OAKLEY CROSSROADS
STREAM & BUFFER RESTORATION

FINAL AS-BUILT & BASELINE MONITORING REPORT

Pitt County, North Carolina
SCO Project Number 050659701
EEP Project Number 273

Prepared for:
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

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Prepared by:

Stantec Consulting Services, Inc.
801 Jones Franklin Road, Suite 300
Raleigh, NC 27606

EXECUTIVE SUMMARY

The As-Built/Baseline Monitoring Report presented here includes the monitoring plan success criteria, methodology, and baseline conditions for the Oakley Crossroads Stream and Buffer Restoration site. This northern Pitt County, North Carolina site is located four miles south of the Town of Robersonville. The unnamed tributary (UT) flows from west to east through the permanent conservation easement before discharging into Tranters Creek.

The overall goal of the Oakley restoration project was to improve water quality and wildlife habitat by restoring a stable stream and riparian buffer system to the project site. The objectives of the project were to restore stream stability and improve aquatic habitat, restore riparian buffer along the stream channel, preserve riverine wetlands, establish a wildlife corridor, divert an unbuffered agricultural ditch system from the stream channel to an irrigation pond, and establish native vegetation within the permanent conservation easement. Located within the Tar-Pamlico River basin, this project was instituted prior to October 11, 2007 and is therefore eligible for riparian buffer restoration credit up to 200 feet from the top of bank of all perennial and intermittent waterways within the conservation easement area.

Historically, the stream had been altered by vegetation removal, channel bed material removal, and grade alteration leading to unstable dimension, pattern, and profile. The pre-construction condition was a straightened, impounded stream with highly erosive banks (as per the results of a BEHI study conducted by Stantec). Major project components included restoration and enhancement of UT to Tranters Creek through Priority 2 restoration techniques, floodplain grading, and brush mattress installation. Another component of the project included the restoration of riparian buffers along the stream through the planting of native hardwood trees. Existing riverine wetlands are also being preserved within the permanent conservation easement.

All three sections of the stream will be visually monitored at least twice per year. A survey of the longitudinal profile and seven permanent cross-sections will be completed each year on section 1 and section 2. Section 3 will be visually assessed for stability. A crest gauge is located along section 1, near cross-section 3, and will be observed during each monitoring visit. At least two bankfull events must occur during the five year monitoring period with the events occurring in different years. Existing wetlands will be visually assessed twice each monitoring year.

Vegetative sample plots will be quantitatively monitored in the fall of each monitoring year. Nine vegetation plots will be monitored as per the CVS-EEP Protocol for Recording Vegetation, version 4.2 (CVS-EEP 2008). The plots will be monitored for a minimum of 5 years. The vegetative success of the restoration site will be evaluated based on the species density and survival rates. Vegetation monitoring will be considered successful for stream mitigation credit if at least 260 stems/acre (trees and shrubs), both volunteer and planted, are surviving at the end of five years. The interim measure of vegetative success for the site will be the survival of at least 320 3-year old stems per acre at the end of year three of the monitoring period and 280 4-year old stems per acre at the end of year four of the monitoring period. Vegetation monitoring will be considered successful for riparian buffer mitigation credit if at least 320 native planted hardwood stems/acre (trees only) are surviving at the end of year five. Planted vegetation must include a minimum of at least two planted native hardwood tree species. There is no interim measure of vegetative success for riparian buffers.

Results of the as-built survey in comparison to the design demonstrate that the constructed stream falls within the acceptable design range for profile and sediment transport capacity. In terms of dimension, the constructed stream generally exhibits a higher width, lower depth, and overall higher width-to-depth ratio than design parameters. However, the bankfull area is consistent with design. As a result, the constructed channel will have the ability to naturally adjust toward the intended E-type channel. Additionally, the results of the as-built survey show that 152 linear feet (LF) of restored stream has less than the required minimum 50 foot riparian buffer. These areas will be sought for stream mitigation credit (SMUs) at a mitigation ratio of 1:1 until guidance is released on stream credit for areas not meeting the 50 foot riparian buffer requirement.

Additionally, the results of the as-built survey baseline monitoring show that of the 18.05 acres of riparian buffer planted, 0.18 acres do not meet the minimum requirement of 50 feet buffer width from top of stream bank to the conservation easement boundary, 0.66 acres are greater than the maximum 200 feet from top of bank, and 0.2 acres cannot count towards riparian buffer credit (BMUs) due to the presence of two undiffuse waterways. Additionally, 0.12 acres of buffer cannot count towards BMUs, because they are not contiguous with the buffer area or they are replanting areas. The result is 16.89 acres that are eligible for riparian buffer credit.

Baseline vegetation monitoring revealed that the site was not planted with the required bare root density of 680 total stems/acre that was specified in the planting plan. Additionally, livestakes as per Change Order 3 were not planted. Also, brush mattresses will be monitored during the MY1 monitoring effort in September 2011 to assess whether they are establishing successfully. As per Stantec's discussions with NCEEP, it was decided that a threshold of 80% vegetative coverage constitutes successful establishment of brush mattresses. Where necessary, supplemental plantings will occur between January and March 2012 as per NCEEP's Vegetation Agreement with Ecosystems Grading Solutions, Inc.

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1.0 Project Goals, Background and Attributes

1.1 LOCATION AND SETTING

The Oakley Crossroads Stream and Wetland Restoration project is located approximately four miles south of Robersonville, North Carolina in northern Pitt County (Appendix A, Figure 1). The project is located within the Tar-Pamlico River Basin (NCDWQ Tranters Creek Subbasin 03-03-06) and the United States Geological Survey (USGS) 14-digit Hydrologic Unit Code 0302010309002. The 1.59 square mile project watershed is located in the eastern portion of the Coastal Plain Physiographic Province of North Carolina.

1.2 PROJECT GOALS AND OBJECTIVES

The project site stream, Tranters Creek, and the Tar River are nutrient sensitive waters (NCDWQ 2004). Agricultural land use practices in the area have narrowed or removed many natural vegetated buffers, as well as draining and converting many wet hardwood forests to cropland. The pre-construction condition was a straightened, impounded stream with highly erosive banks (as per the results of a BEHI study conducted by Stantec). The goal of the Oakley restoration project was to improve water quality and wildlife habitat by restoring a stable stream and riparian buffer system to the project site. This involved the Priority 2 restoration of the stream channel and associated riparian buffers, as well as the preservation of a bottomland hardwood wetland system along the restored stream channel. The restored site will provide a wildlife corridor between Tranters Creek and forested areas along Briery Swamp to the south.

Priority 2 stream restoration was carried out on the majority of the project stream of the Oakley site. This involved reconnecting the stream channel to its floodplain which will allow overbank flooding to more easily access existing riverine wetlands. Water quality functions will be improved due to floodplain processes, increased filtering of pollutants, and attenuation of floodwaters. The stream restoration also involved restoring riffle / pool sequences and adding structures to help stabilize the channel as well as add diversity to the instream habitat.

The primary design goal was to improve water quality and wildlife habitat by restoring a stable stream and wetland system to the project site. To achieve these goals the following objectives were identified:

- Provide a stable stream channel (3,789 linear feet of stream restoration and 329 linear feet of stream enhancement)
- Restore 18.05 acres (786,258 square feet) of riparian buffer along stream channel, 16.89 acres (735,728 square feet) of which are eligible for riparian buffer restoration credit
- Improve aquatic and terrestrial habitat along a tributary to Tranters Creek
- Establish a wildlife corridor between Tranters Creek and Briery Swamp to the south
- Preserve 1.37 acres of jurisdictional riverine wetlands

- Improve water quality by diverting an existing unbuffered agricultural ditch from the stream channel into the expanded Taylor pond allowing nutrients to filter out and providing the landowner with additional reclaimed water to irrigate agricultural fields.

1.3 PROJECT STRUCTURE, RESTORATION TYPE AND APPROACH

1.3.1 Project Structure

The project involved the restoration of 3,789 linear feet (LF) of stream, the enhancement of 329 LF of stream, the restoration of 16.89 acres (AC) of riparian buffer, and the preservation of 1.37 AC of riverine wetland. A recorded conservation easement of 26.6 AC will protect the stream and riparian buffers in perpetuity. Refer to Table 1 and Figure 2 in Appendix A for a table and detailed plan view of the project components.

1.3.2 Restoration Type and Approach

Historic land use practices in the Tranters Creek watershed maximized available land for agricultural uses, narrowing or removing many natural vegetative stream buffers as well as draining and converting many wet hardwood forests to cropland. Historically, the stream had been altered by vegetation removal, channel bed material removal, and grade alteration leading to unstable dimension, pattern, and profile. The purpose of the project was to restore a stable stream and riparian buffer system to the project site. The stream channel restoration was designed using Rosgen's Natural Channel Design Methodology (Rosgen, 1996).

A combination of Priority 2 restoration techniques and floodplain grading were used for the restoration portion of the project (section 1) along 3,789 LF of stream. The majority of the floodplain grading occurred on the upstream end of the project. As the restoration moved downstream, there was less need for floodplain grading. The channel slope was adjusted with the change in the existing floodplain slope. The channel design followed that of a stable E5 stream. A typical E5 stream is a slightly entrenched, meandering, sand dominated, riffle-pool channel with a well-developed floodplain (Rosgen, 1996). The E5 stream type is typical of coastal plain areas such as the Oakley Site. The stream was built off-line and wooden structures were installed to provide grade control and habitat. Brush mattresses were installed to enhance adequate riparian vegetation.

The right and left banks immediately downstream of the Briley culvert were highly eroded along approximately 40 feet of the stream (section 2). Dimension was restored to this section by installing log footers, backfilling the banks, installing brush mattresses, and live staking. An additional 289 LF (section 3) downstream of section 2 was planted with riparian buffer plantings along the left and right bank of the stream.

As part of the channel restoration, the flashboard riser system on the Briley portion of the stream was removed. Also, a low water, ford stream crossing was constructed at the Riley / Briley property line to replace a failed concrete slab bridge. Existing farm roads and stream crossings on the Taylor and Briley properties have remained in place.

The conservation easement was selectively planted as needed to restore riparian buffer. Existing forested areas outside of the construction limits were left as is, and existing desirable saplings were preserved as

much as possible. These forested areas do not count towards riparian buffer restoration square footage. This project was instituted prior to October 11, 2007 and is therefore eligible for riparian buffer restoration credit up to 200 feet from the top of bank of all perennial and intermittent waterways within the conservation easement area.

Although additional wetlands will likely establish in post-construction conditions, no wetland restoration or enhancement credit is being sought for this project due to the Priority 2 restoration approach. Wetland areas which were not planted are being sought for preservation credit.

1.4 PROJECT HISTORY, CONTACTS, AND ATTRIBUTE DATA

The restoration project was designed by Stantec Consulting Services Inc., with construction and planting on the project completed in May 2011. The as-built survey was also completed in May 2011.

The 1.59 square mile project watershed is located in the Coastal Plain Physiographic Province of North Carolina. Slopes in the watershed are generally less than four percent. Elevations on the Oakley project site range from 38 to 50 feet above mean sea level. The project site's watershed is rural with a mixture of forested lands, agricultural row crops and pasture, and scattered residential development. According to the soil survey for Pitt County (Soil Conservation Service, 1974) the majority of the easement is underlain by Bladen fine sandy loam and Pantego loam, both hydric soils. Other soils mapped within the easement include Coxville fine sandy loam, Craven fine sandy loam, Goldsboro sandy loam, Norfolk sandy loam, Ocilla loamy fine sand, Rains fine sandy loam and Wagram loamy sand.

Refer to Tables 2-4 in Appendix A for additional project and contact details.

2.0 Success Criteria

Channel stability and vegetation survival will be monitored on the project site. Post-restoration monitoring will be conducted for a minimum of five years or until the success criteria are met following the completion of construction to document project success.

2.1 MORPHOLOGIC PARAMETERS AND CHANNEL STABILITY

2.1.1 Dimension

Dimensional characteristics obtained from cross-sectional surveying on section 1 and section 2 will be compared year to year. All monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type. Natural variability is expected, however the system should not experience trends toward excessive increasing bank erosion, channel degradation, or channel aggradation. Section 3 involved riparian buffer planting as a stabilization technique to enhance stream function. Monitoring efforts for section 3 will focus on visual documentation of stability. Also, XS-7 is located just below the Briley culvert and will continue to be monitored.

2.1.2 Pattern and Profile

Wood structures were installed to maintain profile throughout the reach. The longitudinal profiles should show that the bedform features are remaining stable. The pools should remain deep with flat water surface slopes, and the riffles should remain steeper and shallower than the pools.

2.1.3 Substrate

Since the streams throughout the project site are dominated by sand-size particles, pebble count procedures would not show a significant change in bed material size or distribution over the monitoring period; therefore, as per NCEEP, bed material analyses will not be undertaken for this project.

2.1.4 Sediment Transport

Sediment transport evaluations will not be undertaken during the five-year monitoring period. However, the dimension, pattern, and profile survey for baseline conditions will be analyzed to calculate shear stress and stream power to determine if these values fall within the acceptable range of values for NC sandbed systems.

2.2 VEGETATION

The vegetative success of the restoration site will be evaluated based on the species density and survival rates. This project is generating both stream and riparian buffer mitigation assets. Vegetation success for these assets is measured in two ways. Stream mitigation units (SMUs) require 260 planted and volunteer native hardwood stems (trees and shrubs) per acre for a minimum of 5 years. Buffer mitigation units (BMUs) require 320 planted native hardwood stems (trees only) per acre for a minimum of 5 years. In accordance with North Carolina Division of Water Quality Administrative Code 15A NCAC 02B.0260 (TAR-PAMLICO RIVER BASIN, *Mitigation Program for Protection and Maintenance of Existing*

Riparian Buffers) '[planted vegetation] shall include a minimum of at least two native hardwood tree species planted at a density to provide 320 trees per acre at maturity." Also, for SMUs, the buffer must be at least 50-feet wide on both sides of the channel.

The interim measure of vegetative success for SMUs for the site will be the survival of at least 320 3-year old stems per acre at the end of year three of the monitoring period and 280 4-year old stems per acre at the end of year four monitoring period. There are no interim measures of vegetative success for BMUs.

During monitoring, any encroachments into the conservation easement should be reported to NCEEP and remediated.

2.3 HYDROLOGY

2.3.1 Streams

Two bankfull events must be documented within the five-year monitoring period for the restored stream. The two bankfull events must occur in separate years; otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years. One crest gauge was installed along the restored stream as depicted in Figure 2 in Appendix A. The gauge will be checked at each site visit to determine if a bankfull event has occurred. Other signs of bankfull flow including wrack lines, sediment deposition, and actual observance of flow will be documented as well.

2.3.2 Wetlands

Neither wetland restoration or enhancement credit is being sought for this project. As such, this section is not applicable.

3.0 Monitoring Plan Guidelines

3.1 HYDROLOGY

3.1.1 Wetland

Neither wetland restoration or enhancement credit is being sought for this project. Existing jurisdictional wetlands as depicted in Figure 2 in Appendix A are being preserved. These wetlands will be visually assessed during each monitoring year.

3.1.2 Stream

One crest gauge has been installed onsite. Each visit to the site will include documentation of the highest stage for the monitoring interval and a reset of the device. Other indications of bankfull flow including the presence of wrack lines, sediment, or flooding will also be recorded and documented photographically. Refer to Figure 2 in Appendix A for the location of the crest gauge.

3.2 STREAM CHANNEL STABILITY AND GEOMORPHOLOGY

3.2.1 Dimension

A total of 7 permanent cross-sections (4 riffles, 3 pools) have been installed along section 1 and section 2. Each cross-section was marked on both banks with permanent pins. A common benchmark has been established for cross-sections to facilitate comparison of year-to-year data. The annual cross-section survey will include points measured at all breaks in slope including top of bank, bankfull, inner berm, edge of water, and thalweg if the features are present. Dimensional data will be compared from year to year to ensure project stability. Stream channel stability and geomorphic monitoring for section 3 will be documented visually. Refer to Figure 2 in Appendix A for locations of cross-sections along section 1 and section 2, and the locations of photo station points. XS-7 is located just below the Briley culvert and will continue to be monitored.

3.2.1 Pattern and Profile

Annual measurements for the plan view of section 1 and section 2 will include sinuosity, meander width ratio, and radius of curvature. Radius of curvature measurements will be taken on newly constructed meanders for the first year of monitoring only. A longitudinal profile will be completed each year of the monitoring period for the entire length of section 1 and section 2. Measurements will include thalweg, water surface, inner berm, bankfull, and top of low bank. Each of these measurements will be taken at the head of each feature (e.g. riffle, run, pool, and glide).

3.2.2 Substrate

Since the streams throughout the project site are dominated by sand-size particles, pebble count procedures would not show a significant change in bed material size or distribution over the monitoring period; therefore, as per NCEEP, bed material analyses were not undertaken for this project.

3.2.1 Sediment Transport

As mentioned previously, additional sediment transport evaluations will not be undertaken during the five-year monitoring period. However, the dimension, pattern, and profile survey for baseline conditions will be analyzed to calculate shear stress and stream power of section 1 and section 2. These values will then be compared to the range of values for stable NC sandbed systems to determine if the restored stream's values are acceptable.

3.3 VEGETATION

Vegetative sample plots will be quantitatively monitored during September of each monitoring year. Nine vegetation plots will be monitored as per the CVS-EEP Protocol for Recording Vegetation, version 4.2 (CVS-EEP 2008). The plots will be monitored for a minimum of five years. Refer to Figure 2 in Appendix A for the locations of the vegetation plots. Baseline monitoring data is provided in the Appendix C data tables.

Nine 10m x 10m ($100m^2$) CVS plots were established within the project area. In each plot, four plot corners were permanently located with rebar. Planted vegetation (Level 1) was recorded for the baseline monitoring. Volunteer plant species (Level 2) will only be considered in vegetative success

determinations for the stream portion of this project. As such, volunteer plant species will be recorded for subsequent monitoring years in vegetation plots located within the 50 foot buffer of the restored stream. Refer to Figure 2 in Appendix A. In all vegetation plots, species composition, density, and survival of the planted vegetation will be monitored.

Any vegetative problem areas in the project will be noted and reported in each subsequent monitoring report. Vegetative problem areas may include areas that either lack vegetation or include populations of exotic vegetation.

3.4 PHOTO STATIONS

Representative photo station points have been identified and located using GPS. The stations are shown on Figure 2 in Appendix A. Photos will be taken at each location at approximately the same time each year. Vegetation plot photos will be taken during the vegetation monitoring event each year.

3.5 MONITORING PLAN VIEW

A plan view of the monitoring scheme is presented in Figure 2 in Appendix A.

3.6 MAINTENANCE AND CONTINGENCY PLANS

Any maintenance needs will be determined during monitoring visits. During the baseline monitoring year upon completion of construction, the contractor must address any issues under their warranty. In subsequent monitoring years, the monitoring firm will determine maintenance needs. Maintenance items will be coordinated with NCEEP to determine the appropriate course of action. The monitoring firm will visually assess the site to verify that the stream and buffer are functioning as needed and will note any adjustments that may be necessary.

According to the Restoration Plan, it is not anticipated that invasive species will be a significant problem on the Oakley Restoration Site. However, the historic presence of beaver and nutria may signify the need for future wildlife management. Wildlife, including but not limited to beavers and deer, have the potential to destroy vegetation and stream features either by foraging or flooding. Should a significant portion of the site be damaged such that the success criteria cannot be achieved, measures such as trapping, beaver dam removal, or repellents may be used. During monitoring, any potential encroachments into the conservation easement will be reported to NCEEP.

During construction, the following concerns were observed and will be closely monitored. These include: honeysuckle in existing forested areas within the easement, nutria (which caused bank damage during construction), beavers downstream of the project site, nuisance aquatic vegetation (water starwort, *Callitriche heterophylla*) in channel during contruction, and juncus growing in the channel which may impede flow.

Additionally, during the construction Final Walk-Through (July 14, 2011), concern was expressed by NCEEP that some brush mattresses were not establishing adequately. Upon further discussion it was decided that a threshold of 80% vegetative coverage constitutes successful establishment of brush mattresses, and that all brush mattresses on the site are currently meeting or exceeding that threshold. Brush mattresses will be visually assessed during the MY1 monitoring effort in September of 2011. Any

brush mattress areas not meeting this criterion will be noted. If necessary, supplemental planting will occur in any deficient areas between January and March of 2012, as per NCEEP's Vegetation Agreement with Ecosystems Grading Solutions, Inc.

Also during the Final Walk-Through, it was noted that livestakes per Change Order 3 had not been planted. The intended planting areas per Change Order 3 (upstream and downstream of the Taylor and Briley culverts and near cross-section 7) will be planted between January and March of 2012, as per NCEEP's Vegetation Agreement with Ecosystems Grading Solutions, Inc. Livestake density in other areas of the site were not assessed during the Final Walk-Through and will instead be handled at the end of the warranty period.

4.0 As-Built Conditions / Baseline

4.1 AS-BUILT/RECORD DRAWINGS

Site grading was completed in May 2011. Planting was completed in May 2011 and the baseline vegetation data collection occurred on June 14, 2011. The as-built survey was performed by Turner Land Surveying from April 7-8 and May 5-7, 2011. Baseline morphological surveying was completed by Stantec on June 19, 2011. The As-Built Plan Sheets are located in Appendix D.

4.2 BASELINE DATA (YEAR 0)

4.2.1 Channel Morphology

4.2.1.1. Profile

The entire length of the Oakley restoration reach was surveyed by Stantec staff using survey-grade GPS to assess baseline conditions. Multiple parameters were located including top of bank, thalweg, and water surface. The longitudinal profile is shown in Appendix B. Comparison of the as-built profile data with the design data indicates that construction is consistent and within the acceptable design range.

4.2.1.2. Dimension

Seven cross sections on the restoration reach were surveyed by Stantec staff. Baseline morphological data is presented in Tables 5 and 6 in Appendix B, along with cross-sectional data at the seven permanent cross sections. Comparison of the as-built data with the design data indicates that, in general, the constructed sections exhibit a higher width, lower depth and overall higher width-to-depth ratio. The bankfull area is consistent with design. As a result, the constructed channel will have the ability to naturally adjust toward the intended E-type channel.

4.2.1.3. Pattern

The pattern of the restoration reach was picked up during both the as-built survey and the baseline morphology survey. The location is shown on both the component map in Appendix A as well as in the As-Built plan sheets in Appendix D. Morphological calculations are included in Table 5 in Appendix B. The pattern values lie within the design parameters for a stable channel.

4.2.1.4. Substrate

Since the stream throughout the project site is dominated by sand-size particles, pebble count procedures would not show a significant change in bed material size or distribution over the monitoring period; therefore as per NCEEP, bed material analyses were not undertaken for this project.

4.2.1.5. Sediment Transport

Sediment transport evaluations consisted of two characteristics: shear stress and stream power. Shear stress is a function of the specific gravity of water, riffle cross-section geometry, and average channel

slope. Stream power is a function of specific weight of water, bankfull discharge, average channel slope, and riffle bankfull width. These factors were calculated with the data gathered through the measurement of the plan, pattern, and profile. Comparison of the as-built sediment competency and capacity indicates consistency with the design intent to reduce sediment transport.

4.2.2 Verification of Plantings

Stantec staff completed the baseline vegetation monitoring on June 14, 2011 using the CVS-EEP Protocol for Recording Vegetation, version 4.2 (CVS-EEP 2008). Monitoring was conducted in nine vegetation plots. Vegetation plots 2, 5, and 7 are located in the riverine bottomland hardwood forest planting zone. Plots 1, 3, 4, 6, 8, and 9 are located in the mesic mixed hardwood forest planting zone. Plots 2, 5, and 7 lay completely within the 50 foot stream buffer.

According to the data collected, the average density of planted trees among the nine plots is 396 stems/acre. The average density of planted trees and shrubs is 418 stems/acre. All three of the plots within the 50 foot stream buffer (Plots 2, 5, and 7) are currently meeting the interim 3-year vegetation success criteria of 320 stems/acre (trees and shrubs). Plots 1 and 9 are failing the riparian buffer vegetation success criteria of 320 planted trees/acre. The original planting plan specified 680 total stems/acre. All vegetation plots except Plot 8 are failing to meet the planting plan specifications of 680 total stems/acre, by more than 10%. Vegetation sampling details are included in Appendix C.

During the construction Final Walk-Through conducted on July 14, 2011, several vegetation problem areas were observed. As discussed above, it was noted that the bare root planting density was not to planting plan specifications of 680 total stems/acre. Additionally, it was noted that livestakes as per Change Order 3 had not been planted. The one hundred livestakes were to have been planted on both banks upstream and downstream of the Taylor and Briley culverts and in the area near cross-section 7.

During baseline vegetation monitoring invasive species were observed in the project area. NCEEP will conduct treatment for invasive plants this fall, including treatment for honeysuckle in areas that were not planted, water starwort (an aggressive, but not invasive aquatic weed) in the restored channel, and Chinese privet and honeysuckle in the easement area along section 3.

It should be noted that due to conservation easement constraints, approximately 152 LF of section 1 fell short of the required 50 foot riparian buffer along the right bank. These areas are depicted in Figure 2b Appendix A. These areas have also been deducted from the acreage that is eligible for riparian buffer credit. Additionally, a left bank easement was not acquired along section 3 of the stream. However, an easement was acquired along the right bank and that area was planted. This area qualifies for buffer restoration credit.

4.2.3 Photo Documentation

Photo stations were established in 25 locations along the project. The location of the stations can be seen in Figure 2 in Appendix A. Baseline vegetation station photos were taken on June 14, 2011 during the baseline vegetation monitoring. Vegetation station photos for the baseline monitoring year are provided in Appendix C. Baseline stream station photos were taken on June 19, 2011. Stream station photos for the baseline monitoring year are provided in Appendix B.

4.2.4 Hydrology

A crest gauge was installed onsite on June 14, 2011. The crest gauge will be used in future monitoring to verify bankfull events. The location of the crest gauge is included in Figure 2 in Appendix A.

5.0 References

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United States Department of Agriculture-Soil Conservation Service, 1974. Soil Survey of Pitt County, North Carolina. Greenville, NC.

6.0 Appendices

Appendix A – General Tables and Figures

Appendix B – Morphological Summary Data and Plots

Appendix C – Vegetation Data

Appendix D – As-Built Plan Sheets

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Appendix A - General Tables and Figures

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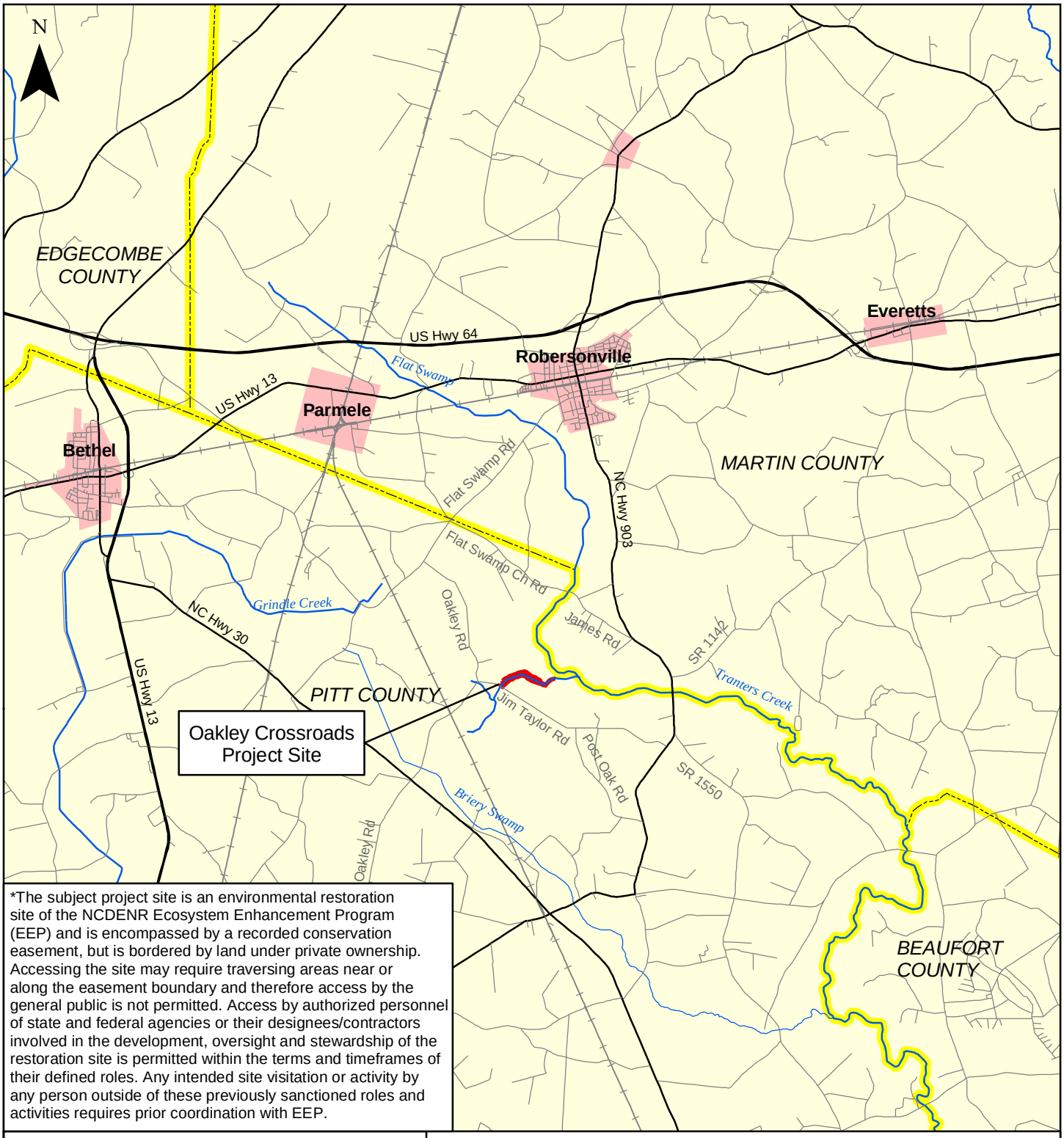
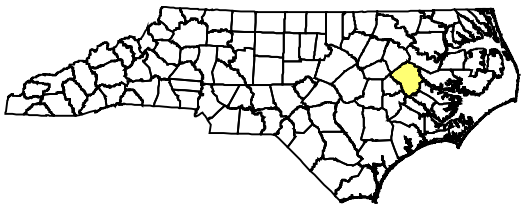


*The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP.



