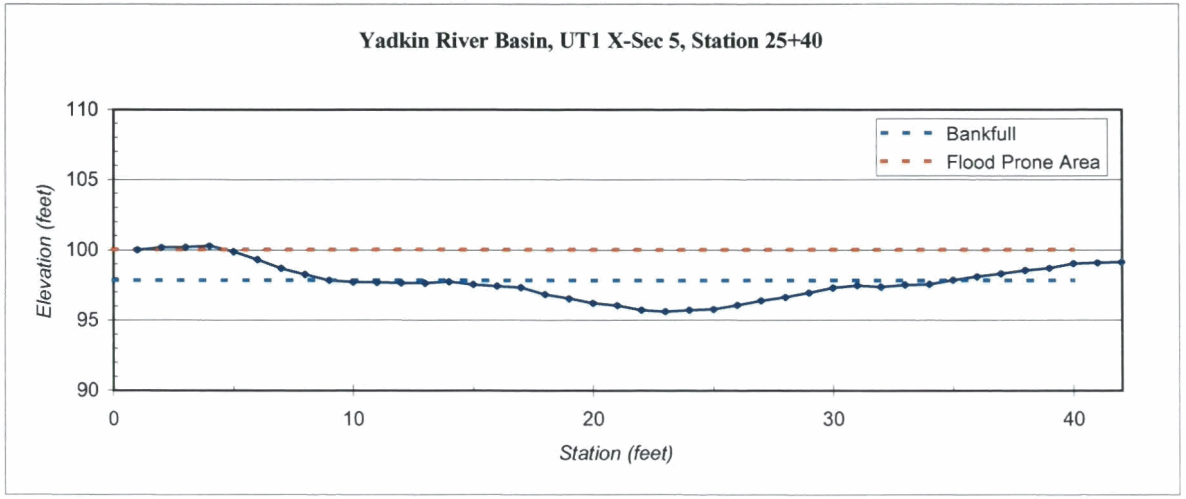
Briles Site Restoration Plan
UT1 to Jackson Creek

River Basin:	Yadkin
Watershed:	UT1 X-Sec 5
XS ID	Station 25+40
Drainage Area (sq mi):	0.62
Date:	Verified - July 2004
Field Crew:	G. Mryncza, A. Helms, B. Hayes

Station	Rod Ht.	Elevation
0.0	4.66	100.00
1.0	4.50	100.16
2.0	4.48	100.18
3.5	4.39	100.27
4.0	4.81	99.85
5.0	5.37	99.29
6.0	5.98	98.68
7.0	6.41	98.25
8.0	6.83	97.83
9.0	6.95	97.71
10.0	6.99	97.67
11.0	7.02	97.64
12.0	7.04	97.62
13.1	6.93	97.73
13.6	7.14	97.52
14.0	7.24	97.42
14.1	7.34	97.32
14.5	7.84	96.82
15.0	8.13	96.53
15.7	8.45	96.21
16.6	8.61	96.05
17.0	8.95	95.71
17.9	9.02	95.64
19.0	8.95	95.71
20.0	8.87	95.79
20.7	8.60	96.06
21.2	8.28	96.38
21.9	8.03	96.63
22.6	7.72	96.94
23.6	7.36	97.30
25.0	7.19	97.47
27.0	7.30	97.36
29.0	7.15	97.51
30.0	7.10	97.56
31.0	6.81	97.85
32.0	6.56	98.10
33.0	6.36	98.30
34.0	6.11	98.55
35.0	5.96	98.70
36.5	5.65	99.01
38.0	5.57	99.09
40.0	5.53	99.13
25-13.6	5.54	99.12

SUMMARY DATA	
Bankfull Elevation:	97.8
Bankfull Cross-Sectional Area:	18.8
Bankfull Width:	22.9
Flood Prone Area Elevation:	100.0
Flood Prone Width:	37.3
Max Depth at Bankfull:	2.2
Mean Depth at Bankfull:	0.8
W / D Ratio:	27.9
Entrenchment Ratio:	1.6
Bank Height Ratio:	2.0
Slope (ft/ft):	0.004
Discharge (cfs)	39

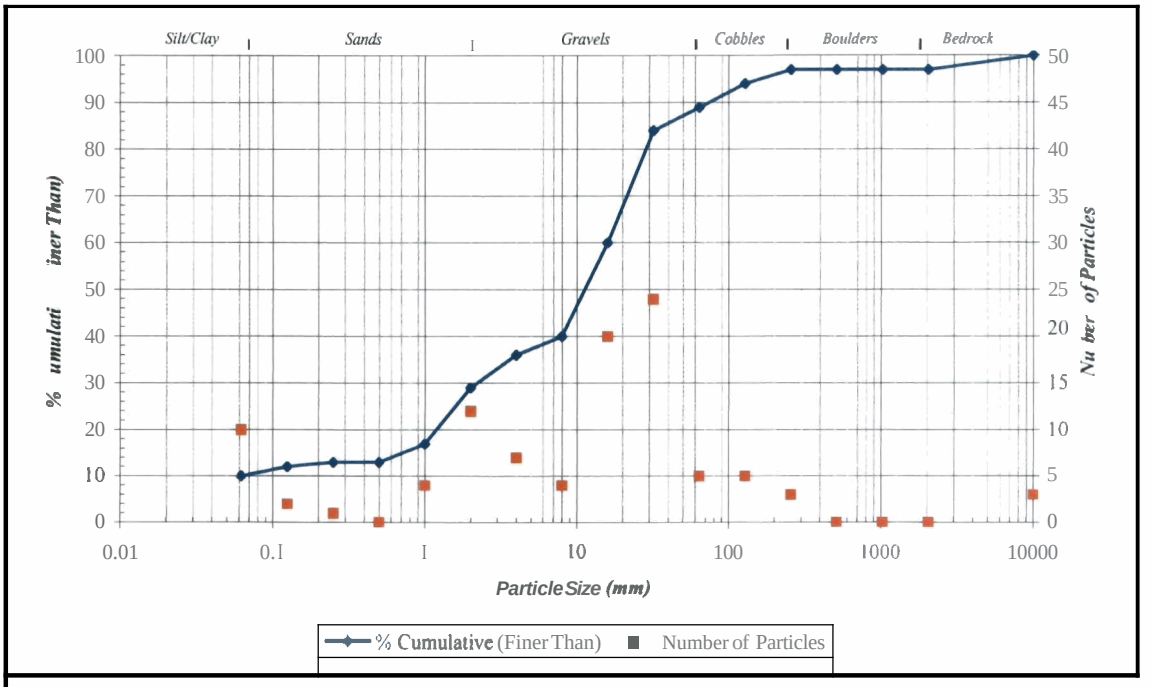
Stream Type:	B5c



Briles Site Restoration Plan
UT1 to Jackson Creek

Stream:	UT1 to Jackson Creek
Location:	UT1 Cross-section #5 (Sta 15+40)
bate:	4/30/2003

Particle		Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	10	10	10
Sand	Very Fine Sand	0.062 < 0.125	2	2	12
	Fine Sand	0.125 < 0.25	1	1	13
	Medium Sand	0.25 < 0.50	0	0	13
	Coarse Sand	0.50 < 1.0	4	4	17
	Very Coarse Sand	1 < 2	12	12	29
Gravel	Very Fine Gravel	2 < 4	7	7	36
	Fine Gravel	4 < 8	4	4	40
	Medium Gravel	8 < 16	20	20	60
	Coarse Gravel	16 < 32	24	24	84
	Very Coarse Gravel	32 < 64	5	5	89
Cbl	Small Cobble	64 < 128	5	5	94
	Large Cobble	128 < 256	3	3	97
Bldr	Small Boulder	256 < 512	0	0	97
	Medium Boulder	512 < 1024	0	0	97
	Large Boulder	1024 < 2048	0	0	97
Bdrk	Bedrock	Bedrock	3	3	100
Totals:			100	100	100



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.8	1.75	0.25	11.6	125

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
10	19	60	8	0	3

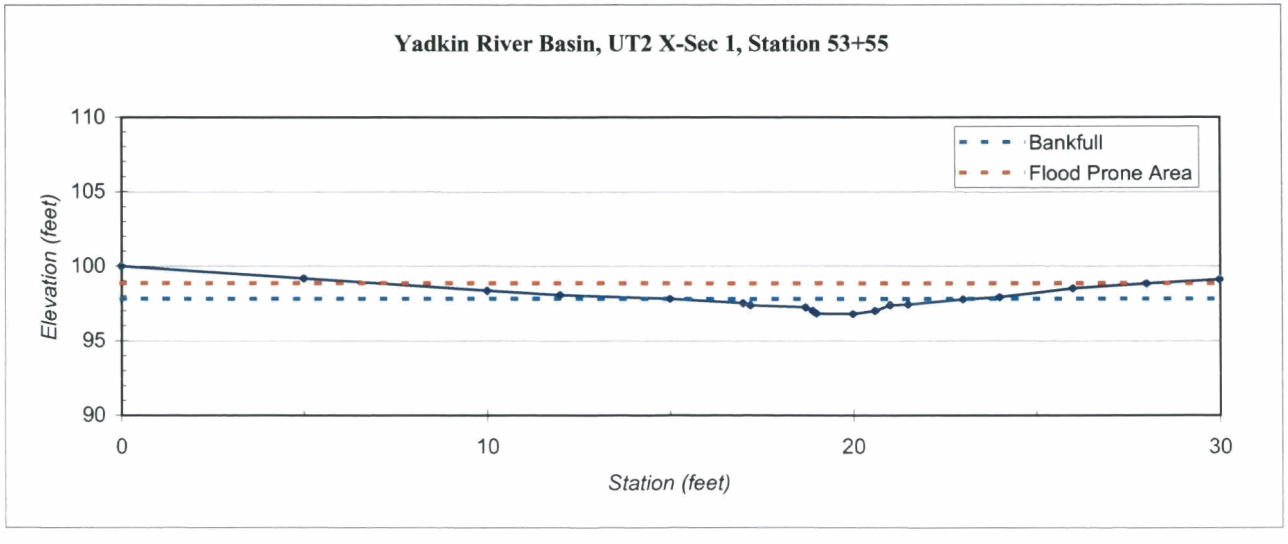
Briles Site Restoration Plan
UT2 to Jackson Creek

River Basin:	Yadkin
Watershed:	UT2 X-Sec 1
XS ID	Station 53+55
Drainage Area (sq mi):	0.11
Date:	Verified - July 2004
Field Crew:	G. Mryncza, A. Helms, B. Hayes

Station	Rod Ht.	Elevation
0.0	5.86	100.00
5.0	6.67	99.19
10.0	7.50	98.36
12.0	7.79	98.07
15.0	8.03	97.83
17.0	8.33	97.53
17.2	8.46	97.40
18.7	8.60	97.26
18.9	8.86	97.00
19.0	9.04	96.82
20.0	9.05	96.81
20.6	8.86	97.00
21.0	8.47	97.39
21.5	8.43	97.43
23.0	8.09	97.77
24.0	7.93	97.93
26.0	7.35	98.51
28.0	7.03	98.83
30.0	6.74	99.12

SUMMARY DATA	
Bankfull Elevation:	97.8
Bankfull Cross-Sectional Area:	3.7
Bankfull Width:	8.4
Flood Prone Area Elevation:	98.9
Flood Prone Width:	21.1
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.4
W / D Ratio:	18.9
Entrenchment Ratio:	2.5
Bank Height Ratio:	-
Slope (ft/ft):	0.014
Discharge (cfs)	9

