BIG WARRIOR STREAM RESTORATION MITIGATION PLAN

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1.0 INTRODUCTION

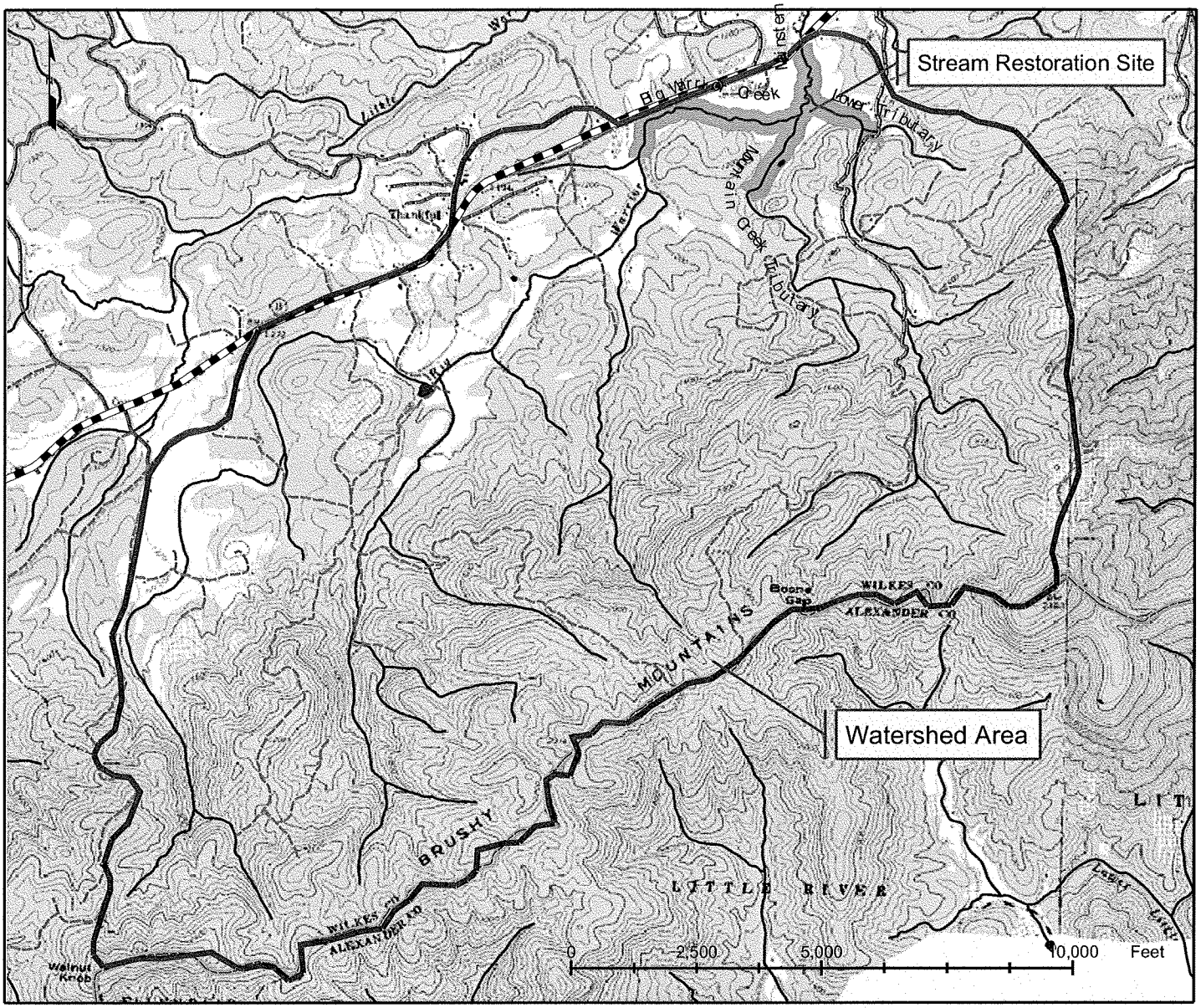
The North Carolina Ecosystem Enhancement Program (NCEEP) has completed a stream restoration project along Big Warrior Creek in Wilkes County, North Carolina. The project site includes the lower mainstem of Big Warrior Creek, as well as two of its tributaries, for a total restoration length of approximately 11,035 feet. This report provides baseline monitoring results from the project and sets forth a monitoring plan for the next five years.

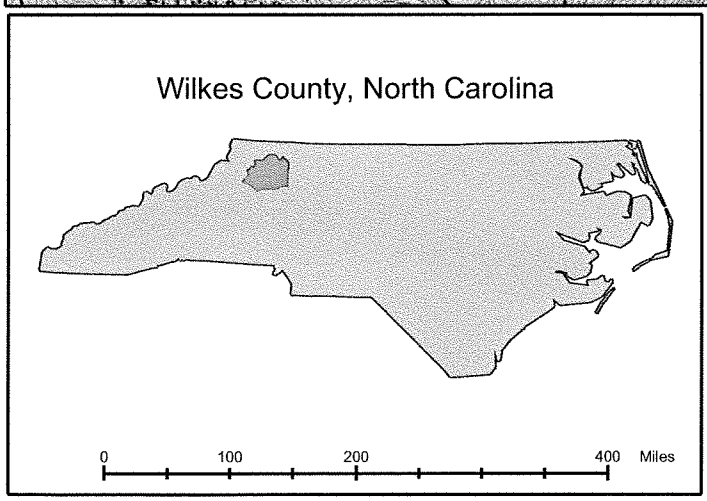
The Big Warrior Creek Stream Restoration project is located in Wilkes County, North Carolina, approximately 8 miles southwest of the Town of Wilkesboro (Figure 1). Big Warrior Creek and its tributaries originate in the Brushy Mountains near the boundary between Wilkes County and Alexander County. The streams begin in the sloped, wooded foothills of the Brushy Mountains and flows through a broad agricultural valley. Downstream of the project area, Big Warrior Creek ultimately flows into the W. Kerr Scott Reservoir along the Yadkin River.

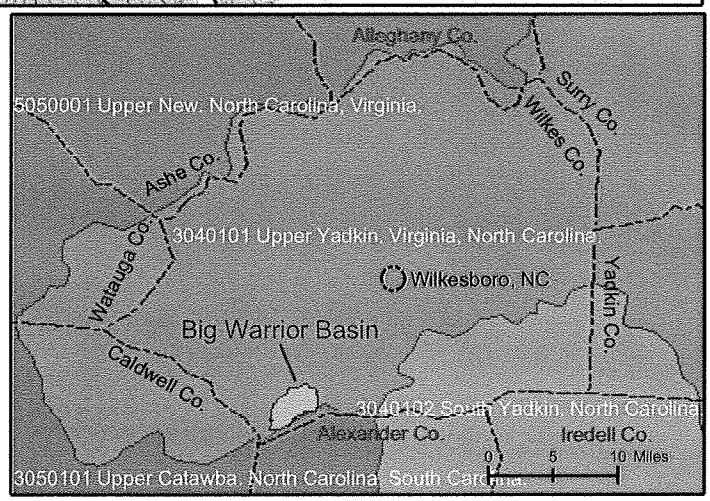
From its downstream end at the box culvert under NC State Highway18, the completed project extends upstream approximately 7,185 feet through pastureland and along the northern perimeter of a low-lying hillslope. Through the project area, the mainstem stream is a third-order channel (at 1:24,000 scale). Two second-order tributaries join the mainstem channel within the study area. The project includes restoration of portions of the tributaries, including 2,415 feet of the upstream-most Mountain Creek Tributary (as referenced in a historical deed) and approximately 1,435 feet of the downstream-most tributary—hereinafter referred to as "Lower Tributary." Mountain Creek Tributary flows unimpeded from a steep, forested colluvial valley before reaching the project area. Lower Tributary emerges from a confined colluvial valley and passes through a culvert under Boone Gap Road to enter the project area.

The overarching goal of the project is to establish a stable planform, cross-sectional, and profile pattern to Big Warrior Creek and its tributaries, with the premise that geomorphic and habitat function will follow appropriate channel form. Specific objectives included the following:

1. Reduce bank erosion.
2. Exclude cattle from the stream and riparian zone.
3. Improve water quality.
4. Establish a floodplain at a lower elevation.
5. Enhance in-stream habitat.
6. Improve functional and aesthetic value of the riparian corridor.
7. Preserve existing beneficial channel, floodplain features, and riparian vegetation.







Ecosystem Enhancement Program

Big Warrior Creek Restoration
Wilkes County, North Carolina
Biohabitats Project No. 02803.01

Figure 1
Location of Big Warrior Creek Restoration

CDM

Biohabitats

2.0 SUMMARY

The physical monitoring described in this Mitigation Plan is intended to provide a framework for documenting channel and riparian conditions in the 5 years following project construction. This information is needed to diagnose unforeseen problems resulting from the design and construction of the project and/or changes in the stream environment.

This Mitigation Plan presents an overview of the stream restoration site, the methodologies utilized in developed baseline (post-construction) conditions, and recently recorded baseline monitoring data. Success criteria are established for use in evaluating monitoring data collected over the next 5 years. In the event that problems are identified during monitoring, a contingency plan is outlined to suggest immediate remedial actions.

2.1 Description

In November 2004 a stream restoration design and construction project using natural stream channel geometry design parameters was completed on Big Warrior Creek in Wilkes County, North Carolina near Wilkesboro. The project was undertaken by the Ecosystem Enhancement Program (EEP) of the North Carolina Department of Environment and Natural Resources. CDM and Biohabitats have established the monitoring stations and protocol, and collected baseline monitoring data. The stream restoration design entailed reconfiguration of the cross-sectional geometry, planform pattern, and channel profile and reforestation of the alluvial valley to improve physical conditions at the site.

2.2 Field Methods

The following section describes the methods applied to establish monitoring stations and collect monitoring data. Parameters to be measured during each monitoring period include longitudinal profile, channel cross sections, pebble counts, photographs, and vegetative plots. Locations of all monitoring stations are depicted in the planform maps in Appendix A.

2.2.1 Longitudinal Profile and Cross Sections

Eight locations for channel cross sections were selected by Biohabitats and CDM for monitoring. Permanent rebar monuments were created by the Contractor's surveyor, WK Dickson, along both sides of each cross section. Established elevations are indicated by wooden stakes at each monument. These monuments were used to tie the cross sections and longitudinal profile into real vertical space during survey data reduction. There is also one North Carolina Geological Survey (NCGS) monument near the site referred to as "3 ATA." If the rebar monuments cannot be relocated, future surveying for this monitoring plan can tie into this NCGS monument.

Following installation of the rebar monuments, the eight cross sections were surveyed with a standard survey level, survey rod and measuring tapes. Baseline cross-sectional measurements are intended to document a range of future adjustments in channel geometry. Cross-sectional features measured during the surveying efforts included monumented cross-sectional endpoints (capped rebar), topographic breaks in slope, bankfull indicators, edge of water at time of survey, and channel features that may influence the direction and/or speed of flow in the channel. The locations of monumented cross sections are shown by numbered, dark blue line segments in Appendix A. Results from the baseline cross-sectional measurements are shown in Appendix C. Two of the cross sections (#2 and #3) overlap the longitudinal profile.

One continuous thalweg profile was surveyed through a 2,000+-foot section of the project reach to establish baseline streambed elevations. Features such at riffles and pools were noted in the survey. The location and elevation of flow deflection and grade control structures such as rock vanes and rock cross vanes were also surveyed. The extent of the field-surveyed longitudinal profile is shown by magenta line segments on Sheets 2 through 4 of Appendix A. The baseline longitudinal profile from December 2004 is shown in Appendix B.

To construct the baseline profile survey shown in Appendix B, measuring tapes were stretched end-to-end along the thalweg to record cumulative distance downstream. Because the thalweg will adjust slightly in planform from year to year, it should be expected that the total reach length will be somewhat different for each monitoring year. As a result, a point at a given distance on a

field-surveyed profile graph may not represent the same location shown on the as-built survey plan (Appendix A). The magnitude of the offset can, however, be evaluated by locally comparing the x-axis "distance" of a stationary in-stream structure (e.g., a cross vane) between years.

2.2.2 Pebble Counts

To evaluate textural properties of the bed following completion of construction, pebble counts were conducted at each cross section location using standard Wolman pebble count methodology (Wolman, 1954). The 100 particles selected for sampling were chosen from pool and riffle units in proportion to the percentage area that the channel units represented through the sample area (e.g., for a reach with 40% riffle and 60% pool, 40 particles were selected from the riffle and 60 particles were selected from the pool). Baseline results from the pebble counts are shown in Appendix D. Pebble counts taken in the future at these same locations will be compared with the baseline data in this report to establish changes in particle size and persistence of riffle armoring.

2.2.3 Photographs

To document the overall channel stability and development of the riparian zone with time, photographs were taken along the length of the project reach. These photographs were not monumented, but were taken from vantages providing clear views of the channel banks, structures, and vegetation. The vantages of these photographs may change with time if conditions (e.g. vegetation growth, bank erosion) warrant it. Baseline photographs are included in this report in Appendix E.

2.2.4 Vegetation Plots

Seven (7) sample vegetation plots were established in the field. The locations of vegetation sampling were selected using predetermined sample plot locations to straddle a range of planting zones. The locations of vegetation plots are shown on Sheets 11 through 20 of Appendix A. At each monitoring location, a center point and four (4) additional points were identified around which to configure the sampling. The center points of the sample plots were marked in the field by partially embedded 4-foot long rebar with yellow caps, and will be reoccupied annually.

The four sample points around the center point were located due North, South, East and West of the center point, each approximately 37 feet from the center point. The 37-foot radial distance equates to approximately 1/10 of an acre. At each of the five points, a 6-foot diameter circle was established to estimate percent understory cover, canopy closure, and herbaceous cover. All trees and shrubs within the 37-foot radius were identified and tallied and the overall condition of the tree or shrub was assessed to identify mortality, herbivory, disease, and/or infestation. A sampling data worksheet was used to compile the data gathered at each of the sample plots. Baseline monitoring results for each plot are shown in Appendix F, along with a summary of cumulative tree density at the beginning of the appendix. Monitoring results show an average tree density of 279 stems/acres, which falls short of the State requirement of 320 stems per acre.

2.3 Plan View of Project

Appendix A includes scaled 11" by 17" planform maps adapted from the as-built drawings to reflect monitoring locations. The plots show the as-built topography superimposed on the design plans for reference. The maps show the location of all in-stream structures, vegetation planting zones, vegetation sample plots, and the easement boundary. Final planting schedules corresponding with species planted by planting zone are shown in Appendix G. Many changes were made during construction in the field with the agreement of the Designer and the Contractor based on professional judgment of what would improve the installation.

2.4 Contact Information

The table below summarizes contact information for the design firm, construction firm, and the Wetlands Restoration Program.

Table 2.1 Contact Information for Brown Branch Stream Restoration

Design Firm	Construction Firm	NCEEP
Address: CDM 5400 Glenwood Avenue, Suite 300 Raleigh, NC 27612	**Address:** Shamrock Environmental Corporation, Inc. P.O. Box 14987 Greensboro, NC 27415	**Address:** NC Ecosystem Enhancement Program 1652 Mail Service Center Raleigh, NC 27699-1652

Design Firm	Construction Firm	NCEEP
Phone: (919) 787-5620	**Phone:** (336) 375-1989	**Phone:** (919) 715-1157
Primary Contact: Kelly Boone	**Primary Contact:** Bill Wright	**Project Manager:** Jeff Jurek

3.0 SUCCESS CRITERIA

Determining whether changes in stream conditions constitute problems can be difficult. Streams, by their nature, are dynamic systems which gradually adjust their cross section, profile, and planform with changing environmental conditions. Because rivers are dynamic systems which are subject to catastrophic events, evaluation of changes in the newly constructed channel must be taken in the context of the entire river system. Therefore, each annual monitoring plan will synthesize all monitoring results to evaluate if a local change does in fact pose a problem to the larger stream restoration project.

To evaluate the physical success of the constructed stream restoration, monitoring results will be reviewed annually from Year 1 through Year 5. Results from that monitoring will be evaluated in terms of the success criteria outlined below. If results show that significant problems have developed between monitoring rounds, a suite of contingencies will be undertaken, as outlined in Section 6.0.

3.1 Channel Dimension

Channel aggradation (bar formation) and/or degradation (bed and bank scour) all occur naturally as part of fluvial processes and one should not be overly concerned when they occur, especially in areas where they are expected. Unexpected occurrence of channel bars and/or bed scour of the new channel may form after a storm event, but these changes are typically transient and may be reversed by the next storm. These features will be noted during all scheduled monitoring to ascertain if they are temporary, static, or growing. Monumented cross sections will provide the best means for evaluating channel dimension during the monitoring period. Table 3.1 summarizes success criteria for the cross-sectional monitoring data to help determine if observed changes shall be considered as in the realm of acceptable channel dynamics versus contrary to the intent and integrity of the project.

In meander cross sections, some erosion of the outer bank and along the pool bottom will not constitute a problem. To indicate success, most pools should persist in meander bends, most

riffles should persist in straight sections, and cross-sectional areas should show no radical change in width/depth ratio. Along the pool, however, if erosion is very rapid (e.g., 1 ft/yr) and continues for five years, some contingency measure should be undertaken. Also if the progression of bed or bank scour threatens the overall stability of the bank, its structures or in-stream structures, again, the problems will need to be addressed. Similarly, if a bar is aggrading (growing) it could expand to the point where flows are directed into one or both banks causing erosion and possible bank failure. In this case the bar needs to be removed before bank failure occurs and the cause of the bar formation should be determined.

Table 3.1 Summary of Success Criteria for Channel Dimension

Associated Monitoring Tasks	Success Criteria
Permanent Cross Sections	▪ Pools are maintained in most meanders; riffles persist in most straight reaches. ▪ Measured bankfull dimensions are similar (+/-25%) to that of design and/or within range of ratios for reference reaches ▪ No rapid, chronic bank erosion (> 1 ft/yr) and/or imminent threat to bank stability ▪ No significant mid-channel bar development in riffles; thalweg does not bifurcate ▪ No significant chronic sedimentation in pools

Bar formation is often caused by debris jams. Large woody debris is generally beneficial to natural streams, where it creates important habitat niches and affects sediment dynamics. However, in a newly constructed channel without the stabilizing role of bank vegetation, large woody debris can deflect flow and cause local scour beyond the intended short-term range of stream dynamics. Therefore, large accumulations of woody material during the first five years after construction could be problematic. Such deleterious debris jams will be removed along with the bar material, and grade control structures will be modified to stop the accumulation of sediments.

In riffle cross sections, some aggradation and/or degradation is expected as the thalweg shifts slightly across the bankfull channel and as frequent flood events slightly reshape the banks.

However, if bar development is so pronounced that the thalweg is split and flow is directed towards a vulnerable bank, some contingency measure may be undertaken.

3.2 Channel Planform Pattern

The overall channel pattern and therefore sinuosity should remain the same during the monitoring period. Significant planform problems that would warrant contingencies include a meander cutoff, extensive erosion in the vicinity of bank and bed protection structures, and debris jams obstructing or redirecting flow. Table 3.2 outlines these success criteria. Both the longitudinal profile and photographs will provide a means for assessment of channel planform pattern.

Table 3.2 Summary of Success Criteria for Channel Planform Pattern

Associated Monitoring Tasks	Success Criteria
Longitudinal Profile (to obtain thalweg length)	▪ Measured sinuosity is same as as-built design (+/- 0.1 ft/ft), based on measured thalweg length and same valley length
Photographs	▪ No channel avulsions ▪ No significant changes in radius of curvature ▪ Valley and stream types persist

3.3 Longitudinal Profile

Table 3.3 summarizes success criteria for evaluation of Big Warrior Creek's longitudinal profile. Monitoring of the longitudinal profile will indicate success if the general pool/riffle sequence persists through the monitoring period—that is, pools remain in meander bends and riffles remain in straight sections of the channel. The most serious problem that could occur would be the development of a headcut that progresses past a grade control device. If this is observed, contingency measures should be undertaken immediately (see Section 6.0).

Particularly in the first few years of monitoring, we anticipate that the extent of individual riffles will change. For example, the downstream end of a riffle may extend somewhat

towards a pool, but should not completely fill or eliminate the pool feature. Conversely, if scour during high flows mobilizes sediment through a pool, the pool may extend longitudinally or deepen.

Table 3.3 Summary of Success Criteria for Longitudinal Profile

Associated Monitoring Tasks	Success Criteria
Longitudinal Profile	▪ Pool-riffle sequences persist in sequence with planform pattern (i.e. pools generally in meander bends; riffles generally in straight sections) ▪ No development of headcuts ▪ Riffle slopes do not exceed reference reach and/or design values ▪ Measured thalweg length undergoes little change (+/- <200ft)

3.4 Channel Bed Materials

We expect that pebble counts will indicate some fluctuations in the grain-size distribution of bed materials, and possibly some minor net coarsening as finer materials are flushed from the bed with time. As shown in Table 3.4, success criteria include pools remaining distinctly finer than riffles, and no major shift in the median classification of the grain-size distribution (e.g., a gravel-dominated section becomes sand-dominated). A major deviation in particles size may indicate an adjacent or upstream erosion problem, and should be evaluated for its root cause.

Table 3.4 Summary of Success Criteria for Channel Bed Materials

Associated Monitoring Tasks	Success Criteria
Pebble Counts	▪ D_{50} and D_{84} measurements remain gravel-sized (as based on percent pools and riffles) ▪ Some coarsening of riffles and/or fining of pools may occur

3.5 Photographs

Repeat photography should show no major changes in channel pattern and no progressive bank erosion. In addition, photographs should indicate the net survival and gradual growth of vegetation in the planting zones through the project (Table 3.5). Non-monumented photographs of bank and bed structures should show no serious threat to their stability during monitoring.

Table 3.5 Summary of Success Criteria for Photo Points

Associated Monitoring Tasks		Success Criteria
Photographs	Permanent Photo Stations	▪ No rapid, chronic bank erosion ▪ No major change in planform pattern ▪ Vegetation growth evident
	Non-monumented Photographs	▪ No threat to structural stability of structures

3.6 Vegetation Survival

North Carolina State guidelines require the survival of at least 320 tree stems/acre. Success will be determined by survival of tree species within the sample plots. In addition, at least six different planted tree species should be present at the entire site. If the vegetative success criteria are not met, the cause of failure will be determined and appropriate corrective action will be taken.

Herbaceous vegetation is also extremely important to riparian function and ultimate project success. Herbaceous species provide below-ground and above-ground habitat, ameliorate soil compaction while increasing infiltration rates, introduce organic matter into the soil, and prevent soil erosion. A target coverage of 80% is recommended for the project during each monitoring year. If the 80% criteria is met, but large contiguous patches of bare soil appear in erosion-prone areas, these areas may also warrant additional attention.

Table 3.6 Summary of Success Criteria for Vegetation Survival

Associated Monitoring Tasks	Success Criteria
Vegetation Plots	▪ Survival is at least 320 stems/acre for trees after 5 years ▪ At least 6 planted species are represented in surviving species
Photographs	▪ Vegetation growth evident throughout planted zones ▪ Vegetation forms contiguous riparian zone ▪ At least 80% herbaceous coverage maintained, with no problematic contiguous bare areas

4.0 MONITORING SCHEDULE

The Big Warrior Creek Stream Restoration was officially accepted following a final walkthrough on November 12, 2004. The as-built monitoring results described in this report will be followed by five rounds of annual monitoring guided by the Ecosystem Enhancement Program. Following each year of monitoring outlined in Table 4.1, a revised monitoring report will be submitted to the Corps.

Vegetation monitoring is most successfully conducted during the growing season when leaf coverage is good. Therefore, annual monitoring could occur during each August (or as late as early September) to aid plant species identification while still approximating a year-long lapse since the November completion date. At present, the EEP has not delegated data collection and report preparation for monitoring in Years 2 through 5. This will be determined at a later date.

Table 4.1 Proposed Monitoring Schedule

Monitoring Parameter	Post-Construction Documentation	Annual Monitoring*				
		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
		Aug, 2005	Aug. 2006	Aug. 2007	Aug. 2008	Aug. 2009
Cross Sections	■	X	X	X	X	X
Longitudinal Profile	■	X	X	X	X	X
Permanent Photo Stations	■	X	X	X	X	X
Photos of Structures	■	X	X	X	X	X
Vegetation	■	X	X	X	X	X

* Most construction was completed in September 2002 (minor punch list items were completed in January 2003). Installation of vegetation was completed in February 2003. Annual monitoring should be conducted during August, when vegetation can be evaluated sufficiently prior to the dormancy.
■ = Baseline data collected (provided in this report)
X = Measurement proposed

5.0 MITIGATION

The Big Warrior Stream Restoration includes portions that quality as "Restoration" and as "Enhancement." The definitions of the two approaches are reviewed below in the context of the design.

5.1 Stream Restoration

The majority of the constructed channel qualifies as "Restoration," under the following definition following the April 2001 (Version 3.0) "Internal Technical Guide for Stream Work in North Carolina" by NCDENR:

> *"Stream restoration is defined as the process of converting an unstable, altered or degraded stream corridor, including adjacent riparian zone and flood-prone areas to its natural or referenced, stable conditions considering recent and future watershed conditions. This process also includes restoring the geomorphic dimension, pattern, and profile as well as the biological and chemical integrity, including transport of water and sediment produced by the stream's watershed in order to achieve dynamic equilibrium."*

The total length of constructed stream that qualifies for restoration is 10,585 feet, and includes the full lengths of the restored tributaries (2,415 along Mountain Creek, 1,435 feet along Lower Tributary) and the contiguous length of the mainstem from STA 0+00 upstream to STA 67+35. The channel design through these areas was based on reference reach data (dimension, pattern, and profile) from similar, stable streams in the same geographic province of North Carolina. The design also accounted for watershed hydrology, stream hydraulics, and associated sediment transport processes.

5.2 Stream Enhancement

Upstream of STA 67+35 along the mainstem, the design included minor bank regrading, the installation of bank protection (log toe protection) and in-stream structures (rock J-vane and rock cross vane), and revegetation. However, the channel cross-section and planform geometry were not significantly modified. This 450-foot section qualifies as "Stream Enhancement" under the Internal Technical Guide's definition:

"Stream enhancement is the process of implementing certain stream rehabilitation practices in order to improve water quality and/or ecological function. These practices are typically conducted on a stream bank or in the flood prone area. For example, an enhancement procedure may be fencing out a stream from cattle and re-establishing vegetation in order to provide stream bank stability. However, these types of practices should only be attempted on a stream reach that is not experiencing severe aggradation or erosion. Enhancement activities may also include the placement of instream habitat structures. However, care must be taken to ensure that the placement of the instream structures will not affect the overall dimension, pattern, or profile of a stable stream."

6.0 MAINTENANCE AND CONTINGENCY PLANS

Table 6.1 summarizes contingency plans for common problems that may be identified during monitoring.

Table 6.1 Stream Restoration Contingency Plan

Parameter	Concern	Contingency Plan	Timeframe*
Cross Section	Severe bank erosion threatening stability of bank and/or bed/bank structure(s)	▪ Pump baseflow around work area ▪ Place large rock(s) (min. 30" dia.) at base of scour ▪ Fill scour area with clean fill ▪ Place topsoil in eroded area and compact. Seed with permanent seed mixture and stabilize with biodegradable matting ▪ Plant with Sandbar willow (*Salix exigua, interior*) or Silky willow (*Salix sericea*) and Silky dogwood (*Cornus amomum*) (1' - 2' cont.) on outer edge of eroded area.	Monthly
Planform	Serious bank erosion in vicinity of bank/bed structure(s)	▪ Place top soil in eroded area and compact. Seed with permanent seed mixture and stabilize with biodegradable matting ▪ Plant with Sandbar willow (*Salix exigua, interior*) or Silky willow (*Salix sericea*) and Silky dogwood (*Cornus amomum*) (1' - 2' cont.) on outer edge of eroded area	Monthly
	Debris jam or beaver dam obstructing/ redirecting flow	▪ Remove any obstruction that forms within the first five years	Monthly
Profile	Headcut progresses past grade control device	▪ Pump baseflow around work area ▪ Stabilize head cut with placed large rock (min. 30" dia.) structure, such as a cross vane or step, as appropriate	Immediate
	Severe scour at downstream end of bed structure	▪ Divert flow away from work area or pump around ▪ Place large rock (min. 30" dia.) in scour hole without excavating ▪ Push rock down if necessary to make flush with channel	Monthly
Vegetation	Section of planted vegetation not growing or stem survival <320 tree stems/acre	▪ Determine reason for failure. ▪ If failure was due to insufficient light, and shade tolerant species were used, remove the dead plant material and plant containerized stock of shade tolerant shrubs such as silky dogwood (*Cornus amomum*), arrowwood (*Viburnum dentatum*), and blackhaw (*Viburnum prunifolium*). ▪ If failure was due to use of dead plant material, improper installation, disease, or drought, remove the dead plant material and replace with live plant material during the proper season.	Seasonally

*Timeframe is as follows: Immediate (1-7 days), Monthly (within 1 month), Seasonal (within 6 months).

7.0 REFERENCES

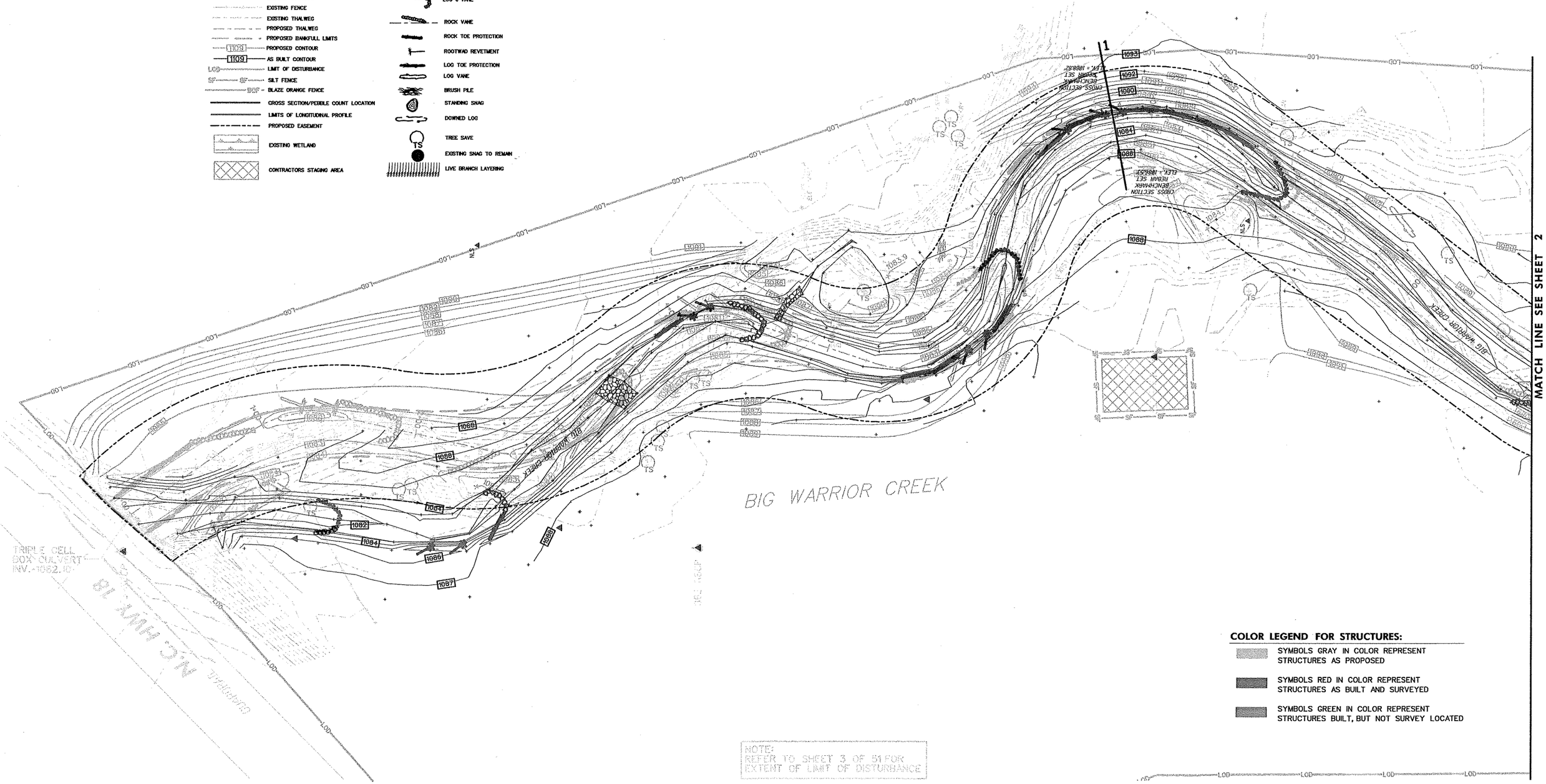
Internal Technical Guide for Stream Work in North Carolina, The Division of Land Resources (DLR) and The Division of Water Quality (DWQ), NCDENR, Version 3.0, April 2001.

Wolman, M.G., 1954. A method of sampling coarse river-bed material, Transactions of the American Geophysical Union, 35: 951-956.