Legend

- Local Roads
- Major Roads
- Railroads
- Conservation Easement
- Streams
- Municipality
- County Boundary

Figure 1. Project Vicinity Map

Oakley Crossroads
Stream & Buffer Restoration
Pitt County, North Carolina

0 0.5 1 2 Miles

Stantec

Ecosystem Enhancement Program

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Figure 2. Project Components and Assets and Baseline Monitoring Map

Oakley Crossroads Stream and Buffer Restoration Project
EEP #: 273
Pitt County, North Carolina
August 2011

- Crest gage
- Vegetation monitoring plots (VP 1-9)
- Stream cross-section surveys (XS 1-7)
- Conservation easement
- As-built Stream Restoration Centerline (3,789 ft)
- As-built Stream Enhacement II (40 ft)
- As-built Stream Enhacement II (planting only) (289 ft)
- As-built hydrography (on-site)
- Non-buffered waterways
- As-built ponds
- Ford crossing
- Riparian buffer credit (775,181 sq ft)
- Riparian buffer, no credit, <50'
- Riparian buffer, no credit, >200'
- Riparian buffer, no credit, undiffuse flow
- Riparian buffer, no credit, non-contiguous
- Riparian buffer, no credit, replanted
- Existing tree stands
- Wetland preservation (1.37 acres)

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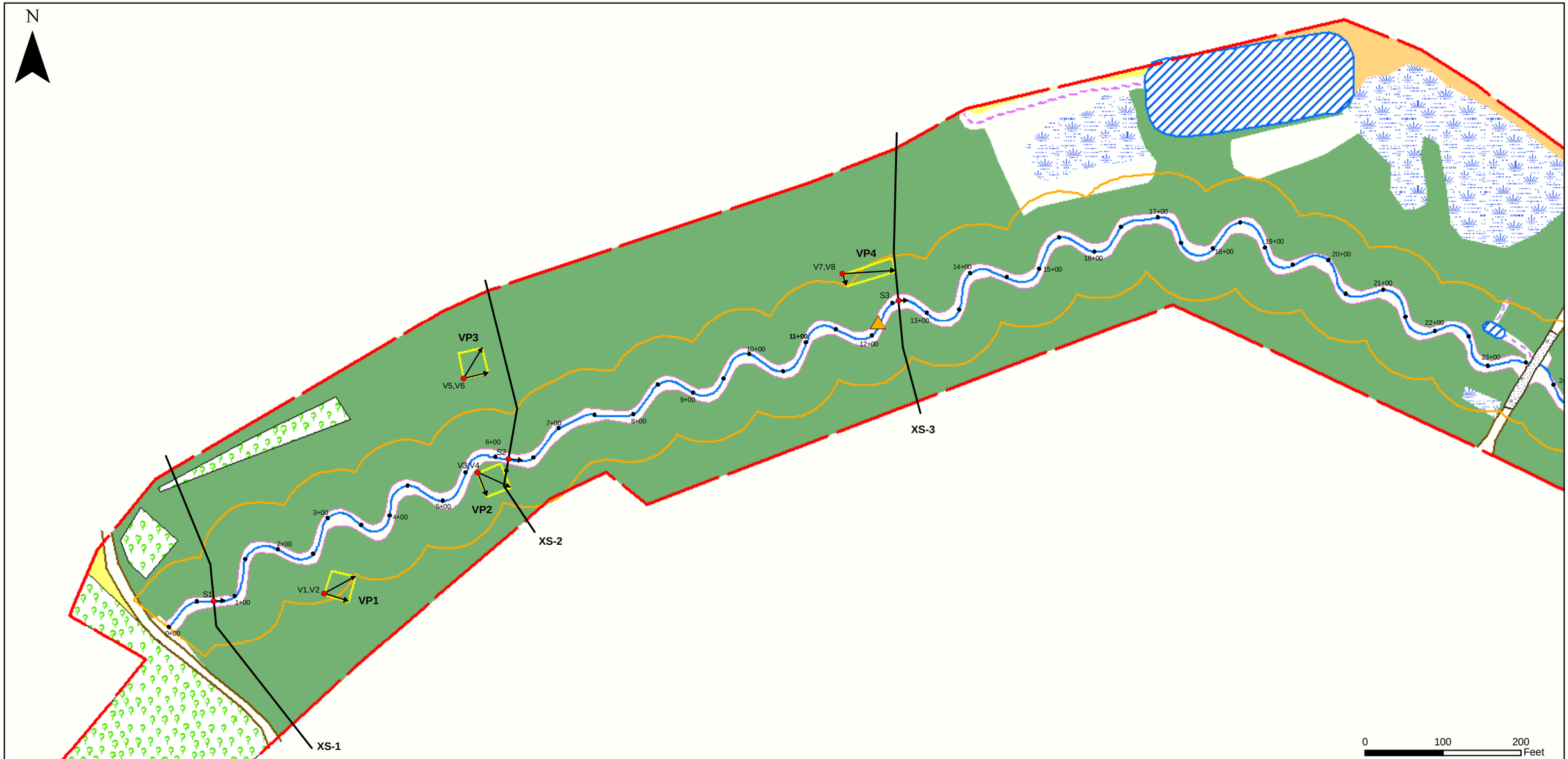

Figure 2a. Project Components and Assets and Baseline Monitoring Map

Oakley Crossroads Stream and Buffer Restoration Project
EEP #: 273
Pitt County, North Carolina
August 2011

- Crest gage
- Photo points (Veg=V, Stream=S)
- Vegetation monitoring plots (VP 1-9)
- Stream cross-section surveys (XS 1-7)
- Farm paths
- Conservation easement
- As-built ponds
- As-built Stream Restoration Centerline (3,789 ft)
- As-built Top of Bank
- As-built Stream Enhacement II (40 ft)
- As-built Stream Enhacement II (planting only) (289 ft)
- As-built hydrography (on-site)
- Non-buffered waterways
- 50 foot stream buffer
- Ford crossing
- Riparian buffer credit (775,181 sq ft)
- Riparian buffer, no credit, <50'
- Riparian buffer, no credit, >200'
- Riparian buffer, no credit, undiffuse flow
- Riparian buffer, no credit, non-contiguous
- Riparian buffer, no credit, replanted
- Existing tree stands
- Wetland preservation (1.37 acres)

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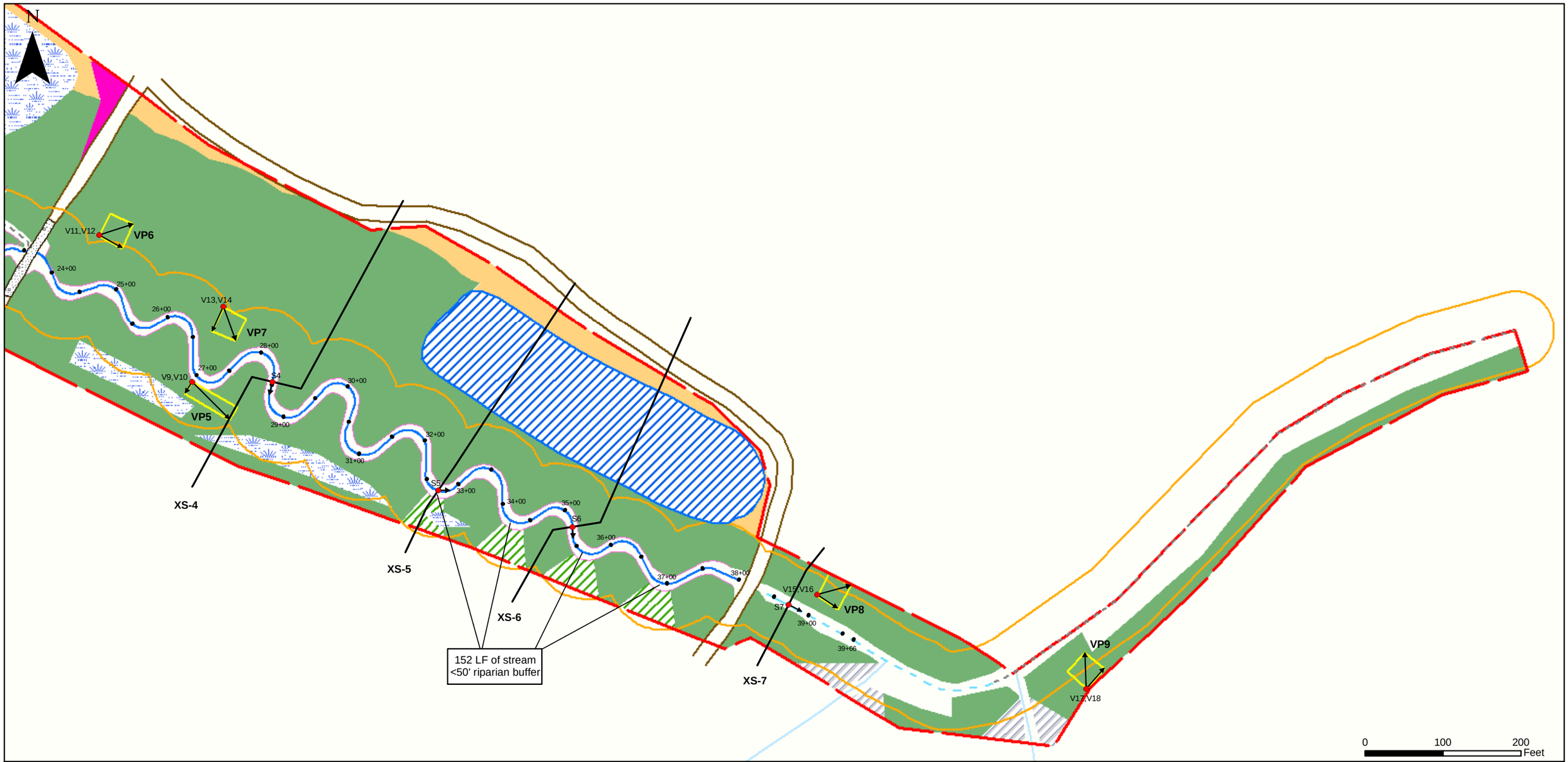

Figure 2b. Project Components and Assets and Baseline Monitoring Map

Oakley Crossroads Stream and Buffer Restoration Project
EEP #: 273
Pitt County, North Carolina
August 2011

- Crest gage
- Photo points (Veg=V, Stream=S)
- Vegetation monitoring plots (VP 1-9)
- Stream cross-section surveys (XS 1-7)
- Farm paths
- Conservation easement
- As-built ponds
- As-built Stream Restoration Centerline (3,789 ft)
- As-built Top of Bank
- As-built Stream Enhancement II (40 ft)
- As-built Stream Enhancement II (planting only) (289 ft)
- As-built hydrography (on-site)
- Non-buffered waterways
- 50 foot stream buffer
- Ford crossing
- Riparian buffer credit (775,181 sq ft)
- Riparian buffer, no credit, <50'
- Riparian buffer, no credit, >200'
- Riparian buffer, no credit, undiffuse flow
- Riparian buffer, no credit, non-contiguous
- Riparian buffer, no credit, replanted
- Existing tree stands
- Wetland preservation (1.37 acres)

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Table 1. Project Components and Mitigation Credits

Oakley Crossroads Stream and Buffer Restoration (EEP# 273)

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	3,789	142		0.27			735,728		

Project Components

Project Component or Reach ID	Stationing/ Location	Existing Footage/ Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio	Mitigation Units	Comment
Section 1	00+00 to 37+98.64	2,950	PII	R	3,637	1:1	3,637	Ten foot width of ford crossing removed from total length. 152 LF of restored stream with <50' buffer separated into line item below. Total restoration footage 3,637 LF.
Section 1, <50 ft buffer	~33+00 to ~37+00	152	PII	R	152	1:1	152	152 LF of restored stream has <50' buffer on right bank.
Section 2	~38+39 to ~38+79	40	EII	RE	40	1.5:1	26.7	Enhancement - log structures, brush mattresses and planting.
Section 3	downstream of Section 2	289	EII	RE	289	2.5:1	115.6	Enhancement - planting only.
Riparian Buffer	n/a	n/a	R	R	735,728 sq ft	1:1	735,728	786,258 sq ft planted, 735,728 sq ft of which are eligible for mitigation credit. Area removed for areas with undiffuse flow, buffer width >200', or buffer width <50'.
Wetlands	n/a	1.37	P	RE	1.37	5:1	0.27	

Component Summation

Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-riparian Wetland (Ac)	Buffer (sq ft)	Upland (Ac)
		Riverine	Non-Riverine			
Restoration	3,789				735,728	
Enhancement						
Enhancement I						
Enhancement II	329					
Creation						
Preservation		1.37				
HQ Preservation						

BMP Elements

Element	Location	Purpose/Function	Notes
n/a	n/a	n/a	n/a

BMP Elements

BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond;
FS = Filter Strip; Grassed Swale = S; LS = Level Spreader; NI = Natural Infiltration Area, O = Other
CF = Cattle Fencing; WS = Watering System; CH = Livestock Housing

Table 2. Project Activity and Reporting History		
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)		
Elapsed Time Since Grading Complete:	**1 month**	
Elapsed Time Since Planting Complete:	**1 month**	
Number of Reporting Years[1]:	**0**	
	Data Collection	**Completion or**
Activity or Deliverable	**Complete**	**Delivery**
Mitigation Plan	n/a	August 2006
Final Design – Construction Plans	n/a	June 2010
Construction	n/a	May 2011
Seeding	n/a	May 2011
Planting	n/a	May 2011
As-built (Year 0 Monitoring – baseline)	June 2011	July 2011
Year 1 Monitoring	n/a	n/a
Year 2 Monitoring	n/a	n/a
Year 3 Monitoring	n/a	n/a
Year 4 Monitoring	n/a	n/a
Year 5 Monitoring	n/a	n/a

1 = Equals the number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table	
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)	
Designer	Stantec Consulting Services, Inc.
	801 Jones Franklin Rd, Ste 300, Raleigh, NC 27606
Primary project design POC	Nathan Jean (970) 449-8615
Construction Contractor	Ecosystems Grading Solutions, Inc.
	6642 Roper Hollow Rd., Morganton, NC 28655
Construction contractor POC	Bobby Koone (828) 584-3018
Survey Contractor	Turner Land Surveying
	3201 Glenridge Dr., Raleigh, NC 27604
Survey contractor POC	Elizabeth and David Turner (919) 875-1378
Planting Contractor	Bruton Natural Systems, Inc.
	P.O. Box 1197, Remont, NC 27830
Planting contractor POC	Charlie Bruton (919) 242-6555
Seeding Contractor	Ecosystems Grading Solutions, Inc.
	6642 Roper Hollow Rd., Morganton, NC 28655
Contractor point of contact	Bobby Koone (828) 584-3018
Seed Mix Sources	Green Resources
Nursery Stock Suppliers	Southeastern Native Plant Nursery
	South Carolina Super Tree Nursery
	Natives
Monitoring Performers	Stantec Consulting Services, Inc.
	801 Jones Franklin Rd, Ste 300, Raleigh, NC 27606
Stream Monitoring POC	Brian Mazzochi (919) 865-7580
Vegetation Monitoring POC	Amber Coleman (919)865-7399
Wetland Monitoring POC	n/a

Table 4. Project Baseline Information and Attributes			
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)			
Project Information			
Project County	Pitt		
Project Area (acres)	26.6		
Project Coordinates (latitude and longitude)	35.76692, -77.269077		
Project Watershed Summary Information			
Physiographic Region	Coastal Plain		
River Basin	Tar-Pamlico		
USGS HUC for Project (14 digit)	0302010309002		
NCDWQ Sub-basin for Project	03-03-06		
Project Drainage Area (sq mi)	1.59		
Project Drainage Area % Impervious	<1%		
CGIA Landuse Classification	Cropland and Pasture		
Reach Summary Information			
Reach name	Section 1	Section 2	Section 3
Length of reach (linear feet)	3,799	40	289
Valley classification	VIII	VIII	VIII
Drainage area (acres)	10,178.6	10,178.8	10,260.1
NCDWQ stream identification score	41	40.5	40.5
NCDWQ classification	n/a	n/a	n/a
Morphological description (stream type)	E5	F5	F5
Evolutionary trend	E5	C5	C5
Underlying mapped soils	Bladen	Pantego	Pantego
Drainage class	Poorly drained	Very poorly drained	Very poorly drained
Soil hydric status	Yes	Yes	Yes
Slope	0-2%	0-1%	0-1%
FEMA classification	Zone X	Zone X	Zone X
Native vegetation community	Riverine bottomland hardwood and mesic mixed hardwood forest		
Percent composition of exotic invasive vegetation	0%	0%	10%
Wetland Summary Information			
n/a - wetland preservation only			
Regulatory Considerations			
Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States - Section 404	Yes	Yes	USACE 404 permit
Waters of the United States - Section 401	Yes	Yes	NCDWQ 401 permit
Endangered Species Act	No	n/a	n/a
Historic Preservation Act	No	n/a	n/a
Coastal Zone Management Act (CZMA)/Coastal Aream Management Act (CAMA)	No	n/a	n/a
FEMA Floodplain Compliance	No	n/a	n/a

Appendix B – Morphological Summary Data and Plots

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Table 5. Baseline Stream Data Summary
Oakley Crossroads Stream and Wetland Restoration / EEP Project No. 050659701 - Segment/Reach: Mainstem (3,950 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					-	10.40	-	-	-	4	7.80	11.20	-	14.60	-	2	-	12.3	-	14.64	17.31	-	20.82	-	4
Floodprone Width (ft)					-	15.00	-	-	-	4	120.00	126.50	-	133.00	-	2	-	240.0	-	80.66	182.63	-	367.14	-	4
Bankfull Mean Depth (ft)					-	1.80	-	-	-	4	0.70	1.15	-	1.60	-	2	-	1.5	-	0.88	1.13	-	1.43	-	4
[1]Bankfull Max Depth (ft)					-	2.70	-	-	-	4	1.60	1.85	-	2.10	-	2	-	2.4	-	2.15	2.56	-	2.99	-	4
Bankfull Cross Sectional Area (ft^2)					-	19.00	-	-	-	4	9.50	11.05	-	12.60	-	2	-	19.0	-	18.16	19.08	-	20.90	-	4
Width/Depth Ratio					-	5.70	-	-	-	4	4.80	13.60	-	22.40	-	2	-	8.0	-	10.24	16.19	-	23.66	-	4
Entrenchment Ratio					-	1.40	-	-	-	4	8.20	12.65	-	17.10	-	2	-	19.5	-	4.66	10.55	-	21.21	-	4
[1]Bank Height Ratio					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Profile																									
Riffle Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.83	35.98	-	53.02		4
Riffle Slope (ft/ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	0.003	-	0.006		4
Pool Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.47	33.67	-	44.45		2
Pool Max depth (ft)					-	-	-	-	-	-	1.7	2.3	-	2.9	-	2	-	4	-	2.81	3.12	-	3.43		2
Pool Spacing (ft)					-	-	-	-	-	-	5	27	35	67	-	4	43	52.5	62	43.4	64.26	-	94.03		2
Pattern																									
Channel Beltwidth (ft)					-	-	-	-	-	-	45	72.5	-	100		2	62	74.0	86	38.56	55.94	-	86.18	-	48.00
Radius of Curvature (ft)					-	-	-	-	-	-	8	12.8	14	21		4	22	27.0	31	19.24	27.81	-	36.28	-	56.00
Rc:Bankfull width (ft/ft)					-	-	-	-	-	-	0.5	1.2	1.4	1.8		4	1.8	2.2	2.5	1.11	1.61	-	2.10	-	56.00
Meander Wavelength (ft)					-	-	-	-	-	-	17	75	100	156		4	86	111	135	85.46	103.92	-	118.61	-	48.00
Meander Width Ratio					-	-	-	-	-	-	5.8	6.3	-	6.8		2	5	6.0	7	2.23	3.23	-	4.98	-	48.00
Transport parameters																									
Reach Shear Stress (competency) lb/f^2						0.2												0.14			0.093				
Max part size (mm) mobilized at bankfull						-												-			25				
Unit Stream Power (transport capacity) lbs/ft/s per unit width[6]						0.25												0.17			0.16				
Additional Reach Parameters																									
Rosgen Classification						G5c						C5, E5						E5			C4				
Bankfull Velocity (fps)						1.9												1.7			1.65				
Bankfull Discharge (cfs)						30																			
Valley length (ft)						-						-													
Channel Thalweg length (ft)						-						-						-			3950				
Sinuosity (ft)						1.01						1.18						1.28			1.4				
Water Surface Slope (Channel) (ft/ft)						0.0018						0.002						0.0014			0.00146				
BF slope (ft/ft)						-						-						-			**0.00144**				
[3]Bankfull Floodplain Area (acres)						-						-						-			-				
[4]% of Reach with Eroding Banks						-						-													
Channel Stability or Habitat Metric						-						-													
Biological or Other						-						-													

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

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Table 6. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Oakley Crossroads Stream and Wetland Restoration / EEP Project No. 050659701 - Segment/Reach: Mainstem (3,950 feet)

	Cross Section 1 (STA 0+72, Riffle)							Cross Section 2 (STA 6+17, Riffle)							Cross Section 3 (STA 12+59, Pool)							Cross Section 4 (STA 28+46, Riffle)							Cross Section 5 (STA 32+71, Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)	20.82							16.60							20.58							14.64							19.06						
Floodprone Width (ft)	80.66							124.27							248.08							367.14							289.16						
Bankfull Mean Depth (ft)	0.88							1.09							1.79							1.43							1.55						
Bankfull Max Depth (ft)	2.15							2.54							3.43							2.99							2.81						
Bankfull Cross Sectional Area (ft^2)	18.33							18.16							36.86							20.90							29.47						
Bankfull Width/Depth Ratio	23.66							15.23							11.50							10.24							12.30						
Bankfull Entrenchment Ratio	3.88							7.49							12.05							25.08							15.17						
Bankfull Bank Height Ratio																																				
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

	Cross Section 6 (STA 35+24, Riffle)							Cross Section 7 (STA 38+71, Other)							Cross Section 8 (Riffle)							Cross Section 9 (Pool)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)	17.17							82.89																												
Floodprone Width (ft)	158.46							132.69																												
Bankfull Mean Depth (ft)	1.10							0.99																												
Bankfull Max Depth (ft)	2.55							6.23																												
Bankfull Cross Sectional Area (ft^2)	18.91							81.89																												
Bankfull Width/Depth Ratio	15.61							83.73																												
Bankfull Entrenchment Ratio	9.23							1.60																												
Bankfull Bank Height Ratio																																				
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

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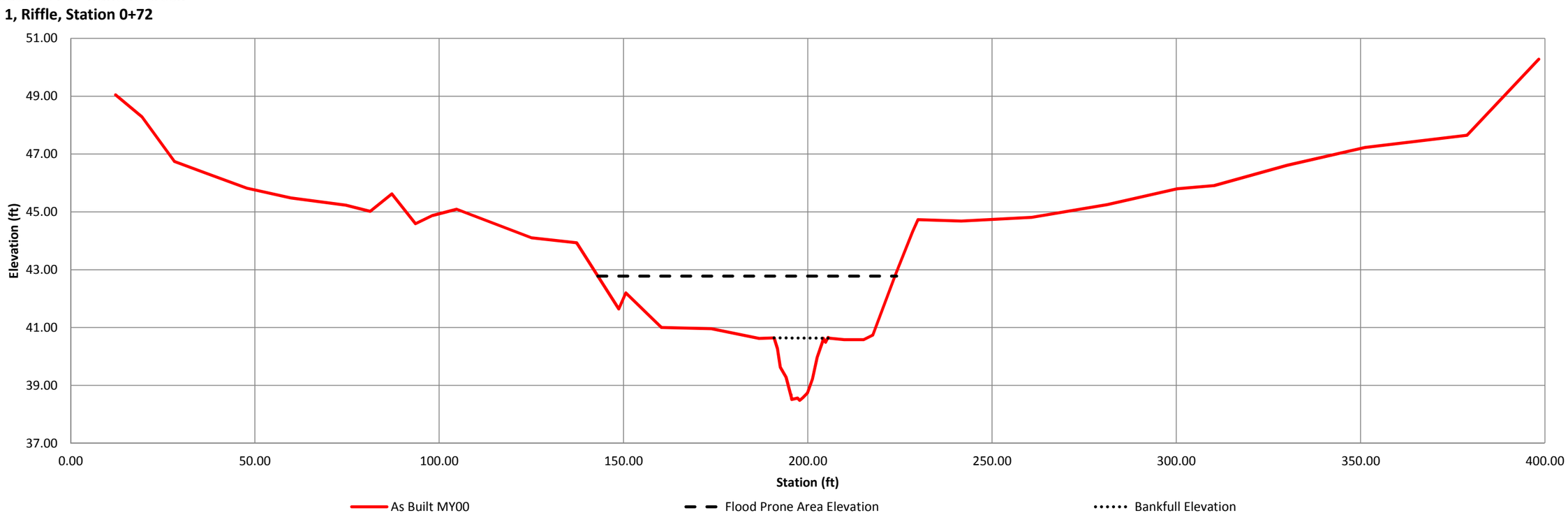
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-1, Riffle, STA 0+72
Drainage Area(sq. mi.)	1.59
Date	6/20/2011
Field Crew	M.Geenen, B.Mazzochi

Station	Elevation
12.21	49.05
19.33	48.29
28.16	46.74
35.77	46.38
47.80	45.82
59.77	45.48
74.68	45.23
81.30	45.02
87.17	45.62
93.57	44.59
98.13	44.87
104.75	45.09
125.09	44.10
137.30	43.93
148.71	41.64
150.62	42.20
160.31	41.00
173.90	40.96
186.83	40.62
190.89	40.64
191.77	40.27
192.56	39.63
194.11	39.28
195.41	38.65

SUMARY DATA	MY00
Bankfull Elevation	40.6
Bankfull Cross-Sectional Area	18.3
Bankfull Width	18.6
Flood Prone Area Elevation	42.8
Flood Prone Width	81
Max Depth at Bankfull	2.2
Mean Depth at Bankfull	1.1
W/D Ratio	17.3
Entrenchment Ratio	4.4
Bank Height Ratio	1.0
Stream Type	C

Sta. 0+75 Looking Downstream



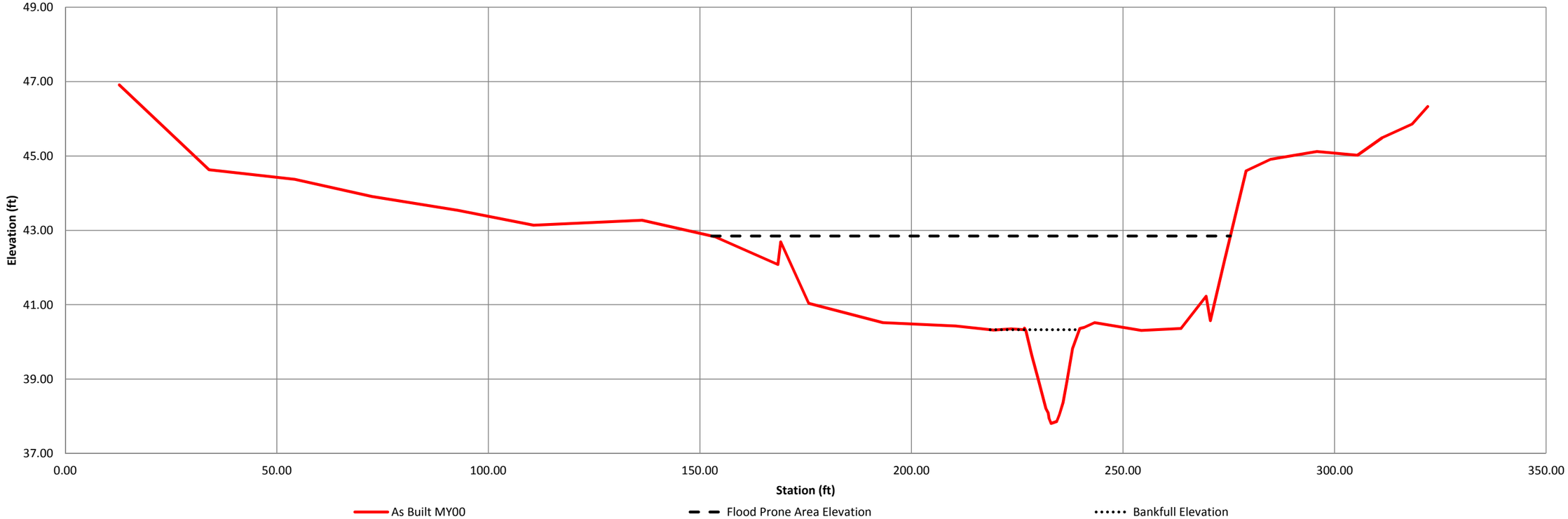
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-2, Riffle, STA 6+17
Drainage Area(sq. mi.)	1.59
Date	6/20/2011
Field Crew	M.Geenen, B.Mazzochi

Station	Elevation
12.76	46.91
33.99	44.63
54.24	44.37
72.47	43.91
92.77	43.54
110.68	43.14
136.32	43.27
153.53	42.83
168.42	42.08
169.10	42.69
175.71	41.04
193.21	40.52
210.45	40.43
219.41	40.32
223.60	40.35
226.57	40.33
226.69	40.37
227.04	40.30
228.42	39.64
229.95	38.99
231.78	38.21
232.29	38.09
232.51	37.94
232.99	37.81

SUMARY DATA	MY00
Bankfull Elevation	40.3
Bankfull Cross-Sectional Area	17.9
Bankfull Width	15.1
Flood Prone Area Elevation	42.9
Flood Prone Width	123
Max Depth at Bankfull	2.5
Mean Depth at Bankfull	1.3
W/D Ratio	12.0
Entrenchment Ratio	8.1
Bank Height Ratio	1.0
Stream Type	C

Sta. 6+17 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 2, Riffle, Station 6+17



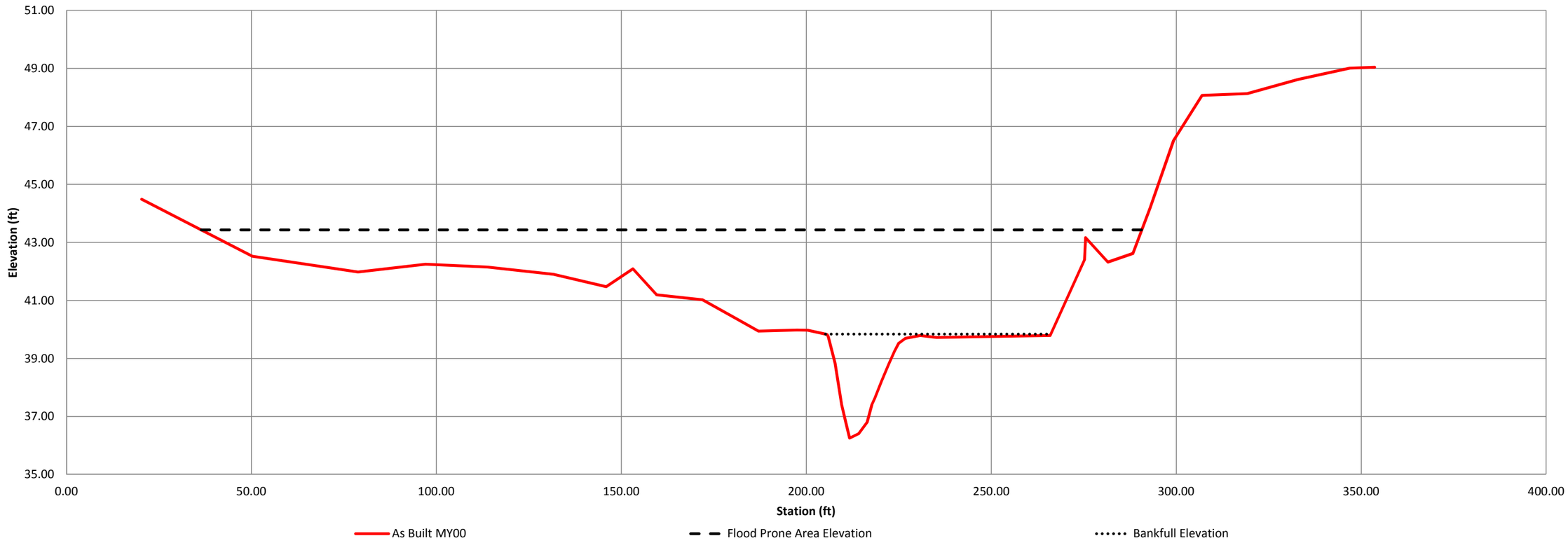
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-3, Pool, STA 12+59
Drainage Area(sq. mi.)	1.59
Date	6/20/2011
Field Crew	M.Geenen, B.Mazzochi

Station	Elevation
20.32	44.49
50.25	42.52
78.82	41.98
97.11	42.25
113.72	42.15
131.64	41.90
145.91	41.47
153.13	42.09
159.54	41.19
171.94	41.02
180.95	40.38
187.04	39.94
197.51	39.98
200.36	39.97
205.21	39.84
205.63	39.82
205.93	39.76
207.79	38.83
209.56	37.40
210.71	36.78
211.70	36.25
214.13	36.40
216.45	36.80

SUMARY DATA	MY00
Bankfull Elevation	39.8
Bankfull Cross-Sectional Area	42.5
Bankfull Width	44.8
Flood Prone Area Elevation	43.4
Flood Prone Width	254
Max Depth at Bankfull	3.6
Mean Depth at Bankfull	1.8
W/D Ratio	24.9
Entrenchment Ratio	5.7
Bank Height Ratio	1.0
Stream Type	C

Sta. 12+59 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 3, Pool, Station 12+59



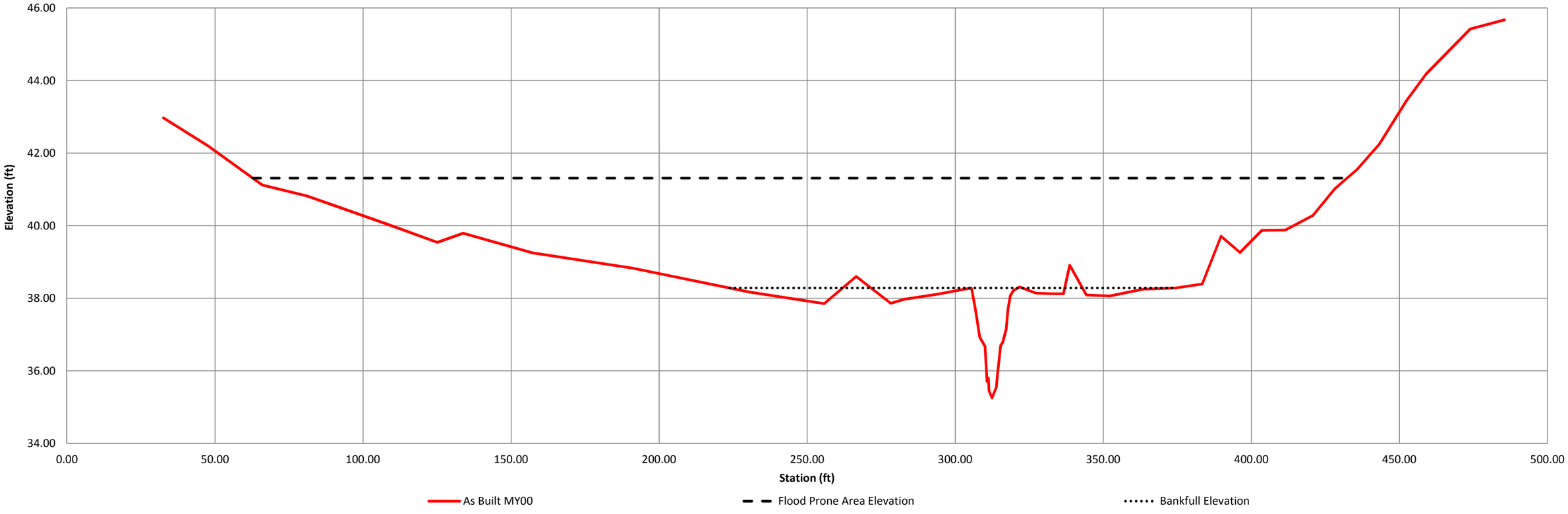
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-4, Riffle, STA 28+46
Drainage Area(sq. mi.)	1.59
Date	6/20/2011
Field Crew	M.Geenen, B.Mazzochi

Station	Elevation
32.58	42.97
47.64	42.20
65.92	41.12
81.03	40.82
88.43	40.61
108.82	40.02
125.06	39.54
133.82	39.79
157.24	39.25
191.12	38.83
230.32	38.17
255.76	37.85
266.56	38.60
278.21	37.86
282.75	37.97
293.74	38.11
305.40	38.28
305.58	38.25
306.89	37.65
308.24	36.93
310.07	36.67
310.71	35.71
311.20	35.80

SUMARY DATA	MY00
Bankfull Elevation	38.3
Bankfull Cross-Sectional Area	21.5
Bankfull Width	16.2
Flood Prone Area Elevation	41.3
Flood Prone Width	370
Max Depth at Bankfull	3.0
Mean Depth at Bankfull	1.5
W/D Ratio	10.7
Entrenchment Ratio	22.9
Bank Height Ratio	1.0
Stream Type	C

Sta. 28+46 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 4, Riffle, Station 28+46