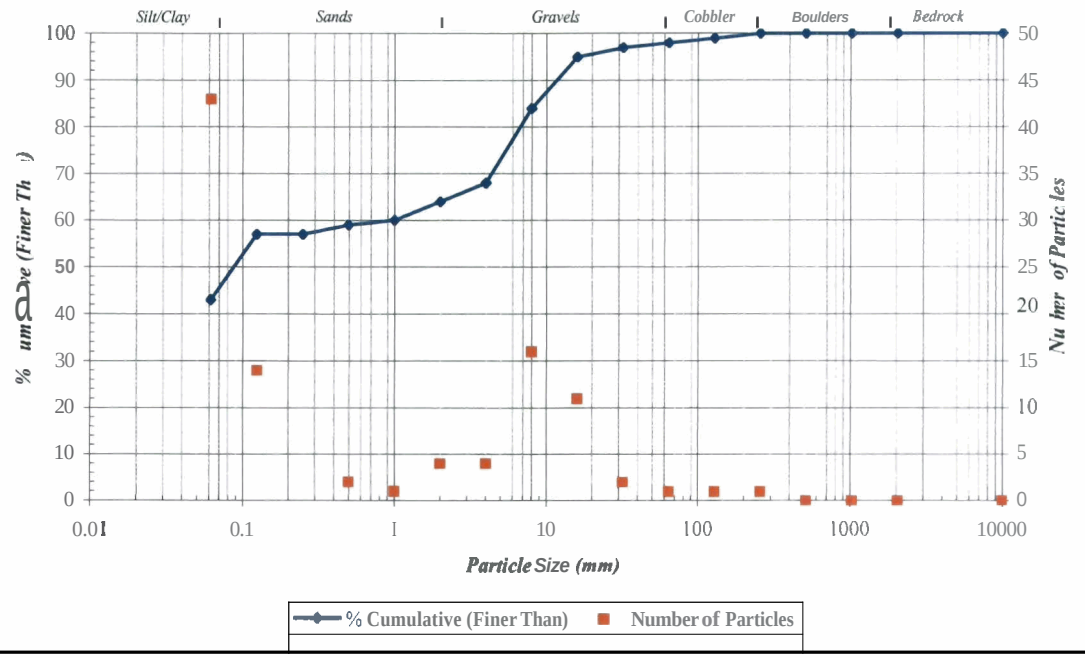
Stream Type:	B5c



Briles Site Restoration Plan
UT2 to Jackson Creek

Stream:	UT2 to Jackson Creek
Location:	UT2 Cross-section #1 (Sta 3+55)
Date:	4/29/2003

Particle		Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	43	43	43
Sand	Very Fine Sand	0.062 < 0.125	14	14	57
	Fine Sand	0.125 < 0.25		0	57
	Medium Sand	0.25 < 0.50	2	2	59
	Coarse Sand	0.50 < 1.0	1	1	60
	Very Coarse Sand	1 < 2	4	4	64
Gravel	Very Fine Gravel	2 < 4	4	4	68
	Fine Gravel	4 < 8	16	16	84
	Medium Gravel	8 < 16	11	11	95
	Coarse Gravel	16 < 32	2	2	97
	Very Coarse Gravel	32 < 64	1	1	98
Cbl	Small Cobble	64 < 128	1	1	99
	Large Cobble	128 < 256	1	1	100
Bldr	Small Boulder	256 < 512	0	0	100
	Medium Boulder	512 < 1024	0	0	100
	Large Boulder	1024 < 2048	0	0	100
Bdrk	Bedrock	Bedrock	0	0	100
Totals:			100	100	100



Size percent less than (mm)				
D16	D35	D50	**D84**	**D95**
<0.062	<0.062	0.09	9.5	11

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
43	**21**	**34**	**2**	0	0

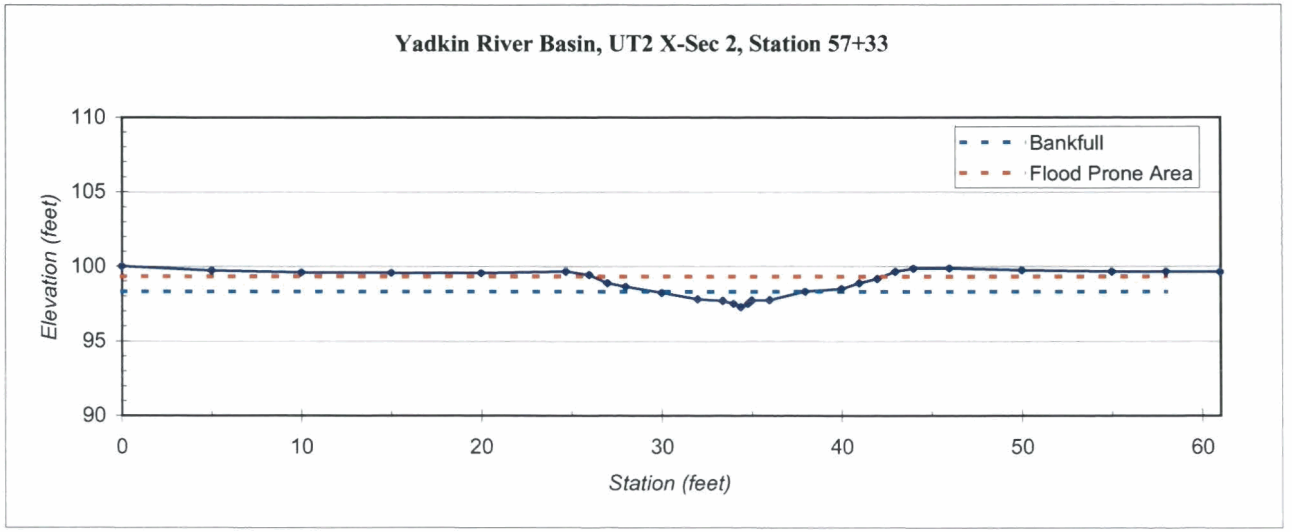
Briles Site Restoration Plan
UT2 to Jackson Creek

River Basin:	Yadkin
Watershed:	UT2 X-Sec 2
XS ID	Station 57+33
Drainage Area (sq mi):	0.11
Date:	Verified - July 2004
Field Crew:	G. Mryncza, A. Helms, B. Hayes

Station	Rod Ht.	Elevation
0.0	4.83	100.00
5.0	5.12	99.71
10.0	5.23	99.60
15.0	5.26	99.57
20.0	5.28	99.55
24.7	5.17	99.66
26.0	5.41	99.42
27.0	5.95	98.88
28.0	6.19	98.64
30.0	6.60	98.23
32.0	7.03	97.80
33.4	7.14	97.69
34.0	7.34	97.49
34.4	7.56	97.27
34.8	7.34	97.49
35.0	7.12	97.71
36.0	7.10	97.73
38.0	6.53	98.30
40.0	6.33	98.50
41.0	5.94	98.89
42.0	5.66	99.17
43.0	5.17	99.66
44.0	4.97	99.86
46.0	4.95	99.88
50.0	5.07	99.76
55.0	5.17	99.66
58.0	5.18	99.65
61.0	5.19	99.64

SUMMARY DATA	
Bankfull Elevation:	98.3
Bankfull Cross-Sectional Area:	3.8
Bankfull Width:	8.3
Flood Prone Area Elevation:	99.3
Flood Prone Width:	16.6
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.5
W / D Ratio:	18.3
Entrenchment Ratio:	2.0
Bank Height Ratio:	2.3
Slope (ft/ft):	0.0104
Discharge (cfs)	10

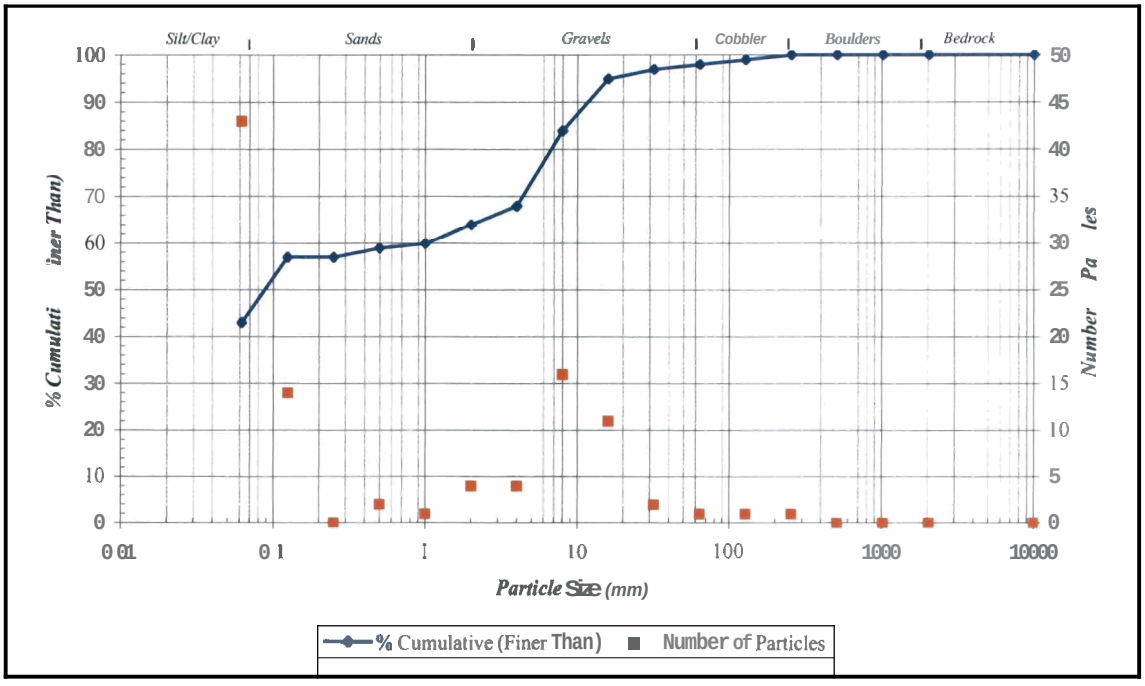
Stream Type:	B5c



Briles Site Restoration Plan
UT2 to Jackson Creek

Stream:	UT to Jackson Creek
Location:	UT2 Cross-section #2 (Sta 7+33)
Date:	**4/29/2003**

Particle		Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	43	43	43
Sand	Very Fine Sand	0.062 < 0.125	14	14	57
	Fine Sand	0.125 < 0.25	0	0	57
	Medium Sand	0.25 < 0.50	2	2	59
	Coarse Sand	0.50 < 1.0	1	1	60
	Very Coarse Sand	1 < 2	4	4	64
Gravel	Very Fine Gravel	2 < 4	4	4	68
	Fine Gravel	4 < 8	16	16	84
	Medium Gravel	8 < 16	11	11	95
	Coarse Gravel	16 < 32	2	2	97
	Very Coarse Gravel	32 < 64	1	1	98
Cbl	Small Cobble	64 < 128	1	1	99
	Large Cobble	128 < 256	1	1	100
Bldr	Small Boulder	256 < 512	0	0	100
	Medium Boulder	512 < 1024	0	0	100
	Large Boulder	1024 < 2048	0	0	100
Bdrk	Bedrock	Bedrock	0	0	100
Totals:			100	100	100



