TENNESSEE STREAM TSMP MITIGATION PROGRAM

Chilogatee Branch Stream Restoration Project Mitigation Plan

Blount County, Tennessee

TSMP Project No. 03-020-12

October 8, 2013

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1.0 OBJECTIVES

The TSMP intends to provide 3,281 credits by restoring and enhancing 4,600 existing linear feet of Chilogatee Branch and 754 existing linear feet of four unnamed tributaries located in the Great Smoky Mountains National Park near Tallassee, Tennessee. These credits will be allocated to the Upper Tennessee Geographic Service Area, which encompasses the following six 8-digit HUC's:

- 06010201 Fort Loudoun Reservoir
- 06010204 Little Tennessee River
- 06010205 Upper Clinch River
- 06010206 Powell River
- 06010207 Clinch River
- 06010208 Emory River

The objectives of the Chilogatee Branch Stream Restoration Project are as follows:

- Restore natural stream morphology
- Provide channel stability
- Restore / improve stream hydrology and floodplain connectivity
- Restore and enhance native riparian vegetation
- Improve aquatic habitat

2.0 SITE SELECTION

The project site was identified using the Compensation Planning Framework based on anticipated future needs in the service area. The factors in Sections 2.1 and 2.2 describe what was considered during the site selection process.

2.1 Service Area Needs

The Upper Tennessee Service area is a predominantly rural service area encompassing 4,719 square miles and 6,139 stream miles. Aquatic resource threats include altered hydrologic regimes, altered in-stream physical habitat conditions, altered near-stream (buffer) conditions, sedimentation, nutrient loading, thermal alteration and contaminants most often caused by incompatible agricultural practices, urbanization, wastewater management practices, water management practices and invasive species.

Historic aquatic resource losses in this service area have resulted from activities such as channelization, channel relocation, channel widening and other alterations permitted through Aquatic Resource Alteration Permits (ARAP) from the Tennessee Department of Environment and Conservation (TDEC). Between 2000 and 2009, TDEC issued 1,030 ARAPs in this geographic service area accounting for nearly 12% of all ARAPs issued in the state of Tennessee.

2.2 Project Viability

The project has a high likelihood of success. The project stream is part of a headwater system that has a small drainage area. The majority of these headwaters are located within property owned by the State of Tennessee and the Great Smoky Mountains National Park. Therefore, upstream development and negative impacts that could affect project success are unlikely to occur. The project itself lies within the Great Smoky Mountains National Park. Silt loam soils within the site will likely facilitate rapid vegetation establishment, increasing short-term and long-term bank and floodplain stability. These factors combined with the National Park Service management policies give the TSMP a high level of confidence in the probability of accomplishing an ecologically self-sustaining restoration project.

3.0 SITE PROTECTION INSTRUMENT

Site protection for the project will be provided in accordance with 33 CFR 332.7(a)(1) which allows for long-term protection on governmental lands to be provided through a natural resource management plan or the like. The management policies found within NPS Management Policies 2006 that pertain to the project site are attached in Appendix B. These policies will provide for the long-term protection and management of the entire property and is consistent with the 1916 Organic Act and the National Park Service Mission Statement. The plan is also consistent with the long-term management and protection goals of the TSMP. In addition, a Memorandum of Understanding was executed with the United States Department of the Interior National Park Service and can also be found in Appendix C.

4.0 BASELINE INFORMATION

4.1 Watershed Description

The project site is located in a rural setting within the Level III Ecoregion 66, Southern Metasedimentary Mountains. The local watershed is part of the Little Tennessee River 8-digit HUC (06010204). The drainage area of the project stream is approximately 2.23 square miles (1427 acres) at the downstream project limits. Barbourville fine sandy loam and Barbourville silt loam are the dominant soil types within the project limits. Land use/land cover in the contributing drainage area is dominated by forest (98%). The remainder of the watershed is comprised of pasture/grasslands, low-density residential and power transmission easements (2%). There is a negligible amount of impervious surface in the watershed.

4.2 Historic and Existing Hydrology

Historically, Chilogatee Branch and its tributaries were likely moderate to high gradient, gravel and cobble dominated streams that were hydrologically and hydraulically connected to their floodplains. Riparian vegetation was likely a combination of upland and bottomland hardwood species given its topographic position in the landscape. Roadway projects and other infrastructure, as well as agricultural and silvicultural practices, have altered both the physical character and

hydrology of the project streams and floodplains since local development began. Valley fill and constriction, pattern alteration, dredging, impoundment and vegetation removal have led to a loss in natural stream function and varying levels of instability.

Jurisdictional Determination Forms for the project stream can be found in Appendix D, and Hydrologic Determination Data can be found in Appendix E.

4.3 Site Description

The project consists of Chilogatee Branch and its tributaries in the Great Smoky Mountains National Park in Blount County, TN (centroid 35.56797°N, -84.00199°W). Topographic and aerial maps, as well as representative photographs of the project site are included in Appendix F and G, respectively. This site is managed by the National Parks Service. The project streams will be restored and enhanced within a valley that has been denuded of most of its riparian vegetation. The project encompasses approximately 5,354 linear feet of 1st and 3rd order streams. The project consists of three contiguous reaches and four tributaries. The top of the project begins as it enters Happy Valley, and the project will end at the valley constriction of Happy Valley Road and Foothills Parkway just before it enters Chilhowee Reservoir.

Reach 1A is composed of the upper 2,152 linear feet of main-stem stream length and extends from the upstream end of the site to just downstream of the confluence with UT1. The valley form consists of a moderate down-valley gradient with a low-slope cross-valley gradient bordered by moderately steep valley walls. The majority of the channel within this reach has a moderate width-depth ratio and is classified as a Type B4 stream under the Rosgen classification system. This reach is in a relatively stable condition and appears to be supporting healthy stream functions including proper sediment transport, bed form diversity and in-stream habitat, although there is evidence of remnant spoil piles that suggest portions of this reach have been dredged, straightened or relocated in the past. Several short lengths of channel bank appear to have suffered minor degradation in the recent past but do not appear to be trending toward total instability. Generally, a wide riparian buffer exists on one side of the stream while only a narrow band of bank vegetation exists on the opposing bank, which separates the stream from pasture.

Reach 1B is composed of 360 linear feet of main-stem stream length and has been relocated to the right side of the valley at the edge of an open field and extends from downstream of UT1 to just upstream of the confluence with UT3. The valley form is similar to Reach 1 except that it has a slightly wider valley bottom. The dominant character of this section of stream is one of instability and degradation due to past land use practices and other alterations. Previous channelization, realignment and straightening have left the stream with weak bed features and an unstable pattern. This reach classifies as a Type F3 stream.

Reach 2 is composed of 1118 linear feet of main-stem stream length. This reach extends from just upstream of the confluence with UT3 and cuts across the valley.

The valley form is similar to the upstream reaches with a broader valley bottom that presents a more alluvial floodplain bordered by colluvial slopes. This reach is severely confined by the side wall of the valley on the right bank and the spoil berm on the left bank. This confinement is promoting erosion of the right bank and effectively eliminating proper channel-floodplain connectivity. It is possible that the present position of the channel will eventually lead to a hill-slope collapse or a channel evulsion, which would return the stream to its historical position in the valley bottom. It exhibits vertical, eroding banks, as well as, weak bed features and an unstable pattern. This entire reach classifies as a Type G4 stream, and channel evolution suggests that, without reshaping and alignment efforts, the stream will remain in an unstable condition for the foreseeable future.

Reach 3 is composed of 969 linear feet of main-stem stream length. This reach runs adjacent to Happy Valley Road to the valley constriction of Happy Valley Road and Foothills Parkway, which is the end of the project. It has been relocated from the center low-point in the valley to the left side of the valley, so that it functions as a roadside drainage channel. This reach also exhibits vertical, eroding banks, as well as, weak bed features and an unstable pattern. This entire reach classifies as a Type G4 stream, and channel evolution suggests that, without reshaping and alignment efforts, the stream will remain in an unstable condition for the foreseeable future.

UT1 is a natural spring that has been heavily impacted by past land-use and alterations. Base flow provides hydrology for an abandoned agricultural pond. A constructed berm separates the abandoned pond and UT1 from Chilogatee Branch. The seep flow permeates the base of the berm and discharges into Chilogatee Branch just downstream.

UT3 is composed of 252 linear feet and flows into Chilogatee Branch at the upper end of Reach 2 from Happy Valley Road. This tributary is a small stream that has been straightened and channelized to flow directly across topographic gradients to facilitate drainage of fields. A narrow band of riparian vegetation has established on its banks. This tributary classifies as a Type G stream.

UT4 is composed of 502 linear feet. It enters the site from the east and has been channelized to form a ditch that cuts across topographic gradients to facilitate drainage of the roadway. The channel is subject to a moderate sediment load and its character is one of incision and degradation due to impacts from road runoff and the unstable profile of its receiving waters. This channel is classified as Type G stream.

UT5 presently does not extend into the site, but instead discharges directly into Chilogatee Branch through a roadway cross pipe under Happy Valley Road.

The Habitat Assessment Score of the project stream(s) is 78, which is considered impaired for streams in the Southern Metasedimentary Mountains with drainage areas greater than two square miles. The Pfankuch rating is Poor. The BEHI rating is Extreme.

The project is not located within a mapped FEMA flood zone. There are no prehistoric or historic archaeological sites recorded that would be affected by the implementation of this project (Appendix H). Nonetheless, a Phase I Archaeological Survey has been performed, and a draft report has been prepared and submitted to the National Parks Service (lead agency) and the USACE. The Tennessee Natural Heritage Program lists seven vascular plants and two vertebrate animals within one mile of the site and lists one non-vascular plant, thirteen vascular plants and six vertebrate animals within four miles of the site as state endangered, threatened or of special concern (Appendix I). There is also the potential that the federally endangered Indiana Bat (*Myotis sodalis)* occurs at the site, but based upon the Indiana Bat Habitat Assessment and correspondence with the USFWS the project will not result in significant impacts to the species or its habitat (Appendix J).

5.0 DETERMINATION OF CREDITS/RELEASE SCHEDULE

The project has the potential to produce 3,281 credits as detailed below:

Reach	Existing Linear Footage	Mitigation Type	Proposed Linear Footage	Ratio	Stream Credits
Reach 1A	2152	Enhancement I	2152	4:1	538
Reach 1B	360	Restoration	360	1.5:1	240
Reach 2	1118	Restoration	868	1.25:1	694
Reach 3	969	Restoration	1141	1.25:1	913
UT1	0	Replacement	235	1:1	235
UT3	252	Restoration	215	1.5:1	143
UT4	502	Restoration	338	1.25:1	270
UT5	0	Replacement	248	1:1	248
Total					3281

The TSMP proposes the following credit release schedule. As project milestones are reached, the TSMP will submit the appropriate documentation to regulatory agencies for confirmation of credit release.

Chilogatee Branch Credit Release Schedule	
Permit Approval	15%
Site Protection	10%
Record Drawings	25%
Monitoring Event 1	10%
Monitoring Event 2	10%
Monitoring Event 3	10%
Monitoring Event 4	0%
Monitoring Event 5	20%

6.0 MITIGATION WORK PLAN

Specifics regarding the approach and methods of work are detailed within this section and the attached plans (Appendix K) and technical specifications (Appendix L).

6.1 Approach Per Reach

The project consists of three reaches and four unnamed tributaries. The enhancement and restoration concepts for each reach are described below.

Reach 1A (DA 1.72 mi^2) – Reach 1 is a candidate for Enhancement I where minor stabilization efforts will be implemented in conjunction with riparian plantings. In areas where bank instability is evident, the bed width may be increased and banks laid back to provide for proper hydraulic geometry and reduced stresses along the channel toe. Appropriate plantings will be installed in the area currently occupied by pasture grasses to restore the riparian buffer community.

Reach 1B (DA 1.97 mi^2) – On-line restoration activities will include reconstructing portions of the channel dimension, pattern and profile, constructing a bankfull bench where the channel is incised and confined by the adjacent terrace, as well as installation of in-stream structures to provide aquatic habitat. Where existing bank vegetation and pattern are deemed acceptable, the channel bed will likely be raised in place to reduce earthwork and make use of existing materials and conditions to the maximum extent possible.

Reaches 2 and 3 (DA 2.23 mi^2) – The channel will be re-meandered through the existing pasture and will be reconstructed as a Type B stream on new alignment in the natural low of the valley. The new alignment will provide proper dimension, pattern and profile along with appropriate reconnection of the channel to its floodplain. Existing bed material will be harvested and reused in the construction of the new channel bed and the alignment will be designed to minimize disturbance to existing wetlands and mature vegetation.

UT1 (spring fed) – UT1 will be restored as a Type B stream with new alignment but located essentially in its current position in the valley. Grading will be required to remove the constructed berm that separates the abandoned agricultural pond from Chilogatee Branch and to restore natural morphology to the tributary. Restoration efforts will focus on correcting past alterations to the topography in order to redefine the proper channel position and dimensions.

UT3 (DA 0.18 mi^2) – UT3 will be restored as a Type B stream on new alignment that follows a more natural down-valley gradient. Since the upstream grade is controlled by an existing culvert the profile will start flatter than the valley slope and have a constructed bankfull bench until a proper vertical channel-to-valley position can be achieved.

UT4 (DA 0.19 mi^2) – UT4 will be restored as a Type B stream on new alignment that follows a more natural down-valley gradient and abandon its current position on the landscape as a roadside ditch.

UT5 (spring fed) – UT5 will be restored as a Type Bc stream on new alignment which will connect to Chilogatee Branch at a down-valley position that allows compensation of the grade differential of the two stream beds.

6.2 Planting Plan

Riparian restoration will consist of establishing a permanent riparian buffer extending an average of at least 50 ft beyond the top of bank where possible. This riparian buffer will be planted to provide post-construction erosion control, stream bank stabilization and riparian habitat enhancement. The riparian buffer will include native species, which have been identified as naturally occurring at the project site. Plants used within the floodplain will be somewhat flood tolerant to accommodate for periodic flooding events throughout the year. A variety of shrubs and trees will be planted to provide cover and habitat for wildlife.

6.3 Exotic/Invasive Species Control Plan

As a part of the National Park Service's ongoing management, the site has been thoroughly worked in recent years to rid any terrestrial exotic and/or invasive species that occurred. At the present time there are no significant populations of terrestrial exotic and/or invasive species to address.

6.4 Schedule and Sequence

Construction of the project should commence in the Winter of 2013/2014, only after authorization from the appropriate regulatory authorities. It is anticipated that construction of the project should take less than 15 weeks, barring extended periods of inclement weather or poor site conditions.

The stream restoration will require the use of heavy equipment including, but not limited to one or more track hoe(s), one or more mini-excavator(s) and one or more low-ground pressure track truck(s). Proper construction sequencing should minimize the amount of land clearing necessary to accomplish the restoration

For reaches 2 and 3 and all unnamed tributaries, the restored channel will be constructed off-line. Excavated soil will be temporarily stockpiled within the limits of disturbance until the constructed channel has been completed and stabilized before backfilling the old channel in select locations. Although construction timing should reduce the likelihood of sustained stream flow, the construction may take place in flowing water. When working in the flowing water, the TSMP may utilize rock check dams and/or silt curtains to reduce sediment discharge downstream.

6.5 Conservation Area

The Organic Act of 1916 protects the Great Smoky Mountains National Park (established by the Act of May 22, 1926) by requiring the National Park Service "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." According to the NPS Mission Statement, "the National Park Service preserves the natural resources." The NPS Management Policies 2006: Sections 4.4.2.4, 4.6.4, and 4.6.6 reflect the goals and management practices that are employed by the TSMP, therefore no conservation easement will be required on the project area, which encompasses 12.2 acres.

7.0 PROJECT MAINTENANCE

The project objective is to restore the stream to a state of dynamic equilibrium, thereby balancing discharge, slope, sediment load, and sediment size. Stability is not defined as an absence of change, but rather stable patterns of variation. Newly restored streams often demonstrate some level of adjustment and sediment sorting. Over time, the restored stream channel should be self-sustaining and dynamic, capable of adjusting to changes in discharge and sediment supply while maintaining stability.

Maintenance may be required on any stream restoration project and should be expected to occur as a normal component of the project. Routine maintenance may require treatment to address isolated areas of bank stabilization, repair of in-stream structures, or excessive tree mortality. Through site inspections and formal monitoring events, the TSMP will document site conditions, evaluate changes, and determine if corrective actions are warranted. The TSMP intends to operate under original permit authorizations to carry out construction and routine maintenance when necessary. If it is determined that corrective action beyond routine maintenance is necessary in order to ensure project success, the TSMP will prepare and submit an Adaptive Management Plan to the DE and IRT. Adaptive Management is more thoroughly discussed in Section 11.

8.0 PERFORMANCE STANDARDS

Performance standards are used to assess whether the project is meeting its objectives. Appropriate performance standards include attributes that are objective and verifiable, with values based on reference conditions that also reflect the range of natural variability as a result of natural processes and anthropogenic disturbances. Initial performance standards with design-derived values for the project are attached as Appendix M.

Unforeseen site conditions or constraints may require minor design modifications during project construction. Such field changes may necessitate corresponding adjustments in performance standards. In such cases, the TSMP will include the final, modified performance standards with the record drawings upon completion of construction.

8.1 Morphology

The purpose of morphological monitoring is to evaluate the stability of the restored stream. Project-specific morphologic performance standards for the Chilogatee Branch Stream Restoration Project will include the following parameters:

8.1.1 Dimension

A representative number of cross-sectional measurements will be collected to document channel dimension(s) throughout the project. If changes in dimension are observed, they will be evaluated to determine whether the adjustments are indicative of natural channel evolution, and movement toward stability (ecological potential), or whether those changes indicate movement towards an unstable condition.

8.1.2 Pattern

During the first monitoring event, measurements of restored channel pattern, to include belt width, meander length, and radius of curvature will be collected within the same section(s) surveyed for the longitudinal profile(s). Calculations will be made of sinuosity, meander width ratio, radius of curvature/bankfull width ratio, and meander length/bankfull width ratio.

8.1.3 Profile

Slope has a major influence on stream channel morphology, sediment/bedload, hydraulic, and biological functions. Water surface slope is most accurately determined through longitudinal surveys. Longitudinal profile data will be collected on representative stream reaches to document water surface slope, average facet slopes, and pool to pool spacing. Although slight variances in stream profile over time should be expected, pools should maintain their depth with flatter water surface slopes, while riffles should remain shallower and steeper.

8.2 Hydrology (Stage Discharge)

Documenting peak stage discharge for the restored stream is another method to assess or analyze the appropriateness of the design discharge for the channel. The occurrence of stream flows meeting and/or exceeding the designed bankfull stage will be evaluated during each monitoring event, using collected data or visual observations.

8.3 Vegetation

The purpose of vegetation monitoring is to document planted and volunteer native woody species survivorship and composition, herbaceous ground coverage and invasive species occurrence. For the Chilogatee Branch Stream Restoration Project,

the vegetative monitoring will be modified to coincide with the modified planting plan. In general, vegetative monitoring will consist of documenting the percent bare ground coverage.

8.4 Channel Stability (Bed and Bank)

The Pfankuch Channel Stability Evaluation will be used to evaluate the upper and lower banks and streambed for evidence of instability. The use of toe and bank pins and bar material bulk sampling may be required on a project-specific basis to facilitate more detailed evaluation of bed and bank stability.

8.5 Habitat

The applicable EPA Rapid Bioassessment Protocol Habitat Assessment Form will be used to evaluate each project reach prior to restoration. The project will be evaluated again using the same protocol during the final monitoring event. It is expected that the habitat score for the restored reach should be greater than 75% of the median ecoregion reference reach.

9.0 MONITORING REQUIREMENTS

The TSMP is responsible for monitoring projects to determine and document the success of a project based upon the established performance standards. For the Chilogatee Branch Stream Restoration Project, monitoring will be conducted by the TSMP for a minimum of five years, or until regulatory agencies determine that the established performance standards have been met. All monitoring will be conducted using the procedures set forth in the TSMP Monitoring Protocol. Monitoring reports should be submitted to the regulatory agencies and IRT by October 31 after each monitoring event.

	Qualitative Visual Assessment	Photo Documentation	Vegetation	Morphology	Stability	Hydrology	Habitat Assessment
Monitoring Event 1	X	X		X	X	X	
Monitoring Event 2	X	X	X	X	X	X	
Monitoring Event 3	X	X	X		X	X	
Monitoring Event 4	X	X			X	X	
Monitoring Event 5	X	X	X	X	X	X	X

10.0 LONG TERM MANAGEMENT PLAN

Upon successful completion of the monitoring period, the National Park Service will be responsible for the long-term management of the site, in accordance with the NPS

Management Policies 2006 and the Memorandum of Understanding between TSMP and USDOI NPS (found in Appendices B and C, respectively).

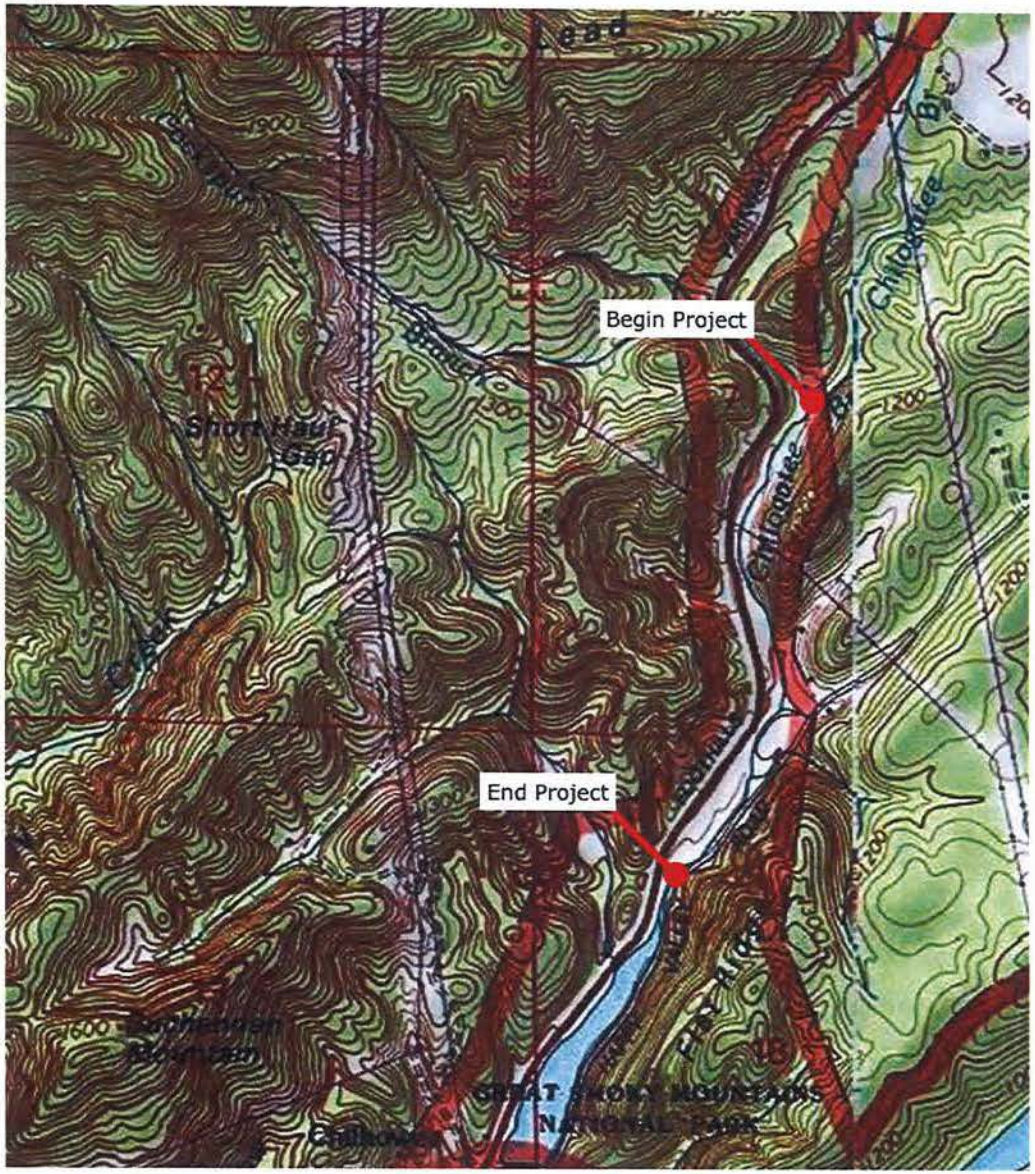
11.0 ADAPTIVE MANAGEMENT PLAN

Adaptive management is a management strategy that anticipates likely challenges associated with compensatory mitigation projects and provides for the implementation of actions to address those challenges, as well as unforeseen changes to those projects. It requires consideration of the risk, uncertainty, and dynamic nature of the compensatory mitigation projects and guides modifications of those projects to optimize performance. It includes the selection of appropriate measures that will ensure that the aquatic resource functions are provided and involves analysis of monitoring results to identify potential problems of a compensatory mitigation project and the identification and implementation of measures to rectify those problems.