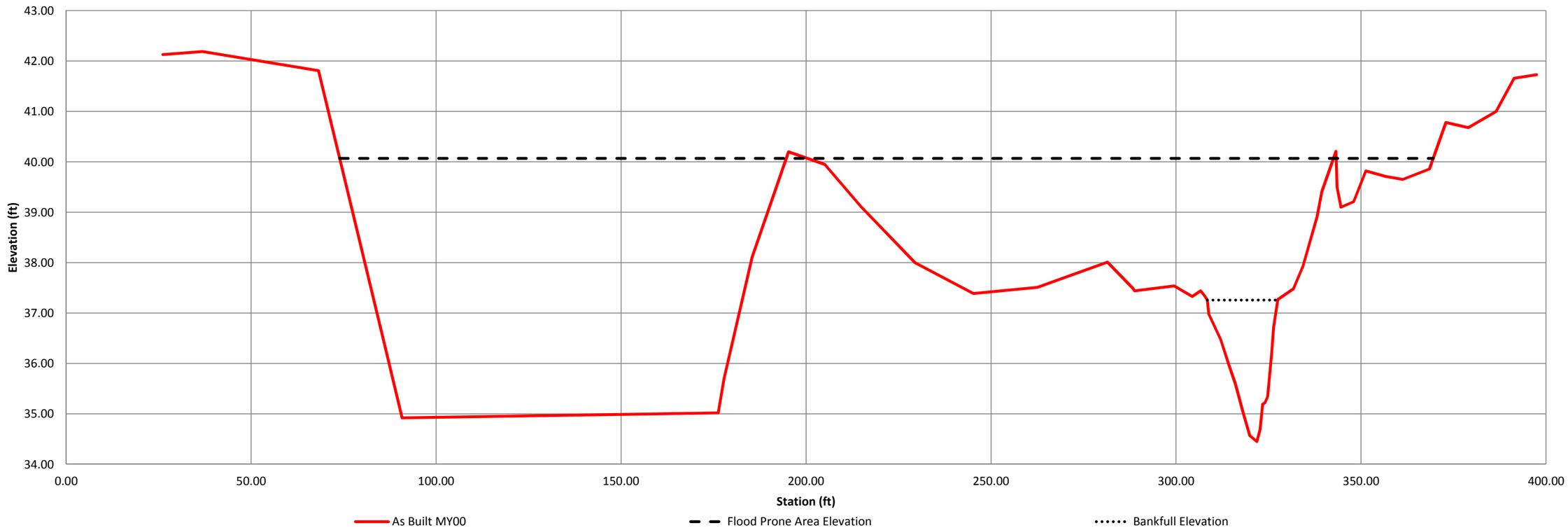
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-5, Pool, STA 32+71
Drainage Area(sq. mi.)	1.59
Date	6/20/2011
Field Crew	M.Geenen, B.Mazzochi

Station	Elevation
26.15	42.13
36.87	42.19
68.22	41.81
85.37	36.59
90.80	34.92
176.23	35.02
177.81	35.70
185.44	38.11
195.27	40.20
205.06	39.95
214.85	39.11
229.47	38.00
245.21	37.39
262.60	37.51
281.47	38.01
288.37	37.49
288.85	37.44
299.46	37.54
304.38	37.33
306.65	37.44
307.72	37.34
308.44	37.26
308.86	36.98

SUMARY DATA	MY00
Bankfull Elevation	37.3
Bankfull Cross-Sectional Area	29.5
Bankfull Width	19.0
Flood Prone Area Elevation	40.1
Flood Prone Width	296
Max Depth at Bankfull	2.8
Mean Depth at Bankfull	1.4
W/D Ratio	13.6
Entrenchment Ratio	15.5
Bank Height Ratio	1.0
Stream Type	C

Sta. 32+71 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 5 Pool, Station 32+71



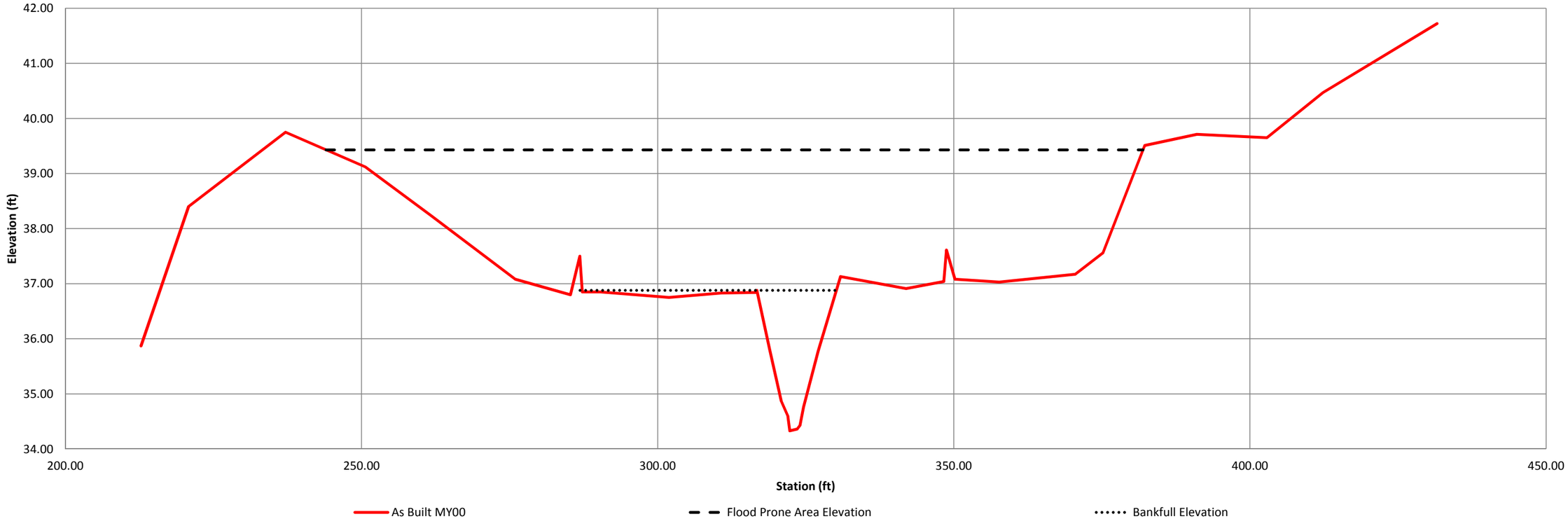
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-6, Riffle, STA 35+24
Drainage Area(sq. mi.)	1.59
Date	6/20/2011
Field Crew	M.Geenen, B.Mazzochi

Station	Elevation
212.76	35.87
220.80	38.40
237.17	39.75
250.63	39.12
261.67	38.24
275.95	37.08
285.28	36.80
286.84	37.50
287.26	36.85
290.35	36.85
301.91	36.75
310.76	36.83
316.51	36.84
316.76	36.88
318.89	35.81
320.87	34.87
321.98	34.60
322.30	34.33
323.55	34.36
324.04	34.43
324.63	34.76
327.11	35.78
330.86	37.13
341.94	36.91

SUMARY DATA	MY00
Bankfull Elevation	36.9
Bankfull Cross-Sectional Area	18.9
Bankfull Width	17.2
Flood Prone Area Elevation	39.4
Flood Prone Width	138
Max Depth at Bankfull	2.6
Mean Depth at Bankfull	1.3
W/D Ratio	13.5
Entrenchment Ratio	8.0
Bank Height Ratio	1.0
Stream Type	C

Sta. 35+24 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 6, Riffle, Station 35+24



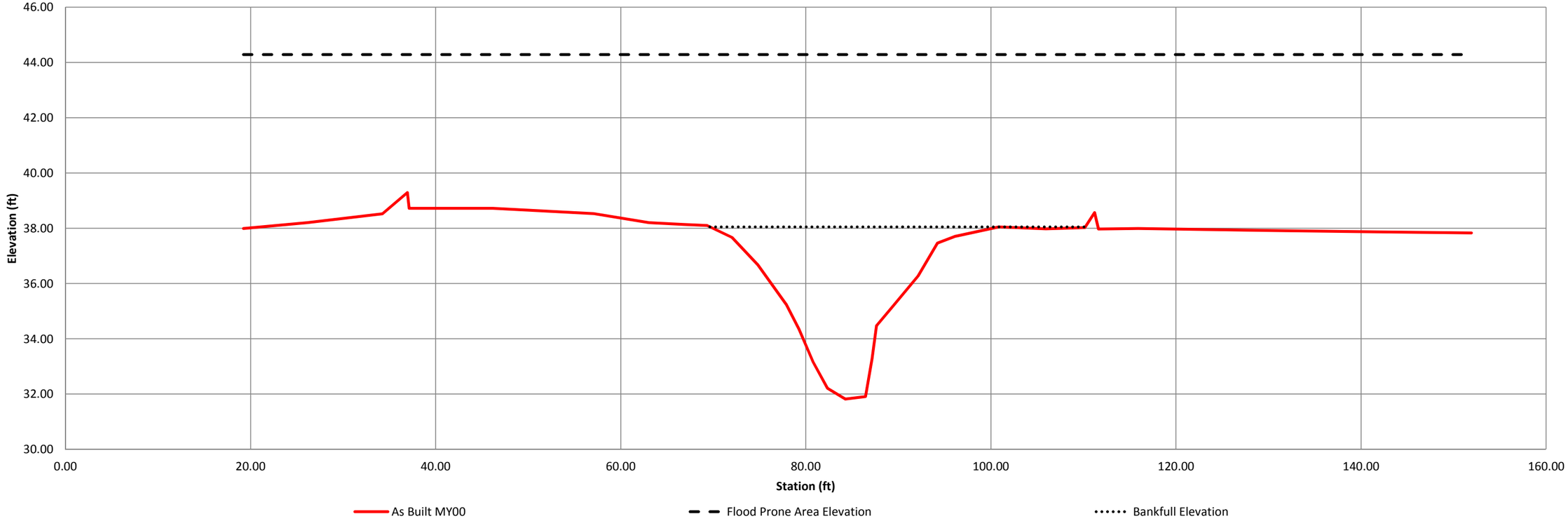
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-7, Riffle, STA 38+71
Drainage Area(sq. mi.)	1.59
Date	6/20/2011
Field Crew	M.Geenen, B.Mazzochi

Station	Elevation
19.24	37.99
26.11	38.20
34.24	38.52
36.95	39.29
37.14	38.72
39.57	38.72
46.18	38.72
57.09	38.53
63.06	38.20
66.76	38.14
69.33	38.10
72.02	37.67
74.83	36.67
77.89	35.25
79.27	34.35
80.79	33.16
82.34	32.21
84.27	31.82
86.46	31.91
87.16	33.28
87.65	34.47
89.37	35.16
92.14	36.27
94.23	37.46

SUMARY DATA	MY00
Bankfull Elevation	38.1
Bankfull Cross-Sectional Area	81.4
Bankfull Width	78.9
Flood Prone Area Elevation	44.3
Flood Prone Width	133
Max Depth at Bankfull	6.2
Mean Depth at Bankfull	3.1
W/D Ratio	25.3
Entrenchment Ratio	1.7
Bank Height Ratio	1.0
Stream Type	C

Sta. 38+71 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 67 Riffle, Station 38+71



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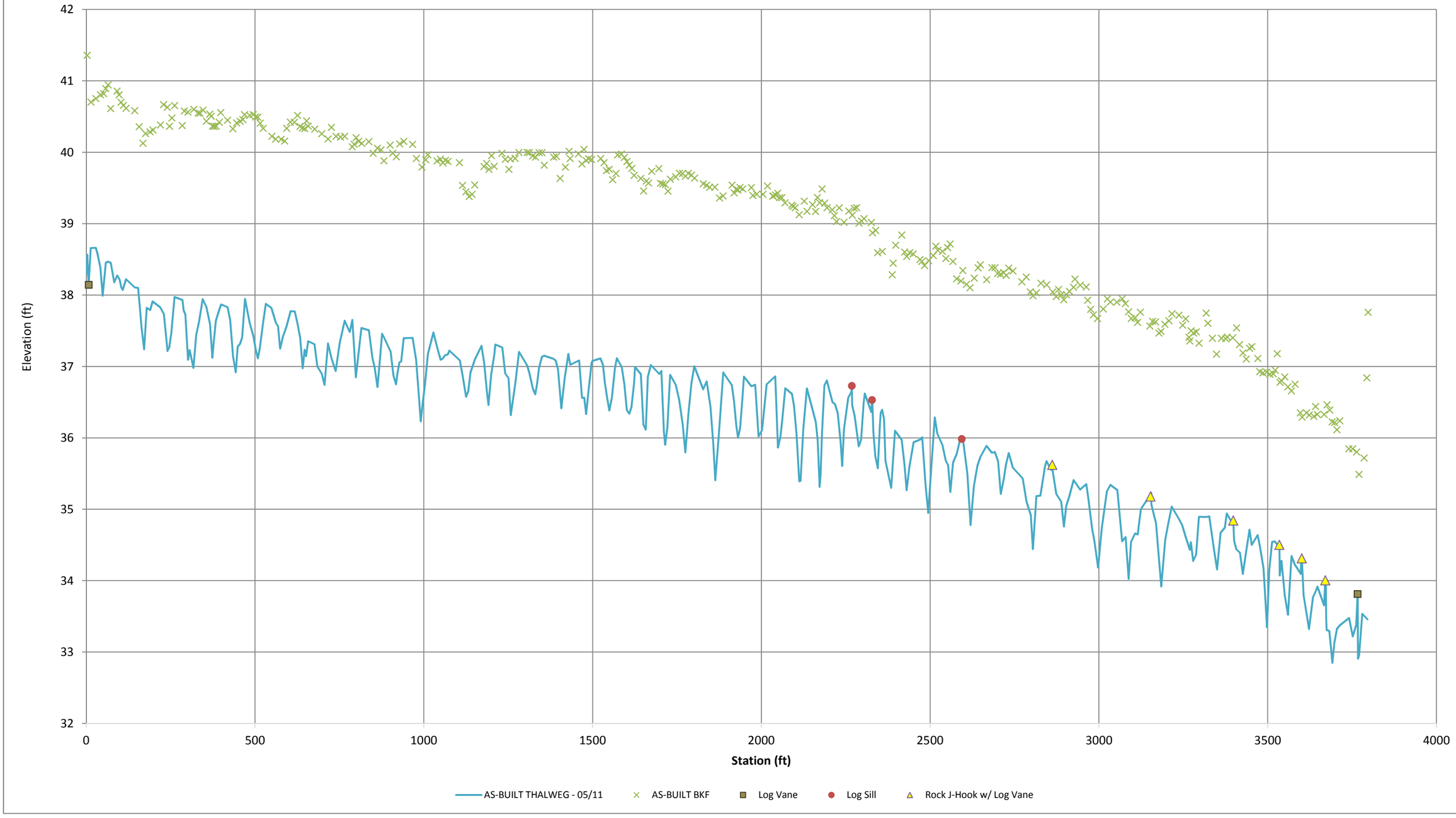
Oakley Longitudinal Proile
As-built Stationing 0+00 to 37+99



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Stream Monitoring Photos

Photo Station S1 – Stream channel looking downstream at cross-section 1
Station 00+72 - Priority 2 (6/19/2011 Year 0)

Photo Station S2 –Stream channel looking downstream at cross-section 2
Station 06+17 – Priority 2 (6/19/2011 Year 0)

Photo Station S3 – Stream channel looking downstream at cross-section 3 Station 12+59 – Priority 2 (6/19/2011 Year 0)

Photo Station S4 – Stream channel looking downstream at cross-section 4 Station 28+46 – Priority 2 (6/19/2011 Year 0)

Photo Station S5 – Stream channel looking downstream at cross-section 5 Station 32+71 – Priority 2 (6/19/2011 Year 0)

Photo Station S6 – Stream channel looking downstream at cross-section 6 Station 35+24 – Priority 2 (6/19/2011 Year 0)

Photo Station S7 – Stream channel looking downstream at cross-section 7
Station 38+71 – Enhancement 2 (6/19/2011 Year 0)

Appendix C - Vegetation Data

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Table 7 - Planted and Total Counts (Species by Plot wih Annual Means)

			Current Plot Data (MY0 2011)																									Annual Means		
			273-01-0001			273-01-0002			273-01-0003			273-01-0004			273-01-0005			273-01-0006			273-01-0007			273-01-0008			273-01-0009			MY0 (2011)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Eubotrys racemosa	dog-hobble	Shrub Tree				1	1	1																					1	1	1
Fraxinus pennsylvanica	**green ash**	**Tree**	4	4	4				2	2	2	3	3	3				4	4	4									13	13	13
Magnolia virginiana	**sweetbay**	**Tree**	1	1	1							1	1	1				1	1	1									3	3	3
Morella cerifera	wax myrtle	Shrub Tree	2	2	2							1	1	1															3	3	3
Nyssa biflora	**swamp tupelo**	**Tree**																			1	1	1						1	1	1
Nyssa sylvatica	**blackgum**	**Tree**							1	1	1				1	1	1												2	2	2
Platanus occidentalis	**American sycamore**	**Tree**	1	1	1				3	3	3	5	5	5				1	1	1	2	2	2				2	2	2	14	14	14
Quercus	**oak**	**Tree**				1	1	1										1	1	1				5	5	5				7	7	7
Quercus falcata	**southern red oak**	**Tree**							3	3	3	2	2	2										7	7	7				12	12	12
Quercus lyrata	**overcup oak**	**Tree**				3	3	3							1	1	1													4	4	4
Quercus michauxii	**swamp chestnut oak**	**Tree**				4	4	4							3	3	3				2	2	2							9	9	9
Quercus nigra	**water oak**	**Tree**	1	1	1													5	5	5	1	1	1							7	7	7
Quercus phellos	**willow oak**	**Tree**				1	1	1							4	4	4				4	4	4	7	7	7				16	16	16
Unknown	unknown																				1	1	1							1	1	1
		Plot Area (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.22		
		Stem count	9	9	9	10	10	10	9	9	9	12	12	12	9	9	9	12	12	12	11	11	11	19	19	19	2	2	2	93	93	93
		Species count	5	5	5	5	5	5	4	4	4	5	5	5	4	4	4	5	5	5	6	6	6	3	3	3	1	1	1	14	14	14
Stream Restoration Criteria		**Stems per ACRE**	364	364	364	405	405	405	364	364	364	486	486	486	364	364	364	486	486	486	445	445	445	769	769	769	81	81	81	418	418	418
		Stem count	7	7	7	9	9	9	9	9	9	11	11	11	9	9	9	12	12	12	10	10	10	19	19	19	2	2	2	88	88	88
		Species count	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	3	3	3	1	1	1	11	11	11
Buffer Restoration Criteria		**Stems per ACRE**	283	283	283	364	364	364	364	364	364	445	445	445	364	364	364	486	486	486	405	405	405	769	769	769	81	81	81	396	396	396

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
*Requirement: Planting plan specs of 680 total stems/acre

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Table 8 - CVS Metadata	
Oakley Crossroads Stream and Buffer Restoration - EEP #273	
Report Prepared By	Alex Baldwin
Date Prepared	6/24/2011 12:25
Database name	Stantec_Oakley-2011-A.mdb
Database location	U:\175613016\project\site_data\vegetation
Computer name	BALDWINA
File size	28442624
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	273
Project Name	Oakley Crossroads (G)
Description	Stream and Wetland Restoration
River Basin	Tar-Pamlico
Length(ft)	
Stream-to-edge width (ft)	
Area (sq m)	
Required Plots (calculated)	
Sampled Plots	9

Table 9 - CVS Vigor by Species									
Oakley Crossroads Stream and Buffer Restoration - EEP #273									
	Species	**CommonName**	**4**	**3**	**2**	**1**	**0**	**Missing**	**Unknown**
	Eubotrys racemosa	dog-hobble		1					
	Fraxinus pennsylvanica	green ash	3	10					
	Nyssa biflora	swamp tupelo			1				
	Nyssa sylvatica	blackgum	1		1				
	Quercus falcata	southern red oak	5	4	3		1		
	Quercus lyrata	overcup oak	2	2					
	Quercus michauxii	swamp chestnut oak	2	7					
	Quercus nigra	water oak	1	4	2		3		
	Quercus phellos	willow oak	9	5	2				
	Morella cerifera	wax myrtle	3						
	Quercus	oak		2	3	2			
	Magnolia virginiana	sweetbay	3						
	Platanus occidentalis	American sycamore	6	8			2		
	Unknown	unknown				1	4		
TOT:	**14**	**14**	**35**	**43**	**12**	**3**	**10**		

Table 10 - CVS Vegetation Damage by Species							
Oakley Crossroads Stream and Buffer Restoration - EEP #273							
	Species	CommonName	Count of Damage Categories	(no damage)	Unknown		
	Eubotrys racemosa	dog-hobble	0	1			
	Fraxinus pennsylvanica	green ash	0	13			
	Magnolia virginiana	sweetbay	0	3			
	Morella cerifera	wax myrtle	0	3			
	Nyssa biflora	swamp tupelo	0	1			
	Nyssa sylvatica	blackgum	0	2			
	Platanus occidentalis	American sycamore	2	14	2		
	Quercus	oak	0	7			
	Quercus falcata	southern red oak	1	12	1		
	Quercus lyrata	overcup oak	0	4			
	Quercus michauxii	swamp chestnut oak	0	9			
	Quercus nigra	water oak	3	7	3		
	Quercus phellos	willow oak	0	16			
	Unknown	unknown	4	1	4		
TOT:	**14**	**12**	**10**	**93**	**10**		

Table 11 - CVS Vegetation Damage by Plot						
Oakley Crossroads Stream and Buffer Restoration - EEP #273						
	plot	Count of Damage Categories	(no damage)	Unknown		
	273-01-0001	6	9	6		
	273-01-0002	1	10	1		
	273-01-0003	0	9			
	273-01-0004	0	12			
	273-01-0005	0	9			
	273-01-0006	0	12			
	273-01-0007	2	11	2		
	273-01-0008	0	19			
	273-01-0009	1	2	1		
TOT:	**9**	**10**	**93**	**10**		

Table 12 - CVS Planted Stems by Plot and Species

Oakley Crossroads Stream and Buffer Restoration - EEP #273

	Comment	Species	CommonName	Total Planted Stems	# plots	avg# stems	plot 273-01-0001	plot 273-01-0002	plot 273-01-0003	plot 273-01-0004	plot 273-01-0005	plot 273-01-0006	plot 273-01-0007	plot 273-01-0008	plot 273-01-0009
		Eubotrys racemosa	dog-hobble	1	1	1		1							
		Fraxinus pennsylvanica	green ash	13	4	3.25	4		2	3		4			
		Magnolia virginiana	sweetbay	3	3	1	1			1		1			
		Morella cerifera	wax myrtle	3	2	1.5	2			1					
		Nyssa biflora	swamp tupelo	1	1	1							1		
		Nyssa sylvatica	blackgum	2	2	1			1		1				
		Platanus occidentalis	American sycamore	14	6	2.33	1		3	5		1	2		2
		Quercus	oak	7	3	2.33		1				1		5	
		Quercus falcata	southern red oak	12	3	4			3	2				7	
		Quercus lyrata	overcup oak	4	2	2		3			1				
		Quercus michauxii	swamp chestnut oak	9	3	3		4			3		2		
		Quercus nigra	water oak	7	3	2.33	1					5	1		
		Quercus phellos	willow oak	16	4	4		1			4		4	7	
		Unknown	unknown	1	1	1							1		
TOT:	**0**	**14**	**14**	**93**	**14**		**9**	**10**	**9**	**12**	**9**	**12**	**11**	**19**	**2**
		Stems per acre					364	405	364	486	364	486	445	769	81

*Highlighted values indicate planted denisty is below requirement by more than 10%

Vegetation Monitoring Plot Photos

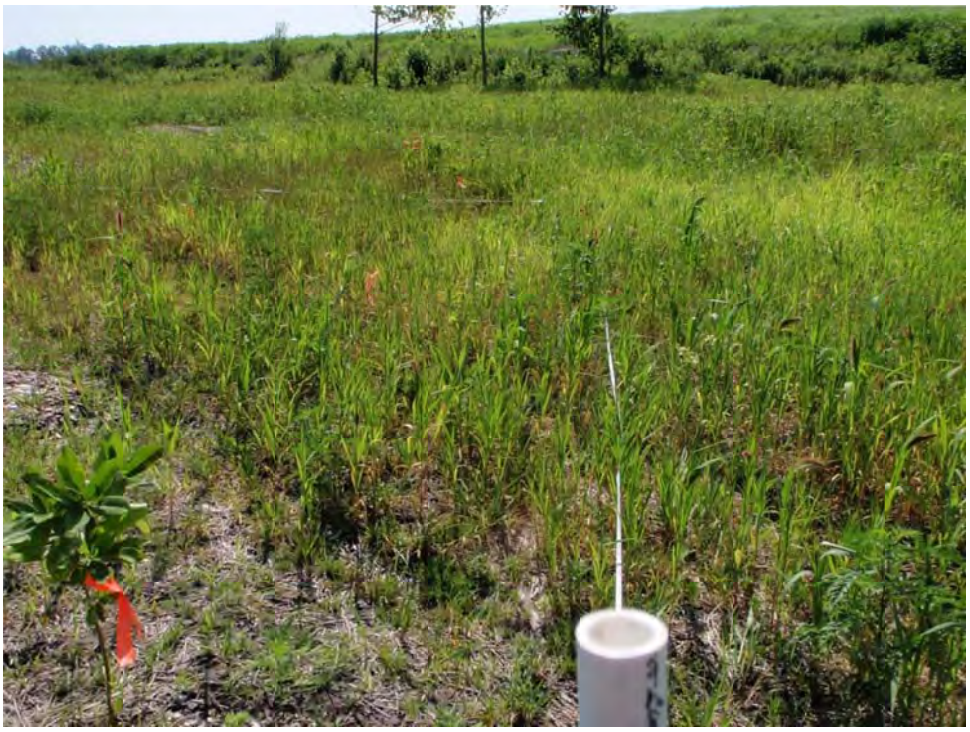


Photo Station V1 - Veg Plot 1 looking southeast (6/14/2011 Year 0)

Photo Station V2 - Veg Plot 1 looking east (6/14/2011 Year 0)

Photo Station V3 - Veg Plot 2 looking south (6/14/2011 Year 0)

Photo Station V4 - Veg Plot 2 looking southeast (6/14/2011 Year 0)

Photo Station V5 - Veg Plot 3 looking east (6/14/2011 Year 0)

Photo Station V6 - Veg Plot 3 looking northeast (6/14/2011 Year 0)

Photo Station V7 - Veg Plot 4 looking south (6/14/2011 Year 0)

Photo Station V8 - Veg Plot 4 looking southeast (6/14/2011 Year 0)

Photo Station V9 - Veg plot 5 looking south (6/14/2011 Year 0)

Photo Station V10 - Veg plot 5 looking southeast (6/14/2011 Year 0)

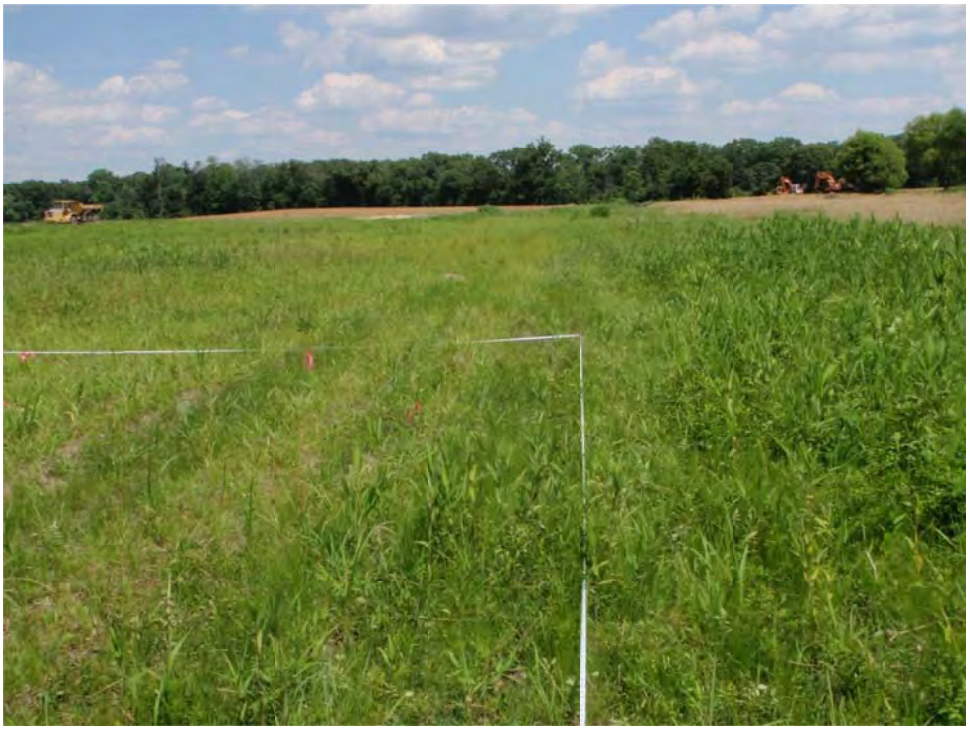


Photo Station V11 - Veg plot 6 looking east (6/14/2011 Year 0)

Photo Station V12 - Veg plot 6 looking northeast (6/14/2011 Year 0)

Photo Station V13 - Veg plot 7 looking southeast (6/14/2011 Year 0)

Photo Station V14 - Veg plot 7 looking east (6/14/2011 Year 0)

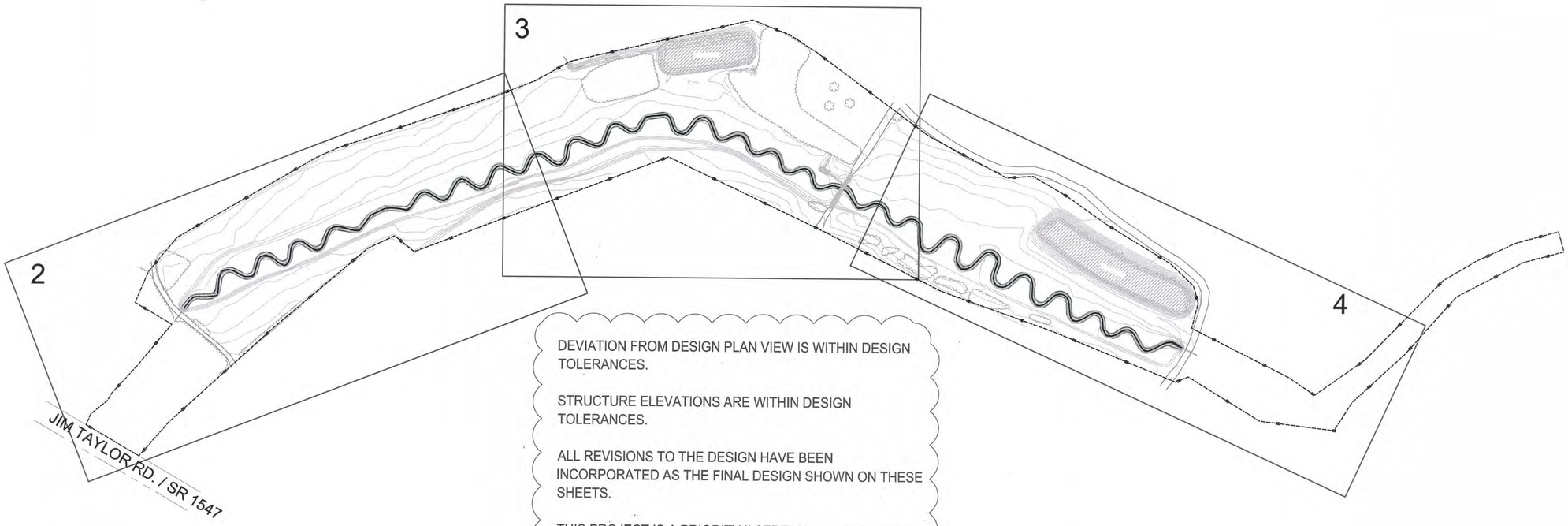
Photo Station V15 - Veg plot 8 looking east (6/14/2011 Year 0)

Photo Station V16 - Veg plot 8 looking northeast (6/14/2011 Year 0)

Photo Station V17 - Veg plot 9 looking northeast (6/14/2011 Year 0)

Photo Station V18 - Veg plot 9 looking north (6/14/2011 Year 0)

Appendix D - As-Built Plan Sheet



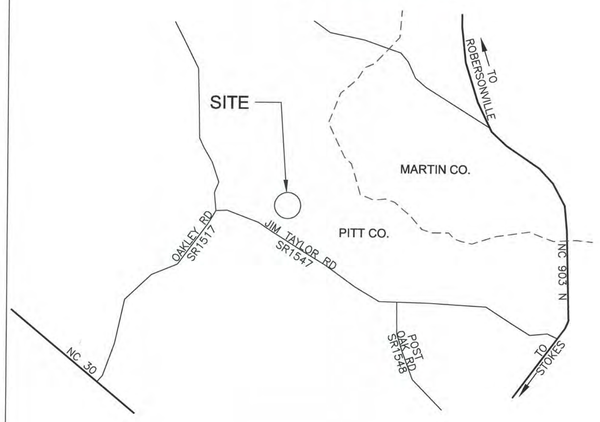
DEVIATION FROM DESIGN PLAN VIEW IS WITHIN DESIGN TOLERANCES.

STRUCTURE ELEVATIONS ARE WITHIN DESIGN TOLERANCES.

ALL REVISIONS TO THE DESIGN HAVE BEEN INCORPORATED AS THE FINAL DESIGN SHOWN ON THESE SHEETS.

THIS PROJECT IS A PRIORITY II STREAM RESTORATION.

VICINITY MAP



SHEET INDEX

SURVEY NOTES

1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88.
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 (NSRS 2007) DATUM.
4. CONTROL SET USING RTK GPS METHODS AND THE NCGS CORS NETWORK. CONTROL ESTABLISHED AND VERIFIED THROUGH AVERAGED 180 EPOCH RTK OBSERVATIONS MADE AT A MINIMUM OF TWO HOURS APART. RTK GPS UNIT USED WAS SPECTRA EPOCH 35 GPS ROVER OPERATING AT 450-470 MHZ.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. ALL CROSS-SECTIONS ARE FROM LEFT BANK TO RIGHT BANK (FACING DOWNSTREAM).
7. THE LONGITUDINAL STATIONING SHOWN ON THE PLAN VIEW IS THE AS-BUILT SURVEY LENGTH WHICH MAY VARY FROM THE FINAL DESIGN LENGTH.