Size percent less than (mm)				
D16	D35	D50	D84	D95
<0.062	<0.062	0.09	9	10.5

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
43	21	34	2	0	0

Appendix E

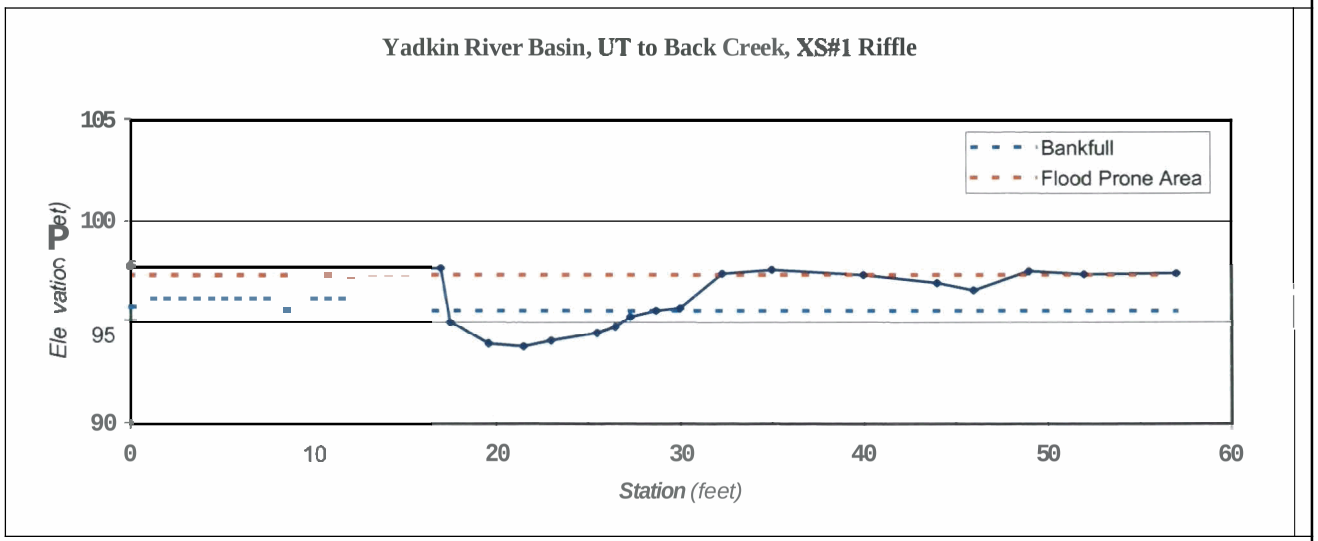
Reference Reach Data

River Basin:	Yadkin
Watershed:	UT to Back Creek
XS ID	XS#1 Riffle
Drainage Area (sq mi):	0.63
Date:	-
Field Crew:	A. Schlindwein, M. Schlegel

Station	Rod Ht.	Elevation
0	2.23	97.77
10	2.44	97.56
17	2.33	97.67
17.5	5	95.00
19.6	6.01	93.99
21.5	6.15	93.85
23	5.87	94.13
25.5	5.53	94.47
26.5	5.23	94.77
27.3	4.71	95.29
28.7	4.41	95.59
30	4.28	95.72
32.3	2.6	97.40
35	2.41	97.59
40	2.66	97.34
44	3.05	96.95
46	3.42	96.58
49	2.48	97.52
52	2.64	97.36
57	2.57	97.43

SUMMARY DATA	
Bankfull Elevation:	95.59
Bankfull Cross-Sectional Area:	12.50
Bankfull Width:	10.40
Flood Prone Area Elevation:	97.33
Flood Prone Width!	150.00
Max Depth at Bankfull:	1.74
Mean Depth at Bankfull:	1.20
W / D Ratio:	8.7
Entrenchment Ratio:	14.40
Bank Height Ratio:	
Slope (ft/ft):	0.014

Stream Type:	E4/C4



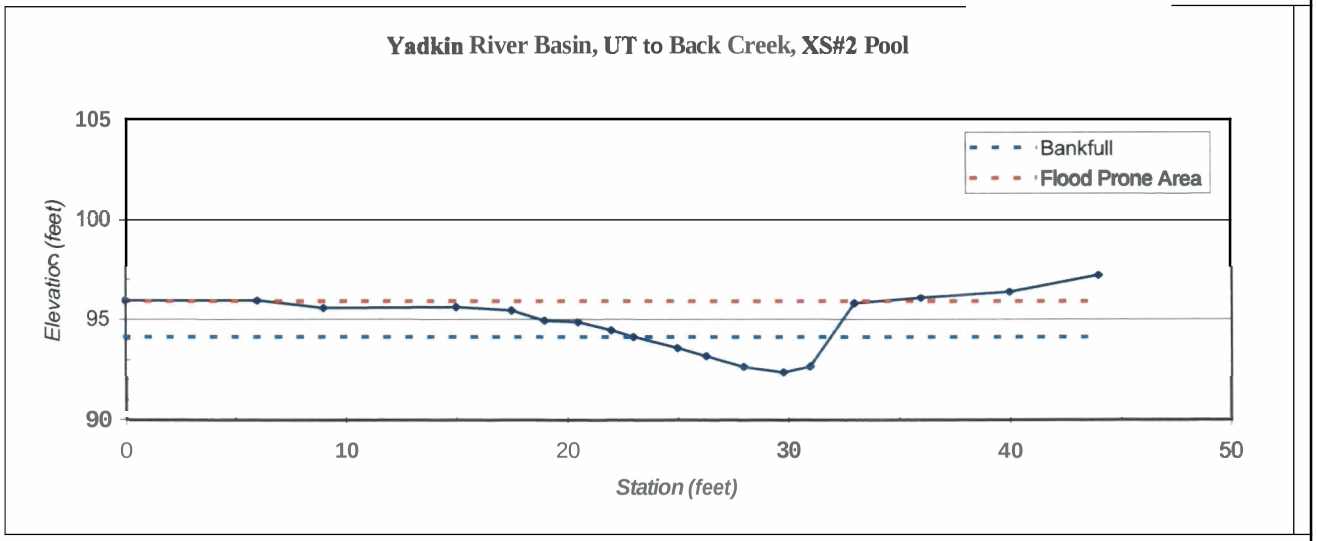
Briles** Site **Restoration Plan
*Reference Reach: **UT to Back** Creek*

River Basin:	Yadkin
Watershed:	UT to Back Creek
XS ID	XS#2 Pool
Drainage Area (sq mi):	0.63
Date:	-
Field Crew:	A. Schlindwein, M. Schlegel

Station	Rod Ht.	Elevation
0	4.05	95.95
6	4.05	95.95
9	4.44	95.56
15	4.39	95.61
17.5	4.55	95.45
19	5.05	94.95
20.5	5.13	94.87
22	5.52	94.48
23	5.85	94.15
25	6.41	93.59
26.3	6.81	93.19
28	7.34	92.66
29.8	7.61	92.39
31	7.33	92.67
33	4.2	95.80
36	3.92	96.08
40	3.63	96.37
44	2.8	97.20

SUMMARY DATA	
Bankfull Elevation:	94.15
Bankfull Cross-Sectional Area:	10.40
Bankfull Width:	10.10
Flood Prone Area Elevation:	95.91
Flood Prone Width:	
Max Depth at Bankfull:	1.76
Mean Depth at Bankfull:	1.03
W / D Ratio:	
Entrenchment Ratio:	
Bank Height Ratio:	
Slope (ft/ft):	0.001
Discharge (cfs)	-

c 4



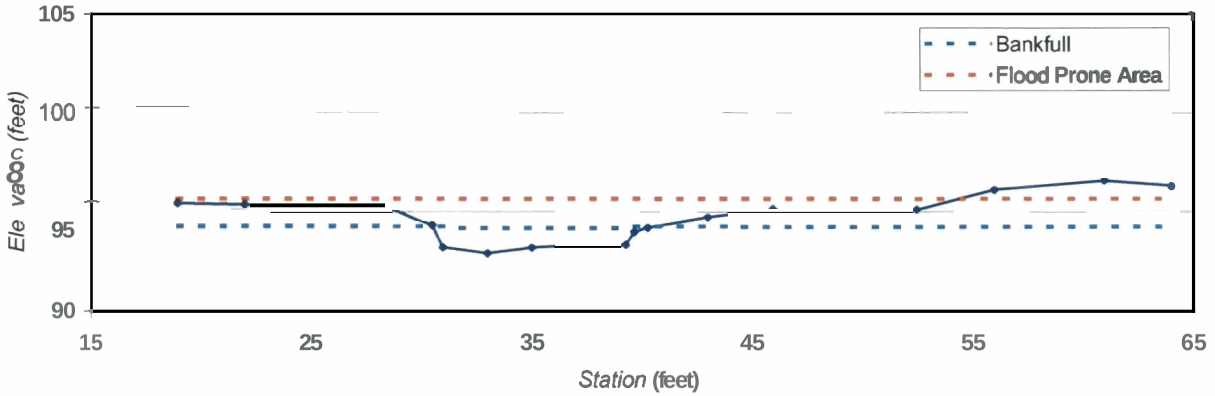
River Basin:	Yadkin
Watershed:	UT to Back Creek
XS ID	XS#3 Riffle
Drainage Area (sq mi):	0.63
Date:	-
Field Crew:	A. Schlindwein, M. Schlegel

Station	Rod Ht.	Elevation
19	4.53	95.47
22	4.59	95.41
28.5	4.78	95.22
30.5	5.64	94.36
31	6.77	93.23
33	7.06	92.94
35	6.78	93.22
37	6.65	93.35
39.3	6.6	93.40
39.7	5.97	94.03
40.3	5.76	94.24
43	5.27	94.73
46	4.84	95.16
48.5	5.15	94.85
52.5	4.88	95.12
56	3.9	96.10
61	3.45	96.55
64	3.7	96.30

SUMMARY DATA	
Bankfull Elevation:	94.30
Bankfull Cross-Sectional Area:	14.40
Bankfull Width:	16.10
Flood Prow Area Elevation:	95.66
Flood Prone Width:	150 00
Max Depth at Bankfull:	1.36
Mean Depth at Bankfull:	0 89
W / D Ratio:	18 0
Entrenchment Ratio:	9.30
Bank Height Ratio:	
Slope (ft/ft):	0 014
	63

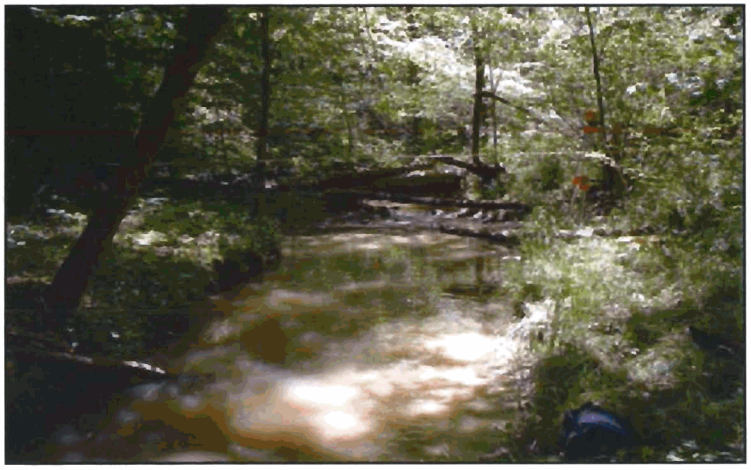
Stream Type:	C4

Yadkin River Basin, UT to Back Creek, XS#3 Riffle



Briles Site Restoration Plan
Reference Reach: UT to Back Creek

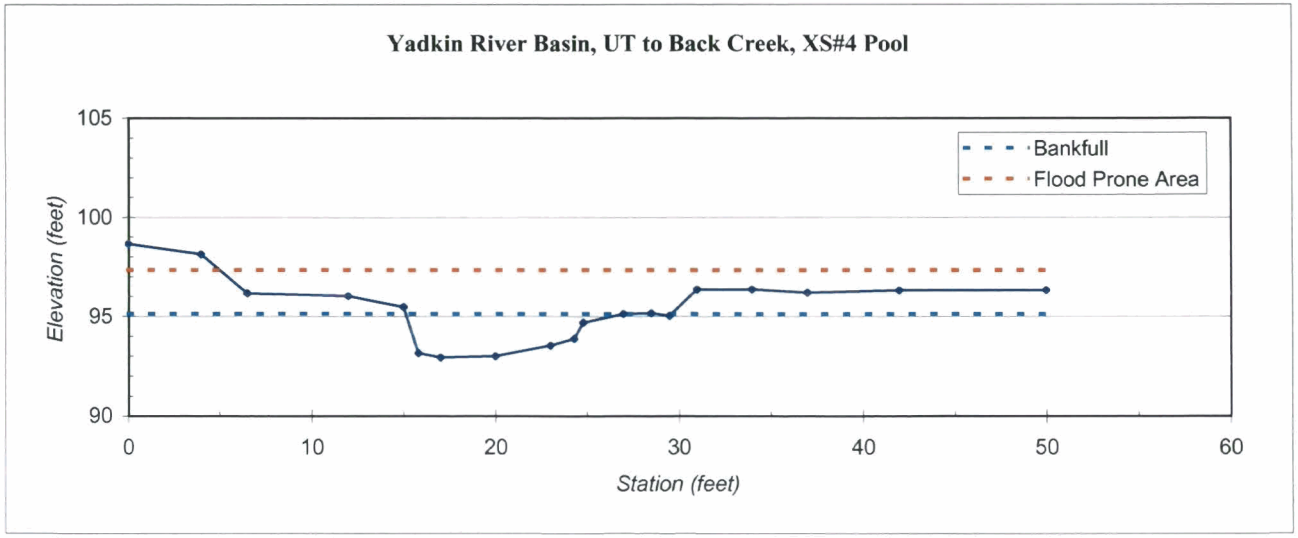
River Basin:	Yadkin
Watershed:	UT to Back Creek
XS ID	XS#4 Pool
Drainage Area (sq mi):	0.63
Date:	-
Field Crew:	A. Schlindwein, M. Schlegel