Should any portion or aspect of the project not meet the specified performance standards based upon monitoring reports and/or additional visual observations in a monitoring year, the TSMP will investigate and document the nature and cause(s) of the resulting conditions. If it is determined that corrective action is not warranted, the rationale for such a decision shall be stated. Continued monitoring of the condition or area, including the use of more detailed methodologies and at a more intensive rate, may be necessary. These actions shall also be documented. In instances where corrective action is warranted and approaches beyond the scope of routine maintenance are deemed necessary to ensure project success, an Adaptive Management Corrective Action Plan shall be prepared. This plan will include a description of the areas of concern, proposed courses of action, an adjusted project schedule, including monitoring period, revised performance standards, and predicted changes to credit generation, if applicable.

12.0 FINANCIAL ASSURANCES

The TSMP has been operating as an In-Lieu-Fee program in Tennessee since 2003. With a decade of experience in stream restoration, the TSMP has completed 26 stream restoration/enhancement projects, totaling more than 232,000 linear feet, and producing 142,000 stream mitigation credits. The TSMP's rigorous project management process was developed based on the program's experience in the identification, development and implementation of stream mitigation projects. As a result, the TSMP builds project-specific budgets that include realistic costs for project development, design, implementation, maintenance, monitoring, long-term management, as well as a contingency based on uncertainties and risk analysis. In accordance with the TSMP In-Lieu-Fee Instrument, the TSMP commits to fund the Chilogatee Branch Stream Restoration Project until performance standards are satisfied and credits have been released. Should the project exceed our anticipated costs, the TSMP has the ability to adjust the credit fee schedule for future impacts, if necessary, to ensure that sufficient funding is available to fulfill its mitigation obligation.



TENNESSEE STREAM TSMP MITIGATION PROGRAM

Chilogatee Branch Topographic Map

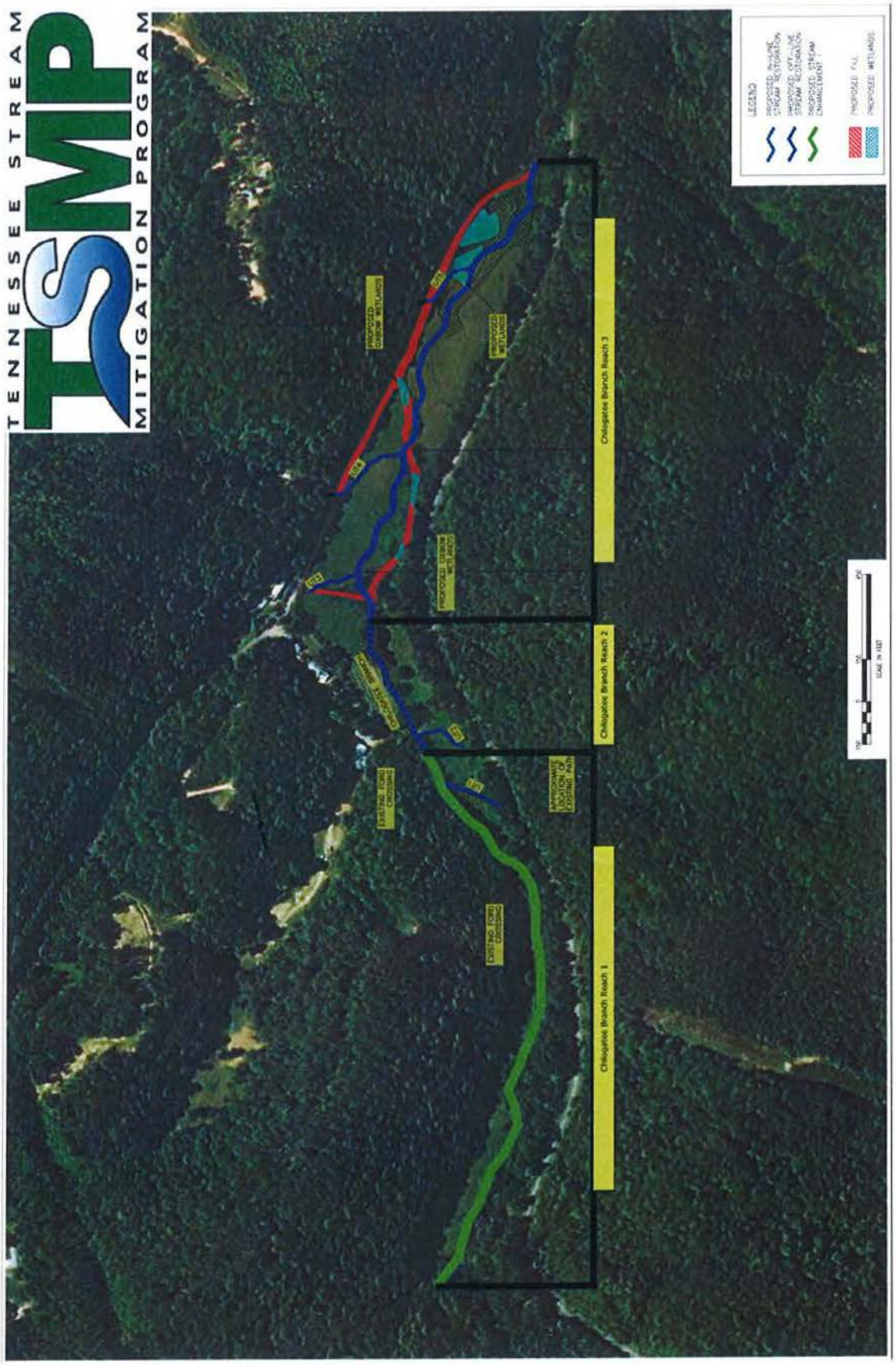
TSMP Project # 03-020-12

***Project Stream**

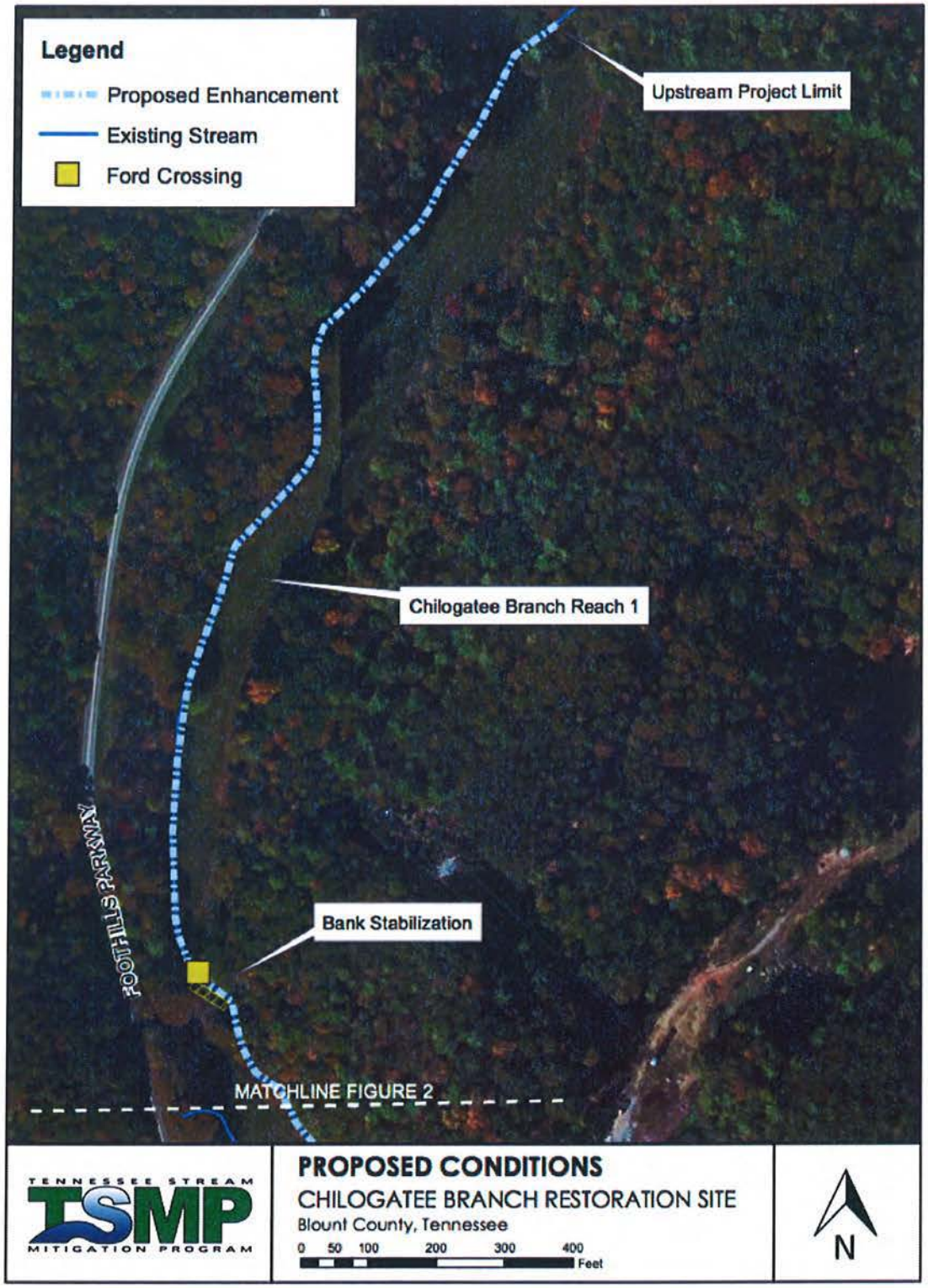
*Indicated By

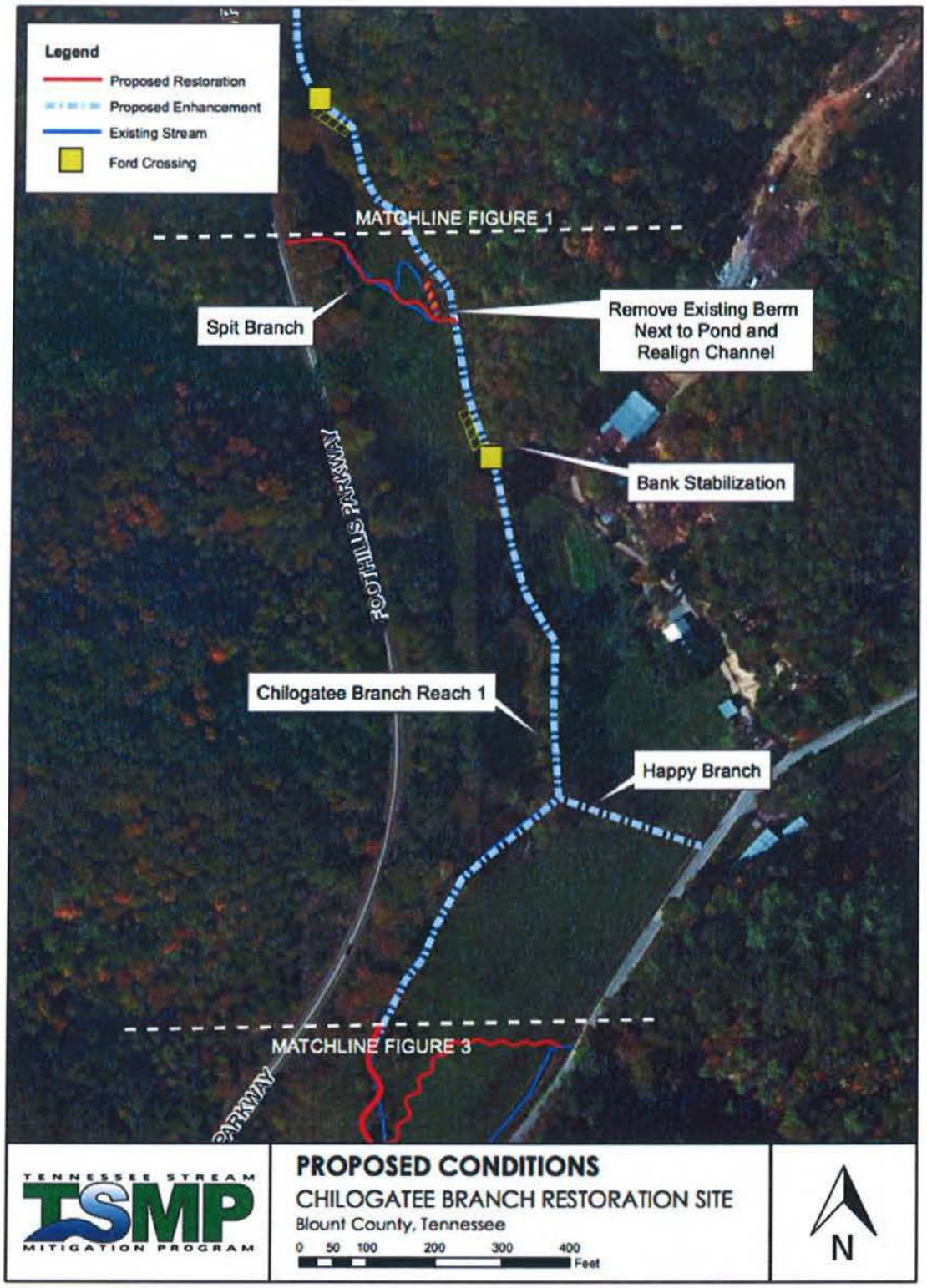
2000 ft

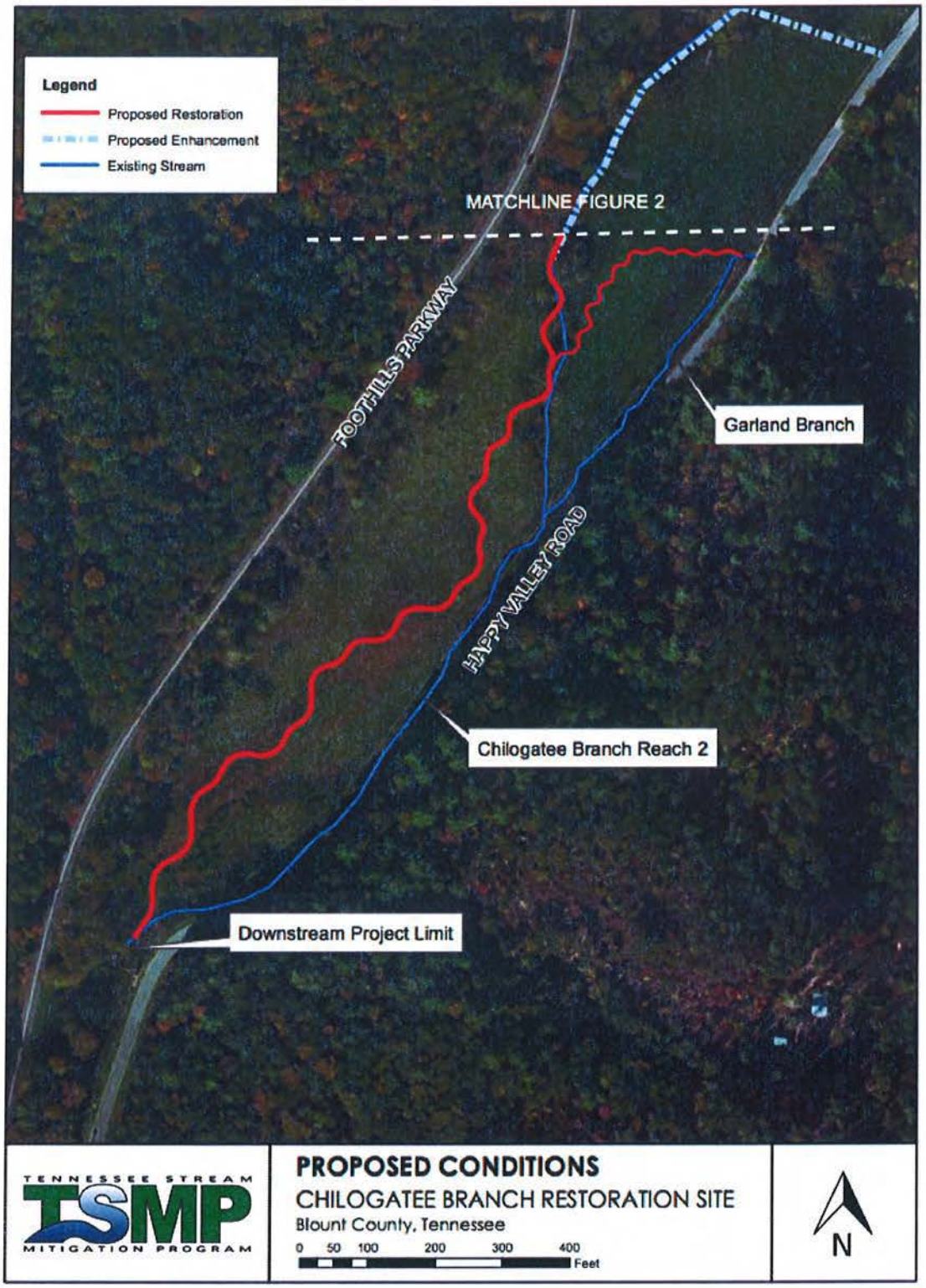
N


TENNESSEE STREAM
TSMP
MITIGATION PROGRAM
LEGEND
PROPOSED IN-LINE STREAM RESTORATION
PROPOSED OFF-LINE STREAM RESTORATION
PROPOSED STREAM ENHANCEMENT
PROPOSED FILL
PROPOSED WETLANDS
Chilogatee Branch Reach 1
Chilogatee Branch Reach 2
Chilogatee Branch Reach 3
EXISTING FORD CROSSING
EXISTING FORD CROSSING
PROPOSED OXBOW WETLANDS
PROPOSED OXBOW WETLANDS
PROPOSED OXBOW WETLANDS
PROPOSED OXBOW WETLANDS
SCALE IN FEET

2.0 IMAGERY
2.1 Project Boundary & Sample Site Delineation




Legend
Proposed Restoration
Proposed Enhancement
Existing Stream
Ford Crossing
MATCHLINE FIGURE 1
Spit Branch
Remove Existing Berm Next to Pond and Realign Channel
Bank Stabilization
FOOTHILLS PARKWAY
Chilogatee Branch Reach 1
Happy Branch
MATCHLINE FIGURE 3
PARKWAY
TENNESSEE STREAM TSMP MITIGATION PROGRAM
PROPOSED CONDITIONS
CHILOGATEE BRANCH RESTORATION SITE
Blount County, Tennessee
0 50 100 200 300 400 Feet
N


Legend
Proposed Restoration
Proposed Enhancement
Existing Stream
MATCHLINE FIGURE 2
FOOTHILLS PARKWAY
HAPPY VALLEY ROAD
Garland Branch
Chilogatee Branch Reach 2
Downstream Project Limit
TENNESSEE STREAM
TSMP
MITIGATION PROGRAM
PROPOSED CONDITIONS
CHILOGATEE BRANCH RESTORATION SITE
Blount County, Tennessee
0 50 100 200 300 400
Feet
N

TSMP PROJECT #03-020-12

TENNESSEE STREAM MITIGATION PROGRAM

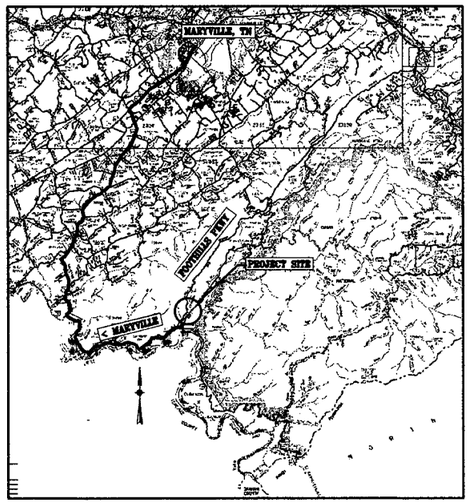
STATE	TSMP PROJECT NO.	SHEET NO.	TOTAL SHEETS
TN	03-020-12	1	32

REV.	DESCRIPTION	DATE	APPROVED
A	PRELIMINARY PLANS	9/30/2013	

REVISIONS

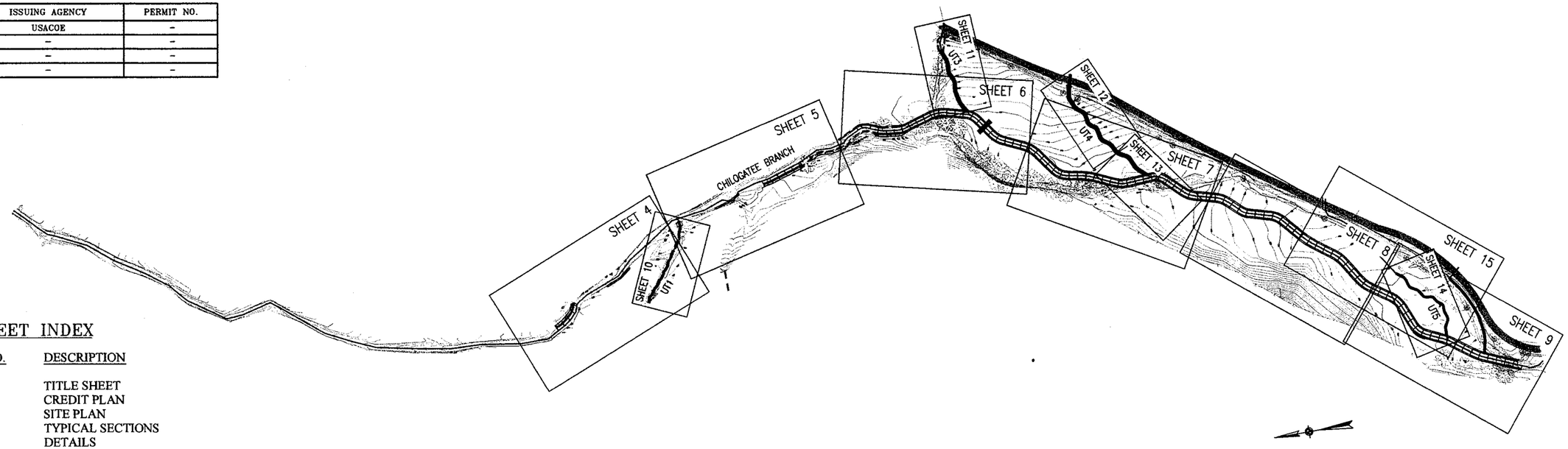
CHILOGATEE BRANCH STREAM RESTORATION PROJECT

CHILOGATEE BRANCH
BLOUNT COUNTY, TENNESSEE



VICINITY MAP
NOT TO SCALE

ISSUING AGENCY	PERMIT NO.
USACOE	-
-	-
-	-
-	-



SHEET INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET
1A	CREDIT PLAN
1B	SITE PLAN
2	TYPICAL SECTIONS
3-3B	DETAILS
4-15	PLAN AND PROFILE
P1-P4	PLANTING PLAN
EC1-EC9	EROSION CONTROL PLANS
~~XS-1 - XS~~	~~CROSS SECTIONS~~ (FINAL ONLY)