Revision	By	Appd.	YY.MM.DD
#1 EEP Comments 7-18-11	C.W.G.	C.W.G.	11.08.05

Seal

NORTH CAROLINA PROFESSIONAL SEAL 034257 ENGINEER C. WILLIAM GASKILL

C.W. Gaskill 8-5-11

Consultants

Contractor

Ecosystems Grading Solutions, Inc.

Surveyor

Turner Land Surveying, PLLC

Stantec
801 Jones Franklin St.
Suite 300
Raleigh, Nc 27606
Tel. 919.851-6886
Fax. 919.518.7024
www.stantec.com

Client/Project

NC Ecosystem Enhancement Program

Oakley Crossroads Stream & Wetland Restoration

Pitt County, NC

File Name: REDLINES.DWG	CWG Dwn.	CWG Chkd.	N/A Dsgn.	11.07.11 YY.MM.DD

Title

Redline Plan Sheets

Project No.	Scale	
171300129	1" = 150'	
Drawing No.	Sheet	Revision
	1 of	6

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2011/08/04 3:29 PM By: Gaskill, CW

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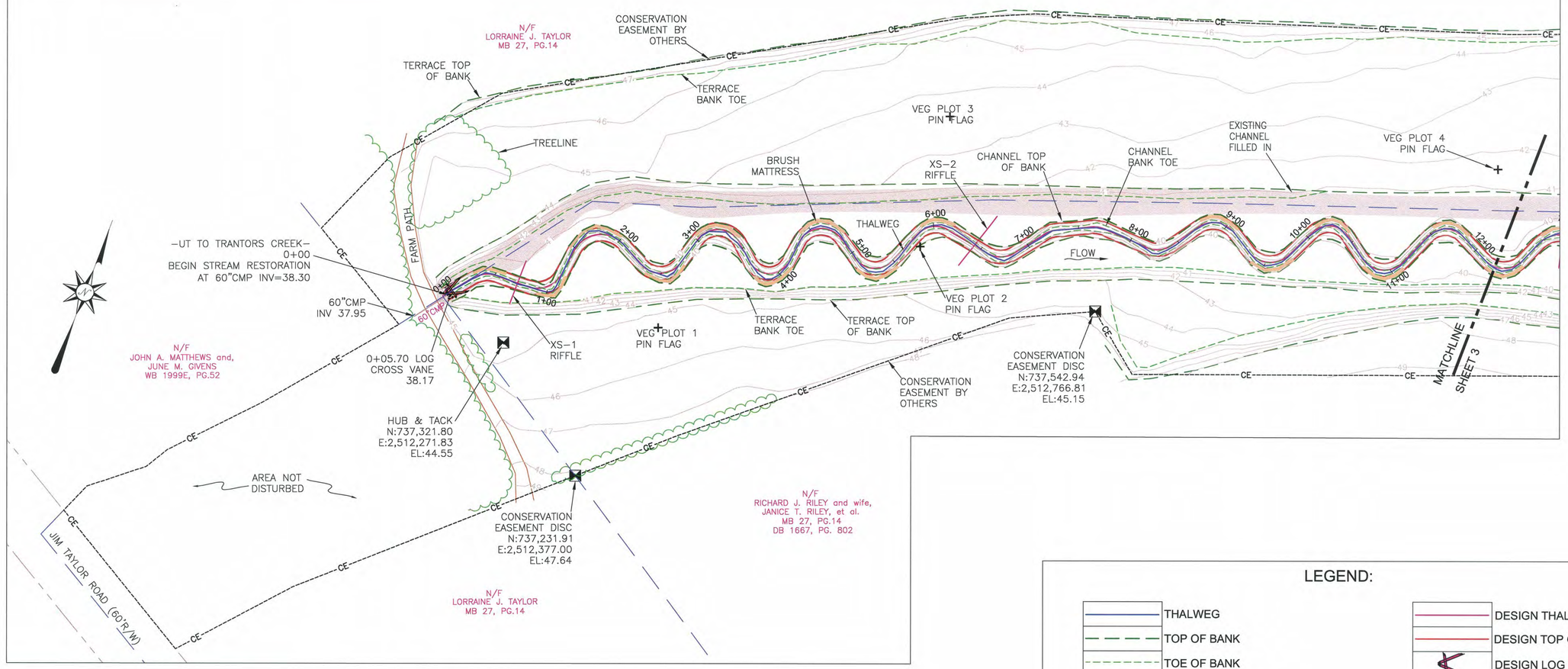


DEVIATION FROM DESIGN PLAN VIEW IS WITHIN DESIGN TOLERANCES.

STRUCTURE ELEVATIONS ARE WITHIN DESIGN TOLERANCES.

ALL REVISIONS TO THE DESIGN HAVE BEEN INCORPORATED AS THE FINAL DESIGN SHOWN ON THESE SHEETS.

THIS PROJECT IS A PRIORITY II STREAM RESTORATION.

LEGEND:

- THALWEG
- TOP OF BANK
- TOE OF BANK
- CENTERLINE DITCH
- EXISTING WETLANDS
- CE — CONSERVATION EASEMENT
- PROPERTY LINE NOT SURVEYED
- BENCH MARK/CONTROL PT
- LOG SILL
- LOG VANE WITH ROCK SILL
- LOG CROSS VANE
- OPEN WATER
- DESIGN THALWEG
- DESIGN TOP OF BANK
- DESIGN LOG CROSS VANE
- DESIGN LOG SILL
- DESIGN LOG VANE WITH ROCK SILL

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

Seal

NORTH CAROLINA PROFESSIONAL SEAL 034257 ENGINEER C.W. GASKILL

C.W. Gaskill 8-5-11

Consultants

Contractor

Ecosystems Grading Solutions, Inc.

Surveyor

Turner Land Surveying, PLLC

Stantec

801 Jones Franklin St.
Suite 300
Raleigh, NC 27606
Tel. 919.851-6866
Fax. 919.518.7024
www.stantec.com

Client/Project

NC Ecosystem Enhancement Program

Oakley Crossroads Stream & Wetland Restoration

Pitt County, NC

File Name: REDLINES.DWG | Dwn. CWG | Chkd. CWG | Dsgn. N/A | YY.MM.DD 11.07.11

Title

0+00 TO 12+00 PLAN VIEW

Project No. 171300129

Scale 1" = 50'

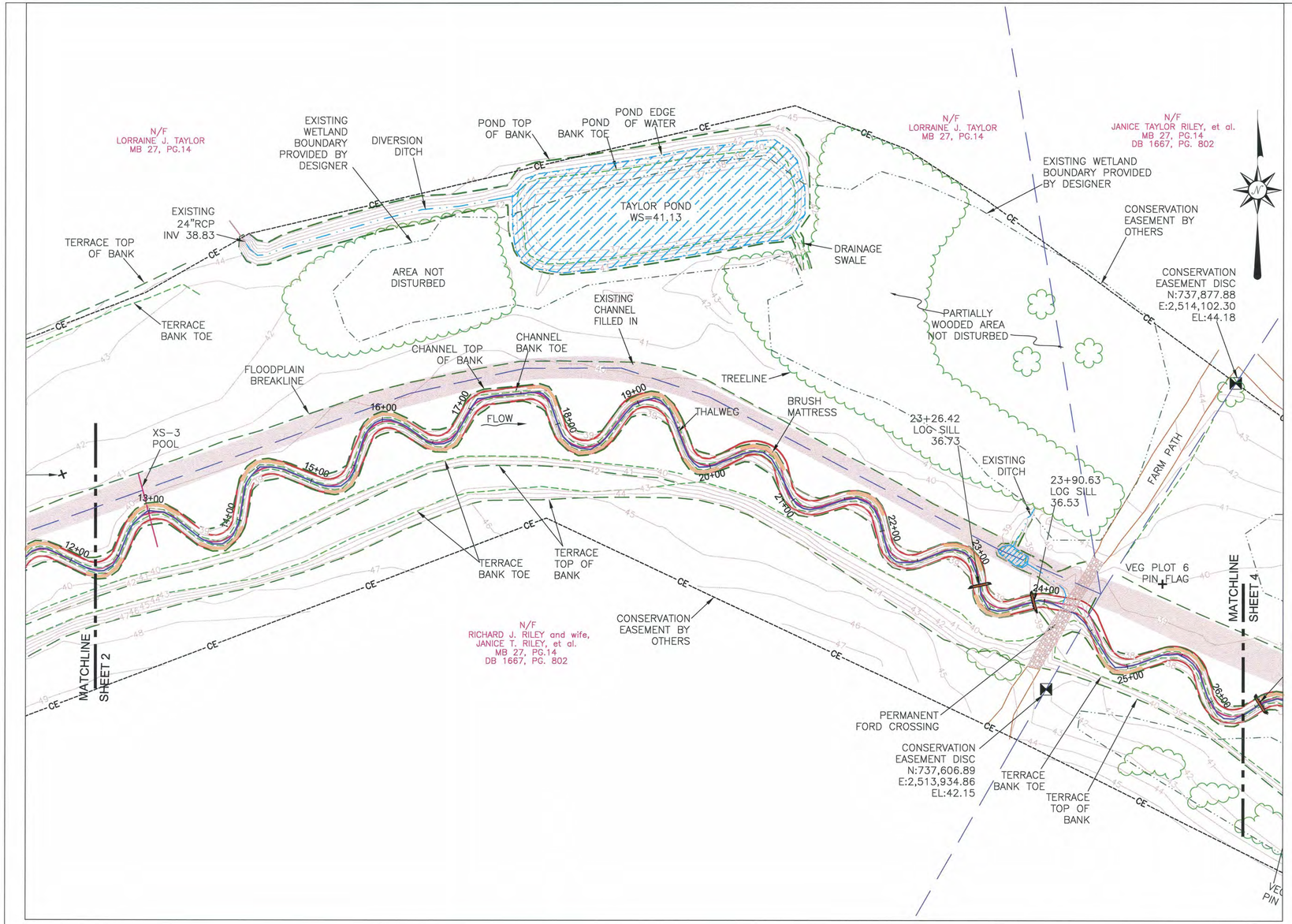
Drawing No.

Sheet 2 of 6

Revision

(J:\171300129\engr\construction\Redlines\REDLINES.dwg 2011/08/04 3:29 PM By: Oswald, Cliff)

ORIGINAL SHEET – ANSI D HORIZ



DEVIATION FROM DESIGN PLAN VIEW IS WITHIN DESIGN TOLERANCES.

STRUCTURE ELEVATIONS ARE WITHIN DESIGN TOLERANCES.

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THIS PROJECT IS A PRIORITY II STREAM RESTORATION.

LEGEND:

- THALWEG
- TOP OF BANK
- TOE OF BANK
- CENTERLINE DITCH
- EXISTING WETLANDS
- CE — CONSERVATION EASEMENT
- PROPERTY LINE NOT SURVEYED
- BENCH MARK/CONTROL PT
- LOG SILL
- LOG VANE WITH ROCK SILL
- LOG CROSS VANE
- OPEN WATER
- DESIGN THALWEG
- DESIGN TOP OF BANK
- DESIGN LOG CROSS VANE
- DESIGN LOG SILL
- DESIGN LOG VANE WITH ROCK SILL

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

Seal

NORTH CAROLINA PROFESSIONAL SEAL 034257 ENGINEER C.W. GASKILL, IV

C.W. Gaskill 8-5-11

Consultants

Contractor

Ecosystems Grading Solutions, Inc.

Surveyor

Turner Land Surveying, PLLC

Stantec
801 Jones Franklin St.
Suite 300
Raleigh, NC 27606
Tel. 919.851-6866
Fax. 919.518.7024
www.stantec.com

Client/Project

NC Ecosystem Enhancement Program

Oakley Crossroads Stream & Wetland Restoration

Pitt County, NC

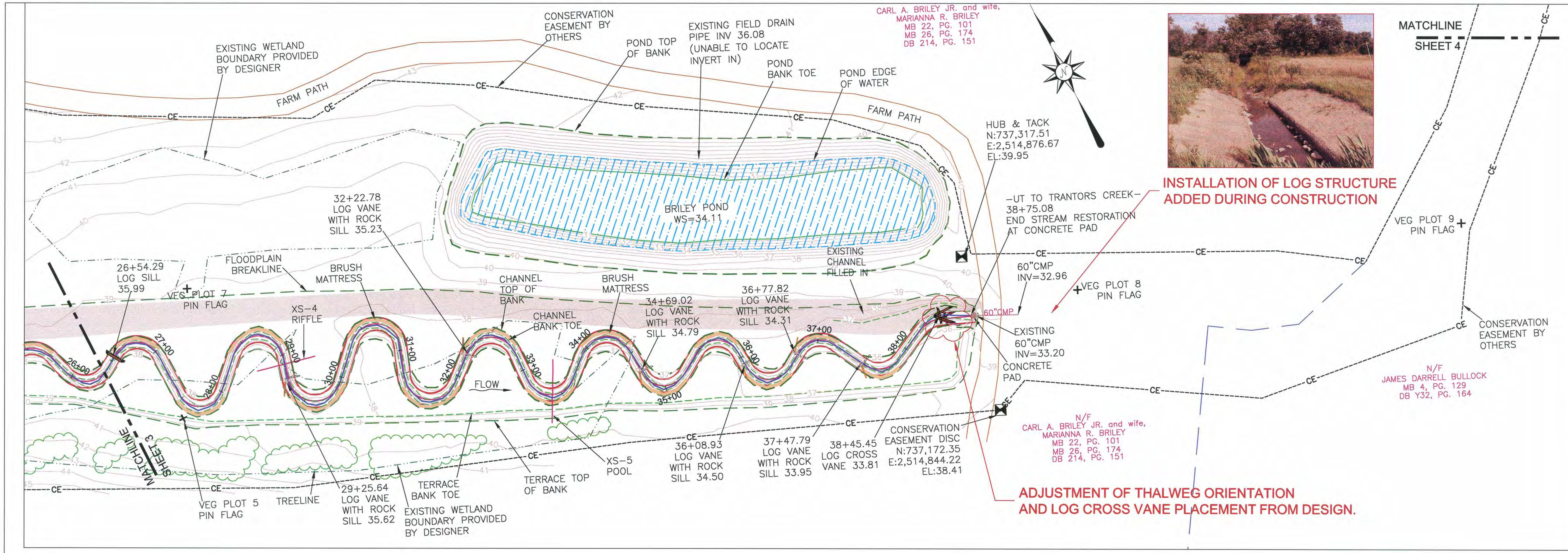
File Name: REDLINES.DWG	CWG Dwn.	CWG Chkd.	N/A Dsgn.	11.07.11 YY.MM.DD

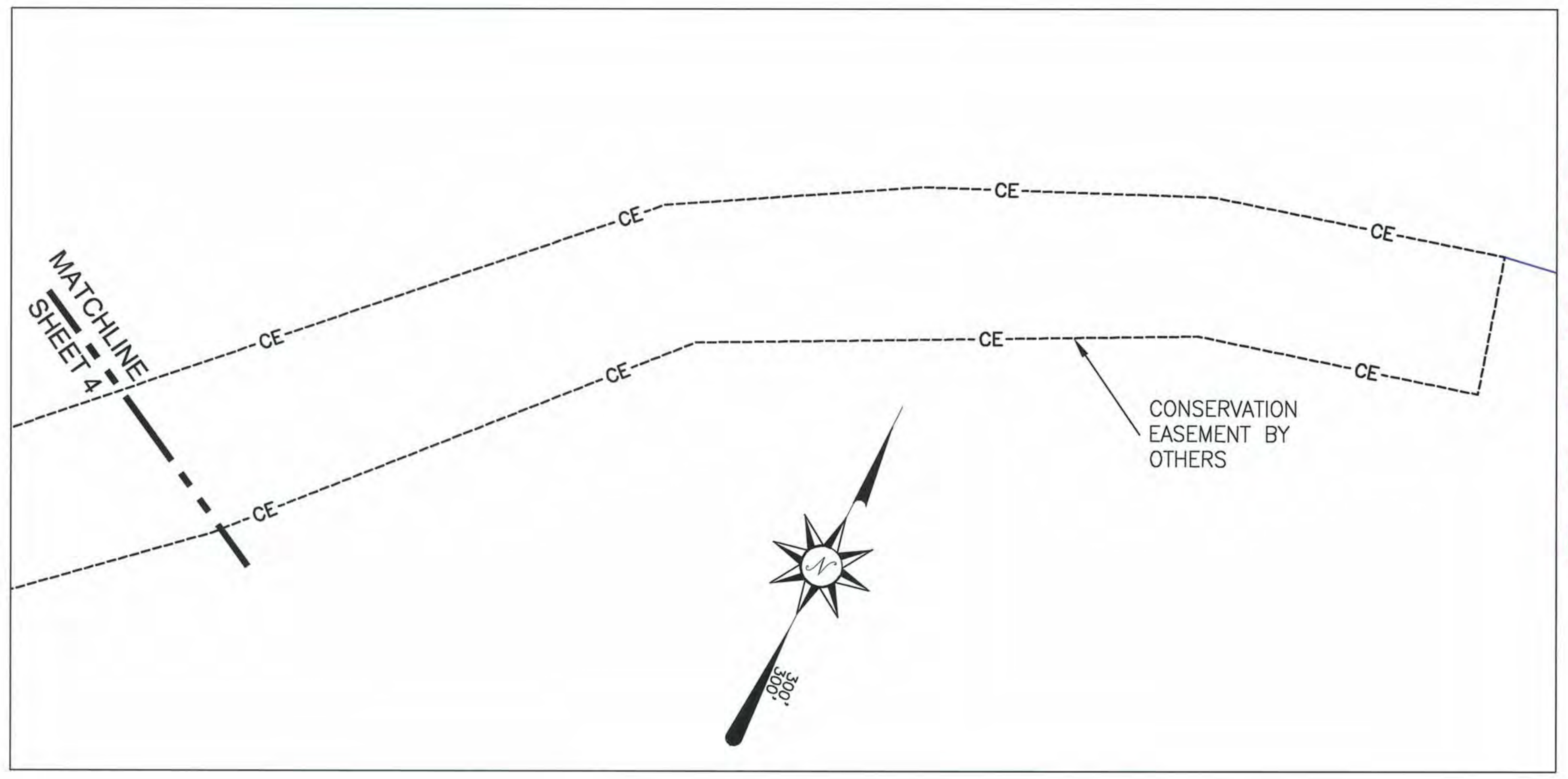
Title

12+00 TO 26+00 PLAN VIEW

Project No.	Scale	
171300129	1" = 50'	
Drawing No.	Sheet	Revision
	3 of	6

ORIGINAL SHEET – ANSI D HORIZ





DEVIATION FROM DESIGN PLAN VIEW IS WITHIN DESIGN TOLERANCES.

STRUCTURE ELEVATIONS ARE WITHIN DESIGN TOLERANCES.

ALL REVISIONS TO THE DESIGN HAVE BEEN INCORPORATED AS THE FINAL DESIGN SHOWN ON THESE SHEETS.

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LEGEND:

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- DESIGN LOG SILL
- DESIGN LOG VANE WITH ROCK SILL

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

Seal

NORTH CAROLINA PROFESSIONAL SEAL 034257 ENGINEER C.W. GASKILL, JR.

C.W. Gaskill 8-5-11

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Pitt County, NC

File Name: REDLINES.DWG | CWG Dwn. | CWG Chkd. | N/A Dsgn. | 11.07.11 YY.MM.DD

Title
26+00 TO 39+25 PLAN VIEW

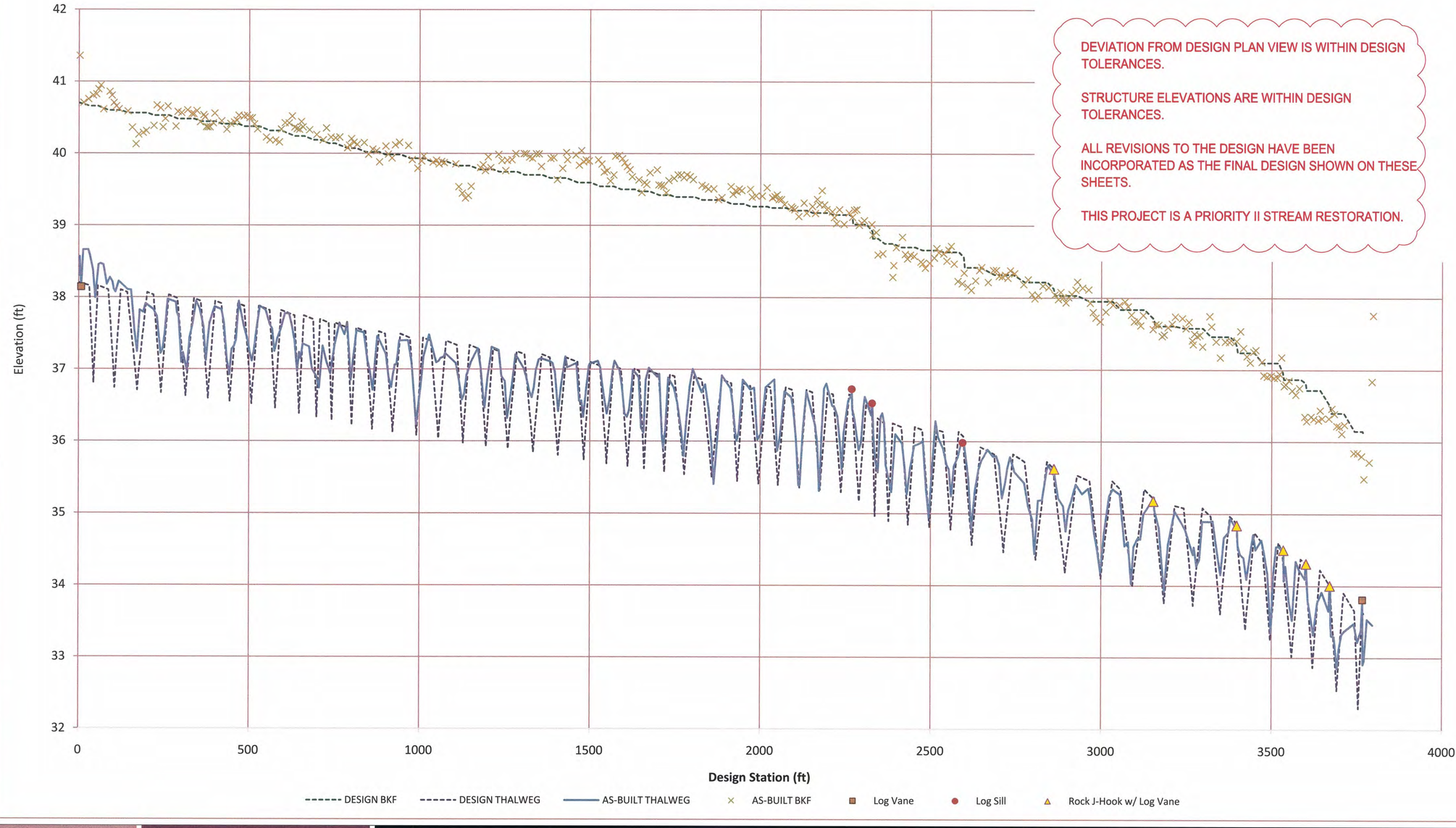
Project No. 171300129
Scale 1" = 50'

Drawing No.
Sheet 4 of 6
Revision

U:\171300129\cm\construction\Redlines\REDLINES.dwg 2011/08/04 3:29 PM By: Gaskill, CW

ORIGINAL SHEET – ANSI D HORZ

Oakley Profile
As-Built



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Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

Seal

NORTH CAROLINA PROFESSIONAL SEAL 034257 ENGINEER C. W. GASKILL, IV

C.W. Gaskill IV. 8-5-11

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Pitt County, NC

File Name: REDLINES.DWG	CWG Dwn.	CWG Chkd.	N/A Dsgn.	11.07.11 YY.MM.DD

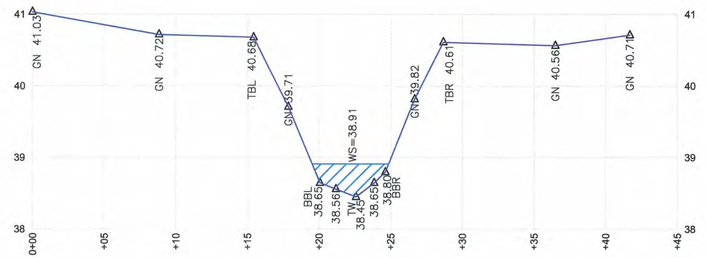
Title

Long Profile

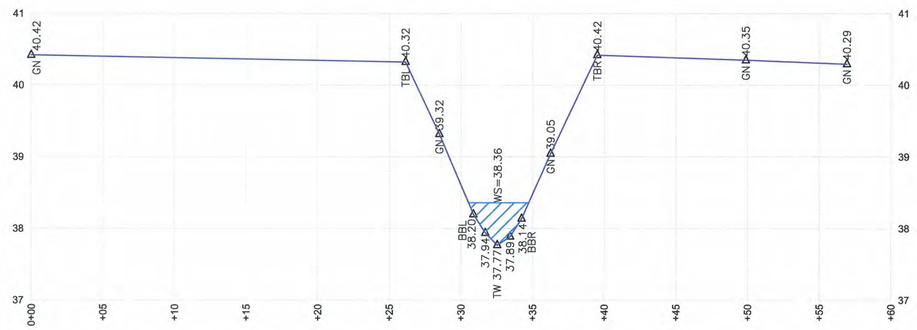
Project No.	Scale	
171300129	NONE	
Drawing No.	Sheet	Revision
	5 of	6

ORIGINAL SHEET – ANSI D HORIZ

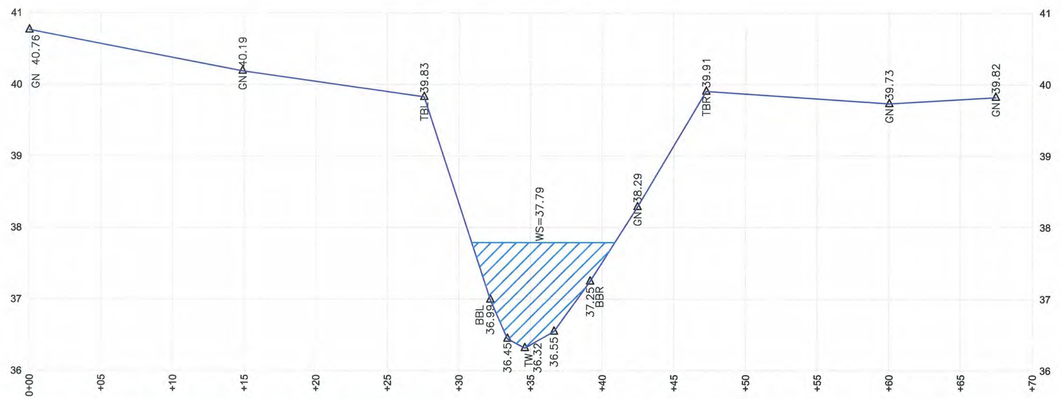
CROSS SECTION 1 - RIFFLE



CROSS SECTION 2 - RIFFLE



CROSS SECTION 3 - POOL



DEVIATION FROM DESIGN PLAN VIEW IS WITHIN DESIGN TOLERANCES.

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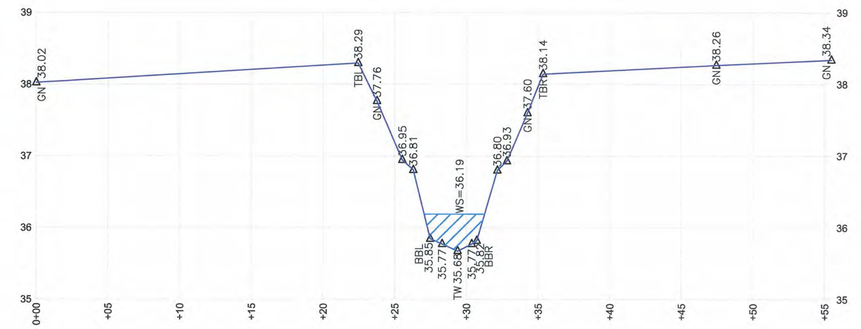
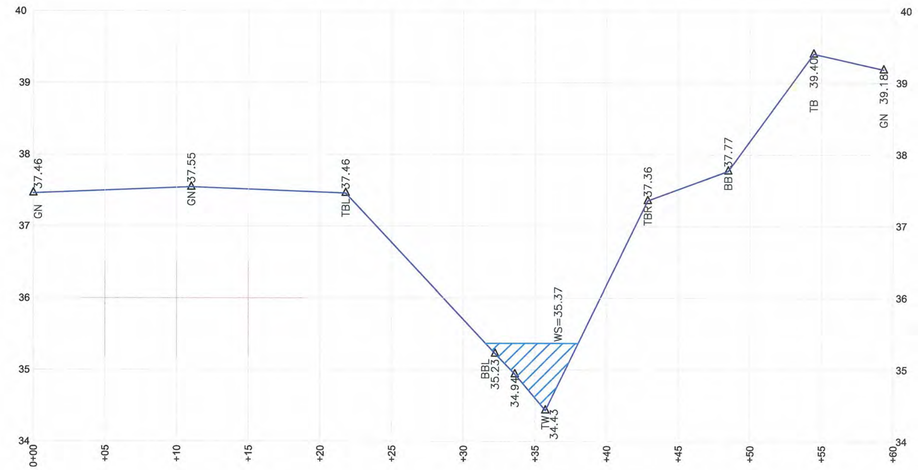
CROSS SECTION 4 - RIFFLE



CROSS SECTION 5 - POOL



GN–GROUND
TBL–CHANNEL LEFT TOP OF BANK
TBR–CHANNEL RIGHT TOP OF BANK
BBL–CHANNEL LEFT BANK TOE
BBR–CHANNEL RIGHT BANK TOE
TW–THALWEG
WS–WATER SURFACE

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

Seal

NORTH CAROLINA PROFESSIONAL SEAL 034257 ENGINEER W. GASKILL

C.W. Gaskill 8-5-11

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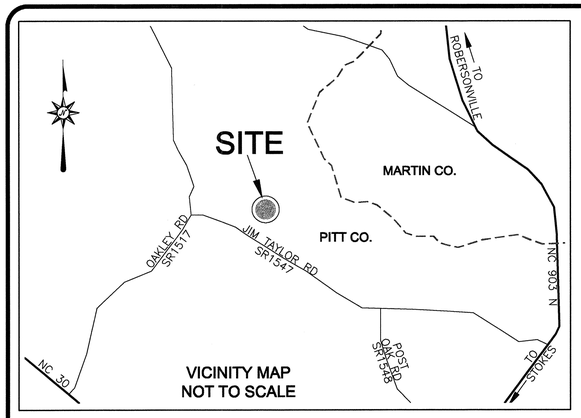
Pitt County, NC

File Name: REDLINES.DWG	CWG Dwn.	CWG Chkd.	N/A Dsgn.	11.07.11 YY.MM.DD

Title
Cross-Sections

Project No. 171300129
Drawing No.
Scale HORZ:1" = 5' ; VERT: 1" = 1'
Sheet 6 of 6
Revision



VICINITY MAP
NOT TO SCALE

AS-BUILT SURVEY OF
OAKLEY CROSSROADS STREAM & WETLAND RESTORATION
SCO# 05-06597-01
PITT COUNTY

REFERENCES:

OWNER:
NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM
1652 MAIL SERVICE CENTER
RALEIGH, NC 27099-1652
(919)715-0476
EEP PROJ. MGR.: JESSICA KEMP
EEP REVIEW COORDINATOR: LIN XU

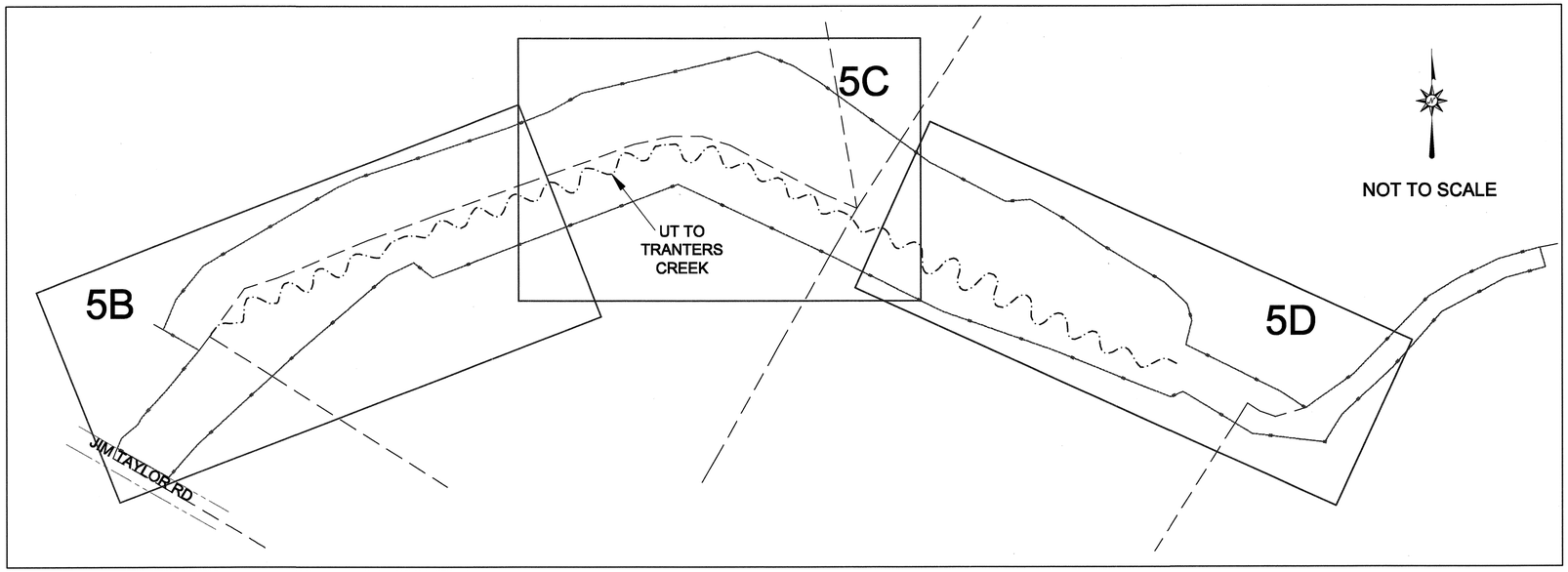
CONTRACTOR:
ECOSYSTEMS GRADING SOLUTIONS, INC.
MORGANTON, NC
(828)584-3018

DESIGNER:
STANTEC CONSULTING SERVICES, INC.
RALEIGH, NC
(919)851-6866

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 16th DAY OF JUNE, 2011.