Station	Rod Ht.	Elevation
0	1.33	98.67
4	1.85	98.15
6.5	3.83	96.17
12	3.97	96.03
15	4.52	95.48
15.8	6.85	93.15
17	7.06	92.94
20	7	93.00
23	6.47	93.53
24.3	6.13	93.87
24.8	5.32	94.68
27	4.86	95.14
28.5	4.83	95.17
29.5	4.97	95.03
31	3.63	96.37
34	3.64	96.36
37	3.79	96.21
42	3.68	96.32
50	3.67	96.33

SUMMARY DATA	
Bankfull Elevation:	95.14
Bankfull Cross-Sectional Area:	19.30
Bankfull Width:	13.00
Flood Prone Area Elevation:	97.34
Flood Prone Width:	-
Max Depth at Bankfull:	2.20
Mean Depth at Bankfull:	1.48
W / D Ratio:	8.8
Entrenchment Ratio:	-
Bank Height Ratio:	-
Slope (ft/ft):	0.001
Discharge (cfs)	-

Stream Type:	C4



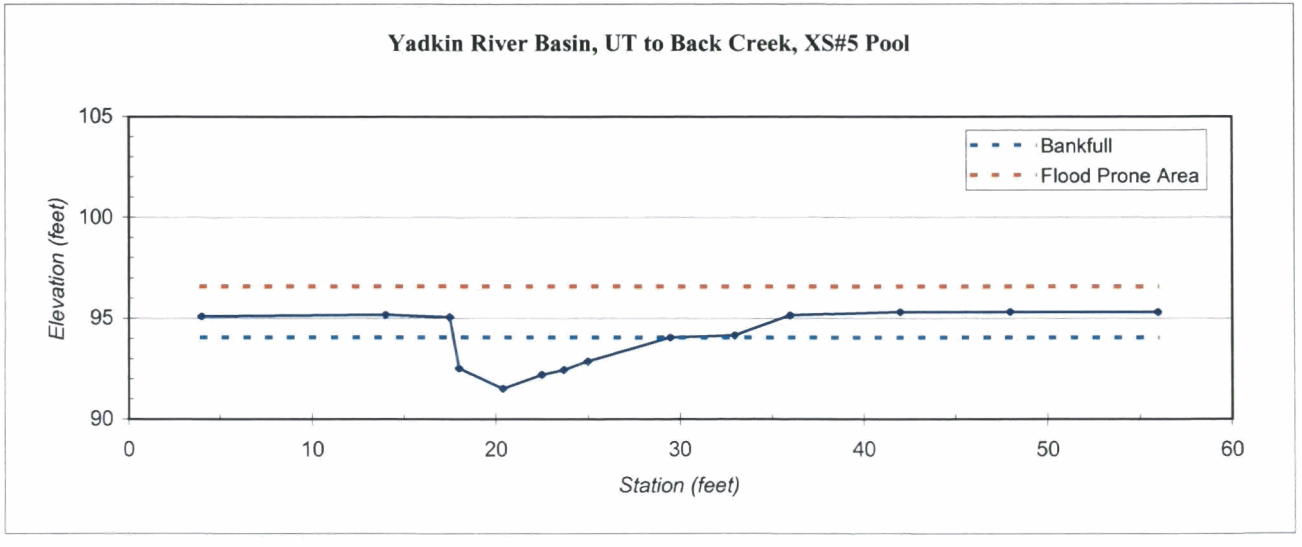
Briles Site Restoration Plan
Reference Reach: UT to Back Creek

River Basin:	Yadkin
Watershed:	UT to Back Creek
XS ID	XS#5 Pool
Drainage Area (sq mi):	0.63
Date:	-
Field Crew:	A. Schlindwein, M. Schlegel

Station	Rod Ht.	Elevation
4	4.92	95.08
14	4.84	95.16
17.5	4.97	95.03
18	7.5	92.50
20.4	8.5	91.50
22.5	7.82	92.18
23.7	7.57	92.43
25	7.15	92.85
29.5	5.96	94.04
33	5.86	94.14
36	4.86	95.14
42	4.69	95.31
48	4.69	95.31
56	4.71	95.29

SUMMARY DATA	
Bankfull Elevation:	94.04
Bankfull Cross-Sectional Area:	18.00
Bankfull Width:	13.00
Flood Prone Area Elevation:	96.58
Flood Prone Width:	-
Max Depth at Bankfull:	2.54
Mean Depth at Bankfull:	1.38
W / D Ratio:	9.4
Entrenchment Ratio:	-
Bank Height Ratio:	-
Slope (ft/ft):	<0.001
Discharge (cfs)	-

Stream Type:	C4



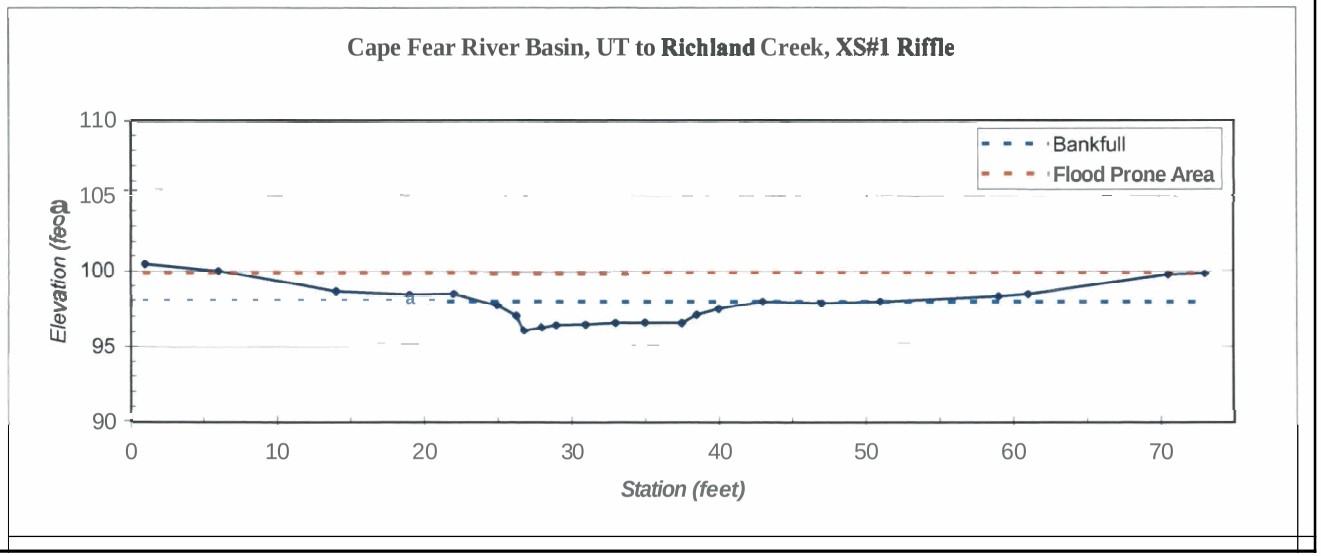
Briles Site Restoration Plan
Reference Reach: LJTto Richland Creek

River Basin:	Cape Fear
Watershed:	UT to Richland Creek
XS ID	XS#1 Riffle
Drainage Area (sq mi):	0.9
Date:	
Field Crew:	A. Schlindwein, M. Schlegel

Station	Rod Ht.	Elevation
1	1.75	100.45
6	2.19	100.01
14	3.54	98.66
19	3.76	98.44
22	3.73	98.47
25	4.51	97.69
26.3	5.2	97.00
26.8	6.15	96.05
28	5.95	96.25
29	5.78	96.42
31	5.75	96.45
33	5.62	96.58
35	5.61	96.59
37.5	5.65	96.55
38.5	5.12	97.08
40	4.73	97.47
43	4.23	97.97
47	4.36	97.84
51	4.23	97.97
59	3.87	98.33
61	3.72	98.48
70.5	2.46	99.74
73	2.38	99.82

SUMMARY DATA	
Bankfull Elevation:	97.97
Bankfull Cross-Sectional Area:	21.20
Bankfull Width:	18.00
Flood Prone Area Elevation:	99.89
Flood Prone Width:	200.00
Max Depth at Bankfull:	1.92
Mean Depth at Bankfull:	1.18
W/D Ratio:	15.3
Entrenchment Ratio:	7.40
Bank Height Ratio:	
Slope (ft/ft):	0.030
Discharge (cfs)	123

Stream Type:	C3/C4

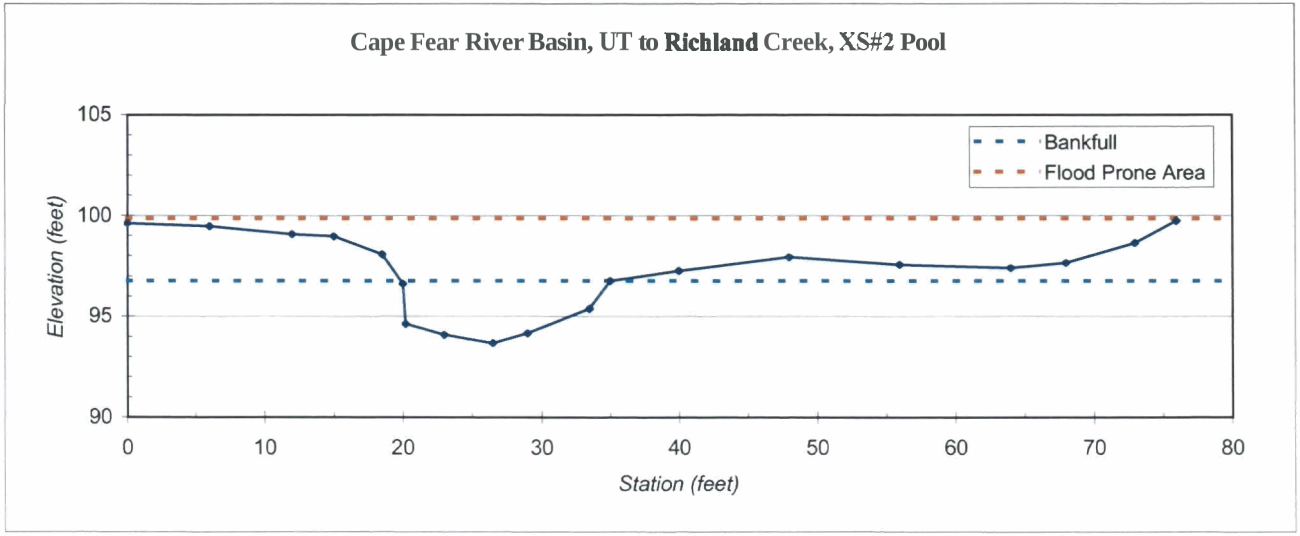


River Basin:	Cape Fear
Watershed:	UT to Richland Creek
XS ID	XS#2 Pool
Drainage Area (sq mi):	0.9
Date:	
Field Crew:	A. Schlindwein, M. Schlegel

