FINAL
MITIGATION PLAN

Pee Dee Stream Restoration Site
Montgomery County, North Carolina
Project No.95350
Contract No.: 004644

Yadkin River Basin
Cataloging Unit 03040104

Prepared for:

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

December 2013

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Prepared for:

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1652 Mail Service Center
Raleigh, NC 27699-1652

Prepared By:

Environmental Banc & Exchange, LLC
909 Capability Drive, Suite 3100
Raleigh, NC 27606

And:

Wolf Creek Engineering, PLLC
7 Florida Avenue
Weaverville, NC 28787
(828) 658-3649

December 2013

IRT PROCESS SUMMARY

The NCIRT Review comments and the USACE Approval letter dated December 12, 2013 are included in the following pages to document the IRT Review process for this project. The following is a list of revisions that have been made to the Mitigation Plan in response to these comments:

1. Page 35- Section 7.2.1 has been expanded to describe the beneficial impacts of removing the agricultural pond.
2. Appendix B- USACE Jurisdictional Determination forms are included.
3. Page 32- The credit release schedules for Forested and Non-Forested wetlands have been removed.
4. Page 43- The "Ecosystem enhancement Program Monitoring Requirements and Performance Standards for Stream and Wetland Mitigation" dated November 7, 2011 has been referenced.

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

12 December, 2013

Regulatory Division

Re: NCIRT Review and USACE Approval of the Pee Dee Stream Restoration Project Draft Mitigation Plan; SAW 2012-01077; EEP IMS #95350

Mr. Tim Baumgartner
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Ecosystem Enhancement Program (NCEEP) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Pee Dee Stream Restoration Project Draft Mitigation Plan, which closed on 22 November, 2013. These comments are attached for your review.

Based on our review of these comments, we have determined that no major concerns have been identified with the Draft Mitigation Plan. However, the minor issues with the Draft as discussed in the attached comment memo must be addressed in the Final Mitigation Plan.

The Final Mitigation Plan is to be submitted with the Preconstruction Notification (PCN) Application for Nationwide permit approval of the project along with a copy of this letter and a summation of the addressed comments. If it is determined that the project does not require a Department of the Army permit, you must still provide a copy of the Final Mitigation Plan, along with a copy of this letter, to the appropriate USACE field office at least 30 days in advance of beginning construction of the project. Please note that this approval does not preclude the inclusion of permit conditions in the permit authorization for the project, particularly if issues mentioned above are not satisfactorily addressed. Additionally, this letter provides initial approval for the Mitigation Plan, but this does not guarantee that the project will generate the requested amount of mitigation credit. As you are aware, unforeseen issues may arise during construction or monitoring of the project that may require maintenance or reconstruction that may lead to reduced credit.

Thank you for your prompt attention to this matter, and if you have any questions regarding this letter, the mitigation plan review process, or the requirements of the Mitigation Rule, please call me at 919-846-2564.

Sincerely,

Tyler Crumbley
Regulatory Specialist

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
CESAW-RG/H. Wicker
CESAW-RG-L/C. Wicker
NCEEP/Tsomides

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

CESAW-RG/Crumbley 22 November, 2013

MEMORANDUM FOR RECORD

SUBJECT: Pee Dee- NCIRT Comments During 30-day Mitigation Plan Review

PURPOSE: The comments listed below were posted to the NCEEP Mitigation Plan Review Portal during the 30-day comment period in accordance with Section 332.8(g) of the 2008 Mitigation Rule.

NCEEP Project Name: Pee Dee Stream Restoration Project, Montgomery County, NC

USACE AID#: SAW-2012-01077
NCEEP #: 95350

30-Day Comment Deadline: 22 November, 2013

1. *T. Crumbley, USACE, 22 November, 2013*:

- Any impacts (eg. filling, draining, converting) to current waters of the U.S. (streams, wetlands and open waters) must be accounted for and discussed in the Pre-Construction Notification and the loss or conversion of those waters must be replaced on-site. (the conversion of ponds to stream is considered an impact, but the functional uplift provided allows for this conversion to be conducted under NWP 27. These impacts do, however need to be accounted for in the PCN and the functional uplifts described in detail).

- Please submit the USACE Jurisdictional Determination documents within the Final Mitigation Plan.

- Pg. 32. The credit release schedules include both Forested and Non-Forested wetlands. If no wetland credits are being proposed, please remove these schedules from the mitigation plan.

- Section 9, pgs. 43 and 44, Performance Standards and Monitoring Requirements: It is stated that the Performance Standards will be consistent with the USACE 2003, but additional

District/EEP guidance must also be adhered to. Specifically the “Ecosystem Enhancement Program Monitoring Requirements and Performance Standards for Stream and Wetland Mitigation” Dated November 7, 2011. (Section IV C.) *All monitoring and performance standard requirements need to comply with this EEP/District guidance unless the project was instituted prior to the release of this guidance*

/s/
Tyler Crumbley
Regulatory Specialist,
Regulatory Division

EXECUTIVE SUMMARY

Environmental Banc & Exchange (EBX) proposes to restore and enhance three unstable stream reaches in Montgomery County. The Pee Dee Site is located approximately 1 mile south of the town of Pee Dee, NC in Montgomery County. The Pee Dee Stream Restoration Project (the Site) was identified in the 2009 Lower Yadkin River Basin RBRP as a stream restoration opportunity to improve water quality and habitat within the TLW. The Site encompasses approximately 18.6 acres of agricultural land and consists of three unstable tributaries to Clarks Creek - Thompson Creek, Dale Branch and Jerry Branch. This mitigation plan describes the details, methods and protocols proposed to generate approximately **6,408 stream mitigation credits**, which includes **approximately 5,992 linear feet of stream restoration through Priority I restoration and approximately 625 linear feet of enhancement**. Approximately 13 percent of the credits are generated from intermittent streams.

General Site Conditions

Historic land use at the Site has consisted primarily of livestock grazing and dairy farm operation. Additional land use practices, including the maintenance and removal of riparian vegetation along on-site streams have contributed to unstable channel characteristics and degraded water quality.

Current stream conditions at the Pee Dee Stream Restoration Site are characterized by incised channels with unstable banks and a riparian buffer dominated by invasive exotic vegetation. Thompson Creek flows into an old agricultural pond that is partially silted-in and then flows through a sparsely forested reach where the channel is incised and degraded. Dale and Jerry Branch flow through active pastures where the riparian vegetation is primarily invasive exotics and the channels are severely impacted by unrestricted livestock access. There are extreme headcuts and eroding channel banks throughout the site that are contributing excessive fine sediment to the channel substrate and to Clarks Creek.

Restoration Concept

Restoration and enhancement practices proposed for this project have been designed with the intent to minimize unnecessary disturbance to adjacent land. Professional judgment has been used to determine which channel reaches could potentially benefit most from preservation or enhancement over full restoration. Where restoration was determined to be warranted, consideration was given to which reaches could best be served by maintaining as much of the existing channel pattern as possible.

Proposed Thompson Creek, Dale Branch and Jerry Branch are designed as Type B4 streams. These channel configurations provide a stable and natural form in the Type II colluvial valleys in which the existing streams are found. The proposed channel dimensions, patterns and profiles are based on hydraulic relationships and morphologic dimensionless ratios of the reference reaches.

The installation of brush, rock and wood structures will be utilized throughout the restored reaches. Log structures will be used to provide vertical stability to the channel and assist in maintaining riffle and pool features. Brush-toe structures will be combined with log structures to provide bank stability and improve structure function. On-site material including brush, boulders, logs and bed material will be used to the maximum extent possible and in-stream structures will be designed to improve aquatic habitat.

This mitigation plan has been written in conformance with the requirements of the following:

- Federal rule for compensatory mitigation project sites as described in the Federal Register Title 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.8 paragraphs (c)(2) through (c)(14).
- NCDENR Ecosystem Enhancement Program In-Lieu Fee Instrument signed and dated July 28, 2010

These documents govern NCEEP operations and procedures for the delivery of compensatory mitigation.

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APPENDICES

1.0 RESTORATION PROJECT GOALS AND OBJECTIVES

EEP develops River Basin Restoration Priorities (RBRP) to guide its restoration activities within each of the state's 54 cataloging units. RBRPs delineate specific watersheds that exhibit both the need and opportunity for wetland, stream and riparian buffer restoration. These watersheds are called Targeted Local Watersheds (TLWs) and receive priority for EEP planning and restoration project funds.

The 2009 Lower Yadkin River Basin RBRP identified HUC 03040104020020 as a Targeted Local Watershed http://www.nceep.net/services/restplans/Yadkin_Pee_Dee_RBRP_2009_Final.pdf

The 2009 Lower Yadkin River Basin RBRP identified water quality issues due to livestock operations as well as runoff and wastewater from future population growth as major stressors within this TLW. The Pee Dee Stream Restoration Project (the Site) was identified as a stream restoration opportunity to improve water quality and habitat within the TLW.

The project goals address stressors identified in the TLW and include the following:

- Improve water quality within the restored channel reaches and downstream watercourses by reducing sediment and nutrient inputs and increasing dissolved oxygen levels
- Improve local aquatic and terrestrial ecological function via stream shading, habitat complexities, and organic/woody material introduction
- Improve aquatic and benthic macroinvertebrate habitat and associated stream bed form
- Improve site hydrology and attenuate flood flows on-site and downstream
- Provide approximately 18.6 acres of riparian area restoration with a native plant community
- Protect stream and riparian improvements with livestock best management practices
- Protect the site in perpetuity with a permanent conservation easement

The project goals will be addressed through the following project objectives:

- Implement Priority I or II restoration of 5,992 feet of stream and enhancement of 625 feet of stream
- Implement appropriate changes in dimension, pattern and/or profile to create geomorphologically stable conditions along project area reaches
- Modify degraded stream channels to enable proper sediment transport capacity and improved stream bed character
- Construct a floodplain bench that is accessible at the proposed bankfull channel elevation.
- Remove a major impoundment
- Integrate in-stream structures and native bank vegetation

- Plant native woody and herbaceous riparian vegetation with a minimum width of 50 feet from the edge of the restored channels
- Eradicate invasive, exotic or undesirable plant species
- Install cattle exclusion fencing, two new wells, two new cattle drinking stations, and upgrade eight existing cattle drinking stations

2.0 SITE SELECTION

2.1 Directions to Site

The Pee Dee Stream Restoration Site is located in southwestern Montgomery County approximately 3 miles northwest of Mount Gilead, North Carolina (See Figure 1).

From Raleigh, take I-40 West for approximately 5.8 miles. Take exit 293 onto US-1 South/US-64 West toward Apex/Sanford/Asheboro for approximately 31 miles. Continue onto US-1 South/US-15South/US-501 South making a slight right onto White Hill Road. After about 8 miles, make a slight right onto Monroe Road and then turn right onto NC-24 West/NC-27 West and continue for approximately 29 miles. Make a slight left onto NC-109 south, turn right onto Pee Dee Road (SR1174), and then turn left onto Javondale Farm.

From Asheville, take I-40 East and take exit 152A for Interstate 77 S toward Charlotte. Take I-77 for 2.2 miles. Take Exit 49 A for US 70/G Bagnal Blvd. Continue on US-70 for 21 miles. Turn right onto Jake Alexander Blvd W and go 6.0 miles. Turn right onto US-52 S/E Innes Street and continue to follow US-52 for 28.6 miles. Turn left onto NC 27 E and go 2.1 miles. Turn right onto NC 24 E/NC 27 W/ NC 73 W/ E Main Street. Continue to follow this for 6.2 miles. Take a slight right to follow NC 73. Continue onto Pee Dee Road. Javondale Farm is on right about 1.6 miles.

The entrance to the Site is at latitude 35°15'26.95" N and longitude 80°01'47.83" W.

2.2 Site Selection

2.2.1 Description

The Site encompasses approximately 18.6 acres of predominately agricultural land and includes three tributaries to Clarks Creek – Thompson Creek, Dale Branch and Jerry Branch (See Figure 4).

Historic land use at the Site has consisted primarily of livestock grazing and dairy farm operations. Additional land use practices, including the maintenance and removal of riparian vegetation and the relocating, dredging, and straightening of on-site streams have contributed to unstable channel characteristics and degraded water quality.

2.2.2 USGS Hydrologic Unit Code and NCDWQ River Basin Designations

The Pee Dee Site is located approximately 1 mile south of the town of Pee Dee, NC in Montgomery County (Appendix A, Figure 1). The Pee Dee Site lies within the Yadkin River Watershed [NC Division of Water Quality (DWQ) sub-basin 03-07-10 and local HUC 03040104020020]. The Site is currently utilized for cattle production and contains three unstable tributaries to Clarks Creek - Thompson Creek, Dale Branch, and Jerry Branch. Clarks Creek, which is listed as DWQ Class C water, flows into the Pee Dee River. The site is located within an NCEEP targeted watershed.

Class C waters are protected for uses such as secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner (NCDWQ).

2.2.3 Watershed Characterization

The Site watershed is characteristic of the Piedmont region with moderate rainfall with annual precipitation averaging 47.2 inches. Elevations within the Site range from 390 feet at the northwestern boundary along Thompson Creek to 280 feet at the eastern extent along Jerry Branch. The Site encompasses approximately 6,263 linear feet of existing streams including Thompson Creek, Dale Branch and Jerry Branch.

The drainage area of Thompson Creek at the downstream end of the Site is 0.197 mi^2 (126 acres). The drainage area of Dale Branch at the downstream end of the Site is 0.092 mi^2 (59 acres) and the drainage area of Jerry Branch at the downstream end of the Site is 0.158 mi^2 (101 acres). Land use within the watershed consists of 56 % pasture, 17% forest, 15% pine plantation, 7% low-density residential, 4% cropland, and 1% other uses. Impervious areas cover less than 1% of the total watershed.

2.2.4 Physiography, Geology, and Soils

The project area is located in the Carolina Slate Belt Level IV ecoregion of the Piedmont Level III ecoregion (USGS 2002). This ecoregion is comprised of mineral-rich metavolcanic and metasedimentary rocks with slatey cleavage. The local lithology is mapped as part of the Tillery Formation (€Zmd1) which consists of metamudstone and Meta-argillite, thin to thick bedded, with bedding plane and axial-planar cleavage and interbedded with metasandstone, metaconglomerate and metavolcanic rock.

The valleys associated with the three project streams are Type II colluvial valleys (Rosgen). The valleys present a structurally influenced morphology with valley bottom cross-slopes averaging 7% and a longitudinal slope averaging approximately 3%. The regional drainage pattern may be described as dendritic; however, the local drainage appears to have a subdued trellis pattern, indicating an influence of the underlying geology on the valley alignments. The depth to bedrock is fairly consistent throughout the Site, laying approximately 3 ft. below the valley bottom on Dale and Jerry Branch and approximately 2.5 ft. below valley grade on Thompson Creek. The consistent depth to bedrock paired with a sloped down-valley gradient indicates that the valley slope is geologically controlled. Further evidence of structural influence is expressed in the valley cross slopes. The cross slope on west side of the valley are generally steeper (25% - 40%) than the east side slopes (10% - 25%). This pattern is also observed in the surrounding region and is an indicator of the geologic influence on the valley form either through differential weathering or tectonic activity.

Soils found on site include Badin-Goldston complex, Badin-Tarrus complex, Chenneby silt loam, and Goldston-Badin complex (Figure 3). Streams tend to dry up and water yields to wells are low as this rock contains some of the lowest water-yielding rock units in the Carolinas. All stream beds on site are dominated by sand and small gravel eroded from the riparian and upland areas disturbed by livestock.

2.2.5 Historical Land Use and Development Trends

The Pee Dee Stream Restoration Site encompasses approximately 18.6 acres of pastureland for cattle. Grazing livestock have historically had access to most stream reaches and adjacent terraces. The lack of deep-rooted vegetation and unstable channel characteristics appear to have contributed to the degradation of stream banks.

The current landowner has owned the property since 1954. The land was originally used as a dairy farm and has recently been changed to a beef cattle operation. The current owners created the pond at the upstream end of Thompson Creek in the 1960s. The streams on the property have not been dredged within the last 58 years.

2.2.6 Existing Site Conditions

In order to assess existing geomorphic conditions, cross section measurements were taken at twenty-four (24) locations within the site. These measurements were used to evaluate existing width-depth ratios, bank-height ratios, entrenchment ratios and stream classification (See Appendix C). Additionally, a bed width index and a maximum depth index were calculated to assess departure from reference conditions. Data collected from naturalized streams in the surrounding watersheds, the reference reach surveys and the regional curve sites were used to develop regional hydraulic geometry relationships for reference channel bed width and reference maximum bankfull.

The bed width index (BWI) was calculated by dividing the channel bed width measurements taken from the site by the reference bed width, and the max depth index (MDI) was calculated by dividing the measured maximum bankfull depth by the reference maximum bankfull depth. BWI values less than 1.0 indicate that the bed is narrower than the natural bed width and there will be a tendency for the channel to widen resulting in scour at the toe of bank. MDI values greater than 1.0 indicate that the channel depth is greater than the natural channel depth and that the resulting increase in shear stress may cause scour in the bed.

Vertical and lateral stability were further evaluated by mapping existing erosional and depositional features throughout the site and calculating bank erosion hazard index (BEHI) and near-bank stress (NBS) rating (Appendix C4).

Thompson Creek

The majority of Thompson Creek classifies as a Type G stream with low width-depth ratios typically ranging from 5 to 9 and entrenchment ratios typically ranging from 1.3 to 1.7. The bank-height ratios on Thompson are typically within the range of 1.4 to 3.3. Additionally, the BWI values range for 1.1 to 1.2 while the MDI values range from 1.8 to 4.3. This suggests that channel adjustments have probably neared the end of downward profile degradation and lateral bed widening with future adjustment likely to occur in the form pattern adjustments and lateral channel migration.

The upper end of Thompson Creek flows through open pasture that is heavily impacted by livestock and then flows into an old 1-acre agricultural pond. The pond has partially silted in at the upstream end and has breached the earthen dam at the downstream end. The breach occurred at the lateral emergency spillway location and downcutting is limited by the presence of bedrock. The pond has contributed to the limited function of Thompson Creek by impeding sediment transport and floodplain connectivity, as well affecting aquatic habitat through the presence of algal blooms and siltation.

Thompson Creek, below the pond, has a limited riparian buffer consisting of the invasive species multiflora rose (*Rosa multiflora*) and Chinese privet (*Ligustrum sinense*). The remaining native vegetation has been highly impacted from livestock encroachment. As a result, the channel has become severely incised and bank erosion is contributing fine sediment to the bed. In many locations bedrock is exposed in the bottom of the channel along with the presence of a significant portion of angular, slaty cobble. This cobble is not being supplied from upstream reaches but instead represents an immobile fraction of bed material that is derived from detachment of exposed bedrock.

Along the lower reach of Thompson Creek the channel incision is significantly reduced and the bed material transitions to primarily silt and fine gravel indicating that previous channel downcutting is now experiencing aggradation. The present aggradation appears to be a temporary phase in the degradational process that is primarily driven by a local debris jam and a plugged cross pipe.

Downstream of the existing cross pipe the channel enters a forested reach with livestock exclusion fencing. This downstream reach is relatively stable, with the channel grade controlled by bedrock and mature vegetation providing an appropriate riparian buffer.

Dale Branch
The majority of Dale Branch classifies as a Type G stream with low width-depth ratios typically ranging from 7 to 9 and entrenchment ratios typically ranging from 1.1 to 1.5. The bank-height ratio on Dale Branch ranges from 1.6 to 7.9. The BWI values range from 1.2 to 2.0 while the MDI values typically range from 1.7 to 9.4. These values suggest that where the channel has already down-cut, the channel bottom has fully widened and toe scour is no longer a dominant factor contributing to degradation.

The upstream end of Dale Branch begins at a group of seeps that collect to form the base flow of the stream. This area of seeps is subjected to heavy livestock use as is evidenced by bare soil and eroding banks. Immediately downstream of the seep area, the channel flows into a small abandoned agricultural pond. The pond area is presently fenced with only limited livestock access. The earthen embankment is breached at the center and a headcut is migrating into the pond bottom. The pond appears to have almost completely silted in and converted into a small wetland feature. The present headcut threatens the long term viability of this wetland feature.

Downstream of the pond, Dale Branch is no longer protected by exclusionary fencing and is characterized by channel incision and eroding banks. The riparian vegetation is comprised predominately of the invasive exotic Chinese privet along with multiflora rose and Tree of Heaven.

A pattern of degradation is repeated several times throughout the entire reach of Dale Branch. This pattern can be described in the downstream direction as beginning with a stream that briefly exhibits appropriate channel dimensions and vertical positioning with respect to the valley bottom. This brief expression, usually only 20 ft. to 50 ft. in length, is then abruptly followed by a significant headcut, usually greater than 3 ft. and as deep as 6 ft. Proceeding downstream the channel grade is relatively low (less than 0.5 percent) and the valley grade is somewhat steeper (3 to 4 percent) resulting in diminishing incision until the channel reaches another brief section of appropriate vertical position, which is in turn followed by another headcut. These erosional sequences occur over a length of approximately 200 to 300 feet.

At the downstream end of Dale Branch the channel enters the Clarks Creek floodplain where it becomes deeply incised in the floodplain alluvium. The most downstream end of this incision is characterized by severe meandering and bank erosion.

Jerry Branch
The majority of Jerry Branch classifies as a Type G stream with low width-depth ratios typically ranging from 5 to 7 and entrenchment ratios typically ranging from 1.4 to 2.6. The bank-height ratios on Jerry are typically within the range of 1.5 to 7.9. Additionally, the BWI values range for 0.7 to 1.7 while the MDI values range from 0.9 to 12.9. These values suggest that where the channel has already down-cut the channel bottom has fully widened and toe scour is no longer a dominant factor contributing to degradation.

Jerry Branch is characterized by livestock incursions, channel incision and eroding banks. The riparian vegetation is dominated by Chinese privet. Jerry Branch follows a similar pattern of degradation as witnessed on Dale Branch of sequential headcuts and incision that terminates with a deeply incised, meandering reach in the Clarks Creek floodplain.

Discussion of Existing Conditions
A comprehensive understanding of the erosional patterns and degradational history of the project streams was deemed essential to developing an appropriate design solution to the unique challenges of the Site. The design challenge can best be understood by recognizing that the down-valley grades are generally in the 3 percent range while the bed material of these headwater streams is primarily silt, sand and small gravel which normally would only sustain channel grades in the 0.1 to 0.3 percent range.

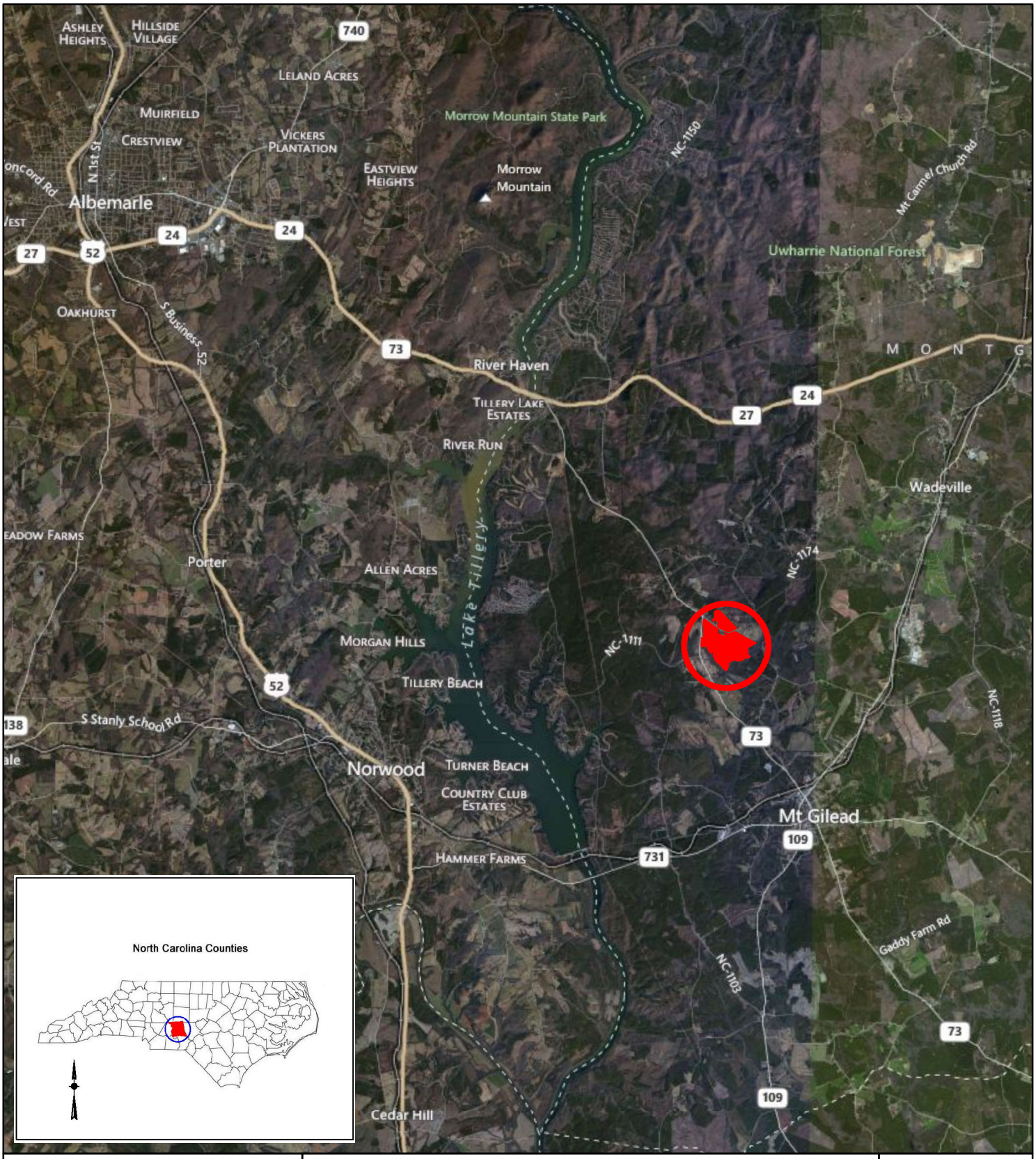
The investigation into the erosional patterns and degradational history of the Site included bed material sampling, exploratory pits and soils investigations. These investigations revealed that accumulation of depositional material on the valley bottom generally appears to only be 6 to 12 inches in depth. There was no strong evidence of upload erosional scars that would suggest a past history of rapid sediment delivery into the fluvial system. Additionally, auger samples did not reveal the presence of a buried 'A' horizon and probes of the channel bed suggested only a thin layer (0.1 to 0.2 ft.) of bed sediments overlying parent material. These findings do not point to a history of valley development that involves significant deposition or valley floor aggradation.

Depositional features such as point bars, lateral bars and dune formations are only minimally present throughout all of the channel reaches. This is juxtaposed to the presence of significant headcuts and extensive vertical channel banks. Samples collected of the bank materials and valley soils indicate a high clay content with a minor fraction of small gravel. The resulting erosional processes are separating the finer clay and silt particles from the small gravel and sand so that only a small fraction of the material produced is accumulating as bed material while the larger portion of finer material is being routed as suspended load by the incised channel.

Visual inspection of the soil horizon along exposed banks, hand auger samples and exploratory pits exposed occasional soil horizons that contained high gravel concentrations. The gravel particles were embedded with clay and the gravel layers were typically bounded by dense clay layers above and below. Occasionally the gravel would grade downward to larger particles. These gravel layers were initially interpreted as originating from fluvial processes and seen as evidence that the valley bottom had been subjected to a history of aggradation through fluvial deposition. However, close inspection of orientation and positioning of the grains along with the embedding matrix revealed that the gravel layers are likely the product of in situ granular disintegration of former bedrock. This observation is consistent with nature of the parent material, mudstone and meta-argillite, which are essentially metamorphosed, lithified mud and clay.

The conclusion of these findings is that the valley form and slopes are likely representative of a paleo-surface formed primarily through long term weathering processes, not the result of rapid disturbance-driven processes of aggradation and degradation. This weathering process has taken place over a geologic timescale that has been strongly influenced and controlled by the underlying parent material and bedrock. Historically, the hydrologic regime and the resistive components of the valley bottom did not result in sufficient available energy to rapidly degrade the landscape. In the past, the forested watershed would have produced considerably less runoff than the presently pastured watershed and the valley bottom would have likely contained a more substantial 'A' horizon that would have trapped and retained runoff in the organically rich surface further attenuating the hydrologic output. Resisting the erosive action of this diminished flow would have been a considerable presence of woody debris supplied by the mature forest and the highly resistant nature of the clay subsoils.

The conversion of the forested watershed into pasture would have certainly increased runoff conditions and the removal of woody debris from clear cutting reduced the stream's ability to resist the erosive forces. Yet these two factors alone may not fully explain the dramatic shift to a degradational state. It is likely that the introduction of cattle and associated input of mechanical energy provided the necessary forces to break down the remaining woody material and the clay subsoils which ultimately allowed the propagation of the dramatic headcuts throughout the site.



VICINITY MAP

PEE DEE RESTORATION SITE

Montgomery County, North Carolina

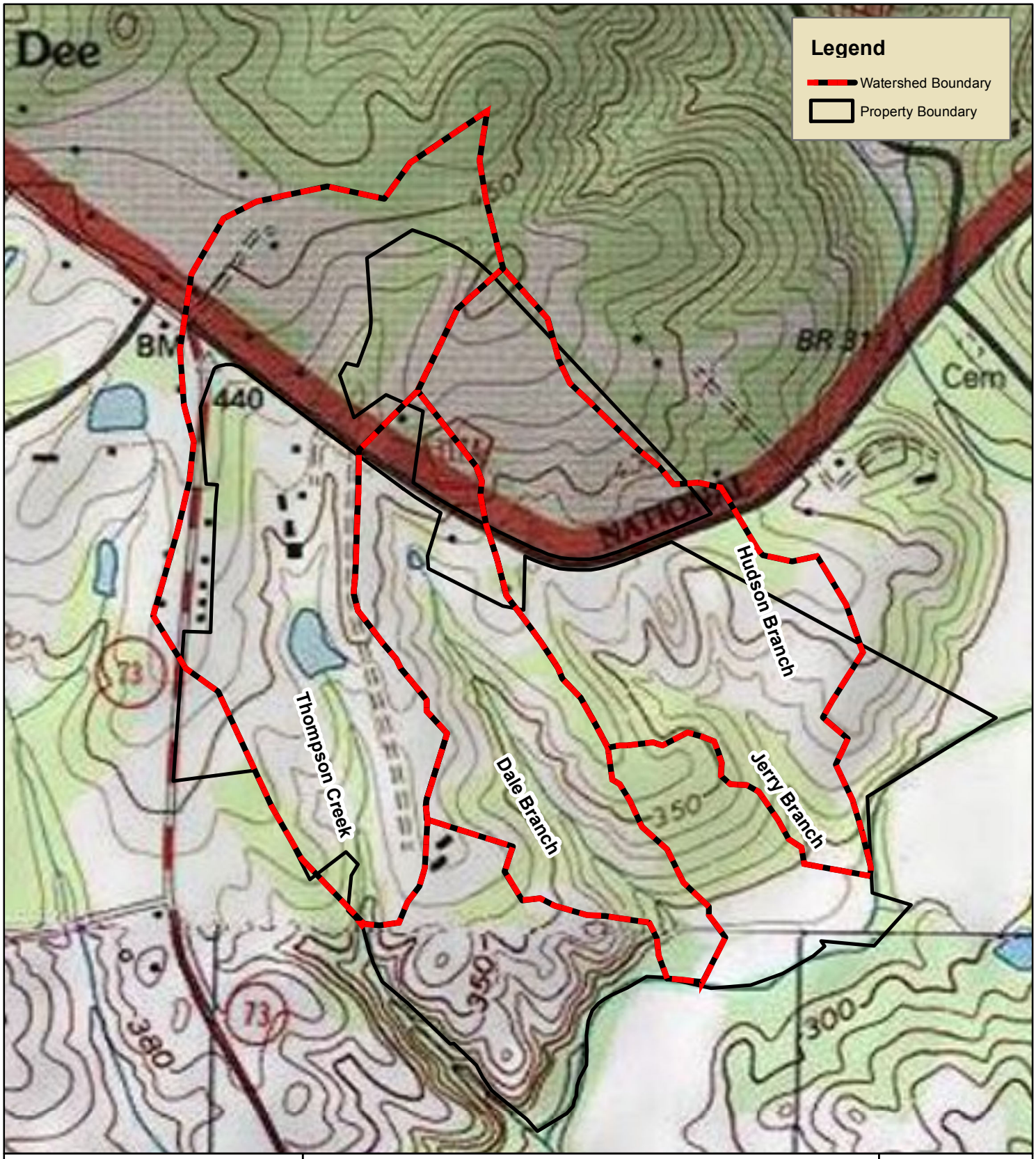
0 0.5 1 2 3 4 Miles

N

FIGURE

1

Date: 6/10/2013



Wolf Creek ENGINEERING

WATERSHED MAP

PEE DEE RESTORATION SITE

Montgomery County, North Carolina

USGS Topographic Map

0 225 450 900 1,350 1,800

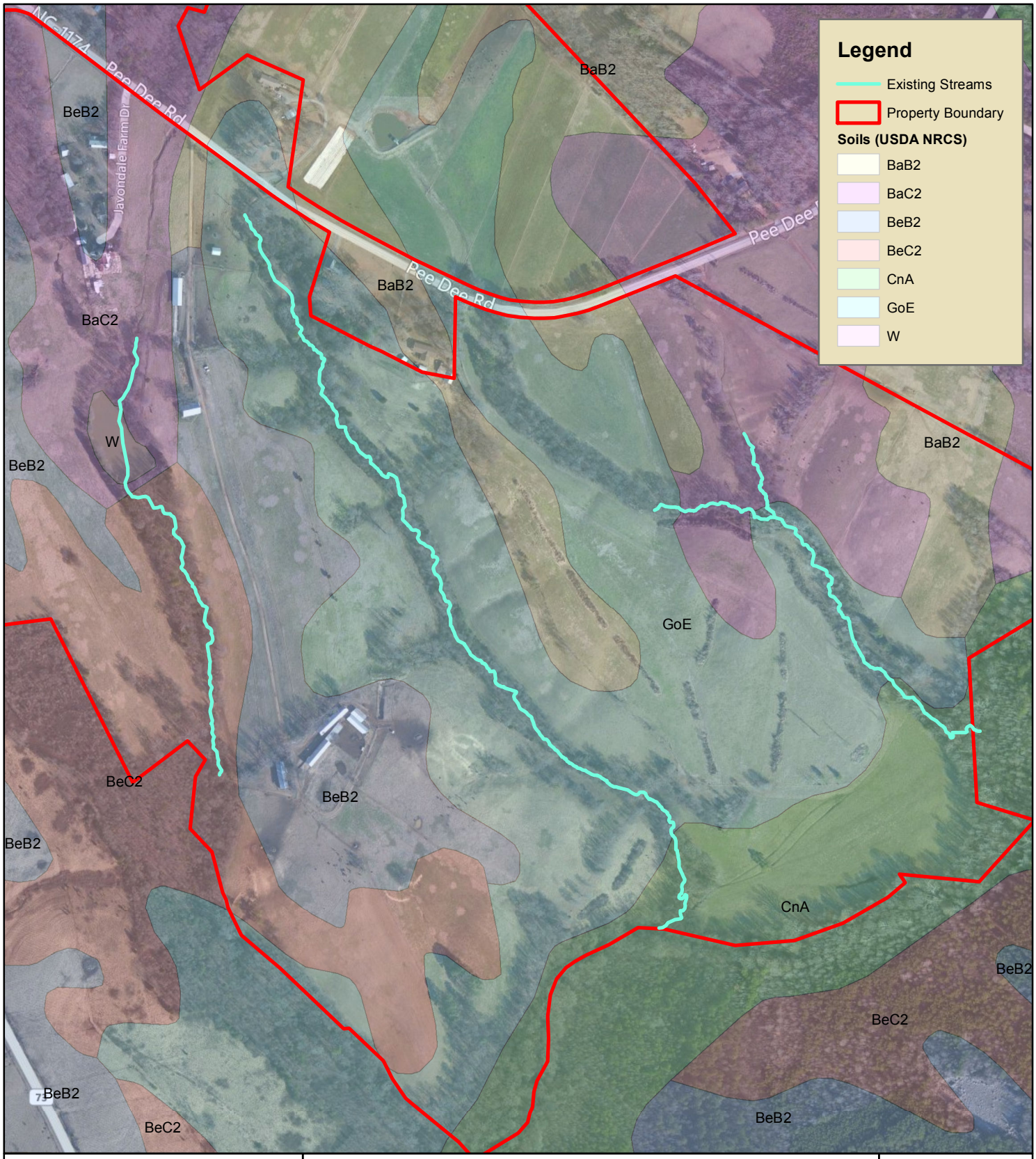
Feet

N

FIGURE

2

Date: 10/8/2013



SOILS MAP

PEE DEE RESTORATION SITE

Montgomery County, North Carolina

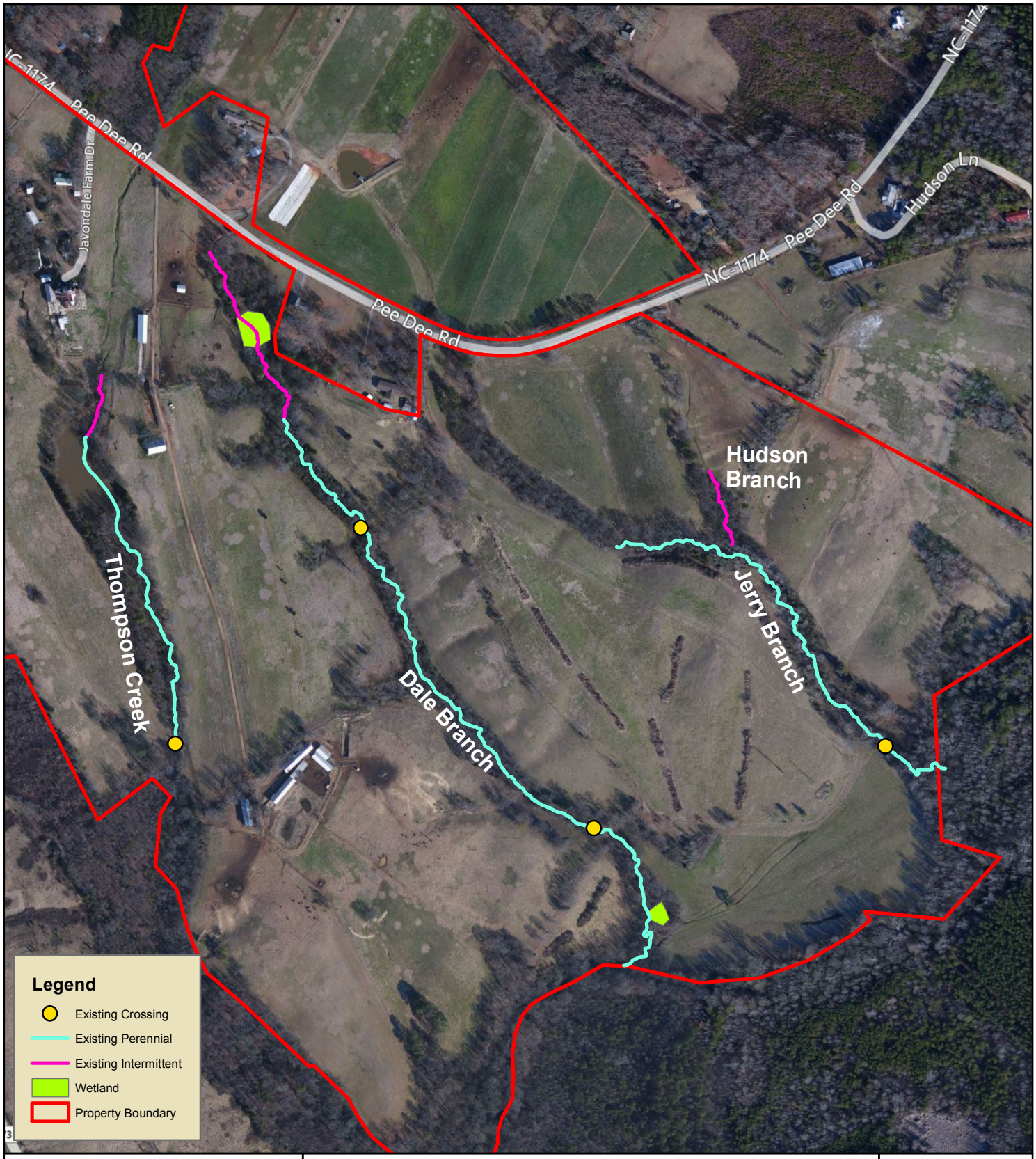
0 150 300 600 900 1,200 Feet

N

FIGURE

3

Date: 10/1/2013



EXISTING CONDITIONS MAP

PEE DEE RESTORATION SITE

Montgomery County, North Carolina

0 150 300 600 900 1,200 Feet

N

FIGURE

4

Date: 6/18/2013

PREPARED FOR: Ecosystem Enhancement Program

PREPARED BY: Wolf Creek Engineering

NOT TO SCALE

1993 AERIAL PHOTO
ENVIRONMENTAL DATA RESOURCES, INC.

HISTORICAL AERIAL PHOTO

PEE DEE RESTORATION SITE
MONTGOMERY COUNTY, NORTH CAROLINA

FIGURE 5

Photo 1: Thompson Creek facing downstream 12/4/12

Photo 2: Thompson Creek facing downstream 12/4/12

Photo 3: Pond on Thompson Cr facing upstream 12/4/12

Photo 4: Downstream of pond on Thompson Cr facing dam 12/4/12

Photo 5: Thompson Creek facing downstream 12/4/12

Photo 6: Thompson Creek facing downstream 12/4/12

Photo 7: Thompson Creek facing upstream 12/4/12

Photo 8: Thompson Creek facing downstream towards pipe crossing 12/4/12

Photo 9: Thompson Creek facing downstream 12/4/12

Photo 10: Dale Branch facing upstream 12/4/12

Photo 11: Dale Branch facing downstream 12/4/12

Photo 12: Dale Branch facing downstream 12/4/12

Photo 13: Dale Branch facing downstream 12/4/12

Photo 14: Dale Branch bank erosion 12/4/12

Photo 15: Dale Branch facing downstream 12/4/12

Photo 16: Dale Branch facing downstream 12/4/12

Photo 17: Dale Branch facing downstream 12/4/12

Photo 18: Dale Branch facing downstream 12/4/12

Photo 19: Jerry Branch facing downstream 12/4/12

Photo 20: Jerry Branch facing upstream 12/4/12

Photo 21: Jerry Branch facing upstream 12/4/12

Photo 22: Jerry Branch facing downstream 12/4/12

Photo 23: Jerry Branch facing upstream 12/4/12

Photo 24: Jerry Branch facing downstream 12/4/12

Photo 25: Jerry Branch facing downstream at fence crossing 12/4/12

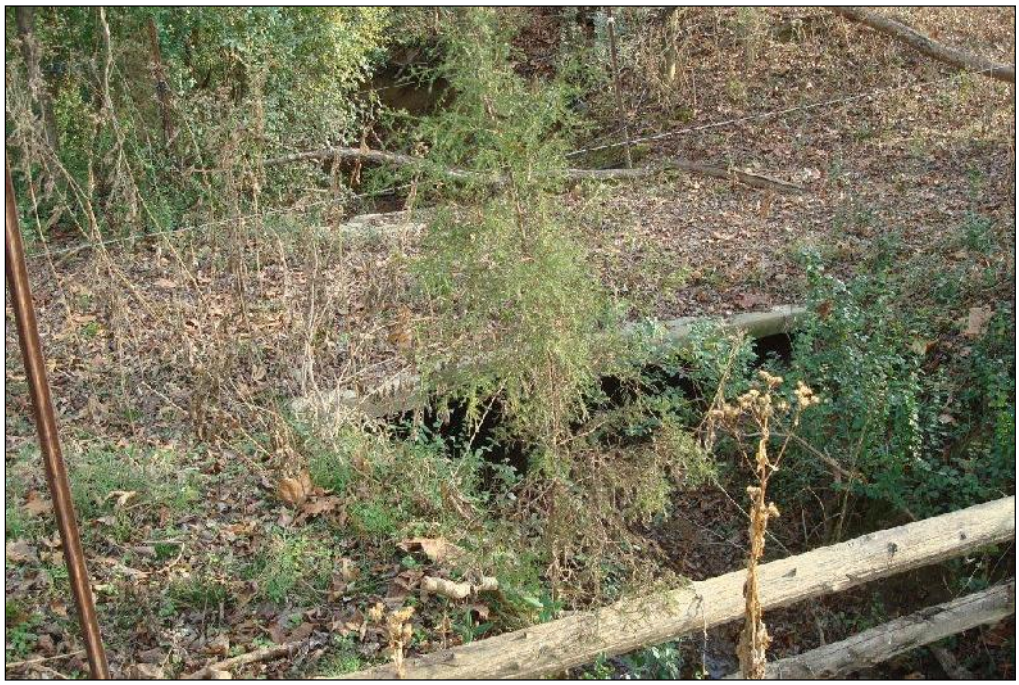


Photo 26: Concrete Bridge on Jerry Branch facing downstream 12/4/12

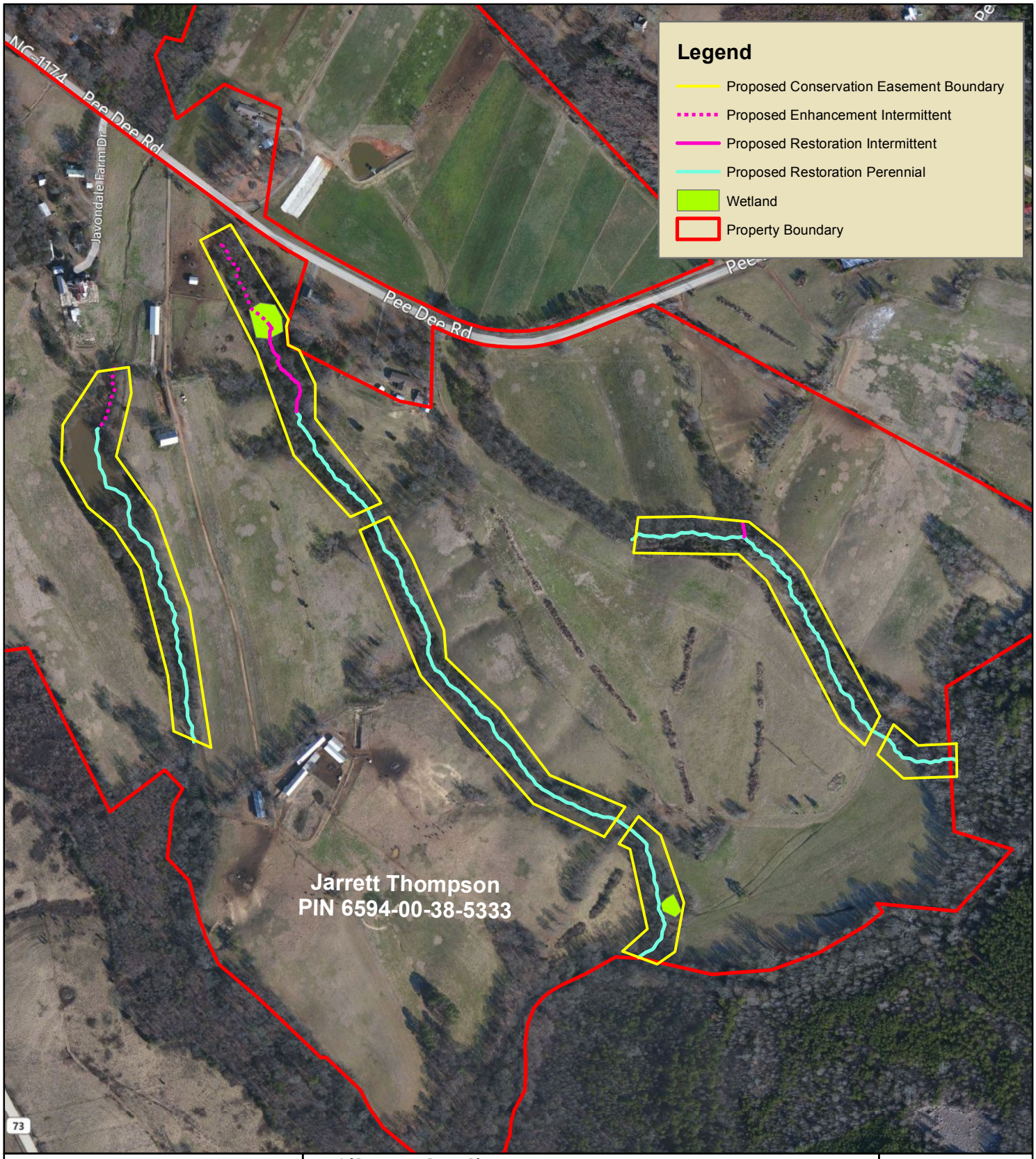
3.0 SITE PROTECTION INSTRUMENT

The land required for the construction, management, and stewardship of this mitigation project includes portions of the following parcels.

Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage Protected
Jarrett Thompson	6594-00-38 5333	Montgomery	Conservation Easement	727-516	18.6

Recorded documents are provided in Appendix A.

All site protection instruments require 60-day advance notification to the Corps and the State prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.



Wolf Creek ENGINEERING

Site Protection Map

PEE DEE RESTORATION SITE

Montgomery County, North Carolina

2010 Aerial Image (Bing Maps)

0 150 300 600 900 1,200

Feet

N

FIGURE

6

Date: 10/1/2013

4.0 BASELINE INFORMATION

4.1 Project Information

Project Name	Pee Dee Stream Restoration		
County	Montgomery County		
Project Area (acres)	18.6 ac.		
Project Coordinates (latitude and longitude)	35°15'26.95" N, 80°01'47.83" W		
Project Watershed Summary Information			
Physiographic Province	Foothills		
River Basin	Yadkin		
USGS Hydrologic Unit 8-digit	03040104	USGS Hydrologic Unit 14-digit	03040104020020
DWQ Sub-basin	03-07-10		
Project Drainage Area (acres)	286		
Project Drainage Area Percentage of Impervious Area	<10%		
CGIA Land Use Classification	2.01.03 Hay and Pasture Land		

4.2 Reach Summary Information

Parameters	Thompson Creek	Dale Branch	Jerry Branch	Hudson Branch	
Length of reach (linear feet)	1596	2782	1832	53	
Valley classification (Rosgen)	II	II	II	II	
Drainage area	102	58	83	19	
NCDWQ stream identification score	30.5	34	30.5	N/A	
NCDWQ Water Quality Classification	C	C	C	C	
Morphological Description (stream type) (Rosgen)	G4	G5	G5	G5	
Evolutionary trend (Rosgen)	IV	IV	IV	IV	
Underlying mapped soils	GoE, BeC2, BaC2	GoE, CnA	GoE, BaC2, BaB2	BaC2	
Drainage class	Well-drained	Well-drained	Well-drained	Well-drained	
Soil Hydric status	Non-Hydric	Non-Hydric	Non-Hydric	Non-Hydric	
Slope	2%	2%	2%	2%	
FEMA classification	N/A	N/A	N/A	N/A	
Native vegetation community	Agricultural	Agricultural	Agricultural	Agricultural	
Percent composition of exotic invasive vegetation	30%	30%	30%	30%	

4.3 Wetland Summary Information

Parameters	Wetland 1	Wetland 2	
Size of Wetland (acres)	0.30	0.10	
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian Non-Riverine	Riparian Non-Riverine	
Mapped Soil Series	GoE	CnA	
Drainage class	B	B/D	
Soil Hydric Status	Hydric	Hydric	
Source of Hydrology	Groundwater	Groundwater	
Hydrologic Impairment	None	None	
Native vegetation community	Non-tidal Freshwater Marsh	Non-tidal Freshwater Marsh	
Percent composition of exotic invasive vegetation	15%	15%	

4.4 Regulatory Considerations

Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States – Section 404	Yes		
Waters of the United States – Section 401	Yes		
Endangered Species Act	N/A		ERTR
Historic Preservation Act	N/A		ERTR
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	N/A		
FEMA Floodplain Compliance	N/A		
Essential Fisheries Habitat	N/A		ERTR

5.0 DETERMINATION OF CREDITS

Mitigation credits presented in these tables are projections based upon site design. Upon completion of site construction the project components and credits data will be revised to be consistent with the as-built condition.

Pee Dee Stream Restoration, Montgomery County
EEP Project Number 95350

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	**6408**								

Project Components

Project Component -or- Reach ID	Stationing/Location	Existing Footage/Acreage	*Approach (PI, PII etc.)*	*Restoration -or- Restoration Equivalent*	*Restoration Footage or Acreage*	Mitigation Ratio
Thompson Creek 1	**100+00 -102+50**	**250**	**PI**	**EI**	**250**	**1.5:1**
Thompson Creek 1 - 2	**102+50 - 115+64**	**1346**	**PI**	**R**	**1314**	**1:1**
Dale Branch 1	**200+00 - 203+75**	**375**	**PI**	**EI**	**375**	**1.5:1**
Dale Branch 2 - 5	**203+75 - 234+50**	**2407**	**PI**	**R**	**2955**	**1:1**
Jerry Branch	**300+00-317+30**	**1832**	**PI**	**R**	**1670**	**1:1**
Hudson Branch	**403+05-403+58**	**53**	**PI**	**R**	**52.6**	**1:1**

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	5992					
Enhancement						
Enhancement I	416.7					
Enhancement II						
Creation						
Preservation						
High Quality Preservation						

BMP Elements

Element	Location	Purpose/Function	Notes
FB	Entire Site	Protect Stream	

BMP Elements
BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

6.0 CREDIT RELEASE SCHEDULE

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary DA authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the Interagency Review Team (IRT), will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described as follows:

Stream Credits			
Monitoring Year	**Credit Release Activity**	**Interim Release**	**Total Released**
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50% (60%*)
3	Third year monitoring report demonstrates performance standards are being met	10%	60% (70%*)
4	Fourth year monitoring report demonstrates performance standards are being met	5%	65% (75%*)
5	Fifth year monitoring report demonstrates performance standards are being met	10%	75% (85%*)
6	Sixth year monitoring report demonstrates performance standards are being met	5%	80% (90%)
7	Seventh year monitoring report demonstrates performance standards are being met and project has received closeout approval	10%	90% (100%)

Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by the NCEEP without prior written approval of the DE upon satisfactory completion of the following activities:

a. Approval of the final Mitigation Plan
b. Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
c. Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; Per the NCEEP Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.
d. Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 10% of a site's total stream credits shall be released after two bank-full events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than two bank-full events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the NCEEP will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report

7.0 MITIGATION WORK PLAN

7.1 Description of Target Stream

Reference reaches were sought to provide a target for design of the proposed streams. Searches were conducted first upstream and downstream of the Site and then into surrounding watersheds to find suitable references that contained comparable slope, bed material and valley type. No references were identified that provided a stable headwater, Piedmont, small gravel-bed stream within a narrow valley that had a down-valley gradient of 2 to 4 percent. This was not unexpected since only a watershed that had never been logged or disturbed could provide a stable environment for such a stream. However, a Type B4c reference was located on Talbott's Branch, a tributary to Betty McGee's Creek in Randolph County, North Carolina that provides many of the desired attributes.

7.1.1 Reference Reach

The reference reach was selected to represent the probable configurations for the proposed stream restoration. Detailed geomorphic survey and Level II Rosgen classifications were conducted on Talbott's Branch for a total of 309 LF (See Appendix C).

Talbott's Branch Reference

The Talbott's Branch reference reach is located within the Piedmont hydrophysiographic region of North Carolina. The Talbott's Branch watershed has many characteristics in common with the Pee Dee watershed including average annual rainfall, elevation changes and valley type. The reference watershed is located in Birkhead Mountains Wilderness area in the Uwharrie National Forest near Asheboro North Carolina. The drainage area for the Talbott's Branch reference is 0.42 mi^2.

The Talbott's Branch reach is representative of a B4c channel in a moderately sloped valley (2.3%). Channel slope and valley form of this stream are consistent with the Site and provide reasonable analogues for the potential channel forms that can be expected at the Site. The reference stream has a channel slope of 1.5% to 2.3 %, width/depth ratio of 12 to 20 and sinuosity of 1.05 to 1.10. The bed material of the reference however, is considerably larger than the small gravel of the Site. Talbott's Branch bed material has a D_{50} of 58 mm and a D_{84} of 120 mm.

Discharge and Bankfull Verification

Bankfull was readily identified on Talbott's Branch as it exhibited consistent indicators throughout the reach. Verification of bankfull was accomplished by plotting the bankfull cross sectional area against the regional curve data (Appendix C). The graph indicates that the bankfull identified in the surveyed reach is slightly lower than the line of the regional curve but consistent with the range of data collected in the regional curve study.

After verification of bankfull cross sectional area, bankfull discharge was calculated for the surveyed reach using a single-section analysis. Manning's 'n' was estimated from relative roughness calculations of the bed material and from observation of the channel form and vegetation conditions. Water surface slope was assumed to be consistent with the slope of the bed profile. Discharge was then compared to the regional curve data which indicated that the calculated bankfull discharges were consistent with the regional curve data.

Channel Stability Assessment

A detailed channel stability assessment was not performed for the reference reach since the bank and bed stability was apparent from observation. Subsequent review of the surveyed dimensions confirmed that width-depth ratios and bank-height ratios were within the appropriate range for stable, self-maintaining streams. Additional observations included significant upstream and downstream reconnaissance to identify any past, present, or future signs or sources of degradation.

Limited Reach References

Through the course of conducting the reference reach searches, several streams were identified as possessing qualities of stability and natural form. However, these reaches were determined not to be suitable references for the project due to incompatible stream type, valley form or insufficient reach length. In these locations morphological measurements were taken to supplement the data acquired from the reference reach sites. Measurements on thirteen individual reaches included bankfull width, bed width, depth of bankfull, toe depth, and width of thalweg.

7.2 Design Narrative

7.2.1 Restoration Approach

Thompson Creek

Thompson Creek is divided into three main reaches; Reach 1 is located upstream of the old pond dam, Reach 2 extends from the pond down to the existing pipe crossing, Reach 3 is downstream of the existing pipe crossing.

Reach 1 is proposed as a semi-passive restoration of a Type B5c stream through the pond bottom. The earthen dam will be breached in stages to drain the remaining surface water and expose the pond bottom sediments. The topographic survey included soundings of the pond bottom in order to estimate the proper breach elevation however, it is expected that the design elevation will need to be adjusted based on site conditions revealed following the draining of the pond. The pond outlet will be lowered just enough to permit the reformation of a channel in the pond bottom but not to the extent that stored sediments are eroded from the old pond. It is expected that log sill structures will need to be installed in strategic locations especially near the upstream end of the pond in order to stabilize the bed profile. Channel reconstruction is not planned for this reach since construction access into the pond bottom sediments would be difficult if not impossible. By breaching the dam, Thompson Creek will be reconnected as a stream corridor. This will restore stream functions such as floodplain connectivity and sediment transport, as well as improve aquatic habitat. By removing a stagnant agricultural pond and restoring Thompson Creek back to a stable stream corridor an overall functional uplift will occur.

Reach 2 is proposed for Priority I restoration as a Type B4 stream with moderate sinuosity and an average channel slope of 2.2%. Consideration was given to restoring the channel on its current grade since the stream is now running on bedrock in many locations and as a result the profile has stabilized. However, the presence of mature vegetation on the floodplain and the extent of grading and removal of topsoil that would be required dissuaded this approach. Instead the channel will be reconnected with its historic floodplain through a combination of lifting in place and complete channel reconstruction. The proposed channel alignment has been selected to incorporate existing mature vegetation where possible and to minimize its disturbance.

Thompson Creek is distinguished from Dale and Jerry Branch by the presence of large gravel and cobble bed material. This gravel and cobble will be harvested and reused in the proposed channel. The use of this bed material will provide for a self-armored channel with a slope slightly less than the valley slope. The additional grade differential will be made up for through the use of boulder and log step structures.

Dale and Jerry Branch

The restoration approach for Dale and Jerry Branch will be to reestablish the conditions that provided for the historic stability of these two streams. This will involve reintroduction of extensive wood grade control and removal of livestock access. Due to the extent of degradation this will also require backfilling of the existing channels and reconstructing the proper channel dimensions. The disparity between the natural low-gradient slopes for streams with small gravel bed material (0.2% to 0.3%) and the moderately

steep valley slopes (2% to 4%) will be resolved by using logs to create small steps and then having relatively flat channel reaches between each log structure. Since logs will be used as grade control the steps will be held to a maximum drop of 0.4 ft. Where site conditions exceed the slope that can be accommodated within these limitations a threshold design approach will be used to establish an armored reach grade control.

Generally, the channels will be restored as Type B4 streams using a Priority I approach which will reconnect the channel to the historic floodplain. In some areas this will involve filling and reconstructing the channel in its present position in the valley while in other areas this will require reconstructing the channel offset from the existing channel. There are a few locations, particularly upstream of the major headcuts where the stream is more stable and closer to proper position in the valley, where efforts will be made to retain as much of the existing alignment as possible. In these areas log sills will be used to adjust and stabilize the profile and the channel will be raised in place.

Dale Branch
Dale Branch is divided into five reaches, based on significant changes in drainage area. Reach 1 is located at the upstream end; from the seep heads to the abandoned pond dam. Reach 2 extends from the pond to the existing timber crossing. Reach 3 extends from the timber crossing to main ephemeral tributary on the west side. Reach 4 is located downstream of the west tributary to the existing ford crossing and Reach 5 is downstream of the existing ford crossing.

Reach 1 is proposed for enhancement by stabilizing existing banks and slopes near the seep heads, removal of invasive species and replanting of the riparian buffer. At the downstream end of Reach 1 the breach in the dam embankment will be stabilized to prevent future headcutting and degradation of the wetland feature in the abandoned pond bottom. Reach 2 is proposed for Priority I restoration by using a significant portion of the existing channel alignment and raising the channel in place. Some alignment alterations will be required to correct severe meanders or reduce bank scour potential.

Reaches 3, 4 and 5 are proposed for Priority I restoration and will follow the above described general approach with the exception of a few transitional reaches. One of these reaches is at the downstream end of Reach 5 which flows into the Clarks Creek floodplain. In this area a Priority II approach will be required to transition down to the grade of Clarks Creek.

Jerry Branch
Jerry Branch is divided into three reaches; Reach 1 is located above the confluence with Hudson Branch. Reach 2 is located below the confluence with Hudson Branch and Reach 3 is located at the downstream end of the Site. All three reaches are proposed for Priority I restoration and will follow the above described general approach with the exception of a few transitional reaches. Similar to the downstream in of Dale, the lower end of Reach 3 which flows into the Clarks Creek floodplain involve a Priority II approach to transition down to the grade of Clarks Creek.

Hudson Branch
Hudson Branch is proposed for Priority I restoration of a Type B4 stream. Hudson will be raised in place using log sills to set the profile grade and backfilling the majority of the existing channel. Some channel reconstruction will be required to properly connect Hudson to the restored Jerry Branch.

7.2.2 Restoration Methods
Restoration of Type B4 and B4c streams will consist of constructing a low sinuosity (1.05) stream with a moderate width-depth ratio (13-19) that accesses the floodplain at greater-than-bankfull flows. Existing bed material will be harvested for reuse in the constructed channel to the maximum extent practical. On-site sources have been identified for supplementing the available bed material. In some locations steeper channel gradients do not allow for the stable placement of on-site bed material. In these areas the riffles

will require armoring with larger caliber quarry stone. Where quarry stone is used it will be mixed with on-site material to reduce voids and provide substrate consistency.

In some locations topographic constraints prevent Priority I restoration and it will be necessary to construct a bankfull bench. Along these reaches, topsoil will be removed prior to excavation and stockpiled. After completion of grading operations, topsoil will be redistributed across the floodplain bench to facilitate vegetation success.

Log structures will be used to provide vertical stability to the channel, assist in maintaining riffle and pool features and to provide habitat diversity. Brush-toe structures will be installed in combination with the log structures to provide bank stability, increase bank roughness and provide aquatic habitat diversity.

Trees with diameters in the range of 12" to 24" will be harvested from the site or nearby property for use as in-stream structures. Small diameter (less than 6") woody plants suitable for transplanting will be harvested on-site where available.

Earthwork activities will include excavation of the proposed channels, partial or complete backfilling of existing channels and removal of existing spoil berms. Grading work is designed to restore or mimic natural contours. During construction, all wetland areas will be protected from construction activities by construction barrier fencing.

Cross pipes will be oversized so that the pipe diameter will be comparable to the channel bed width where practical. The invert of the pipe will be buried below the bed of the channel to allow bed material to pass through the pipe. A boulder grade control structure will be placed downstream of the pipe to hold the low water surface just above the outlet and allow for aquatic life passage.

Best Management Practice (BMP) devices will be used in several areas to provide sediment removal from areas of concentrated runoff. In these areas where runoff collects from adjacent agriculture land, a small sediment basin with a riprap outfall will be constructed to trap sediment prior to entering the stream. The BMP's will be maintained during construction, however, it is expected that following completion of the project the basins will gradually fill in and become vegetated. No long term maintenance will be performed on the basins.

All disturbed areas will be stabilized with temporary and permanent seed and covered with straw or mulch. Live stakes will be installed on the stream banks in accordance with the planting plan in Appendix D. The entire conservation easement area will be planted with bare root seedlings in accordance with the planting plan in Appendix D.

7.2.3 Data Analysis

Hydraulic and Hydrologic Analysis

Design typical channel sections were developed using the hydraulic geometry curves assembled from data of locations on site, immediately adjacent to the site, within the watershed and the neighboring watersheds (See Appendix C1). Trend lines fit to this data set were used to calculate target hydraulic geometry and establish proposed channel dimensions. Hydraulic geometries of the proposed sections were then compared to regional, reference and existing channel values.

The proposed channel sections were evaluated for their ability to convey the bankfull flows and the flood flows of the watershed by performing a hydraulic analysis. Flood flow hydrology was based on USGS Regional Regression equations for the Blue Ridge-Piedmont hydrologic area. Bankfull discharge was based on the NRCS revised regional curves for the North Carolina Mountain and Piedmont hydrologic area. The analysis consisted of first modeling the existing conditions with the HEC-RAS water surface profile model. Cross sections were taken through the channel and the adjacent valley at representative

locations throughout the project reach. Existing hydraulic conditions were evaluated and the model calibrated based on available site data.

The ability to accurately verify bankfull within the site is limited by the degraded channel conditions and the lack of clear bankfull indicators. On a coarse scale, the existing HEC-RAS model does indicate bankfull water surface elevations within the channel banks where the channel is incised and above inner berm features where present.

Proposed conditions were analyzed by revising the existing sections based on the proposed channel geometry and by revising the model to reflect proposed pattern conditions and anticipated future roughness coefficients. Comparison of the existing and proposed HEC-RAS models provided assistance in the analysis of the sediment transport, bankfull flow capacity and confirmation that there will be no hydraulic trespass onto adjacent properties.

Sediment Competence Analysis

Data collection for sediment competence analysis included bar material and bed material bulk samples. The bed material consists of a mix of sand and small gravel with a large constituent being composed of sand (20%-40%). Bed material collected in the sediment pits following a near bankfull event indicate that the total sand content may be as high as 90% to 95%, leaving only 5% to 10% of the mobile bed material to be composed of small gravel. Pebble counts and bulk bed material samples consistently indicate the D_{50} to be 5 to 8 mm and D_{84} to be 11 to 15 mm. However, this may overestimate the actual representative particle sizes given the findings from the sediment pit samples. In either case, shear stress calculations for particle sizes less than 10 to 20 mm should always be considered suspect as this represents the practical limit for competence calculations. For Dale, Jerry and Hudson, 6 mm was selected for the representative particle size which results in a design slope range of 0.19% to 0.34%. These slopes are consistent with measured stable riffles identified within the site.

Shear stress calculations for Thompson Creek were performed to establish the maximum slope for a threshold design channel. The coarse sediment sample taken on Thompson Creek had a D_{50} of 54 mm and a D_{84} of 140 mm. The representative particle size was selected to be 25 mm in order to provide a safety factor of 2 for non-mobilization of the fraction of larger particles. The design slope range of 0.65% to 0.81% is predicted to provide the conditions necessary for self-armoring but still allow for routing of the sand and small gravel supplied the watershed.

Sediment Capacity Analysis

In order to assist in evaluating the sediment capacity, a set of consecutive pit traps were installed in the stream bed at the downstream end of a relatively stable reach of Dale Branch. Two samples were collected from the pit traps following rainfall events. These samples were sieved and weighed. The second sample collected from the pit trap was following a rainfall event that registered 0.85 ft. on the crest gauge. From this sample it was estimated that the total bed load was between 0.15 to 0.25 tons for this near-bankfull event.

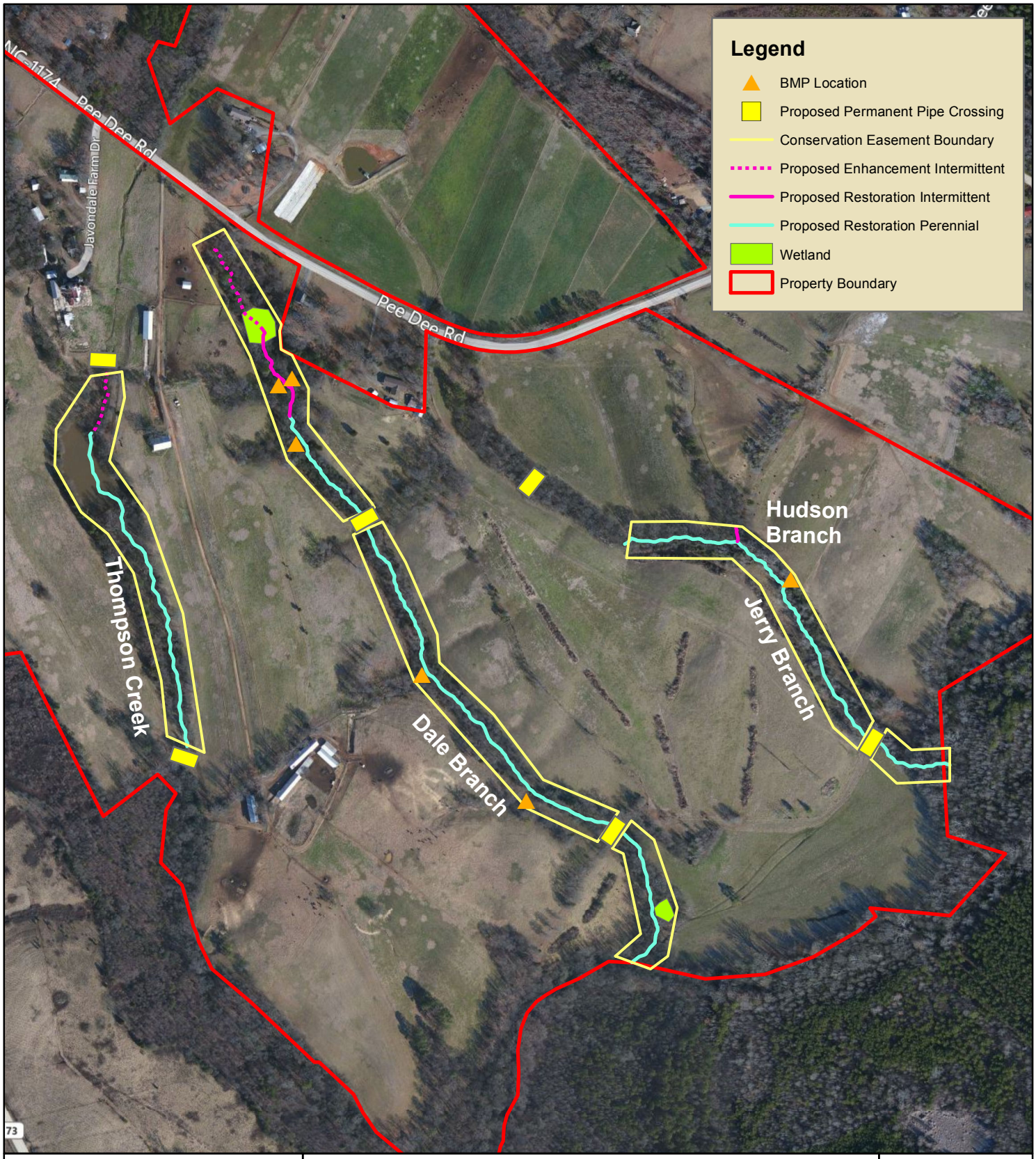
A flow duration hydrograph was constructed to simulate the second sampling event in order to model sediment transport using the quasi-unsteady flow routine in HEC-RAS. Seven sediment transport functions were evaluated for consistency with sediment data collected in the pit traps. The Wilcock transport function provided results that fit best with the data. The Wilcock function predicted 0.20 to 0.29 tons of cumulative sediment output while the other sediment transport function predicted sediment output values more than one order of magnitude greater than the estimated load. Based on this correlation, the Wilcock function was used to evaluate sediment capacity under existing and proposed conditions.

Two quasi-unsteady simulations were run in HEC-RAS to qualitatively evaluate the sediment transport capacity. The modeling consisted of running the 2-year and the 10-year discharge for a constant 1 and 2

hour simulation, respectively, on a 0.1 hour computational increment cycle. Existing and proposed models were compared for differences in channel bed elevation and cumulative sediment output.

Bed invert changes are nearly 0 ft. for the 2-year and 10-year flow. With respect to cumulative mass output the model predicts a similar volume for proposed bankfull as for existing bankfull and an approximate reduction of 20% and 80% in the sediment output in the 2-year and 10-year events, respectively. This is primarily in response to the proposed reconfiguration of the channel geometry which will reduce elevated shear stress associated with the presently incised channel. Given the limited predicted change in proposed channel invert elevation this can be interpreted as not resulting in aggradation.

The design configuration was also evaluated for sediment transport capacity by assessing continuity and magnitude of stream power. Generally the proposed conditions model show a significant decrease in stream power in all storm events. The decrease in stream power is to be expected due to the proposed increase in channel width/depth ratio and the elimination of the channel incision. However, this should not be a concern since the actual stream power values are sufficiently high to transport the sand particles which constitute the main wash load component.



PROPOSED CONDITIONS MAP

PEE DEE RESTORATION SITE

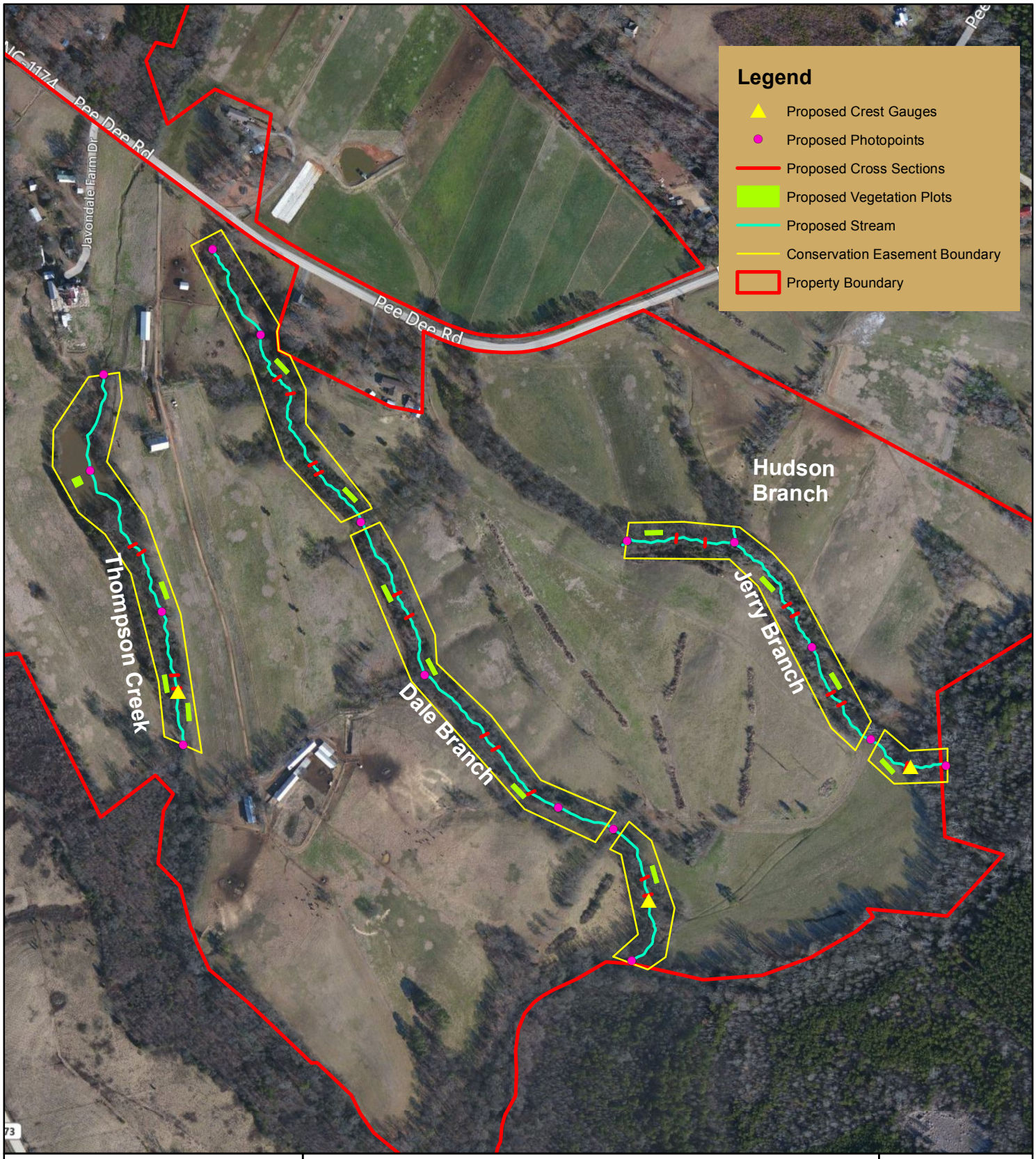
Montgomery County, North Carolina

0 150 300 600 900 1,200 Feet

N

FIGURE 7

Date: 7/23/2013



PROPOSED MONITORING FEATURES

PEE DEE RESTORATION SITE

Montgomery County, North Carolina

0 150 300 600 900 1,200 Feet

N

FIGURE 8

Date: 10/8/2013

8.0 MAINTENANCE PLAN

EBX will monitor the site on a regular basis and shall conduct a physical inspection of the site a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

Component/Feature	**Maintenance through project close-out**
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head-cutting. Management of beaver activity will include removal of nuisance beavers and beaver dams that affect the stream.
Wetland	Routine wetland maintenance and repair activities may include securing of loose coir matting and supplemental installations of live stakes and other target vegetation within the wetland. Areas where storm water and floodplain flows intercept the wetland may also require maintenance to prevent scour.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site Boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as needed basis. Boundary markings will comply with requirements of the RFP Addendum titled "Full Delivery Requirement for Completion of Survey for Conservations Easements" dated 7/21/11
Utility Right-of-Way	Utility rights-of-way within the site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.
Ford Crossing	Ford crossings within the site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.
Road Crossing	Road crossings within the site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.
Storm water Management Device	Storm water management devices will be monitored and maintained per the protocols and procedures defined by the NC Division of Water Quality Storm Water Best Management Practices Manual.

9.0 PERFORMANCE STANDARDS

Morphologic Parameters and Channel Stability

Restored and enhanced streams shall be in compliance with the standards set forth in the USACE 2003 Stream Mitigation Guidelines and the "Ecosystem Enhancement Program Monitoring Requirements and Performance Standards for Stream and Wetland Mitigation" dated November 7, 2011. Restored and enhanced streams should demonstrate morphologic stability to be considered successful. Stability does not equate to an absence of change, but rather to sustainable rates of change or stable patterns of variation. Restored streams often demonstrate some level of initial adjustment in the several months that follow construction and some change/variation subsequent to that is also to be expected. However, the observed change should not be unidirectional such that it represents a robust trend. If some trend is evident, it should be very modest or indicate migration to a stable form.

The performance standards shall be consistent with the requirements described in Federal rule for compensatory mitigation project sites as described in the Federal Register Title 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.5 paragraphs (a) and (b).

Dimension

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

Pattern and Profile

Measurements and calculated values should indicate stability with little deviation from as-built conditions and established morphological ranges for the restored stream type. Pool depths may vary from year to year, but the majority should maintain depths sufficient to be observed as distinct features in the profile. The pools should maintain their depth with flatter water surface slopes, while the riffles should remain shallower and steeper. Pattern measurements will not be collected unless conditions seem to indicate that a detectable change appears to have occurred based on profile and/or dimension measurements.

Substrate

Calculated D_{50} and D_{84} values should indicate coarser size class distribution of bed materials in riffles and finer size class distribution in pools. The majority of riffle pebble counts should indicate maintenance or coarsening of substrate distributions. Generally, it is anticipated that the bed material will coarsen over time.

Sediment Transport

Depositional features should be consistent with a stable stream that is effectively managing its sediment load. Point bar and inner berm features, if present, should develop without excessive encroachment of the channel. Isolated development of robust (i.e. comprised of coarse material and/or vegetated actively diverting flow) mid-channel or lateral bars will be acceptable. Likewise, development of a higher number of mid-channel or lateral bars that are minor in terms of their permanency such that profile measurements do not indicate systemic aggradation will be acceptable, but trends in the development of robust mid-channel or alternating bar features will be considered a destabilizing condition and may require intervention or have success implications.

Surface Water Hydrology

Monitoring of stream surface water stages should indicate recurrence of bankfull flow on average every 1 to 2 years. At a minimum, throughout the monitoring period, the surface water stage should achieve bankfull or greater elevations at least twice. The bankfull events must occur during separate monitoring years.

Vegetation

Riparian vegetation monitoring shall be conducted for a minimum of seven years to ensure that success criteria are met per USACE guidelines. Accordingly, success criteria will consist of a minimum survival of 320 stems per acre by the end of the Year 3 monitoring period, a minimum of 260 stems per acre at the end of Year 5 and a minimum of 210 stems per acre in Year 7. If monitoring indicates either that the specified survival rate is not being met or the development of detrimental conditions (i.e., invasive species, diseased vegetation), appropriate corrective actions will be developed and implemented.

10.0 MONITORING REQUIREMENTS

Annual monitoring data will be reported using the EEP monitoring template. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of EEP databases for analysis, research purposes, and assist in decision making regarding project close-out.

Required	Parameter	Quantity	Frequency	Notes
YES	Dimension	As per November 2011 NCEEP monitoring requirements	Monitoring Years 1, 2, 3, 5, and 7	Cross-sections to be monitored over seven (7) years and shall include an assessment of bank height ratio and entrenchment ratio
YES	Bank Erosion Pins	As per November 2011 NCEEP monitoring requirements	Monitoring Years 1, 2, 3, 5, and 7	Bank pin arrays shall be installed at pool (bend) monitoring cross-sections; arrays shall be measured at time of cross-section surveys
NO	Profile	As per November 2011 NCEEP monitoring requirements	As needed	
YES	Substrate	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	annual	
YES	Surface Water Hydrology	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	annual	A Crest Gauge will be installed on site; the device will be inspected on a semi-annual basis to document the occurrence of bankfull events on the project
NO	Groundwater Hydrology	Quantity and location of gauges will be determined in consultation with EEP	annual	Groundwater monitoring gauges with data recording devices will be installed on site; the data will be downloaded on a monthly basis during the growing season
YES	Vegetation	Quantity and location of vegetation plots will be determined in consultation with EEP	Monitoring Years 1, 2, 3, 5, and 7	Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols
YES	Exotic and nuisance vegetation		Semi-annual	Locations of exotic and nuisance vegetation will be mapped
YES	Project boundary		Semi-annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped

11.0 LONG-TERM MANAGEMENT PLAN

Upon approval for close-out by the Interagency Review Team (IRT) the site will be transferred to the State of North Carolina. This party shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement or the deed restriction document(s) are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.

The NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program currently houses EEP stewardship endowments within the non-reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The NCDENR Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation sites. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation.

12.0 ADAPTIVE MANAGEMENT PLAN

Upon completion of site construction EEP will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described previously in this document. If, during the course of annual monitoring it is determined the site's ability to achieve site performance standards are jeopardized, EEP will notify the USACE of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Corrective Action Plan is prepared and finalized EEP will:

1. Notify the USACE as required by the Nationwide 27 permit general conditions.
2. Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE.
3. Obtain other permits as necessary.
4. Implement the Corrective Action Plan.
5. Provide the USACE a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

13.0- FINANCIAL ASSURANCES

Pursuant to Section IV H and Appendix III of the Ecosystem Enhancement Program's In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the U.S. Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by EEP. This commitment provides financial assurance for all mitigation projects implemented by the program.

14.0 OTHER INFORMATION

14.1 DEFINITIONS

Morphological description – the stream type; stream type is determined by quantifying channel entrenchment, dimension, pattern, profile, and boundary materials; as described in Rosgen, D. (1996), *Applied River Morphology, 2nd edition*

Native vegetation community – a distinct and reoccurring assemblage of populations of plants, animals, bacteria and fungi naturally associated with each other and their population; as described in Schafale, M.P. and Weakley, A. S. (1990), *Classification of the Natural Communities of North Carolina, Third Approximation*

Project Area - includes all protected lands associated with the mitigation project

14.2 REFERENCES

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APPENDIX A
SITE PROTECTION INSTRUMENT(S)

Y+W

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BOOK 727 PAGE 515(16) 336213

This document presented and filed:
11/22/2013 10:47:35 AM

LMP $421.00 Rev 30.00 $451.00 pd

Excise Tax: $421.00

Kaye G. Norris, Montgomery County, NC
REAL ESTATE EXCISE TAX: $421.00

STATE OF NORTH CAROLINA

DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

MONTGOMERY COUNTY

SPO File Number: 62-AQ
EEP Project Number: 95350

Prepared by: Office of the Attorney General
Property Control Section
Return to: NC Department of Administration
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

THIS DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS, made this **22nd** day of **November**, 2013, Javondale, LP, ("**Grantor**"), whose mailing address is 118 Javondale Farm Drive, Mt. Gilead, NC 27306 to the State of North Carolina, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Ecosystem Enhancement Program (formerly known as the Wetlands Restoration Program) within the Department of Environment and Natural Resources for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between Environmental Banc & Exchange, LLC and the North Carolina Department of Environment and Natural Resources, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number 004644.

WHEREAS, The State of North Carolina is qualified to be the Grantee of a Conservation Easement pursuant to N.C. Gen. Stat. § 121-35; and

WHEREAS, the Department of Environment and Natural Resources and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Understanding, (MOU) duly executed by all parties on November 4, 1998. This MOU recognized that the Wetlands Restoration Program was to provide effective compensatory mitigation for authorized impacts to wetlands, streams and other aquatic resources by restoring, enhancing and preserving the wetland and riparian areas of the State; and

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the Ecosystem Enhancement Program is to provide for compensatory mitigation by effective protection of the land, water and natural resources of the State by restoring, enhancing and preserving ecosystem functions; and

WHEREAS, the Department of Environment and Natural Resources, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, the North Carolina Division of Water Quality, the North Carolina Division of Coastal Management, and the National Marine Fisheries Service entered into an agreement to continue the In-Lieu Fee operations of the North Carolina Department of Natural Resources' Ecosystem Enhancement Program with an effective date of 28 July, 2010, which supersedes and replaces the previously effective MOA and MOU referenced above; and

WHEREAS, the acceptance of this instrument for and on behalf of the State of North Carolina was granted to the Department of Administration by resolution as approved by the Governor and Council of State adopted at a meeting held in the City of Raleigh, North Carolina, on the 8th day of February 2000; and

WHEREAS, the Ecosystem Enhancement Program in the Department of Environment and Natural Resources, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in the Pee Dee Township, Montgomery County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately 220.20 acres

and being conveyed to the Grantor by deed as recorded in **Deed Book 717 at Page 745** of the Montgomery County Registry, North Carolina; and

WHEREAS, Grantor is willing to grant a Conservation Easement and Right of Access over the herein described areas of the Property, thereby restricting and limiting the use of the areas of the Property subject to the Conservation Easement to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept said Easement and Access Rights. The Conservation Easement shall be for the protection and benefit of the waters of tributaries to Clarks Creek.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement along with a general Right of Access.

The Conservation Easement Area consists of the following:

Tracts A, B, C, D, E, and F containing a total of **21.02 acres** as shown on the plats of survey entitled "Final Plat, Conservation Easement for North Carolina Ecosystem Enhancement Program, Project Name: Pee Dee Mitigation Project, SPO File No. 62-AQ, EEP Site No. 95350, Property of Javondale, LP," dated November 7, 2013 by Phillip B. Kee, PLS Number NC-4647 and recorded in the Montgomery County, North Carolina Register of Deeds at **Plat Book F Page 87-A**.

See attached "**Exhibit A**", Legal Description of area of the Property hereinafter referred to as the "Conservation Easement Area"

The purposes of this Conservation Easement are to maintain, restore, enhance, construct, create and preserve wetland and/or riparian resources in the Conservation Easement Area that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; to maintain permanently the Conservation Easement Area in its natural condition, consistent with these purposes; and to prevent any use of the Easement Area that will significantly impair or interfere with these purposes. To achieve these purposes, the following conditions and restrictions are set forth:

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

The Conservation Easement Area shall be restricted from any development or usage that would impair or interfere with the purposes of this Conservation Easement. Unless expressly reserved as a compatible use herein, any activity in, or use of, the Conservation Easement Area by the Grantor is prohibited as inconsistent with the purposes of this Conservation Easement. Any rights not expressly reserved hereunder by the Grantor have been acquired by the Grantee. Any rights not expressly reserved hereunder by the Grantor, including the rights to all mitigation credits, including, but not limited to, stream, wetland, and riparian buffer mitigation units, derived from each site within the area of the Conservation Easement, are conveyed to and belong to the Grantee. Without limiting the generality of the foregoing, the following specific uses are prohibited, restricted, or reserved as indicated:

A. Recreational Uses. Grantor expressly reserves the right to undeveloped recreational uses, including hiking, bird watching, hunting and fishing, and access to the Conservation Easement Area for the purposes thereof.

B. Motorized Vehicle Use. Motorized vehicle use in the Conservation Easement Area is prohibited except within a Crossing Area(s) or Road or Trail as shown on the recorded survey plat **or as specifically allowed within a fence maintenance zone as described in section D or a Road or Trail described in section H**.

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including organized educational activities such as site visits and observations. Educational uses of the property shall not alter vegetation, hydrology or topography of the site.

D. Damage to Vegetation. Except within Crossing Area(s) as shown on the recorded survey plat and as related to the removal of non-native plants, diseased or damaged trees, or vegetation that destabilizes or renders unsafe the Conservation Easement Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Conservation Easement Area is prohibited with the following exception:

Notwithstanding the foregoing, if there is a fence within the Conservation Easement Area, the Grantor reserves the right to mow and maintain vegetation within 10 feet of the Conservation Easement boundary ***as shown on the Survey Plat*** and extending along the entire length of the fence. The Grantor, his successors or assigns shall be solely responsible for maintenance of the fence for as long as there is livestock on the Grantor's property adjacent to the Conservation Easement Area.

E. Industrial, Residential and Commercial Uses. All industrial, residential and commercial uses are prohibited in the Conservation Easement Area.

F. Agricultural Use. All agricultural uses are prohibited within the Conservation Easement Area including any use for cropland, waste lagoons, or pastureland.

G. New Construction. There shall be no building, facility, mobile home, antenna, utility pole, tower, or other structure constructed or placed in the Conservation Easement Area.

H. Roads and Trails. There shall be no construction or maintenance of roads, trails, walkways, or paving in the Conservation Easement Area with the following exception:

Only roads and trails located within the Conservation Easement Area prior to completion of the construction of the restoration project and within crossings shown on the recorded survey plat may be maintained by Grantor, successors or assigns to allow for access to the interior of the Property, and must be repaired and maintained to prevent runoff and degradation to the Conservation Easement Area. Such roads and trails shall be covered with pervious materials such as loose gravel or permanent vegetation in order to minimize runoff and prevent sedimentation.

All roads, trails and crossings within the Conservation Easement Area shall be shown on the recorded survey plat.

I. Signs. No signs shall be permitted in the Conservation Easement Area except interpretive signs describing restoration activities and the conservation values of the Conservation Easement Area, signs identifying the owner of the Property and the holder of the Conservation Easement, signs giving directions, or signs prescribing rules and regulations for the use of the Conservation Easement Area.

J. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or any other material in the Conservation Easement Area is prohibited.

K. Grading, Mineral Use, Excavation, Dredging. There shall be no grading, filling, excavation, dredging, mining, drilling, hydraulic fracturing; removal of topsoil, sand, gravel, rock, peat, minerals, or other materials.

L. Water Quality and Drainage Patterns. There shall be no diking, draining, dredging, channeling, filling, leveling, pumping, impounding or diverting, causing, allowing or permitting the diversion of surface or underground water in the Conservation Easement Area. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns is allowed. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides in the Conservation Easement Area is prohibited. In the event of an emergency interruption or shortage of all other water sources, water from within the Conservation Easement Area may temporarily be withdrawn for good cause shown as needed for the survival of livestock on the Property.

M. Subdivision and Conveyance. Grantor voluntarily agrees that no further subdivision, partitioning, or dividing of the Conservation Easement Area portion of the Property owned by the Grantor in fee simple ("fee") that is subject to this Conservation Easement is allowed. Any future transfer of the Property shall be subject to this Conservation Easement and Right of Access and to the

Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Conservation Easement Area for the purposes set forth herein.

N. Development Rights. All development rights are permanently removed from the Conservation Easement Area and are non-transferrable.

O. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural features of the Conservation Easement Area or any intentional introduction of non-native plants, trees and/or animal species by Grantor is prohibited.

The Grantor may request permission to vary from the above restrictions for good cause shown, provided that any such request is not inconsistent with the purposes of this Conservation Easement, and the Grantor obtains advance written approval from the N.C. Ecosystem Enhancement Program, whose mailing address is 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, receive a perpetual Right of Access to the Conservation Easement Area over the Property at reasonable times to undertake any activities to restore, construct, manage, maintain, enhance, protect, and monitor the stream, wetland and any other riparian resources in the Conservation Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

B. Restoration Activities. These activities include planting of trees, shrubs and herbaceous vegetation, installation of monitoring wells, utilization of heavy equipment to grade, fill, and prepare the soil, modification of the hydrology of the site, and installation of natural and manmade materials as needed to direct in-stream, above ground, and subterraneous water flow.

C. Signs. The Grantee, its employees and agents, successors or assigns, shall be permitted to place signs and witness posts on the Property to include any or all of the following: describe the project, prohibited activities within the Conservation Easement, or identify the project boundaries and the holder of the Conservation Easement.

D. Fences. Conservation Easements are purchased to protect the investments by the State (Grantee) in natural resources. Livestock within conservations easements damages the investment and can result in reductions in natural resource value and mitigation credits which would cause financial harm to the State. Therefore, Landowners (Grantor) with livestock are required to restrict livestock access to the Conservation Easement area. Repeated failure to do so may result in the State (Grantee) repairing or installing livestock exclusion devices (fences) within the conservation area for the purpose of restricting livestock access. In such cases, the landowner (Grantor) must provide access to the State (Grantee) to make repairs.

E. Crossing Area(s). The Grantee is not responsible for maintenance of crossing area(s), however, the Grantee, its employees and agents, successors or assigns, reserve the right to repair crossing area(s), at its sole discretion and to recover the cost of such repairs from the Grantor if such repairs are needed as a result of activities of the Grantor, his successors or assigns.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

B. Inspection. The Grantee, its employees and agents, successors and assigns, have the right, with reasonable notice, to enter the Conservation Easement Area over the Property at reasonable times for the purpose of inspection to determine whether the Grantor is complying with the terms, conditions and restrictions of this Conservation Easement.

C. Acts Beyond Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury or change in the Conservation Easement Area caused by third parties, resulting from causes beyond the Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life or damage to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

E. No Waiver. Enforcement of this Easement shall be at the discretion of the Grantee and any forbearance, delay or omission by Grantee to exercise its rights hereunder in the event of any breach of any term set forth herein shall not be construed to be a waiver by Grantee.

V. MISCELLANEOUS

A. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of the Conservation Easement, and the application of such provision to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

C. Any notices shall be sent by registered or certified mail, return receipt requested to the parties at their addresses shown herein or to other addresses as either party establishes in writing upon notification to the other.

D. Grantor shall notify Grantee in writing of the name and address and any party to whom the Property or any part thereof is to be transferred at or prior to the time said transfer is made. Grantor further agrees that any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed is subject to the Conservation Easement herein created.

E. The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the State Property Office and the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property or of any request to void or modify this Conservation Easement. Such notifications and modification requests shall be addressed to:

Ecosystem Enhancement Program Manager
State Property Office
1321 Mail Service Center

Raleigh, NC 27699-1321

and

General Counsel
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

G. The parties recognize and agree that the benefits of this Conservation Easement are in gross and assignable provided, however, that the Grantee hereby covenants and agrees, that in the event it transfers or assigns this Conservation Easement, the organization receiving the interest will be a qualified holder under N.C. Gen. Stat. § 121-34 et seq. and § 170(h) of the Internal Revenue Code, and the Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue in perpetuity the conservation purposes described in this document.

VI. QUIET ENJOYMENT

Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Conservation Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes of this Conservation Easement. Without limiting the generality of the foregoing, the Grantor expressly reserves to the Grantor, and the Grantor's invitees and licensees, the right of access to the Conservation Easement Area, and the right of quiet enjoyment of the Conservation Easement Area,

TO HAVE AND TO HOLD, the said rights and easements perpetually unto the State of North Carolina for the aforesaid purposes,

AND Grantor covenants that Grantor is seized of said premises in fee and has the right to convey the permanent Conservation Easement herein granted; that the same is free from encumbrances and that Grantor will warrant and defend title to the same against the claims of all persons whomsoever.

IN TESTIMONY WHEREOF the Grantor has hereunto set his hand and seal, the day and year first above written.

Javondale, LP

Pearl A Thompson (SEAL)
Pearl A. Thompson, Partner

NORTH CAROLINA, COUNTY OF MONTGOMERY

I, The undersigned Notary Public of the County of Montgomery and State aforesaid, certify that Pearl A. Thompson personally came before me this day and acknowledged that she as Partner of Javondale, LP, a North Carolina Limited Partnership, and that by authority duly given and as the act of such entity, she signed the foregoing instrument in its name on its behalf.

IN WITNESS WHEROF, I have hereunto set my hand and Notary Seal this the 29 ND day of November, 2013.

Phyllis M Brown
Notary Public

My commission expires:

9/13/2018

Exhibit A

Being all of Area A thru F, containing a total of 21.02 acres, as shown on a final plat of a Conservation Easement Survey entitled "The State of North Carolina, Ecosystem Enhacement Program" prepared by Kee Mapping & Surveying, Phillip B. Kee, PLS NC-4647, dated November 7th, 2013 and recorded on 11/12/2013 in Plat Cabinet F, Slide 87-A, to which reference is hereby made and incorporated herein, see plat for a more particular description of metes and bounds.

Exhibit:

A Conservation Easement for
The State of North Carolina,
Ecosystem Enhancement Program,
Pee Dee Stream Restoration Site
The Property of Javondale, LP
SPO FILE NUMBER: 62-AQ EEP PROJECT ID: 95350

The following conservation easement area is located off of Pee Dee Road (SR #1174) within the Pee Dee Township, Montgomery County, North Carolina and being on a portion of that property conveyed to Javondale, LP and described as Parcel One in Deed Book 717 Page 745 as recorded in the Montgomery County Register of Deeds and being more particularly described as follows:

Conservation Easement Area "A" 5.37 Acres:

BEGINNING AT A 5/8" REBAR SET WITH AN EEP CAP (CORNER 1), said rebar being located S 71°36'54" W a horizontal ground distance of 438.10 feet from a 1" iron pipe set in concrete with a Kee control cap, said iron pipe being located in a pasture approximately 360 feet from the southeast corner of a barn and having North Carolina State Plane Coordinates of Northing:549071.22 feet and Easting:1692882.65 feet;

Thence with the aforesaid conservation easement area the following (13) courses and distances:

(1) S 19°39'08" E a distance of 390.89 feet to a 5/8" rebar set with an EEP cap (corner 2);
(2) S 08°41'56" E a distance of 525.22 feet to a 5/8" rebar set with an EEP cap (corner 3), said rebar being located N 39°59'06" E a distance of 129.40 feet from an existing 1/2" rebar with a L-3116 cap, said rebar being a common corner of Deed book 717 Page 745 (Parcel One) and Deed Book 380 Page 624 of the Montgomery County Registry;
(3) N 66°17'10" W a distance of 152.73 feet to a 5/8" rebar set with an EEP cap (corner 4), said rebar being located N 00°23'53" E a distance of 116.62 feet from an existing 1/2" rebar with a L-3116 cap, said rebar being a common corner of Deed book 717 Page 745 (Parcel One) and Deed Book 380 Page 624 of the Montgomery County Registry;
(4) N 06°08'20" W a distance of 208.56 feet to a 5/8" rebar set with an EEP cap (corner 5);
(5) N 14°22'52" W a distance of 415.00 feet to a 5/8" rebar set with an EEP cap (corner 6);
(6) N 40°36'32" W a distance of 302.32 feet to a 5/8" rebar set with an EEP cap (corner 7);
(7) N 29°33'11" W a distance of 197.98 feet to a 5/8" rebar set with an EEP cap (corner 8);
(8) N 01°59'53" E a distance of 136.55 feet to a 5/8" rebar set with an EEP cap (corner 9);
(9) N 33°15'00" E a distance of 237.61 feet to a 5/8" rebar set with an EEP cap (corner 10);
(10) N 81°53'30" E a distance of 117.31 feet to a 5/8" rebar set with an EEP cap (corner 11);
(11) S 06°04'46" E a distance of 97.34 feet to a 5/8" rebar set with an EEP cap (corner 12);
(12) S 13°30'57" W a distance of 243.16 feet to a 5/8" rebar set with an EEP cap (corner 13);
(13) S 35°16'11" E a distance of 249.53 feet to the TRUE POINT OF BEGINNING.

Conservation Easement Area "B" 3.87 Acres:

BEGINNING AT A 5/8" REBAR SET WITH AN EEP CAP (CORNER 14), said rebar being located N 57°00'15" E a horizontal ground distance of 125.41 feet from a 1" iron pipe set in concrete with a Kee control cap, said iron pipe being located in a pasture approximately 360 feet from the southeast corner of a barn and having North Carolina State Plane Coordinates of Northing:549071.22 feet and Easting:1692882.65 feet;

Thence with the aforesaid conservation easement area the following (4) courses and distances:

(1) N 19°37'11" W a distance of 411.25 feet to a 5/8" rebar set with an EEP cap (corner 15);
(2) N 26°58'12" W a distance of 468.97 feet to a 5/8" rebar set with an EEP cap (corner 16);
(3) N 63°02'08" E a distance of 127.53 feet to a 5/8" rebar set with an EEP cap (corner 17);
(4) S 31°17'58" E a distance of 416.07 feet to a 5/8" rebar set with an EEP cap (corner 18), said rebar being in a common line of Deed Book 717 Page 745 (Parcel One) and Deed Book 574 Page 16 of the Montgomery County Registry;

Thence with the aforesaid common line and continuing with the conservation easement area the following (3) courses and distances:

(1) S 16°17'34" W a distance of 25.72 feet to an existing 1/2" rebar (corner 19);
(2) S 04°40'36" E a distance of 69.89 feet to an existing fence corner post (corner 20);
(3) S 63°32'06" E a distance of 46.46 feet to a 5/8" rebar set with an EEP cap (corner 21);

Thence leaving the aforementioned common line and continuing with the conservation easement area the following (3) courses and distances:

(1) S 25°51'12" E a distance of 139.25 feet to a 5/8" rebar set with an EEP cap (corner 22);
(2) S 00°22'59" W a distance of 129.59 feet to a 5/8" rebar set with an EEP cap (corner 23), said rebar being located S 48°18'38" W a distance of 217.11 feet from an existing 3/4" iron pipe;
(3) S 38°34'07" E a distance of 402.11 feet to a 5/8" rebar set with an EEP cap (corner 24) in the northern margin of a 60 foot wide stream crossing, said rebar being located N 26°48'28" W a distance of 60.07 feet from a 5/8" rebar set with an EEP cap (corner 27);

Thence with the northern margin of the aforesaid stream crossing, S 65°57'34" W a distance of 130.13 feet to a 5/8" rebar set with an EEP cap (corner 25), said rebar being located N 35°49'27" W a distance of 61.29 feet from a 5/8" rebar set with an EEP cap (corner 26);

Thence leaving the northern margin of the aforesaid stream crossing and continuing with the conservation easement area, N 42°32'42" W a distance of 311.79 feet to THE TRUE POINT OF BEGINNING.

Conservation Easement Area "C" 4.51 Acres:

BEGINNING AT A 5/8" REBAR SET WITH AN EEP CAP (CORNER 26) in the southern margin of a 60 foot wide stream crossing, said rebar being located S 59°02'19" E a horizontal ground distance of 410.36 feet from a 1" iron pipe set in concrete with a Kee control cap, said iron pipe being located in a pasture

approximately 360 feet from the southeast corner of a barn and having North Carolina State Plane Coordinates of Northing: 549071.22 feet and Easting: 1692882.65 feet;

Thence with southern margin of the aforesaid stream crossing and the conservation easement area N 65°57'34" E a distance of 120.51 feet to a 5/8" rebar set with an EEP cap (corner 27), said rebar being located S 26°48'28" E a distance of 60.07 feet from a 5/8" rebar set with an EEP cap (corner 24);

Thence leaving the southern margin of the aforementioned stream crossing and continuing with the conservation easement area the following (6) courses and distances:

(1) S 29°43'38" E a distance of 175.60 feet to a 5/8" rebar set with an EEP cap (corner 28);
(2) S 23°38'37" E a distance of 294.46 feet to a 5/8" rebar set with an EEP cap (corner 29), said rebar being located S 68°24'38" W a distance of 759.76 feet from a 5/8" rebar set with an EEP cap (corner 57);
(3) S 04°25'17" E a distance of 105.65 feet to a 5/8" rebar set with an EEP cap (corner 30);
(4) S 46°07'57" E a distance of 281.57 feet to a 5/8" rebar set with an EEP cap (corner 31);
(5) S 37°22'16" E a distance of 305.76 feet to a 5/8" rebar set with an EEP cap (corner 32);
(6) S 66°55'36" E a distance of 305.58 feet to a 5/8" rebar set with an EEP cap (corner 33) in the northern margin of a 60 foot wide stream crossing, said rebar being located N 55°31'33" W a distance of 60.00 feet from a 5/8" rebar set with an EEP cap (corner 37);

Thence with the northern margin of the aforesaid stream crossing, S 34°53'28" W a distance of 136.11 feet to a 5/8" rebar set with an EEP cap (corner 34), said rebar being located N 64°54'33" W a distance of 60.89 feet from a 5/8" rebar set with an EEP cap (corner 45);

Thence leaving the northern margin of the aforementioned stream crossing and continuing with the conservation easement area the following (3) courses and distances:

(1) N 64°54'41" W a distance of 292.61 feet to a 5/8" rebar set with an EEP cap (corner 35);
(2) N 41°28'20" W a distance of 637.75 feet to a 5/8" rebar set with an EEP cap (corner 36);
(3) N 22°39'06" W a distance of 591.72 feet to THE TRUE POINT OF BEGINNING.

Conservation Easement Area "D" 1.68 Acres:

BEGINNING AT A 5/8" REBAR SET WITH AN EEP CAP (CORNER 37) in the southern margin of a 60 foot wide stream crossing, said rebar being located S 47°25'07" E a horizontal ground distance of 1893.82 feet from a 1" iron pipe set in concrete with a Kee control cap, said iron pipe being located in a pasture approximately 360 feet from the southeast corner of a barn and having North Carolina State Plane Coordinates of Northing: 549071.22 feet and Easting: 1692882.65 feet;

Thence leaving the southern margin of the aforesaid stream crossing and with the conservation easement area the following (8) courses and distances:

(1) S 49°25'05" E a distance of 110.77 feet to a 5/8" rebar set with an EEP cap (corner 38);
(2) S 18°50'19" E a distance of 266.41 feet to a 5/8" rebar set with an EEP cap (corner 39);
(3) S 10°27'02" W a distance of 185.44 feet to a 5/8" rebar set with an EEP cap (corner 40);

(4) S 54°10'14" W a Total distance of 81.39 feet to a calculated point, passing a 5/8" rebar set with an EEP cap (corner 41) at a 8.47 feet offset on the north bank of Clarks Creek;
(5) N 69°44'20" W a distance of 139.11 feet to a calculated point;
(6) N 48°18'27" E, passing a 5/8" rebar set with an EEP cap (corner 42) at a distance of 7.91 feet on the north bank of Clarks Creek, a total distance of 125.72 feet to a 5/8" rebar set with an EEP cap (corner 43);
(7) N 12°09'19" W a distance of 306.30 feet to a 5/8" rebar set with an EEP cap (corner 44);
(8) N 64°54'03" W a distance of 45.93 feet to a 5/8" rebar set with an EEP cap (corner 45)in the southern margin of a 60 foot wide stream crossing, said rebar being located S 64°54'33" E a distance of 60.89 feet from a 5/8" rebar set with an EEP cap (corner 34);

Thence with the southern margin of the aforesaid stream crossing and continuing with the conservation easement area N 34°53'28" E a distance of 126.18 feet to THE TRUE POINT OF BEGINNING.

Conservation Easement Area "E" 4.74 Acres:

BEGINNING AT A 5/8" REBAR SET WITH AN EEP CAP (CORNER 46), said rebar being located S 61°43'28" E a distance of 875.96 feet from an existing 3/4" iron pipe and located S 83°19'08" E a horizontal ground distance of 1402.78 feet from a 1" iron pipe set in concrete with a Kee control cap, said iron pipe being located in a pasture approximately 360 feet from the southeast corner of a barn and having North Carolina State Plane Coordinates of Northing: 549071.22 feet and Easting: 1692882.65 feet;

Thence with the conservation easement area the following (3) courses and distances:

(1) N 89°14'44" E a distance of 432.29 feet to a 5/8" rebar set with an EEP cap (corner 47);
(2) S 41°39'17" E a distance of 271.46 feet to a 5/8" rebar set with an EEP cap (corner 48);
(3) S 28°11'11" E a distance of 620.46 feet to a 5/8" rebar set with an EEP cap (corner 49) in the northern margin of a 60 foot wide stream crossing, said rebar being located N 59°08'20" W a distance of 60.07 feet from a 5/8" rebar with an EEP cap (corner 58);

Thence with the northern margin of the aforesaid stream crossing S 28°03'30" W, a distance of 121.68 feet to a 5/8" rebar set with an EEP cap (corner 50), said rebar being located N 52°35'00" W a distance of 60.81 feet from a 5/8" rebar set with an EEP cap (corner 63);

Thence leaving the northern margin of the aforementioned stream crossing and continuing with the conservation easement area the following (8) courses and distances:

(1) N 47°39'37" W a distance of 122.55 feet to a 5/8" rebar set with an EEP cap (corner 51);
(2) N 37°06'39" W a distance of 111.60 feet to a 5/8" rebar set with an EEP cap (corner 52);
(3) N 24°25'04" W a distance of 249.80 feet to a 5/8" rebar set with an EEP cap (corner 53);
(4) N 46°41'28" W a distance of 112.33 feet to a 5/8" rebar set with an EEP cap (corner 54);
(5) N 24°37'26" W a distance of 121.27 feet to a 5/8" rebar set with an EEP cap (corner 55);
(6) N 64°53'06" W a distance of 244.06 feet to a 5/8" rebar set with an EEP cap (corner 56);

(7) N 85°29'14" W a distance of 254.54 feet to a 5/8" rebar set with an EEP cap (corner 57), said rebar being located N 68°24'38" E a distance of 759.76 feet from a 5/8" rebar set with an EEP cap (corner 29);
(8) N 07°55'09" E a distance of 142.85 feet to THE TRUE POINT OF BEGINNING.

Conservation Easement Area "F" 0.85 Acres:

BEGINNING AT A 5/8" REBAR SET WITH AN EEP CAP (CORNER 58) in the southern margin of a 60 foot wide stream crossing, said rebar being located S 68°14'41" E a horizontal ground distance of 2530.81 feet from a 1" iron pipe set in concrete with a Kee control cap, said iron pipe being located in a pasture approximately 360 feet from the southeast corner of a barn and having North Carolina State Plane Coordinates of Northing: 549071.22 feet and Easting: 1692882.65 feet;

Thence leaving the southern margin of the aforesaid stream crossing and with the conservation easement area the following (5) courses and distances:

(1) S 49°26'10" E a distance of 120.94 feet to a 5/8" rebar set with an EEP cap (corner 59);
(2) N 87°00'20" E a total distance of 143.39 feet to a calculated point, passing a 5/8" rebar set with an EEP cap (corner 60) at a 10.11 feet offset on the west bank of Clarks Creek;
(3) S 00°08'51" E a distance of 124.00 feet to a calculated point;
(4) S 87°50'57" W, passing a 5/8" rebar set with an EEP cap (corner 61) at a distance of 11.61 feet on the west bank of Clarks Creek, at a total distance of 199.61 feet to a 5/8" rebar set with an EEP cap (corner 62);
(5) N 47°14'50" W a distance of 131.31 feet to a 5/8" rebar set with an EEP cap (corner 63) in the southern margin of a 60 foot wide stream crossing, said rebar being located S 52°35'00" E a distance of 60.81 feet from a 5/8" rebar set with an EEP cap (corner 50);

Thence with the southern margin of the aforesaid stream crossing and continuing with the conservation easement area N 28°03'30" E a distance of 128.63 feet to THE TRUE POINT OF BEGINNING.

Being all of that area of land containing a total of 21.02 Acres, being the same more or less, according to a plat of survey entitled "A Conservation Easement Survey for: The State of North Carolina, Ecosystem Enhancement Program, Pee Dee Stream Restoration Site"; on the property of Javondale, LP; Job# 120759-CE. This description was prepared from an actual survey and shown on the aforementioned plat by Kee Mapping and Surveying, PA (License # C-3039) between the dates of 02/12/13 – 08/02/13 and under the supervision of Phillip B. Kee, NC PLS (License # L-4647).

TOGETHER WITH the right to use a 12 foot wide non-exclusive easement for the purpose of ingress, egress and regress to the conservation easement areas as shown and described on the above referenced plat of survey prepared by Kee Mapping and Surveying, PA and being more particularly described in Section IIIA of the conservation easement agreement.

2:48 PM 11-12-2013 $21.00pd PLAT CABINET: F SLIDE: 87-A

I CERTIFY THAT THIS PLAT SHOWN HEREON IS NOT WITHIN THE WATERSHED PROTECTION DISTRICT OR COMPLIES WITH THE WATERSHED PROTECTION DISTRICT FOR MONTGOMERY COUNTY AND IS APPROVED BY THE PLANNING BOARD FOR RECORDING IN THE REGISTER OF DEEDS OFFICE.

A&M Gabbard 11-12-2013
WATERSHED ADMINISTRATOR DATE

THIS PLAT DOES NOT CREATE A SUBDIVISION OF PROPERTY IN MONTGOMERY COUNTY. THE PURPOSE OF THIS SURVEY IS TO IDENTIFY THE CONSERVATION EASEMENT AREAS ONLY. NO TRANSFER OF PROPERTY IS TAKING PLACE.

MONTGOMERY COUNTY, NORTH CAROLINA:

Tonya Ethridge, REVIEW OFFICER FOR MONTGOMERY COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

Tonya Ethridge 11-12-13
REVIEW OFFICER DATE

THE PROPERTY IS EXEMPT FROM THE SUBDIVISION REGULATIONS UNDER PARAGRAPH 1 OF ARTICLE V, SECTION 501 OF THE MONTGOMERY COUNTY SUBDIVISION ORDINANCE.

A&M Gabbard 11-12-2013
SUBDIVISION ADMINISTRATOR DATE

REGISTERED THIS THE 12 DAY OF November 2013 AT 2:48 PM AND RECORDED IN PLAT CABINET F SLIDE 87-A BY:

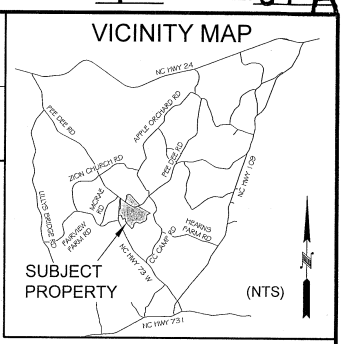
Shirley Webb
DEPUTY

Kaye H. Norris By:
REGISTER OF DEEDS

TOTAL CONSERVATION EASEMENT AREA: 21.02 ACRES

THE CONSERVATION EASEMENT AREA SHOWN HEREON IS LOCATED ON A PORTION OF THAT PROPERTY CONVEYED TO JAVONDALE, LP FROM JARRETT ALEXANDER THOMPSON AND WIFE, PEARL ATKINS THOMPSON AS DESCRIBED IN DEED BOOK 717 PAGE 745 (PARCEL ONE) AND RECORDED IN THE MONTGOMERY COUNTY REGISTER OF DEEDS.

VICINITY MAP



COORDINATE TABLE

CORNER #	NORTHING	EASTING
1	548933.05	1692466.91
2	548564.93	1692598.37
3	548045.75	1692677.80
4	548107.17	1692537.97
5	548314.54	1692515.67
6	548716.53	1692412.59
7	548946.04	1692215.82
8	549118.26	1692118.17
9	549254.73	1692122.93
10	549453.44	1692253.21
11	549469.98	1692369.35
12	549373.19	1692379.66
13	549136.77	1692322.83
14	549139.52	1692987.84
15	549526.90	1692849.75
16	549944.87	1692637.06
17	550002.69	1692750.72
18	549647.17	1692966.87
19	549622.49	1692959.65
20	549552.83	1692965.35
21	549532.12	1693006.95
22	549406.81	1693067.67
23	549277.22	1693066.81
24	548962.82	1693317.50
25	548909.81	1693198.66
26	548860.11	1693234.54
27	548909.21	1693344.80
28	548756.72	1693431.67
29	548486.98	1693549.76
30	548381.64	1693557.91
31	548186.51	1693760.91
32	547943.51	1693946.50
33	547823.75	1694227.63
34	547712.11	1694149.78
35	547836.16	1693864.76
36	548314.03	1693462.42
37	547789.79	1694277.10
38	547717.73	1694361.23
39	547465.59	1694447.25
40	547283.22	1694413.61
41	547240.54	1694354.50
42	547289.02	1694223.04
43	547367.38	1694311.01
44	547666.81	1694246.51
45	547686.29	1694204.92
46	548908.02	1694275.90
47	548913.71	1694708.15
48	548710.89	1694888.57
49	548164.01	1695161.64
50	548056.63	1695124.41
51	548139.17	1695033.82
52	548228.17	1694966.49
53	548455.62	1694863.22
54	548532.67	1694781.48
55	548642.92	1694730.95
56	548746.51	1694509.97
57	548766.53	1694256.22
58	548133.19	1695233.21
59	548054.55	1695325.08
60	548061.49	1695458.18
61	547937.59	1695456.99
62	547930.54	1695269.13
63	548019.68	1695172.70

LINE TABLE

LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
L32	S 62°36'11" E	72.37'	L52	S 54°10'14" W	81.39'
L33	N 00°23'53" E	116.62'	L53	N 69°44'20" W	139.11'
L34	N 81°53'30" E	117.31'	L54	N 48°18'27" E	125.72'
L35	S 06°04'46" E	97.34'	L55	N 34°53'28" E	126.18'
L36	S 13°30'57" W	243.16'	L56	N 64°54'33" W	60.89'
L37	S 35°16'11" E	249.53'	L57	S 28°03'30" W	121.68'
L38	N 68°17'10" W	152.73'	L58	S 59°08'22" E	60.81'
L39	N 39°59'06" E	129.40'	L59	S 49°26'10" E	120.94'
L40	N 63°02'08" E	127.53'	L60	N 87°00'20" E	143.39'
L41	S 16°17'34" W	25.72'	L61	S 00°08'51" E	124.00'
L42	S 04°40'36" E	69.89'	L62	S 87°50'57" W	199.61'
L43	S 63°32'06" E	46.46'	L63	N 47°14'50" W	131.31'
L44	S 25°51'12" E	139.25'	L64	N 28°03'30" E	128.63'
L45	S 00°22'59" W	129.59'	L65	N 52°35'00" W	60.81'
L46	S 65°57'34" W	130.13'	L66	S 16°17'34" W	226.24'
L47	S 26°48'28" E	60.07'	L67	S 63°32'06" E	202.94'
L48	N 65°57'34" E	120.51'	L68	S 63°32'06" E	45.03'
L49	S 34°53'28" W	136.11'	L69	S 48°18'38" W	217.11'
L50	N 35°49'27" W	61.29'	L70	N 57°00'15" E	125.41'
L51	S 55°31'33" E	60.00'			

BRANCH LINE TABLE

LINE	BEARING	DISTANCE
L1	S 14°37'19" W	74.00'
L2	S 19°10'43" E	48.64'
L3	S 35°40'30" E	82.09'
L4	S 11°01'52" W	56.76'
L5	S 38°55'31" W	43.88'
L6	S 00°47'00" W	57.27'
L7	S 26°39'47" W	53.40'
L8	S 01°19'36" W	161.14'
L9	S 28°58'21" E	233.88'
L10	S 10°25'27" E	91.89'
L11	S 57°11'54" E	113.86'
L12	S 41°48'12" E	202.63'
L13	S 55°23'19" E	90.55'
L14	S 41°17'17" E	164.82'
L15	S 61°55'16" E	113.00'
L16	S 20°00'29" E	64.04'
L17	S 45°27'53" E	251.93'
L18	S 84°29'12" E	49.09'
L19	S 33°16'36" E	105.87'

CLARKS CREEK LINE TABLE

LINE	BEARING	DISTANCE
L20	N 53°52'50" E	327.46'
L21	N 08°26'33" E	558.69'
L22	N 59°17'30" E	352.74'
L23	S 74°21'01" E	230.92'
L24	S 81°22'27" E	164.84'
L25	S 87°39'20" E	238.29'
L26	N 58°14'21" E	457.28'
L27	S 84°40'34" E	295.38'
L28	N 38°49'31" E	216.49'
L29	N 17°28'27" E	59.56'
L30	N 42°56'40" W	211.18'
L31	N 00°07'23" E	587.13'

CONSERVATION EASEMENT CORNER-NC EEP CAP (TYPICAL)

SURVEYOR'S NOTES:

1. ALL DISTANCES ARE GROUND MEASUREMENTS IN US SURVEY FEET UNLESS OTHERWISE NOTED.
2. AREAS CALCULATED BY THE COORDINATE METHOD.
3. PROPERTY SUBJECT TO ALL EASEMENTS, RIGHT OF WAYS AND RESTRICTIONS THAT ARE RECORDED, UNRECORDED, UNWRITTEN AND UNWRITTEN.
4. MONTGOMERY COUNTY GIS WEBSITE USED TO IDENTIFY ADJOINING PROPERTY OWNERS.
5. THE PROFESSIONAL SURVEYOR HAS MADE NO INVESTIGATION OR INDEPENDENT SEARCH FOR EASEMENTS, RIGHT OF WAYS, ENCUMBRANCES, RESTRICTIVE COVENANTS, CORRECT OWNERSHIP OR ANY OTHER FACTS THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE. A NC LICENSED ATTORNEY SHOULD BE CONSULTED.
6. BY GRAPHIC DETERMINATION, A PORTION OF THE SUBJECT PROPERTY APPEARS TO LIE WITHIN THE 1% ANNUAL CHANCE FLOOD AREA (AE) AS DETERMINED BY THE F.E.M.A. MAP #3710659400J; DATED: 01/02/08.
7. GRID COORDINATES AND BEARINGS WERE DERIVED FROM GLOBAL POSITIONING SYSTEM OBSERVATIONS THAT WERE OBSERVED ON (11/06/12) AND WERE PERFORMED TO THE GEOSPATIAL POSITIONING ACCURACY STANDARDS (CLASS A HORIZONTAL AND CLASS C VERTICAL); AT THE 95% CONFIDENCE LEVEL USING GPS L1 STATIC OBSERVATIONS WITH MAGELLAN PROMARK3 RECEIVERS.
8. UTILITIES WERE LOCATED BASED ON VISIBLE ABOVE GROUND STRUCTURES, THEREFORE THE LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE OR MAY BE PRESENT AND NOT SHOWN HEREON. CALL 1-800-632-4949 BEFORE DIGGING.
9. THE STATE OF NORTH CAROLINA RESERVES THE RIGHT TO USE A 12' WIDE NON-EXCLUSIVE EASEMENT FOR THE PURPOSE OF INGRESS, EGRESS AND REGRESS FROM PATHS AND ROADS, WHICH ARE SHOWN HEREON IN APPROXIMATE LOCATIONS, FOR ACCESS TO CONSERVATION EASEMENT AREAS. ACCESS IS ALSO PERMITTED BETWEEN ALL STREAM CROSSINGS. SEE SECTION IIIA IN THE CONSERVATION EASEMENT AGREEMENT.
10. ALL EXISTING FENCES WITHIN THE CONSERVATION EASEMENT AREAS ARE TO BE REMOVED.
11. PER JERRY THOMPSON ON 02/27/13: LINE CALLS L1-L3 REPRESENT THE CENTERLINE OF THE OLD BRANCH CHANNEL. WATER HOLE WAS DUG IN THE 1960'S FOR LIVESTOCK.
12. WETLAND AREAS WERE DERIVED FROM IDENTIFICATIONS AND MARKINGS PROVIDED BY EQUINOX ENVIRONMENTAL CONSULTATION AND DESIGN INC. FOR INCLUSION ON THIS MAP.

CERTIFICATE OF OWNERSHIP AND DEDICATION:

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY AS SHOWN AND DESCRIBED HEREON. I ALSO HEREBY ACCEPT AND ADOPT THIS RECORD PLAT AND CONSERVATION EASEMENT WITH MY FREE CONSENT AND DEDICATED ALL EASEMENTS, RIGHT OF WAYS AND ACCESS ROADS TO PUBLIC AND/OR PRIVATE USE AS NOTED ON SAID PLAT.

Pearl A. Thompson 11-12-13
PEARL A. THOMPSON DATE

CERTIFICATE OF SURVEY AND ACCURACY:

I, PHILLIP B. KEE, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN DEED BOOK: 717 PAGE: 745 AND PC: N/A SLIDE: N/A); THAT DASHED LINES INDICATE LINES NOT SURVEYED; THAT THE RATIO OF PRECISION AS CALCULATED DOES NOT EXCEED 1:10,000 ; AND THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

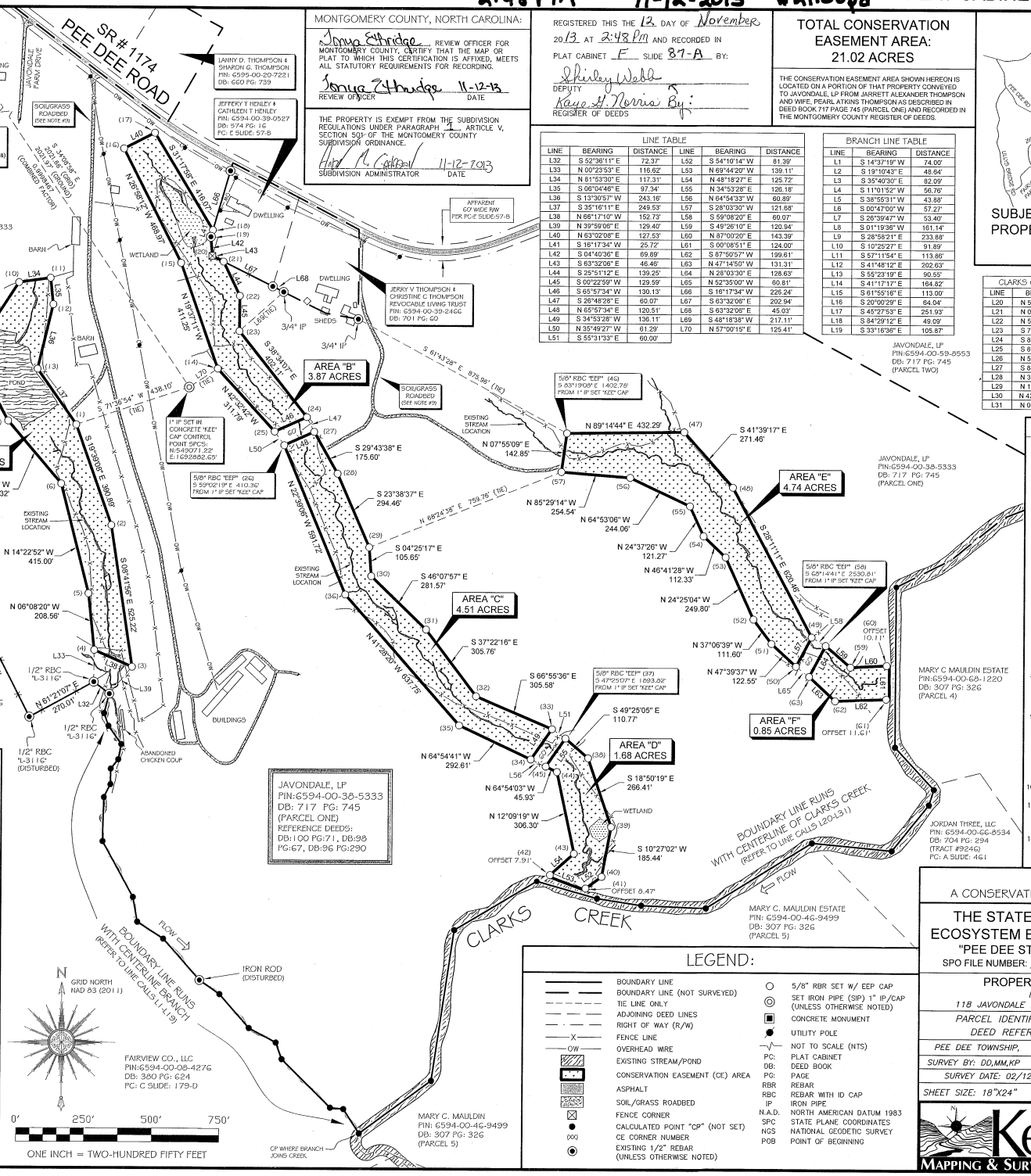
I ALSO HEREBY CERTIFY THAT THIS PLAT IS OF ONE OF THE FOLLOWING: GS 47-30 F(11) D; THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 7TH DAY OF NOVEMBER, A.D., 2013.

NORTH CAROLINA PROFESSIONAL SEAL L-4647 LAND SURVEYOR PHILLIP B. KEE

THIS DOCUMENT IS NOT VALID UNLESS SIGNED AND SEALED.

Phillip B. Kee
PHILLIP B. KEE, PLS NC-4647



LEGEND:

- BOUNDARY LINE
- BOUNDARY LINE (NOT SURVEYED)
- TIE LINE ONLY
- ADJOINING DEED LINES
- RIGHT OF WAY (R/W)
- FENCE LINE
- OW OVERHEAD WIRE
- EXISTING STREAM/POND
- CONSERVATION EASEMENT (CE) AREA
- ASPHALT
- SOIL/GRASS ROADBED
- FENCE CORNER
- CALCULATED POINT "CP" (NOT SET)
- (XX) CE CORNER NUMBER
- EXISTING 1/2" REBAR (UNLESS OTHERWISE NOTED)
- 5/8" RBR SET W/ EEP CAP
- SET IRON PIPE (SIP) 1" IP/CAP (UNLESS OTHERWISE NOTED)
- CONCRETE MONUMENT
- UTILITY POLE
- NOT TO SCALE (NTS)

PC: PLAT CABINET
DB: DEED BOOK
PG: PAGE
RBR REBAR
RBC REBAR WITH ID CAP
IP IRON PIPE
N.A.D. NORTH AMERICAN DATUM 1983
SPC STATE PLANE COORDINATES
NGS NATIONAL GEODETIC SURVEY
POB POINT OF BEGINNING

FINAL PLAT OF A CONSERVATION EASEMENT SURVEY FOR:

THE STATE OF NORTH CAROLINA, ECOSYSTEM ENHANCEMENT PROGRAM, "PEE DEE STREAM RESTORATION SITE"

SPO FILE NUMBER: 62-AQ EEP PROJECT ID: 95350

PROPERTY OF: JAVONDALE, LP
MAILING ADDRESS:
118 JAVONDALE FARM DRIVE, MT. GILEAD, NC 27306
PARCEL IDENTIFICATION #: 6594-00-38-5333
DEED REFERENCES: DB: 717 PG: 745
PEE DEE TOWNSHIP, MONTGOMERY COUNTY, NORTH CAROLINA

SURVEY BY: DD,MM,KP	DRAWN BY: EC	CHECKED BY: PBK
SURVEY DATE: 02/12/13 - 08/02/13		JOB #120759-CE
SHEET SIZE: 18"X24"	SHEET #: 1 OF 1	SCALE: 1"=250'

Kee MAPPING & SURVEYING
P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039

APPENDIX B
BASELINE INFORMATION DATA

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Pee Dee Stream RestorationSite
County Name:	Montgomery County
EEP Number:	95350
Project Sponsor:	NCEEP
Project Contact Name:	Harry Tsomides
Project Contact Address:	5 Ravenscroft Drive, Suite 102, Asheville, NC 28801
Project Contact E-mail:	harry.tsomides@ncdener.gov
EEP Project Manager:	Harry Tsomides

Project Description

Stream restoration activities will restore approximately 6,138 feet of stream along Thompson Creek, Dale Branch, and Jerry Branch by restoring natural channel morphology and proper sediment transport capacity, improving bed form diversity, constructing a floodplain bench, improving channel and stream bank stabilization, establishing a forested and herbaceous riparian buffer plant community.

For Official Use Only

Reviewed By:

10/4/13
Date

Harry Tsomides
EEP Project Manager

Conditional Approved By:

Date

For Division Administrator
FHWA

☐ **Check this box if there are outstanding issues**

Final Approval By:

10-4-13
Date

For Division Administrator
FHWA

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☑ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☑ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☑ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☑ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☑ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☑ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☑ No ☐ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☑ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☑ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☑ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☑ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☑ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Does the project require the acquisition of real estate?	☑ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☑ Yes ☐ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☑ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☐ Yes ☑ No
2. Is the site of religious importance to American Indians?	☐ Yes ☑ No ☐ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☑ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☑ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☑ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☑ No ☐ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☑ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☑ No ☐ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☑ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☐ Yes ☑ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☑ No ☐ N/A
4. Is the project "likely to adversely affect" the species and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☑ No ☐ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?	☐ Yes ☐ No ☑ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☑ N/A

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	☐ Yes ☑ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☑ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☑ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☑ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	☑ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☑ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☑ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted?	☑ Yes ☐ No ☐ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☑ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☑ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☑ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☑ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☑ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☑ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☑ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☑ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☑ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☑ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☑ N/A

NC DWQ Stream Identification Form Version 4.11

WP# 9

Date: 4/10/13	**Project/Site:** Pee Dee Oak Br	**Latitude:** 35.25469
Evaluator: K. Mitchell / S. Melton	**County:** Montgomery	**Longitude:** 80.02820
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 31	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:* Morrow Mountain

A. Geomorphology (Subtotal = 14.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	(3)
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = (0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = (3)	

C. Biology (Subtotal = 8.5)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	(2)	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	(0.5)	1	1.5
24. Amphibians	0	0.5	(1)	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

WP#3

NC DWQ Stream Identification Form Version 4.11

Date: 4/10/13	**Project/Site:** Pee Dee Dale Br	**Latitude:** 35.25664°N
Evaluator: K. Mitchell / S. Melton	**County:** Montgomery	**Longitude:** 080.02936
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 24	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** Morrow Mt. *e.g. Quad Name:*

A. Geomorphology (Subtotal = 12.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	(1) →	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	(1) →	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = (0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = (3)	

C. Biology (Subtotal = 4.5)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 9/1/11	**Project/Site:** Pee Dee Thompson	**Latitude:** WP 1 35.255
Evaluator: S. Melton / K. Mitchell	**County:** Montgomery	**Longitude:** -80.831
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 30.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** Morrow Mountain *e.g. Quad Name:*

A. Geomorphology (Subtotal = 19)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = (0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5.5)				
12. Presence of Baseflow	(0)	1	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = (3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: photo 1 - Pee Dee Thompson

photo 2 & 3 - picture of Clarks Creek ↑ & ↓ - WP 2

NC DWQ Stream Identification Form Version 4.11

Date: 9/1/11	**Project/Site:** Pee Dee Thompson	**Latitude:** ~80.031
Evaluator: S. melton / K. Mitchell	**County:** Montgomery	**Longitude:** 35.255
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 21	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** Morrow Mountain *e.g. Quad Name:*

A. Geomorphology (Subtotal = 11)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	(0.5)	1	1.5
11. Second or greater order channel	No = (0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5)				
12. Presence of Baseflow	(0)	1	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = (3)	

C. Biology (Subtotal = 5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 9/1/11	**Project/Site:** Pee Dee / Jerry Branch	**Latitude:** WP 6 35.253
Evaluator: S. Meadows K. Mitchell	**County:** Montgomery	**Longitude:** -80.023
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 30.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** Morrow Mountain *e.g. Quad Name:*

A. Geomorphology (Subtotal = 19)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = (0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5.5)				
12. Presence of Baseflow	(0)	1	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = (3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: Photo 6, 7 - Cheeks Creek - WP 5

Photo 8, 9 - Jerry Branch

NC DWQ Stream Identification Form Version 4.11

Date: 9/1/11	**Project/Site:** Pee Dee Jerry Branch	**Latitude:** WP8 35.254
Evaluator: S. Meller / K. Mitchell	**County:** Montgomery	**Longitude:** -80.025
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 21.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** Morrow Mountain *e.g. Quad Name:*

A. Geomorphology (Subtotal = 11.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	(0)	1	2	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	1	(2)	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	No = (0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 4)				
12. Presence of Baseflow	(0)	1	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = (3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Hudson

WP 34

Date: 7/11/2012	**Project/Site:** Pee Dee UT to Jerry Br	**Latitude:** 35.254336
Evaluator: K. Mitchell	**County:** Montgomery	**Longitude:** -80.022985
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 21.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** Morrow Mountain *e.g. Quad Name:* Mt Gilead West

A. Geomorphology (Subtotal = 10.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	(0)	1	2	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	No = (0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5)				
12. Presence of Baseflow	(0)	1	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = (3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

Print Form

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Wetland B

Project/Site: Pee Dee City/County: Montgomery County Sampling Date: 7-11-2012

Applicant/Owner: EBX State: NC Sampling Point: WP 22

Investigator(s): K. Mitchell Section, Township, Range:

Landform (hillslope, terrace, etc.): Pond - Footprint - Fringe Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR or MLRA): LRR P Lat: 35.249855 Long: -80.023745 Datum: NAD 83

Soil Map Unit Name: Chennedy NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☒ No ☐
Hydric Soil Present?	Yes ☒ No ☐	
Wetland Hydrology Present?	Yes ☒ No ☐	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☒ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☒	No ☐	Depth (inches):
Water Table Present?	Yes ☒	No ☐	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ☒	No ☐	Depth (inches):

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: 20

Tree Stratum (Plot size: 30 Ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus pennsylvanica	5%	☒	FACW
2.		☐	
3.		☐	
4.		☐	
5.		☐	
6.		☐	
7.		☐	
	5%	= Total Cover	

Sapling Stratum (Plot size:)			
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
6.		☐	
7.		☐	
	= Total Cover		

Shrub Stratum (Plot size:)			
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
6.		☐	
7.		☐	
	= Total Cover		

Herb Stratum (Plot size: 5 ft.) 50=15% 20=2%			
1. Boehmeria cylindrica	30%	☒	FACW
2. Carex torta	20%	☐	OBL
3. Saururus cernuus	50%	☒	OBL
4.		☐	
5.		☐	
6.		☐	
7.		☐	
8.		☐	
9.		☐	
10.		☐	
11.		☐	
12.		☐	
	100%	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
	= Total Cover		

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Vegetation Strata:

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

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

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

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

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: ____-WP22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5YR 5/1	90					Loam	
6-10	7.5YR 5/3	85	7.5YR 4/4	5%			Loam	
10-12	7.5YR 5/4	20					Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12) **(LRR T, U)**
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks:

Print Form

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Pee Dee City/County: Montgomery Co. Sampling Date: 7/11/12

Applicant/Owner: EBX State: NC Sampling Point: WP29

Investigator(s): K. Mitchell Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 0%

Subregion (LRR or MLRA): LRR P Lat: 35.249798 Long: -80.023691 Datum: NAD83

Soil Map Unit Name: Chenneby NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒
Hydric Soil Present?	Yes ☐ No ☒	
Wetland Hydrology Present?	Yes ☐ No ☒	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☒ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☒ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WP29

Tree Stratum (Plot size: 30 Ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus pennsylvanica	60%	☒	FACW
2. Prunus serotina	3%	☐	FACU
3.		☐	
4.		☐	
5.		☐	
6.		☐	
7.		☐	
	63% = Total Cover		
Sapling Stratum (Plot size:)			
1. Fraxinus pennsylvanica	10%	☒	FACW
2.		☐	
3.		☐	
4.		☐	
5.		☐	
6.		☐	
7.		☐	
	10% = Total Cover		
Shrub Stratum (Plot size:)			
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
6.		☐	
7.		☐	
	= Total Cover		
Herb Stratum (Plot size:)			
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
6.		☐	
7.		☐	
8.		☐	
9.		☐	
10.		☐	
11.		☐	
12.		☐	
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.		☐	
2.		☐	
3.		☐	
4.		☐	
5.		☐	
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Vegetation Strata:

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

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

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

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

Woody vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: WP 29

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 6/6	100					Clay/Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12) **(LRR T, U)**
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Wetland A

Project/Site: Pee Dee – Dale Branch Pond City/County: Montgomery Sampling Date: 6/18/2013

Applicant/Owner: EBX State: NC Sampling Point: 1

Investigator(s): JHT Section, Township, Range:

Landform (hillslope, terrace, etc.): Old Pond Local relief (concave, convex, none): Concave Slope (%): 0-2

Subregion (LRR or MLRA): LRR N Lat: 35.255934 Long: -80.028929 Datum: NAD 83 (FT)

Soil Map Unit Name: Goldston - Badin NWI classification: N A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology Yes significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

Photos = N-001, S-002

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 2

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Hydrology altered in past by impoundment of Dale Branch. Subsequent sedimentation of pond has created wetland conditions.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point:_____

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30')			
1. Salix nigra	60	✓	OBL
2. Liquidambar styraciflua	15		FAC
3. Rhus spp.?	10		FACU
4. Ulmus alata	10		FACU
5. Forestiera ligustrina	15		FAC
6.			
7.			
	_____ = Total Cover		
50% of total cover: 100	20% of total cover: 20		
Sapling/Shrub Stratum (Plot size:_____)			
1. Privet	10	✓	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	_____ = Total Cover		
50% of total cover: 5	20% of total cover: 2		
Herb Stratum (Plot size: _____)			
1. Polygonum spp.	80	✓	FACW
2. Carex spp.	5		FAC
3. Fragaria virginiana	10		FACU
4. Boehmeria cylindrica	5		FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No _____

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

SOIL Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/3	100						
8-18	2.5 4/2	98	5Y 2.5/1	2	C	M		Manganese concretions

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- X Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

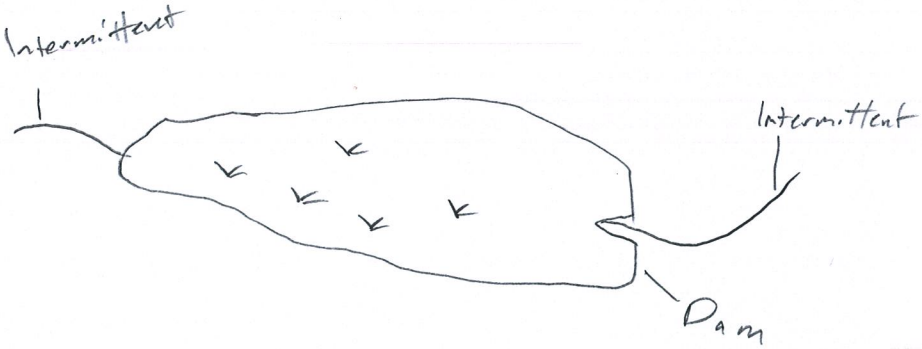
Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:



EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. Edward Curtis), NC Floodplain Mapping Unit (attn. John Gerber) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Pee Dee Stream Restoration Site
Name if stream or feature:	Tributaries to Clark's Creek
County:	Montgomery County, NC
Name of river basin:	Yadkin River Basin
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Montgomery County
DFIRM panel number for entire site:	6594
Consultant name:	Wolf Creek Engineering, pllc
Phone number:	(828) 658-3649
Address:	7 Florida Ave. Weaverville, NC 28787

Design Information

Environmental Banc and Exchange (EBX) proposes to restore and enhance three unstable tributaries to Clark's Creek in Montgomery County. The site is located approximately one mile south of the town of Pee Dee, NC at latitude 35°15'27" and longitude 80°01'48". The site encompasses approximately 20 acres of agricultural land consists of three small tributaries to Clark's Creek. No restoration work is proposed for Clark's Creek.

Reach	Length	Priority
Thompson Creek	*250*	*One (Restoration)*
Thompson Creek	*1314*	*Three (Enhancement)*
Dale Branch	*375*	*One (Restoration)*
Dale Branch	*2955*	*Three (Enhancement)*
Jerry Branch	*1670*	*One (Restoration)*

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

○ Yes ◉ No

If project is located in a SFHA, check how it was determined:

☐ Redelineation

☐ Detailed Study

☐ Limited Detail Study

☐ Approximate Study

☐ Don't know

List flood zone designation:

Check if applies:

☐ AE Zone

- ○ Floodway
- ○ Non-Encroachment
- ◉ None

☐ A Zone

- ○ Local Setbacks Required
- ○ No Local Setbacks Required

If local setbacks are required, list how many feet:

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

○ Yes ◉ No

Land Acquisition (Check)

☐ State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☑ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program?

◉ Yes ○ No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: Edward Curtis, (919) 715-8000 x369)

Name of Local Floodplain Administrator: Andrew Gahagan
Phone Number: (910) 572-3304

Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

- [x] No Action
- [ ] No Rise
- [ ] Letter of Map Revision
- [ ] Conditional Letter of Map Revision
- [ ] Other Requirements

List other requirements: None

Comments:
Clark's Creek is a detailed study stream with an established floodway. No work is to be done on Clark's Creek except where two of the tributaries tie into Clark's Creek. None of the tributaries are studied streams. Coordination with Montgomery County Floodplain Manager, Andrew Gahagan, verified that a map revision would not be required for lateral grading work into the Clark's Creek floodplain that is required for restoration of the tributaries.

Name: S. Grant Ginn, P.E. Signature:

Title: President Date: 6/18/13

APPENDIX C
MITIGATION WORK PLAN DATA and ANALYSES

C1 Hydraulic Geometry
- Design Curves
- Morphology Curves

C2 Design Calculations
- Conceptual Design Calculations
- Sediment Regime
- Design Section Calculations
- Morphologic Tables
- Competence Calculations
- Capacity Calculations
- Bed Material Calculations

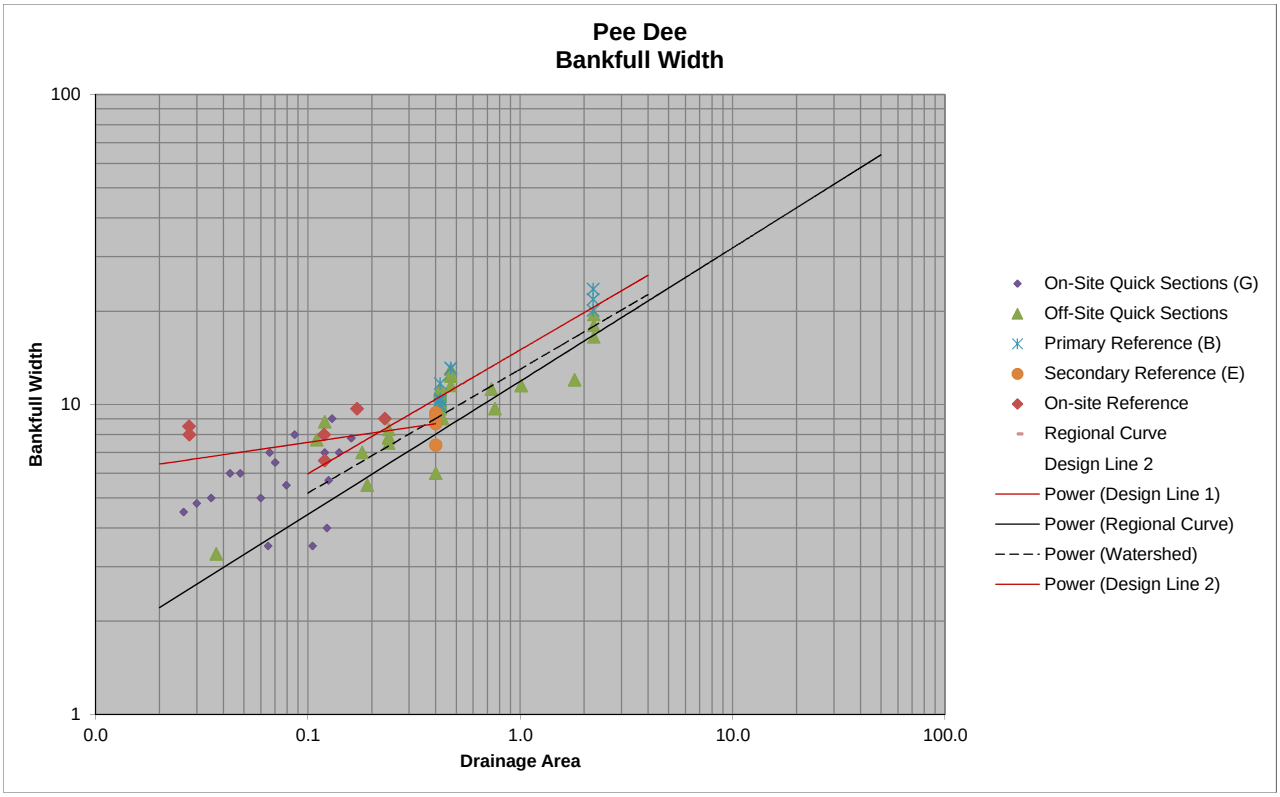
C3 Hydraulic Modeling
- Existing HEC-RAS Output
- Proposed HEC-RAS Output
- HEC-RAS Sediment Transport

C4 Assessment Data
- BEHI/NBS Calculations
- Existing Morphology
- Sediment Data
- Morphologic Site Map

C5 Reference Reach Data
- Talbott's Branch

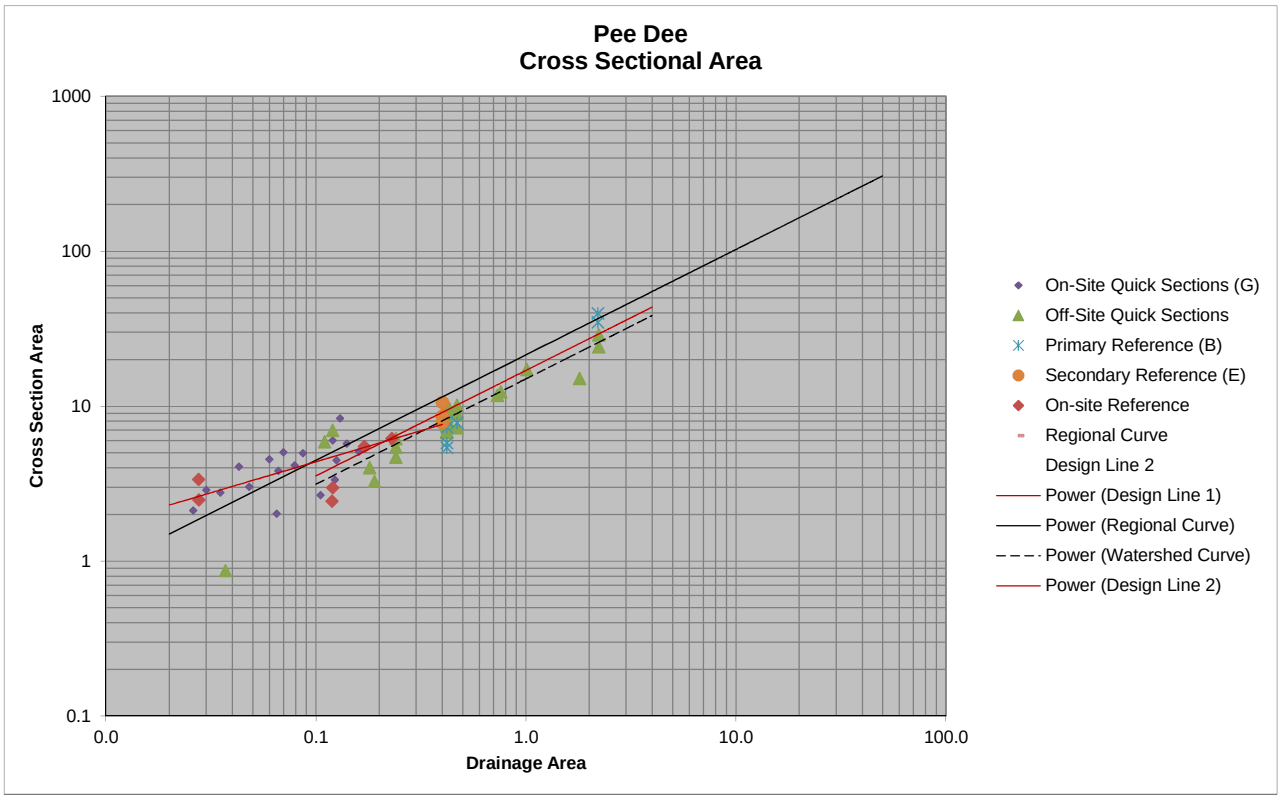
APPENDIX C1

Hydraulic Geometry



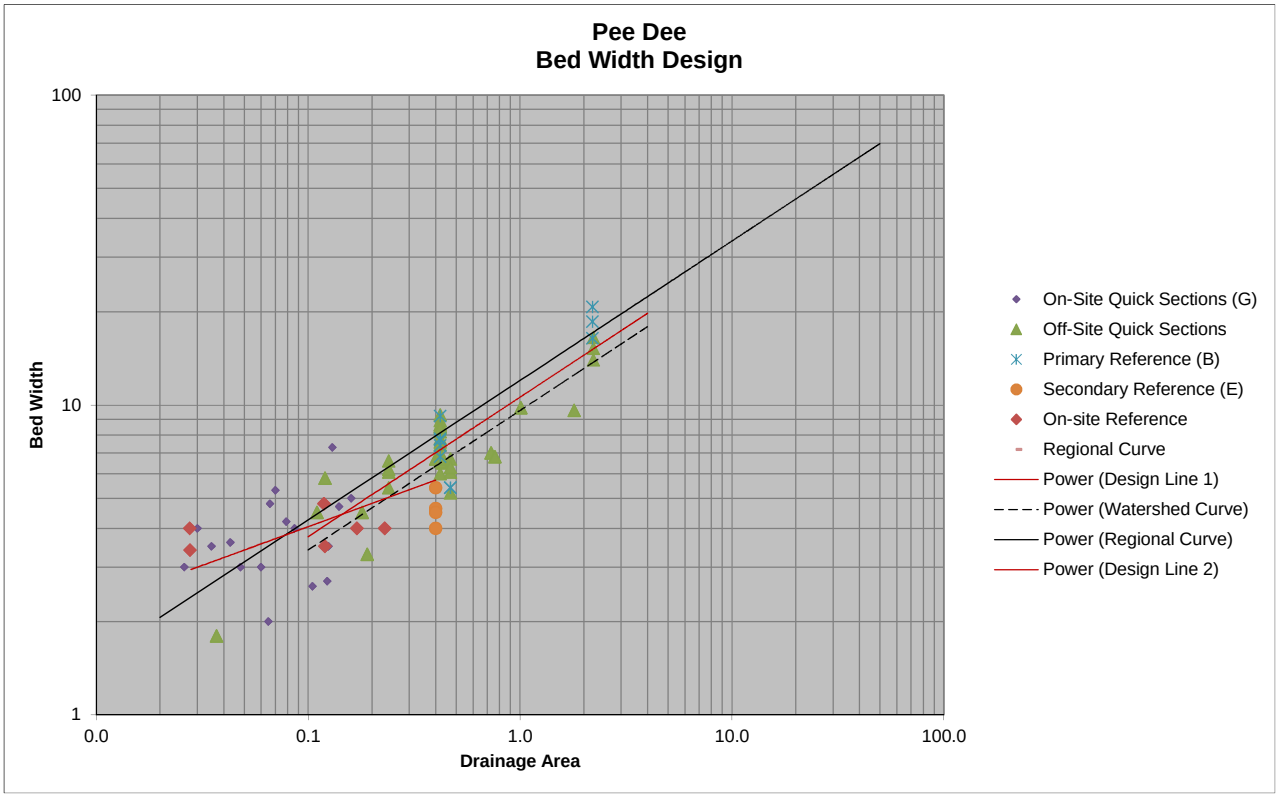
	Coefficient	Exponent
Design Line 1	15.0	0.40
Design Line 2	9.5	0.10
Regional Curve	11.9	0.43
Watershed Curve	13.0	0.40

Design Line 1		Design Line 2		Regional Curve		Watershed Curve	
X	Y	X	Y	X	Y	X	Y
0.1	5.972	0.02	6.424	0.02	2.211	0.1	5.175
4	26.117	0.4	8.668	50	63.935	4	22.634



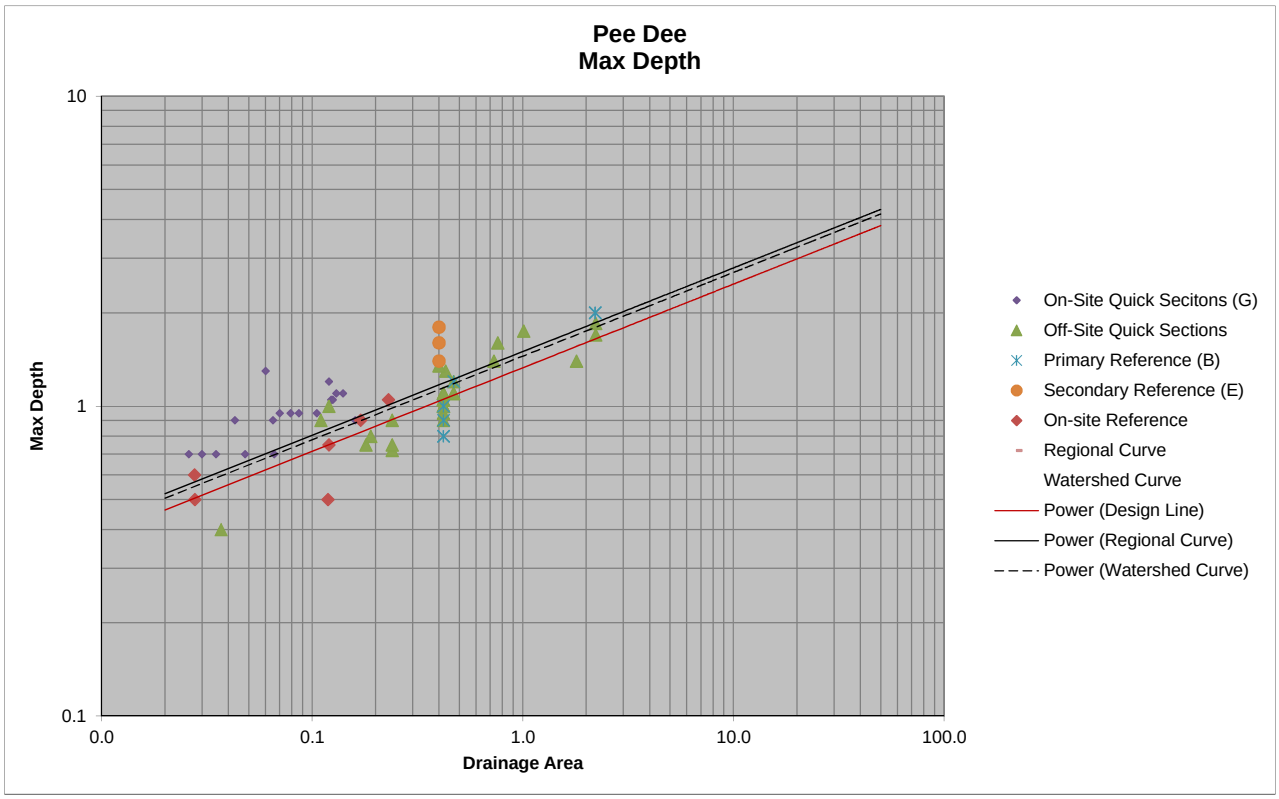
	Coefficient	Exponent
Design Line 1	17.0	0.68
Design Line 2	11.0	0.40
Regional Curve	21.4	0.68
Watershed Curve	15.0	0.68

Design Line 1		Design Line 2		Regional Curve		Watershed Curve	
X	Y	X	Y	X	Y	X	Y
0.1	3.552	0.02	2.300	0.02	1.499	0.1	3.134
4	43.636	0.4	7.625	50	306.423	4	38.503



	Coefficient	Exponent
Design Line 1	10.6	0.45
Design Line 2	7.2	0.25
Regional Curve	12.0	0.45
Watershed Curve	9.6	0.45

Design Line 1		Design Line 2		Regional Curve		Watershed Curve	
X	Y	X	Y	X	Y	X	Y
0.1	3.761	0.028	2.945	0.02	2.064	0.1	3.406
4	19.780	0.4	5.726	50	69.778	4	17.914



	Coefficient	Exponent
Design Line	1.33	0.27
Regional Curve	1.50	0.27
Watershed Curve	1.45	0.27

Design Line		Regional Curve		Watershed Curve	
X	Y	X	Y	X	Y
0.02	0.463	0.02	0.522	0.02	0.504
50	3.824	50	4.313	50	4.170

APPENDIX C2

Design Calculations

Stream Design Calculations

Status Summary

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Design Component	Status	Date of Final	Designer
Conceptual Design	FINAL	6/15/13	CME
Discharge Calculations	FINAL	3/6/13	SGG
Sediment Regime	FINAL	3/21/13	SGG
Section Design	FINAL	3/21/13	SGG
Typical Section Dimensions	FINAL	6/15/13	CME
Plan/Profile Measurements	DRAFT	6/15/13	CME
Morphologic Design Table	FINAL	3/5/13	SGG
Structure Dimensions	DRAFT		
Competence Calculations	FINAL	3/21/13	SGG
Design Slopes	DRAFT		
HEC-RAS	FINAL	3/18/13	SGG
Sediment Transport	FINAL	3/18/13	SGG
Transition Reach Design	DRAFT		
Supplemental Bed Material	DRAFT		
Credit Calculations	FINAL	6/18/13	MMF

Conceptual Design

Estimated Channel Values from Regional Curves

Design Status

FINAL
6/15/13
CME

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Hydro-Physio Province: NC Piedmont

Regional Curve Equations

	Coefficient	Exponent	
W_{BKF}:	11.89	0.43	(Limited Data, Not Used in Calculations)
A_{BKF}:	21.43	0.68	(Limited Data, Not Used in Calculations)
d_{MEAN}:	1.5	0.32	
Q_{BKF}:	89.04	0.72	
W_{BED}:	12	0.45	
d_{MAX}:	1.5	0.27	

Approximate Equations

	Coefficient	Exponent	
W_{BKF}:	8.29	0.45	(Used in Calculations)
d_{MAX}:	2.1	0.32	(Used in Calculations)

Reach	Estimated Dimensions from Regional Curves								
	Drain. Area (mi^2)	W_{BKF} (ft)	A_{BKF} (ft^2)	d_{MEAN} (ft)	W_{BED} (ft)	d_{MAX} (ft)	Pool Spacing (ft)	Rc (ft)	Tangent Length (ft)
Thompson Creek 1A	0.11	4.6	4.8	0.7	3.0	1.0	23	9	9
Thompson Creek 1B	0.11	4.6	4.8	0.7	3.0	1.0	23	9	9
Thompson Creek 2	0.14	5.1	5.6	0.8	3.4	1.1	26	10	10
Thompson Creek 3	0.16	5.4	6.2	0.8	3.6	1.2	27	11	11
Dale Branch 1	0.03	2.6	2.0	0.5	1.7	0.7	13	5	5
Dale Branch 2A	0.04	3.0	2.4	0.5	1.9	0.7	15	6	6
Dale Branch 2B	0.04	3.0	2.4	0.5	1.9	0.7	15	6	6
Dale Branch 2C	0.04	3.0	2.4	0.5	1.9	0.7	15	6	6
Dale Branch 2D	0.04	3.0	2.4	0.5	1.9	0.7	15	6	6
Dale Branch 2E	0.04	3.0	2.4	0.5	1.9	0.7	15	6	6
Dale Branch 3	0.05	3.3	2.8	0.6	2.1	0.8	16	7	7
Dale Branch 4	0.08	4.0	3.8	0.7	2.6	0.9	20	8	8
Dale Branch 5A	0.09	4.2	4.2	0.7	2.8	1.0	21	8	8
Dale Branch 5B	0.09	4.2	4.2	0.7	2.8	1.0	21	8	8
Dale Branch 5C	0.09	4.2	4.2	0.7	2.8	1.0	21	8	8
Jerry Branch 1	0.07	3.8	3.5	0.6	2.5	0.9	19	8	8
Jerry Branch 2	0.12	4.8	5.1	0.8	3.2	1.1	24	10	10
Jerry Branch 3	0.13	4.9	5.4	0.8	3.3	1.1	25	10	10
Hudson Branch 1	0.03	2.6	2.0	0.5	1.7	0.7	13	5	5

Reach Locations

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Reach	Existing Thalweg Stationing		Proposed Design Stationing		Description
	Begin	End	Begin	End	
Thompson Creek 1A	100+00	102+50	100+00	102+50	U/s of Dam
Thompson Creek 1B	102+50	105+10	102+50	105+11	U/s of Dam
Thompson Creek 2	105+10	116+50	105+11	115+64	Dam to Ford
Thompson Creek 3	116+50	118+50	115+64	118+13	D/s of Ford
Dale Branch 1	200+00	205+33	200+00	203+75	Enhancement U/s of Pond
Dale Branch 2A	200+00	205+33	203+75	205+00	Transition out of pond
Dale Branch 2B			205+00	206+40	D/s of pond to bedrock transition
Dale Branch 2C			206+40	207+50	Bedrock Transition
Dale Branch 2D			207+50	211+15	Fr BR Transition to pipe transition
Dale Branch 2E			211+15	213+50	Transition to and out of u/s pipe
Dale Branch 3	205+33	211+01	213+50	219+00	Pipe Crossing to draw on right
Dale Branch 4	211+01	219+25	219+00	227+25	Draw on right to pipe transition
Dale Branch 5A	219+25	221+87	227+25	229+70	Transition to and out of d/s pipe
Dale Branch 5B	221+87	226+46	229+70	232+85	D/s of pipe to transition to Clarks Cr
Dale Branch 5C			232+85	234+50	Transition to Clarks Cr
Jerry Branch 1	300+00	304+50	300+00	304+35	U/s of Hudson
Jerry Branch 2	304+50	311+20	304+35	310+60	Hudson to Reference Section
Jerry Branch 3	311+20	317+18	310+60	317+30	D/s of Reference Section
Hudson Branch 1	400+00	403+58		403+58	

Discharge Calculations

Estimated Values from Regional Regression Equations

Design Status
FINAL
3/6/13
SGG

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Regional Regression Equations

Event	Coefficient	Exponent	Include
Bankfull	89.04	0.72	✓
2-yr	135	0.702	✓
5-yr	242	0.677	✓
10-yr	334	0.662	✓
25-yr	476	0.645	✓
50-yr	602	0.635	✓
100-yr	745	0.625	✓
200-yr	908	0.616	
500-yr	1160	0.605	

Estimated Discharges

Reach	Drainage Area (mi^2)	Bankfull (cfs)	2-yr (cfs)	5-yr (cfs)	10-yr (cfs)	25-yr (cfs)	50-yr (cfs)	100-yr (cfs)		
Thompson Creek 1A	0.11	18	29	54	77	115	148	188		
Thompson Creek 1B	0.11	18	29	54	77	115	148	188		
Thompson Creek 2	0.14	22	34	64	91	134	173	218		
Thompson Creek 3	0.16	24	37	70	99	146	188	237		
Dale Branch 1	0.03	7	12	23	33	50	65	83		
Dale Branch 2A	0.04	9	14	27	40	60	78	100		
Dale Branch 2B	0.04	9	14	27	40	60	78	100		
Dale Branch 2C	0.04	9	14	27	40	60	78	100		
Dale Branch 2D	0.04	9	14	27	40	60	78	100		
Dale Branch 2E	0.04	9	14	27	40	60	78	100		
Dale Branch 3	0.05	10	16	32	46	69	90	115		
Dale Branch 4	0.08	14	23	44	63	93	121	154		
Dale Branch 5A	0.09	16	25	47	68	101	130	165		
Dale Branch 5B	0.09	16	25	47	68	101	130	165		
Dale Branch 5C	0.09	16	25	47	68	101	130	165		
Jerry Branch 1	0.07	13	21	40	57	86	111	141		
Jerry Branch 2	0.12	19	30	58	82	121	157	198		
Jerry Branch 3	0.13	20	32	61	87	128	165	208		
Hudson Branch 1	0.03	7	12	23	33	50	65	83		

Sediment Regime

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Design Status
FINAL
3/21/13
SGG

Reach	Thompson Creek	Dale Branch	Jerry Branch	Upstream Adjacent Forecast (Thompsn)	Upstream Extended Forecast (Thompsn)	Upstream Adjacent Forecast (Dale)	Upstream Extended Forecast (Dale)
Bed Material Nature							
Depth of Bed Probe (ft)	< 0.1	0.1	< 0.1	No	< 0.1	0.1	0.1
Matrix Bonding	Loose	Loose	Loose	Data	Loose	Loose	Loose
Parent Material Exposure	Yes	Yes	Yes	Available	No	Yes	Yes
Well Graded	No	No	No	(Pond)	No	No	No
Depositional Patterns							
Point Bars	Minimal	Minimal	Minimal		None	Minimal	Minimal
Mid-channel Bars	Minimal	Moderate	None		None	Moderate	Moderate
Side-channel Bars	None	None	None		None	None	None
Diagonal Bars	None	None	None		None	None	None
Bar Length/W_{BED}	2	2	1.5		None	2	2
Dune Presentation of Bars	None	None	None		None	None	None
Channel Branching	None	None	None		None	None	None
Tributary Deltas	None	None	None		None	None	None
Dune Length/Height (ft)	None	None	None		None	None	None
Ripple Length/Height (ft)	None	None	None		None	None	None
Sediment Measurements							
Pebble Count (Riffle) % Sand	9%	14%	11%				
Pebble Count (Riffle) D_{50}	8	6	6				
Pebble Count (Riffle) D_{84}	15	11	13				
Pebble Count (Riffle) D_{95}	24	15	22				
Pebble Count (Reach) % Sand							
Pebble Count (Reach) D_{50}							
Pebble Count (Reach) D_{84}							
Pebble Count (Reach) D_{95}							
Bar Sample % Sand	19%		25%				
Bar Sample D_{50}	7		6				
Bar Sample D_{84}	14		13				
Bar Sample D_{95}	24		21				
Bar Sample D_{MAX}	37		32				
Bed Sample % Sand	9%	14%	11%				
Bed Sample D_{50}	8	6	6				
Bed Sample D_{84}	15	11	13				
Bed Sample D_{95}	24	15	22				
Sediment Regime							
Sediment Load	Mod. Low	Mod. Low	Mod. Low		Low	Mod. Low	Mod. Low
Sediment Mobility	Moderate	Moderate	Moderate		Moderate	Moderate	Moderate

Sediment Regime

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

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SGG

Reach	Upstream Adjacent Forecast (Jerry)	Upstream Extended Forecast (Jerry)	Dale Bed Surface Sample	West Slope Dale Valley	Coarse Bed Sample (Thompsn)	Test Pit Sample (Dale)	Aggregate Source Sample (Jerry)
Bed Material Nature							
Depth of Bed Probe (ft)	< 0.1	< 0.1					
Matrix Bonding	Loose	Loose					
Parent Material Exposure	Yes	Yes					
Well Graded	No	No					
Depositional Patterns							
Point Bars	Minimal	Minimal					
Mid-channel Bars	None	None					
Side-channel Bars	None	None					
Diagonal Bars	None	None					
Bar Length/W_{BED}	1.5	1.5					
Dune Presentation of Bars	None	None					
Channel Branching	None	None					
Tributary Deltas	None	None					
Dune Length/Height (ft)	None	None					
Ripple Length/Height (ft)	None	None					
Sediment Measurements							
Pebble Count (Riffle) % Sand			21%		3%		1%
D_{50}			7	7	54		43
D_{84}			15	15	140		78
D_{95}			20	21	150		87
Pebble Count (Reach) % Sand							
D_{50}							
D_{84}							
D_{95}							
Bar Sample % Sand						31%	
D_{50}						5	
D_{84}						8	
D_{95}						13	
D_{MAX}						16	
Bed Sample % Sand			21%		3%		1%
D_{50}			7	7	54		43
D_{84}			15	15	140		78
D_{95}			20	21	150		87
Sediment Regime							
Sediment Load	Mod. Low	Mod. Low					
Sediment Mobility	Moderate	Moderate					

Design Section 1

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Design Status

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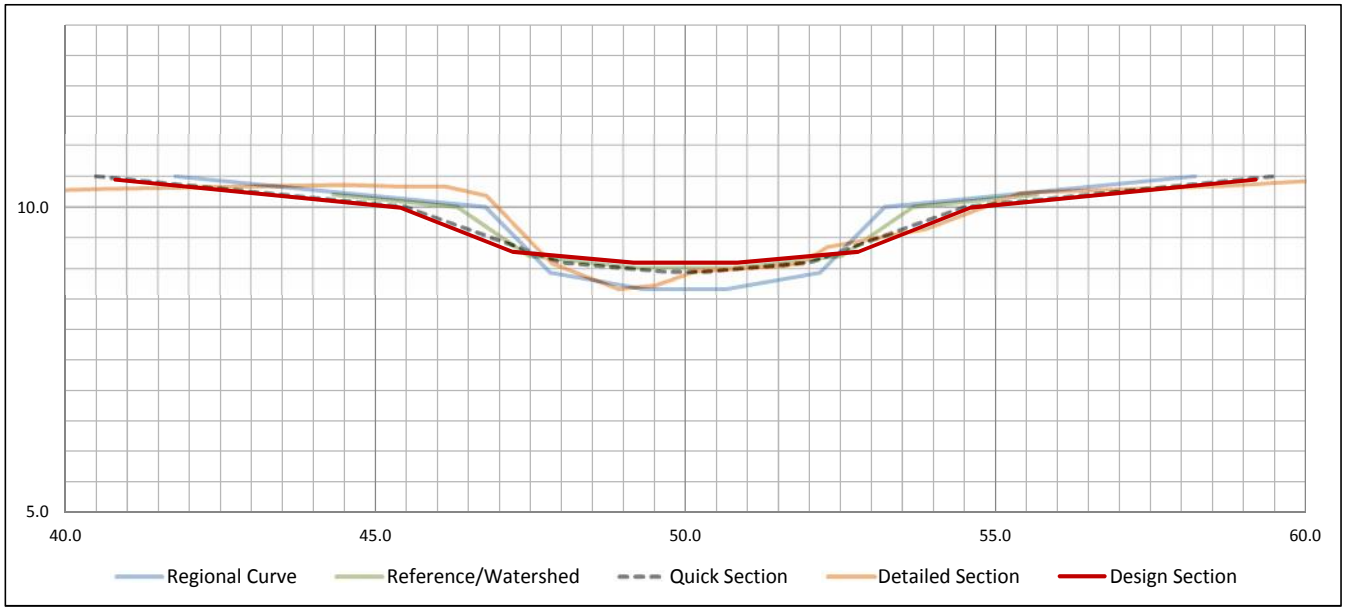

Design Section

	Coef	Exp
W_{BED}	10.60	0.45
d_{MAX}	1.33	0.27
Bank Slope	2.5	(H:1)
Thalweg Ratio	0.3	
Toe Depth Ratio	0.8	
Bench Width Ratio	0.5	
Bench Slope	10	(H:1)
Drainage Area	0.24	(sq. mi.)

Point of Comparison
Thompson Creek Downstream of Site

Section Comparisons

	Regional Curve	Ref/ Wtrshed	Quick Section	Detailed Section	Design Section
W_{BKF}	6.4	7.3	9.0	8.6	9.2
	143%	125%	102%	107%	
W_{BED}	4.3	5.1	4.0		5.6
	129%	110%	139%		
W_{THL}	1.3	1.5	0.6		1.7
	129%	110%	279%		
d_{MAX}	1.3	1.0	1.1	1.5	0.9
	68%	92%	86%	60%	
d_{TOE}	1.1	0.8	0.9		0.7
	68%	92%	80%		
A_{BKF}	8.1	5.7	6.2	7.6	6.0
	74%	106%	97%	79%	
d_{MEAN}	1.26	0.77	0.69	0.88	0.65
	52%	84%	95%	74%	
P	7.4	7.9	9.3	9.7	9.5
	129%	121%	102%	98%	
Hydr. R	1.10	0.72	0.66	0.78	0.63
	57%	87%	95%	81%	
W/d Ratio	5.1	9.5	13.1	9.8	14.1
	276%	148%	108%	144%	

Design Section 2

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Design Status

FINAL
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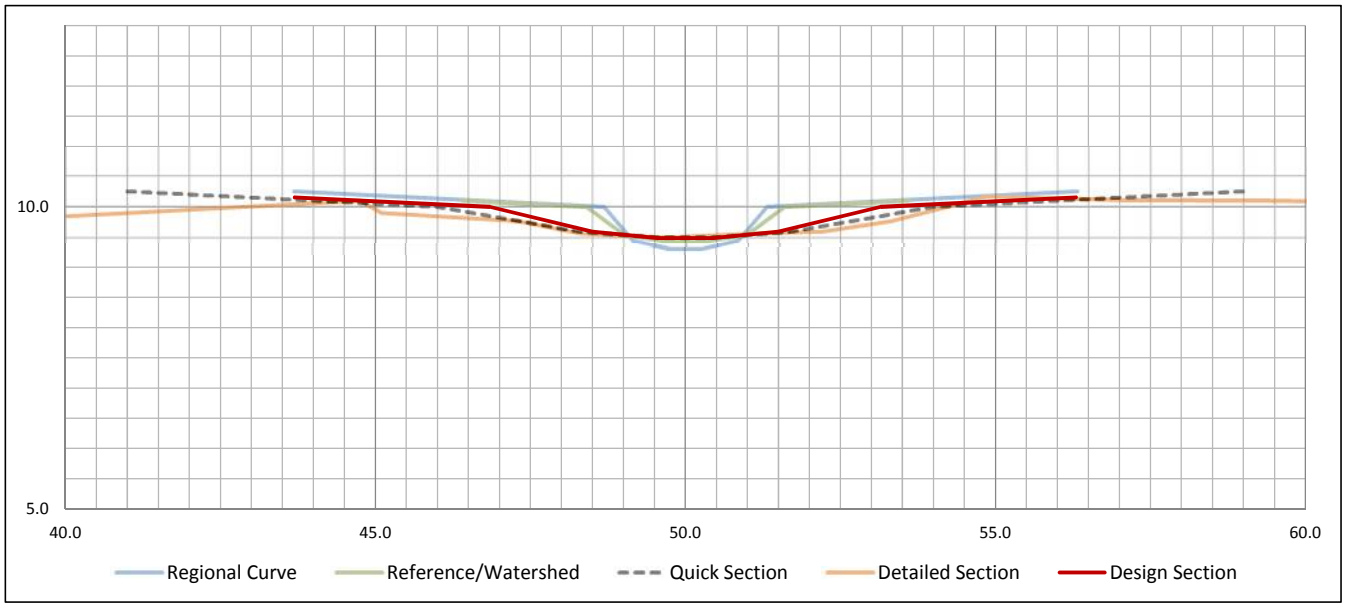
SGG



Design Section

	Coef	Exp
W_{BED}	7.20	0.25
d_{MAX}	1.33	0.27
Bank Slope	4.0	(H:1)
Thalweg Ratio	0.3	
Toe Depth Ratio	0.8	
Bench Width Ratio	0.5	
Bench Slope	20	(H:1)
Drainage Area	0.03	(sq. mi.)

Point of Comparison
Upstream of Dale Branch

Section Comparisons

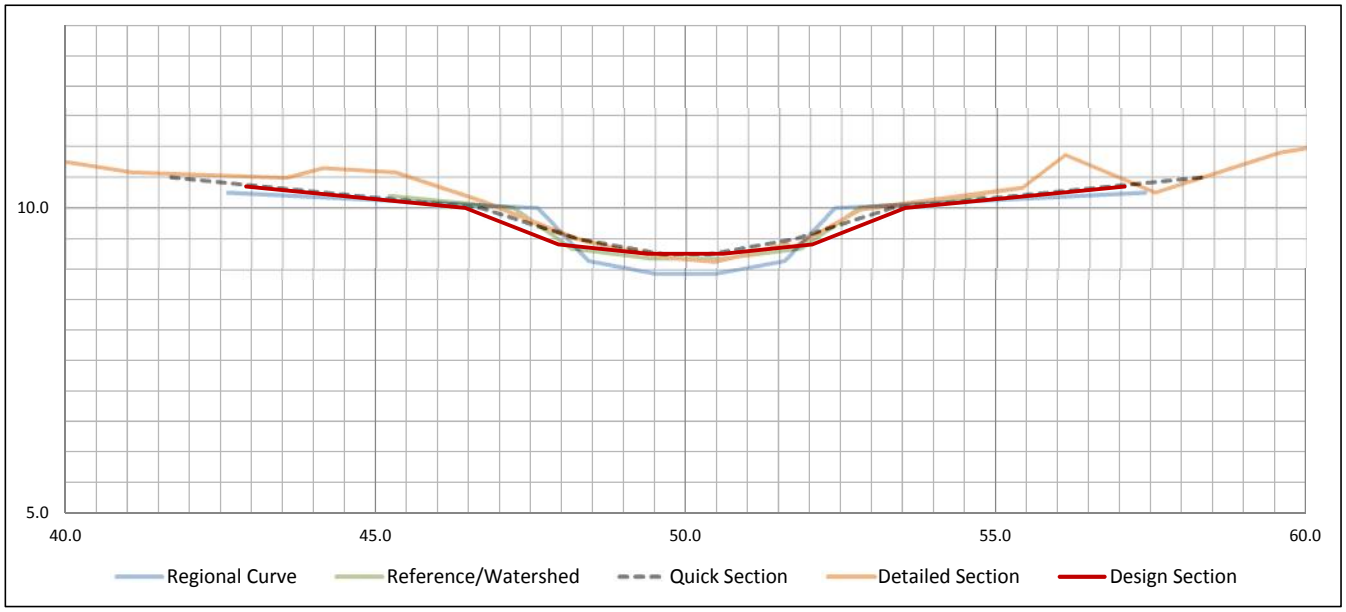
	Regional Curve	Ref/ Wtrshed	Quick Section	Detailed Section	Design Section
W_{BKF}	2.6	3.2	8.0	10.1	6.3
	239%	197%	79%	62%	
W_{BED}	1.7	2.0	3.4		3.0
	177%	151%	88%		
W_{THL}	0.5	0.6	0.8		0.9
	177%	151%	112%		
d_{MAX}	0.7	0.6	0.5	0.6	0.5
	75%	92%	103%	87%	
d_{TOE}	0.5	0.5	0.4		0.4
	75%	92%	103%		
A_{BKF}	2.0	1.4	2.5	3.8	2.1
	107%	153%	85%	55%	
d_{MEAN}	0.75	0.43	0.31	0.38	0.34
	45%	78%	108%	89%	
P	3.2	3.5	8.1	12.5	6.4
	203%	183%	79%	51%	
Hydr. R	0.62	0.39	0.31	0.31	0.33
	53%	84%	107%	108%	
W/d Ratio	3.5	7.4	25.7	26.7	18.7
	533%	253%	73%	70%	

Design Section 3

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Design Status

FINAL
3/21/13
SGG



Design Section

	Coef	Exp
W_{BED}	10.60	0.45
d_{MAX}	1.33	0.27
Bank Slope	2.5	(H:1)
Thalweg Ratio	0.3	
Toe Depth Ratio	0.8	
Bench Width Ratio	0.5	
Bench Slope	10	(H:1)
Drainage Area	0.12	(sq. mi.)

Point of Comparison
Jerry Branch On-site Reference

Section Comparisons

	Regional Curve	Ref/ Wtrshed	Quick Section	Detailed Section	Design Section
W_{BKF}	4.8	5.6	6.6	4.6	7.1
	148%	127%	107%	154%	
W_{BED}	3.2	3.7	3.5		4.1
	129%	110%	117%		
W_{THL}	1.0	1.1	0.7		1.2
	129%	110%	175%		
d_{MAX}	1.1	0.8	0.8	0.9	0.8
	70%	92%	100%	88%	
d_{TOE}	0.9	0.7	0.5		0.6
	70%	92%	120%		
A_{BKF}	5.1	3.5	3.1	2.4	3.7
	74%	106%	123%	154%	
d_{MEAN}	1.06	0.64	0.46	0.53	0.53
	50%	83%	115%	100%	
P	5.6	6.0	6.8	7.7	7.3
	132%	122%	108%	95%	
Hydr. R	0.91	0.59	0.45	0.31	0.51
	56%	87%	114%	163%	
W/d Ratio	4.5	8.7	14.3	8.7	13.4
	297%	153%	94%	154%	

Typical Section Dimensions

Design Status

FINAL
6/15/13
CME

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Reach	Drainage Area (mi^2)	Design Section	W_{BKF}	W_{BED}	W_{THAL}	W_{BENCH}	d_{MAX}	d_{TOE}	Bank Slope (H:1)
Thompson Creek 1A	0.11	2	8.8	4.1	1.2	4	0.73	0.59	4
Thompson Creek 1B	0.11	2	8.8	4.1	1.2	4	0.73	0.59	4
Thompson Creek 2	0.14	1	7.5	4.4	1.3	4	0.78	0.63	2.5
Thompson Creek 3	0.16	1	7.9	4.6	1.4	4	0.81	0.65	2.5
Dale Branch 1	0.03	2	6.3	3.0	0.9	3	0.52	0.41	4
Dale Branch 2A	0.04	1	4.7	2.5	0.7	2	0.56	0.45	2.5
Dale Branch 2B	0.04	2	6.8	3.2	1.0	3	0.56	0.45	4
Dale Branch 2C	0.04	1	4.7	2.5	0.7	2	0.56	0.45	2.5
Dale Branch 2D	0.04	2	6.8	3.2	1.0	3	0.56	0.45	4
Dale Branch 2E	0.04	1	4.7	2.5	0.7	2	0.56	0.45	2.5
Dale Branch 3	0.05	2	7.2	3.4	1.0	4	0.59	0.47	4
Dale Branch 4	0.08	1	6.1	3.4	1.0	3	0.67	0.54	2.5
Dale Branch 5A	0.09	1	6.4	3.6	1.1	3	0.69	0.56	2.5
Dale Branch 5B	0.09	1	6.4	3.6	1.1	3	0.69	0.56	2.5
Dale Branch 5C	0.09	1	6.4	3.6	1.1	3	0.69	0.56	2.5
Jerry Branch 1	0.07	2	7.9	3.7	1.1	4	0.65	0.52	4
Jerry Branch 2	0.12	1	7.1	4.1	1.2	4	0.75	0.60	2.5
Jerry Branch 3	0.13	1	7.3	4.2	1.3	4	0.77	0.61	2.5
Hudson Branch 1	0.03	2	6.3	3.0	0.9	3	0.52	0.41	4

Reach	Pool Dimensions				
	Width Ratio	W_{IN}	W_{OUT}	d_{POOL}/d_{MAX} Ratio	d_{POOL}
Thompson Creek 1A	1.1	5.3	4.4	1.5	1.10
Thompson Creek 1B	1.1	5.3	4.4	1.5	1.10
Thompson Creek 2	1.1	4.5	3.8	1.5	1.17
Thompson Creek 3	1.1	4.7	3.9	1.5	1.22
Dale Branch 1	1.1	3.8	3.1	1.5	0.77
Dale Branch 2A	1.1	2.8	2.4	1.5	0.84
Dale Branch 2B	1.1	4.1	3.4	1.5	0.84
Dale Branch 2C	1.1	2.8	2.4	1.5	0.84
Dale Branch 2D	1.1	4.1	3.4	1.5	0.84
Dale Branch 2E	1.1	2.8	2.4	1.5	0.84
Dale Branch 3	1.1	4.3	3.6	1.5	0.89
Dale Branch 4	1.1	3.7	3.0	1.5	1.01
Dale Branch 5A	1.1	3.8	3.2	1.5	1.04
Dale Branch 5B	1.1	3.8	3.2	1.5	1.04
Dale Branch 5C	1.1	3.8	3.2	1.5	1.04
Jerry Branch 1	1.1	4.7	3.9	1.5	0.97
Jerry Branch 2	1.1	4.3	3.5	1.5	1.13
Jerry Branch 3	1.1	4.4	3.6	1.5	1.15
Hudson Branch 1	1.1	3.8	3.1	1.5	0.77

Hydraulic Dimensions

Design Status

FINAL
3/5/13
SGG

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Reach	Stream Type	A_{BKF}	P_{WET}	R_{HYD}	d_{MEAN}	W/D Ratio	Entrench Ratio
Thompson Creek 1A	Bc	4.2	9.0	0.5	0.5	18.6	4.5
Thompson Creek 1B	Bc	4.2	9.0	0.47	0.48	18.6	3.4
Thompson Creek 2	Bc	4.2	7.8	0.54	0.55	13.5	4.0
Thompson Creek 3	Bc	4.6	8.2	0.56	0.58	13.7	3.2
Dale Branch 1	Bc	2.1	6.4	0.33	0.34	18.7	5.6
Dale Branch 2A	Bc	1.8	4.9	0.36	0.38	12.5	2.5
Dale Branch 2B	Bc	2.5	6.9	0.36	0.36	18.7	2.4
Dale Branch 2C	Bc	1.8	4.9	0.36	0.38	12.5	2.5
Dale Branch 2D	Bc	2.5	6.9	0.36	0.36	18.7	2.7
Dale Branch 2E	Bc	1.8	4.9	0.36	0.38	12.5	3.0
Dale Branch 3	Bc	2.8	7.3	0.38	0.39	18.7	4.2
Dale Branch 4	Bc	2.9	6.3	0.45	0.47	13.0	4.1
Dale Branch 5A	Bc	3.1	6.6	0.47	0.49	13.1	2.4
Dale Branch 5B	C	3.1	6.6	0.47	0.49	13.1	3.1
Dale Branch 5C	Bc	3.1	6.6	0.47	0.49	13.1	1.9
Jerry Branch 1	Bc	3.3	8.0	0.41	0.42	18.6	2.5
Jerry Branch 2	Bc	3.7	7.3	0.51	0.53	13.4	3.5
Jerry Branch 3	Bc	4.0	7.6	0.52	0.54	13.5	3.4
Hudson Branch 1	Bc	2.1	6.4	0.33	0.34	18.7	4.8

Morphologic Dimensions

Reach	Pool Spacing/W_{AVG}			Pool Spacing				Belt Width	
	min	target	max	min	target	max	min	target	max
Thompson Creek 1A	3.3	4.4	5.5	21.4	**28.6**	35.7	9.7	**13.0**	16.2
Thompson Creek 1B	3.3	4.4	5.5	21.4	**28.6**	35.7	9.7	**13.0**	16.2
Thompson Creek 2	3.3	4.4	5.5	19.6	**26.2**	32.7	8.9	**11.9**	14.9
Thompson Creek 3	2.9	3.9	4.9	18.3	**24.4**	30.4	9.4	**12.5**	15.7
Dale Branch 1	3.3	4.4	5.5	15.4	**20.5**	25.6	7.0	**9.3**	11.6
Dale Branch 2A	3.7	5.0	6.2	13.5	**17.9**	22.4	5.4	**7.2**	9.0
Dale Branch 2B	3.1	4.1	5.2	15.5	**20.7**	25.9	7.5	**10.0**	12.5
Dale Branch 2C	2.4	3.2	4.0	8.7	**11.6**	14.4	5.4	**7.2**	9.0
Dale Branch 2D	3.1	4.1	5.2	15.5	**20.7**	25.9	7.5	**10.0**	12.5
Dale Branch 2E	2.7	3.6	4.6	9.9	**13.1**	16.4	5.4	**7.2**	9.0
Dale Branch 3	3.1	4.1	5.2	16.4	**21.9**	27.4	8.0	**10.6**	13.3
Dale Branch 4	3.1	4.1	5.2	14.7	**19.6**	24.6	7.1	**9.5**	11.9
Dale Branch 5A	2.9	3.9	4.9	14.5	**19.3**	24.2	7.5	**10.0**	12.4
Dale Branch 5B	5.0	6.0	7.0	24.9	**29.9**	34.8	10.0	**19.9**	24.9
Dale Branch 5C	2.1	2.8	3.5	10.5	**14.0**	17.5	7.5	**10.0**	12.4
Jerry Branch 1	2.9	3.9	4.9	16.8	**22.5**	28.1	8.7	**11.6**	14.4
Jerry Branch 2	2.9	3.9	4.9	16.3	**21.7**	27.1	8.4	**11.2**	14.0
Jerry Branch 3	3.1	4.1	5.2	17.9	**23.9**	29.8	8.6	**11.5**	14.4
Hudson Branch 1	2.6	3.4	4.3	11.9	**15.9**	19.9	7.0	**9.3**	11.6

Morphologic Dimensions

Design Status

DRAFT
6/15/13
CME

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Reach	R_C/W_{AVG}		Radius of Curvature		S_{AVG}	S_{VALLEY}	Sinuosity	Meander Width Ratio
	min	max	min	max				
Thompson Creek 1A	2.0	3.0	13	19	0.007	0.018	1.1	3
Thompson Creek 1B	2.0	3.0	13	19	0.030	0.032	1.0	3
Thompson Creek 2	2.0	3.0	12	18	0.022	0.024	1.1	3
Thompson Creek 3	2.0	3.0	13	19	0.023	0.028	1.2	3
Dale Branch 1	2.0	3.0	9	14	0.039	0.023	1.1	4
Dale Branch 2A	2.0	3.0	7	11	0.120	0.100	1.1	3
Dale Branch 2B	2.0	3.0	10	15	0.029	0.016	1.1	4
Dale Branch 2C	2.0	3.0	7	11	0.045	0.036	1.0	3
Dale Branch 2D	2.0	3.0	10	15	0.042	0.031	1.0	3
Dale Branch 2E	2.0	3.0	7	11	0.040	0.027	1.1	2
Dale Branch 3	2.0	3.0	11	16	0.027	0.025	1.0	2
Dale Branch 4	2.0	3.0	9	14	0.028	0.028	1.0	2
Dale Branch 5A	2.0	3.0	10	15	0.050	0.029	1.0	2
Dale Branch 5B	1.5	2.5	7	12	0.023	0.023	1.0	2
Dale Branch 5C	2.0	3.0	10	15	0.043	0.041	1.0	2
Jerry Branch 1	2.0	3.0	12	17	0.037	0.031	1.0	2
Jerry Branch 2	2.0	3.0	11	17	0.024	0.028	1.1	2
Jerry Branch 3	2.0	3.0	12	17	0.024	0.019	1.0	2
Hudson Branch 1	2.0	3.0	9	14	0.012	0.050	1.1	2

Reach	Percent Tangent	Percent Curve	Feature Length					
			Minimum		Target		Maximum	
			Tangent	Curve	Tangent	Curve	Tangent	Curve
Thompson Creek 1A	60%	40%	12.9	8.6	17	11	21	14
Thompson Creek 1B	60%	40%	12.9	8.6	17	11	21	14
Thompson Creek 2	60%	40%	11.8	7.8	16	10	20	13
Thompson Creek 3	65%	35%	11.9	6.4	16	9	20	11
Dale Branch 1	60%	40%	9.2	6.1	12	8	15	10
Dale Branch 2A	55%	45%	7.4	6.1	10	8	12	10
Dale Branch 2B	60%	40%	9.3	6.2	12	8	16	10
Dale Branch 2C	65%	35%	5.6	3.0	8	4	9	5
Dale Branch 2D	60%	40%	9.3	6.2	12	8	16	10
Dale Branch 2E	65%	35%	6.4	3.4	9	5	11	6
Dale Branch 3	60%	40%	9.9	6.6	13	9	16	11
Dale Branch 4	60%	40%	8.8	5.9	12	8	15	10
Dale Branch 5A	65%	35%	9.4	5.1	13	7	16	8
Dale Branch 5B	55%	45%	13.7	11.2	16	13	19	16
Dale Branch 5C	65%	35%	6.8	3.7	9	5	11	6
Jerry Branch 1	65%	35%	10.9	5.9	15	8	18	10
Jerry Branch 2	65%	35%	10.6	5.7	14	8	18	9
Jerry Branch 3	60%	40%	10.7	7.2	14	10	18	12
Hudson Branch 1	65%	35%	7.7	4.2	10	6	13	7

Structure Dimensions

Design Status

DRAFT

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Reach	Arm Length (L)	Throat Width (W)	Buried Length (X)	Total Log Length	Boulder Size		
					Length	Width	Depth
Thompson Creek 1A	7.0	3.0	3	13	3	2	1
Thompson Creek 1B	7.0	3.0	3	13	3	2	2
Thompson Creek 2	7.0	3.0	3	13	3	2	2
Thompson Creek 3	7.0	3.0	3	13	3	2	2
Dale Branch 1	5.0	2.0	3	11	3	2	2
Dale Branch 2A	4.0	2.0	3	10	3	2	2
Dale Branch 2B	5.0	2.0	3	11	3	2	2
Dale Branch 2C	4.0	2.0	3	10	3	2	2
Dale Branch 2D	5.0	2.0	3	11	3	2	2
Dale Branch 2E	4.0	2.0	3	10	3	2	2
Dale Branch 3	5.0	2.0	3	11	3	2	2
Dale Branch 4	5.0	2.0	3	11	3	2	2
Dale Branch 5A	6.0	2.0	3	12	3	2	2
Dale Branch 5B	6.0	2.0	3	12	3	2	2
Dale Branch 5C	6.0	2.0	3	12	3	2	2
Jerry Branch 1	6.0	3.0	3	12	3	2	2
Jerry Branch 2	7.0	2.0	3	13	3	2	2
Jerry Branch 3	7.0	2.0	3	13	3	2	2
Hudson Branch 1	5.0	2.0	3	11	3	2	1

Competence Calculations

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Design Status
FINAL
3/21/13
SGG

Reach	Hydraulic Radius (ft)	Largest Particle Calculations				Representative Particle Calculations			
		τ*	γ_s	D_{MAX} (mm)	S (ft/ft)	τ*	γ_s	D_{50} (mm)	S (ft/ft)
Thompson Creek 1A	0.47	0.009	1.65	32	0.0033	0.035	1.65	6	0.0024
Thompson Creek 1B	0.47	0.010	1.65	37	0.0043	0.032	1.65	25	0.0093
Thompson Creek 2	0.54	0.010	1.65	37	0.0037	0.032	1.65	25	0.0081
Thompson Creek 3	0.56	0.009	1.65	32	0.0028	0.035	1.65	6	0.0020
Dale Branch 1	0.33	0.009	1.65	32	0.0047	0.035	1.65	6	0.0034
Dale Branch 2A	0.36	0.009	1.65	32	0.0043	0.035	1.65	6	0.0031
Dale Branch 2B	0.36	0.009	1.65	32	0.0044	0.035	1.65	6	0.0032
Dale Branch 2C	0.36	0.009	1.65	32	0.0043	0.035	1.65	6	0.0031
Dale Branch 2D	0.36	0.009	1.65	32	0.0044	0.035	1.65	6	0.0032
Dale Branch 2E	0.36	0.009	1.65	32	0.0043	0.035	1.65	6	0.0031
Dale Branch 3	0.38	0.009	1.65	32	0.0041	0.035	1.65	6	0.0030
Dale Branch 4	0.45	0.009	1.65	32	0.0035	0.035	1.65	6	0.0025
Dale Branch 5A	0.47	0.009	1.65	32	0.0033	0.035	1.65	6	0.0024
Dale Branch 5B	0.47	0.009	1.65	32	0.0033	0.035	1.65	6	0.0024
Dale Branch 5C	0.47	0.009	1.65	32	0.0033	0.035	1.65	6	0.0024
Jerry Branch 1	0.41	0.009	1.65	32	0.0038	0.035	1.65	6	0.0027
Jerry Branch 2	0.51	0.009	1.65	32	0.0030	0.035	1.65	6	0.0022
Jerry Branch 3	0.52	0.009	1.65	32	0.0030	0.035	1.65	6	0.0022
Hudson Branch 1	0.33	0.009	1.65	32	0.0047	0.035	1.65	6	0.0034

Reach	Calculation Method	Sediment Load	Percent Calculated Slope		Design Slope Range (ft/ft)		
			Min	Max			
Thompson Creek 1A	Representative Particle	Low	80%	100%	0.0019	to	0.0024
Thompson Creek 1B	Representative Particle	Low	80%	100%	0.0074	to	0.0093
Thompson Creek 2	Representative Particle	Low	80%	100%	0.0065	to	0.0081
Thompson Creek 3	Representative Particle	Low	80%	100%	0.0016	to	0.0020
Dale Branch 1	Representative Particle	Low	80%	100%	0.0028	to	0.0034
Dale Branch 2A	Representative Particle	Low	80%	100%	0.0025	to	0.0031
Dale Branch 2B	Representative Particle	Low	80%	100%	0.0025	to	0.0032
Dale Branch 2C	Representative Particle	Low	80%	100%	0.0025	to	0.0031
Dale Branch 2D	Representative Particle	Low	80%	100%	0.0025	to	0.0032
Dale Branch 2E	Representative Particle	Low	80%	100%	0.0025	to	0.0031
Dale Branch 3	Representative Particle	Low	80%	100%	0.0024	to	0.0030
Dale Branch 4	Representative Particle	Low	80%	100%	0.0020	to	0.0025
Dale Branch 5A	Representative Particle	Low	80%	100%	0.0019	to	0.0024
Dale Branch 5B	Representative Particle	Low	80%	100%	0.0019	to	0.0024
Dale Branch 5C	Representative Particle	Low	80%	100%	0.0019	to	0.0024
Jerry Branch 1	Representative Particle	Low	80%	100%	0.0022	to	0.0027
Jerry Branch 2	Representative Particle	Low	80%	100%	0.0018	to	0.0022
Jerry Branch 3	Representative Particle	Low	80%	100%	0.0017	to	0.0022
Hudson Branch 1	Representative Particle	Low	80%	100%	0.0028	to	0.0034

Transition Reach Design

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Design Status
DRAFT

Reach	Location	Bankfull d_{MAX}	Design Depth (ft)	Critical Shear τ*	Transition Slope (ft/ft)	Shear Stress τ	Design Size (in)	Armor Stone Size
Thompson Creek 2	105+50	0.78	1.17	0.04	0.05	3.66	10.7	12 in Stone
Thompson Creek 2	106+40	0.78	0.78	0.04	0.01	0.39	1.1	6 in Stone
Thompson Creek 2	115+57	0.78	0.78	0.04	0.04	2.05	6.0	6 in Stone
Thompson Creek 2	115+57	0.78	1.56	0.04	0.04	4.10	11.9	12 in Stone
Dale Branch 1	203+50	0.52	0.52	0.04	0.08	2.42	7.0	12 in Stone
Dale Branch 1	203+50	0.52	0.77	0.04	0.08	3.62	10.6	12 in Stone
Dale Branch 3	219+00	0.59	0.59	0.04	0.05	1.85	5.4	6 in Stone
Dale Branch 3	219+00	0.59	1.01	0.04	0.05	3.14	9.2	12 in Stone
Dale Branch 4	220+70	0.67	0.67	0.04	0.05	2.10	6.1	12 in Stone
Dale Branch 4	220+70	0.67	1.21	0.04	0.05	3.78	11.0	12 in Stone
Dale Branch 4	222+25	0.67	0.67	0.04	0.05	2.10	6.1	12 in Stone
Dale Branch 4	225+00	0.67	1.28	0.04	0.05	3.99	11.6	12 in Stone
Jerry Branch 3	314+00	0.77	0.77	0.04	0.05	2.39	7.0	12 in Stone
Jerry Branch 3	314+00	0.77	1.30	0.04	0.05	4.07	11.8	12 in Stone

Supplemental Bed Material Design

Design Status

DRAFT

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Material Gradation Percentage of Total by Weight								
Material Size	Sand/Clay	ABC(M)	1/2" Stone (No. 57)	3/4" Stone (No. 5)	2" Stone (Surge)	6" Stone NCDOT (Class A)	12" Stone NCDOT (Class B)	18" Stone NCDOT (Class I)
Sand								
#16								
#10	100							
#8		12						
#4		9	2					
3/8"		9	3					
1/2"		16	12	2				
3/4"		16	25	3				
1"		13	48	32				
1.5"		12	7	58				
2"		13	3	5				
3"						19		
4"					50	19		
5"					50	19		
6"						19	19	13
8"						19	19	13
9"						5	19	14
10"							19	14
12"							19	14
14"							5	13
16"								14
18"								5
24"								
Total %	100	100	100	100	100	100	100	100

Supplemental Bed Material Design

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Design Status
DRAFT

Material Composition								
Reach	Sand/Clay	ABC(M)	1/2" Stone (No. 57)	3/4" Stone (No. 5)	2" Stone (Surge)	6" Stone NCDOT (Class A)	12" Stone NCDOT (Class B)	18" Stone NCDOT (Class I)
Thompson Creek 1A	40%	60%						
Thompson Creek 1B	10%			30%	30%	30%		
Thompson Creek 2	10%			30%	30%	30%		
Thompson Creek 3	40%	60%						
Dale Branch 1	40%	60%						
Dale Branch 2A	40%	60%						
Dale Branch 2B	40%	60%						
Dale Branch 2C	40%	60%						
Dale Branch 2D	40%	60%						
Dale Branch 2E	40%	60%						
Dale Branch 3	40%	60%						
Dale Branch 4	40%	60%						
Dale Branch 5A	40%	60%						
Dale Branch 5B	40%	60%						
Dale Branch 5C	40%	60%						
Jerry Branch 1	40%	60%						
Jerry Branch 2	40%	60%						
Jerry Branch 3	40%	60%						
Hudson Branch 1	40%	60%						

Design Size Distribution (mm)						
Reach	D_{16}	D_{35}	D_{50}	D_{65}	D_{84}	D_{95}
Thompson Creek 1A	2	2	4	12	24	43
Thompson Creek 1B	22	35	81	100	123	172
Thompson Creek 2	22	35	81	100	123	172
Thompson Creek 3	2	2	4	12	24	43
Dale Branch 1	2	2	4	12	24	43
Dale Branch 2A	2	2	4	12	24	43
Dale Branch 2B	2	2	4	12	24	43
Dale Branch 2C	2	2	4	12	24	43
Dale Branch 2D	2	2	4	12	24	43
Dale Branch 2E	2	2	4	12	24	43
Dale Branch 3	2	2	4	12	24	43
Dale Branch 4	2	2	4	12	24	43
Dale Branch 5A	2	2	4	12	24	43
Dale Branch 5B	2	2	4	12	24	43
Dale Branch 5C	2	2	4	12	24	43
Jerry Branch 1	2	2	4	12	24	43
Jerry Branch 2	2	2	4	12	24	43
Jerry Branch 3	2	2	4	12	24	43
Hudson Branch 1	2	2	4	12	24	43

Credit Calculations

Project: Pee Dee
Project No.: 1058-PDEE
Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

Credit Ratio Definition

Title	Approach	Credit Ratio
R	Restoration	1 : 1
EI	Enhancement I	1.5 : 1
EII	Enhancement II	2.5 : 1
P	Preservation	5 : 1
HQP	High Quality Pres.	5 : 1

Reach	Location	Existing	Proposed	Total Existing	Total Proposed	Approach	SMU
Thompson Creek 1A			250	0.0	250.0	EI	166.7
Thompson Creek 1B			261	0.0	261.0	R	261.0
Thompson Creek 2			1053	0.0	1053.0	R	1053.0
Thompson Creek 3	193' not enough buffer from pipe outlet			0.0	0.0	R	0.0
Dale Branch 1			375	0.0	375.0	EI	250.0
Dale Branch 2A			125	0.0	125.0	R	125.0
Dale Branch 2B			140	0.0	140.0	R	140.0
Dale Branch 2C			110	0.0	110.0	R	110.0
Dale Branch 2D			365	0.0	365.0	R	365.0
Dale Branch 2E	235'-subtracted 60'		175	0.0	175.0	R	175.0
			Subtotals:	0.0	2854.0		2645.7
			Totals:	**0.0**	**Below**		**Below**

FINAL
6/18/13
MMF

Component Totals

Approach	Title	Ft	SMU	Totals	
Restoration	R	Below	Below		
Enhancement I	EI	625.0	416.7	**Below**	
Enhancement II	EII	0.0	0.0		**Below**
Preservation	P	0.0	0.0	**0.0**	
High Quality Pres.	HQP	0.0	0.0		

Credit Calculations

Project: Pee Dee
Project No.: 1058-PDEE

Credit Ratio Definition

Title | Approach | Credit Ratio

Client: EBX
Contract No.: -
County/State: Montgomery Co., NC

R	Restoration	1 : 1
EI	Enhancement I	1.5 : 1
EII	Enhancement II	2.5 : 1
P	Preservation	5 : 1
HQP	High Quality Pres.	5 : 1

Reach	Location	Existing	Proposed	Total Existing	Total Proposed	Approach	SMU
Dale Branch 3			550	0.0	550.0	R	550.0
Dale Branch 4			825	0.0	825.0	R	825.0
Dale Branch 5A	245-subtracted 60'		185	0.0	185.0	R	185.0
Dale Branch 5B			315	0.0	315.0	R	315.0
Dale Branch 5C			165	0.0	165.0	R	165.0
Jerry Branch 1			435	0.0	435.0	R	435.0
Jerry Branch 2			625	0.0	625.0	R	625.0
Jerry Branch 3	670- subtracted 60'		610	0.0	610.0	R	610.0
Hudson Branch 1			52.6	0.0	52.6	R	52.6
				0.0	0.0	R	0.0
			Subtotals:	0.0	3762.6		3762.6
			Totals:	**0.0**	**6616.6**		**6408.3**

FINAL
6/18/13
MMF

Component Totals

Approach	Title	Ft	SMU	Totals	
Restoration	R	5991.6	5991.6		
Enhancement I	EI	625.0	416.7	**6408.3**	
Enhancement II	EII	0.0	0.0		**6408.3**
Preservation	P	0.0	0.0	**0.0**	
High Quality Pres.	HQP	0.0	0.0		

APPENDIX C3

Hydraulic Modeling

HEC-RAS Output -Existing Channel											
River	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	E.G. Elev	Froude # Chl	Vel Chnl	Shear Chan	Power Chan	Power Total
			(cfs)	(ft)	(ft)	(ft)		(ft/s)	(lb/sq ft)	(lb/ft s)	(lb/ft s)
1	8	BKF	9	354.33	354.97	355.07	0.92	2.82	0.37	1.04	0.69
1	8	2 yr	14	354.33	355.04	355.19	0.99	3.35	0.49	1.66	1.08
1	8	10 yr	40	354.33	355.33	355.52	0.91	4.08	0.61	2.47	1.25
1	8	50 yr	78	354.33	355.55	355.85	1.01	5.25	0.91	4.78	2.55
1	8	100 yr	100	354.33	355.66	356.01	1.03	5.69	1.03	5.85	3.17
1	7	BKF	9	347.6	348.2	348.46	1	4.09	0.68	2.77	2.77
1	7	2 yr	14	347.6	348.38	348.73	1	4.71	0.83	3.92	3.92
1	7	10 yr	40	347.6	349.09	349.74	1.01	6.49	1.35	8.74	8.74
1	7	50 yr	78	347.6	349.87	350.76	1	7.53	1.66	12.54	12.54
1	7	100 yr	100	347.6	350.22	351.22	1.01	8	1.82	14.57	14.26
1	6	BKF	9	339.05	339.94	340.12	0.8	3.39	0.46	1.56	1.56
1	6	2 yr	14	339.05	340.17	340.38	0.75	3.7	0.5	1.87	1.87
1	6	10 yr	40	339.05	340.86	341.32	0.82	5.43	0.93	5.04	5.04
1	6	50 yr	78	339.05	341.36	342.28	1.01	7.69	1.74	13.39	13.39
1	6	100 yr	100	339.05	341.71	342.77	1.01	8.26	1.95	16.07	16.07
1	5	BKF	10	337.43	338.31	338.55	0.88	3.94	0.6	2.35	2.35
1	5	2 yr	16	337.43	338.53	338.86	0.95	4.61	0.78	3.58	3.58
1	5	10 yr	46	337.43	339.28	339.78	0.94	5.69	1.03	5.88	4.42
1	5	50 yr	90	337.43	339.9	340.48	0.88	6.42	1.18	7.56	4.42
1	5	100 yr	115	337.43	340.17	340.76	0.84	6.62	1.2	7.95	4.09
1	4	BKF	10	322.57	323.12	323.3	1.01	3.4	0.51	1.73	1.73
1	4	2 yr	16	322.57	323.26	323.49	1	3.81	0.59	2.23	2.23
1	4	10 yr	46	322.57	323.73	324.04	0.96	4.48	0.71	3.19	2.36
1	4	50 yr	90	322.57	324.1	324.41	0.84	4.83	0.72	3.47	1.55
1	4	100 yr	115	322.57	324.21	324.57	0.87	5.26	0.82	4.33	1.96
1	3	BKF	14	299.63	300.17	300.38	1.01	3.65	0.56	2.03	2.03
1	3	2 yr	23	299.63	300.34	300.62	1.01	4.24	0.68	2.9	2.9
1	3	10 yr	63	299.63	300.87	301.37	1.01	5.67	1.01	5.75	5.75
1	3	50 yr	121	299.63	301.59	302.08	0.83	5.69	0.9	5.14	2.47
1	3	100 yr	154	299.63	301.79	302.31	0.84	6.05	0.98	5.94	2.87
1	2	BKF	14	294.54	295.2	295.39	1	3.53	0.53	1.88	1.88
1	2	2 yr	23	294.54	295.35	295.62	1.01	4.15	0.67	2.78	2.78
1	2	10 yr	63	294.54	295.86	296.35	1.01	5.58	1	5.57	5.57
1	2	50 yr	121	294.54	296.41	297.09	1.01	6.64	1.27	8.42	8.42
1	2	100 yr	154	294.54	296.66	297.44	1.01	7.1	1.39	9.84	9.59
1	1	BKF	16	286.4	287.22	287.51	0.98	4.31	0.69	2.99	2.99
1	1	2 yr	25	286.4	287.43	287.81	1	5	0.87	4.35	4.35
1	1	10 yr	68	286.4	288.17	288.86	1.01	6.68	1.32	8.79	8.79
1	1	50 yr	130	286.4	288.95	289.92	0.98	7.91	1.65	13.08	10.49
1	1	100 yr	165	286.4	289.71	290.07	0.59	5.53	0.74	4.07	0.83

HEC-RAS Output-Proposed Channel											
River	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	E.G. Elev	Froude # Chl	Vel Chnl	Shear Chan	Power Chan	Power Total
			(cfs)	(ft)	(ft)	(ft)		(ft/s)	(lb/sq ft)	(lb/ft s)	(lb/ft s)
1	8	BKF	9	354.5	355.07	355.26	1	3.5	0.53	1.84	1.74
1	8	2 yr	14	354.5	355.23	355.44	0.92	3.79	0.55	2.08	1.22
1	8	10 yr	40	354.5	355.65	355.88	0.8	4.44	0.62	2.75	0.85
1	8	50 yr	78	354.5	355.92	356.22	0.86	5.39	0.84	4.54	1.46
1	8	100 yr	100	354.5	356.03	356.37	0.9	5.92	0.98	5.82	1.96
1	7	BKF	9	350.51	351.08	351.27	1.01	3.51	0.53	1.86	1.77
1	7	2 yr	14	350.51	351.24	351.45	0.9	3.75	0.54	2.02	1.17
1	7	10 yr	40	350.51	351.67	351.96	0.86	4.8	0.72	3.47	1.36
1	7	50 yr	78	350.51	352.01	352.38	0.89	5.78	0.95	5.47	2.11
1	7	100 yr	100	350.51	352.15	352.57	0.92	6.26	1.07	6.73	2.62
1	6.5	BKF	9	345.9	346.47	346.66	1.01	3.52	0.53	1.87	1.78
1	6.5	2 yr	14	345.9	346.63	346.84	0.9	3.73	0.53	1.99	1.14
1	6.5	10 yr	40	345.9	347.06	347.37	0.88	4.9	0.75	3.69	1.67
1	6.5	50 yr	78	345.9	347.44	347.83	0.88	5.82	0.95	5.54	2.26
1	6.5	100 yr	100	345.9	347.59	348.03	0.92	6.36	1.1	6.96	2.88
1	6	BKF	9	340.51	341.68	341.69	0.2	1.11	0.04	0.04	0.02
1	6	2 yr	14	340.51	342.07	342.08	0.17	1.09	0.03	0.04	0.02
1	6	10 yr	40	340.51	343.75	343.76	0.1	1.01	0.02	0.02	0.01
1	6	50 yr	78	340.51	344.72	344.74	0.12	1.31	0.03	0.04	0.02
1	6	100 yr	100	340.51	344.87	344.89	0.14	1.64	0.05	0.09	0.03
1	5.5		Culvert								
1	5	BKF	10	339.63	340.23	340.42	1.01	3.58	0.54	1.95	1.92
1	5	2 yr	16	339.63	340.39	340.63	0.95	4	0.61	2.42	1.73
1	5	10 yr	46	339.63	340.89	341.15	0.78	4.56	0.63	2.88	0.91
1	5	50 yr	90	339.63	341.2	341.53	0.85	5.63	0.89	4.99	1.77
1	5	100 yr	115	339.63	341.31	341.71	0.91	6.27	1.07	6.71	2.4
1	4	BKF	10	322.7	323.33	323.56	1.01	3.8	0.59	2.24	2.24
1	4	2 yr	16	322.7	323.52	323.79	0.96	4.26	0.66	2.83	2.09
1	4	10 yr	46	322.7	324.07	324.28	0.71	4.35	0.56	2.44	0.55
1	4	50 yr	90	322.7	324.32	324.6	0.81	5.47	0.83	4.55	1.19
1	4	100 yr	115	322.7	324.43	324.74	0.86	6	0.97	5.85	1.59
1	3	BKF	14	300.17	300.94	301.19	1.01	3.98	0.63	2.5	2.5
1	3	2 yr	23	300.17	301.16	301.44	1.01	4.26	0.69	2.94	2.94
1	3	10 yr	63	300.17	301.72	302.09	0.88	4.98	0.77	3.86	2.04
1	3	50 yr	121	300.17	302.18	302.59	0.83	5.66	0.88	4.98	1.98
1	3	100 yr	154	300.17	302.35	302.8	0.84	6.05	0.97	5.85	2.31
1	2.5		Culvert								
1	2	BKF	14	296.7	297.47	297.72	1.01	3.98	0.63	2.5	2.5
1	2	2 yr	23	296.7	297.69	297.97	1.01	4.27	0.69	2.95	2.95
1	2	10 yr	63	296.7	298.21	298.53	0.86	4.76	0.72	3.42	1.54
1	2	50 yr	121	296.7	298.57	298.97	0.88	5.7	0.92	5.27	2.38
1	2	100 yr	154	296.7	298.72	299.17	0.91	6.21	1.06	6.56	2.9
1	1	BKF	16	288.13	288.95	289.19	0.98	3.98	0.62	2.45	2.45
1	1	2 yr	25	288.13	289.15	289.43	1	4.29	0.69	2.97	2.97
1	1	10 yr	68	288.13	289.64	289.83	0.74	4.08	0.53	2.15	0.62
1	1	50 yr	130	288.13	289.86	290.13	0.84	5.16	0.78	4.05	1.42
1	1	100 yr	165	288.13	289.96	290.26	0.88	5.61	0.91	5.09	1.91

HEC-RAS Output Comparison							
River	River Sta	Profile	WSEL Diff	Power ch Diff	Power ch % Diff	Power Tot Diff	Power Tot % Diff
1	8	BKF	0.1	0.8	77%	1.05	152%
1	8	2 yr	0.19	0.42	25%	0.14	13%
1	8	10 yr	0.32	0.28	11%	-0.4	-32%
1	8	50 yr	0.37	-0.24	-5%	-1.09	-43%
1	8	100 yr	0.37	-0.03	-1%	-1.21	-38%
1	7	BKF	2.88	-0.91	-33%	-1	-36%
1	7	2 yr	2.86	-1.9	-48%	-2.75	-70%
1	7	10 yr	2.58	-5.27	-60%	-7.38	-84%
1	7	50 yr	2.14	-7.07	-56%	-10.43	-83%
1	7	100 yr	1.93	-7.84	-54%	-11.64	-82%
1	6	BKF	1.74	-1.52	-97%	-1.54	-99%
1	6	2 yr	1.9	-1.83	-98%	-1.85	-99%
1	6	10 yr	2.89	-5.02	-100%	-5.03	-100%
1	6	50 yr	3.36	-13.35	-100%	-13.37	-100%
1	6	100 yr	3.16	-15.98	-99%	-16.04	-100%
1	5	BKF	1.92	-0.4	-17%	-0.43	-18%
1	5	2 yr	1.86	-1.16	-32%	-1.85	-52%
1	5	10 yr	1.61	-3	-51%	-3.51	-79%
1	5	50 yr	1.3	-2.57	-34%	-2.65	-60%
1	5	100 yr	1.14	-1.24	-16%	-1.69	-41%
1	4	BKF	0.21	0.51	29%	0.51	29%
1	4	2 yr	0.26	0.6	27%	-0.14	-6%
1	4	10 yr	0.34	-0.75	-24%	-1.81	-77%
1	4	50 yr	0.22	1.08	31%	-0.36	-23%
1	4	100 yr	0.22	1.52	35%	-0.37	-19%
1	3	BKF	0.77	0.47	23%	0.47	23%
1	3	2 yr	0.82	0.04	1%	0.04	1%
1	3	10 yr	0.85	-1.89	-33%	-3.71	-65%
1	3	50 yr	0.59	-0.16	-3%	-0.49	-20%
1	3	100 yr	0.56	-0.09	-2%	-0.56	-20%
1	2	BKF	2.27	0.62	33%	0.62	33%
1	2	2 yr	2.34	0.17	6%	0.17	6%
1	2	10 yr	2.35	-2.15	-39%	-4.03	-72%
1	2	50 yr	2.16	-3.15	-37%	-6.04	-72%
1	2	100 yr	2.06	-3.28	-33%	-6.69	-70%
1	1	BKF	1.73	-0.54	-18%	-0.54	-18%
1	1	2 yr	1.72	-1.38	-32%	-1.38	-32%
1	1	10 yr	1.47	-6.64	-76%	-8.17	-93%
1	1	50 yr	0.91	-9.03	-69%	-9.07	-86%
1	1	100 yr	0.25	1.02	25%	1.08	130%

HEC-RAS Sediment Data UT1 Existing (Bankfull)

River	Reach	RS	Ch Dist	Invert Change (ft)	Mass Out Cum: All (tons)	Mass In Cum: All (tons)
Dale	1	8	110.33	0.00	0.10	0.10
Dale	1	7	337.98	0.00	0.18	0.10
Dale	1	6	90.04	0.00	0.18	0.18
Dale	1	5	731.84	0.00	0.20	0.18
Dale	1	4	870.25	0.00	0.24	0.20
Dale	1	3	120.8	0.00	0.25	0.24
Dale	1	2	249.49	0.00	0.29	0.25
Dale	1	1	398.45	0.00	0.29	0.29

HEC-RAS Sediment Data- UT1 Proposed (Bankfull)

River	Reach	RS	Ch Dist	Invert Change (ft)	Mass Out Cum: All (tons)	Mass In Cum: All (tons)
Dale	1	8	110.33	0.00	0.15	0.15
Dale	1	7	152.72	0.00	0.15	0.15
Dale	1	6.5	185.26	0.00	0.10	0.15
Dale	1	6	90.04	0.00	0.10	0.10
Dale	1	5	731.84	0.00	0.17	0.10
Dale	1	4	870.25	0.00	0.20	0.17
Dale	1	3	120.8	0.00	0.22	0.20
Dale	1	2	249.49	0.00	0.26	0.22
Dale	1	1	398.45	0.00	0.25	0.26

HEC-RAS Sediment Data- UT1 Existing (2-Year)

River	Reach	RS	Ch Dist	Invert Change (ft)	Mass Out Cum: All (tons)	Mass In Cum: All (tons)
Dale	1	8	110.33	0.00	0.17	0.17
Dale	1	7	337.98	0.00	0.28	0.17
Dale	1	6	90.04	0.00	0.29	0.28
Dale	1	5	731.84	0.00	0.34	0.29
Dale	1	4	870.25	0.00	0.38	0.34
Dale	1	3	120.8	0.00	0.39	0.38
Dale	1	2	249.49	0.00	0.47	0.39
Dale	1	1	398.45	0.00	0.49	0.47

HEC-RAS Sediment Data- UT1 Proposed (2-Year)

River	Reach	RS	Ch Dist	Invert Change (ft)	Mass Out Cum: All (tons)	Mass In Cum: All (tons)
Dale	1	8	110.33	0.00	0.14	0.14
Dale	1	7	152.72	0.00	0.13	0.14
Dale	1	6.5	185.26	0.00	0.08	0.13
Dale	1	6	90.04	0.00	0.09	0.08
Dale	1	5	731.84	0.00	0.18	0.09
Dale	1	4	870.25	0.00	0.24	0.18
Dale	1	3	120.8	0.00	0.29	0.24
Dale	1	2	249.49	0.00	0.39	0.29
Dale	1	1	398.45	0.00	0.39	0.39

HEC-RAS Sediment Data- UT1 Existing (10-Year)

River	Reach	RS	Ch Dist	Invert Change (ft)	Mass Out Cum: All (tons)	Mass In Cum: All (tons)
Dale	1	8	110.33	0.00	0.21	0.21
Dale	1	7	337.98	0.00	0.81	0.21
Dale	1	6	90.04	0.00	1.00	0.81
Dale	1	5	731.84	0.00	0.94	1.00
Dale	1	4	870.25	0.00	0.90	0.94
Dale	1	3	120.8	0.00	0.96	0.90
Dale	1	2	249.49	0.00	1.20	0.96
Dale	1	1	398.45	0.00	1.30	1.20

HEC-RAS Sediment Data-UT1 Proposed (10-Year)

River	Reach	RS	Ch Dist	Invert Change (ft)	Mass Out Cum: All (tons)	Mass In Cum: All (tons)
Dale	1	8	110.33	0.00	0.14	0.14
Dale	1	7	152.72	0.00	0.19	0.14
Dale	1	6.5	185.26	0.00	0.16	0.19
Dale	1	6	90.04	0.00	0.20	0.16
Dale	1	5	731.84	0.00	0.16	0.20
Dale	1	4	870.25	0.00	0.19	0.16
Dale	1	3	120.8	0.00	0.24	0.19
Dale	1	2	249.49	0.00	0.36	0.24
Dale	1	1	398.45	0.00	0.27	0.36

APPENDIX C4

Assessment Data

Erosion Rate Calculations

Project: 1058-PDEE Date: 1/9/2013

Stream: Thompson Crew: MM,CE,GG

Reach/Description: Page: 1 Of: 14

Feature	Units							
Reach Name		1	2	3	4	5	6	
Station/Location		100+00	107+00	108+00	108+00	109+50	109+50	
Photo No.								
Reach Length	ft	200	100	150	150	50	50	
Bank	RT-LT-Both	Both	Both	RT	LT	RT	LT	
Bank Height	ft	1	2	3.5	3.5	2	4	
Bankfull Height	ft	0.6	1	1	1	1	4	
Root Depth	ft	0.2	0.3	0.4	0.1	0.2	0.5	
Root Density	%	30%	30%	40%	10%	50%	20%	
Bank Angle	Degrees	20	75	90	90	40	90	
Surface Protection	%	30%	30%	75%	10%	70%	25%	
Bank Material	C-G-S-SC	SC	C	Crew:	C	C	C	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	C	C	OC	OC	OC	OC	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	Yes	No	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		1.67	2.00	3.50	3.50	2.00	1.00	
BEHI Score		6.13	8.00	10.00	10.00	8.00	1.00	
Root Depth / Bnk Ht		0.20	0.15	0.11	0.03	0.10	0.13	
BEHI Score		7.60	8.20	8.63	9.66	8.80	8.50	
Bank Angle		20	75	90	90	40	90	
BEHI Score		2.00	5.50	8.00	8.00	3.00	8.00	
Surface Protection		30%	30%	75%	10%	70%	25%	
BEHI Score		6.00	6.00	2.14	10.00	2.57	6.67	
Bank Material Adjustment		0	-10	FALSE	-10	-10	-10	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		30.93	27.10	38.16	37.62	21.70	23.83	
Rating		High	Moderate	High	High	Moderate	Moderate	
NBS Calculation								
Thalweg Position Score		1	1	1.5	1.5	1.5	1.5	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	1	0	0	0	0	
Total NBS Rating		1	2	1.5	1.5	1.5	1.5	
WARSS NBS Rating		1	3	2	2	2	2	
Rating		Very Low	Moderate	Low	Low	Low	Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.1	0.1	0.1	0.1	0.0	0.0	**Sheet Total**
Erosion Total (ft^3/yr)		19	12	54	54	3	6	148

Erosion Rate Calculations

Project: 1058-PDEE | Date: 1/9/2013

Stream: Thompson | Crew: MM,CE,GG

Reach/Description: | Page: 2 | Of: 16

Feature	Units							
Reach Name		7	8	9	10	11	12	
Station/Location		110+00	111+50	113+50	114+00	116+50	117+00	
Photo No.								
Reach Length	ft	150	200	30	200	50	100	
Bank	RT-LT-Both	Both	Both	Both	Both	Both	LT	
Bank Height	ft	2.6	1	2	1.5	3	2.5	
Bankfull Height	ft	0.9	0.4	0.8	0.8	0.8	0.08	
Root Depth	ft	0.5	0.1	1	0.3	1	0.3	
Root Density	%	30%	30%	40%	20%	50%	30%	
Bank Angle	Degrees	80	20	80	60	75	70	
Surface Protection	%	40%	30%	20%	45%	70%	30%	
Bank Material	C-G-S-SC	C	SC	C	C	C	C	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	OC	C	C	C	C	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	No	No	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		2.89	2.50	2.50	1.88	3.75	31.25	
BEHI Score		9.42	8.80	8.80	7.24	10.00	10.00	
Root Depth / Bnk Ht		0.19	0.10	0.50	0.20	0.33	0.12	
BEHI Score		7.69	8.80	4.00	7.60	6.00	8.56	
Bank Angle		80	20	80	60	75	70	
BEHI Score		6.00	2.00	6.00	4.00	5.50	5.00	
Surface Protection		40%	30%	20%	45%	70%	30%	
BEHI Score		5.14	6.00	7.33	4.71	2.57	6.00	
Bank Material Adjustment		-10	0	-10	-10	-10	-10	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		27.49	35.20	23.47	23.02	21.85	29.08	
Rating		Moderate	High	Moderate	Moderate	Moderate	Moderate	
NBS Calculation								
Thalweg Position Score		1.5	1	1	1	1	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	0	0	0	0	0	
Total NBS Rating		1.5	1	1	1	1	1	
WARSS NBS Rating		2	1	1	1	1	1	
Rating		Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.1	0.0	0.0	0.0	0.0	**Sheet Total**
Erosion Total (ft^3/yr)		12	19	1	5	3	4	44

Erosion Rate Calculations

Project: 1058-PDEE | Date: 1/9/2013

Stream: Thompson | Crew: MM,CE,GG

Reach/Description: | Page: 3 | Of: 16

Feature	Units							
Reach Name		13	14	15	16	17	18	
Station/Location		117+00	118+00	118+50	118+80	118+80	119+50	
Photo No.								
Reach Length	ft	100	50	30	70	70	150	
Bank	RT-LT-Both	RT	Both	Both	LT	RT	Both	
Bank Height	ft	1.5	1.5	3.5	4.2	2	2.5	
Bankfull Height	ft	0.8	0.8	0.8	0.8	0.8	0.9	
Root Depth	ft	0.3	0.5	0.4	0.2	0.4	0.3	
Root Density	%	35%	50%	30%	10%	40%	20%	
Bank Angle	Degrees	35	80	90	90	90	75	
Surface Protection	%	30%	60%	15%	15%	40%	25%	
Bank Material	C-G-S-SC	SC	C	C	C	C	C	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	C	C	C	OC	OC	OC	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	>1	<1	<1	
Local Slope > Avg	Yes-No	No	No	Yes	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		1.88	1.88	4.38	5.25	2.50	2.78	
BEHI Score		7.24	7.24	10.00	10.00	8.80	9.24	
Root Depth / Bnk Ht		0.20	0.33	0.11	0.05	0.20	0.12	
BEHI Score		7.60	6.00	8.63	9.43	7.60	8.56	
Bank Angle		35	80	90	90	90	75	
BEHI Score		2.75	6.00	8.00	8.00	8.00	5.50	
Surface Protection		30%	60%	15%	15%	40%	25%	
BEHI Score		6.00	3.43	8.00	8.00	5.14	6.67	
Bank Material Adjustment		0	-10	-10	-10	-10	-10	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		32.65	20.44	34.17	35.37	28.47	29.65	
Rating		High	Moderate	High	High	Moderate	High	
NBS Calculation								
Thalweg Position Score		1	1	1	1.5	1.5	1.5	
Toe Depth Ratio Score		0	0	0	1	0	0	
Local Slope Score		0	0	1	0	0	0	
Total NBS Rating		1	1	2	2.5	1.5	1.5	
WARSS NBS Rating		1	1	3	4	2	2	
Rating		Very Low	Very Low	Moderate	High	Low	Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.1	0.0	0.1	0.1	0.0	0.1	**Sheet Total**
Erosion Total (ft^3/yr)		14	1	12	35	4	38	105

Erosion Rate Calculations

Project: 1058-PDEE Date: 1/9/2013

Stream: Jerry Crew: MM,CE,GG

Reach/Description: Page: 4 Of: 16

Feature	Units							
Reach Name		19	20	21	22	23	24	
Station/Location		300+00	300+00	301+00	301+50	301+70	302+30	
Photo No.								
Reach Length	ft	100	100	50	20	60	80	
Bank	RT-LT-Both	RT	LT	Both	Both	Both	Both	
Bank Height	ft	1.5	1.2	2.2	2.2	3.3	1.2	
Bankfull Height	ft	0.6	0.6	0.6	0.6	0.6	0.6	
Root Depth	ft	0.3	0.1	1	1	1	1	
Root Density	%	15%	20%	20%	30%	25%	50%	
Bank Angle	Degrees	65	45	85	7	90	80	
Surface Protection	%	50%	60%	20%	20%	10%	30%	
Bank Material	C-G-S-SC	C	C	C	C	C	C	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	C	C	C	C	C	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	No	Yes	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		2.50	2.00	3.67	3.67	5.50	2.00	
BEHI Score		8.80	8.00	10.00	10.00	10.00	8.00	
Root Depth / Bnk Ht		0.20	0.08	0.45	0.45	0.30	0.83	
BEHI Score		7.60	9.00	4.55	4.55	6.36	2.33	
Bank Angle		65	45	85	7	90	80	
BEHI Score		4.50	3.25	7.00	1.35	8.00	6.00	
Surface Protection		50%	60%	20%	20%	10%	30%	
BEHI Score		4.28	3.43	7.33	7.33	10.00	6.00	
Bank Material Adjustment		-10	-10	-10	-10	-10	-10	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		24.78	23.46	27.67	21.41	33.35	17.33	
Rating		Moderate	Moderate	Moderate	Moderate	High	Low	
NBS Calculation								
Thalweg Position Score		1	1	1	1	1	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	0	1	0	0	0	
Total NBS Rating		1	1	2	1	1	1	
WARSS NBS Rating		1	1	3	1	1	1	
Rating		Very Low	Very Low	Moderate	Very Low	Very Low	Very Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.1	0.0	0.1	0.0	**Sheet Total**
Erosion Total (ft^3/yr)		3	2	7	1	19	0	31

Erosion Rate Calculations

Project: 1058-PDEE | Date: 1/9/2013

Stream: Jerry | Crew: MM,CE,GG

Reach/Description: | Page: 5 Of: 16

Feature	Units							
Reach Name		25	26	27	28	29	30	
Station/Location		303+00	304+50	400+00	400+50	305+00	306+10	
Photo No.				trib	trib			
Reach Length	ft	150	50	50	100	110	120	
Bank	RT-LT-Both	Both	Both	Both	Both	Both	Both	
Bank Height	ft	3	5	1.5	2.5	3.5	1.5	
Bankfull Height	ft	0.6	0.6	0.4	0.4	0.6	0.6	
Root Depth	ft	1.3	1.5	0.5	1	2	0.5	
Root Density	%	15%	20%	30%	40%	30%	40%	
Bank Angle	Degrees	90	90	60	75	80	45	
Surface Protection	%	15%	15%	50%	20%	40%	70%	
Bank Material	C-G-S-SC	C	C	C	C	C	C	
Stratification	N-M-E	N	Y	N	N	N	N	
Thalweg Position	C-OC-Toe	C	C	OC	OC	C	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	Yes	Yes	No	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		5.00	8.33	3.75	6.25	5.83	2.50	
BEHI Score		10.00	10.00	10.00	10.00	10.00	8.80	
Root Depth / Bnk Ht		0.43	0.30	0.33	0.40	0.57	0.33	
BEHI Score		4.80	6.40	6.00	5.20	3.64	6.00	
Bank Angle		90	90	60	75	80	45	
BEHI Score		8.00	8.00	4.00	5.50	6.00	3.25	
Surface Protection		15%	15%	50%	20%	40%	70%	
BEHI Score		8.00	8.00	4.28	7.33	5.14	2.57	
Bank Material Adjustment		-10	-10	-10	-10	-10	-10	
Stratification Adjustment		0	FALSE	0	0	0	0	
Total BEHI Score		29.93	31.60	22.95	25.90	22.50	18.84	
Rating		High	High	Moderate	Moderate	Moderate	Low	
NBS Calculation								
Thalweg Position Score		1	1	1.5	1.5	1	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		1	1	0	0	0	0	
Total NBS Rating		2	2	1.5	1.5	1	1	
WARSS NBS Rating		3	3	2	2	1	1	
Rating		Moderate	Moderate	Low	Low	Very Low	Very Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.1	0.1	0.0	0.0	0.0	0.0	**Sheet Total**
Erosion Total (ft^3/yr)		50	28	2	8	7	0	95

Erosion Rate Calculations

Project: 1058-PDEE | Date: 1/9/2013

Stream: Jerry | Crew: MM,CE,GG

Reach/Description: | Page: 6 Of: 16

Feature	Units							
Reach Name		31	32	33	34	35	36	
Station/Location		307+30	307+30	308+50	310+00	310+20	311.2	
Photo No.								
Reach Length	ft	120	120	140	20	100	80	
Bank	RT-LT-Both	RT	LT	Both	Both	Both	Both	
Bank Height	ft	2.5	1.5	2	1	1.5	1	
Bankfull Height	ft	0.8	0.8	0.8	0.8	0.8	0.8	
Root Depth	ft	1	0.5	0.4	0.2	0.3	0.3	
Root Density	%	35%	40%	40%	10%	30%	40%	
Bank Angle	Degrees	85	50	75	30	85	40	
Surface Protection	%	30%	70%	50%	50%	20%	60%	
Bank Material	C-G-S-SC	C	C	C	SC	C	SC	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	OC	OC	C	C	C	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	No	No	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		3.13	1.88	2.50	1.25	1.88	1.25	
BEHI Score		9.80	7.24	8.80	3.93	7.24	3.93	
Root Depth / Bnk Ht		0.40	0.33	0.20	0.20	0.20	0.30	
BEHI Score		5.20	6.00	7.60	7.60	7.60	6.40	
Bank Angle		85	50	75	30	85	40	
BEHI Score		7.00	3.50	5.50	2.50	7.00	3.00	
Surface Protection		30%	70%	50%	50%	20%	60%	
BEHI Score		6.00	2.57	4.28	4.28	7.33	3.43	
Bank Material Adjustment		-10	-10	-10	0	-10	0	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		26.13	17.53	25.12	28.04	28.37	25.15	
Rating		Moderate	Low	Moderate	Moderate	Moderate	Moderate	
NBS Calculation								
Thalweg Position Score		1.5	1.5	1	1	1	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	0	0	0	0	0	
Total NBS Rating		1.5	1.5	1	1	1	1	
WARSS NBS Rating		2	2	1	1	1	1	
Rating		Low	Low	Very Low	Very Low	Very Low	Very Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.0	0.0	0.0	0.0	**Sheet Total**
Erosion Total (ft^3/yr)		10	1	5	0	3	1	19

Erosion Rate Calculations

Project: 1058-PDEE | Date: 1/9/2013

Stream: Jerry | Crew: MM,CE,GG

Reach/Description: | Page: 7 | Of: 16

Feature	Units							
Reach Name		37	38	39	40	41	42	
Station/Location		312+00	313+00	314+00	315+25	315+25	316+00	
Photo No.								
Reach Length	ft	100	100	125	75	75	70	
Bank	RT-LT-Both	Both	Both	Both	LT	RT	Both	
Bank Height	ft	2.2	2.5	1.2	1.5	1.2	4	
Bankfull Height	ft	0.8	0.8	0.8	0.9	0.9	0.9	
Root Depth	ft	0.8	1	0.3	1	1	1.5	
Root Density	%	40%	30%	20%	50%	50%	30%	
Bank Angle	Degrees	75	90	70	80	65	90	
Surface Protection	%	70%	35%	45%	70%	90%	20%	
Bank Material	C-G-S-SC	C	G	C	C	C	C	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	C	C	C	C	C	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	Yes	No	No	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		2.75	3.13	1.50	1.67	1.33	4.44	
BEHI Score		9.20	9.80	5.25	6.13	4.37	10.00	
Root Depth / Bnk Ht		0.36	0.40	0.25	0.67	0.83	0.38	
BEHI Score		5.64	5.20	7.00	3.17	2.33	5.50	
Bank Angle		75	90	70	80	65	90	
BEHI Score		5.50	8.00	5.00	6.00	4.50	8.00	
Surface Protection		70%	35%	45%	70%	90%	20%	
BEHI Score		2.57	5.57	4.71	2.57	0.86	7.33	
Bank Material Adjustment		-10	5	-10	-10	-10	-10	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		20.97	41.97	21.30	13.58	7.06	29.33	
Rating		Moderate	Very High	Moderate	Low	Very Low	Moderate	
NBS Calculation								
Thalweg Position Score		1	1	1	1	1	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		1	0	0	0	0	0	
Total NBS Rating		2	1	1	1	1	1	
WARSS NBS Rating		3	1	1	1	1	1	
Rating		Moderate	Very Low	Very Low	Very Low	Very Low	Very Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.1	0.5	0.0	0.0	0.0	0.0	**Sheet Total**
Erosion Total (ft^3/yr)		13	127	3	0	0	5	147

Erosion Rate Calculations

Project: 1058*PDEE | Date: 1/9/2013

Stream: Jerry | Crew: MM,CE,GG

Reach/Description: | Page: 8 | Of: 16

Feature	Units							
Reach Name		43	44					
Station/Location		316+70	317+50					
Photo No.								
Reach Length	ft	150	130					
Bank	RT-LT-Both	Both	Both					
Bank Height	ft	3	4					
Bankfull Height	ft	0.9	1					
Root Depth	ft	1	1.5					
Root Density	%	40%	30%					
Bank Angle	Degrees	85	100					
Surface Protection	%	40%	30%					
Bank Material	C-G-S-SC	C	C					
Stratification	N-M-E	N	N					
Thalweg Position	C-OC-Toe	C	C					
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1					
Local Slope > Avg	Yes-No	No	No					
BEHI Calculation								
Bnk Ht / Bkf Ht		3.33	4.00					
BEHI Score		10.00	10.00					
Root Depth / Bnk Ht		0.33	0.38					
BEHI Score		6.00	5.50					
Bank Angle		85	100					
BEHI Score		7.00	8.33					
Surface Protection		40%	30%					
BEHI Score		5.14	6.00					
Bank Material Adjustment		-10	-10					
Stratification Adjustment		0	0					
Total BEHI Score		26.36	28.33					
Rating		Moderate	Moderate					
NBS Calculation								
Thalweg Position Score		1	1					
Toe Depth Ratio Score		0	0					
Local Slope Score		0	0					
Total NBS Rating		1	1	0	0	0	0	
WARSS NBS Rating		1	1					
Rating		Very Low	Very Low					
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0					**Sheet Total**
Erosion Total (ft^3/yr)		8	9					16

Erosion Rate Calculations

Project: 1058*PDEE Date: 1/9/2013

Stream: Dale Crew: MM,CE,GG

Reach/Description: Page: 9 Of: 16

Feature	Units							
Reach Name		1	1	2	3	4	5	
Station/Location		200+25	200+25	201+25	201+60	202+00	203+00	
Photo No.								
Reach Length	ft	150	150	35	40	100	100	
Bank	RT-LT-Both	LT	RT	Both	Both	Both	Both	
Bank Height	ft	3.5	3	2.5	2	1.2	2.2	
Bankfull Height	ft	0.5	0.5	0.5	0.5	0.5	0.6	
Root Depth	ft	0.75	1	1	0.5	0.3	1.5	
Root Density	%	25%	25%	25%	20%	25%	20%	
Bank Angle	Degrees	80	70	70	65	50	80	
Surface Protection	%	30%	50%	30%	60%	60%	35%	
Bank Material	C-G-S-SC	C	C	C	C	C	C	
Stratification	N-M-E	N	N	N	N	N	M	
Thalweg Position	C-OC-Toe	C	C	C	C	C	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	No	No	No	Yes	Yes	
BEHI Calculation								
Bnk Ht / Bkf Ht		7.00	6.00	5.00	4.00	2.40	3.67	
BEHI Score		10.00	10.00	10.00	10.00	8.64	10.00	
Root Depth / Bnk Ht		0.21	0.33	0.40	0.25	0.25	0.68	
BEHI Score		7.43	6.00	5.20	7.00	7.00	3.09	
Bank Angle		80	70	70	65	50	80	
BEHI Score		6.00	5.00	5.00	4.50	3.50	6.00	
Surface Protection		30%	50%	30%	60%	60%	35%	
BEHI Score		6.00	4.28	6.00	3.43	3.43	5.57	
Bank Material Adjustment		-10	-10	-10	-10	-10	-10	
Stratification Adjustment		0	0	0	0	0	5	
Total BEHI Score		28.71	24.17	24.86	24.26	21.73	27.84	
Rating		Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	
NBS Calculation								
Thalweg Position Score		1	1	1	1	1	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	0	0	0	1	1	
Total NBS Rating		1	1	1	1	2	2	
WARSS NBS Rating		1	1	1	1	3	3	
Rating		Very Low	Very Low	Very Low	Very Low	Moderate	Moderate	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.0	0.0	0.1	0.1	**Sheet Total**
Erosion Total (ft^3/yr)		9	8	1	1	7	13	40

Erosion Rate Calculations

Project: 1058*PDEE | Date: 2/20/2013

Stream: Dale | Crew: MM,CE,GG

Reach/Description: | Page: 10 | Of: 16

Feature	Units							
Reach Name		6	7	8	9	10	11	
Station/Location		204+00	205+00	205+30	206+00	206+00	206+75	
Photo No.								
Reach Length	ft	100	30	70	75	75	125	
Bank	RT-LT-Both	Both	Both	Both	RT	LT	Both	
Bank Height	ft	5	2	2.5	2.5	2	1.5	
Bankfull Height	ft	0.6	0.6	0.6	0.6	0.6	0.6	
Root Depth	ft	0.3	1	0.7	1	0.8	0.3	
Root Density	%	15%	35%	30%	40%	30%	25%	
Bank Angle	Degrees	90	55	65	85	70	45	
Surface Protection	%	15%	35%	30%	60%	50%	40%	
Bank Material	C-G-S-SC	C	C	C	C	C	C	
Stratification	N-M-E	M	N	N	N	N	N	
Thalweg Position	C-OC-Toe	C	C	C	C	C	OC	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	No	No	No	No	Yes	
BEHI Calculation								
Bnk Ht / Bkf Ht		8.33	3.33	4.17	4.17	3.33	2.50	
BEHI Score		10.00	10.00	10.00	10.00	10.00	8.80	
Root Depth / Bnk Ht		0.06	0.50	0.28	0.40	0.40	0.20	
BEHI Score		9.28	4.00	6.64	5.20	5.20	7.60	
Bank Angle		90	55	65	85	70	45	
BEHI Score		8.00	3.75	4.50	7.00	5.00	3.25	
Surface Protection		15%	35%	30%	60%	50%	40%	
BEHI Score		8.00	5.57	6.00	3.43	4.28	5.14	
Bank Material Adjustment		-10	-10	-10	-10	-10	-10	
Stratification Adjustment		5	0	0	0	0	0	
Total BEHI Score		40.16	20.99	26.02	23.49	22.88	24.12	
Rating		Very High	Moderate	Moderate	Moderate	Moderate	Moderate	
NBS Calculation								
Thalweg Position Score		1	1	1	1	1	1.5	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	0	0	0	0	1	
Total NBS Rating		1	1	1	1	1	2.5	
WARSS NBS Rating		1	1	1	1	1	4	
Rating		Very Low	Very Low	Very Low	Very Low	Very Low	High	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.5	0.0	0.0	0.0	0.0	0.1	**Sheet Total**
Erosion Total (ft^3/yr)		253	1	3	3	3	21	284

Erosion Rate Calculations

Project: 1058*PDEE | Date: 2/20/2013

Stream: Dale | Crew: MM,CE,GG

Reach/Description: | Page: 11 Of: 16

Feature	Units							
Reach Name		12	13	14	15	16	17	
Station/Location		208+00	208+50	209+50	210+50	211+50	213+00	
Photo No.								
Reach Length	ft	50	100	100	100	150	75	
Bank	RT-LT-Both	Both	Both	Both	Both	Both	Both	
Bank Height	ft	1.5	1	5	3.5	1.3	2	
Bankfull Height	ft	0.6	0.6	0.6	0.6	0.6	0.6	
Root Depth	ft	1	0.3	1.5	1.5	0.3	0.5	
Root Density	%	35%	25%	25%	35%	20%	25%	
Bank Angle	Degrees	45	30	95	75	50	65	
Surface Protection	%	35%	35%	15%	35%	50%	30%	
Bank Material	C-G-S-SC	C	C	C	C	C	C	
Stratification	N-M-E	N	N	M	N	N	N	
Thalweg Position	C-OC-Toe	OC	C	OC	C	OC	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	No	No	No	No	Yes	
BEHI Calculation								
Bnk Ht / Bkf Ht		2.50	1.67	8.33	5.83	2.17	3.33	
BEHI Score		8.80	6.13	10.00	10.00	8.27	10.00	
Root Depth / Bnk Ht		0.67	0.30	0.30	0.43	0.23	0.25	
BEHI Score		3.17	6.40	6.40	4.86	7.23	7.00	
Bank Angle		45	30	95	75	50	65	
BEHI Score		3.25	2.50	8.17	5.50	3.50	4.50	
Surface Protection		35%	35%	15%	35%	50%	30%	
BEHI Score		5.57	5.57	8.00	5.57	4.28	6.00	
Bank Material Adjustment		-10	-10	-10	-10	-10	-10	
Stratification Adjustment		0	0	5	0	0	0	
Total BEHI Score		17.68	19.60	36.57	23.93	22.67	26.66	
Rating		Low	Moderate	High	Moderate	Moderate	Moderate	
NBS Calculation								
Thalweg Position Score		1.5	1	1.5	1	1.5	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	0	0	0	0	1	
Total NBS Rating		1.5	1	1.5	1	1.5	2	
WARSS NBS Rating		2	1	2	1	2	3	
Rating		Low	Very Low	Low	Very Low	Low	Moderate	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.1	0.0	0.0	0.1	**Sheet Total**
Erosion Total (ft^3/yr)		0	2	51	6	6	9	74

Erosion Rate Calculations

Project: 1058*PDEE | Date: 2/20/2013

Stream: Dale | Crew: MM,CE,GG

Reach/Description: | Page: 12 | Of: 16

Feature	Units							
Reach Name		18	19	20	21	21	22	
Station/Location		213+75	216+50	217+5	218+5	218+5	219+5	
Photo No.								
Reach Length	ft	275	100	100	100	100	180	
Bank	RT-LT-Both	Both	Both	Both	RT	LT	Both	
Bank Height	ft	1	2.8	3.1	3.5	2.5	3.5	
Bankfull Height	ft	0.6	0.6	0.8	0.8	0.8	0.9	
Root Depth	ft	0.4	1	1.2	1.5	0.5	0.4	
Root Density	%	15%	20%	35%	40%	20%	25%	
Bank Angle	Degrees	45	90	55	75	60	60	
Surface Protection	%	35%	20%	40%	30%	65%	70%	
Bank Material	C-G-S-SC	C	C	C	C	C	C	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	C	C	OC	C	C	OC	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	Yes	No	No	No	Yes	
BEHI Calculation								
Bnk Ht / Bkf Ht		1.67	4.67	3.88	4.38	3.13	3.89	
BEHI Score		6.13	10.00	10.00	10.00	9.80	10.00	
Root Depth / Bnk Ht		0.40	0.36	0.39	0.43	0.20	0.11	
BEHI Score		5.20	5.71	5.35	4.86	7.60	8.63	
Bank Angle		45	90	55	75	60	60	
BEHI Score		3.25	8.00	3.75	5.50	4.00	4.00	
Surface Protection		35%	20%	40%	30%	65%	70%	
BEHI Score		5.57	7.33	5.14	6.00	3.00	2.57	
Bank Material Adjustment		-10	-10	-10	-10	-10	-10	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		19.35	30.10	22.44	24.07	23.87	24.82	
Rating		Low	High	Moderate	Moderate	Moderate	Moderate	
NBS Calculation								
Thalweg Position Score		1	1	1.5	1	1	1.5	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	1	0	0	0	1	
Total NBS Rating		1	2	1.5	1	1	2.5	
WARSS NBS Rating		1	3	2	1	1	4	
Rating		Very Low	Moderate	Low	Very Low	Very Low	High	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.1	0.0	0.0	0.0	0.1	**Sheet Total**
Erosion Total (ft^3/yr)		0	31	10	6	4	71	122

Erosion Rate Calculations

Project:	1058*PDEE	Date:	2/20/2013
Stream:	Dale	Crew:	MM,CE,GG
Reach/Description:		Page: 13	Of: 16

Feature	Units							
Reach Name		23	24	25	26	27		
Station/Location		221+50	22+50	223+75	224+25	226+50		
Photo No.								
Reach Length	ft	120	125	50	125	100		
Bank	RT-LT-Both	Both	Both	Both	Both	Both		
Bank Height	ft	1.5	2	2.8	1.7	3.5		
Bankfull Height	ft	0.8	0.8	0.8	0.8	0.9		
Root Depth	ft	0.2	0.5	1	0.8	2		
Root Density	%	15%	35%	30%	20%	25%		
Bank Angle	Degrees	45	70	85	65	90		
Surface Protection	%	25%	40%	30%	30%	60%		
Bank Material	C-G-S-SC	C	C	C	C	C		
Stratification	N-M-E	N	N	N	N	N		
Thalweg Position	C-OC-Toe	C	C	OC	C	C		
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1		
Local Slope > Avg	Yes-No	No	No	No	No	No		
BEHI Calculation								
Bnk Ht / Bkf Ht		1.88	2.50	3.50	2.13	3.89		
BEHI Score		7.24	8.80	10.00	8.20	10.00		
Root Depth / Bnk Ht		0.13	0.25	0.36	0.47	0.57		
BEHI Score		8.40	7.00	5.71	4.35	3.64		
Bank Angle		45	70	85	65	90		
BEHI Score		3.25	5.00	7.00	4.50	8.00		
Surface Protection		25%	40%	30%	30%	60%		
BEHI Score		6.67	5.14	6.00	6.00	3.43		
Bank Material Adjustment		-10	-10	-10	-10	-10		
Stratification Adjustment		0	0	0	0	0		
Total BEHI Score		25.29	24.77	27.28	21.80	23.17		
Rating		Moderate	Moderate	Moderate	Moderate	Moderate		
NBS Calculation								
Thalweg Position Score		1	1	1.5	1	1		
Toe Depth Ratio Score		0	0	0	0	0		
Local Slope Score		0	0	0	0	0		
Total NBS Rating		1	1	1.5	1	1	0	
WARSS NBS Rating		1	1	2	1	1		
Rating		Very Low	Very Low	Low	Very Low	Very Low		
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.0	0.0	0.0		**Sheet Total**
Erosion Total (ft^3/yr)		3	4	4	4	6		21

Erosion Rate Calculations

Project: 1058*PDEE | Date: 6/5/2013

Stream: Dale | Crew: MM,CE,GG

Reach/Description: | Page: 14 Of: 16

Feature	Units							
Reach Name		Dale Ext	Dale Ext	Dale Ext	Dale Ext	Dale Ext	Dale Ext	
Station/Location		207+25	20700	20625	20600	20550	20550	
Photo No.								
Reach Length	ft	125	25	75	25	50	50	
Bank	RT-LT-Both	Both	RT	Both	Both	RT	LT	
Bank Height	ft	1.5	2.5	1.5	2	0.5	1.2	
Bankfull Height	ft	0.5	0.5	0.5	0.5	0.5	0.5	
Root Depth	ft	0.3	0.7	0.3	0.4	0.2	0.2	
Root Density	%	35%	25%	15%	25%	25%	35%	
Bank Angle	Degrees	45	100	30	85	30	70	
Surface Protection	%	40%	15%	25%	30%	25%	25%	
Bank Material	C-G-S-SC	C	C	C	C	C	C	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	C	OC	C	C	C	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	No	Yes	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		3.00	5.00	3.00	4.00	1.00	2.40	
BEHI Score		9.60	10.00	9.60	10.00	1.00	8.64	
Root Depth / Bnk Ht		0.20	0.28	0.20	0.20	0.40	0.17	
BEHI Score		7.60	6.64	7.60	7.60	5.20	8.00	
Bank Angle		45	100	30	85	30	70	
BEHI Score		3.25	8.33	2.50	7.00	2.50	5.00	
Surface Protection		40%	15%	25%	30%	25%	25%	
BEHI Score		5.14	8.00	6.67	6.00	6.67	6.67	
Bank Material Adjustment		-10	-10	-10	-10	-10	-10	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		24.66	32.04	25.97	29.93	14.03	27.53	
Rating		Moderate	High	Moderate	High	Low	Moderate	
NBS Calculation								
Thalweg Position Score		1	1.5	1	1	1	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	0	1	0	0	0	
Total NBS Rating		1	1.5	2	1	1	1	
WARSS NBS Rating		1	2	3	1	1	1	
Rating		Very Low	Low	Moderate	Very Low	Very Low	Very Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.1	0.1	0.1	0.0	0.0	**Sheet Total**
Erosion Total (ft^3/yr)		3	6	7	5	0	1	22

Erosion Rate Calculations

Project:	1058*PDEE	Date:	6/5/2013
Stream:	Dale	Crew:	MM,CE,GG
Reach/Description:		Page: 15	Of: 16

Feature	Units							
Reach Name		Dale Ext	Dale Ext	Dale Ext	Dale Ext	Dale Ext		
Station/Location		20500	20450	20375	20125	20000		
Photo No.								
Reach Length	ft	50	50	75	125	125		
Bank	RT-LT-Both	Both	Both	Both	Both	Both		
Bank Height	ft	0.5	2.5	3	0.5	2.5		
Bankfull Height	ft	0.5	0.5	0.5	0.3	0.03		
Root Depth	ft	0.1	0.5	1	0.1	0.2		
Root Density	%	10%	25%	30%	15%	15%		
Bank Angle	Degrees	30	85	90	20	40		
Surface Protection	%	10%	30%	25%	15%	25%		
Bank Material	C-G-S-SC	C	C	C	C	C		
Stratification	N-M-E	N	N	N	N	N		
Thalweg Position	C-OC-Toe	C	C	C	C	C		
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1		
Local Slope > Avg	Yes-No	No	Yes	Yes	No	Yes		
BEHI Calculation								
Bnk Ht / Bkf Ht		1.00	5.00	6.00	1.67	83.33		
BEHI Score		1.00	10.00	10.00	6.13	10.00		
Root Depth / Bnk Ht		0.20	0.20	0.33	0.20	0.08		
BEHI Score		7.60	7.60	6.00	7.60	9.04		
Bank Angle		30	85	90	20	40		
BEHI Score		2.50	7.00	8.00	2.00	3.00		
Surface Protection		10%	30%	25%	15%	25%		
BEHI Score		10.00	6.00	6.67	8.00	6.67		
Bank Material Adjustment		-10	-10	-10	-10	-10		
Stratification Adjustment		0	0	0	0	0		
Total BEHI Score		20.83	29.93	29.33	23.33	28.55		
Rating		Moderate	High	Moderate	Moderate	Moderate		
NBS Calculation								
Thalweg Position Score		1	1	1	1	1		
Toe Depth Ratio Score		0	0	0	0	0		
Local Slope Score		0	1	1	0	1		
Total NBS Rating		1	2	2	1	2	0	
WARSS NBS Rating		1	3	3	1	3		
Rating		Very Low	Moderate	Moderate	Very Low	Moderate		
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.1	0.1	0.0	0.1		**Sheet Total**
Erosion Total (ft^3/yr)		0	14	13	1	19		48

Erosion Rate Calculations

Project:	1058*PDEE	Date:	6/5/2013
Stream:	Dale	Crew:	MM,CE,GG
Reach/Description:		Page: 16	Of: 16

Feature	Units							
Reach Name		Jerry Ext	Jerry Ext	Jerry Ext	Jerry Ext	Jerry Ext	Jerry Ext	
Station/Location		30300	30200	30100	30025	30000		
Photo No.								
Reach Length	ft	125	100	100	75	25		
Bank	RT-LT-Both	Both	Both	Both	Both	Both		
Bank Height	ft	1.3	3	1.2	0.08	2		
Bankfull Height	ft	0.4	0.4	0.4	0.3	0.3		
Root Depth	ft	0.1	0.8	0.5	0.2	0.4		
Root Density	%	15%	20%	20%	30%	25%		
Bank Angle	Degrees	75	90	50	30	85		
Surface Protection	%	15%	35%	25%	25%	20%		
Bank Material	C-G-S-SC	C	C	C	C	C		
Stratification	N-M-E	N	N	N	N	N		
Thalweg Position	C-OC-Toe	C	C	C	C	C		
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1		
Local Slope > Avg	Yes-No	No	Yes	No	No	No		
BEHI Calculation								
Bnk Ht / Bkf Ht		3.25	7.50	3.00	0.27	6.67		
BEHI Score		FALSE	10.00	9.60	1.00	10.00		
Root Depth / Bnk Ht		0.08	0.27	0.42	2.50	0.20		
BEHI Score		9.08	6.80	5.00	0.00	7.60		
Bank Angle		75	90	50	30	85		
BEHI Score		5.50	8.00	3.50	2.50	7.00		
Surface Protection		15%	35%	25%	25%	20%		
BEHI Score		8.00	5.57	6.67	6.67	7.33		
Bank Material Adjustment		-10	-10	-10	-10	-10		
Stratification Adjustment		0	0	0	0	0		
Total BEHI Score		22.42	29.66	23.66	2.31	31.27		
Rating		Moderate	High	Moderate	Very Low	High		
NBS Calculation								
Thalweg Position Score		1	1	1	1	1		
Toe Depth Ratio Score		0	0	0	0	0		
Local Slope Score		0	1	0	0	0		
Total NBS Rating		1	2	1	1	1	0	
WARSS NBS Rating		1	3	1	1	1		
Rating		Very Low	Moderate	Very Low	Very Low	Very Low		
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.1	0.0	0.0	0.1		**Sheet Total**
Erosion Total (ft^3/yr)		3	33	2	0	5		43

Site Assessment Calculations

Project: 1058-PDEE Date: 1/9/2013

Stream: All Crew: mm,ce,gg

Reach/Description: All Page: 1 Of: 4

Feature	Units							
Section Number		1	2	3	4	5	6 (ref)	7 (ref)
Reach Name		Thompson	Thompson	Thompson	Thompson	Thompson	Thompson	Thompson
Location		u/s pond	d/s pond	111+45	115+50	116+75	d/s site	d/s site
D_A	square miles	0.061	0.121	0.128	0.138	0.155	0.165	0.233
W_{BKF}	ft	5	7	9	7	7.8	9.7	9
W_{BED}	ft	3	4.8	7.3	4.7	5	4	4
D_{BKF}	ft	1	1	0.9	0.9	0.9	0.8	0.9
$D_{TOE\ LT}$	ft	0	0	0.1	-0.1	-0.2	0	0
$D_{TOE\ RT}$	ft	0	-0.3	0	0.05	-0.2	-0.1	0
Field D_{THAL}	ft	0.3	0.2	0.2	0.2	0	0.1	0.15
W_{THAL}	ft	0.7	1	1	0.8	1.1	0.8	0.6
Bank Height	ft	1.5	3.5	2.6	1.5	3	0.9	1.2
Flood Prone Width	ft	20	9	15	20	12	25	15
Quick Section Calculation								
D_{MAX}		1.30	1.20	1.10	1.10	0.90	0.90	1.05
Average D_{TOE}		1.00	0.85	0.95	0.88	0.70	0.75	0.90
D_{THAL}		0.30	0.35	0.15	0.23	0.20	0.15	0.15
A_{BKF}		4.6	6.0	8.4	5.7	5.1	5.5	6.2
D_{MEAN}		0.91	0.86	0.93	0.82	0.65	0.57	0.69
W/D ratio		5.5	8.1	9.7	8.5	12.0	17.1	13.1
Bank Height Ratio		1.2	2.9	2.4	1.4	3.3	1.0	1.1
Entrenchment Ratio		4.0	1.3	1.7	2.9	1.5	2.6	1.7
Index Calculations								
Ref Bed Width Coef		9.6	9.6	9.6	9.6	9.6	9.6	9.6
Ref Bed Width Exp		0.45	0.45	0.45	0.45	0.45	0.45	0.45
Ref Max Depth Coef		1.45	1.45	1.45	1.45	1.45	1.45	1.45
Ref Max Depth Exp		0.27	0.27	0.27	0.27	0.27	0.27	0.27
Reference Bed Width		2.7	3.7	3.8	3.9	4.1	4.3	5.0
Bed Width Index (BWI)		1.1	1.3	1.9	1.2	1.2	0.9	0.8
Reference D_{MAX}		0.7	0.8	0.8	0.8	0.9	0.9	1.0
Max Depth Index (MDI)		2.2	4.3	3.1	1.8	3.4	1.0	1.2
Stream Type (Rosgen)								
Stream Type		G	G	G	G	G	C	B

Site Assessment Calculations

Project: 1058-PDEE Date: 1/9/2013

Stream: All Crew: mm,ce,gg

Reach/Description: All Page: 2 Of: 4

Feature	Units							
Section Number		8	9	10	11	12 (ref)	13 (ref)	14
Reach Name		Jerry	Jerry	TRIB	Jerry	Jerry	Jerry	Jerry
Location		301+50	302+30		308+00	311+40	311+60	313+80
D_A	square miles	0.065	0.066	0.026	0.105	0.119	0.12	0.123
W_{BKF}	ft	3.5	7	4.5	3.5	8	6.6	4
W_{BED}	ft	2	4.8	3	2.6	4.8	3.5	2.7
D_{BKF}	ft	0.6	0.6	0.5	0.8	0.4	0.7	0.9
$D_{TOE\ LT}$	ft	0	0	-0.2	0	-0.25	-0.15	0
$D_{TOE\ RT}$	ft	0	0	0.1	0	0	-0.3	0.1
Field D_{THAL}	ft	0.3	0.1	0.2	0.15	0.1	0.05	0.15
W_{THAL}	ft	0.5	1	0.5	0.5	1.2	0.7	0.6
Bank Height	ft	2.2	9	2.5	7.5	0.75	0.75	3
Flood Prone Width	ft	9	3.3	8	2.5	15	15	6.5
Quick Section Calculation								
D_{MAX}		0.90	0.70	0.70	0.95	0.50	0.75	1.05
Average D_{TOE}		0.60	0.60	0.45	0.80	0.28	0.48	0.95
D_{THAL}		0.30	0.10	0.25	0.15	0.23	0.28	0.10
A_{BKF}		2.0	3.8	2.1	2.7	2.4	3.0	3.3
D_{MEAN}		0.58	0.55	0.47	0.76	0.30	0.45	0.84
W/D ratio		6.0	12.8	9.5	4.6	26.3	14.6	4.8
Bank Height Ratio		2.4	12.9	3.6	7.9	1.5	1.0	2.9
Entrenchment Ratio		2.6	0.5	1.8	0.7	1.9	2.3	1.6
Index Calculations								
Ref Bed Width Coef		9.6	9.6	9.6	9.6	9.6	9.6	9.6
Ref Bed Width Exp		0.45	0.45	0.45	0.45	0.45	0.45	0.45
Ref Max Depth Coef		1.45	1.45	1.45	1.45	1.45	1.45	1.45
Ref Max Depth Exp		0.27	0.27	0.27	0.27	0.27	0.27	0.27
Reference Bed Width		2.8	2.8	1.9	3.5	3.7	3.7	3.7
Bed Width Index (BWI)		0.7	1.7	1.6	0.7	1.3	0.9	0.7
Reference D_{MAX}		0.7	0.7	0.5	0.8	0.8	0.8	0.8
Max Depth Index (MDI)		3.2	12.9	4.6	9.5	0.9	0.9	3.6
Stream Type (Rosgen)								
Stream Type		G	G	G	G	B		G

Site Assessment Calculations

Project: 1058-PDEE Date: 2/20/2013

Stream: All Crew: mm,ce,gg

Reach/Description: All Page: 3 Of: 4

Feature	Units							
Section Number		15	16 (ref)	17 (ref)	18	19	20	21
Reach Name		Jerry	Dale	Dale	Dale	Dale	Dale	Dale
Location		316+20	200+00	200+10	201+80	204+30	206+65	209+10
D_A	square miles	0.125	0.0276	0.0277	0.03	0.035	0.043	0.048
W_{BKF}	ft	5.7	8.5	8	4.8	5	6	6
W_{BED}	ft	3.5	4	3.4	4	3.5	3.6	3
D_{BKF}	ft	0.9	0.5	0.4	0.6	0.6	0.7	0.6
$D_{TOE\ LT}$	ft	0	0	0	0.1	0	0.1	0
$D_{TOE\ RT}$	ft	0	0	0	-0.1	0	0.1	0.1
Field D_{THAL}	ft	0.15	0.1	0.1	0.1	0.1	0.2	0.1
W_{THAL}	ft	1	0.9	0.8	0.7	1	1	0.6
Bank Height	ft	3.5	0.6	0.6	2.2	5.5	2	1.1
Flood Prone Width	ft	8	18	20	7	7	9	15
Quick Section Calculation								
D_{MAX}		1.05	0.60	0.50	0.70	0.70	0.90	0.70
Average D_{TOE}		0.90	0.50	0.40	0.60	0.60	0.80	0.65
D_{THAL}		0.15	0.10	0.10	0.10	0.10	0.10	0.05
A_{BKF}		4.5	3.4	2.5	2.9	2.8	4.1	3.0
D_{MEAN}		0.79	0.40	0.31	0.60	0.56	0.68	0.50
W/D ratio		7.3	21.4	25.7	8.0	9.0	8.8	11.9
Bank Height Ratio		3.3	1.0	1.2	3.1	7.9	2.2	1.6
Entrenchment Ratio		1.4	2.1	2.5	1.5	1.4	1.5	2.5
Index Calculations								
Ref Bed Width Coef		9.6	9.6	9.6	9.6	9.6	9.6	9.6
Ref Bed Width Exp		0.45	0.45	0.45	0.45	0.45	0.45	0.45
Ref Max Depth Coef		1.45	1.45	1.45	1.45	1.45	1.45	1.45
Ref Max Depth Exp		0.27	0.27	0.27	0.27	0.27	0.27	0.27
Reference Bed Width		3.8	1.9	1.9	2.0	2.1	2.3	2.4
Bed Width Index (BWI)		0.9	2.1	1.8	2.0	1.6	1.5	1.2
Reference D_{MAX}		0.8	0.6	0.6	0.6	0.6	0.6	0.6
Max Depth Index (MDI)		4.2	1.1	1.1	3.9	9.4	3.2	1.7
Stream Type (Rosgen)								
Stream Type		G	C	C	G	G	G	G

Site Assessment Calculations

Project:	1058-PDEE	Date:	2/20/2013
Stream:	All	Crew:	mm,ce,gg
Reach/Description:	All	Page:	4 Of: 4

Feature	Units							
Section Number		22	23	24				
Reach Name		Dale	Dale	Dale				
Location		218+00	219+85	224+20				
D_A	square miles	0.07	0.079	0.0865				
W_{BKF}	ft	6.5	5.5	8				
W_{BED}	ft	5.3	4.2	4				
D_{BKF}	ft	0.8	0.8	0.75				
$D_{TOE\ LT}$	ft	-0.1	-0.1	0				
$D_{TOE\ RT}$	ft	0	0	0				
Field D_{THAL}	ft	0.15	0.15	0.2				
W_{THAL}	ft	0.8	0.9	0.8				
Bank Height	ft	3.1	3.5	2.5				
Flood Prone Width	ft	9	6.5	9				
Quick Section Calculation								
D_{MAX}		0.95	0.95	0.95				
Average D_{TOE}		0.75	0.75	0.75				
D_{THAL}		0.20	0.20	0.20				
A_{BKF}		5.0	4.1	5.0				
D_{MEAN}		0.77	0.75	0.62				
W/D ratio		8.4	7.3	12.9				
Bank Height Ratio		3.3	3.7	2.6				
Entrenchment Ratio		1.4	1.2	1.1				
Index Calculations								
Ref Bed Width Coef		9.6	9.6	9.6				
Ref Bed Width Exp		0.45	0.45	0.45				
Ref Max Depth Coef		1.45	1.45	1.45				
Ref Max Depth Exp		0.27	0.27	0.27				
Reference Bed Width		2.9	3.1	3.2				
Bed Width Index (BWI)		1.8	1.4	1.3				
Reference D_{MAX}		0.7	0.7	0.7				
Max Depth Index (MDI)		4.4	4.8	3.3				
Stream Type (Rosgen)								
Stream Type		G	G	F				

3) Bulk Sample Sieve Analysis

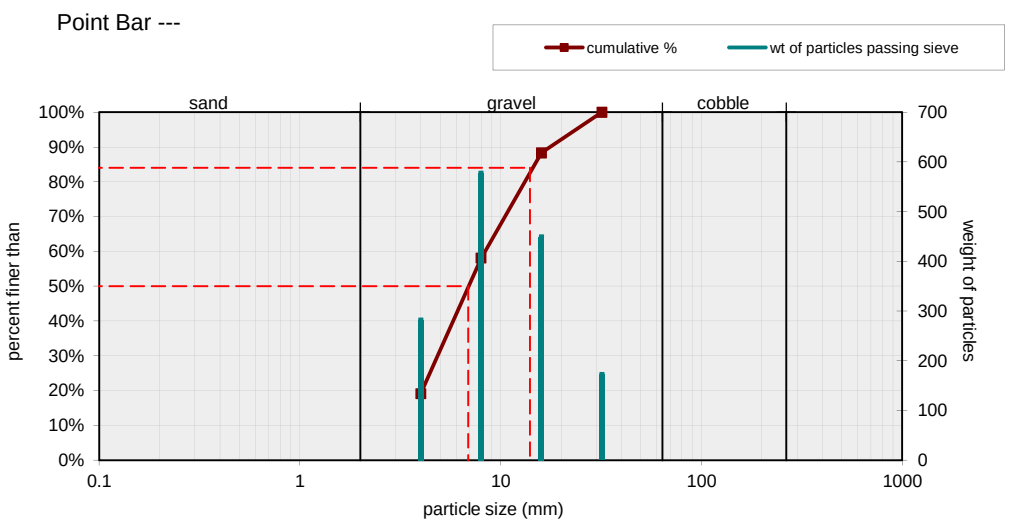
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		282	282	19%	---	---
4		577	577	39%	19%	19%
8		449	449	30%	39%	58%
16		172	172	12%	30%	88%
32			0	0%	12%	100%

total wt retained in sieves: 1480

Note: Sand 358 g, u/s Thompson



Size (mm)					
D16	---	D65	9.4	sand	100%
D35	5.3	D84	14		
D50	6.9	D95	24		

Largest Particle	
1	48
2	15
3	
4	
5	
	31.50

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
65	37	10	0.20
48	28	10	0.27

			---
mean shape factor:			0.24

3) Bulk Sample Sieve Analysis

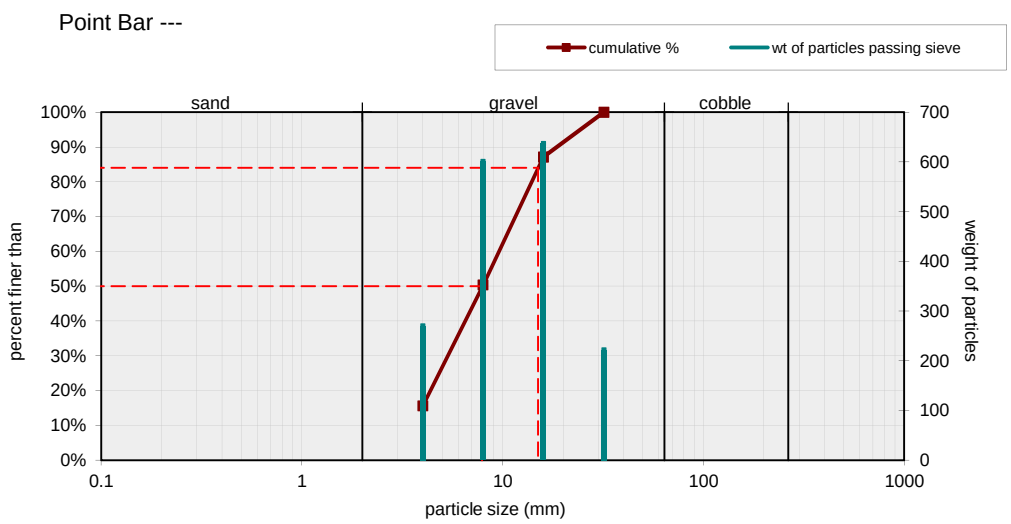
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		270	270	16%	---	---
4		601	601	35%	16%	16%
8		637	637	37%	35%	50%
16		222	222	13%	37%	87%
32			0	0%	13%	100%

total wt retained in sieves: 1730

Note: Sand 177 g, Thompson d/s property line, riffle



Size (mm)					
D16	4	D65	11	sand	100%
D35	5.9	D84	15		
D50	7.9	D95	24		

Largest Particle	
1	22
2	18
3	
4	
5	
	20.00

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
53	21	12	0.36
32	30	11	0.36

			---
	mean shape factor:		0.36

3) Bulk Sample Sieve Analysis

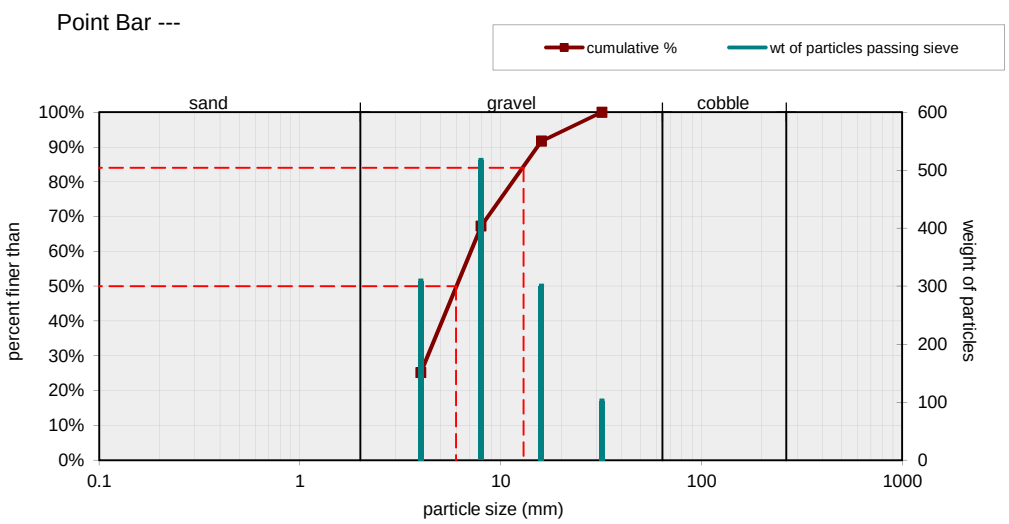
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		309	309	25%	---	---
4		517	517	42%	25%	25%
8		300	300	24%	42%	67%
16		102	102	8%	24%	92%
32			0	0%	8%	100%

total wt retained in sieves: 1228

Note: Sand 419 g, Jerry Bar



	Size (mm)				
D16	---	D65	7.7	sand	100%
D35	4.7	D84	13		
D50	6	D95	21		

Largest Particle	
1	25
2	20
3	
4	
5	
	22.50

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
40	30	15	0.43
60	32	4	0.09

			---
mean shape factor:			0.26

3) Bulk Sample Sieve Analysis

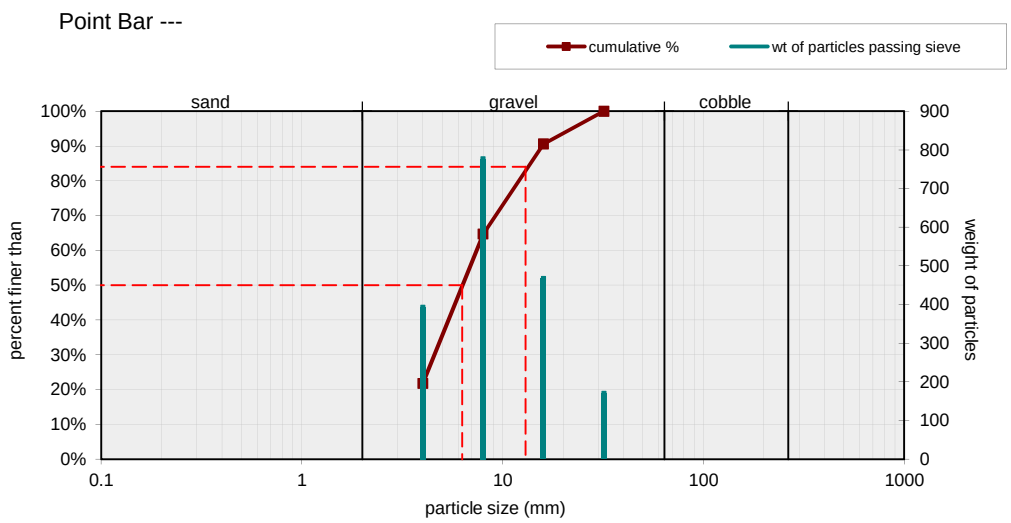
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		393	393	22%	---	---
4		777	777	43%	22%	22%
8		467	467	26%	43%	65%
16		170	170	9%	26%	91%
32			0	0%	9%	100%

total wt retained in sieves: 1807

Note: 217 g, Jerry Bed



Size (mm)					
D16	---	D65	8.1	sand	100%
D35	5	D84	13		
D50	6.3	D95	22		

Largest Particle	
1	18
2	18
3	
4	
5	
	18.00

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
40	35	5	0.13
51	30	3	0.08

			---
mean shape factor:			0.11

3) Bulk Sample Sieve Analysis

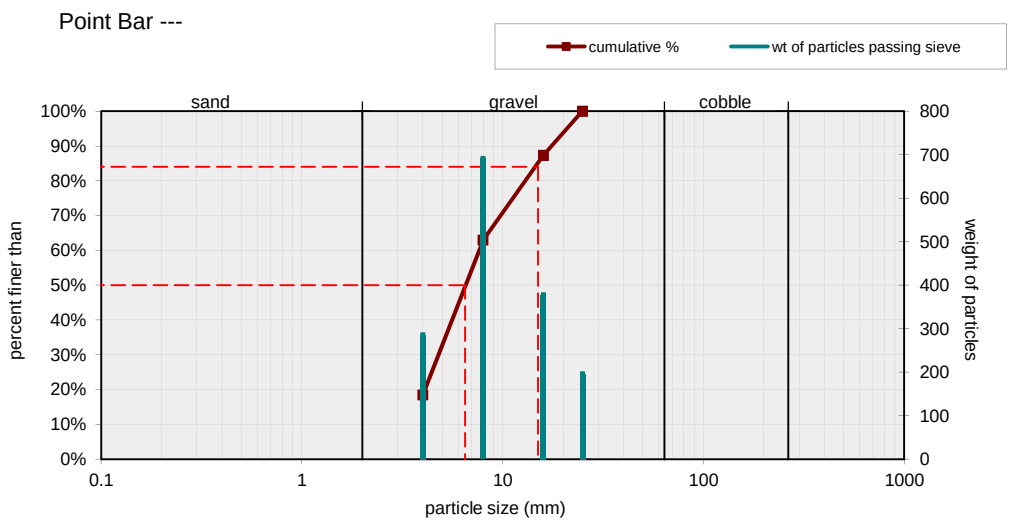
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		286	286	18%	---	---
4		691	691	45%	18%	18%
8		378	378	24%	45%	63%
16		196	196	13%	24%	87%
25			0	0%	13%	100%

total wt retained in sieves: 1551

Note: West Slope Dale



	Size (mm)				
D16	---	D65	8.5	sand	100%
D35	5.2	D84	15		
D50	6.5	D95	21		

Largest Particle	
1	19
2	12
3	
4	
5	
	15.50

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
31	25	15	0.54
35	26	12	0.40

			---
	mean shape factor:		0.47

3) Bulk Sample Sieve Analysis

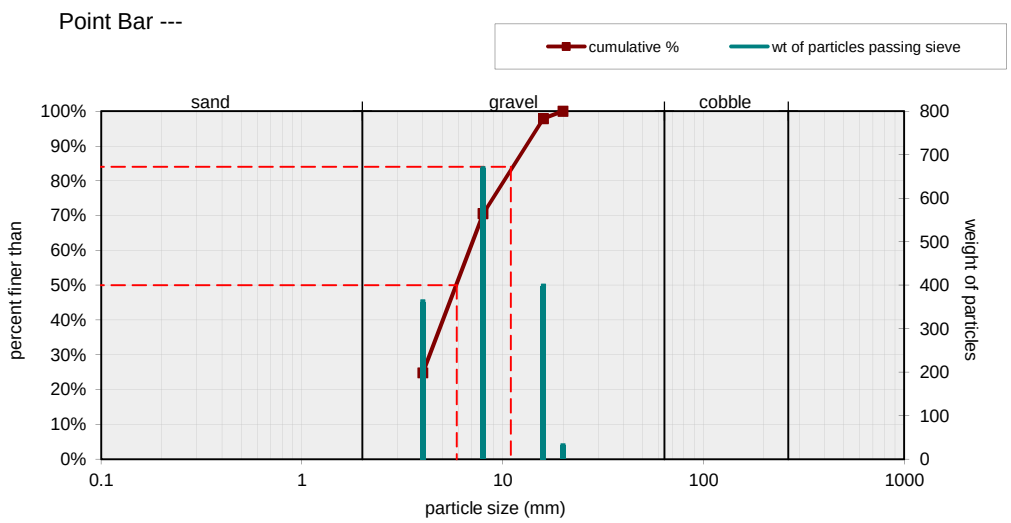
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		362	362	25%	---	---
4		668	668	46%	25%	25%
8		398	398	27%	46%	71%
16		31	31	2%	27%	98%
20			0	0%	2%	100%

total wt retained in sieves: 1459

Note: 235g, Dale Bed at Gage



Size (mm)					
D16	---	D65	7.4	sand	100%
D35	4.7	D84	11		
D50	5.9	D95	15		

Largest Particle	
1	12
2	8
3	
4	
5	
	10.00

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
35	20	10	0.38
25	15	12	0.62

			---
mean shape factor:			0.50

3) Bulk Sample Sieve Analysis

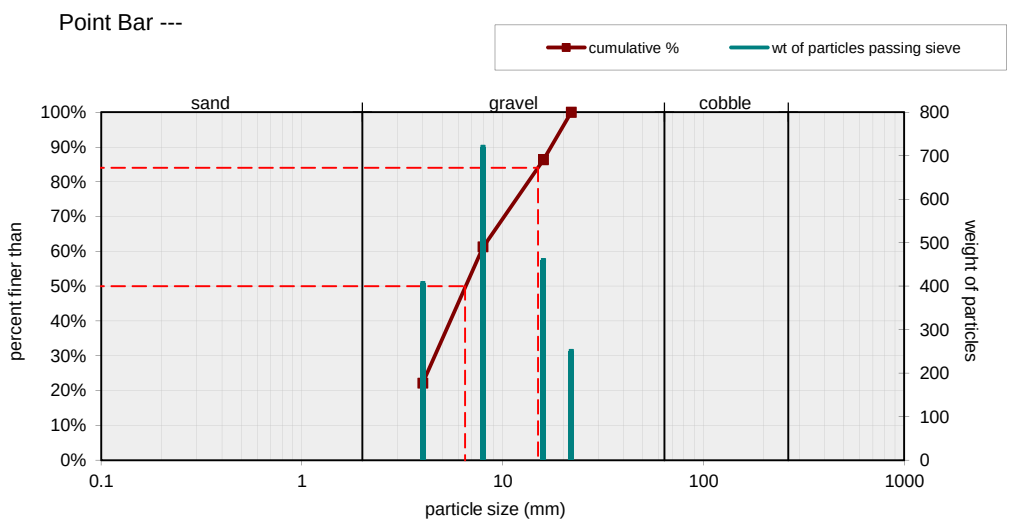
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		406	406	22%	---	---
4		719	719	39%	22%	22%
8		459	459	25%	39%	61%
16		250	250	14%	25%	86%
22			0	0%	14%	100%

total wt retained in sieves: 1834

Note: 491 g, Dale Bed #2, BMP



Size (mm)					
D16	---	D65	8.9	sand	100%
D35	5	D84	15		
D50	6.5	D95	20		

Largest Particle	
1	46
2	27
3	
4	
5	
	36.50

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
27	20	20	0.86
50	35	10	0.24

			---
mean shape factor:			0.55

3) Bulk Sample Sieve Analysis

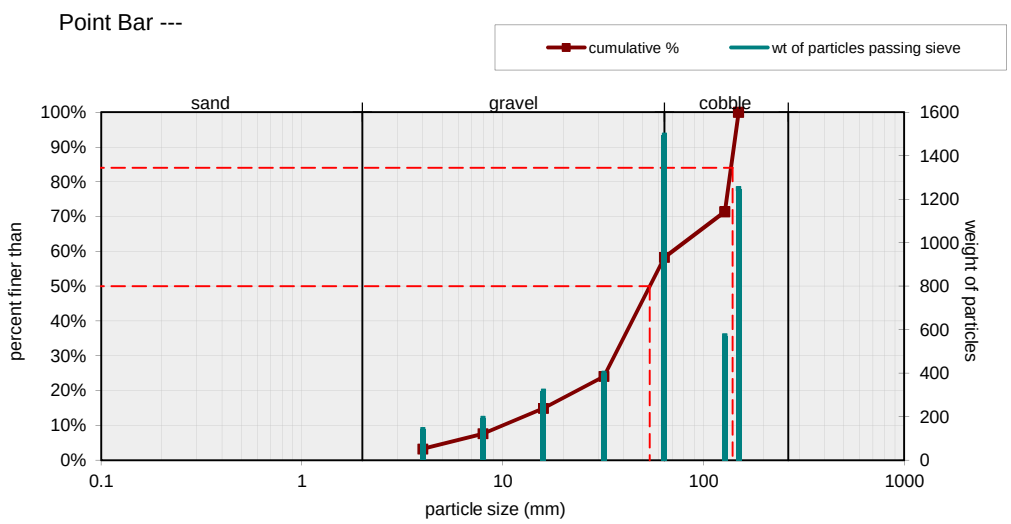
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		141	141	3%	---	---
4		192	192	4%	3%	3%
8		317	317	7%	4%	8%
16		400	400	9%	7%	15%
32		1494	1494	34%	9%	24%
64		572	572	13%	34%	58%
128		1248	1248	29%	13%	71%
150			0	0%	29%	100%

total wt retained in sieves: 4364

Note: 119 g, Thompson Bed



Size (mm)					
D16	17	D65	91	sand	100%
D35	40	D84	140		
D50	54	D95	150		

Largest Particle	
1	1248
2	326
3	
4	
5	
	787.00

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
220	150	50	0.28
80	75	30	0.39

			---
mean shape factor:			0.33

3) Bulk Sample Sieve Analysis

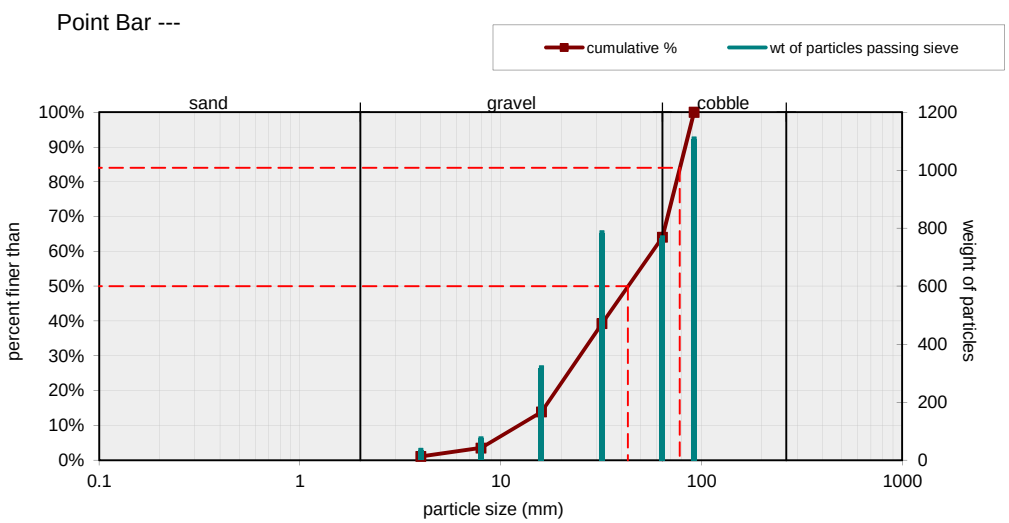
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		34	34	1%	---	---
4		74	74	2%	1%	1%
8		319	319	10%	2%	4%
16		784	784	25%	10%	14%
32		766	766	25%	25%	39%
64		1108	1108	36%	25%	64%
92			0	0%	36%	100%

total wt retained in sieves: 3085

Note: 36 g, Agg source on Jerry



Size (mm)					
D16	17	D65	65	sand	100%
D35	28	D84	78		
D50	43	D95	87		

Largest Particle	
1	577
2	334
3	
4	
5	
	455.50

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
155	92	20	0.17
81	80	42	0.52

			---
mean shape factor:			0.34

3) Bulk Sample Sieve Analysis

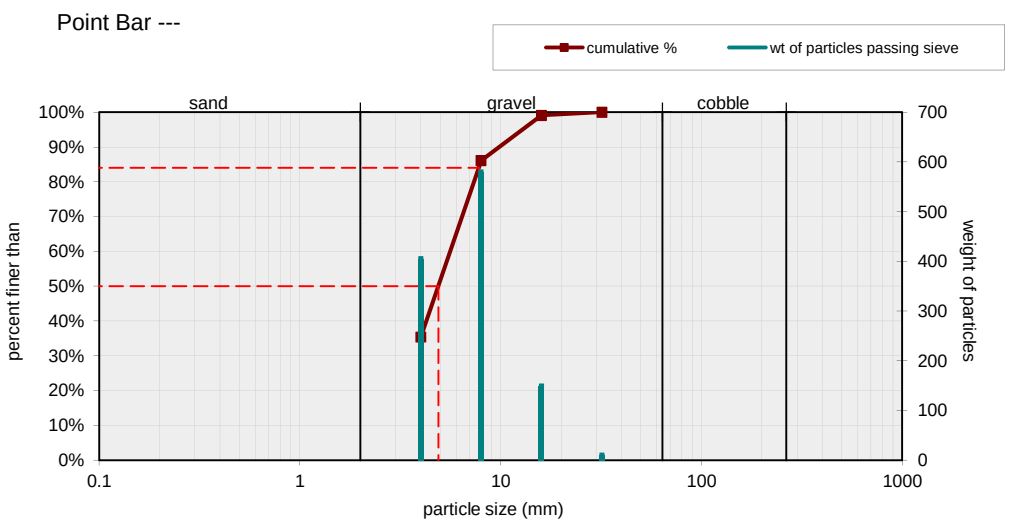
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		405	405	35%	---	---
4		580	580	51%	35%	35%
8		149	149	13%	51%	86%
16		10	10	1%	13%	99%
32			0	0%	1%	100%

total wt retained in sieves: 1144

Note: 515g,Pit Sample on Dale



Size (mm)					
D16	---	D65	6	sand	100%
D35	---	D84	7.8		
D50	4.9	D95	13		

Largest Particle	
1	6
2	4
3	
4	
5	
	5.00

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
21	16	12	0.65
25	16	2	0.10

			---
mean shape factor:			0.38

3) Bulk Sample Sieve Analysis

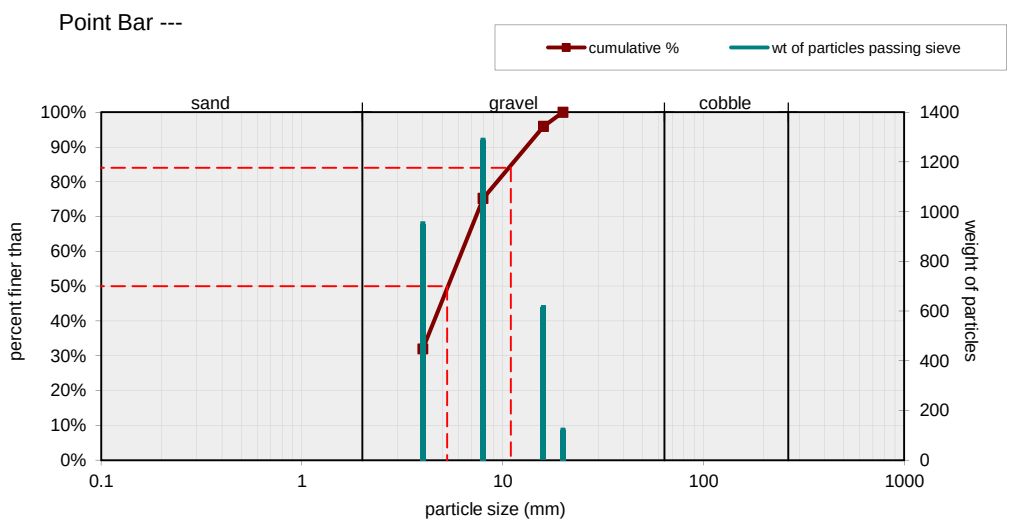
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		951	951	32%	---	---
4		1287	1287	43%	32%	32%
8		613	613	21%	43%	75%
16		121	121	4%	21%	96%
20			0	0%	4%	100%

total wt retained in sieves: 2972

Note: 970g,Pit Sample on Dale

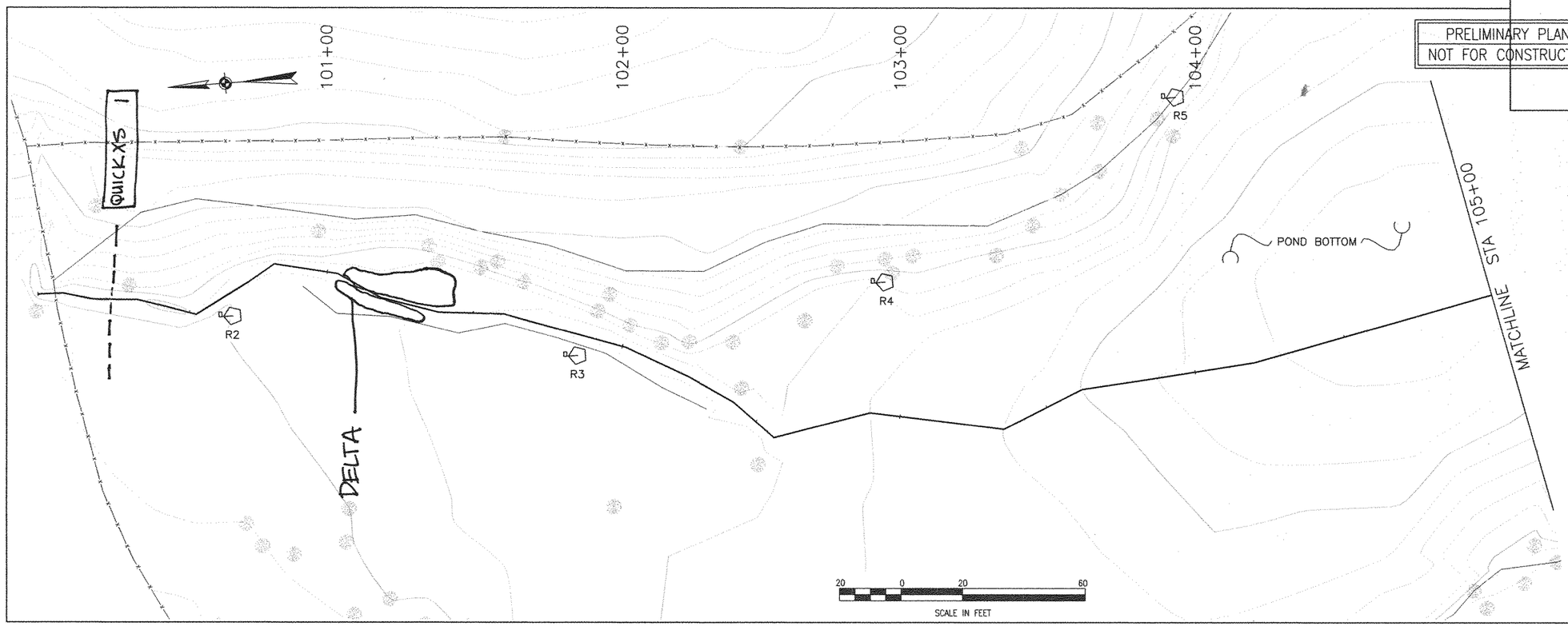


Size (mm)					
D16	---	D65	6.8	sand	100%
D35	4.2	D84	11		
D50	5.3	D95	16		

Largest Particle	
1	20
2	8
3	
4	
5	
	14.00

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
45	20	15	0.50
35	22	5	0.18

			---
mean shape factor:			0.34



PRELIMINARY PLANS
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LICENSE NO. P-0417
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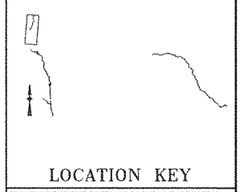
PHONE: (828) 658-3649
WWW.WOLFCREEKENG.COM

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1058	4
DATE 12/19/2012	CHKD. BY SGG		

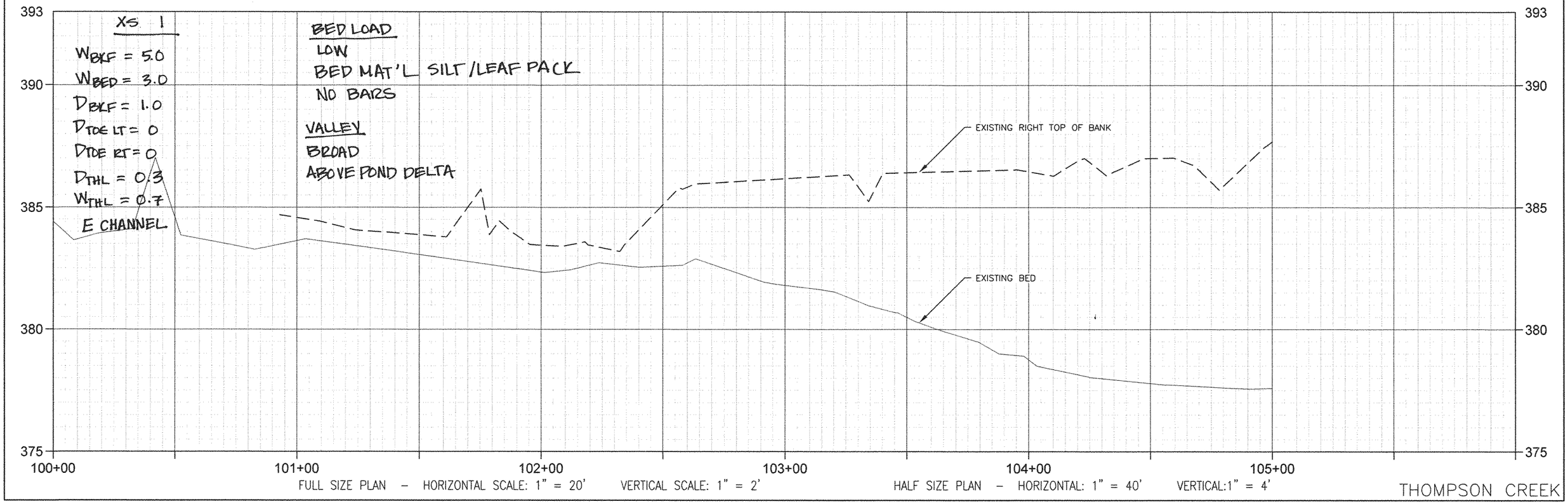
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

EXISTING FENCE



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

THOMPSON CREEK

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PRELIMINARY PLANS
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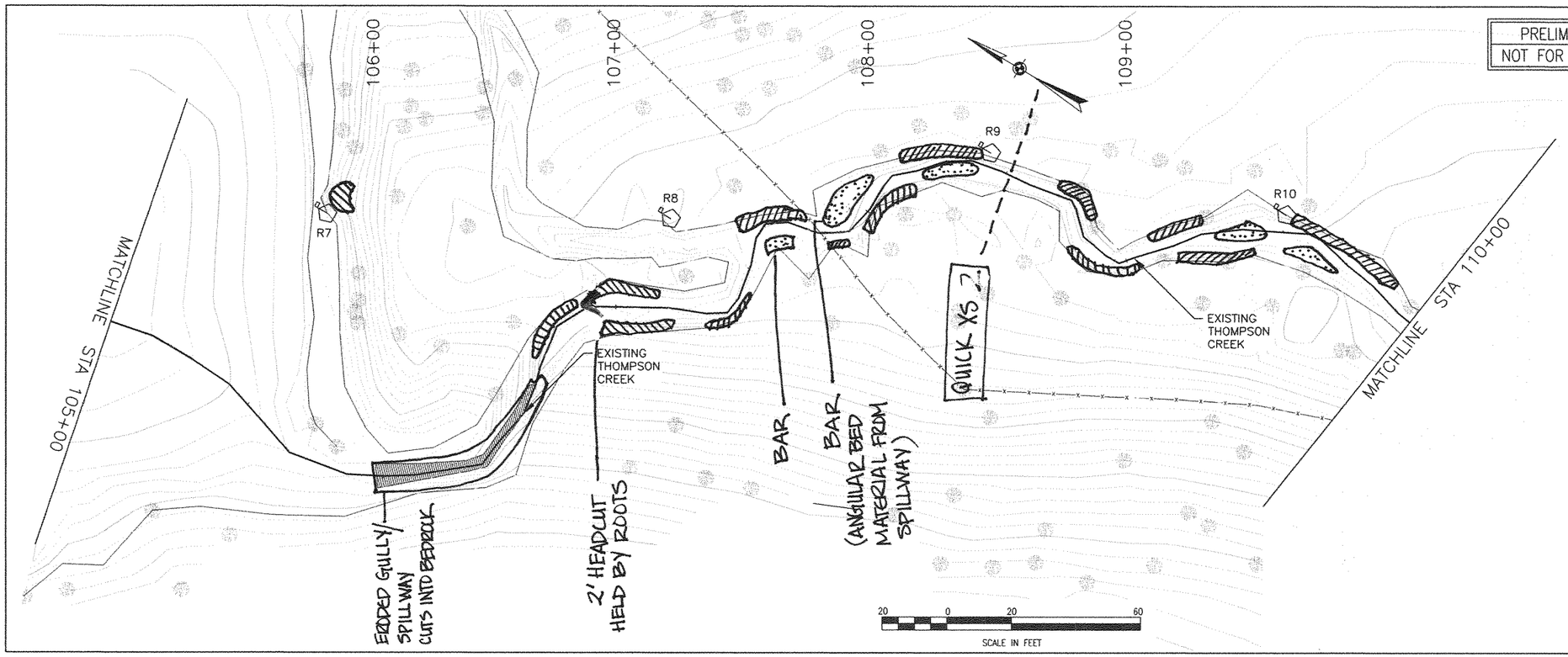
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1058	5
DATE 12/19/2012	CHKD. BY SGG		

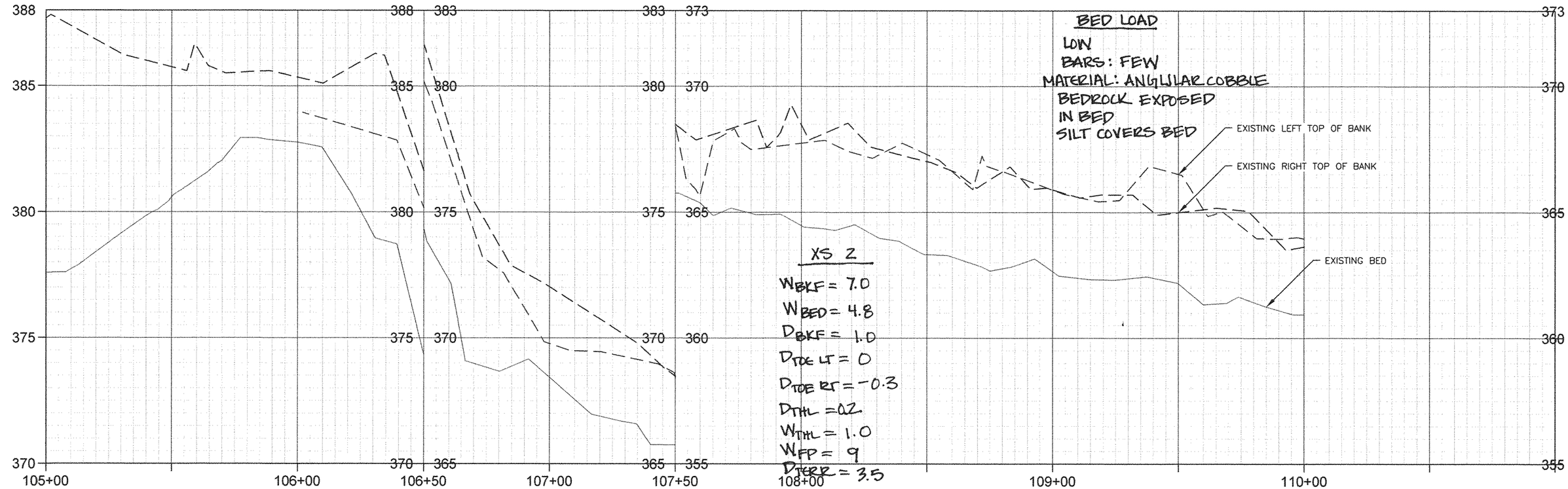
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

- EXISTING FENCE
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2' G7 CHANNEL HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL:1" = 4'

THOMPSON CREEK

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PRELIMINARY PLANS
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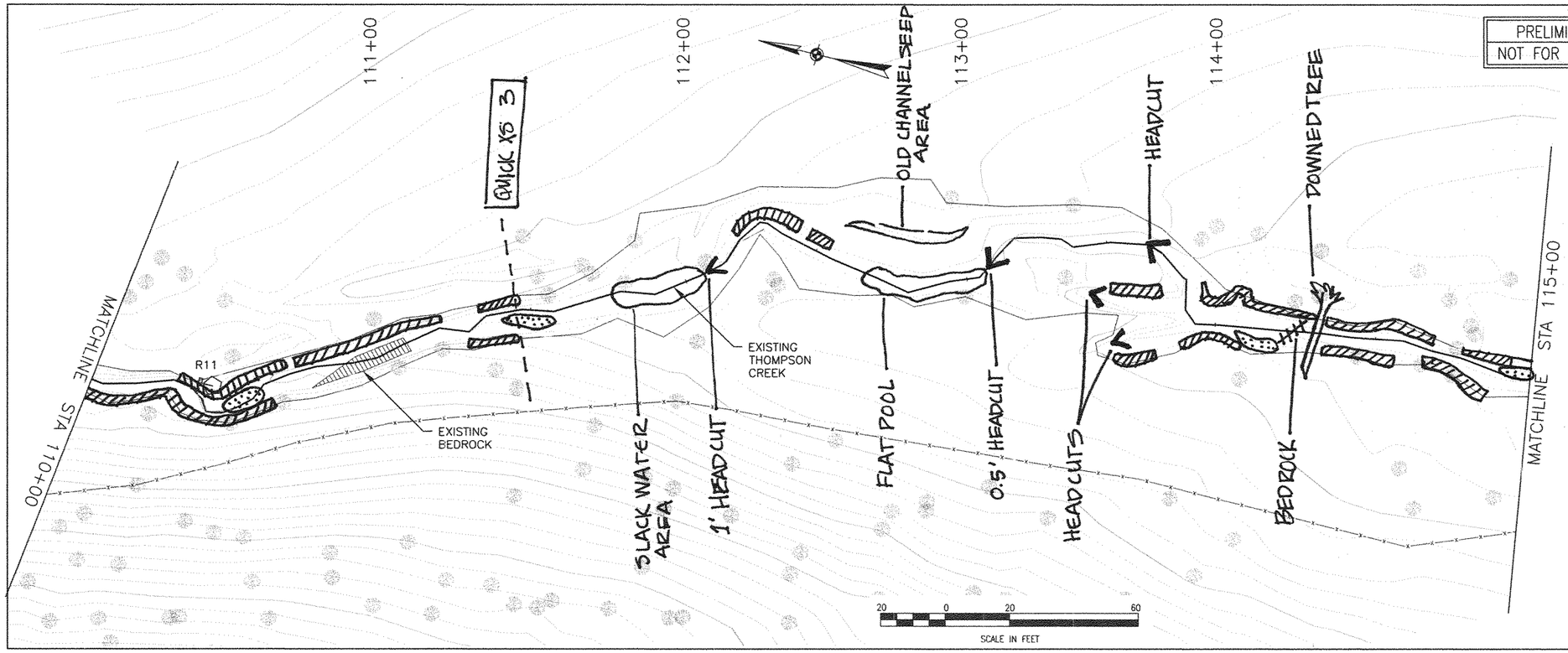
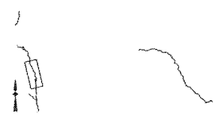
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DSGN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1058	6
DATE 12/19/2012	CKED. BY SGG		

DATE	BY	REV.	DESCRIPTION

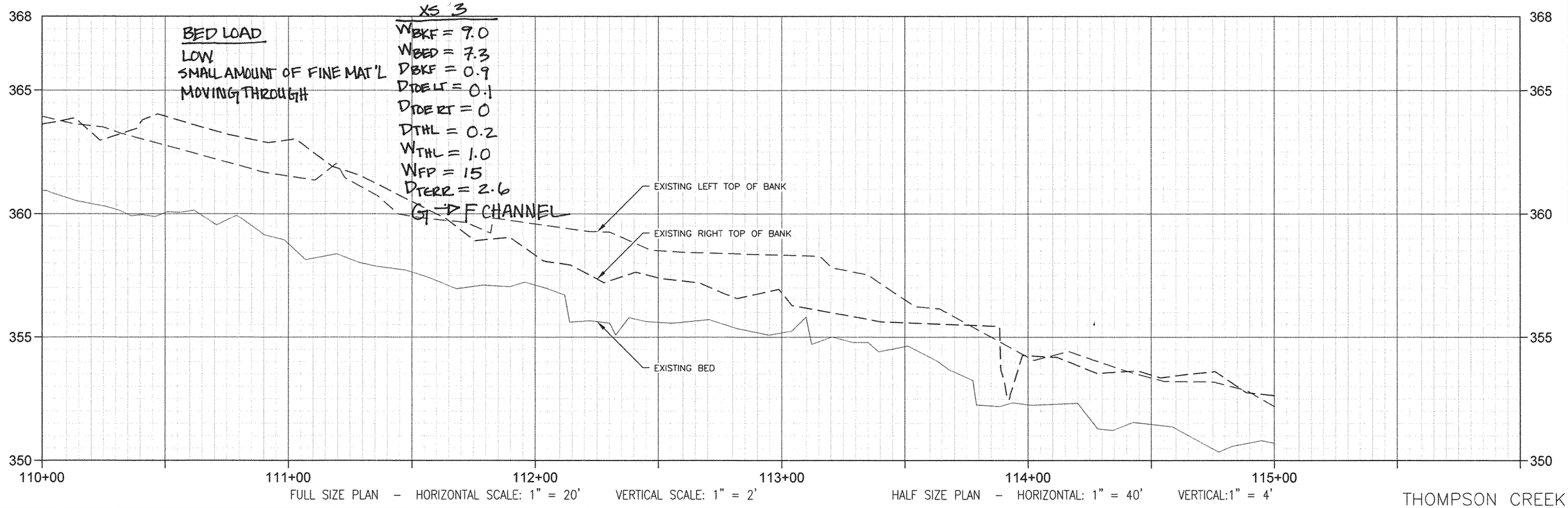


LOCATION KEY



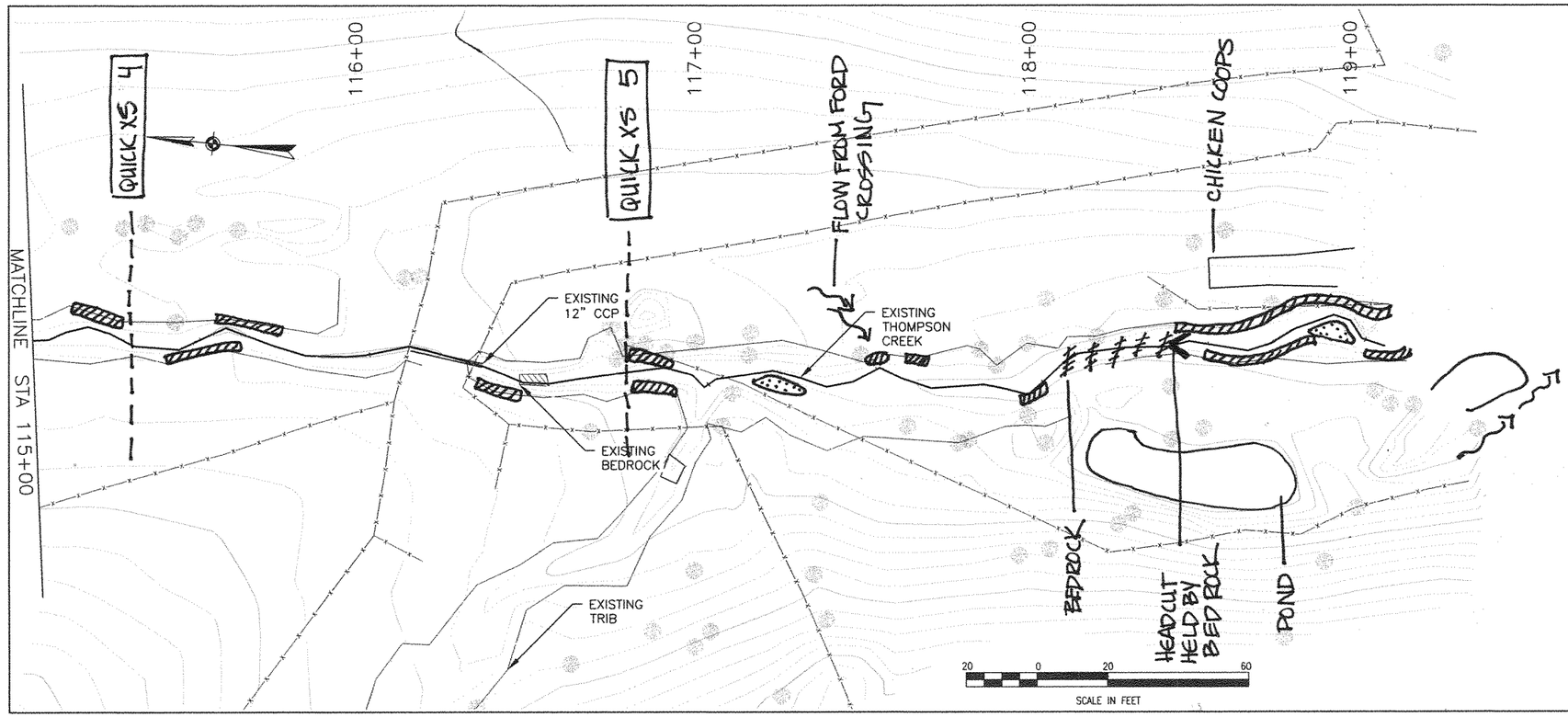
LEGEND

EXISTING FENCE
ERODING BANKS
BAR



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

THOMPSON CREEK



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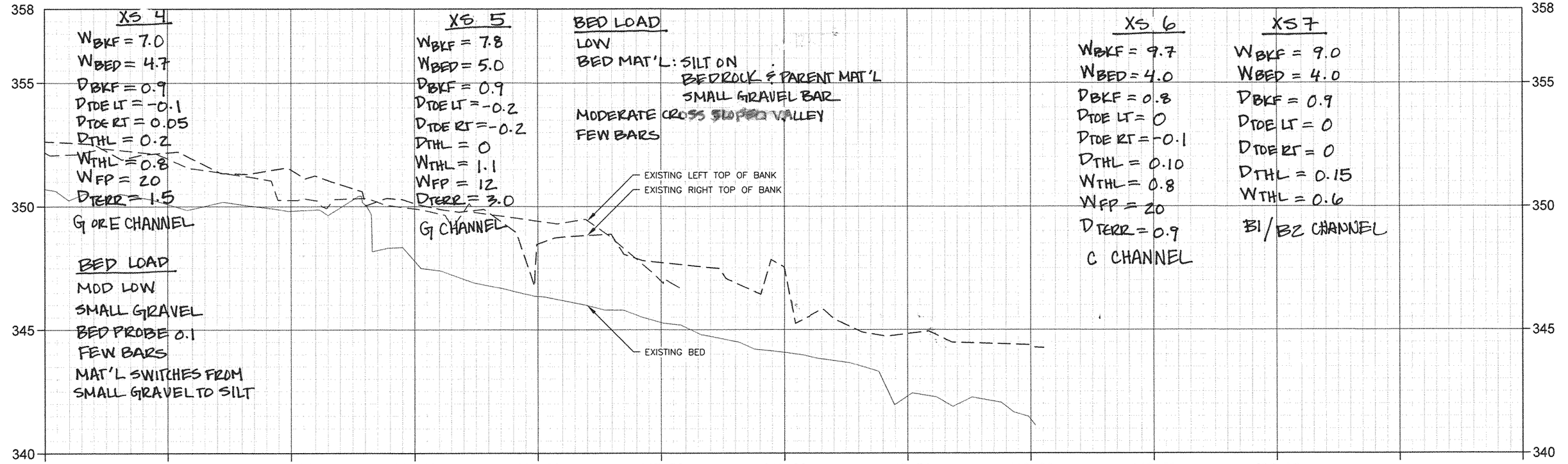
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	DWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1058	7
DATE 12/19/2012	CKED. BY SGG		

DATE	BY	REV.	DESCRIPTION

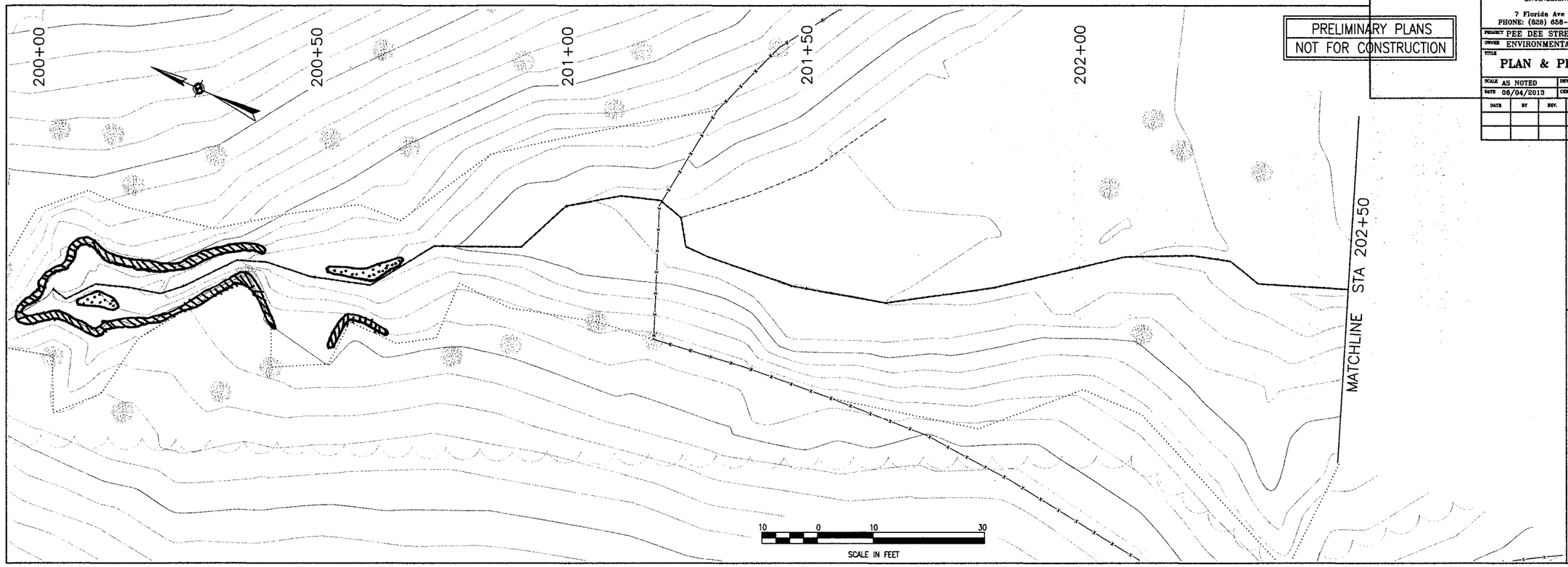
LOCATION KEY

LEGEND
- EXISTING FENCE
- ERODING BANKS
- BAR



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

THOMPSON CREEK



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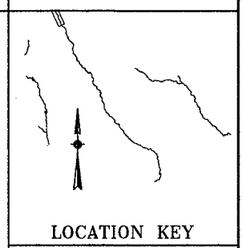
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

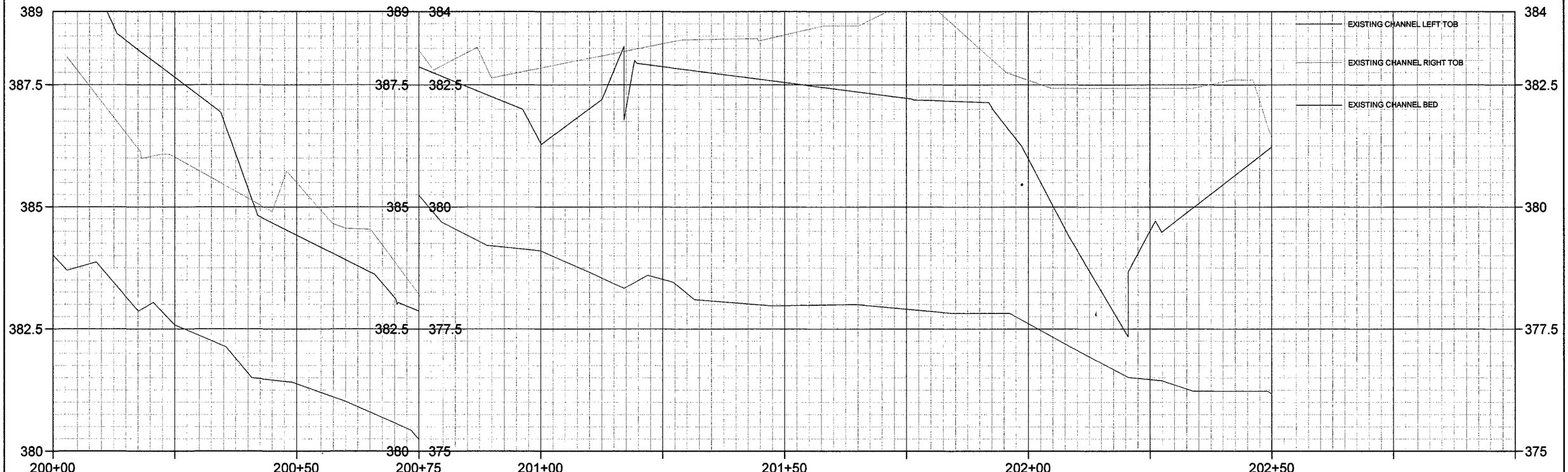
SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	12
DATE 06/04/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND
- EXISTING FENCE
- EXISTING THALWEG
- EXISTING T.O.B.
- EXISTING TREE
- SAVE TREE
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

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PRELIMINARY PLANS
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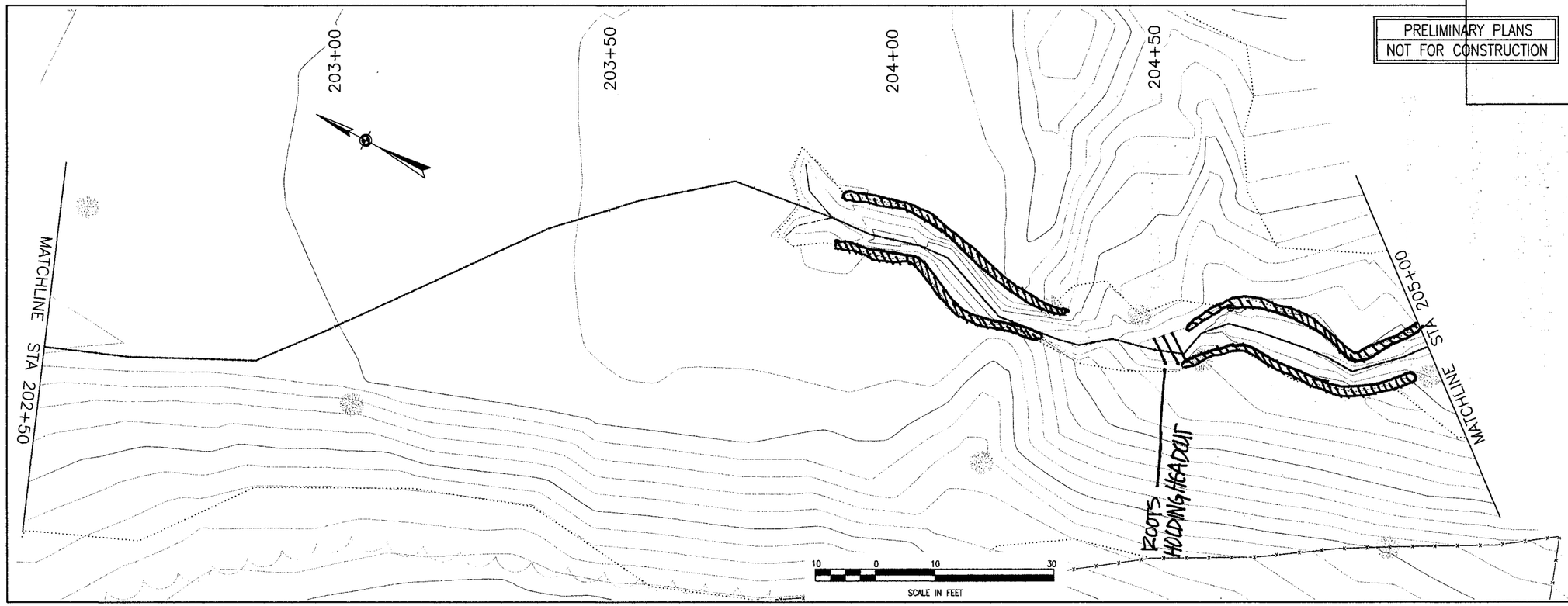
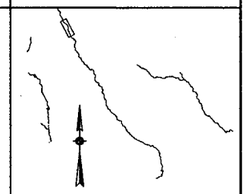
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	13
DATE 06/04/2013	CHKD. BY SGG		

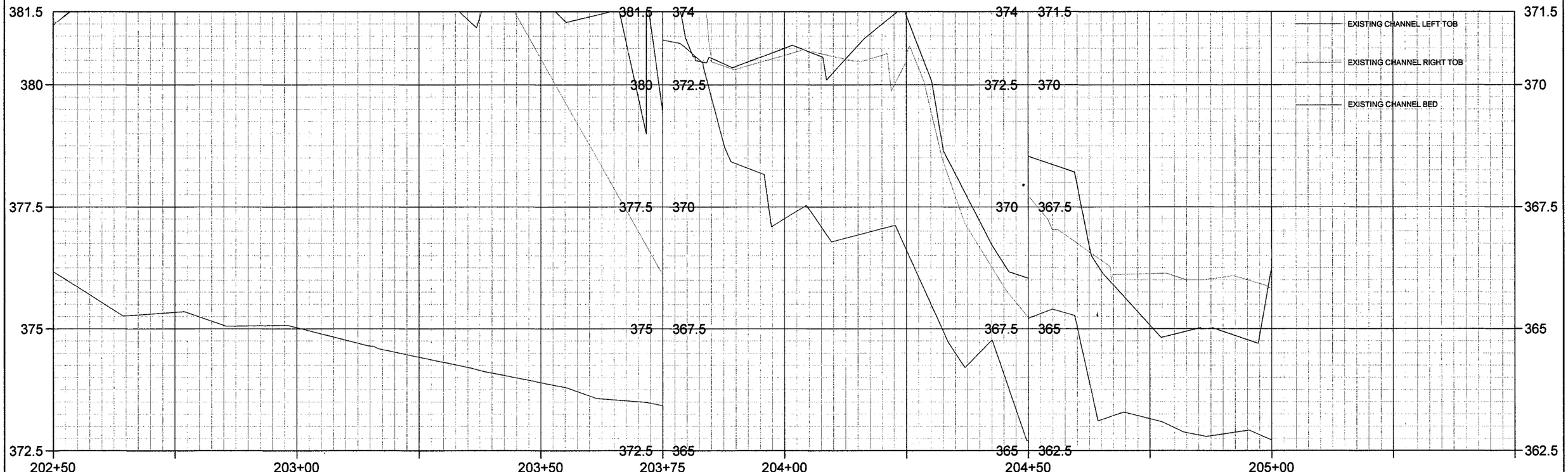
DATE	BY	REV.	DESCRIPTION





LOCATION KEY

LEGEND
- EXISTING FENCE
- EXISTING THALWEG
- EXISTING T.O.B.
- EXISTING TREE
- SAVE TREE
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

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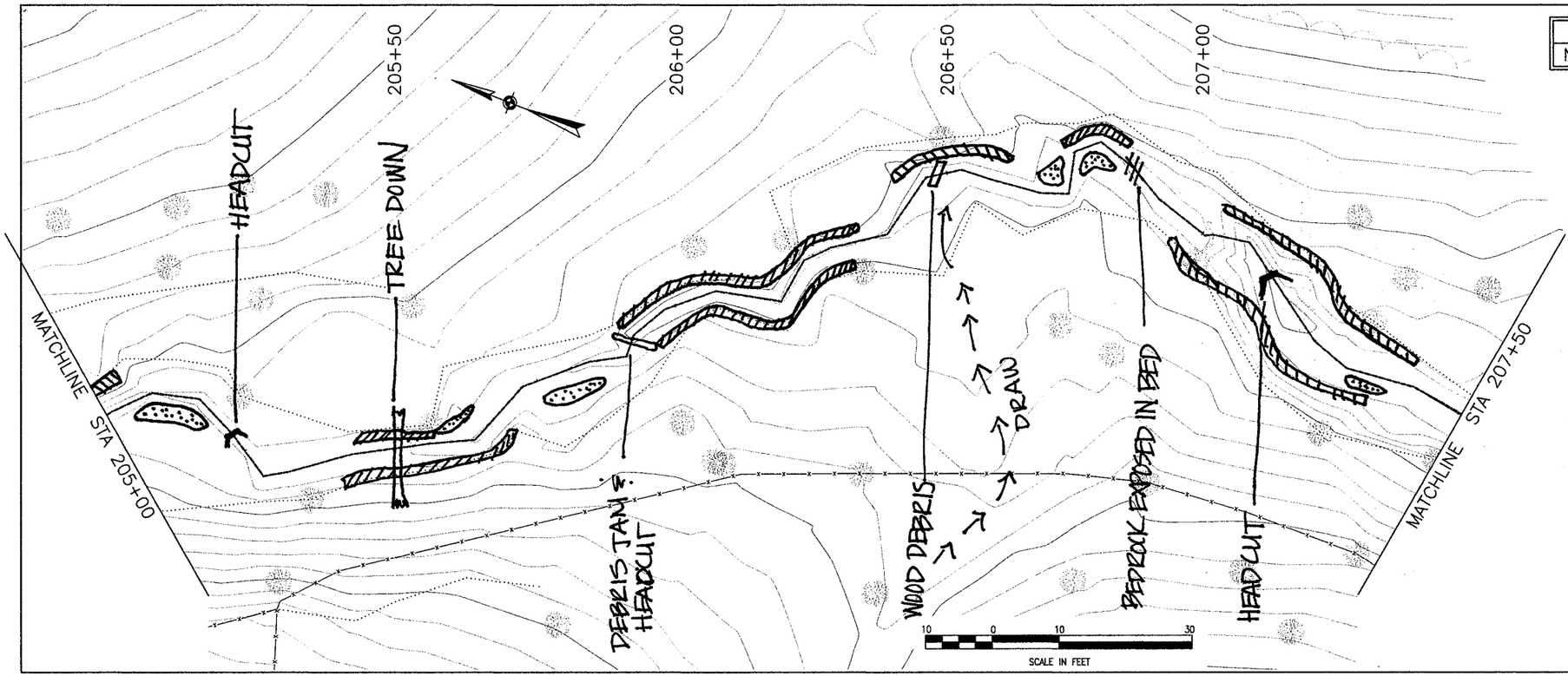
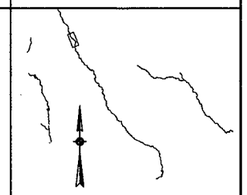
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	14
DATE 06/04/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

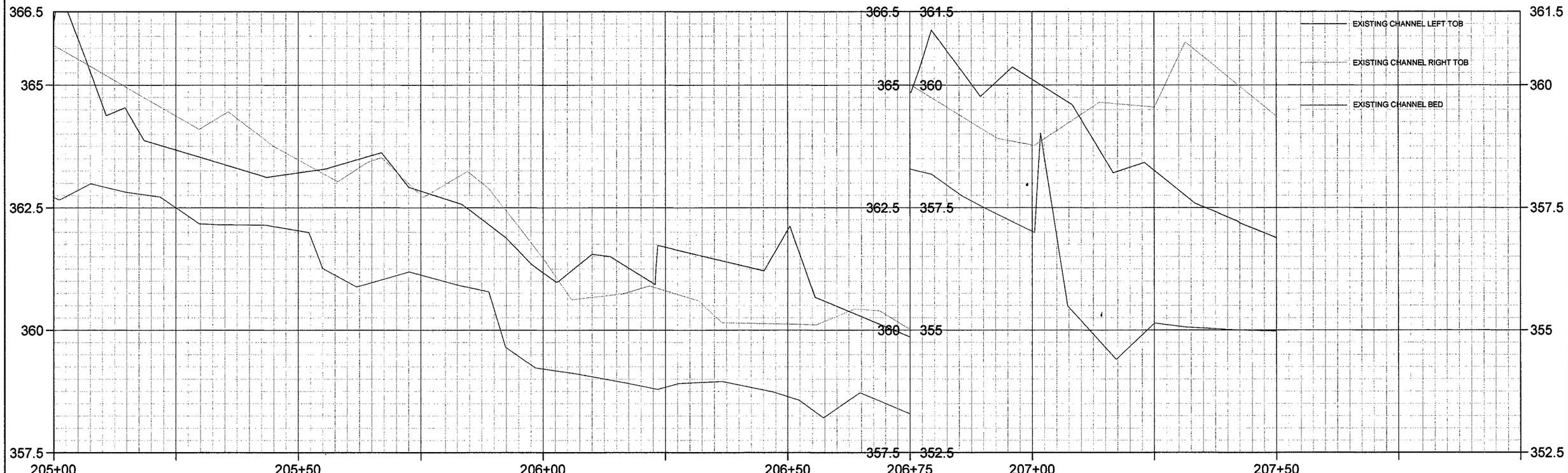
PRELIMINARY PLANS
NOT FOR CONSTRUCTION





LOCATION KEY

LEGEND
- EXISTING FENCE
- EXISTING THALWEG
- EXISTING T.O.B.
- EXISTING TREE
- SAVE TREE
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

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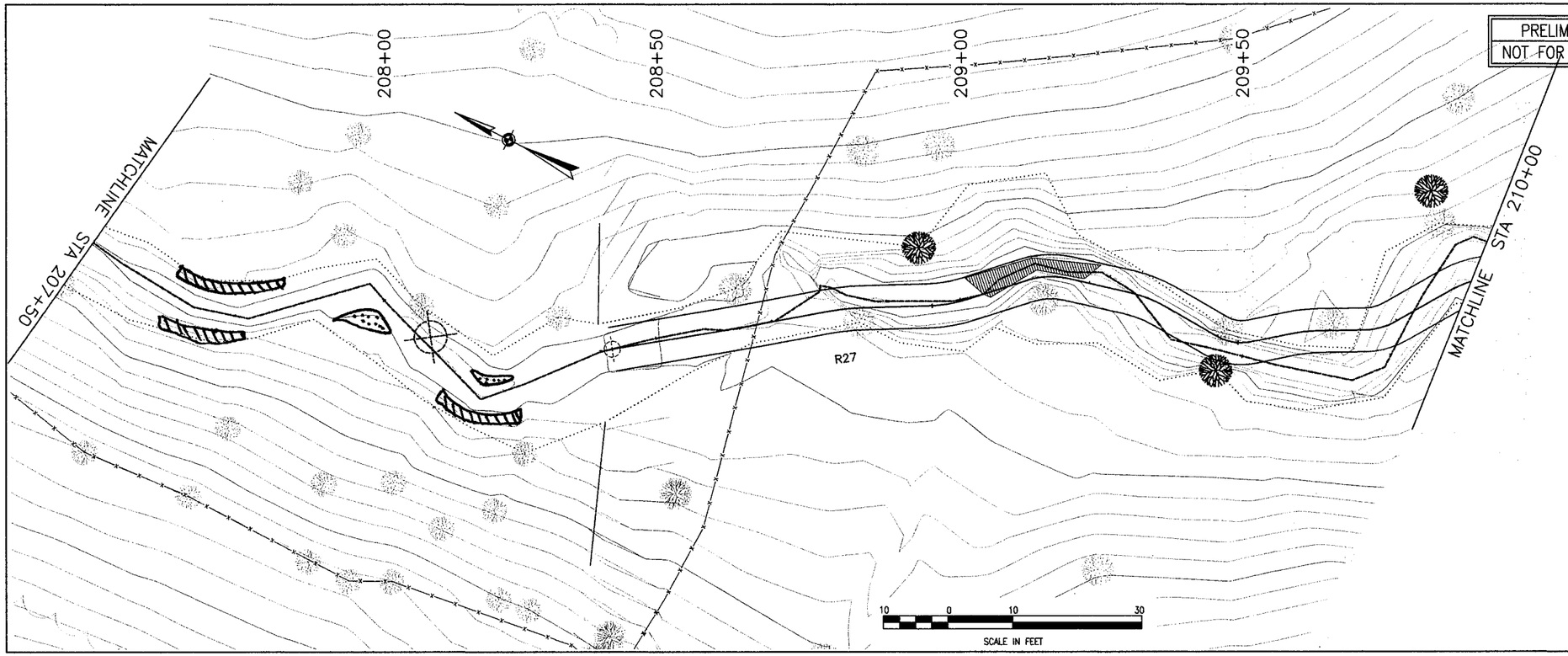
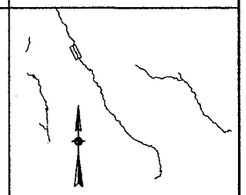
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	15
DATE 06/04/2013	CKED. BY SGG		

DATE	BY	REV.	DESCRIPTION

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

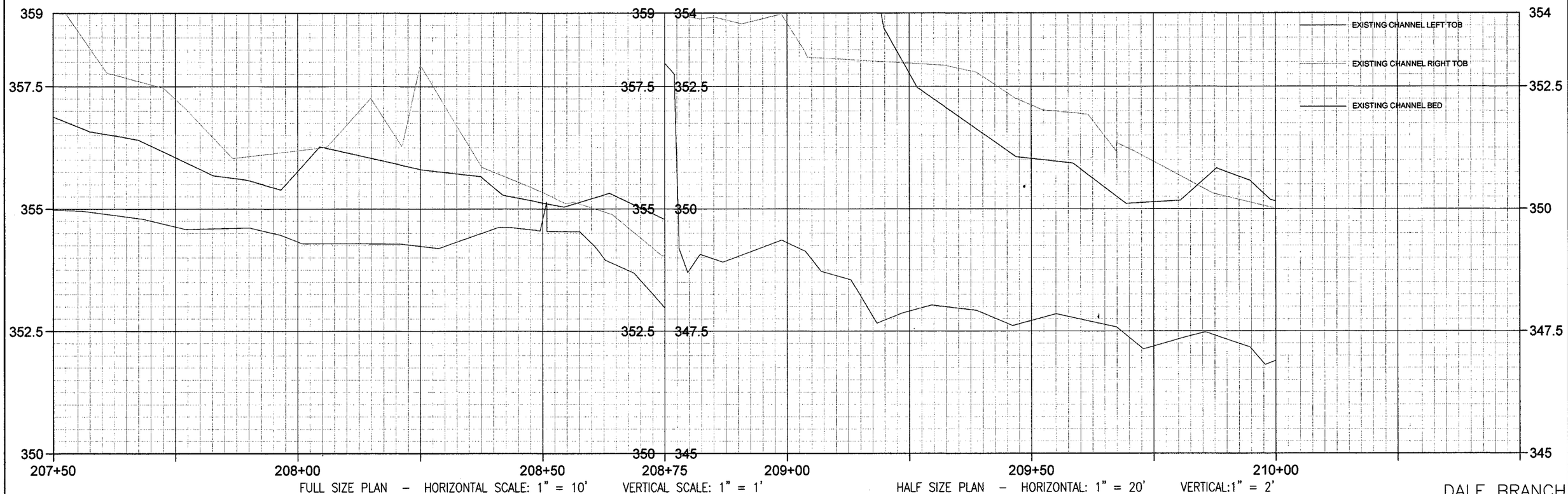




LOCATION KEY

LEGEND

- EXISTING FENCE
- EXISTING THALWEG
- EXISTING T.O.B.
- EXISTING TREE
- SAVE TREE
- Eroding BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

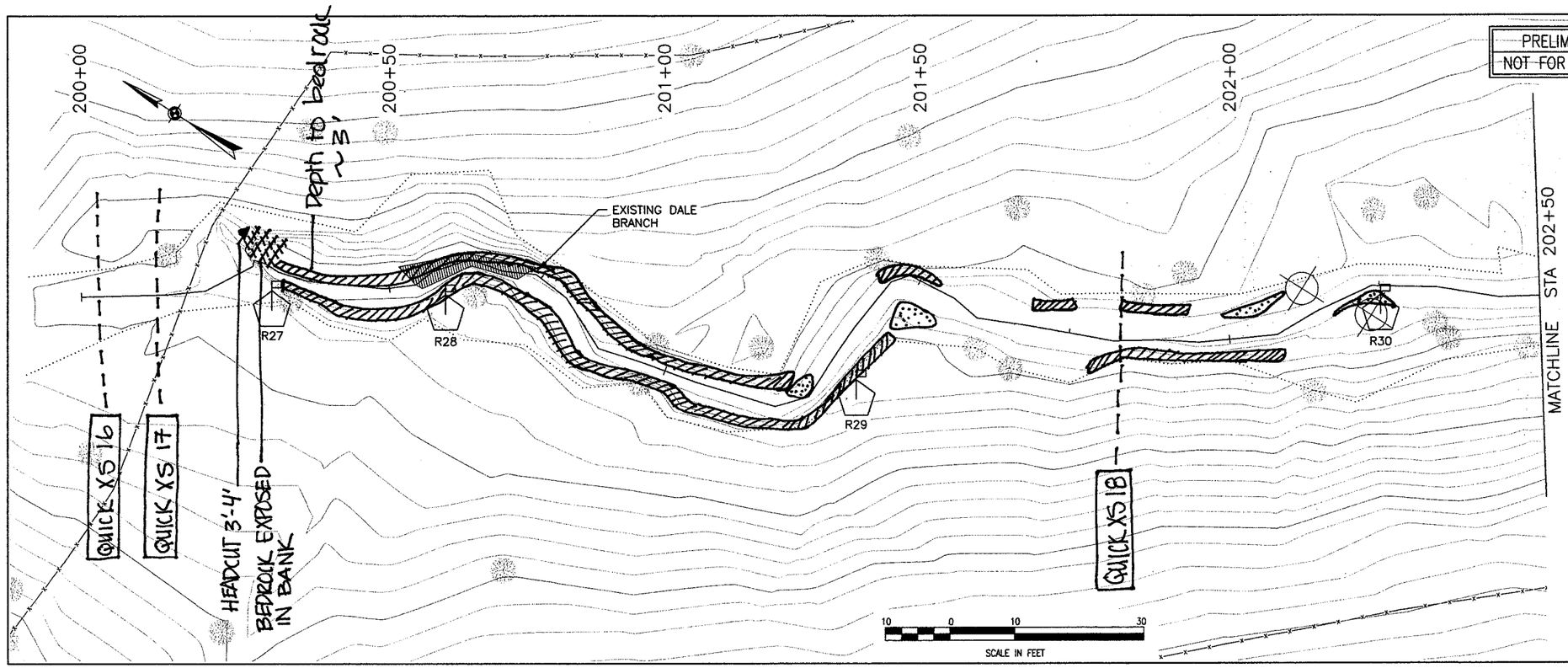
Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
7 Florida Ave Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

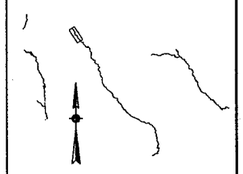
PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE: AS NOTED	DRWN. BY: CME	PROJECT NO. 1058	SHEET NUMBER 12
DATE: 2/19/2013	CKED. BY: SGG		

DATE	BY	REV.	DESCRIPTION

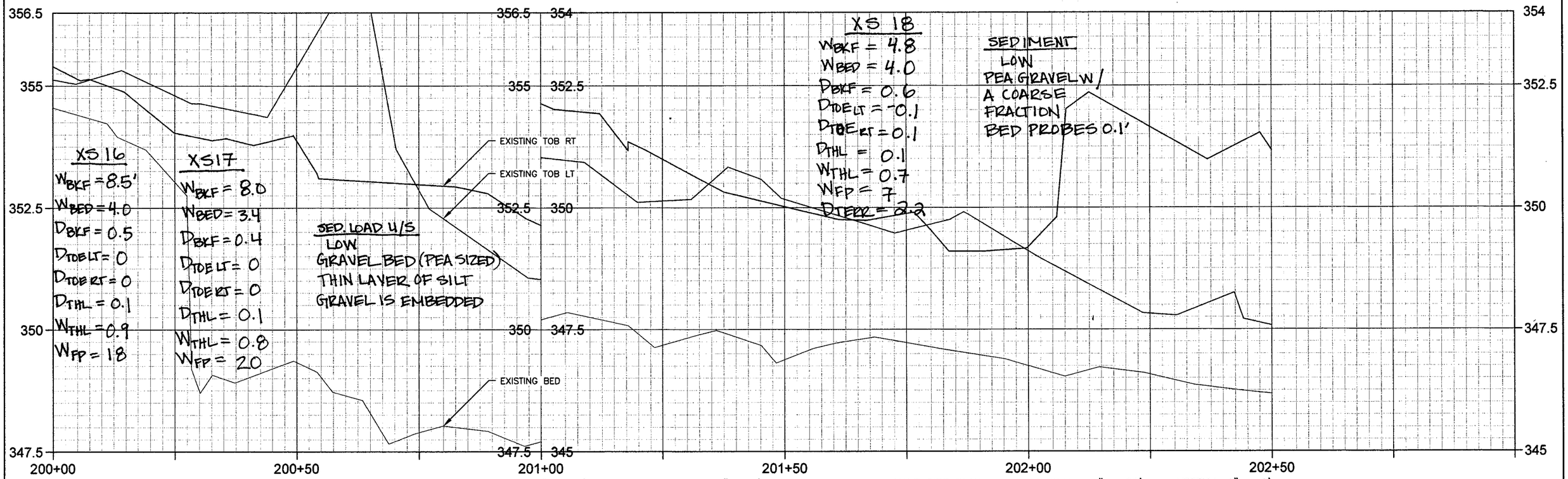




LOCATION KEY

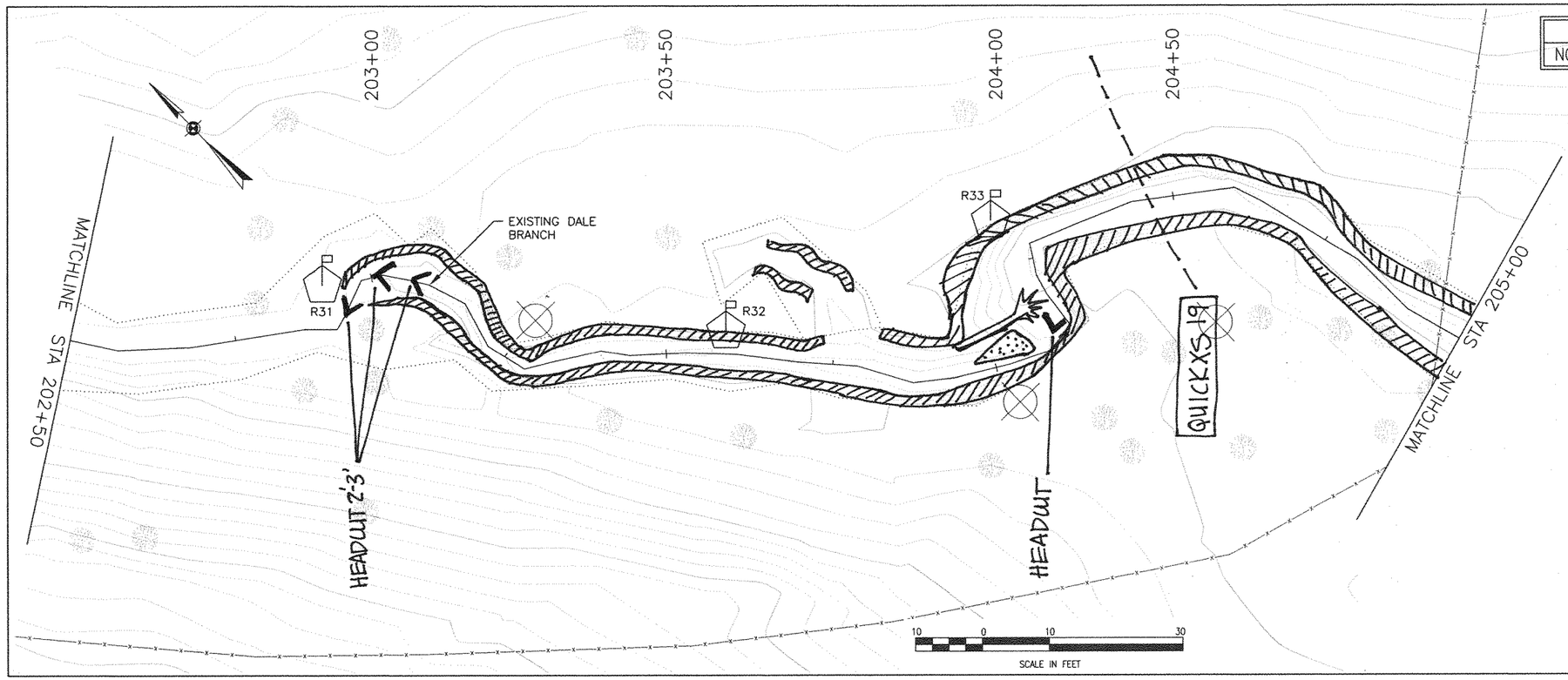
LEGEND

- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL: 1" = 2'

DALE BRANCH



PRELIMINARY PLANS
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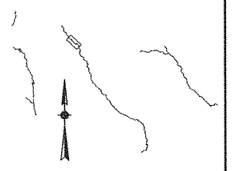
LICENSE NO. P-0417
7 Florida Ave Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE AS NOTED	DRWN. BY CME	PROJECT NO.	SHEET NUMBER
DATE 2/19/2013	CHKD. BY SGG	1058	13

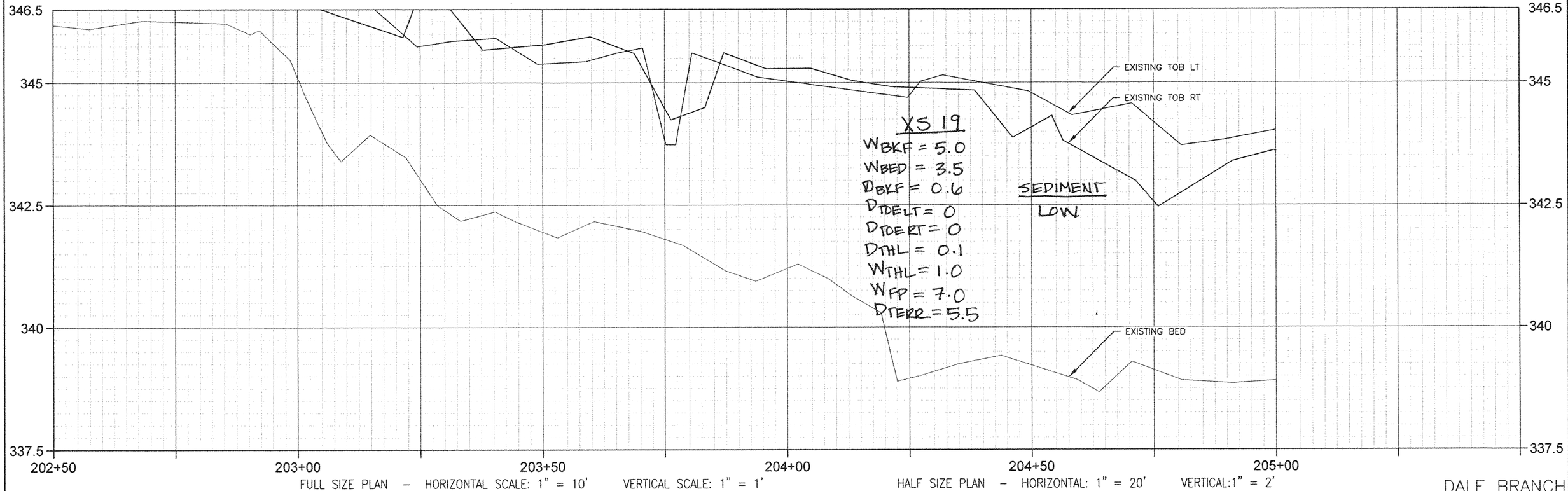
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

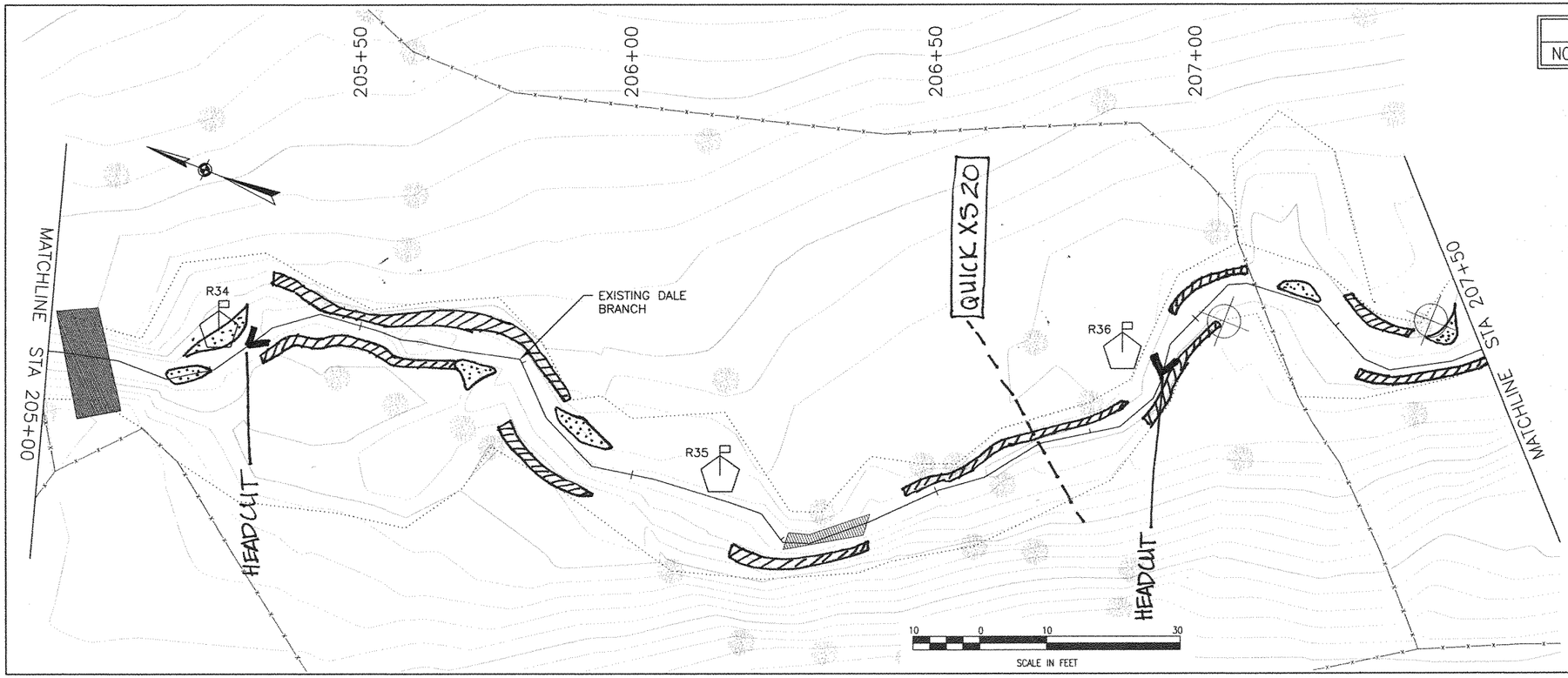
LEGEND

- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH



PRELIMINARY PLANS
NOT FOR CONSTRUCTION

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LICENSE NO. P-0417
7 Florida Ave
Weaverville, NC 28787
PHONE: (828) 658-3649
WWW.WOLFCREEKENG.COM

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

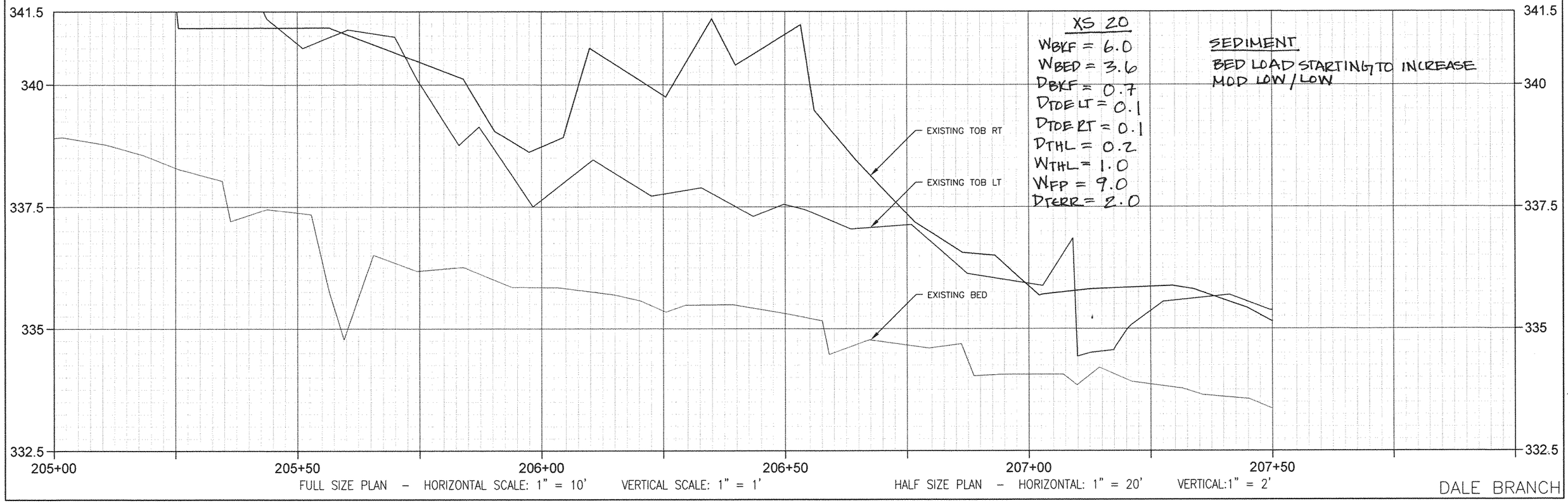
SCALE	AS NOTED	DRWN. BY	CME	PROJECT NO.	SHEET NUMBER
DATE	2/19/2013	CHKD. BY	SGG	1058	14

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

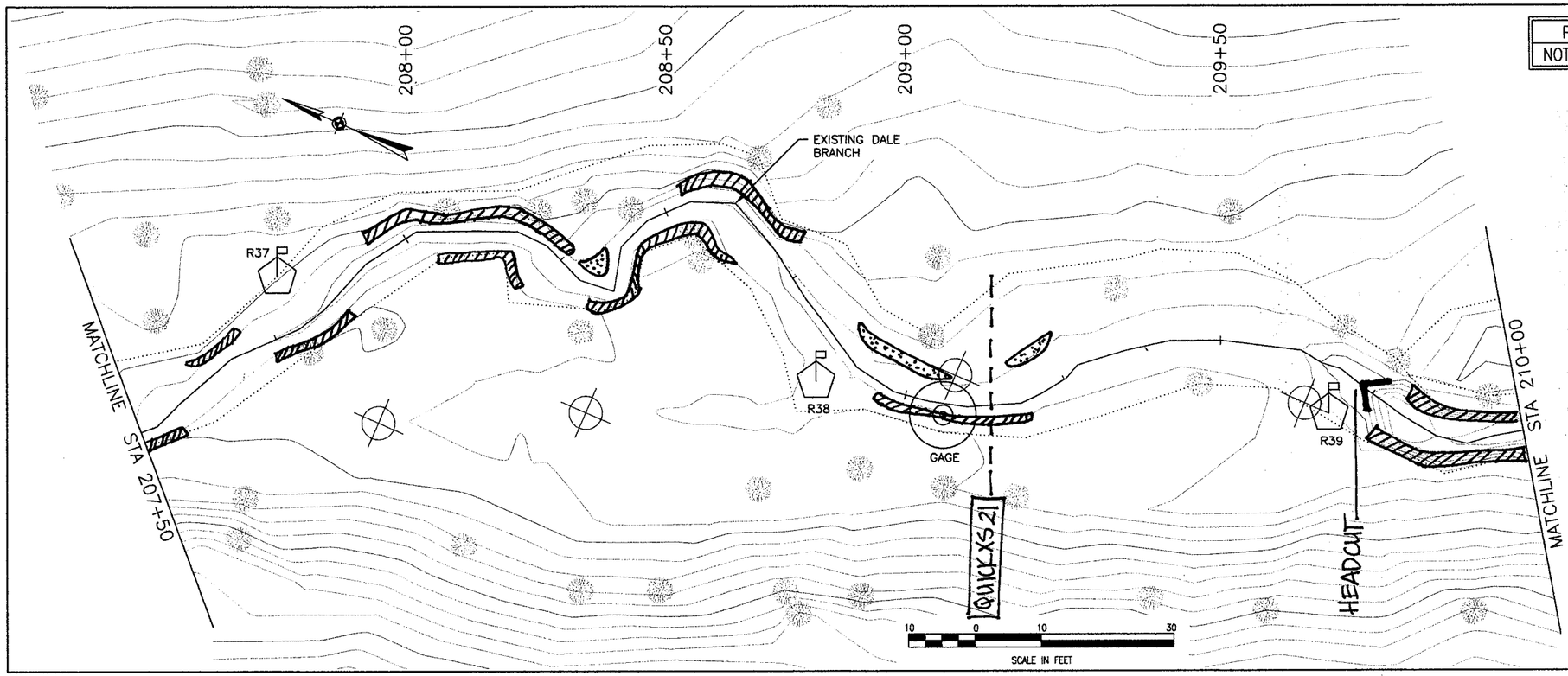
LEGEND

- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH



PRELIMINARY PLANS
NOT FOR CONSTRUCTION

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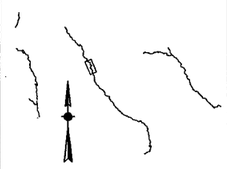
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
7 Florida Ave Waynesville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	15
DATE 2/19/2013	CHKD. BY SGG		

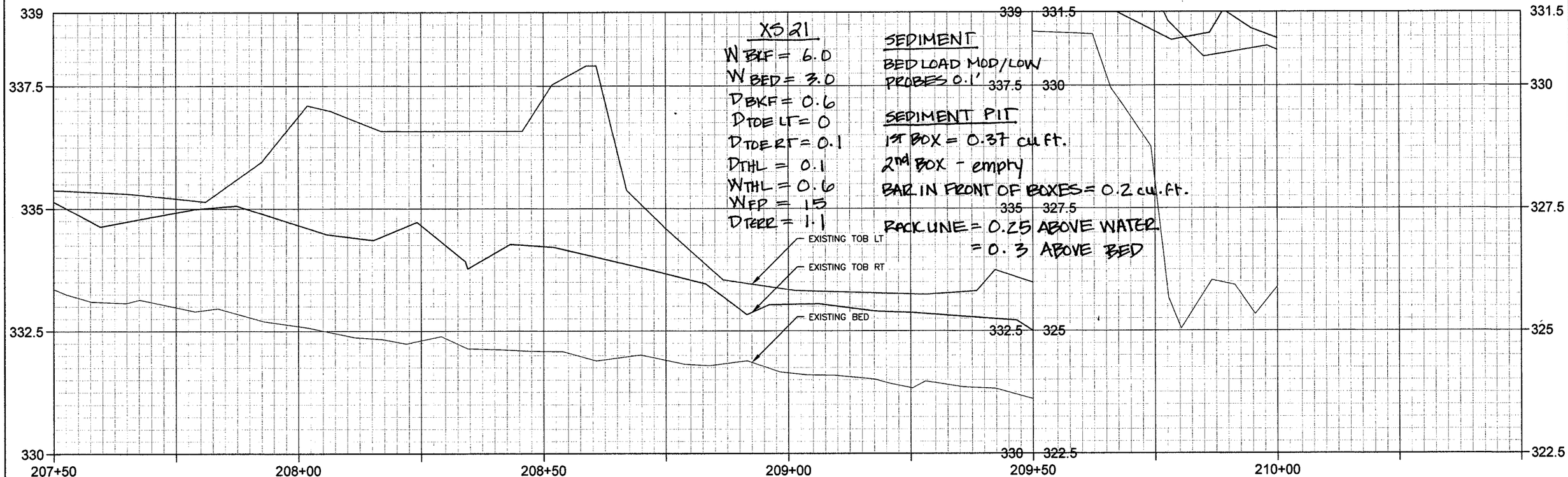
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL: 1" = 2'

DALE BRANCH

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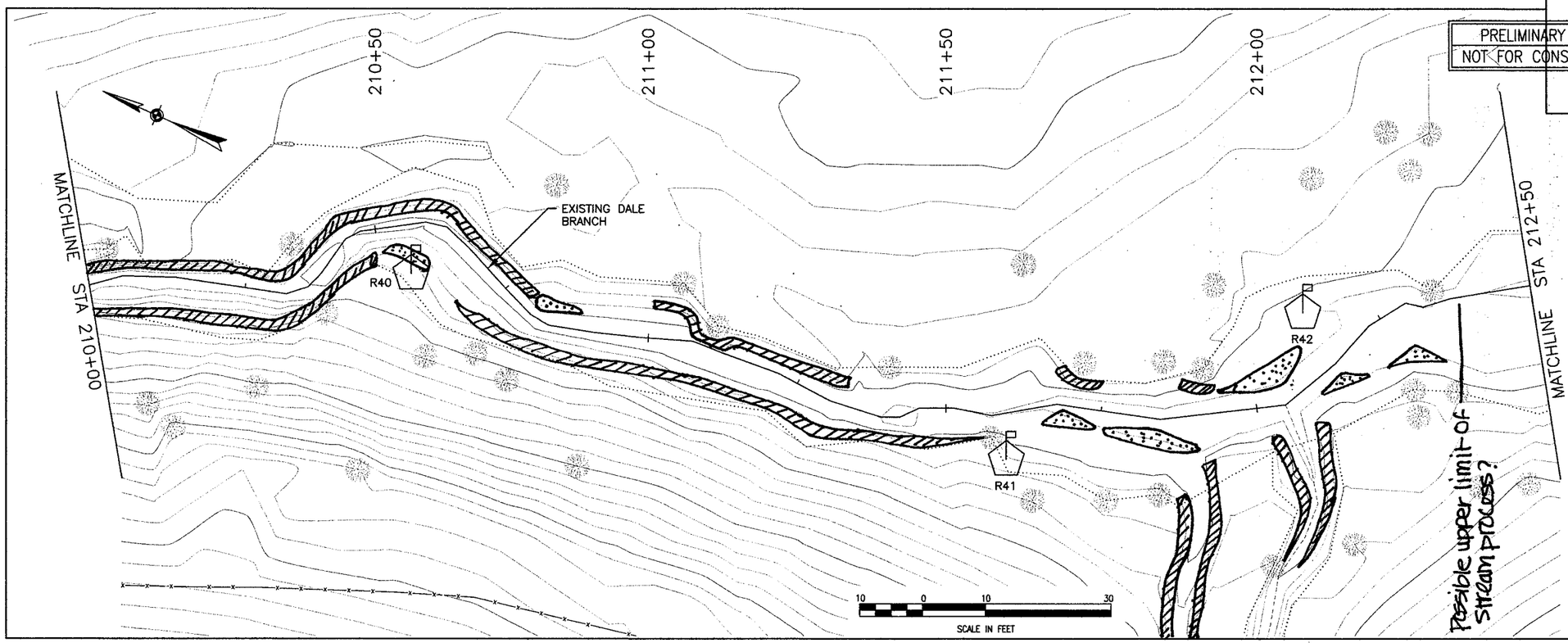
PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

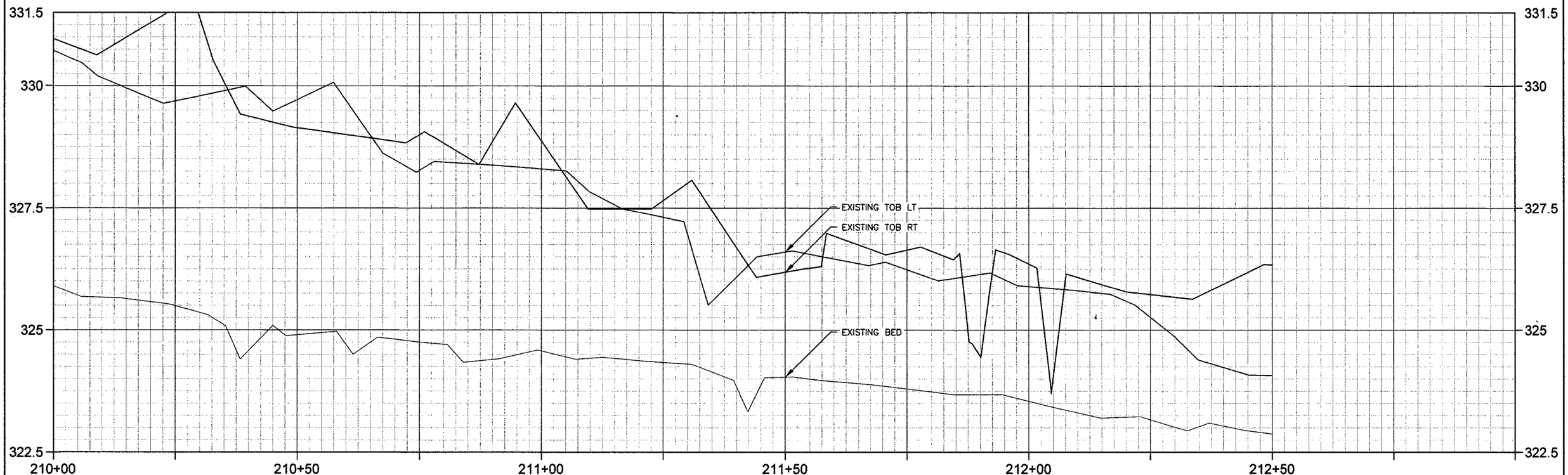
SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	16
DATE 2/19/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND
- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

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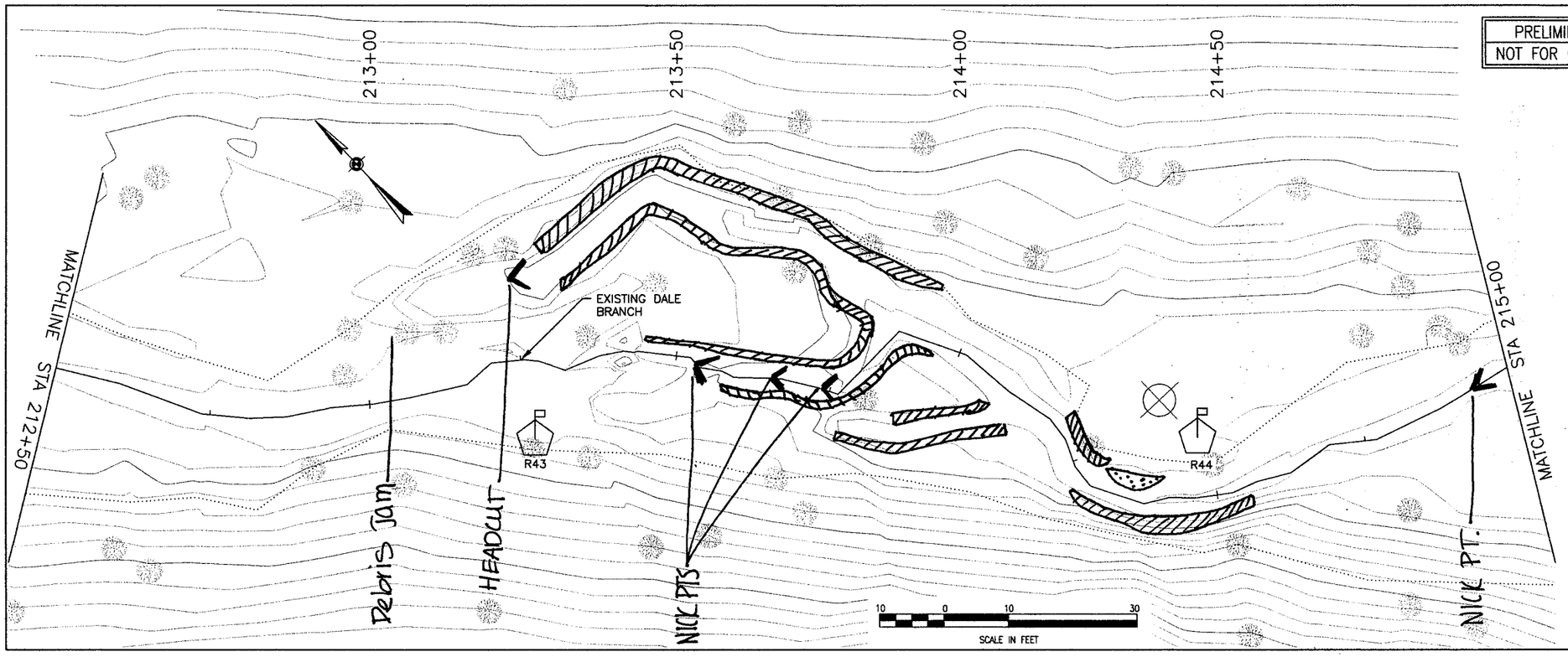
PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	17
DATE 2/19/2013	CHKD. BY SGG		

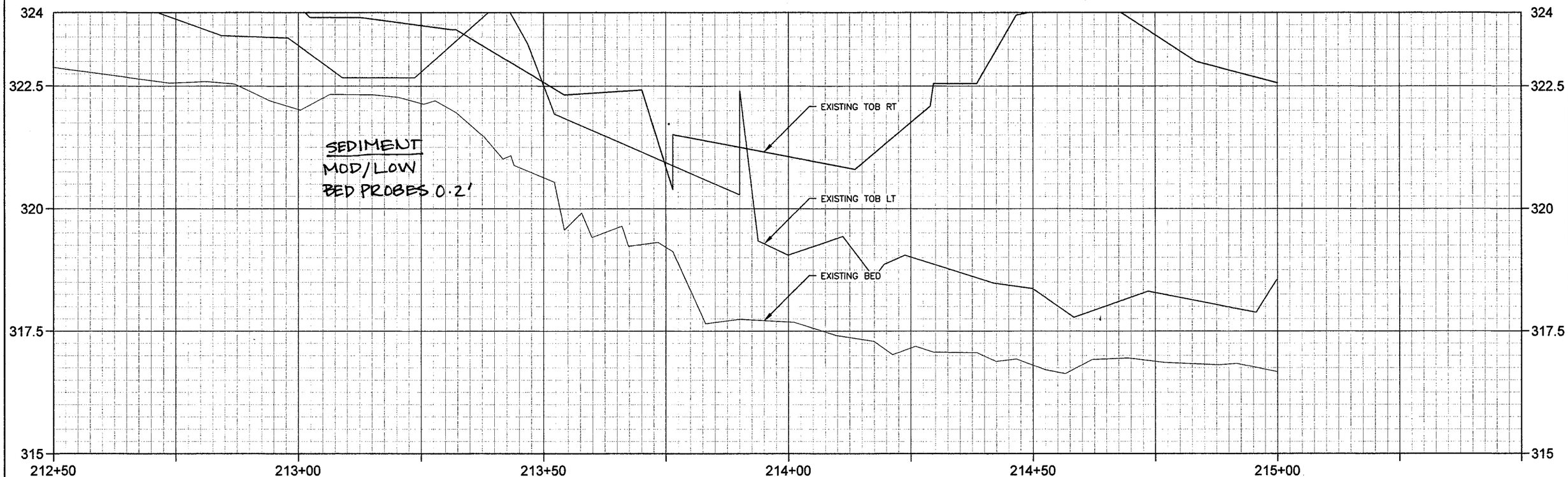
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

—x—x— EXISTING FENCE
..... EXISTING T.O.B.
ERODING BANKS
BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

PRELIMINARY PLANS
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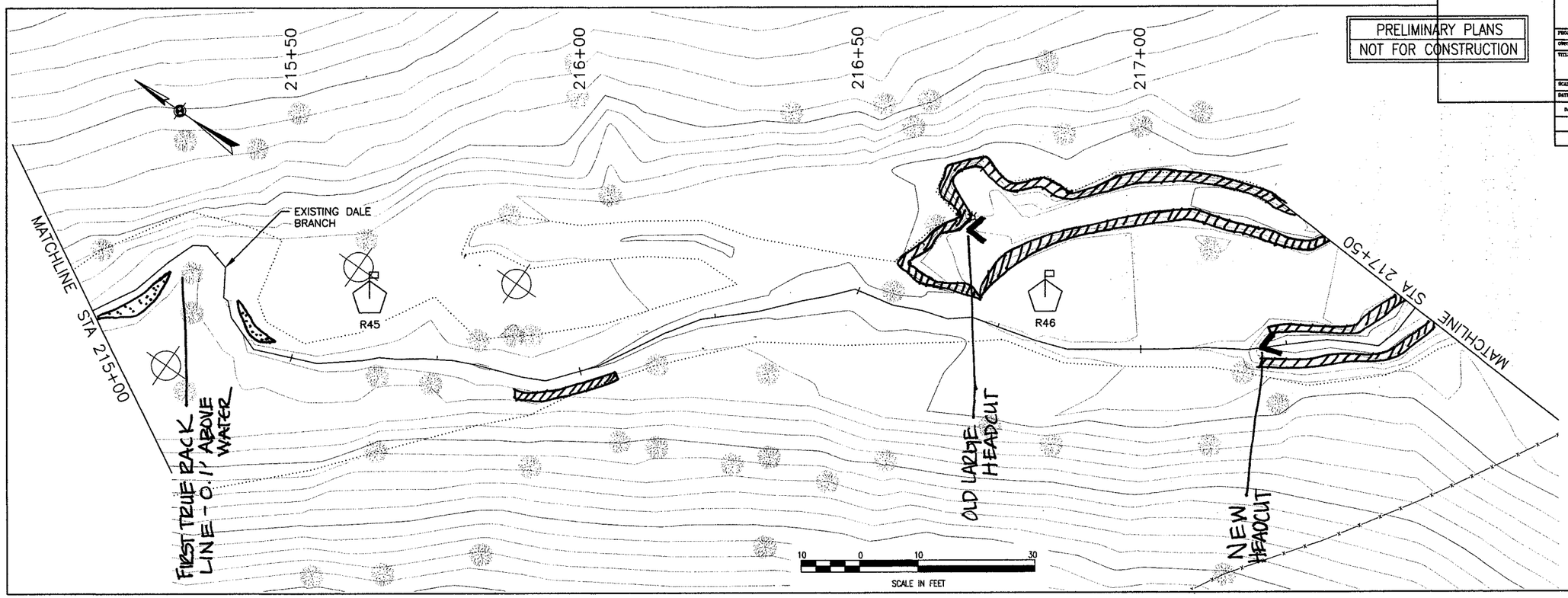
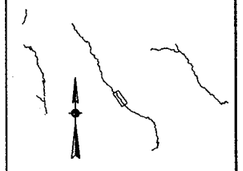
LICENSE NO. P-0417
7 Florida Ave
PHONE: (828) 656-3649
Weaverville, NC 28787
WWW.WOLFCREEKENG.COM

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	18
DATE 2/19/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

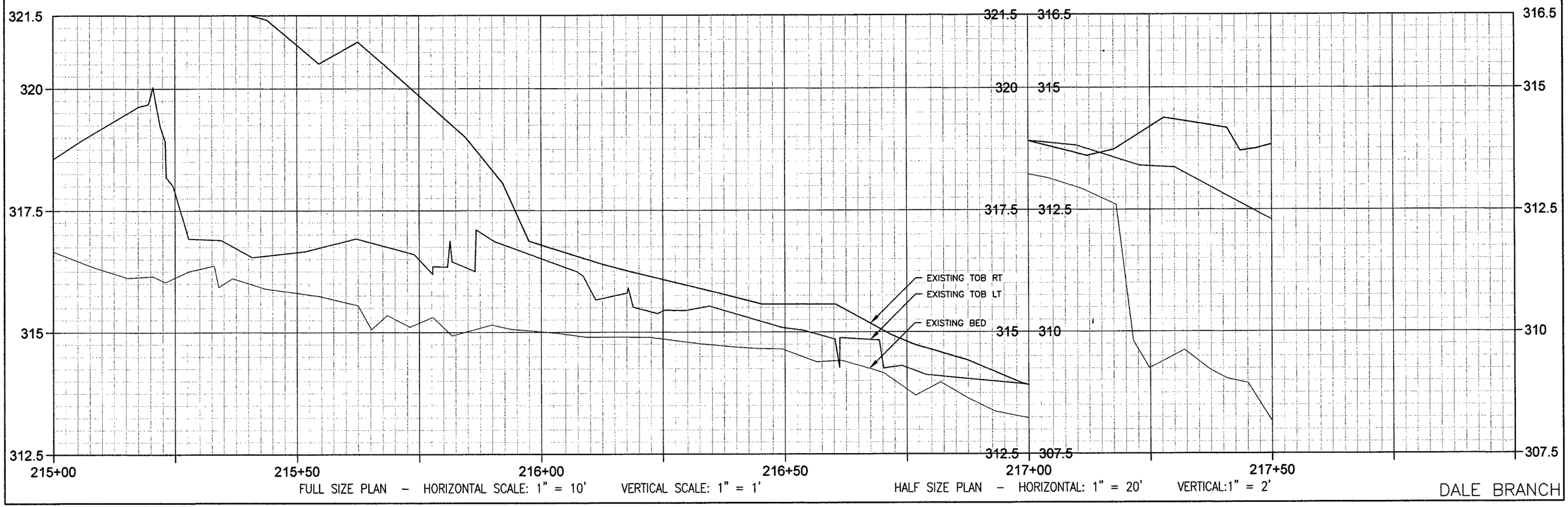




LOCATION KEY

LEGEND

- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



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

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

DALE BRANCH

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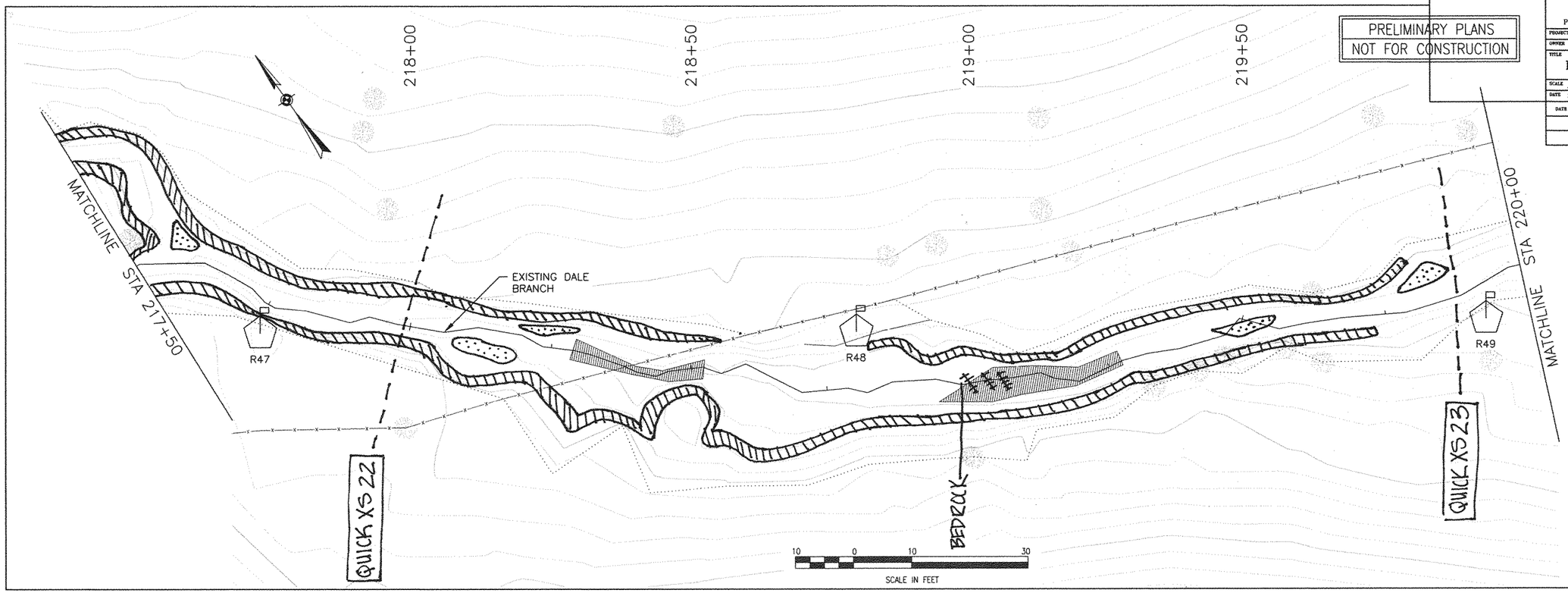
7 Florida Ave Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

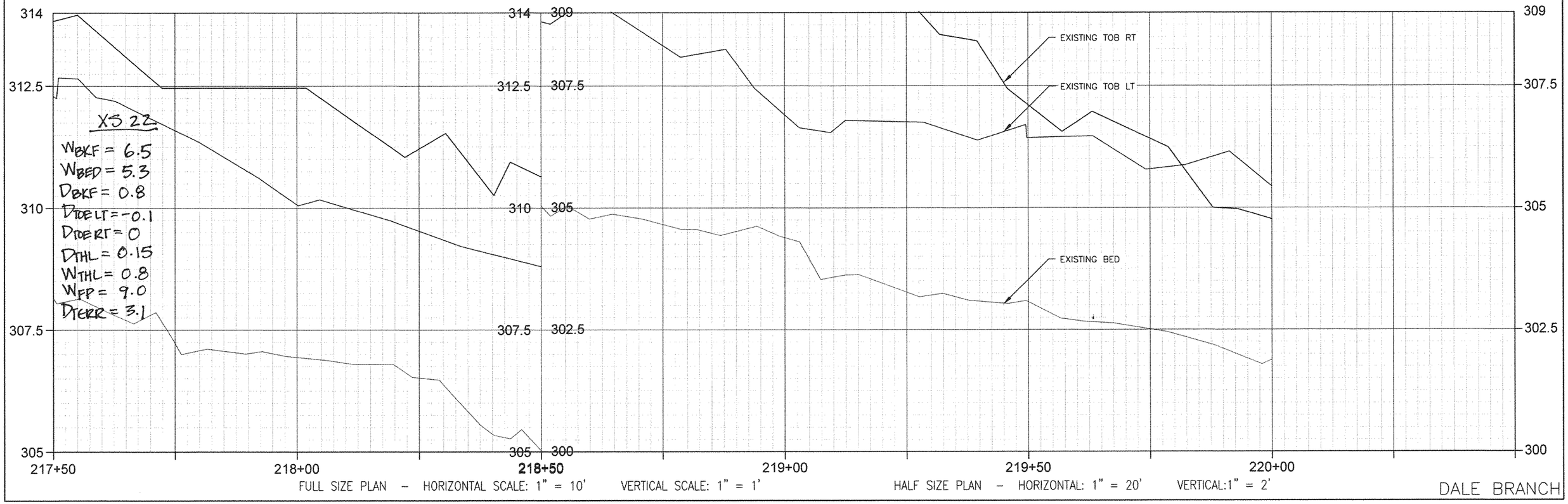
SCALE	DWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	19
DATE 2/19/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND
- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

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LICENSE NO. P-0417
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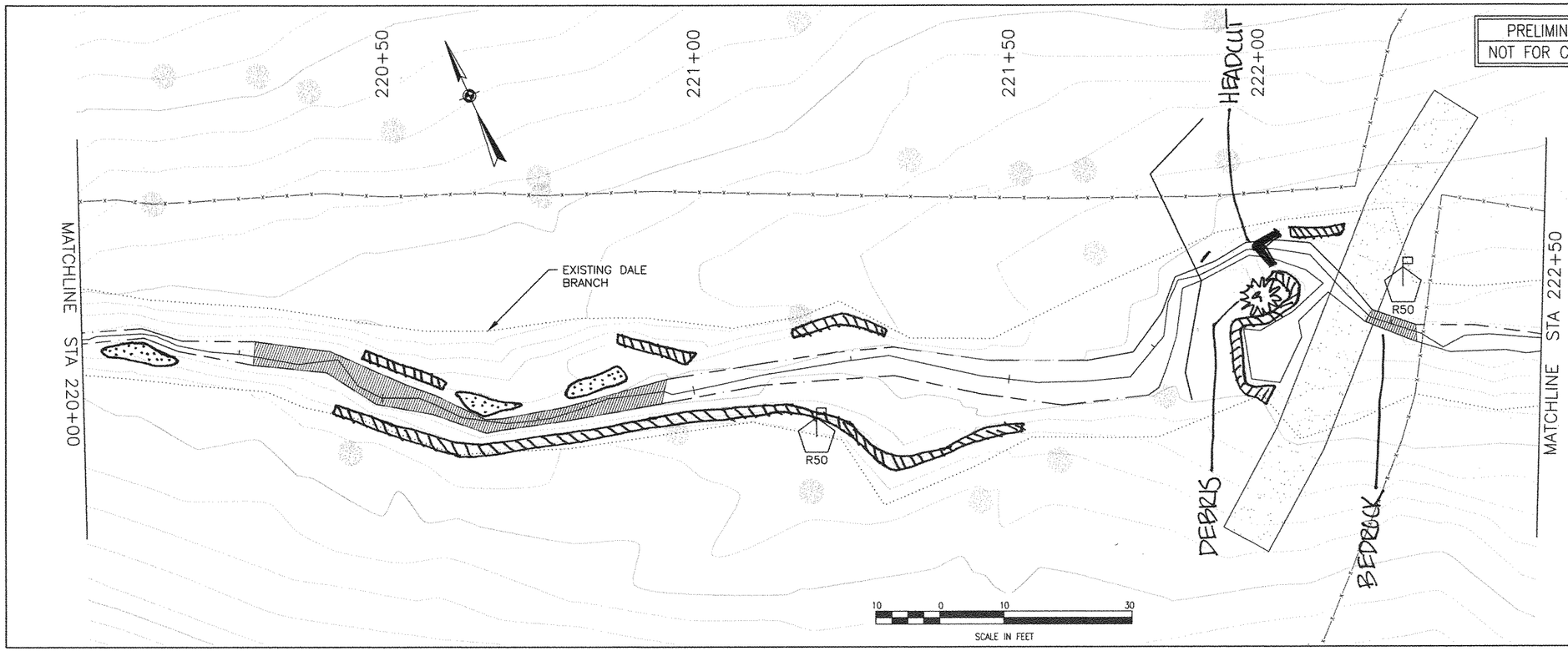
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

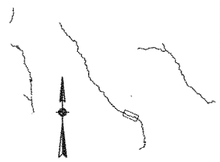
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	20
DATE 3/15/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

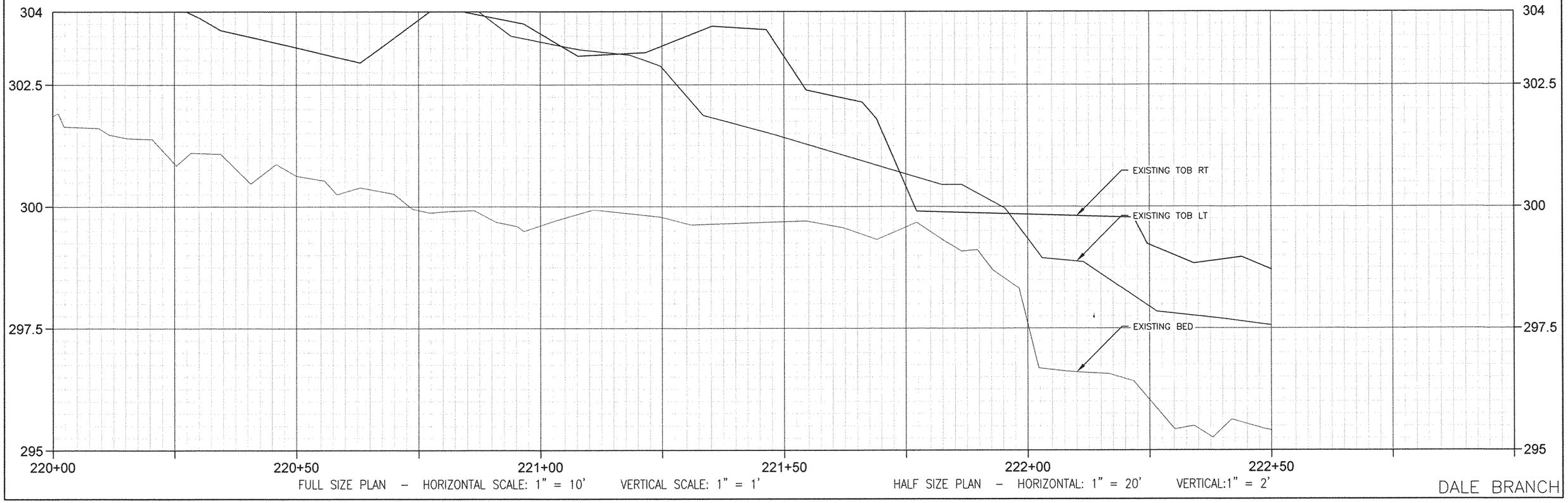


LOCATION KEY



LEGEND

- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

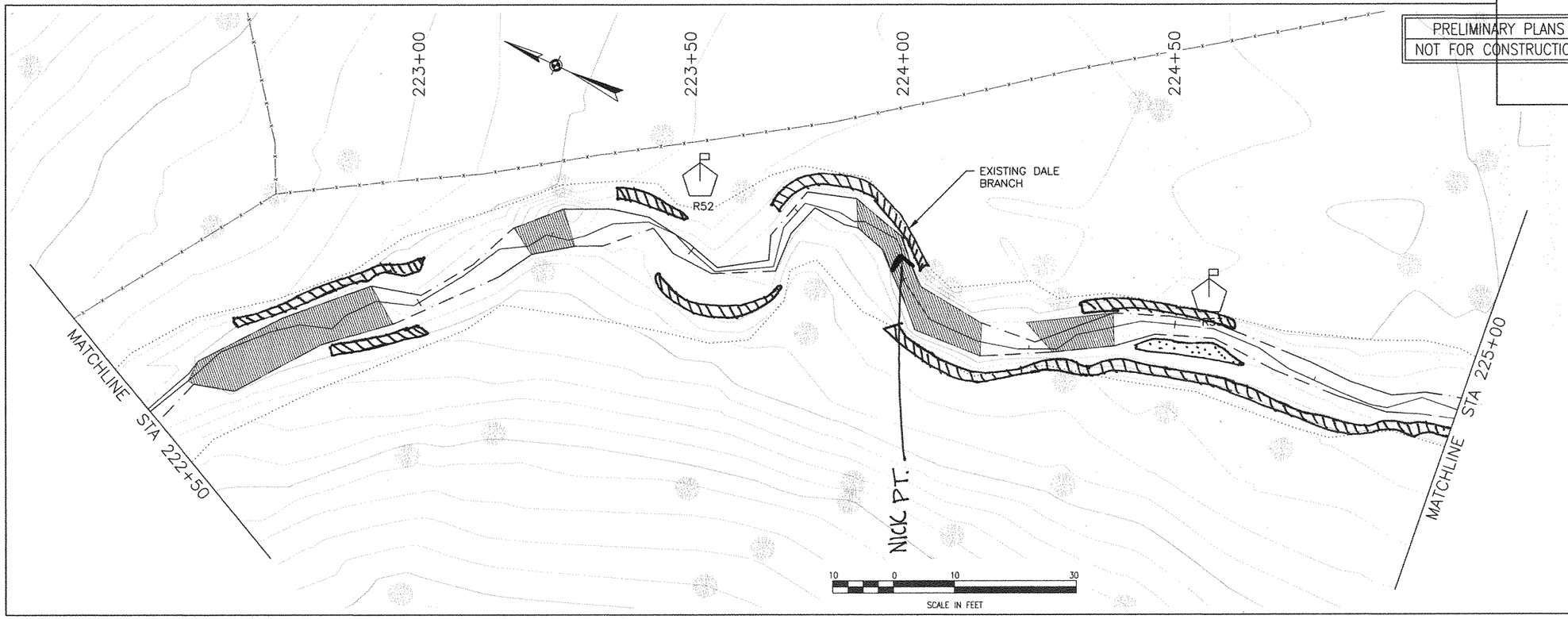
Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
7 Florida Ave
Weaverville, NC 28787
PHONE: (828) 658-3849
WWW.WOLFCREEKENG.COM

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	21
DATE 3/15/2013	CHKD. BY SGG		

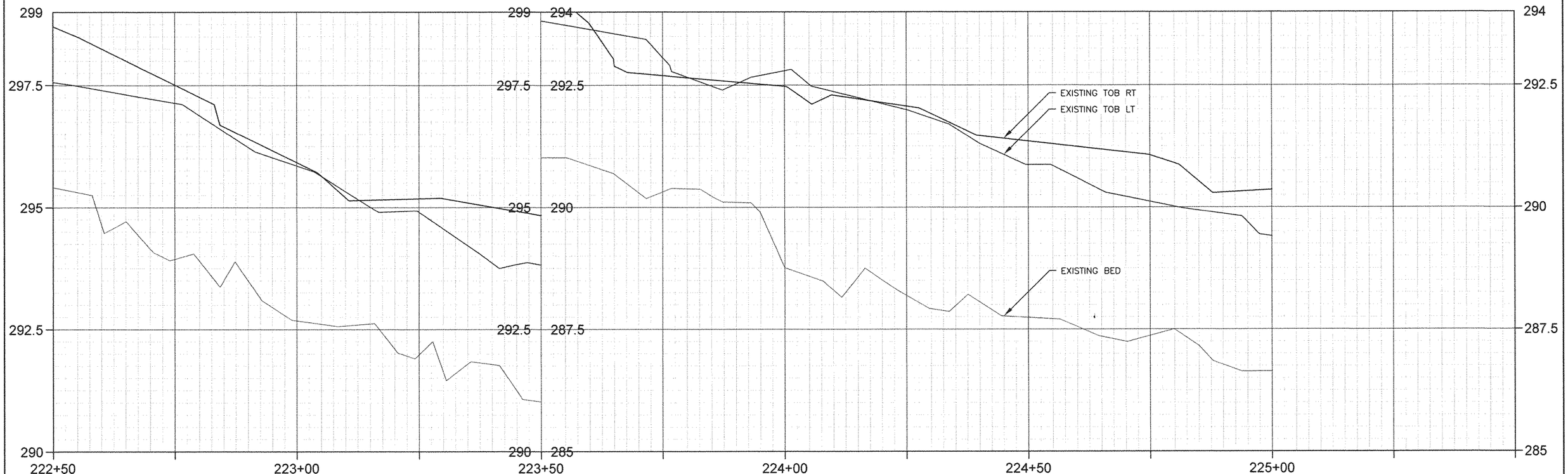
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

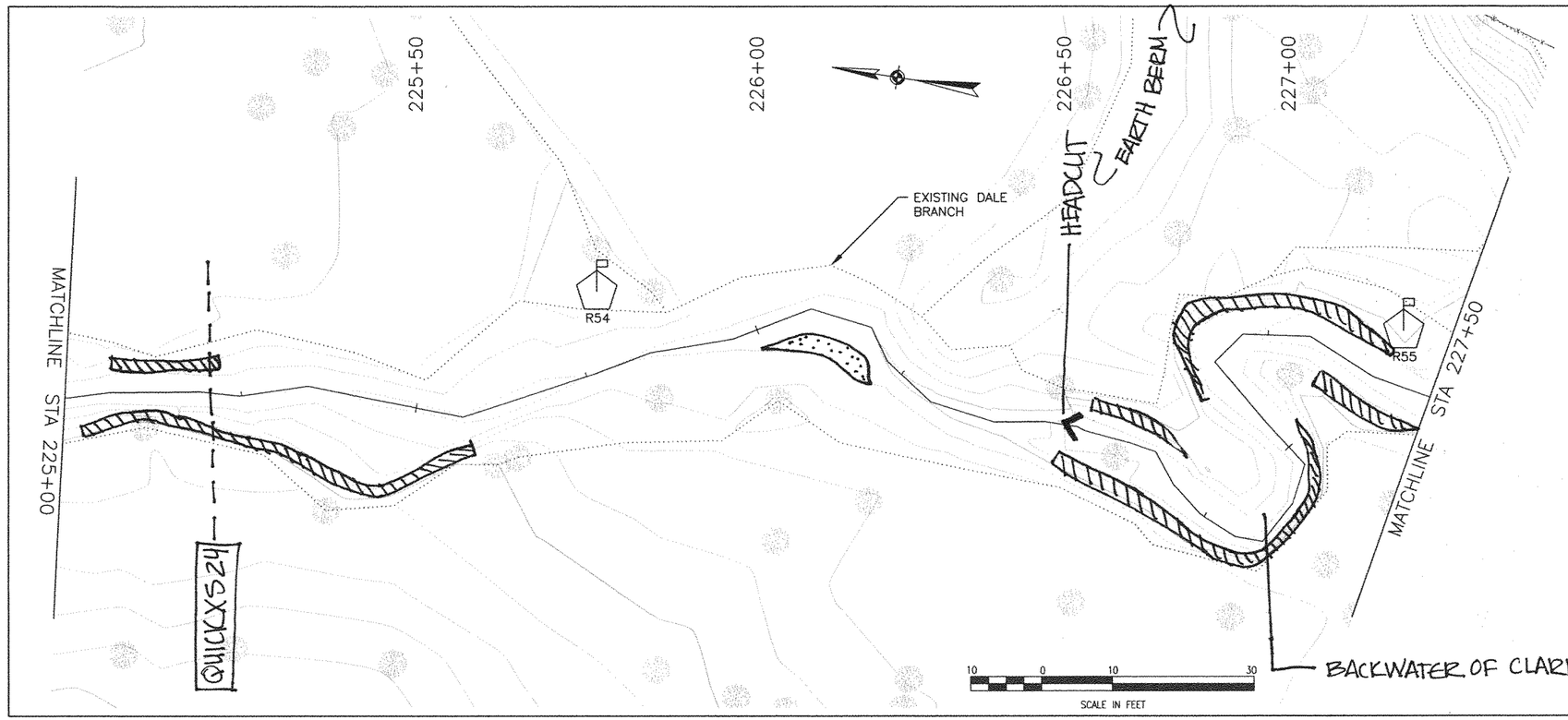
LEGEND

- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH



PRELIMINARY PLANS
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LICENSE NO. P-0417
7 Florida Ave Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

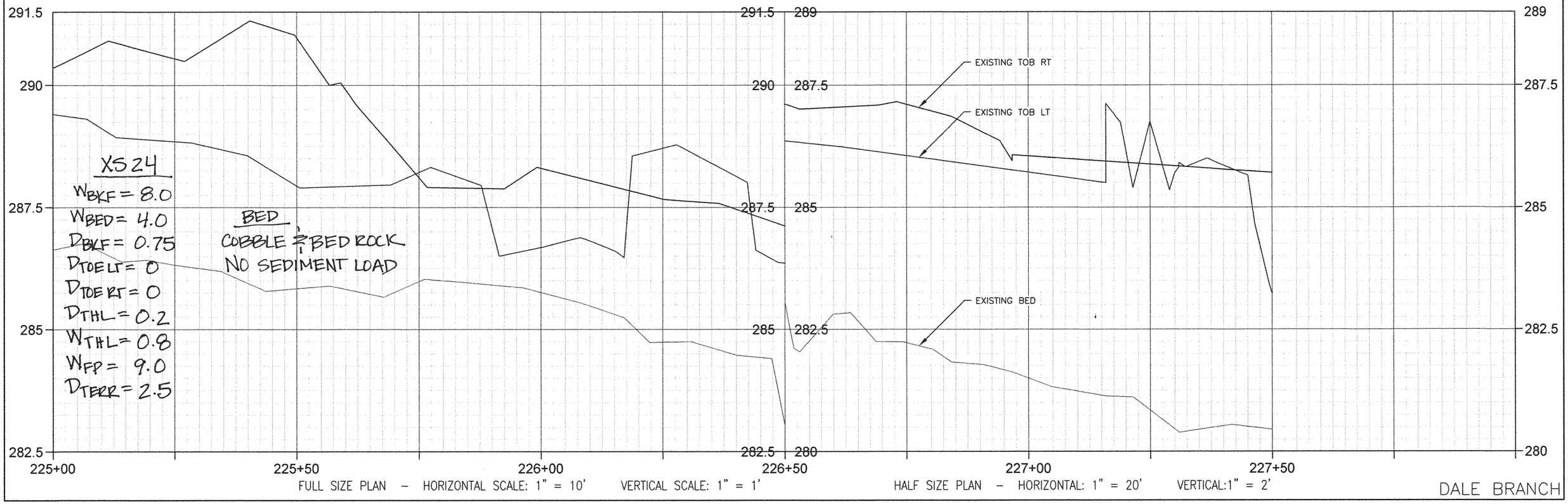
SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	22
DATE 3/15/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

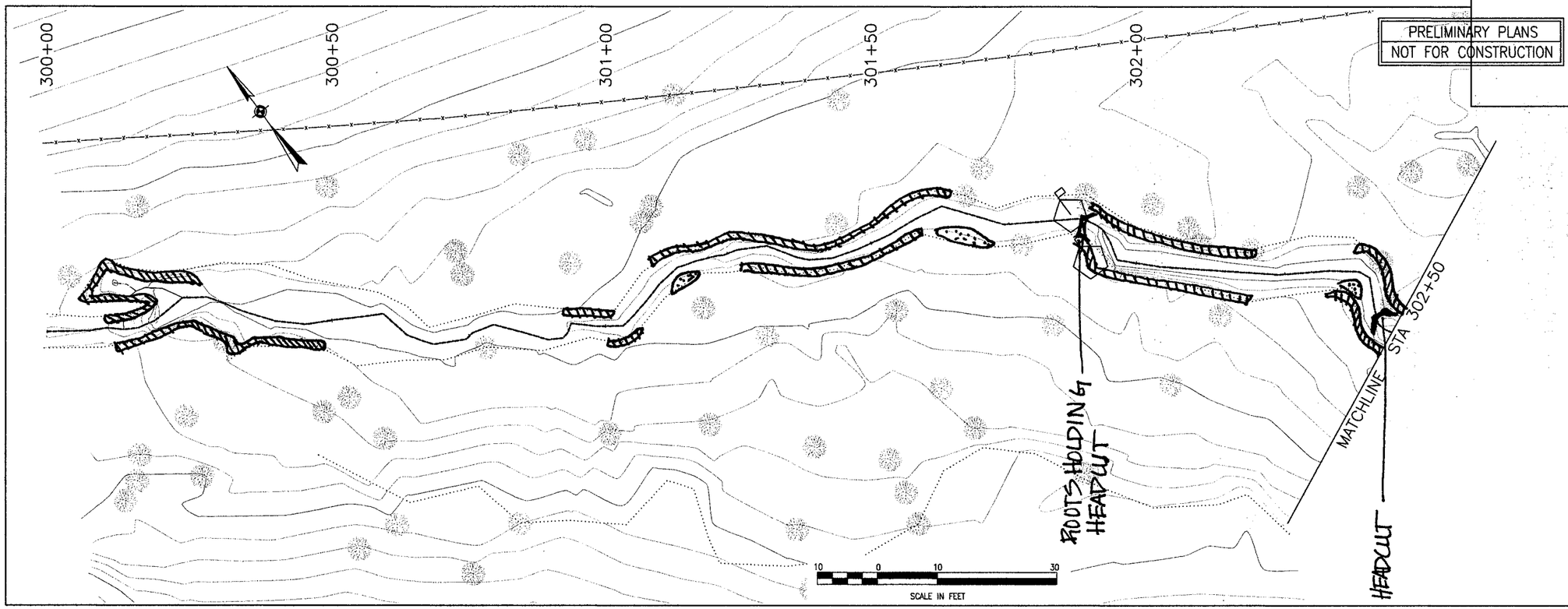
LEGEND

- EXISTING FENCE
- EXISTING T.O.B.
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH



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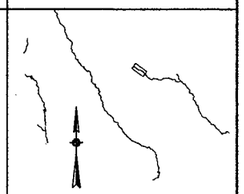
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
7 Florida Ave Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

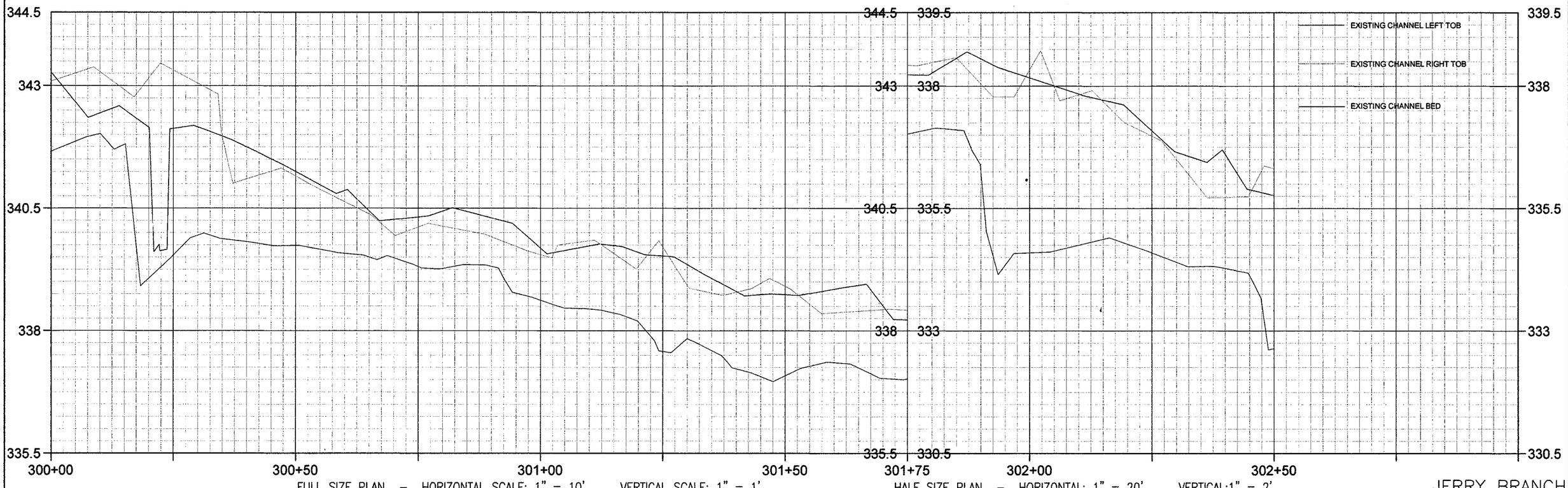
SCALE	AS NOTED	DRWN. BY	CME	PROJECT NO.	SHEET NUMBER
DATE	6/04/2013	CKED. BY	SGC	1058	27

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND
- EXISTING FENCE
- EXISTING THALWEG
- EXISTING T.O.B.
- EXISTING TREE
- SAVE TREE
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

JERRY BRANCH

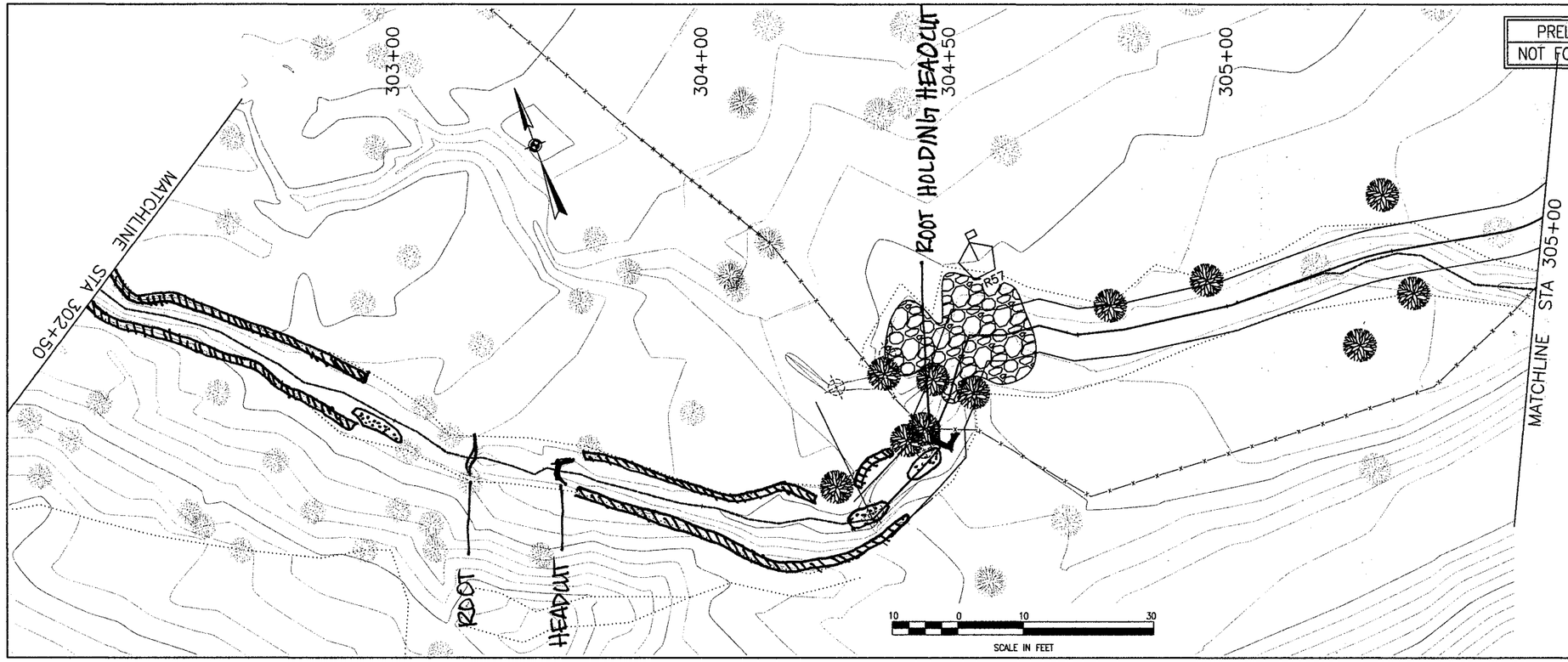
Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
7 Florida Ave Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	28
DATE 6/04/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

PRELIMINARY PLANS
NOT FOR CONSTRUCTION



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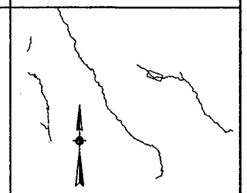
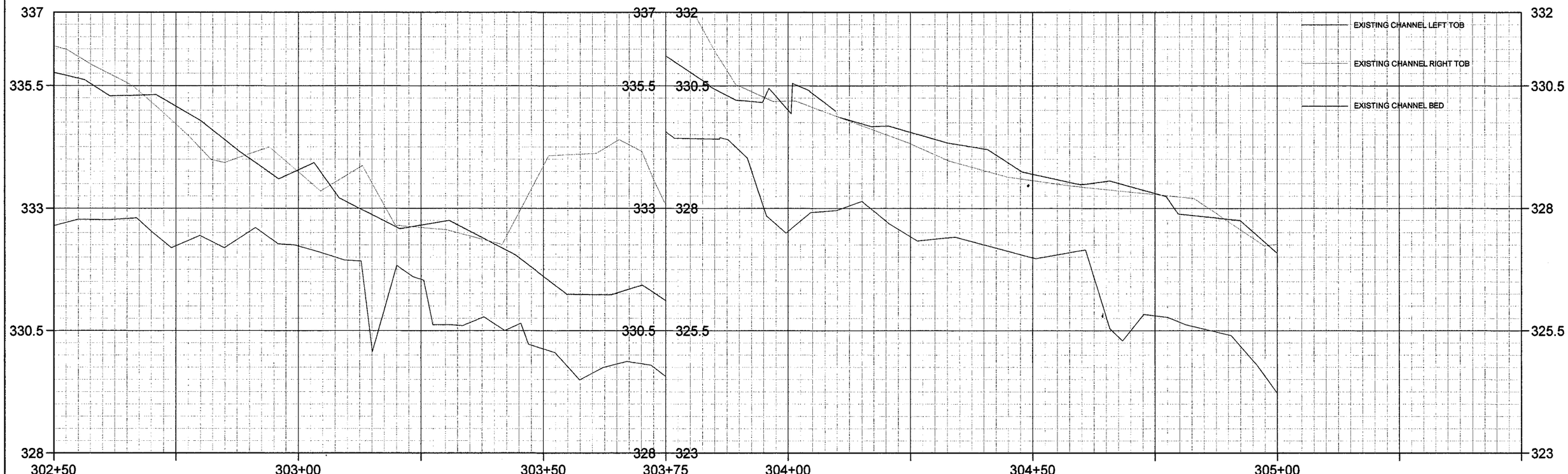


LEGEND

- EXISTING FENCE
- EXISTING THALWEG
- EXISTING T.O.B.
- EXISTING TREE
- SAVE TREE
- ERODING BANKS
- BAR



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

JERRY BRANCH

Wolf Creek Engineering
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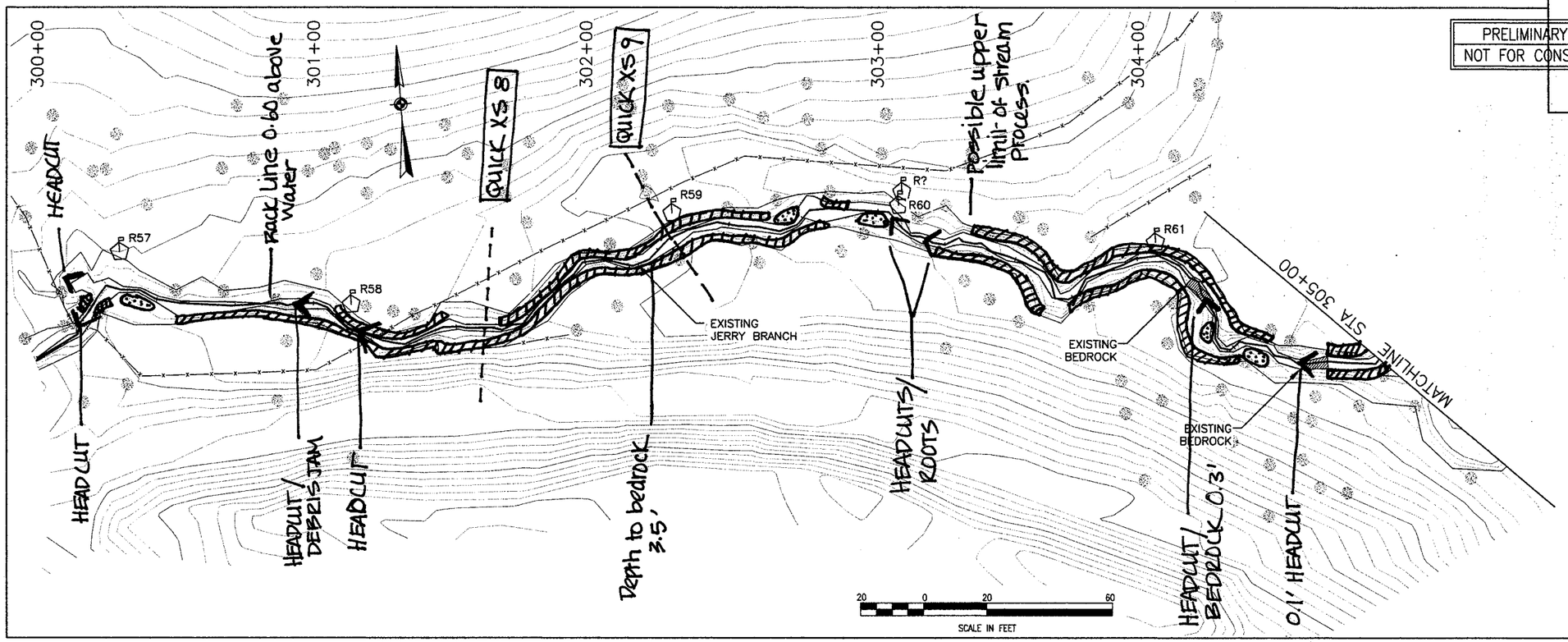
PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **PLAN & PROFILE**

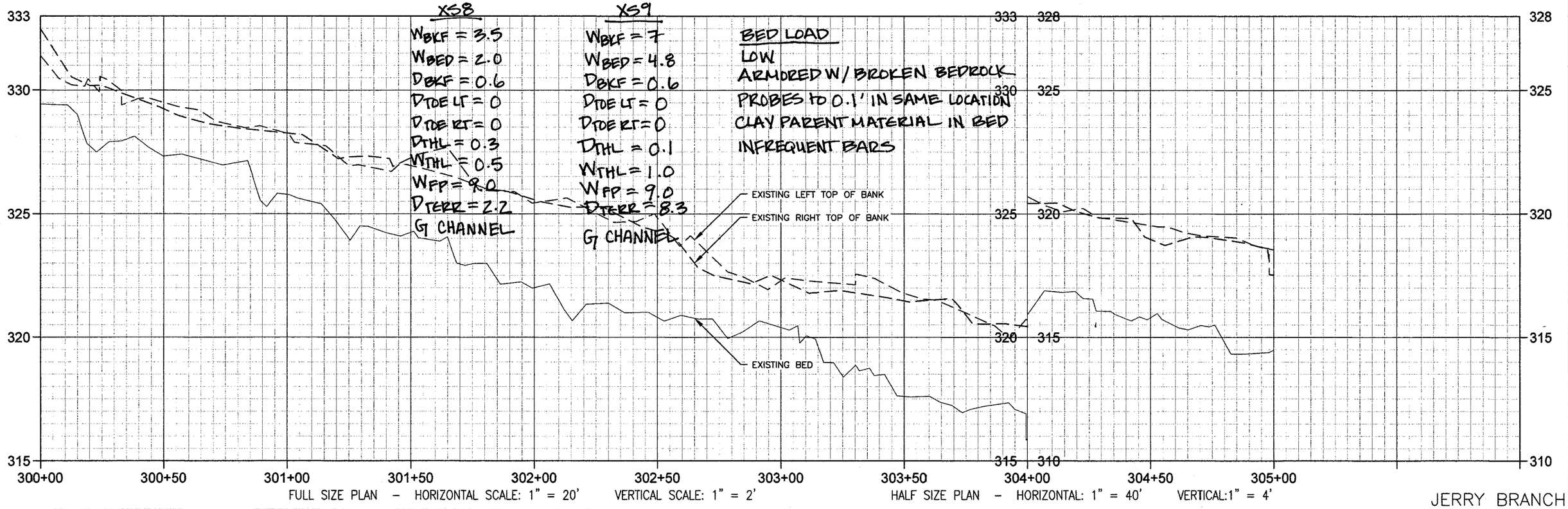
SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1058	8
DATE 1/7/2013	CHKD. BY SGC		

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND
- EXISTING FENCE
- ERODING BANKS
- BAR



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

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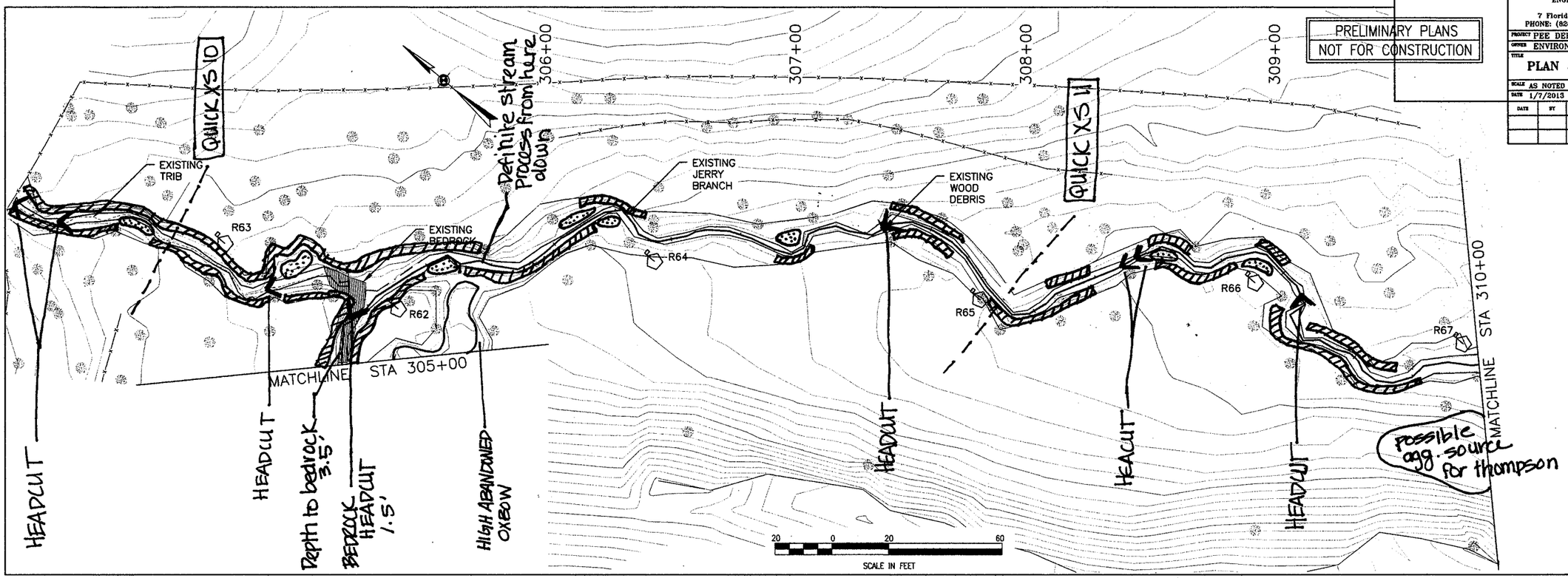
PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC AND EXCHANGE
TITLE	PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1058	9
DATE 1/7/2013	CKED. BY SGG		

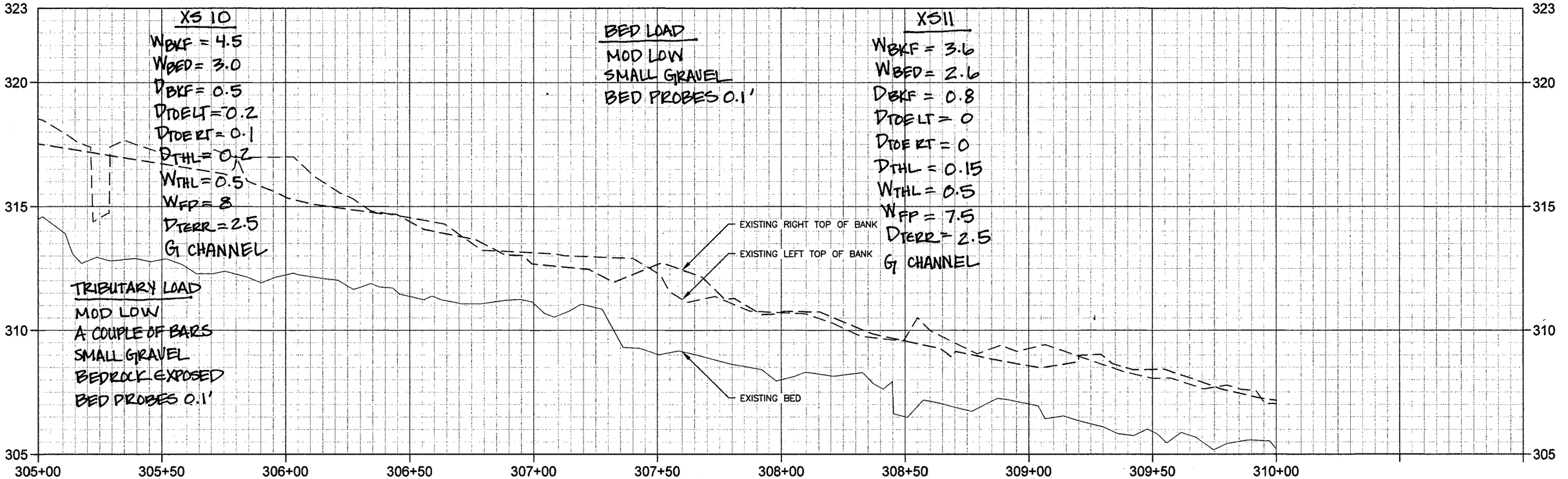
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

- EXISTING FENCE
- ERODING BANKS
- BAR



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

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

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PROJECT: PEE DEE STREAM RESTORATION
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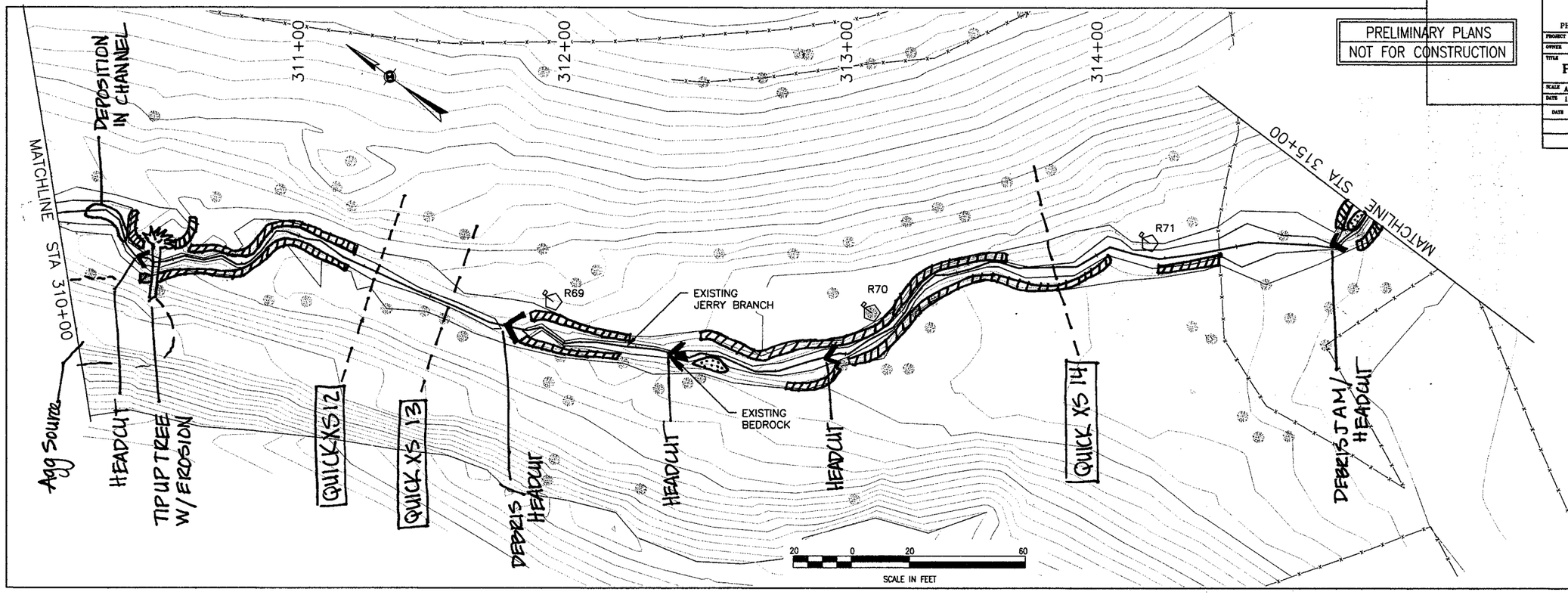
TITLE: **PLAN & PROFILE**

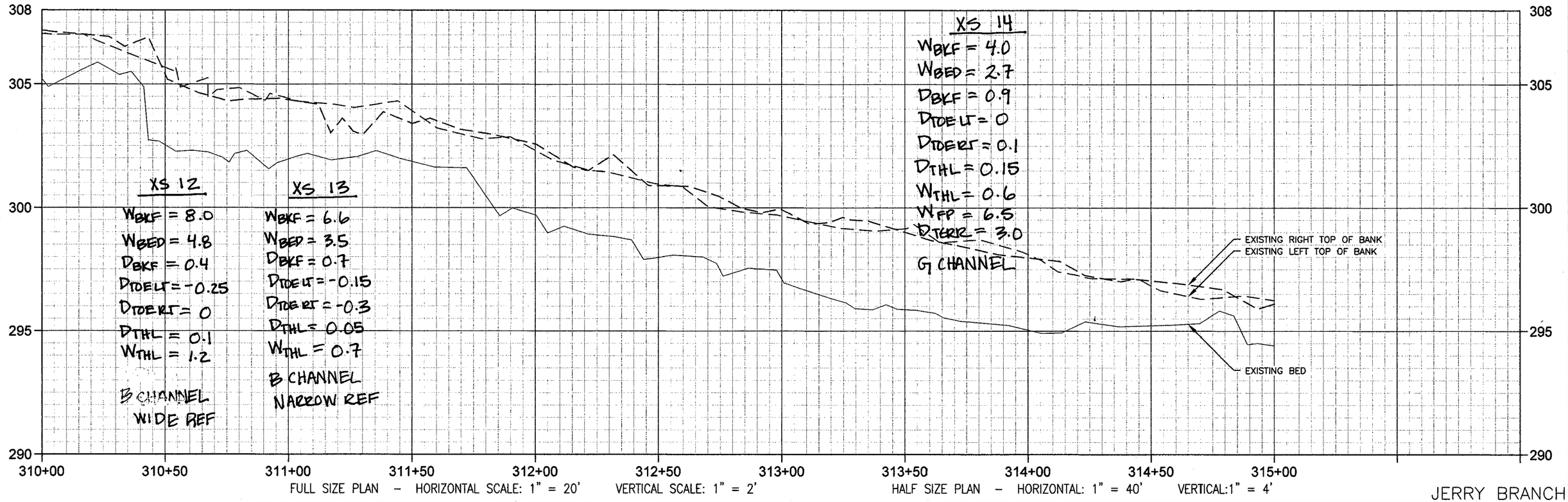
SCALE	AS NOTED	DRWN. BY	cme	PROJECT NO.	SHEET NUMBER
DATE	1/7/2013	CKED. BY	SGG	1058	10

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND
- EXISTING FENCE
- ERODING BANKS
- BAR



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

JERRY BRANCH

PRELIMINARY PLANS
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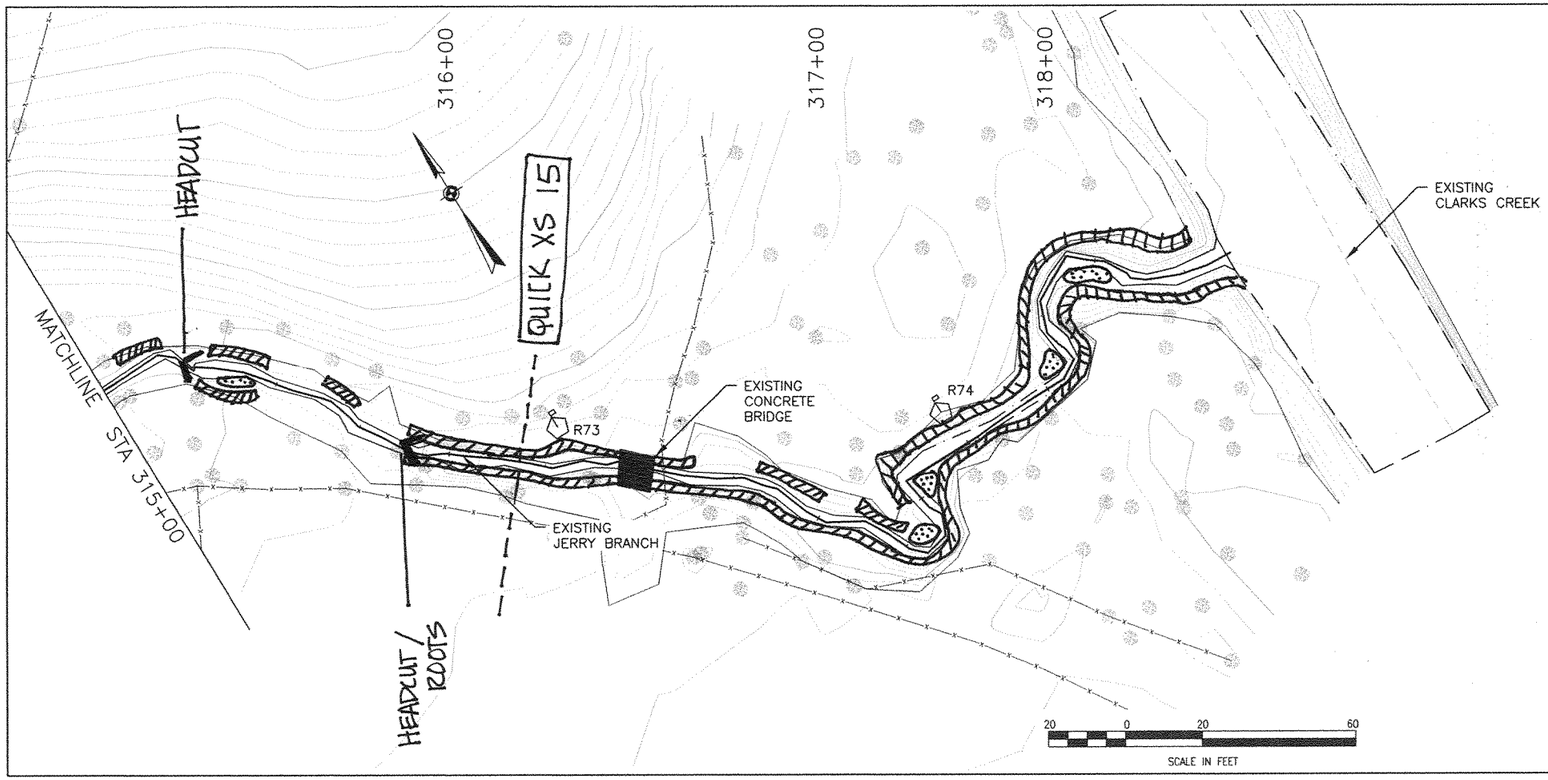
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1058	11
DATE 1/7/2013	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



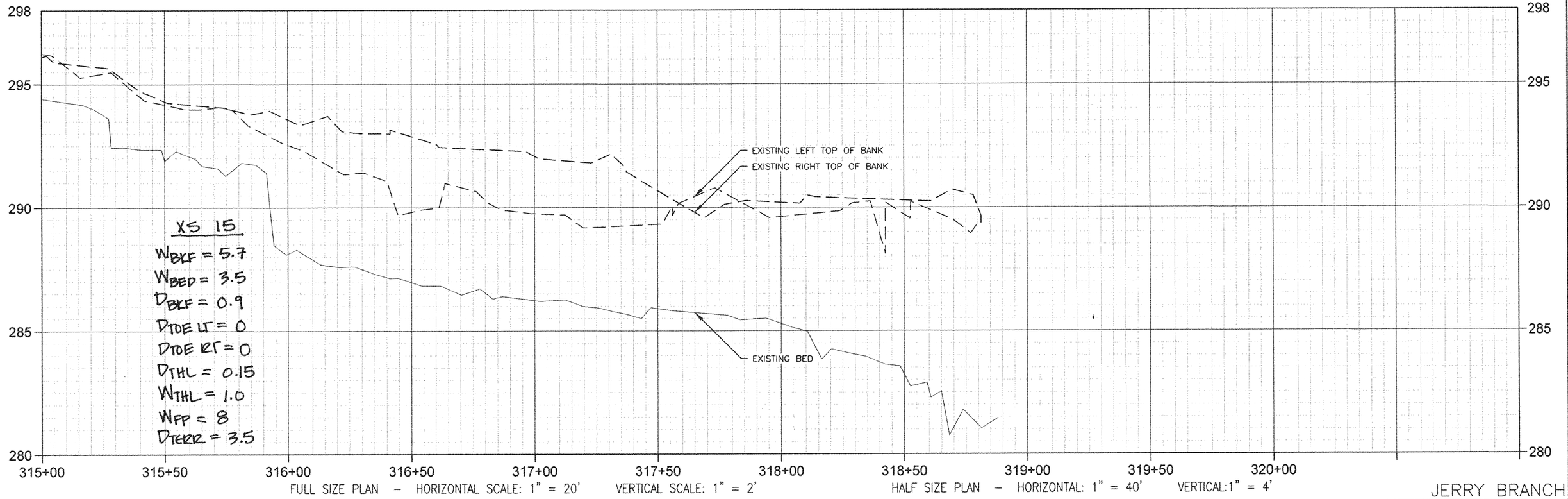
LOCATION KEY

LEGEND

EXISTING FENCE

ERODING BANKS

BAR



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

JERRY BRANCH

APPENDIX C5

Reference Reach Data

Summary

Stream:	Talbott's Branch
Watershed:	Forested
Location:	Birkhead National Forest
Latitude:	---
Longitude:	---
State:	North Carolina
County:	---
Date:	April 10, 2013
Observers:	Grant Ginn, Chris Engle, Megan Mailloux
Channel type:	B4c
Drainage area (sq.mi.):	0.42
notes:	---

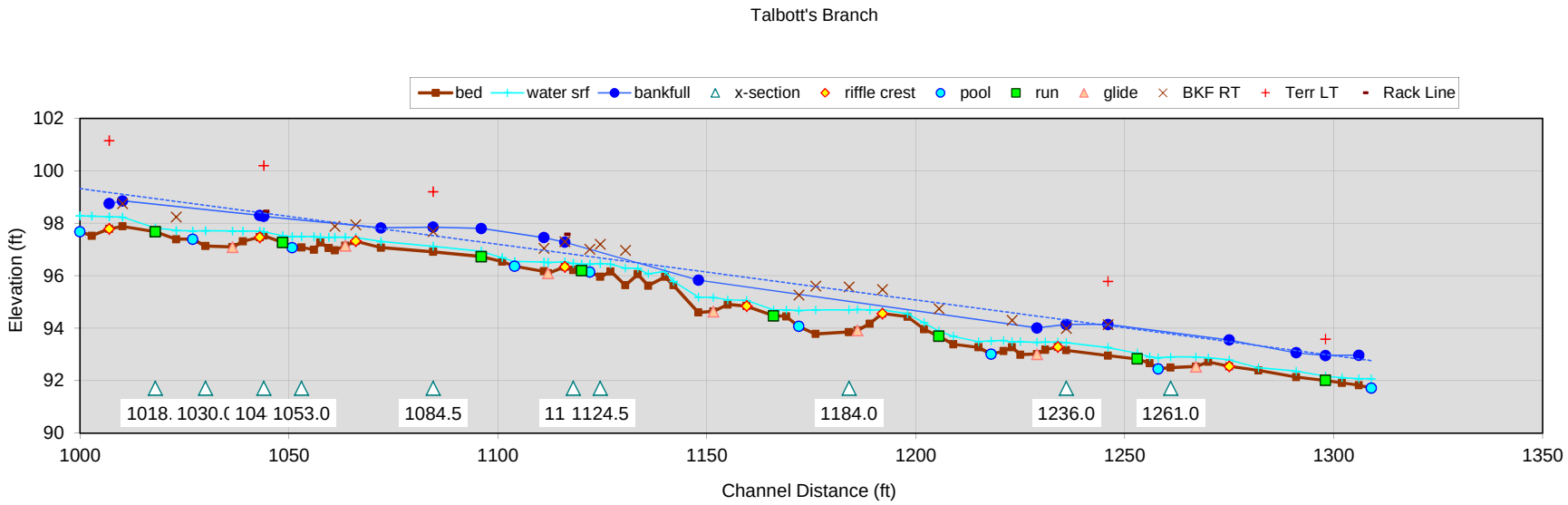
Dimension		bankfull channel typical	min	max	
floodplain:	width flood prone area (ft)	18.0	16.0	21.0	
	low bank height (ft)	0.9	0.8	1.3	
riffle-run:	x-area bankfull (sq.ft.)	7.3	5.4	8.0	
	width bankfull (ft)	11.7	9.8	13.1	
	mean depth (ft)	0.62	0.5	0.8	
	max depth (ft)	0.9	0.8	1.2	
	hydraulic radius (ft)	0.6			
pool:	x-area pool (sq.ft.)	10.1	7.8	10.1	
	width pool (ft)	11.1	8.6	12.3	
	max depth pool (ft)	1.2	1.1	1.7	
	hydraulic radius (ft)	0.8			
dimensionless ratios:		typical	min	max	
	width depth ratio	18.8	12.3	19.6	
	entrenchment ratio	1.5	1.4	1.8	
	riffle max depth ratio	1.4	1.3	1.9	
	bank height ratio	1.0	0.9	1.4	
	pool area ratio	1.4	1.1	1.4	
	pool width ratio	0.9	0.7	1.1	
	pool max depth ratio	1.9	1.8	2.7	
hydraulics:		typical	min	max	
	discharge rate (cfs)	28.0	15.0	29.6	
	channel slope (%)	1.5			
		riffle-run	min	max	pool
	velocity (ft/s)	3.8	2.8	3.7	2.8
	Froude number	0.87	0.69	0.74	0.30
	shear stress (lbs/sq.ft.)	0.562	0.486	0.734	0.749
	shear velocity (ft/s)	0.538	0.501	0.615	0.622
	stream power (lb/s)	26.2	14.1	27.7	
	unit stream power (lb/ft/s)	2.240	1.399	2.840	
	relative roughness	3.7	---	---	
	friction factor u/u*	7.1	4.1	5.0	
	threshold grain size (t*=0.06) (mm)	26.0	23.9	36.1	
	Shield's parameter	0.032			

Pattern	typical	min	max
meander length (ft)	---	---	---
belt width (ft)	21.0	---	---
amplitude (ft)	---	---	---
radius (ft)	18.0	---	---
arc angle (degrees)	---	---	---
stream length (ft)	390.0		
valley length (ft)	260.0		
Sinuosity	1.5		
Meander Length Ratio	---	---	---
Meander Width Ratio	1.8	---	---
Radius Ratio	1.5	---	---

Profile	typical	min	max
pool-pool spacing (ft)	39.0	18.0	53.0
riffle length (ft)	14.0	4.0	30.0
pool length (ft)	13.0	7.0	30.0
run length (ft)	7.0	2.0	13.0
glide length (ft)	6.0	2.5	8.0
channel slope (%)	1.53		
riffle slope (%)	2.7	1.7	5.9
pool slope (%)	0.7	0	4.3
run slope (%)	1.9	0	4.9
glide slope (%)	0.4	1	1.4
measured valley slope (%)	1.7		
valley slope from sinuosity (%)	2.3		
Riffle Length Ratio	1.2	0.3	2.6
Pool Length Ratio	1.1	0.6	2.6
Run Length Ratio	0.6	0.2	1.1
Glide Length Ratio	0.5	0.2	0.7
Riffle Slope Ratio	1.8	1.1	3.9
Pool Slope Ratio	0.5	0	2.8
Run Slope Ratio	1.2	0	3.2
Glide Slope Ratio	0.3	0.7	0.9
Pool Spacing Ratio	3.3	1.5	4.5

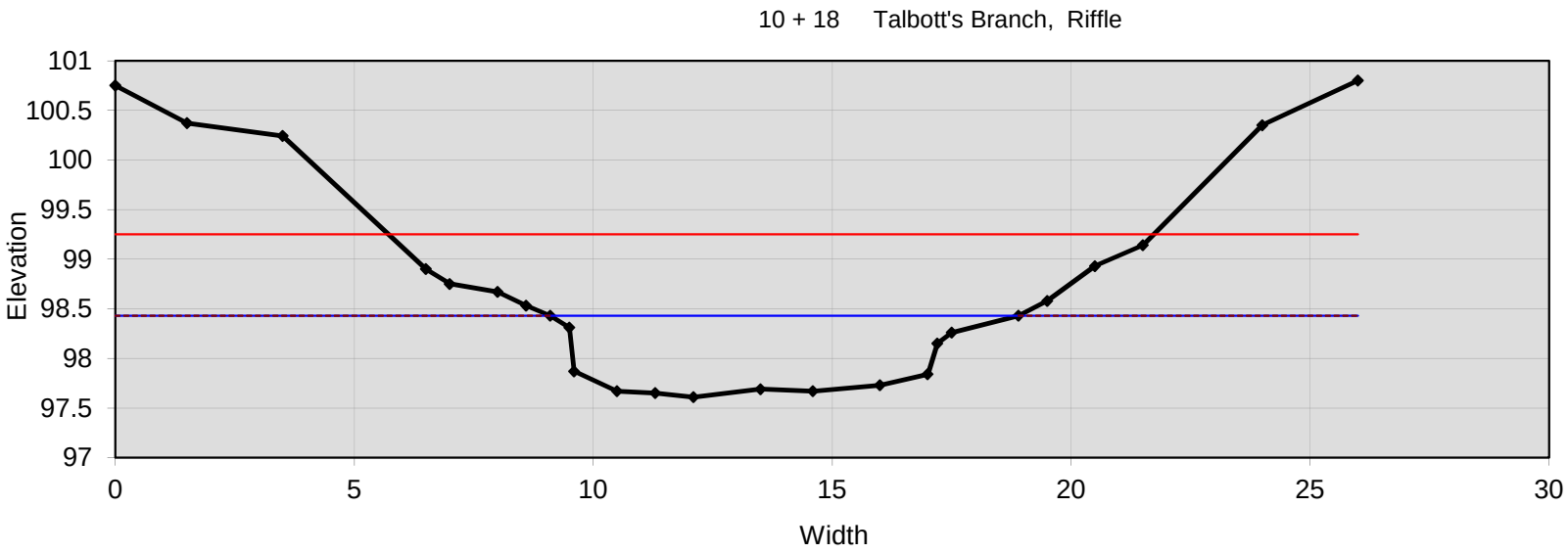
Channel Materials	Riffle Surface		Point Bar	BkF Channel
D16 (mm)	14	---	27	12
D35 (mm)	35	---	46	44
D50 (mm)	52	---	63	58
D65 (mm)	74	---	72	78
D84 (mm)	110	---	85	120
D95 (mm)	170	---	94	190
mean (mm)	39.2			37.9
dispersion	2.9			3.5
skewness	-0.1			-0.2
Shape Factor	0.54			
% Silt/Clay	4%	---	0%	2%
% Sand	2%	---	100%	2%
% Gravel	49%	---	0%	47%
% Cobble	38%	---	0%	39%
% Boulder	1%	---	0%	1%
% Bedrock	6%	---		9%
% Clay Hardpan		---		
% Detritus/Wood		---		
% Artificial		---		
Largest Mobile (mm)	947			

Longitudinal Slope Profile



	slope (%)		slope ratio		length (ft)		length ratio		pool-pool spacing (ft)		p-p ratio	
reach	1.53		---		1309.0	(111.9 channel widths	---		---		---	
riffle	3.4	(1.7 - 5.9)	2.2	(1.1 - 3.9)	14.1	(4 - 30)	1.2	(0.3 - 2.6)	---		---	
pool	0.67	(0 - 4.3)	0.4	(0 - 2.8)	12.6	(7 - 29.5)	1.1	(0.6 - 2.5)	38.6	(18 - 53.2)	3.3	(1.5 - 4.5)
run	1.9	(0 - 4.9)	1.2	(0 - 3.2)	7.0	(2 - 12.5)	0.6	(0.2 - 1.1)	---		---	
glide	0.44	(0 - 1.4)	0.3	(0 - 0.9)	5.7	(2.5 - 8)	0.5	(0.2 - 0.7)	---		---	

Cross Section 1018



Bankfull Dimensions	
5.8	x-section area (ft.sq.)
9.8	width (ft)
0.6	mean depth (ft)
0.8	max depth (ft)
10.4	wetted parimeter (ft)
0.6	hyd radi (ft)
16.7	width-depth ratio

Flood Dimensions	
16.0	W flood prone area (ft)
1.6	entrenchment ratio
0.8	low bank height (ft)
1.0	low bank height ratio

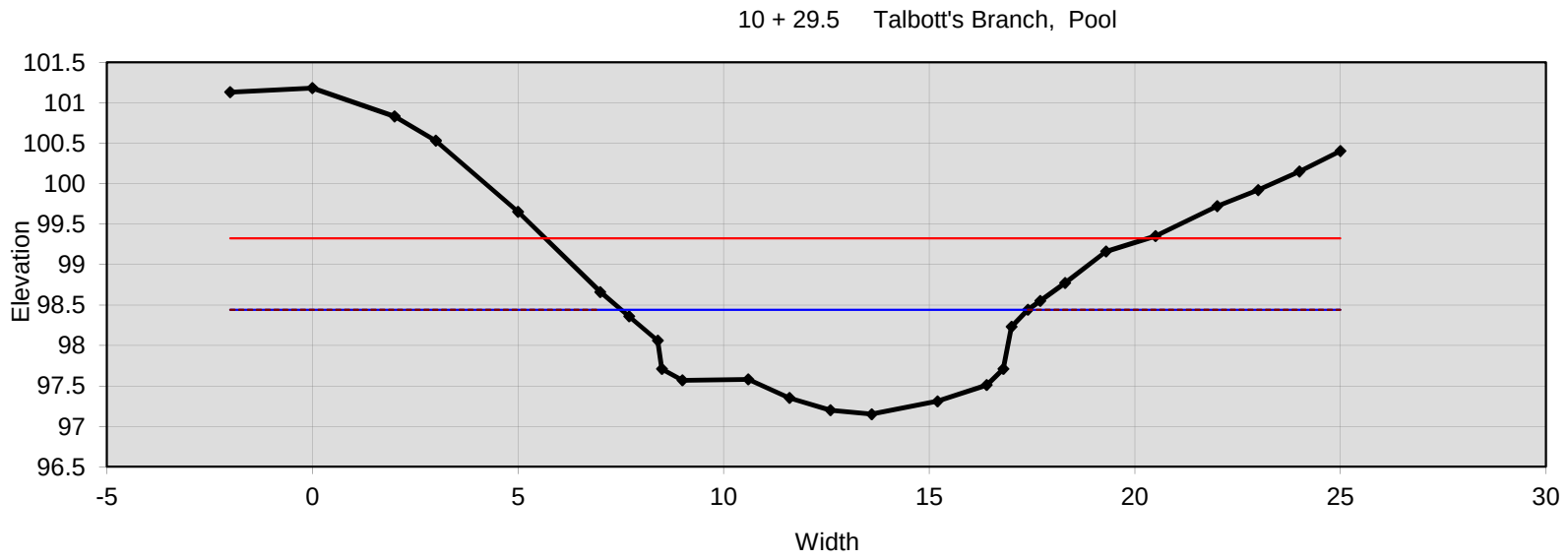
Materials	
52	D50 Riffle (mm)
110	D84 Riffle (mm)
26	threshold grain size (mm):

Bankfull Flow	
3.0	velocity (ft/s)
17.1	discharge rate (cfs)
0.70	Froude number

Flow Resistance	
0.042	Manning's roughness
0.25	D'Arcy-Weisbach fric.
4.3	resistance factor u/u*
1.6	relative roughness

Forces & Power	
1.53	channel slope (%)
0.53	shear stress (lb/sq.ft.)
0.52	shear velocity (ft/s)
1.66	unit strm power (lb/ft/s)

Cross Section 1029.5



Bankfull Dimensions	
9.1	x-section area (ft.sq.)
9.9	width (ft)
0.9	mean depth (ft)
1.3	max depth (ft)
10.8	wetted parimeter (ft)
0.8	hyd radi (ft)
10.8	width-depth ratio

Flood Dimensions	
14.7	W flood prone area (ft)
1.5	entrenchment ratio
1.3	low bank height (ft)
1.0	low bank height ratio

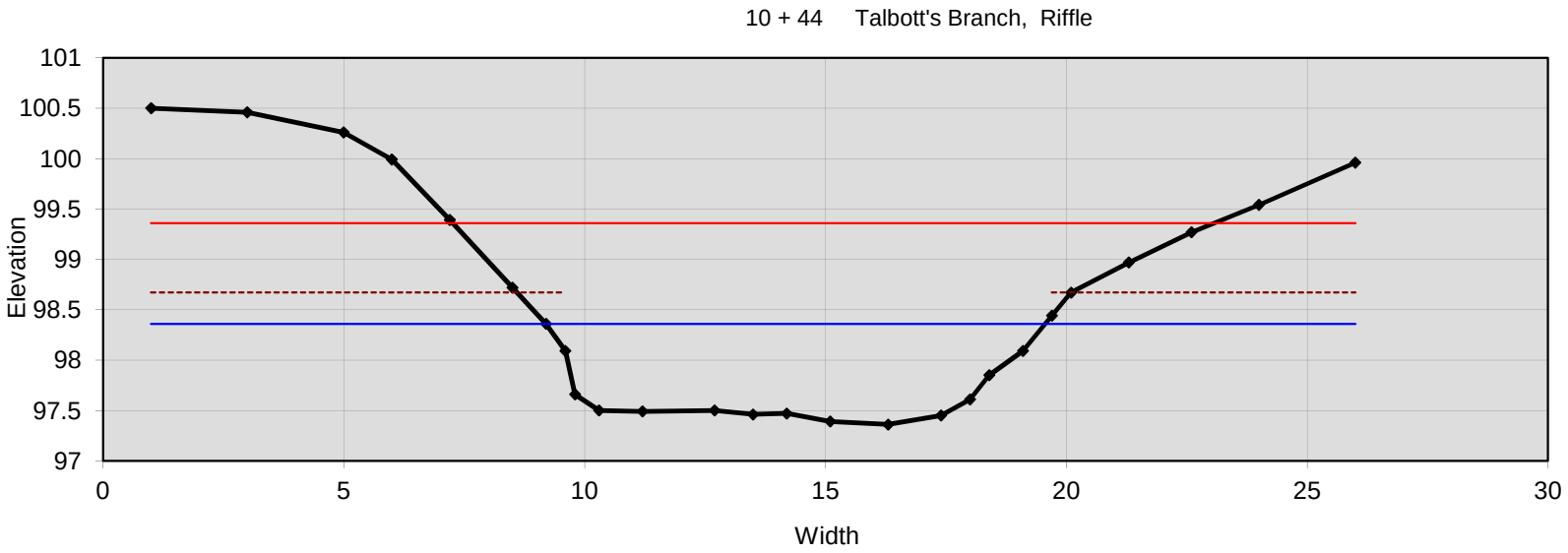
Materials	
52	D50 Riffle (mm)
110	D84 Riffle (mm)
39	threshold grain size (mm):

Bankfull Flow	
3.9	velocity (ft/s)
35.4	discharge rate (cfs)
0.75	Froude number

Flow Resistance	
0.042	Manning's roughness
0.22	D'Arcy-Weisbach fric.
5.3	resistance factor u/u*
2.5	relative roughness

Forces & Power	
1.53	channel slope (%)
0.80	shear stress (lb/sq.ft.)
0.64	shear velocity (ft/s)
3.4	unit strm power (lb/ft/s)

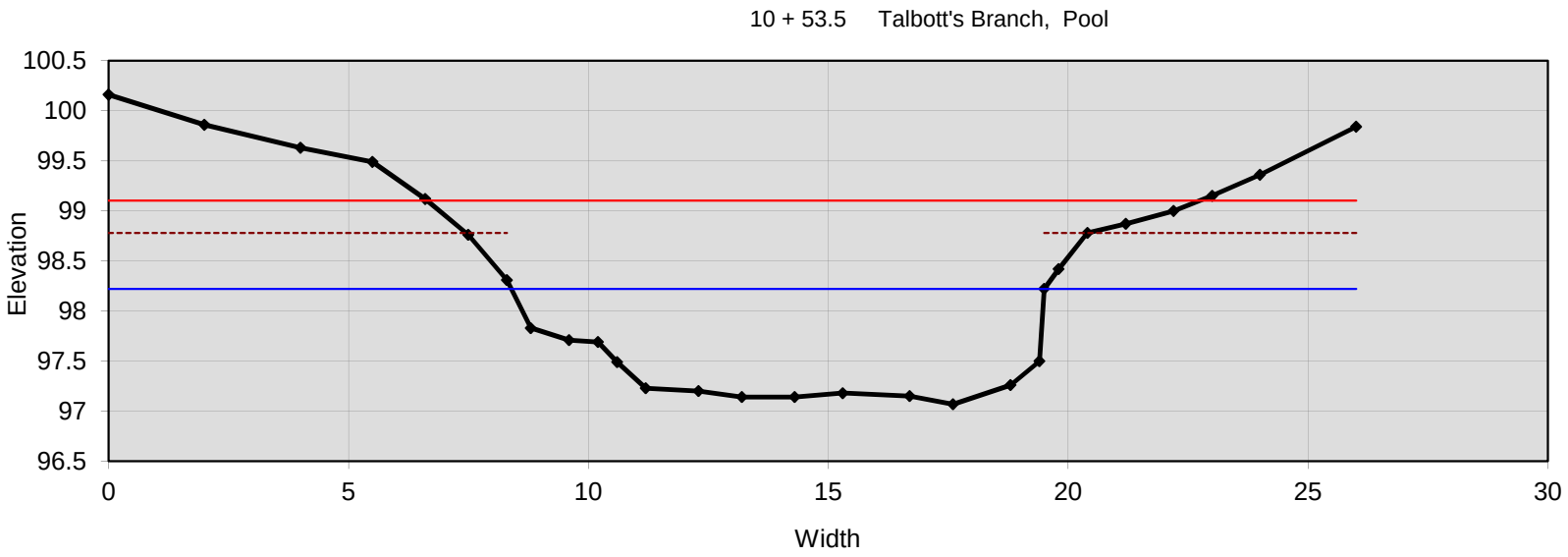
Cross Section 1044



Bankfull Dimensions		Flood Dimensions		Materials	
8.0	x-section area (ft.sq.)	15.8	W flood prone area (ft)	52	D50 Riffle (mm)
10.0	width (ft)	1.6	entrenchment ratio	110	D84 Riffle (mm)
0.8	mean depth (ft)	1.3	low bank height (ft)	36	threshold grain size (mm):
1.0	max depth (ft)	1.3	low bank height ratio		
10.5	wetted parimeter (ft)				
0.8	hyd radi (ft)				
12.3	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
3.7	velocity (ft/s)	0.042	Manning's roughness	1.53	channel slope (%)
29.6	discharge rate (cfs)	0.22	D'Arcy-Weisbach fric.	0.73	shear stress (lb/sq.ft.)
0.74	Froude number	5.0	resistance factor u/u*	0.62	shear velocity (ft/s)
		2.2	relative roughness	2.8	unit strm power (lb/ft/s)

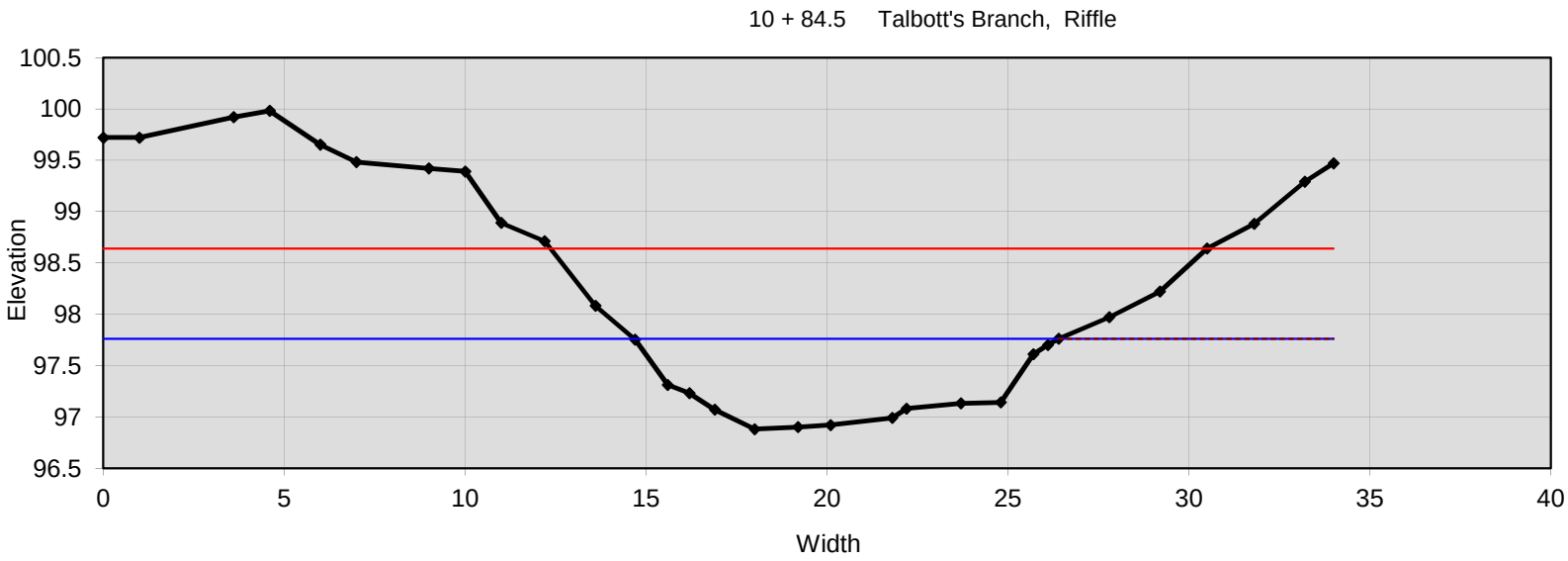
Cross Section 1053.5



Bankfull Dimensions		Flood Dimensions		Materials	
10.1	x-section area (ft.sq.)	16.1	W flood prone area (ft)	52	D50 Riffle (mm)
11.1	width (ft)	1.4	entrenchment ratio	110	D84 Riffle (mm)
0.9	mean depth (ft)	1.7	low bank height (ft)	39	threshold grain size (mm):
1.1	max depth (ft)	1.5	low bank height ratio		
12.1	wetted parimeter (ft)				
0.8	hyd radi (ft)				
12.2	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
3.9	velocity (ft/s)	0.042	Manning's roughness	1.53	channel slope (%)
39.4	discharge rate (cfs)	0.22	D'Arcy-Weisbach fric.	0.80	shear stress (lb/sq.ft.)
0.75	Froude number	5.2	resistance factor u/u*	0.64	shear velocity (ft/s)
		2.5	relative roughness	3.4	unit strm power (lb/ft/s)

Cross Section 1084.5



Bankfull Dimensions	
7.3	x-section area (ft.sq.)
11.7	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
12.0	wetted parimeter (ft)
0.6	hyd radi (ft)
18.8	width-depth ratio

Flood Dimensions	
18.1	W flood prone area (ft)
1.5	entrenchment ratio
0.9	low bank height (ft)
1.0	low bank height ratio

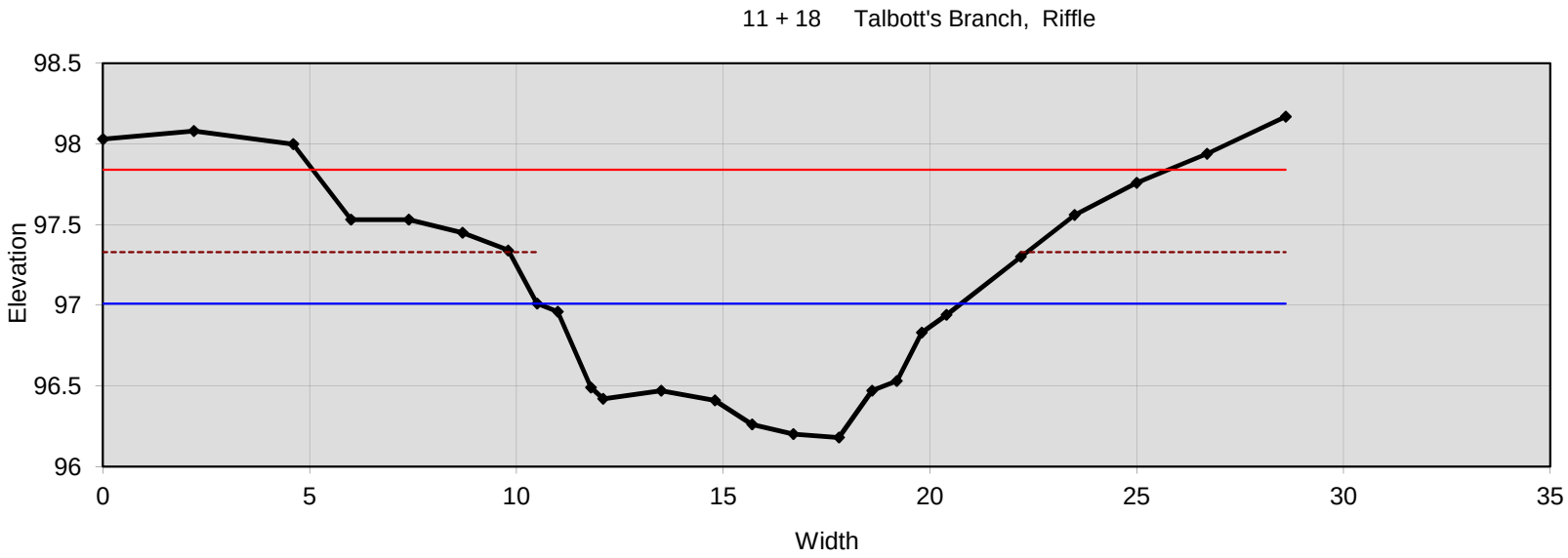
Materials	
52	D50 Riffle (mm)
110	D84 Riffle (mm)
29	threshold grain size (mm):

Bankfull Flow	
3.2	velocity (ft/s)
23.1	discharge rate (cfs)
0.71	Froude number

Flow Resistance	
0.042	Manning's roughness
0.24	D'Arcy-Weisbach fric.
4.5	resistance factor u/u*
1.7	relative roughness

Forces & Power	
1.53	channel slope (%)
0.58	shear stress (lb/sq.ft.)
0.55	shear velocity (ft/s)
1.88	unit strm power (lb/ft/s)

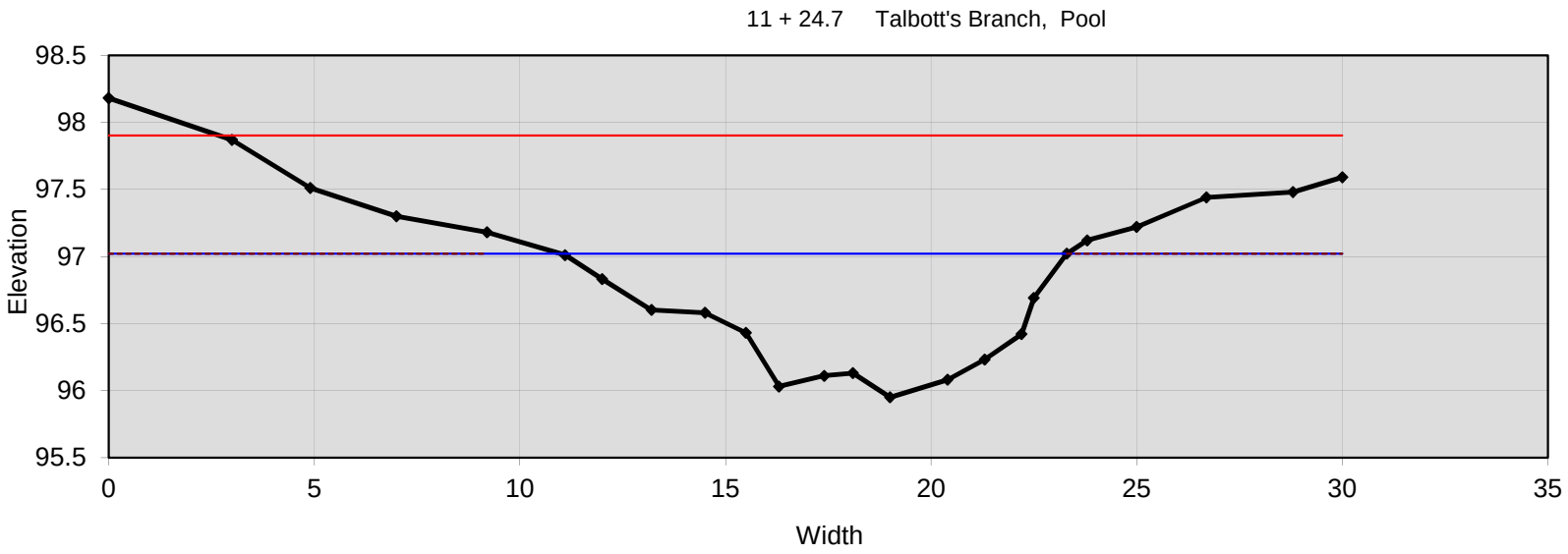
Cross Section 1118



Bankfull Dimensions		Flood Dimensions		Materials	
5.4	x-section area (ft.sq.)	20.7	W flood prone area (ft)	52	D50 Riffle (mm)
10.3	width (ft)	2.0	entrenchment ratio	110	D84 Riffle (mm)
0.5	mean depth (ft)	1.2	low bank height (ft)	24	threshold grain size (mm):
0.8	max depth (ft)	1.4	low bank height ratio		
10.5	wetted parimeter (ft)				
0.5	hyd radi (ft)				
19.6	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
2.8	velocity (ft/s)	0.042	Manning's roughness	1.53	channel slope (%)
15.0	discharge rate (cfs)	0.26	D'Arcy-Weisbach fric.	0.49	shear stress (lb/sq.ft.)
0.69	Froude number	4.1	resistance factor u/u*	0.50	shear velocity (ft/s)
		1.5	relative roughness	1.4	unit strm power (lb/ft/s)

Cross Section 1124.7



Bankfull Dimensions	
7.8	x-section area (ft.sq.)
12.3	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
12.7	wetted parimeter (ft)
0.6	hyd radi (ft)
19.4	width-depth ratio

Flood Dimensions	
---	W flood prone area (ft)
---	entrenchment ratio
1.1	low bank height (ft)
1.0	low bank height ratio

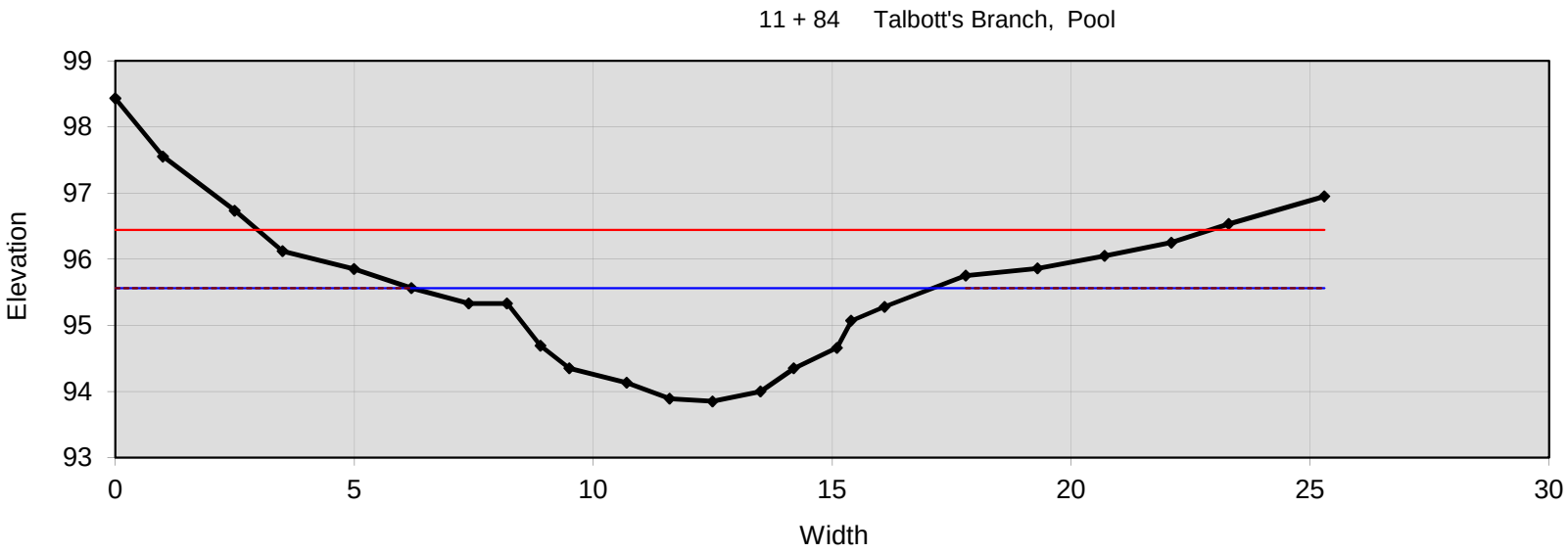
Materials	
52	D50 Riffle (mm)
110	D84 Riffle (mm)
29	threshold grain size (mm):

Bankfull Flow	
3.2	velocity (ft/s)
24.8	discharge rate (cfs)
0.71	Froude number

Flow Resistance	
0.042	Manning's roughness
0.24	D'Arcy-Weisbach fric.
4.6	resistance factor u/u*
1.8	relative roughness

Forces & Power	
1.53	channel slope (%)
0.59	shear stress (lb/sq.ft.)
0.55	shear velocity (ft/s)
1.92	unit strm power (lb/ft/s)

Cross Section 1184



Bankfull Dimensions	
10.0	x-section area (ft.sq.)
10.9	width (ft)
0.9	mean depth (ft)
1.7	max depth (ft)
11.7	wetted parimeter (ft)
0.9	hyd radi (ft)
11.9	width-depth ratio

Flood Dimensions	
20.0	W flood prone area (ft)
1.8	entrenchment ratio
1.7	low bank height (ft)
1.0	low bank height ratio

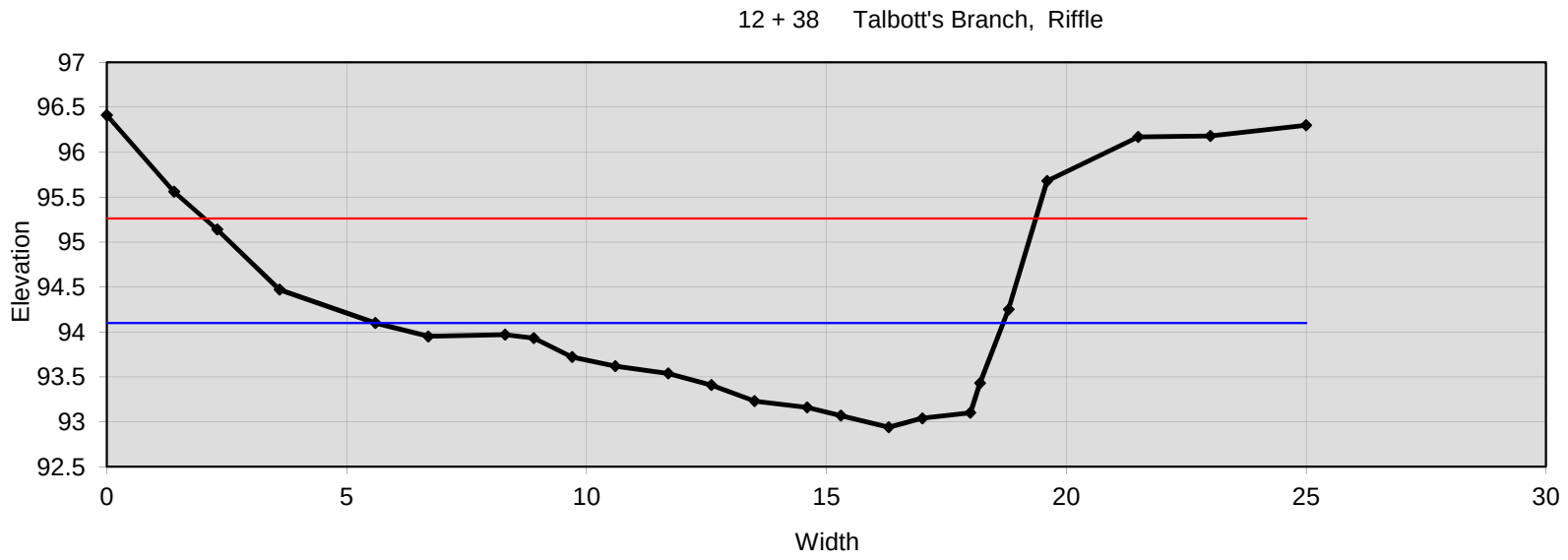
Materials	
52	D50 Riffle (mm)
110	D84 Riffle (mm)
40	threshold grain size (mm):

Bankfull Flow	
3.9	velocity (ft/s)
39.4	discharge rate (cfs)
0.75	Froude number

Flow Resistance	
0.042	Manning's roughness
0.22	D'Arcy-Weisbach fric.
5.6	resistance factor u/u*
2.5	relative roughness

Forces & Power	
1.53	channel slope (%)
0.81	shear stress (lb/sq.ft.)
0.65	shear velocity (ft/s)
3.5	unit strm power (lb/ft/s)

Cross Section 1238



Bankfull Dimensions	
7.8	x-section area (ft.sq.)
13.1	width (ft)
0.6	mean depth (ft)
1.2	max depth (ft)
13.7	wetted parimeter (ft)
0.6	hyd radi (ft)
22.1	width-depth ratio

Flood Dimensions	
17.3	W flood prone area (ft)
1.3	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

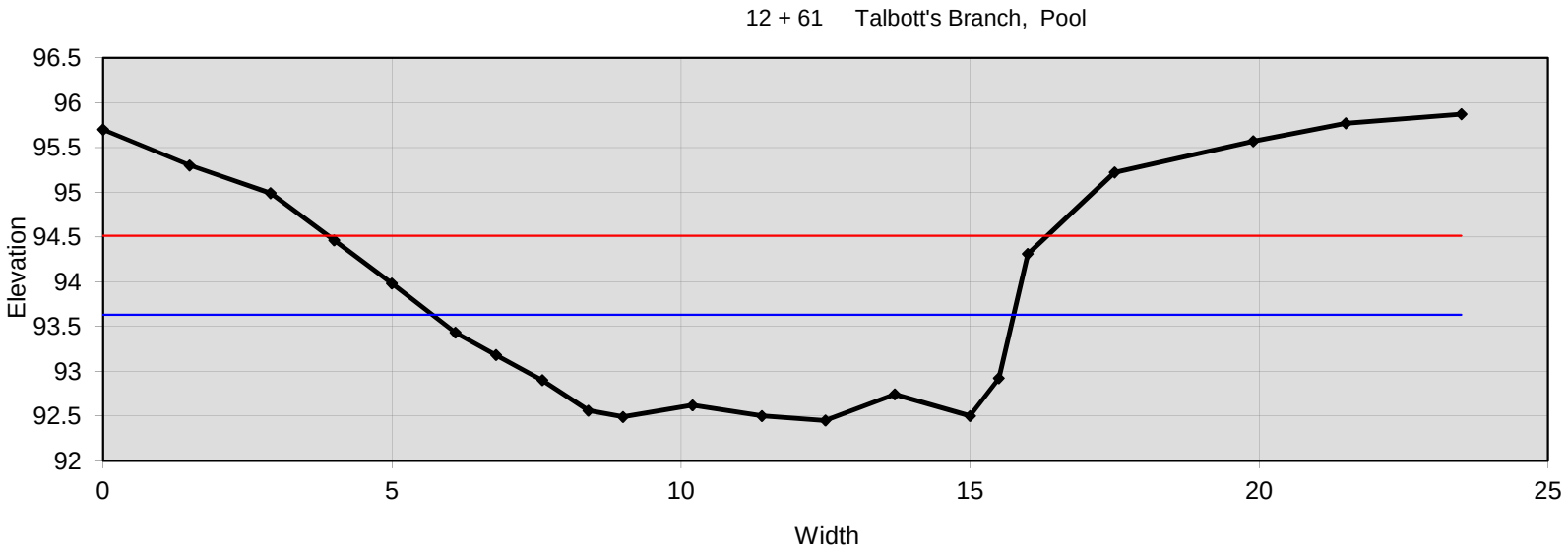
Materials	
52	D50 Riffle (mm)
110	D84 Riffle (mm)
27	threshold grain size (mm):

Bankfull Flow	
3.0	velocity (ft/s)
23.3	discharge rate (cfs)
0.70	Froude number

Flow Resistance	
0.042	Manning's roughness
0.25	D'Arcy-Weisbach fric.
4.6	resistance factor u/u*
1.6	relative roughness

Forces & Power	
1.53	channel slope (%)
0.54	shear stress (lb/sq.ft.)
0.53	shear velocity (ft/s)
1.7	unit strm power (lb/ft/s)

Cross Section 1261



Bankfull Dimensions		Flood Dimensions		Materials	
8.4	x-section area (ft.sq.)	12.4	W flood prone area (ft)	52	D50 Riffle (mm)
8.6	width (ft)	1.5	entrenchment ratio	110	D84 Riffle (mm)
1.0	mean depth (ft)	---	low bank height (ft)	42	threshold grain size (mm):
1.2	max depth (ft)	---	low bank height ratio		
9.4	wetted parimeter (ft)				
0.9	hyd radi (ft)				
8.7	width-depth ratio				

Bankfull Flow		Flow Resistance		Forces & Power	
4.1	velocity (ft/s)	0.042	Manning's roughness	1.53	channel slope (%)
34.0	discharge rate (cfs)	0.21	D'Arcy-Weisbach fric.	0.85	shear stress (lb/sq.ft.)
0.76	Froude number	5.4	resistance factor u/u*	0.66	shear velocity (ft/s)
		2.7	relative roughness	3.8	unit strm power (lb/ft/s)

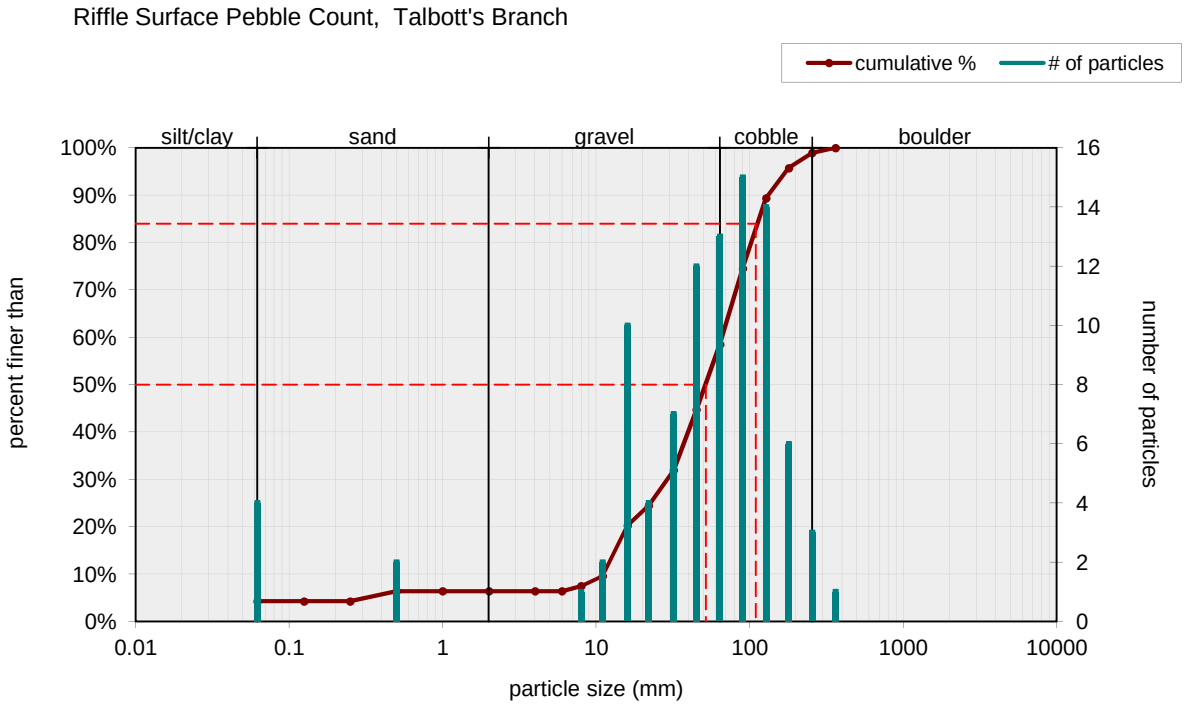
1) Individual Pebble Count

Two individual samples may be entered below. Select sample type for each.