PRELIMINARY PLANS

GRAPHIC SCALES (SCALE IN FEET)

PLAN SHEETS 4-9,15: 20 0 20 60
HORIZONTAL PROFILE SHEETS 4-9,15: 20 0 20 60
PLAN SHEETS 10-14: 10 0 10 30
HORIZONTAL PROFILE SHEETS 10-14: 10 0 10 30
VERTICAL PROFILE SHEETS 4-9,15: 2 0 2 6
VERTICAL PROFILE SHEETS 10-14: 1 0 1 3

PROJECT LENGTHS

EXISTING:	CHILOGATEE BRANCH	= 4600 FT
	UT1	= 0 FT
	UT3	= 252 FT
	UT4	= 502 FT
	UT5	= 0 FT
	TOTAL LENGTH	= 5354 FT
PROPOSED RESTORATION & ENHANCEMENTS:	CHILOGATEE BRANCH	= 4521 FT
	UT1	= 235 FT
	UT3	= 215 FT
	UT4	= 338 FT
	UT5	= 248 FT
	TOTAL LENGTH	= 5557 FT

Prepared by:

Wolf Creek Engineering

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PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT ENGINEER

Prepared for:

TENNESSEE STREAM TSMP MITIGATION PROGRAM

CHRIS CROCKETT
PROJECT MANAGER

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

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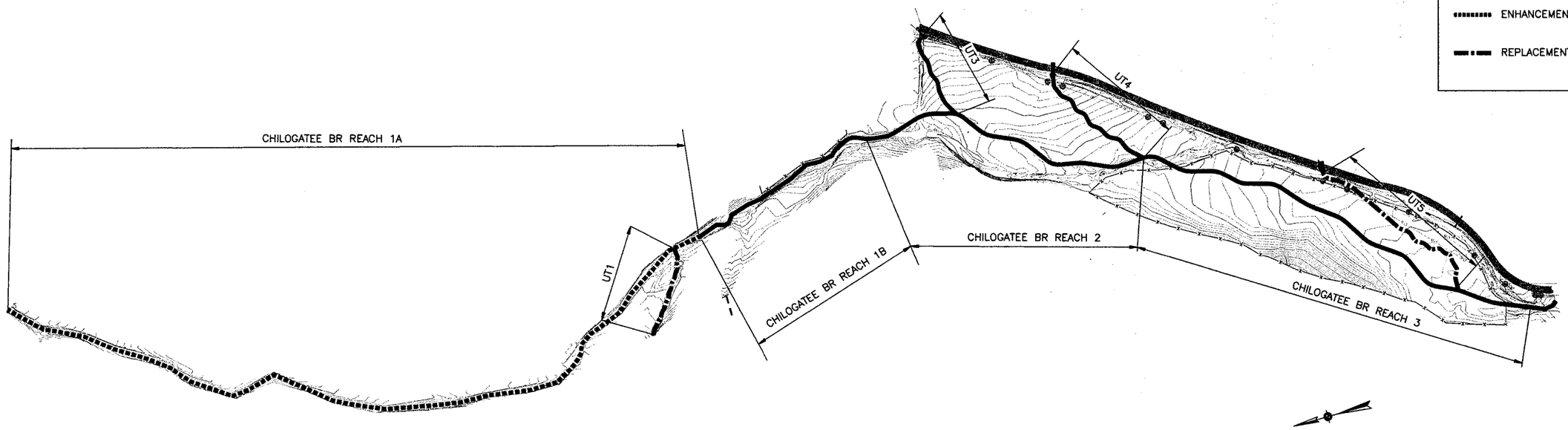
PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM RESTORATION PROGRAM
TITLE: **CREDIT PLAN**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	mam	1060	1A
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LEGEND
- RESTORATION
- ENHANCEMENT
- REPLACEMENT



MITIGATION CREDIT TABLE					
REACH	APPROACH	EXISTING LENGTH (ft)	PROPOSED LENGTH (ft)	CREDIT RATIO	CREDITS
CHILOGATEE BR 1A	ENHANCEMENT I	2152.3	2152.3	4:1	538
CHILOGATEE BR 1B	RESTORATION	360.3	360.3	1.5:1	240
CHILOGATEE BR 2	RESTORATION	1118	867.6	1.25:1	694
CHILOGATEE BR 3	RESTORATION	969	1141	1.25:1	913
UT 1	REPLACEMENT	0	235	1:1	235
UT 3	RESTORATION	252	215	1.5:1	143
UT 4	RESTORATION	502	338	1.25:1	270
UT 5	REPLACEMENT	0	248	1:1	248
TOTAL					3281

150 0 150 450
SCALE IN FEET

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

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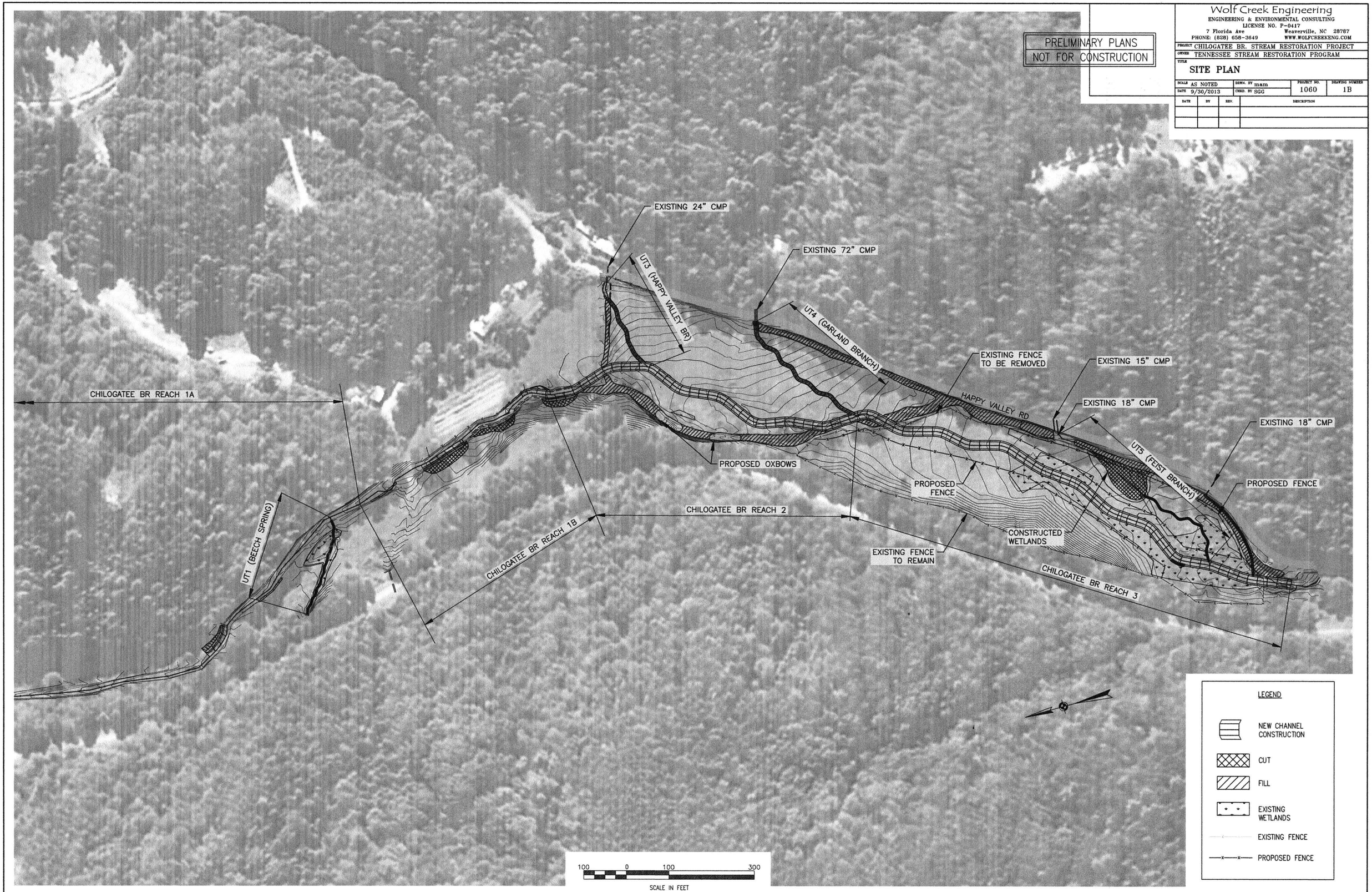
PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM RESTORATION PROGRAM
TITLE: **SITE PLAN**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	mam	1060	1B
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



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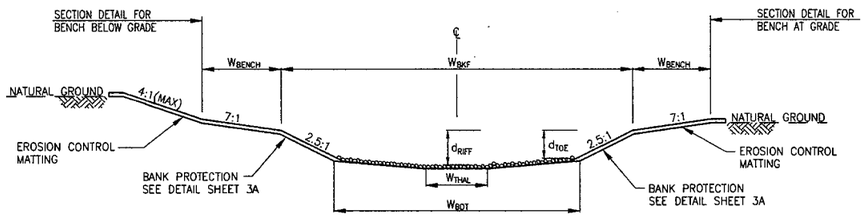
PRELIMINARY PLANS
NOT FOR CONSTRUCTION

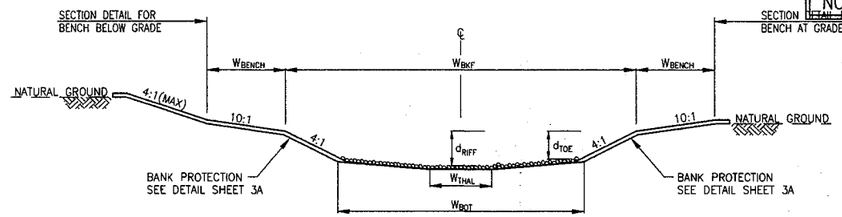
PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM MITIGATION PROGRAM
TITLE: **TYPICAL SECTIONS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MAM	1060	2
DATE 9/30/2013	CHKD. BY SGG		

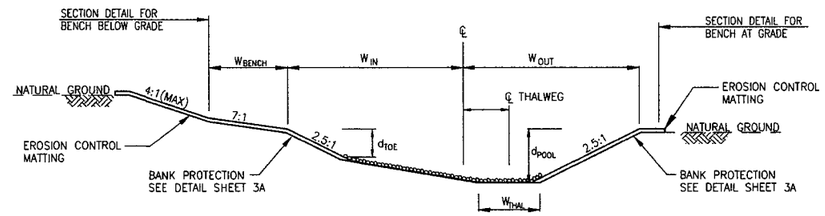
DATE	BY	REV.	DESCRIPTION



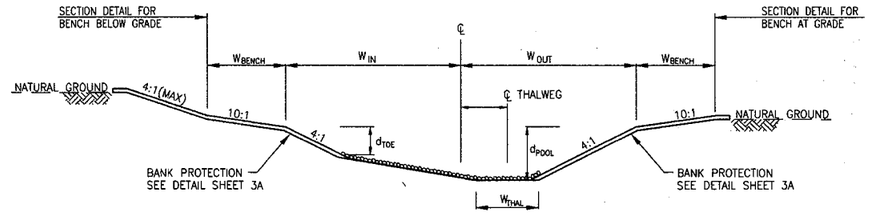
SECTION 1
TYPICAL RIFFLE
NOT TO SCALE



SECTION 2
TYPICAL RIFFLE
NOT TO SCALE



SECTION 1
TYPICAL POOL
NOT TO SCALE



SECTION 2
TYPICAL POOL
NOT TO SCALE

GENERAL NOTES:
1. CONTRACTOR SHALL PERFORM ALL NECESSARY SUBSURFACE UTILITY INVESTIGATIONS PRIOR TO COMMENCING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF EXISTING CONDITIONS, OBSTRUCTIONS, AND UTILITIES WHICH MAY AFFECT PROPOSED WORK. CONSTRUCTION SHALL BEGIN AT THE UPSTREAM END OF EACH CHANNEL REACH AND PROCEED DOWNSTREAM UNLESS APPROVED OTHERWISE BY THE ENGINEER.
2. ALL MECHANIZED EQUIPMENT OPERATED IN OR NEAR THE STREAM OR ITS TRIBUTARIES SHALL BE INSPECTED REGULARLY AND MAINTAINED TO PREVENT CONTAMINATION OF STREAM WATERS FROM FUELS, LUBRICANTS, HYDRAULIC FLUIDS, OR OTHER TOXIC MATERIALS.
3. CLEARING AND GRUBBING SHALL BE LIMITED TO THAT WHICH IS NECESSARY FOR CONSTRUCTION OF THE PROPOSED CHANNEL AND SHALL BE APPROVED BY THE ENGINEER.
4. CONTRACTOR IS RESPONSIBLE FOR PROVIDING SAFE INGRESS AND EGRESS FROM SITE FOR ALL VEHICLES, INCLUDING BUT NOT LIMITED TO, TRAFFIC ON ADJACENT PUBLIC ROADS AFFECTED BY CONSTRUCTION TRAFFIC.
5. CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIALS GENERATED BY CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRS TO EXISTING FACILITIES FROM DAMAGES OCCURRING AS A RESULT OF CONSTRUCTION ACTIVITIES.
7. THE INSTALLATION OF EROSION CONTROL MEASURES AND PRACTICES SHALL OCCUR PRIOR TO LAND DISTURBING ACTIVITIES.

TABLE 1: SECTION DIMENSIONS

REACH	TYPICAL SECTION	STATION	RIFFLE DIMENSIONS						POOL DIMENSIONS			
			W_{BKF} (ft)	W_{BED} (ft)	W_{THAL} (ft)	W_{BENCH} (ft)	d_{RIFF} (ft)	d_{TOE} (ft)	W_{IN} (ft)	W_{OUT} (ft)	d_{POOL} (ft)	APPROX. POOL DEPTH
CHILOGATEE BR 1A	1	100+00 TO 121+25	21.4	14.8	4.4	5	1.64	1.31	12.8	10.7	2.46	1.0
CHILOGATEE BR 1B	1	121+25 TO 126+08	21.4	14.8	4.4	5	1.64	1.31	12.8	10.7	2.46	1.0
CHILOGATEE BR 2	1	126+08 TO 133+89	22.2	15.5	4.7	11	1.68	1.35	13.3	11.1	2.53	1.0
CHILOGATEE BR 3	1	133+89 TO 145+41	23.3	16.4	4.9	12	1.74	1.39	14.0	11.7	2.61	1.0
UT 1 (BEECH SPRING)	2	200+00 TO 202+35	4.7	2.0	0.6	2	0.43	0.35	2.8	2.4	0.65	0.5
UT 3 (HAPPY VALLEY BR)	1	300+00 TO 302+15	8.9	5.3	1.6	4	0.90	0.72	5.3	4.4	1.35	0.5
UT 4 (GARLAND BR)	1	400+28 TO 403+67	9.1	5.4	1.6	5	0.92	0.73	5.4	4.5	1.37	0.5
UT 5 (FEIST SPRING)	2	502+84 TO 505+32	4.7	2.0	0.6	2	0.43	0.35	2.8	2.4	0.65	0.5

NOTE: IN LOCATIONS WHERE MATURE VEGETATION EXISTS ADJACENT TO PROPOSED CHANNEL, THE BENCH WIDTH (W_{BENCH}) SHALL BE REDUCED AS DIRECTED BY THE ENGINEER

TABLE 2: SUPPLEMENTAL BED MATERIAL

REACH	PERCENT OF TOTAL MAX						
	Sand/Clay	1/2" stone (No 57)	3/4" stone (No 5)	2" stone (Surge)	6" stone	12" stone	DEPTH OF BED MATERIAL
CHILOGATEE BR 1A	20	–	–	40	40	–	0.6
CHILOGATEE BR 1B	20	–	–	40	40	–	0.6
CHILOGATEE BR 2	20	–	–	40	40	–	0.6
CHILOGATEE BR 3	20	–	–	40	40	–	0.6
UT 1 (BEECH SPRING)	20	–	–	40	40	–	0.6
UT 3 (HAPPY VALLEY BR)	20	–	–	40	40	–	0.4
UT 4 (GARLAND BR)	20	–	–	40	40	–	0.4
UT 5 (FEIST SPRING)	20	–	–	40	40	–	0.4

SURVEY:
THE COORDINATE SYSTEM IS THE NAD83 STATE PLANE GRID.

CHANNEL CONSTRUCTION NOTES:
1. BED MATERIAL ON RIFFLE SECTIONS SHALL CONSIST OF BED MATERIAL EXCAVATED FROM EXISTING CHANNEL. WHERE INSUFFICIENT BED MATERIAL IS PRESENT IT SHALL BE SUPPLEMENTED WITH MATERIAL ACCORDING TO TABLE 2 AND AS DIRECTED BY THE ENGINEER.
2. THE CHANNEL BANKS SHALL BE STABILIZED ACCORDING TO THE BANK PROTECTION DETAILS ON SHEET 3A.
3. DIMENSION TOLERANCES SHALL BE AS FOLLOWS:
   WIDTH: +/- 0.5 FT
   DEPTH: +/- 0.2 FT
   RIFFLE ELEVATIONS: +/- 0.1 FT
   POOL ELEVATIONS: + 0.1 FT, - 0.5 FT
   STRUCTURE ELEVATIONS: +/- 0.1 FT
4. EXISTING CHANNEL INDICATED TO BE FILLED ON PLANS SHALL BE BACKFILLED WITH 1-FOOT LIFTS AND COMPACTED TO IN-SITU SOIL DENSITY. CHANNEL SHALL BE FREE FROM BRUSH AND ORGANIC DEBRIS PRIOR TO BACKFILLING.
5. PUMP AROUND OPERATION SHALL BE USED TO DIVERT FLOW DURING CONSTRUCTION EXCEPT AS ALLOWED BY THE ENGINEER. ALL EXCAVATION SHALL BE PERFORMED IN THE DRY OR IN ISOLATED REACHES EXCEPT AS ALLOWED BY THE ENGINEER.

TABLE 3: MORPHOLOGIC TABLE

REACH	CHILOGATEE BRANCH 1A	CHILOGATEE BRANCH 1B	CHILOGATEE BRANCH 2	CHILOGATEE BRANCH 3	UT1	UT3	UT4	UT5
STREAM TYPE	B4c	B4c	B4c	B4c	B4c	B4c	B4c	B4c
DRAINAGE AREA (mi^2)	1.79	1.79	1.98	2.23	0.02	0.18	0.19	0.02
W_{BKF} (ft)	21.4	21.4	22.2	23.3	4.7	8.9	9.1	4.7
XS_{BKF} (ft^2)	26.9	26.9	28.8	31.2	1.3	5.7	5.9	1.3
d_{MEAN} (ft)	1.26	1.26	1.30	1.34	0.27	0.65	0.66	0.27
d_{MAX} (ft)	1.64	1.64	1.68	1.74	0.43	0.90	0.92	0.43
S_{AVG} (ft/ft)	0.023	0.022	0.019	0.015	0.015	0.050	0.040	0.030
S_{VALLEY} (ft/ft)	0.021	0.020	0.022	0.020	0.017	0.050	0.040	0.029
W/D RATIO	17	17	17.2	17.4	17.6	13.8	13.8	17.6
ENTRENCHMENT RATIO	1.6	1.2	1.8	1.7	2.3	1.4	1.3	1.5
SINUOSITY	1.00	1.08	1.06	1.06	1.09	1.04	1.06	1.14
POOL-TO-POOL RATIO	–	–	–	–	–	–	–	–
MEANDER WIDTH RATIO	1.4	1.7	1.9	2.0	4.2	2.0	1.9	2.7

TREE SURVEY/HARVEST/PROTECTION NOTES:
1. WOODY MATERIAL WILL BE HARVESTED ON-SITE FOR USE AS IN-STREAM STRUCTURES FOR STREAMBANK STABILITY, GRADE CONTROL, AND AQUATIC HABITAT ENHANCEMENT/RESTORATION. WOODY MATERIAL INCLUDES BOTH LARGE AND SMALL SIZE DIAMETER TREES INCLUDING STEM AND ROOT MASS. TREES WILL BE HARVESTED FROM UPLAND AREAS AS WELL AS ALONG RECONSTRUCTED STREAM BANKS DURING THE RESTORATION CONSTRUCTION PROCESS.
2. PREFERRED HARVEST TREES TO BE SELECTED FOR RESTORATION PURPOSES SHALL FIRST INCLUDE ALL DISEASED, DAMAGED, HAZARD, AND UNDESIRABLE TREE SPECIES UNTIL THE QUANTITIES NEEDED FOR STREAM RESTORATION ARE MET. AREAS SELECTED FOR HARVEST SHALL OCCUR WITHIN THE LIMITS OF DISTURBANCE AND DELINEATED BY A CERTIFIED ARBORIST OR OTHER PROFESSIONAL ECOLOGIST/BIOLOGIST.
3. ALL WOODY MATERIALS WILL BE STOCKPILED IN THE APPROVED STAGING AND STOCKPILE AREAS.
4. IN ALL AREAS WHERE TREES ARE HARVESTED PROPER BMP AND EROSION AND SEDIMENT CONTROL WILL BE IMPLEMENTED AND THE AREA IMMEDIATELY STABILIZED WITH TEMPORARY AND PERMANENT SEEDING/MULCH AS HARVESTING OCCURS.