Station	Rod Ht.	Elevation
0	2.59	99.61
6	2.75	99.45
12	3.14	99.06
15	3.24	98.96
18.5	4.14	98.06
20	5.59	96.61
20.2	7.59	94.61
23	8.13	94.07
26.5	8.53	93.67
29	8.05	94.15
33.5	6.84	95.36
35	5.44	96.76
40	4.95	97.25
48	4.27	97.93
56	4.64	97.56
64	4.82	97.38
68	4.55	97.65
73	3.58	98.62
76	2.48	99.72

SUMMARY DATA	
Bankfull Elevation:	96.76
Bankfull Cross-Sectional Area:	35.60
Bankfull Width:	15.20
Flood Prone Area Elevation:	99.85
Flood Prone Width:	-
Max Depth at Bankfull:	3.09
Mean Depth at Bankfull:	2.34
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-
Slope (ft/ft):	-
Discharge (cfs)	-

Stream Type:	C3/C4



Briles Site Restoration Plan
Reference Reach: UT to Richland Creek

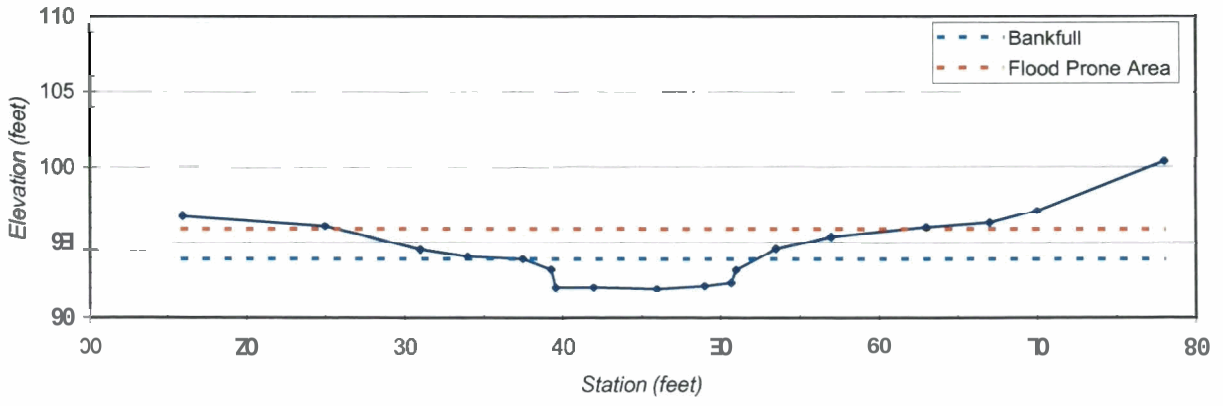
River Basin:	Cape Fear
Watershed:	UT to Richland Creek
XS ID	XS#3 Riffle
Drainage Area (sq mi):	0.9
Date:	
Field Crew:	A. Schlindwein, M. Schlegel

Station	Rod Ht.	Elevation
16	4.57	96.71
25	5.22	96.06
31	6.75	94.53
34	7.19	94.09
37.5	7.37	93.91
39.3	8.07	93.21
39.6	9.25	92.03
42	9.22	92.06
46	9.33	91.95
49	9.12	92.16
50.7	8.93	92.35
51	8.09	93.19
53.5	6.69	94.59
57	5.94	95.34
63	5.29	95.99
67	4.99	96.29
70	4.17	97.11
78	0.9	100.38

SUMMARY DATA	
Bankfull Elevation:	93.91
Bankfull Cross-Sectional Area:	22.30
Bankfull Width:	14.80
Flood Prone Area Elevation:	95.87
Flood Prone Width:	150.00
Max Depth at Bankfull:	1.96
Mean Depth at Bankfull:	1.51
W / D Ratio:	9.8
Entrenchment Ratio:	10.10
Bank Height Ratio:	
Slope (ft/ft):	0.017
Discharge (cfs)	151

Stream Type:	C3/C4

Cape Fear River Basin, UT to Richland Creek, XS#3 Riffle



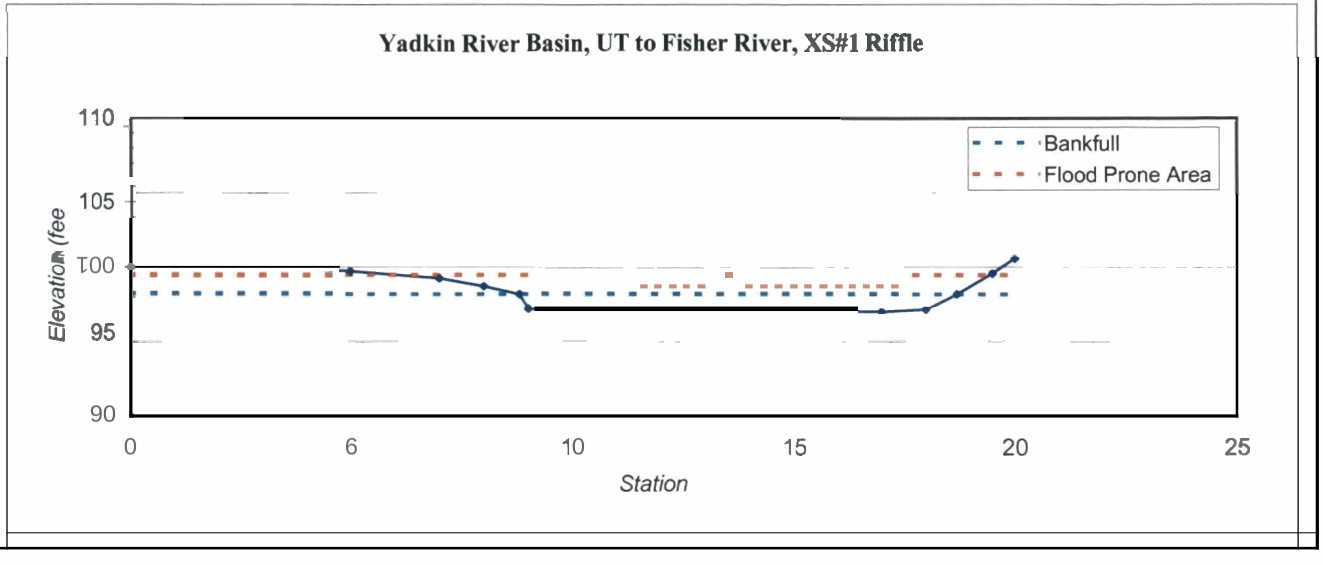
Briles Site Restoration Plan
Reference Reach: UT to Fisher River

River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#1 Riffle
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	2.22	100.00
3.0	2.15	100.07
5.0	2.50	99.72
7.0	2.98	99.24
8.0	3.49	98.73
8.8	4.00	98.22
9.0	4.96	97.26
12.0	5.03	97.19
14.0	5.25	96.97
16.0	5.16	97.06
17.0	5.20	97.02
18.0	5.06	97.16
18.7	4.00	98.22
19.5	2.65	99.57
20.0	1.66	100.56

SUMMARY DATA	
Bankfull Elevation:	98.22
Bankfull Cross-Sectional Area:	10.40
Bankfull Width:	10.00
Flood Prone Area Elevation:	99.47
Flood Prone Width:	13.10
Max Depth at Bankfull:	1.25
Mean Depth at Bankfull:	1.04
W / D Ratio:	9.6
Entrenchment Ratio:	1.30
Bank Height Ratio:	2.08
Slope (ft/ft):	0.013
[illegible]	42

Stream Type:	B4c



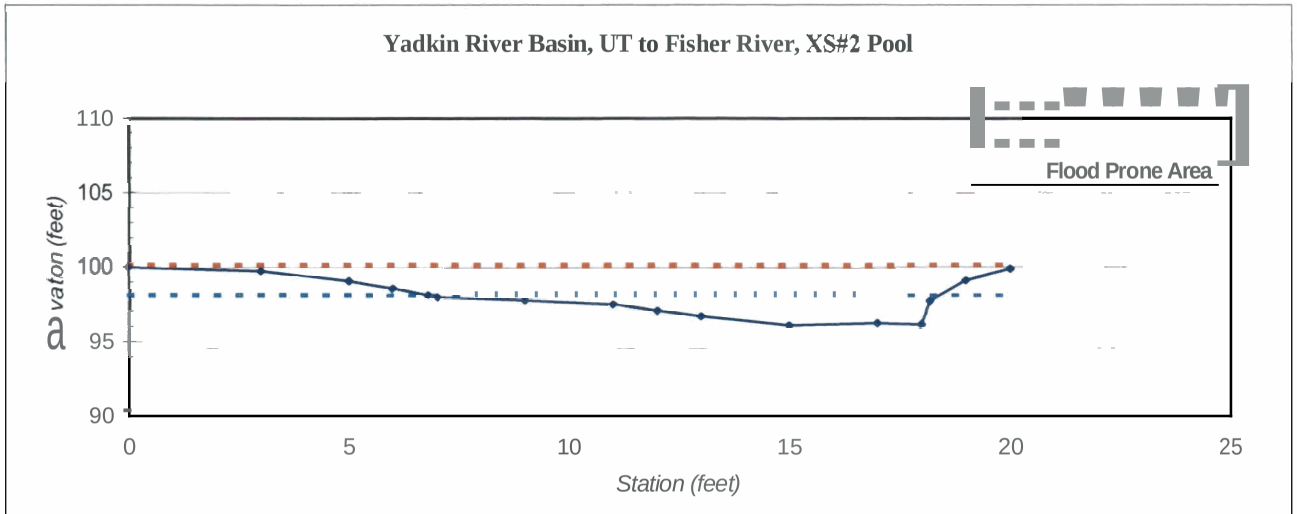
Briles Site Restoration Plan
Reference Reach:** UT to **Fisher River

River Basin:	
Watershed:	UT to Fisher River
XS ID	
Dr Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	[illegible], A. Spiller

Station	Rod Ht.	Elevation
0.0	2.68	100.00
3.0	2.94	99.74
5.0	3.61	99.07
6.0	4.10	98.58
6.8	4.56	98.12
7.0	4.70	97.98
9.0	4.94	97.74
11.0	5.21	97.47
12.0	5.64	97.04
13.0	6.00	96.68
15.0	6.59	96.09
17.0	6.42	96.26
18.0	6.50	96.18
18.2	4.93	97.75
19.0	3.56	99.12
20.0	2.80	99.88

SUMMARY DATA	
Bankfull Elevation:	98.12
Bankfull Cross-Sectional Area:	13.40
Bankfull Width:	11.62
Flood Prone Area Elevation:	100.15
Flood Prom Width:	
Max Depth at Bankfull:	2.03
Mean Depth at Bankfull:	1.15
W / D Ratio:	10.1
Entrenchment Ratio:	
Bank Height Ratio:	0.81
Slope (ft/ft):	0.001
Discharge (cfs)	56