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	4
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	
medium sand	0.25 - 0.5	2
coarse sand	0.5 - 1	
very coarse sand	1 - 2	
very fine gravel	2 - 4	
fine gravel	4 - 6	
fine gravel	6 - 8	1
medium gravel	8 - 11	2
medium gravel	11 - 16	10
coarse gravel	16 - 22	4
coarse gravel	22 - 32	7
very coarse gravel	32 - 45	12
very coarse gravel	45 - 64	13
small cobble	64 - 90	15
medium cobble	90 - 128	14
large cobble	128 - 180	6
very large cobble	180 - 256	3
small boulder	256 - 362	1
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		94
bedrock	----------	6
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		100

Note: us rif @ 1060



Size (mm)	
D16	14
D35	35
D50	52
D65	74
D84	110
D95	170

Size Distribution	
mean	39.2
dispersion	2.9
skewness	-0.13

Type			
silt/clay	4%	bedrock	6%
sand	2%		
gravel	49%		
cobble	38%		
boulder	1%		

2) Weighted Pebble Count

Feature Percent of Reach

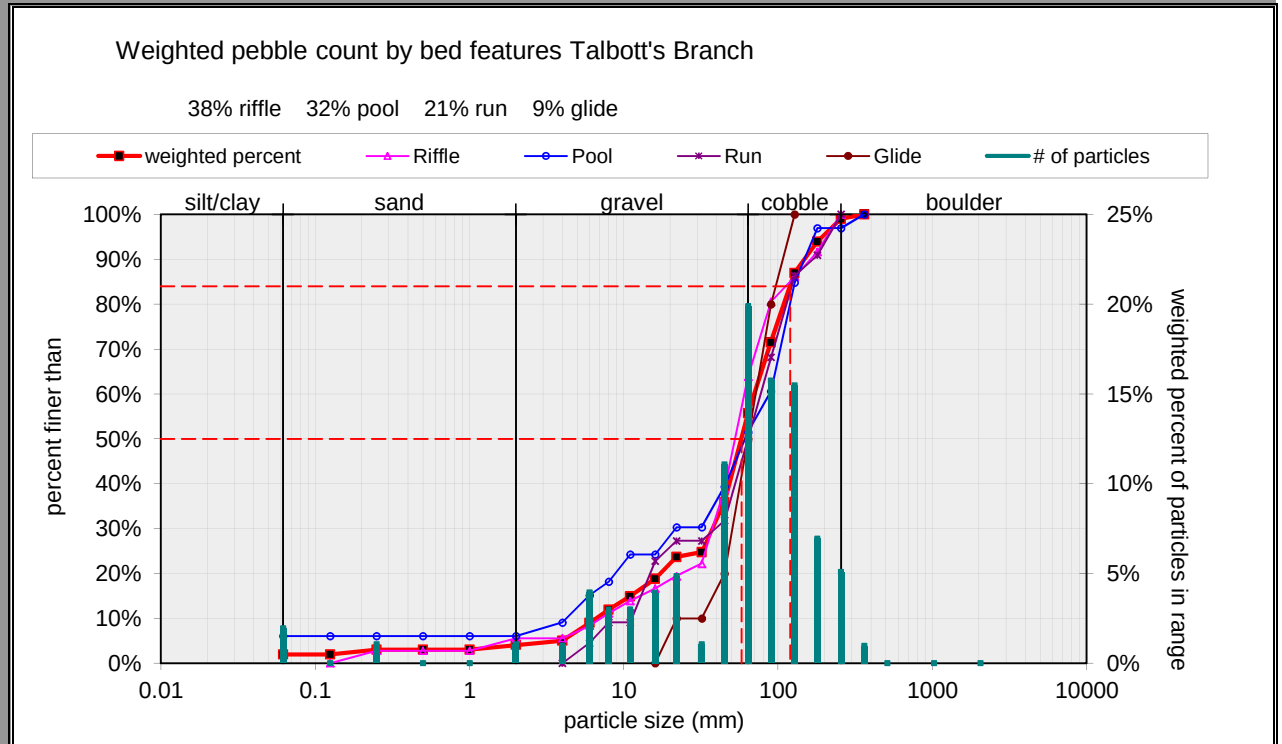
Riffle, Pool, Run, Glide

Riffle	37.5	%	Run	21	%
Pool	32	%	Glide	8.9	%

Weighted pebble count by bed features

Material	Size Range (mm)	weighted
silt/clay	0 - 0.062	1.9
very fine sand	0.062 - 0.125	0.0
fine sand	0.125 - 0.25	1.1
medium sand	0.25 - 0.5	0.0
coarse sand	0.5 - 1	0.0
very coarse sand	1 - 2	1.1
very fine gravel	2 - 4	1.0
fine gravel	4 - 6	3.9
fine gravel	6 - 8	3.0
medium gravel	8 - 11	3.0
medium gravel	11 - 16	3.9
coarse gravel	16 - 22	4.8
coarse gravel	22 - 32	1.1
very coarse gravel	32 - 45	11.1
very coarse gravel	45 - 64	19.9
small cobble	64 - 90	15.8
medium cobble	90 - 128	15.5
large cobble	128 - 180	6.9
very large cobble	180 - 256	5.1
small boulder	256 - 362	1.0
small boulder	362 - 512	0.0
medium boulder	512 - 1024	0.0
large boulder	1024 - 2048	0.0
very large boulder	2048 - 4096	0.0
total particle weighted count:		100
bedrock		10.2
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
total weighted count:		110.2

Note:



Size (mm)	
D16	12
D35	44
D50	58
D65	78
D84	120
D95	190

Size Distribution	
mean	37.9
dispersion	3.5
skewness	-0.18

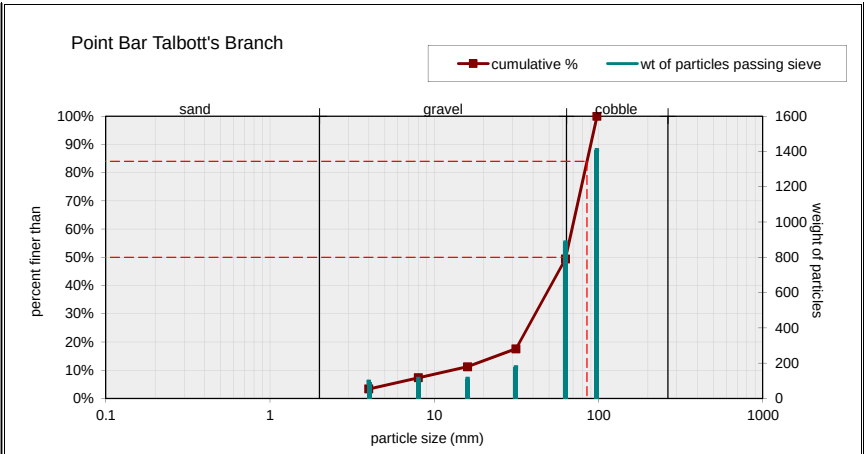
Type			
silt/clay	2%	bedrock	9%
sand	2%		
gravel	47%		
cobble	39%		
boulder	1%		

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		93	93	3%	---	---
4		110	110	4%	3%	3%
8		109	109	4%	4%	7%
16		176	176	6%	4%	11%
31.5		885	885	32%	6%	18%
63		1407	1407	51%	32%	49%
98			0	0%	51%	100%

total wt retained in sieves: 2780

Note: 169 g sand



Size (mm)				
D16	27	D65	72	
D35	46	D84	85	
D50	63	D95	94	

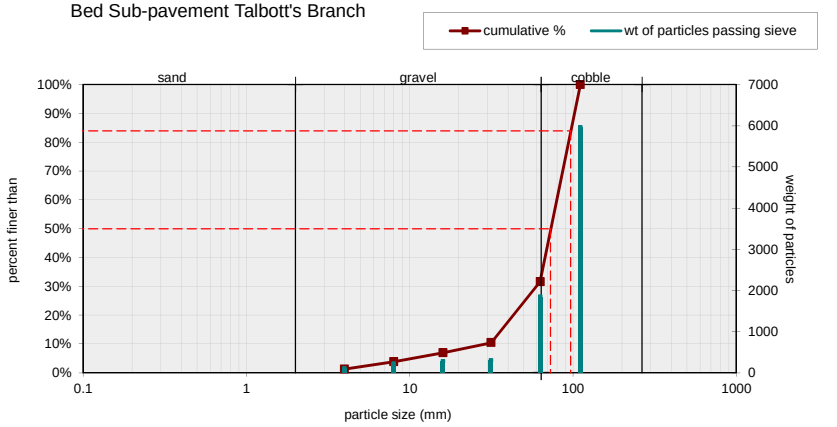
sand 100%

Bed Sub-pavement

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		107	107	1%	---	---
4		223	223	3%	1%	1%
8		277	277	3%	3%	4%
16		302	302	3%	3%	7%
31.5		1841	1841	21%	3%	10%
63		5960	5960	68%	21%	32%
111			0	0%	68%	100%

total: 8710

Note: 125 g sand



Size (mm)			
D16	38	D65	83
D35	65	D84	97
D50	73	D95	110

Largest Particle	
1	867
2	525
3	1463
4	934
5	
	947.25

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
166	98	50	0.39
68	58	52	0.83
130	90	70	0.65
170	111	40	0.29

			---
	mean shape factor:		0.54

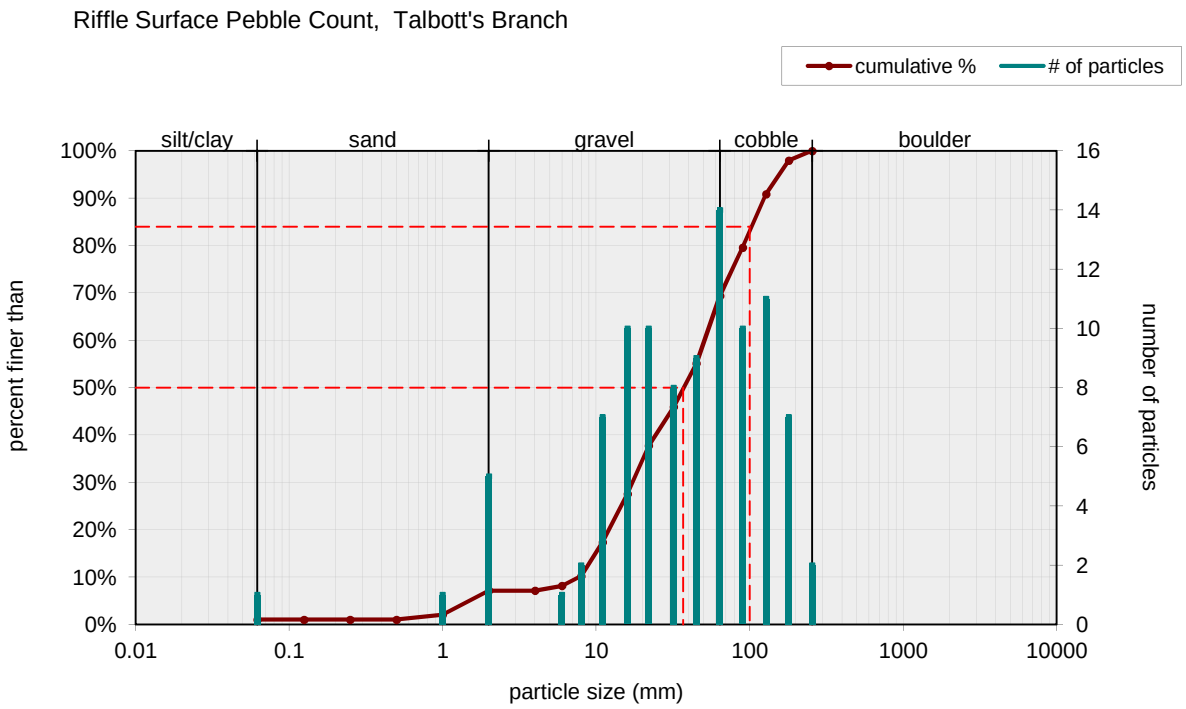
1) Individual Pebble Count

Two individual samples may be entered below. Select sample type for each.

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	1
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	
medium sand	0.25 - 0.5	
coarse sand	0.5 - 1	1
very coarse sand	1 - 2	5
very fine gravel	2 - 4	
fine gravel	4 - 6	1
fine gravel	6 - 8	2
medium gravel	8 - 11	7
medium gravel	11 - 16	10
coarse gravel	16 - 22	10
coarse gravel	22 - 32	8
very coarse gravel	32 - 45	9
very coarse gravel	45 - 64	14
small cobble	64 - 90	10
medium cobble	90 - 128	11
large cobble	128 - 180	7
very large cobble	180 - 256	2
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		98
bedrock	----------	2
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
total count:		100

Note: ds rif @ 1060



Size (mm)	
D16	10
D35	20
D50	37
D65	57
D84	100
D95	160

Size Distribution	
mean	31.6
dispersion	3.2
skewness	-0.07

Type			
silt/clay	1%	bedrock	2%
sand	6%		
gravel	61%		
cobble	30%		
boulder	0%		

2) Weighted Pebble Count

Feature Percent of Reach

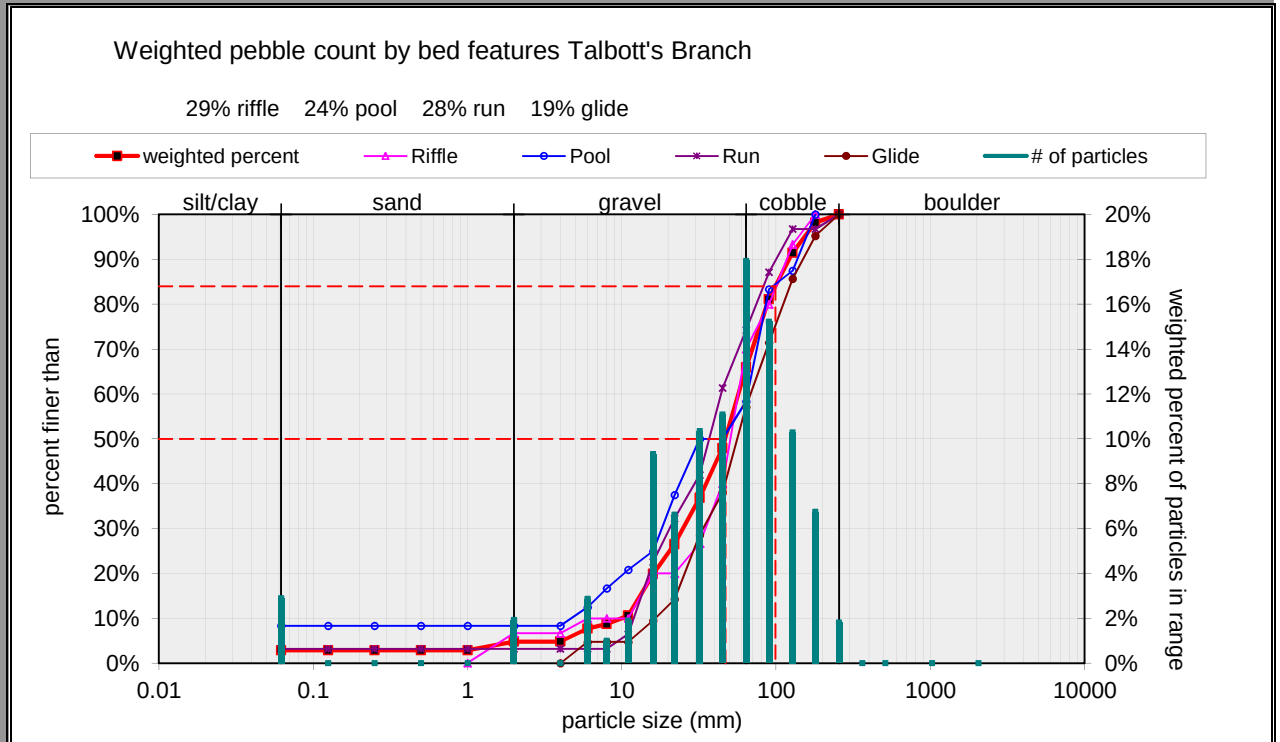
Riffle, Pool, Run, Glide

Riffle	29	%	Run	27.6	%
Pool	24.4	%	Glide	18.7	%

Weighted pebble count by bed features

Material	Size Range (mm)	weighted
silt/clay	0 - 0.062	2.9
very fine sand	0.062 - 0.125	0.0
fine sand	0.125 - 0.25	0.0
medium sand	0.25 - 0.5	0.0
coarse sand	0.5 - 1	0.0
very coarse sand	1 - 2	1.9
very fine gravel	2 - 4	0.0
fine gravel	4 - 6	2.9
fine gravel	6 - 8	1.0
medium gravel	8 - 11	1.9
medium gravel	11 - 16	9.3
coarse gravel	16 - 22	6.6
coarse gravel	22 - 32	10.4
very coarse gravel	32 - 45	11.1
very coarse gravel	45 - 64	17.9
small cobble	64 - 90	15.2
medium cobble	90 - 128	10.3
large cobble	128 - 180	6.7
very large cobble	180 - 256	1.8
small boulder	256 - 362	0.0
small boulder	362 - 512	0.0
medium boulder	512 - 1024	0.0
large boulder	1024 - 2048	0.0
very large boulder	2048 - 4096	0.0
total particle weighted count:		100
bedrock		15.4
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
total weighted count:		115.4

Note: ds reach



Size (mm)	
D16	14
D35	30
D50	47
D65	63
D84	99
D95	150

Size Distribution	
mean	37.2
dispersion	2.7
skewness	-0.11

Type			
silt/clay	3%	bedrock	13%
sand	2%		
gravel	53%		
cobble	30%		
boulder	0%		

3) Bulk Sample Sieve Analysis

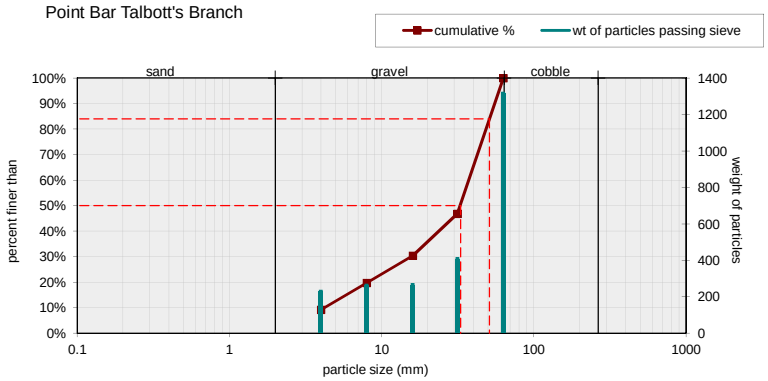
Two samples may be entered below. Select sample type for each.

Point Bar

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		228	228	9%	---	---
4		260	260	11%	9%	9%
8		264	264	11%	11%	20%
16		406	406	16%	11%	30%
31.5		1314	1314	53%	16%	47%
63			0	0%	53%	100%

total wt retained in sieves: 2472

Note: 455 g sand



Size (mm)			
D16	6.3	D65	40
D35	19	D84	51
D50	33	D95	59

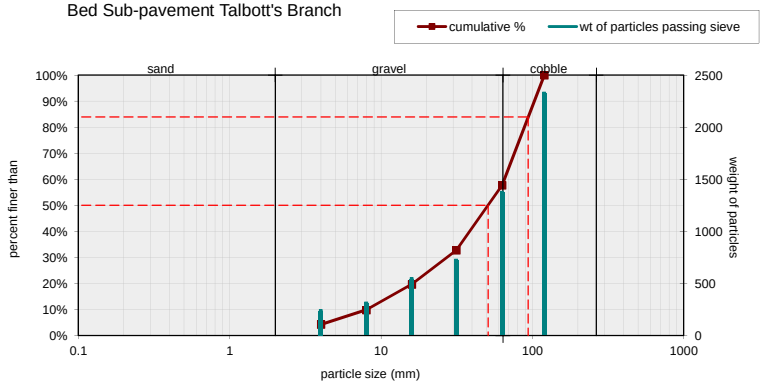
sand 100%

Bed Sub-pavement

Sieve Size (mm)	Sieve Weight (g)	Sieve & Sample Weight (g)	Retained on Sieve (g)		Passing Sieve	
2		233	233	4%	---	---
4		307	307	6%	4%	4%
8		539	539	10%	6%	10%
16		717	717	13%	10%	20%
31.5		1369	1369	25%	13%	33%
63		2323	2323	42%	25%	58%
120			0	0%	42%	100%

total: 5488

Note: 295 g sand



Size (mm)			
D16	12	D65	70
D35	34	D84	94
D50	51	D95	110

Largest Particle	
1	348
2	154
3	1131
4	652
5	
	571.25

Particle Shape Factor			
axis (mm)			
a	b	c	Sp
90	65	40	0.52
80	50	20	0.32
240	120	20	0.12
140	60	40	0.44

			---
	mean shape factor:		0.35

TALBOTTS BRANCH REFERENCE REACH

Photo 1: Talbotts Branch facing downstream 4/10/13

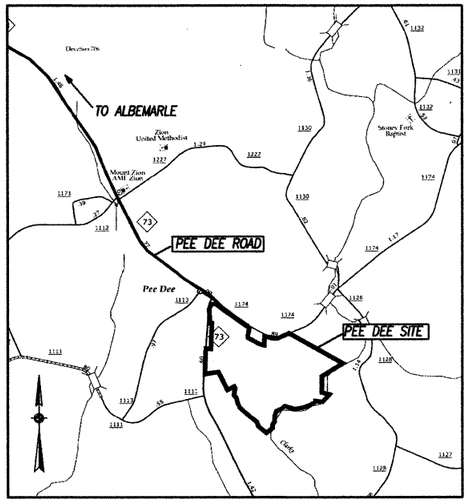
Photo 2: Talbotts Branch facing downstream 4/10/13

Photo 3: Talbotts Branch facing downstream 4/10/13

Photo 4: Talbotts Branch facing downstream 4/10/13

APPENDIX D
PROJECT PLAN SHEETS (11”x17”)

NC EEP PROJECT #95350



VICINITY MAP
NOT TO SCALE

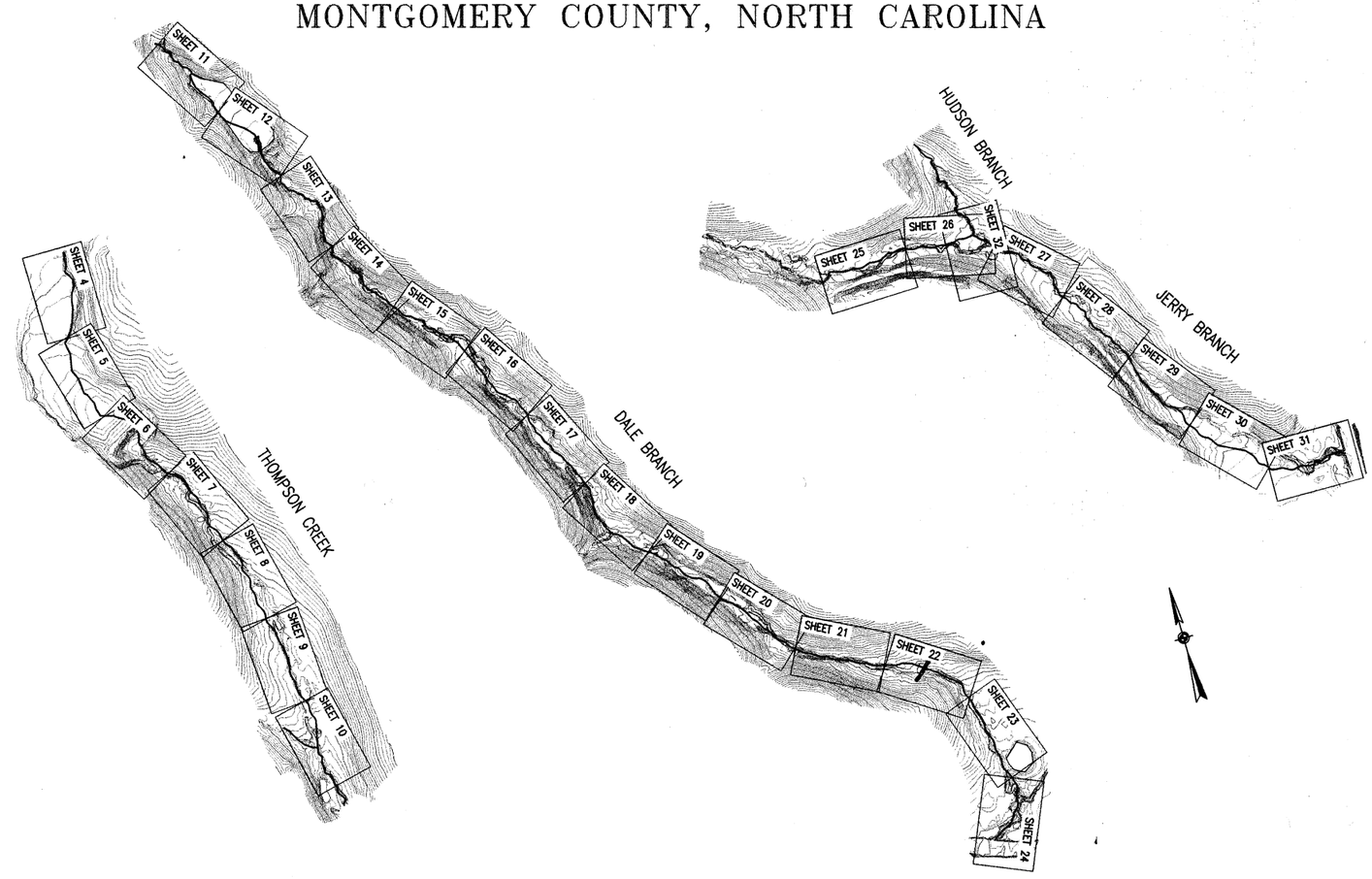
ENVIRONMENTAL BANC AND EXCHANGE

PEE DEE STREAM RESTORATION PROJECT

THOMPSON CREEK, DALE BRANCH, JERRY BRANCH AND HUDSON BRANCH
MONTGOMERY COUNTY, NORTH CAROLINA

STATE	EEP PROJECT NO.	SHEET NO.	TOTAL SHEETS
NC	95350	1	83

	REVISIONS		
	Final Plans	1/9/2014	
SYM.	DESCRIPTION	DATE	APPROVED



SHEET INDEX

FINAL PLANS

GRAPHIC SCALES (SCALE IN FEET)

10 0 10 30
PLAN SHEETS

20 0 10 30
HORIZONTAL PROFILE

2 0 1 6
VERTICAL PROFILE

PROJECT LENGTHS

PROPOSED RESTORATION:

THOMPSON CREEK	= 1314 FT
DALE BRANCH	= 2955 FT
JERRY BRANCH	= 1670 FT
HUDSON BRANCH	= 53 FT

PROPOSED ENHANCEMENT:

THOMPSON CREEK	= 250 FT
DALE BRANCH	= 375 FT
TOTAL LENGTH	= 6617 FT

Prepared by:

Wolf Creek ENGINEERING

Wolf Creek Engineering, Pllc
License No. P-0417
7 Florida Avenue
Weaverville, North Carolina 28787
Phone: 828-658-3649
www.wolfcreekeng.com

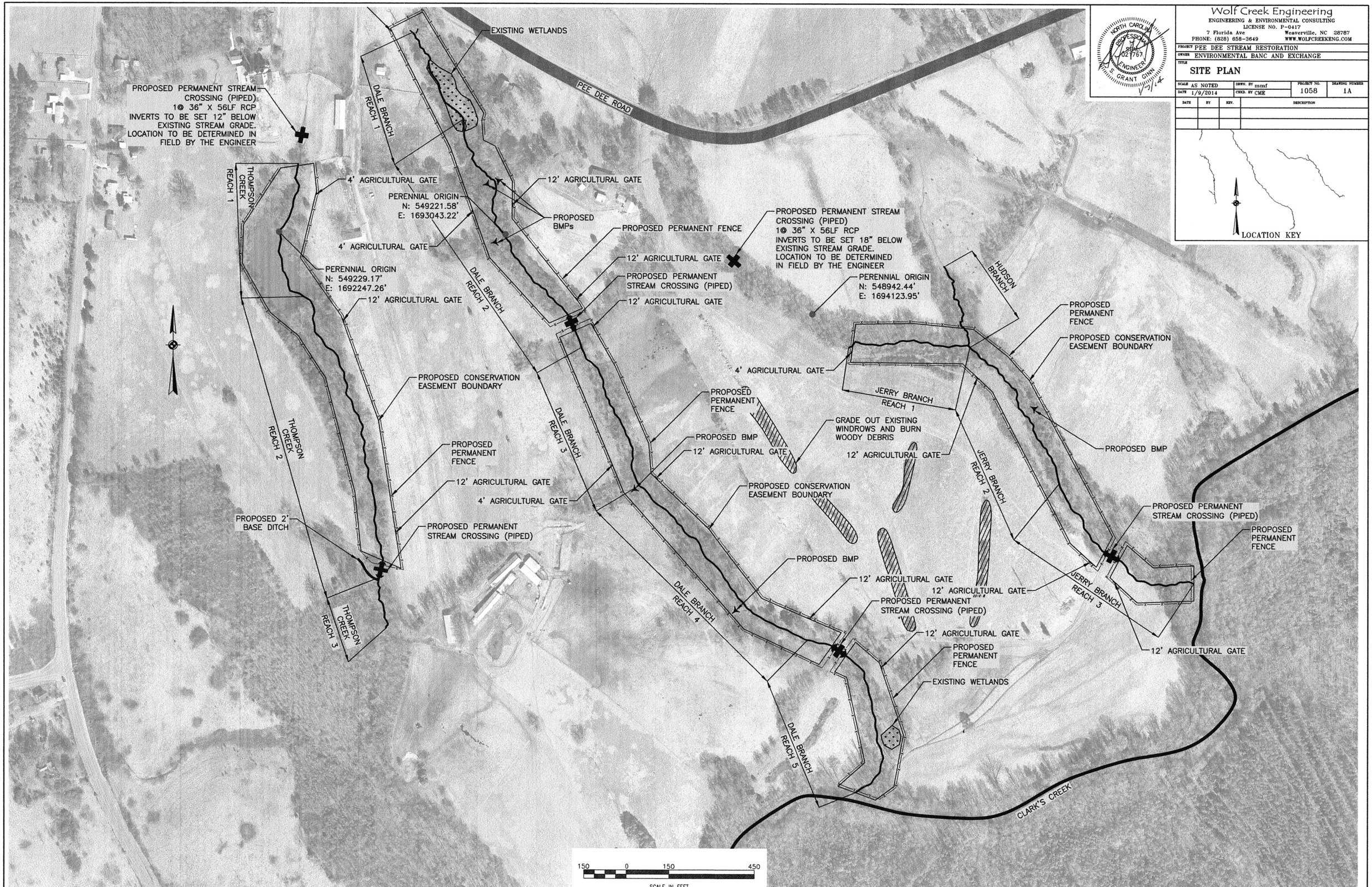
NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER S GRANT GINN

1/7/14
PROJECT ENGINEER

Prepared for:

EBX

Tommy Cousins
PROJECT MANAGER



NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER S. GRANT GINN 1/9/14

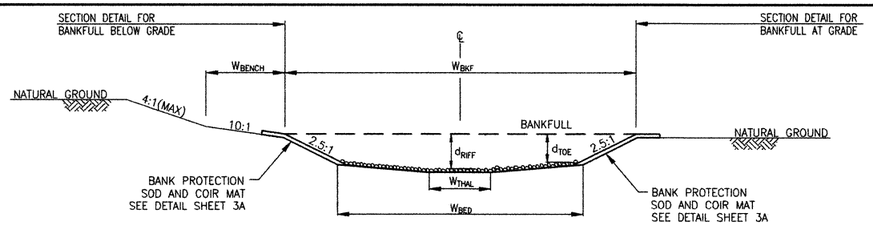
Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
7 Florida Ave Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **SITE PLAN**

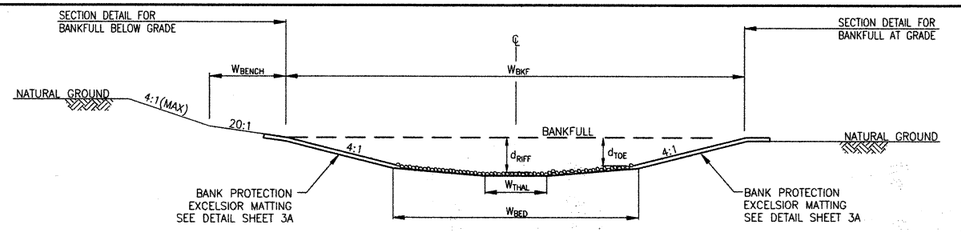
SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	mmf	1058	1A
DATE 1/9/2014	CHKD. BY CME		

DATE	BY	REV.	DESCRIPTION

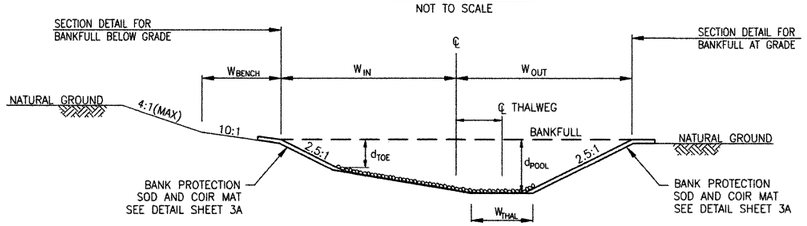
LOCATION KEY



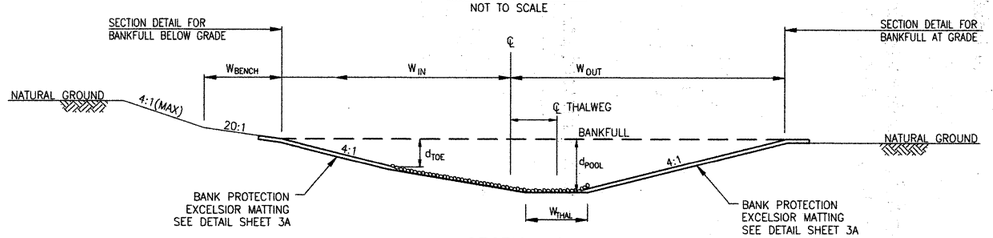
SECTION 1
TYPICAL RIFFLE
NOT TO SCALE



SECTION 2
TYPICAL RIFFLE
NOT TO SCALE



SECTION 1
TYPICAL POOL
NOT TO SCALE



SECTION 2
TYPICAL POOL
NOT TO SCALE

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
7 Florida Ave. Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

NORTH CAROLINA PROFESSIONAL SEAL 047767 ENGINEER GRANT GUNN 1/9/14

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **TYPICAL SECTIONS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	mmf	1058	2
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

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.
2. CONSTRUCTION SHALL BEGIN AT THE UPSTREAM END OF EACH CHANNEL REACH AND PROCEED DOWNSTREAM UNLESS APPROVED OTHERWISE BY THE ENGINEER.
3. 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.
4. CLEARING AND GRUBBING SHALL BE LIMITED TO THAT WHICH IS NECESSARY FOR CONSTRUCTION OF THE PROPOSED CHANNEL AND SHALL BE APPROVED BY THE ENGINEER.
5. 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.
6. CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIALS GENERATED BY CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRS TO EXISTING FACILITIES FROM DAMAGES OCCURRING AS A RESULT OF CONSTRUCTION ACTIVITIES.
8. THE INSTALLATION OF EROSION CONTROL MEASURES AND PRACTICES SHALL OCCUR PRIOR TO LAND DISTURBING ACTIVITIES.

SURVEY:
THE COORDINATE SYSTEM IS THE NAD83(2007) STATE PLANE GRID.

CHANNEL CONSTRUCTION NOTES:
1. BED MATERIAL ON RIFFLE SECTIONS SHALL CONSIST OF BED MATERIAL EXCAVATED FROM EXISTING CHANNEL AND 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.

TREE HARVEST 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 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. TREES SELECTED FOR PROTECTION ARE INDICATED ON PLANS.
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.

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
THOMPSON CREEK - 1A	2	100+00 TO 102+50	8.8	4.1	1.2	4	0.73	0.59	5.3	4.4	1.10	0.5
THOMPSON CREEK - 1B	2	102+50 TO 105+11	8.8	4.1	1.2	4	0.73	0.59	5.3	4.4	1.10	0.5
THOMPSON CREEK - 2	1	105+11 TO 116+61	7.5	4.4	1.3	4	0.78	0.63	4.5	3.8	1.17	0.5
THOMPSON CREEK - 3	1	116+61 TO 118+13	7.9	4.6	1.4	4	0.81	0.65	4.7	3.9	1.22	0.5
DALE BRANCH - 1	2	200+00 TO 203+75	6.3	3.0	0.9	3	0.52	0.41	3.8	3.1	0.77	0.5
DALE BRANCH - 2A	1	203+75 TO 205+00	4.7	2.5	0.7	2	0.56	0.45	2.8	2.4	0.84	0.5
DALE BRANCH - 2B	2	205+00 TO 206+40	6.8	3.2	1.0	3	0.56	0.45	4.1	3.4	0.84	0.5
DALE BRANCH - 2C	1	206+40 TO 207+50	4.7	2.5	0.7	2	0.56	0.45	2.8	2.4	0.84	0.5
DALE BRANCH - 2D	2	207+50 TO 211+09	6.8	3.2	1.0	3	0.56	0.45	4.1	3.4	0.84	0.5
DALE BRANCH - 2E	1	211+09 TO 213+50	4.7	2.5	0.7	2	0.56	0.45	2.8	2.4	0.84	0.5
DALE BRANCH - 3	2	213+50 TO 219+00	7.2	3.4	1.0	4	0.59	0.47	4.3	3.6	0.89	0.5
DALE BRANCH - 4	1	219+00 TO 227+25	6.1	3.4	1.0	3	0.67	0.54	3.7	3.0	1.01	0.5
DALE BRANCH - 5A	1	227+25 TO 229+70	6.4	3.6	1.1	3	0.69	0.56	3.8	3.2	1.04	0.5
DALE BRANCH - 5B	1	229+70 TO 232+85	6.4	3.6	1.1	3	0.69	0.56	3.8	3.2	1.04	0.5
DALE BRANCH - 5C	1	232+85 TO 234+50	6.4	3.6	1.1	3	0.69	0.56	3.8	3.2	1.04	0.5
JERRY BRANCH - 1	2	300+00 TO 304+35	7.9	3.7	1.1	4	0.65	0.52	4.7	3.9	0.97	0.5
JERRY BRANCH - 2	1	304+35 TO 310+60	7.1	4.1	1.2	4	0.75	0.60	4.3	3.5	1.13	0.5
JERRY BRANCH - 3	1	310+60 TO 317+30	7.3	4.2	1.3	4	0.77	0.61	4.4	3.6	1.15	0.5
HUDSON BRANCH	2	402+74 TO 403+76	6.3	3.0	0.9	3	0.52	0.41	3.8	3.1	0.77	0.5

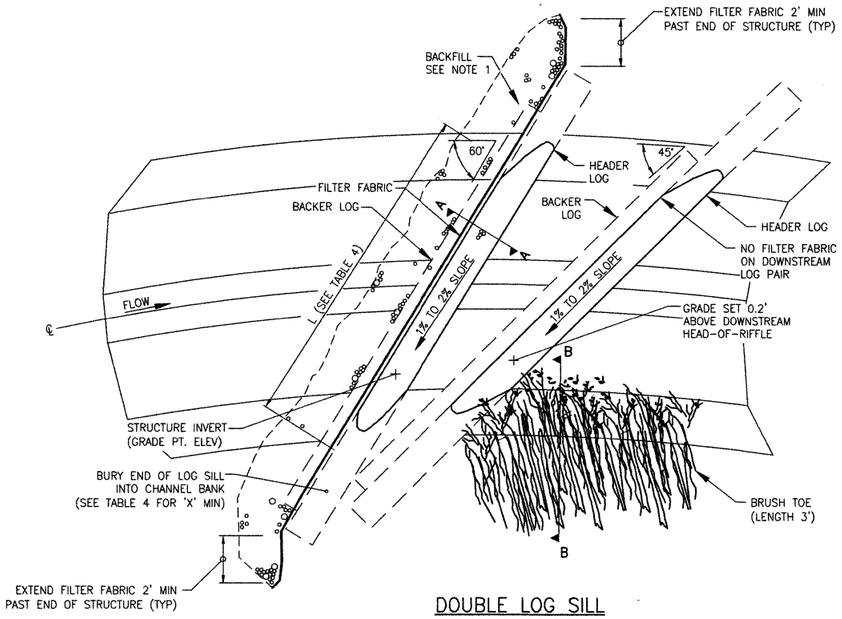
TABLE 2: SUPPLEMENTAL BED MATERIAL

REACH	PERCENT OF TOTAL MAX							DEPTH OF BED MATERIAL
	ON-SITE SAND/CLAY	3/8" STONE	1/2" STONE	3/4" STONE	2" STONE	6" STONE	12" STONE	
THOMPSON CREEK - 1A	40%	60%	-	-	-	-	-	0.5
THOMPSON CREEK - 1B	10%	-	-	30%	30%	30%	-	0.5
THOMPSON CREEK - 2	10%	-	-	30%	30%	30%	-	0.5
THOMPSON CREEK - 3	40%	60%	-	-	-	-	-	0.5
DALE BRANCH - 1	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 2A	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 2B	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 2C	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 2D	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 2E	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 3	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 4	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 5A	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 5B	40%	60%	-	-	-	-	-	0.4
DALE BRANCH - 5C	40%	60%	-	-	-	-	-	0.4
JERRY BRANCH - 1	40%	60%	-	-	-	-	-	0.4
JERRY BRANCH - 2	40%	60%	-	-	-	-	-	0.4
JERRY BRANCH - 3	40%	60%	-	-	-	-	-	0.4
HUDSON BRANCH	40%	60%	-	-	-	-	-	0.3

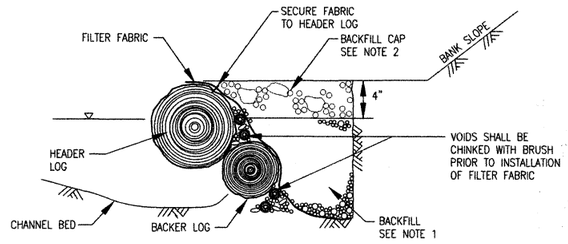
NOTE: SUPPLEMENTAL BED MATERIAL TABLE IS PROVIDED IN THE EVENT THAT SUFFICIENT MATERIAL IS NOT AVAILABLE ON SITE. HOWEVER, SITE INVESTIGATIONS INDICATE THAT SUFFICIENT MATERIAL IS AVAILABLE ON SITE.

TABLE 3: MORPHOLOGIC TABLE

REACH	THOMPSON CREEK 1A	THOMPSON CREEK 1B	THOMPSON CREEK 2	THOMPSON CREEK 3	DALE BRANCH 1	DALE BRANCH 2A	DALE BRANCH 2B	DALE BRANCH 2C	DALE BRANCH 2D	DALE BRANCH 2E	DALE BRANCH 3	DALE BRANCH 4	DALE BRANCH 5A	DALE BRANCH 5B	DALE BRANCH 5C	JERRY BRANCH 1	JERRY BRANCH 2	JERRY BRANCH 3	HUDSON BRANCH
STREAM TYPE	B4	B4	B4	B4	B4	B4	B4	B4	B4	B4	B4	B4	B4	C4	B4	B4	B4	B4	B4
DRAINAGE AREA (mi^2)	0.11	0.11	0.14	0.16	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.08	0.09	0.09	0.09	0.07	0.12	0.13	0.03
W_{BKF} (ft)	8.8	8.8	7.5	7.9	6.3	4.7	6.8	4.7	6.8	4.7	7.2	6.1	6.4	6.4	6.4	7.9	7.1	7.3	6.3
XS_{BKF} (ft^2)	4.2	4.2	4.2	4.6	2.1	1.8	2.5	1.8	2.5	1.8	2.8	2.9	3.1	3.1	3.1	3.3	3.7	4.0	2.1
d_{MEAN} (ft)	0.48	0.48	0.55	0.58	0.34	0.38	0.36	0.38	0.36	0.38	0.39	0.47	0.49	0.49	0.49	0.42	0.53	0.54	0.34
d_{MAX} (ft)	0.73	0.73	0.78	0.81	0.52	0.56	0.56	0.56	0.56	0.56	0.59	0.67	0.69	0.69	0.69	0.65	0.75	0.77	0.52
S_{AVG} (ft/ft)	0.007	0.030	0.022	0.023	0.039	0.120	0.029	0.045	0.042	0.040	0.027	0.028	0.050	0.023	0.043	0.037	0.024	0.024	0.012
S_{VALLEY} (ft/ft)	0.018	0.032	0.024	0.028	0.023	0.100	0.016	0.036	0.031	0.027	0.025	0.028	0.029	0.023	0.041	0.031	0.028	0.019	0.050
W/D RATIO	18.6	18.6	13.5	13.7	18.7	12.5	18.7	12.5	18.7	12.5	18.7	13.0	13.1	13.1	13.1	18.6	13.4	13.5	18.7
ENTRENCHMENT RATIO	4.5	3.4	4.0	3.2	5.6	2.5	2.4	2.5	2.7	3.0	4.2	4.1	2.4	3.1	1.9	2.5	3.5	3.4	4.8
SINUOSITY	1.1	1.0	1.1	1.2	1.1	1.1	1.1	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.1
POOL-TO-POOL RATIO	4.4	4.4	4.4	3.9	4.4	5.0	4.1	3.2	4.1	3.6	4.1	4.1	3.9	6.0	2.8	3.9	3.9	4.1	3.4
MEANDER WIDTH RATIO	3	3	3	3	4	3	4	3	3	2	2	2	2	2	2	2	2	2	2

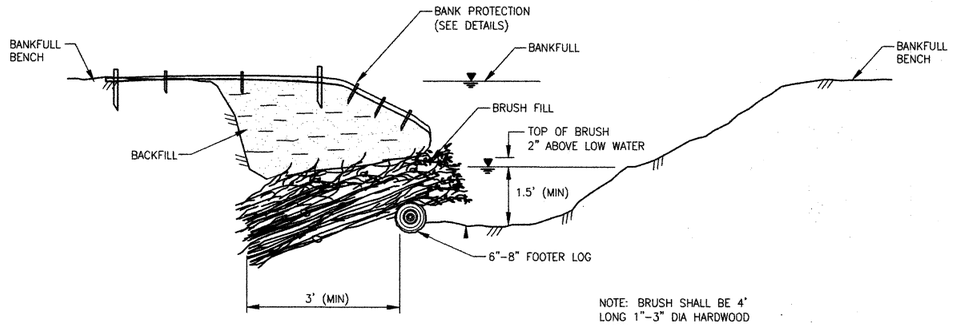


DOUBLE LOG SILL
PLAN VIEW
NOT TO SCALE



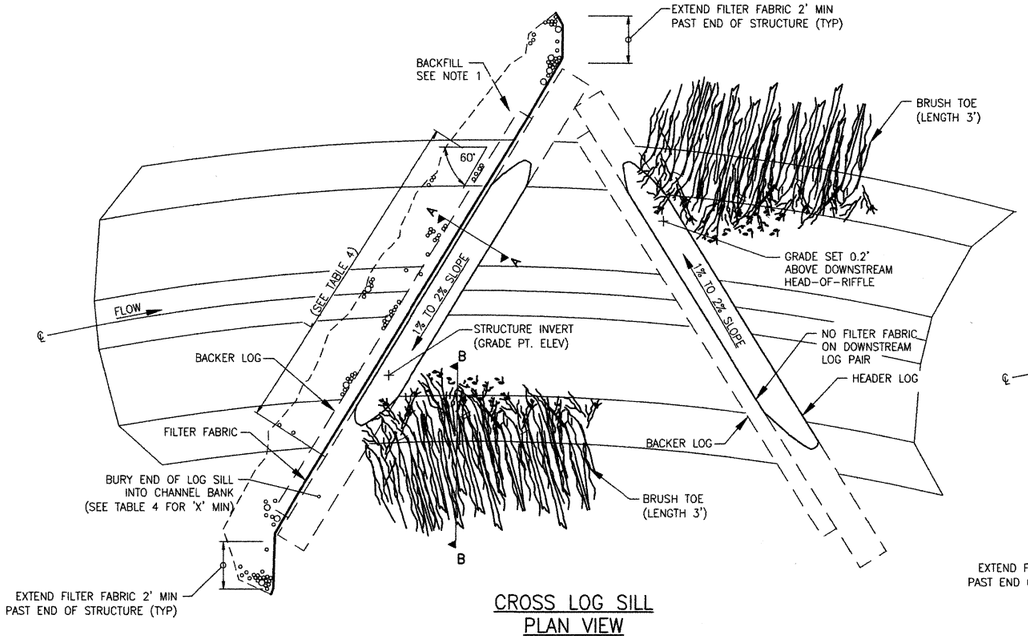
SECTION A-A
NOT TO SCALE

NOTES:
1. STRUCTURE BACKFILL MATERIAL SHALL CONSIST OF ON-SITE SOIL COMPACTED TO IN-SITU DENSITY.
2. STRUCTURE BACKFILL CAP SHALL CONSIST OF 2"-4" STONE AND ON-SITE SOIL MIXED IN EQUAL PARTS. MIXTURE CAN BE ACHIEVED BY COMPACTING STONE INTO PLACED SOIL. WHERE ON-SITE STONE/GRAVEL IS AVAILABLE AND OF SUFFICIENT SIZE IT MAY BE USED IN PLACE OF QUARRY STONE, AS APPROVED BY THE ENGINEER.
3. ALL VOIDS AND GAPS BETWEEN BOULDERS AND LOGS SHALL BE CHINKED WITH STONE PRIOR TO INSTALLATION OF FILTER FABRIC.

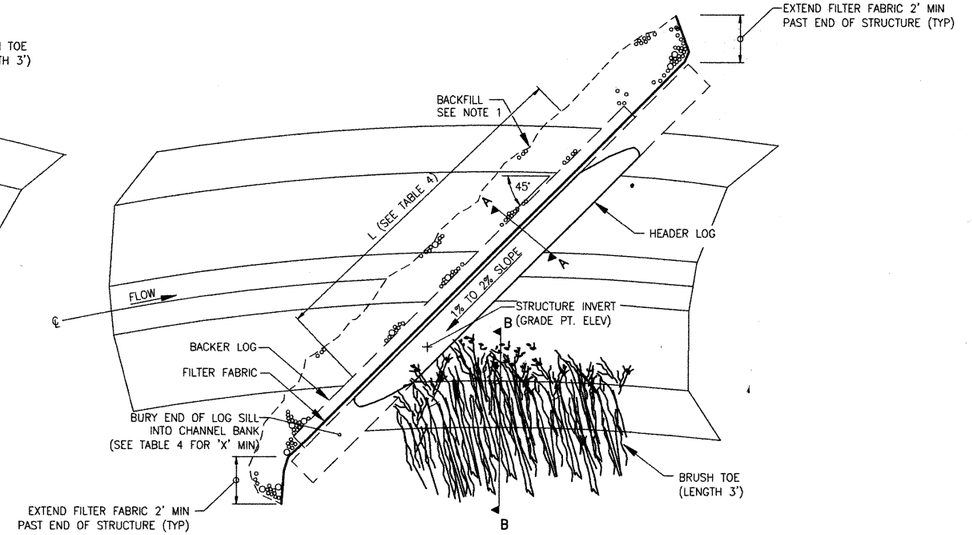


NOTE: BRUSH SHALL BE 4' LONG 1"-3" DIA HARDWOOD LIMBS.

SECTION B-B
NOT TO SCALE



CROSS LOG SILL
PLAN VIEW
NOT TO SCALE



LOG SILL
PLAN VIEW
NOT TO SCALE

TABLE 4: STRUCTURE DIMENSIONS							
REACH	STRUCTURES			BOULDERS			TOTAL LOG LENGTH (FT)
	L (FT)	W (FT)	X (FT)	LENGTH (FT)	WIDTH (FT)	DEPTH (FT)	
THOMPSON CREEK 1A	7	3	3	2.0-3.0	1.5-2.0	1.0-1.5	13
THOMPSON CREEK 1B	7	3	3	2.5-3.5	2.0-2.5	1.5-2.0	13
THOMPSON CREEK 2	7	3	3	2.5-3.5	2.0-2.5	1.5-2.0	13
THOMPSON CREEK 3	7	3	3	2.5-3.5	2.0-2.5	1.5-2.0	13
DALE BRANCH 1	5	2	3	2.5-3.5	2.0-2.5	1.5-2.0	11
DALE BRANCH 2A	4	2	3	2.5-3.5	2.0-2.5	1.5-2.0	10
DALE BRANCH 2B	5	2	3	2.5-3.5	2.0-2.5	1.5-2.0	11
DALE BRANCH 2C	4	2	3	2.5-3.5	2.0-2.5	1.5-2.0	10
DALE BRANCH 2D	5	2	3	2.5-3.5	2.0-2.5	1.5-2.0	11
DALE BRANCH 2E	4	2	3	2.5-3.5	2.0-2.5	1.5-2.0	10
DALE BRANCH 3	5	2	3	2.5-3.5	2.0-2.5	1.5-2.0	11
DALE BRANCH 4	5	2	3	2.5-3.5	2.0-2.5	1.5-2.0	11
DALE BRANCH 5A	6	2	3	2.5-3.5	2.0-2.5	1.5-2.0	12
DALE BRANCH 5B	6	2	3	2.5-3.5	2.0-2.5	1.5-2.0	12
DALE BRANCH 5C	6	2	3	2.5-3.5	2.0-2.5	1.5-2.0	12
JERRY BRANCH 1	6	3	3	2.5-3.5	2.0-2.5	1.5-2.0	12
JERRY BRANCH 2	7	2	3	2.5-3.5	2.0-2.5	1.5-2.0	13
JERRY BRANCH 3	7	2	3	2.5-3.5	2.0-2.5	1.5-2.0	13
HUDSON BRANCH	5	2	3	2.0-3.0	1.5-2.0	1.0-1.5	11

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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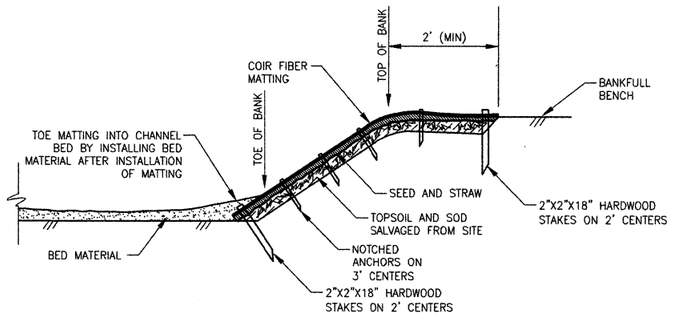
NORTH CAROLINA PROFESSIONAL SEAL 21787 ENGINEER GRANT GINN 1/9/14

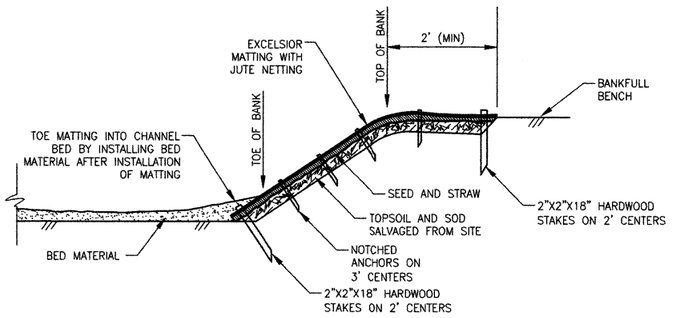
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: DETAILS

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	mmf	1058	3
DATE 1/9/2014	CHKD. BY SGG		

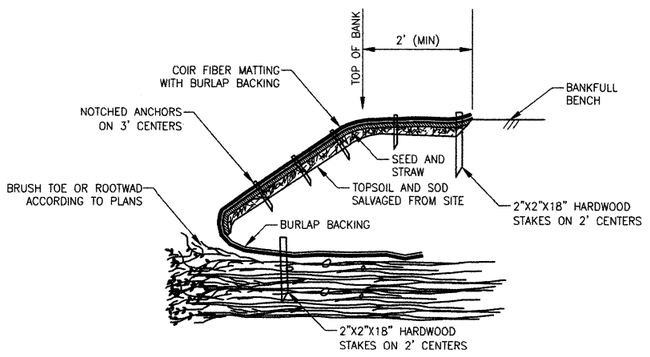
DATE	BY	REV.	DESCRIPTION



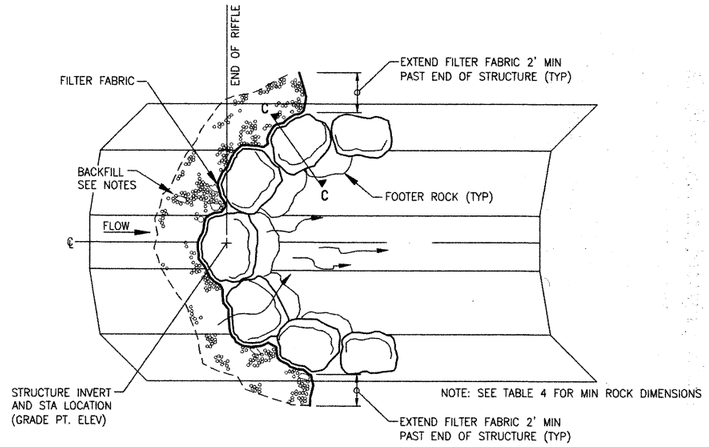
BANK PROTECTION – METHOD 1
SOD AND COIR MAT
NOT TO SCALE



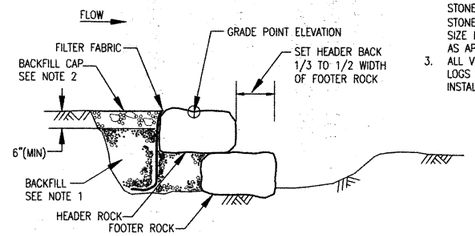
BANK PROTECTION – METHOD 2
SOD AND EXCELSIOR MAT
NOT TO SCALE



BANK PROTECTION – METHOD 3
SOIL LIFT
NOT TO SCALE

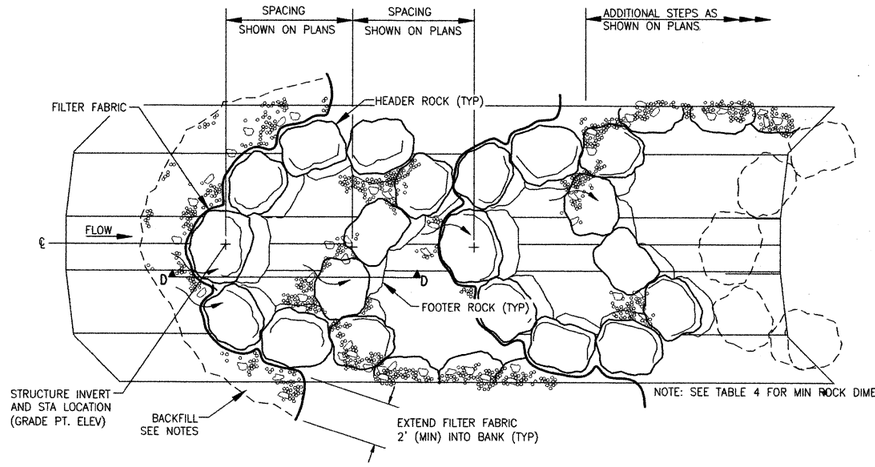


BOULDER ARCH
PLAN VIEW
NOT TO SCALE

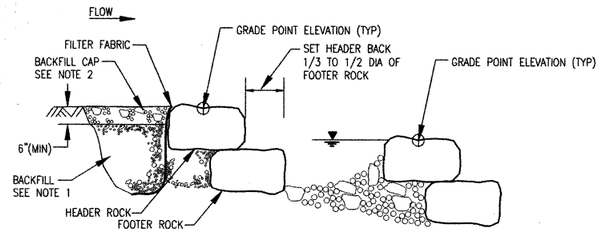


SECTION C–C
NOT TO SCALE

NOTES:
1. STRUCTURE BACKFILL MATERIAL SHALL CONSIST OF ON–SITE SOIL COMPACTED TO IN–SITU DENSITY.
2. STRUCTURE BACKFILL CAP SHALL CONSIST OF 2"–4" STONE AND ON–SITE SOIL MIXED IN EQUAL PARTS. MIXTURE CAN BE ACHIEVED BY COMPACTING STONE INTO PLACED SOIL. WHERE ON–SITE STONE/GRAVEL IS AVAILABLE AND OF SUFFICIENT SIZE IT MAY BE USED IN PLACE OF QUARRY STONE, AS APPROVED BY THE ENGINEER.
3. ALL VOIDS AND GAPS BETWEEN BOULDERS AND LOGS SHALL BE CHINKED WITH STONE PRIOR TO INSTALLATION OF FILTER FABRIC.



BOULDER STEP
PLAN VIEW
NOT TO SCALE



SECTION D–D
NOT TO SCALE

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NORTH CAROLINA PROFESSIONAL SEAL 29767 ENGINEER GRANT GOINS 5/1/14

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **DETAILS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	mmf	1058	3A
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
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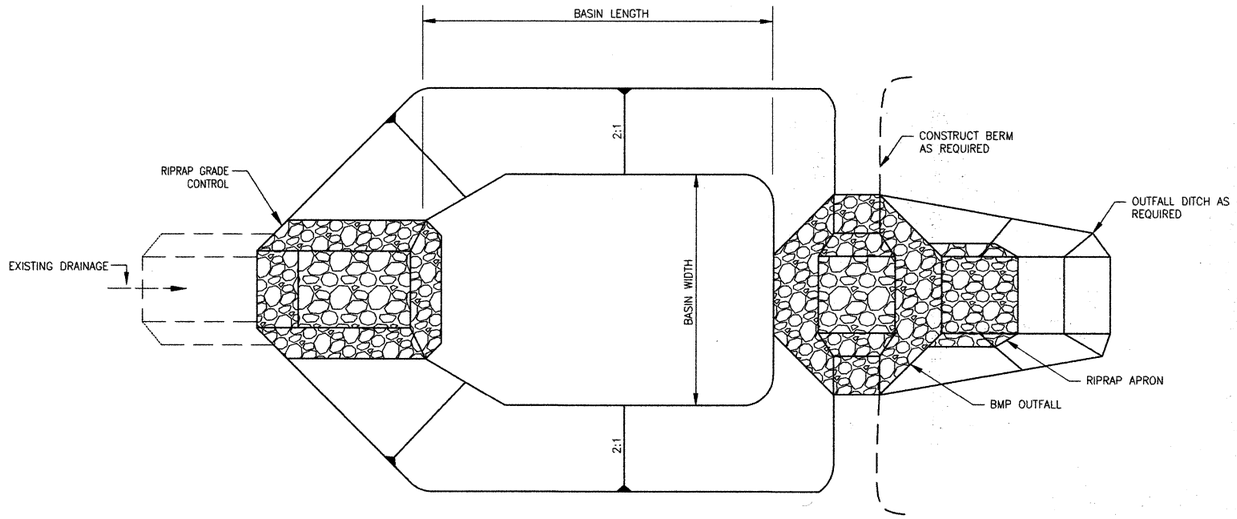
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER GRANT GINN

PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC AND EXCHANGE
TITLE	**DETAILS**

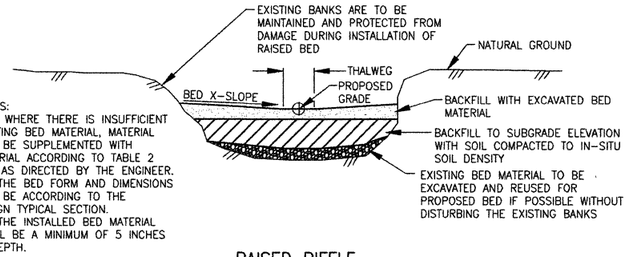
SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	mmf	1058	3B
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



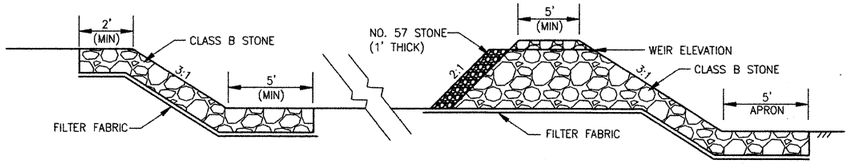
NOTE: BASIN WIDTH AND LENGTH INDICATED ON PLANS.

BMP DETAIL
NOT TO SCALE

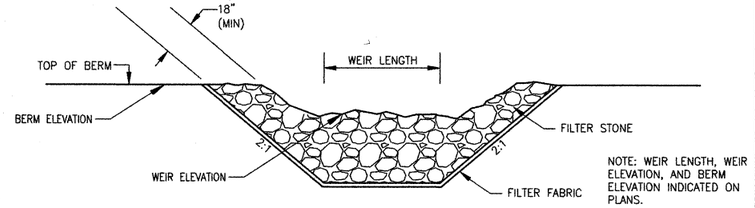


NOTES:
1. WHERE THERE IS INSUFFICIENT EXISTING BED MATERIAL, MATERIAL WILL BE SUPPLEMENTED WITH MATERIAL ACCORDING TO TABLE 2 AND AS DIRECTED BY THE ENGINEER.
2. THE BED FORM AND DIMENSIONS WILL BE ACCORDING TO THE DESIGN TYPICAL SECTION.
3. THE INSTALLED BED MATERIAL SHALL BE A MINIMUM OF 5 INCHES IN DEPTH.

RAISED RIFFLE
NOT TO SCALE

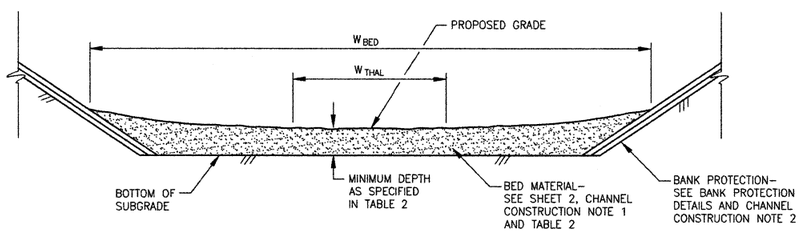


BMP SECTION
NOT TO SCALE

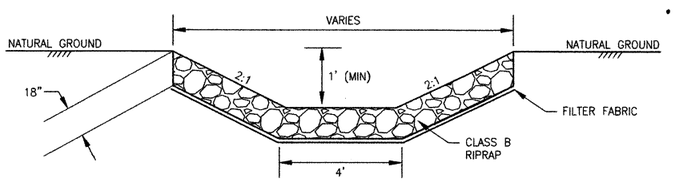


NOTE: WEIR LENGTH, WEIR ELEVATION, AND BERM ELEVATION INDICATED ON PLANS.

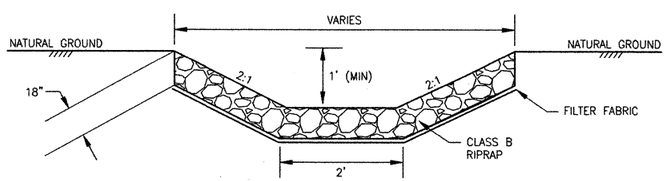
BMP OUTFALL ELEVATION
NOT TO SCALE



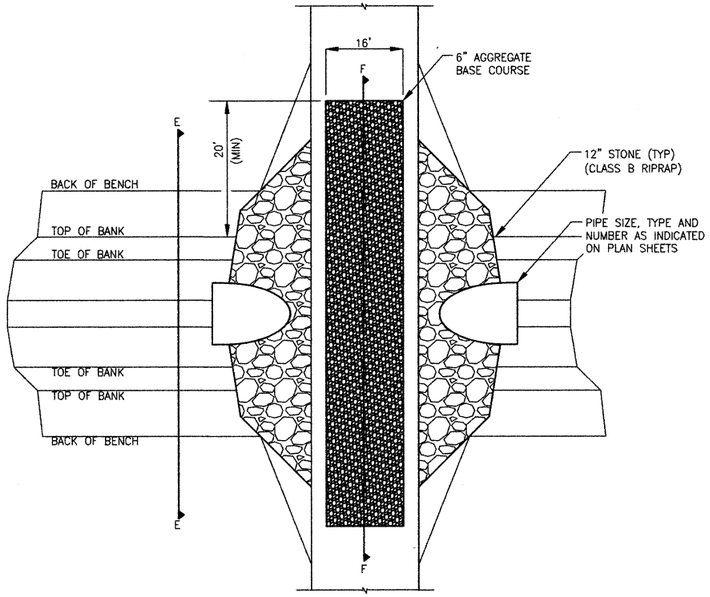
BED MATERIAL DETAIL
NOT TO SCALE



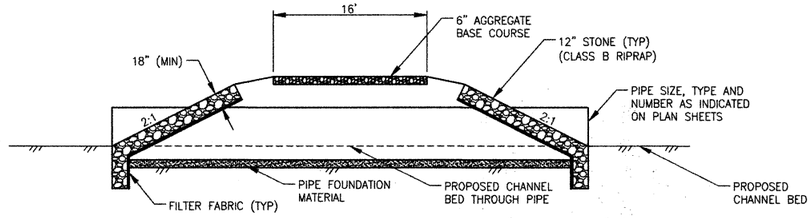
4' BASE DITCH W/ CLASS B RIPRAP
NOT TO SCALE



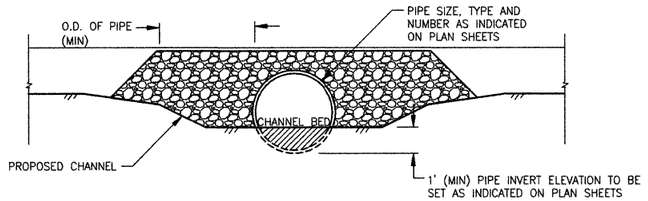
2' BASE DITCH W/ CLASS B RIPRAP
NOT TO SCALE



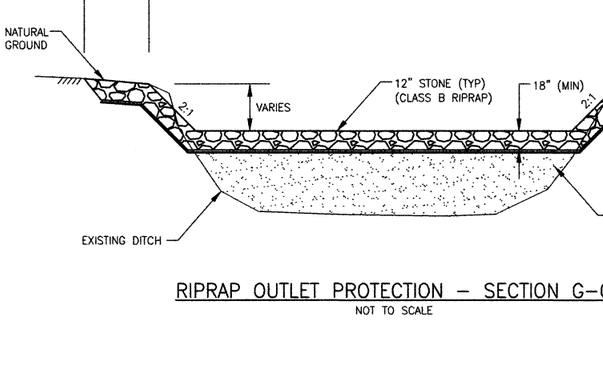
PERMANENT CROSSING (PIPE)
PLAN VIEW
NOT TO SCALE



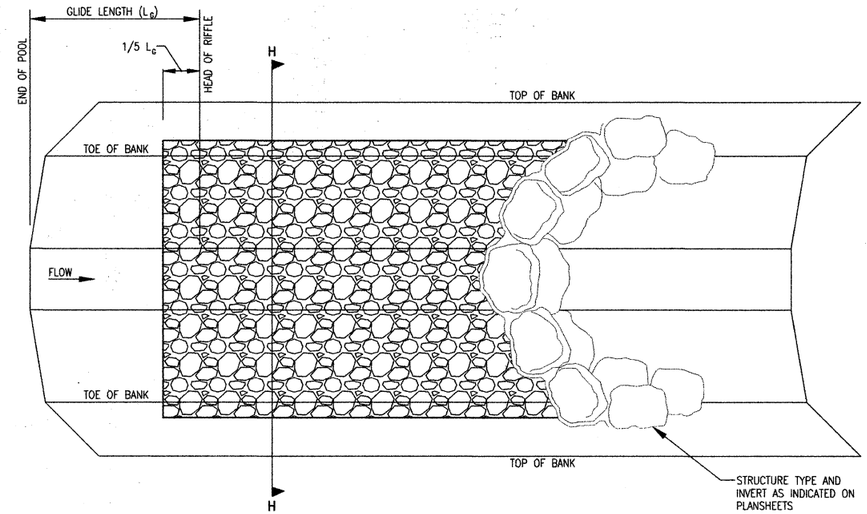
PERMANENT CROSSING (PIPE)
SECTION
NOT TO SCALE



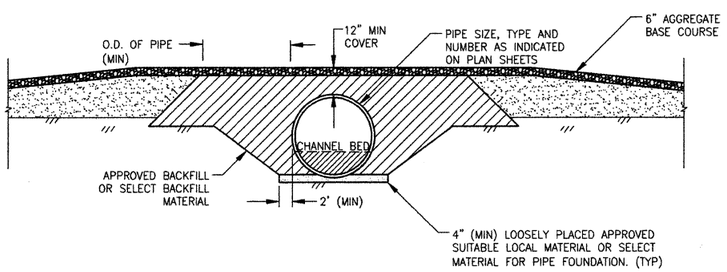
PERMANENT CROSSING (PIPE)
ELEVATION E–E
NOT TO SCALE



RIPRAP OUTLET PROTECTION – PLAN
NOT TO SCALE

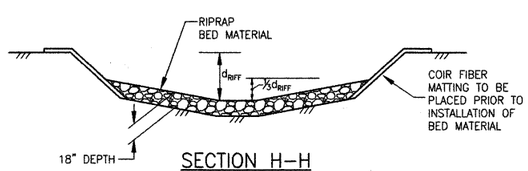


ARMORED RIFFLE DETAIL
NOT TO SCALE



PERMANENT CROSSING (PIPE)
SECTION F–F
NOT TO SCALE

RIPRAP OUTLET PROTECTION – SECTION G–G
NOT TO SCALE



SECTION H–H
NOT TO SCALE

NOTES:
1. ARMORED RIFFLE BED MATERIAL SHALL BE COMPOSED OF MATERIAL IN THE FOLLOWING PROPORTIONS AS DIRECTED BY THE ENGINEER.

MATERIAL	% BY VOLUME
12–IN STONE	60
2–IN STONE	30
ONSITE SOIL	10

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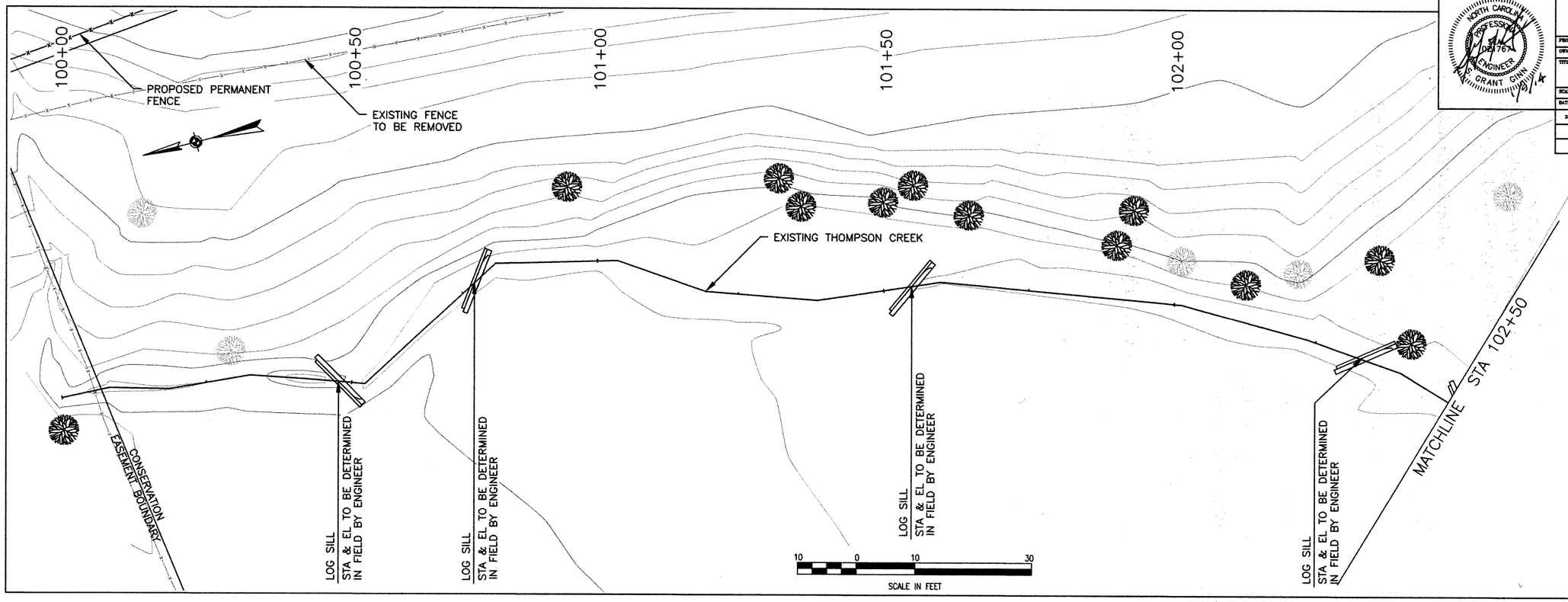
PHONE: (828) 658–3649 WWW.WOLFCREEKENG.COM

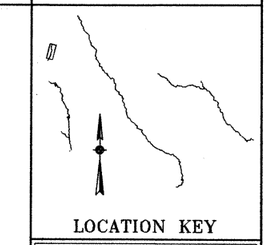
NORTH CAROLINA PROFESSIONAL 042767 ENGINEER U.S. GRANT GINN

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **DETAILS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	mmf	1058	3C
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION





LEGEND

- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE

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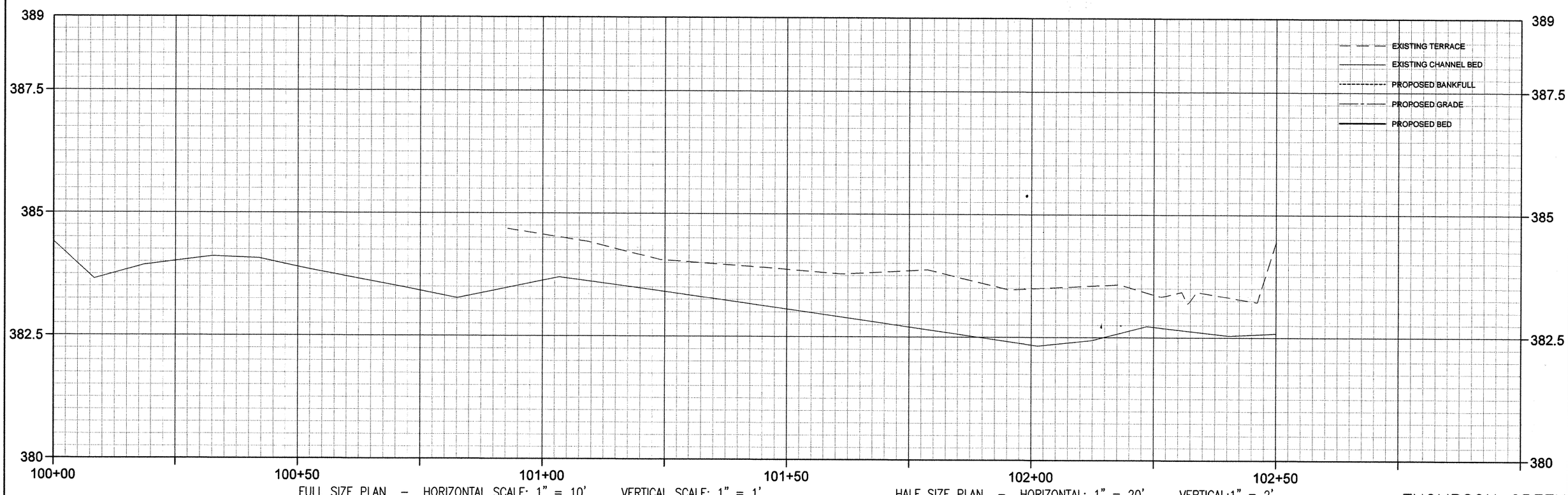
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE AS NOTED	DRWN. BY mmf	PROJECT NO. 1058	SHEET NUMBER 4
DATE 1/9/2014	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'

THOMPSON CREEK

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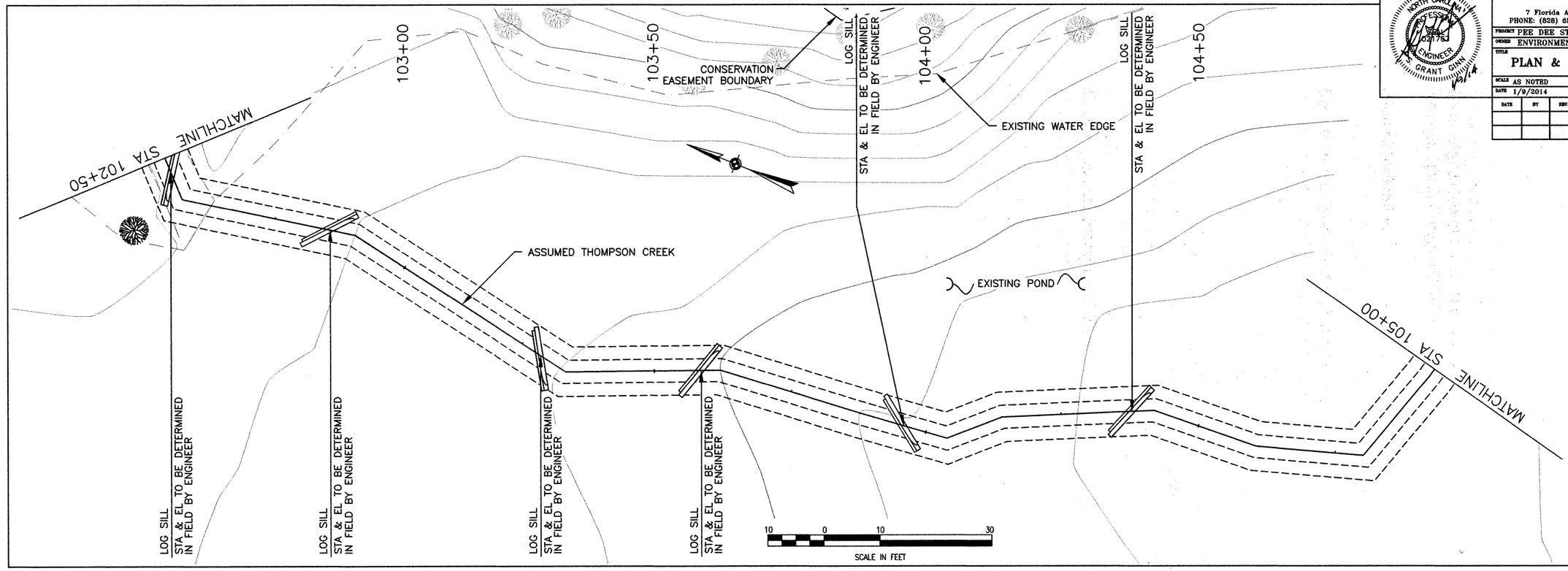
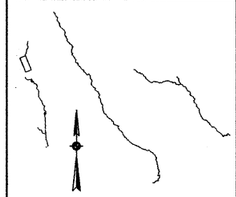
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	mmf	1058	5
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

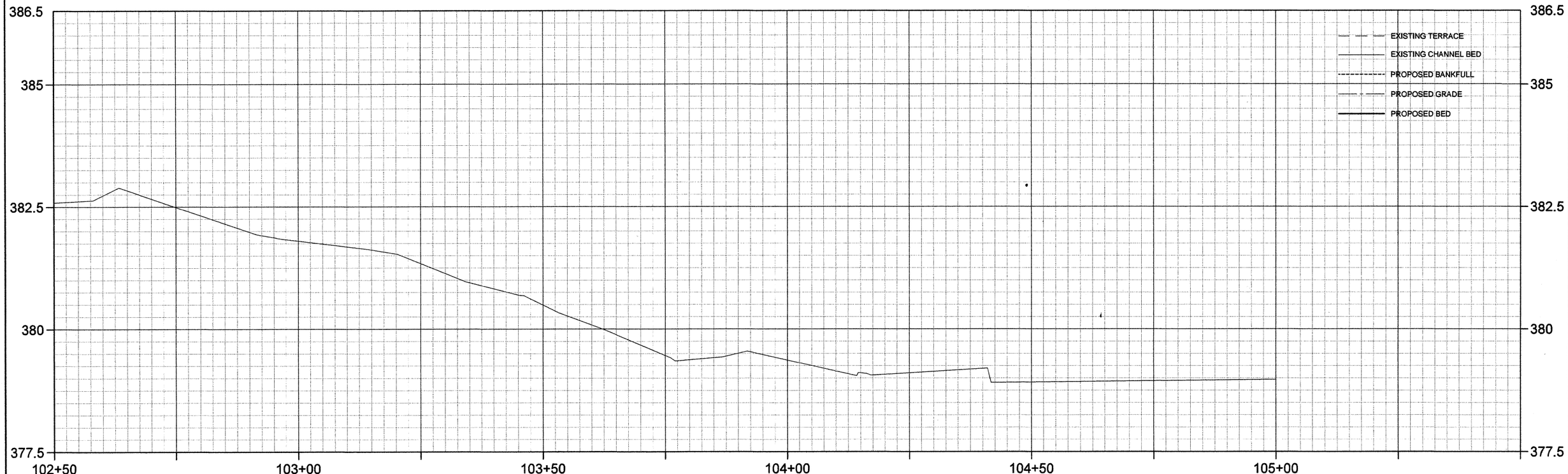
NORTH CAROLINA PROFESSIONAL 021751 ENGINEER GRANT GINN





LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

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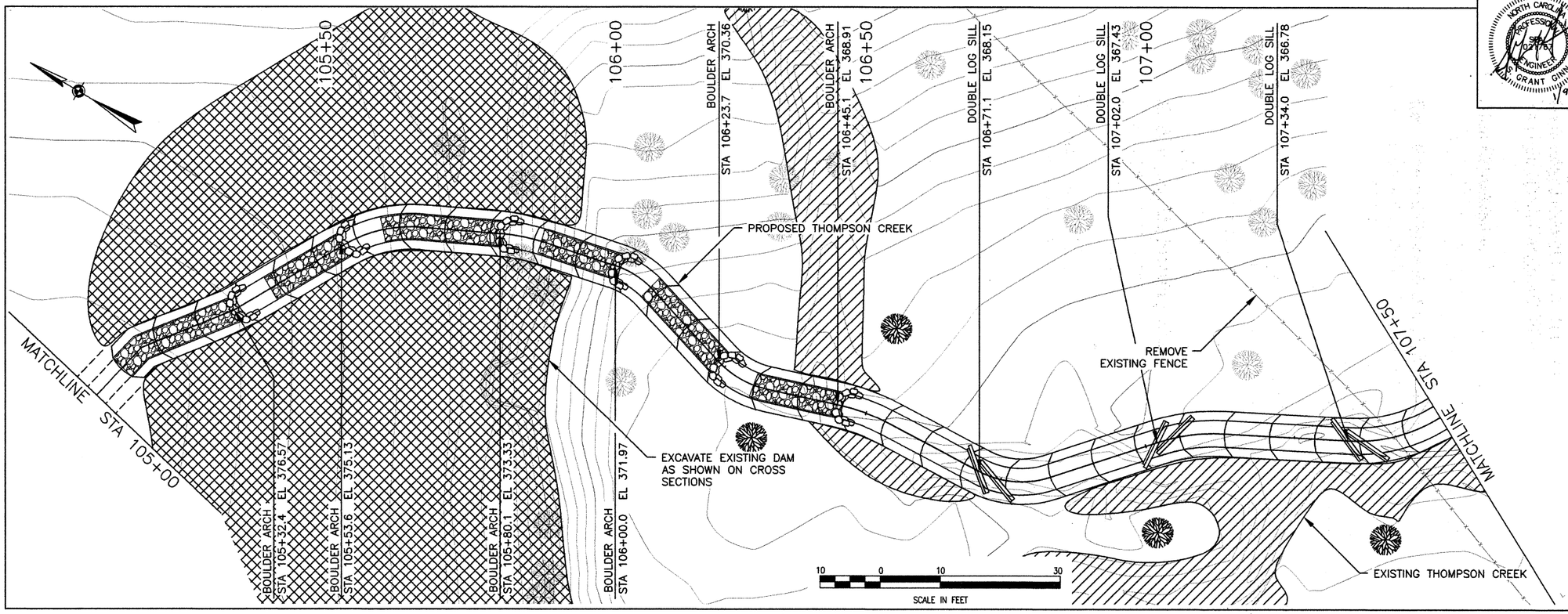
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	mmf	1058	6
DATE 1/9/2014	CHKD. BY SGG		

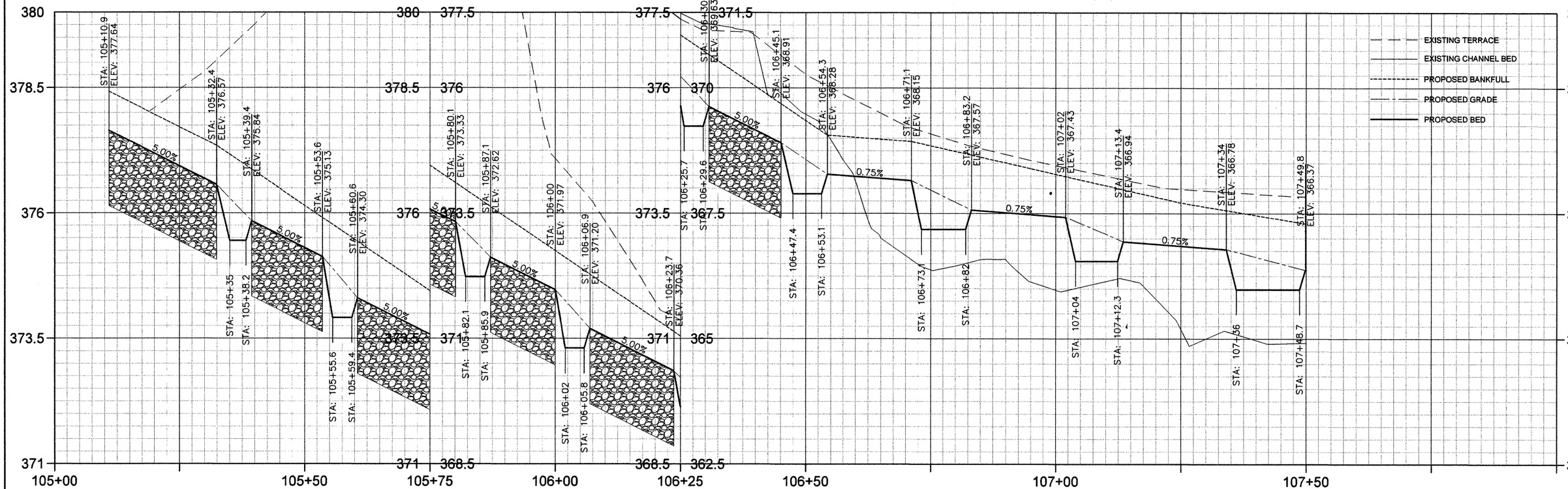
DATE	BY	REV.	DESCRIPTION

NORTH CAROLINA PROFESSIONAL SEAL 023767 ENGINEER S. GRANT GINN 1/9/14



LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

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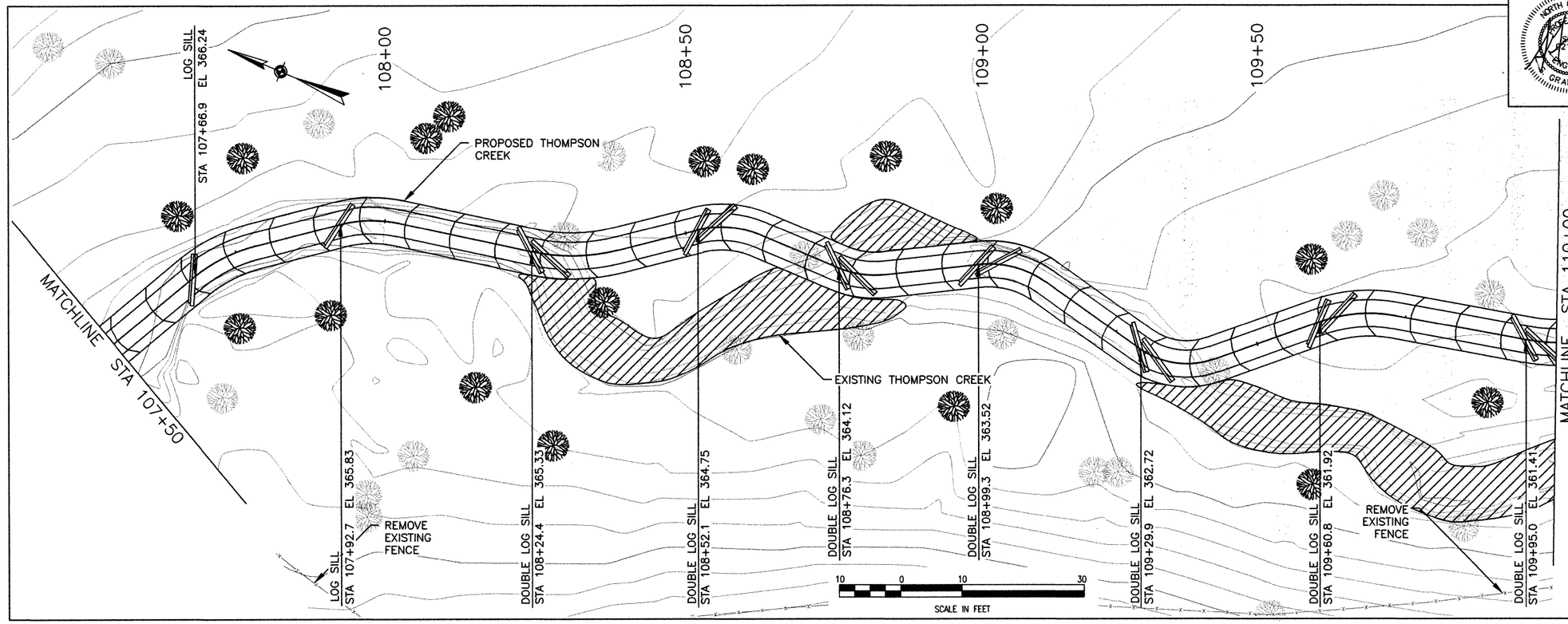
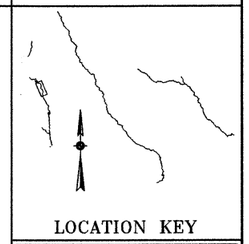
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	mmf	1058	7
DATE: 1/9/2014	CHKD. BY: SGC		

DATE	BY	REV.	DESCRIPTION

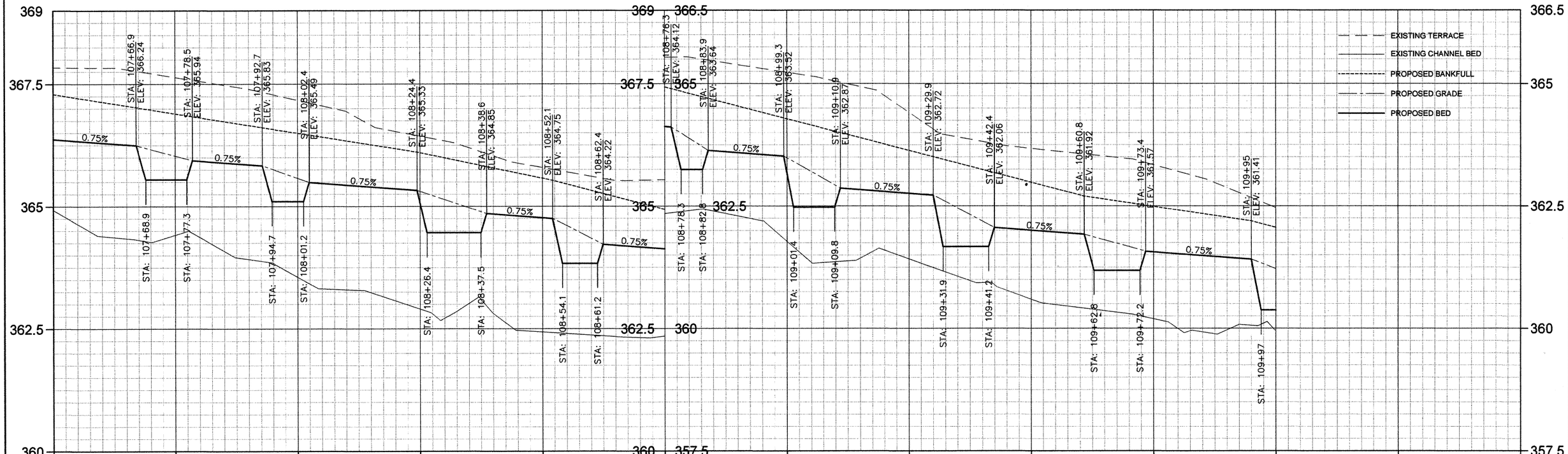
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 021767 GRANT GINN





LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

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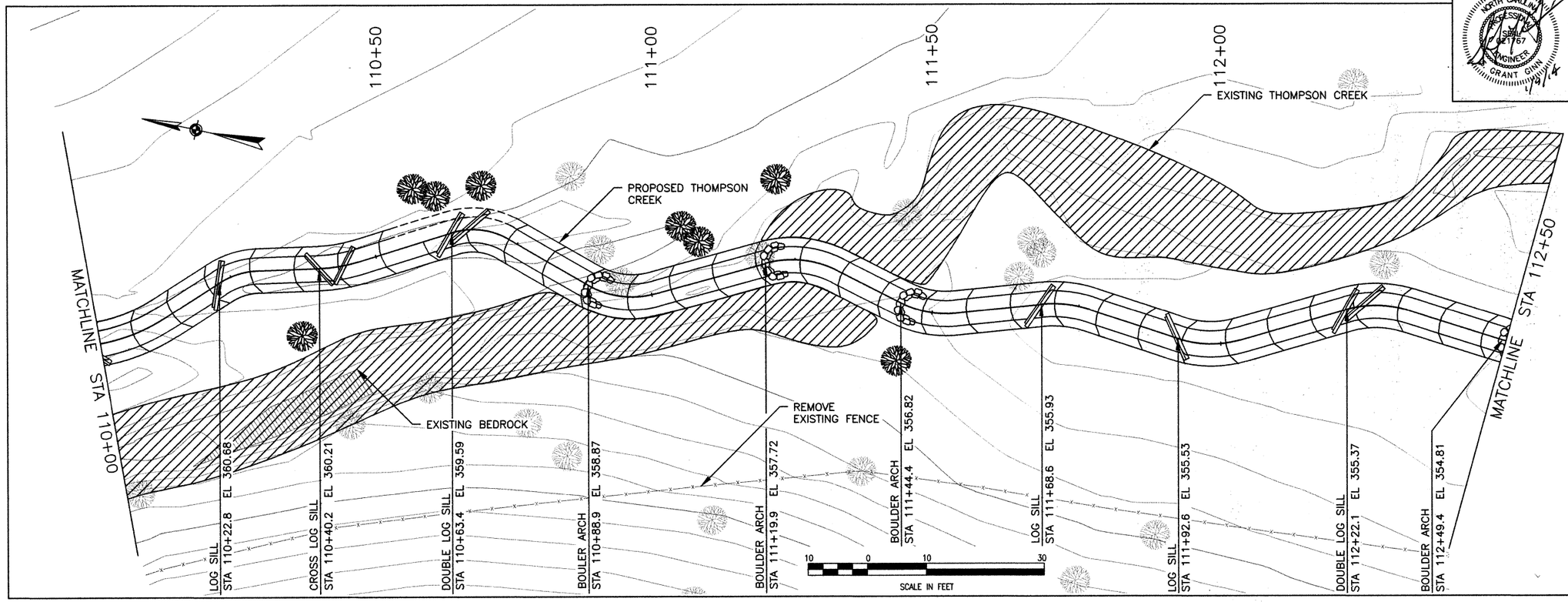
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	mmf	1058	8
DATE 1/9/2014	CHKD. BY SGG		

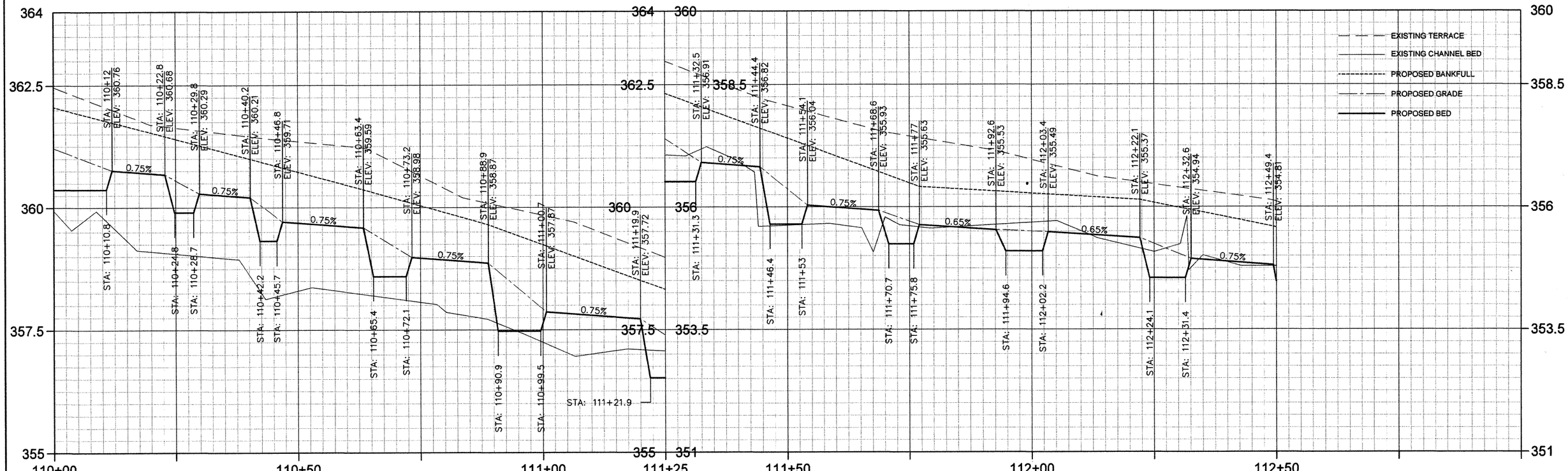
DATE	BY	REV.	DESCRIPTION

NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER GRANT GINN



LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

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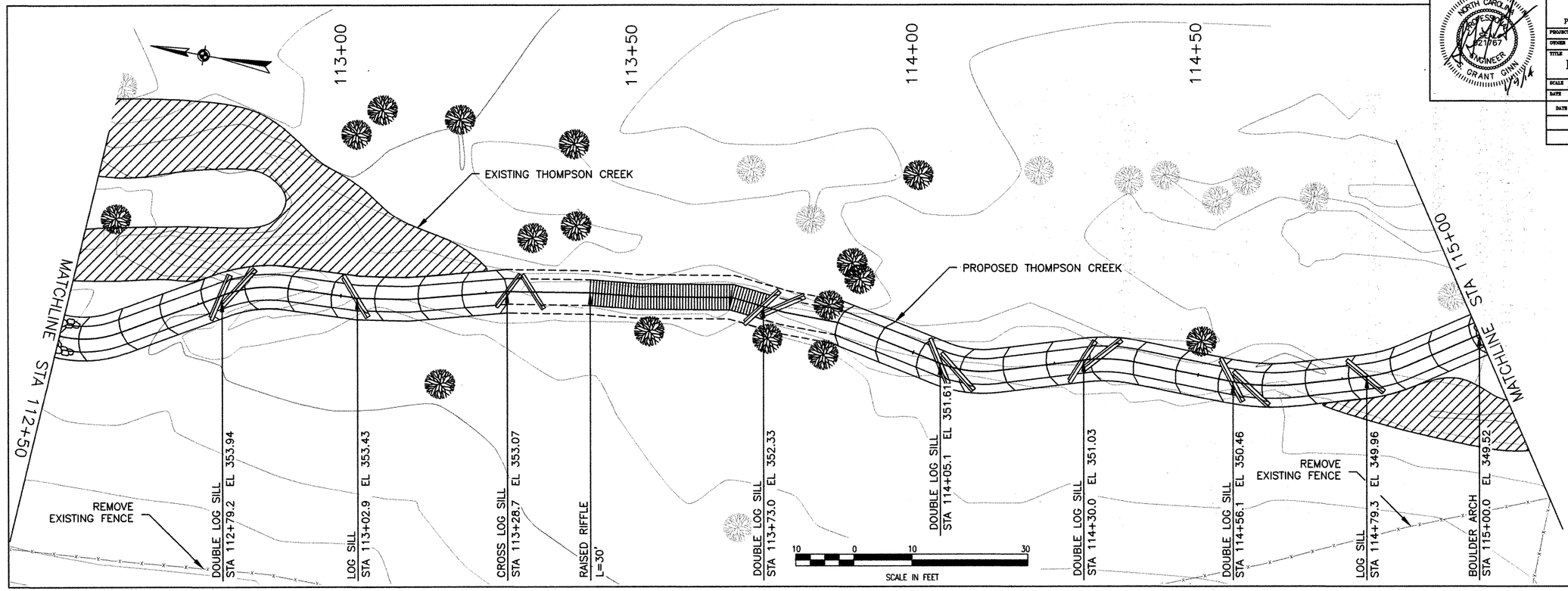
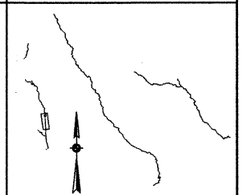
NORTH CAROLINA PROFESSIONAL 21767 ENGINEER GRANT GINN

PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC & EXCHANGE
TITLE	PLAN & PROFILE
SCALE	AS NOTED
DATE	1/9/2014
DRWN. BY	mmf
CHKD. BY	SGG
PROJECT NO.	1058
SHEET NUMBER	9

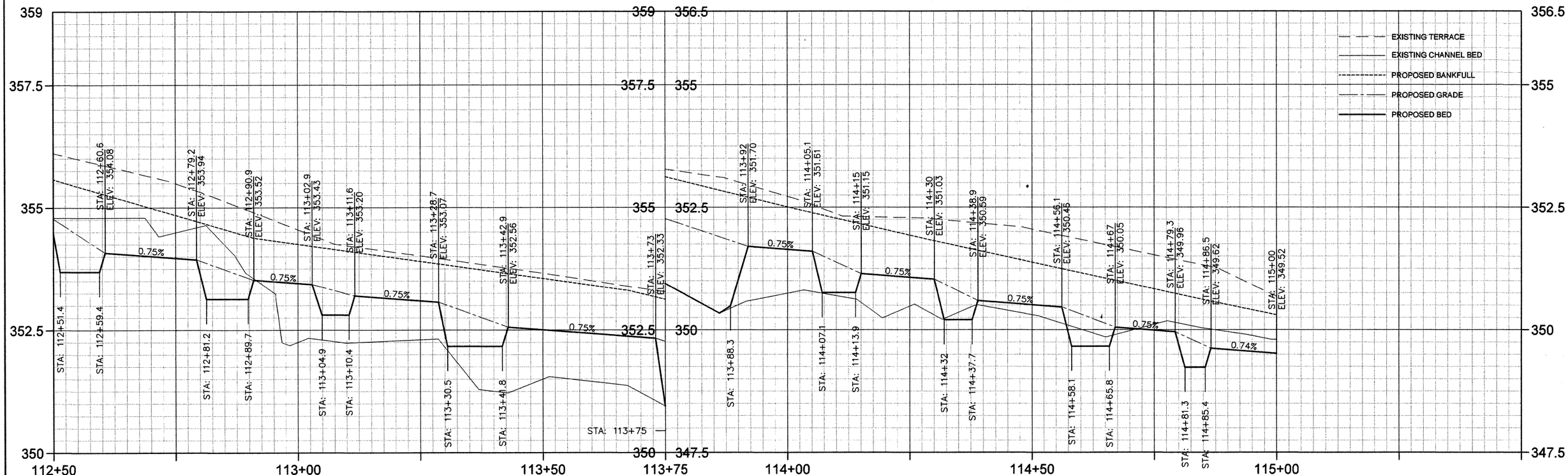
DATE	BY	REV.	DESCRIPTION





LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



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

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

THOMPSON CREEK

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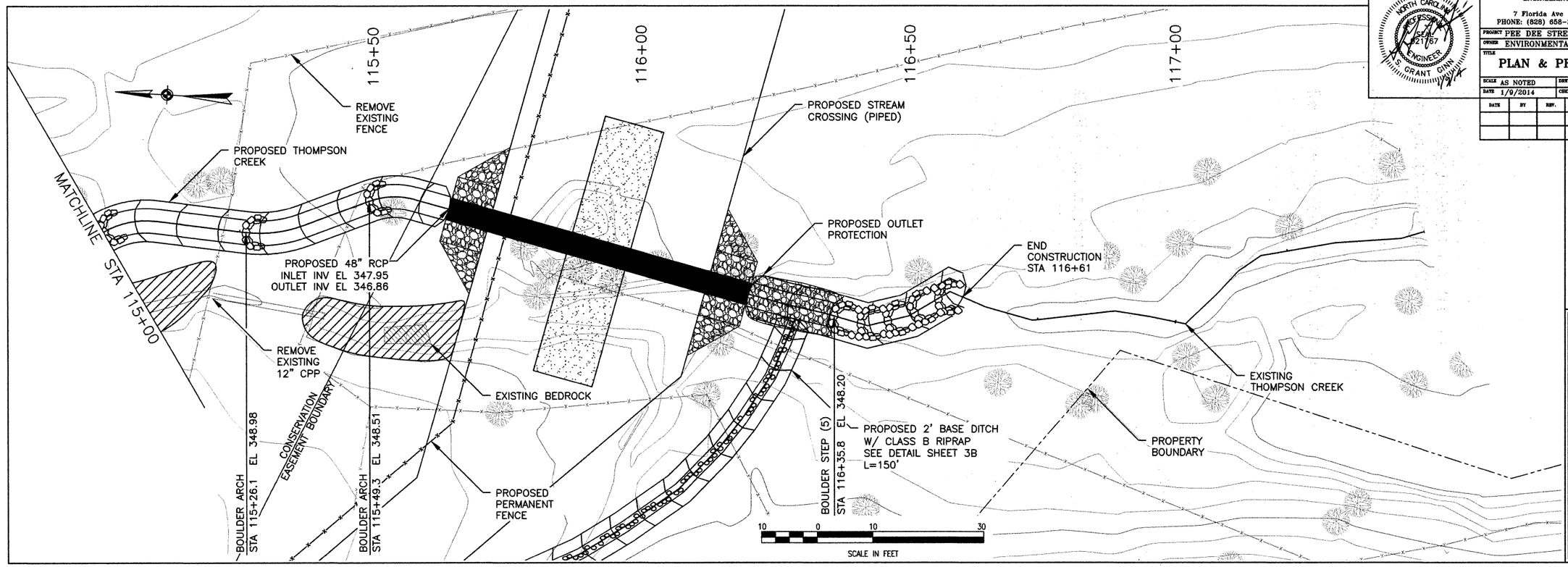
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

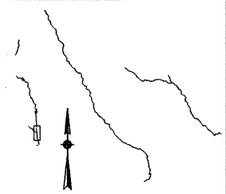
SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	mmf	1058	10
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

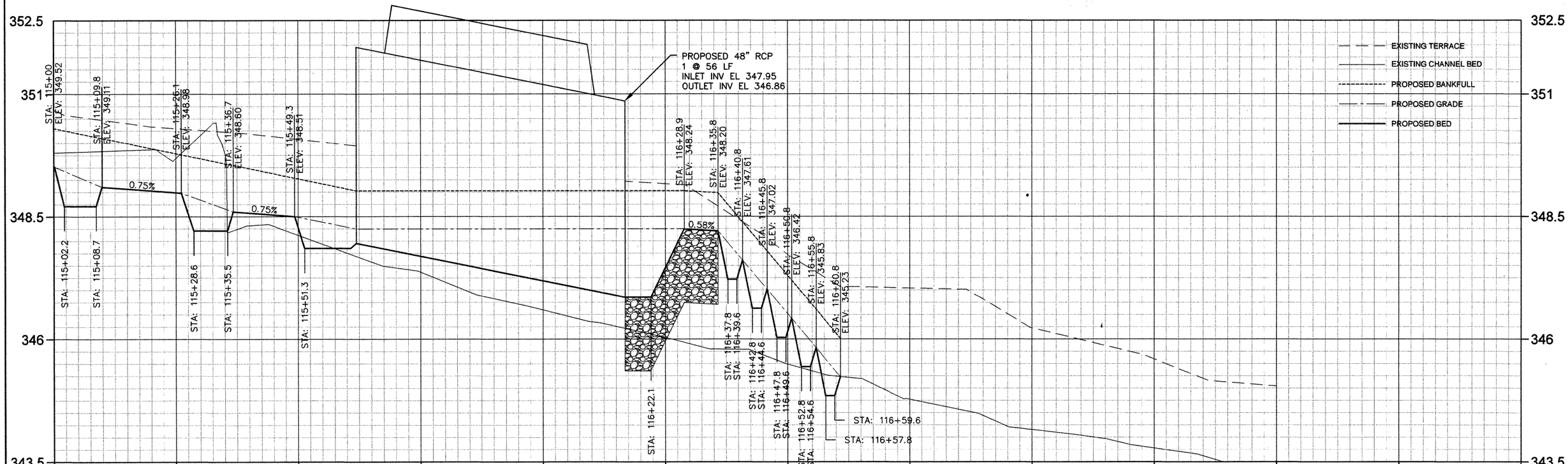
NORTH CAROLINA PROFESSIONAL SEAL L-2757 ENGINEER S. GRANT GINN



LOCATION KEY

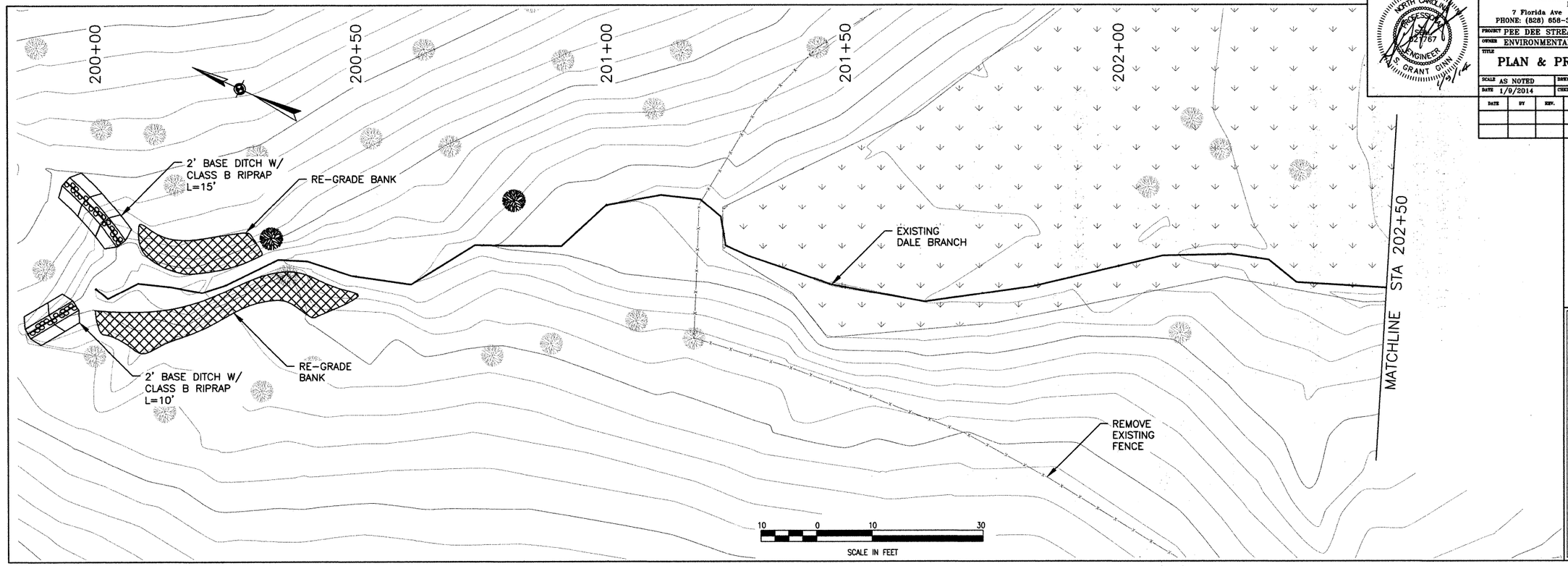


LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

THOMPSON CREEK



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NORTH CAROLINA PROFESSIONAL SEAL 027767 ENGINEER S. GRANT GINN

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	11
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE

FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

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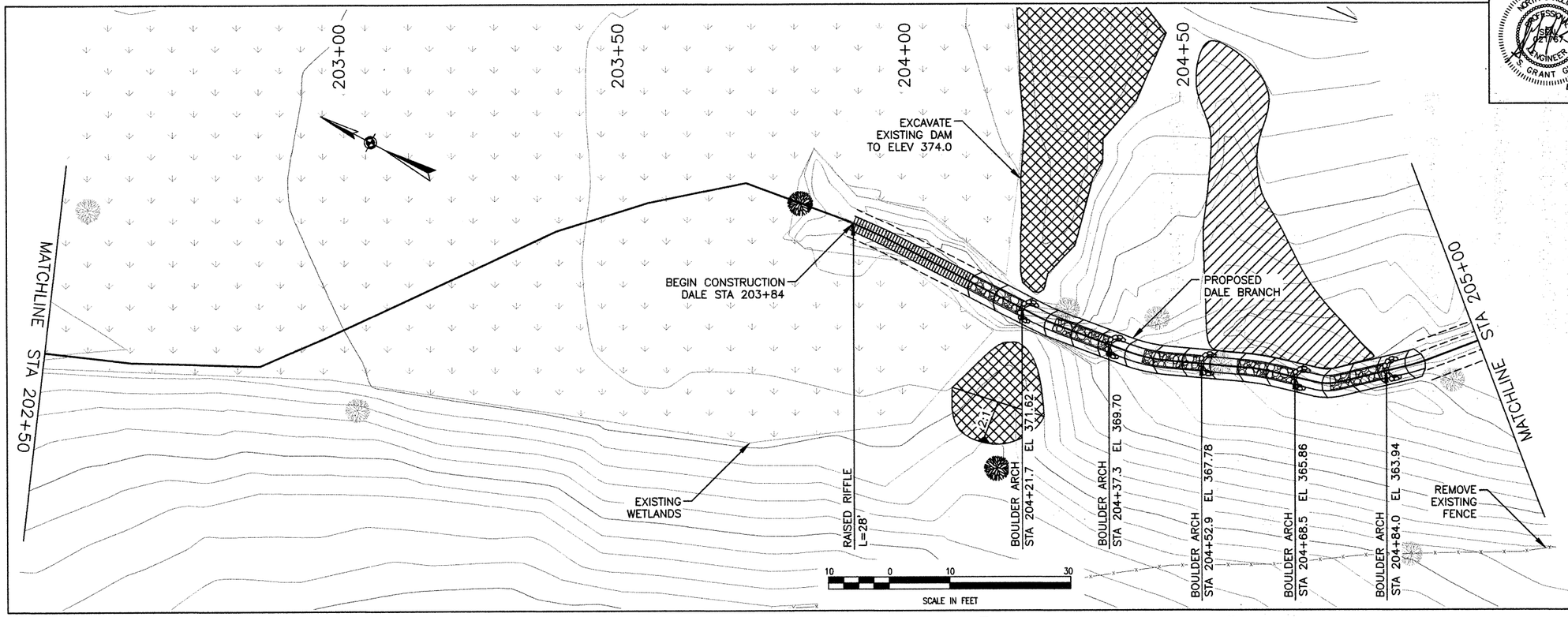
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE

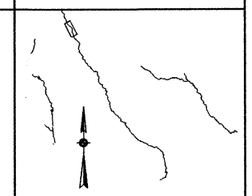
PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	12
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

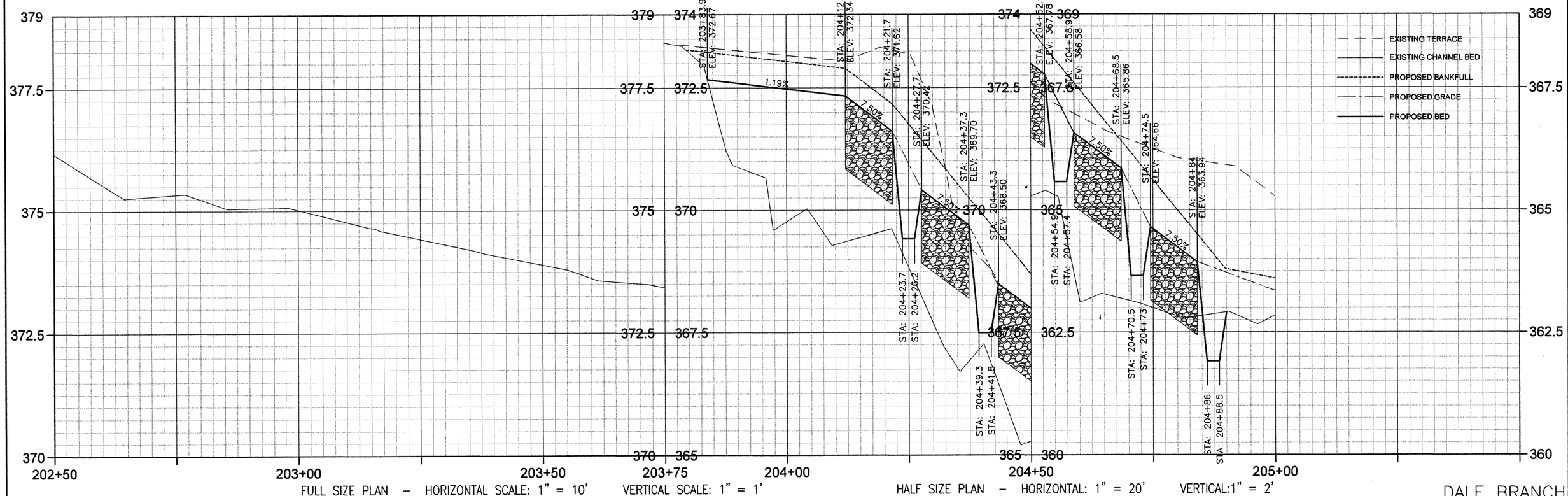
NORTH CAROLINA PROFESSIONAL SEAL 027167 ENGINEER W. GRANT GINN 1/9/14





LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



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

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

DALE BRANCH

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LICENSE NO. P-0417
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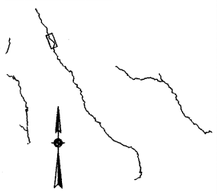
PHONE: (828) 658-3849 WWW.WOLFCREEKENG.COM

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	13
DATE 1/9/2014	CHKD. BY SGG		

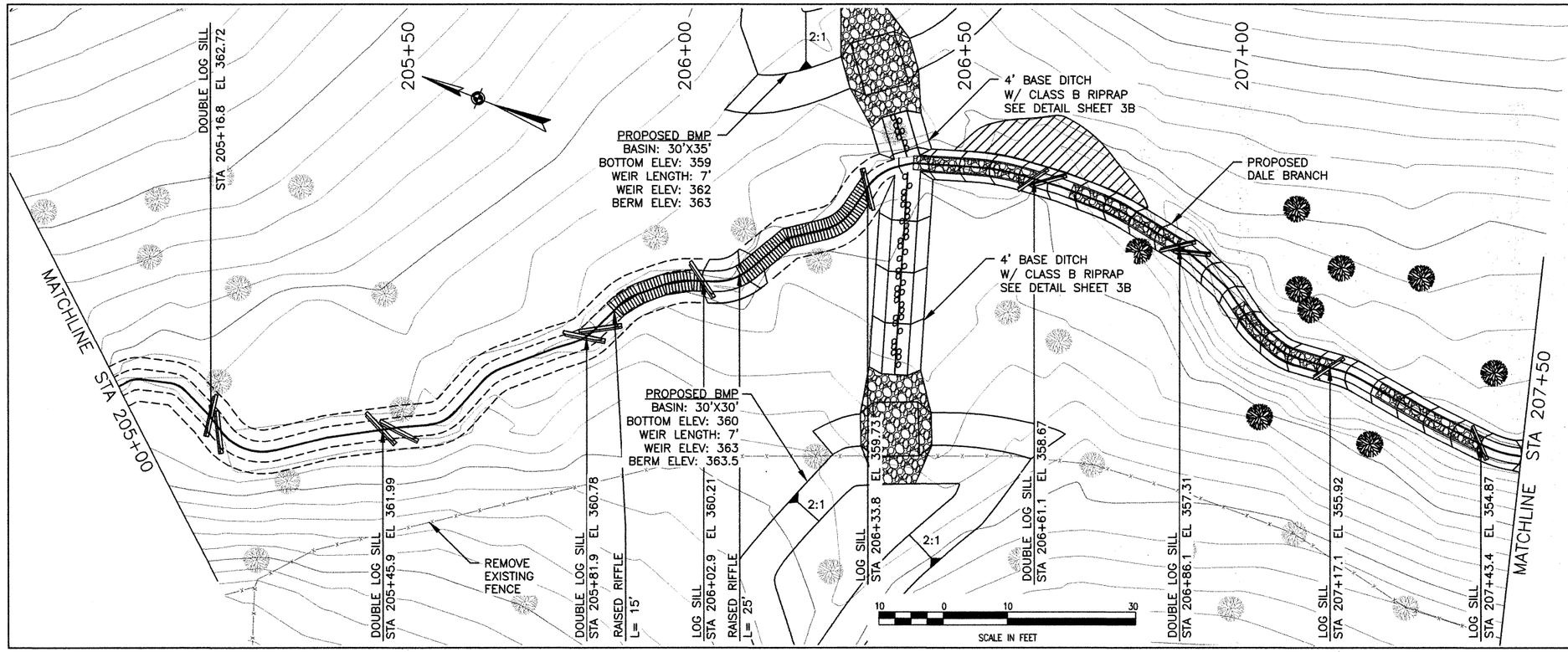
DATE	BY	REV.	DESCRIPTION

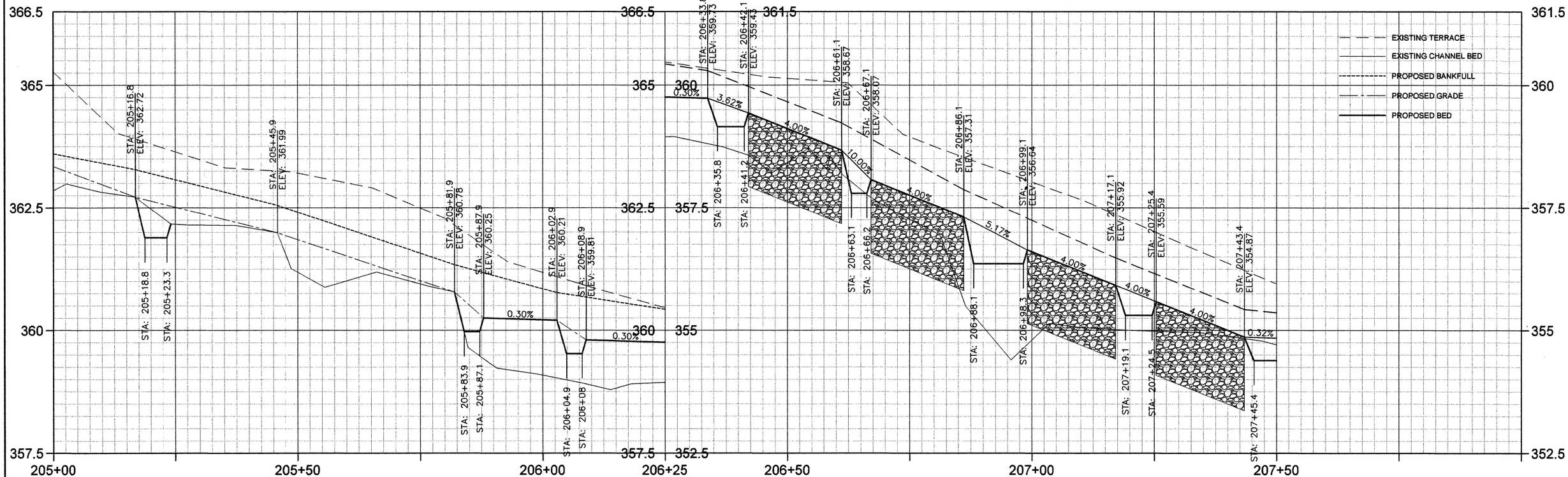
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 027767 ENGINEER GRANT GINN 1/9/14



LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE

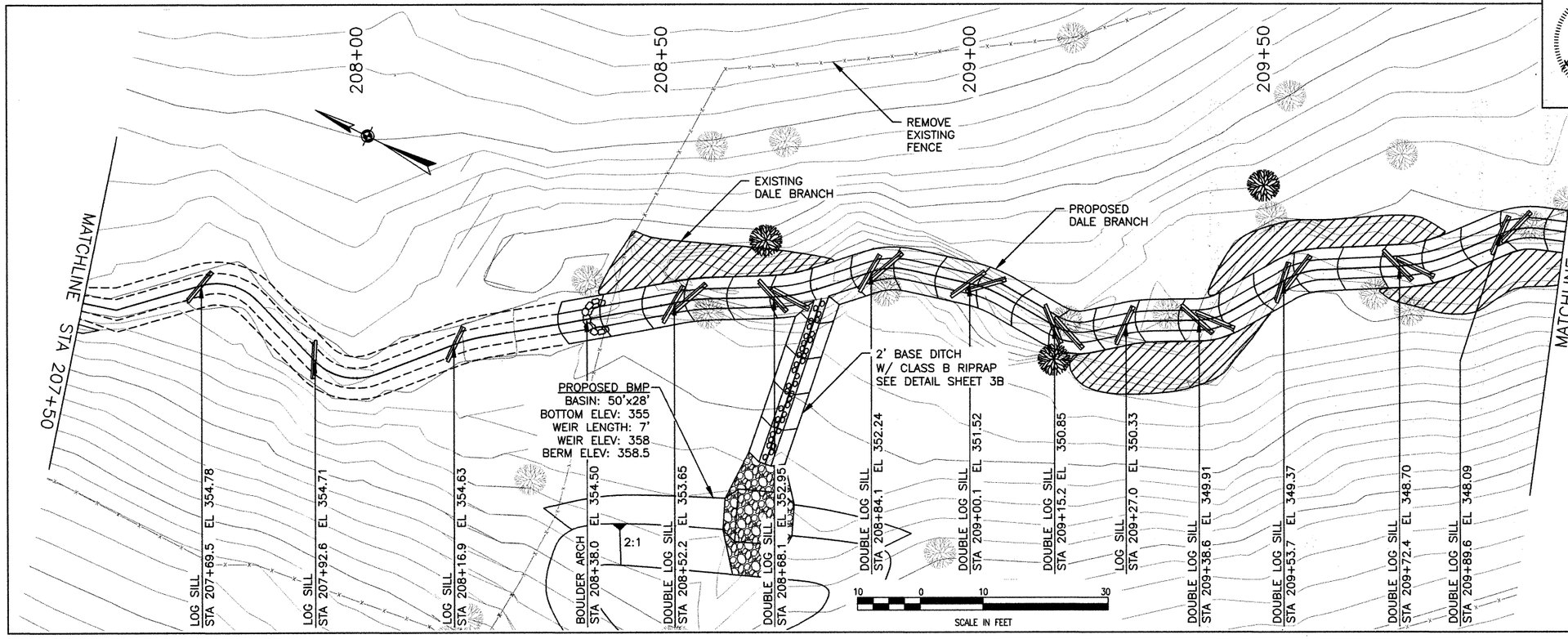




FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'

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

DALE BRANCH



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NORTH CAROLINA PROFESSIONAL 32810 ENGINEER W. GRANT GINN 1/9/14

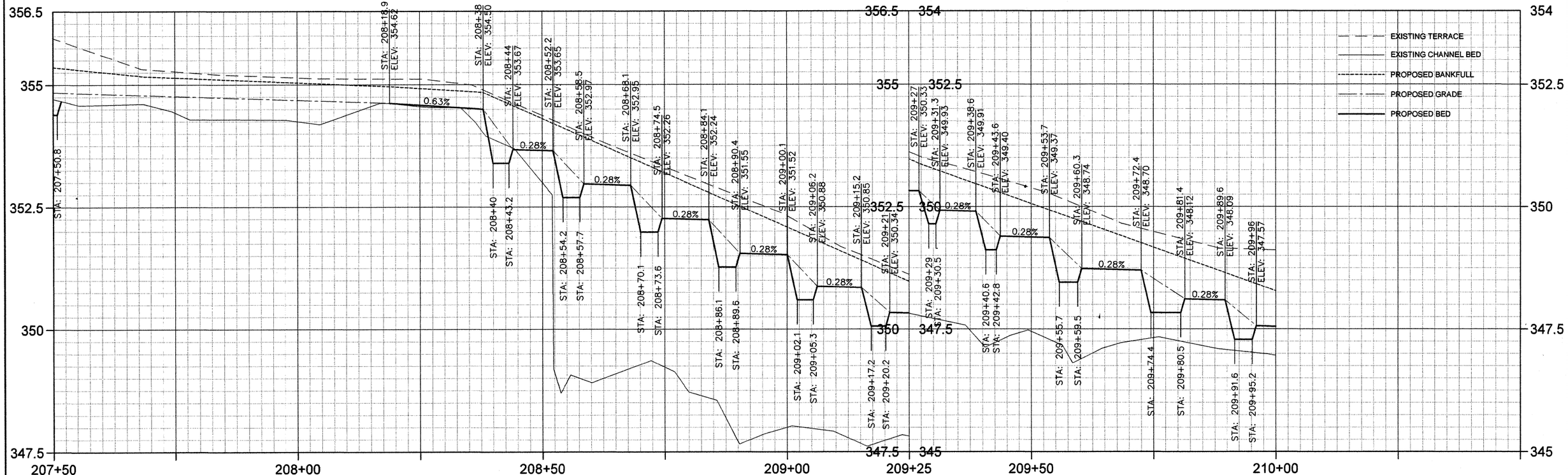
PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC & EXCHANGE
TITLE	PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	14
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



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

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

DALE BRANCH

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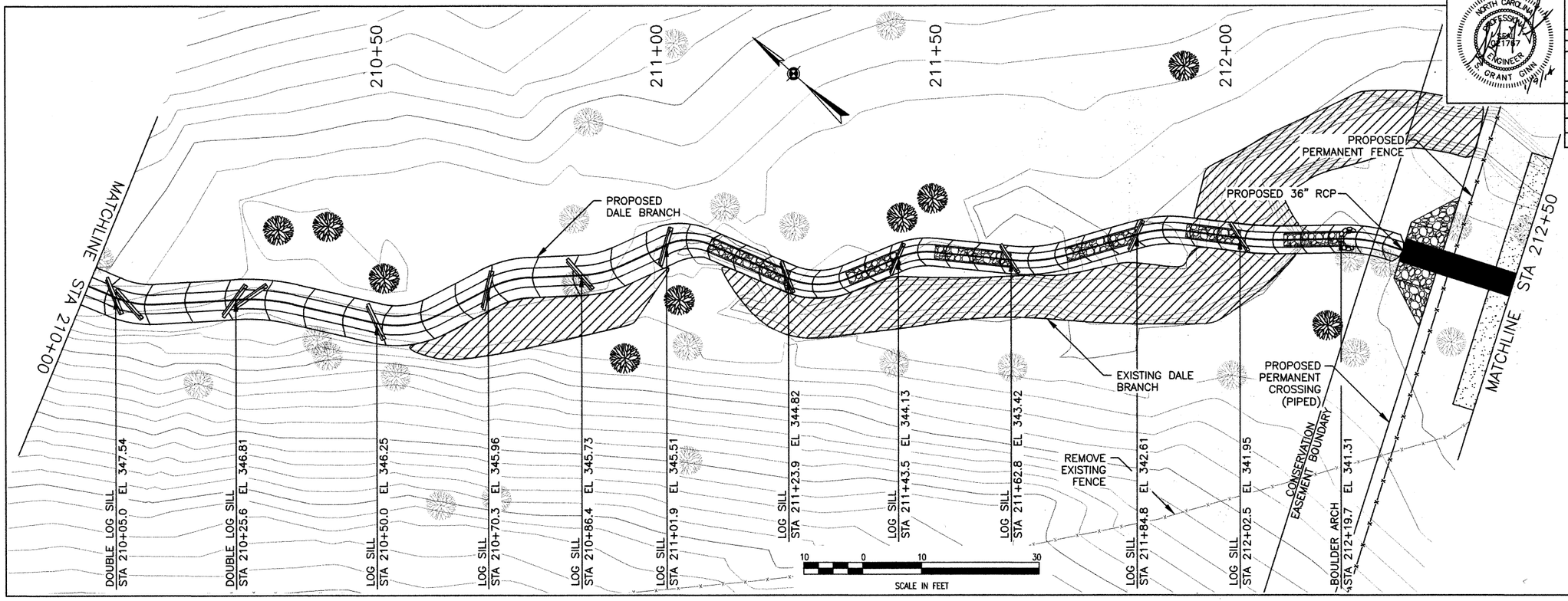
PROJECT PRE DRE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE AS NOTED	DRWN. BY CME	PROJECT NO. 1058	SHEET NUMBER 15
DATE 1/9/2014	CHKD. BY SGG		

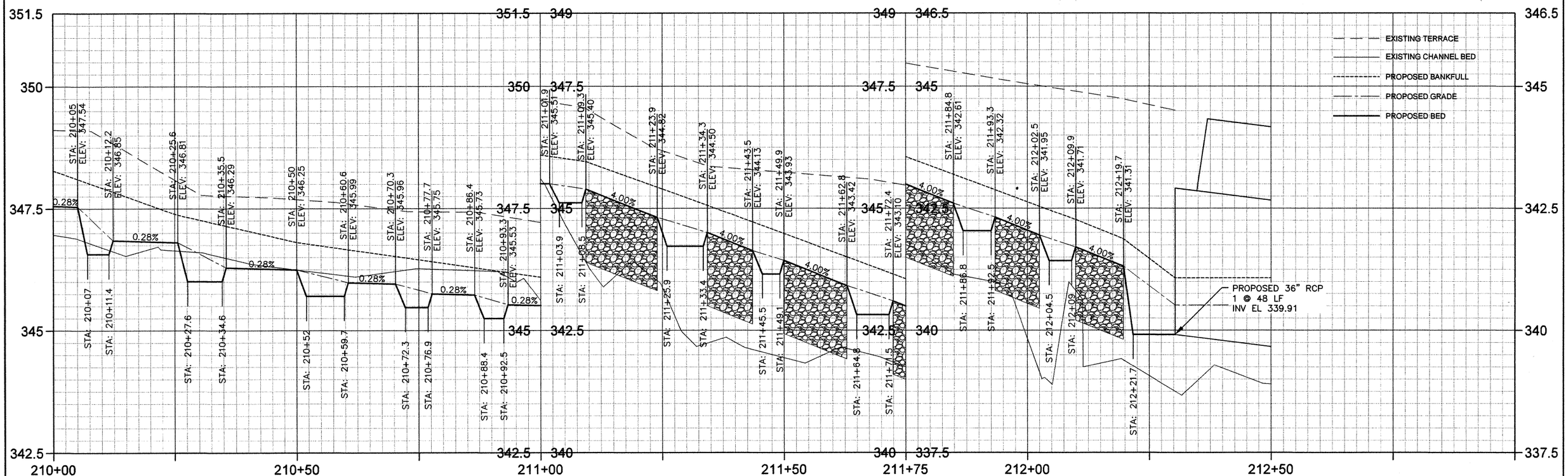
DATE	BY	REV.	DESCRIPTION

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 41787 GRANT GINN



LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

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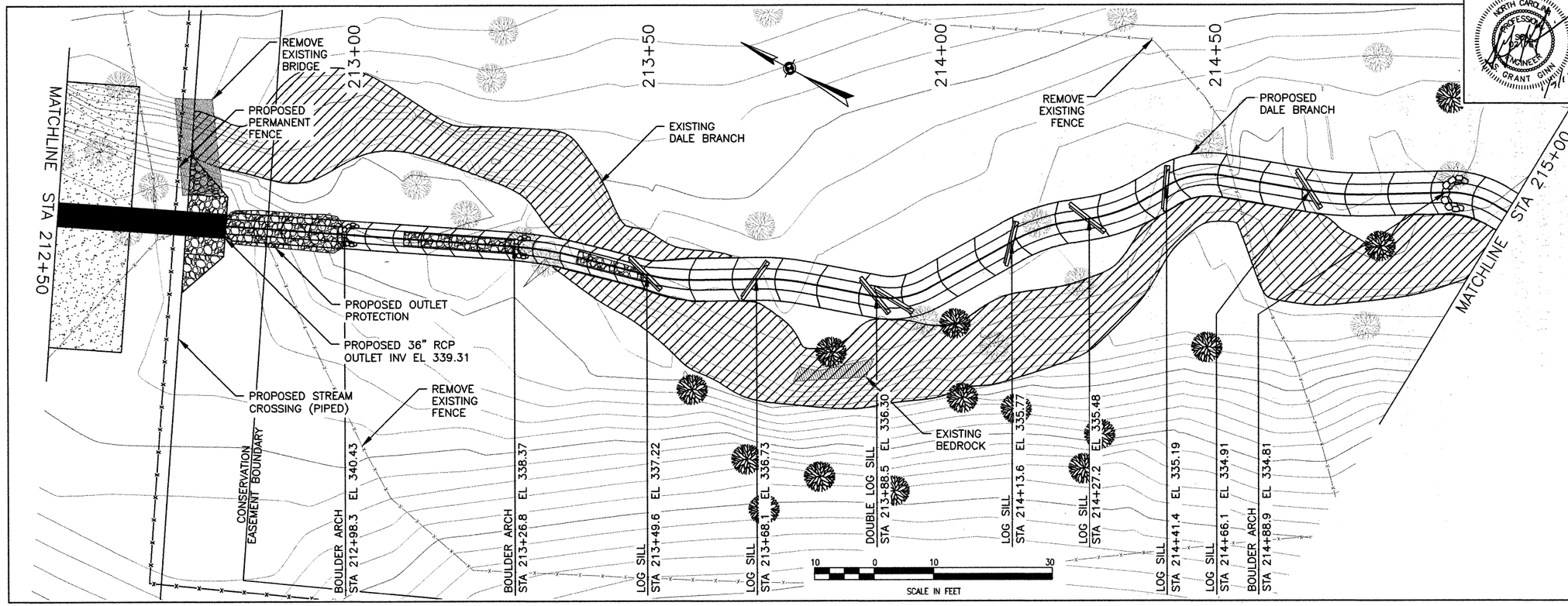
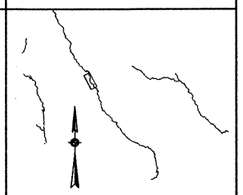
NORTH CAROLINA PROFESSIONAL SEAL 037417 ENGINEER W. GRANT GINN

PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC & EXCHANGE
TITLE	PLAN & PROFILE
SCALE	AS NOTED
DATE	1/9/2014
DESN. BY	CME
CHKD. BY	SGG
PROJECT NO.	1058
SHEET NUMBER	16

DATE	BY	REV.	DESCRIPTION

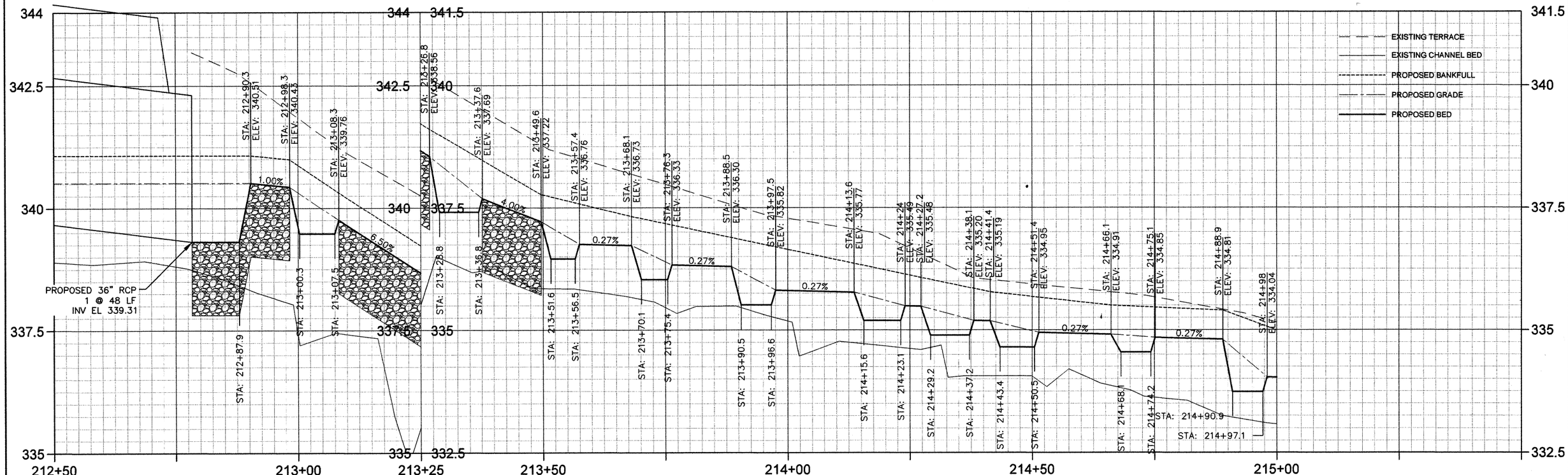


LOCATION KEY



LEGEND

- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



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

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

DALE BRANCH

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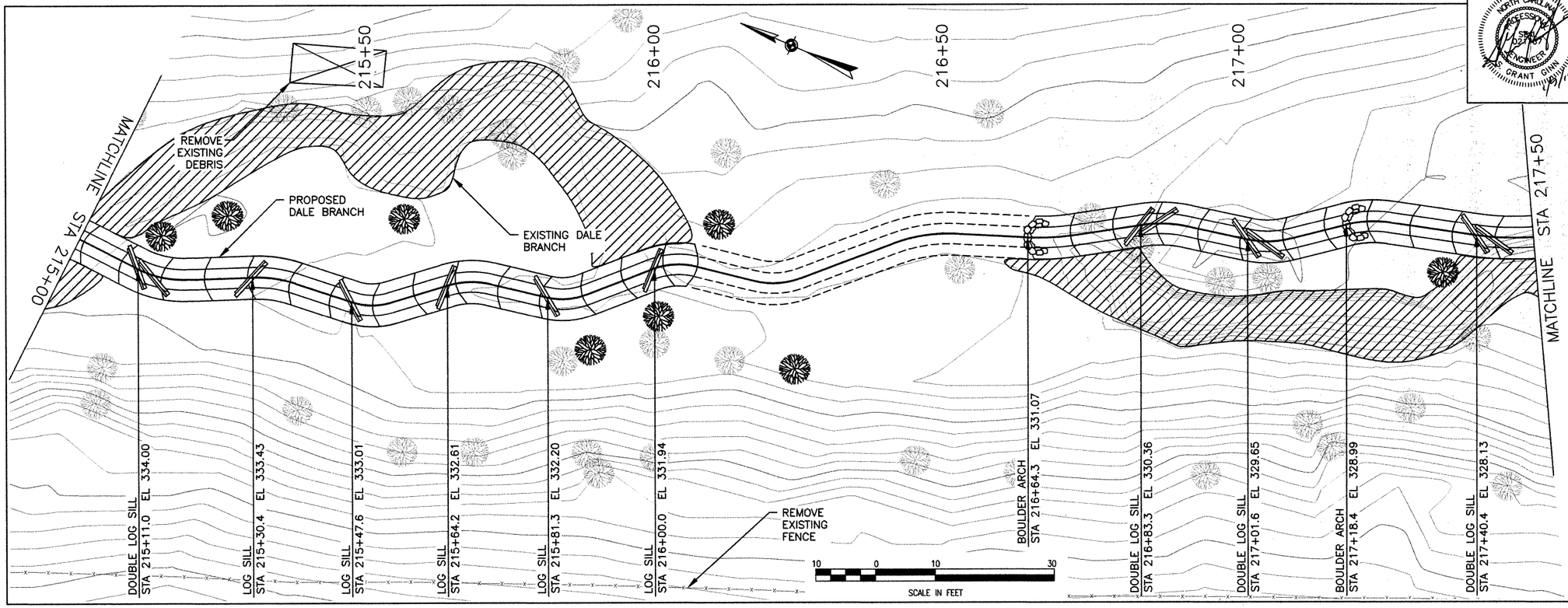
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	AS NOTED	DRWN. BY	CME	PROJECT NO.	SHEET NUMBER
DATE	1/9/2014	CHKD. BY	SGG	1058	17

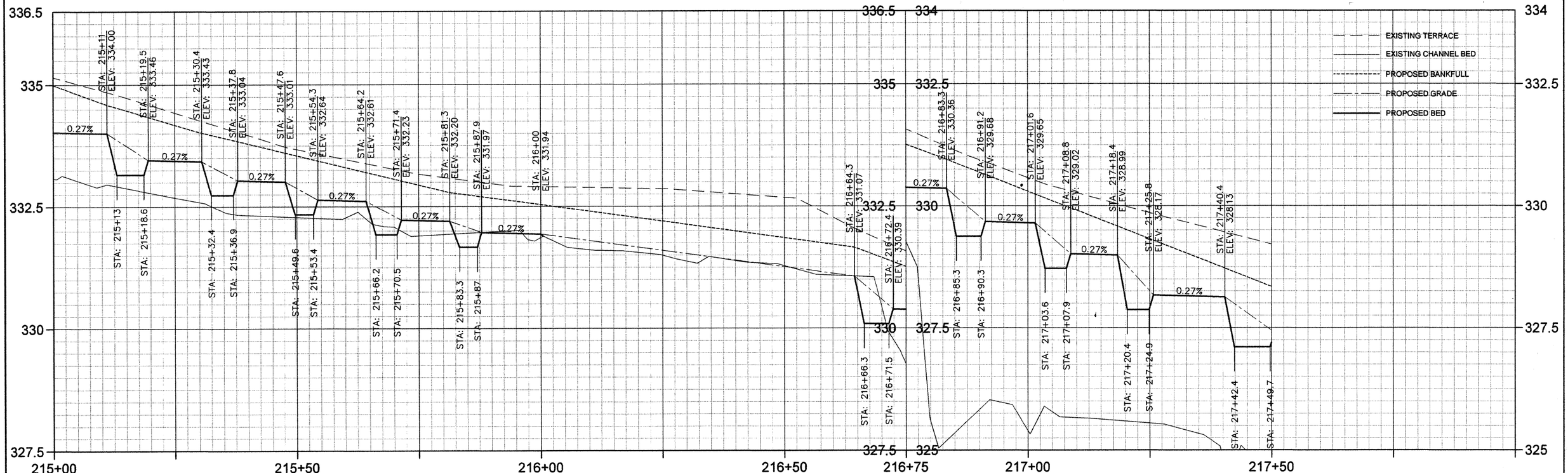
DATE	BY	REV.	DESCRIPTION

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 024407 SCOTT GRANT GINN



LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

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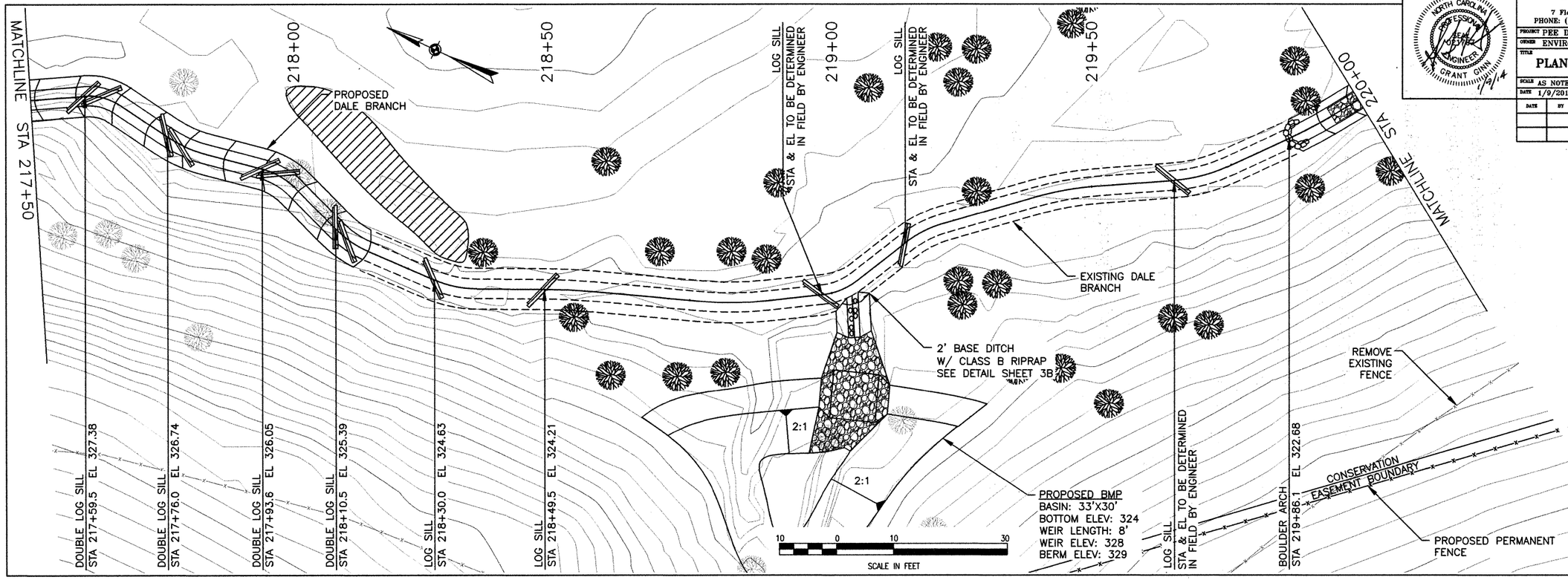
NORTH CAROLINA PROFESSIONAL SEAL 037247 ENGINEER GRANT GINN 1/9/14

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

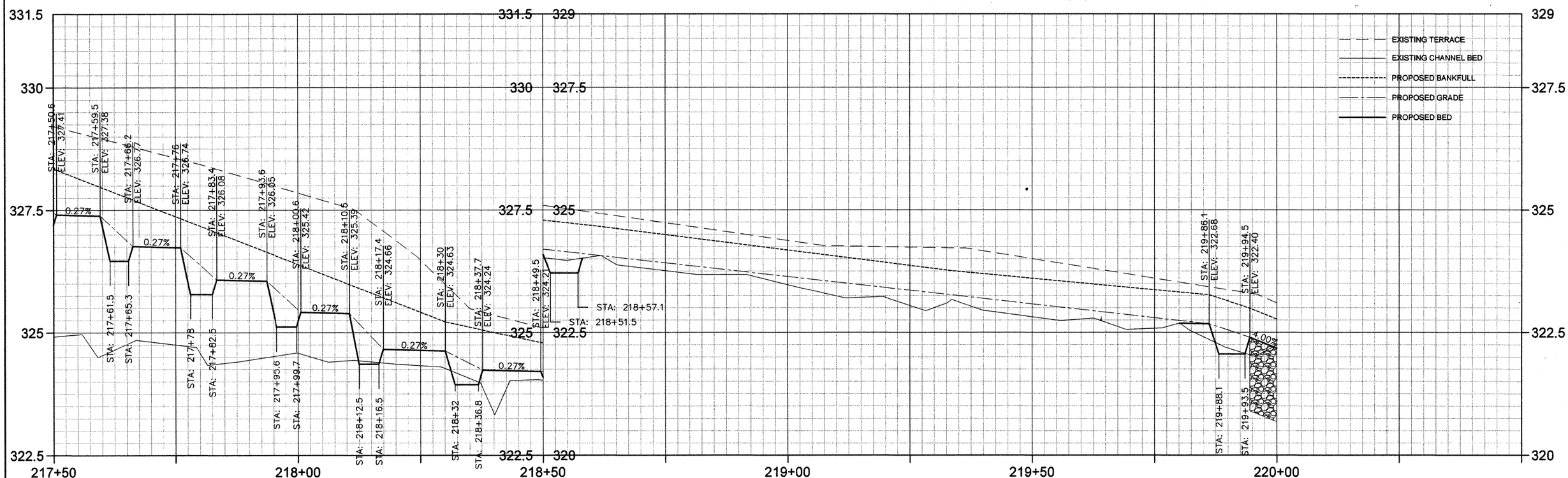
SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	18
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



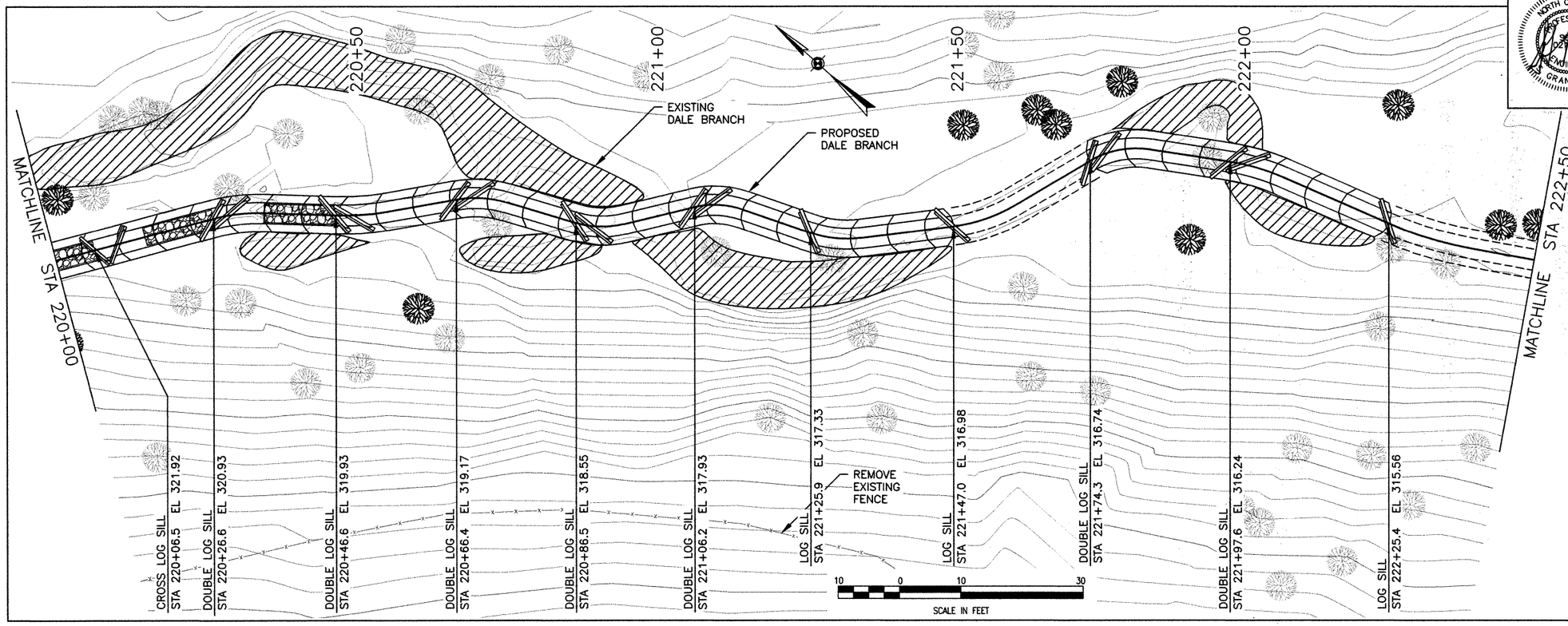
LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH



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NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER GRANT GINN 1/9/14

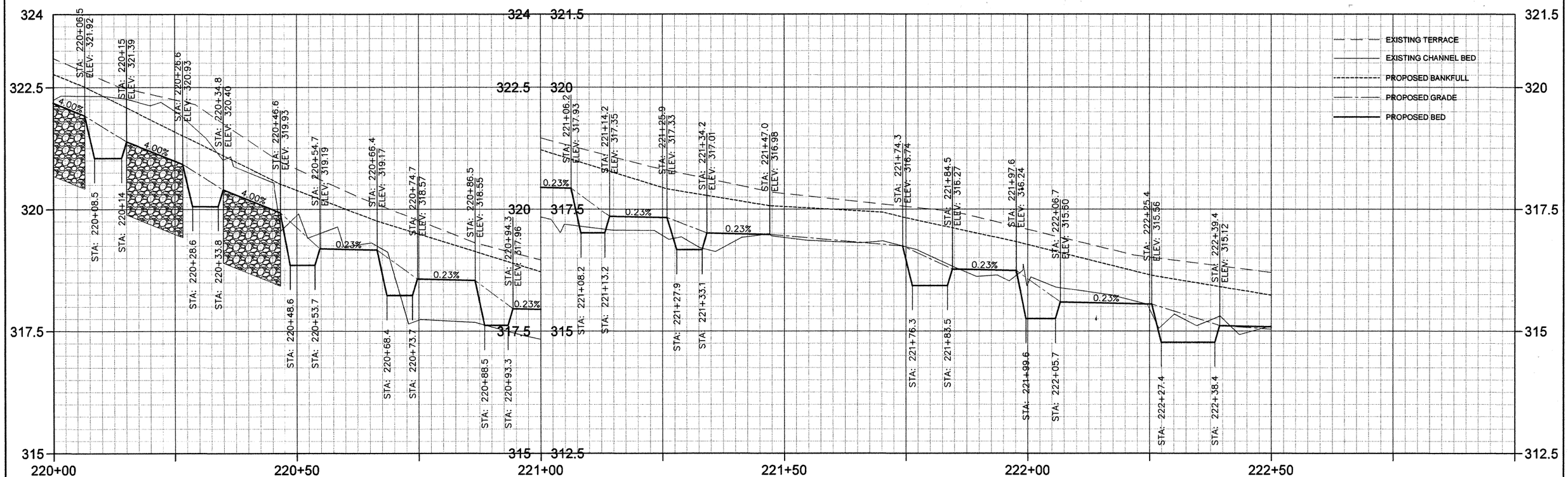
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	AS NOTED	DRWN. BY	CME	PROJECT NO.	SHEET NUMBER
DATE	1/9/2014	CHKD. BY	SGG	1058	19

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH

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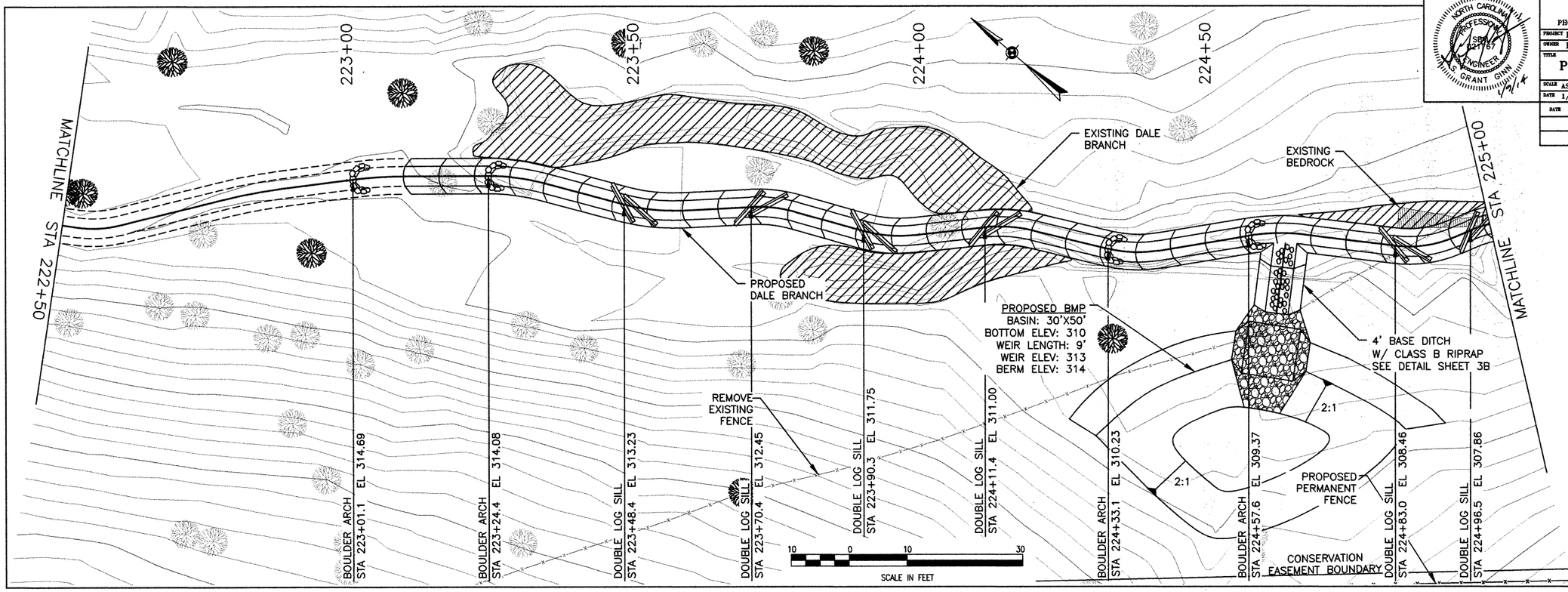
NORTH CAROLINA PROFESSIONAL SEAL 42787 ENGINEER S. GRANT GINN

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

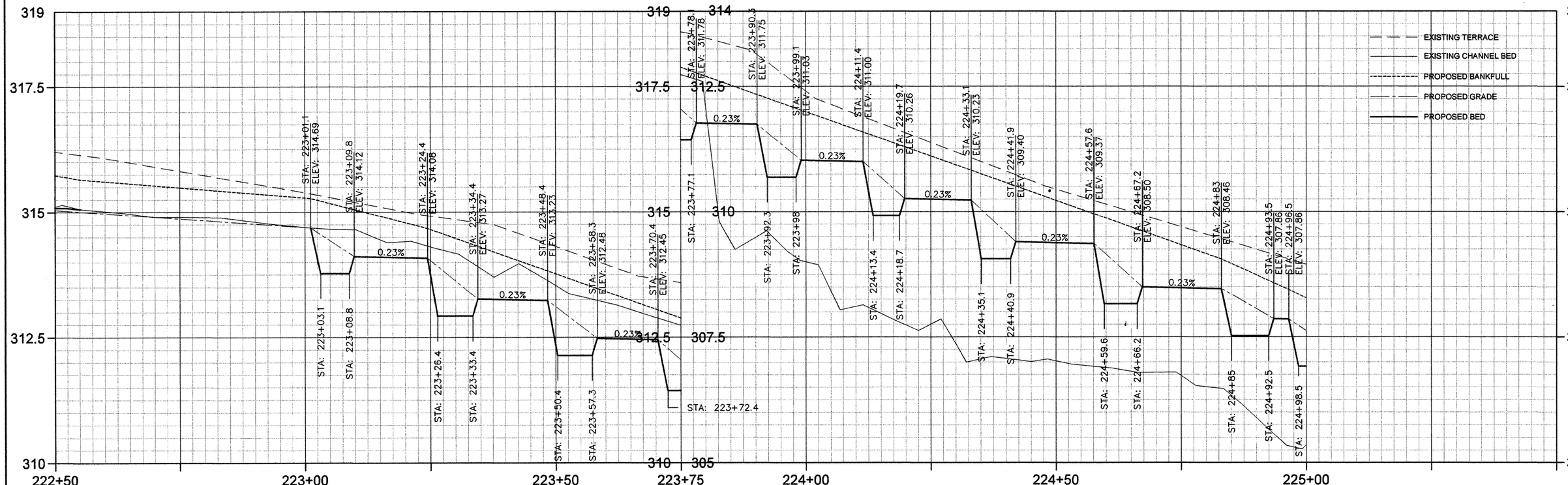
SCALE	AS NOTED	DRWN. BY CME	PROJECT NO. 1058	SHEET NUMBER 20
DATE	1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



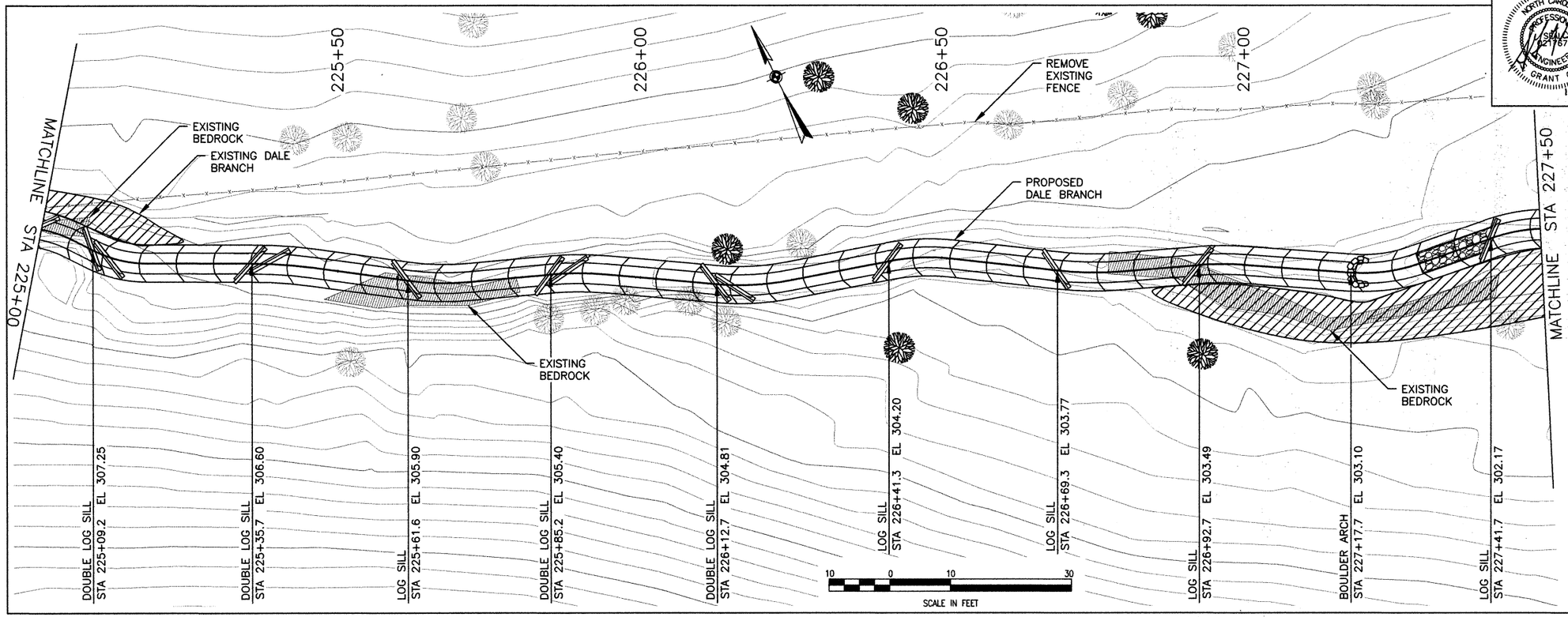
LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DALE BRANCH



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NORTH CAROLINA PROFESSIONAL SEAL 032767 ENGINEER GRANT GINN

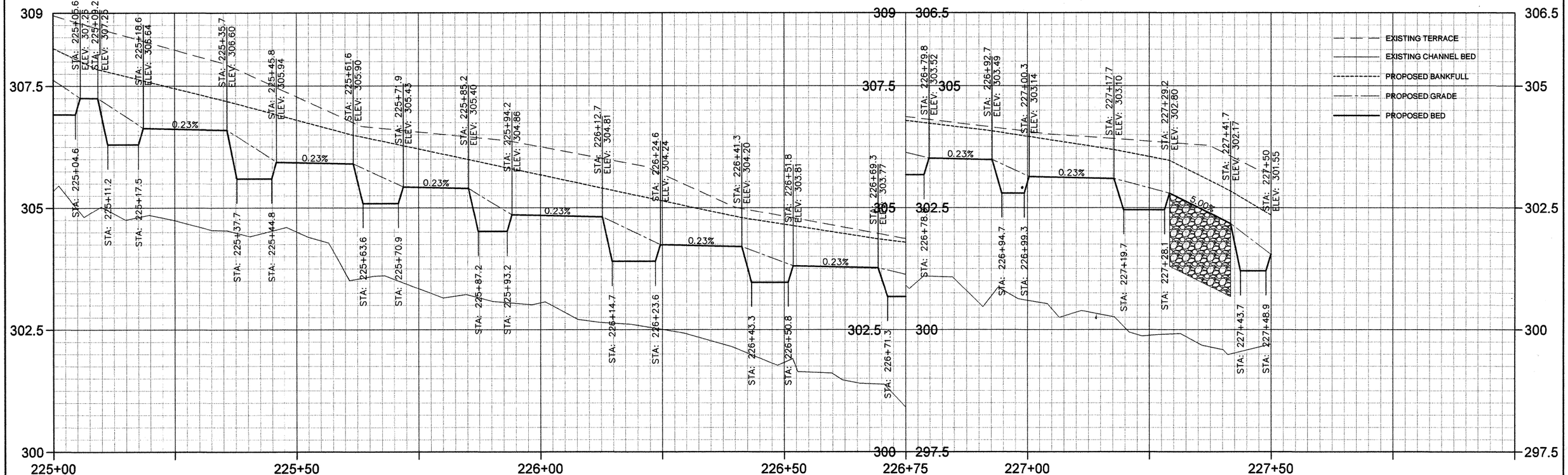
PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC & EXCHANGE
TITLE	PLAN & PROFILE

SCALE	AS NOTED	DRWN. BY	CME	PROJECT NO.	SHEET NUMBER
DATE	1/9/2014	CHKD. BY	SGG	1058	21

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

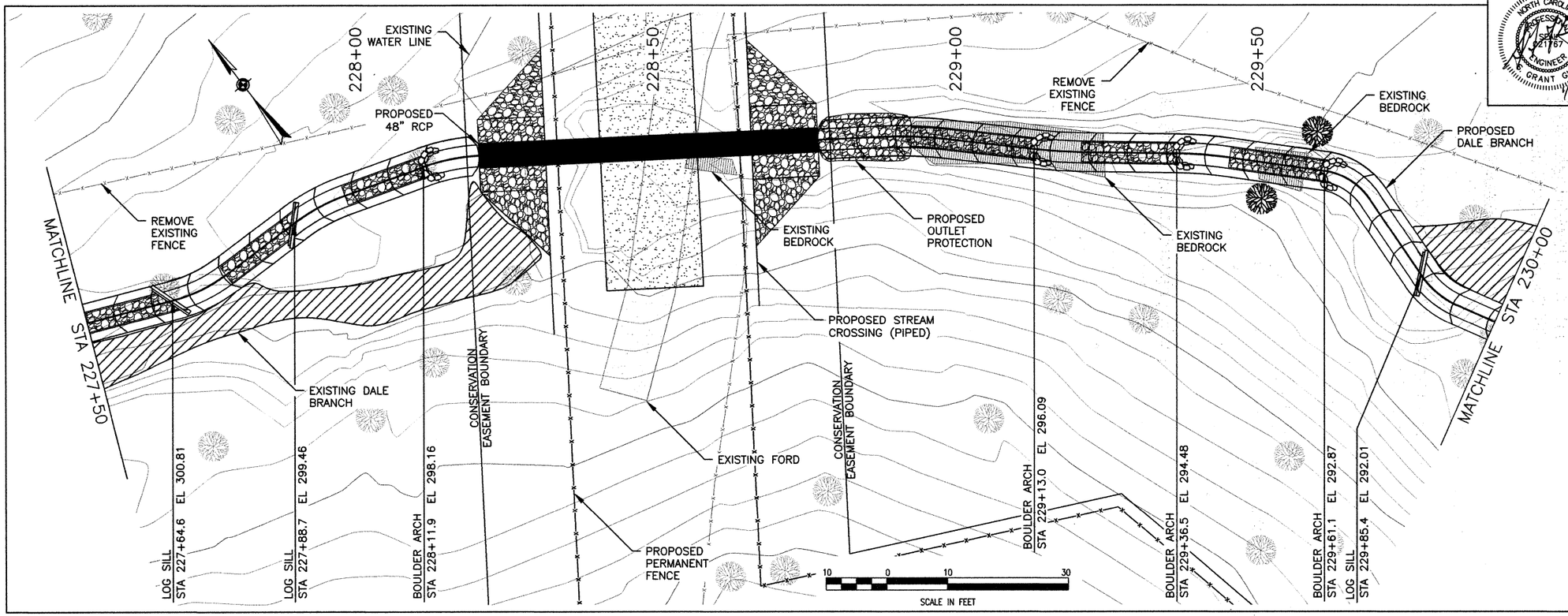
LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



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

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

DALE BRANCH



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NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER GRANT GINN 1/9/14

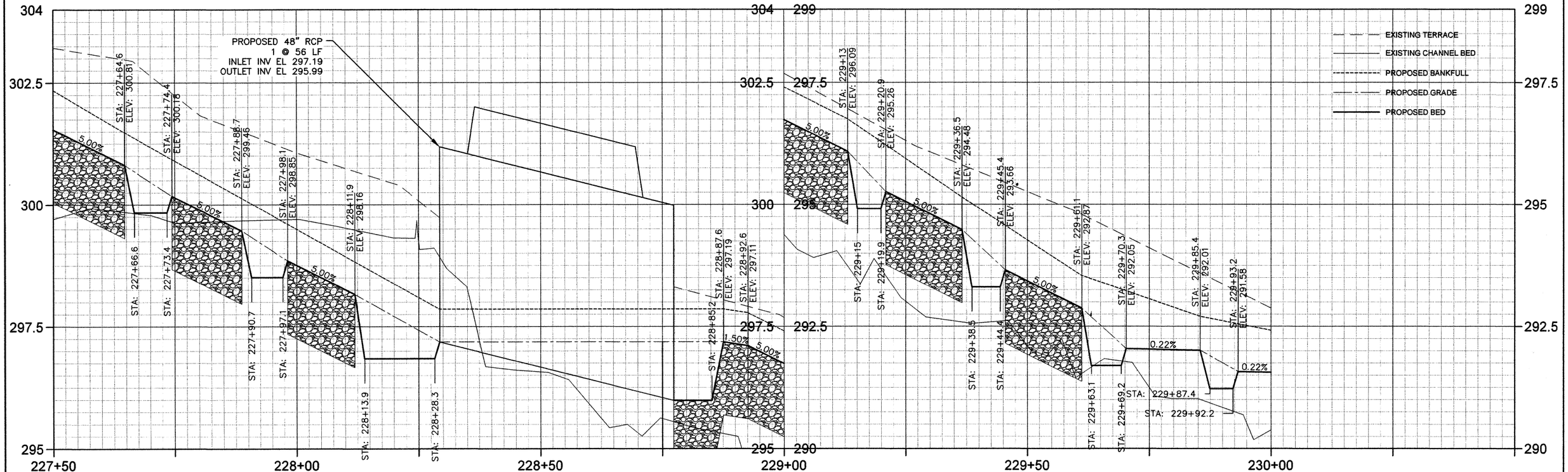
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	22
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

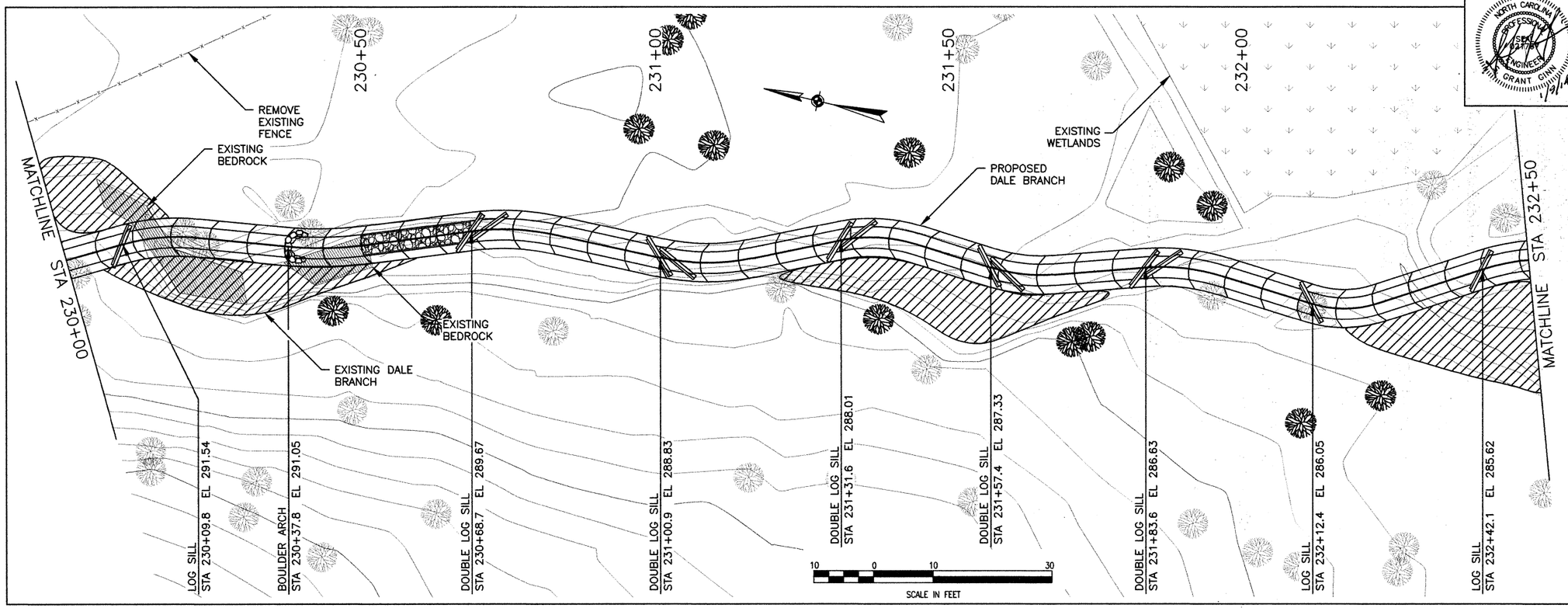
LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



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

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

DALE BRANCH



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NORTH CAROLINA PROFESSIONAL SEAL 037477 ENGINEER GRANT GINN 1/9/14

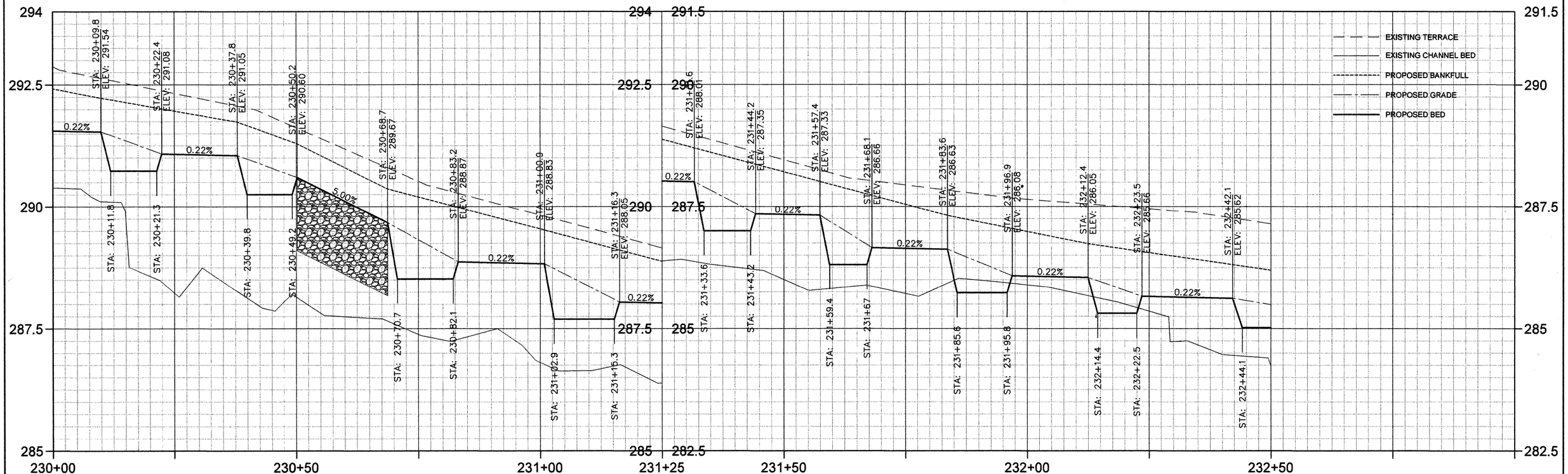
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	23
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

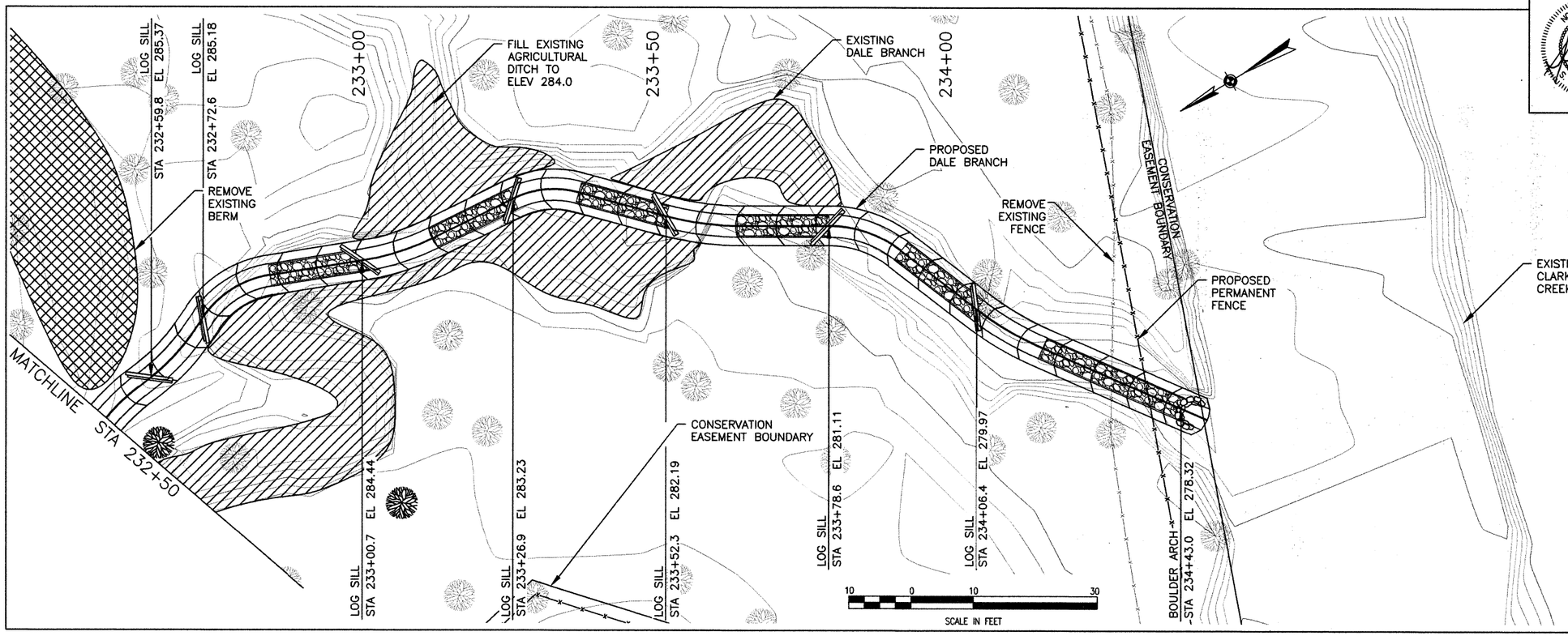
LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



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

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

DALE BRANCH



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NORTH CAROLINA PROFESSIONAL ENGINEER S. GRANT GINN

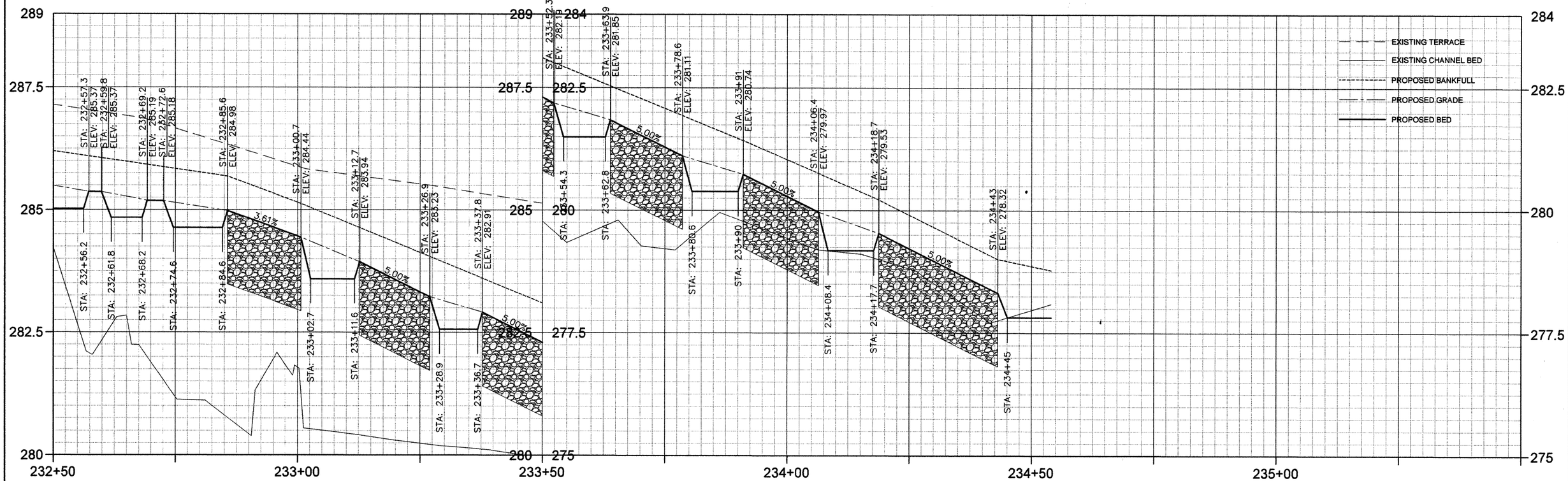
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	24
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



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

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

DALE BRANCH

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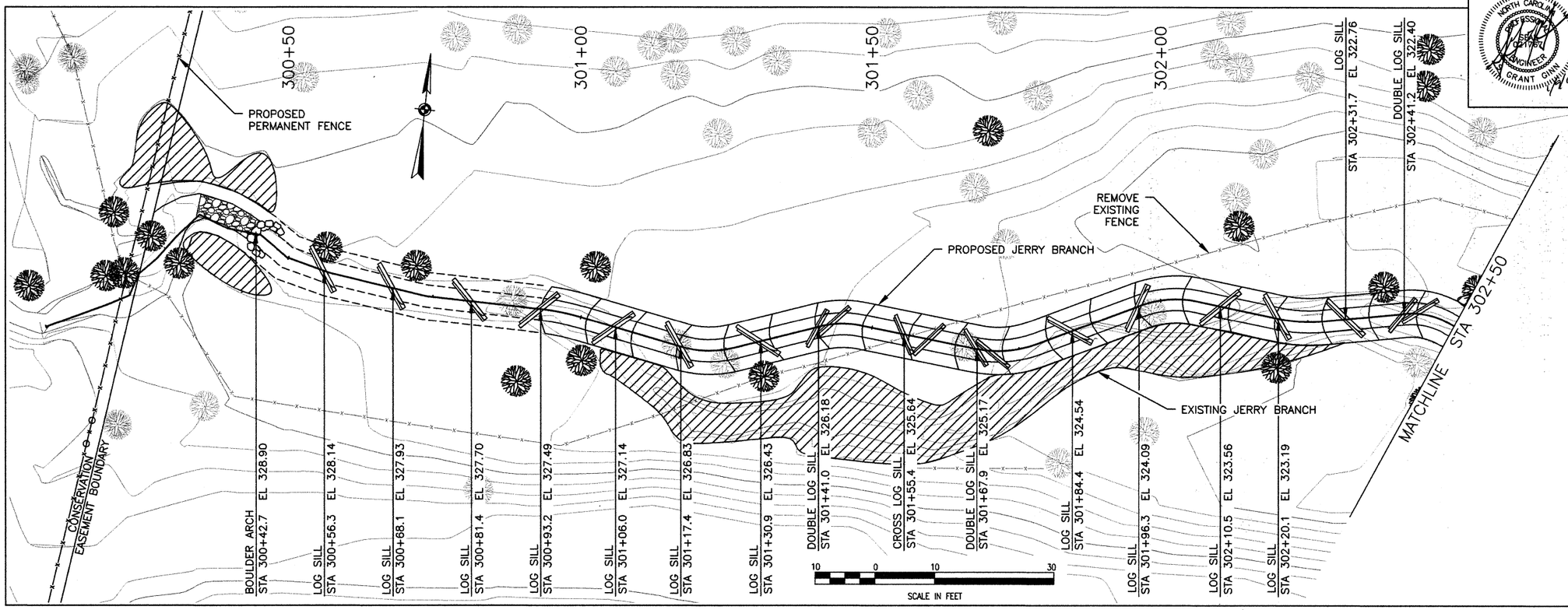
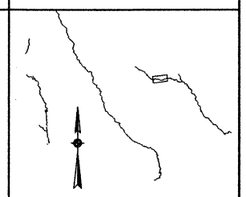
PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	25
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

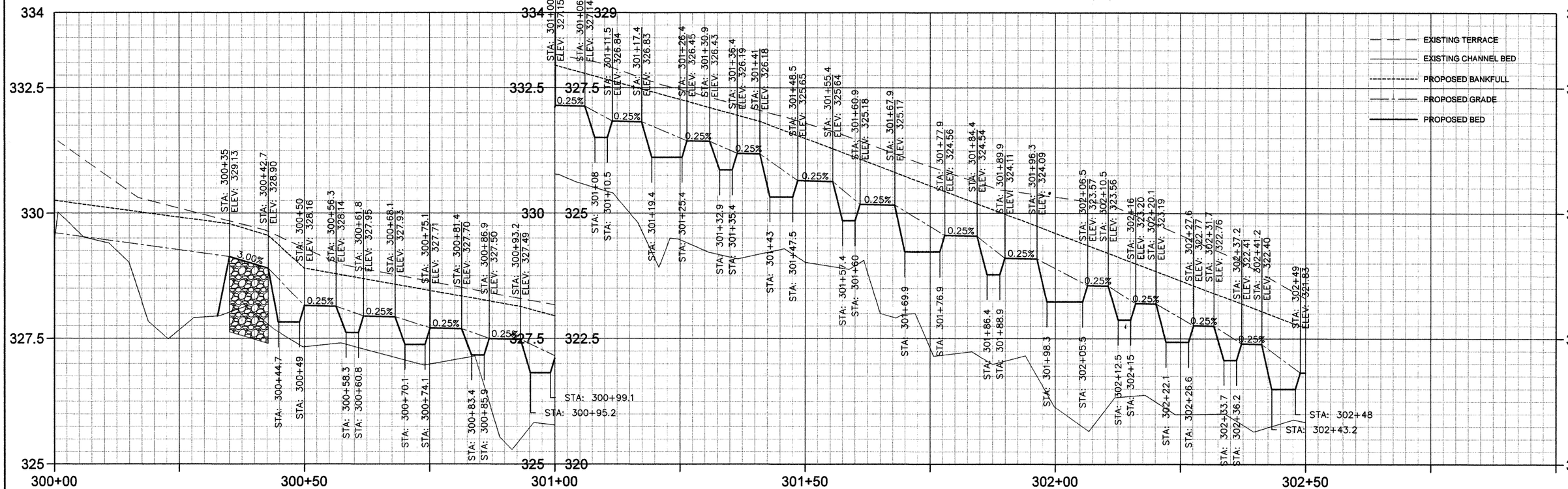
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 047761 GRANT GINN 1/9/14





LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

JERRY BRANCH

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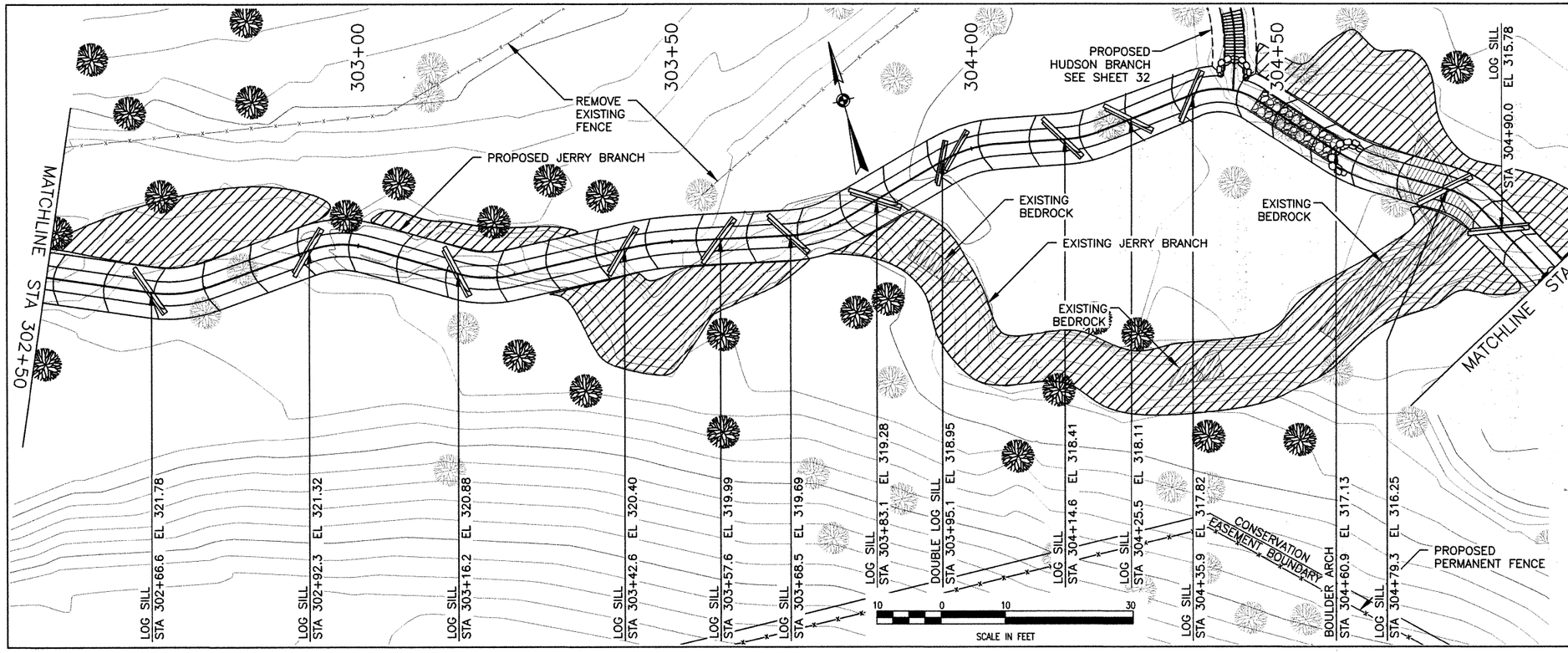
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	26
DATE 1/9/2014	CHKD. BY SGG		

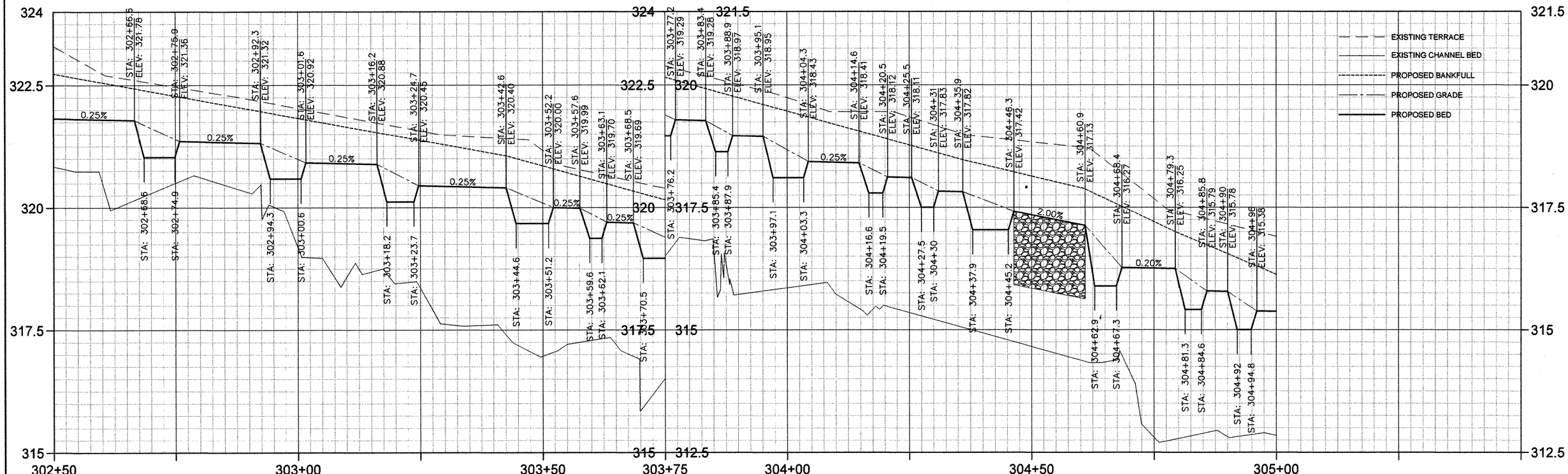
DATE	BY	REV.	DESCRIPTION

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 034767 GRANT GINN 1/9/14



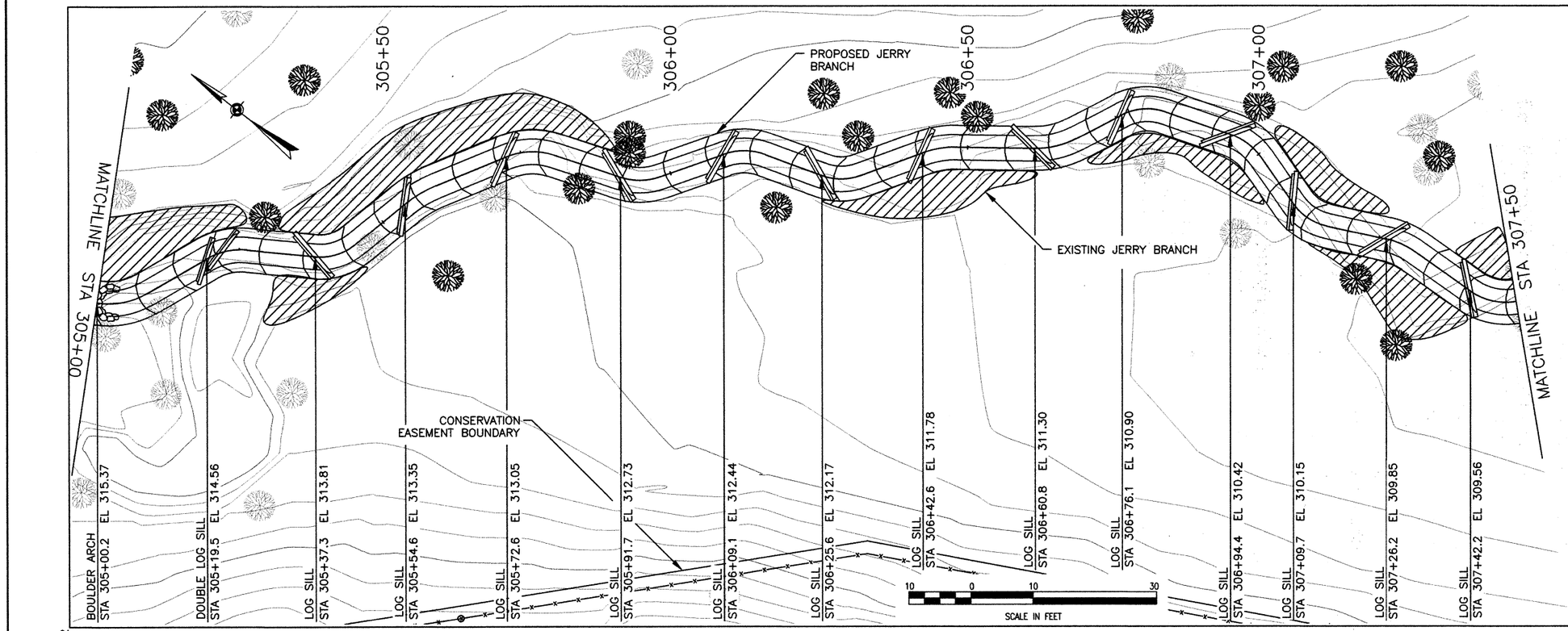
LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

JERRY BRANCH



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NORTH CAROLINA PROFESSIONAL 27257 ENGINEER SEAL GRANT GINN

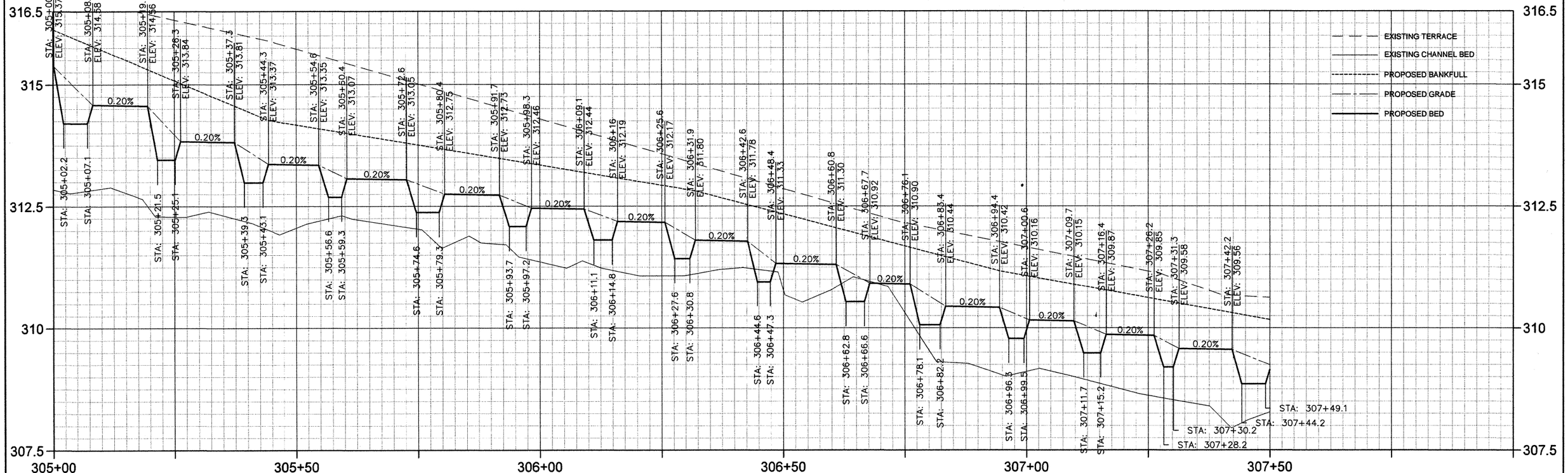
PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC & EXCHANGE
TITLE	PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	27
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
- EXISTING TREE
- SAVE TREE



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JERRY BRANCH

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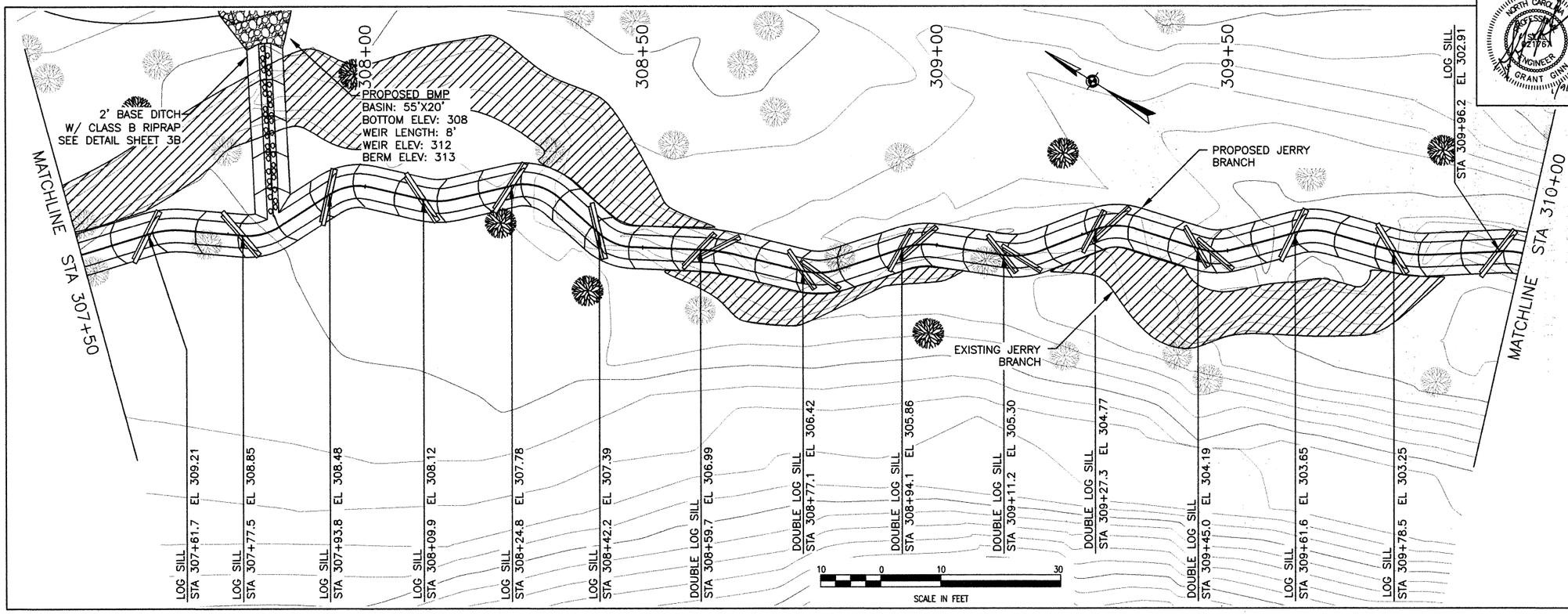
PROJECT: PRE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC & EXCHANGE
TITLE: **PLAN & PROFILE**

SCALE	AS NOTED	DRWN. BY	CME	PROJECT NO.	SHEET NUMBER
DATE	1/9/2014	CHKD. BY	SGG	1058	28

DATE	BY	REV.	DESCRIPTION

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 021761 GRANT GINN



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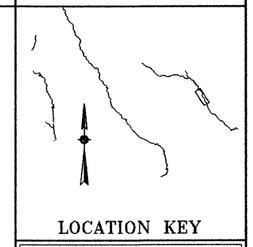

LEGEND
- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
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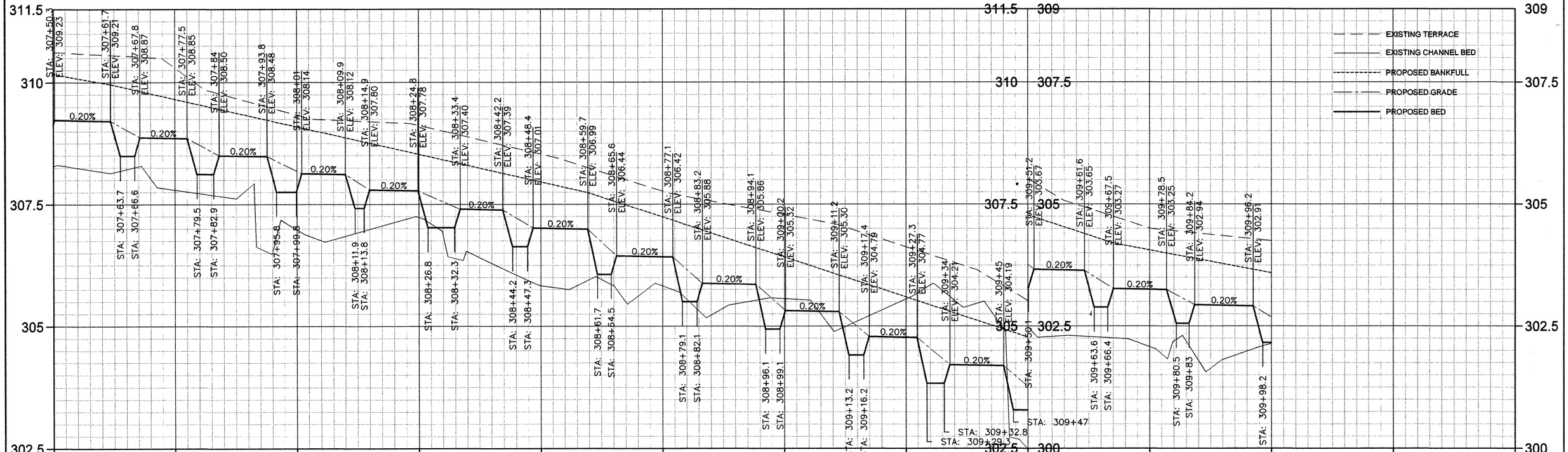

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JERRY BRANCH

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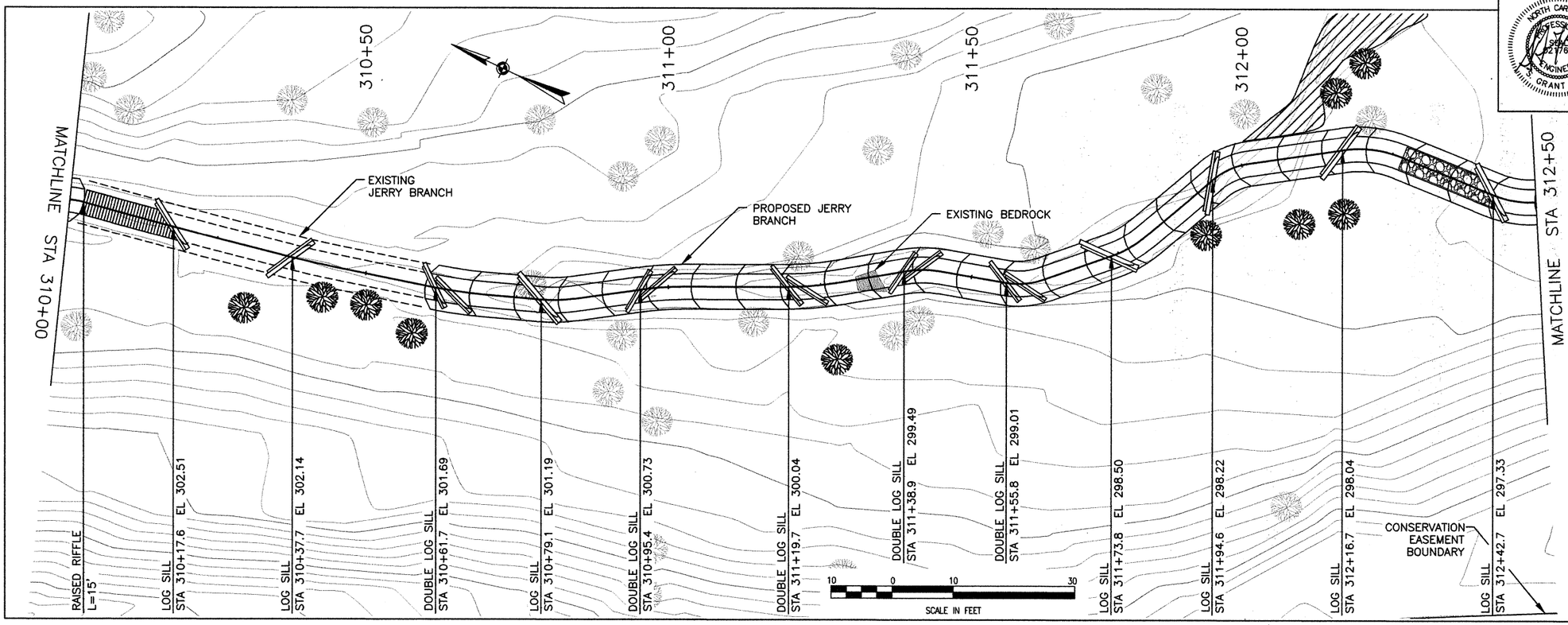
NORTH CAROLINA PROFESSIONAL SEAL 21767 ENGINEER GRANT GINN

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE	AS NOTED	DRWN. BY CME	PROJECT NO. 1058	SHEET NUMBER 29
DATE	1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



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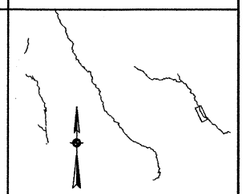

LEGEND

- PROPOSED RESTORATION
- IN-LINE RESTORATION
- PROPOSED ARMORED RIFFLE
- PROPOSED FILL
- PROPOSED CUT
- EXISTING FENCE
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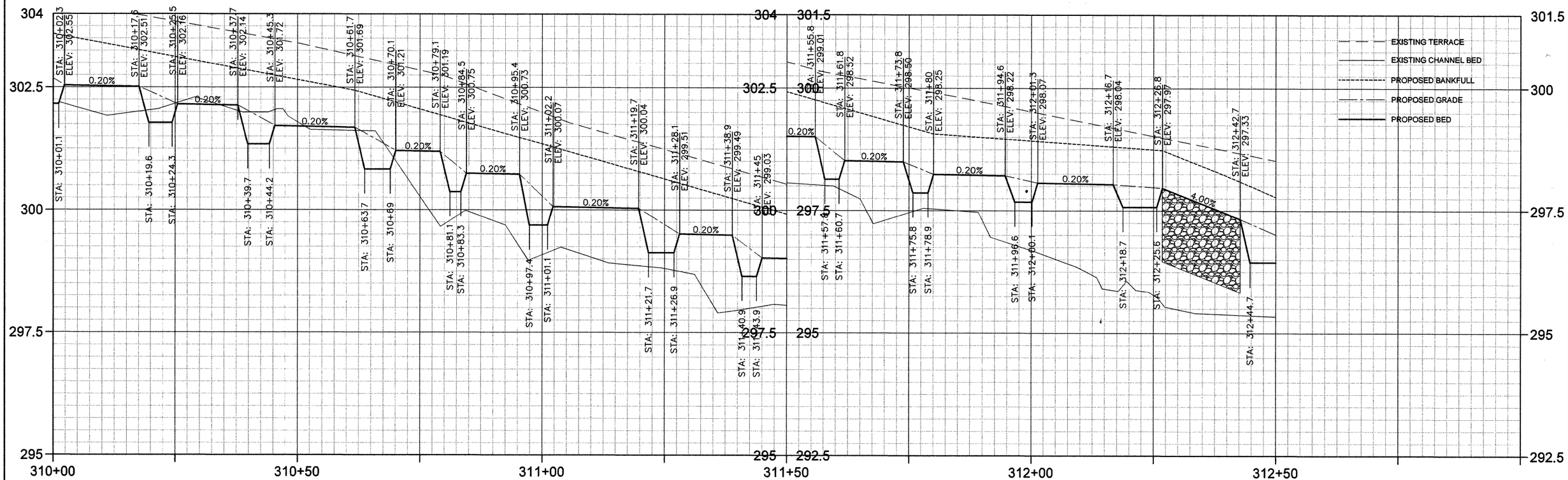
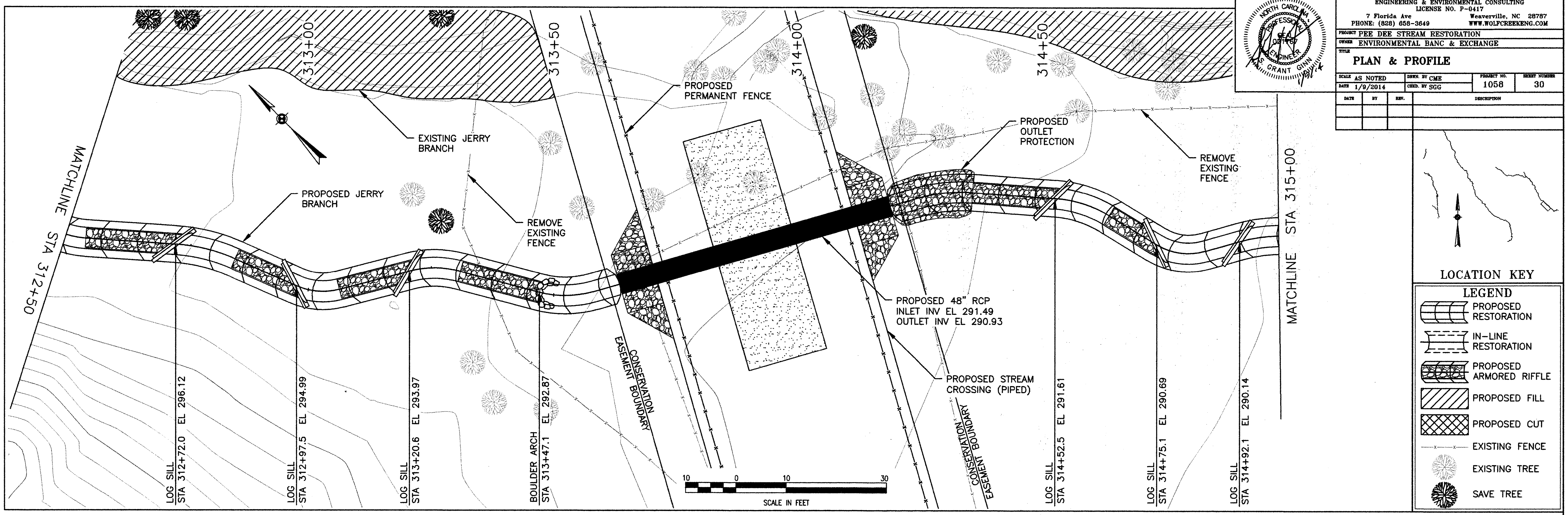
- SAVE TREE



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

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

JERRY BRANCH



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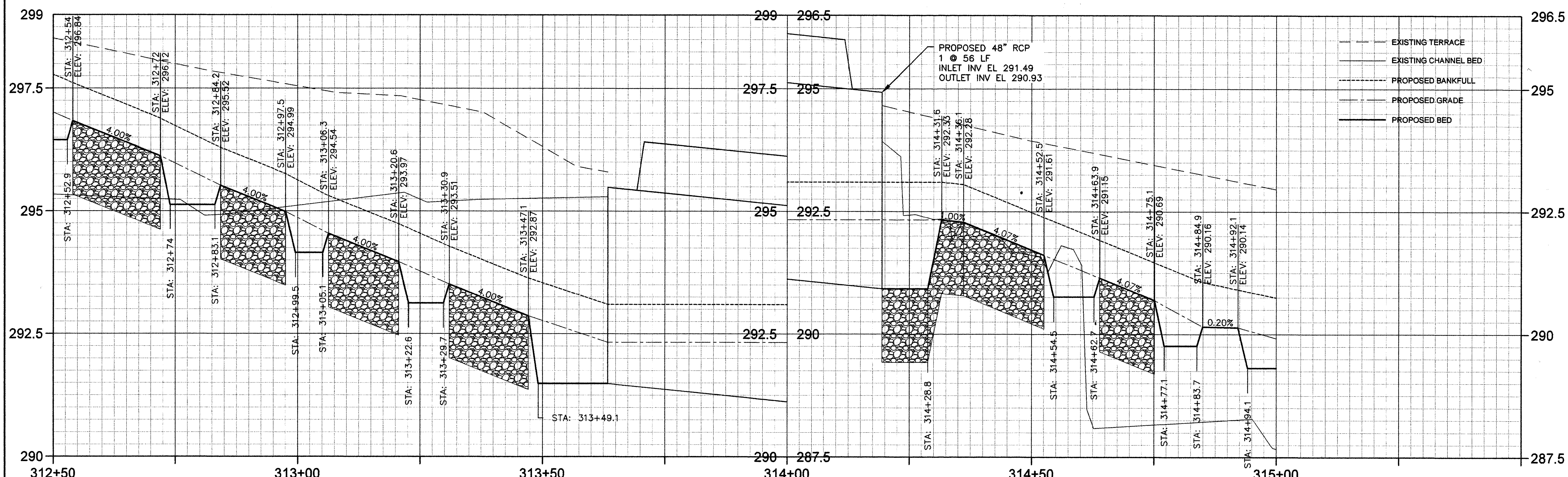
NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER S. GRANT GINN

PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC & EXCHANGE
TITLE	PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CME	1058	30
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



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JERRY BRANCH

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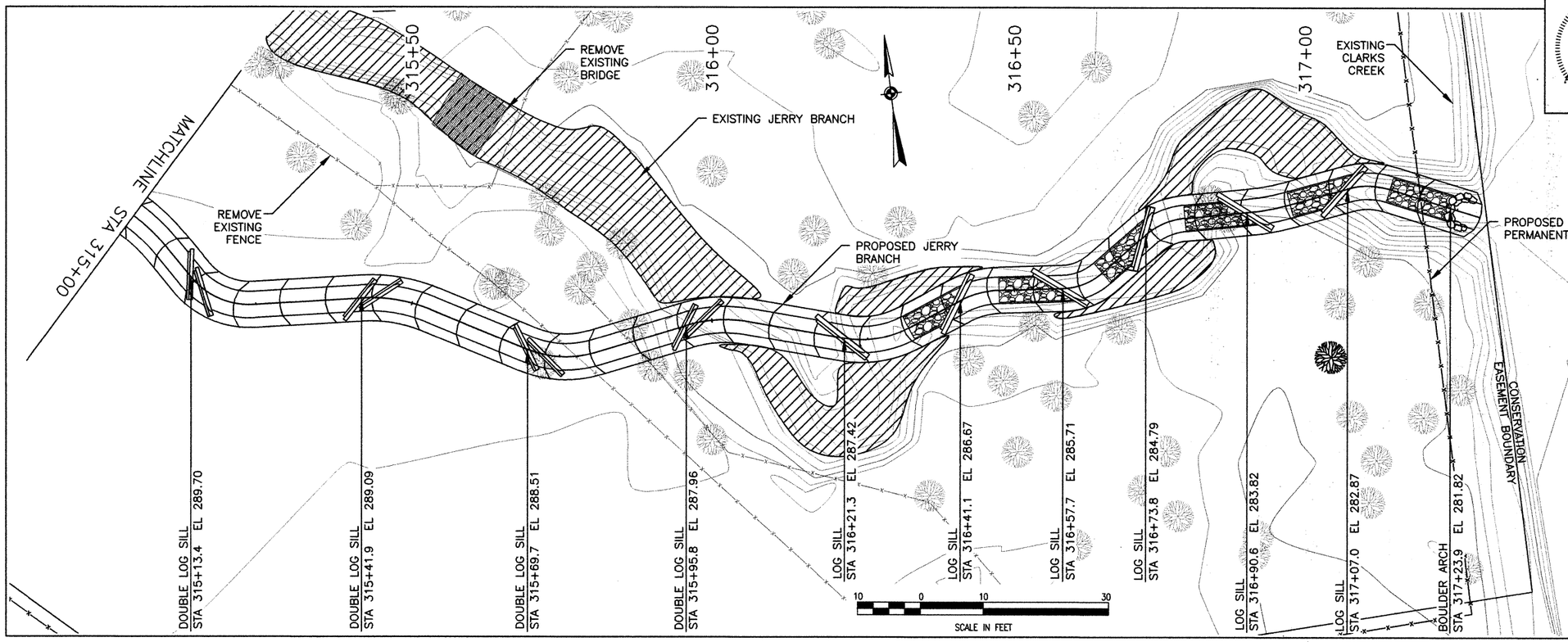
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC & EXCHANGE
TITLE **PLAN & PROFILE**

SCALE AS NOTED	DRWN. BY CME	PROJECT NO. 1058	SHEET NUMBER 31
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

NORTH CAROLINA PROFESSIONAL SEAL 047767 ENGINEER W. GRANT GINN 1/9/14



LOCATION KEY

LEGEND
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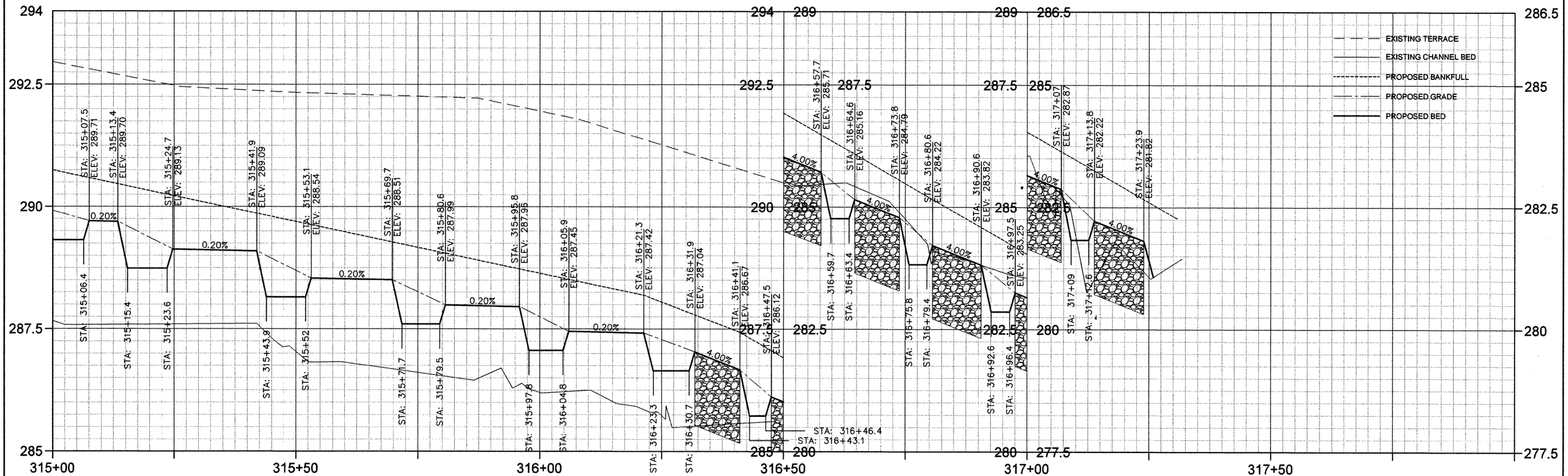

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JERRY BRANCH

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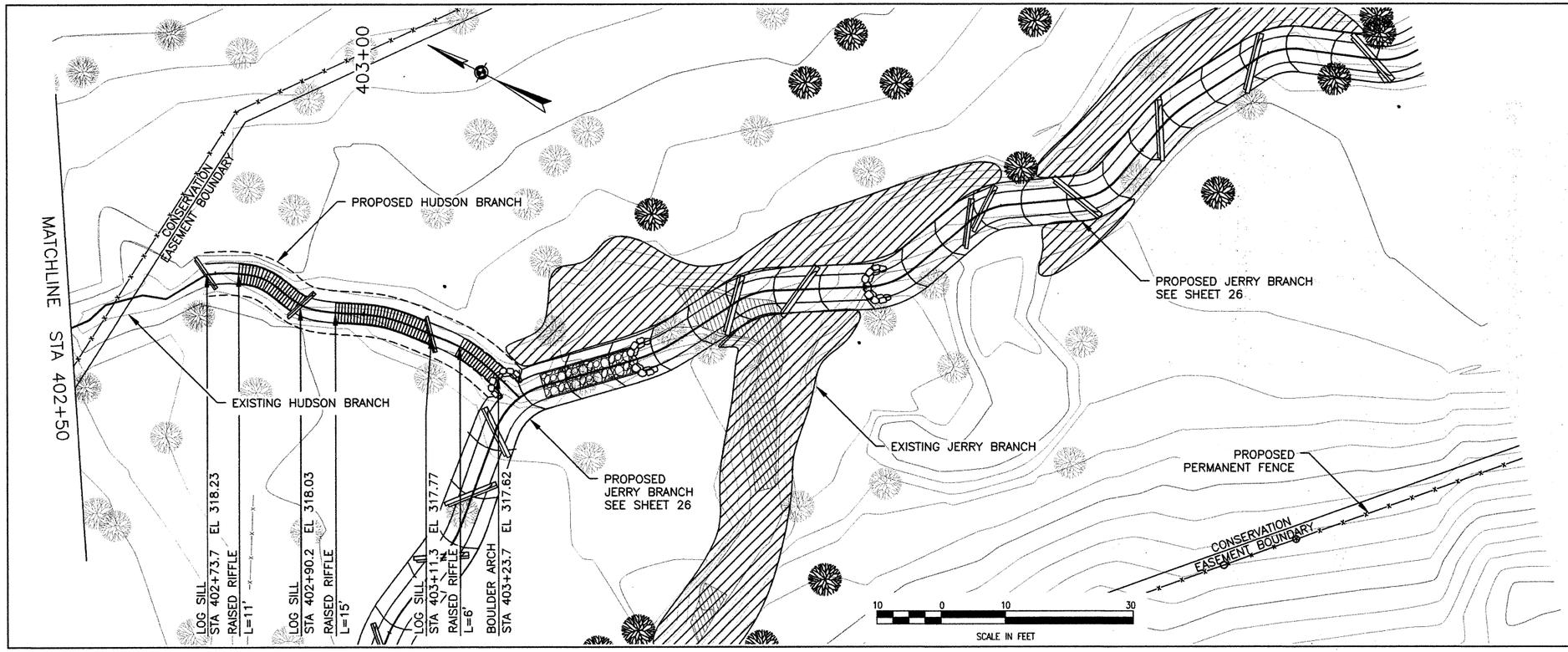
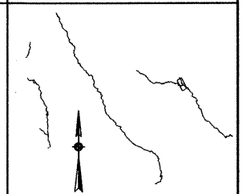
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040487 SGRANT GINN 1/9/14

PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC & EXCHANGE
TITLE	PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	mmf	1058	32
DATE 1/9/2014	CHKD. BY SGC		

DATE	BY	REV.	DESCRIPTION





LOCATION KEY

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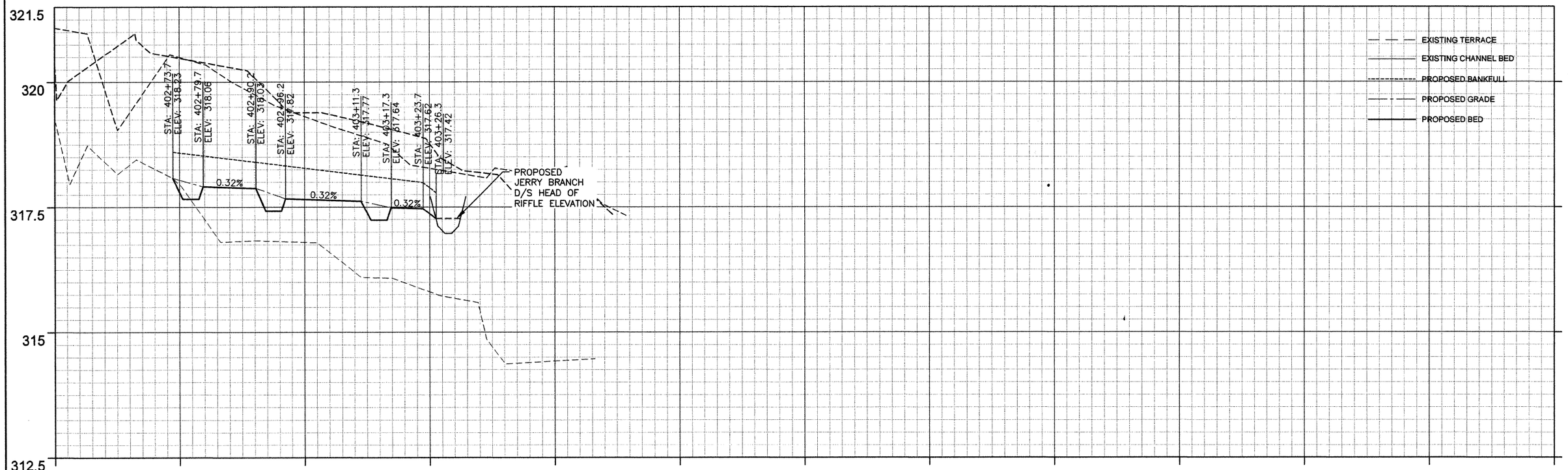

FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'

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HUDSON BRANCH

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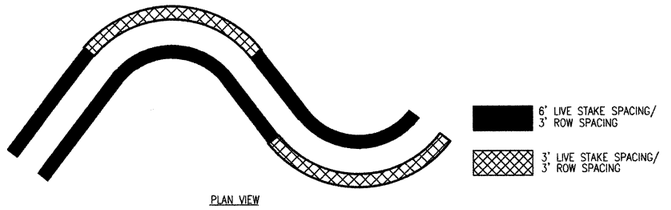
NORTH CAROLINA PROFESSIONAL 021767 ENGINEER GRANT GINN 1/9/14

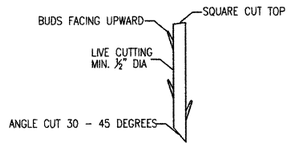
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **PLANTING DETAILS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	P-1
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

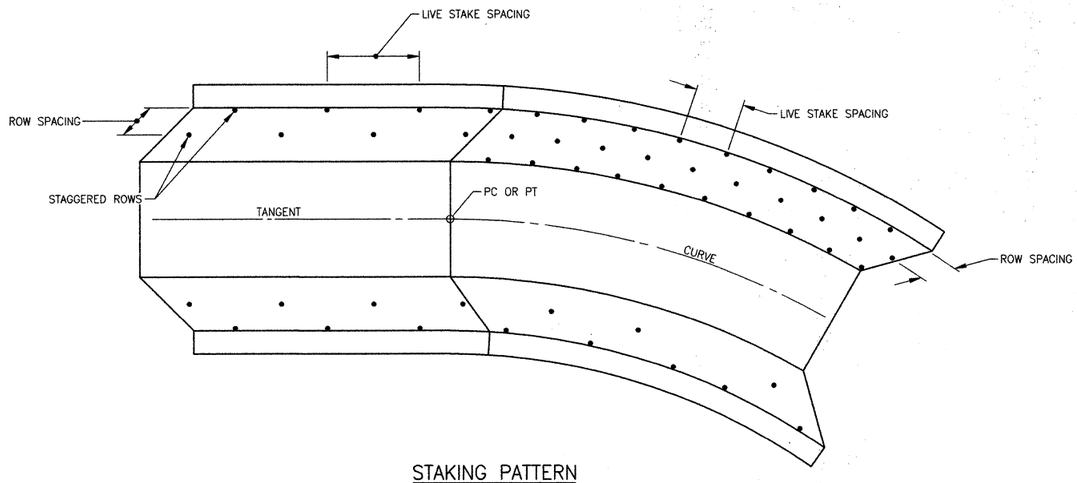


PLAN VIEW



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



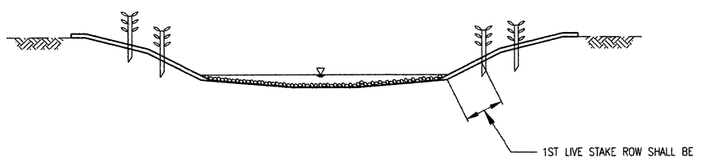
STAKING PATTERN
NOT TO SCALE

PLANTING NOTES:

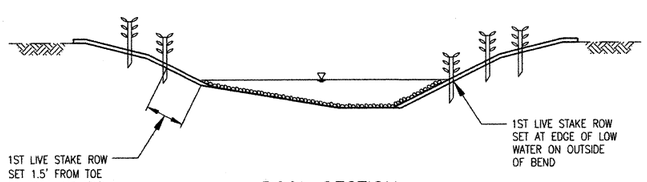
TEMPORARY AND PERMANENT SEED
1. ALL DISTURBED AREAS WILL BE STABILIZED USING MULCH AND TEMPORARY SEED TO PROVIDE ADEQUATE GROUND COVER AND CONDITION THE SOIL.
2. MULCH MUST BE ADDED TO ACHIEVE 80% COVERAGE (ROUGHLY 2 TONS/ACRE FOR WHEAT STRAW)
3. A FERTILITY SOIL TEST SHALL BE USED TO DETERMINE FERTILIZER AMOUNTS OR, IF NO SOIL TEST IS AVAILABLE, A STANDARD MIXTURE SHALL BE APPLIED OF 2 TONS OF LIME PER ACRE AND 700-1000 LBS OF 10-10-10 FERTILIZER PER ACRE.

BARE ROOT PLANTINGS
1. PLANT BARE ROOT SHRUBS AND TREES IN AREAS AS INDICATED ON THE PLANS.
2. PROVIDE 8' 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.



RIFFLE SECTION
NOT TO SCALE



POOL SECTION
NOT TO SCALE

STREAMSIDE					
COMMON NAME	STRATUM	SCIENTIFIC NAME	SPACING (ft)	PLANT MATERIAL SIZE	TOTAL STEMS
Black Willow	midstory	*Salix nigra*	3x3	Live Stake	547
Buttonbush	understory	*Cephalanthus occidentalis*	3x3	Live Stake	547
Silky Dogwood	understory	*Cornus amomum*	3x3	Live Stake	547
Ninebark	understory	*Physocarpus opulifolius*	3x3	Live Stake	547
TOTAL					2188

BUFFER PLANTINGS					
COMMON NAME	SCIENTIFIC NAME	PLANT MATERIAL SIZE	STEMS/ACRE	AREA (Acres)	TOTAL STEMS
River Birch	*Betula nigra*	Bare Root	85	16.9	1437
Ironwood	*Carpinus caroliniana*	Bare Root	85	16.9	1437
Shagbark Hickory	*Carya ovata*	Bare Root	85	16.9	1437
Green Ash	*Fraxinus pennsylvanica*	Bare Root	85	16.9	1437
Sycamore	*Platanus occidentalis*	Bare Root	85	16.9	1437
Water Oak	*Quercus nigra*	Bare Root	85	16.9	1437
Willow Oak	*Quercus phellos*	Bare Root	85	16.9	1437
American Elm	*Ulmus americana*	Bare Root	85	16.9	1437
TOTAL					11492

COMMON NAME	SCIENTIFIC NAME	SEEDING DENSITY (lbs/acre)	% MIX
PERMANENT MIX			
Switchgrass	*Panicum virgatum*	4.5	15
Broom Sedge	*Andropogon viginicus*	4.5	15
Indian Grass	*Sorhgastrum nutans*	6	20
Eastern Gamma Grass	*Tripsacum dactyoides*	7.5	25
Lance-Leaved Coreopsis	*Coreopsis lanceolata*	3	10
Deer tongue	*Panicum clandestinum*	4.5	15
	Totals	30	100%

COMMON NAME	SCIENTIFIC NAME	LBS/ ACRE
Temporary Seeding		
August to March (cool season)		
Oats		12
Wheat Grass	*Triticum aestivum*	12
Rye Grain	*Secale cereal*	13
Barley		13

April to August (warm season)		
Millet	*Utochola ramose*	20
Buckwheat	*Fagopyrum esculentum*	30

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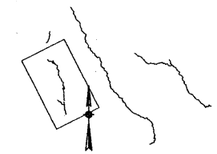
NORTH CAROLINA PROFESSIONAL 021761 ENGINEER S. GRANT GINN 1/9/14

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **PLANTING PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	P-2
DATE 1/9/2014	CHKD. BY SGG		

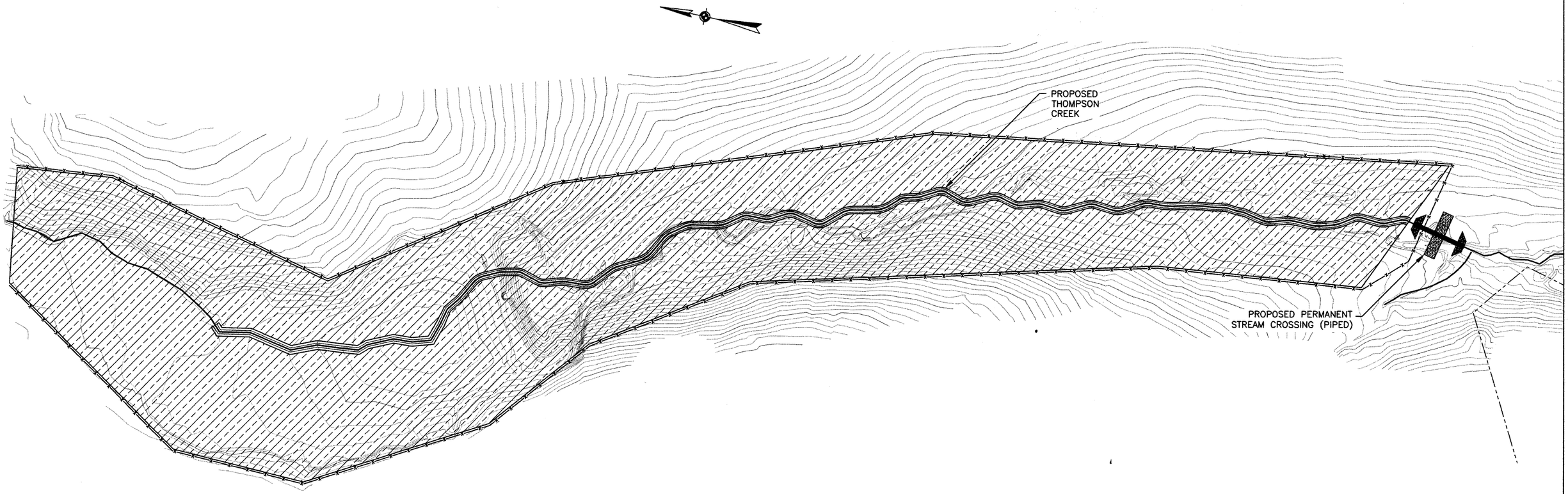
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

BUFFER PLANTINGS



50 0 50 150
SCALE IN FEET

THOMPSON CREEK

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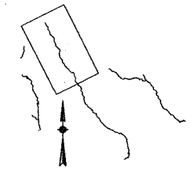
NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER GRANT GINN

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **PLANTING PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMP	1058	P-3
DATE 1/9/2014	CHKD. BY SGG		

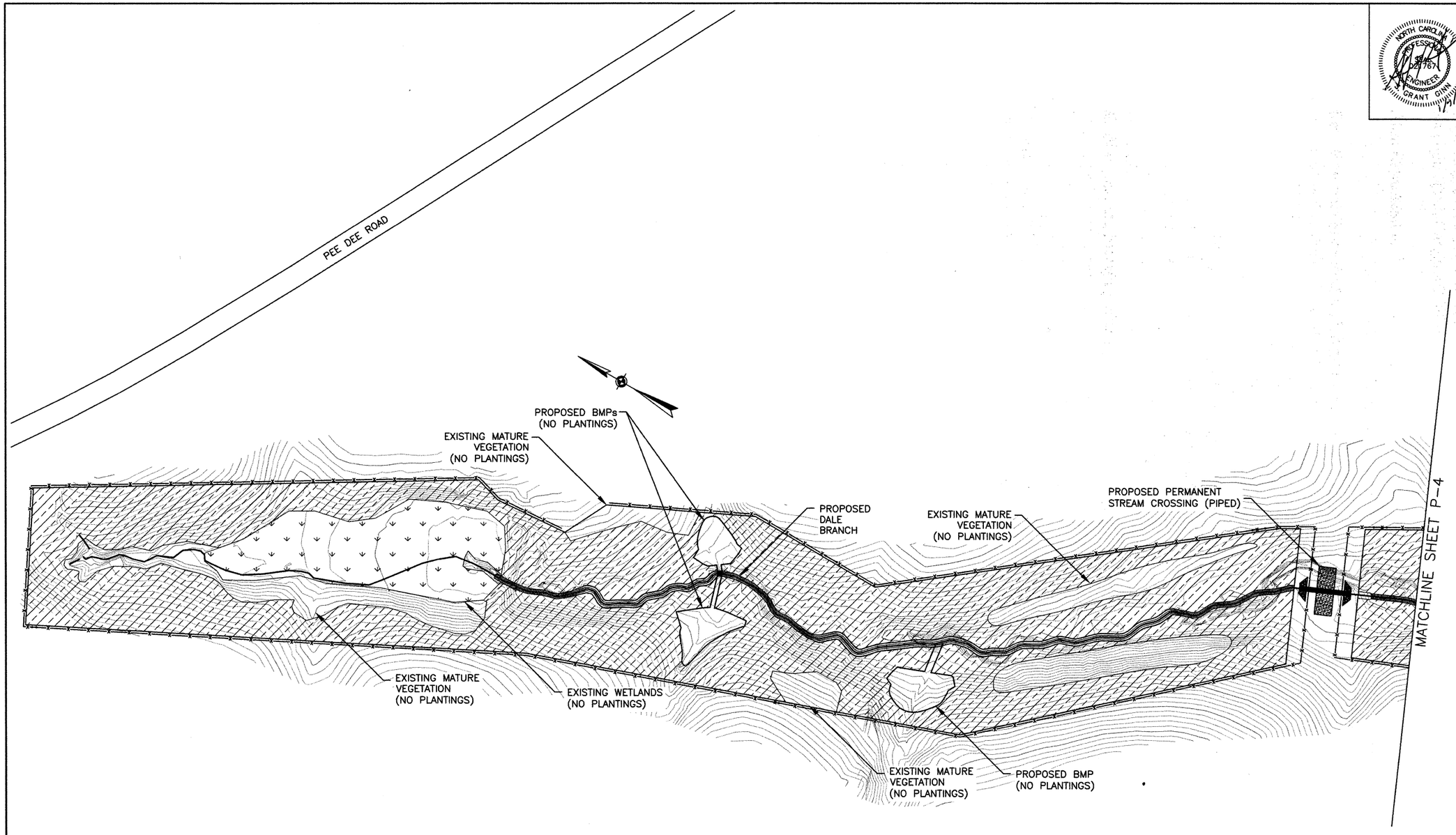
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

BUFFER PLANTINGS



50 0 50 150
SCALE IN FEET

DALE BRANCH

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

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE

TITLE: **PLANTING PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	P-4
DATE 1/9/2014	CHKD. BY SGG		

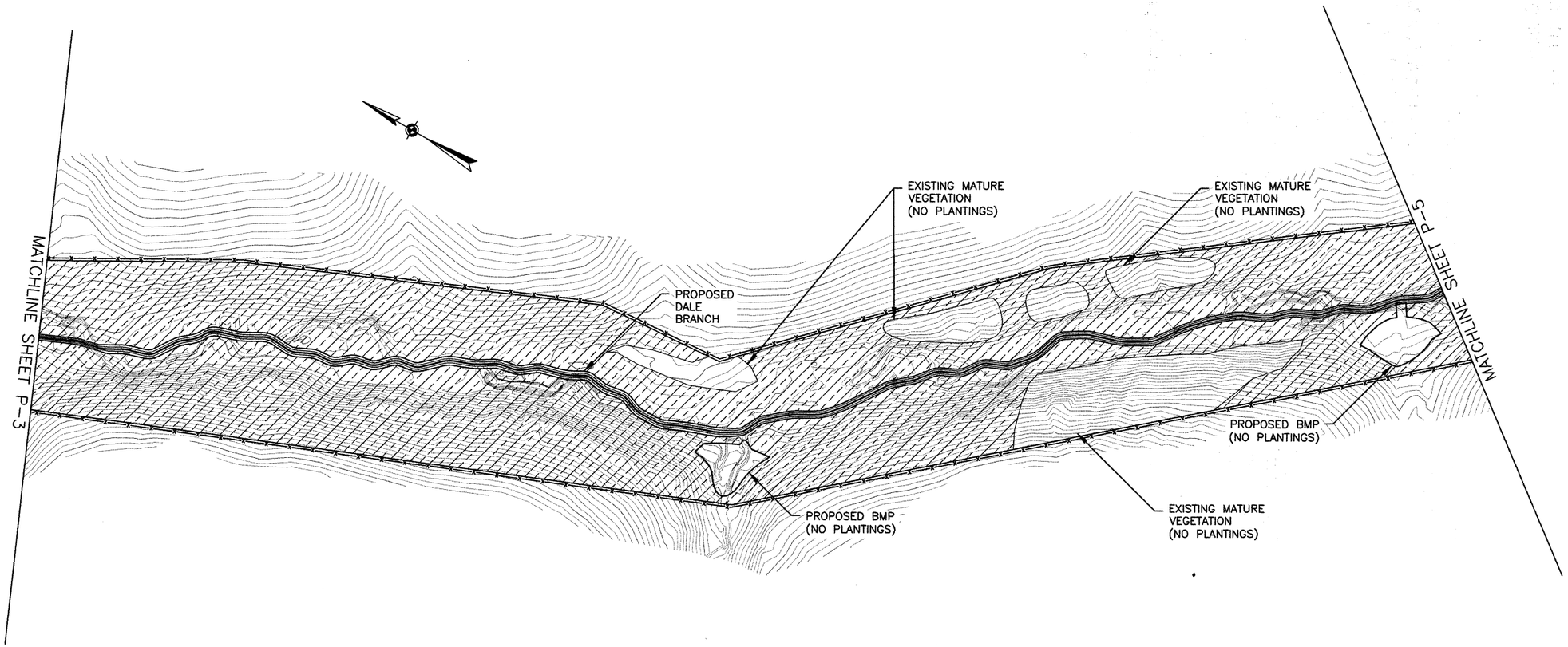
DATE	BY	REV.	DESCRIPTION

NORTH CAROLINA PROFESSIONAL SEAL 027767 ENGINEER GRANT GINN 1/9/14

LOCATION KEY

LEGEND

BUFFER PLANTINGS



50 0 50 150
SCALE IN FEET

DALE BRANCH

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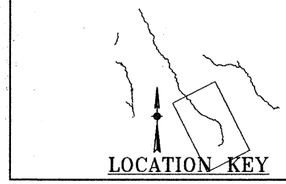
NORTH CAROLINA PROFESSIONAL SEAL 022767 ENGINEER GRANT GINN

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **PLANTING PLANS**

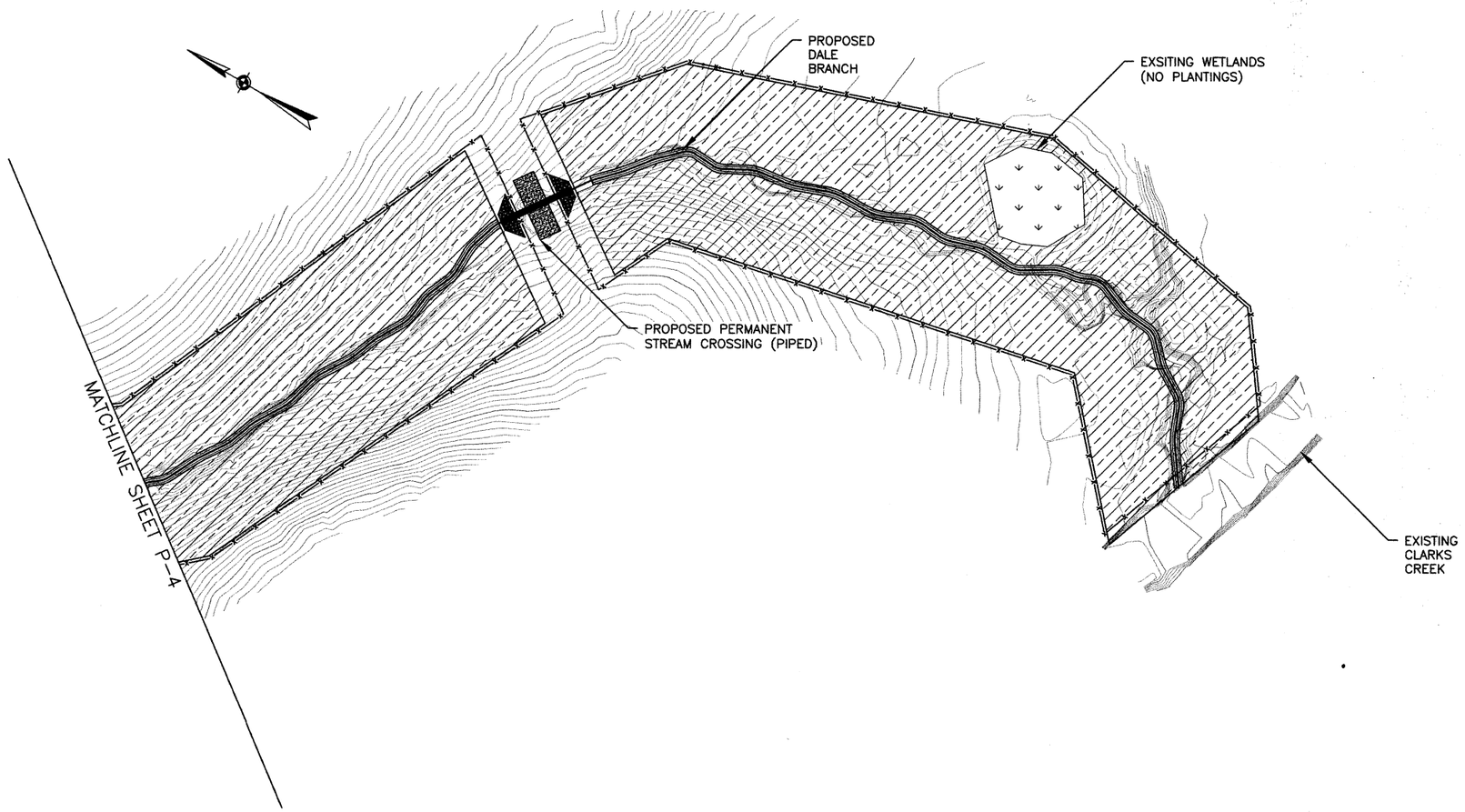
SCALE	DESIGN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	P-5
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LEGEND

BUFFER PLANTINGS



50 0 50 150
SCALE IN FEET

DALE BRANCH

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
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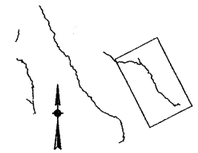
7 Florida Ave Weaverville, NC 28787
PHONE: (828) 658-9649 WWW.WOLFCREEKENG.COM

NORTH CAROLINA PROFESSIONAL SEAL 021062 ENGINEER SCOTT GRANT GINN 1/9/14

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **PLANTING PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	P-6
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

BUFFER PLANTINGS

50 0 50 150
SCALE IN FEET

JERRY BRANCH

NC EEP PROJECT #95350

ENVIRONMENTAL BANC AND EXCHANGE

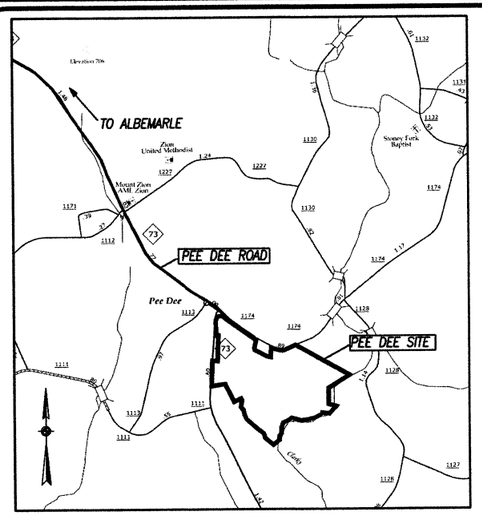
PEE DEE STREAM RESTORATION PROJECT

THOMPSON CREEK, DALE BRANCH, JERRY BRANCH AND HUDSON BRANCH
MONTGOMERY COUNTY, NORTH CAROLINA

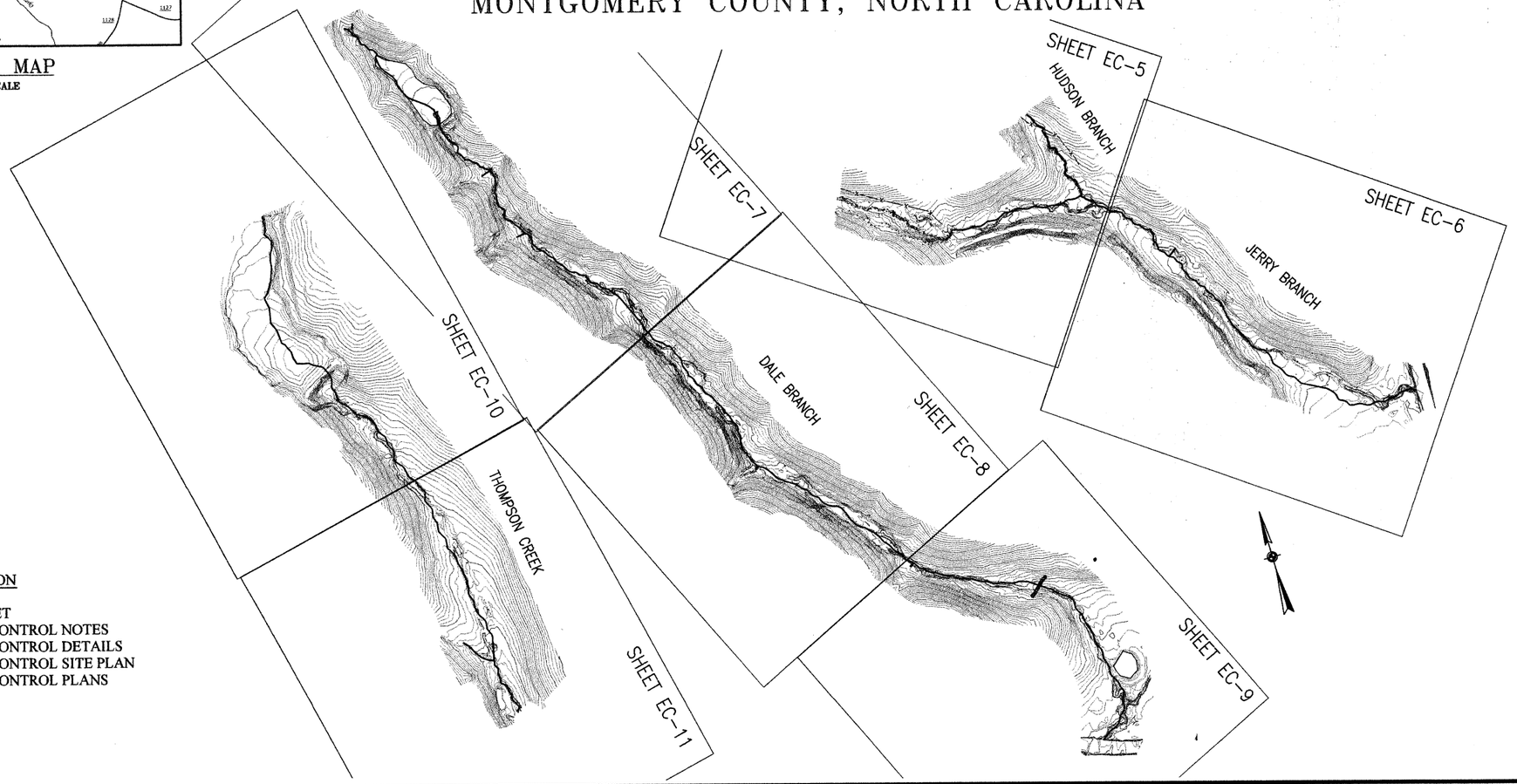
STATE	EEP PROJECT NO.	SHEET NO.	TOTAL SHEETS
NC	95350	1	12

NO.	DESCRIPTION	DATE	APPROVED
	Final Plans	1/9/2014	
REVISIONS			

Disturbed Acreage: 32.3 ac



VICINITY MAP
NOT TO SCALE



SHEET INDEX

GRAPHIC SCALES (SCALE IN FEET)

150 0 150 450
SITE PLAN SHEET

50 0 50 150
PLAN SHEETS

PROJECT LENGTHS

PROPOSED RESTORATION:	
THOMPSON CREEK	= 1314 FT
DALE BRANCH	= 2955 FT
JERRY BRANCH	= 1670 FT
HUDSON BRANCH	= 53 FT
PROPOSED ENHANCEMENT:	
THOMPSON CREEK	= 250 FT
DALE BRANCH	= 375 FT
TOTAL LENGTH	= 6617 FT

Prepared by:

Wolf Creek Engineering, PllC
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Weaverville, North Carolina 28787
Phone: 828-658-3649
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NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER S. GRANT GINN

1/9/14
PROJECT ENGINEER

Prepared for:

EBX

Tommy Cousins
PROJECT MANAGER

EROSION CONTROL PLANS

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
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7 Florida Ave. Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **EROSION CONTROL NOTES**

SCALE AS NOTED	DRWN. BY cme	PROJECT NO. 1058	DRAWING NUMBER EC-2
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

GENERAL NOTES:

DISTURBED ACREAGE: 32.25 ACRES INCLUDING CONSTRUCTION EASEMENT
SITE SOILS: BADIN–GOLDSTON COMPLEX, BADIN–TARRUS COMPLEX, CHENNEBY SILT LOAM, AND GOLDSTON–BADIN COMPLEX

1. THE CONTRACTOR SHALL INSTALL AND MAINTAIN THROUGHOUT THE DURATION OF CONSTRUCTION ALL EROSION CONTROL MEASURES IN ACCORDANCE WITH THESE PLANS AND IN ACCORDANCE WITH APPLICABLE EROSION AND SEDIMENT CONTROL REGULATIONS.
2. ALL EROSION CONTROL MEASURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NORTH CAROLINA EROSION AND SEDIMENT CONTROL REGULATIONS, U.S. DEPARTMENT OF AGRICULTURE, AND U.S. NATURAL RESOURCES CONSERVATION SERVICE REGULATIONS.
3. THE CONTRACTOR SHALL CONTINUOUSLY MAINTAIN ALL EROSION CONTROL DEVICES AND STRUCTURES TO MINIMIZE EROSION.
4. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED CONTINUOUSLY, RELOCATED WHEN AND AS NECESSARY, AND SHALL BE CHECKED AFTER EVERY RAINFALL. SEEDED AREAS SHALL BE CHECKED REGULARLY AND SHALL BE WATERED, FERTILIZED, RE–SEEDED, AND MULCHED AS NECESSARY TO OBTAIN A DENSE STAND OF GRASS. IF ANY MEASURE IS FOUND TO BE DAMAGED, DEFICIENT, OR UNSTABLE IT SHALL BE REPAIRED IMMEDIATELY.
5. DISTURBED AREAS THAT ARE NOT OTHERWISE STABILIZED SHALL BE AMENDED AND SEEDED, TEMPORARILY OR PERMANENTLY IN ACCORDANCE WITH THE NORTH CAROLINA SEDIMENT CONTROL REGULATIONS. PERMANENT SEEDING AND GRASS ESTABLISHMENT ARE REQUIRED PRIOR TO PROJECT COMPLETION AND ACCEPTANCE.
6. ALL PERIMETER DIKES, SWALES, DITCHES, PERIMETER SLOPES AND ALL SLOPES STEEPER THAN 3:1 SHALL BE PROVIDED TEMPORARY OR PERMANENT STABILIZATION WITH GROUND COVER WITHIN 7 DAYS OF ANY LAND–DISTURBING ACTIVITY.
7. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 14 DAYS AFTER FINAL SITE STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED. TRAPPED SEDIMENT AND DISTURBED SOIL AREAS RESULTING FROM THE DISPOSITION OF TEMPORARY MEASURES SHALL BE PERMANENTLY STABILIZED TO PREVENT FURTHER EROSION AND SEDIMENTATION.
8. WHERE SEDIMENT IS TRANSPORTED ONTO A PAVED OR PUBLIC ROAD SURFACE, THE ROAD SURFACE SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM THE ROADS BY SHOVELING OR SWEEPING AND TRANSPORTED TO A SEDIMENT CONTROL DISPOSAL AREA. STREET WASHING SHALL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER.
9. A CONSTRUCTION ENTRANCE SHALL BE INSTALLED AT ALL ACCESS POINTS FROM ANY PUBLIC ROAD. WHEN A CRUSHED STONE CONSTRUCTION ENTRANCE HAS BEEN COVERED WITH SOIL OR HAS BEEN PUSHED INTO THE SOIL BY CONSTRUCTION TRAFFIC, IT SHALL BE REPLACED WITH A DEPTH OF STONE EQUAL TO THAT OF THE ORIGINAL APPLICATION.
10. ALL DRAINAGE INLETS SHALL BE PROTECTED FROM SILTATION. INEFFECTIVE PROTECTION DEVICES SHALL BE IMMEDIATELY REPLACED AND THE INLET CLEANED. FLUSHING IS NOT AN ACCEPTABLE METHOD OF CLEANING.
11. DURING CONSTRUCTION OF THE PROJECT, SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE TEMPORARY PROTECTION AND PERMANENT STABILIZATION OF ALL SOIL STOCKPILES ON SITE AS WELL AS SOIL INTENTIONALLY TRANSPORTED FROM THE PROJECT SITE.
12. SEDIMENT BASINS AND TRAPS, PERIMETER DIKES, SEDIMENT BARRIERS, AND OTHER MEASURES INTENDED TO TRAP SEDIMENT SHALL BE CONSTRUCTED AS A FIRST STEP IN ANY LAND DISTURBING ACTIVITY AND SHALL BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE.
13. STABILIZATION MEASURES SHALL BE APPLIED TO STRUCTURES SUCH AS DAMS, DIKES, AND DIVERSIONS, IMMEDIATELY AFTER INSTALLATION.
14. ALL SILT BASINS, SILT TRAPS, AND SEDIMENT BASINS SHALL BE CLEANED OUT WHEN HALF OF THE CAPACITY HAS BEEN REACHED.
15. A PUMP AROUND OPERATION SHALL BE USED TO DIVERT FLOW DURING CONSTRUCTION.
16. CONSTRUCTION ACTIVITIES SHALL BE LIMITED TO AREA INSIDE THE CONSERVATION EASEMENT AND THE TEMPORARY CONSTRUCTION EASEMENT.

SITE PRESERVATION AGREEMENT:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ANY DAMAGE BY THE CONTRACTOR TO EXISTING FACILITIES INCLUDING BUT NOT LIMITED TO ROADS, GATES, FENCES, CURBS, AND UTILITIES. CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT ALL ACCESS LOCATIONS PER THE PLANS AND SPECIFICATIONS.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY IMPROVEMENT TO THE ROAD CONDITION, GATES, AND FENCES, REQUIRED FOR ACCESS DURING CONSTRUCTION.

EROSION CONTROL MEASURES DURING CONSTRUCTION:
DURING CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ADDITIONAL EROSION CONTROL MEASURES NOT SHOWN ON THE PLANS BUT NECESSARY TO CONTROL EXCESS SEDIMENT, IF DETERMINED BY THE ENGINEER.

STAGING AND STOCKPILE AREAS:
SPECIFIED AREAS SHOWN ON THE PLANS HAVE BEEN ESTABLISHED AS STAGING AND STOCKPILE AREAS. THE CONTRACTOR MAY ESTABLISH ADDITIONAL STAGING AND STOCKPILE AREAS ALONG THE PROJECT, AS NECESSARY, TO CARRY OUT THE WORK. ALL STAGING AND STOCKPILE AREAS MUST BE INSIDE THE LIMITS OF DISTURBANCE AND APPROVED BY THE ENGINEER. SILT FENCE SHALL BE REQUIRED IN AREAS WHERE LOOSE SOIL HAS BEEN PLACED IN THE STAGING AND STOCKPILE AREAS.

MISCELLANEOUS:
THE CONTRACTOR SHALL BE RESPONSIBLE FOR HAVING A RAIN GAUGE ON THE PROJECT SITE AND FOR RECORDING DAILY RAINFALL AMOUNTS DURING CONSTRUCTION.

PHASING OF WORK:

1. CONSTRUCT PIPE CROSSING ON JERRY BRANCH UPSTREAM OF RESTORATION WORK. CONSTRUCT JERRY BRANCH FROM STA 300+35 TO STA 317+24. THIS PHASE INCLUDES CONSTRUCTION OF HUDSON BRANCH.
2. CONSTRUCT DALE BRANCH FROM STA 200+00 TO STA 234+50.
3. CONSTRUCT PIPE CROSSING ON THOMPSON CREEK UPSTREAM OF RESTORATION WORK. CONSTRUCT THOMPSON CREEK FROM STA 100+00 TO STA 116+61.

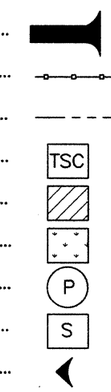
CONSTRUCTION SEQUENCE

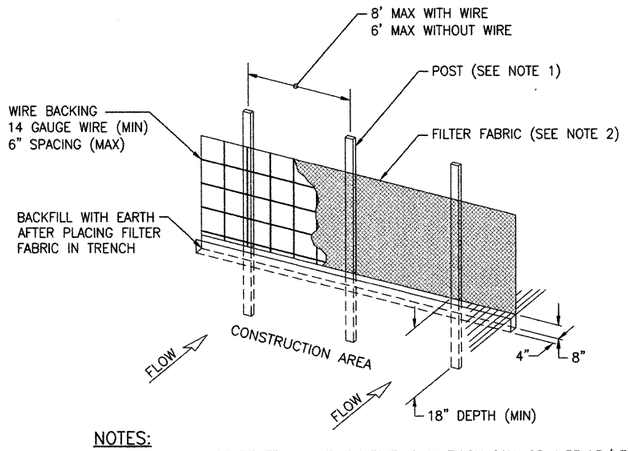
THE CONTRACTOR SHALL FOLLOW THE SEQUENCE OF CONSTRUCTION IN ACCORDANCE WITH THE PLANS AND AS DIRECTED BY THE ENGINEER.

THE CONTRACTOR SHALL CONDUCT STREAM WORK, INCLUDING INSTALLATION OF IN–STREAM STRUCTURES, GRADING, STABILIZATION MEASURES, AND SEEDING AND MULCHING, ON A SECTION OF STREAM THAT CAN BE ENTIRELY COMPLETED IN A SINGLE DAY.

1. THE CONTRACTOR SHALL IDENTIFY THE PROJECT BOUNDARY, LIMITS OF DISTURBANCE, SENSITIVE AREAS, STAGING AREAS, AND CONSTRUCTION ENTRANCES WITH THE ENGINEER.
2. THE CONTRACTOR SHALL PREPARE STABILIZED CONSTRUCTION ENTRANCES AS INDICATED ON THE PLAN.
3. THE CONTRACTOR SHALL MOBILIZE EQUIPMENT, MATERIALS, PREPARE STAGING AREAS, AND STOCKPILE AREAS AS SHOWN ON THE PLANS.
4. CONSTRUCTION TRAFFIC TO BE LIMITED TO 'LIMITS OF DISTURBANCE' AS INDICATED ON THE CONSTRUCTION PLANS AND AS DIRECTED BY THE ENGINEER.
5. THE CONTRACTOR SHALL INSTALL ALL TEMPORARY ROCK CHECK DAMS, SILT FENCE, TREE PROTECTION FENCE, AND MULCHING AROUND ALL CONSTRUCTION AREAS INCLUDING STAGING AND STOCKPILE AREAS AS INDICATED ON THE CONSTRUCTION PLANS AND AS DIRECTED BY THE ENGINEER.
6. THE CONTRACTOR SHALL INSTALL ALL TEMPORARY STREAM CROSSINGS AS SHOWN ON THE PLANS. DITCHES AND STREAM REACHES WILL BE LEFT OPEN DURING INITIAL PHASES OF CONSTRUCTION TO ALLOW FOR DRAINAGE AND TO KEEP SITE ACCESSIBLE.
7. 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.
8. THE CONTRACTOR SHALL BEGIN CLEARING, FLOODPLAIN EXCAVATION, AND GRADING WORK TO DESIGN GRADES AT THE UPSTREAM END OF EACH CHANNEL AS INDICATED ON THE CONSTRUCTION PLANS. THE CONTRACTOR SHALL NOT DISTURB ANY MORE FLOODPLAIN AREA LARGER AND STREAM REACH LONGER THAN CAN STABILIZED IN ONE DAY.
9. ONCE A SECTION OF STREAM AND FLOODPLAIN HAVE BEEN EXCAVATED TO DESIGN GRADES, IN–STREAM STRUCTURES, MATTING, AND TRANSPLANTS SHALL BE INSTALLED IN THAT SECTION. EXISTING BED MATERIAL SHALL BE HARVESTED AND PLACED IN THE CONSTRUCTED CHANNEL DURING PUMP–AROUND OPERATIONS SO THAT BOTH CHANNELS ARE IN THE DRY DURING CONSTRUCTION ACTIVITIES.
10. THE CONTRACTOR SHALL BEGIN INSTALLING IN–STREAM STRUCTURES FROM THE UPSTREAM SECTION WORKING DOWNSTREAM. **ALL CONSTRUCTION WORK IS TO BE PERFORMED IN THE DRY** UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR OTHER REGULATORY AGENCY. IF EXCESSIVE SEDIMENTATION DOWNSTREAM BECOMES A CONCERN, THE ENGINEER OR PROJECT MANAGER IN CHARGE MAY DIRECT THE CONTRACTOR TO INSTALL A TEMPORARY ROCK CHECK DAM AND SETTLING BASIN DOWNSTREAM. THIS AREA IS TO BE MAINTAINED ON A REGULAR BASIS BY THE CONTRACTOR.
11. ONCE A STREAM WORK PHASE IS COMPLETE, THE CONTRACTOR WILL APPLY TEMPORARY SEEDING, PERMANENT SEEDING, AND MULCH TO ALL AREAS DISTURBED DURING CONSTRUCTION. TEMPORARY AND PERMANENT SEEDING MIXTURES WILL BE APPLIED AS SHOWN ON THE PLANTING PLAN. TEMPORARY SEEDING WILL BE APPLIED IN ALL AREAS SUSCEPTIBLE TO EROSION SUCH THAT GROUND COVER IS ESTABLISHED WITHIN 7 WORKING DAYS FOLLOWING COMPLETION OF ANY GRADING PHASE. PERMANENT GROUND COVER WILL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS FOLLOWING COMPLETION OF CONSTRUCTION.
12. ALL SEEDING AND MULCHING SHALL BE COMPLETED BEFORE LEAVING THE PROJECT SITE ALONG WITH REMOVAL OF ANY TEMPORARY STREAM CROSSINGS AND TEMPORARY CHECK DAMS.
13. THE CONTRACTOR OR OTHER QUALIFIED PERSONNEL SHALL PLANT ALL WOODY VEGETATION AND INSTALL LIVE STAKING ACCORDING TO THE PLANTING DETAILS AND SPECIFICATIONS. ALL PERMANENT SEEDING AND PLANTINGS SHALL BE PERFORMED DURING THE APPROPRIATE TIME OF YEAR.
14. THE CONTRACTOR SHALL ENSURE THAT THE SITE IS FREE OF TRASH AND LEFTOVER MATERIALS PRIOR TO DEMOBILIZATION OF EQUIPMENT FROM THE SITE.

SEDIMENT & EROSION CONTROL LEGEND

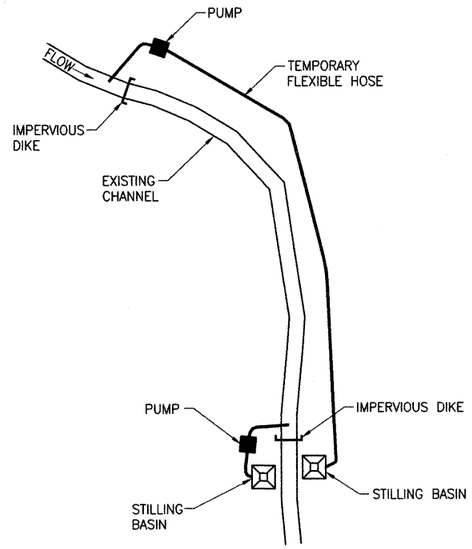




NOTES:

1. POSTS SHALL BE EITHER 4-IN THICK PINE, 2-IN THICK OAK, OR 1.33 LB/LF STEEL WITH A MINIMUM LENGTH OF 4-FT. STEEL POSTS SHALL HAVE PROJECTIONS TO FACILITATE FASTENING FABRIC.
2. FILTER FABRIC SHALL MEET THE FOLLOWING:
   A) MINIMUM WIDTH OF 36 INCHES.
   B) EOS NOT LARGER THAN U.S. STANDARD SIEVE NO. 70
   C) GRAB STRENGTH 90-120 LB.
   D) CONFORM TO ASTM D-1682 OR ASTM D-177
3. SILT FENCES TO BE INSTALLED IN LOCATIONS AS SHOWN ON THE EROSION AND SEDIMENT CONTROL PLAN AND AS DIRECTED BY THE ENGINEER PRIOR TO BEGINNING OF CONSTRUCTION TO CONTROL SEDIMENT.
4. SILT FENCES TO BE MAINTAINED AND CLEANED AS NECESSARY TO MAINTAIN IN FUNCTIONAL CONDITION. SILT FENCES SHALL BE INSPECTED AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL EVENT.
5. SILT FENCES TO BE REMOVED AND THE AREA TO BE RESTORED TO ITS NATURAL CONDITION WHEN PERMANENT EROSION AND SEDIMENT CONTROL PROCEDURES ARE EFFECTIVE.

TEMPORARY SILT FENCE
N.T.S.



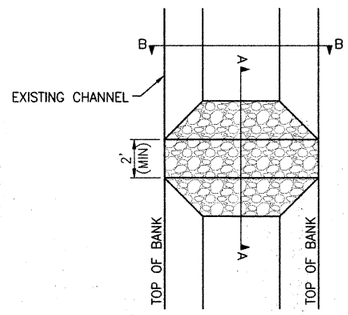
SEQUENCE OF CONSTRUCTION FOR TYPICAL PUMP-AROUND

1. INSTALL STILLING BASINS.
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE. (DOWNSTREAM DIKE FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED WITHIN THE PUMP-AROUND AREA BETWEEN THE IMPERVIOUS DIKES. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS DIKES.
8. REMOVE STILLING BASINS AND BACKFILL. STABILIZED DISTURBED AREA WITH SEED AND MULCH.

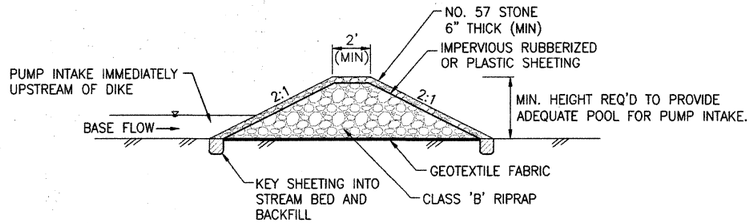
NOTES:

1. ALL EXCAVATION SHALL BE PERFORMED IN ONLY DRY OR ISOLATED SECTIONS OF THE CHANNEL.
2. IMPERVIOUS DIKES ARE TO BE USED TO ISOLATE WORK FROM STREAM FLOW WHEN NECESSARY.
3. ALL GRADED AREAS SHALL BE STABILIZED WITHIN 24 HOURS.
4. MAINTENANCE OF STREAM FLOW OPERATION SHALL BE INCIDENTAL TO THE WORK. THIS INCLUDES SHEETING, DIVERSIONS PIPES, PUMPS AND HOSES.
5. PUMPS AND HOSES SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA.

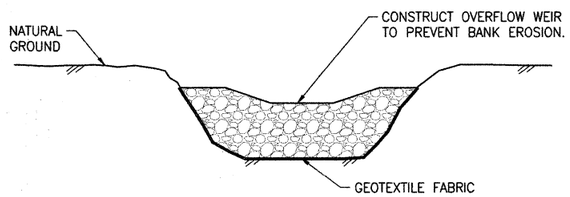
PUMP-AROUND OPERATION (TYP)
N.T.S.



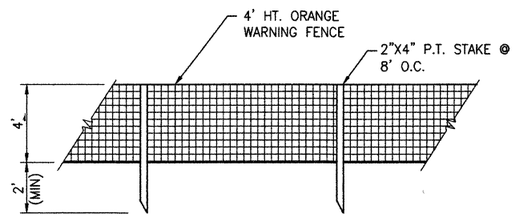
IMPERVIOUS DIKE PLAN
N.T.S.



IMPERVIOUS DIKE SECTION A-A
N.T.S.

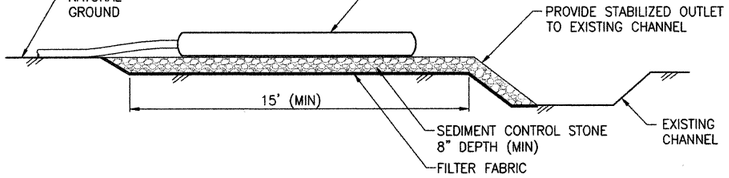


IMPERVIOUS DIKE SECTION B-B
N.T.S.

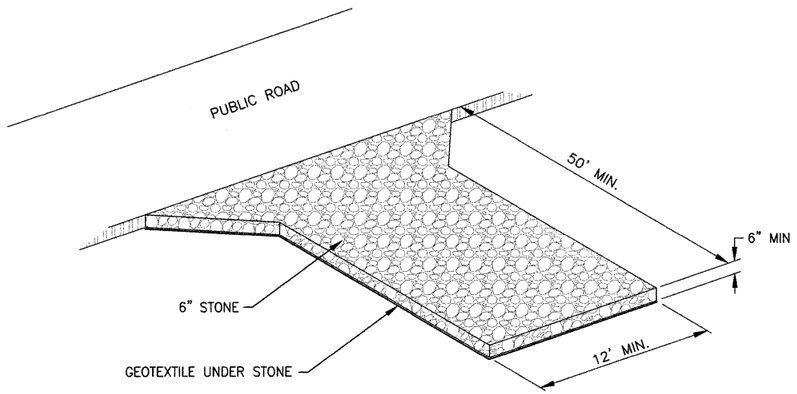


NOTE:
PROVIDE FENCE AS SHOWN ON PLAN. PROVIDE AT LEAST ONE FOOT OF DISTANCE FROM TREE TO FENCE FOR EACH INCH OF TREE DBH. LOCATE FENCE OUTSIDE OF CRITICAL ROOT ZONE.

TREE PROTECTION FENCE
N.T.S.



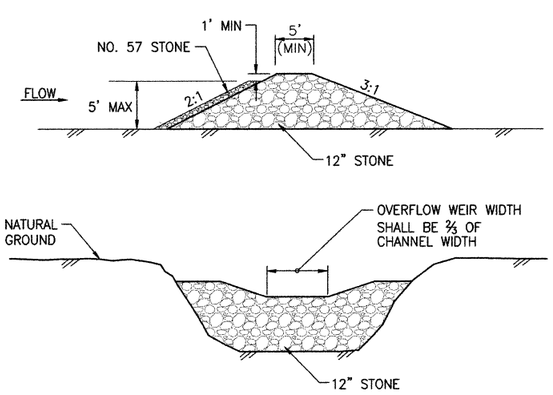
SPECIAL STILLING BASIN WITH ROCK PAD
N.T.S.



NOTES:

1. MAINTAIN CONSTRUCTION ENTRANCE IN CONDITION NECESSARY TO PREVENT MUD OR SEDIMENT FROM LEAVING THE SITE.
2. IMMEDIATELY REMOVE ANY OBJECTIONABLE MATERIAL SPILLED, WASHED, OR TRACKED ONTO PUBLIC ROADWAYS.

CONSTRUCTION ENTRANCE
N.T.S.



TEMPORARY ROCK CHECK DAM
N.T.S.

Wolf Creek Engineering
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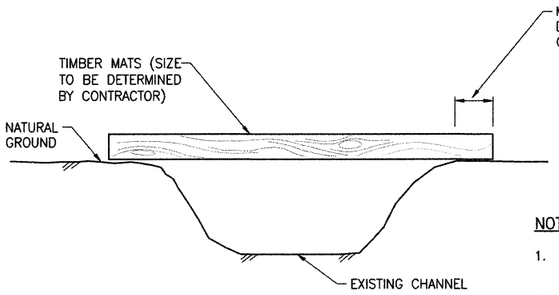
NORTH CAROLINA PROFESSIONAL SEAL 027761 ENGINEER GRANT GINN 1/9/14

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **EROSION CONTROL DETAILS**

SCALE	AS NOTED	DRWN. BY	cmc	PROJECT NO.	DRAWING NUMBER
DATE	1/9/2014	CHKD. BY	SGG	1058	EC-3

DATE	BY	REV.	DESCRIPTION

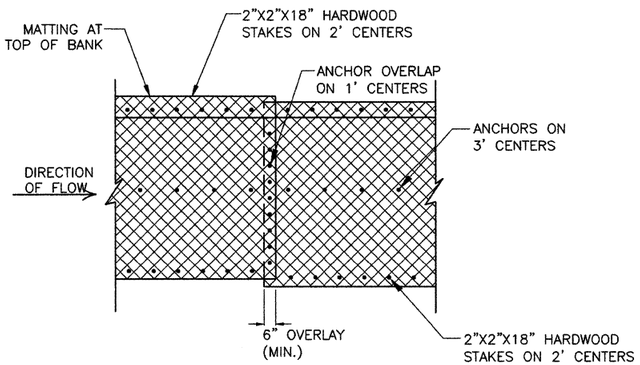


TEMPORARY STREAM CROSSING TIMBER MAT

N.T.S.

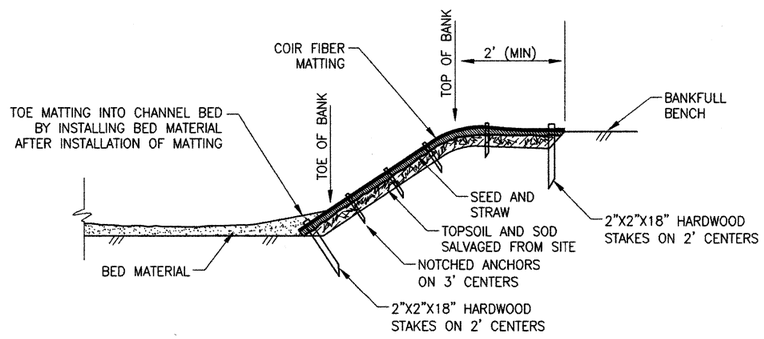
NOTES

1. CONTRACTOR SHALL USE TIMBER MATS FOR ALL TEMPORARY STREAM CROSSINGS EXCEPT WHERE PERMANENT PIPE OR FORD CROSSINGS ARE USED.
2. TIMBER MATS ARE TO BE SUFFICIENTLY LONG TO EXTEND BEYOND THE BANK SO THAT BANK FAILURE IS PREVENTED.
3. ALL TEMPORARY STREAM CROSSINGS SHALL BE MAINTAINED IN GOOD WORKING CONDITION. REGULAR INSPECTION AND MAINTENANCE OF CROSSINGS IS THE RESPONSIBILITY OF THE CONTRACTOR.



COIR FIBER MATTING DETAIL PLAN VIEW

NOT TO SCALE



BANK PROTECTION SOD AND MAT

NOT TO SCALE

NOTES:

1. COIR MATTING TO BE UNDERLAIN BY TOPSOIL/SOD, SEED AND STRAW.
2. MATTING SHALL BE INSTALLED PRIOR TO THE INTRODUCTION OF WATER TO A STREAM SECTION.

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NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER GRANT GINN 1/9/14

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **EROSION CONTROL DETAILS**

SCALE	AS NOTED	DRWN. BY	cme	PROJECT NO.	DRAWING NUMBER
DATE	1/9/2014	CHKD. BY	SGG	1058	EC-3A

DATE	BY	REV.	DESCRIPTION

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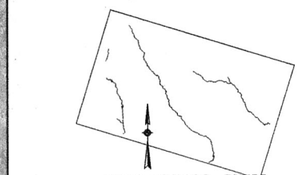
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

NORTH CAROLINA PROFESSIONAL SEAL 037767 ENGINEER GRANT GINN

PROJECT	PEE DEE STREAM RESTORATION
OWNER	ENVIRONMENTAL BANC AND EXCHANGE
TITLE	EROSION CONTROL SITE PLAN

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	EC-4
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

PEE DEE ROAD

HUDSON BRANCH

JERRY BRANCH

CONSERVATION EASEMENT BOUNDARY

PROPOSED TEMPORARY HUAL ROUTE

PROPOSED LIMITS OF DISTURBANCE

DALE BRANCH

THOMPSON BRANCH

150 0 150 450

SCALE IN FEET

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NORTH CAROLINA PROFESSIONAL SEAL 027677 ENGINEER GRANT GINN 1/9/14

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **EROSION CONTROL PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	EC-5
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

PEE DEE ROAD

PROPOSED HUDSON BRANCH

P3 S3 P4 S2 TSC

MATCHLINE SHEET EC-6

PROPOSED PERMANENT STREAM CROSSING (PIPED)

P1 S1

P2

EXISTING FARM ROAD

USE EXISTING FARM ROAD FOR HAUL ROUTE

EXISTING FARM ROAD

MATCHLINE SHEET EC-7 & EC-8

50 0 50 150
SCALE IN FEET

JERRY BRANCH

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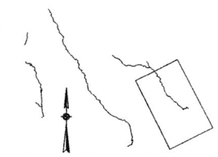
NORTH CAROLINA PROFESSIONAL SEAL 027767 ENGINEER SGT GRANT GINN 1/9/14

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **EROSION CONTROL PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	EC-6
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

MATCHLINE SHEET EC-5

PROPOSED JERRY BRANCH

PROPOSED BMP

TSC

P5

S4

S5

USE EXISTING FARM ROAD FOR HAUL ROUTE

PROPOSED TEMPORARY HAUL ROUTE

EXISTING FARM ROAD

PROPOSED PERMANENT STREAM CROSSING (PIPED)

P6

TSC

S6

EXISTING FARM ROAD

50 0 50 150
SCALE IN FEET

JERRY BRANCH

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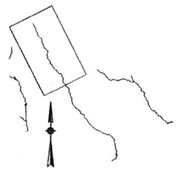
NORTH CAROLINA PROFESSIONAL SEAL 021761 ENGINEER GRANT GINN

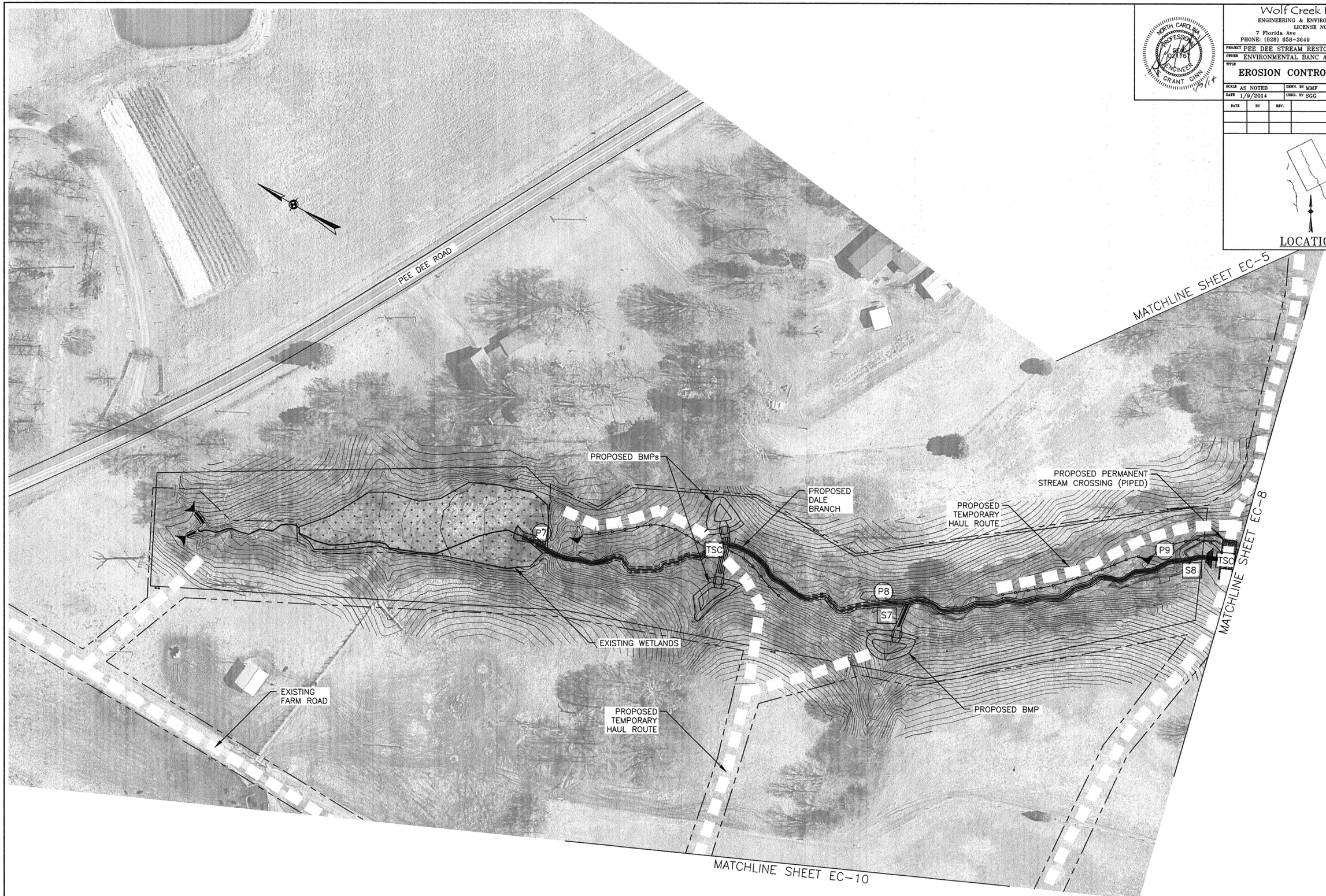
PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **EROSION CONTROL PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	EC-7
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LOCATION KEY



50 0 50 150
SCALE IN FEET

DALE BRANCH

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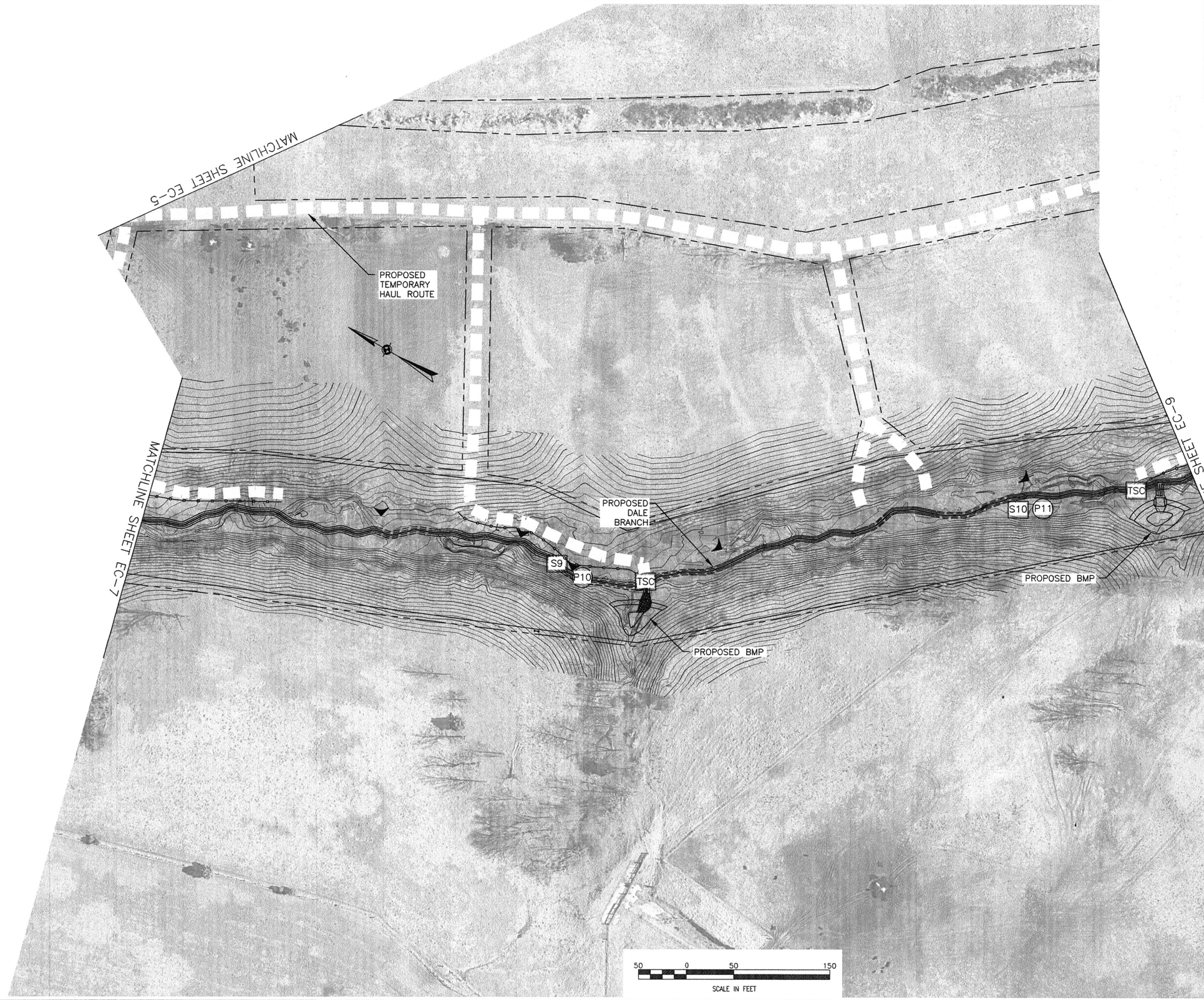
NORTH CAROLINA PROFESSIONAL SEAL 021763 ENGINEER GRANT GINN 1/9/14

PROJECT PEE DEE STREAM RESTORATION
OWNER ENVIRONMENTAL BANC AND EXCHANGE
TITLE **EROSION CONTROL PLANS**

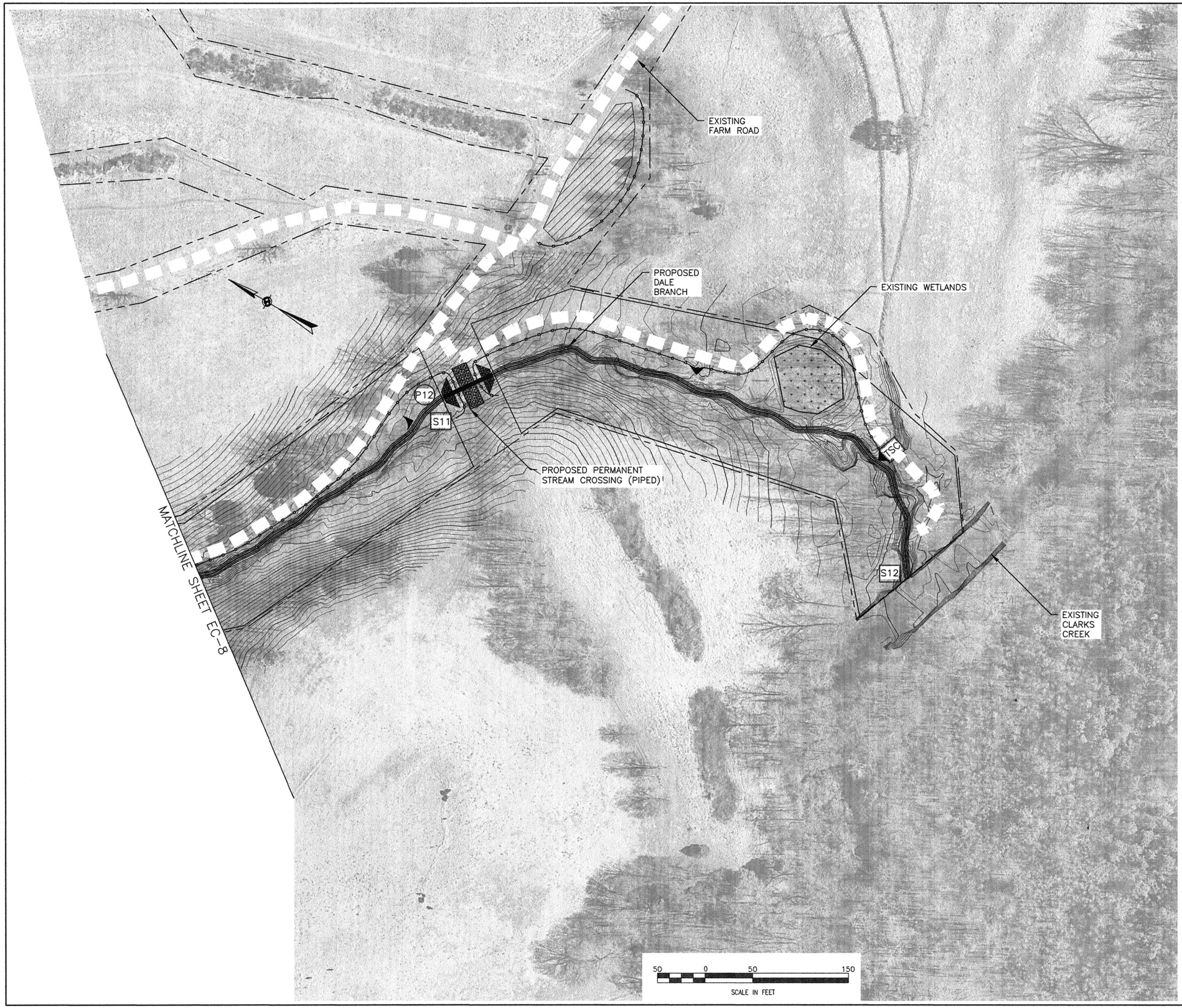
SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	EC-8
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

LOCATION KEY



DALE BRANCH



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NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER S. GRANT GINN

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **EROSION CONTROL PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	EC-9
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

DALE BRANCH

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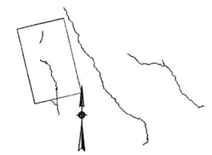
NORTH CAROLINA PROFESSIONAL SEAL 021767 ENGINEER S. GRANT GINN 1/9/14

PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **EROSION CONTROL PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	EC-10
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



LOCATION KEY

MATCHLINE SHEET EC-7

PROPOSED TEMPORARY HAUL ROUTE

EXISTING FARM ROAD

PROPOSED PERMANENT STREAM CROSSING (PIPED)

P13 S13 P14 S14 P15 S15 P16 S16 P17

PROPOSED THOMPSON CREEK

MATCHLINE SHEET EC-11

50 0 50 150
SCALE IN FEET

THOMPSON CREEK

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PROJECT: PEE DEE STREAM RESTORATION
OWNER: ENVIRONMENTAL BANC AND EXCHANGE
TITLE: **EROSION CONTROL PLANS**

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	MMF	1058	EC-11
DATE 1/9/2014	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

NORTH CAROLINA PROFESSIONAL SEAL 032176 ENGINEER GRANT GINN

LOCATION KEY

MATCHLINE SHEET EC-10

USE EXISTING PIPED CROSSING

P18

S17

TSC

S18

PROPOSED PERMANENT STREAM CROSSING (PIPED)

50 0 50 150
SCALE IN FEET

THOMPSON CREEK