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

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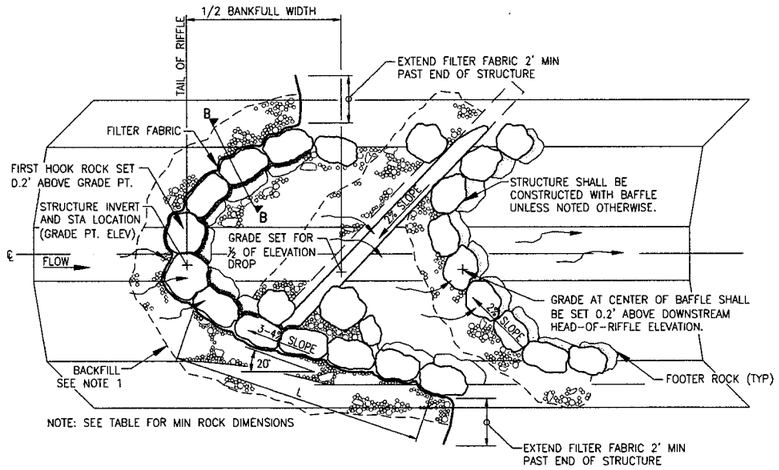
PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM MITIGATION PROGRAM
TITLE: DETAILS

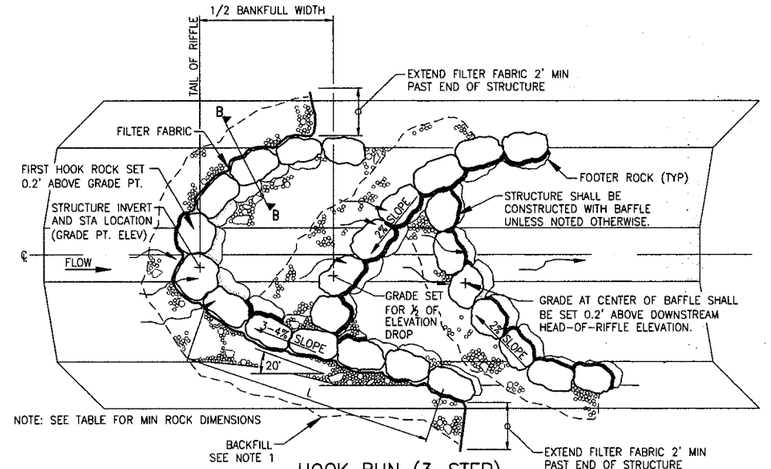
SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	CME	1060	3
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

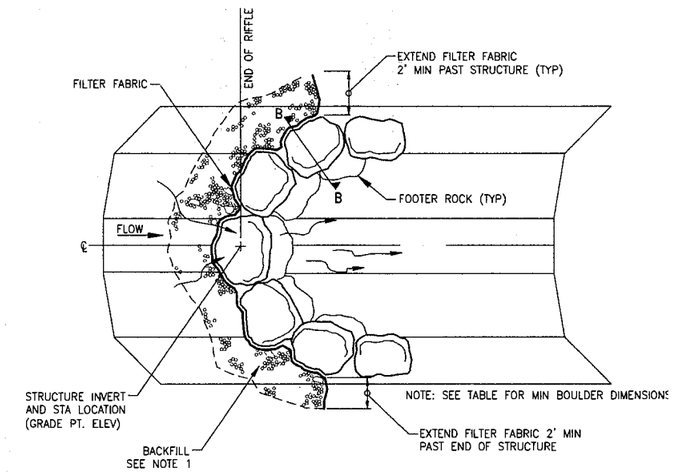
NOTES:
1. STRUCTURE BACKFILL MATERIAL SHALL CONSIST OF 6" STONE, 2" STONE AND SOIL MIXED IN EQUAL PARTS. WHERE EXISTING BED MATERIAL IS AVAILABLE AND OF SUFFICIENT SIZE IT MAY BE USED IN PLACE OF QUARRY STONE, AS APPROVED BY THE ENGINEER.
2. ALL VOIDS AND GAPS BETWEEN BOULDERS SHALL BE CHINKED WITH STONE PRIOR TO INSTALLATION OF FILTER FABRIC.



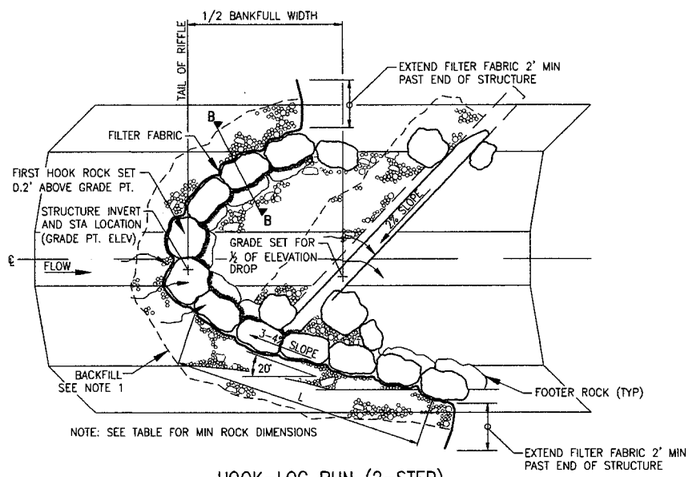
HOOK-LOG RUN (3-STEP)
PLAN VIEW
NOT TO SCALE



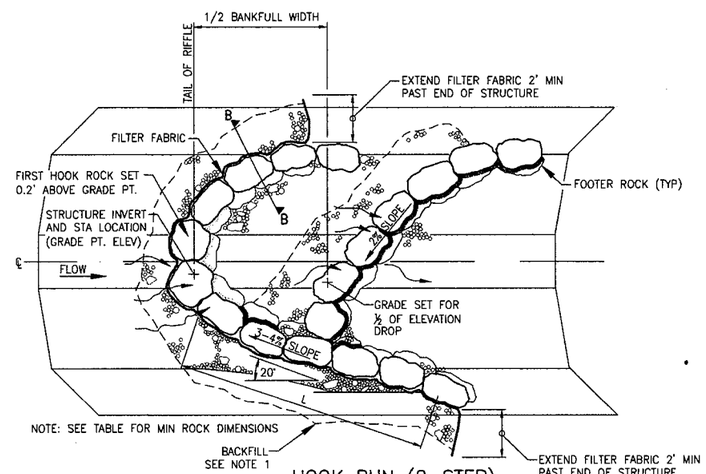
HOOK RUN (3-STEP)
PLAN VIEW
NOT TO SCALE



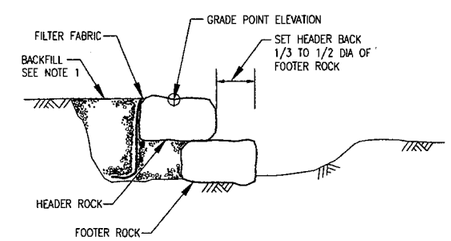
BOULDER ARCH
PLAN VIEW
NOT TO SCALE



HOOK-LOG RUN (2-STEP)
PLAN VIEW
NOT TO SCALE



HOOK RUN (2-STEP)
PLAN VIEW
NOT TO SCALE



SECTION B-B
NOT TO SCALE

TABLE 4: STRUCTURE DIMENSIONS

REACH	STRUCTURES		BOULDERS			TOTAL LOG LENGTH (FT)
	L (FT)	X (FT)	LENGTH (FT)	WIDTH (FT)	DEPTH (FT)	
CHILOGATEE REACH 1	24	8	2.5-3.5	2.0-2.5	1.5-2.0	29
CHILOGATEE REACH 2	25	8	2.5-3.5	2.0-2.5	1.5-2.0	30
CHILOGATEE REACH 3	26	8	2.5-3.5	2.0-2.5	1.5-2.0	31
UT1	3	3	2.0-3.0	1.5-2.0	1.0-1.5	9
UT3	8	3	2.0-3.0	1.5-2.0	1.0-1.5	13
UT4	9	3	2.0-3.0	1.5-2.0	1.0-1.5	14
UT5	3	3	2.0-3.0	1.5-2.0	1.0-1.5	9

NOTE: TOTAL LOG LENGTH INCLUDES THE ROOTBALL

TABLE 5: LOG DIAMETERS

TOTAL LOG LENGTH (FT)	MIN DIAMETER (IN)	MAX DIAMETER (IN)
< 20	12	18
20-40	18	24
40-60	24	30

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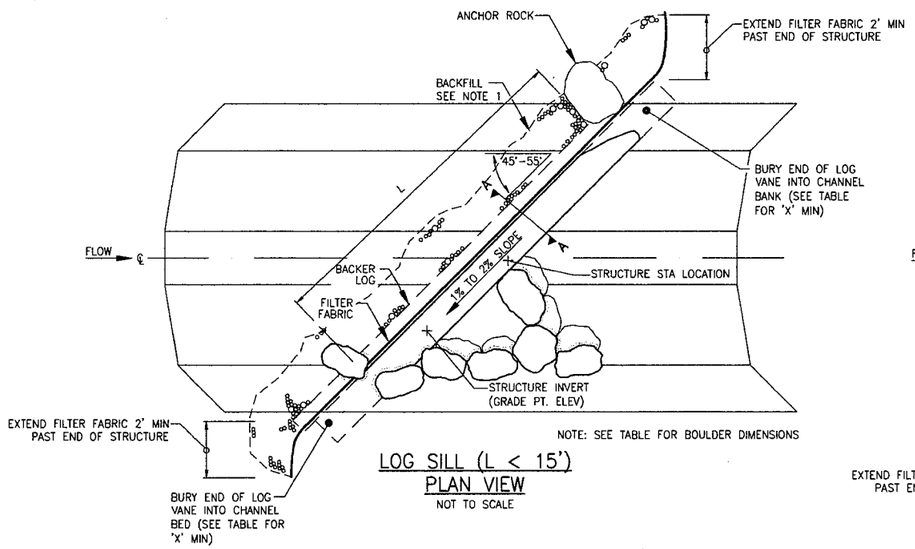
PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT	CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER	TENNESSEE STREAM MITIGATION PROGRAM
TITLE	DETAILS

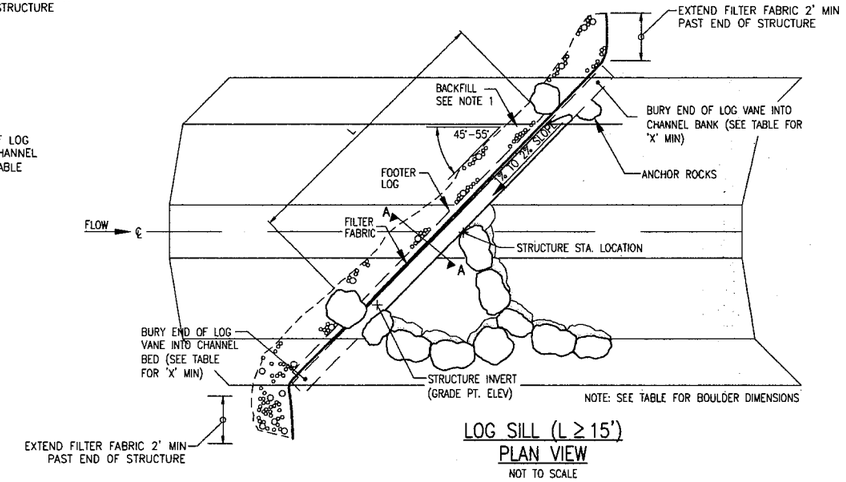
SCALE AS NOTED	DRWN. BY CME	PROJECT NO. 1060	DRAWING NUMBER 3A
DATE 9/30/2013	CHKD. BY SGC		

DATE	BY	REV.	DESCRIPTION

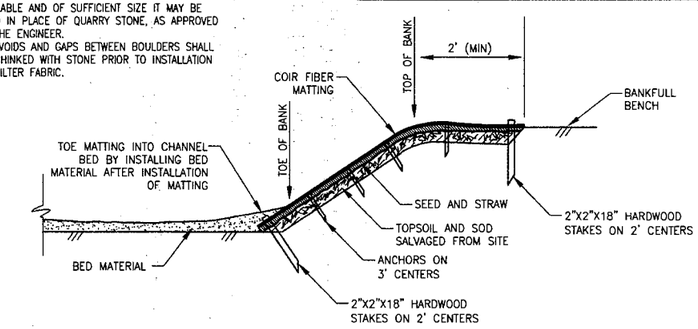
NOTES:
1. STRUCTURE BACKFILL MATERIAL SHALL CONSIST OF 6" STONE, 2" STONE AND SOIL MIXED IN EQUAL PARTS. WHERE EXISTING BED MATERIAL IS AVAILABLE AND OF SUFFICIENT SIZE IT MAY BE USED IN PLACE OF QUARRY STONE, AS APPROVED BY THE ENGINEER.
2. ALL VOIDS AND GAPS BETWEEN BOULDERS SHALL BE CHINKED WITH STONE PRIOR TO INSTALLATION OF FILTER FABRIC.



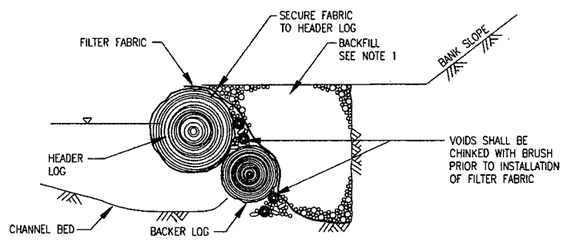
LOG SILL (L < 15')
PLAN VIEW
NOT TO SCALE



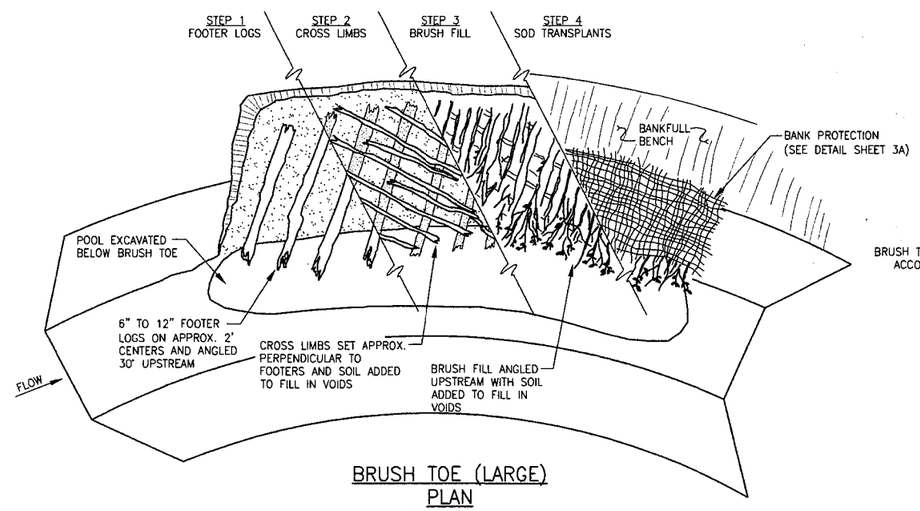
LOG SILL (L ≥ 15')
PLAN VIEW
NOT TO SCALE



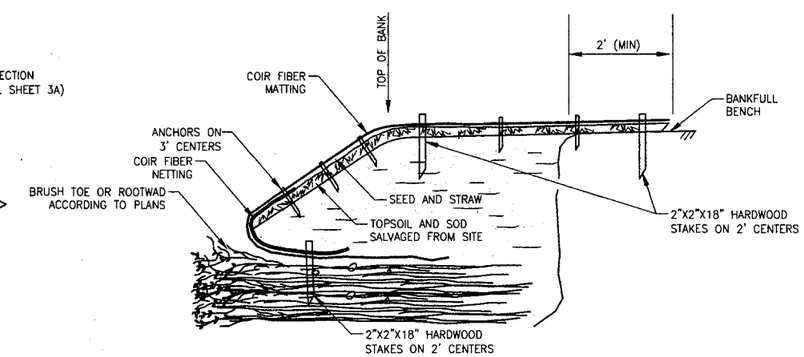
BANK PROTECTION
SOD AND MAT
NOT TO SCALE



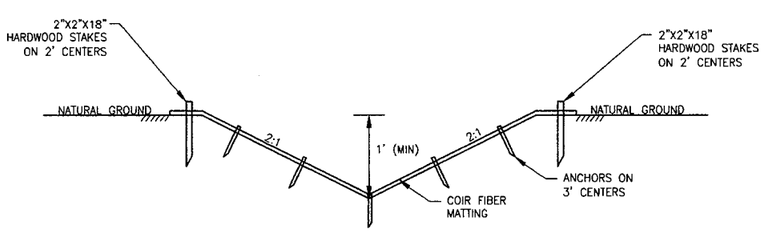
SECTION A-A
NOT TO SCALE



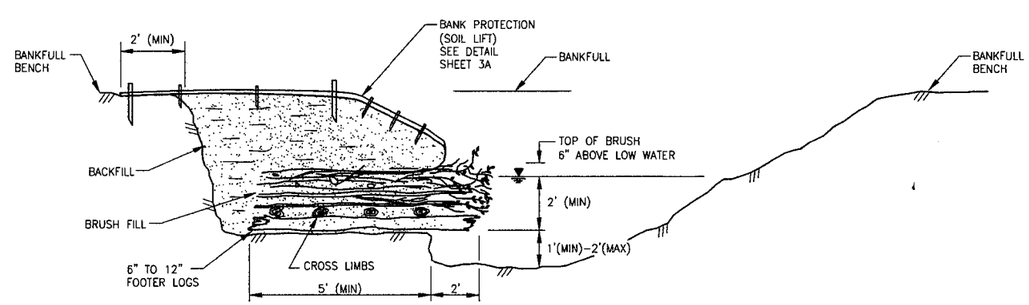
BRUSH TOE (LARGE)
PLAN
NOT TO SCALE



BANK PROTECTION
SOIL LIFT
NOT TO SCALE



STANDARD "V" DITCH
NOT TO SCALE



BRUSH TOE (LARGE)
SECTION
NOT TO SCALE

PRELIMINARY PLANS
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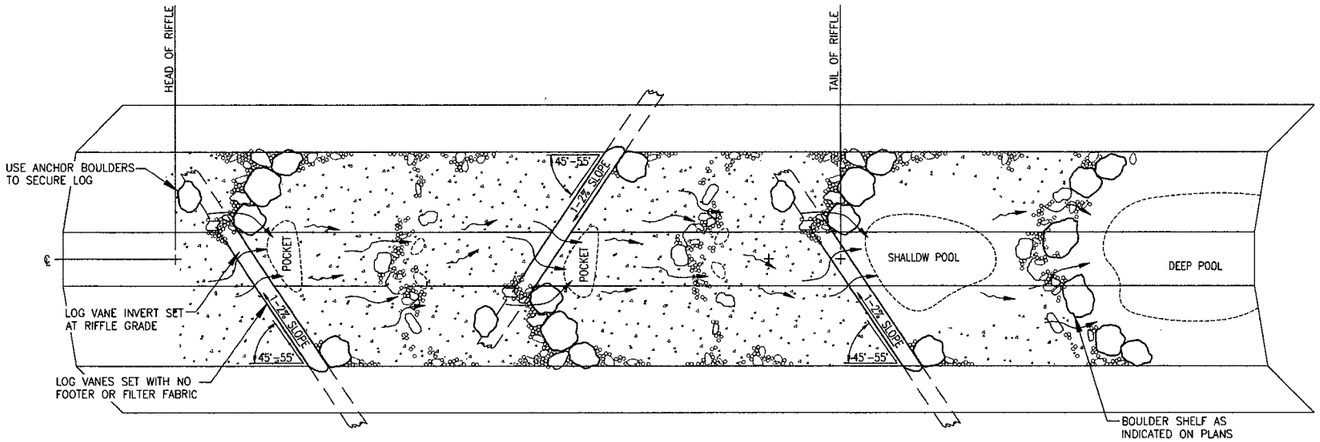
PROJECT	CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER	TENNESSEE STREAM MITIGATION PROGRAM
TITLE	DETAILS
SCALE	AS NOTED
DATE	9/30/2013
DRWN. BY	MAM
CHKD. BY	SGG
PROJECT NO.	1060
DRAWING NUMBER	3B

DATE	BY	REV.	DESCRIPTION

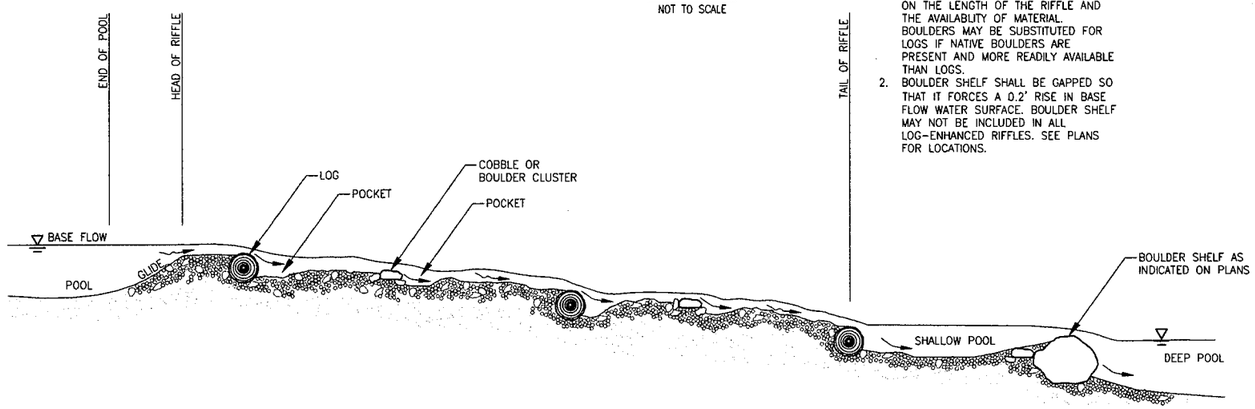


LOG-ENHANCED RIFFLE PLAN VIEW

NOT TO SCALE

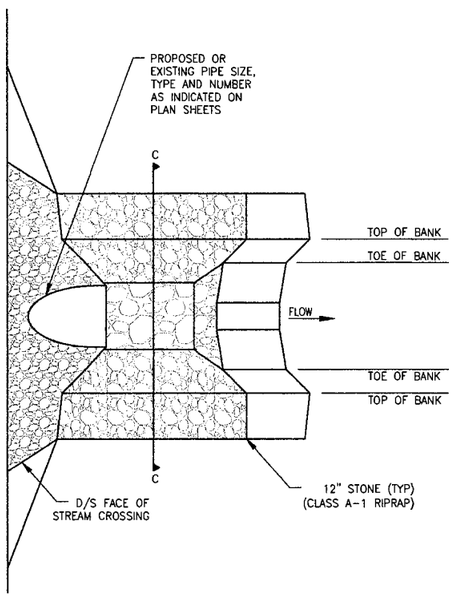
NOTES:

1. NUMBER OF LOGS MAY VARY DEPENDING ON THE LENGTH OF THE RIFFLE AND THE AVAILABLITY OF MATERIAL. BOULDERS MAY BE SUBSTITUTED FOR LOGS IF NATIVE BOULDERS ARE PRESENT AND MORE READILY AVAILABLE THAN LOGS.
2. BOULDER SHELF SHALL BE GAPPED SO THAT IT FORCES A 0.2' RISE IN BASE FLOW WATER SURFACE. BOULDER SHELF MAY NOT BE INCLUDED IN ALL LOG-ENHANCED RIFFLES. SEE PLANS FOR LOCATIONS.



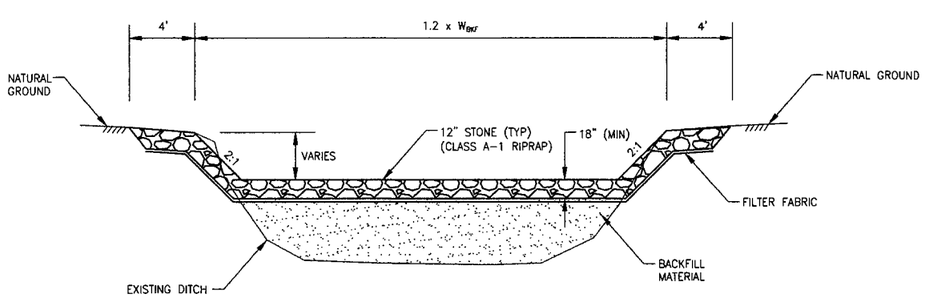
LOG-ENHANCED RIFFLE PROFILE VIEW

NOT TO SCALE



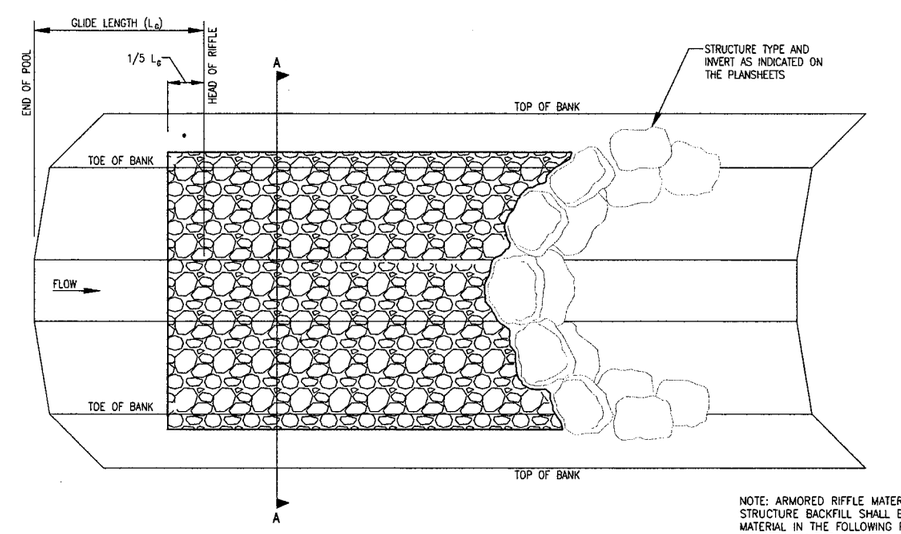
DISSAPATION POOL – PLAN

NOT TO SCALE



DISSAPATION POOL – SECTION C-C

NOT TO SCALE

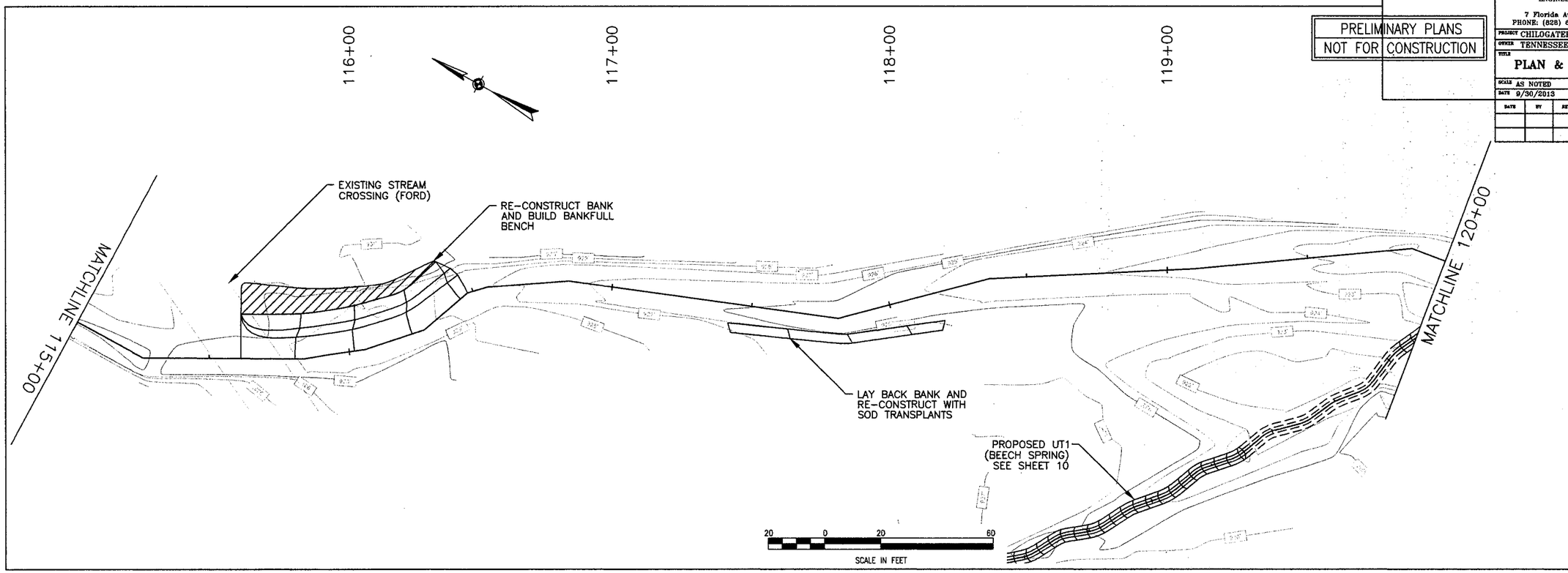


ARMORED RIFFLE DETAIL

NOT TO SCALE

NOTE: ARMORED RIFFLE MATERIAL AND STRUCTURE BACKFILL SHALL BE COMPOSED OF MATERIAL IN THE FOLLOWING PROPORTIONS AS DIRECTED BY THE ENGINEER:

MATERIAL	% BY VOLUME
12" STONE (CLASS B)	60%
6" STONE (CLASS A)	30%
ONSITE SOIL	10%



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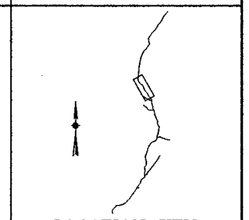
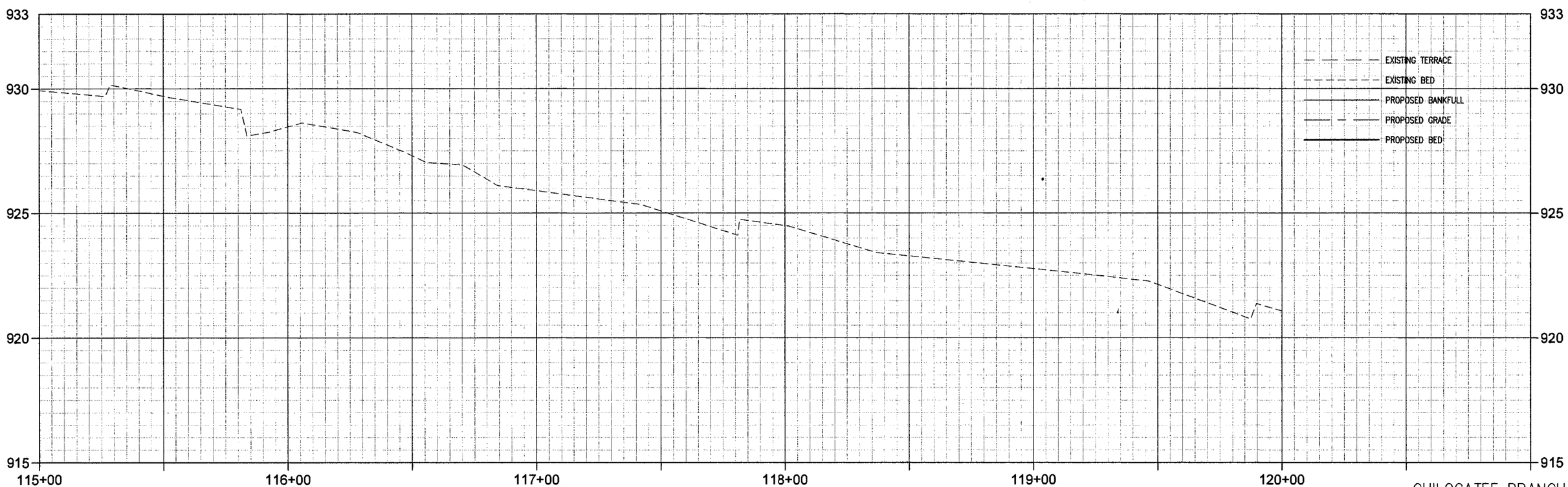
PROJECT CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER TENNESSEE STREAM MITIGATION PROGRAM
TITLE **PLAN & PROFILE**

SCALE AS NOTED	DRWN. BY MMF	PROJECT NO. 1060	SHEET NUMBER 4
DATE 9/30/2013	CHKD. BY CME		

DATE	BY	REV.	DESCRIPTION


LOCATION KEY

LEGEND
- CUT
- FILL
- EXISTING UTILITY
- EXISTING FENCE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE
- TRANSPLANT



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2'
HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL:1" = 4'

CHILOGATEE BRANCH

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PRELIMINARY PLANS
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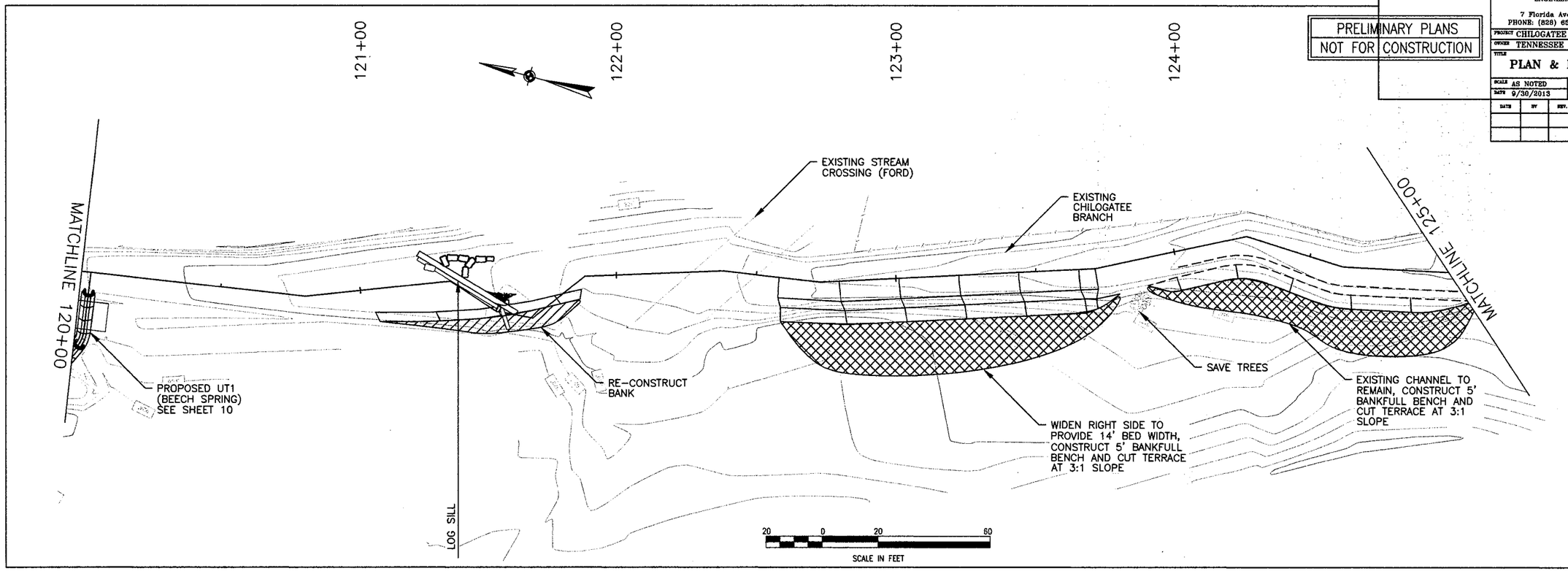
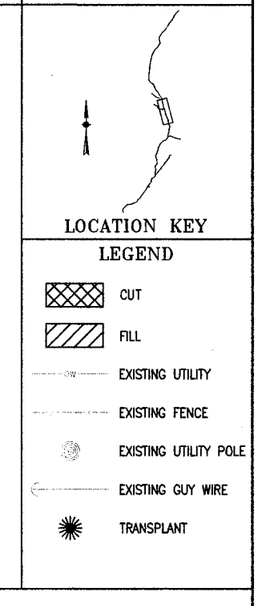
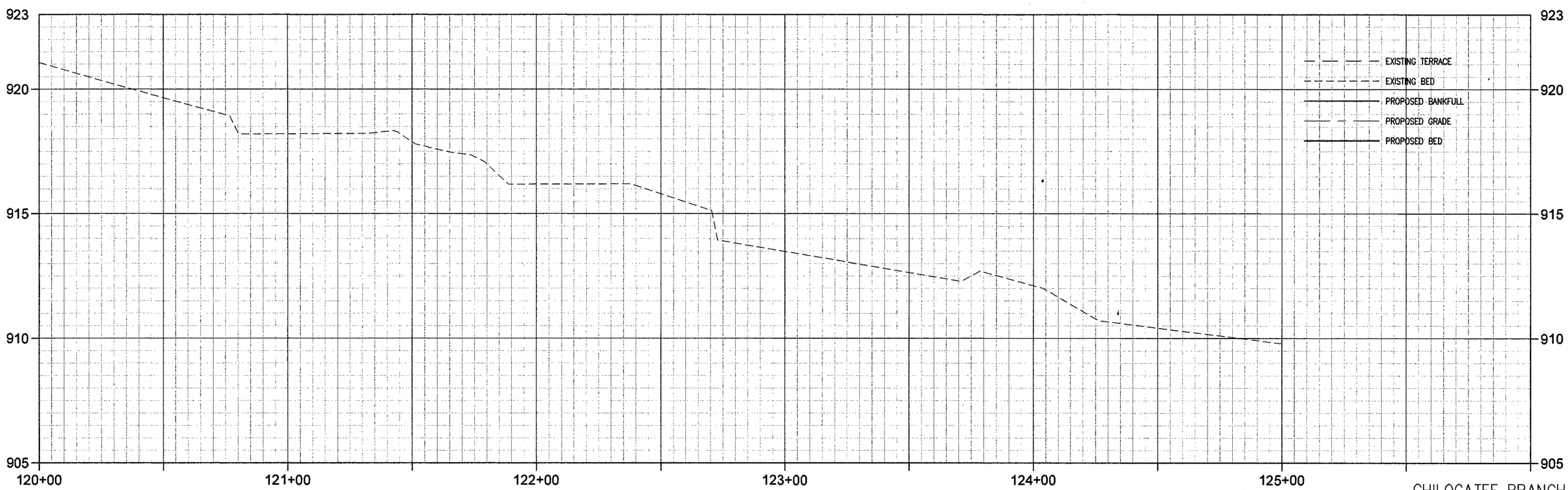
PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM MITIGATION PROGRAM
TITLE: **PLAN & PROFILE**

SCALE	AS NOTED	DRWN. BY MMF	PROJECT NO.	SHEET NUMBER
DATE	9/30/2013	CHKD. BY CME	1060	5

DATE	BY	REV.	DESCRIPTION

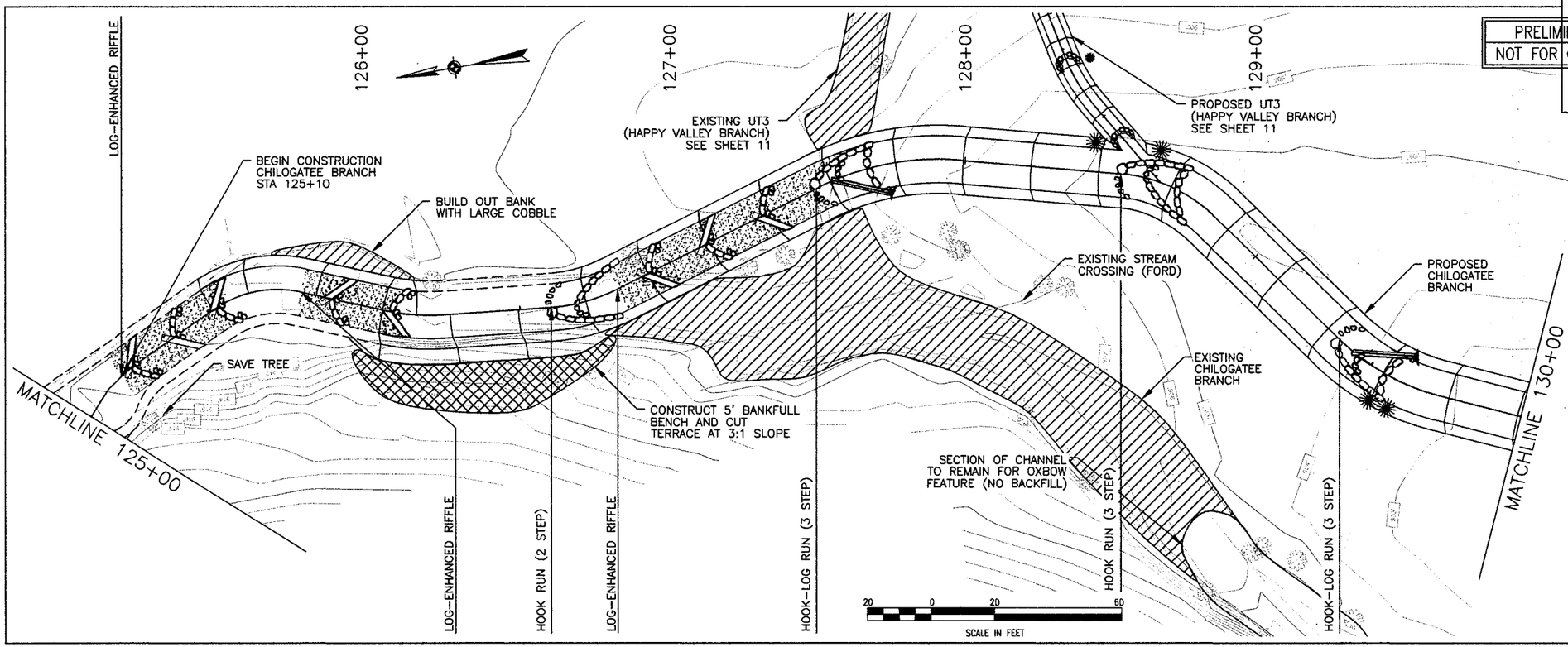






FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2'
HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL:1" = 4'

CHILOGATEE BRANCH



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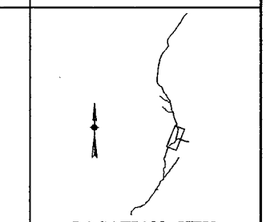
PROJECT CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER TENNESSEE STREAM MITIGATION PROGRAM
TITLE PLAN & PROFILE

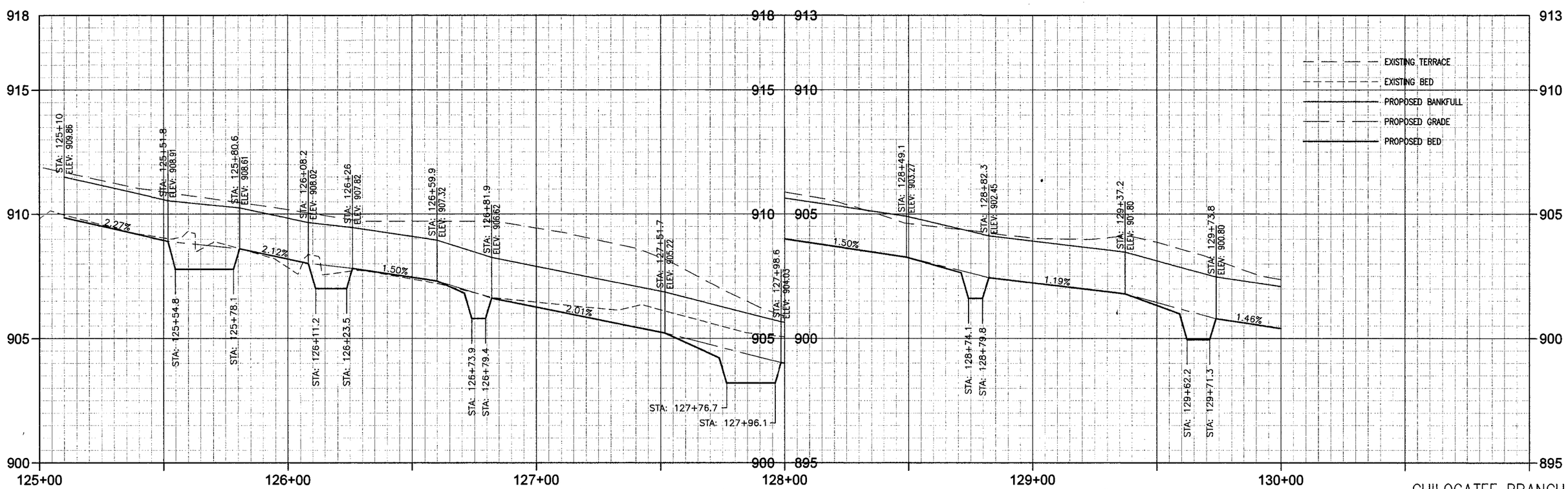
SCALE AS NOTED	DRWN. BY MMF	PROJECT NO.	SHEET NUMBER
DATE 9/30/2013	CHKD. BY CME	1060	6

DATE	BY	REV.	DESCRIPTION



LEGEND

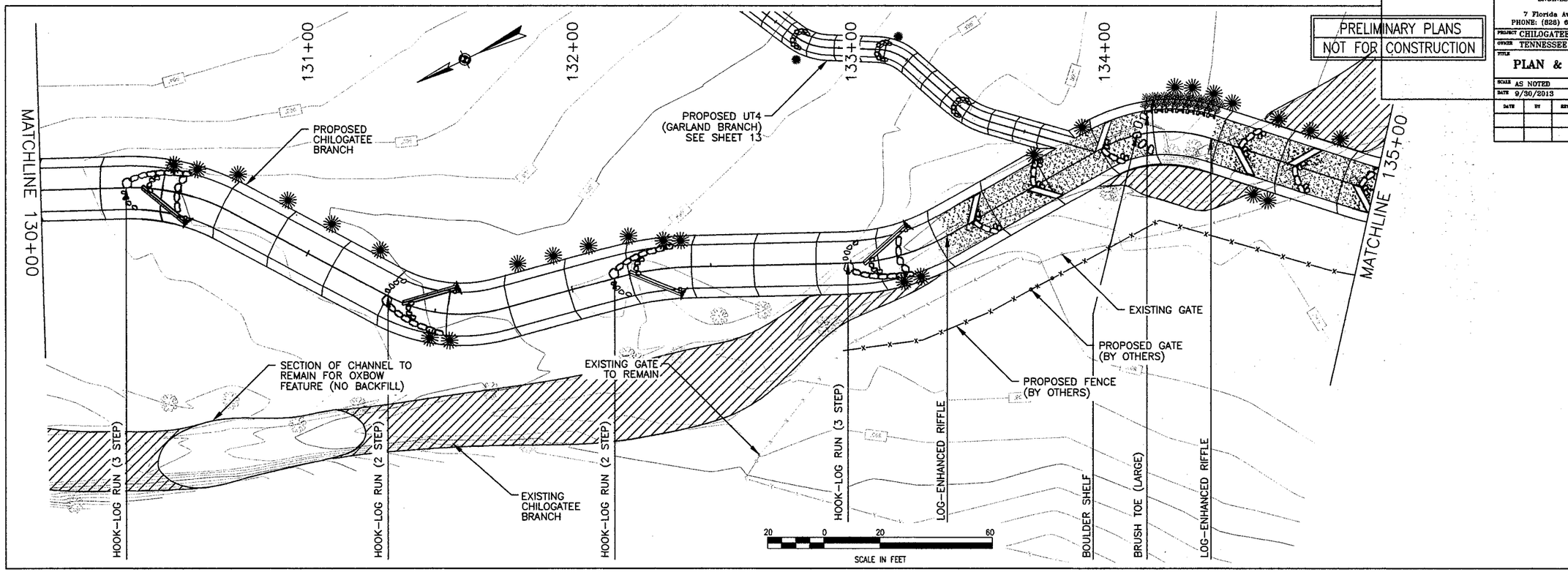
- CUT
- FILL
- EXISTING UTILITY
- EXISTING FENCE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE
- TRANSPLANT



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2'

HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL:1" = 4'

CHILOGATEE BRANCH



PRELIMINARY PLANS
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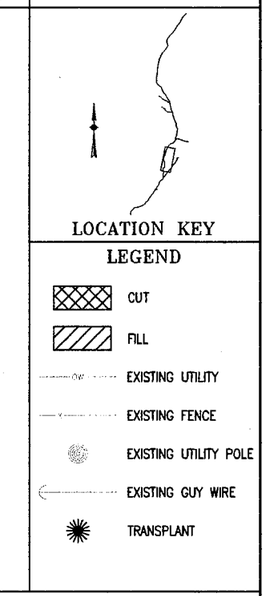
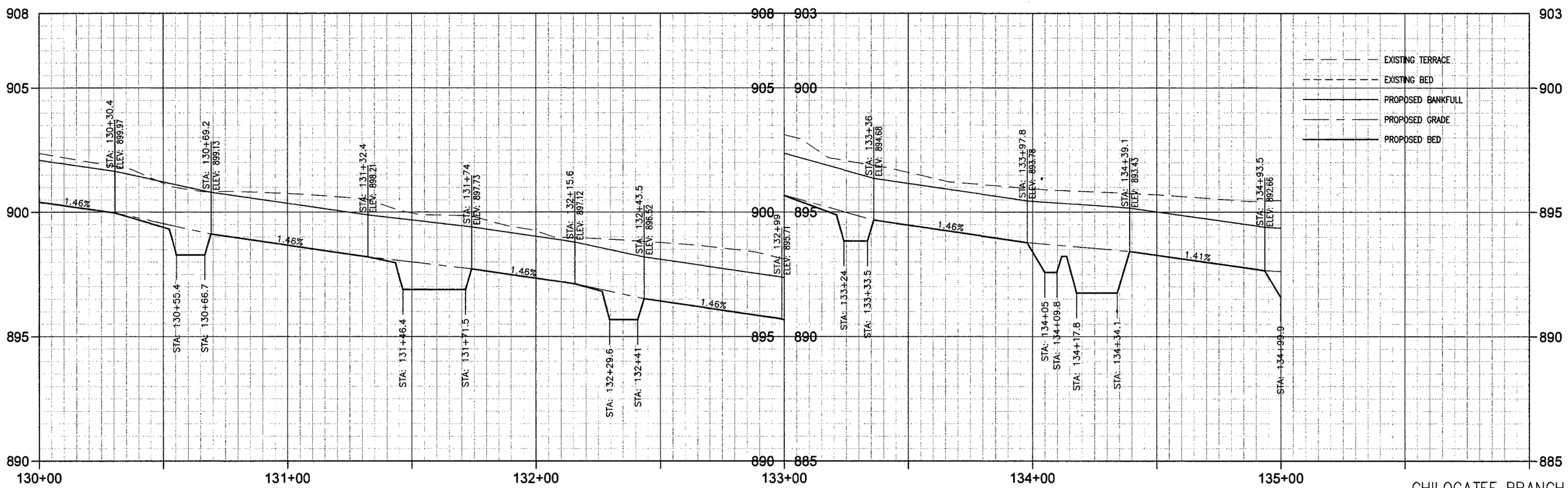
PROJECT CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER TENNESSEE STREAM MITIGATION PROGRAM
TITLE PLAN & PROFILE

SCALE AS NOTED	DRWN. BY MMF	PROJECT NO. 1060	SHEET NUMBER 7
DATE 9/30/2013	CHKD. BY CME		

DATE	BY	REV.	DESCRIPTION

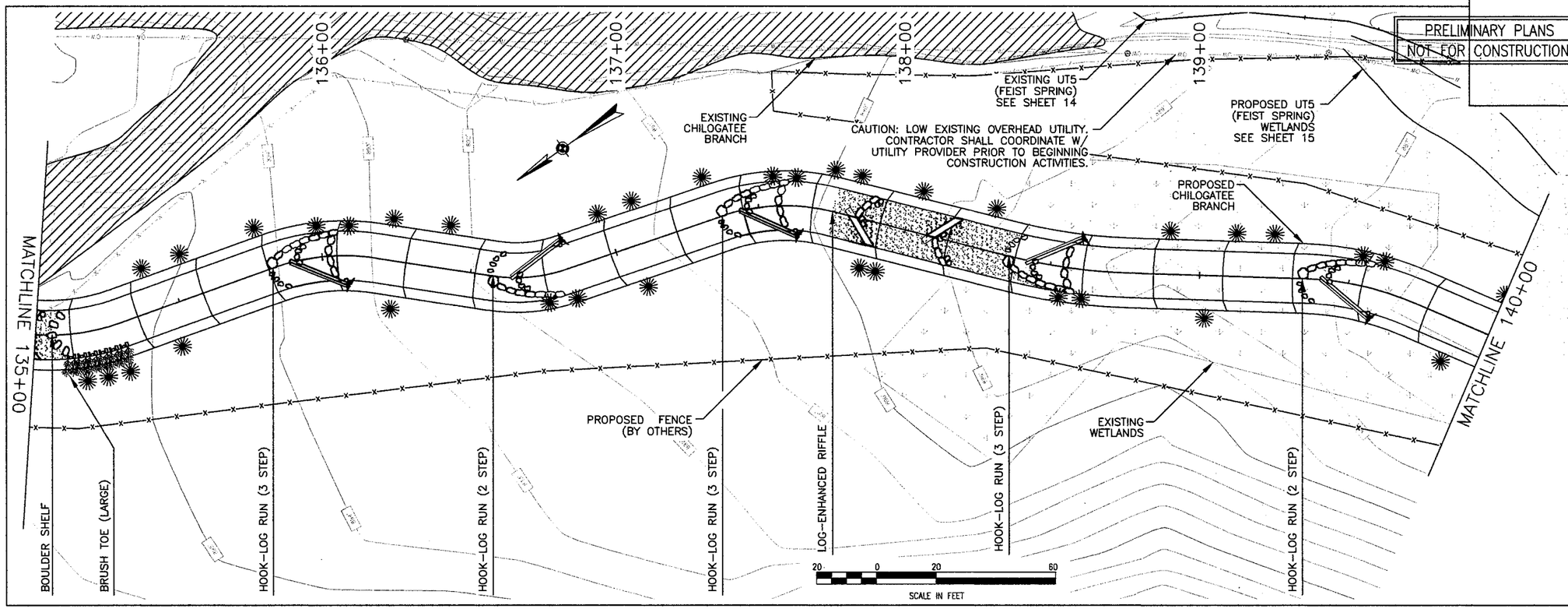




FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2'

HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL:1" = 4'

CHILOGATEE BRANCH



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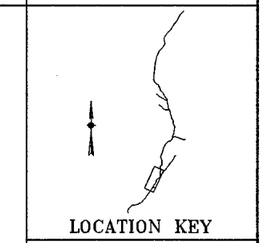
PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM MITIGATION PROGRAM
TITLE: **PLAN & PROFILE**

SCALE	AS NOTED	DRWN. BY MMF	PROJECT NO.	SHEET NUMBER
DATE	9/30/2013	CHKD. BY CME	1060	8

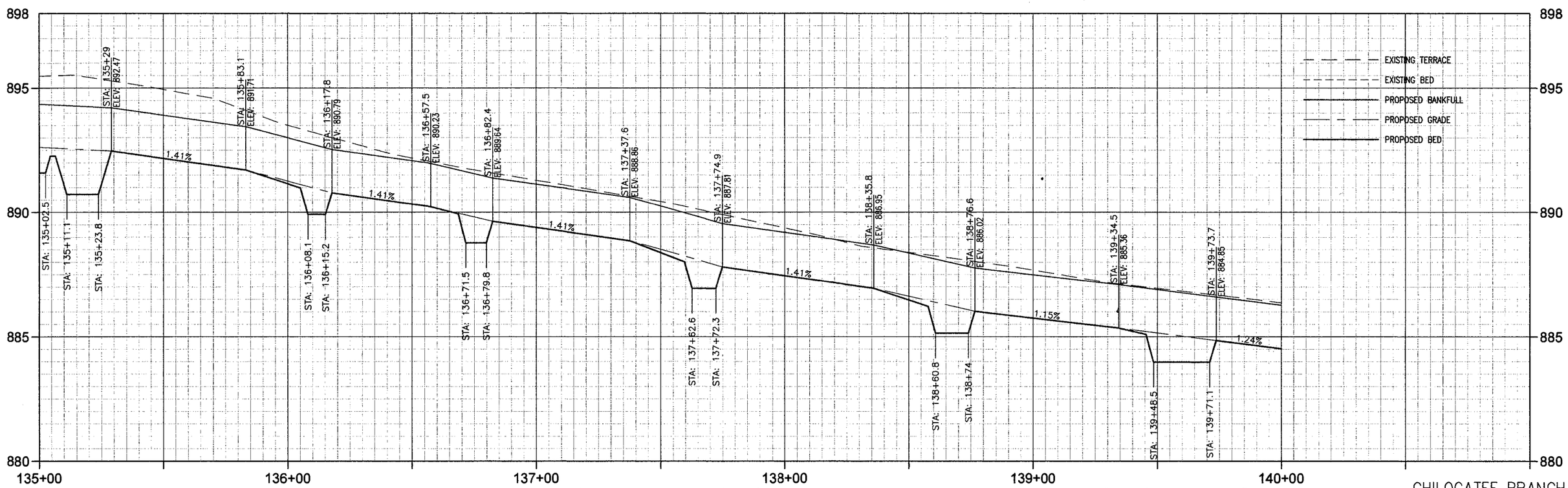
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

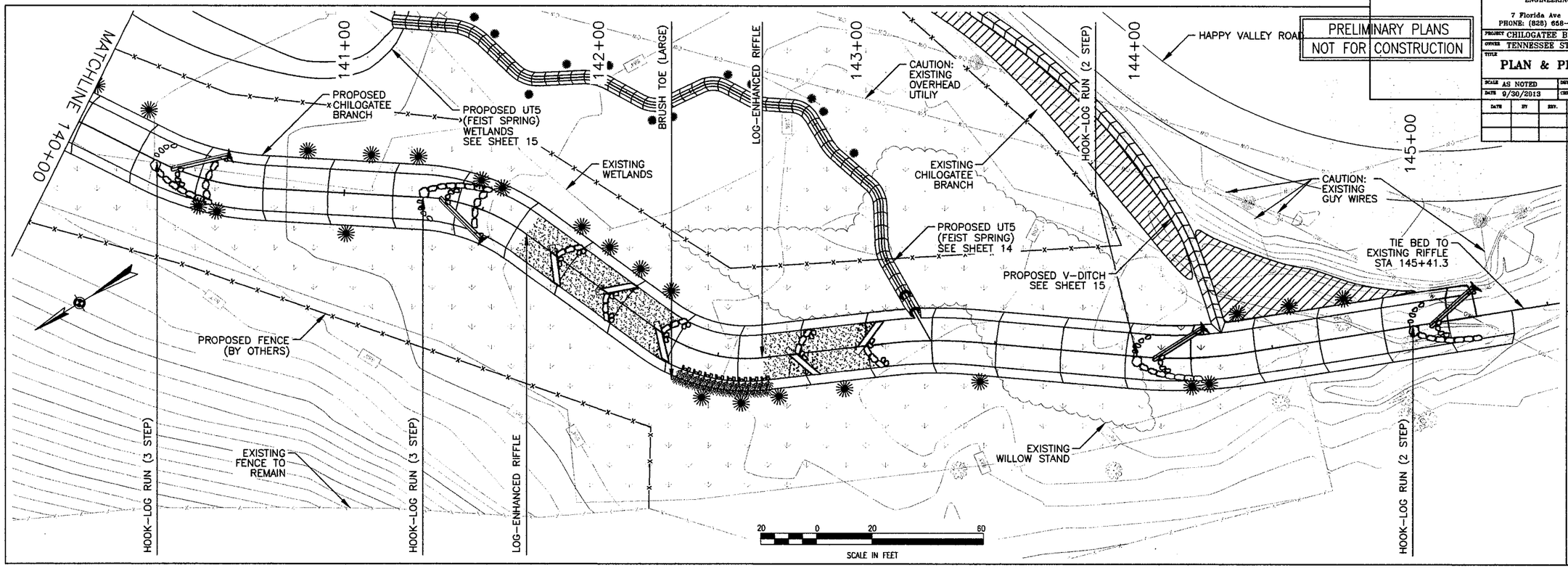
- CUT
- FILL
- EXISTING UTILITY
- EXISTING FENCE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE
- TRANSPLANT



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2'

HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL:1" = 4'

CHILOGATEE BRANCH



PRELIMINARY PLANS
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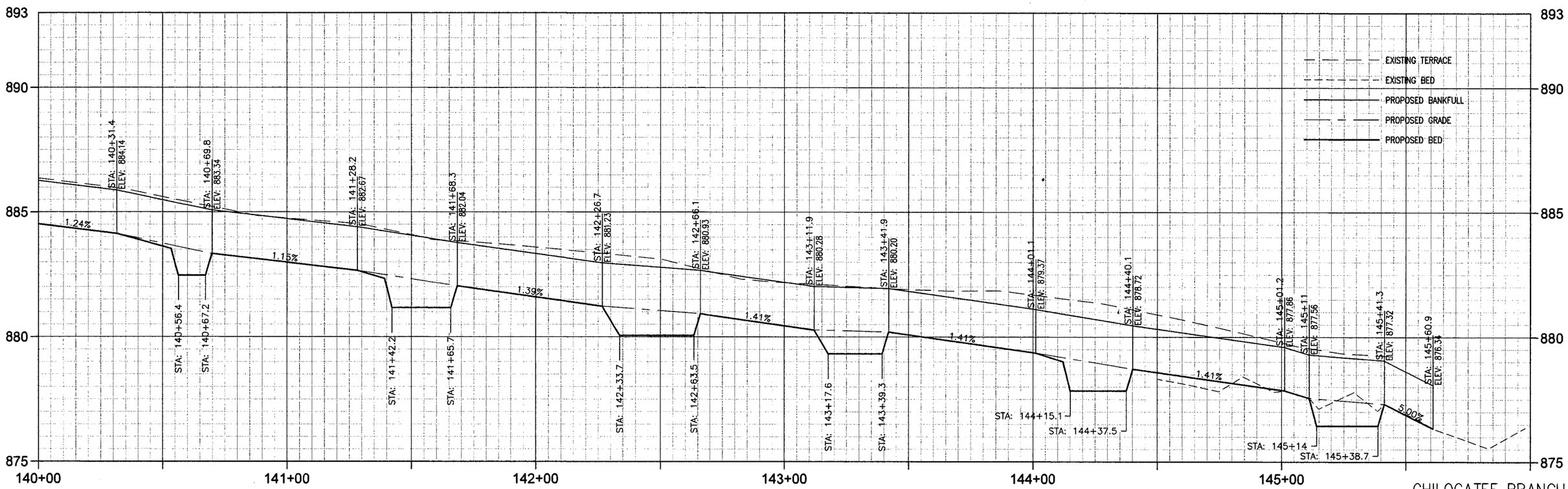
PROJECT CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER TENNESSEE STREAM MITIGATION PROGRAM
TITLE PLAN & PROFILE

SCALE AS NOTED	DRWN. BY MMF	PROJECT NO. 1060	SHEET NUMBER 9
DATE 9/30/2013	CHKD. BY CME		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

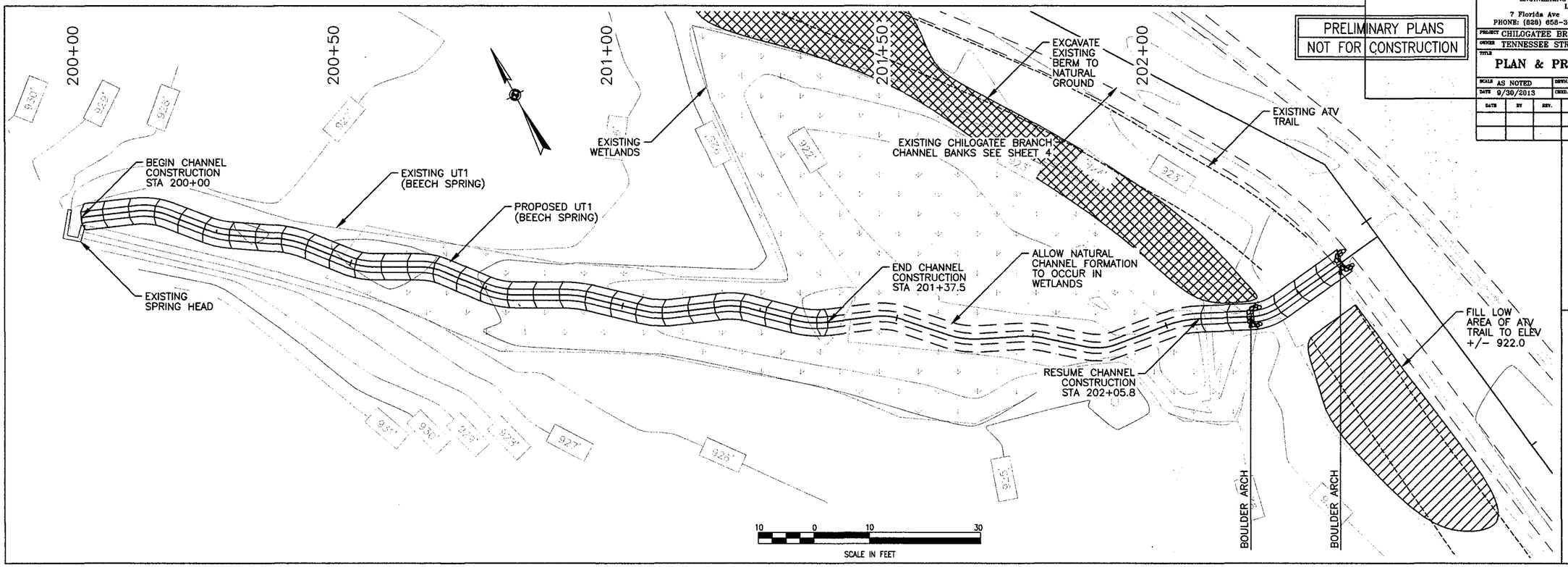
LEGEND
- CUT
- FILL
- EXISTING UTILITY
- EXISTING FENCE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE
- TRANSPLANT



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2'

HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL:1" = 4'

CHILOGATEE BRANCH



PRELIMINARY PLANS
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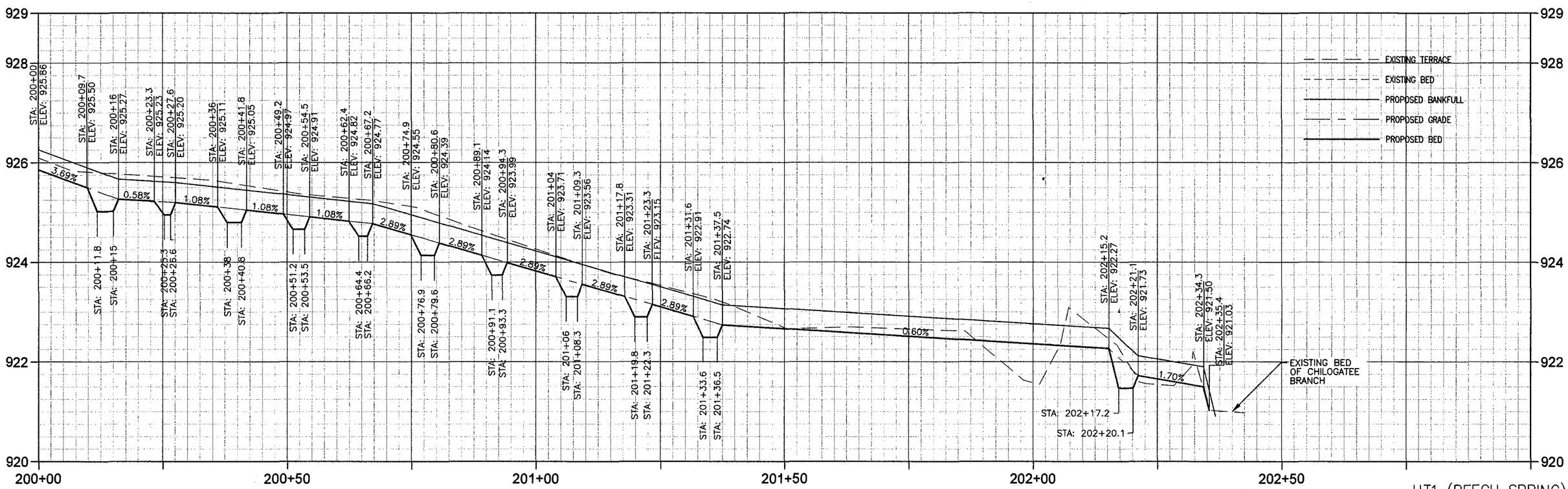
PROJECT CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER TENNESSEE STREAM MITIGATION PROGRAM
TITLE PLAN & PROFILE

SCALE AS NOTED	DRWN. BY MMF	PROJECT NO. 1060	SHEET NUMBER 10
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

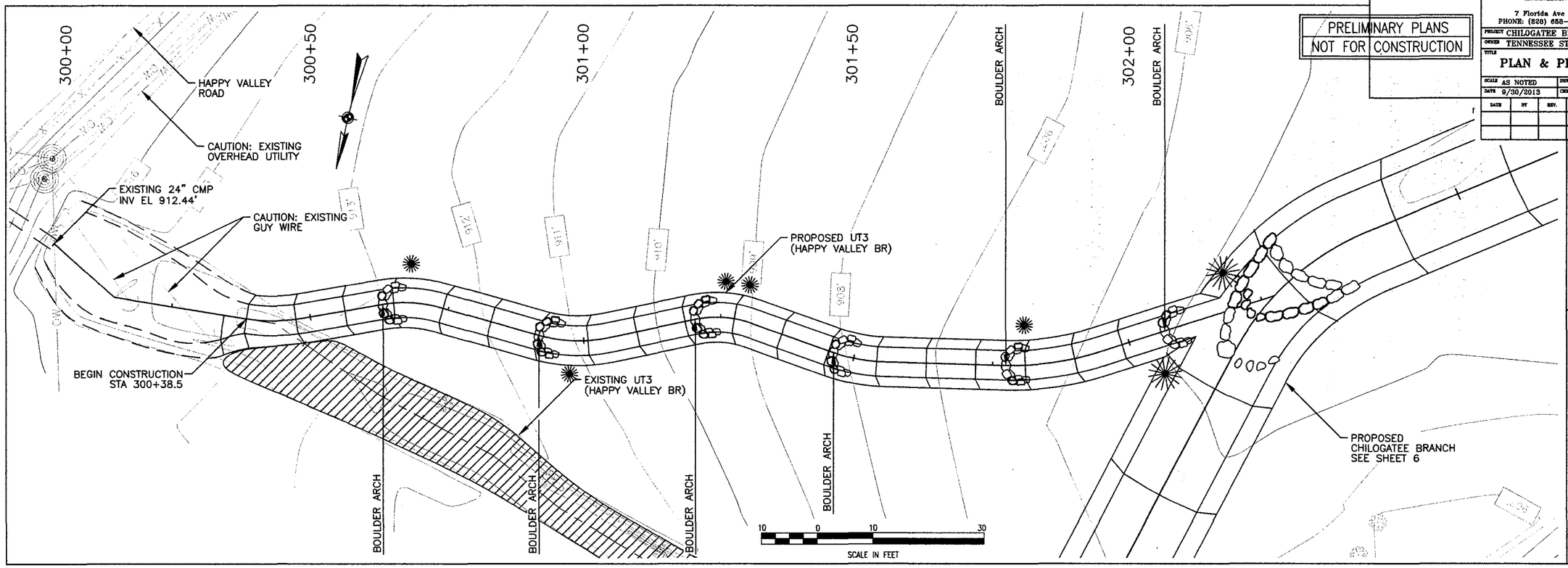
LEGEND
- CUT
- FILL
- EXISTING UTILITY
- EXISTING FENCE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE
- TRANSPLANT