Stream Type:	B4c



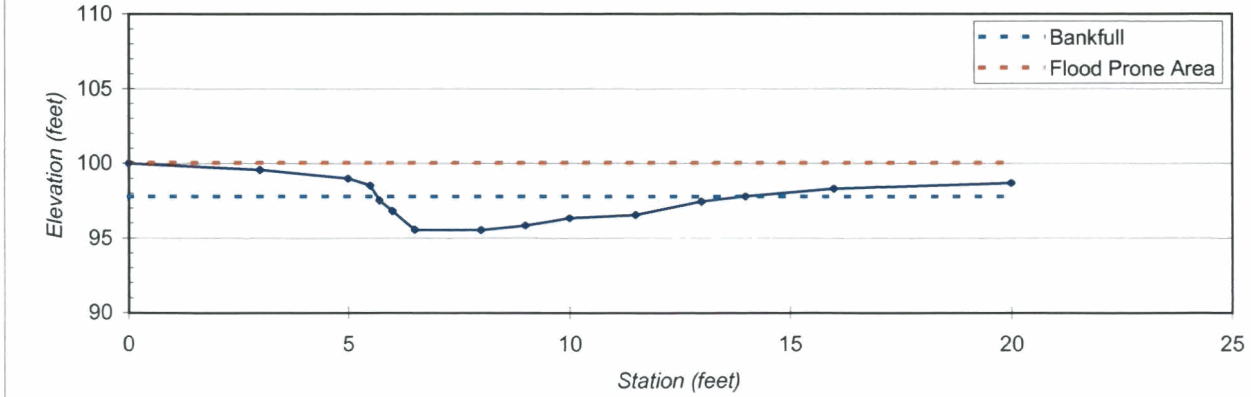
Briles Site Restoration Plan
Reference Reach: UT to Fisher River

River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#3 Pool
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	1.33	100.00
3.0	1.78	99.55
5.0	2.35	98.98
5.5	2.82	98.51
5.7	3.81	97.52
6.0	4.52	96.81
6.5	5.79	95.54
8.0	5.82	95.51
9.0	5.50	95.83
10.0	5.02	96.31
11.5	4.80	96.53
13.0	3.90	97.43
14.0	3.55	97.78
16.0	3.03	98.30
20.0	2.66	98.67

SUMMARY DATA	
Bankfull Elevation:	97.78
Bankfull Cross-Sectional Area:	11.60
Bankfull Width:	8.35
Flood Prone Area Elevation:	100.05
Flood Prone Width:	
Max Depth at Bankfull:	2.27
Mean Depth at Bankfull:	1.39
W / D Ratio:	6.0
Entrenchment Ratio:	
Bank Height Ratio:	0.85
Slope (ft/ft):	0.001
Discharge (cfs)	52

Stream Type:	B4c



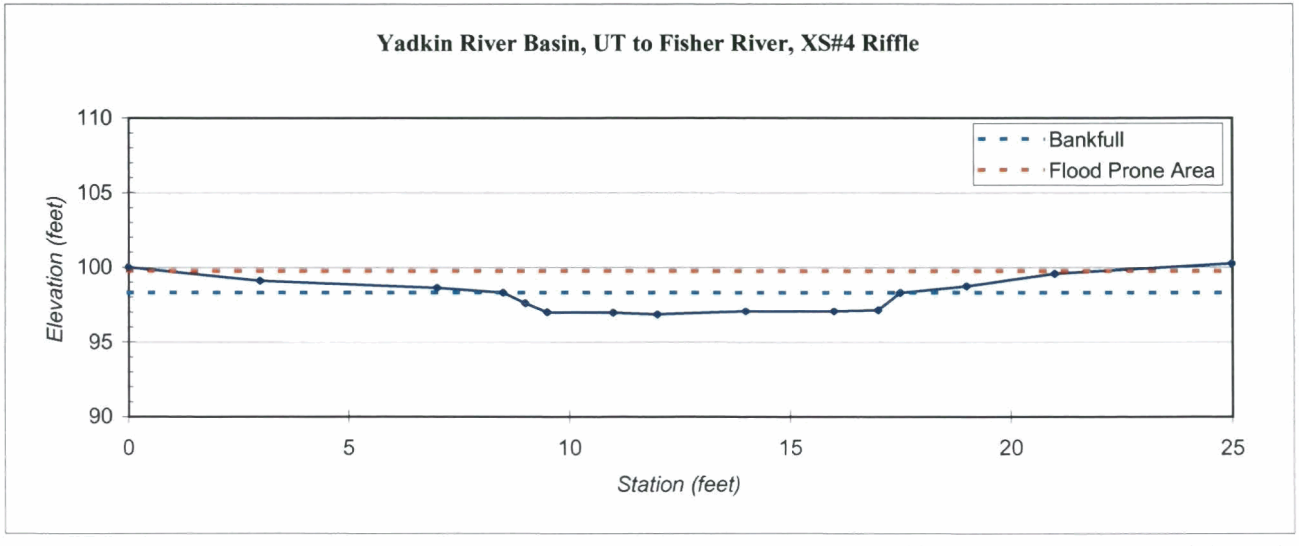
Briles Site Restoration Plan
Reference Reach: UT to Fisher River

River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#4 Riffle
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	4.62	100.00
3.0	5.54	99.08
7.0	6.01	98.61
8.5	6.34	98.28
9.0	7.04	97.58
9.5	7.66	96.96
11.0	7.67	96.95
12.0	7.79	96.83
14.0	7.58	97.04
16.0	7.57	97.05
17.0	7.51	97.11
17.5	6.34	98.28
19.0	5.90	98.72
21.0	5.06	99.56
25.0	4.37	100.25

SUMMARY DATA	
Bankfull Elevation:	98.28
Bankfull Cross-Sectional Area:	10.70
Bankfull Width:	9.00
Flood Prone Area Elevation:	99.73
Flood Prone Width:	20.50
Max Depth at Bankfull:	1.45
Mean Depth at Bankfull:	1.19
W / D Ratio:	7.6
Entrenchment Ratio:	2.30
Bank Height Ratio:	1.00
Slope (ft/ft):	0.013
Discharge (cfs)	46

Stream Type:	B4c



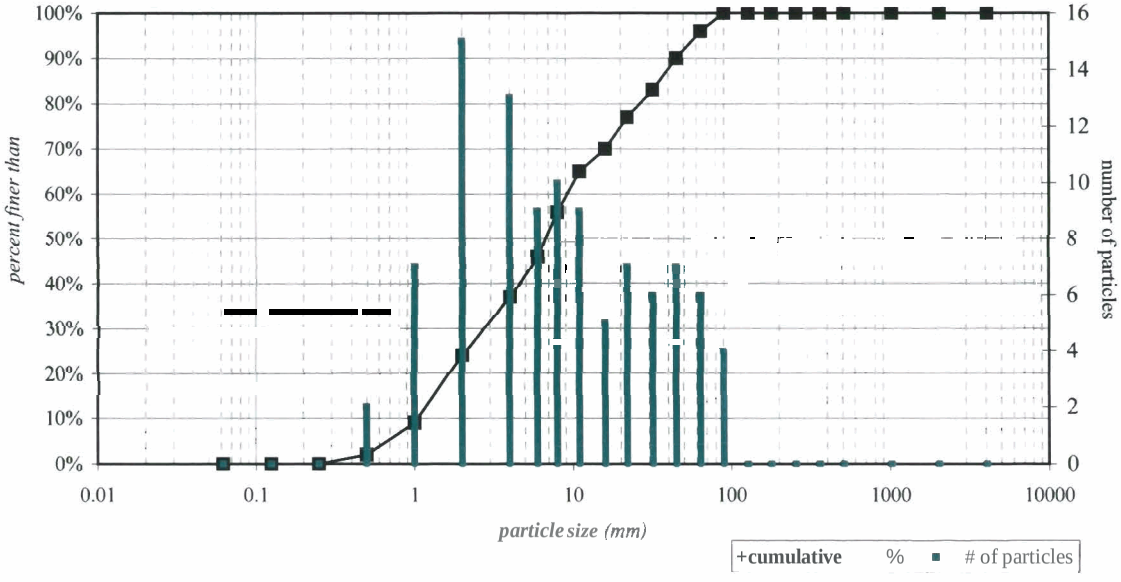
Briles Site Restoration Plan
Reference Reach: UT to Fisher River

Pebble Count

Material	Size Range (mm)		Count	
silt/clay	0	0.062	**0**	##
very fine sand	0.062	0.13	**0**	##
fine sand	0.13	0.25	**0**	##
medium sand	0.25	0.5	**2**	##
coarse sand	0.5	1	**7**	##
very coarse sand	1	2	**15**	##
very fine gravel	2	4	**13**	##
fine gravel	4	6	**9**	##
fine gravel	6	8	**10**	##
medium gravel	8	11	**9**	##
medium gravel	11	16	**5**	##
coarse gravel	16	22	**7**	##
coarse gravel	22	32	**6**	##
very coarse gravel	32	45	**7**	##
very coarse gravel	45	64	**6**	##
small cobble	64	90	**4**	##
medium cobble	90	128	**0**	##
large cobble	128	180	**0**	##
very large cobble	180	256	**0**	##
small boulder	256	362	**0**	##
small boulder	362	512	**0**	##
medium boulder	512	1024	**0**	##
large boulder	1024	2048	**0**	##
very large boulder	2048	4096	**0**	##
		total particle count:	100	

bedrock			
clay hardpan			
detritus/wood			
artificial			
		total count:	100

	UT to Fisher River
	Surry County, NC
	Reach
Note:	



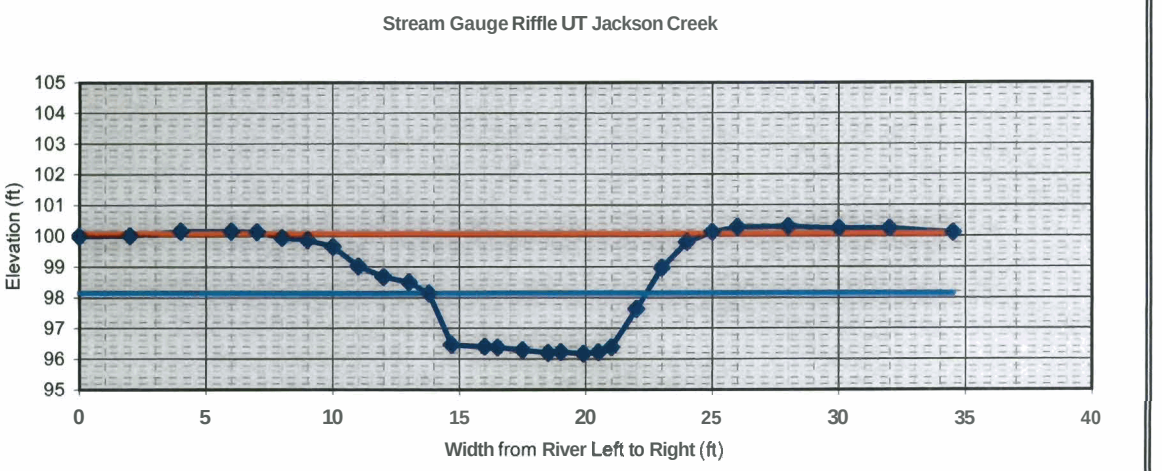
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	1.382	3.60	6.7	11	34	60	4.9	6.8	4.9

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	24%	72%	4%	0%	0%	0%	0%	0%

Appendix F

Sediment Transport

Cross Section



section:	Stream Gauge
	Riffle
stream:	UT Jackson Creek
location:	Randolph Co., NC
description:	Steam Gauge Cross-section
height of instrument (ft):	105.32