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER



NOT TO SCALE

I, DAVID S. TURNER, CERTIFY THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL GPS SURVEY MADE UNDER MY SUPERVISION AND THE FOLLOWING INFORMATION WAS USED TO PERFORM THE SURVEY:

(1) CLASS OF SURVEY: CLASS C
(2) POSITIONAL ACCURACY AT 95% CONFIDENCE LEVEL: HORIZONTAL= 0.054 USFT, VERTICAL= 0.106 USFT
(3) TYPE OF GPS FIELD PROCEDURE: REAL-TIME KINEMATIC/VRS
(4) DATES OF SURVEY: APRIL 7-8 & MAY 5-7
(5) DATUM/EPOCH: NAD83 (2007)
(6) PUBLISHED/FIXED-CONTROL USE: TLS#3HT NORTHING=737321.911 USFT, EASTING=2512271.868 USFT, ELEV=44.56 USFT
(7) GEOID MODEL: GEOID 03
(8) COMBINED GRID FACTOR: 0.99991504
(9) UNITS: US FEET

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

SHEET INDEX

GENERAL NOTES

1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88.
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 (NSRS 2007) DATUM.
4. CONTROL SET USING RTK GPS METHODS AND THE NCGS CORS NETWORK. CONTROL ESTABLISHED AND VERIFIED THROUGH AVERAGED 180 EPOCH RTK OBSERVATIONS MADE AT A MINIMUM OF TWO HOURS APART. RTK GPS UNIT USED WAS SPECTRA EPOCH 35 GPS ROVER OPERATING AT 450-470 MHZ.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. ALL CROSS-SECTIONS ARE FROM LEFT BANK TO RIGHT BANK (FACING DOWNSTREAM).

REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING, PLLC
3201 Glenridge Drive, Raleigh, NC 27604 -- (919)875-1378
P-0702 -- Lturner921@nc.rr.com -- Dturner119@nc.rr.com
www.TURNERLANDSURVEYING.com

TITLE

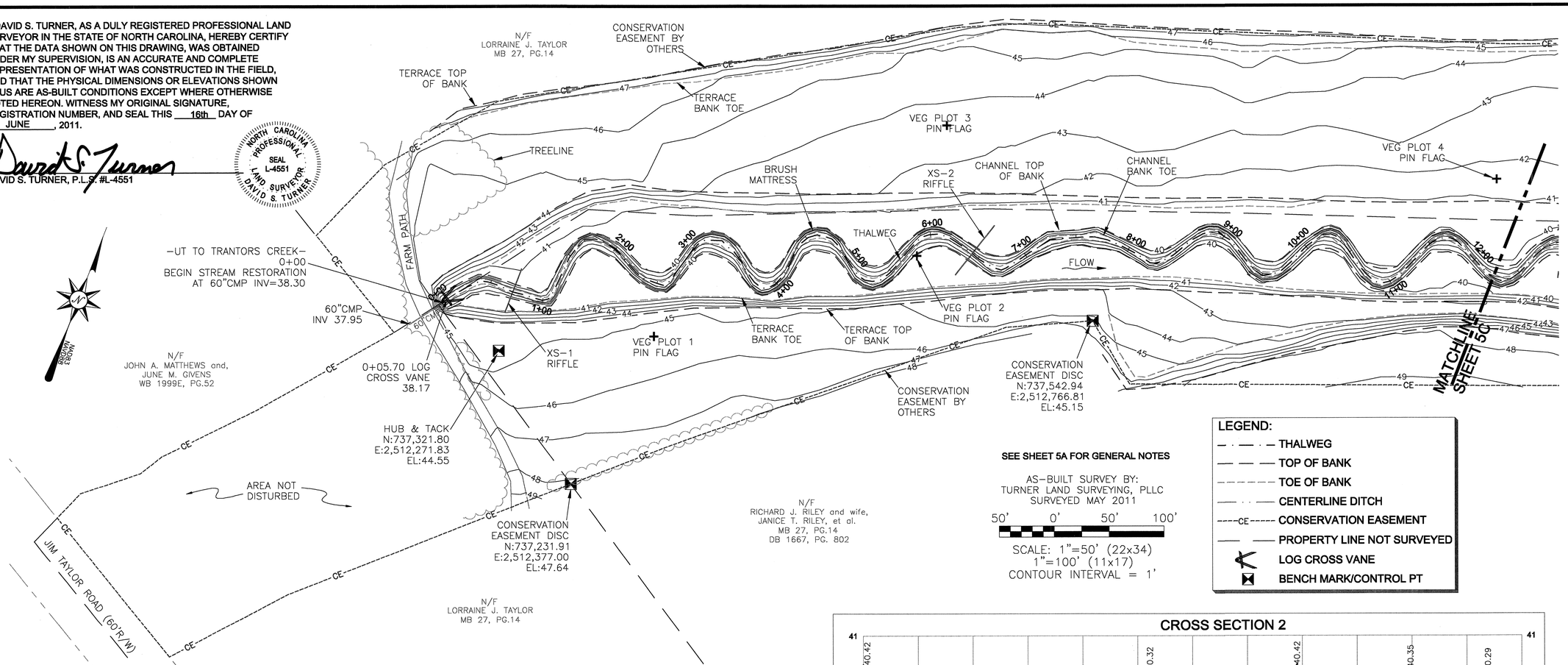
AS-BUILT SURVEY OF
OAKLEY CROSSROADS STREAM & WETLAND RESTORATION
SCO# 05-06597-01
PITT COUNTY NORTH CAROLINA

DATE:	5/10/2011
SURVEYED BY:	DST/EGT
DRAWN BY:	DST/EGT
REVIEWED BY:	DST/EGT
PROJECT:	TLS-10-010
FILE:	OAKLEY CROSSROADS_273_AB_TLS_F
SCALE:	AS SHOWN
SHEET	5A

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 16th DAY OF JUNE, 2011.

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER



SEE SHEET 5A FOR GENERAL NOTES

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED MAY 2011

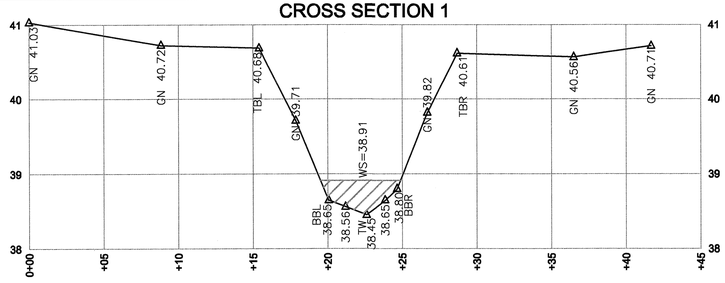
50' 0' 50' 100'

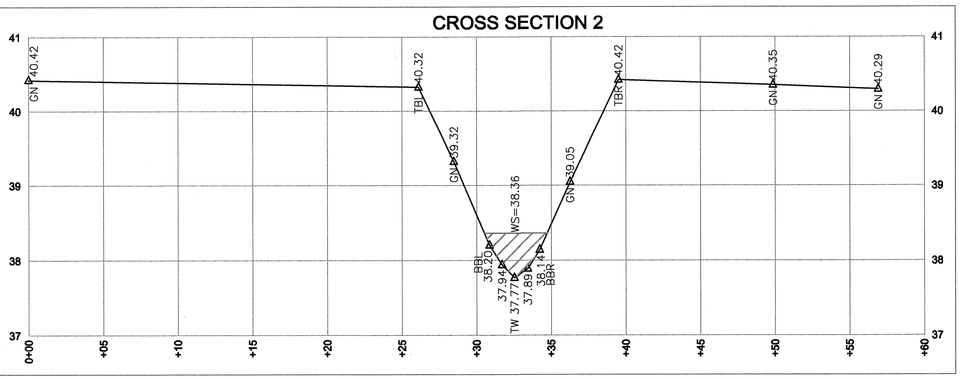
SCALE: 1"=50' (22x34)
1"=100' (11x17)
CONTOUR INTERVAL = 1'

LEGEND:
- THALWEG
- TOP OF BANK
- TOE OF BANK
- CENTERLINE DITCH
- CE CONSERVATION EASEMENT
- PROPERTY LINE NOT SURVEYED
- LOG CROSS VANE
- BENCH MARK/CONTROL PT

CROSS SECTION SCALE
HORIZONTAL: 1"=5' (22x34)
1"=10' (11x17)
VERTICAL: 1"=1' (22x34)
1"=2' (11x17)

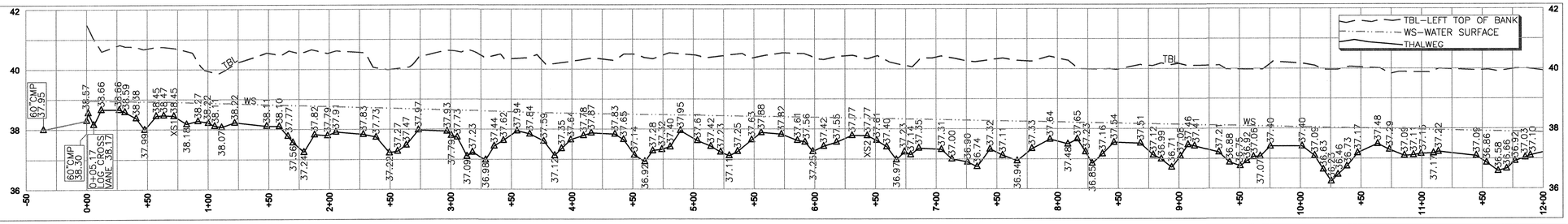
GN–GROUND
TBL–CHANNEL LEFT TOP OF BANK
TBR–CHANNEL RIGHT TOP OF BANK
BBL–CHANNEL LEFT BANK TOE
BBR–CHANNEL RIGHT BANK TOE
TW–THALWEG
WS–WATER SURFACE





AS-BUILT LONGITUDINAL PROFILE STA 0+00 TO 12+00

PROFILE SCALE
HORIZONTAL: 1"=50' (22x34)
1"=100' (11x17)
VERTICAL: 1"=2' (22x34)
1"=4' (11x17)



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P-0702 – Lturner92@nc.rr.com – Dturner119@nc.rr.com
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PLAN VIEW
AS-BUILT SURVEY OF
OAKLEY CROSSROADS STREAM & WETLAND RESTORATION
SCO# 05-06597-01
NORTH CAROLINA
PITT COUNTY

DATE: 5/10/2011
SURVEYED BY: DST/EGT
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-10-010
FILE: OAKLEY CROSSROADS_273_AB_TLS_F
SCALE: AS SHOWN

SHEET 5B

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 16th DAY OF JUNE, 2011.

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

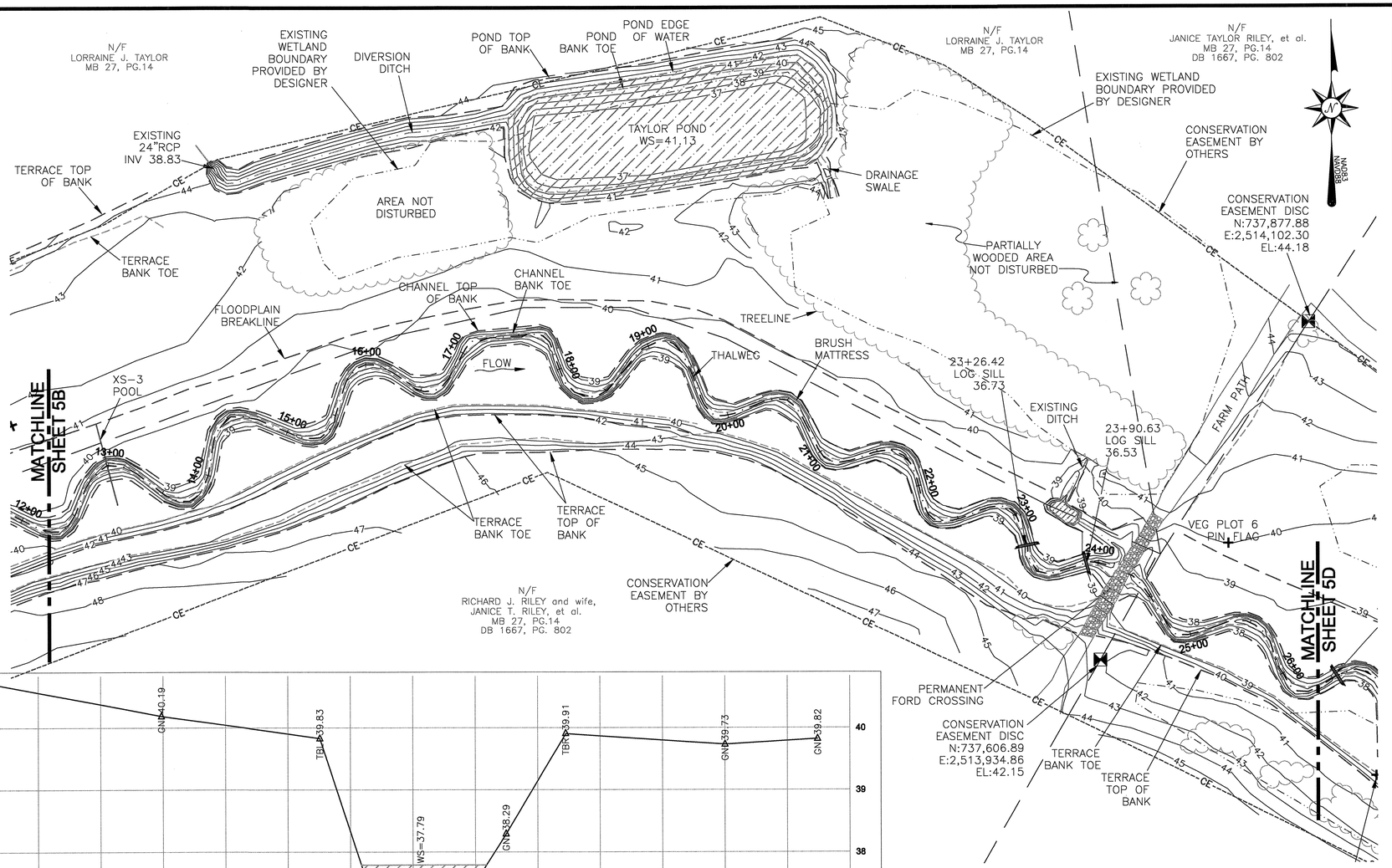
LEGEND:
- THALWEG
- TOP OF BANK
- TOE OF BANK
- CENTERLINE DITCH
- EXISTING WETLANDS
- CE CONSERVATION EASEMENT
- PROPERTY LINE NOT SURVEYED
- BENCH MARK/CONTROL PT
- LOG SILL
- LOG VANE WITH ROCK SILL
- LOG CROSS VANE
- OPEN WATER

SEE SHEET 5A FOR GENERAL NOTES

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED MAY 2011

50' 0' 50' 100'

SCALE: 1"=50' (22x34)
1"=100' (11x17)
CONTOUR INTERVAL = 1'



CROSS SECTION 3

CROSS SECTION SCALE
HORIZONTAL: 1"=5' (22x34)
1"=10' (11x17)
VERTICAL: 1"=1' (22x34)
1"=2' (11x17)

GN–GROUND
TBL–CHANNEL LEFT TOP OF BANK
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BBL–CHANNEL LEFT BANK TOE
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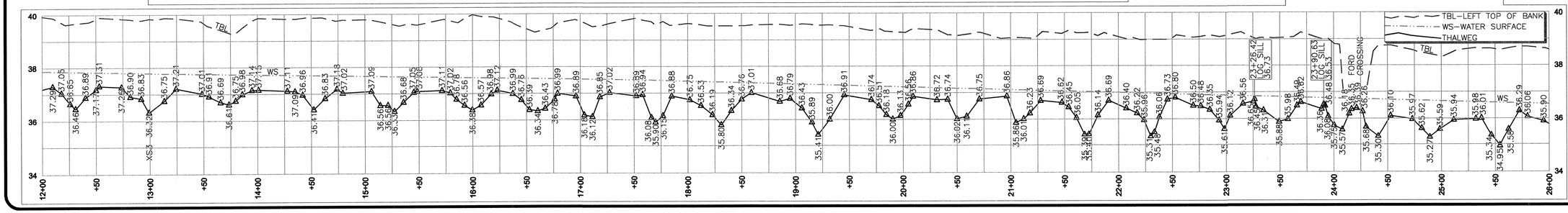
TW–THALWEG
WS–WATER SURFACE

AS-BUILT LONGITUDINAL PROFILE STA 12+00 TO 26+00

PROFILE SCALE
HORIZONTAL: 1"=50' (22x34)
1"=100' (11x17)
VERTICAL: 1"=2' (22x34)
1"=4' (11x17)



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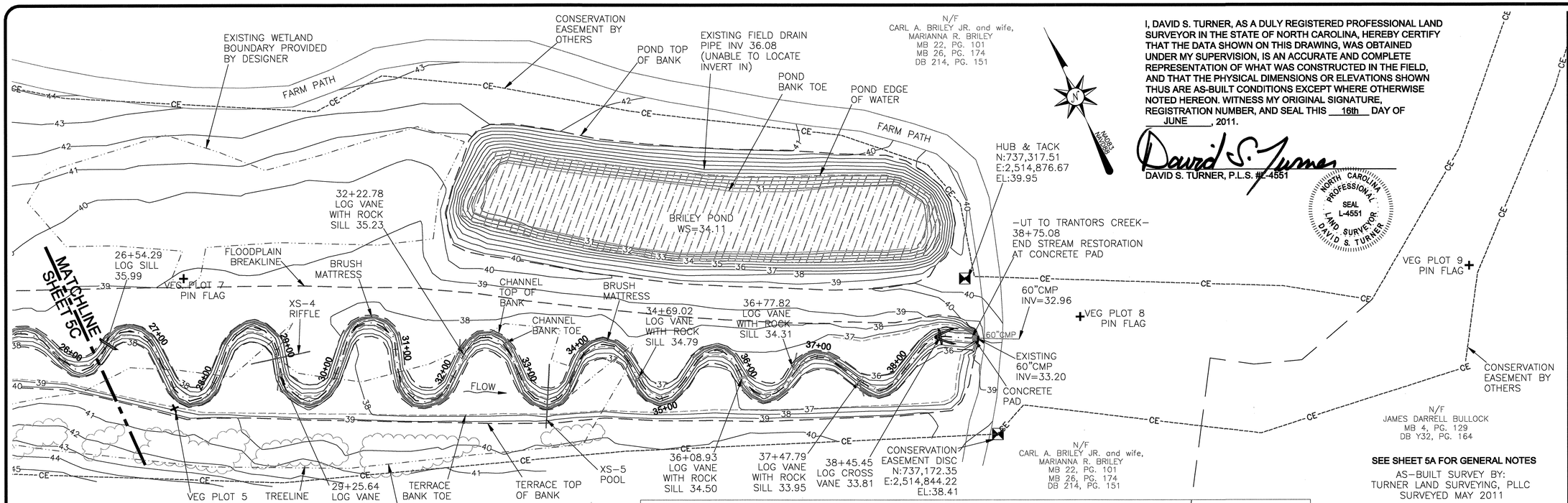
PLAN VIEW
AS-BUILT SURVEY OF
OAKLEY CROSSROADS STREAM & WETLAND RESTORATION
SCO# 05-06597-01
NORTH CAROLINA
PITT COUNTY

DATE:	5/10/2011
SURVEYED BY:	DST/EGT
DRAWN BY:	DST/EGT
REVIEWED BY:	DST/EGT
PROJECT:	TLS-10-010
FILE:	OAKLEY CROSSROADS_273_AB_TLS_F
SCALE:	AS SHOWN
SHEET	5C



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NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

SEE SHEET 5A FOR GENERAL NOTES

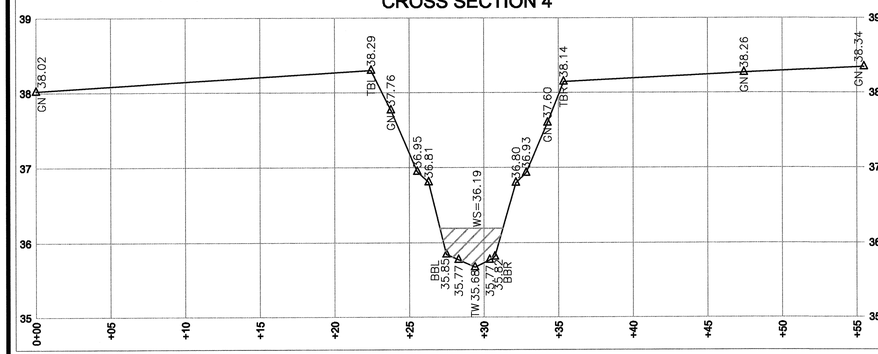
AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED MAY 2011

50' 0' 50' 100'

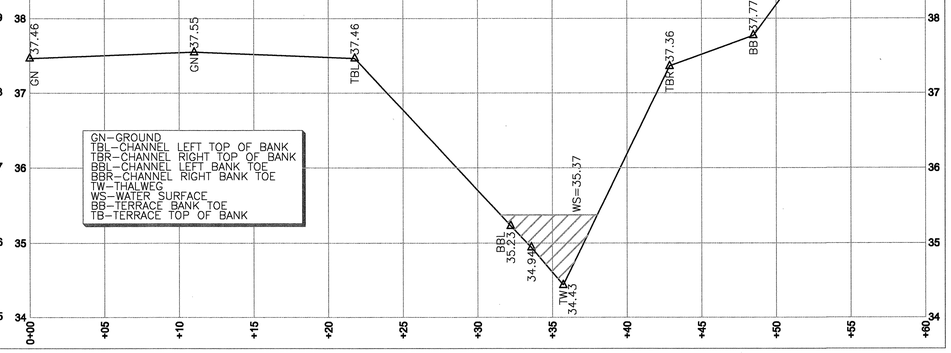
SCALE: 1"=50' (22x34)
1"=100' (11x17)
CONTOUR INTERVAL = 1'

CROSS SECTION SCALE
HORIZONTAL: 1"=5' (22x34) VERTICAL: 1"=1'(22x34)
1"=10' (11x17) 1"=2'(11x17)

CROSS SECTION 4

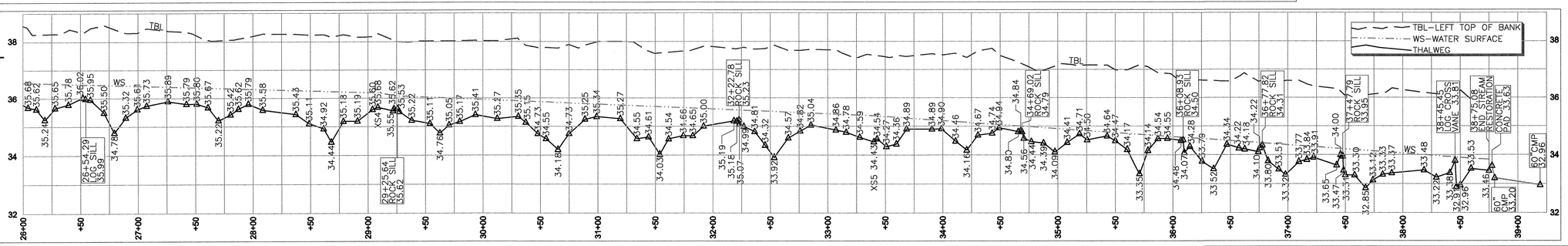


CROSS SECTION 5



AS-BUILT LONGITUDINAL PROFILE STA 26+00 TO 39+25

PROFILE SCALE
HORIZONTAL:
1"=50' (22x34)
1"=100' (11x17)
VERTICAL:
1"=2' (22x34)
1"=4' (11x17)



LEGEND:

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AS-BUILT SURVEY OF
OAKLEY CROSSROADS STREAM & WETLAND RESTORATION
SCO# 05-06597-01

NORTH CAROLINA
PITT COUNTY

DATE:	5/10/2011
SURVEYED BY:	DST/EGT
DRAWN BY:	DST/EGT
REVIEWED BY:	DST/EGT
PROJECT:	TLS-10-010
FILE:	OAKLEY CROSSROADS_ 273_AB_TLS_F
SCALE:	AS SHOWN
SHEET	5D

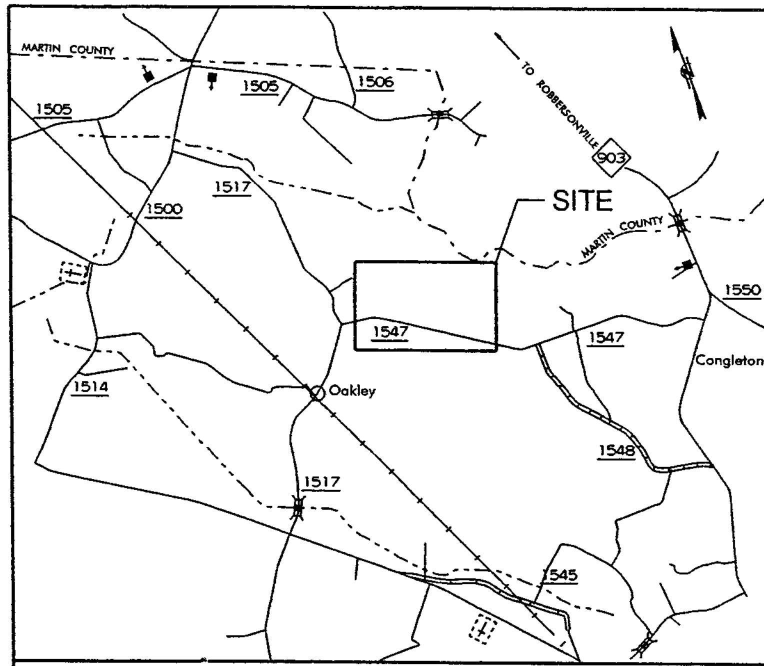
PROJECT: SCO-050659701 \ OAKLEY

STATE	REP PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SCO-050659701	1	

STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

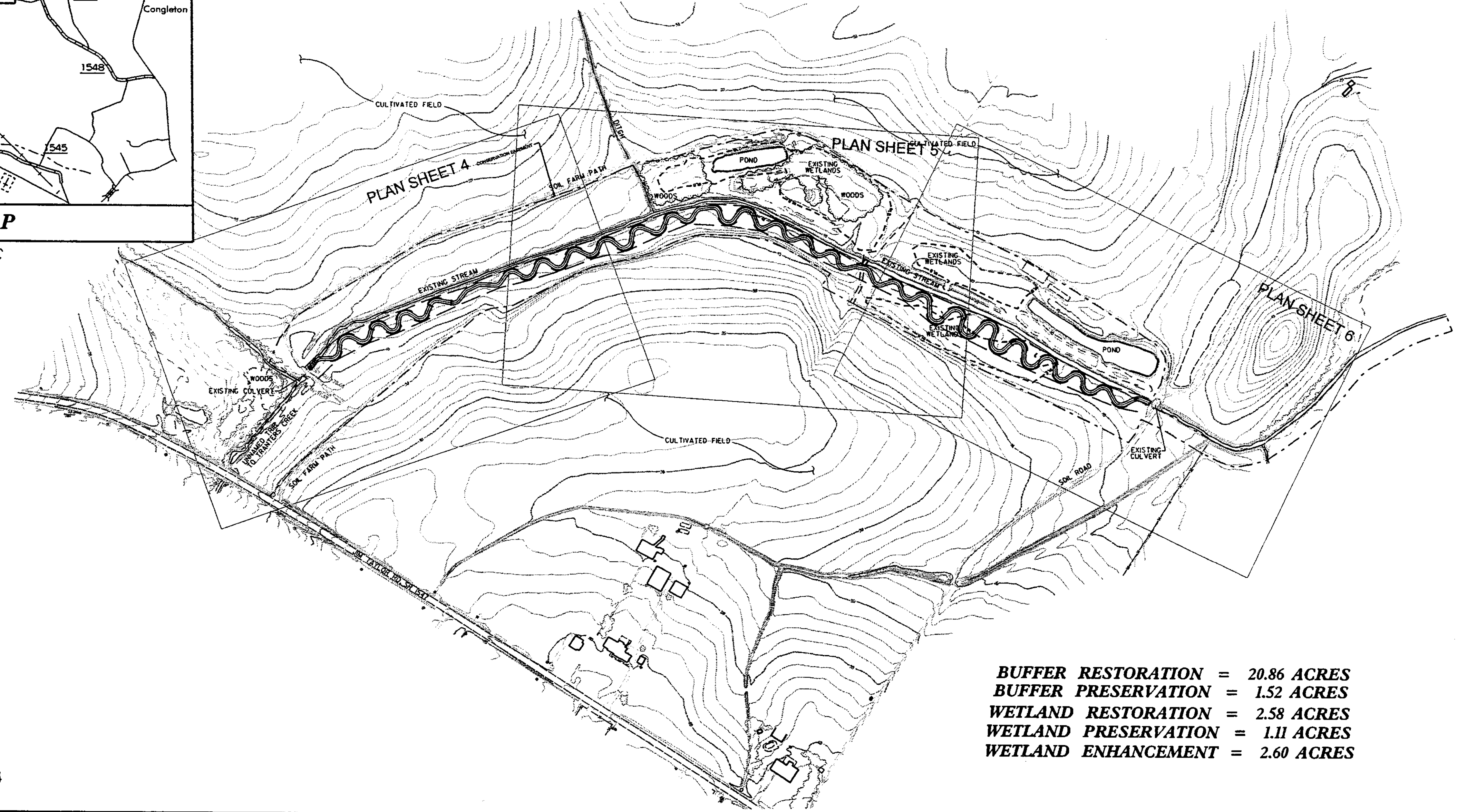
OAKLEY CROSSROADS STREAM AND WETLAND RESTORATION

LOCATION: PITT COUNTY, NC



VICINITY MAP

PITT COUNTY, NC



INDEX OF SHEETS

BUFFER RESTORATION = 20.86 ACRES
BUFFER PRESERVATION = 1.52 ACRES
WETLAND RESTORATION = 2.58 ACRES
WETLAND PRESERVATION = 1.11 ACRES
WETLAND ENHANCEMENT = 2.60 ACRES

GRAPHIC SCALES

50 25 0 50 100
PLANS

20 10 0 20 40
PROFILE (HORIZONTAL)

4 2 0 4 8
PROFILE (VERTICAL)

DESIGN DATA

DESIGN STREAM TYPE = E5

BANKFULL CROSS-SECTIONAL AREA (FT^2) = 19.0

BANKFULL WIDTH (FT) = 12.3

WIDTH TO DEPTH RATIO = 8.0

PROJECT LENGTH

EXISTING STREAM LENGTH = 2940'
PROPOSED DESIGN STREAM LENGTH = 3799'
PRIORITY I RESTORATION = 3799'
LIMITS OF DISTURBANCE = 14.2 ACRES

PROJECT MANAGER — JESSICA KEMP
PROJECT COORDINATOR — LIN XU

Prepared in the Office of:
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866 Fax. 919.851.7024
www.stantec.com

LETTING DATE:

BRAD FAIRLEY
PROJECT MANAGER

NATHAN E. JEAN, PE
PROJECT DESIGN ENGINEER

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

04-29-09

SIGNATURE P.E.