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'

HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

UT1 (BEECH SPRING)



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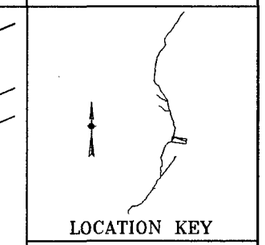
PROJECT CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER TENNESSEE STREAM MITIGATION PROGRAM
TITLE **PLAN & PROFILE**

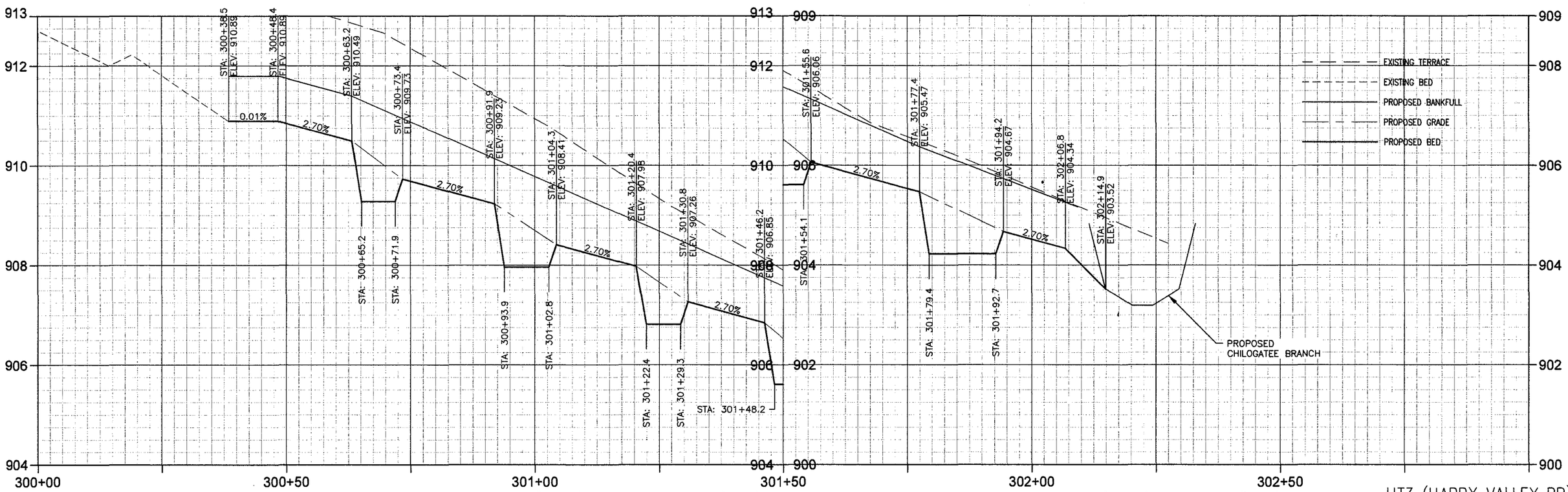
SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	MMF	1060	11
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LEGEND

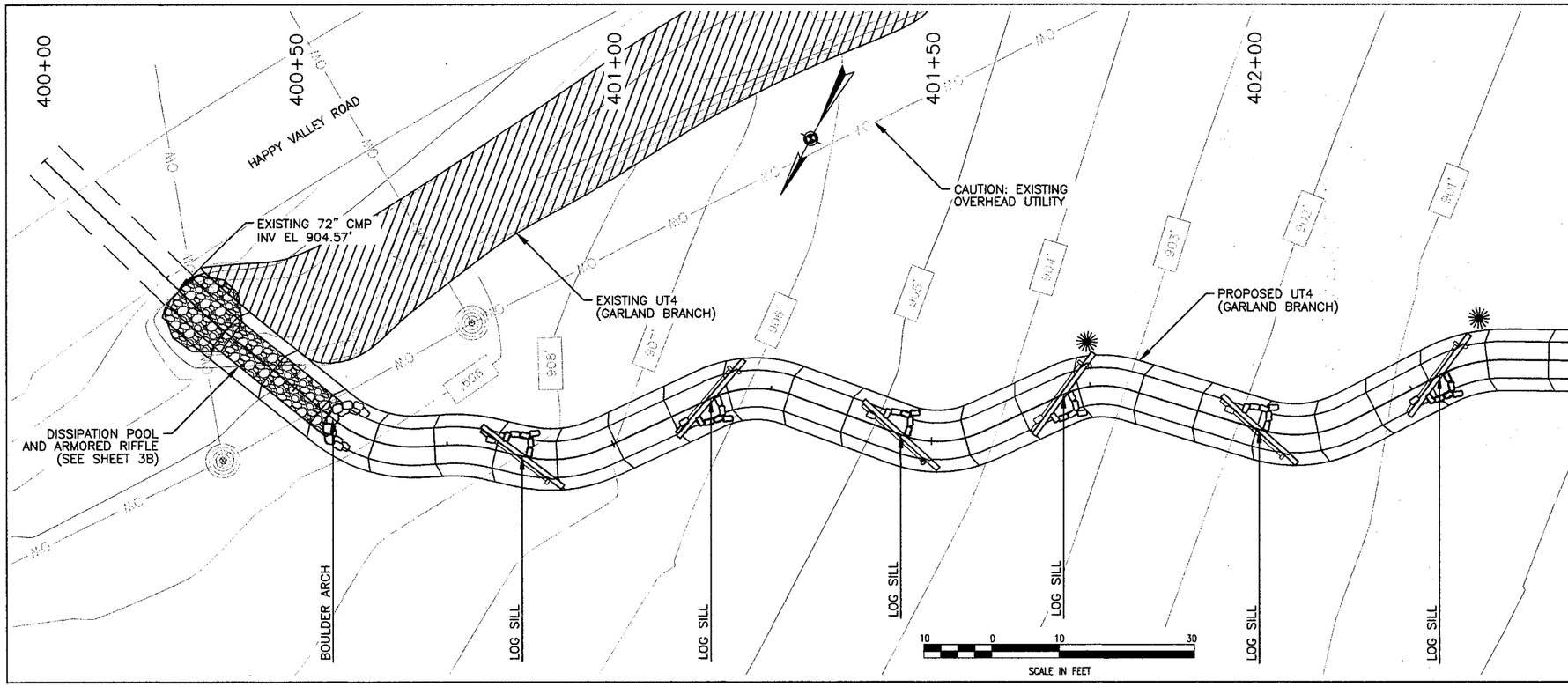
- CUT
- FILL
- EXISTING UTILITY
- EXISTING FENCE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE
- TRANSPLANT



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'

HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

UT3 (HAPPY VALLEY BR)



PRELIMINARY PLANS
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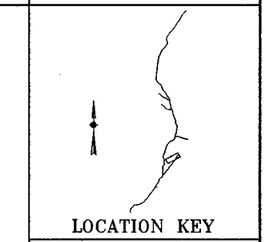
PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM MITIGATION PROGRAM
TITLE: PLAN & PROFILE

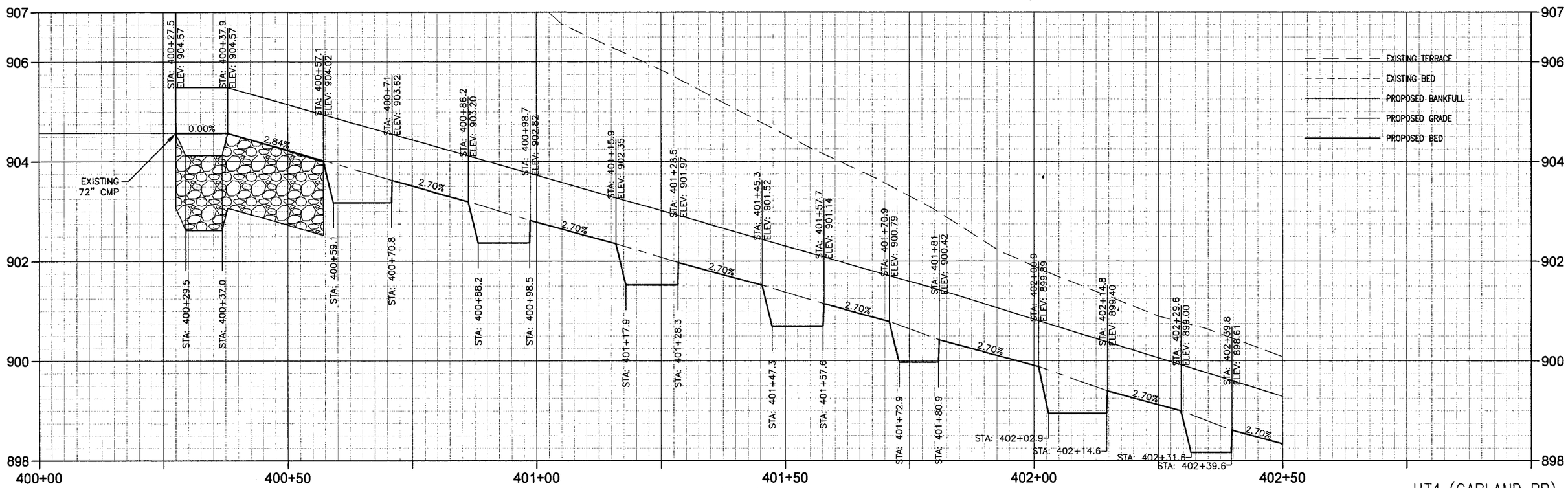
SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	MMF	1060	12
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LEGEND

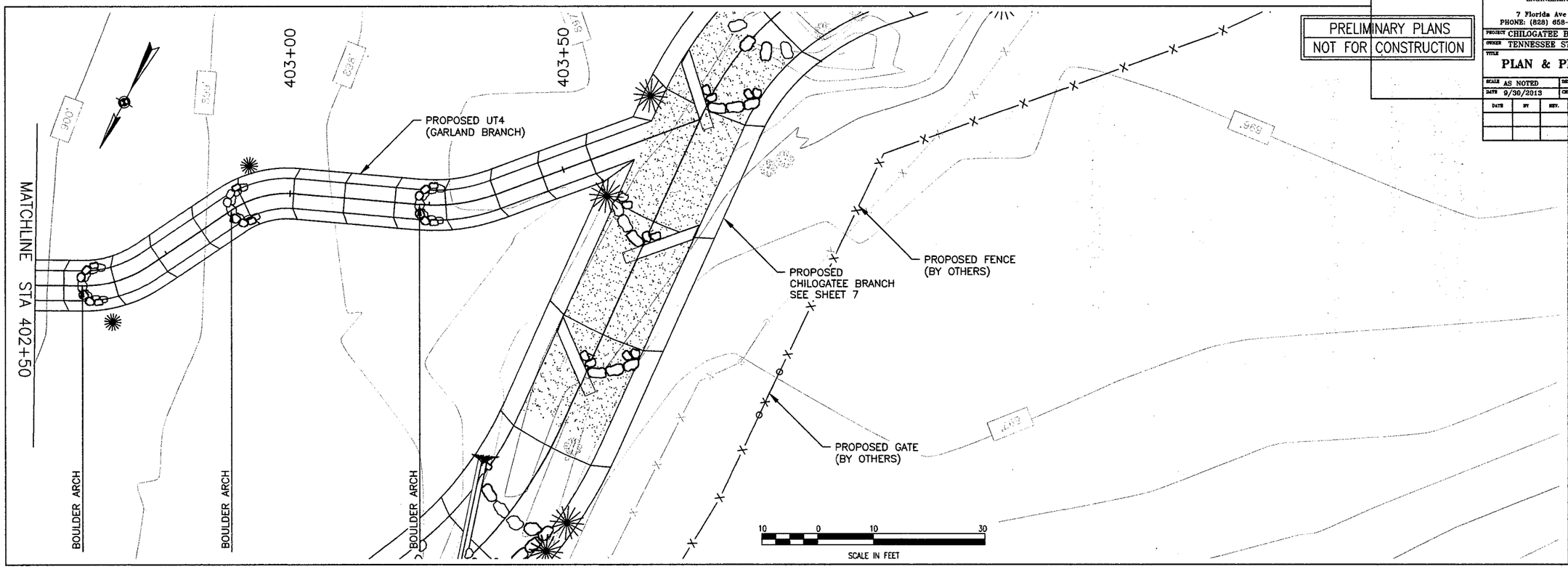
- CUT
- FILL
- EXISTING UTILITY
- EXISTING FENCE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE
- TRANSPLANT



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'

HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL: 1" = 2'

UT4 (GARLAND BR)



PRELIMINARY PLANS
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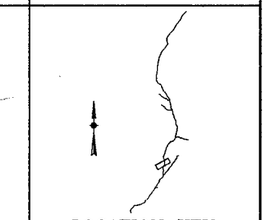
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

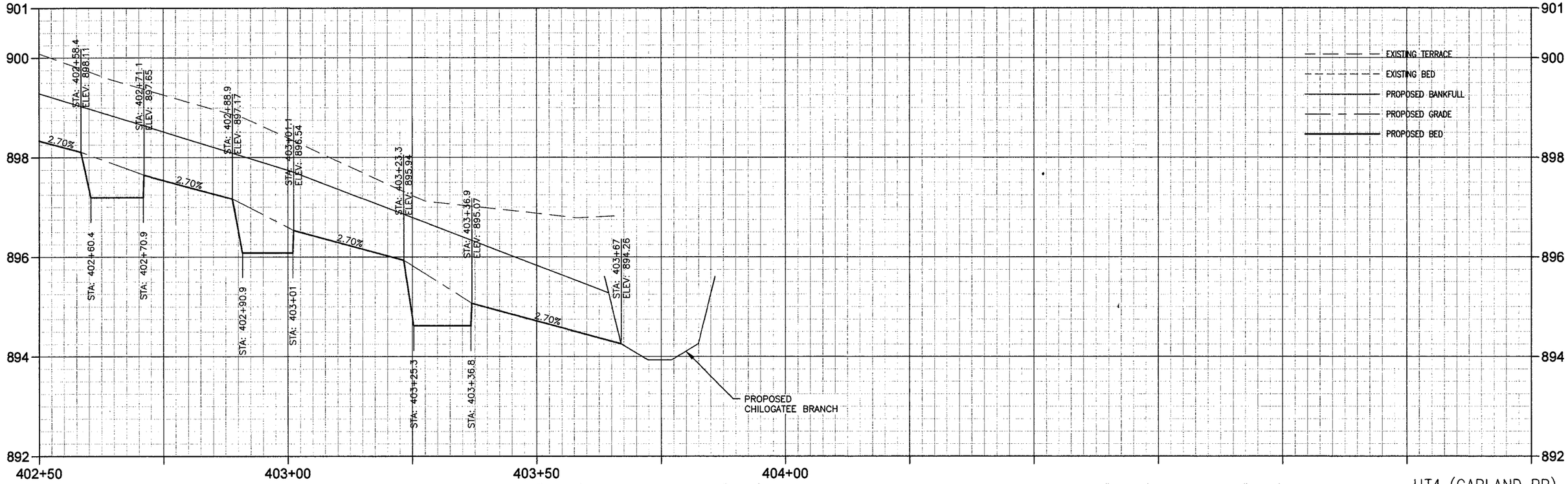
PROJECT CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER TENNESSEE STREAM MITIGATION PROGRAM
TITLE **PLAN & PROFILE**

SCALE	DESN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	MMF	1060	13
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION


LOCATION KEY

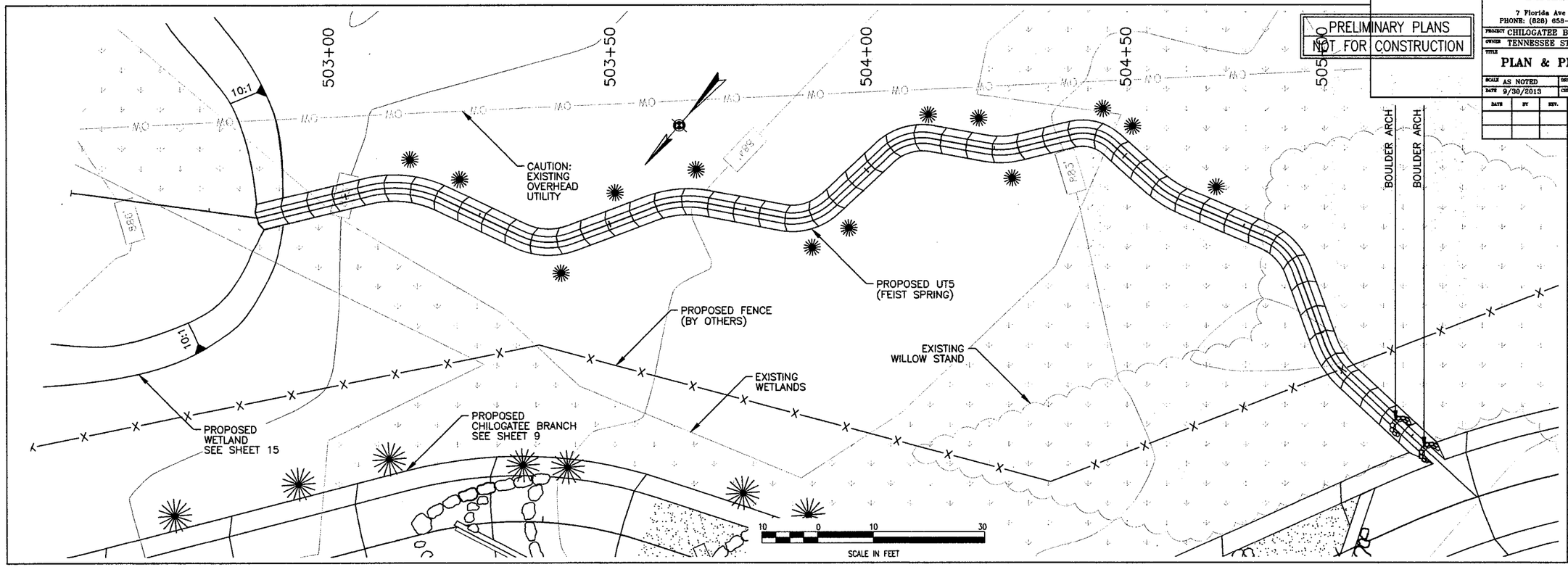
LEGEND
- CUT
- FILL
- EXISTING UTILITY
- EXISTING FENCE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE
- TRANSPLANT



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'

HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

UT4 (GARLAND BR)



PRELIMINARY PLANS
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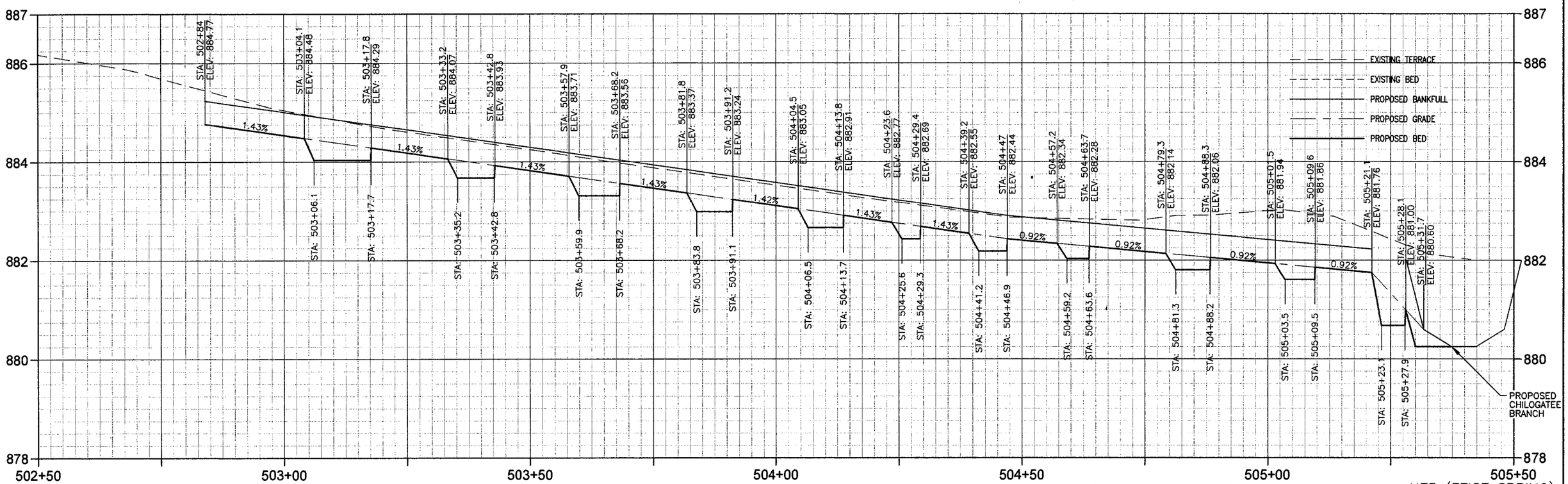
PROJECT CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER TENNESSEE STREAM MITIGATION PROGRAM
TITLE PLAN & PROFILE

SCALE AS NOTED	DRWN. BY MMF	PROJECT NO. 1060	SHEET NUMBER 14
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'

HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

UT5 (FEIST SPRING)

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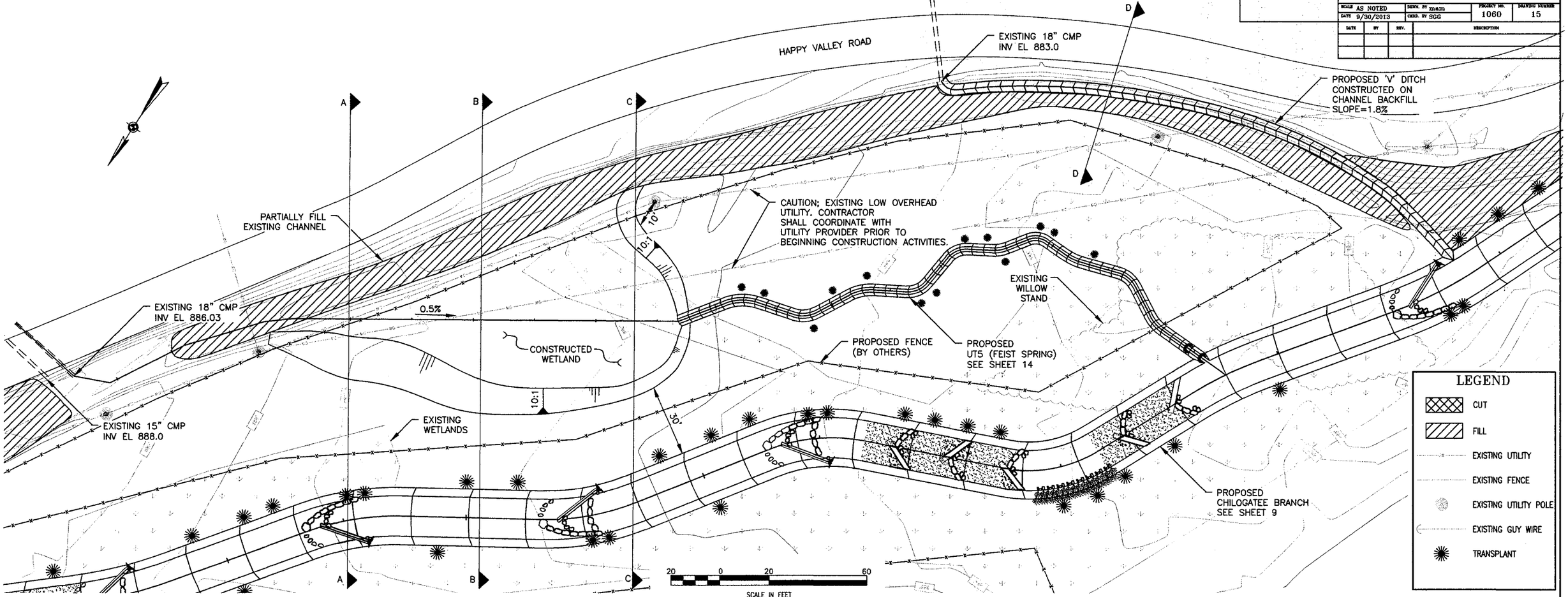
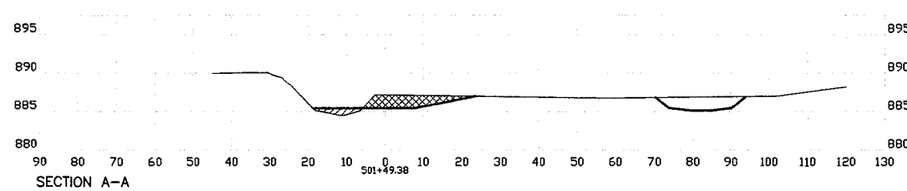
PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM RESTORATION PROGRAM
TITLE: **WETLAND GRADING PLAN**