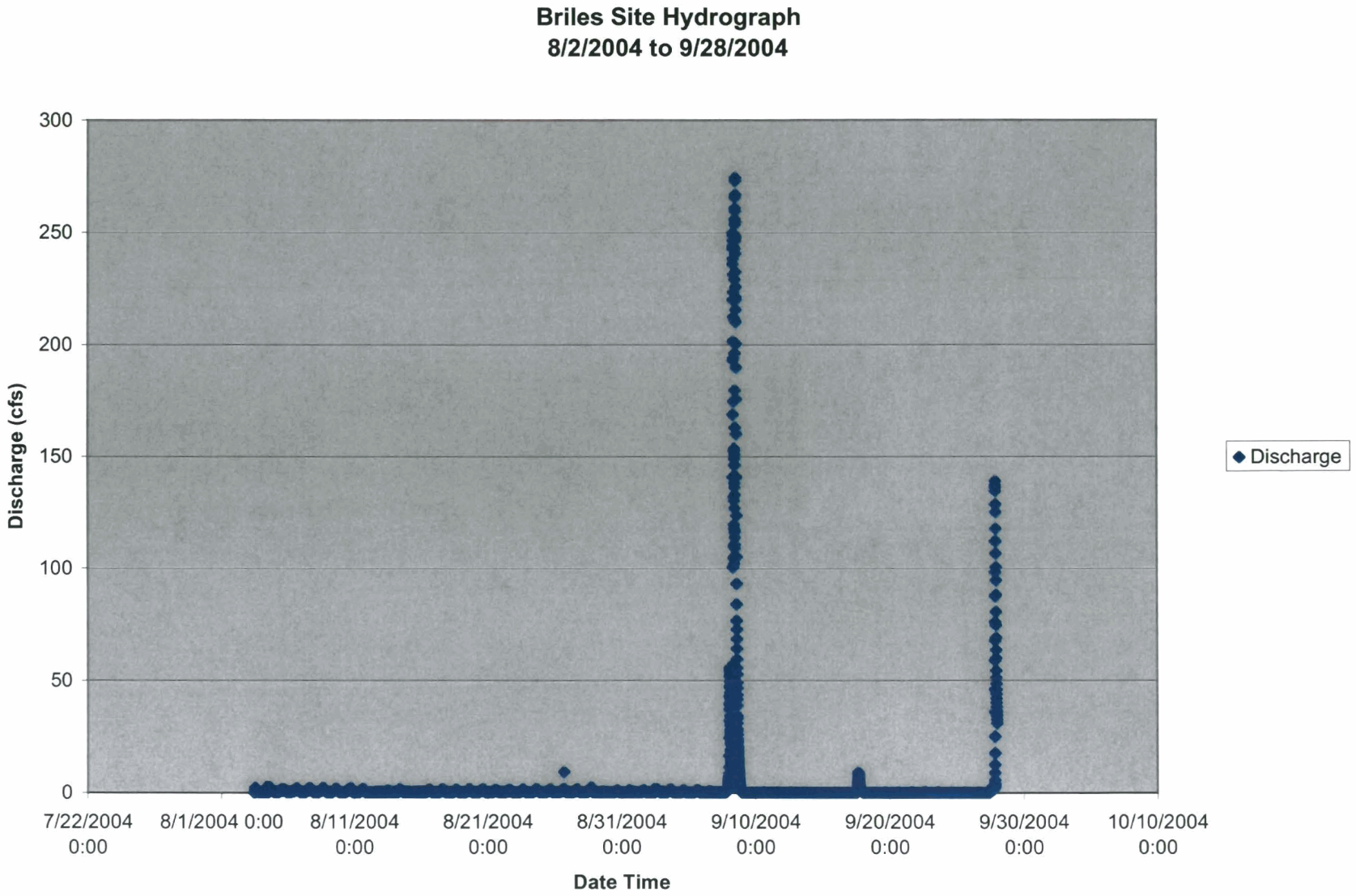
notes	omit pt.	distance (ft)	FS (ft)	elevation
		0	5.32	100
		2	5.3	100.02
		4	5.15	100.17
		6	5.15	100.17
		7	5.17	100.15
		8	5.36	99.96
TOB		9	5.43	99.89
		10	5.64	99.68
		11	6.28	99.04
		12	6.63	98.69
		13	6.8	98.52
BKF		13.8	7.17	98.15
		14.7	8.84	96.48
		16	8.9	96.42
		16.5	8.93	96.39
		17.5	9.01	96.31
		18.5	9.1	96.22
		19	9.07	96.25
THLW		19.9	9.13	96.19
		20.5	9.08	96.24
		21	8.93	96.39
		22	7.68	97.64
		23	6.34	98.98
		24	5.51	99.81
RTOB		25	5.18	100.14
		26	5.03	100.29
		28	5.01	100.31
		30	5.05	100.27
		32	5.05	100.27
		34.5	5.19	100.13

FS bankfull	FS top of bank	W fpa (ft)	channel slope (%)	Manning's "n"
7.17	5.43	18.0		
98.15	99.89			

dimensions			
13.5	x-section area	1.6	d mean
8.6	width	10.5	wet P
2.0	d max	1.3	hyd radi
3.7	bank ht	5.4	w/d ratio
18.0	W flood prone area	2.1	ent ratio

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

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


Briles Site Hydrograph
8/2/2004 to 9/28/2004
300
250
200
150
100
50
0
Discharge (cfs)
7/22/2004 0:00
8/1/2004 0:00
8/11/2004 0:00
8/21/2004 0:00
8/31/2004 0:00
9/10/2004 0:00
9/20/2004 0:00
9/30/2004 0:00
10/10/2004 0:00
Date Time
Discharge

Point / Side BAR-BULK MATERIALS SAMPLE DATA: Size Distribution Analysis | Party: GM, AH, BH

Location: Briles Site - Bar 1 | Date:July 12, 2004 | Notes: Some Artificial Influence; Sample Ended at Armor Layer

Total Weight Before Sieving (oz)
165.00
165.00

SUB SAMPLES	Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)	
	< 2.0		2.0		4.0		8.0		16.0		31.5		64.0		128.0		256.0		> 256.0			
	Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)			
	29		42.5		45		47		49.5		48.5											
	Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights			
	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net		
1	71.0	42.0	59.0	16.5	65.0	20.0	83.0	36.0	100.0	50.5												
2		0.0																				
3		0.0																				
4		0.0																				
5		0.0																				
6		0.0																				
7		0.0																				
8		0.0																				
9		0.0																				
10		0.0																				
11		0.0																				
12		0.0																				
13		0.0																				
14		0.0																				
15		0.0																				
Net Wt. Total	42.0		16.5		20.0		36.0		50.5		0.0		0.0		0.0		0.0		0.0		165.0	
% Grand Tot.	25.5%		10.0%		12.1%		21.8%		30.6%		0.0%		0.0%		0.0%		0.0%		0.0%			
Accum. % =<	25.5%	→	35.5%	→	47.6%	→	69.4%	→	100.0%	→	100.0%	→	100.0%	→	100.0%	→	100.0%	→	100.0%			

SURFACE MATERIALS DATA
(Two Largest Particles)

No.	Dia.	WT.
1	27.0	1.0
2	25.0	1.0

Bucket + Materials Weight_____

Bucket Tare Weight_____

Materials Weight_____
(Materials less than: _____mm.)

Be Sure to Add Separate Material Weights to Grand Total

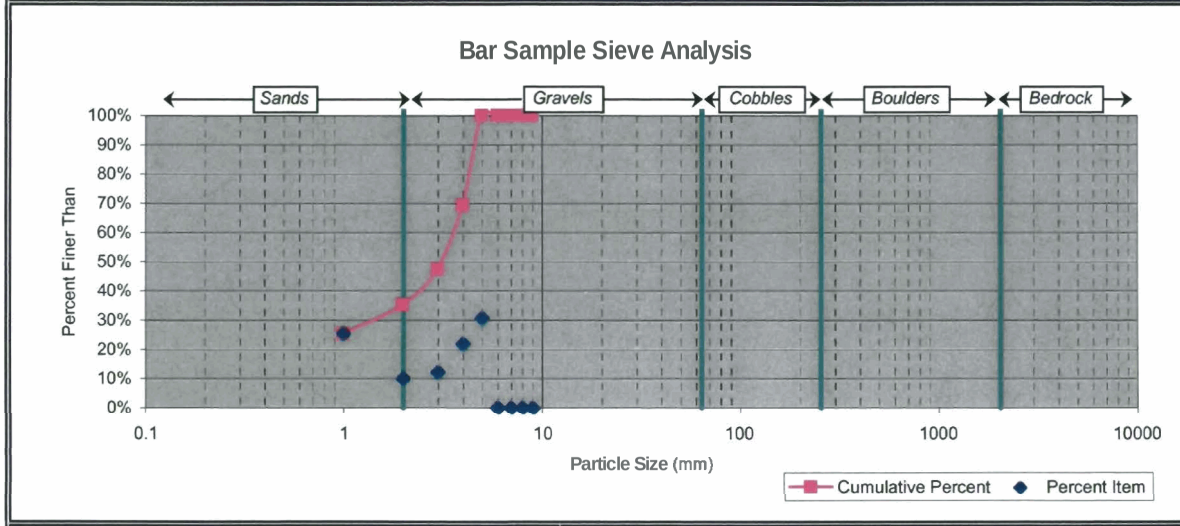
GRAND TOTAL SAMPLE WEIGHT

NOTES

Bar Sample Sieve Analysis

Smallest Sieve Passed (mm)	Weight (oz)	% Item	Percent Finer Than
2.0	42	25.5%	25.5%
4.0	16.5	10.0%	35.5%
8.0	20.0	12.1%	47.6%
16.0	36.0	21.8%	69.4%
31.5	50.5	30.6%	100.0%
64.0	0.0	0.0%	100.0%
128.0	0.0	0.0%	100.0%
256.0	0.0	0.0%	100.0%
> 256.0	0.0	0.0%	100.0%
Total:	165.0	100%	

Stream: UT to Jackson Creek (Briles) - Bar #1
Watershed: Jackson Creek - Cape Fear River
Location: Bar #1 near Station 11+00
Note:



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
3.9	3.9	8.6	22.1	28.2	0%	25%	75%	0%	---	---

Point / Side BAR-BULK MATERIALS SAMPLE DATA: Size Distribution Analysis | Party: GM, AH, BH

Location: Briles Site-Bar 2 | Date: | Notes:

Total Weight Before Sieving (oz)
127.00
127.00

SUB SAMPLES	Sieve Size (mm)	Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)	
	< 2.0	2.0		4.0		8.0		16.0		31.5		54.0		64.0		70.0		90.0	
	Tare Weight (oz)	Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)	
	29	42.5		45		47		49.5		48.5									
	Sample Weights	Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights	
	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net
1	64.0	35.0	58.0	15.5	60.0	15.0	72.0	25.0	86.0	36.5									
2																			
3																			
4																			
5		0.0																	
6		0.0																	
7		0.0																	
8		0.0																	
9		0.0																	
10		0.0																	
11		0.0																	
12		0.0																	
13		0.0																	
14		0.0																	
15		0.0																	
Net Wt. Total	35.0		15.5		15.0		25.0		36.5		0.0		0.0		0.0		0.0		0.0	127.0
% Grand Tot.	27.6%		12.2%		11.8%		19.7%		28.7%		0.0%		0.0%		0.0%		0.0%		0.0%	
Accum. % =<	27.6%	→	39.8%	→	51.6%	→	71.3%	→	100.0%	→	100.0%	→	100.0%	→	100.0%	→	100.0%	→	100.0%	

GRAND TOTAL SAMPLE WEIGHT

SURFACE MATERIALS DATA
(Two Largest Particles)

No.	Dia.	WT.
1	44.0	1.2
2	34.0	1.0

Bucket
+ Materials
Weight_____

Bucket
Tare
Weight_____

Materials
Weight_____
(Materials less than:
_____mm.)