4/29/2009
J:\1730029\eeh\design\dwn\Oakley_sim_T01.dgn

STREAM CONSTUCTION DETAILS

Stantec
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
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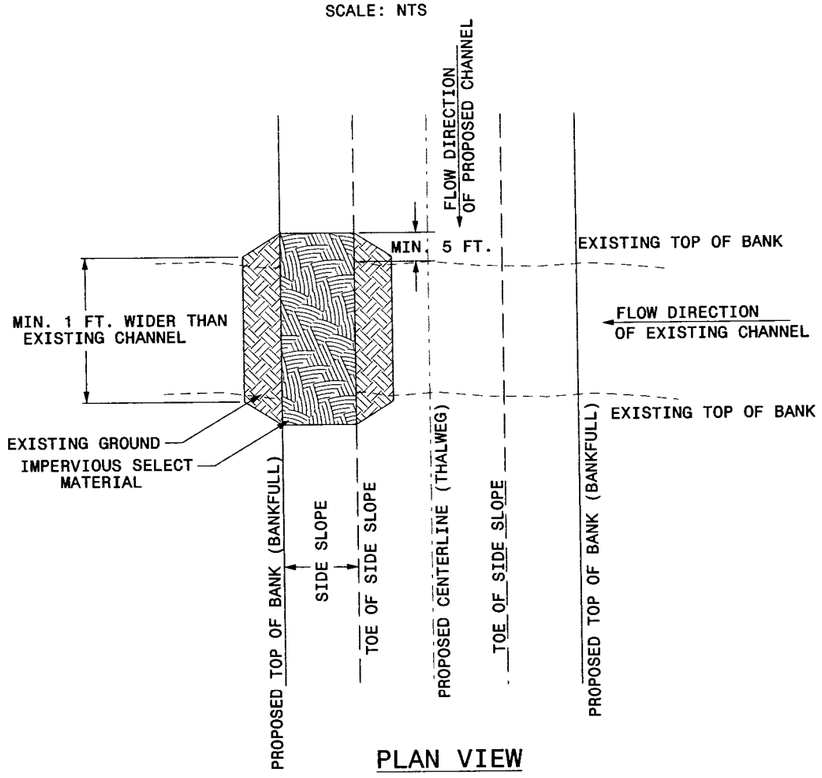
PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

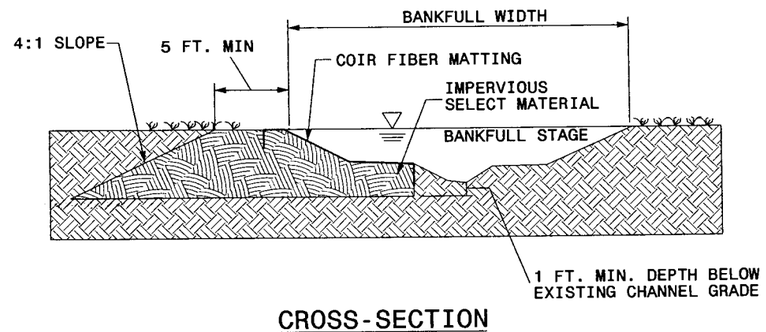
06/28/2010

IMPERVIOUS STREAM CHANNEL PLUG

SCALE: NTS

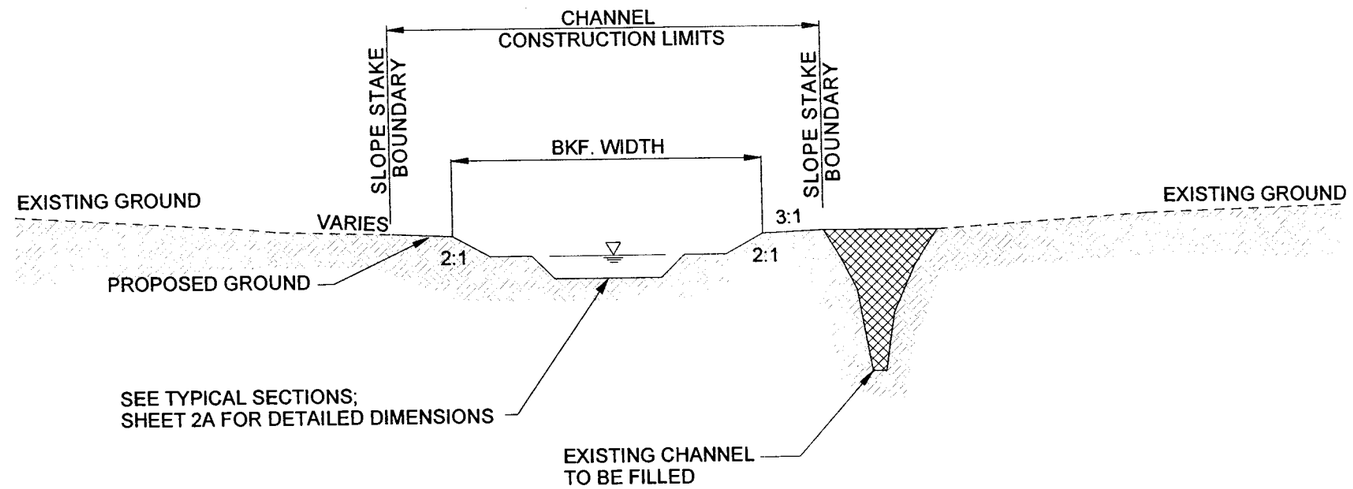


PLAN VIEW



CROSS-SECTION

PRIORITY I TYPICAL CHANNEL SECTION



LOCATION	STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO.	SCO-050659701
COUNTY	PITT
DESIGNED BY	NEJ
DRAWN BY	CGM
CHECKED BY	BAM
DATE	REV. 06/18/2

STREAM CONSTUCTION DETAILS

Stantec
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2A
PROJECT ENGINEER	

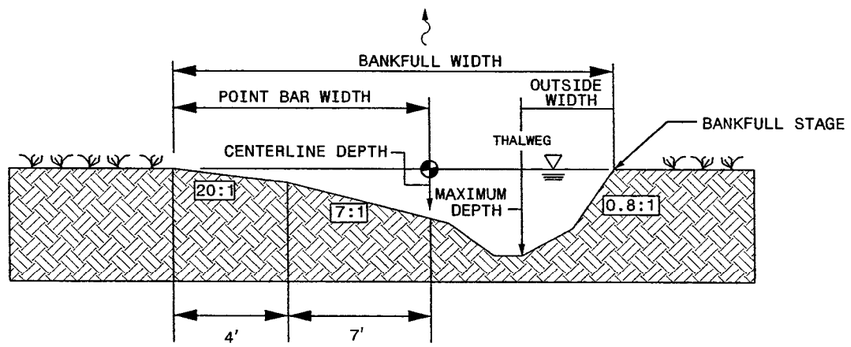
NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN
6-19-08

TYPICAL SECTION - POOL RIGHT

MIRROR ABOUT CENTERLINE FOR POOL LEFT

BANKFULL WIDTH	21.0
POINT BAR WIDTH	11.0
MAX DEPTH (THALWEG)	4.0
OUTSIDE WIDTH	3.2
CENTERLINE DEPTH	1.2

ALL UNITS ARE IN FEET

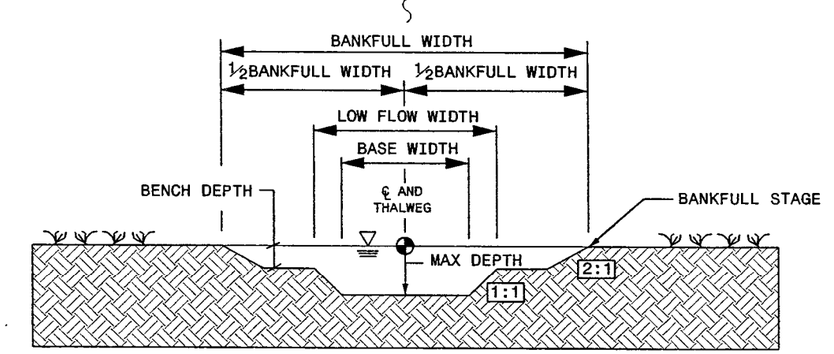


THALWEG (DEEPEST POINT IN A CROSS SECTION)
IS LOCATED IN THE MIDDLE OF THE BASE WIDTH.
NOTES: - ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION
- ⊕ - GRADE POINT IS THE CENTERLINE OF THE STREAM
- ALL SHARP CORNERS SHOULD BE ROUNDED
SCALE: NTS

TYPICAL SECTION - RIFFLE

BANKFULL WIDTH	12.5
BASE WIDTH	3.4
MAXIMUM DEPTH	2.5
LOW FLOW WIDTH	5.6
BENCH DEPTH	1.4

ALL UNITS ARE IN FEET



THALWEG (DEEPEST POINT IN CROSS SECTION) IS LOCATED IN CENTER OF CHANNEL IN A RIFFLE.
NOTES: - ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION
- ⊕ - GRADE POINT IS THE CENTERLINE OF THE STREAM
- ALL SHARP CORNERS SHOULD BE ROUNDED
SCALE: NTS

LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO.: SCO-050659701 COUNTY: PITT
DESIGNED BY: NEJ DRAWN BY: CGM
CHECKED BY: BAM DATE:

STREAM CONSTUCTION DETAILS

Stantec
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
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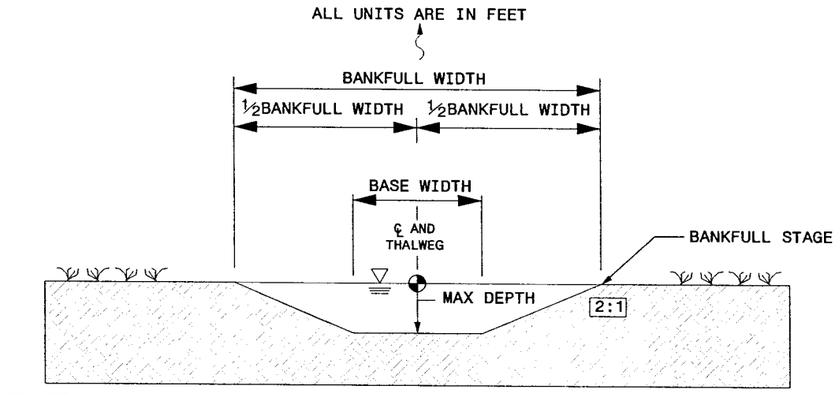
PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2A-1
PROJECT ENGINEER	

REVISED TYPICAL SECTION - RIFFLE

BANKFULL WIDTH	12.5
BASE WIDTH	2.3
MAXIMUM DEPTH	2.5



THALWEG (DEEPEST POINT IN CROSS SECTION) IS LOCATED IN CENTER OF CHANNEL IN A RIFFLE.

NOTES:
- ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION
- ⊕ - GRADE POINT IS THE CENTERLINE OF THE STREAM
- ALL SHARP CORNERS SHOULD BE ROUNDED

SCALE: NTS

CONTRACTOR IS TO USE THIS ALTERNATIVE CROSS SECTION ONLY WHEN FIELD CONDITIONS MAKE CONSTRUCTING THE ORIGINALLY DESIGNED CROSS SECTION IMPRACTICABLE. FINAL DETERMINATION WILL BE MADE BY THE ON-SITE CONSTRUCTION ADMINISTRATOR.

LOCATION:	STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO.	SCO-050659701
COUNTY:	PITT
DESIGNED BY:	NEJ
DRAWN BY:	NEJ
CHECKED BY:	BAM
DATE:	08/10/2010

STREAM CONSTUCTION DETAILS

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2B
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

4-29-09

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Suite 300, 801 Jones Franklin Road
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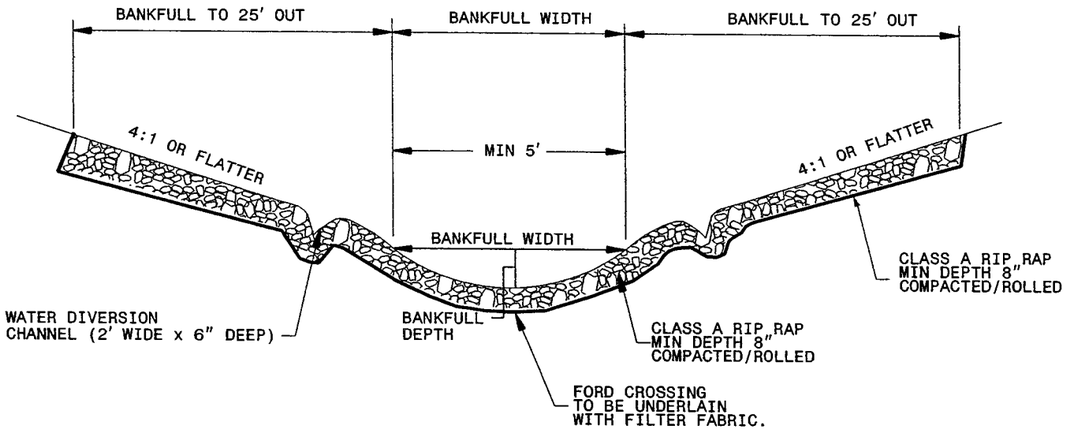
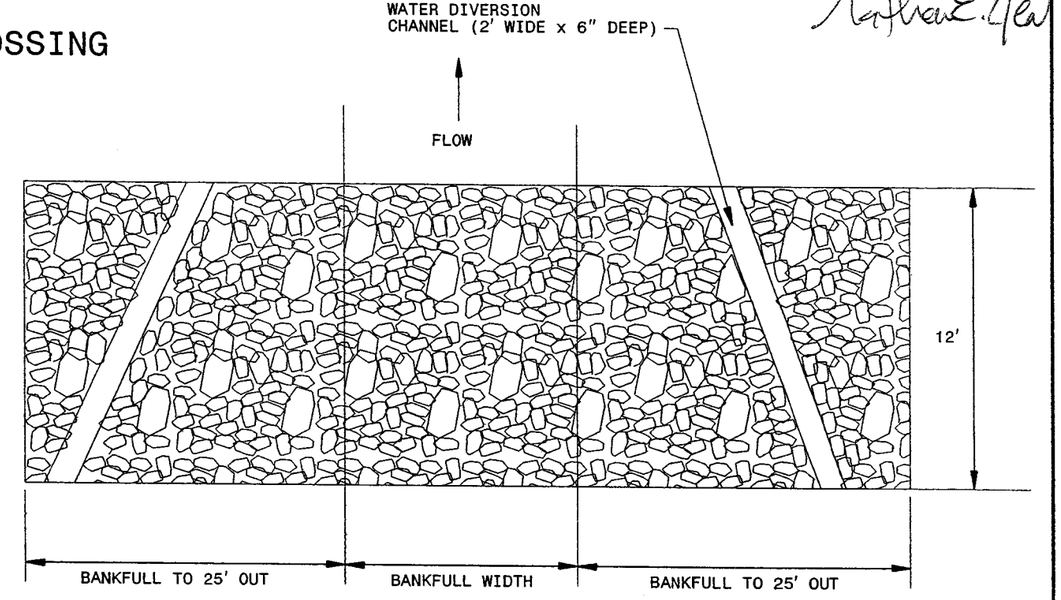
PERMANENT FORD CROSSING

SCALE: N.T.S.



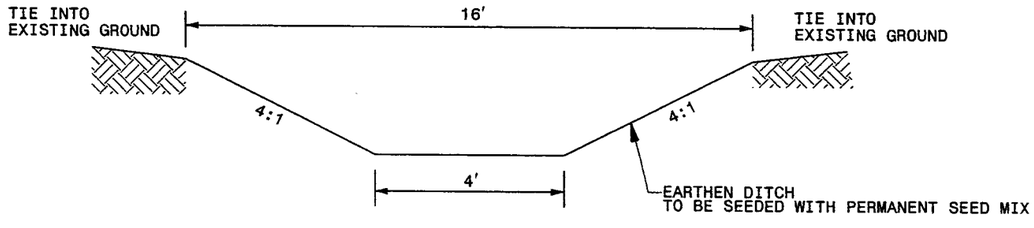
CROSS-SECTION



PLAN VIEW

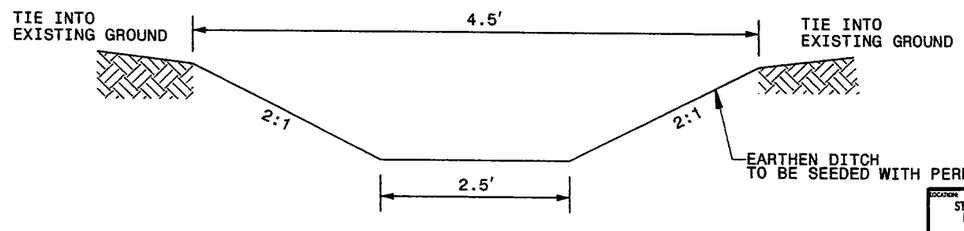
DIVERSION DITCH

SCALE: N.T.S.



DIVERSION DITCH 2

SCALE: N.T.S.



LOCATION:	STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO.:	SCO-050659701
COUNTY:	PITT
DESIGNED BY:	NEJ
DRAWN BY:	CGM
CHECKED BY:	BAM
SCALE:	

STREAM CONSTUCTION DETAILS

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Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
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Fax. 919.851.7024
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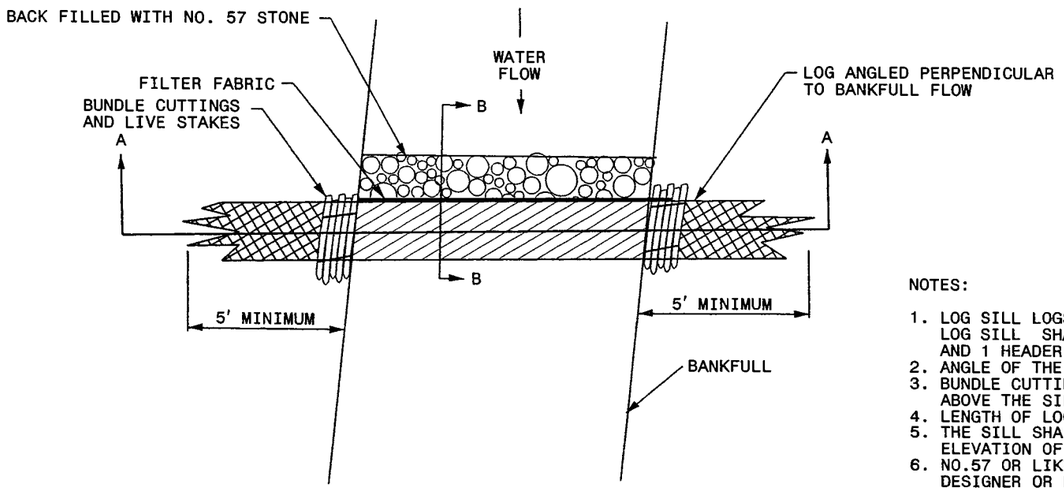
PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2C
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

LOG SILL
SCALE: NTS

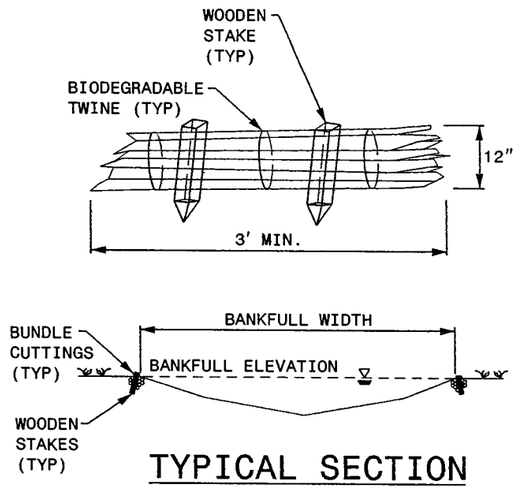


PLAN VIEW

NOTES:

1. LOG SILL LOGS SHALL BE AT LEAST 12" IN DIAMETER. LOG SILL SHALL BE CONSTRUCTED WITH 1 FOOTER LOG AND 1 HEADER LOG.
2. ANGLE OF THE SILL SHALL BE PERPENDICULAR TO FLOW.
3. BUNDLE CUTTINGS SHALL BE PLACED AT THE CHANNEL EDGE ABOVE THE SILL ON BOTH THE LEFT AND RIGHT BANKS.
4. LENGTH OF LOG SHALL EXTEND A MINIMUM OF 5' INTO EACH BANK.
5. THE SILL SHALL BE INSTALLED FLUSH WITH THE THALWEG ELEVATION OF THE STREAM.
6. NO.57 OR LIKE STONE SHOULD BE USED AS APPROVED BY THE DESIGNER OR DESIGNERS REPRESENTATIVE

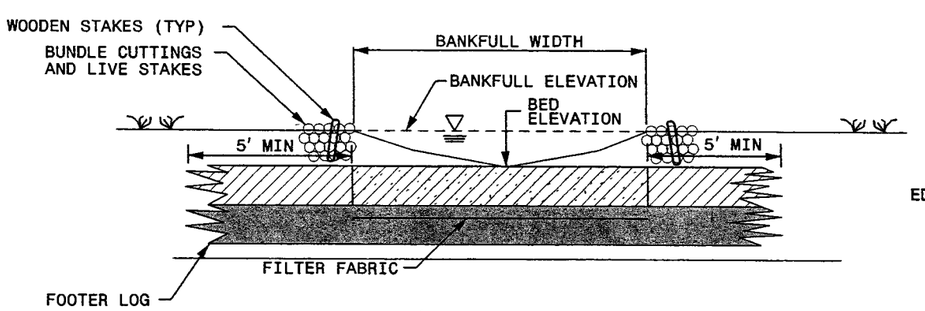
BUNDLE CUTTINGS
SCALE: NTS



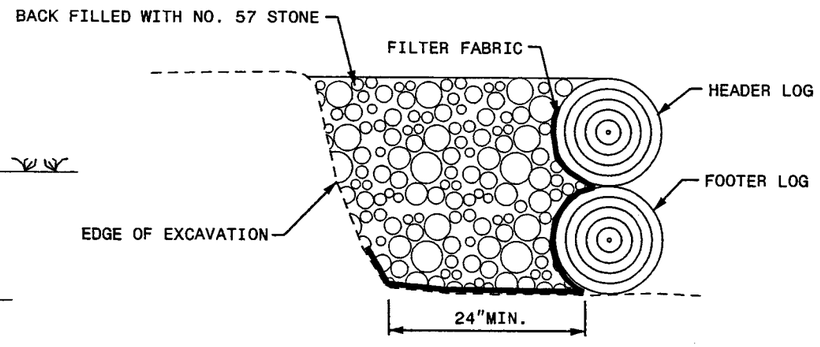
TYPICAL SECTION

NOTES:

1. BUNDLE CUTTINGS SHALL BE COMPOSED OF CUTTINGS FROM VEGETATION USED FOR LIVE STAKING.
2. THE BUNDLE SHALL BE A MINIMUM OF 12" IN DIAMETER AND A MINIMUM OF 3' LONG.
3. TWO WOODEN STAKES SHALL BE DRIVEN THROUGH THE BUNDLE TO ANCHOR THE BUNDLES TO THE GROUND.
4. APPROXIMATELY 2" OF TOP SOIL SHALL BE FILLED ON TOP OF THE BUNDLE CUTTINGS AFTER INSTALLATION.
5. STAKE SHALL BE 1"X2" AND SHALL BE DRIVEN IN TO A DEPTH SUFFICIENT TO SECURE BUNDLE CUTTING.



SECTION A-A



SECTION B-B

LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO.: SCO-050659701 COUNTY: PITT
DESIGNED BY: NEJ DRAWN BY: CGM
CHECKED BY: BAM DATE:

STREAM CONSTUCTION DETAILS

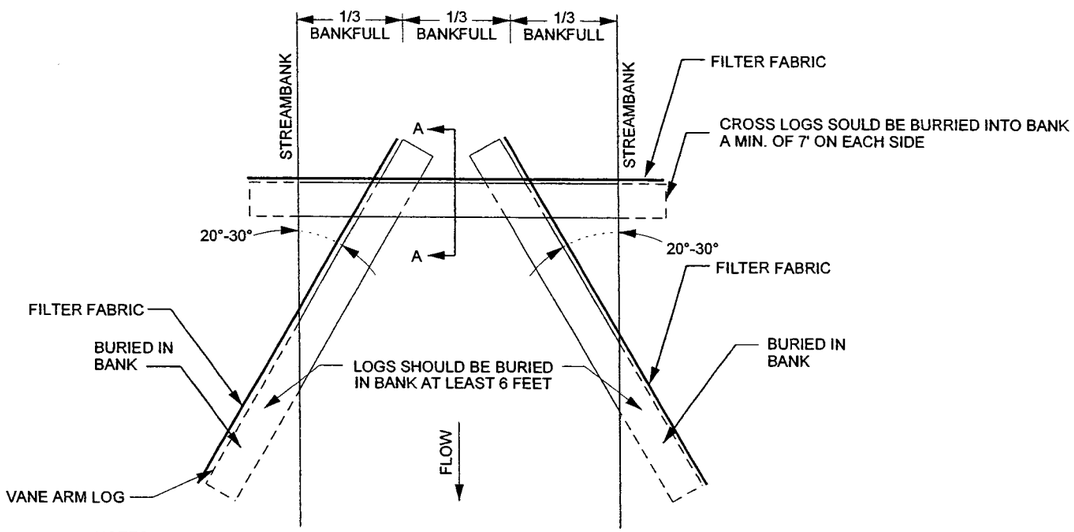
Stantec
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2D
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHANIEL E. JEAN
4/17/09

LOG CROSS VANE

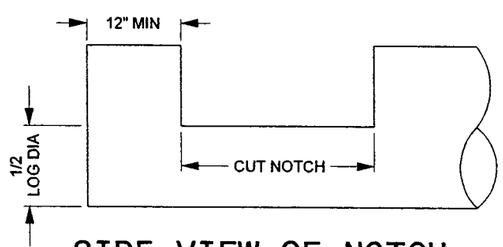
SCALE: NTS



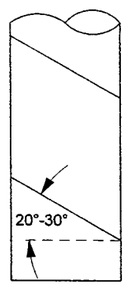
NOTES:

1. CROSS LOGS SHOULD BE A MINIMUM OF 12" IN DIAMETER. VANE ARM LENGTH SHOULD BE A MINIMUM OF 12" IN DIAMETER. ALL LOGS SHOULD BE RELATIVELY STRAIGHT.
2. CROSS LOGS SHOULD BE BURIED INTO BANK A MINIMUM OF 7'.
3. VANE ARM LOGS SHOULD BE BURIED INTO THE BANK A MINIMUM OF 6'-10'.

PLAN VIEW



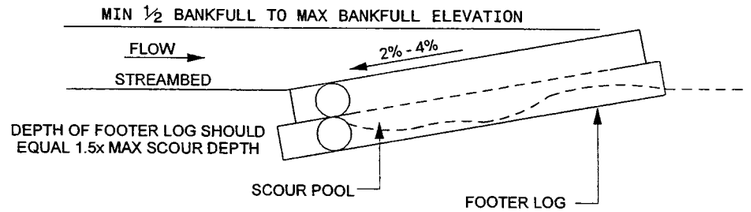
SIDE VIEW OF NOTCH



PLAN VIEW OF NOTCH

NOTES:

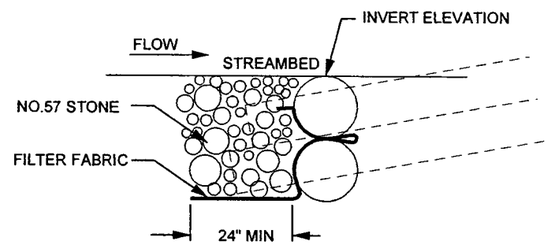
1. NOTCH IS FORMED BY MAKING CUTS WITH A CHAINSAW 1-2" APART AND THEN KNOCKING OUT SECTIONS WITH A CHISEL AND HAMMER.
2. ANGLE OF NOTCH SHOULD MATCH ANGLE BETWEEN LOG ARMS OF CROSSVANE AND STREAMBANK.
3. NOTCHES SHALL BE PLACED ON BOTH CROSS ARM AND VANE ARM.



NOTE:

SET ELEVATION OF TOP OF CROSS LOGS OR BOULDERS TO INVERT ELEVATION OF STREAMBED

ELEVATION VIEW



SECTION A-A

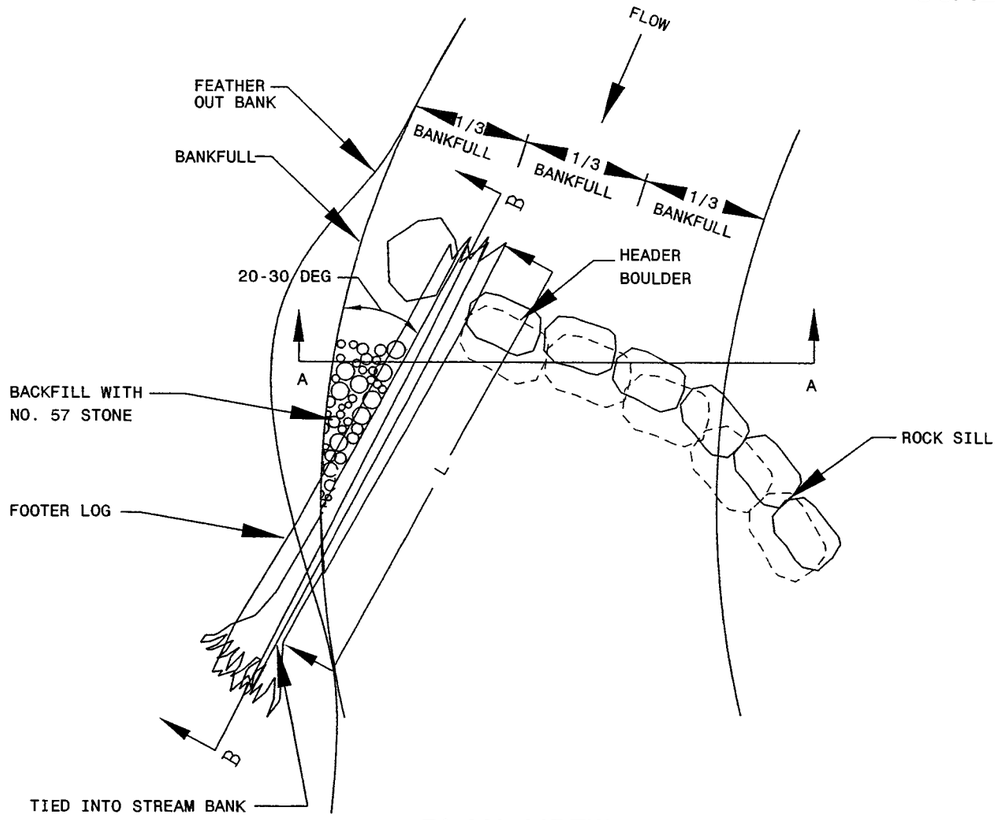
NOTES:

1. USE FILTER FABRIC TO SEAL GAPS BETWEEN LOGS.
2. NAIL FILTER FABRIC TO TOP OF FOOTER LOG USING 3" 10d GALVANIZED COMMON NAIL ON 2' SPACING ALONG LOG.

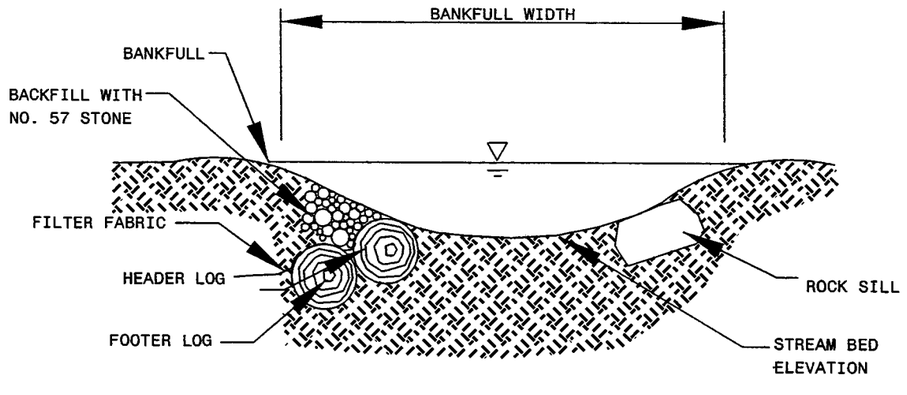
LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO.: SCO-050659701 COUNTY: PITT
DESIGNED BY: NEJ DRAWN BY: CGM
CHECKED BY: BAM DATE:

STREAM CONSTUCTION DETAILS

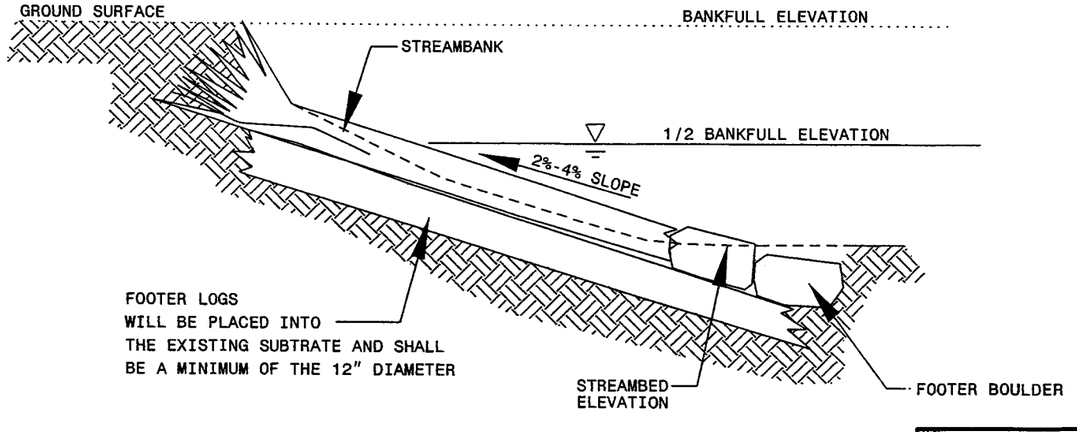
LOG VANE WITH ROCK J-HOOK
SCALE: NTS



PLAN VIEW



SECTION A-A



SECTION B-B

Stantec

Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
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PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2E
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. LEA

6/29/18

INSTALLATION OF J-HOOK VANE

1. FILTER FABRIC SHALL BE PLACED ON THE UPSTREAM SIDE OF THE STRUCTURE¼DIAMETER FROM THE TOP OF THE LOG. THE NAILS SHALL BE ON 12 INCH CENTERS. FILTER FABRIC SHALL BE BURIED IN THE BOTTOM OF THE CHANNEL AND SHALL BE PLACED THE ENTIRE LENGTH OF STRUCTURE.
2. A HYDRAULIC EXCAVATOR, WITH A BUCKET THAT CONTAINS A HYDARULIC THUMB, SHALL BE USED TO PLACE BOULDERS AND LOGS WITH THE SUPERVISION OF THE ENGINEER.
3. SEE SPECIAL PROVISIONS FOR HEADER AND FOOTER DIMENSIONS.
4. FOOTER LOG SHALL BE PLACED FIRST WITH HEADER LOG PLACED ON TOP PRIOR TO BACKFILLING THE TRENCH WITH NO. 57 STONE FILTER FABRIC SHALL BE PLACED ON THE UPSTREAM SIDE OF THE VANE STRUCTURE TO PREVENT WASHOUT OF SEDIMENT THROUGH LOG GAPS. FILTER FABRIC SHALL EXTEND FROM THE BOTTOM OF THE FOOTER LOG TO THE FINISHED GRADE ELEVATION AND SHALL BE PLACED THE ENTIRE LENGTH OF STRUCTURE. ALL LOGS SHALL BE A MIN. OF 12" IN DIAMETER AND CAN EITHER BE HARD OR SOFT WOOD
5. 1/3 OF THE WAY ACROSS THE CHANNEL FROM THE OUTSIDE BANK THE HEADER ROCK SHALL BE PLACED AT 0.2 FT ABOVE THE CHANNEL INVERT ELEVATION.
6. THERE SHALL BE NO GAPS BETWEEN THE HEADER ROCKS
7. HEADER LOGS S AND FOOTERHALL SLOPE FROM THE BED ELEVATION, AT THE HEAD OF THE VANE, TO ½ BANKFULL ELEVATION AT A SLOPE OF 2%-4%. HEADER AND FOOTER LOGS SHALL BE TIED SECURELY INTO THE BANK IN SUCH A WAY THAT ELIMINATES THE POSSIBILITY OF STREAMFLOW DIVERTING AROUND THEM.
8. ANY SOIL DISTURBED DURING THE PLACEMENT OF J-HOOK LOG VANES, SHALL BE SEEDED USING TEMPORARY AND PERMANENT SEEDING METHODS.