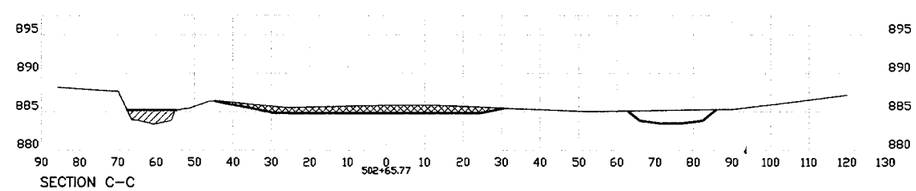
SCALE	AS NOTED	DRWN. BY mam	PROJECT NO.	DRAWING NUMBER
DATE	9/30/2013	CHKD. BY SGG	1060	15

DATE	BY	REV.	DESCRIPTION

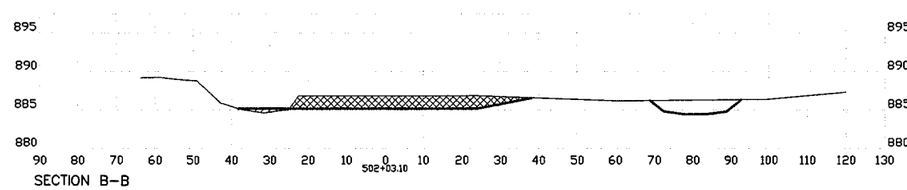




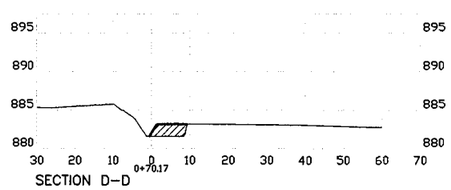
SECTION A-A



SECTION C-C



SECTION B-B



SECTION D-D

CROSS SECTIONS HORIZONTAL SCALE 1"=20' VERTICAL SCALE 1"=10'

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PRELIMINARY PLANS
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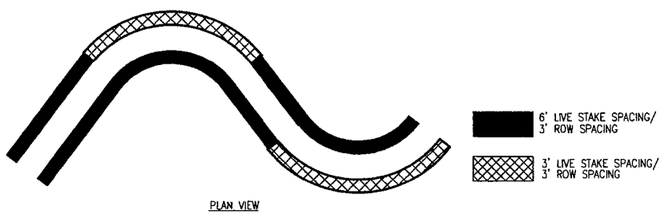
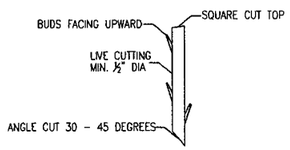
PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM MITIGATION PROGRAM
TITLE: **PLANTING DETAILS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	nmf	1060	P-1
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

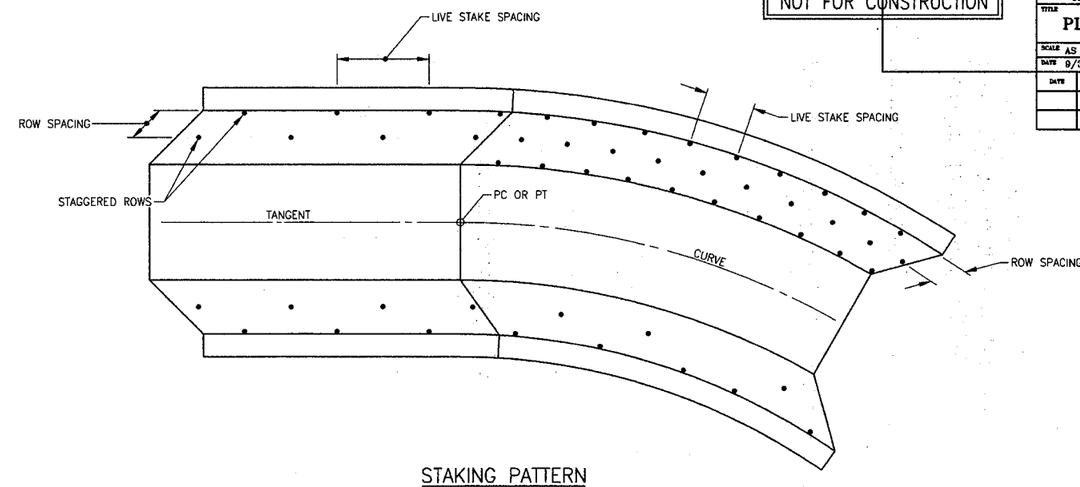


PLAN VIEW

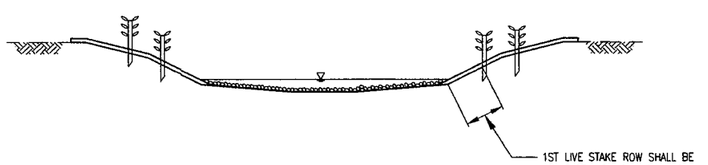


LIVE STAKE DETAIL

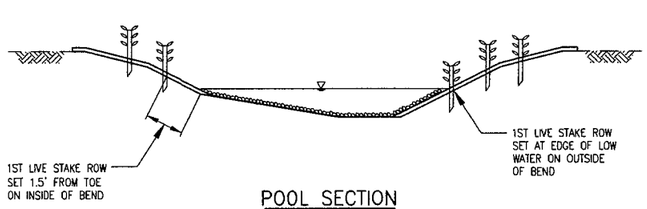
NUMBER OF LIVE STAKE ROWS			
CHANNEL DEPTH (FT)	INSIDE OF BEND	TANGENT	OUTSIDE OF BEND
0 - 1.5	1	1	2
1.5 - 2.5	2	2	3
2.5 - 3.5	3	3	4



STAKING PATTERN
NOT TO SCALE



RIFFLE SECTION
NOT TO SCALE



POOL SECTION
NOT TO SCALE

COMMON NAME	STRATUM	SCIENTIFIC NAME	INIDCATOR STATUS	SPACING (ft)	PLANT MATERIAL SIZE	STEMS/ACRE	AREA (Acres)	TOTAL STEMS
ZONE 1: STREAMSIDE								
Black Willow	midstory	*Salix nigra*	OBL	3x3	Live Stake			268
Alder	understory	*Alnus serrulata*	FACW	3x3	Live Stake			268
Silky Dogwood	understory	*Cornus amomum*	FACW+	3x3	Live Stake			268
Silky Willow	understory	*Salix sericea*	OBL	3x3	Live Stake			268
Common Ninebark	understory	Physocarpus opulifolius	FAC-	3x3	Live Stake			268
Elderberry	understory	Sambucus canadensis	FACW-	3x3	Live Stake			268
Totals								**1608**

ZONE 2: RIPARIAN								
Sycamore	overstory	*Platanus occidentalis*	FACW-	10x10	Bare Root	400	0.74	296
Paw Paw	midstory	*Asimina triloba*	FAC	10x10	Bare Root	400	0.74	296
Swamp Chestnut Oak	overstory	*Quercus michauxii*	FACW-	10x10	Bare Root	400	0.74	296
Green Ash	overstory	*Fraxinus pennsylvanica*	FACW	10x10	Bare Root	400	0.74	296
Persimmon	midstory	*Diospyros virginiana*	FAC	10x10	Bare Root	400	0.74	296
River Birch	overstory	*Betula nigra*	FACW	10x10	Bare Root	400	0.74	296
Ironwood	midstory	Carpinus caroliniana	FAC	10x10	Bare Root	400	0.74	296
Alder	understory	Alnus serrulata	FACW	10x10	Bare Root	400	0.74	296
Spicebush	understory	*Lindera benzoin*	FACW	10x10	Bare Root	400	0.74	296
Witchhazel	midstory	Hamamelis virginiana	FACU	10x10	Bare Root	400	0.74	296
Hazelnut	understory	Corylus americana	FACU	10x10	Bare Root	400	0.74	296
Totals							**8.1**	**2664**

ZONE 3: UPLANDS								
Beech	overstory	*Fagus grandifolia*	FACU	10x10	Bare Root	400	0.15	60
Basswood	overstory	*Tilia americana*	FAC+	10x10	Bare Root	400	0.15	60
Redbud	midstory	*Cercis canadensis*	FACU	10x10	Bare Root	400	0.15	60
Tulip Poplar	overstory	*Liriodendron tulipifera*	FAC	10x10	Bare Root	400	0.15	60
Green Ash	overstory	*Fraxinus pennsylvanica*	FACW	10x10	Bare Root	400	0.15	60
White Oak	overstory	*Quercus alba*	FACU	10x10	Bare Root	400	0.15	60
Northern Red Oak	overstory	Quercus rubra	FACU	10x10	Bare Root	400	0.15	60
Sugarberry	overstory	*Celtis laevigata*	FACW	10x10	Bare Root	400	0.15	60
Sourwood	overstory	Oxydendrum arboreum	FACU	10x10	Bare Root	400	0.15	60
Totals							**1.4**	**480**

ZONE 4: WETLANDS								
Buttonbush	understory	*Cephalanthus occidentalis*	OBL	10x10	Bare Root	400	0.18	72
Black Willow	midstory	*Salix nigra*	OBL	10x10	Bare Root	400	0.18	72
River Birch	overstory	*Betula nigra*	FACW	10x10	Bare Root	400	0.18	72
Alder	understory	*Alnus serrulata*	FACW	10x10	Bare Root	400	0.18	72
Silky Dogwood	understory	*Cornus amomum*	FACW+	10x10	Bare Root	400	0.18	72
Elderberry	understory	*Sambucus canadensis*	FACW-	10x10	Bare Root	400	0.18	72
Totals							**1.1**	**432**

PLANTING NOTES:

GENERAL
1. FINAL PLANTING PLAN TO BE DETERMINED AFTER CONSTRUCTION.

BARE ROOT PLANTINGS
1. PLANT BARE ROOT SHRUBS AND TREES IN AREAS INDICATED ON THE PLANS.
2. PROVIDE 10 FEET OF SPACING BETWEEN PLANTS.
3. LOOSEN COMPACTED SOIL AND PLANT IN HOLES FORMED WITH A MATTOCK, DIBBLE BAR OR EQUAL.
4. PROVIDE PLANTING HOLE SUFFICIENT IN SIZE AND DEPTH TO PREVENT CROWDING OF ROOTS.
5. ROOTS SHALL BE KEPT MOIST DURING TRANSPORTATION, DISTRIBUTION, AND INSTALLATION.
6. PLANTS SHALL BE HEELED-IN INTO MOIST SOIL IF NOT PROMPTLY PLANTED AFTER DELIVERY TO THE PROJECT SITE.

LIVE STAKES:
1. STAKES SHOULD BE CUT AND INSTALLED ON THE SAME DAY.
2. STAKES THAT ARE SPLIT SHALL NOT BE INSTALLED.
3. STAKES SHALL BE INSTALLED PERPENDICULAR TO THE BANK AND WITH BUDS POINTING UPWARDS.
4. STAKES SHALL BE ½ TO 2 INCHES IN DIAMETER AND 2 TO 3 FEET IN LENGTH.
5. AFTER INSTALLATION, THE TOP PORTION OF STAKES SHALL BE PRUNED WITH A SQUARE CUT LEAVING NO LESS THAN 3 INCHES AND NO MORE THAN 6 INCHES ABOVE THE GROUND.

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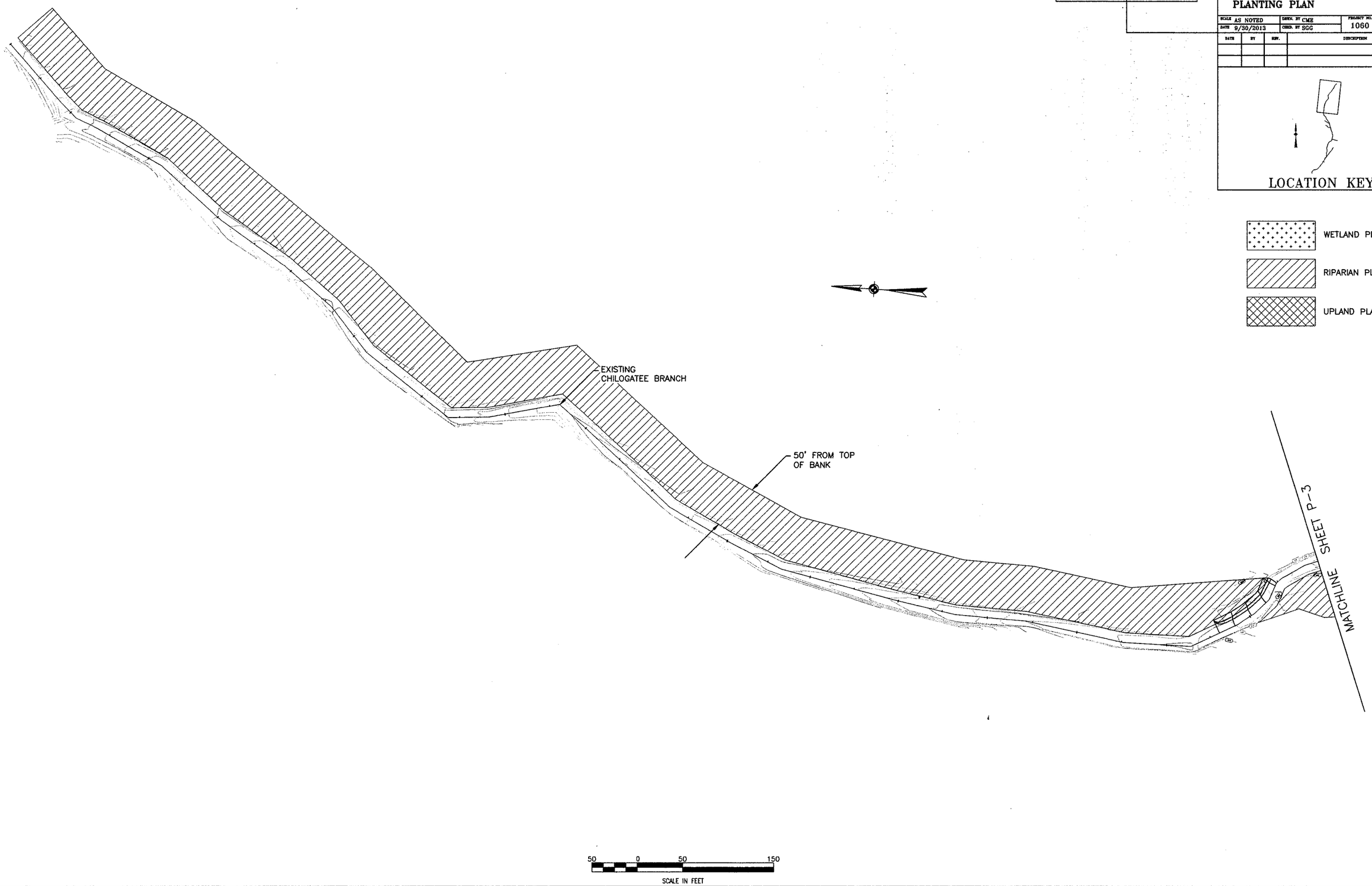
OWNER: TENNESSEE STREAM MITIGATION PROGRAM
TITLE: **PLANTING PLAN**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	CME	1060	P-2
DATE 9/30/2013	CHKD. BY SGC		

DATE	BY	REV.	DESCRIPTION



PRELIMINARY PLANS
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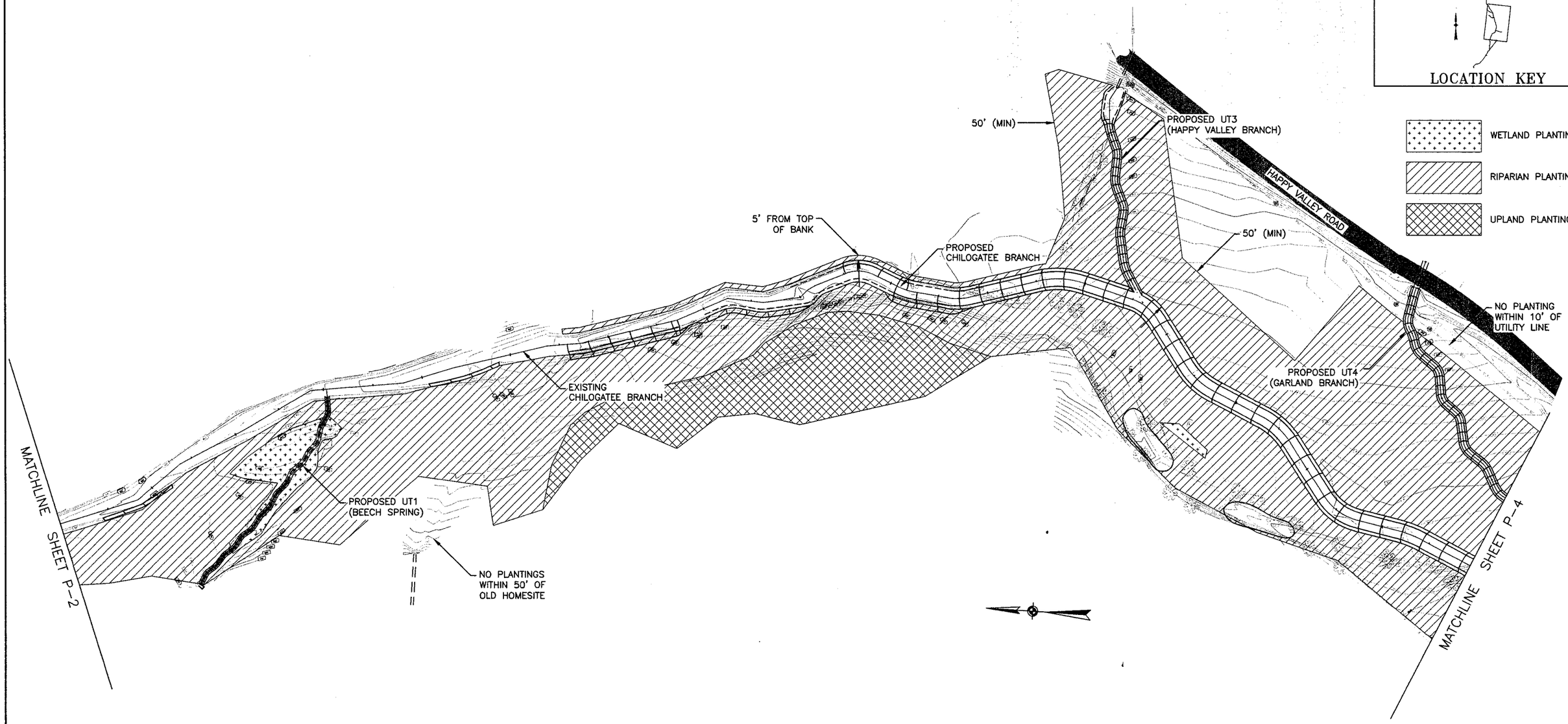
SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	CME	1060	P-3
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



PRELIMINARY PLANS
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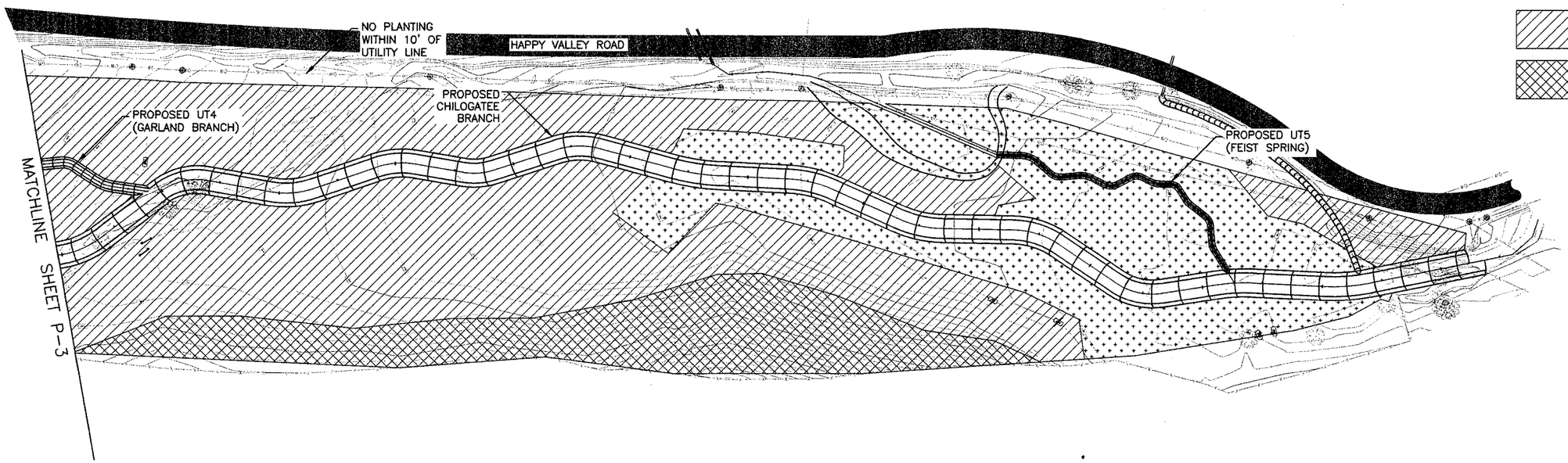
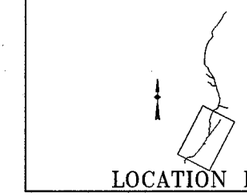
PROJECT: CHILOGATEE BR. STREAM RESTORATION PROJECT
OWNER: TENNESSEE STREAM MITIGATION PROGRAM
TITLE: **PLANTING PLAN**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	CME	1060	P-4
DATE 9/30/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION





WETLAND PLANTINGS
RIPARIAN PLANTINGS
UPLAND PLANTINGS

50 0 50 150
SCALE IN FEET