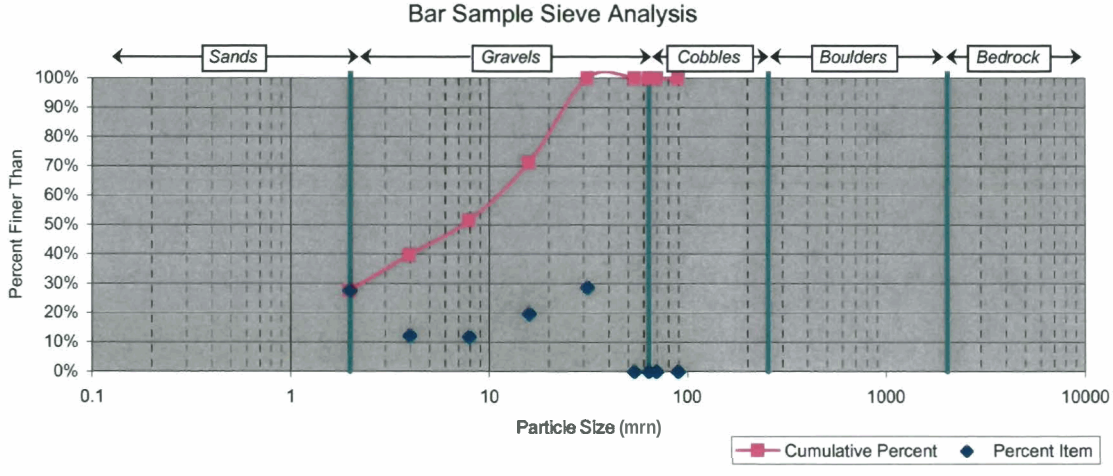
Be Sure to Add Separate Material Weights to Grand Total

NOTES

Bar Sample Sieve Analysis

Smallest Sieve Passed (mm)	Weight (oz)	% Item	Percent Finer Than
2.0	35	27.6%	27.6%
4.0	15.5	12.2%	39.8%
8.0	15.0	11.8%	51.6%
16.0	25.0	19.7%	71.3%
31.5	36.5	28.7%	100.0%
54.0	0.0	0.0%	100.0%
64.0	0.0	0.0%	100.0%
70.0	0.0	0.0%	100.0%
90.0	0.0	0.0%	100.0%
Total:	127.0	100%	

Stream: UT to Jackson Creek (Briles) - Bar #2
Watershed: Jackson Cree* - Cape Fear River
Location: Bar #2 near Station 24+50
Note:



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
3.1	3.1	7.3	21.6	28.0	0%	28%	72%	0%	---	---

Point / Side BAR-BULK MATERIALS SAMPLE DATA: Size Distribution Analysis | Party: GM, AH, BH

Location: Briles Site - Pavement Sample (Station 24+50) | Date:July 12, 2004 | Notes:

Total Weight Before Sieving (oz)
21.00
21.00

SUB SAMPLES	Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)	
	< 2.0		2.0		4.0		8.0		16.0		31.5		64.0		128.0		256.0		> 256.0	
	Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)		Tare Weight (oz)	
	29		42.5		45		47		49.5		48.5									
	Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights	
	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net
1	35.0	6.0	44.0	1.5	51.0	6.0	51.0	4.0	53.0	3.5										
2		0.0																		
3		0.0																		
4		0.0																		
5		0.0																		
6		0.0																		
7		0.0																		
8		0.0																		
9		0.0																		
10		0.0																		
11		0.0																		
12		0.0																		
13		0.0																		
14		0.0																		
15		0.0																		
Net Wt. Total	6.0		1.5		6.0		4.0		3.5		0.0		0.0		0.0		0.0		0.0	21.0
% Grand Tot.	28.6%		7.1%		28.6%		19.0%		16.7%		0.0%		0.0%		0.0%		0.0%		0.0%	
Accum. % =<	28.6%	→	35.7%	→	64.3%	→	83.3%	→	100.0%	→	100.0%	→	100.0%	→	100.0%	→	100.0%	→	100.0%	

SURFACE MATERIALS DATA
(Two Largest Particles)

No.	Dia.	WT.
1	34.0	1.6
2	20.0	1.0

Bucket + Materials Weight_____

Bucket Tare Weight_____

Materials Weight_____
(Materials less than: _____mm.)

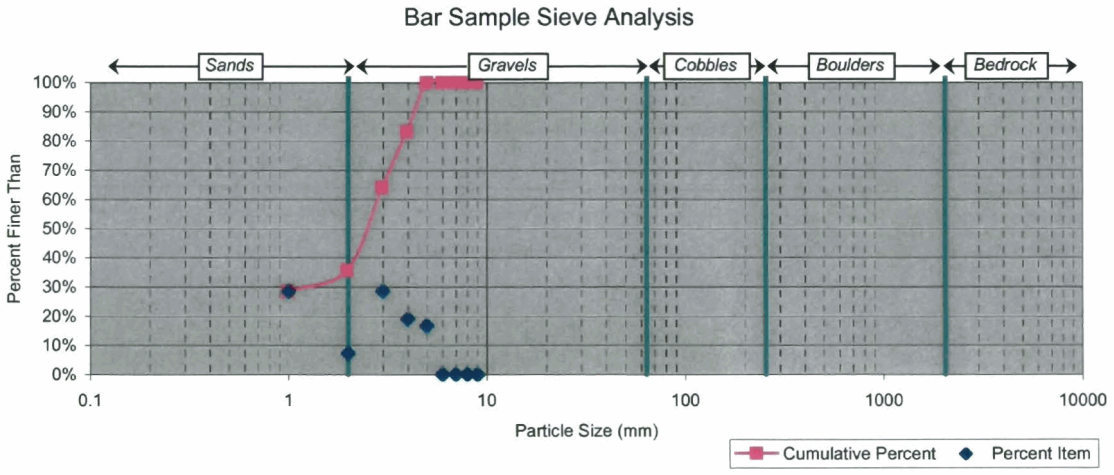
Be Sure to Add Separate Material Weights to Grand Total

GRAND TOTAL SAMPLE WEIGHT

NOTES

Bar Sample Sieve Analysis			
Smallest Sieve Passed (mm)	Weight (oz)	% Item	Percent Finer Than
2.0	6	28.6%	28.6%
4.0	1.5	7.1%	35.7%
8.0	6.0	28.6%	64.3%
16.0	4.0	19.0%	83.3%
31.5	3.5	16.7%	100.0%
64.0	0.0	0.0%	100.0%
128.0	0.0	0.0%	100.0%
256.0	0.0	0.0%	100.0%
> 256.0	0.0	0.0%	100.0%
Total:	21.0	100%	

Stream:	UT to Jackson Creek (Briles) - Pavement #2
Watershed:	Jackson Creek - Cape Fear River
Location:	Pavement near Station 24+50
Note:	



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
3.7	3.7	5.7	16.4	25.7	0%	29%	71%	0%	---	---

Point / Side BAR-BULK MATERIALS SAMPLE DATA: Size Distribution Analysis

Party: GM, AH, BH

Location: Briles Site - Sub-Pavement Sample (24+50)

Date:July 12, 2004

Notes:

Total Weight Before Sieving (oz)
191.00
191.00

SUB SAMPLES	Sieve Size (mm)	< 2.0	2.0	4.0	8.0	16.0	31.5	64.0	128.0	256.0	> 256.0
	Tare Weight (oz)	29	42.5	45	47	49.5	48.5				
	Sample Weights	Total / Net	Total / Net	Total / Net	Total / Net	Total / Net	Total / Net	Total / Net	Total / Net	Total / Net	Total / Net
1		93.0 / 64.0	74.0 / 31.5	73.0 / 28.0	88.0 / 41.0	76.0 / 26.5					
2		/ 0.0									
3		/ 0.0									
4		/ 0.0									
5		/ 0.0									
6		/ 0.0									
7		/ 0.0									
8		/ 0.0									
9		/ 0.0									
10		/ 0.0									
11		/ 0.0									
12		/ 0.0									
13		/ 0.0									
14		/ 0.0									
15		/ 0.0									
Net Wt. Total		64.0	31.5	28.0	41.0	26.5	0.0	0.0	0.0	0.0	0.0
% Grand Tot.		33.5%	16.5%	14.7%	21.5%	13.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Accum. % =<		33.5% →	50.0% →	64.7% →	86.1% →	100.0% →	100.0% →	100.0% →	100.0% →	100.0% →	100.0%

SURFACE MATERIALS DATA
(Two Largest Particles)

No.	Dia.	WT.
1	35.0	1.0
2	15.0	1.0

Bucket + Materials Weight_____

Bucket Tare Weight_____

Materials Weight_____
(Materials less than: _____mm.)

Be Sure to Add Separate Material Weights to Grand Total

191.0

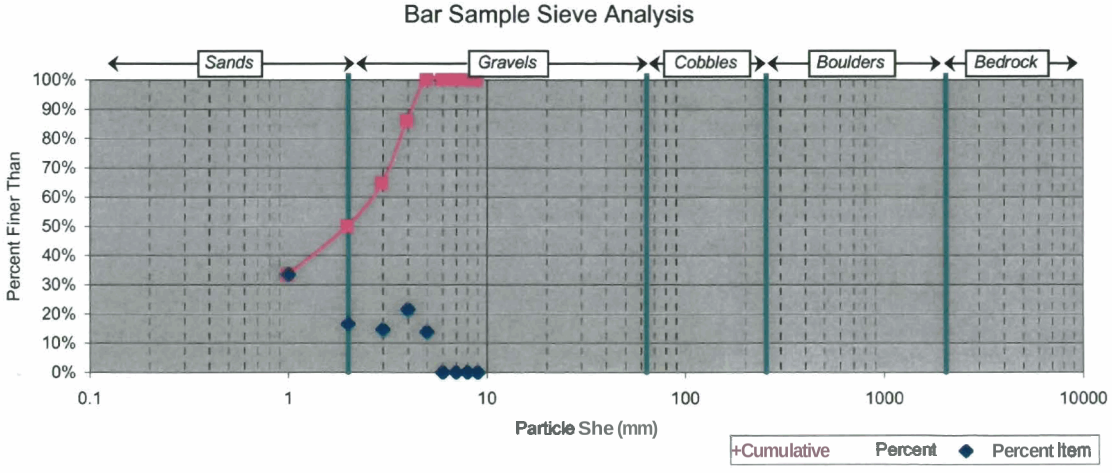
GRAND TOTAL SAMPLE WEIGHT

NOTES

Bar Sample Sieve Analysis

Smallest Sieve Passed (mm)	Weight (oz)	% Item	Percent Finer Than
2.0	64	33.5%	33.5%
4.0	31.5	16.5%	50.0%
8.0	28.0	14.7%	64.7%
16.0	41.0	21.5%	86.1%
31.5	26.5	13.9%	100.0%
64.0	0.0	0.0%	100.0%
128.0	0.0	0.0%	100.0%
256.0	0.0	0.0%	100.0%
> 256.0	0.0	0.0%	100.0%
Total:	191.0	100%	

Stream: UT to Jackson Creek (Briles) - Sub-Pavement #2
Watershed: Jackson Creek - Cape Fear River
Location: Sub-Pavement #2 near Station 24+50
Note:



D16	D35	D50	D84	D95	silt/clay	rand	gravel	cobble	boulder	bedrock
2.1	2.1	4.0	14.9	24.7	0%	34%	66%	0%	---	---