LOCATION:	STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO.: SCO-050659701	COUNTY: PITT
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE:

STREAM CONSTUCTION DETAILS

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2F
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

Stantec

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Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
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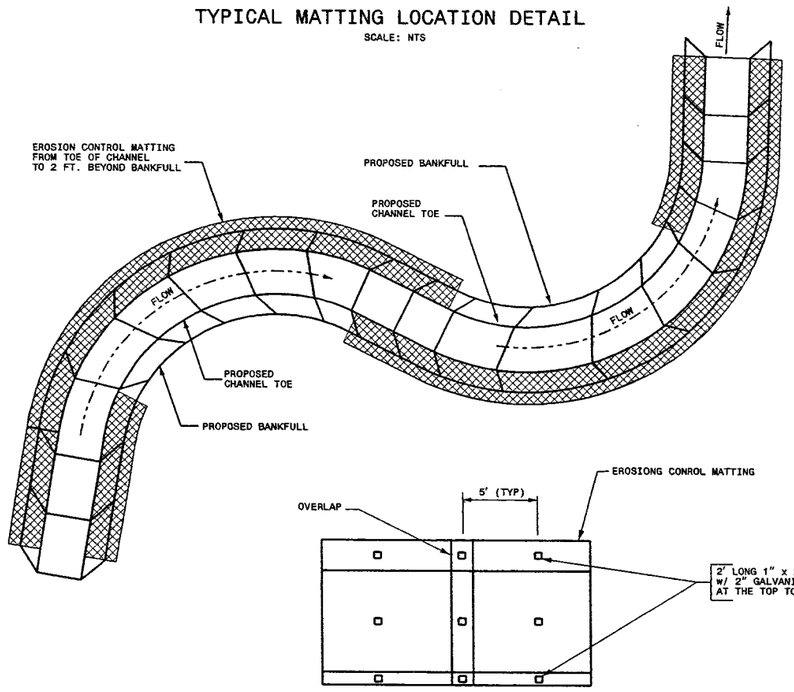
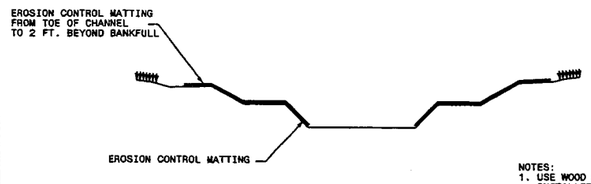
TYPICAL MATTING LOCATION DETAIL

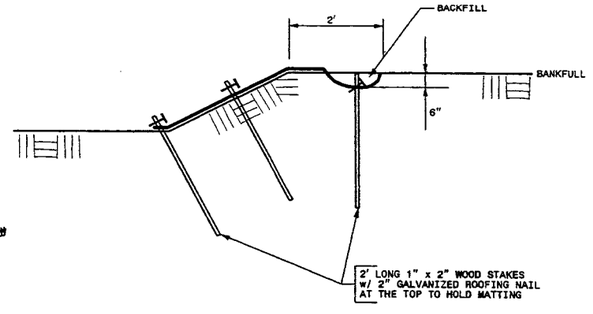
SCALE: NTS



MATTING STAKING VIEW



CROSS SECTION

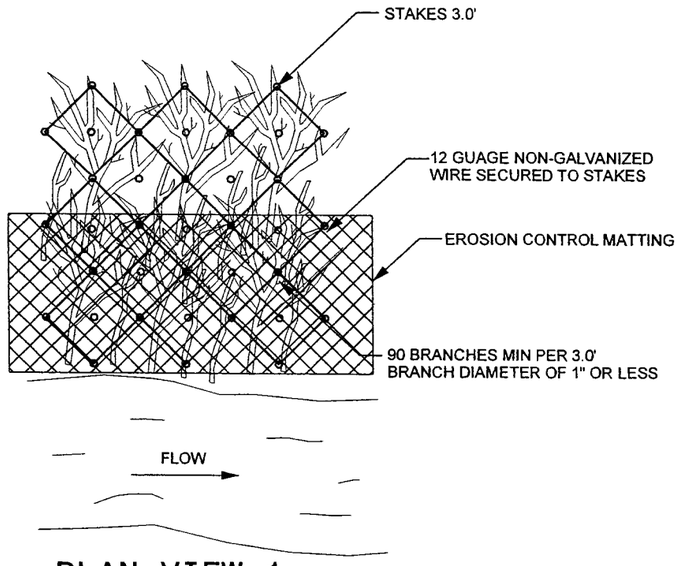


NOTES:
1. USE WOOD STAKES (NOT METAL) FOR MATTING INSTALLED IN PUMP AROUNDS OR IN THE WET.

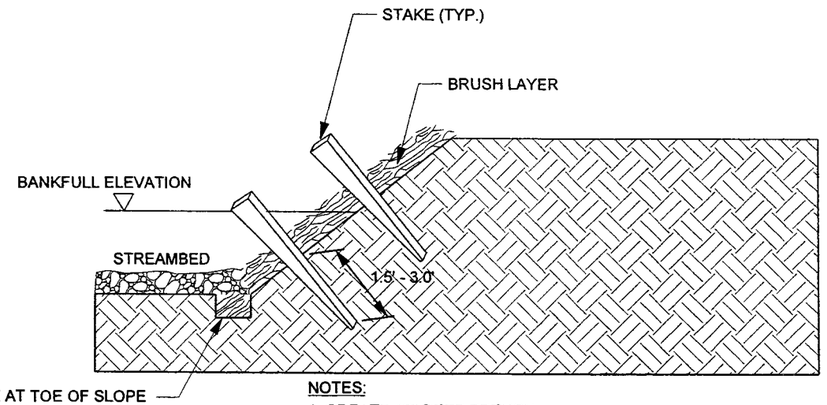
SECTION A-A

BRUSH MATTRESS

SCALE: NTS



PLAN VIEW 1



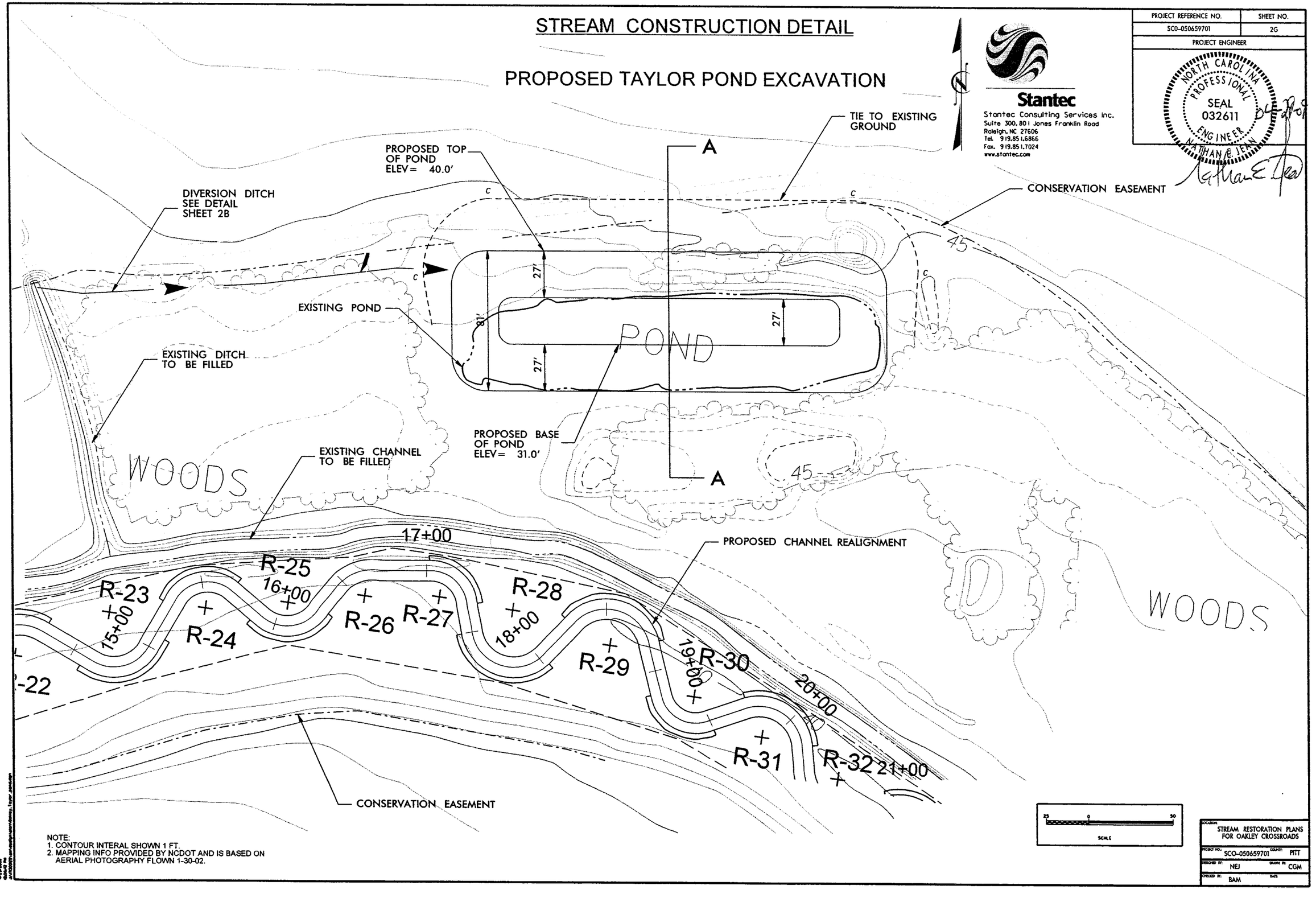
NOTES:
1. CREATE 12" DEEP TRENCH
2. STAKE AND WIRE BRUSH LAYER INTO TRENCH
3. BOARD FOR STAKE SHOULD BE 2" x 2" x 36" OR LONGER
4. STAKE SHOULD BE EXPOSSED A MAX OF 0.5'
5. NO BLACK WILLOW TO BE USED FOR BRUSH LAYER
6. SILKY WILLOW SHALL BE USED AS BRUSH LAYERING

CROSS SECTION

LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS	
PROJECT NO.: SCO-050659701	COUNTY: PITT
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE:

STREAM CONSTRUCTION DETAIL

PROPOSED TAYLOR POND EXCAVATION



NOTE:
1. CONTOUR INTERAL SHOWN 1 FT.
2. MAPPING INFO PROVIDED BY NCDOT AND IS BASED ON AERIAL PHOTOGRAPHY FLOWN 1-30-02.

SCALE: 25 0 50

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2G
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

Stantec
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS

PROJECT NO.	COUNTY
SCO-050659701	PITT
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE:

STREAM CONSTRUCTION DETAIL

PROPOSED TYPICAL SECTION FOR THE TAYLOR POND

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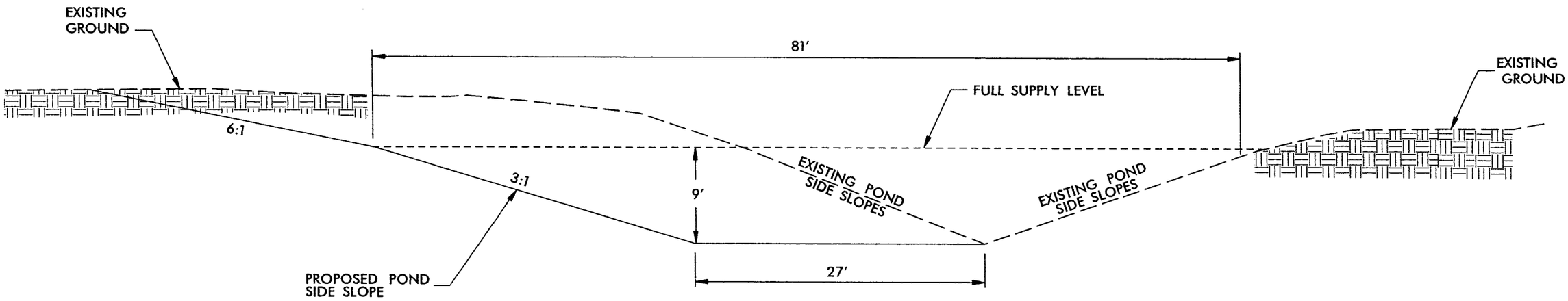
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	2H
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. KEAN
04-22-09



SECTION A–A

SCALE 5 0 10

LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO.: SCO-050659701 COUNTY: PITT
DESIGNED BY: NEJ DRAWN BY: CGM
CHECKED BY: BAM DATE:

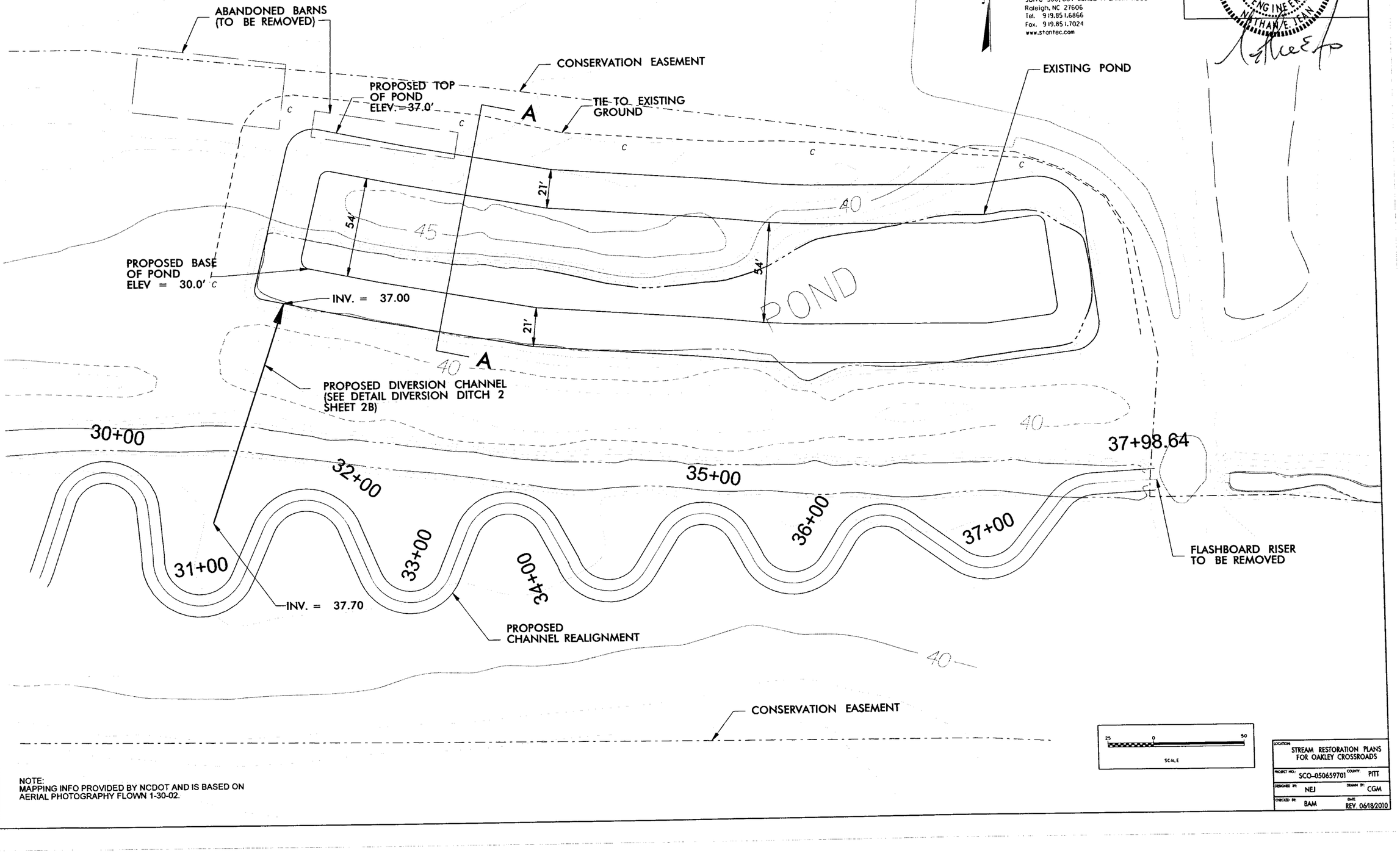
PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	21
PROJECT ENGINEER	

Stantec
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN
6/18/10

STREAM CONSTRUCTION DETAIL

PROPOSED BRILEY POND EXCAVATION



NOTE:
MAPPING INFO PROVIDED BY NCDOT AND IS BASED ON AERIAL PHOTOGRAPHY FLOWN 1-30-02.

LOCATION:	STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO.: SCO-050659701	COUNTY: PITT
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE: REV. 06/18/2010

STREAM CONSTRUCTION DETAIL

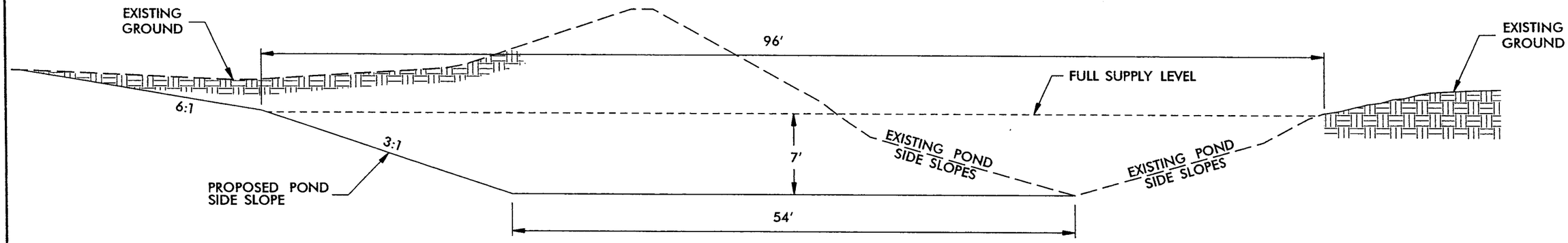
Stantec
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	21
PROJECT ENGINEER	

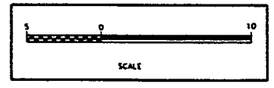
NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

04-28

PROPOSED TYPICAL SECTION FOR THE BRILEY POND



SECTION A-A



LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS

PROJECT NO.: SCO-050659701 COUNTY: PITT

DESIGNED BY: NEJ DRAWN BY: CGM

CHECKED BY: BAM DATE:

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	3

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

04-27-09

Stantec

Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

SEQUENCE OF CONSTRUCTION

SEQUENCE OF CONSTRUCTION EVENTS

The Contractor is responsible for the following sequence of construction in accordance with the construction plans and the Special Provisions. Any changes or improvements to the sequence of construction must be approved by the design engineer or by an on-site designer's construction manager and the owner before work being done. It is the contractor's responsibility to ensure that an approved field change is issued prior to conducting related work.

I. Initial Site Preparation
1. Install construction entrances.
2. Prepare staging and stockpiling areas in locations as shown on the construction plans or as approved by the designer or owner.
3. Stake limits of construction as shown on the construction plans or as directed by the designer or owner.
4. Install sediment and erosion control devices.

II. Channel Construction
1. Note: Project will be constructed from the upstream working in the downstream direction.
2. Install all silt fences as shown on plans.
3. Beginning at Station 0+00 and working downstream construct construction access road on both sides of stream channel as shown on plans. Access road does not require gravel, but is the contractor's responsibility to maintain through out the Sequence of construction. Access road is on both sides of the stream.
4. Construct the proposed stream channel between Stations 0+60 and 37+00. This includes excavation of proposed channel as shown on plans. Construct only that portion of the channel that can be completed and stabilized within the same day. Construct the proposed stream channel to the grade specified. Construct structures as they are encountered. Construct all structures according to details provided and at locations specified on the plan sheets. Designer must approve material for construction of structures before contractor builds structures. Stockpile and separate all soil suitable for fill or topsoil in the area indicated on the construction plans. Any soil unsuitable for fill shall be disposed of as directed in Special Provisions. Any suitable Juncus matting and approved trees and shrubs shall be saved and stockpiled for transplant.
5. Install both pump arounds shown on plans.
6. Construct stream channel between 0+00 and 0+60. Construct only that portion of the channel that can be completed and stabilized within the same day. Construct the proposed stream channel to the grade specified. Construct structures as they are encountered. Construct all structures according to details provided and at locations specified on the plan sheets. Designer must approve all material used for structures before contractor builds structures. Stockpile and separate all soil suitable for fill or topsoil in the area indicated on the construction plans. Any soil unsuitable for fill shall be disposed of as directed in Special Provisions. Any suitable Juncus matting and approved trees and shrubs shall be saved and stockpiled for transplant.
7. Construct stream channel between 37+00 and 37+98.64. Construct only that portion of the channel that can be completed and stabilized within the same day. Construct the proposed stream channel to the grade specified. Construct structures as they are encountered. Construct all structures according to details provided and at locations specified on the plan sheets. Designer must approve material used for structures before contractor builds structures. Stockpile and separate all soil suitable for fill or topsoil in the area indicated on the construction plans. Any soil unsuitable for fill shall be disposed of as directed in Special Provisions. Any suitable Juncus matting and approved trees and shrubs shall be saved and stockpiled for transplant.
8. Construct ford crossing as shown on plans.
9. Turn water into newly constructed channel and remove pump arounds after temporary seeding is installed and established.
10. Install stream channel plug shown on the plans.
11. The flash board riser shall be removed after the channel construction is complete.
12. Expand ponds as shown on the plan sheets.
13. Construct proposed diversion ditches as shown on plans.
14. Fill in existing ditch and old channel.
15. Construct new farm path as shown on plans.
16. Plant the project in accordance to the planting plan provided.

III. The contractor is responsible for maintaining all erosion control measures:
1. Inspect all measures for stability and operation weekly or within 24 hours after any storm event.
2. Clean out silt traps and sediment basins when half of capacity is reached.
3. Remove sediment from behind silt fence when its height reaches 0.5'.
4. If any erosion and sedimentation control measure is found to be unstable or not functioning properly, repairs should be made immediately to maintain measures as designed or as directed by the engineer.

IV. Remove sediment and erosion control devices, any temporary fencing, staking, sensitive area marking material, trash, etc. from the site as approved by the designer or owner.

V. Seed and mulch staging, stockpiling, and any bare areas with permanent seed mixture.

VI. Site clean up shall occur after all construction processes have been completed. Site clean up shall include pick up of trash and construction materials. The access road will be left in pre-construction conditions or better.

LIMITS OF DISTURBANCE = 14.16 ACRES

PROPOSED CHANNEL

FLOODPLAIN LINE

LOG CROSS VANE

LOG SILL

LOG VANE W/ ROCK J-HOOK

BRUSH MATRESS

GRADING LIMITS

CONSERVATION EASEMENT

LIMITS OF DISTURBANCE

TEMPORARY ACCESS ROAD

PERMANENT FORD CROSSING

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

TEMP. SILT FENCE

LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS	
PROJECT NO.: SCO-050659701	COUNTY: PITT
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: DAB	DATE:

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

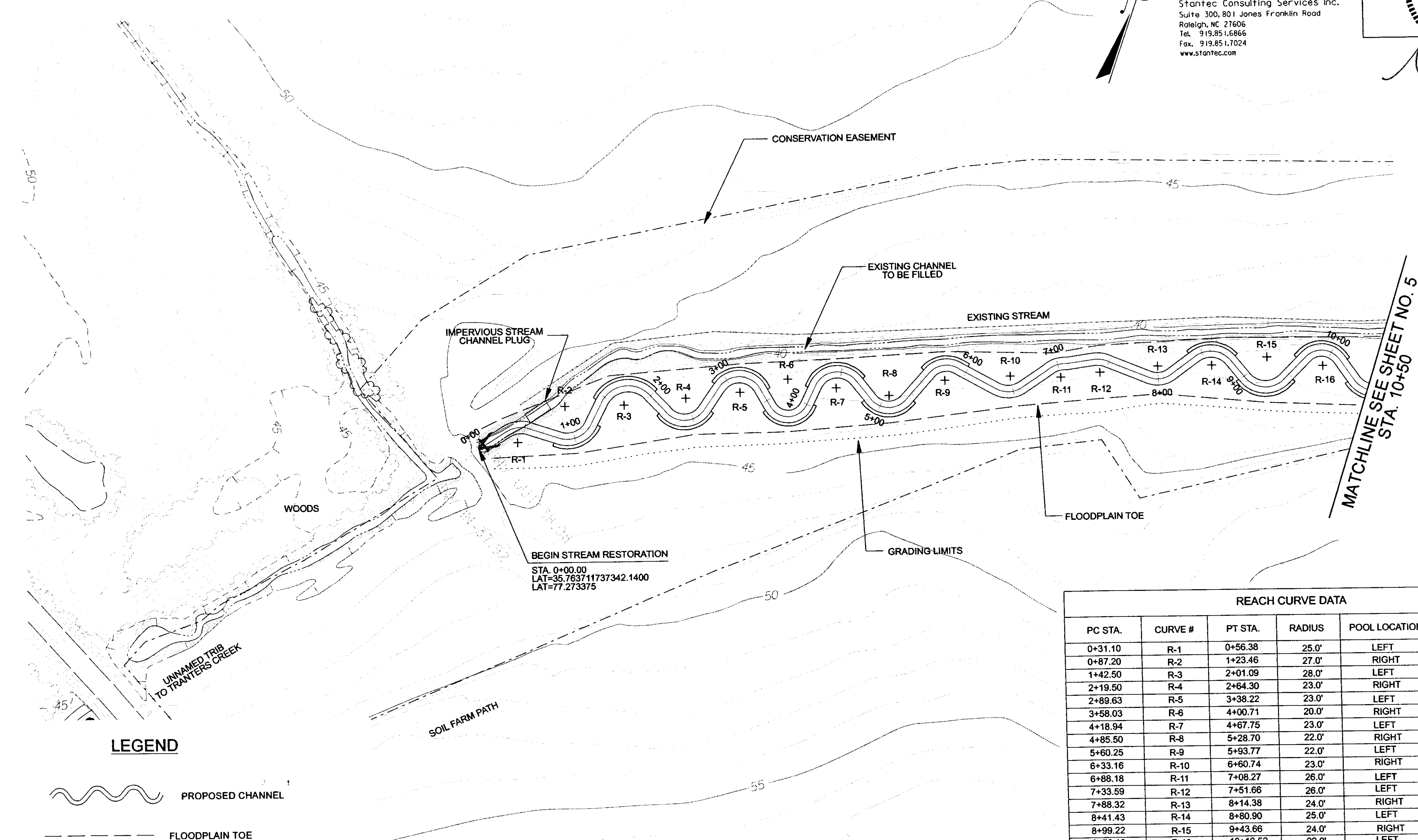
06/

Stantec

Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

PLAN VIEW

STRUCTURE LOCATIONS REACH			
STRUCTURE	STA. INV.	INV. ELEV.	BKF. ELEV.
LOG CROSS VANE	0+00	38.20	40.70



REACH CURVE DATA						
PC STA.	CURVE #	PT STA.	RADIUS	POOL LOCATION	BKF. ELEV.	EXISTING ELEV. @ PC
0+31.10	R-1	0+56.38	25.0'	LEFT	40.65	39.36
0+87.20	R-2	1+23.46	27.0'	RIGHT	40.60	44.11
1+42.50	R-3	2+01.09	28.0'	LEFT	40.56	43.71
2+19.50	R-4	2+64.30	23.0'	RIGHT	40.53	43.77
2+89.63	R-5	3+38.22	23.0'	LEFT	40.48	43.26
3+58.03	R-6	4+00.71	20.0'	RIGHT	40.44	43.27
4+18.94	R-7	4+67.75	23.0'	LEFT	40.41	42.77
4+85.50	R-8	5+28.70	22.0'	RIGHT	40.37	42.97
5+60.25	R-9	5+93.77	22.0'	LEFT	40.31	42.49
6+33.16	R-10	6+60.74	23.0'	RIGHT	40.24	42.88
6+88.18	R-11	7+08.27	26.0'	LEFT	40.19	42.60
7+33.59	R-12	7+51.66	26.0'	LEFT	40.14	42.42
7+88.32	R-13	8+14.38	24.0'	RIGHT	40.07	42.41
8+41.43	R-14	8+80.90	25.0'	LEFT	40.02	41.69
8+99.22	R-15	9+43.66	24.0'	RIGHT	39.98	41.90
9+72.18	R-16	10+10.52	22.0'	LEFT	39.93	41.46
10+32.88	R-17	10+78.13	24.0'	RIGHT	39.89	41.52

LEGEND

- PROPOSED CHANNEL
- FLOODPLAIN TOE
- GRADING LIMITS
- CONSERVATION EASEMENT

NOTE:
1. CONTOUR INTERVAL SHOWN IS 1 FOOT
2. MAPPING INFO PROVIDED BY NCDOT AND IS BASED ON AERIAL PHOTOGRAPHY FLOWN 1-30-02.
3. PRIORITY I STA. 0+00.00 TO 37+98.64
4. ALL BRUSH MATTRESS SHALL EXTEND FROM PT TO PC

50 0 100
SCALE

LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS

PROJECT NO.: SCO-050659701 COUNTY: PITT

DESIGNED BY: NEJ DRAWN BY: JLH

CHECKED BY: BAM DATE: REV. 06/18/2

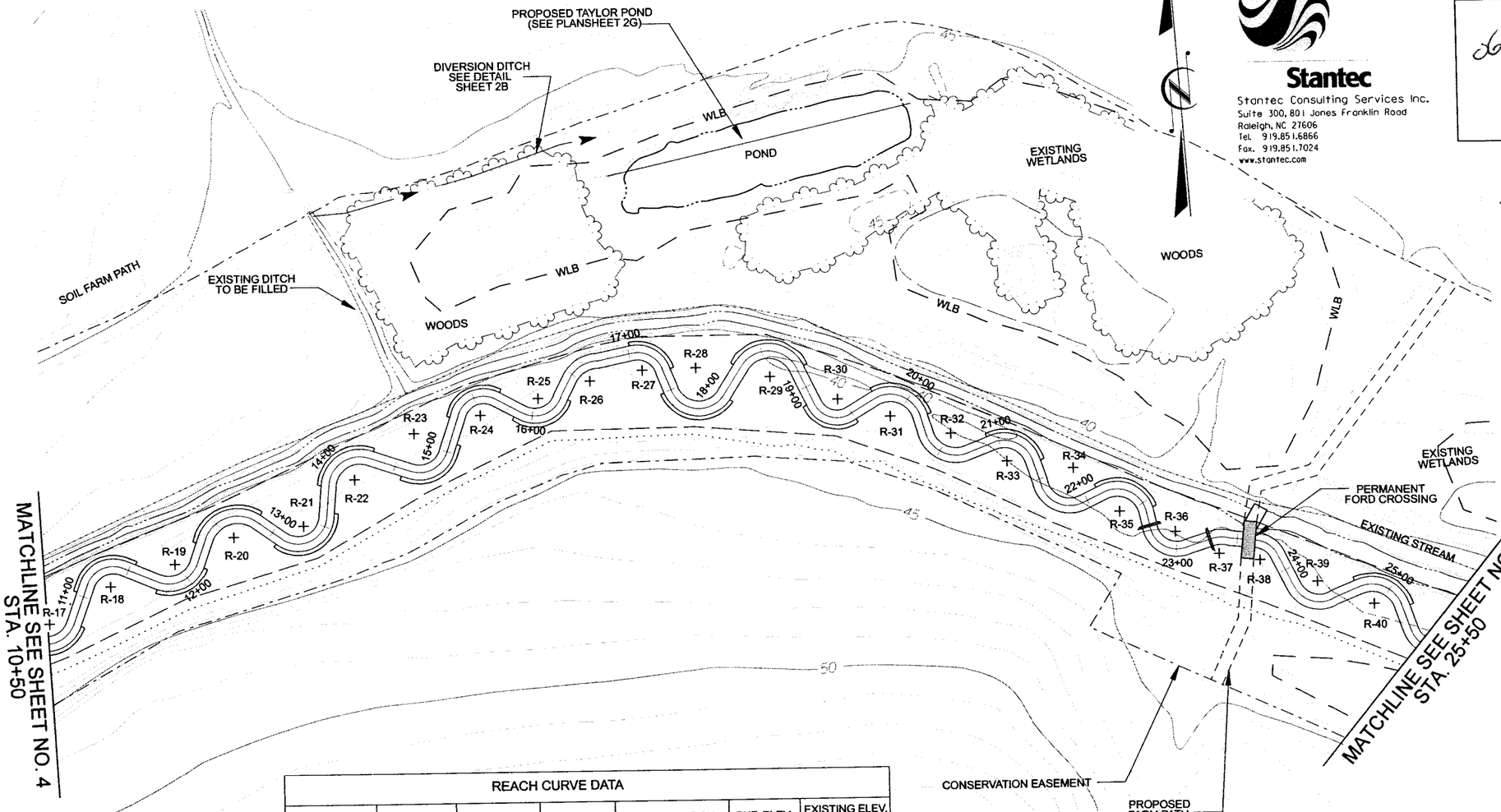
PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	5
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN BEAN