Appendix A
PLANFORM MAPS

LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- EXISTING TREE
- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED CONTOUR
- AS BUILT CONTOUR
- LIMIT OF DISTURBANCE
- SILT FENCE
- BLAZE ORANGE FENCE
- CROSS SECTION/PEBBLE COUNT LOCATION
- LIMITS OF LONGITUDINAL PROFILE
- PROPOSED EASEMENT
- EXISTING WETLAND
- CONTRACTORS STAGING AREA
- ROCK CROSS VANE
- ROCK J-VANE
- LOG J-VANE
- ROCK VANE
- ROCK TOE PROTECTION
- ROOTWAD REVETMENT
- LOG TOE PROTECTION
- LOG VANE
- BRUSH PILE
- STANDING SNAG
- DOWNED LOG
- TREE SAVE
- EXISTING SNAG TO REMAIN
- LIVE BRANCH LAYERING



COLOR LEGEND FOR STRUCTURES:

- SYMBOLS GRAY IN COLOR REPRESENT STRUCTURES AS PROPOSED
- SYMBOLS RED IN COLOR REPRESENT STRUCTURES AS BUILT AND SURVEYED
- SYMBOLS GREEN IN COLOR REPRESENT STRUCTURES BUILT, BUT NOT SURVEY LOCATED

NOTE:
REFER TO SHEET 3 OF 51 FOR EXTENT OF LIMIT OF DISTURBANCE

SCALE
0 30 60

REVISION		
DATE	BY	DESCRIPTION

SEAL

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
APPROVED:
Biohabitats Project No. 02803.01

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• Fostering Ecological Stewardship •

BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 1 OF 20

MATCH LINE SEE SHEET 1

LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- EXISTING TREE
- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
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- SYMBOLS GREEN IN COLOR REPRESENT STRUCTURES BUILT, BUT NOT SURVEY LOCATED

NOTE:
REFER TO SHEET 3 OF 51 FOR EXTENT OF LIMIT OF DISTURBANCE

BIG WARRIOR CREEK

LOWER TRIBUTARY

CULVERT

MATCH LINE SEE SHEET 3

MATCH LINE SEE SHEET 8

SCALE
0 30 60

REVISION		
DATE	BY	DESCRIPTION

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
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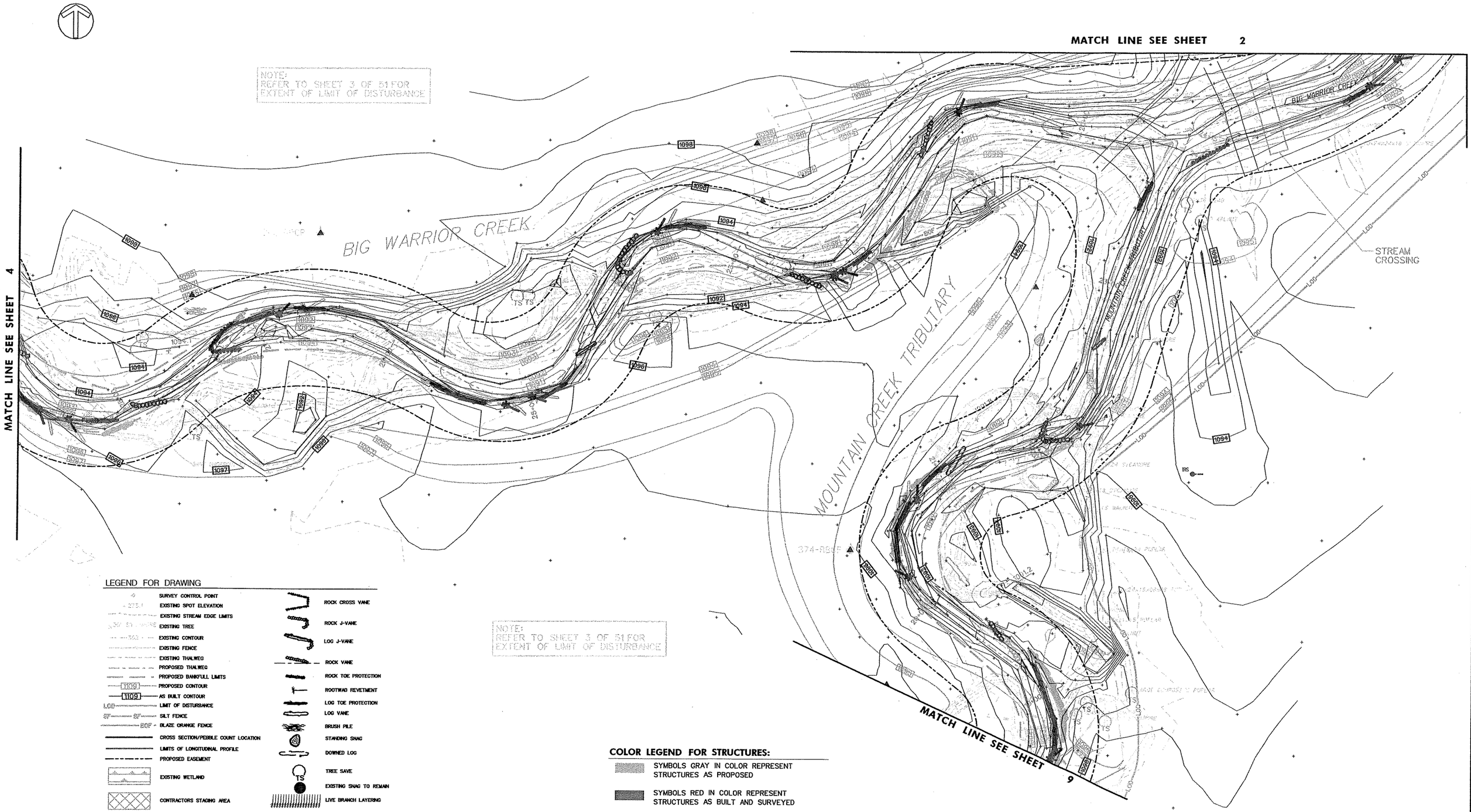
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 2 OF 20



LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- EXISTING TREE
- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED CONTOUR
- AS BUILT CONTOUR
- LIMIT OF DISTURBANCE
- SILT FENCE
- BLAZE ORANGE FENCE
- CROSS SECTION/PEBBLE COUNT LOCATION
- LIMITS OF LONGITUDINAL PROFILE
- PROPOSED EASEMENT
- EXISTING WETLAND
- CONTRACTORS STAGING AREA
- ROCK CROSS VANE
- ROCK J-VANE
- LOG J-VANE
- ROCK VANE
- ROCK TOE PROTECTION
- ROOTWAD REVETMENT
- LOG TOE PROTECTION
- LOG VANE
- BRUSH PILE
- STANDING SNAG
- DOWNED LOG
- TREE SAVE
- EXISTING SNAG TO REMAIN
- LIVE BRANCH LAYERING

COLOR LEGEND FOR STRUCTURES:

- SYMBOLS GRAY IN COLOR REPRESENT STRUCTURES AS PROPOSED
- SYMBOLS RED IN COLOR REPRESENT STRUCTURES AS BUILT AND SURVEYED
- SYMBOLS GREEN IN COLOR REPRESENT STRUCTURES BUILT, BUT NOT SURVEY LOCATED

SCALE
0 30 60

REVISION			
DATE	BY	DESCRIPTION	

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
APPROVED:
Biohabitats Project No. 02803.01

CDM Camp Dresser & McKee Inc.
consulting engineering construction operations
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Fax: 410-583-5678
• Fostering Ecological Stewardship •

BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

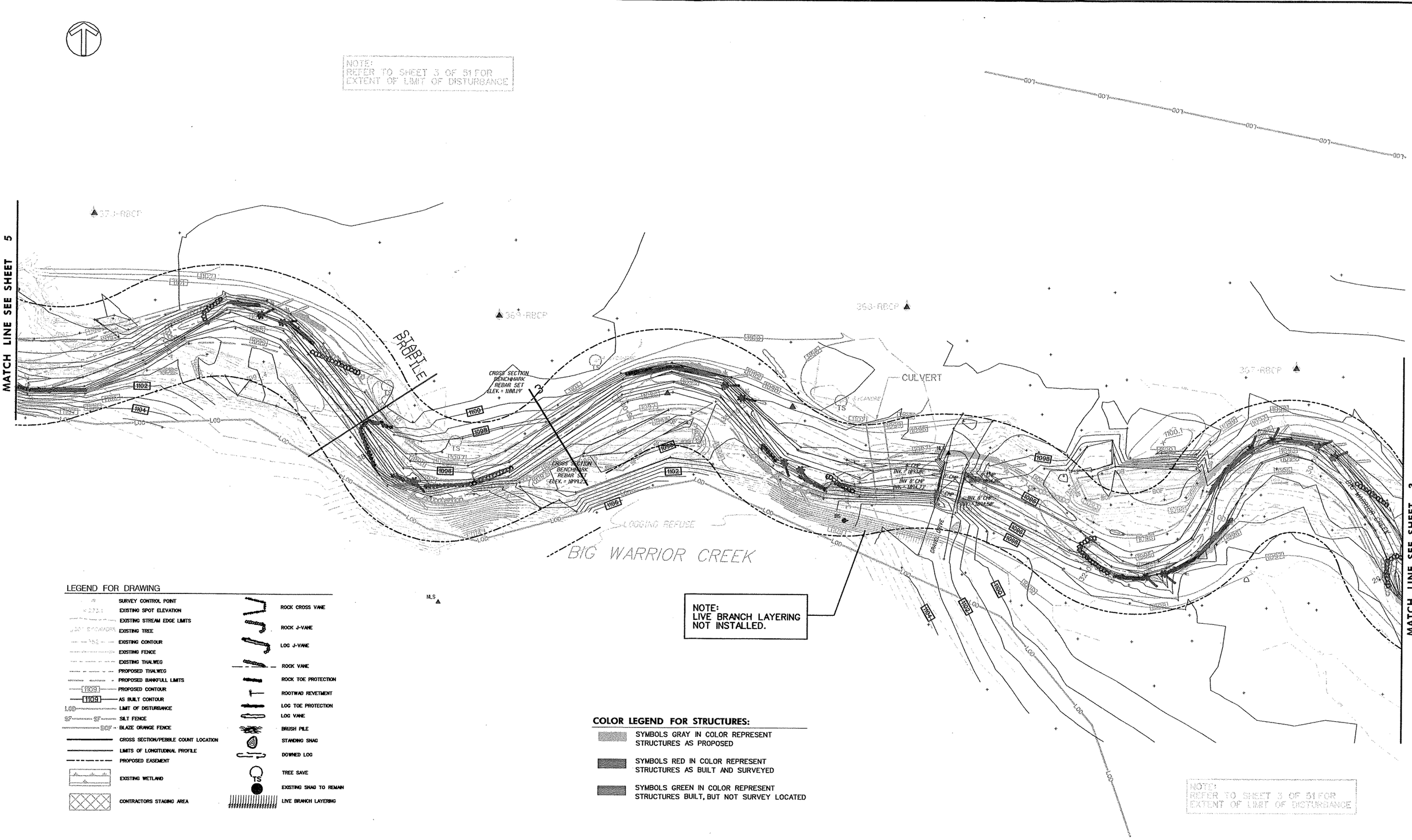
AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 3 OF 20

MATCH LINE SEE SHEET 5

MATCH LINE SEE SHEET 3

NOTE:
REFER TO SHEET 3 OF 51 FOR
EXTENT OF LIMIT OF DISTURBANCE



NOTE:
LIVE BRANCH LAYERING
NOT INSTALLED.

NOTE:
REFER TO SHEET 3 OF 51 FOR
EXTENT OF LIMIT OF DISTURBANCE

LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- EXISTING TREE
- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED CONTOUR
- AS BUILT CONTOUR
- LIMIT OF DISTURBANCE
- SILT FENCE
- BLAZE ORANGE FENCE
- CROSS SECTION/PEBBLE COUNT LOCATION
- LIMITS OF LONGITUDINAL PROFILE
- PROPOSED EASEMENT
- EXISTING WETLAND
- CONTRACTORS STAGING AREA
- ROCK CROSS VANE
- ROCK J-VANE
- LOG J-VANE
- ROCK VANE
- ROCK TOE PROTECTION
- ROOTWAD REVETMENT
- LOG TOE PROTECTION
- LOG VANE
- BRUSH PILE
- STANDING SNAG
- DOWNED LOG
- TREE SAVE
- EXISTING SNAG TO REMAIN
- LIVE BRANCH LAYERING

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- SYMBOLS GREEN IN COLOR REPRESENT STRUCTURES BUILT, BUT NOT SURVEY LOCATED

SCALE
0 30 60

REVISION			
DATE	BY	DESCRIPTION	

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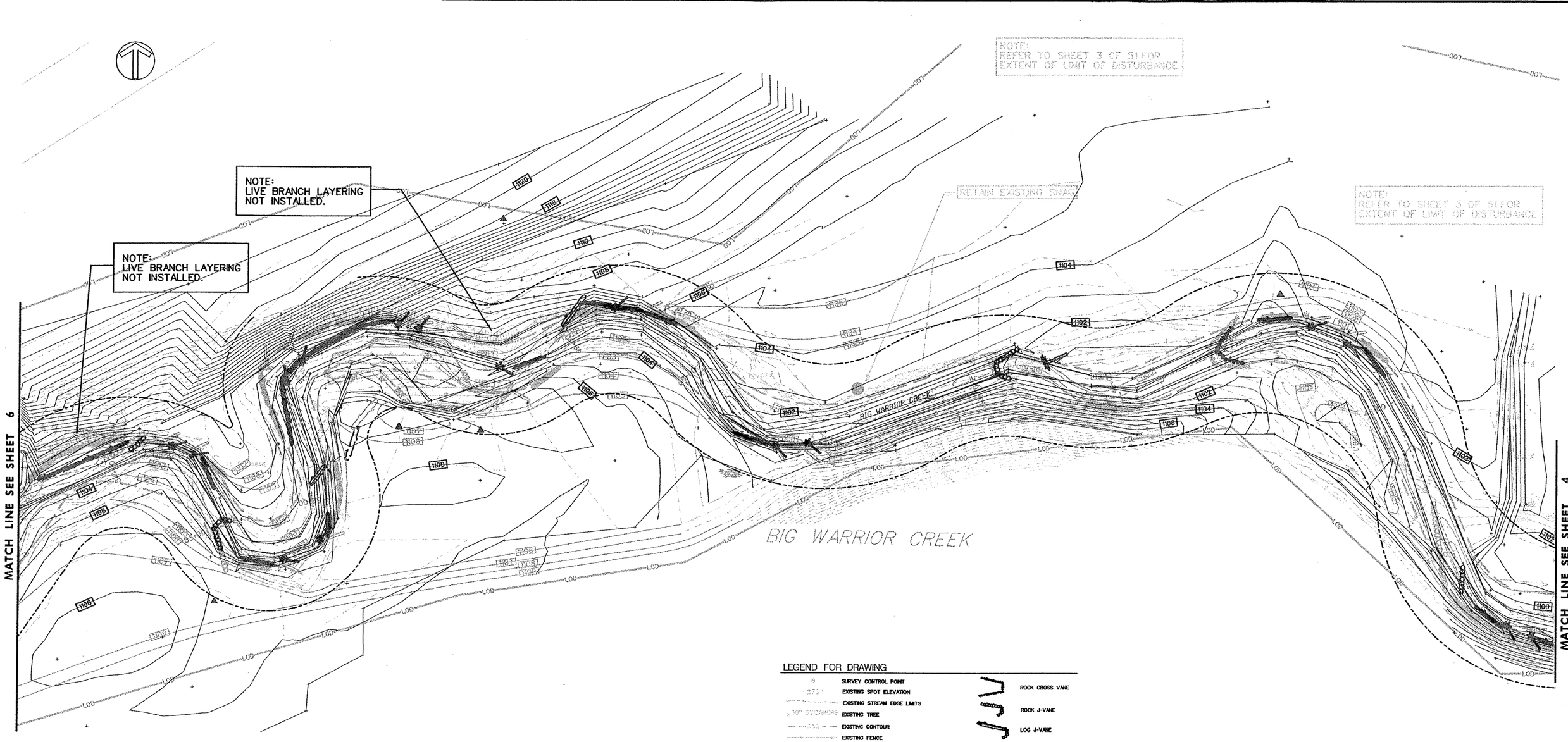
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 4 OF 20



LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- 273.1 EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- 30" SYCAMORE EXISTING TREE
- 153 EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- 1109 PROPOSED CONTOUR
- 1109 AS BUILT CONTOUR
- LOD LIMIT OF DISTURBANCE
- SF SILT FENCE
- BOF BLAZE ORANGE FENCE
- CROSS SECTION/PEBBLE COUNT LOCATION
- LIMITS OF LONGITUDINAL PROFILE
- PROPOSED EASEMENT
- EXISTING WETLAND
- CONTRACTORS STAGING AREA
- ROCK CROSS VANE
- ROCK J-VANE
- LOG J-VANE
- ROCK VANE
- ROCK TOE PROTECTION
- ROOTWAD REVETMENT
- LOG TOE PROTECTION
- LOG VANE
- BRUSH PILE
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- TS TREE SAVE
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SCALE
0 30 60

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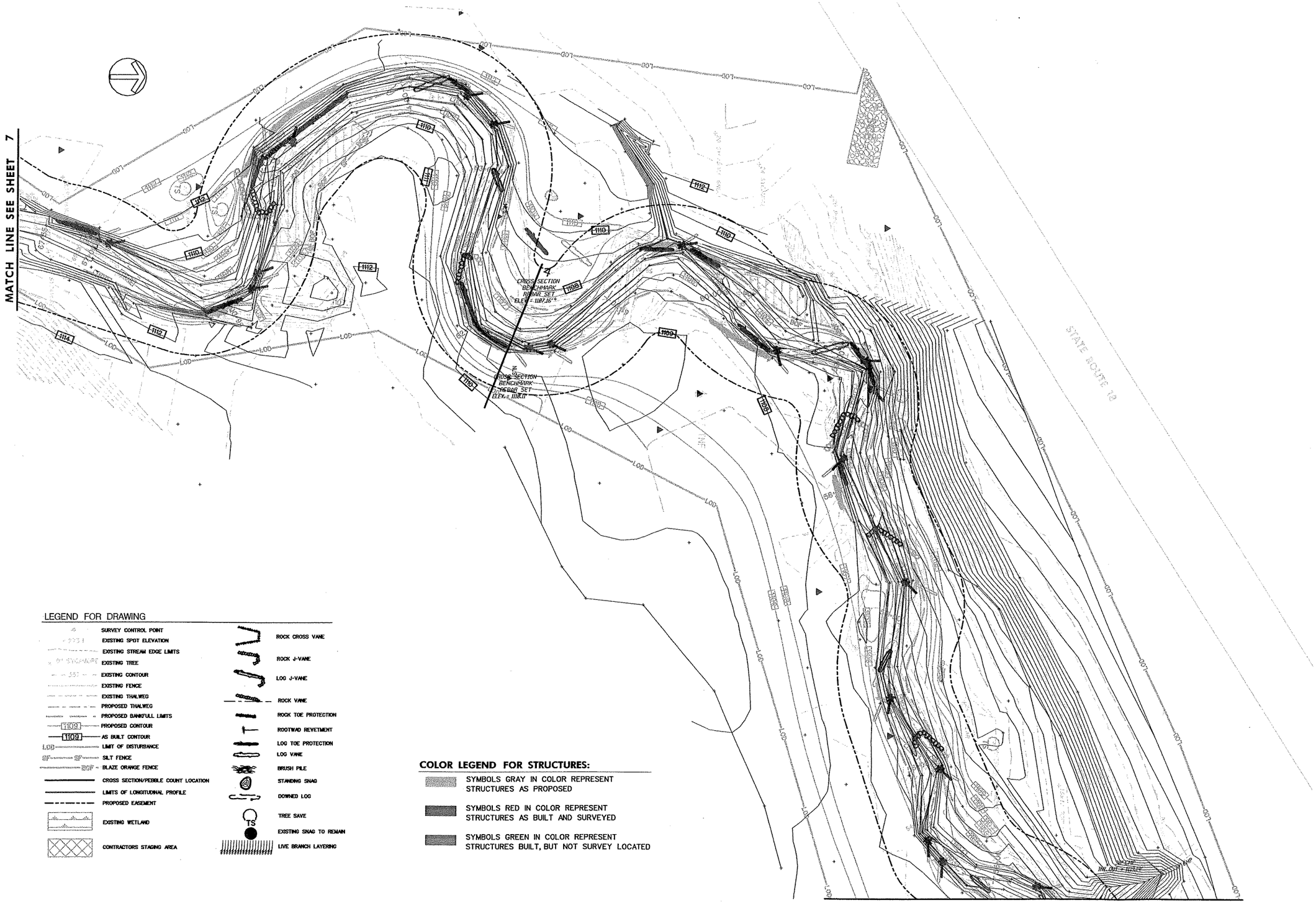
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 5 OF 20



LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- EXISTING TREE
- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED CONTOUR
- AS BUILT CONTOUR
- LIMIT OF DISTURBANCE
- SILT FENCE
- BLAZE ORANGE FENCE
- CROSS SECTION/PEBBLE COUNT LOCATION
- LIMITS OF LONGITUDINAL PROFILE
- PROPOSED EASEMENT
- EXISTING WETLAND
- CONTRACTORS STAGING AREA
- ROCK CROSS VANE
- ROCK J-VANE
- LOG J-VANE
- ROCK VANE
- ROCK TOE PROTECTION
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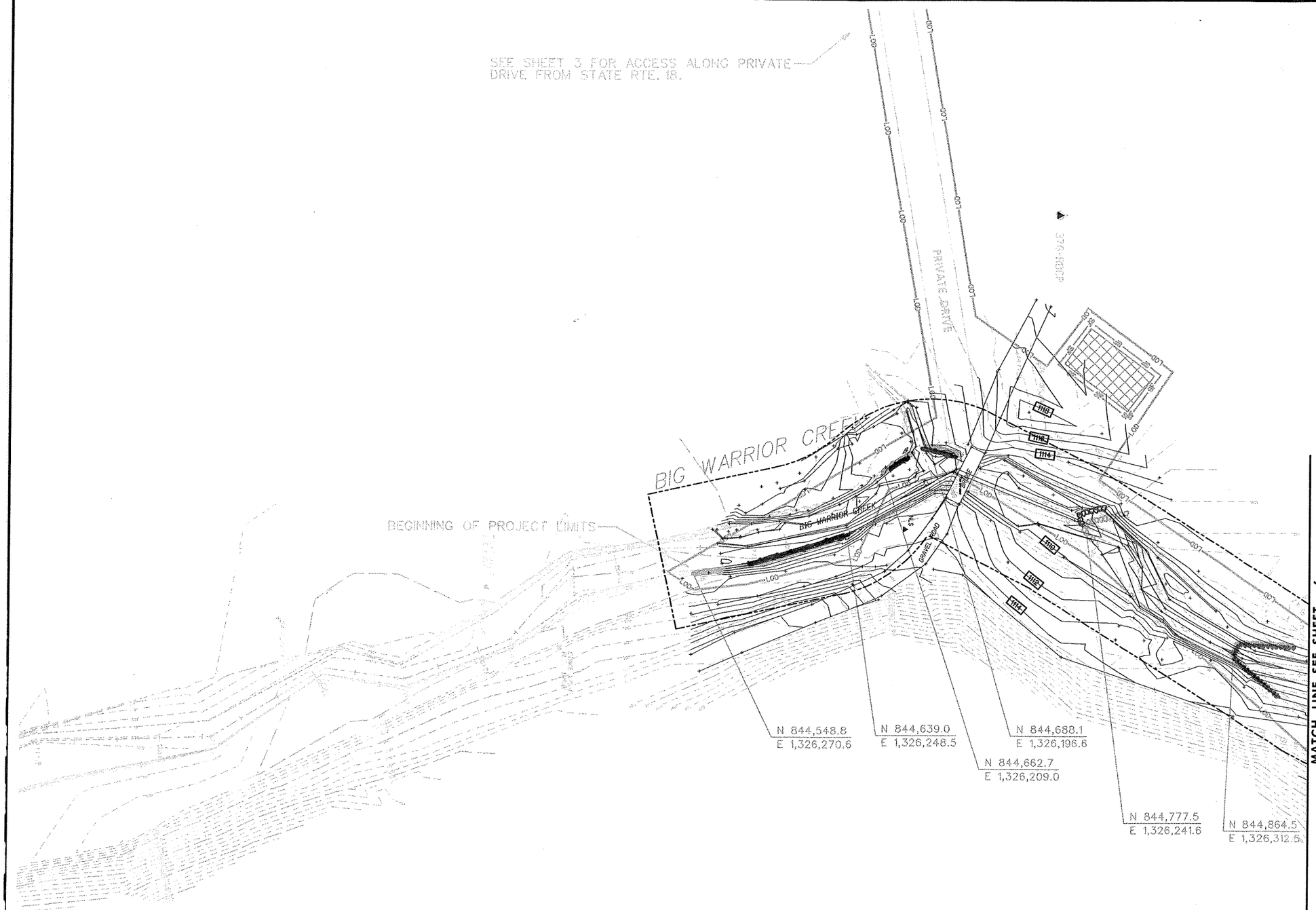
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 6 OF 20



LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- EXISTING TREE
- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- 1119 PROPOSED CONTOUR
- 1109 AS BUILT CONTOUR
- LOD LIMIT OF DISTURBANCE
- SF SILT FENCE
- BOF BLAZE ORANGE FENCE
- CROSS SECTION/PEBBLE COUNT LOCATION
- LIMITS OF LONGITUDINAL PROFILE
- PROPOSED EASEMENT
- EXISTING WETLAND
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- ROCK CROSS VANE
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- DOWNED LOG
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COLOR LEGEND FOR STRUCTURES:

SYMBOLS GRAY IN COLOR REPRESENT STRUCTURES AS PROPOSED

SYMBOLS RED IN COLOR REPRESENT STRUCTURES AS BUILT AND SURVEYED

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SCALE
0 30 60

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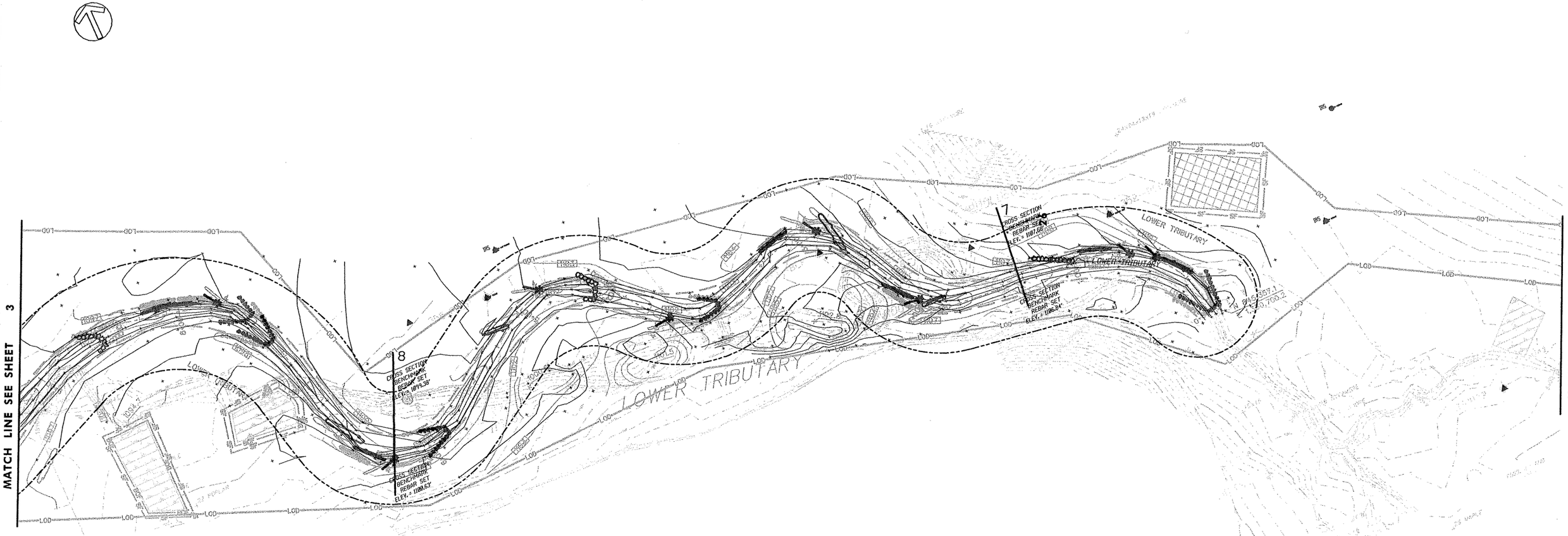
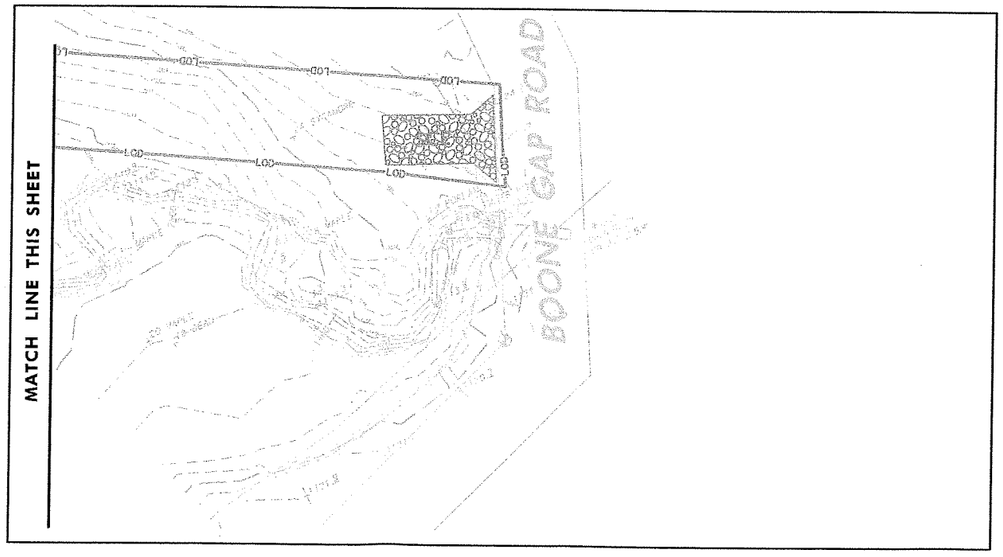
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 7 OF 20





LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- EXISTING TREE
- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED CONTOUR
- AS BUILT CONTOUR
- LIMIT OF DISTURBANCE
- SILT FENCE
- BLAZE ORANGE FENCE
- CROSS SECTION/PEBBLE COUNT LOCATION
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SCALE
0 30 60

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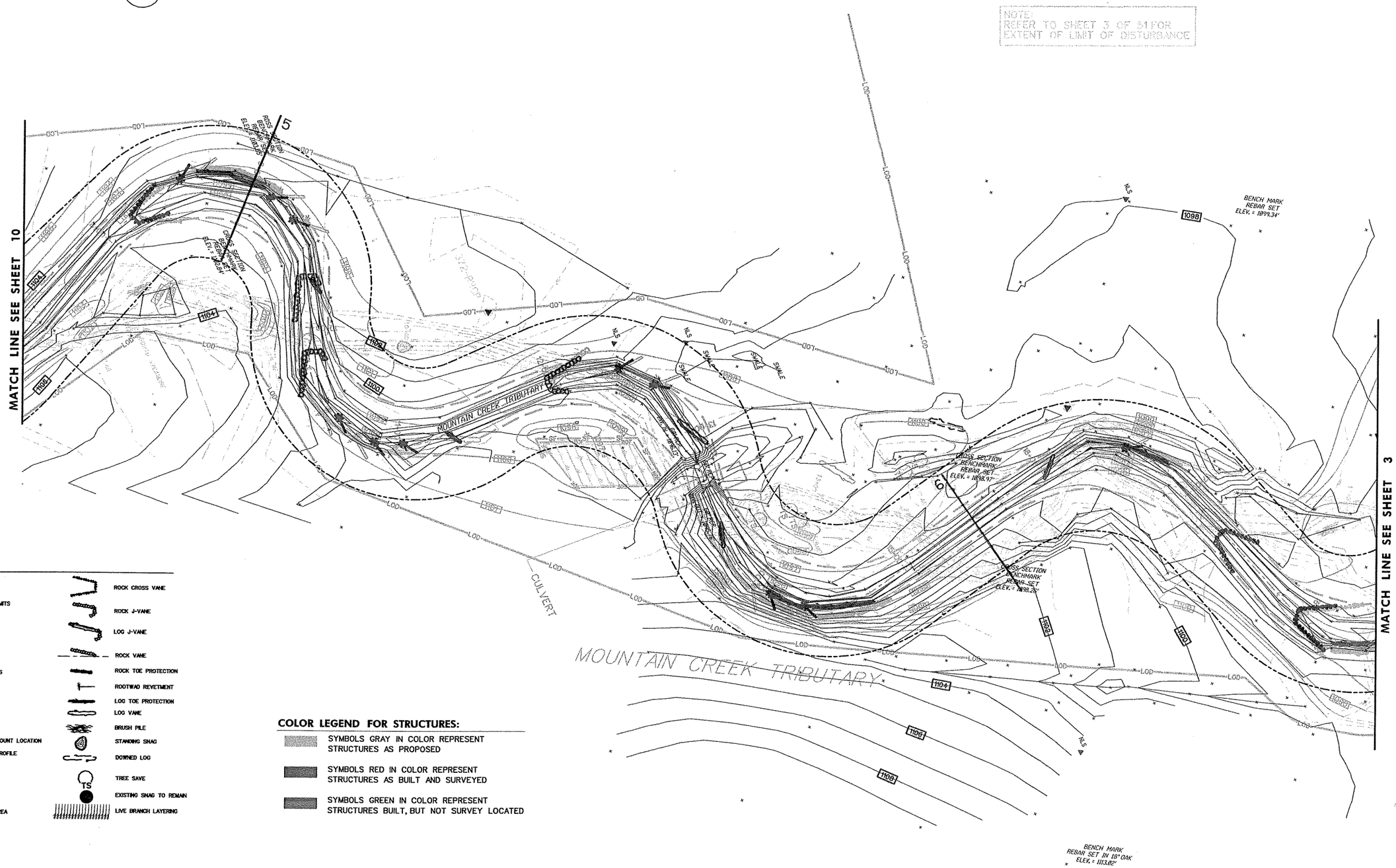
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 8 OF 20



LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- 1234.5 EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- EXISTING TREE
- 1102 EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- 1103 PROPOSED CONTOUR
- 1109 AS BUILT CONTOUR
- LOD LIMIT OF DISTURBANCE
- SF SILT FENCE
- BOF BLAZE ORANGE FENCE
- CROSS SECTION/PEBBLE COUNT LOCATION
- LIMITS OF LONGITUDINAL PROFILE
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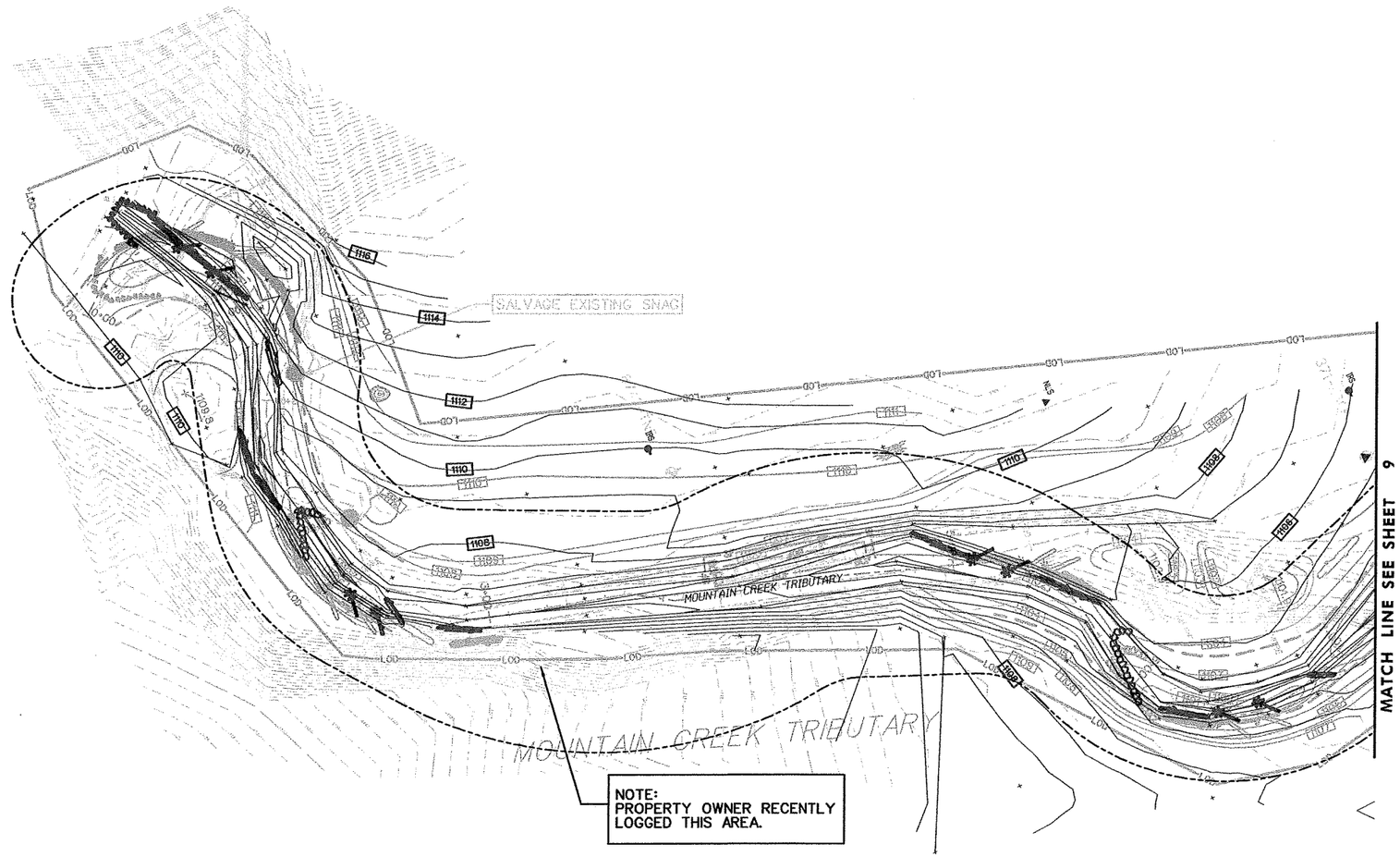
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 9 OF 20



LEGEND FOR DRAWING

- SURVEY CONTROL POINT
- EXISTING SPOT ELEVATION
- EXISTING STREAM EDGE LIMITS
- EXISTING TREE
- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING THALWEG
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED CONTOUR
- AS BUILT CONTOUR
- LIMIT OF DISTURBANCE
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0 30 60

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BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT SURVEY PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 10 OF 20

LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
- ZONE 4- UPLAND WOODS
- ZONE 5- NATIVE GRASSLAND
- INVASIVE SPECIES REMOVAL AREA
- EXISTING WETLAND AREA NOT TO BE DISTURBED
- TEMPORARY FENCING (EXACT LOCATION TO BE DETERMINED IN THE FIELD)
- EXISTING THALWEG
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT
- VEGETATION PLOT #

PLANTING WITHIN HIGHLIGHTED UTILITY CORRIDOR SHALL EXCLUDE ALL TREES

BIG WARRIOR CREEK

N.C. HWY. 18

GUARDRAIL

MATCH LINE SEE SHEET 12

NOTE:
PLANTING ZONE 5 EXTENDS TO LIMIT OF DISTURBANCE AS DEPICTED ON SHEET 3

SCALE
0 30 60

DATE	BY	REVISION DESCRIPTION

DATE: FEB. 2005
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BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT PLANTING PLAN

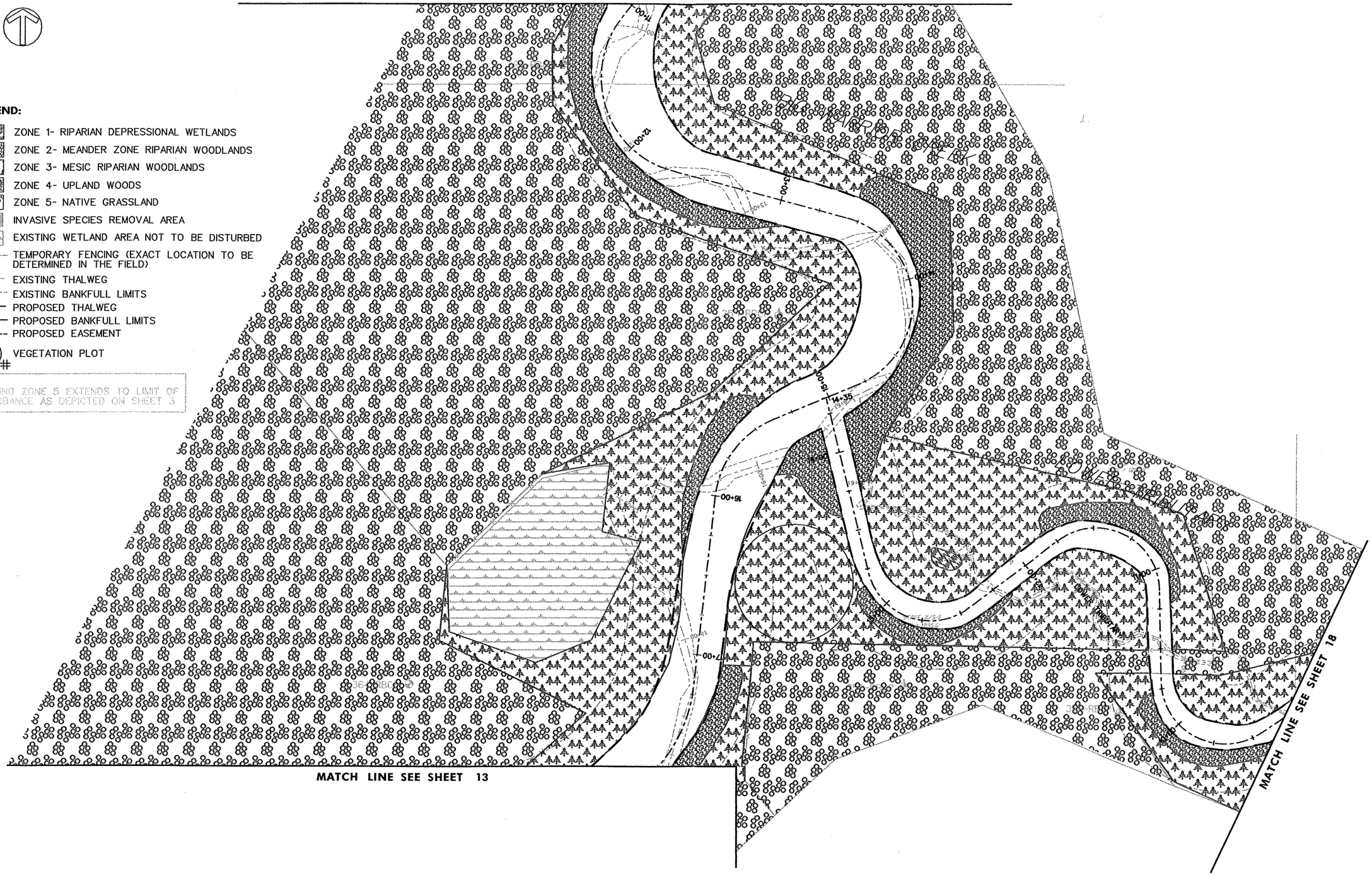
SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 11 OF 20

MATCH LINE SEE SHEET 11

LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
- ZONE 4- UPLAND WOODS
- ZONE 5- NATIVE GRASSLAND
- INVASIVE SPECIES REMOVAL AREA
- EXISTING WETLAND AREA NOT TO BE DISTURBED
- TEMPORARY FENCING (EXACT LOCATION TO BE DETERMINED IN THE FIELD)
- EXISTING THALWEG
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT
- VEGETATION PLOT #

NOTE:
PLANTING ZONE 5 EXTENDS TO LIMIT OF DISTURBANCE AS DEPICTED ON SHEET 3



SCALE
0 30 60

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BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

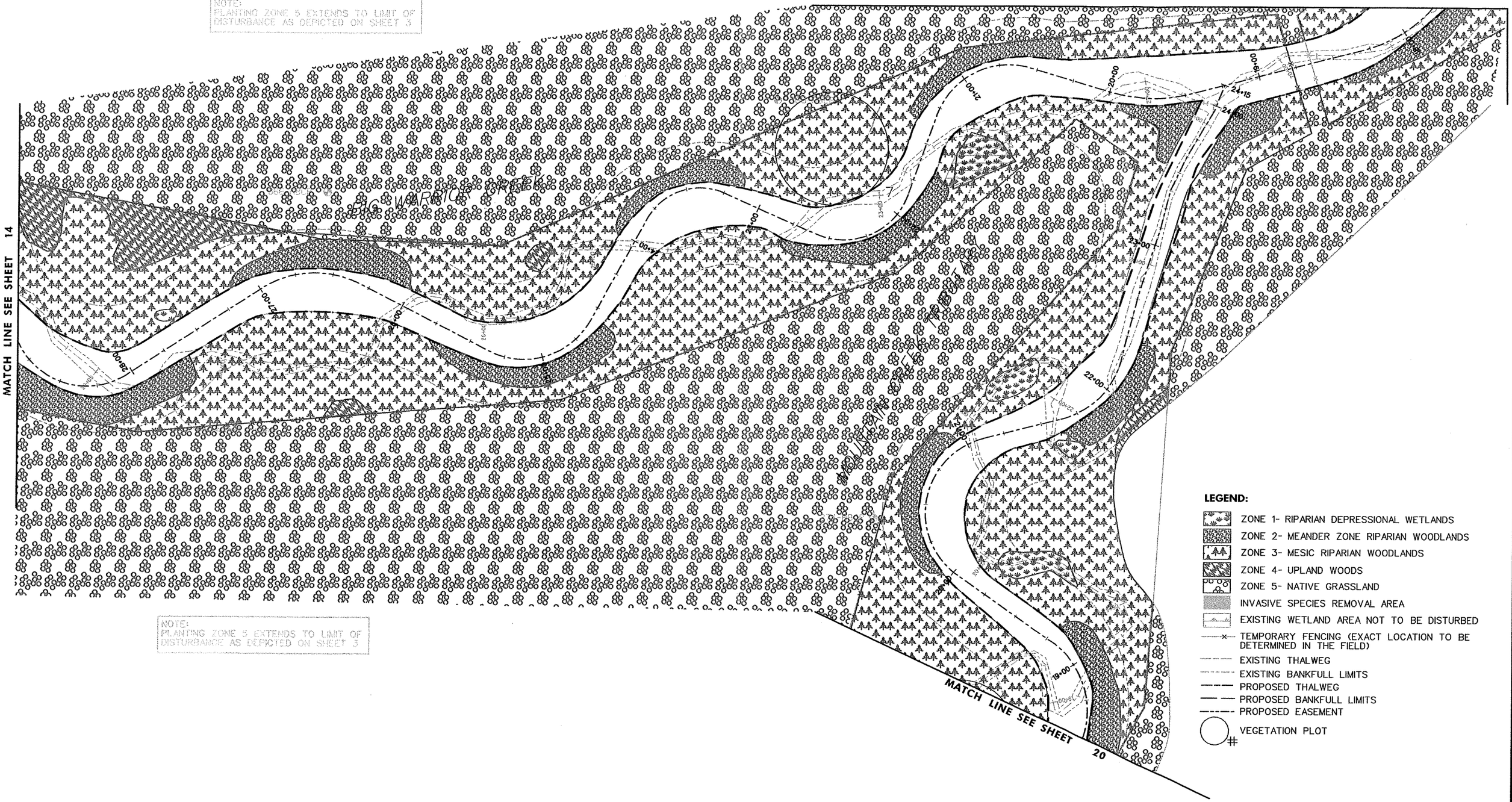
AS BUILT PLANTING PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 12 OF 20

NOTE:
PLANTING ZONE 5 EXTENDS TO LIMIT OF DISTURBANCE AS DEPICTED ON SHEET 3

MATCH LINE SEE SHEET 12

MATCH LINE SEE SHEET 14



NOTE:
PLANTING ZONE 5 EXTENDS TO LIMIT OF DISTURBANCE AS DEPICTED ON SHEET 3

LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
- ZONE 4- UPLAND WOODS
- ZONE 5- NATIVE GRASSLAND
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- EXISTING WETLAND AREA NOT TO BE DISTURBED
- TEMPORARY FENCING (EXACT LOCATION TO BE DETERMINED IN THE FIELD)
- EXISTING THALWEG
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT
- VEGETATION PLOT #

SCALE
0 30 60

SEAL

REVISION			
DATE	BY	DESCRIPTION	

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
APPROVED:
Biohabitats Project No. 02803.01

CDM Camp Dresser & McKee Inc.
consulting engineering construction operations
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Fax: 410-583-5678
• Fostering Ecological Stewardship •

BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT PLANTING PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 13 OF 20

NOTE:
PLANTING ZONE 5 EXTENDS TO LIMIT OF DISTURBANCE AS DEPICTED ON SHEET 3

MATCH LINE SEE SHEET 15

MATCH LINE SEE SHEET 13

LOGGING REFUSE

BIG WARRIOR CREEK

LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
- ZONE 4- UPLAND WOODS
- ZONE 5- NATIVE GRASSLAND
- INVASIVE SPECIES REMOVAL AREA
- EXISTING WETLAND AREA NOT TO BE DISTURBED
- TEMPORARY FENCING (EXACT LOCATION TO BE DETERMINED IN THE FIELD)
- EXISTING THALWEG
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT
- VEGETATION PLOT #

NOTE:
PLANTING ZONE 5 EXTENDS TO LIMIT OF DISTURBANCE AS DEPICTED ON SHEET 3

SCALE
0 30 60

REVISION			
DATE	BY	DESCRIPTION	

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
APPROVED:
Biohabitats Project No. 02803.01

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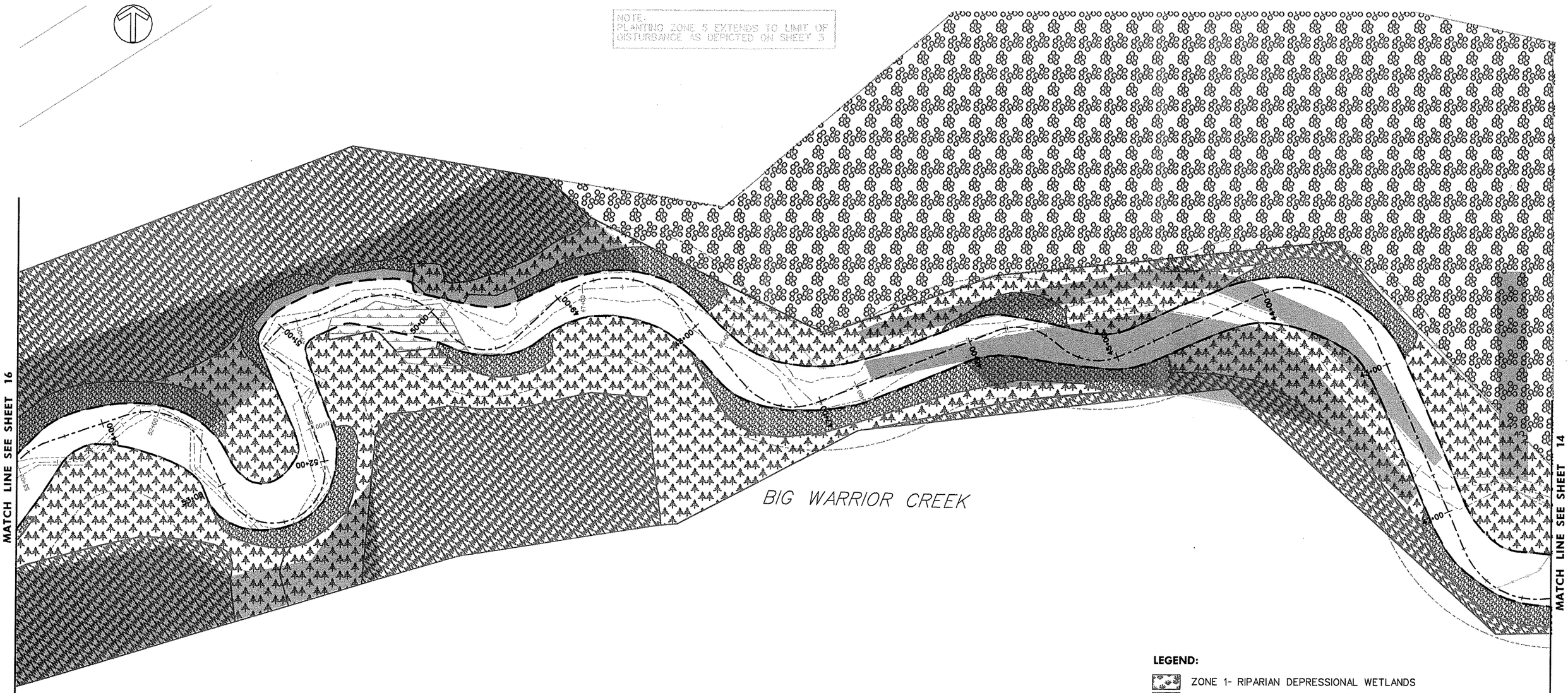
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT PLANTING PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 14 OF 20

NOTE:
PLANTING ZONE 5 EXTENDS TO LIMIT OF DISTURBANCE AS DEPICTED ON SHEET 5



LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
- ZONE 4- UPLAND WOODS
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- EXISTING THALWEG
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT

SCALE
0 30 60

DATE	BY	REVISION DESCRIPTION

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
APPROVED:
Biohabitats Project No. 02803.01

SEAL

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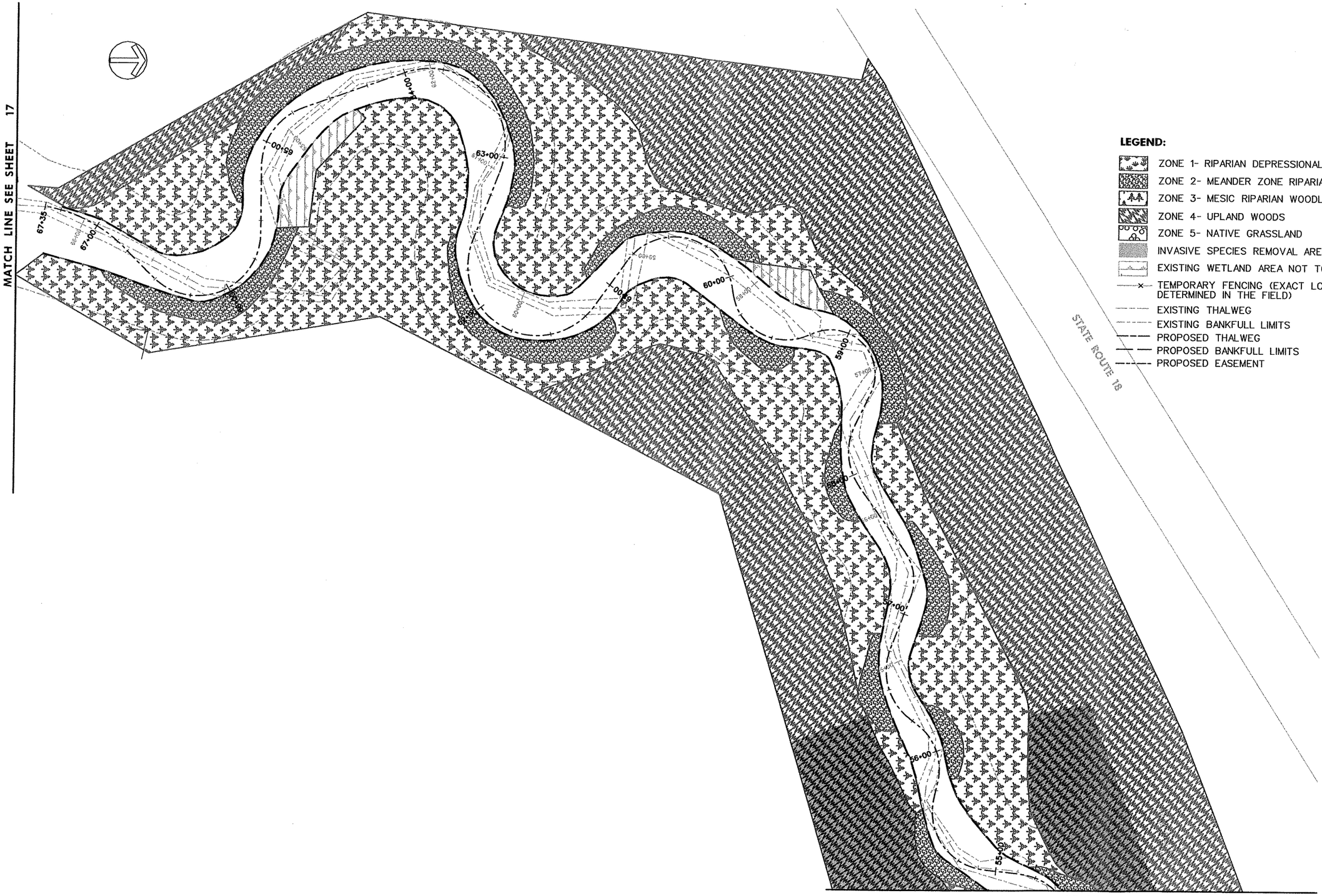
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT PLANTING PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 15 OF 20

MATCH LINE SEE SHEET 17



LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
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- EXISTING THALWEG
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT

MATCH LINE SEE SHEET 15

SCALE
0 30 60

REVISION			
DATE	BY	DESCRIPTION	

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
APPROVED:
Biohabitats Project No. 02803.01

SEAL

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BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT PLANTING PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 16 OF 20

LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
- ZONE 4- UPLAND WOODS
- ZONE 5- NATIVE GRASSLAND
- INVASIVE SPECIES REMOVAL AREA
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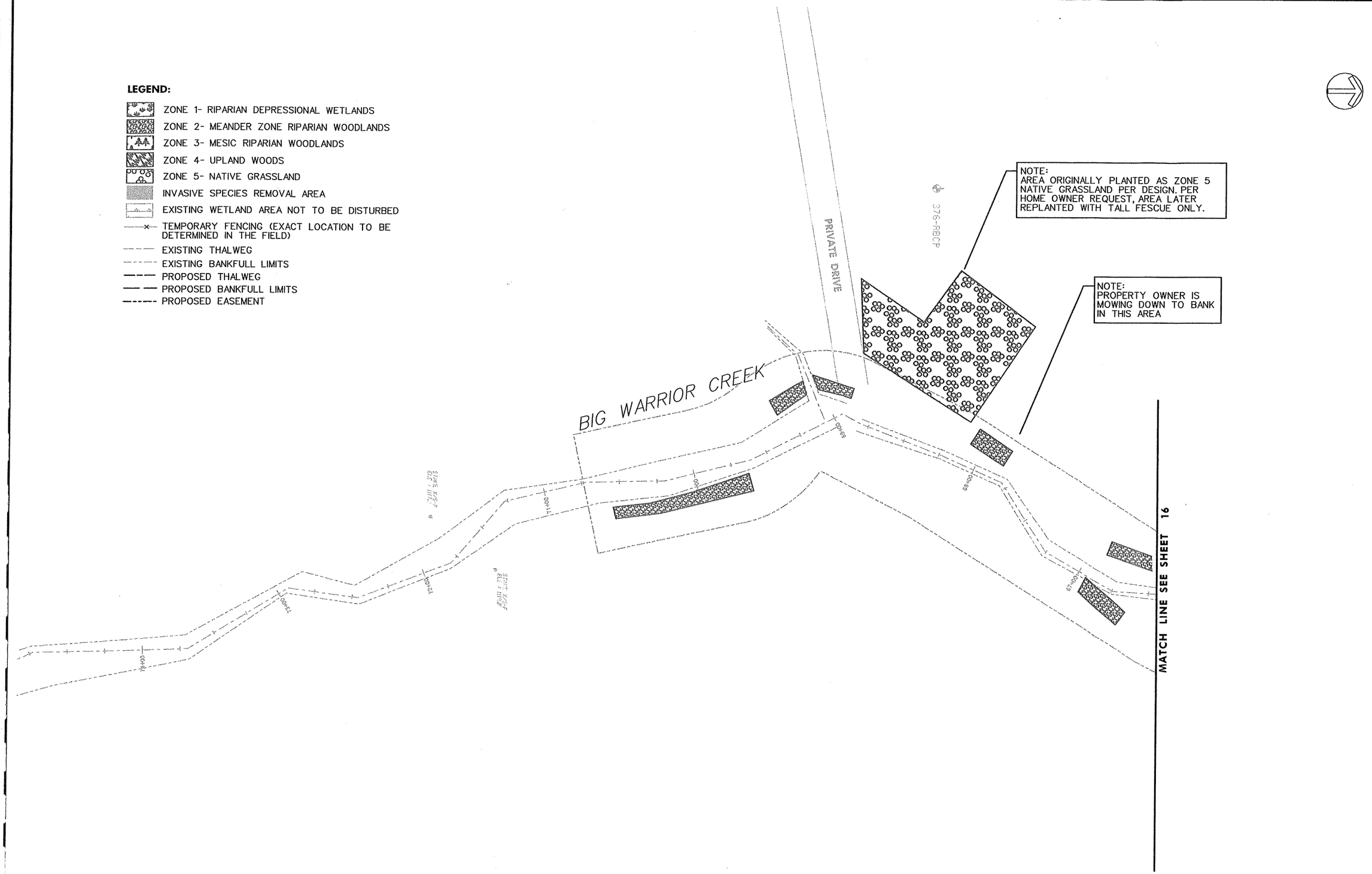
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT



SCALE
0 30 60

DATE	BY	REVISION DESCRIPTION

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
APPROVED:
Biohabitats Project No. 02803.01

SEAL

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BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT PLANTING PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 17 OF 20

LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
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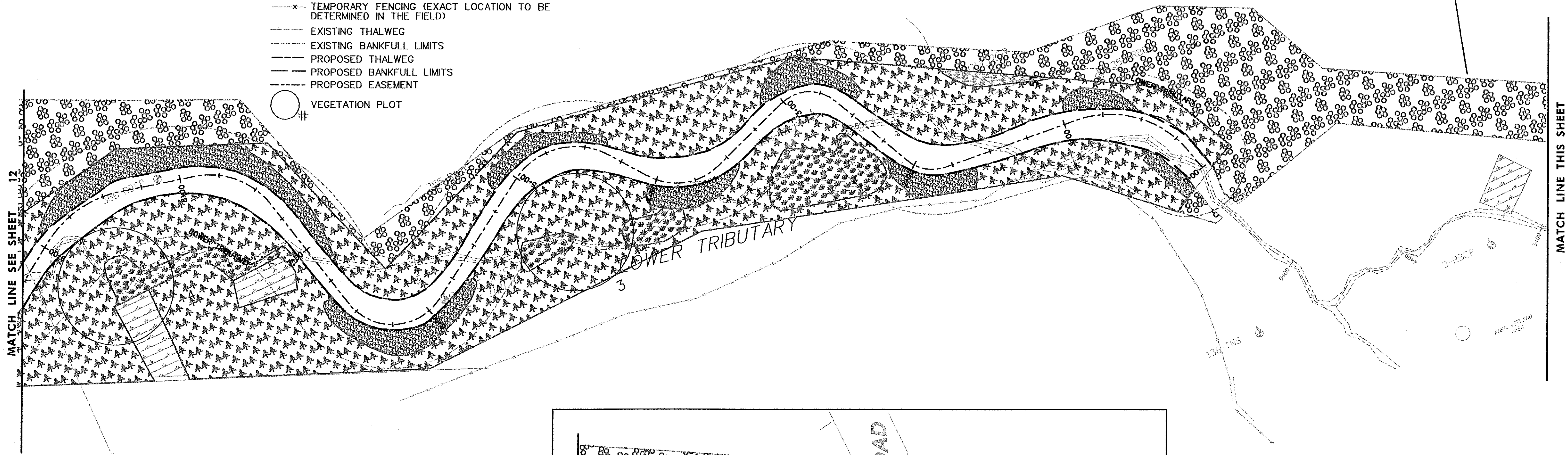
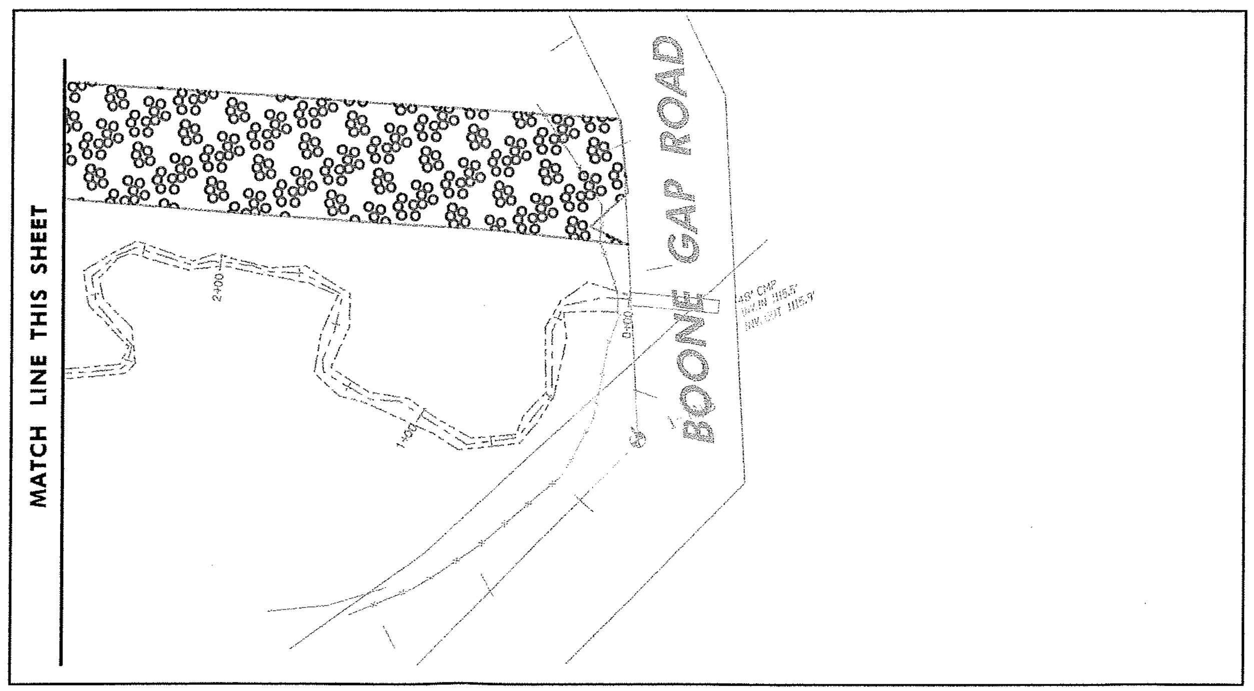
- EXISTING THALWEG
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT
- VEGETATION PLOT





SCALE 0 30 60

REVISION		
DATE	BY	DESCRIPTION

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
APPROVED
Biohabitats Project No. 02803.01

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BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT PLANTING PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 18 OF 20
SEAL

NOTE:
PLANTING ZONE 5 EXTENDS TO LIMIT OF DISTURBANCE AS DEPICTED ON SHEET 3

MATCH LINE SEE SHEET 20

MATCH LINE SEE SHEET 13

MOUNTAIN CREEK TRIBUTARY

LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
- ZONE 4- UPLAND WOODS
- ZONE 5- NATIVE GRASSLAND
- INVASIVE SPECIES REMOVAL AREA
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- EXISTING THALWEG
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT
- VEGETATION PLOT #

SCALE
0 30 60

REVISION			
DATE	BY	DESCRIPTION	

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
APPROVED:
Biohabitats Project No. 02803.01

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BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT PLANTING PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 19 OF 20

LEGEND:

- ZONE 1- RIPARIAN DEPRESSIONAL WETLANDS
- ZONE 2- MEANDER ZONE RIPARIAN WOODLANDS
- ZONE 3- MESIC RIPARIAN WOODLANDS
- ZONE 4- UPLAND WOODS
- ZONE 5- NATIVE GRASSLAND
- INVASIVE SPECIES REMOVAL AREA
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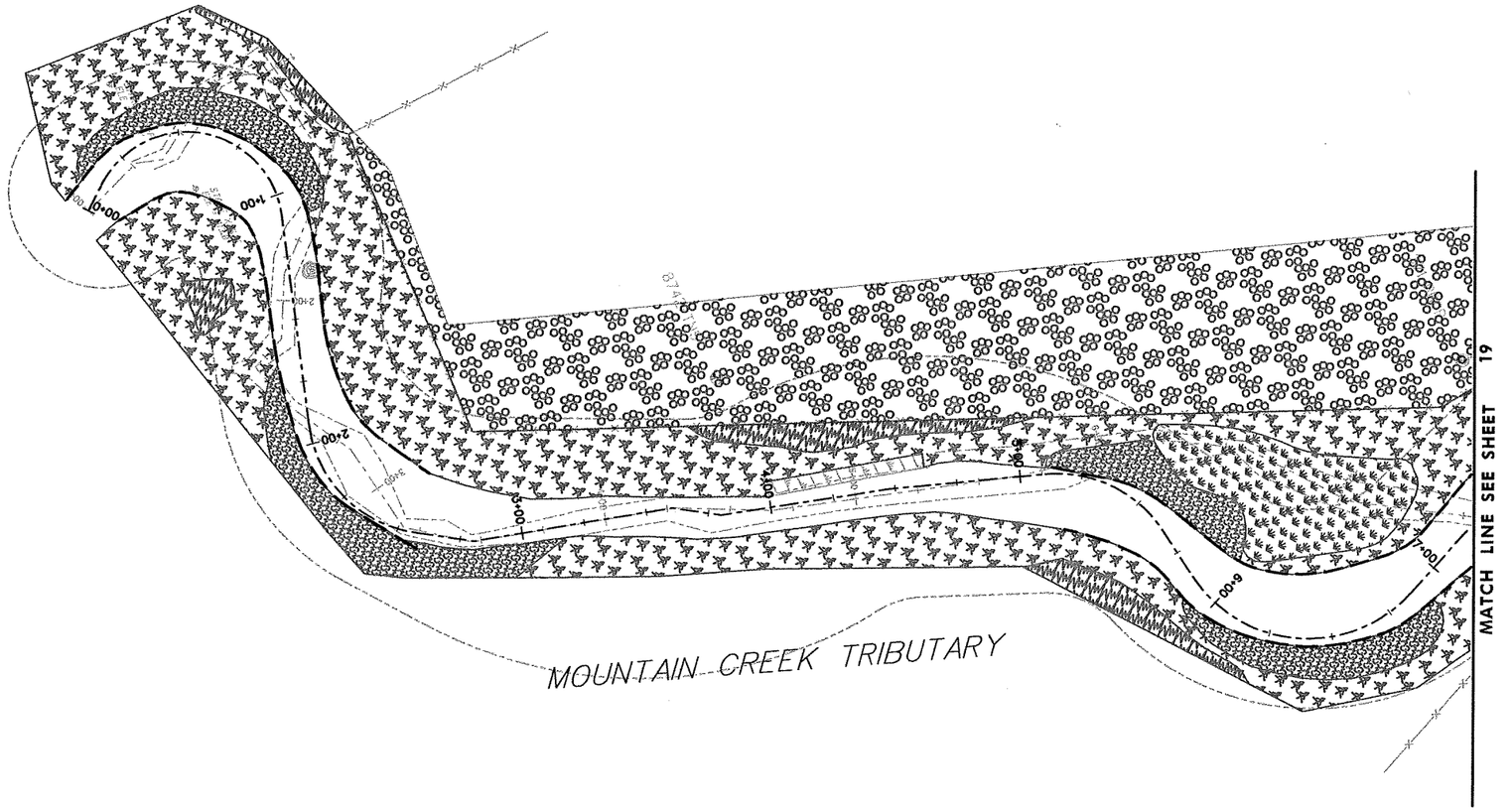
- EXISTING THALWEG
- EXISTING BANKFULL LIMITS
- PROPOSED THALWEG
- PROPOSED BANKFULL LIMITS
- PROPOSED EASEMENT



SCALE
0 30 60

REVISION		
DATE	BY	DESCRIPTION

DATE: FEB. 2005
DESIGNED: EMM
DRAWN: TLS
CHECKED: JKB
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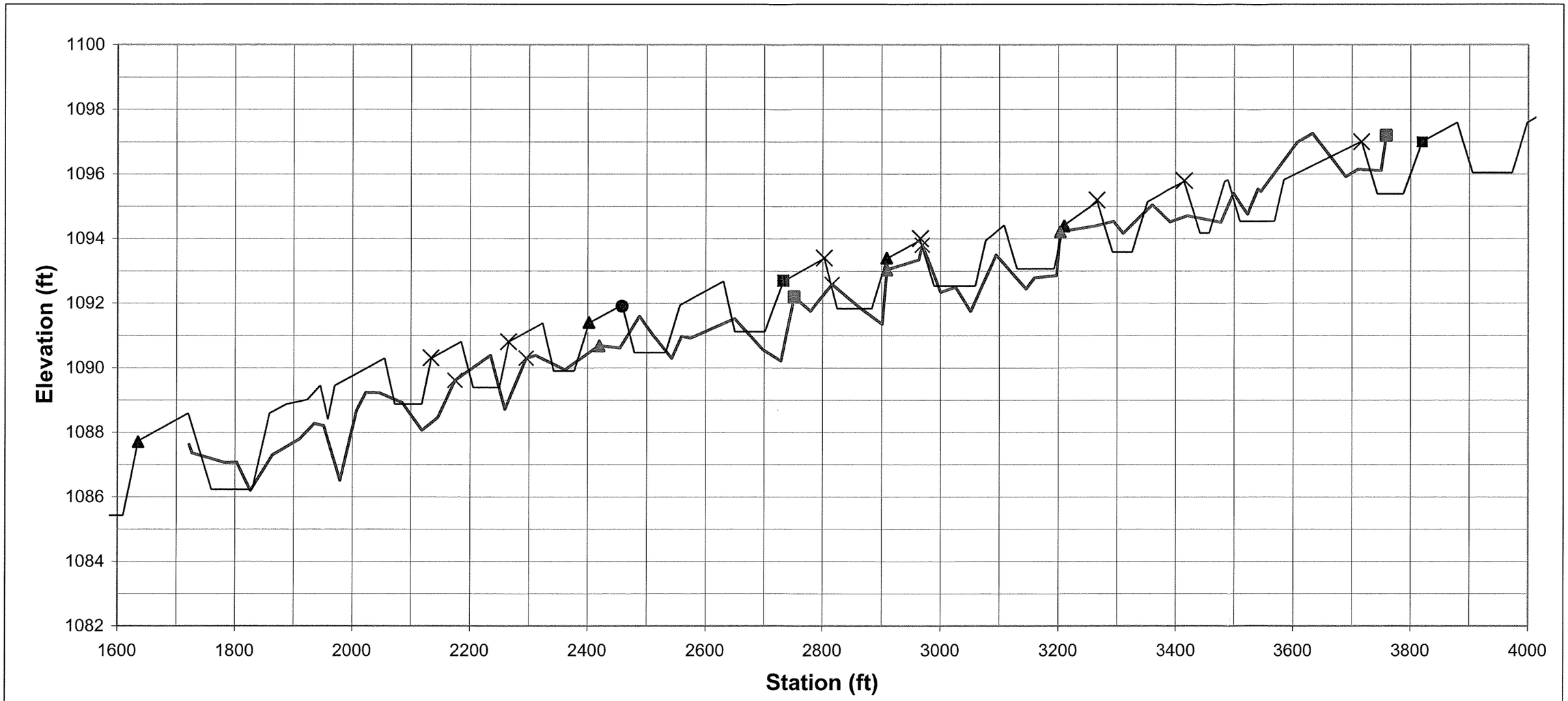
BIG WARRIOR CREEK STREAM RESTORATION

WILKES COUNTY NORTH CAROLINA

AS BUILT PLANTING PLAN

SCALE: 1" = 30'-0"
CONTRACT NO.
SHEET 20 OF 20

Appendix B
LONGITUDINAL PROFILE



LEGEND

- As-Built Surveyed Profile
- Design Profile
- Log Vane
- Rock Cross Vane
- Rock Vane
- Rock J-Vane
- Rock Cross Vane
- Rock Vane
- Rock J-Vane

NOTES:

1) Stationing of features shown above differs slightly from stationing shown in the as-built drawings (Appendix A) due to minor differences in the field interpretation of thalweg.

2) Due to minor differences in the cumulative length of the thalweg in the design versus as-built drawings, an individual feature (e.g., top of riffle) may not plot at the same Station in the two profiles (design and as-built) shown above.

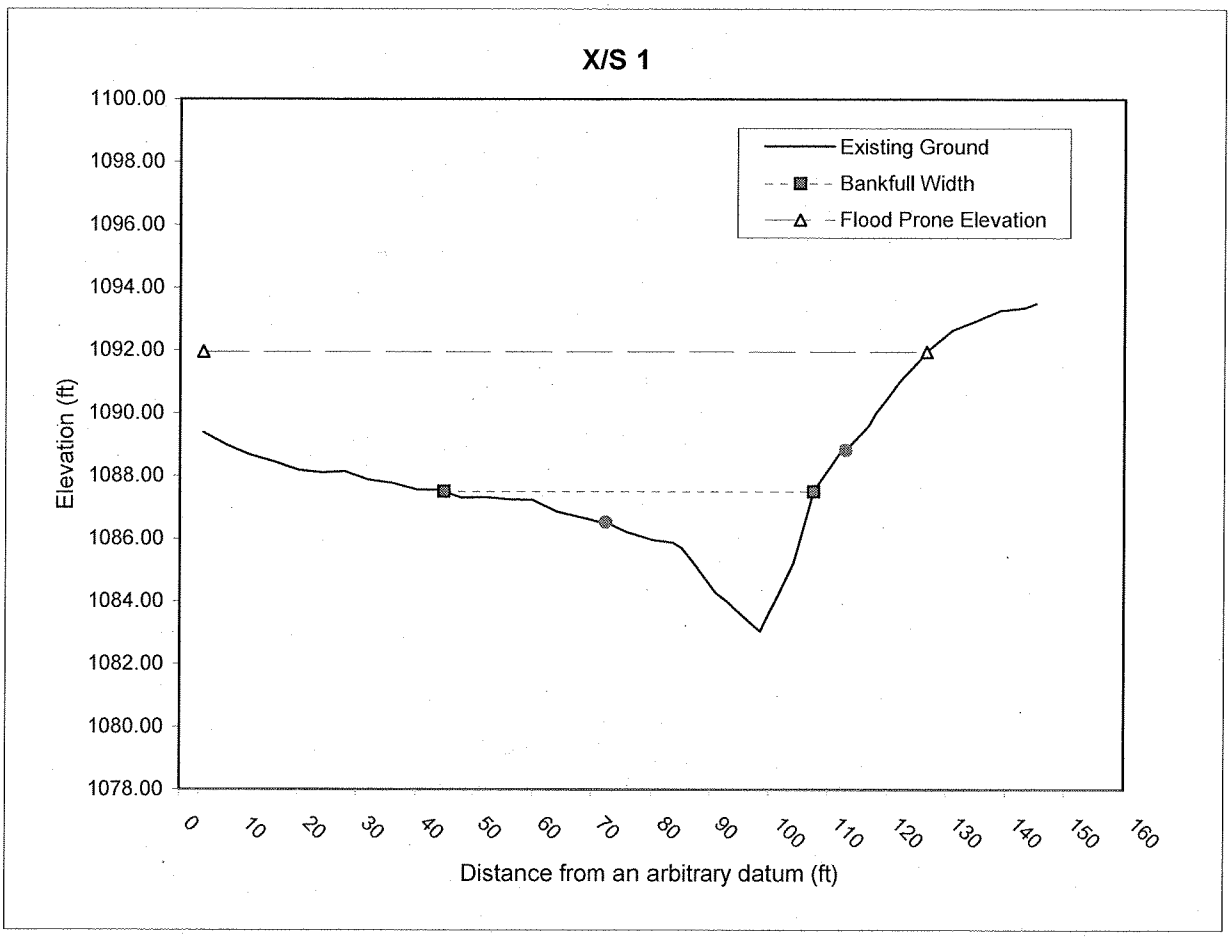
Longitudinal Profile
Downstream Portion of Big Warrior Creek

Baseline Monitoring Conditions
Survey Date: December 7, 2004

Biohabitats
Incorporated

Appendix C
CROSS SECTIONS

Monitoring Cross Section
Big Warrior Creek Stream Restoration
Lower Mainstem, Pool



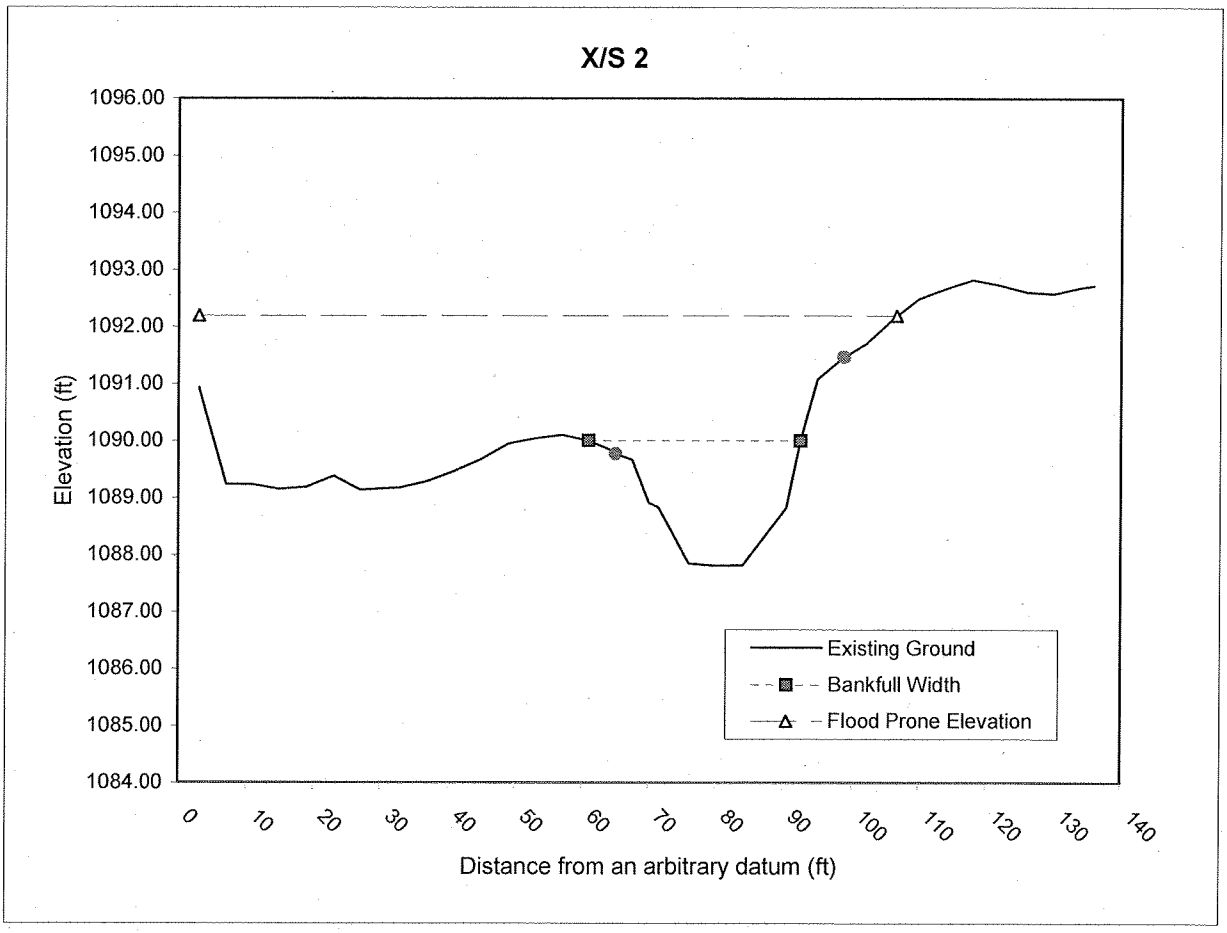
Rosgen Stream Type Classification	
Bankfull Width	62.62 (ft)
Entrenchment	>2.0 (ft/ft)
Width:Depth	41.05 (ft/ft)
Sinousity	(ft/ft)
Slope	0.0040 (ft/ft)
D_{50}	9 (mm)
Stream Type	C4

Flow Calculations	
Max BF Depth	4.45 (ft)
Mean BF Depth	1.53 (ft)
X/S Area	95.53 (ft^2)
Manning's n	0.0350
BF Ave. Velocity	3.52 (ft/s)
Discharge	335.83 (cfs)
Shear Stress	0.37 (lb/ft^2)

Bio Project Number:	02803.01	
Surveyed:	12/07/04	By: BS (BIO), KB (CDM)

NOTES: Single circle on each bank represents benchmark, LBM elevation = 1086.53, RBM = 1088.82

Monitoring Cross Section
Big Warrior Creek Stream Restoration
Lower Mainstem, Riffle



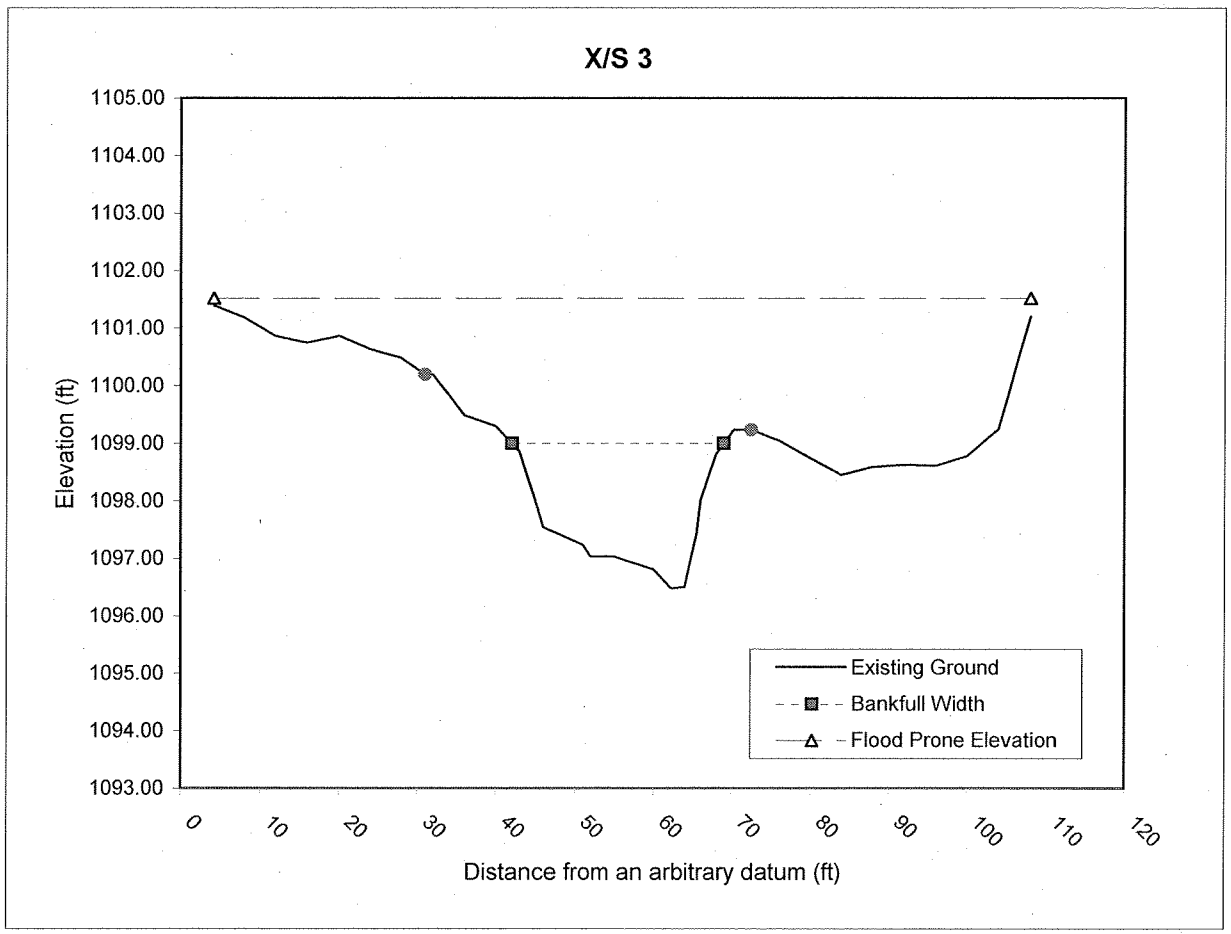
Rosgen Stream Type Classification	
Bankfull Width	31.57 (ft)
Entrenchment	>3.3 (ft/ft)
Width:Depth	23.96 (ft/ft)
Sinousity	(ft/ft)
Slope	0.0040 (ft/ft)
D_{50}	<2 (mm)
Stream Type	C4

Flow Calculations	
Max BF Depth	2.19 (ft)
Mean BF Depth	1.32 (ft)
X/S Area	41.59 (ft^2)
Manning's n	0.0350
BF Ave. Velocity	3.19 (ft/s)
Discharge	132.78 (cfs)
Shear Stress	0.32 (lb/ft^2)

Bio Project Number:	02803.01	
Surveyed:	12/07/04	By: BS (BIO), KB (CDM)

NOTES: Single circle on each bank represents benchmark, LBM elevation = 1089.81, RBM = 1091.47

Monitoring Cross Section
Big Warrior Creek Stream Restoration
Mid- Mainstem, Riffle



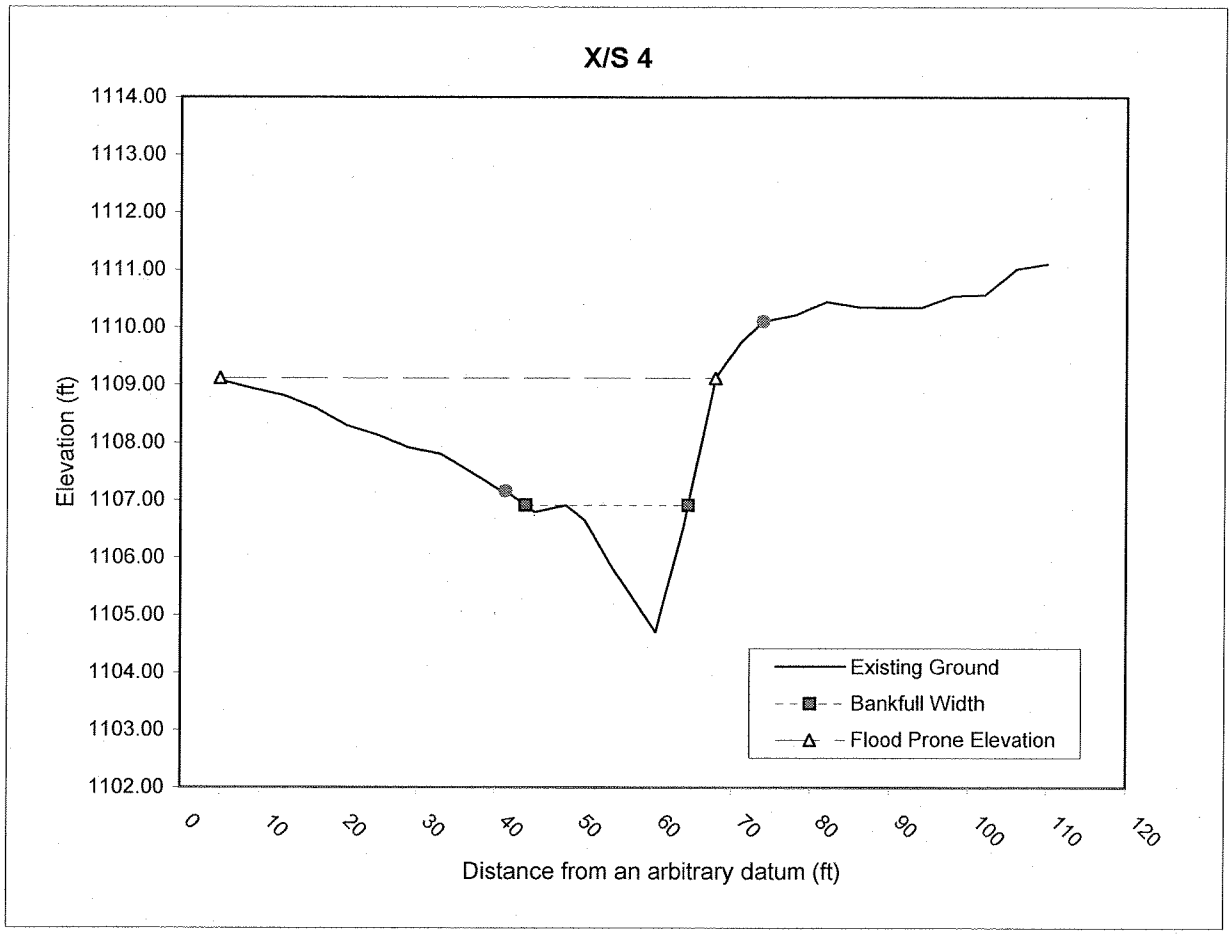
Rosgen Stream Type Classification	
Bankfull Width	26.97 (ft)
Entrenchment	>2.3 (ft/ft)
Width:Depth	16.79 (ft/ft)
Sinousity	(ft/ft)
Slope	0.0040 (ft/ft)
D_{50}	<2 (mm)
Stream Type	C4

Flow Calculations	
Max BF Depth	2.52 (ft)
Mean BF Depth	1.61 (ft)
X/S Area	43.32 (ft^2)
Manning's n	0.0350
BF Ave. Velocity	3.60 (ft/s)
Discharge	155.99 (cfs)
Shear Stress	0.39 (lb/ft^2)

Bio Project Number:	02803.01	
Surveyed:	12/07/04	By: BS (BIO), KB (CDM)

NOTES: Single circle on each bank represents benchmark, LBM elevation = 1100.19, RBM = 1099.23

Monitoring Cross Section
Big Warrior Creek Stream Restoration
Upper Mainstem, Pool



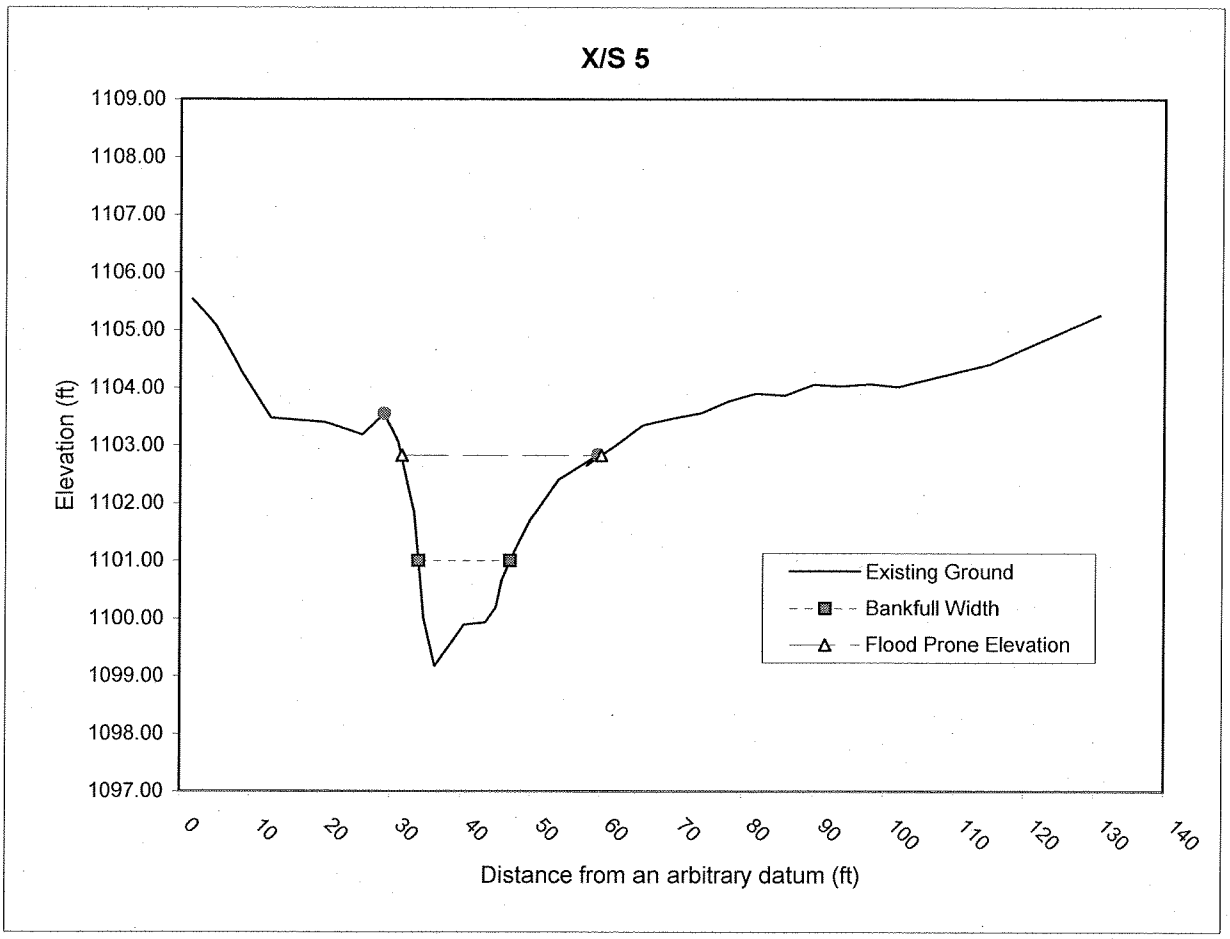
Rosgen Stream Type Classification	
Bankfull Width	20.79 (ft)
Entrenchment	3.03 (ft/ft)
Width:Depth	25.78 (ft/ft)
Sinousity	(ft/ft)
Slope	0.0040 (ft/ft)
D_{50}	3 (mm)
Stream Type	C4

Flow Calculations	
Max BF Depth	2.21 (ft)
Mean BF Depth	0.81 (ft)
X/S Area	16.76 (ft^2)
Manning's n	0.0350
BF Ave. Velocity	2.28 (ft/s)
Discharge	38.14 (cfs)
Shear Stress	0.19 (lb/ft^2)

Bio Project Number:	02803.01	
Surveyed:	12/07/04	By: BS (BIO), KB (CDM)

NOTES: Single circle on each bank represents benchmark, LBM elevation = 1107.16, RBM = 1110.11

Monitoring Cross Section
Big Warrior Creek Stream Restoration
Mountain Creek Tributary, Pool



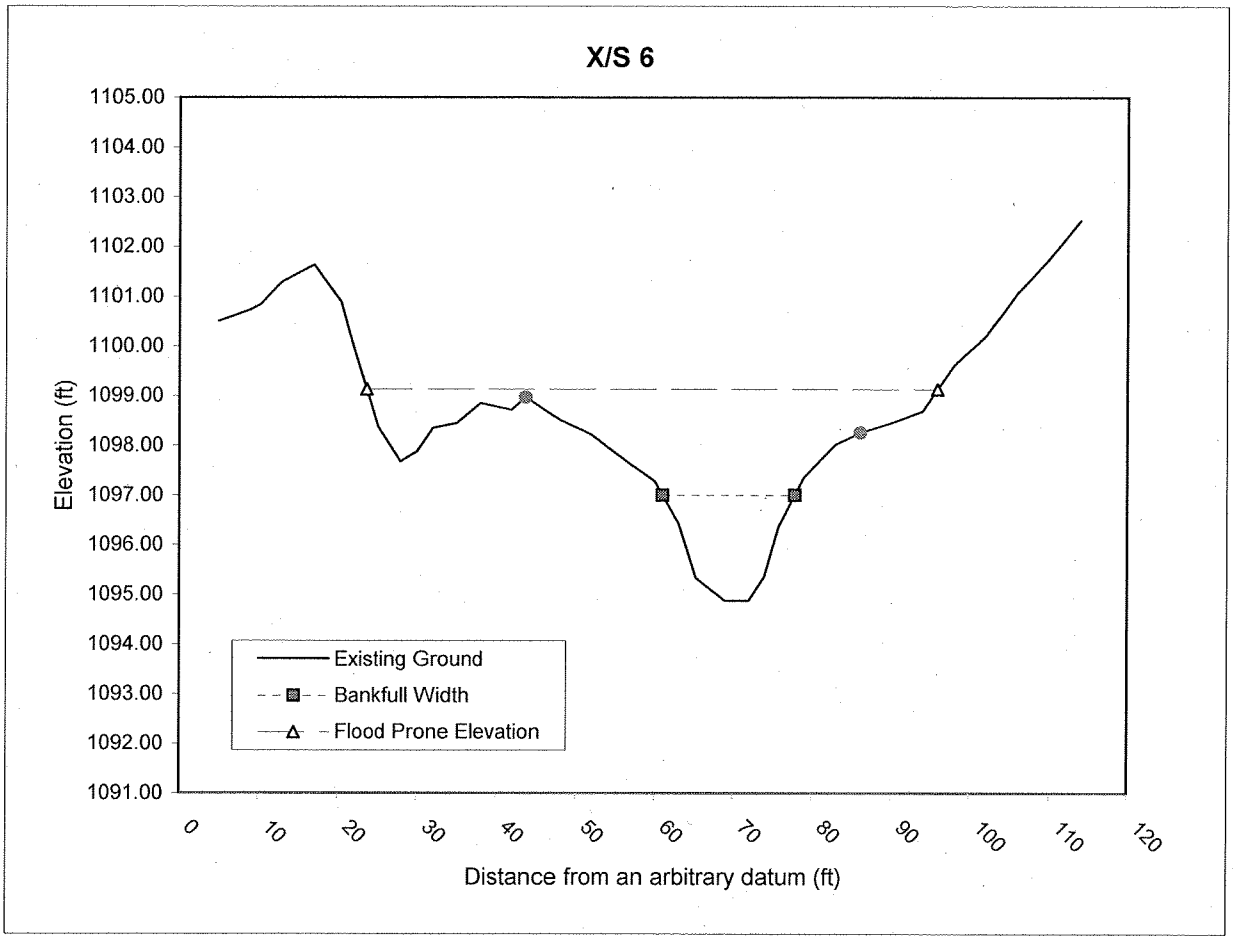
Rosgen Stream Type Classification	
Bankfull Width	13.15 (ft)
Entrenchment	2.18 (ft/ft)
Width:Depth	12.09 (ft/ft)
Sinousity	(ft/ft)
Slope	0.0080 (ft/ft)
D_{50}	20 (mm)
Stream Type	C4

Flow Calculations	
Max BF Depth	1.83 (ft)
Mean BF Depth	1.09 (ft)
X/S Area	14.31 (ft^2)
Manning's n	0.0350
BF Ave. Velocity	3.84 (ft/s)
Discharge	54.92 (cfs)
Shear Stress	0.51 (lb/ft^2)

Bio Project Number:	02803.01	
Surveyed:	12/08/04	By: BS (BIO), KB (CDM)

NOTES: Single circle on each bank represents benchmark, LBM elevation = 1103.55, RBM = 1102.84

Monitoring Cross Section
Big Warrior Creek Stream Restoration
Mountain Creek Tributary, Riffle



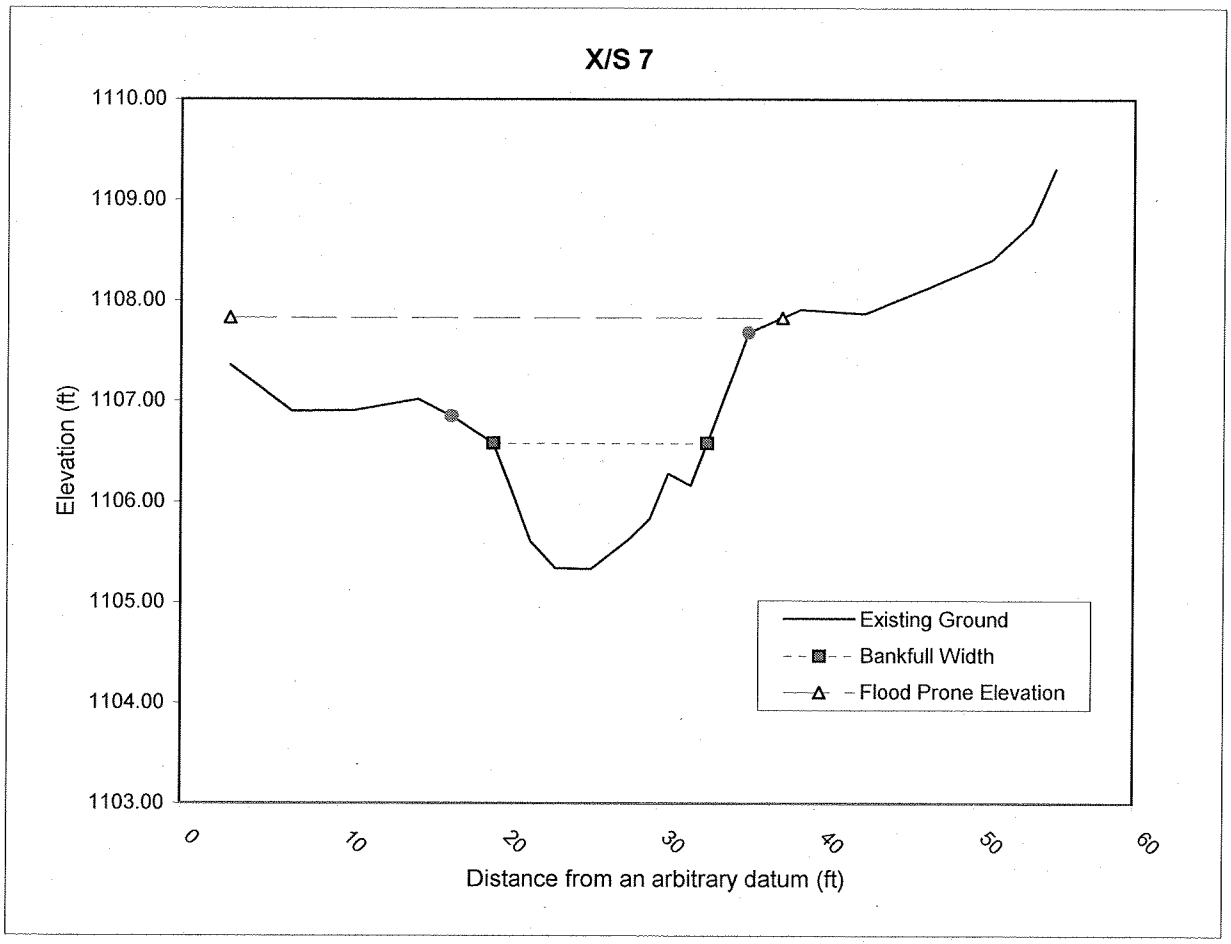
Rosgen Stream Type Classification	
Bankfull Width	16.83 (ft)
Entrenchment	4.29 (ft/ft)
Width:Depth	12.37 (ft/ft)
Sinousity	(ft/ft)
Slope	0.0080 (ft/ft)
D_{50}	17 (mm)
Stream Type	C4

Flow Calculations	
Max BF Depth	2.13 (ft)
Mean BF Depth	1.36 (ft)
X/S Area	22.89 (ft^2)
Manning's n	0.0350
BF Ave. Velocity	4.54 (ft/s)
Discharge	103.86 (cfs)
Shear Stress	0.65 (lb/ft^2)

Bio Project Number:	02803.01	
Surveyed:	12/08/04	By: BS (BIO), KB (CDM)

NOTES: Single circle on each bank represents benchmark, LBM elevation = 1098.97, RBM = 1098.26

Monitoring Cross Section
Big Warrior Creek Stream Restoration
Lower Tributary, Riffle



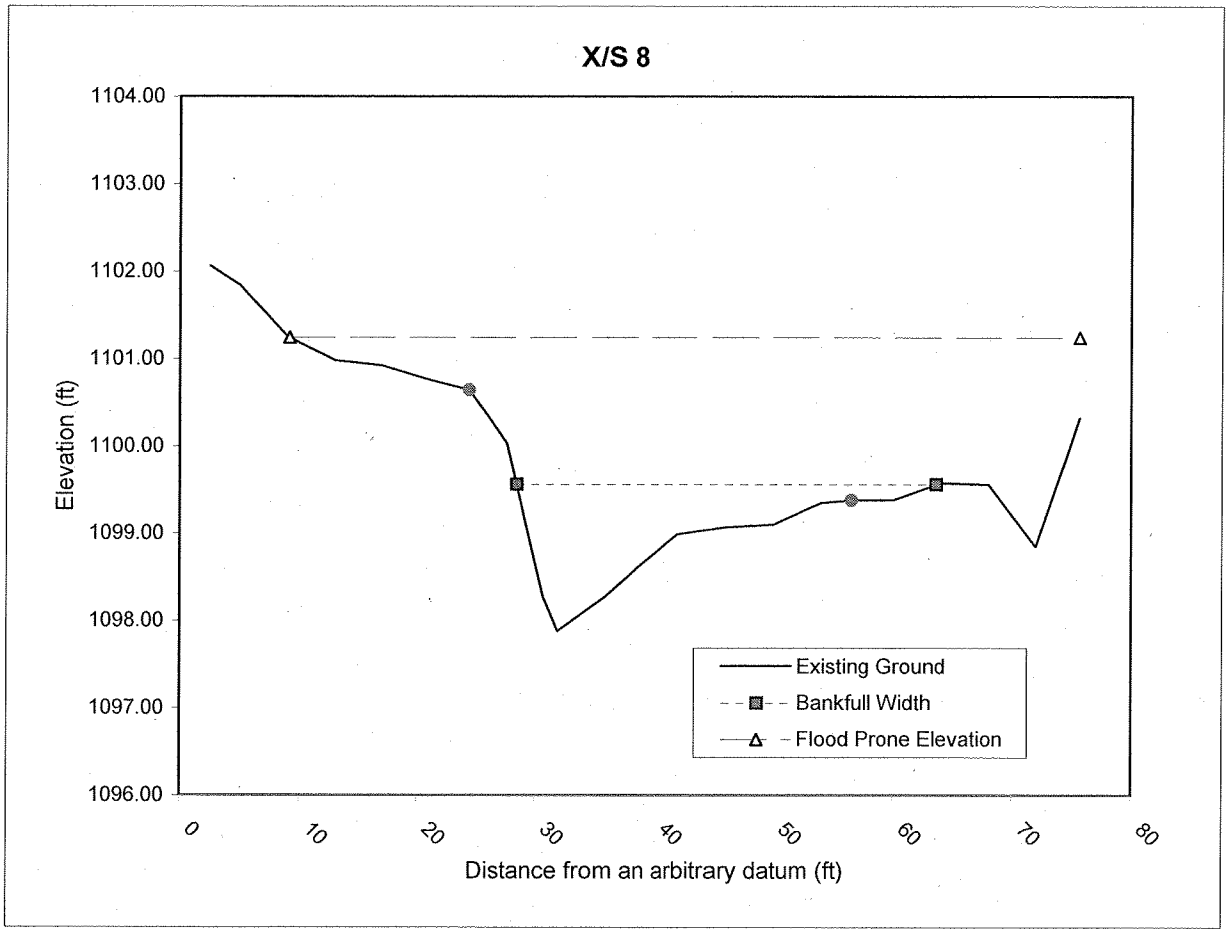
Rosgen Stream Type Classification	
Bankfull Width	13.49 (ft)
Entrenchment	>2.6 (ft/ft)
Width:Depth	16.93 (ft/ft)
Sinousity	(ft/ft)
Slope	0.0140 (ft/ft)
D_{50}	8 (mm)
Stream Type	C4

Flow Calculations	
Max BF Depth	1.25 (ft)
Mean BF Depth	0.80 (ft)
X/S Area	10.76 (ft^2)
Manning's n	0.0350
BF Ave. Velocity	4.24 (ft/s)
Discharge	45.66 (cfs)
Shear Stress	0.68 (lb/ft^2)

Bio Project Number:	02803.01	
Surveyed:	12/07/04	By: BS (BIO), KB (CDM)

NOTES: Single circle on each bank represents benchmark, LBM elevation = 1106.85, RBM = 1107.68

Monitoring Cross Section
Big Warrior Creek Stream Restoration
Lower Tributary, Pool



Rosgen Stream Type Classification		
Bankfull Width	35.17	(ft)
Entrenchment	>1.5	(ft/ft)
Width:Depth	57.58	(ft/ft)
Sinousity		(ft/ft)
Slope	0.0140	(ft/ft)
D_{50}	13	(mm)
Stream Type	C4	

Flow Calculations		
Max BF Depth	1.68	(ft)
Mean BF Depth	0.61	(ft)
X/S Area	21.48	(ft^2)
Manning's n	0.0350	
BF Ave. Velocity	3.59	(ft/s)
Discharge	77.19	(cfs)
Shear Stress	0.53	(lb/ft^2)

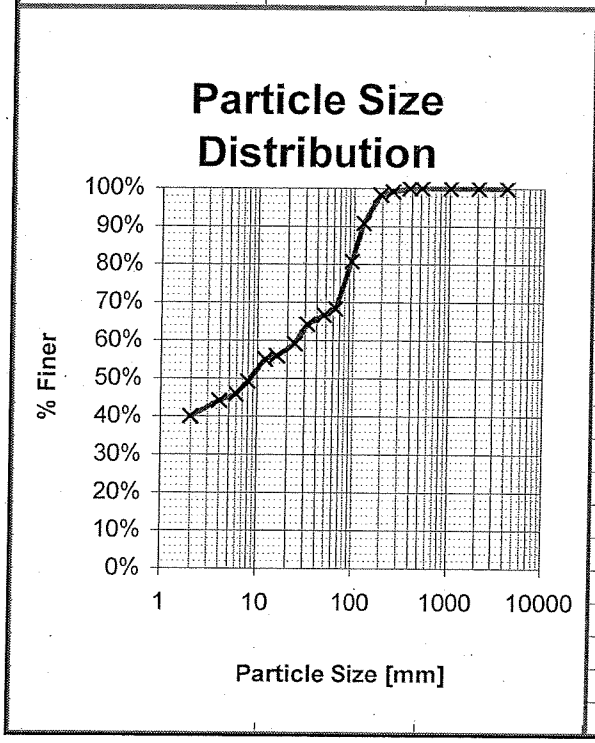
Bio Project Number:	02803.01	
Surveyed:	12/08/04	By: BS (BIO), KB (CDM)

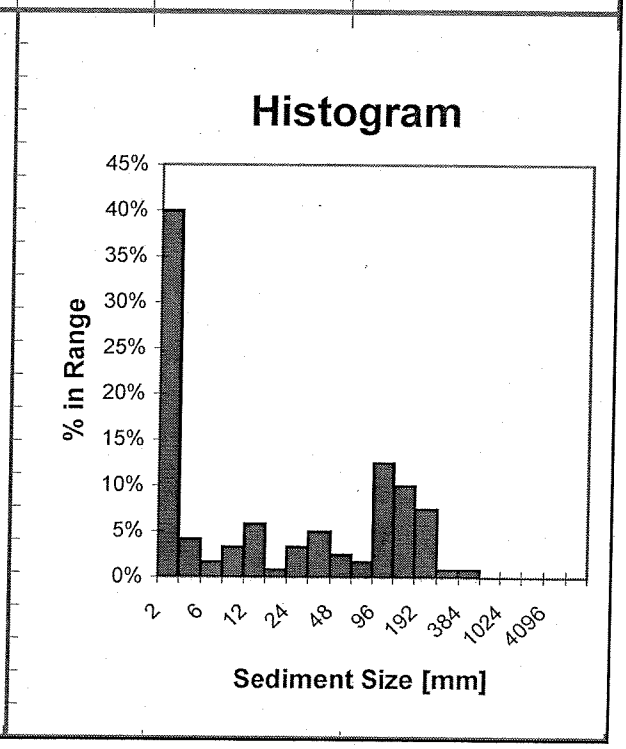
NOTES: Single circle on each bank represents benchmark, LBM elevation = 1100.63, RBM = 1099.38

Appendix D
PEBBLE COUNTS

Site Name:	Big Warrior Creek		Biohabitats, Inc.	
Project No:	02803.01		Pebble Count Data Sheet	
Date:	12/7/2004		Cross Section #1 (Pool)	

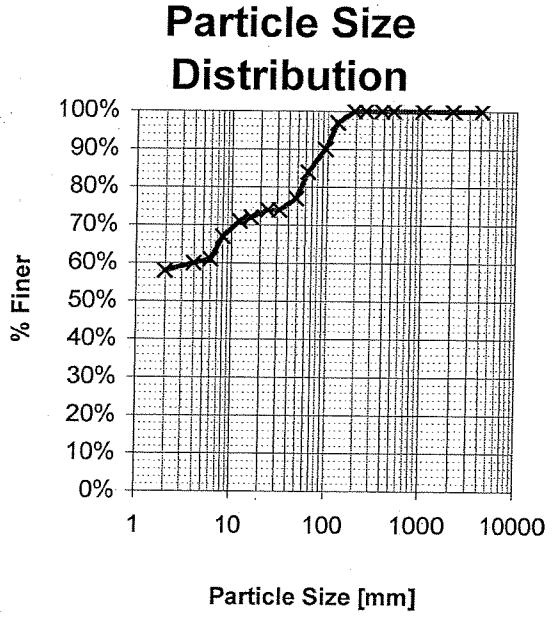
	Particle Size [mm]	Total #	% in Range	% Cumulative
Sand and Silt	< 2	48	40%	40%
Gravels	2 - 4	5	4%	44%
	4 - 6	2	2%	46%
	6 - 8	4	3%	49%
	8 - 12	7	6%	55%
	12 - 16	1	1%	56%
	16 - 24	4	3%	59%
	24 - 32	6	5%	64%
	32 - 48	3	3%	67%
	48 - 64	2	2%	68%
Cobbles	64 - 96	15	13%	81%
	96 - 128	12	10%	91%
	128 - 192	9	8%	98%
	192 - 256	1	1%	99%
Boulders	256 - 384	1	1%	100%
	384 - 512		0%	100%
	512 - 1024		0%	100%
	1024 - 2048		0%	100%
	2048 - 4096		0%	100%
Bedrock			0%	100%
	TOTALS:	120	100%	
D_{50}=	8.6	D_{84}=	106.1	

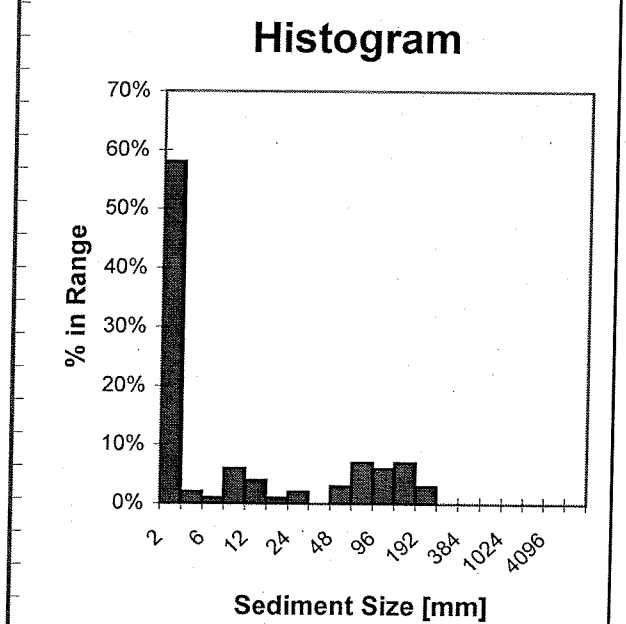




Site Name:	Big Warrior Creek		Biohabitats, Inc.
Project No:	02803.01		Pebble Count Data Sheet
Date:	12/7/2004		Cross Section #2 (Riffle)

	Particle Size [mm]	Total #	% in Range	% Cumulative
Sand and Silt	< 2	58	58%	58%
Gravels	2 - 4	2	2%	60%
	4 - 6	1	1%	61%
	6 - 8	6	6%	67%
	8 - 12	4	4%	71%
	12 - 16	1	1%	72%
	16 - 24	2	2%	74%
	24 - 32	0	0%	74%
	32 - 48	3	3%	77%
	48 - 64	7	7%	84%
Cobbles	64 - 96	6	6%	90%
	96 - 128	7	7%	97%
	128 - 192	3	3%	100%
	192 - 256		0%	100%
Boulders	256 - 384		0%	100%
	384 - 512		0%	100%
	512 - 1024		0%	100%
	1024 - 2048		0%	100%
	2048 - 4096		0%	100%
Bedrock			0%	100%
	TOTALS:	100	100%	
D_{50}=	<2 mm	D_{84}=	64.0	

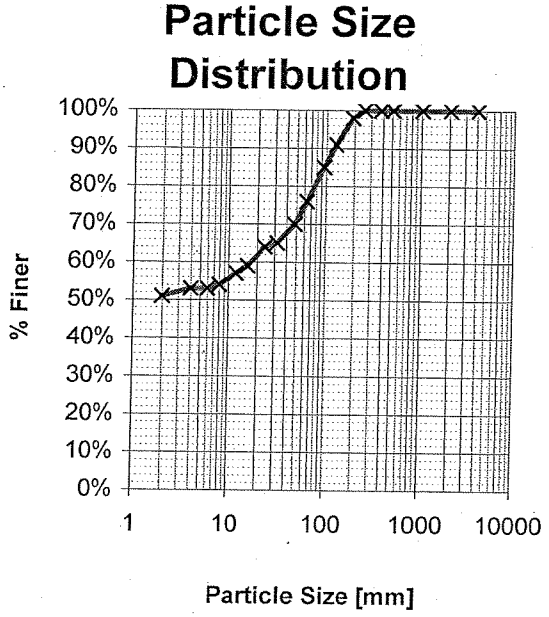


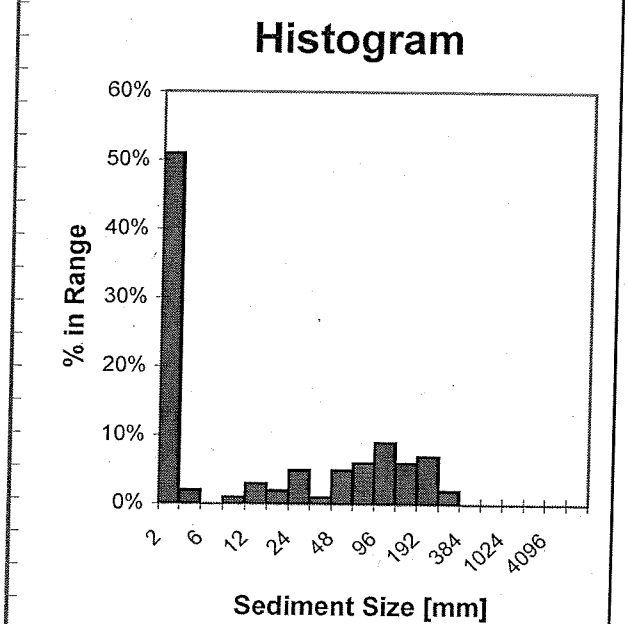


Site Name:	Big Warrior Creek		Biohabitats, Inc.	
Project No:	02803.01		Pebble Count Data Sheet	
Date:	12/7/2004		Cross Section #3 (Riffle)	

	Particle Size [mm]	Total #	% in Range	% Cumulative
Sand and Silt	< 2	51	51%	51%
Gravels	2 - 4	2	2%	53%
	4 - 6	0	0%	53%
	6 - 8	1	1%	54%
	8 - 12	3	3%	57%
	12 - 16	2	2%	59%
	16 - 24	5	5%	64%
	24 - 32	1	1%	65%
	32 - 48	5	5%	70%
	48 - 64	6	6%	76%
Cobbles	64 - 96	9	9%	85%
	96 - 128	6	6%	91%
	128 - 192	7	7%	98%
	192 - 256	2	2%	100%
Boulders	256 - 384		0%	100%
	384 - 512		0%	100%
	512 - 1024		0%	100%
	1024 - 2048		0%	100%
	2048 - 4096		0%	100%
Bedrock			0%	100%
	TOTALS:	100	100%	

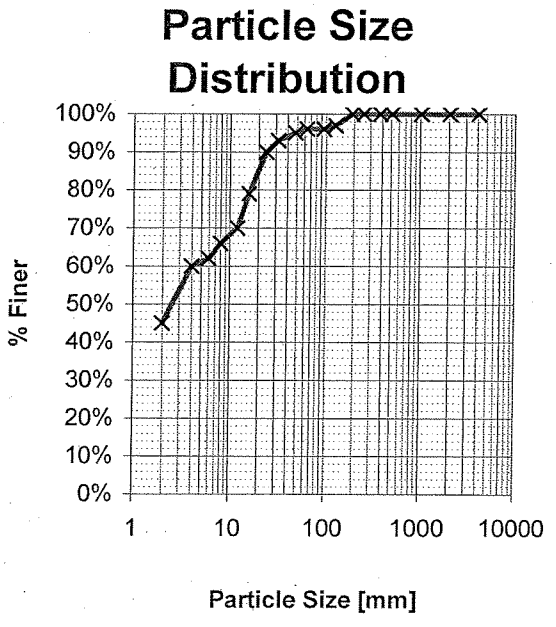
D_{50}= <2 mm D_{84}= 92.4

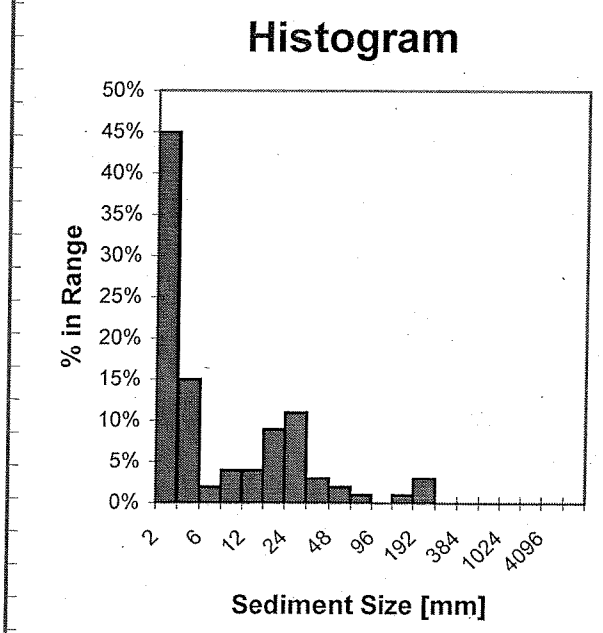




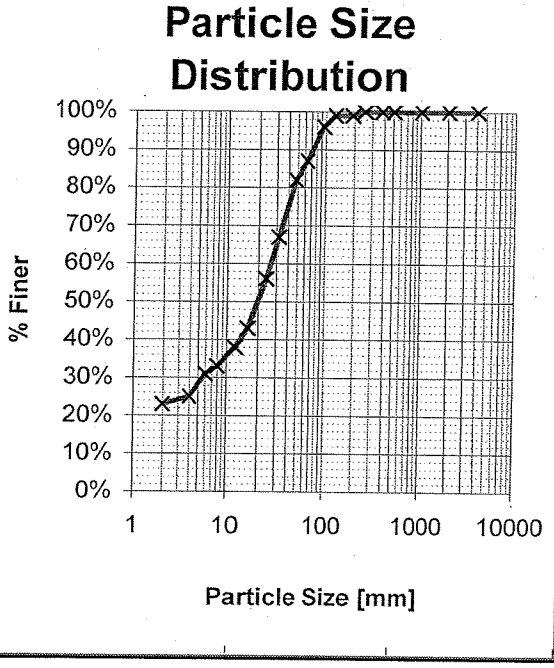
Site Name:	Big Warrior Creek		Biohabitats, Inc.
Project No:	02803.01		Pebble Count Data Sheet
Date:	12/7/2004		Cross Section #4 (Pool)

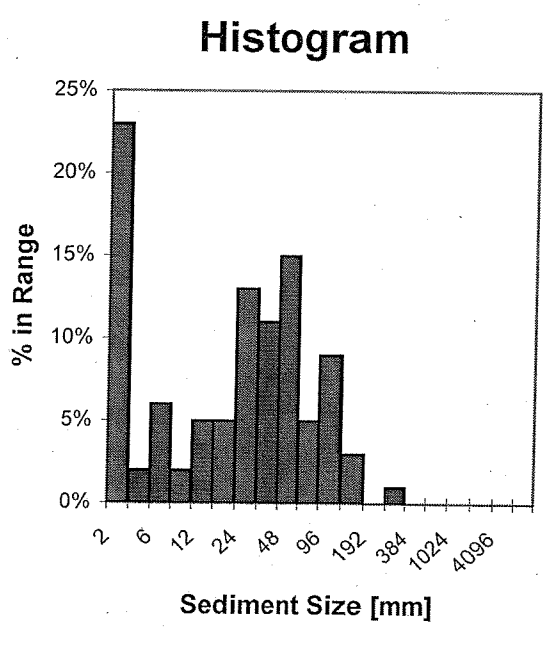
	Particle Size [mm]	Total #	% in Range	% Cumulative
Sand and Silt	< 2	45	45%	45%
Gravels	2 - 4	15	15%	60%
	4 - 6	2	2%	62%
	6 - 8	4	4%	66%
	8 - 12	4	4%	70%
	12 - 16	9	9%	79%
	16 - 24	11	11%	90%
	24 - 32	3	3%	93%
	32 - 48	2	2%	95%
	48 - 64	1	1%	96%
Cobbles	64 - 96	0	0%	96%
	96 - 128	1	1%	97%
	128 - 192	3	3%	100%
	192 - 256		0%	100%
Boulders	256 - 384		0%	100%
	384 - 512		0%	100%
	512 - 1024		0%	100%
	1024 - 2048		0%	100%
	2048 - 4096		0%	100%
Bedrock			0%	100%
	TOTALS:	100	100%	
D_{50}=	2.7	D_{84}=	19.6	





Site Name:	Big Warrior Creek			Biohabitats, Inc.	
Project No:	02803.01			Pebble Count Data Sheet	
Date:	12/7/2004			Cross Section #5 (Pool)	
	Particle Size [mm]		Total #	% in Range	% Cumulative
Sand and Silt	< 2		23	23%	23%
Gravels	2 - 4		2	2%	25%
	4 - 6		6	6%	31%
	6 - 8		2	2%	33%
	8 - 12		5	5%	38%
	12 - 16		5	5%	43%
	16 - 24		13	13%	56%
	24 - 32		11	11%	67%
	32 - 48		15	15%	82%
	48 - 64		5	5%	87%
Cobbles	64 - 96		9	9%	96%
	96 - 128		3	3%	99%
	128 - 192		0	0%	99%
	192 - 256		1	1%	100%
Boulders	256 - 384			0%	100%
	384 - 512			0%	100%
	512 - 1024			0%	100%
	1024 - 2048			0%	100%
	2048 - 4096			0%	100%
Bedrock				0%	100%
		TOTALS:	100	100%	
D_{50}=	20.3	D_{84}=	54.4		

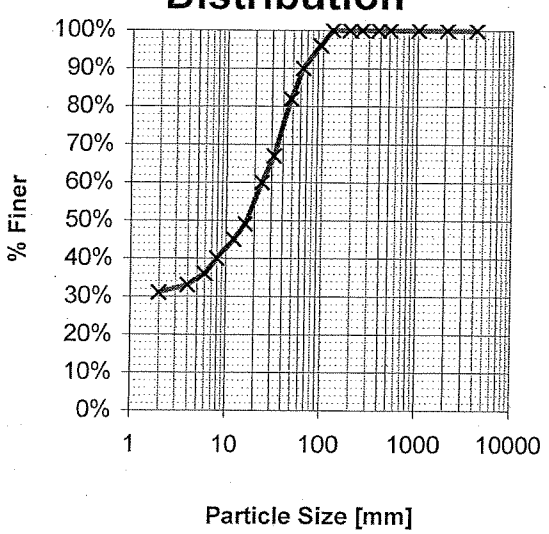


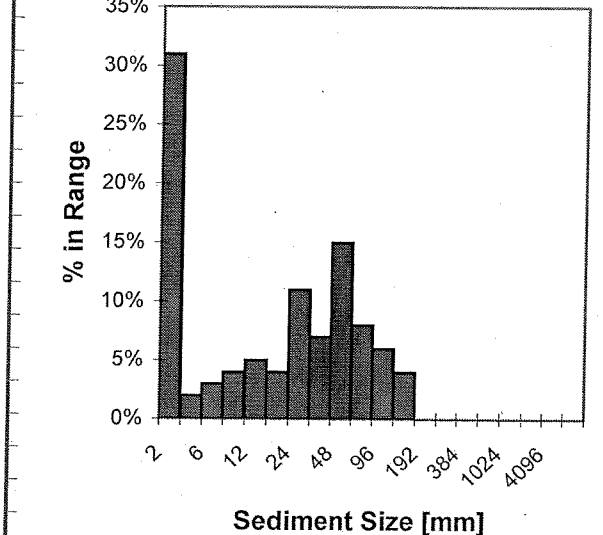


Site Name:	Big Warrior Creek		Biohabitats, Inc.	
Project No:	02803.01		Pebble Count Data Sheet	
Date:	12/7/2004		Cross Section #6 (Riffle)	

	Particle Size [mm]	Total #	% in Range	% Cumulative
Sand and Silt	< 2	31	31%	31%
Gravels	2 - 4	2	2%	33%
	4 - 6	3	3%	36%
	6 - 8	4	4%	40%
	8 - 12	5	5%	45%
	12 - 16	4	4%	49%
	16 - 24	11	11%	60%
	24 - 32	7	7%	67%
	32 - 48	15	15%	82%
	48 - 64	8	8%	90%
Cobbles	64 - 96	6	6%	96%
	96 - 128	4	4%	100%
	128 - 192		0%	100%
	192 - 256		0%	100%
Boulders	256 - 384		0%	100%
	384 - 512		0%	100%
	512 - 1024		0%	100%
	1024 - 2048		0%	100%
	2048 - 4096		0%	100%
Bedrock			0%	100%
	TOTALS:	100	100%	

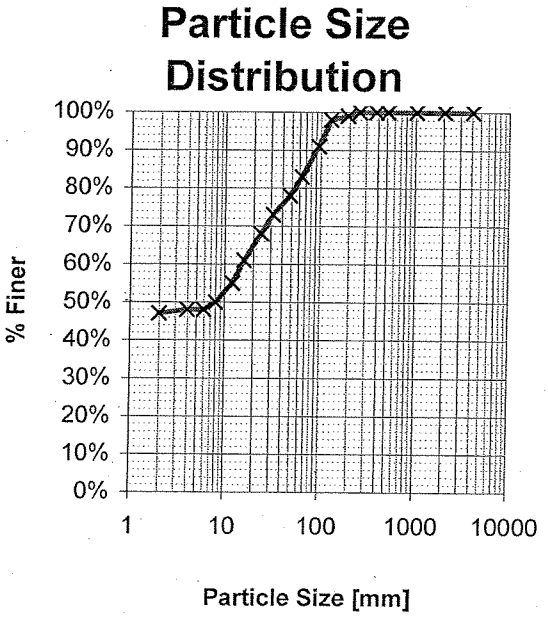
D_{50}=	16.7	D_{84}=	52.0

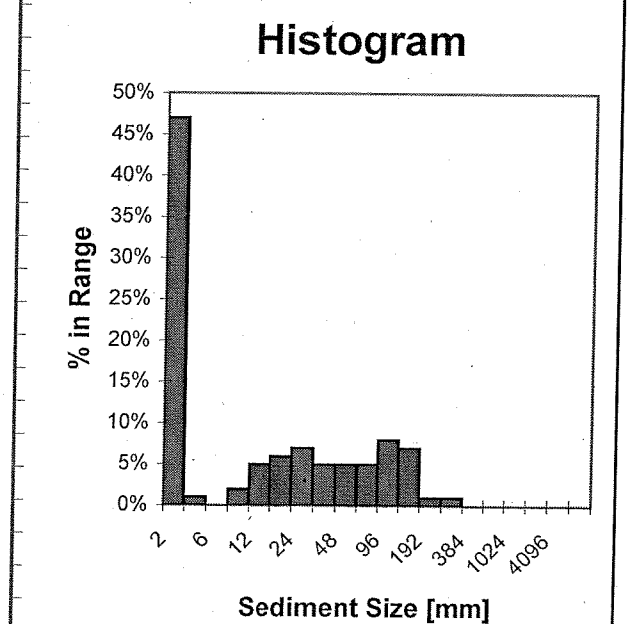




Site Name:	Big Warrior Creek		Biohabitats, Inc.	
Project No:	02803.01		Pebble Count Data Sheet	
Date:	12/7/2004		Cross Section #7 (Riffle)	

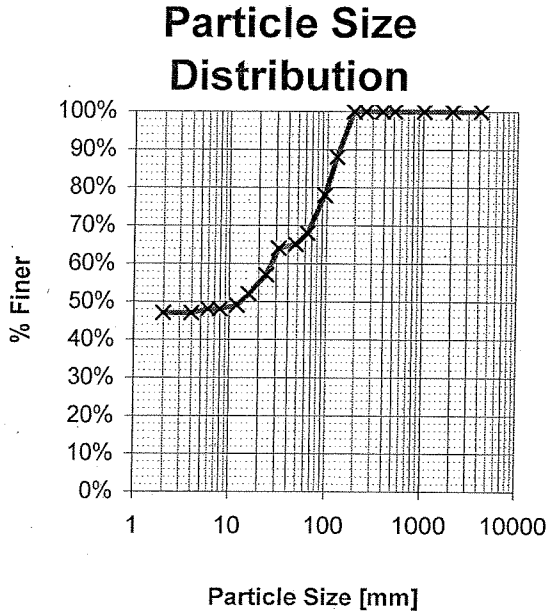
	Particle Size [mm]	Total #	% in Range	% Cumulative
Sand and Silt	< 2	47	47%	47%
Gravels	2 - 4	1	1%	48%
	4 - 6	0	0%	48%
	6 - 8	2	2%	50%
	8 - 12	5	5%	55%
	12 - 16	6	6%	61%
	16 - 24	7	7%	68%
	24 - 32	5	5%	73%
	32 - 48	5	5%	78%
	48 - 64	5	5%	83%
Cobbles	64 - 96	8	8%	91%
	96 - 128	7	7%	98%
	128 - 192	1	1%	99%
	192 - 256	1	1%	100%
Boulders	256 - 384		0%	100%
	384 - 512		0%	100%
	512 - 1024		0%	100%
	1024 - 2048		0%	100%
	2048 - 4096		0%	100%
Bedrock			0%	100%
	TOTALS:	100	100%	
D_{50}=	8.0	D_{84}=	68.0	

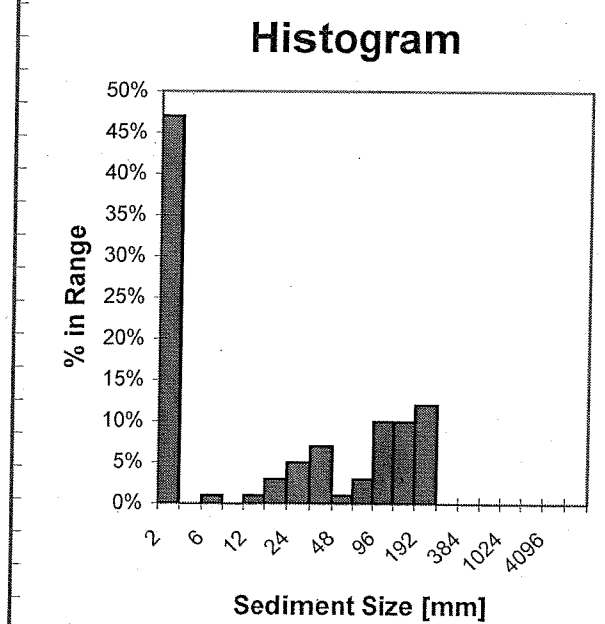




Site Name:	Big Warrior Creek		Biohabitats, Inc.
Project No:	02803.01		Pebble Count Data Sheet
Date:	12/7/2004		Cross Section #8 (Pool)

	Particle Size [mm]	Total #	% in Range	% Cumulative
Sand and Silt	< 2	47	47%	47%
Gravels	2 - 4	0	0%	47%
	4 - 6	1	1%	48%
	6 - 8	0	0%	48%
	8 - 12	1	1%	49%
	12 - 16	3	3%	52%
	16 - 24	5	5%	57%
	24 - 32	7	7%	64%
	32 - 48	1	1%	65%
	48 - 64	3	3%	68%
Cobbles	64 - 96	10	10%	78%
	96 - 128	10	10%	88%
	128 - 192	12	12%	100%
	192 - 256		0%	100%
Boulders	256 - 384		0%	100%
	384 - 512		0%	100%
	512 - 1024		0%	100%
	1024 - 2048		0%	100%
	2048 - 4096		0%	100%
Bedrock			0%	100%
	TOTALS:	100	100%	
D_{50}=	13.3	D_{84}=	115.2	





Appendix E
PHOTOGRAPHS

North Carolina Ecosystem Enhancement Program

Big Warrior Creek Stream Restoration

Post-Construction Photographs of Project Area

Abbreviations/Legend:

MS = Main Stem
MC = Mountain Creek Tributary
LT = Lower Tributary
Right Bank = Right bank looking downstream
Left Bank = Left bank looking downstream

CDM Biohabitats

Main Stem

Station 67+35 to Station 0+00

CDM Biohabitats

Photograph 1. Looking upstream from culvert at log toe protection installed on banks of existing MS channel at upstream end of project area. (4/7/04)

Photograph 2. Looking upstream from culvert at log toe protection installed on banks of existing MS channel at upstream end of project area. (4/7/04)

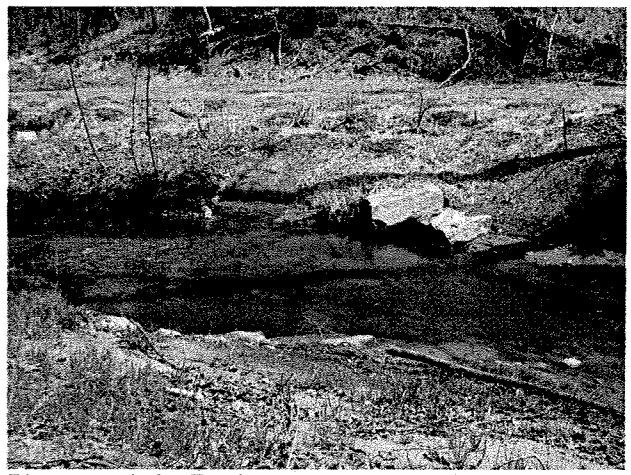
Photograph 3. Looking upstream from culvert at log toe protection installed on banks of existing MS channel at upstream end of project area. (9/27/04)

Photograph 4. Looking downstream from culvert at rock J vane installed in existing MS channel. (4/7/04)

Photograph 5. Looking downstream from culvert at rock J vane installed in existing MS channel. (9/27/04)

Photograph 6. Downstream face of culvert installed at upstream end of project area. (9/27/04)

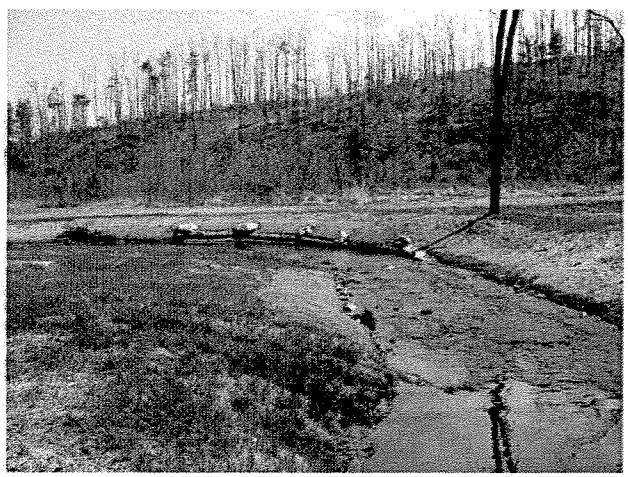
Photograph 7. Looking downstream from rock J vane installed in existing MS channel. (9/27/04)



Photograph 8. Rock cross vane installed in existing MS channel. (4/7/04)

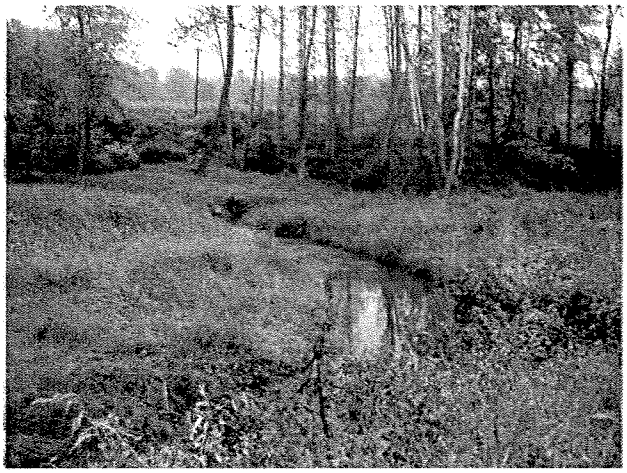
Photograph 9. Looking downstream at log toe protection and root wads installed around bend at MS Station 66+00. (9/27/04)

Photograph 10. Looking downstream from MS Station 65+50 at rock J vane, log toe protection, and root wad. (4/7/04)

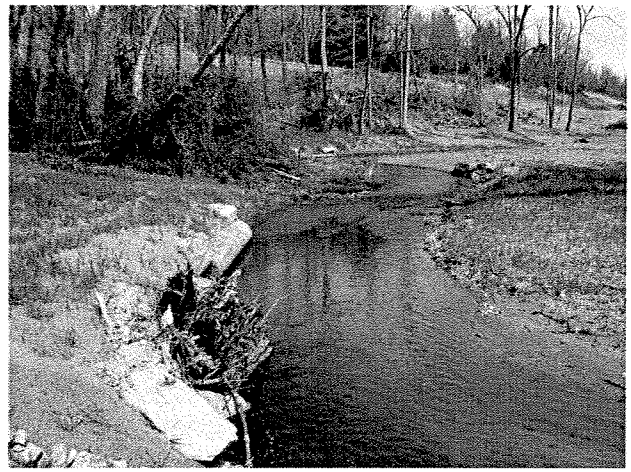


Photograph 11. Looking downstream from MS Station 63+00 at log vane, rock J vane, log toe protection, and root wads. (4/7/04)

Photograph 12. Looking upstream at rock J vane installed at MS Station 62+44. (9/27/04)



Photograph 13. Looking downstream from MS Station 61+50. (9/27/04)

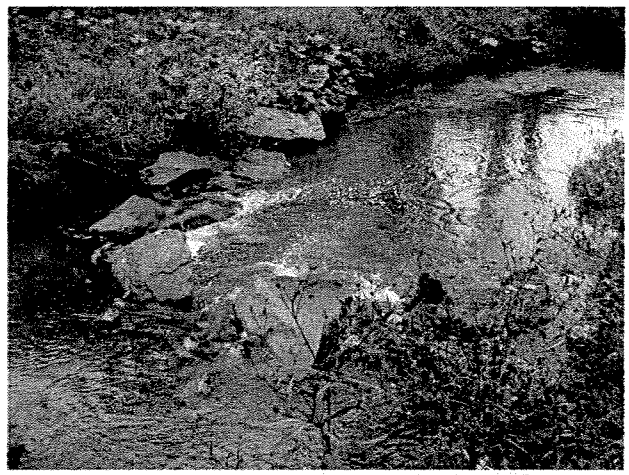


Photograph 14. Looking downstream from MS Station 60+50 at root wad and log toe protection. (4/7/04)

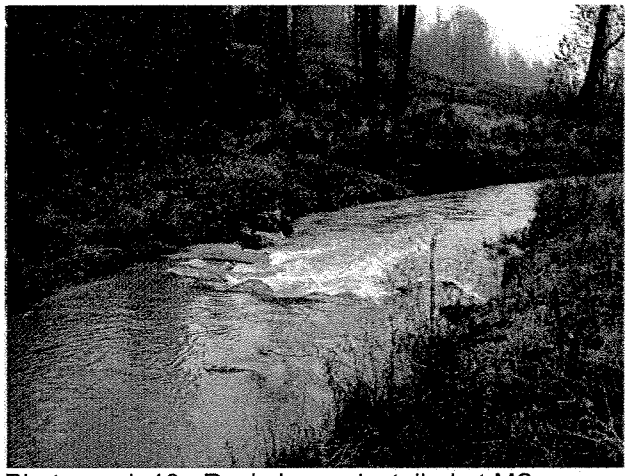
Photograph 15. Looking downstream from MS Station 60+00 at root wad and log toe protection. (9/27/04)

Photograph 16. Looking downstream from root wad at MS Station 59+50 at log vane and log toe protection. (9/27/04)

Photograph 17. Looking downstream from MS Station 58+75 at Station 58+44 rock J vane. (9/27/04)

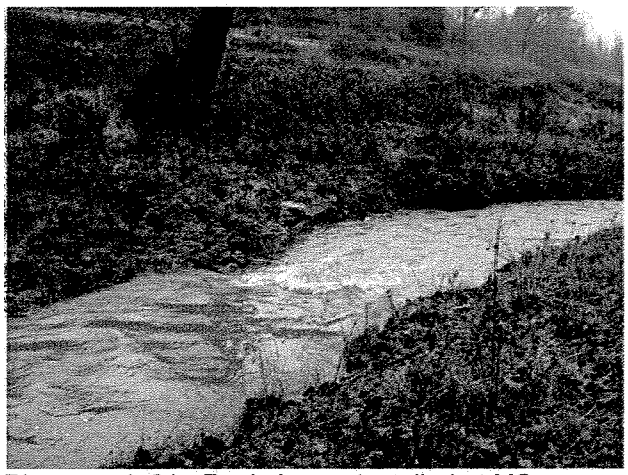


Photograph 18. Rock J vane installed at MS Station 57+66. (9/27/04)



Photograph 19. Rock J vane installed at MS Station 57+66 during storm event. (11/12/04)

Photograph 20. Rock J vane installed at MS Station 56+19. (4/7/04)



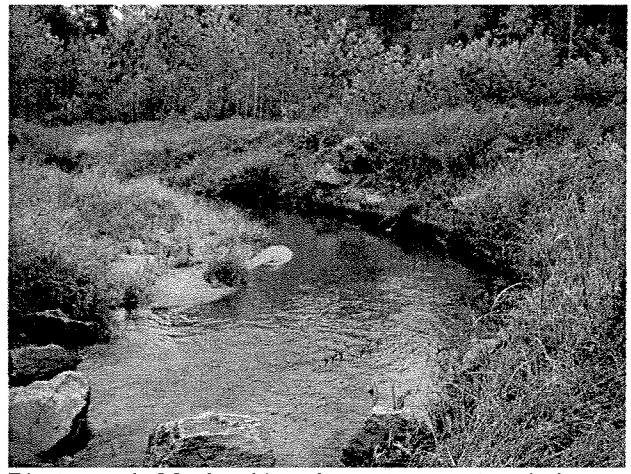
Photograph 21. Rock J vane installed at MS Station 56+19 during storm event. (11/12/04)

Photograph 22. Looking downstream at root wads and log vane installed at MS Station 55+08. (9/27/04)

Photograph 23. Looking upstream from MS Station 53+50 at log toe protection. (9/27/04)

Photograph 24. Looking downstream at log toe protection and MS Station 53+96 rock vane. (4/7/04)

Photograph 25. Looking downstream from Highway 18 at beginning of bend at MS Station 53+50. (9/27/04)



Photograph 26. Looking downstream at rock J vane installed at MS Station 53+01 and downstream log toe protection/root wad. (9/27/04)

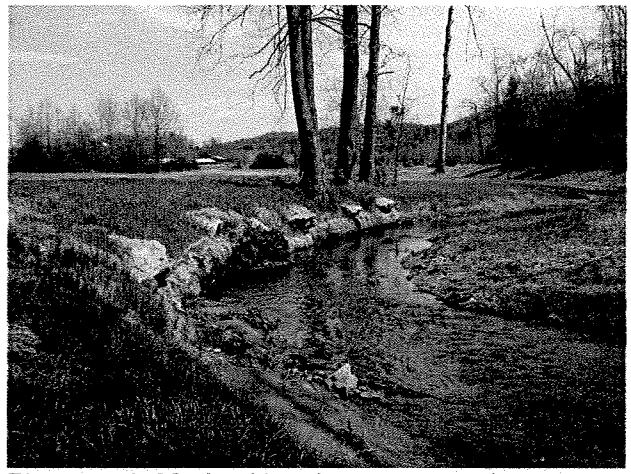
Photograph 27. Looking down from Highway 18 at bend between MS Stations 53+50 and 51+50. (9/27/04)

Photograph 28. Looking upstream at log toe protection and log vane installed at MS Station 51+93. (9/27/04)

Photograph 29. Looking downstream from MS Station 51+25 at log toe protection, root wads, and live branch layering (left bank). (9/27/04)

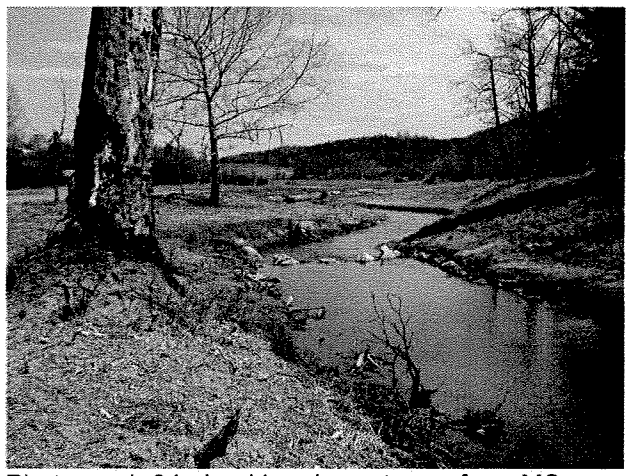
Photograph 30. Looking downstream from MS Station 50+50 at root wads and log toe protection. Preserved wetland on right bank. (9/27/04)

Photograph 31. Looking downstream between MS Stations 49+50 and 48+00. (9/27/04)

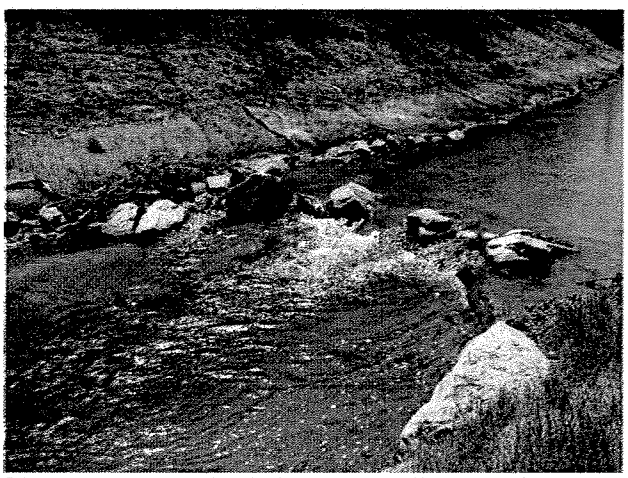


Photograph 32. Looking downstream at log vane installed at MS Station 49+02, log toe protection, and root wad. (4/7/04)

Photograph 33. Looking downstream at root wads between MS Stations 47+50 and 47+00. (4/7/04)

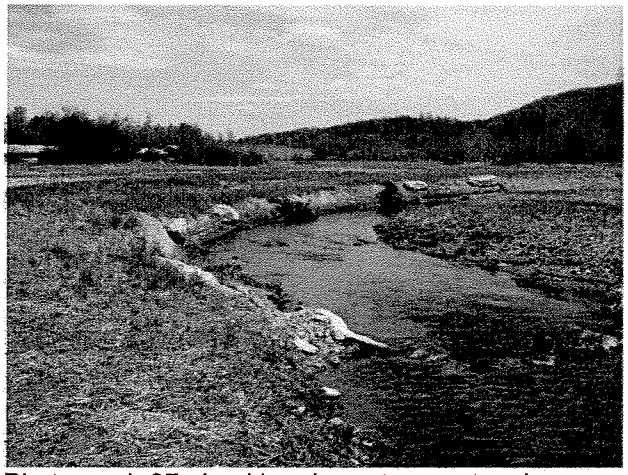


Photograph 34. Looking downstream from MS Station 47+00. (4/7/04)



Photograph 35. Rock J vane installed at MS Station 45+83. (4/7/04)

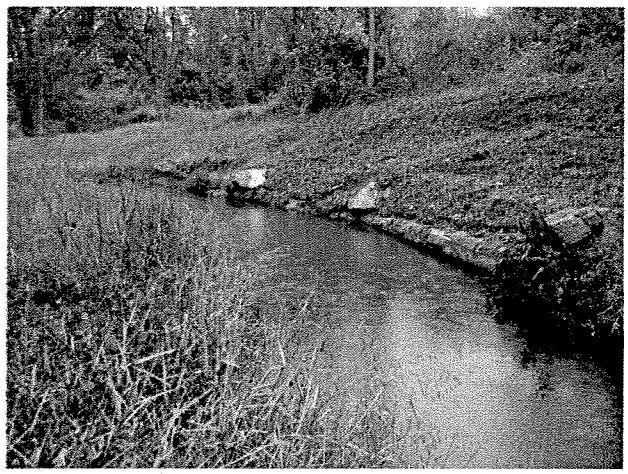
Photograph 36. Looking upstream at rock cross vane installed at MS Station 44+38. (9/27/04)



Photograph 37. Looking downstream at rock cross vane installed at MS Station 44+38 and root wads/log toe protection. (4/7/04)

Photograph 38. Looking downstream from MS Station 43+00 at rock vane installed at MS Station 42+32 and log toe protection/root wads. (4/7/04)

Photograph 39. Looking downstream from MS Station 43+00. (9/27/04)



Photograph 40. Looking downstream at log toe protection and root wads installed between MS Stations 41+50 and 40+75. (9/27/04)

Photograph 41. Looking downstream from MS Station 40+75. (9/27/04)

Photograph 42. Looking downstream from MS Station 40+50 at rock J vane installed at MS Station 39+98 and log toe protection/root wads. (4/7/04)

Photograph 43. Looking upstream from MS Station 39+50. (9/2704)

Photograph 44. Looking upstream from MS Station 38+75. (9/2704)

Photograph 45. Looking downstream at rock vane installed at MS Station 38+80. (4/7/04)

Photograph 46. Looking downstream at rock cross vane installed at MS Station 38+20. (9/27/04)

Photograph 47. Looking downstream from MS Station 38+00 at rock toe protection/root wad and rock vane installed at MS Station 37+17. (4/7/04)

Photograph 48. Looking downstream at rock toe protection installed between MS Station 37+80 and 37+25. (9/27/04)

Photograph 49. Looking downstream from MS Station 36+75. (9/27/04)

Photograph 50. Looking downstream from MS Station 36+50 at log toe protection and root wads. (9/27/04)

Photograph 51. Looking upstream from MS Station 35+75. (9/27/04)

Photograph 52. Looking downstream from MS Station 35+00 at installed rock toe protection and root wads. (9/27/04)

Photograph 53. Looking downstream at rock vane installed at MS Station 34+15. (4/7/04)

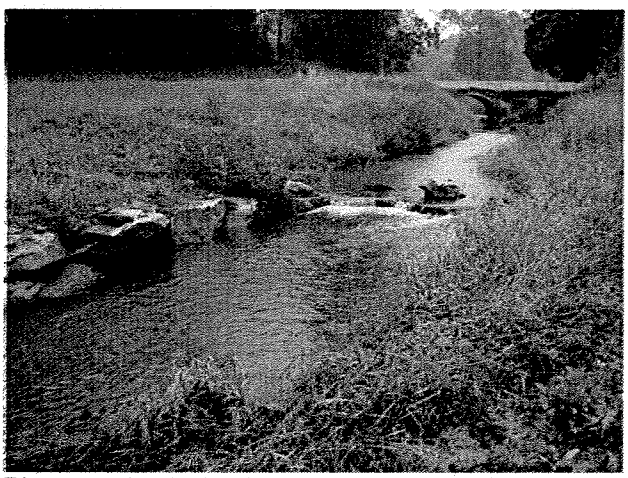
Photograph 54. Looking upstream at rock toe protection, root wads, and rock vane installed between MS Stations 34+75 and 33+75. (4/7/04)

Photograph 55. Looking upstream from culvert installed at MS Station 33+00. (9/27/04)

Photograph 56. Upstream face of culvert installed at MS Station 33+00. (9/27/04)

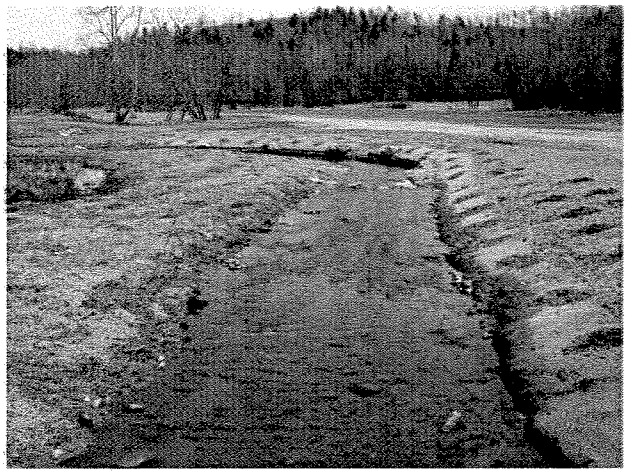
Photograph 57. Downstream face of culvert installed at MS Station 33+00. (9/27/04)

Photograph 58. Looking downstream from culvert installed at MS Station 33+00. (9/27/04)



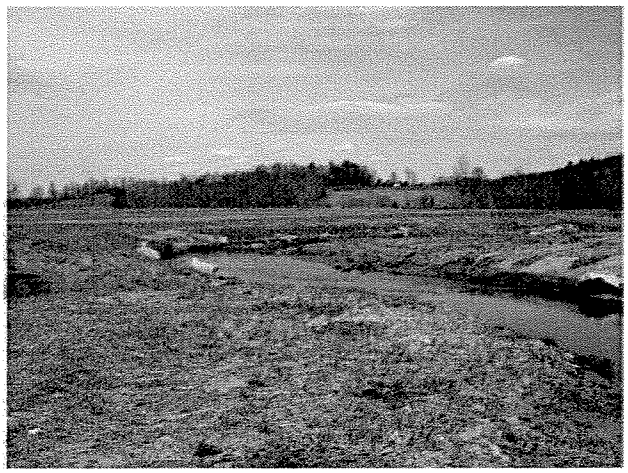
Photograph 59. Looking upstream at rock J vane installed at MS Station 32+11. (9/27/04)

Photograph 60. Looking upstream at preserved wetland in area between MS Stations 32+00 and 31+00. (9/27/04)



Photograph 61. Looking downstream at rock J vane, log toe protection, and root wads installed between MS Stations 32+50 and 31+50. (4/7/04)

Photograph 62. Looking downstream at rock J vane, log toe protection, and root wads installed between MS Stations 32+50 and 31+50. (9/27/04)



Photograph 63. Looking downstream at log toe protection and root wads installed between MS Stations 30+80 and 30+00. (4/7/04)

Photograph 64. Looking downstream at log toe protection and root wads installed between MS Stations 30+80 and 30+00. (9/27/04)

Photograph 65. Looking downstream at rock vane installed at MS Station 29+67. (9/27/04)

Photograph 66. Rock J vane installed at MS Station 29+10. (4/7/04)

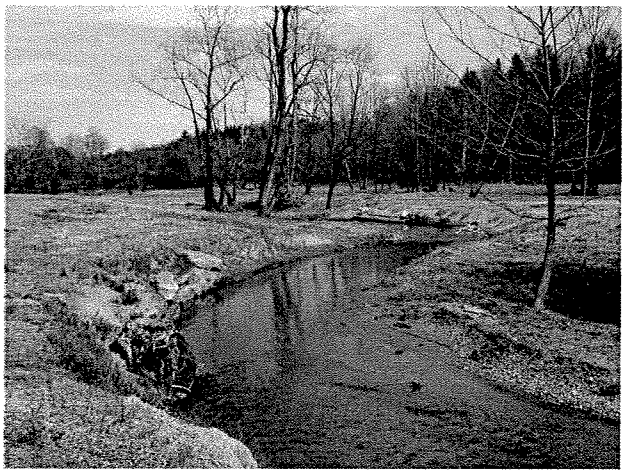
Photograph 67. Looking downstream at rock J vane installed at MS Station 29+10. (9/27/04)

Photograph 68. Rock vane installed at MS Station 28+04. (9/27/04)

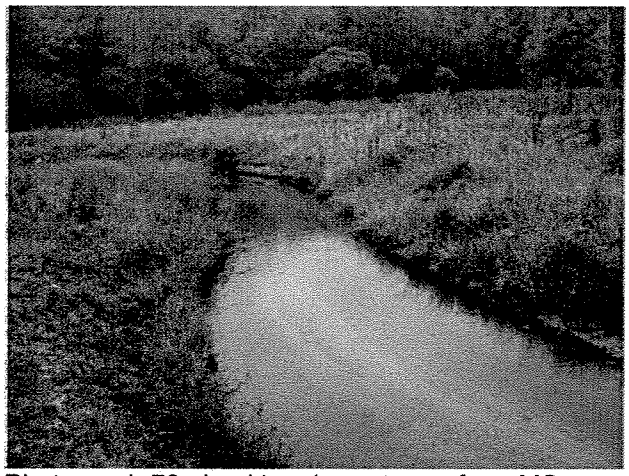
Photograph 69. Looking upstream at rock cross vane installed at MS Station 27+33. (4/7/04)

Photograph 70. Looking upstream at rock cross vane installed at MS Station 27+33. (9/27/04)

Photograph 71. Looking downstream at rock cross vane, log toe protection, and root wad installed between MS Stations 27+33 and 26+25. (4/7/04)



Photograph 72. Looking downstream from MS Station 26+75. (4/7/04)



Photograph 73. Looking downstream from MS Station 26+25. (9/27/04)

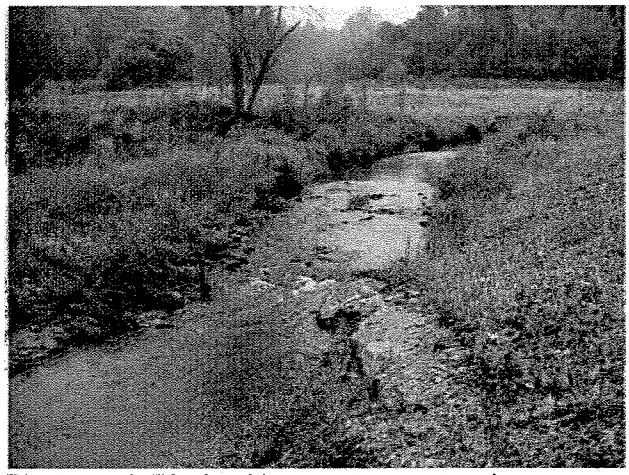
Photograph 74. Looking downstream from log vane installed at MS Station 24+59. (9/27/04)

Photograph 75. Looking upstream at rock J vane installed at MS Station 24+03. (9/27/04)

Photograph 76. Looking upstream at log toe protection and root wad installed between MS Stations 23+50 and 23+00 area. (9/27/04)

Photograph 77. Looking downstream from MS Station 22+00. (9/27/04)

Photograph 78. Looking downstream at rock vane, root wad, and log toe protection installed between MS Stations 21+34 and 20+60. (9/27/04)



Photograph 79. Looking upstream at rock vane installed at MS Station 21+34. (9/27/04)

Photograph 80. Looking upstream from MS Station 20+50. (9/27/04)

Photograph 81. Looking upstream at root wad and log toe protection installed between MS Stations 20+90 and 20+60. (9/27/04)

Photograph 82. Looking downstream at ford stream crossings near confluence of Mountain Creek tributary and main stem. (9/27/04)

Photograph 83. Looking upstream from ford stream crossing installed at MS Station 19+75. (9/27/04)

Photograph 84. Mountain Creek tributary confluence with Big Warrior Creek main stem. (9/27/04)

Photograph 85. Rock toe protection installed between MS Stations 19+25 and 18+80 upstream of ford crossing. (9/27/04)

Photograph 86. Ford stream crossing installed at MS Station 18+75. (9/27/04)

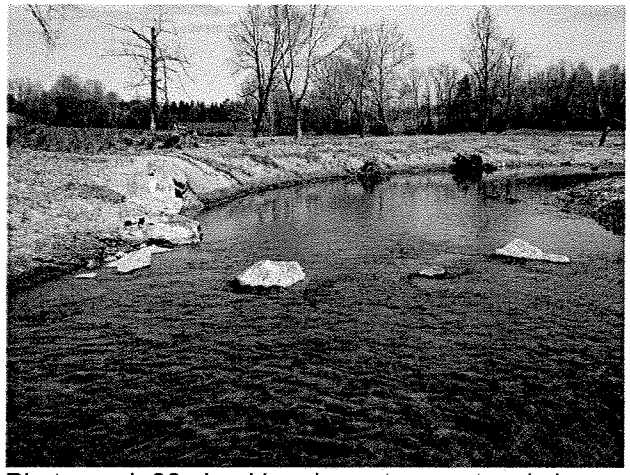
Photograph 87. Looking downstream from ford stream crossing (MS Station 18+75). (9/27/04)

Photograph 88. Looking downstream at bend between MS Stations 18+50 and 18+00. (9/27/04)

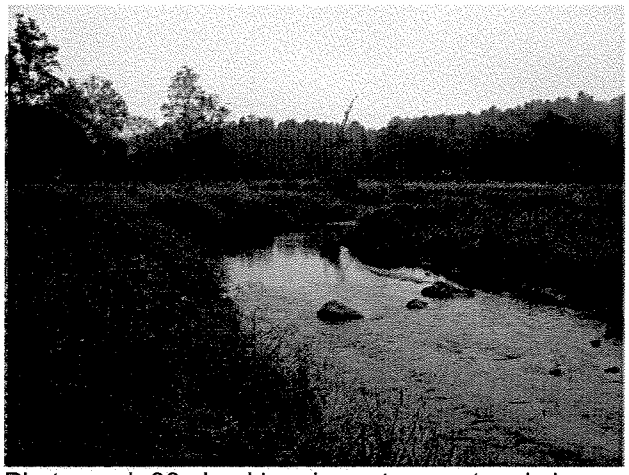
Photograph 89. Looking downstream at log toe protection and root wads installed between MS Stations 18+25 and 17+50. (9/27/04)

Photograph 90. Looking downstream at log toe protection and root wads installed between MS Stations 18+00 and 17+00. (4/7/04)

Photograph 91. Looking downstream at log toe protection and root wads installed between MS Stations 18+10 and 17+20. (9/27/04)



Photograph 92. Looking downstream at rock J vane and root wads installed between MS Stations 16+35 and 15+50. (4/7/04)



Photograph 93. Looking downstream at rock J vane installed at MS Station 16+35. (9/27/04)

Photograph 94. Preserved wetland in area of MS Station 16+00 (left bank). (9/27/04)

Photograph 95. Confluence of Lower tributary at MS Station 15+00. (9/27/04)

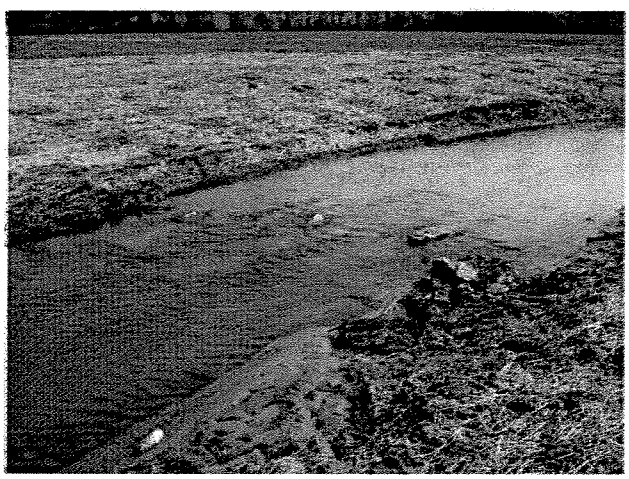
Photograph 96. Log toe protection and root wads installed around bend between MS Stations 14+55 and 13+90 (preserved snag on left bank). (4/7/04)

Photograph 97. Looking upstream at log toe protection and root wads installed around bend between MS Stations 14+10 and 13+45. (4/7/04)

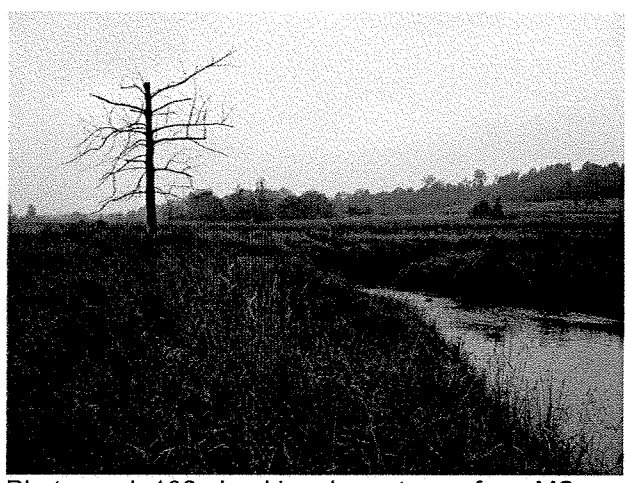
Photograph 98. Looking upstream from left bank at log toe protection and root wads installed between MS Stations 14+25 to 13+90. (9/27/04)

Photograph 99. Looking upstream from left bank at log toe protection and root wads installed between MS Stations 14+15 to 13+70. (9/27/04)

Photograph 100. Looking downstream from left bank at MS Station 13+45. (9/27/04)



Photograph 101. Looking upstream at rock J vane installed at MS Station 13+00. (4/7/04)



Photograph 102. Looking downstream from MS Station 13+50 (preserved snag on left bank). (9/27/04)

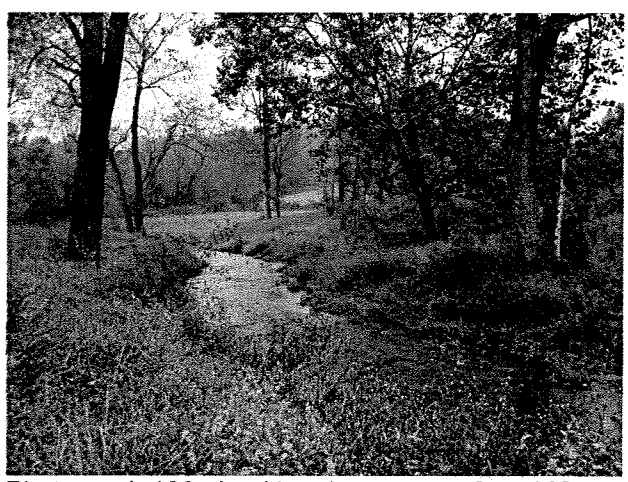
Photograph 103. Looking upstream at log toe protection and root wads installed between MS Stations 12+65 and 11+15. (4/7/04)

Photograph 104. Looking upstream at log toe protection and root wads installed between MS Stations 12+65 and 11+15. (9/2704)

Photograph 105. Looking upstream at rock vane installed at MS Station 11+10. (4/7/04)

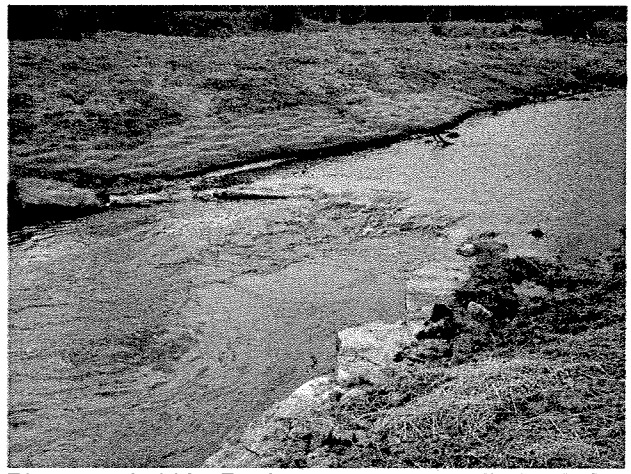
Photograph 106. Looking upstream from MS Station 11+10. (9/27/04)

Photograph 107. Looking downstream from MS Station 12+25. (9/27/04)



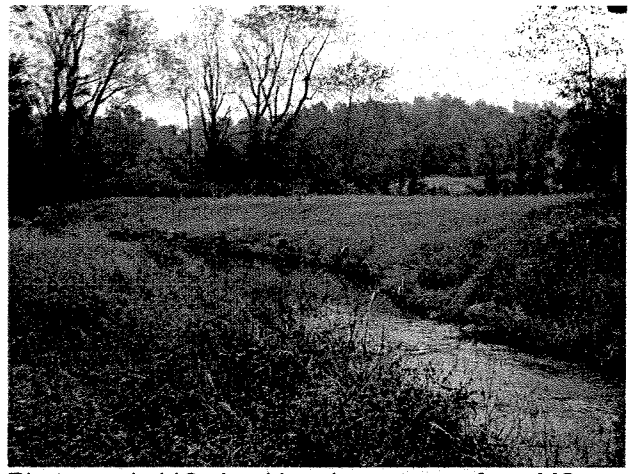
Photograph 108. Looking downstream from MS Station 10+80. (9/27/04)

Photograph 109. Looking upstream from MS Station 10+00. (9/27/04)



Photograph 110. Rock cross vane installed at MS Station 9+04. (4/7/04)

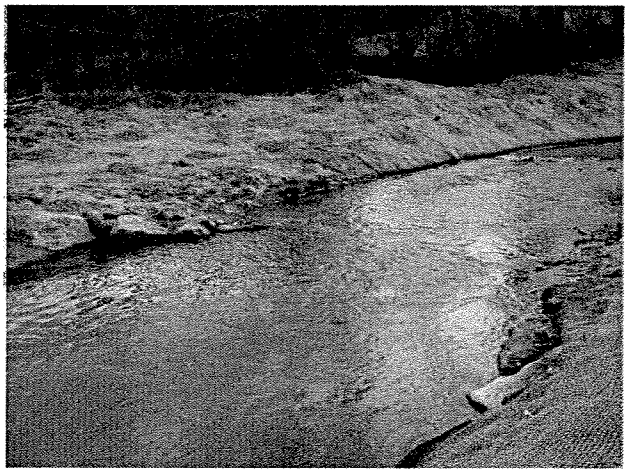
Photograph 111. Looking upstream at rock cross vane installed at MS Station 9+04. (9/27/04)



Photograph 112. Looking downstream from MS Station 9+25. (9/27/04)

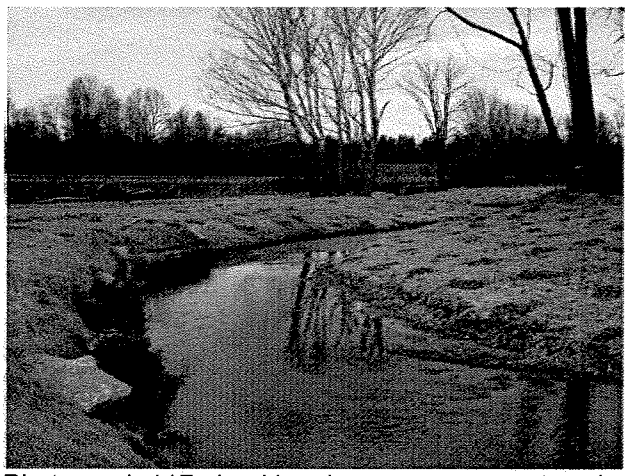
Photograph 113. Looking upstream at log toe protection installed between MS Stations 8+70 and 8+30. (9/27/04)

Photograph 114. Looking upstream at log toe protection installed between MS Stations 8+50 and 8+00. (9/27/04)



Photograph 115. Rock cross vane installed at MS Station 6+58. (4/7/04)

Photograph 116. Rock cross vane installed at MS Station 6+58. (9/27/04)



Photograph 117. Looking downstream at root wads and log toe protection installed between MS Stations 6+10 and 5+40. (4/7/04)

Photograph 118. Looking downstream from MS Station 6+50. (9/27/04)

Photograph 119. Looking upstream from MS Station 5+25. (9/27/04)

Photograph 120. Looking upstream at rock J vane installed at MS Station 4+72 (existing ditch in background). (4/7/04)

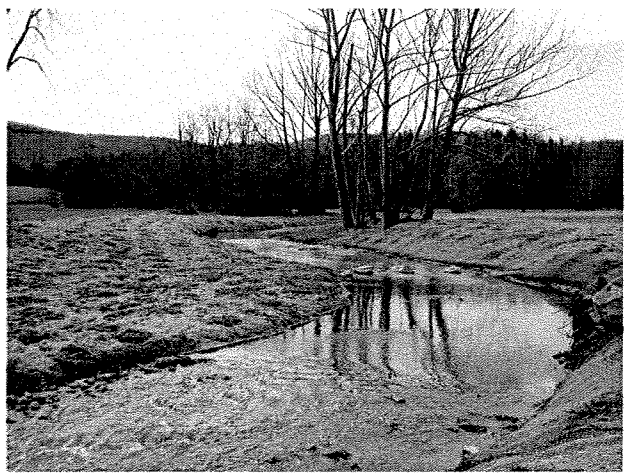
Photograph 121. Looking downstream from MS Station 5+25 at rock J vane. (9/27/04)

Photograph 122. Looking upstream at root wads and log toe protection installed between MS Stations 4+35 and 3+90. (9/27/04)

Photograph 123. Looking downstream from MS Station 4+00. (9/27/04)

Photograph 124. Looking upstream at log J vane installed at MS Station 3+53. (4/7/04)

Photograph 125. Looking upstream at log J vane installed at MS Station 3+53. (9/27/04)



Photograph 126. Looking upstream from MS Station 2+75. (4/7/04)

Photograph 127. Looking upstream from MS Station 2+90 at log J vane installed at MS Station 3+53. (9/27/04)

Photograph 128. Looking downstream at root wads installed between MS Stations 3+10 and 2+80. (4/7/04)

Photograph 129. Looking downstream from rock cross vane installed at MS Station 1+50 area. (4/7/04)

Photograph 130. Looking upstream from MS Station 1+25 area. (9/27/04)

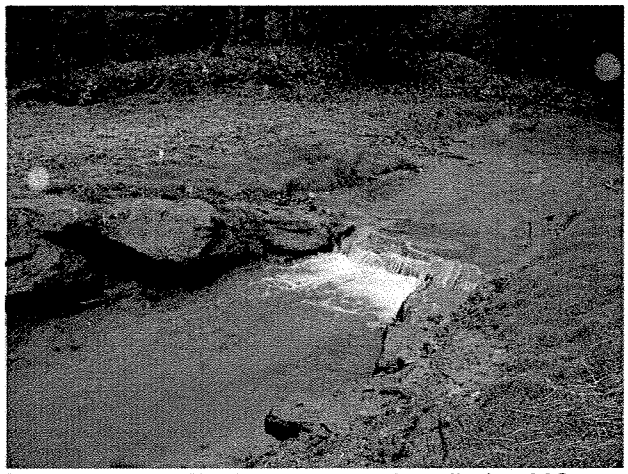
Photograph 131. Gravel path installed at downstream end of main stem for cattle access to NC 18 culvert. (9/27/04)

Photograph 132. Gravel path installed at downstream end of main stem for cattle access to NC 18 culvert. (9/27/04)

Mountain Creek Tributary

Station 0+00 to Station 24+15

CDM Biohabitats



Photograph 1. Rock cross vane installed at MC Station 0+12 (upstream end of restoration area). (12/9/03)

Photograph 2. Looking upstream at rock cross vane, log toe protection, root wads, and log vane installed between MC Stations 0+12 and 1+08. (9/27/04)

Photograph 3. Looking downstream at log toe protection installed between LT Stations 1+50 and 1+90 to protect large trees. (12/18/03)

Photograph 4. Looking downstream at log toe protection installed between LT Stations 1+50 and 1+90 to protect large trees. (9/27/04)

Photograph 5. Rock J vane installed at MC Station 1+93. (12/18/03)

Photograph 6. Looking downstream from rock J vane at root wads and log vane installed between MC Stations 2+20 and 2+57. (9/27/04)

Photograph 7. Log vane installed at MC Station 2+57. (12/18/03)

Photograph 8. Log toe protection installed between MC Stations 2+85 and 3+05. (12/18/03)

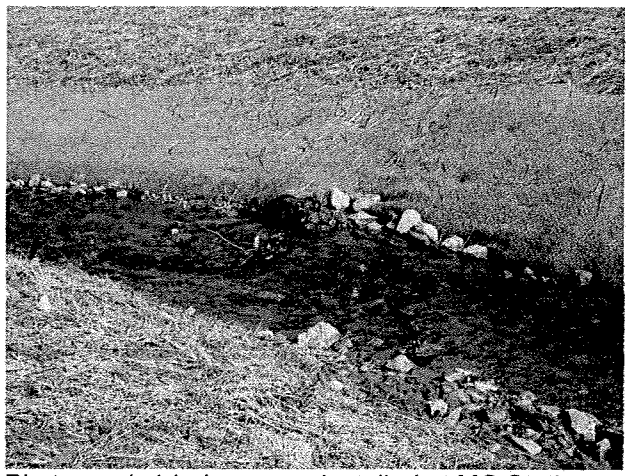
Photograph 9. Looking downstream from MC Station 2+25. (9/27/04)

Photograph 10. Looking downstream at preserved wetland on left bank between MC Stations 4+00 and 4+65. (9/27/04)

Photograph 11. Looking downstream from MC Station 4+65 at log toe protection and root wads installed on left bank between MC Stations 5+05 and 5+70. (9/27/04)

Photograph 12. Looking downstream at rock J vane installed at MC Station 5+86 and log toe protection and root wads installed between MC Stations 6+20 and 6+55. (12/18/03)

Photograph 13. Looking downstream from MC Station 5+70. (9/27/04)

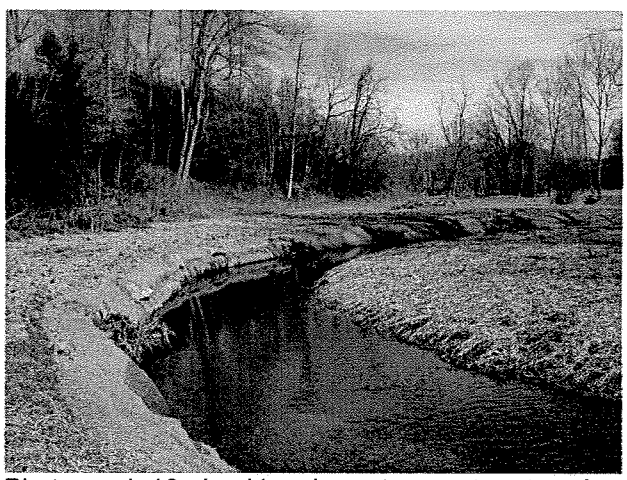


Photograph 14. Log vane installed at MC Station 6+86. (1/16/04)

Photograph 15. Looking downstream from MC Station 6+86. (9/27/04)

Photograph 16. Looking downstream at rock cross vane installed at MC Station 8+25 and root wads and log toe protection installed between MC Stations 8+70 and 9+20. (1/16/04)

Photograph 17. Looking downstream at rock cross vane installed at MC Station 8+25 and root wads and log toe protection installed between MC Stations 8+70 and 9+20. (9/27/04)



Photograph 18. Looking downstream at root wads and log toe protection installed between MC Stations 8+70 and 9+40. (1/16/04)

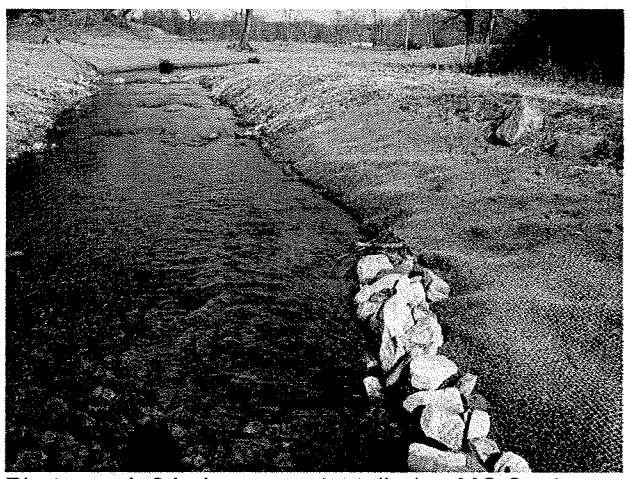
Photograph 19. Looking downstream at root wads and log toe protection installed between MC Stations 8+70 and 9+40. (9/27/04)

Photograph 20. Looking upstream at rock J vane installed at MC Station 9+72. (9/27/04)

Photograph 21. Looking downstream at rock J vane installed at MC Station 10+14. (1/16/04)

Photograph 22. Looking downstream at root wads installed between MC Stations 10+50 and 11+00. (1/16/04)

Photograph 23. Looking downstream at root wads installed between MC Stations 10+50 and 11+00. (9/27/04)



Photograph 24. Log vane installed at MC Station 11+26. (1/16/04)

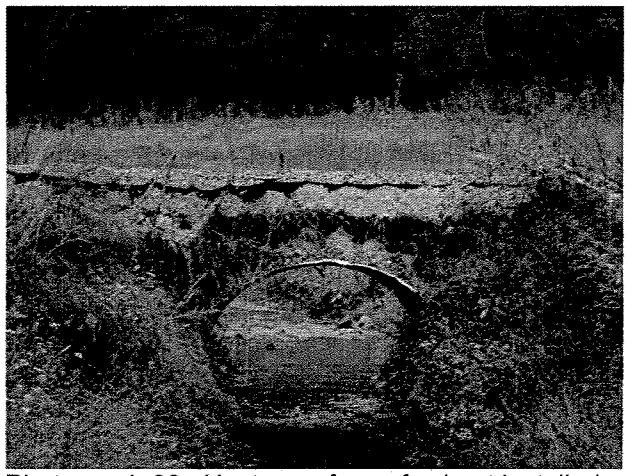
Photograph 25. Looking downstream from MC Station 11+30. (9/27/04)

Photograph 26. Looking downstream at rock J vane installed at MC Station 12+02. (1/16/04)

Photograph 27. Preserved wetland on right bank between MC Stations 11+75 and 13+25. (1/16/04)

Photograph 28. Looking downstream at root wads installed between MC Stations 12+45 and 12+65. (1/16/04)

Photograph 29. Looking downstream from LT Station 12+10 at root wads installed between MC Stations 12+45 and 12+65. (9/27/04)



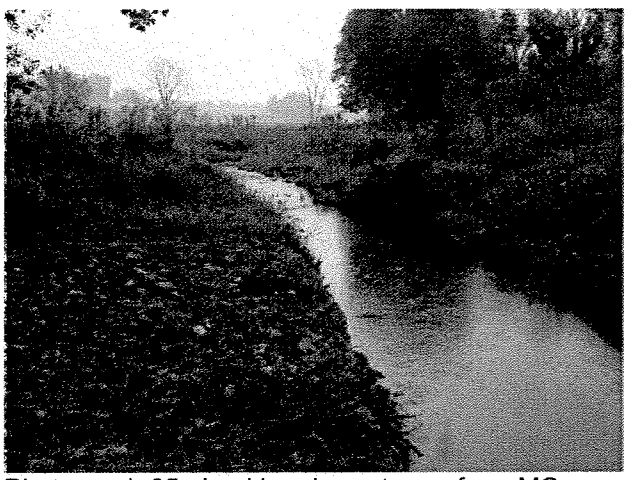
Photograph 30. Upstream face of culvert installed at MC Station 13+29. (9/27/04)

Photograph 31. Downstream face of culvert installed at MC Station 13+29. (9/27/04)

Photograph 32. Log vane installed at MC Station 13+66. (1/16/04)

Photograph 33. Looking downstream from culvert at log vane, root wads, and log toe protection installed between MC Stations 13+66 and 15+85. (4/7/04)

Photograph 34. Looking across culvert at root wads and log toe protection installed on right bank between MC Stations 14+00 and 14+70. (9/27/04)



Photograph 35. Looking downstream from MC Station 14+80. (9/27/04)

Photograph 36. Looking downstream at log vane installed at MC Station 16+03. (1/16/04)

Photograph 37. Looking downstream at log vane, log toe protection, and root wad installed between MC Stations 16+03 and 16+55. (9/27/04)

Photograph 38. Looking downstream from MC Station 16+85. (9/27/04)

Photograph 39. Rock cross vane installed at MC Station 17+25. (9/27/04)

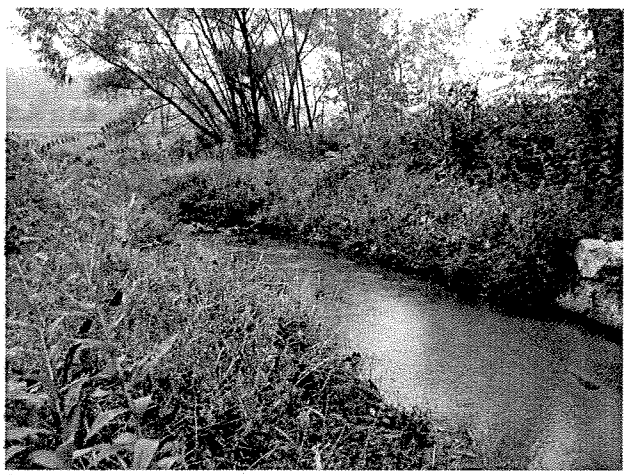
Photograph 40. Looking downstream from MC Station 17+25. (9/27/04)

Photograph 41. Rock cross vane installed at MC Station 17+98. (1/16/04)

Photograph 42. Looking downstream from MC Station 17+98 at log toe protection and root wads installed between MC Stations 18+25 and 19+25. (9/27/04)

Photograph 43. Wetland created from relic channel in MC Station 18+75 area. (1/16/04)

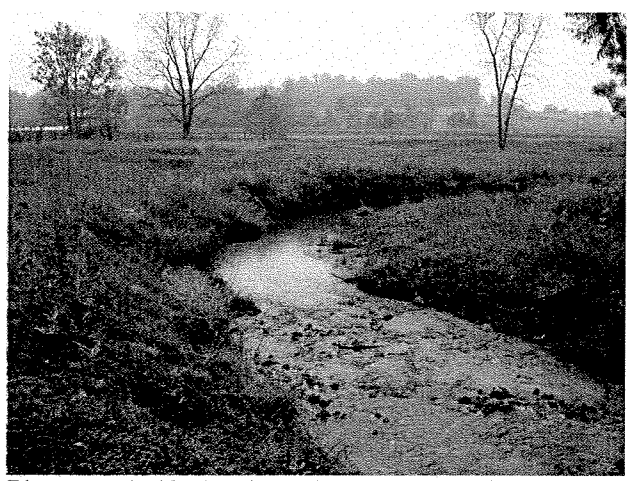
Photograph 44. Wetland created from relic channel in MC Station 19+50 area. (1/16/04)



Photograph 45. Looking downstream from MC Station 19+25. (9/27/04)

Photograph 46. Looking downstream at rock vane installed at MC Station 19+20. (1/16/04)

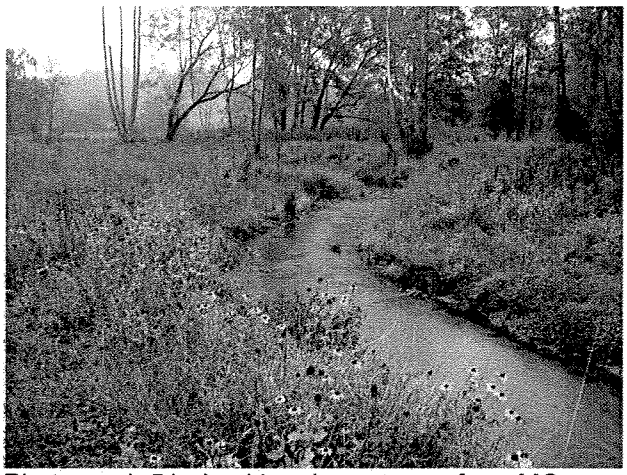
Photograph 47. Looking downstream at log vane installed at MC Station 19+97. (1/16/04)



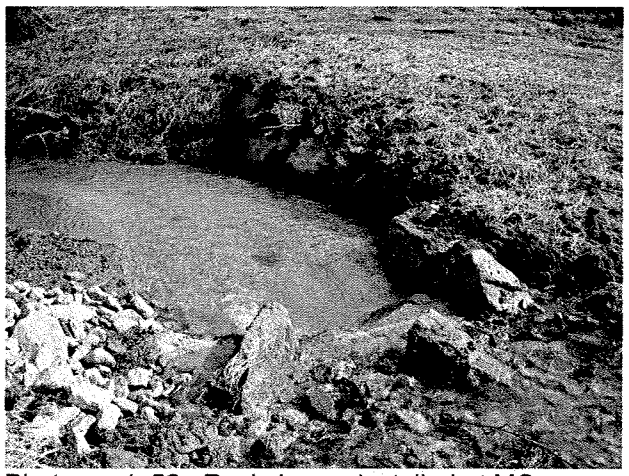
Photograph 48. Looking downstream at log vane, root wads, and log toe protection installed between MC Stations 19+97 and 20+75. (9/27/04)

Photograph 49. Looking downstream at log toe protection and root wad installed between MC Stations 20+60 and 21+00. (9/27/04)

Photograph 50. Log vane installed at MC Station 21+11. (1/16/04)



Photograph 51. Looking downstream from MC Station 20+50. (9/27/04)



Photograph 52. Rock J vane installed at MC Station 21+63. (1/16/04)

Photograph 53. Looking downstream at rock J vane installed at MC Station 21+63. (9/27/04)

Photograph 54. Looking downstream at root wad installed at MC Station 22+05. (9/27/04)

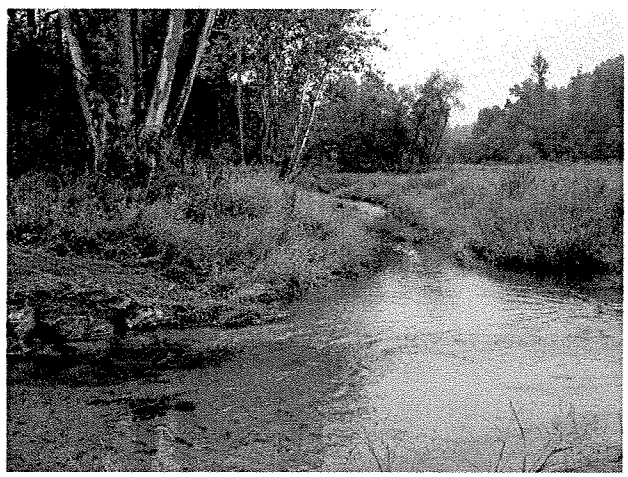
Photograph 55. Looking downstream from MC Station 22+50 at Mountain Creek tributary confluence with main stem. (9/27/04)

Photograph 56. Log toe protection installed on left bank between MC Stations 23+50 and 23+70. (1/16/04)

Photograph 57. Looking upstream at Mountain Creek tributary from MC Station 23+50. (1/16/04)

Photograph 58. Ford crossing replaced at Mountain Creek tributary confluence with main stem (left bank of Mountain Creek tributary). (9/27/04)

Photograph 59. Looking upstream at Mountain Creek tributary confluence with main stem. (6/16/04)

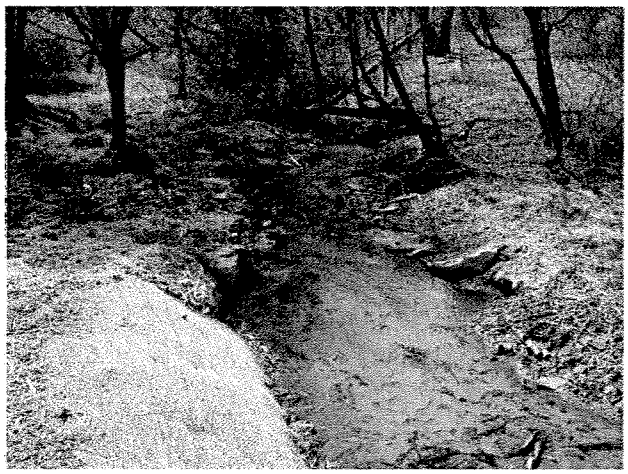


Photograph 60. Looking upstream at Mountain Creek tributary confluence with main stem. (9/27/04)

Lower Tributary

Station 0+00 to Station 14+35

CDM Biohabitats



Photograph 1. Rock cross vane installed at LT Station 0+00 (upstream end of restoration area). (4/7/04)

Photograph 2. Rock cross vane installed at LT Station 0+00 (upstream end of restoration area). (9/27/04)

Photograph 3. Looking downstream at log toe protection and root wads installed between LT Stations 0+25 and 0+95. (4/7/04)

Photograph 4. Looking downstream at log toe protection and root wads installed between LT Stations 0+25 and 0+95. (9/27/04)

Photograph 5. Looking downstream at rock vane installed at LT Station 0+94. (4/7/04)

Photograph 6. Looking downstream at rock vane installed at LT Station 0+94. (9/27/04)

Photograph 7. Looking downstream from LT Station 1+25. (9/27/04)

Photograph 8. Log vane installed at LT Station 1+80. (9/27/04)

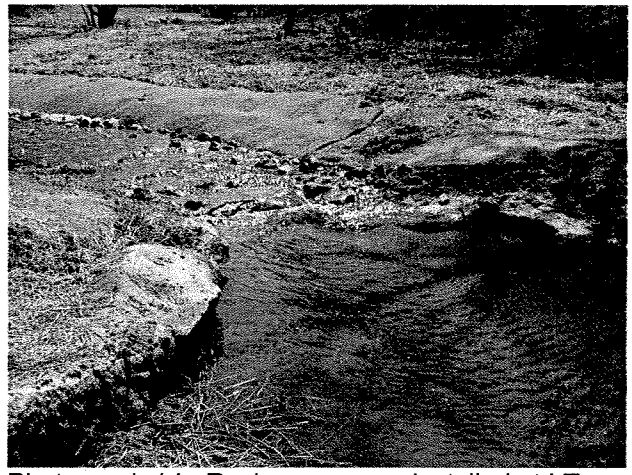
Photograph 9. Looking downstream from LT Station 2+25. (9/27/04)

Photograph 10. Looking downstream at log vane, root wad, and log toe protection installed between LT Stations 2+65 and 3+20. (4/7/04)

Photograph 11. Looking upstream at log vane and root wad installed between LT Stations 2+65 and 2+90. (4/7/04)

Photograph 12. Looking downstream at log vane, root wad, and log toe protection installed between LT Stations 2+65 and 3+20. (9/27/04)

Photograph 13. Looking downstream from LT Station 3+00. (9/27/04)



Photograph 14. Rock cross vane installed at LT Station 3+58. (4/7/04)

Photograph 15. Looking downstream at rock cross vane and root wad installed between LT Stations 3+58 and 3+90. (4/7/04)

Photograph 16. Looking downstream at rock cross vane and root wad installed between LT Stations 3+58 and 3+90. (9/27/04)

Photograph 17. Rock J vane installed at LT Station 4+33. (4/7/04)

Photograph 18. Looking downstream from LT Station 4+00. (9/27/04)

Photograph 19. Looking downstream from LT Station 4+50. (4/7/04)

Photograph 20. Looking downstream from LT Station 4+50. (9/27/04)

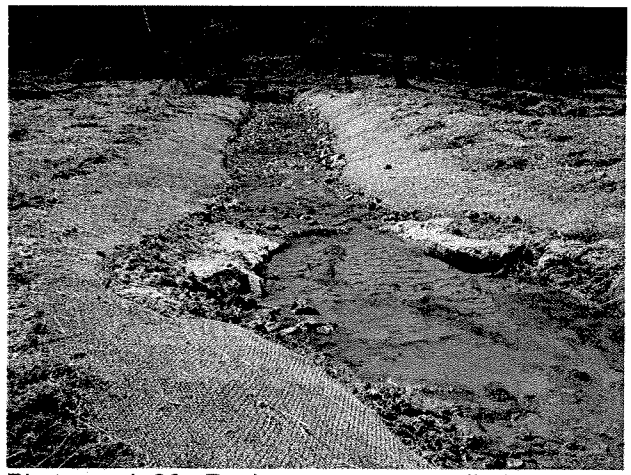
Photograph 21. Log vane installed at LT Station 5+01. (4/7/04)

Photograph 22. Cross vane installed at LT Station 5+90. (4/7/04)

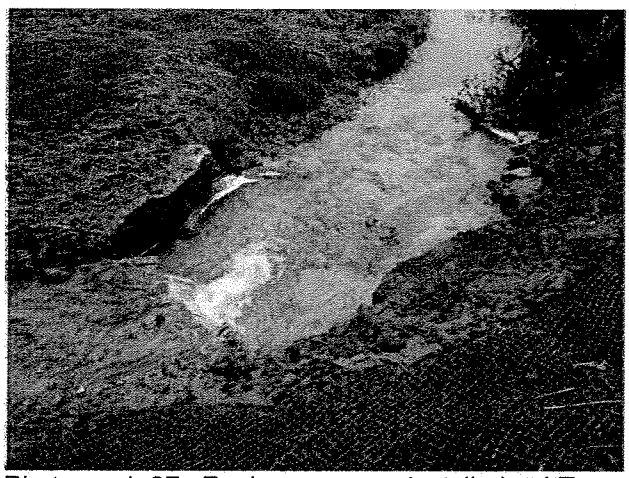
Photograph 23. Looking downstream at cross vane installed at LT Station 5+90. (9/27/04)

Photograph 24. Log vane installed at LT Station 6+57. (4/7/04)

Photograph 25. Looking downstream at root wad and log toe protection installed between LT Stations 6+25 and 6+60. (9/27/04)



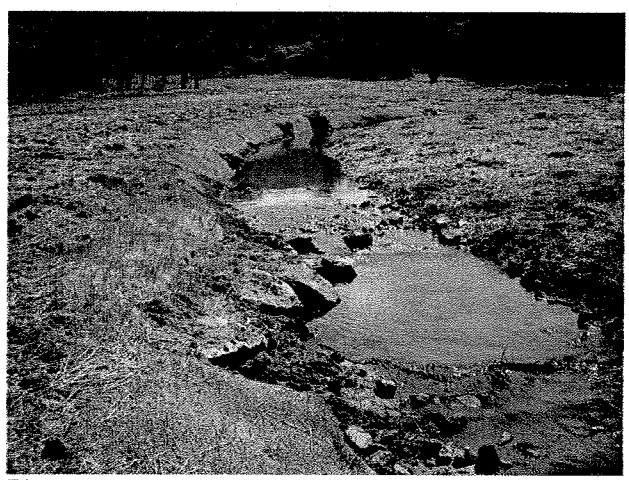
Photograph 26. Rock cross vane installed at LT Station 7+36. (4/7/04)



Photograph 27. Rock cross vane installed at LT Station 7+85. (9/27/04)

Photograph 28. Looking downstream from LT Station 6+75. (9/27/04)

Photograph 29. Looking downstream from LT Station 7+85 at root wad and log toe protection installed between LT Stations 7+75 and 8+25. (9/27/04)



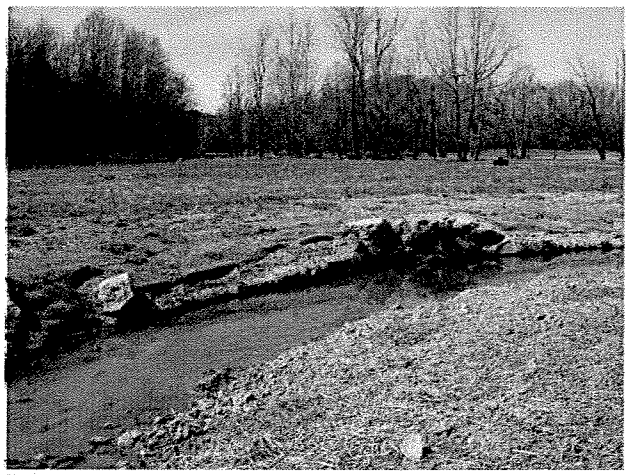
Photograph 30. Looking upstream at rock J vane installed at LT Station 8+38 (4/7/04)

Photograph 31. Looking downstream from rock J vane installed at LT Station 8+38. (9/27/04)

Photograph 32. Preserved wetland near LT Station 7+00 area. (4/7/04)

Photograph 33. Preserved wetland between LT Stations 8+00 and 9+00 area. (4/7/04)

Photograph 34. Log vane installed at LT Station 9+44. (4/7/04)

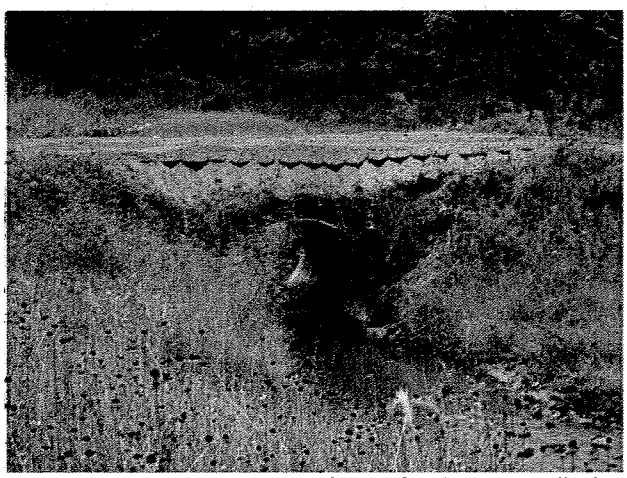


Photograph 35. Looking downstream at log toe protection and root wad installed between LT Stations 10+60 and 10+80. (4/7/04)

Photograph 36. Looking downstream at root wad and log toe protection installed between LT Stations 10+10 and 10+30. (4/7/04)

Photograph 37. Looking downstream at log vane, root wads, and log toe protection installed between LT Stations 9+44 and 10+30. (9/27/04)

Photograph 38. Looking downstream at log vane, root wads, and log toe protection installed between LT Stations 9+44 and 10+30. (9/27/04)



Photograph 39. Upstream face of culvert installed at LT Station 10+38. (9/27/04)

Photograph 40. Downstream face of culvert installed at LT Station 10+38. (9/27/04)

Photograph 41. Looking upstream from culvert at log toe protection and root wads installed between LT Stations 9+65 and 10+30. (9/27/04)

Photograph 42. Looking downstream from culvert at log vane, log toe protection, and root wads installed between LT Stations 10+87 and 11+85. (9/27/04)

Photograph 43. Looking downstream from right bank near LT Station 10+75. (9/27/04)

Photograph 44. Looking upstream from rock cross vane installed at LT Station 12+44. (9/27/04)

Photograph 45. Looking upstream at rock cross vane installed at LT Station 12+44. (4/7/04)

Photograph 46. Looking downstream at log toe protection, root wad, and log vane installed between LT Stations 12+60 and 13+23. (9/27/04)

Photograph 47. Looking upstream at Lower tributary near confluence with main stem between LT Stations 12+60 and 14+00. (4/7/04)

Photograph 48. Looking upstream at Lower tributary confluence with main stem (LT Stations 13+25 and 14+35). (9/27/04)

Appendix F
VEGETATION PLOTS

Project: Big Warrior Stream Restoration
Monitoring Year: Post-Construction Baseline Monitoring
Sampling Date: 09 Dec 2004

SUMMARY OF MEASURED TREE DENSITIES BASELINE MONITORING			
Vegetation Transect Number	**Plot Size**	**Stems/ 0.1 Acre**	**Stems/ Acre**
1	1/10 ac	15	150
2	1/10 ac	41	410
3	1/10 ac	34	340
4	1/10 ac	18	180
5	1/10 ac	17	170
6	1/10 ac	53	530
7	1/10 ac	17	170
Current Average Tree Stems/Acre =			**279**
Required Tree Density After 5 Years =			**320**
CONCLUSION: ***This project currently does not meet tree density requirements.***			

Project: Big Warrior Stream Restoration
Monitoring Year: Post-Planting, Baseline
Sampling Date: 09 Dec 2004
Vegetation Plot: #1
Plot Size: 1/10 acre

BASELINE CONDITIONS, VEGETATION PLOT #1

Tree Species		Planting Plan Strata (or Volunteer only)	# of Trees																TOTAL
			Saplings	2-5.9" dbh			6-11.9" dbh			12-19.9" dbh			20-29.9" dbh			>30" dbh			
Scientific Name	Common Name	Crown Position*	N/A	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	
Betula nigra	River birch	Midstory Tree																	0
Carpinus caroliniana	Ironwood	Midstory Tree																	0
Cercis canadensis	Eastern redbud	Midstory Tree																	0
Cornus florida	Flowering dogwood	Midstory Tree																	0
Fraxinus pennsylvanica	Green ash	Tree																	0
Juglans nigra	Black walnut	Tree																	0
Liriodendron tulipifera	Tulip poplar	Tree																	0
Platanus occidentalis	American sycamore	Tree																	0
Nyssa sylvatica	Black gum	Tree																	0
Quercus palustris	Pin oak	Tree																	0
Salix nigra	Black willow	Tree																	0
Salix nigra	Black willow	(volunteer only)	15																15
TOTAL			15	0			0			0			0			0			15

*(N/A= Not applicable, D= Dominant, CoD= Co-Dominant, O= Other)

NET TREE DENSITY= 150 trees/acre

NOTES:
1) This sample plot includes portions of Planting Zones 1 (riparian depressional wetlands), 3 (mesic riparian woodlands), and 5 (Native Grassland).
2) Tree species listed include all species in the planting plan for the corresponding zones (even if none were sampled). Species sampled that were not in the planting plan are indicated as "volunteer only."
3) Survival of planted species is approximately 0% in this plot.

Project: Big Warrior Stream Restoration
Monitoring Year: Post-Planting, Baseline
Sampling Date: 09 Dec 2004
Vegetation Plot: #2
Plot Size: 1/10 acre

BASELINE CONDITIONS, VEGETATION PLOT #2

Tree Species		Planting Plan Strata (or Volunteer)	# of Trees															TOTAL
			Saplings	2-5.9" dbh			6-11.9" dbh			12-19.9" dbh			20-29.9" dbh			>30" dbh			
Scientific Name	Common Name	Crown Position*	N/A	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	
Betula nigra	River birch	Midstory Tree	12																12
Carpinus caroliniana	Ironwood	Midstory Tree																	0
Cercis canadensis	Eastern redbud	Midstory Tree																	0
Cornus florida	Flowering dogwood	Midstory Tree																	0
Fraxinus pennsylvanica	Green ash	Tree																	0
Juglans nigra	Black walnut	Tree																	0
Liriodendron tulipifera	Tulip poplar	Tree																	0
Nyssa sylvatica	Black gum	Tree																	0
Platanus occidentalis	American sycamore	Tree	29																29
TOTAL			41	0			0			0			0			0			41

*(N/A= Not applicable, D= Dominant, CoD= Co-Dominant, O= Other)

NET TREE DENSITY= 410 trees/acre

NOTES:
1) This sample plot includes portions of Planting Zone 3 (mesic riparian woodlands).
2) Tree species listed include all species in the planting plan for the corresponding zones (even if none were sampled). Species sampled that were not in the planting plan are indicated as "volunteer only."
3) Survival of planted species is approximately 60% in this plot.

Project: Big Warrior Stream Restoration
Monitoring Year: Post-Planting, Baseline
Sampling Date: 09 Dec 2004
Vegetation Plot: #3
Plot Size: 1/10 acre

BASELINE CONDITIONS, VEGETATION PLOT #3

Tree Species		Planting Plan Strata (or Volunteer)	# of Trees															TOTAL
			Saplings	2-5.9" dbh			6-11.9" dbh			12-19.9" dbh			20-29.9" dbh			>30" dbh			
Scientific Name	Common Name	Crown Position*	N/A	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	
Acer rubrum	Red maple	(volunteer only)		3				6				3							12
Betula nigra	River birch	Midstory Tree	3																3
Carpinus caroliniana	Ironwood	Midstory Tree	8			1													9
Cercis canadensis	Eastern redbud	Midstory Tree																	0
Cornus florida	Flowering dogwood	Midstory Tree	7																7
Fraxinus pennsylvanica	Green ash	Tree																	0
Juglans nigra	Black walnut	Tree																	0
Liriodendron tulipifera	Tulip poplar	Tree																	0
Nyssa sylvatica	Black gum	Tree																	0
Platanus occidentalis	American sycamore	Tree																	0
Prunus serotina	Black cherry	(volunteer only)						1											1
Quercus palustris	Pin oak	Tree																	0
Juniperus virginiana	Red cedar	(volunteer only)	1																1
Salix nigra	Black willow	Tree	1																1
TOTAL			20	4			7			3			0			0			34

*(N/A= Not applicable, D= Dominant, CoD= Co-Dominant, O= Other)

NET TREE DENSITY= 340 trees/acre

NOTES:
1) This sample plot includes portions of Planting Zones 1 (riparian depressional wetlands), and 3 (mesic riparian woodlands).
2) Tree species listed include all species in the planting plan for the corresponding zones (even if none were sampled). Species sampled that were not in the planting plan are indicated as "volunteer only."
3) Survival of planted species is approximately 30% in this plot.

Project: Big Warrior Stream Restoration
Monitoring Year: Post-Planting, Baseline
Sampling Date: 09 Dec 2004
Vegetation Plot: #4
Plot Size: 1/10 acre

BASELINE CONDITIONS, VEGETATION PLOT #4

Tree Species		Planting Plan Strata (or Volunteer)	# of Trees															TOTAL
			Saplings	2-5.9" dbh			6-11.9" dbh			12-19.9" dbh			20-29.9" dbh			>30" dbh			
Scientific Name	Common Name	Crown Position*	N/A	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	
Acer rubrum	Red maple	(volunteer only)	1				1	1			2								5
Betula nigra	River birch	Midstory Tree																	0
Carpinus caroliniana	Ironwood	Midstory Tree	1																1
Cercis canadensis	Eastern redbud	Midstory Tree																	0
Cornus florida	Flowering dogwood	Midstory Tree	4	1															5
Fraxinus pennsylvanica	Green ash	Tree																	0
Juglans nigra	Black walnut	Tree																	0
Liriodendron tulipifera	Tulip poplar	Tree																	0
Nyssa sylvatica	Black gum	Tree																	0
Platanus occidentalis	American sycamore	Tree																	0
Prunus serotina	Black cherry	(volunteer only)					1				1								2
Quercus palustris	Pin oak	Tree																	0
Juniperus virginiana	Red cedar	(volunteer only)	1																1
Carya sp.	Hickory	(volunteer only)	4																4
Salix nigra	Black willow	Tree																	0
TOTAL			11	1			3			3			0			0			18

*(N/A= Not applicable, D= Dominant, CoD= Co-Dominant, O= Other)

NET TREE DENSITY= 180 trees/acre

NOTES:
1) This sample plot includes portions of Planting Zones 1 (riparian depressional wetlands), and 3 (mesic riparian woodlands).
2) Tree species listed include all species in the planting plan for the corresponding zones (even if none were sampled).
3) Survival of planted species is approximately 7% in this plot.
4) Where sufficient visual clues were not available to differentiate species, trees were identified to the Genus level.

Project: Big Warrior Stream Restoration
Monitoring Year: Post-Planting, Baseline
Sampling Date: 09 Dec 2004
Vegetation Plot: #5
Plot Size: 1/10 acre

BASELINE CONDITIONS, VEGETATION PLOT #5

Tree Species		Planting Plan Strata (or Volunteer)	# of Trees															TOTAL
			Saplings	2-5.9" dbh			6-11.9" dbh			12-19.9" dbh			20-29.9" dbh			>30" dbh			
Scientific Name	Common Name	Crown Position*	N/A	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	
Acer rubrum	Red maple	(volunteer only)	1																1
Cercis canadensis	Eastern redbud	Midstory Tree																	0
Betula nigra	River birch	Midstory Tree																	0
Carpinus caroliniana	Ironwood	Midstory Tree																	0
Cornus florida	Flowering dogwood	Midstory Tree																	0
Fraxinus pennsylvanica	Green ash	Tree	12																12
Juglans nigra	Black walnut	Tree																	0
Liriodendron tulipifera	Tulip poplar	Tree																	0
Nyssa sylvatica	Black gum	Tree																	0
Quercus palustris	Pin oak	Tree																	0
Platanus occidentalis	American sycamore	Tree									2			1			1		4
Salix nigra	Black willow	Tree																	0
TOTAL			13	0			0			2			1			1			17

*(N/A= Not applicable, D= Dominant, CoD= Co-Dominant, O= Other)

NET TREE DENSITY= 170 trees/acre

NOTES:
1) This sample plot includes portions of Planting Zones 1 (riparian depressional wetlands), and 3 (mesic riparian woodlands).
2) Tree species listed include all species in the planting plan for the corresponding zones (even if none were sampled).
3) Species sampled that were not in the planting plan are indicated as "volunteer only."
4) Survival of planted species is approximately 20% in this plot.

Project: Big Warrior Stream Restoration
Monitoring Year: Post-Planting, Baseline
Sampling Date: 09 Dec 2004
Vegetation Plot: #6
Plot Size: 1/10 acre

BASELINE CONDITIONS, VEGETATION PLOT #6

Tree Species		Planting Plan Strata (or Volunteer)	# of Trees															TOTAL
			Saplings	2-5.9" dbh			6-11.9" dbh			12-19.9" dbh			20-29.9" dbh			>30" dbh			
Scientific Name	Common Name	Crown Position*	N/A	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	
Acer saccharum	Sugar maple	Tree	9																9
Carya cordiformis	Bitternut hickory	Tree																	0
Quercus falcata	Southern red oak	Tree																	0
Cercis canadensis	Eastern redbud	Midstory Tree																	0
Betula nigra	River birch	Midstory Tree																	0
Carpinus caroliniana	Ironwood	Midstory Tree																	0
Cornus florida	Flowering dogwood	Midstory Tree	7																7
Fraxinus pennsylvanica	Green ash	Tree																	0
Liriodendron tulipifera	Tulip poplar	Tree																	0
Nyssa sylvatica	Black gum	Tree																	0
Platanus occidentalis	American sycamore	Tree	16																16
Juglans nigra	Black Walnut	Tree	10																10
Salix nigra	Black willow	(volunteer only)	6				3												9
Salix nigra	Black willow	Tree	2																2
TOTAL			50	0			3			0			0			0			53

*(N/A= Not applicable, D= Dominant, CoD= Co-Dominant, O= Other)

NET TREE DENSITY= 530 trees/acre

NOTES:
1) This sample plot includes portions of Planting Zones 3 (mesic riparian woodlands), and 4 (upland woods).
2) Tree species listed include all species in the planting plan for the corresponding zones (even if none were sampled). Species sampled that were not in the planting plan are indicated as "volunteer only."
3) Where sufficient visual clues were not available to differentiate species, trees were identified to the Genus level.
4) Survival of planted species is approximately 65% in this plot.

Project: Big Warrior Stream Restoration
Monitoring Year: Post-Planting, Baseline
Sampling Date: 09 Dec 2004
Vegetation Plot: #7
Plot Size: 1/10 acre

BASELINE CONDITIONS, VEGETATION PLOT #7

Tree Species		Planting Plan Strata (or Volunteer)	# of Trees																TOTAL
			Saplings	2-5.9" dbh			6-11.9" dbh			12-19.9" dbh			20-29.9" dbh			>30" dbh			
Scientific Name	Common Name	Crown Position*	N/A	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	
Betula nigra	River birch	Midstory Tree																	0
Carpinus caroliniana	Ironwood	Midstory Tree																	0
Cercis canadensis	Eastern redbud	Midstory Tree																	0
Cornus florida	Flowering dogwood	Midstory Tree	10																10
Fraxinus pennsylvanica	Green ash	Tree																	0
Juglans nigra	Black Walnut	Tree	1																1
Nyssa sylvatica	Black gum	Tree																	0
Liriodendron tulipifera	Tulip poplar	Tree																	0
Platanus occidentalis	American sycamore	Tree	4																4
Prunus serotina	Black cherry	(volunteer only)									2								2
TOTAL			15	0			0			2			0			0			17

*(N/A= Not applicable, D= Dominant, CoD= Co-Dominant, O= Other)

NET TREE DENSITY= 170 trees/acre

NOTES:
1) This sample plot includes portions of Planting Zone 3 (mesic riparian woodlands).
2) Tree species listed include all species in the planting plan for the corresponding zones (even if none were sampled). Species sampled that were not in the planting plan are indicated as "volunteer only."
3) Survival of planted species is approximately 20% in this plot.

Project: Big Warrior Stream Restoration
Monitoring Year: Post-Planting, Baseline
Sampling Date: 09 Dec 2004
Vegetation Plot: #8
Plot Size: 1/10 acre

BASELINE CONDITIONS, VEGETATION PLOT #8

Tree Species		Planting Plan Strata (or Volunteer)	# of Trees															TOTAL
			Saplings	2-5.9" dbh			6-11.9" dbh			12-19.9" dbh			20-29.9" dbh			>30" dbh			
Scientific Name	Common Name	Crown Position*	N/A	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	
Acer rubrum	Red maple	(volunteer only)	1																1
Betula nigra	River birch	Midstory Tree																	0
Carpinus caroliniana	Ironwood	Midstory Tree	3																3
Cercis canadensis	Eastern redbud	Midstory Tree																	0
Cornus florida	Flowering dogwood	Midstory Tree	1																1
Fraxinus pennsylvanica	Green ash	Tree																	0
Liriodendron tulipifera	Tulip poplar	Tree																	0
Nyssa sylvatica	Black gum	Tree																	0
Juglans nigra	Black Walnut	Tree	1																1
Platanus occidentalis	American sycamore	Tree																	0
Salix nigra	Black willow	(volunteer only)	1																1
TOTAL			7	0			0			0			0			0			7

*(N/A= Not applicable, D= Dominant, CoD= Co-Dominant, O= Other)

NET TREE DENSITY= 70 trees/acre

NOTES:
1) This sample plot includes portions of Planting Zone 3 (mesic riparian woodlands).
2) Tree species listed include all species in the planting plan for the corresponding zones (even if none were sampled). Species sampled that were not in the planting plan are indicated as "volunteer only."
3) Survival of planted species is approximately 7% in this plot.

Appendix G
PLANTING SCHEDULES

PLANT AND COMPOSITION SCHEDULE

Zone 1: Riparian Depressional Wetlands

Size (acres): 0.50

Overall Spacing (feet off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Size	Spacing Type	Individual Spacing (ft.)
10	436			**TREES**					
		30	65	*Fraxinus pennsylvanica*	Green ash	Bare root	Whip	Random	18
		20	44	*Platanus occidentalis*	American sycamore	Bare root	Whip	Random	22
		30	65	*Quercus palustris*	Pin oak	Bare root	Whip	Random	18
		20	44	*Salix nigra*	Black willow	Bare root	Whip	Random	22
		100	**218**	**= Total**					
14	222			**MIDSTORY TREES**					
		35	39	*Cercis canadensis*	Eastern redbud	Bare root	Whip	Random	24
		35	39	*Betula nigra*	River birch	Bare root	Whip	Random	24
		30	33	*Carpinus caroliniana*	Ironwood	Bare root	Whip	Random	26
		100	**72**	**= Total**					
10	436			**SHRUBS**					
		20	44	*Cephalanthus occidentalis*	Buttonbush	Bare root	Seedlings	Random	22
		15	33	*Cornus amomum*	Silky dogwood	Bare root	Seedlings	Random	26
		15	33	*Lindera benzoin*	Spice bush	Bare root	Seedlings	Random	26
		15	33	*Sambucus canadensis*	Common elderberry	Bare root	Seedlings	Random	26
		20	44	*Calycanthus floridus*	Common sweetshrub	Bare root	Seedlings	Random	22
		15	33	*Viburnum dentatum*	Southern arrowwood	Bare root	Seedlings	Random	26
		100	**220**	**= Total**					
N/A	40			**HERBACEOUS SEED**					
		23	4.6	*Andropogon gerardii*	Big bluestem	LB-76% P.L.S.	N/A	Seed	N/A
		10	2.0	*Carex stricta*	Hummock sedge	LB-76% P.L.S.	N/A	Seed	N/A
		15	3.0	*Dichanthelium clandestinum*	Deer-tongue grass	LB-76% P.L.S.	N/A	Seed	N/A
		15	3.0	*Elymus virginicus*	Virginia wild rye	LB-76% P.L.S.	N/A	Seed	N/A
		10	2.0	*Juncus effusus*	Softrush	LB-76% P.L.S.	N/A	Seed	N/A
		2	0.4	*Lobelia cardinalis*	Cardinal flower	LB-76% P.L.S.	N/A	Seed	N/A
		15	3.0	*Lolium multiflorum*	Annual rye	LB-76% P.L.S.	N/A	Seed	N/A
		10	2.0	*Panicum dichotomiflorum*	Smooth panicgrass	LB-76% P.L.S.	N/A	Seed	N/A
		100	**20.0**	**= Total**					

P.L.S.=Pure Live Seed

PLANT AND COMPOSITION SCHEDULE

Zone 2: Meander Plantings

Size (acres): 2.52

Overall Spacing (feet off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Size	Spacing Type	Individual Spacing (ft.)
8	681			**TREES**					
		20	343	*Fraxinus pennsylvanica*	Green ash	Bare root	Whip	Random	18
		20	343	*Juglans nigra*	Black walnut	Bare root	Whip	Random	18
		20	343	*Liriodendron tulipifera*	Tulip poplar	Bare root	Whip	Random	18
		20	343	*Nyssa sylvatica*	Black gum	Bare root	Whip	Random	18
		20	343	*Platanus occidentalis*	American sycamore	Bare root	Whip	Random	18
		100	**1715**	**= Total**					
6	1210			**SHRUBS**					
		20	610	*Cornus amomum*	Silky dogwood	Bare root	Seedlings	Random	13
		20	610	*Hamamelis virginia*	Witch-hazel	Bare root	Seedlings	Random	13
		20	610	*Physocarpus opulifolius*	Common ninebark	Bare root	Seedlings	Random	13
		20	610	*Lindera benzoin*	Spicebush	Bare root	Seedlings	Random	13
		20	610	*Sambucus canadensis*	Common elderberry	Bare root	Seedlings	Random	13
		100	**3050**	**= Total**					
N/A	30			**HERBACEOUS SEED**					
		20	15.1	*Andropogon gerardii*	Big bluestem	LB-76% P.L.S.	N/A	Seed	N/A
		20	15.1	*Dichanthelium clandestinum*	Deertongue grass	LB-76% P.L.S.	N/A	Seed	N/A
		20	15.1	*Elymus virginicus*	Virginia wild rye	LB-76% P.L.S.	N/A	Seed	N/A
		3	2.3	*Eupatorium fistulosum*	Joe-Pye weed	LB-76% P.L.S.	N/A	Seed	N/A
		2	1.5	*Lobelia cardinalis*	Cardinal flower	LB-76% P.L.S.	N/A	Seed	N/A
		15	11.3	*Lolium multiflorum*	Annual rye	LB-76% P.L.S.	N/A	Seed	N/A
		20	15.1	*Panicum dichotomiflorum*	Smooth panicgrass	LB-76% P.L.S.	N/A	Seed	N/A
		100	**75.6**	**= Total**					

P.L.S.=Pure Live Seed

PLANT AND COMPOSITION SCHEDULE

Zone 3: Riparian Woodlands

Size (acres): 10.64

Overall Spacing (feet off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Size	Spacing Type	Individual Spacing (ft.)
10	436			**TREES**					
		20	928	*Fraxinus pennsylvanica*	Green ash	Bare root	Whip	Random	22
		20	928	*Juglans nigra*	Black walnut	Bare root	Whip	Random	22
		20	928	*Liriodendron tulipifera*	Tulip poplar	Bare root	Whip	Random	22
		20	928	*Nyssa sylvatica*	Black gum	Bare root	Whip	Random	22
		20	928	*Platanus occidentalis*	American sycamore	Bare root	Whip	Random	22
		100	**4640**	**= Total**					
14	222			**MIDSTORY TREES**					
		25	591	*Betula nigra*	River birch	Bare root	Whip	Random	28
		25	591	*Carpinus caroliniana*	Ironwood	Bare root	Whip	Random	28
		25	591	*Cercis canadensis*	Eastern redbud	Bare root	Whip	Random	28
		25	591	*Cornus florida*	Flowering dogwood	Bare root	Whip	Random	28
		100	**2364**	**= Total**					
10	436			**SHRUBS**					
		20	928	*Cornus amomum*	Silky dogwood	Bare root	Seedlings	Random	22
		20	928	*Physocarpus opulifolius*	Common ninebark	Bare root	Seedlings	Random	22
		20	928	*Sambucus canadensis*	Common elderberry	Bare root	Seedlings	Random	22
		20	928	*Calycanthus floridus*	Common sweetshrub	Bare root	Seedlings	Random	22
		20	928	*Viburnum dentatum*	Southern arrowwood	Bare root	Seedlings	Random	22
		100	**4640**	**= Total**					
N/A	40			**HERBACEOUS SEED**					
		15	63.8	*Andropogon gerardii*	Big bluestem	LB-76% P.L.S.	N/A	Seed	N/A
		20	85.1	*Elymus virginicus*	Virginia wild rye	LB-76% P.L.S.	N/A	Seed	N/A
		25	106.4	*Lolium multiflorum*	Annual rye	LB-76% P.L.S.	N/A	Seed	N/A
		15	63.8	*Panicum virgatum*	Switchgrass	LB-76% P.L.S.	N/A	Seed	N/A
		5	21.3	*Rudbeckia hirta*	Black-eyed Susan	LB-76% P.L.S.	N/A	Seed	N/A
		20	85.1	*Schizachyrium scoparium*	Little bluestem	LB-76% P.L.S.	N/A	Seed	N/A
		100	**425.6**	**= Total**					

P.L.S.=Pure Live Seed

PLANT AND COMPOSITION SCHEDULE

Zone 4: Upland Woods

Size (acres): 0.93

Overall Min. Spacing (ft.)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Size	Spacing Type	Individual Min. Spacing (ft.)
10	436			**TREES**					
		20	81	*Acer saccharum*	Sugar maple	Bare root	Whip	Random	22
		20	81	*Carya cordiformis*	Bitternut hickory	Bare root	Whip	Random	22
		25	101	*Fraxinus americana*	White ash	Bare root	Whip	Random	20
		15	61	*Nyssa sylvatica*	Black gum	Bare root	Whip	Random	26
		20	81	*Quercus falcata*	Southern red oak	Bare root	Whip	Random	22
		100	**405**	**= Total**					
14	222			**MIDSTORY TREES**					
		30	62	*Cornus florida*	Flowering dogwood	Bare root	Whip	Random	26
		40	83	*Ostrya virginiana*	American hophornbeam	Bare root	Whip	Random	22
		30	62	*Cercis canadensis*	Eastern redbud	Bare root	Whip	Random	26
		100	**207**	**= Total**					
10	436			**SHRUBS**					
		25	101	*Hamamelis virginiana*	Witch-hazel	Bare root	Seedlings	Random	20
		15	61	*Hydrangea arborescens*	Wild hydrangea	Bare root	Seedlings	Random	26
		30	122	*Rubus idaeus*	Red raspberry	Bare root	Seedlings	Random	18
		30	122	*Halesia carolina*	Carolina silverbell	Bare root	Seedlings	Random	18
		100	**406**	**= Total**					
N/A	30			**HERBACEOUS SEED**					
		20	5.6	*Dichanthelium clandestinum*	Deertongue grass	LB-76% P.L.S.	N/A	Seed	N/A
		20	5.6	*Elymus canadensis*	Canada wild rye	LB-76% P.L.S.	N/A	Seed	N/A
		20	5.6	*Lolium multiflorum*	Annual rye	LB-76% P.L.S.	N/A	Seed	N/A
		20	5.6	*Panicum dichotomiflorum*	Smooth panicgrass	LB-76% P.L.S.	N/A	Seed	N/A
		20	5.6	*Rudbeckia hirta*	Black-eyed Susan	LB-76% P.L.S.	N/A	Seed	N/A
		100	**27.9**	**= Total**					

P.L.S.=Pure Live Seed

Big Warrior Creek
Stream Restoration

PLANT AND COMPOSITION SCHEDULE

Zone 5: Native Grasslands

Size (acres): 31.49

Overall Spacing (feet off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Size	Spacing Type	Individual Spacing (ft.)
N/A	54			**HERBACEOUS SEED**					
		28	476.10	*Dactylis glomerata*	Orchard grass	LB-76% P.L.S.	N/A	SEED	N/A
		37	629.20	*Festuca ovina*	Sheep's fescue	LB-76% P.L.S.	N/A	SEED	N/A
		7	119.00	*Triflorium repens*	White clover	LB-76% P.L.S.	N/A	SEED	N/A
		28	476.10	*Pennisetum glaucum*	Pearl millet	LB-76% P.L.S.	N/A	SEED	N/A
		100	**1700.50**	**= Total**					

P.L.S.=Pure Live Seed