Stantec

Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

PLAN VIEW



REACH CURVE DATA

PC STA.	CURVE #	PT STA.	RADIUS	POOL LOCATION	BKF. ELEV.	EXISTING ELEV. @ PC
10+32.88	R-17	10+78.13	24.0'	RIGHT	39.89	41.52
11+09.48	R-18	11+46.81	22.0'	LEFT	39.83	41.13
11+74.76	R-19	12+15.96	24.0'	RIGHT	39.78	41.67
12+33.23	R-20	12+85.59	27.0'	LEFT	39.74	41.12
13+07.77	R-21	13+58.78	23.0'	RIGHT	39.70	41.30
13+82.18	R-22	14+29.80	25.0'	LEFT	39.66	40.89
14+63.13	R-23	15+00.94	23.0'	RIGHT	39.60	41.20
15+28.73	R-24	15+68.59	21.0'	LEFT	39.54	40.56
15+90.58	R-25	16+30.18	22.0'	RIGHT	39.50	41.17
16+44.19	R-26	16+74.04	24.0'	LEFT	39.47	41.03
17+01.70	R-27	17+34.17	21.0'	LEFT	39.42	40.88
17+47.69	R-28	18+05.34	24.0'	RIGHT	39.40	40.84
18+27.72	R-29	18+86.14	25.0'	LEFT	39.35	40.29
19+13.93	R-30	19+50.25	19.0'	RIGHT	39.30	40.45
19+69.61	R-31	20+18.78	25.0'	LEFT	39.27	40.26
20+28.71	R-32	20+73.88	24.0'	RIGHT	39.25	40.42
20+93.18	R-33	21+34.95	24.0'	LEFT	39.21	39.95
21+51.49	R-34	21+96.92	24.0'	RIGHT	39.18	39.98
22+12.49	R-35	22+59.61	24.0'	LEFT	39.15	39.49
22+68.99	R-36	23+10.55	22.0'	RIGHT	39.02	39.84
23+28.11	R-37	23+44.32	20.0'	LEFT	38.82	40.08
23+64.15	R-38	23+88.73	21.0'	LEFT	38.75	40.88
24+14.00	R-39	24+53.46	23.0'	RIGHT	38.70	40.91
24+75.11	R-40	25+17.63	25.0'	LEFT	38.66	39.63
25+36.20	R-41	25+81.77	24.0'	RIGHT	38.63	40.10

LEGEND

PROPOSED CHANNEL

FLOODPLAIN TOE

GRADING LIMITS

CONSERVATION EASEMENT

NOTE:
1. CONTOUR INTERVAL SHOWN IS 1 FOOT
2. MAPPING INFO PROVIDED BY NCDOT AND IS BASED ON AERIAL PHOTOGRAPHY FLOWN 1-30-02.
3. PRIORITY I STA. 0+00.00 TO 37+98.64
4. PROPOSED BRUSH MATTRESS SHALL EXTEND FROM PC TO PT

STRUCTURE LOCATIONS REACH

STRUCTURE	STA. INV.	INV. ELEV.	BKF. ELEV.
LOG SILL	22+68.99	36.62	39.12
LOG SILL	23+28.11	36.42	38.92

50 0 100
SCALE

LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO: SCO-050659701 COUNTY: PITT
DESIGNED BY: NEJ DRAWN BY: JLH
CHECKED BY: BAM DATE: REV. 06/18/2

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	6

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHANIEL JEAN

PLAN VIEW

STRUCTURE LOCATIONS REACH			
STRUCTURE	STA. INV.	INV. ELEV.	BKF. ELEV.
LOG SILL	25+95.65	36.07	38.57
LOG VANE WITH ROCK J-HOOK	28+59.54	35.63	38.13
LOG VANE WITH ROCK J-HOOK	31+53.65	35.21	37.71
LOG VANE WITH ROCK J-HOOK	33+98.32	34.84	37.34
LOG VANE WITH ROCK J-HOOK	35+33.62	34.47	36.97
LOG VANE WITH ROCK J-HOOK	36+01.03	34.32	36.82
LOG VANE WITH ROCK J-HOOK	36+73.45	34.00	36.50
LOG CROSS VANE	37+67.91	33.61	36.11

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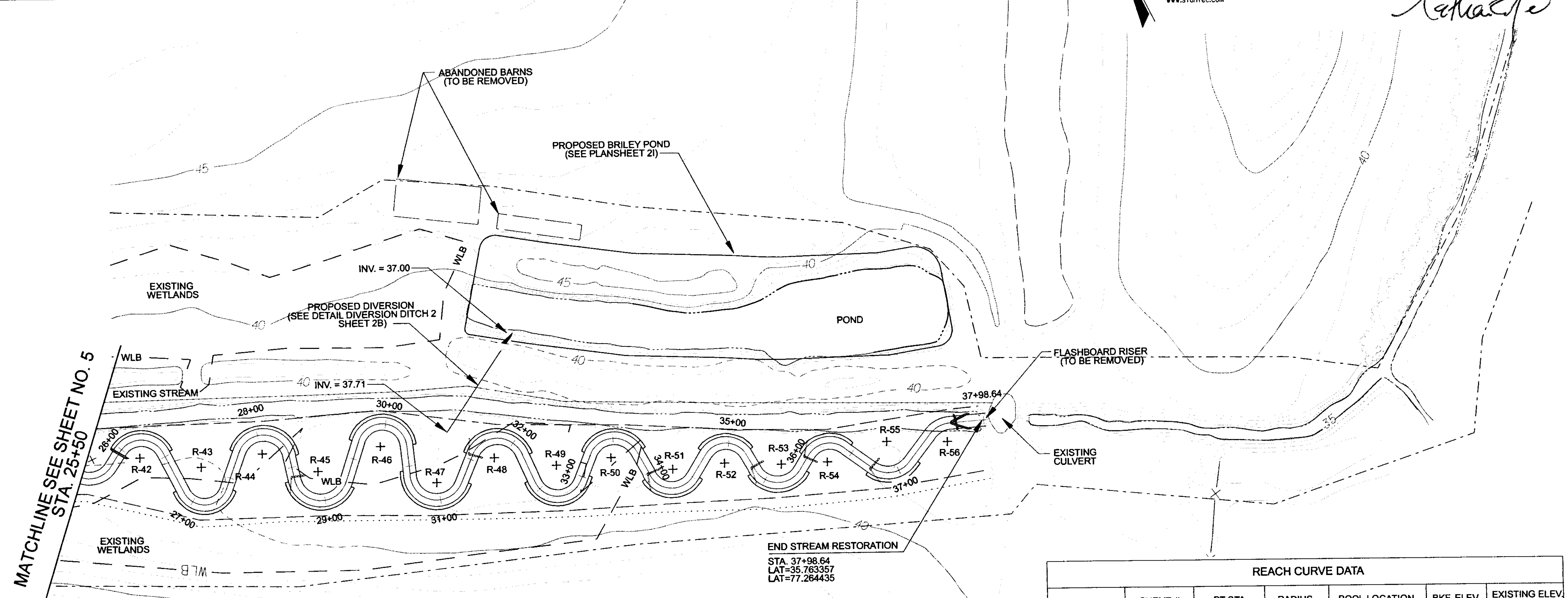


REACH CURVE DATA						
PC STA.	CURVE #	PT STA.	RADIUS	POOL LOCATION	BKF. ELEV.	EXISTING ELEV. @ PC
25+36.20	R-41	25+81.77	24.0'	RIGHT	38.63	40.10
25+95.65	R-42	26+46.28	23.0'	LEFT	38.42	39.76
26+85.80	R-43	27+41.78	22.0'	RIGHT	38.32	40.25
27+75.35	R-44	28+40.73	24.0'	LEFT	38.22	39.56
28+59.54	R-45	29+28.55	25.0'	RIGHT	38.03	39.18
29+65.26	R-46	30+31.86	23.0'	LEFT	37.95	39.71
30+55.79	R-47	31+26.37	25.0'	RIGHT	37.84	39.11
31+53.65	R-48	32+15.25	25.0'	LEFT	37.61	38.80
32+41.87	R-49	32+96.52	23.0'	RIGHT	37.58	38.81
33+20.91	R-50	33+76.74	24.0'	LEFT	37.46	38.55
33+98.32	R-51	34+51.35	23.0'	RIGHT	37.24	38.86
34+73.54	R-52	35+21.71	22.0'	LEFT	37.10	39.13
35+33.62	R-53	35+87.14	24.0'	RIGHT	36.87	39.31
36+01.03	R-54	36+44.03	23.0'	LEFT	36.72	39.18
36+73.45	R-55	37+12.89	25.0'	RIGHT	36.40	39.08
37+44.88	R-56	37+67.91	23.0'	LEFT	36.15	38.58

LEGEND

PROPOSED CHANNEL

FLOODPLAIN TOE

GRADING LIMITS

CONSERVATION EASEMENT

NOTE:
1. CONTOUR INTERVAL SHOWN IS 1 FOOT
2. MAPPING INFO PROVIDED BY NCDOT AND IS BASED ON AERIAL PHOTOGRAPHY FLOWN 1-30-02.
3. PRIORITY I STA. 0+00.00 TO 37+98.64
4. BRUSH MATTRESS SHALL EXTEND FROM PT TO PC

SCALE 50 0 100

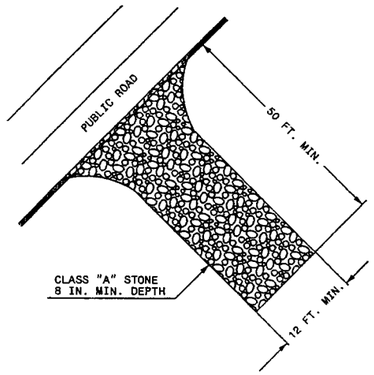
LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS

PROJECT NO.: SCO-050659701		COUNTY: PITT	
DESIGNED BY: NEJ		DRAWN BY: JLH	
CHECKED BY: BAM		DATE: REV. 06/18/2	

EROSION CONTROL DETAIL

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

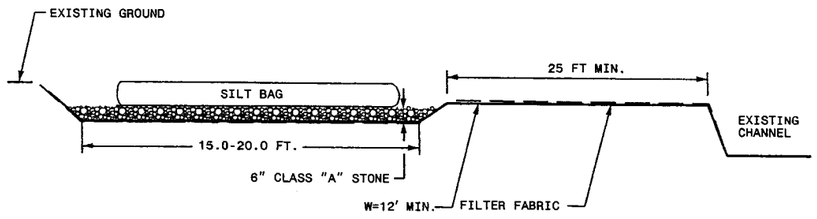
NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOP DRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE MUST BE PROVIDED.
6. FILTER FABRIC TO BE PLACED BENEATH STONE.



PUMP-AROUND OPERATION

SCALE:NTS

SILT BAG WITH ROCK PAD



SCALE:NTS

NOTE: PROVIDE STABILIZED OUTLET

SEQUENCE OF CONSTRUCTION FOR TYPICAL WORK AREA

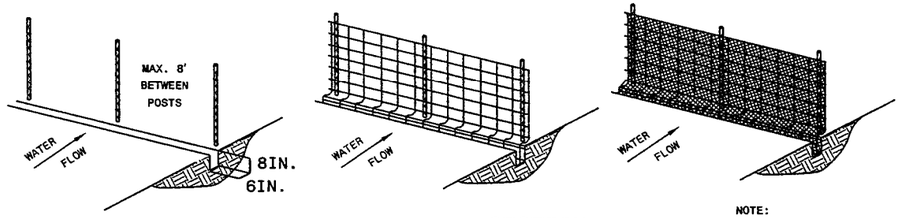
1. INSTALL SPECIAL STILLING BASIN(S).
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE. (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED IN ONE DAY WITHIN THE PUMP AROUND AREAS BETWEEN THE IMPERVIOUS DIKES. THE IMPERVIOUS DIKE LOCATIONS AS SHOWN ON THIS SHEET ONLY SHOW THE UPPER AND LOWER EXTENT OF WORK FOR EACH STREAM SEGMENT. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS DIKE(S) FOR EACH DAY'S WORK.
8. REMOVE SPECIAL STILLING BASIN(S) AND BACKFILL. STABILIZE DISTURBED AREA WITH SEED AND MULCH.

STANDARD TEMPORARY SILT FENCE

STEP 1:
DRIVE STEEL POSTS 24IN. INTO GROUND AND EXCAVATE A 6IN.x 6IN. TRENCH UPHILL ALONG THE LINE OF POSTS. WOOD POSTS 4IN. IN DIAMETER MAY BE USED.

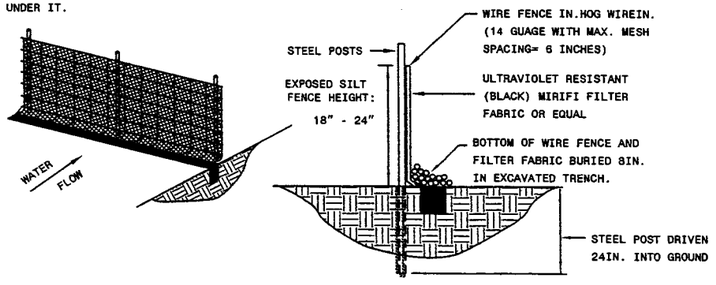
STEP 2:
ATTACH WIRE FENCE TO POSTS AND EXTEND THE BOTTOM OF THE FENCE 8IN. INTO THE EXCAVATED TRENCH.

STEP 3:
ATTACH THE FILTER FABRIC TO THE WIRE FENCE AND EXTEND THE BOTTOM OF THE FABRIC 8IN. INTO THE TRENCH.



STEP 4:
BACKFILL THE TRENCH ANO COMPACT THE SOIL FIRMLY TO ANCHOR THE BOTTOM OF THE SILT FENCE SO THAT RUNOFF IS FORCED TO GO THROUGH THE FENCE AND CANNOT GO UNDER IT.

SECTION

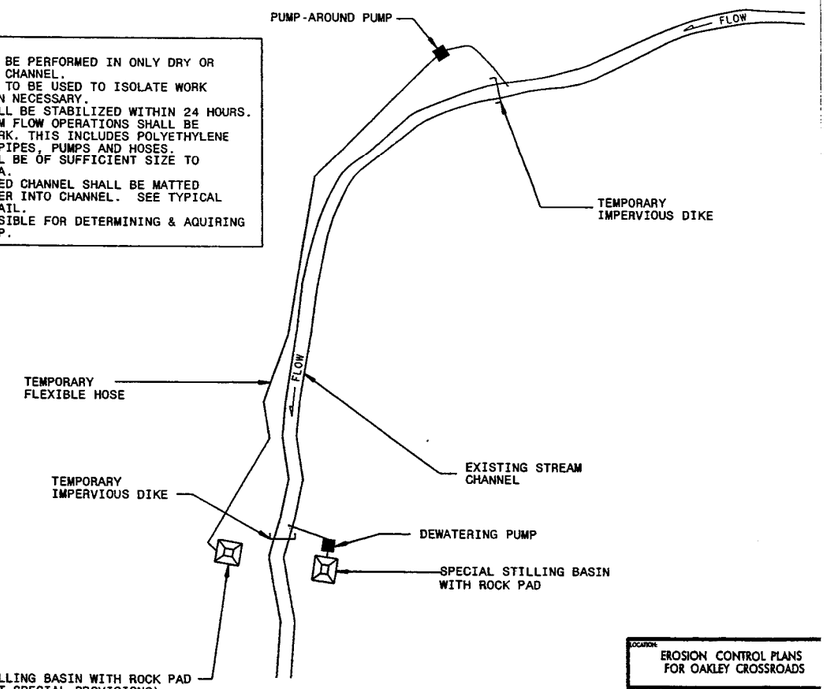


NOTE:
BOTTOM OF FILTER MUST BE PLACED IN TRENCH AND SECURED BY EITHER BACK-FILLING WITH SOIL MATERIAL AND TAMPING OR BY PLACING WASHED STONE TO A HEIGHT OF 6IN. ABOVE GROUND LEVEL.

CONSTRUCTION SPECIFICATIONS

1. CONSTRUCT SEDIMENT FENCE ON LOW SIDE OF TOPSOIL STOCKPILE TO PREVENT SEDIMENT FROM BEING WASHED INTO THE DRAINAGE SYSTEM. FENCE TO EXTEND AROUND APPROXIMATELY 70% OF THE PERIMETER OF THE STOCKPILE.
2. LOCATE POSTS DOWNSLOPE OF FABRIC TO HELP SUPPORT FENCING.
3. BURY TOE OF FENCE APPROXIMATELY 8" DEEP TO PREVENT UNDERCUTTING.
4. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FABRIC AT A SUPPORT POST WITH OVERLAP TO THE NEXT POST.
5. FILTER FABRIC TO BE ON NYLON, PLOYESTER, PROPYLENE OR ETHYLENE YARN WITH EXTRA STRENGTH-50LB/ LIN.^{2}IN. (MINIMUM) AND WITH A FLOW RATE OF AT LEAST 0.3 GAL./FT / MINUTE. FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABLIZERS.

NOTES:
1. ALL EXCAVATION SHALL BE PERFORMED IN ONLY DRY OR ISOLATED SECTIONS OF 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 OPERATIONS SHALL BE INCIDENTAL TO THE WORK. THIS INCLUDES POLYETHYLENE SHEETING, DIVERSION PIPES, PUMPS AND HOSES.
5. PUMPS AND HOSES SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA.
6. SIDESLOPES OF RESTORED CHANNEL SHALL BE MATTED PRIOR TO TURNING WATER INTO CHANNEL. SEE TYPICAL MATTING LOCATION DETAIL.
7. CONTRACTOR IS RESPONSIBLE FOR DETERMINING & AQUIRING THE PROPER SIZED PUMP.



SPECIAL STILLING BASIN WITH ROCK PAD (SEE PROJECT SPECIAL PROVISIONS) UTILIZE A STABILIZED OUTLET INSTEAD OF A SPECIAL STILLING BASIN IF PUMPING CLEAN WATER.

Stantec
Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	EC-1
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. MAN

LOCATION: EROSION CONTROL PLANS FOR OAKLEY CROSSROADS	
PROJECT NO.: SCO-050659701	COUNTY: PITT
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE:

EROSION CONTROL

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	EC 2
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

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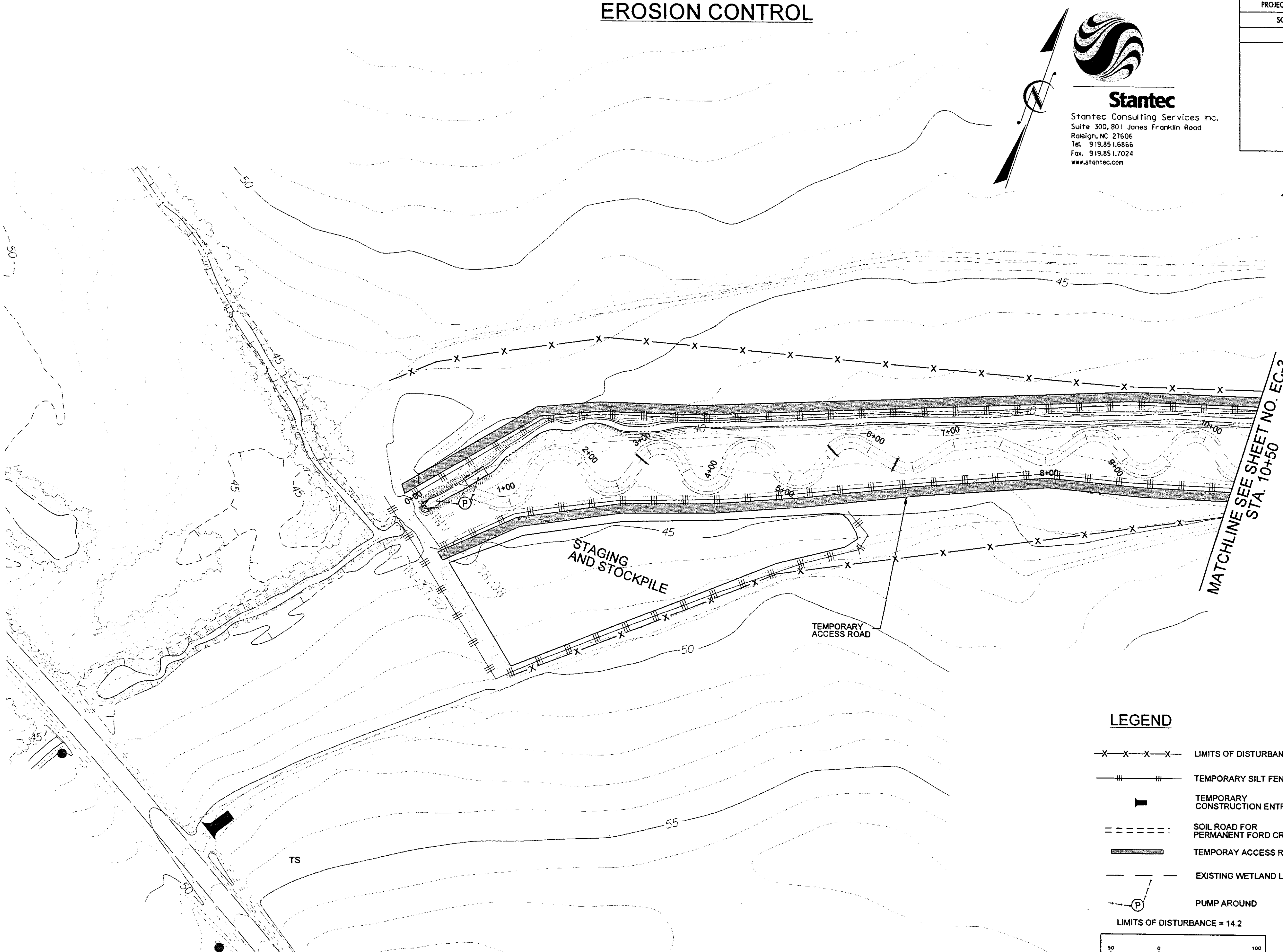

LEGEND

- LIMITS OF DISTURBANCE
- TEMPORARY SILT FENCE
- TEMPORARY CONSTRUCTION ENTRANCE
- SOIL ROAD FOR PERMANENT FORD CROSSING
- TEMPORAY ACCESS ROAD
- EXISTING WETLAND LIMITS
- PUMP AROUND

LIMITS OF DISTURBANCE = 14.2

50 0 100
SCALE

LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS	
PROJECT NO.: SCO-050659701	COUNTY: PITT
DESIGNED BY: NEJ	DRAWN BY: JLH
CHECKED BY: BAM	DATE:

EROSION CONTROL

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	EC 3
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN EDEAN 04-29-09

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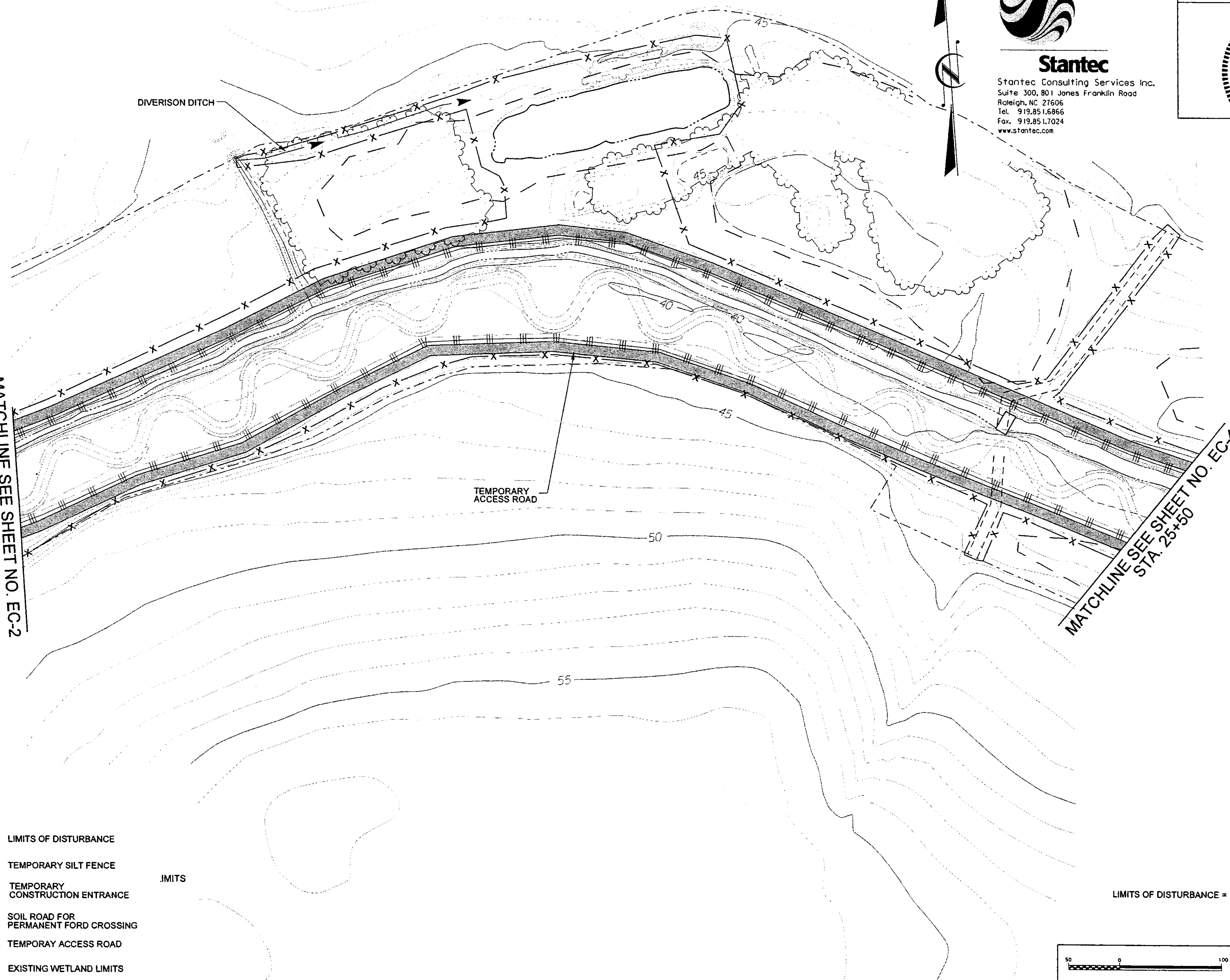

LEGEND

- LIMITS OF DISTURBANCE
- TEMPORARY SILT FENCE
- TEMPORARY CONSTRUCTION ENTRANCE
- SOIL ROAD FOR PERMANENT FORD CROSSING
- TEMPORAY ACCESS ROAD
- EXISTING WETLAND LIMITS

.IMITS

LIMITS OF DISTURBANCE = 14.2

SCALE: 50 0 100

LOCATION: STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS	
PROJECT NO.: SCO-050659701	COUNTY: PITT
DESIGNED BY: NEJ	DRAWN BY: JLH
CHECKED BY: BAM	DATE:

EROSION CONTROL

PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	EC 4
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN

06/29/2010

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Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
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MATCHLINE SEE SHEET NO. EC-3
STA. 25+50

STAGING AND STOCKPILE

TEMPORARY ACCESS ROAD

LEGEND

- LIMITS OF DISTURBANCE
- TEMPORARY SILT FENCE
- TEMPORARY CONSTRUCTION ENTRANCE
- SOIL ROAD FOR PERMANENT FORD CROSSING
- TEMPORAY ACCESS ROAD
- EXISTING WETLAND LIMITS
- PUMP AROUND

LIMITS OF DISTURBANCE = 14.2

SCALE 50 0 100

LOCATION:	STREAM RESTORATION PLANS FOR OAKLEY CROSSROADS
PROJECT NO:	SCO-050659701
COUNTY:	PITT
DESIGNED BY:	NEJ
DRAWN BY:	JLH
CHECKED BY:	BAM
DATE:	

Tag Alder, Virginia Willow, Elederberry are Live Stakes
Overcup Oak, Swamp Cottonwood, Swamp Chestnut Oak, Swamp Black Gum, Willow Oak, Elderberry are Bare Roots
Cherrybark Oak, Green Ash, Black Gum, American Sycamore, Water Oak are Bare Roots
Dog-Hobble, Sweet Bay, Wax Myrtle are Shrubs

PLANTING PLAN

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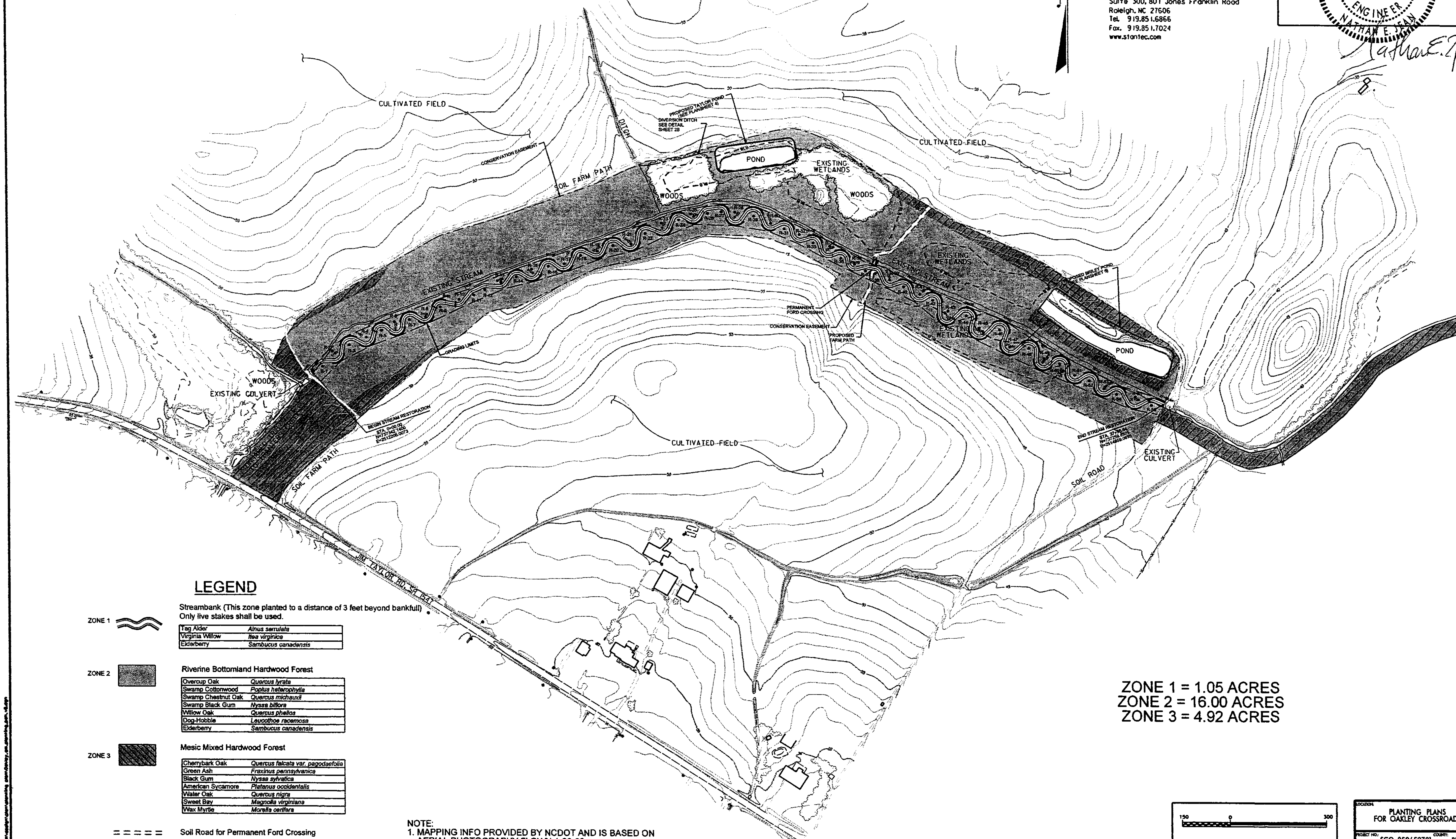
PROJECT REFERENCE NO.	SHEET NO.
SCO-050659701	PL-1

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER NATHAN E. JEAN



ZONE 1 = 1.05 ACRES
ZONE 2 = 16.00 ACRES
ZONE 3 = 4.92 ACRES

LEGEND

ZONE 1 — Streambank (This zone planted to a distance of 3 feet beyond bankfull)
Only live stakes shall be used.

Tag Alder	*Alnus serrulata*
Virginia Willow	*Itea virginica*
Elderberry	*Sambucus canadensis*

ZONE 2 — Riverine Bottomland Hardwood Forest

Overcup Oak	*Quercus lyrata*
Swamp Cottonwood	*Poplus heterophylla*
Swamp Chestnut Oak	*Quercus michauxii*
Swamp Black Gum	*Nyssa biflora*
Willow Oak	*Quercus phellos*
Dog-Hobble	*Leucothoe racemosa*
Elderberry	*Sambucus canadensis*

ZONE 3 — Mesic Mixed Hardwood Forest

Cherrybark Oak	*Quercus falcata var. pagodaefolia*
Green Ash	*Fraxinus pennsylvanica*
Black Gum	*Nyssa sylvatica*
American Sycamore	*Platanus occidentalis*
Water Oak	*Quercus nigra*
Sweet Bay	*Magnolia virginiana*
Wax Myrtle	*Morella cerifera*

= = = = = Soil Road for Permanent Ford Crossing

NOTE:
1. MAPPING INFO PROVIDED BY NCDOT AND IS BASED ON AERIAL PHOTOGRAPHY FLOWN 1-30-02.
2. POND AREAS ARE NOT PART OF PLANTING.

SCALE: 150 0 300

LOCATION: PLANTING PLANS FOR OAKLEY CROSSROADS	
PROJECT NO.: SCO-050659701	COUNTY: PITT
DESIGNED BY: DAB	DRAWN BY: CGM
CHECKED BY: BAM	DATE: