STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

September 10, 2007

U.S. Army Corps of Engineers
Raleigh Regulatory Field Office
6508 Falls of Neuse Road
Suite 120
Raleigh, NC 27615

ATTN: Mr. Eric Alsmeyer
NCDOT Coordinator

Dear Mr. Alsmeyer:

SUBJECT: **Permit Modification Request for TIP No. R-2809A**, Wake Forest Bypass, From west of Thompson Mill Road to east of Jones Dairy Road, Wake County, Federal Aid No. HPSTP-55 (12), State Project No. 8.1402501:

$570 Debit WBS Element 34503.1.1

Reference: R-2809 Department of the Army Section 404 Individual Permit dated April 4, 2002 (USACE Action ID 199601836)
Division of Water Quality Section 401 Water Quality Certification dated February 26, 2002 (DWQ Project No. 010550)
Neuse Buffer Authorization dated February 26, 2002, (DWQ Project No. 010550)

Please find enclosed with this letter a copy of the final design plans, permit drawings, Ecosystem Enhancement Program (EEP) confirmation letter, a copy of the Hydraulic Review meeting minutes, and the Stormwater Management Plan for R-2809A. The above referenced permits were issued for the entire R-2809 project (Sections A, B & C). Construction on Sections B and C are complete. The permits issued for the R-2809A portion of the project were based on preliminary design. The permit was conditioned so that NCDOT would be required to obtain a permit modification prior to construction of R-2809A. The NCDOT has modified the construction plans and permit drawings to reflect the final design on R-2809A. The purpose of this letter is to request a modification to the Department of the Army Individual Section 404 Permit from the USACE, as well as modification to the Section 401 Water Quality Certification and

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2728 CAPITAL BLVD
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Neuse River Buffer Authorization from the DWQ. Also included with this package are revised construction plans for the R-2809C at Buffer Sites 4 and 5 that reflect changes discussed in the field with USACE and DWQ.

Summary of Impacts:
Construction of R-2809A will result in 0.01 acres of permanent fill in non-riverine wetlands, 275 feet of permanent stream impacts, and 79 feet of temporary stream impacts. The original permit accounted for 0.01 acres of permanent fill in non-riverine wetlands, 90 feet of permanent stream impacts, and no temporary stream impacts.

Summary of Mitigation:
The project has been designed to avoid and minimize impacts to jurisdictional areas throughout the NEPA and design processes. However, project impacts will necessitate compensatory mitigation for the unavoidable impacts. The EEP will provide compensatory mitigation for 95 feet of stream impacts and 0.01 acres of non-riverine wetland impacts. Mitigation is not proposed for 180 feet of intermittent stream impacts due to the lack of aquatic habitat. The R-2809A portion of the project was not mitigated for during the original permit application.

The revised design does not compromise NCDOT's compliance with the existing permit conditions. The new impact sites have been evaluated for compliance with the avoidance/minimization criteria and are in compliance with all previous Individual Permit factors, including the following:

- Protected Species,
- Cultural Resources,
- Aquatic Life passage,
- FEMA compliance

RESOURCE STATUS

All impacts to waters of the U.S. occur in the Central Piedmont Ecoregion of the Neuse River Basin within HUC 03020201. Impacts to Waters of the U.S. have increased since the preliminary design was complete (Table 1). A description of the impact sites is included below.

Stream impacts from the construction of the double reinforced concrete box culverts at Station –L- 32+40 were permitted and constructed as part of R-2809B. Permit drawings and design plans are included for this site because work associated the paving of R-2809A will occur at Station –L- 32+40.

Table 1-Impacts to Waters of the U.S. on R-2809A

Site Number	Original Site Number	Final Design Fill Wetlands (ac)	Preliminary Design Fill in Wetlands (ac)	Final Design Permanent Channel Impacts (feet)	Preliminary Design Permanent Channel Impacts (feet)	Final Design Temporary Channel Impacts (feet)	Preliminary Design Temporary Channel Impacts (feet)
1	1 & 2	0.01	0.01	95	90	23	0
2	NA*			62**	0	20	0
3	NA*			118**	0	36	0
Total		0.01	0.01	275	90	79	0

*Streams were not reviewed during the original verification.
**Intermittent streams that will not require mitigation.

REVISIONS **RESULTING IN** JURISDICTIONAL IMPACT CHANGES TO WATERS OF THE U.S. on R-2809A

Site 1-UT1 to Horse Branch (Original permitted as Site numbers 1 and 2), Sheets 4 and 5 of 19

Station –L- 9+25

On the north side of existing NC 98, the existing 40-inch corrugated metal pipe (CMP) in UT1 to Horse Branch (UT1) will be extended with a junction box and a 48-inch corrugated steel pipe (CSP). A 24-inch CSP will also convey water from a lateral base ditch east of UT1 into the new 48-inch CSP. Construction of the lateral base ditch will allow for the removal of an existing concrete ditch. Two preformed scour holes will also be constructed at the outlet of the two 16-inch CSPs carrying storm water from the roadway and discharging prior to entering the buffer. Extension of the pipe and the associated work will result in 0.01 acre of fill in non-riverine wetlands, 95 feet of permanent stream impacts and 23 feet of temporary stream impacts in UT 1.

Impact change: increase of 5 feet of permanent impacts to UT1 to Horse Branch
increase of 23 of temporary impacts to UT1 to Horse Branch

Site 2-UT2 to Horse Branch, Sheets 8 and 9 of 19

Station –L- 13+50

An existing 18-inch concrete pipe will be replaced with a 24-inch CSP in UT2 to Horse Branch (UT2). Two preformed scour holes will also be constructed at the outlets of the two 15-inch CSPs carrying storm water from the roadway, one on the east and one on the west side of UT2. Replacement of the pipe and the associated work will result in 62 feet of permanent stream impacts and 20 feet of temporary stream impacts in UT2. Impacts to UT2 were not originally permitted in the original permit because the stream was not identified during the original delineation and verification. No mitigation is proposed at this site because the stream was determined to be intermittent and no signs of aquatic life were found during the onsite verification with Brian Wrenn of the DWQ on October 15, 2004. Eric Alsmeyer of the USACE deferred to the DWQ.

Impact change: increase of 62 feet of permanent impacts to UT2 to Horse Branch
increase of 20 of temporary impacts to UT2 to Horse Branch

Site 3-UT2 to Horse Branch, Sheet 13 and 14 of 26
Station –Y1- 10+30
A new 30-inch CSP will be placed in UT2 to allow for the construction of a proposed access road. The crossing of UT2 at Site 3 is located approximately 120 feet to the north (downstream) of Site 2. Construction of the 30-inch pipe and the associated work will result in 118 feet of permanent stream impacts and 36 feet of temporary stream impacts in UT2. Impacts to UT2 were not originally permitted in the original permit because the stream was not identified during the original delineation and verification. No mitigation is proposed at this site because the stream was determined to be intermittent and no signs of aquatic life were found during the onsite verification with Brian Wrenn of the DWQ on October 15, 2004. Eric Alsmeyer of the USACE deferred to the DWQ.

Impact change: increase of 118 feet of permanent impacts to UT2 to Horse Branch
increase of 36 feet of temporary impacts to UT2 to Horse Branch

FEDERALLY PROTECTED SPECIES

Plants and animals with federal classification of Endangered (E) or Threatened (T) are protected under provisions of Section 7 and Section 9 of the Endangered Species Act of 1973, as amended. The U.S. Fish and Wildlife Service (FWS) lists 3 federally protected species for Wake County (Table 2). No changes in the county species list has occurred since the original surveys were conducted. A re-survey for Michaux's sumac was conducted on June 20, 2007 and no specimens were found.

The bald eagle was delisted as of August 8, 2007 and is no longer protected by the Endangered Species Act. It is, however, protected under the Bald and Golden Eagle Protection Act. This project will have no effect on the bald eagle since no habitat is present in the project area.

Table 2. Federally Protected Species for Wake County

Scientific Name	Common Name	Habitat Present	Status	Biological Conclusion
Picoides borealis	Red-cockaded woodpecker	No	E	No Effect
Alasmidonta heterodon	Dwarf wedgemussel	No	E	No Effect
Rhus michauxii	Michaux's sumac	Yes	E	No Effect

CULTURAL RESOURCES

Historic Architecture:
In a letter dated December 27, 1995, included in Appendix B of the Finding of No Significant Impact (FONSI), the State Historic Preservation Office (SHPO) concurred that the project will have no effect on Crenshaw Hall and the William Thompson House is outside of the area of potential effects. On December 21, 1995 SHPO signed a concurrence form, that is included in Appendix B of the FONSI, stating that the project would have no effect on the Purefoy-Dunn Plantation.

Archaeology:
An archaeology survey on Archeological Site 31WA175 was conducted on August 19, 1994. No archeological evidence was recorded during the investigation. The investigation concluded that the proposed project would not adversely impact prehistoric archeological site 31WA175. The SHPO concurred with these findings in a memorandum dated July 20, 1994 that is included in the Environmental Assessment.

NEUSE RIVER BASIN BUFFER RULES

This project is located in the Neuse River Basin and is subject to the Neuse River Basin Buffer Rules. Impacts to the Neuse River Basin on R-2809A were approved for 19,936 ft^2 based on the preliminary design in the original buffer certification dated February 26, 2002. Final design buffer impacts total 43,382ft^2. Listed below is a summary of the changes to Neuse River Basin Buffers and required mitigation.

Table 3-Neuse River Basin Buffer Rule Impacts

Site Number	Original Site Number	Final Design Buffer Zone 1 Impacts (sqft)	Preliminary Design Buffer Zone 1 Impacts (sqft)	Impact Change (sqft)	Final Design Buffer Zone 2 Impacts (sqft)	Preliminary Design Buffer Zone 2 Impacts (sqft)	Impact Change (sqft)
1	1	5,651	1,787	**3,864**	3,283	1,432	**1,851**
2	NA	4,338		**4,338**	2,788		**2,788**
3	NA	7,556		**7,556**	4,198		**4,198**
NA	3		7,395	**-7,395**		9,322	**-9,322**
Total		25,814	9,182	**16,632**	17,568	10,754	**6,814**

Table 4-Neuse River Buffer Mitigation Summary

Site #	Allowable Buffer Impacts (sqft)	Allowable with Mitigation (sqft)
1	8,934	
2	7,126	
3		11,754
Total	16,060	11,754

REVISIONS **RESULTING IN** CHANGES TO NEUSE RIVER BASIN BUFFERS on R-2809A

Site 1, Sheets 4 and 5 of 19
Station -L- 9+25
The construction area was increased slightly in order to facilitate construction equipment. Impacts at this site are considered allowable because they occur from a road crossing that impacts between 40 and 150 linear feet and buffer impacts are less then 1/3 of an acre.
Impact change: Increase of 5,715 ft^2 of allowable Buffer impacts

Site 2, Sheets 8 and 9 of 19
Station -L- 13+50
Impacts at Site 2 were not originally permitted in the original permit because the stream was not identified during the original delineation and verification. Buffer impacts occur from the replacement of an existing 18-inch concrete pipe in UT2 to Horse Branch (UT2) with a 24-inch CSP. Two preformed scour holes will also be constructed at the outlets of the two 15-inch CSPs carrying storm water from the roadway, one on the east and one on the west side of UT2. Impacts at this site are considered allowable because they occur from a road crossing that impacts between 40 and 150 linear feet and buffer impacts are less then 1/3 of an acre.
Impact change: Increase of 7,126 ft^2 of allowable Buffer impacts

Site 3, Sheets 13 and 14 of 19
Station –Y1- 10+30
Impacts at Site 3 were not originally permitted in the original permit because the stream was not identified during the original delineation and verification. Buffer impacts occur from the placement of a 30-inch pipe for an access road. Impacts at this site are considered allowable with mitigation because they occur from a road crossing that impacts greater then 150 linear feet.
Impact change: Increase of 11,754 ft^2 of Buffer impacts requiring mitigation

Old Site 3,
Station –Y2- 15+45-
This site was reviewed by Brian Wrenn from DWQ and Brett Feulner from the NCDOT on October 15, 2004 and the determination was made that this site is not subject under the Neuse River Basin Buffer Rules. This site was shown in the original application as subject to the buffer rules but not as a jurisdictional stream.
Impact change: Decrease of 16,717 ft^2 of Buffer impacts requiring mitigation

REVISIONS **RESULTING IN NO** CHANGES to NEUSE BUFFER IMPACTS on R-2809C

Sites 4 and 5
Station –L-82+20 to Station –L-86+36
The NCDOT requested a permit modification on September 7, 2005 that included work on R-2809C at Sites 4 and 5. The modification was issued on September 30, 2005. The modification was requested to comply with the Neuse River Buffer Rules and to provide stability for a relocated channel at its tie in with Smith Creek. On May 30, 2006 the NCDOT Division 5 Construction Office sent the proposed project to prospective bidders. The only bid that was received was significantly higher then the NCDOT's estimate. The project was advertised a second time for bids on July 21, 2006 and no bids were received. During August 2006, Division 5 became aware that Public Service Company of North Carolina (PSCNC) had deviated from an encroachment agreement and open cut through Sites 4 and 5 as well as Smith Creek. Representatives from NCDOT, the USACE, DWQ and PSCNC meet onsite on March 12, 2007 to review the site and discuss how to proceed with plans to stabilize the site. As a result of this deviation, the NCDOT has revised the design plans at these sites. The revised plans do not affect the previously permitted impact quantities; therefore the permit drawings have not been revised. The changes discussed and agreed to in the field are highlighted below.

Station 82+20 to 82+95 –L- Rt
The NCDOT proposes to convert the existing lateral 2-foot base ditch with Class I riprap to a lateral swale/ ditch with rock checks. This will provide treatment of stormwater runoff prior discharging into the riparian buffer.

Station 83+80 to 84+20 –L- Lt
The NCDOT proposes to convert the existing lateral 2-foot base ditch with Class I riprap to a lateral swale/ ditch with rock checks. This will provide treatment of stormwater runoff prior discharging into the riparian buffer.

Station 84+20 to 84+55 –L- Lt
The NCDOT proposes to install a 24-inch and 42-inch RCPs with a junction box with a manhole. NCDOT also proposes to re-grade the floodplain, remove excess riprap and reconstruct the energy dissipator. These structures serve to convey water from the lateral swale/ ditch with rock checks to Smith Creek.

Station 84+40 to 84+90 –L- Lt
The NCDOT proposes to stabilize fill slopes above headwall and wing wall of existing culvert as directed by the Construction Engineer. This will provide long term stability to the fill slope located above the culvert inlet.

Station 84+63 to 84+80 –L- Lt
The NCDOT proposes to construct a temporary stream diversion and install six cross vanes and step pools at the relocated UT to Smith Creek. The cross vanes and step pools will allow water in the relocated stream to transition from natural ground to Smith Creek.

Station 85+10 to 85+60 –L- Lt
NCDOT proposes to excavate fill material in the wetland to pre-construction natural ground elevations as directed by the Construction Engineer. The temporary fill material will be removed from this wetland.

Station 85+36 to 85+51 –L- Lt and Stations 85+80 to 86+36 –L- Lt
The NCDOT proposes to construct a standard 5 to 8 foot base ditch. The base ditch serves to convey runoff to the relocated UT to Smith Creek.

Station 85+10 to 85+75-L- Lt
The NCDOT proposes to stabilize the stream banks of the relocated UT to Smith Creek. This will provide long term stability to the relocated channel.

PROJECT SCHEDULE

This project has a let date of December 18, 2007 and a review date of October 2, 2007.

MITIGATION OPTIONS

The NCDOT is committed to incorporating all reasonable and practicable design features to avoid and minimize jurisdictional impacts, and to provide full compensatory mitigation of all remaining, unavoidable jurisdictional impacts. Avoidance measures were taken during the planning and NEPA compliance stages; minimization measures were incorporated as part of the project design.

Avoidance:
All wetland areas not affected by the project will be protected from unnecessary encroachment. No staging of construction equipment or storage of construction supplies will be allowed in wetlands or near surface waters.

General avoidance measures incorporated into the project design

- Relocation of utility lines within roadway fill in jurisdictional areas
- No Staging of construction equipment or storage of construction supplies will be allowed in wetlands or near surface waters. Staging areas will be determined by the contractor after the project is let.

- No borrow or waste areas will be located in wetland areas without a permit from the USACE.

Minimization:
Minimization has been employed in the project area to the maximum extent particle. Reduction of fill-slopes at stream/wetland crossings and the selection of alternatives that will minimize wetland impacts will reduce unnecessary wetland takings.

Project Wide Minimization Measures
- Use of 2:1 side slopes in jurisdictional areas.
- All culverts will be buried 20% below the streambed.
- NCDOT BMP's for the protection of surface waters will be strictly enforced during the construction of this project.
- The use of rip rap has been eliminated from stream beds

Site Specific Minimization Measures
- Station –L-9+25- The preformed scour hole has been relocated outside of the buffer

COMPENSATORY MITIGATION

The construction of the R-2809A will result in 0.01 acre of non-riverine wetland fill and 95 feet of stream impacts that will require mitigation within the Neuse River Basin. The project will also require mitigation for impacts to Neuse River Basin Buffer impacts for 7,556ft^2 of Zone 1 Impacts and 4,198ft^2 of Zone 2 Impacts.

Based upon the agreements stipulated in the "Memorandum of Agreement Among the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the U.S. Army Corps of Engineers, Wilmington District" (MOA), it is understood that the North Carolina Department of Environment and Natural Resources Ecosystem Enhancement Program (EEP), will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for NCDOT projects.

The offsetting mitigation will be derived from an inventory of assets already in existence within the same 8-digit cataloguing unit. The Department has avoided and minimized impacts to jurisdictional resources to the greatest extent possible as described above. The remaining, unavoidable impacts will be offset by compensatory mitigation provided by the EEP program as noted in the enclosed EEP confirmation letter.

REGULATORY APPROVALS

Section 404 Permit: The NCDOT respectfully requests that the USACE modify the above referenced 404 Permit as required for the above-described activities for the proposed project.

Section 401 and Buffer Certification: The NCDOT respectfully requests that the DWQ modify the 401 water quality certification and the Neuse River Buffer Certification as required for the above described activities for the proposed project. In compliance with Section 143-215.3D(e) of the NCAC we will provide $570.00 to act as payment for processing the Section 401 permit application previously noted in this application (see Subject line).

Thank you for your assistance with this project. If you have any questions or need additional information, please contact Brett Feulner at bmfeulner@dot.state.nc.us or (919) 715-1488.

A copy of this permit application will be posted on the DOT website at: http://www.ncdot.org/doh/preconstruct/pe/neu/permit.html.

Sincerely,

E. R. Lusk

for Gregory J. Thorpe, Ph.D.
Environmental Management Director, PDEA

w/ attachment
Mr. John Hennessy, NCDWQ (5 Copies)
Mr. Travis Wilson, NCWRC
Ms. Kathy Matthews, USEPA
Mr. Michael Street, NCDMF
Mr. Chris Murray, DEO
Mr. Gary Jordan, USFWS
Mr. Victor Barbour, P.E., Project Services Unit
Dr. David Chang, P.E., Hydraulics
Mr. Mark Staley, Roadside Environmental
Mr. Ronald Mikulak, USEPA – Atlanta, GA
Mr. Greg Perfetti, P.E., Structure Design
Mr. J. Wally Bowman, PE., Division Engineer
Mr. Clarence W. Coleman, P.E., FHWA

w/o attachment
Mr. Jay Bennett, P.E., Roadway Design
Mr. Scott McLendon, USACE, Wilmington
Mr. Gene Tarascio, PDEA
Mr. Todd Jones, NCDOT External Audit Branch
File: R-2809A
Mr. Art McMillan, P.E., Highway Design
Mr. Majed Alghandour, P. E., Prog. and TIP
Ms. Beth Harmon, EEP
Mr. Carl Goode, PE, HEU

August 29, 2007

Mr. Gregory J. Thorpe, Ph.D.
Environmental Management Director
Project Development and Environmental Analysis Branch
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, North Carolina 27699-1548

Dear Dr. Thorpe:

Subject: EEP Mitigation Acceptance Letter:

R-2809A, NC 98 (Wake Forest Bypass) from West of SR 1923 (Thompson Mill Road) to US 1, Wake County

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the compensatory stream and nonriparian wetland mitigation and buffer mitigation for the subject project. Based on the information supplied by you on August 29, 2007, the impacts are located in CU 03020201 of the Neuse River Basin in the Central Piedmont (CP) Eco-Region, and are as follows:

Warm Stream:	95 feet
Nonriparian Wetland:	0.01 acre
Buffer Zone 1:	7,556 square feet
Buffer Zone 2:	4,198 square feet

If the buffer impacts or the amount of mitigation required for this project increases, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required.

All buffer mitigation requests and approvals are administrated through the Riparian Restoration Buffer Fund. The NCDOT will be responsible to ensure that appropriate compensation for the buffer mitigation will be provided in the agreed upon method of fund transfer. Upon receipt of the NCDWQ's Buffer Authorization Certification, EEP will transfer funds from Tri-Party MOA Fund into the Riparian Restoration Buffer Fund. Upon completion of transfer payment, NCDOT will have completed its riparian buffer mitigation responsibility for TIP R-2809A. Subsequently,

EEP will conduct a review of current MOA mitigation projects in the river basin to determine if available buffer mitigation credits exist. If there are buffer mitigation credits available, then the Riparian Restoration Buffer Fund will purchase the appropriate amount of buffer mitigation credits from Tri-Party MOA Fund.

During the review of this request, it was noted that this project was not included in the 2007 Impact Projection Database; however, EEP will provide the requested stream and nonriparian wetland mitigation. Depending on the availability and projected need of stream and nonriparian wetland mitigation in this cataloging unit, additional stream mitigation may be required that was not included in the biennial budget submitted to NCDOT on April 2, 2007 (revised April 16, 2007).

EEP commits to implementing sufficient compensatory stream and nonriparian wetland mitigation to offset the impacts associated with this project by the end of the MOA Year in which this project is permitted, in accordance with Section X of the Amendment No. 2 to the Memorandum of Agreement between the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the U. S. Army Corps of Engineers, fully executed on March 8, 2007. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from EEP.

If you have any questions or need additional information, please contact Ms. Beth Harmon at 919-715-1929.

Sincerely,

James B. Stanfill for

William D. Gilmore, P.E.
EEP Director

cc: Mr. Eric Alsmeyer, USACE – Raleigh
Mr. John Hennessy, Division of Water Quality, Wetlands/401 Unit
Ms. Kelly Williams, EEP ILF Coordinator
File: R-2809A

Ecosystem Enhancement PROGRAM

August 29, 2007

Mr. Eric Alsmeyer
U. S. Army Corps of Engineers
Raleigh Regulatory Field Office
6508 Falls of the Neuse Road, Suite 120
Raleigh, North Carolina 27615

Dear Mr. Alsmeyer:

Subject: EEP Mitigation Acceptance Letter:

R-2809A, NC 98 (Wake Forest Bypass) from West of SR 1923 (Thompson Mill Road) to US 1, Wake County; Neuse River Basin (Cataloging Unit 03020201); Central Piedmont (CP) Eco-Region

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the stream and nonriparian wetland mitigation and the buffer mitigation for the unavoidable impact associated with the above referenced project. As indicated in the NCDOT's mitigation request dated August 29, 2007, stream and nonriparian wetland mitigation from EEP is required for approximately 95 feet of warm stream impacts and 0.01 acre nonriparian wetland impact.

Also, this project will impact buffers located in CU 03020201 of the Neuse River Basin. The total buffer impacts are 7,556 square feet in Zone 1 and 4,198 square feet in Zone 2 with a total buffer mitigation requirement of 28,965 square feet. If the buffer impacts or the amount of mitigation required from EEP increases or decreases for this project, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required. All buffer mitigation requests and approvals are administrated through the Riparian Restoration Buffer Fund (Fund 2982).

The NCDOT will be responsible to ensure that the appropriate compensation for the buffer mitigation will be provided in the agreed upon method of fund transfer. Upon receipt of the NCDWQ's Buffer Authorization Certification, EEP will transfer funds from Fund 2984 (Tri-Party MOA Account) into Fund 2982 and commit to provide the appropriate buffer mitigation to offset the impacts associated with this project.

Stream and nonriparian wetland mitigation associated with this project will be provided in accordance with Section X of the Amendment No. 2 to the Memorandum of Agreement between the N. C. Department of Environment and Natural Resources, the N. C. Department of Transportation, and the U. S. Army Corps of Engineers fully executed on March 8, 2007 (Tri-Party MOA). EEP commits to implement sufficient stream mitigation up to 190 stream credits and 0.02 nonriparian wetland credits to offset the impacts associated with this project by the end of the MOA year in which this project is permitted. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from EEP.

If you have any questions or need additional information, please contact Ms. Beth Harmon at 919-715-1929.

Sincerely,

James B. Stanfill for

William D. Gilmore, P.E.
EEP Director

cc: Mr. Gregory J. Thorpe, Ph.D., NCDOT-PDEA
Mr. John Hennessy, Division of Water Quality, Wetlands/401 Unit
Ms. Kelly Williams, EEP ILF Coordinator
File: R-2809A

Subject: Minutes from Interagency 4B Hydraulic Design Review Meeting on February 18, 2004 for R-2809A in Wake County

Team Members:

Eric Alsmeyer-USACE	(present)
John Hennessy-NCDWQ	(present)
Travis Wilson-NCWRC	(present)
Gary Jordan-USFWS	(absent)
Chris Militscher-EPA	(present)
Brett Feulner-PDEA	(present)

Participants:
Marshall Clawson, NCDOT Hydraulics
Galen Cail, NCDOT Hydraulics
Quang Nguyen, NCDOT Structure Design

It was agreed by all that the permit was not complete. There are a number of potential buffer sites* that may be added. Also, the permit will need to include info at buffer and wetland boundaries including 10 yr discharges and velocities and ditch slopes. Detailed treatment info will also be provided. John stated a 4C review will have to be scheduled to review the complete/updated permit.

A general comment was made to eliminate any rip rap in stream beds.

An impact summary sheet in English was requested.

Permit Site 1 & 2 (Sheet 5):

It was stated the outlet pipe will be realigned to the stream to improve the outlet discharge angle with the stream.

Investigate using a flow spreader at the buffer boundary in the ditch coming from the west. Need to justify reason(s) if unable to use. Need to investigate means for stormwater treatment.

Permit Site 3 (Sheet 17):

Investigate using flow spreaders at the buffer boundary in the ditch and at the pipe outlet. Need to justify reason(s) if unable to use. Why is excavation needed at inlet?

Need stream (intermittent) impact quantities.

Need buffer and stream (intermittent) impact quantities for the 800 CSP crossing Sta 16+50 –Y2-. Why is excavation needed at outlet?

*Depending on the acceptance of additional buffered crossings, it may be necessary to provide flow spreaders, 10 yr discharge and velocity data, treatment info, etc.

Subject: Minutes from Interagency 4B Hydraulic Design Review Meeting on February 16, 2005 for R-2809A in Wake County

Team Members:

Eric Alsmeyer-USACE	(present)
Nikki Thomson-NCDWQ	*(absent)
Travis Wilson-NCWRC	(present)
Gary Jordan-USFWS	(absent)
Chris Militscher-EPA	(present)
Brett Feulner-ONE	(present)

Participants:
Marshall Clawson, NCDOT Hydraulics
Galen Cail, NCDOT Hydraulics
Frank Fleming, Sungate Design Group
Kevin Moore, NCDOT Roadway

*Will meet to review at a later date

A prior 4B was held on 2/18/04. However, due to a number of potential buffer/stream sites that had not been reviewed, it was decided to reschedule the 4B. The buffer/stream "calls" have since been assessed.

Sheet 12:

An intermittent, buffered stream crosses at approximate Sta 10+30 –Y1-. It is buffered up to the 450 outlet under existing NC 98. The drainage that outlets into the buffer will be treated. It is proposed to outlet drainage to a JB along the cross pipe. Therefore, outlet energy dissipated in the JB instead of at the stream banks.

Sheet 14:

There was discussion about removing the existing NC 98 fill, since there will be a realignment, to provide potential mitigation. It is presently proposed just to remove the existing pavement after construction. It was mentioned that it may be difficult to remove the fill during construction since traffic will have to be maintained on site.

Subject: Minutes from Interagency 4C Permit Review Meeting on June 15, 2005 for R-2809A in Wake County

Team Members:

Eric Alsmeyer-USACE	(present)
Christina Breen-NCDWQ	(present)
Travis Wilson-NCWRC	(present)
Gary Jordan-USFWS	(absent)
Chris Militscher-EPA	(present)
Elizabeth Lusk-PDEA	(present)
Chris Murray-NCDOT-DEO	(present)

Participants:
Marshall Clawson, NCDOT Hydraulics
Galen Cail, NCDOT Hydraulics
Vince Rivers, NCDOT Hydraulics
Frank Fleming, Sungate Design Group
Lonnie Brooks, NCDOT Structure Design

Buffer Site 1 (Sheet 5):

Relocate PSH out of buffer.

Buffer Site @ R-2809B Box Culvert (Sheet 11):

Need detail for rock checks in ditch 31+20 –L- Rt.

From 400 outlet Sta 32+00 Lt, show ditch prescribed on R-2809B project.

State Project No. 34503.2.1

TIP Project No. R-2809AB

Wake County, NC

NC 98, Wake Forest Bypass from West of SR1923

to West of US 1

STORMWATER MANAGEMENT PLAN

Prepared by:

Sungate Design Group, PA

915 Jones Franklin Road

Raleigh, NC 27606

PROJECT INVOLVEMENT

The proposed project is 2.5 kilometers (1.53 miles) in length and will construct a portion of NC 98 Bypass (-L-) on new location. The project also includes relocation and widening existing Falls of Neuse Rd. (-Y2-) and construction of NC 98 Bypass on new location. NC 98 Bypass will be a divided multilane facility with curb and gutter / grass median and grass swales left and right.

The proposed project contains three crossings of Unnamed Tributaries to Horse Creek, one new See Table 1 for a detailed list of the streams and proposed crossings.

Table 1. Stream Crossings

Stream Name	Drainage Area	Proposed Structure
*Site #1 **UT to Horse Creek	105 acres	Exist. 42"CSP/ Extend w/ 48" CSP
*Site #2 UT to Horse Creek	9 acres	24" CSP
Site #3 *UT to Horse Creek	11 acres	30" RCP

*Site numbers correspond to permit drawings

**Extension of Existing Pipe

UT – Unnamed Tributary

A review of the Environmental Assessment and Environmental Sensitivity Maps indicates that the project is located in Water Supply Watershed but the project is more than a mile from the critical area.

POTENTIAL IMPACTS

The project is located within the Town of Wake Forest Corporate Limits, City of Raleigh Corporate Limits and an Unincorporated area of Wake County. The project is located entirely within the drainage basin of the Neuse River and is therefore subject to the requirements of 15A NCAC 2B .0233, the Neuse River Riparian Buffer Rules. The purpose of the Rule is to protect and preserve riparian buffers in the Neuse River Basin to maintain their nutrient removal functions.

The Neuse Riparian Buffer Rules require that a 50-foot wide riparian buffer directly adjacent to surface waters in the Neuse River Basin be maintained. The Rule also requires that concentrated runoff from new ditches or manmade conveyances be converted to diffused flow before the runoff enters the riparian buffer.

BEST MANAGEMENT PRACTICES (BMPs)

As noted in Table 1, the proposed project contains three jurisdictional stream crossings. All three crossings meet the requirements of 15A NCAC 2B .0233(3) requiring treatment of stormwater runoff. The following discusses each crossing, the BMP proposed or a justification for alternative designs:

Site 1 – UT to Horse Creek (-L- Sta. 9+25)

The proposed work at Site 1 involves widening of existing NC 98 and the extension of the existing 42" CSP with a junction box and a 48" RCP. The increase in size is recommended to facilitate burying the outlet invert 0.8' below the existing stream bed. Rip rap will be placed on the banks and not in the stream for outlet bank stabilization. All storm water will be discharged into pre-formed scour holes outside of zone #2 buffer zone. See attached spreadsheet for calculations.

Site 2 – UT to Horse Creek (-L- Sta. 13+50L)

The proposed work at Site 2 involves the construction of new NC 98 Bypass. A proposed 24" CSP will discharge cross-drainage and grass-swale treated stormwater at this site. All other stormwater not treated will be discharged into pre-formed scour holes outside of zone #2 buffer zone.

Site 3 – Horse Creek (-Y1- Sta.17+59.78)

Site 3 is an additional crossing downstream of Site #2 by –Y3-. –Y3- is a proposed new location two-lane roadway for connection of existing NC 98 with –Y-1. The proposed 30" RCP will discharge cross-drainage and grass-swale treated storm water. The roadway drainage system on –Y3- is treated by grass-swales and proposed to be discharged directly into the 30" crosspipe. This direct connection is the result of determination that the topography is too steep to outlet into the riparian area. Since the stormwater is treated the least damaging alternative is to dissipate the energy from the drainage system in a proposed junction box and the 30" RCP. The proposed 30" RCP will be buried in the existing substrate and the outlet banks will be lined with Class 'I' Rip Rap to stabilize the outlet channel.

R-2809B- Site #1 UT to Richland Creek

As described in the Stormwater Plan for the 'B' section of Richland Creek, the proposed work at Site 1 involved construction of -L- and a 2 @ 7' x 6' RCBC on new location and the relocation of a portion of an unnamed tributary to Richland Creek adjacent to -Y2- (Retail Drive). It is required to discharge stormwater from section 'A' at this site. The majority stormwater is proposed to be treated by grass swales. The remainder of the stormwater is proposed to be treated with a 3' base grass swale before entering the riparian area. Because of topography and limits to R/W, check dams will be incorporated to flatten the slope and achieve 2'/sec. Also permanent reinforcement mat is proposed in the swale to maintain stability.

See attached spreadsheet for treatment calculations.

DESIGN DETAILS

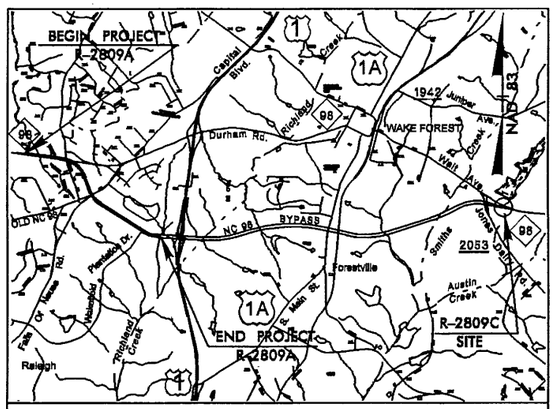
Design details for the enhanced grass swales, variable width base ditches and preformed scour holes are shown on the Roadway Design plans.

9/09/99

TIP PROJECT: R-2809A

CONTRACT: C201737

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbology
See Sheet 1-C & 1-D For Survey Control Sheets



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

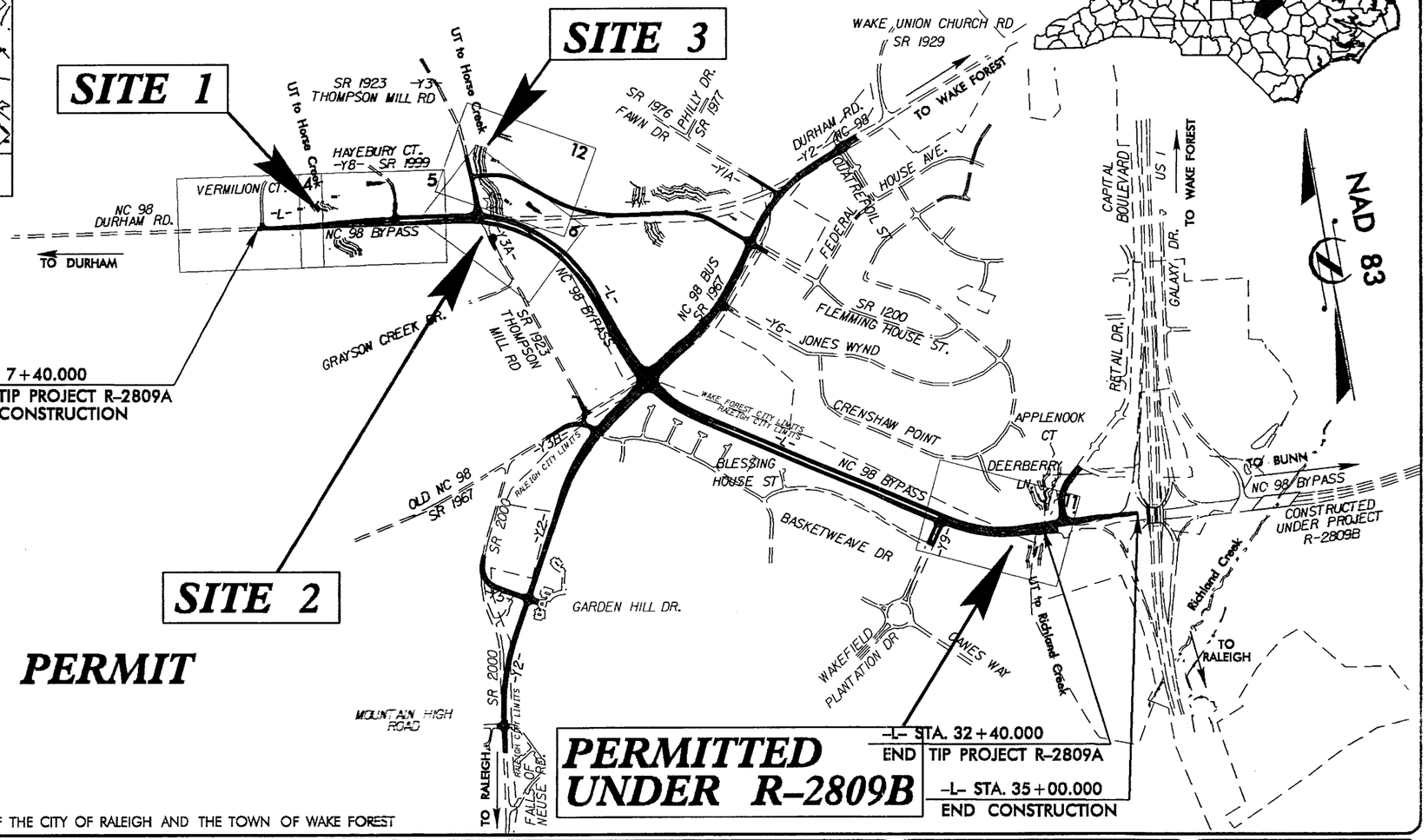
WAKE COUNTY

METRIC

ALL DIMENSIONS IN THESE PLANS ARE IN METERS OR MILLIMETERS UNLESS OTHERWISE SHOWN

STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	R-2809A		1	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION		
34503.1.1	STP-98(1)	PE		
34503.2.5	STP-98(2)	R/W & UTIL		
34503.3.7	STP-98(23)	CONST.		

LOCATION: ***NC 98 (WAKE FOREST BYPASS) FROM WEST OF SR 1923 (THOMPSON MILL ROAD) TO WEST OF US 1 (CAPITAL BLVD.)***



-L- STA. 7+40.000
BEGIN TIP PROJECT R-2809A
BEGIN CONSTRUCTION

PERMITTED UNDER R-2809B

-L- STA. 32+40.000
END TIP PROJECT R-2809A
-L- STA. 35+00.000
END CONSTRUCTION

WETLAND\STREAM PERMIT

PORTIONS OF THIS PROJECT FALLS WITHIN THE BOUNDARIES OF THE CITY OF RALEIGH AND THE TOWN OF WAKE FOREST

GRAPHIC SCALES

5 0 10
PLANS

5 0 10
PROFILE (HORIZONTAL)

1 0 2
PROFILE (VERTICAL)

DESIGN DATA

ADT 2007 = 24,100
ADT 2025 = 36,500
DHV = 10 %
D = 60 %
T = 6 % *
V = 100 km/h

* (TTST 2% & DUAL 4%)

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2809A = 2.500 km
TOTAL LENGTH OF TIP PROJECT R-2809A= 2.500 km

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh, NC 27610

2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JUNE 30, 2005

LETTING DATE: DECEMBER 18, 2007

JASON MOORE, PE
PROJECT ENGINEER

KEVIN E. MOORE, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

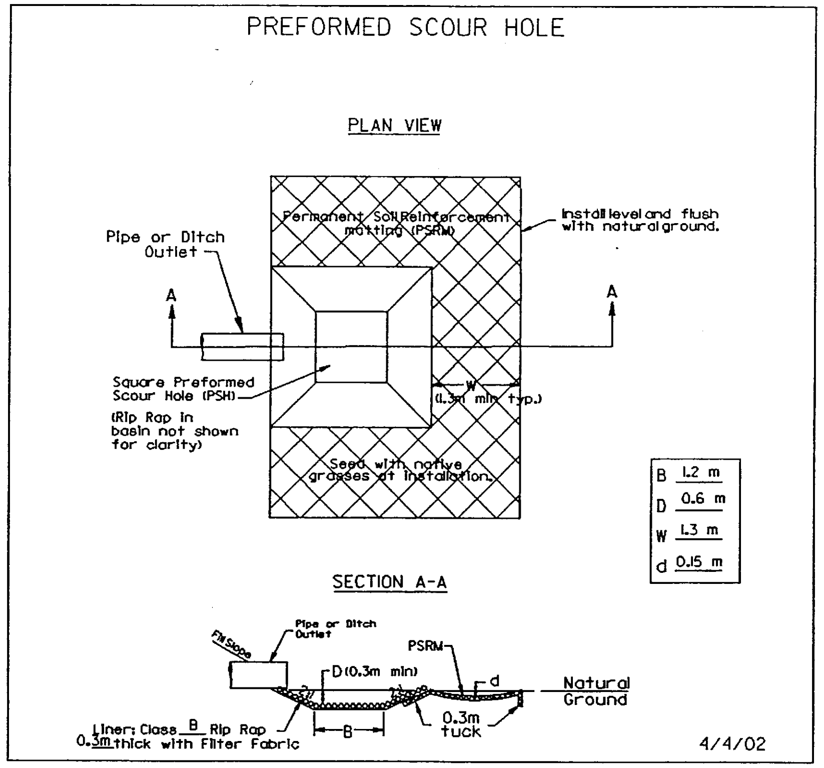
P.E.
SIGNATURE:

DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA

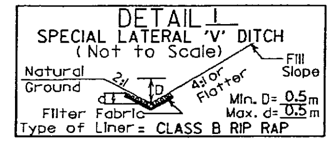
P.E.
STATE HIGHWAY DESIGN ENGINEER

Permit Drawings
Sheet 1 of 19

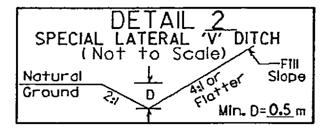
PROJECT REFERENCE NO.	SHEET NO.
R-2809A	2-F
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER



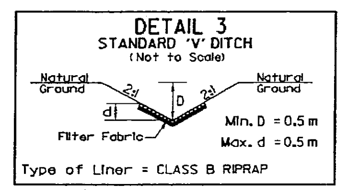
STA. 9+50 -L- LT
STA. 9+99 -L- RT
STA. 13+75 -L- LT
STA. 14+30 -L- LT
STA. 18+73 -L- LT
STA. 19+95 -L- LT



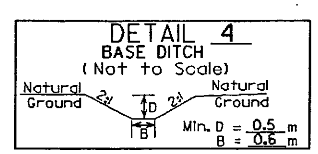
STA. 10+70 TO 11+11 -L- LT
STA. 11+20 TO 11+60 -L- RT
STA. 19+40 TO 19+80 -L- RT
STA. 23+60 TO 23+90 -L- LT
STA. 18+82 TO 19+00 -Y2- RT



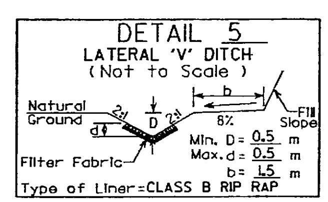
STA. 15+40 TO 15+76 -L- RT
STA. 18+80 TO 19+20 -L- RT
STA. 30+80 TO 31+20 -L- LT
STA. 11+06 TO 11+60 -Y2- LT
STA. 19+20 TO 19+46 -Y2- RT
STA. 26+60 TO 27+00 -Y2- LT
STA. 10+70 TO 10+40 -Y3B- RT
STA. 10+20 TO 10+50 -Y4- LT



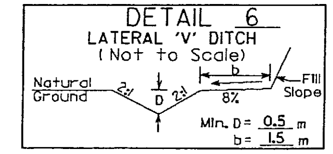
STA. 27+00 TO 27+17 -Y2- LT
STA. 27+17 TO 27+70 -Y2- LT



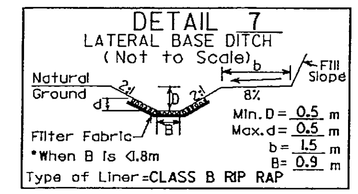
STA. 15+73 -L- LT
STA. 15+78 -L- RT
STA. 17+35 TO 17+55 -L- RT
STA. 24+55 -L- LT
STA. 15+30 -Y2- LT
STA. 12+04 -Y5- LT



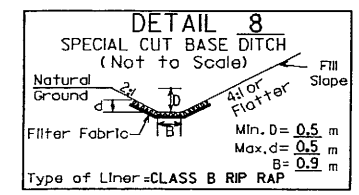
STA. 17+00 TO 17+80 -L- LT
STA. 24+20 TO 24+40 -L- RT
STA. 24+60 TO 25+20 -L- LT
STA. 11+40 TO 11+69 -Y3- LT
STA. 15+20 TO 16+00 -Y2- LT
STA. 16+20 TO 16+80 -Y2- LT



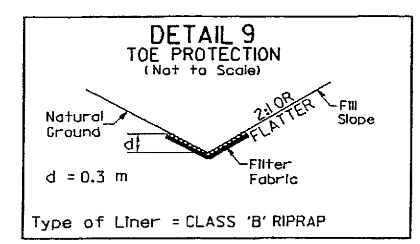
STA. 16+70 TO 17+33 -L- RT
STA. 25+80 TO 28+20 -L- LT



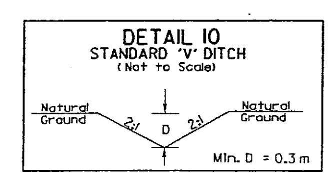
STA. 16+42 TO 17+00 -L- LT



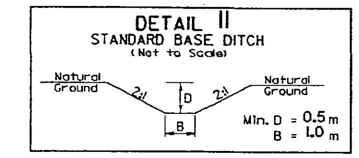
STA. 23+00 TO 23+60 -L- LT



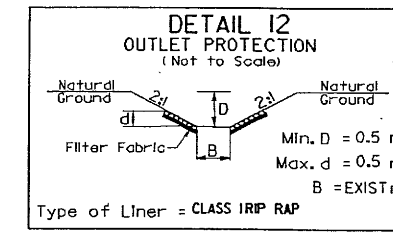
STA 8+35 TO STA 8+50 -L- RT.
STA 9+20 TO STA 9+80 -L- LT.
STA. 23+60 TO 24+10 -L- RT
STA. 12+60 TO 13+00 -Y1- RT
STA. 16+30 TO 17+20-Y1- RT
STA. 26+80 TO 27+20 -Y2- RT



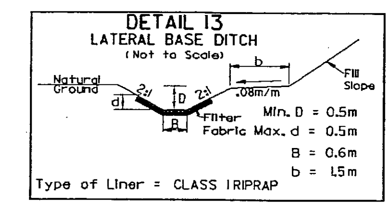
STA. 10+30 -Y1A- RT



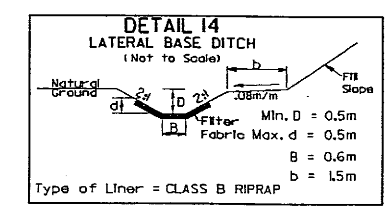
STA. 16+42 -Y2- RT



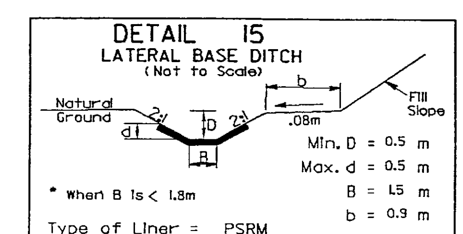
STA. 9+15 -L- LT
STA. 13+95 -L- LT
STA. 11+50 -Y3- RT



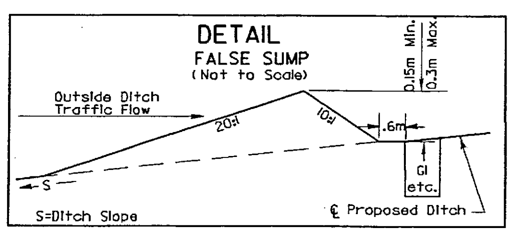
STA. 9+00 TO 9+12 -L- LT

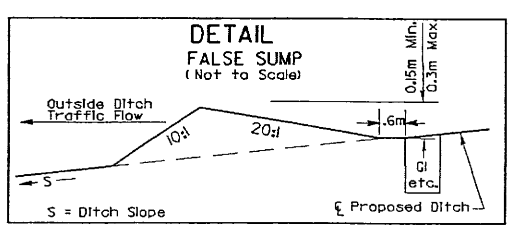


STA. 9+80 TO 10+70 -L- LT



STA. 31+00 TO 31+38 -L- RT



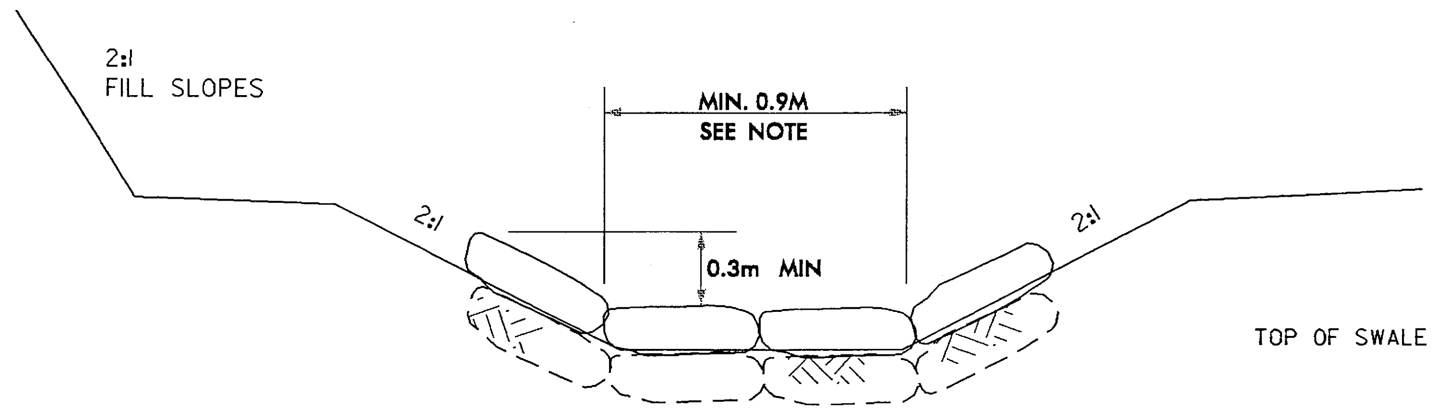


Permit Drawing
Sheet 2 of 19

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	2-G
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

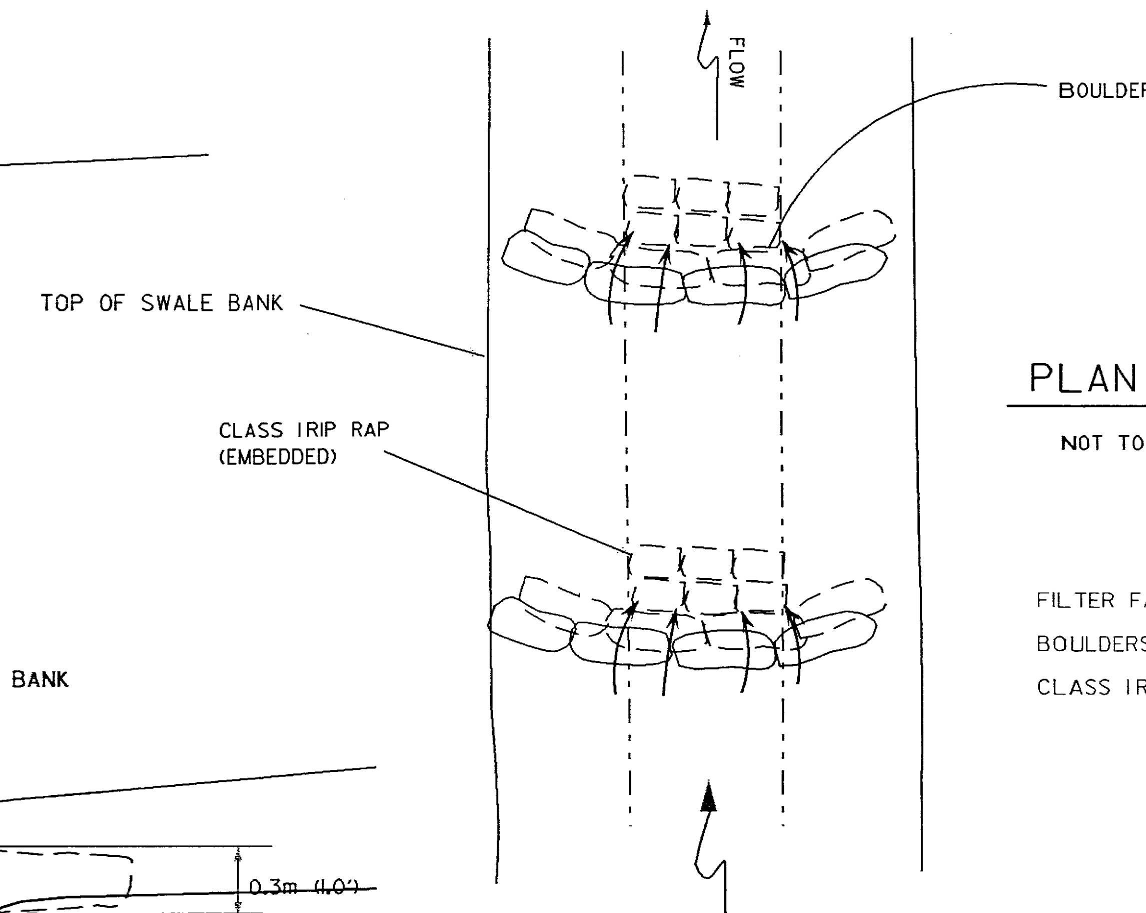
METRIC

LATERAL SWALE/DITCH W/ROCK CHECKS
STA 31+16 TO 31+38 -L- RT



TYPICAL CROSS SECTION

NOT TO SCALE



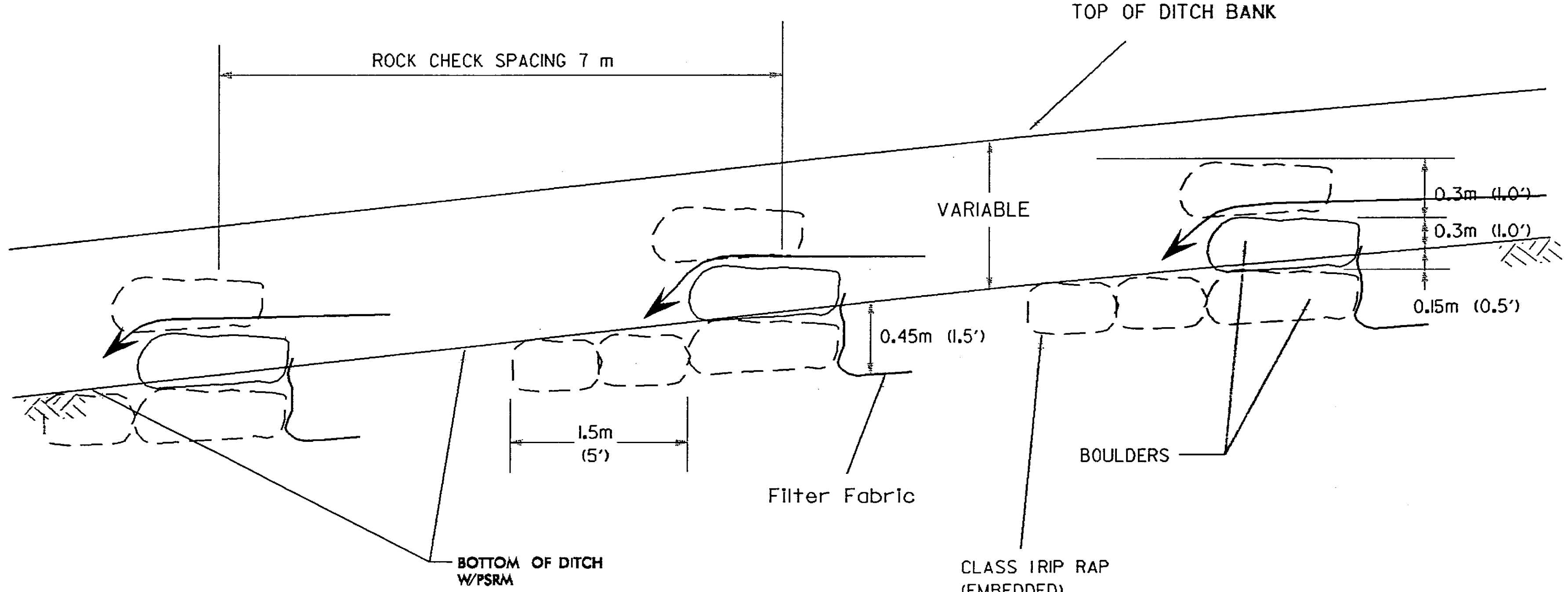
PLAN VIEW

NOT TO SCALE

FILTER FABRIC = $20m^2$

BOULDERS/FOOTER ROCK = 60 MTN

CLASS I RIP RAP = 5 MTN



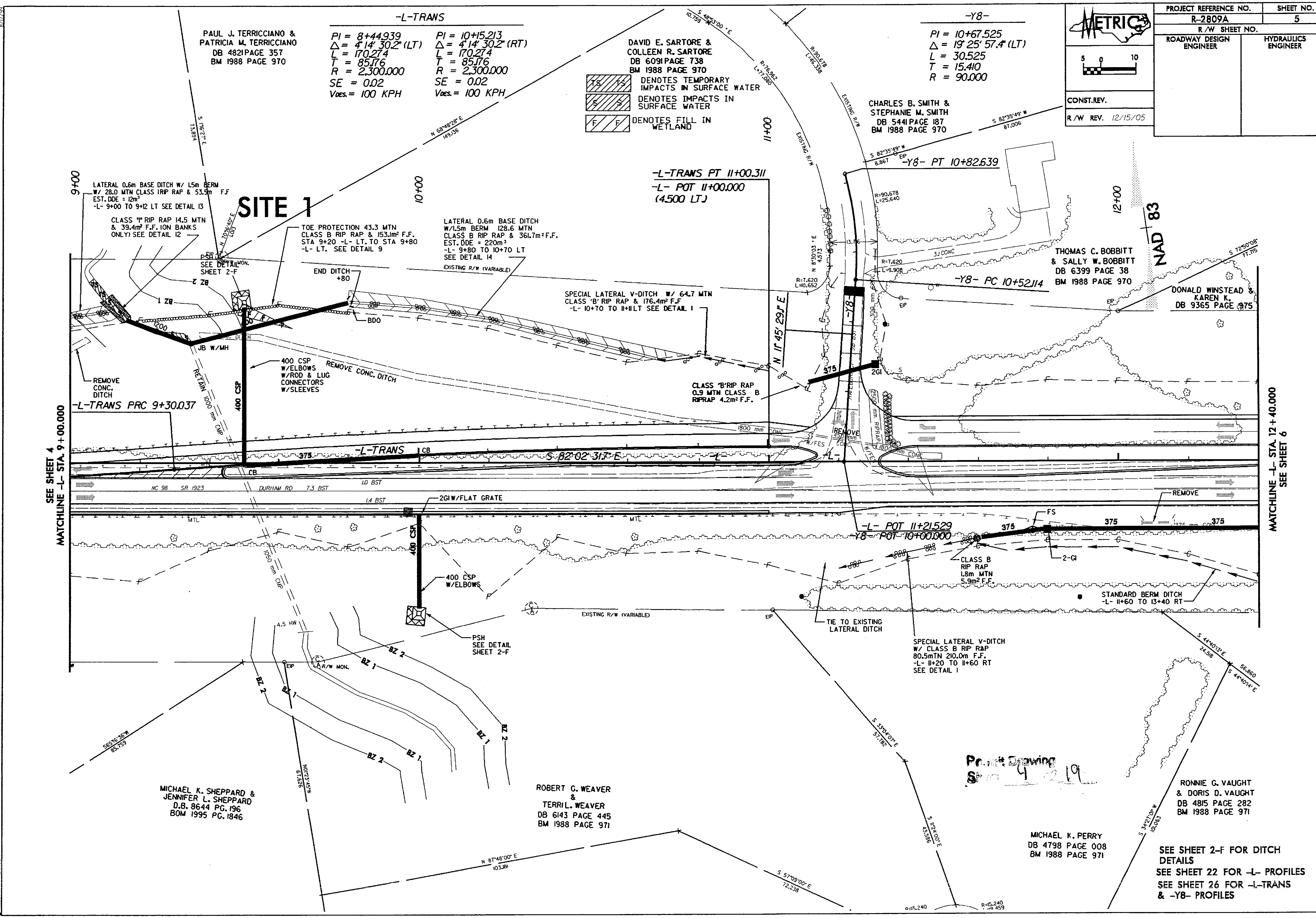
PROFILE

NOT TO SCALE

NOTE:

BOULDERS SHOULD BE ANGULAR AND OBLONG WITH APPROXIMATE DIMENSIONS OF 0.6m x 0.45m x 0.45m (2' x 1.5' x 1.5'). ROCK SHOULD FIT TIGHTLY TOGETHER WITH MINIMAL VOIDS. STAGGER BOULDER JOINTS.

ROCK CHECK SPACING IS DEPENDENT ON DITCH GRADES AT 1' DROP INTERVALS OR SLOPE CONTROL.


PROJECT REFERENCE NO. R-2809A
SHEET NO. 5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST.REV.
R/W REV. 12/15/05
-L-TRANS
PI = 8+44.939
Δ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes = 100 KPH
PI = 10+15.213
Δ = 4°14' 30.2" (RT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes = 100 KPH
-Y8-
PI = 10+67.525
Δ = 19° 25' 57.4" (LT)
L = 30.525
T = 15.410
R = 90.000
PAUL J. TERRICCIANO & PATRICIA M. TERRICCIANO DB 4821 PAGE 357 BM 1988 PAGE 970
DAVID E. SARTORE & COLLEEN R. SARTORE DB 6091 PAGE 738 BM 1988 PAGE 970
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
CHARLES B. SMITH & STEPHANIE M. SMITH DB 5441 PAGE 187 BM 1988 PAGE 970
SITE 1
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 28.0 MTN CLASS I RIP RAP & 53.5m² F.F EST. DDE = 12m³ -L- 9+00 TO 9+12 LT SEE DETAIL 13
CLASS "I" RIP RAP 14.5 MTN & 39.4m² F.F. (ON BANKS ONLY) SEE DETAIL 12
TOE PROTECTION 43.3 MTN CLASS B RIP RAP & 153.1m² F.F. STA 9+20 -L- LT. TO STA 9+80 -L- LT. SEE DETAIL 9
LATERAL 0.6m BASE DITCH W/1.5m BERM 128.6 MTN CLASS B RIP RAP & 361.7m² F.F. EST. DDE = 220m³ -L- 9+80 TO 10+70 LT SEE DETAIL 14
-L-TRANS PT 11+00.311
-L- POT 11+00.000 (4.500 LT)
-Y8- PT 10+82.639
-Y8- PC 10+52.114
SPECIAL LATERAL V-DITCH W/ 64.7 MTN CLASS 'B' RIP RAP & 176.4m² F.F -L- 10+70 TO 11+11 LT SEE DETAIL 1
CLASS "B" RIP RAP 0.9 MTN CLASS B RIPRAP 4.2m² F.F.
THOMAS C. BOBBITT & SALLY W. BOBBITT DB 6399 PAGE 38 BM 1988 PAGE 970
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
NAD 83
PSH SEE DETAIL SHEET 2-F
END DITCH +80
BDO
JB W/MH
400 CSP W/ELBOWS W/ROD & LUG CONNECTORS W/SLEEVES
REMOVE CONC. DITCH
-L-TRANS PRC 9+30.037
-L-TRANS
S 82°02' 31.7" E
NC 98 SR 1923 DURHAM RD
2GI W/FLAT GRATE
400 CSP W/ELBOWS
PSH SEE DETAIL SHEET 2-F
-L- POT 11+21.529
-Y8- POT 10+00.000
CLASS B RIP RAP 1.8m MTN 5.9m² F.F.
STANDARD BERM DITCH -L- 11+60 TO 13+40 RT
TIE TO EXISTING LATERAL DITCH
SPECIAL LATERAL V-DITCH W/ CLASS B RIP RAP 80.5mTN 210.0m F.F. -L- 11+20 TO 11+60 RT SEE DETAIL 1
EXISTING R/W (VARIABLE)
SEE SHEET 4 MATCHLINE -L- STA. 9+00.000
MATCHLINE -L- STA. 12+40.000 SEE SHEET 6
MICHAEL K. SHEPPARD & JENNIFER L. SHEPPARD D.B. 8644 PG. 196 BOM 1995 PG. 1846
ROBERT C. WEAVER & TERRI L. WEAVER DB 6143 PAGE 445 BM 1988 PAGE 971
MICHAEL K. PERRY DB 4798 PAGE 008 BM 1988 PAGE 971
RONNIE G. VAUGHT & DORIS D. VAUGHT DB 4815 PAGE 282 BM 1988 PAGE 971
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR -L- PROFILES
SEE SHEET 26 FOR -L-TRANS & -Y8- PROFILES

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC 5 0 10

CONST.REV.

R/W REV. 12/15/05

-L-TRANS

PI = 8+44.939
Δ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes. = 100 KPH

PI = 10+15.213
Δ = 4°14' 30.2" (RT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes. = 100 KPH

-Y8-

PI = 10+67.525
Δ = 19° 25' 57.4" (LT)
L = 30.525
T = 15.410
R = 90.000

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

F F DENOTES FILL IN WETLAND

PAUL J. TERRICCIANO & PATRICIA M. TERRICCIANO
DB 4821 PAGE 357
BM 1988 PAGE 970

DAVID E. SARTORE & COLLEEN R. SARTORE
DB 6091 PAGE 738
BM 1988 PAGE 970

CHARLES B. SMITH & STEPHANIE M. SMITH
DB 5441 PAGE 187
BM 1988 PAGE 970

THOMAS C. BOBBITT & SALLY W. BOBBITT
DB 6399 PAGE 38
BM 1988 PAGE 970

DONALD WINSTEAD & KAREN K.
DB 9365 PAGE 375

MICHAEL K. SHEPPARD & JENNIFER L. SHEPPARD
D.B. 8644 PG. 196
BOM 1995 PG. 1846

ROBERT G. WEAVER & TERRI L. WEAVER
DB 6143 PAGE 445
BM 1988 PAGE 971

MICHAEL K. PERRY
DB 4798 PAGE 008
BM 1988 PAGE 971

RONNIE G. VAUGHT & DORIS D. VAUGHT
DB 4815 PAGE 282
BM 1988 PAGE 971

SITE 1

-L-TRANS PT 11+00.311
-L- POT 11+00.000
(4.500 LT)

-Y8- PT 10+82.639

-Y8- PC 10+52.114

-L-TRANS PRC 9+30.037

-L-TRANS

-L- POT 11+21.529
-Y8- POT 10+00.000

LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 28.0 MTN CLASS 1 RIP RAP & 53.9m F.F
EST. DDE = 12m³
-L- 9+00 TO 9+12 LT SEE DETAIL 13

CLASS "I" RIP RAP 14.5 MTN & 39.4m² F.F. (ON BANKS ONLY) SEE DETAIL 12

TOE PROTECTION 43.3 MTN CLASS B RIP RAP & 153.1m² F.F.
STA 9+20 -L- LT. TO STA 9+80 -L- LT. SEE DETAIL 9

LATERAL 0.6m BASE DITCH W/1.5m BERM 128.6 MTN CLASS B RIP RAP & 361.7m² F.F.
EST. DDE = 220m³
-L- 9+80 TO 10+70 LT
SEE DETAIL 14

SPECIAL LATERAL V-DITCH W/ 64.7 MTN CLASS 'B' RIP RAP & 176.4m² F.F
-L- 10+70 TO 11+11 LT SEE DETAIL 1

CLASS 'B' RIP RAP 0.9 MTN CLASS B RIPRAP 4.2m² F.F.

400 CSP W/ELBOWS W/ROD & LUG CONNECTORS W/SLEEVES

REMOVE CONC. DITCH

REMOVE CONC. DITCH

2GI W/FLAT GRATE

400 CSP W/ELBOWS

PSH SEE DETAIL SHEET 2-F

PSH SEE DETAIL SHEET 2-F

JB W/MH

RETAIN 1000 mm CMP

1000 mm CMP

1200 mm CMP

1800 mm CMP

1500 mm RIPRAP APRON

1800 mm CONC

REMOVE 1500 mm CONC

REMOVE

FS

2-GI

CLASS B RIP RAP 1.8m MTN 5.9m² F.F.

SPECIAL LATERAL V-DITCH W/ CLASS B RIP RAP 80.5mTN 210.0m F.F.
-L- 11+20 TO 11+60 RT
SEE DETAIL 1

STANDARD BERM DITCH
-L- 11+60 TO 13+40 RT

TIE TO EXISTING LATERAL DITCH

EXISTING R/W (VARIABLE)

EIP

R/W MON.

BZ 1

BZ 2

NC 98 SR 1923 DURHAM RD 7.3 BST

10' BST

14 BST

MTL

S 82°02'31" E

N 11°45'29" E

N 87°48'00" E 103.181

S 57°09'00" E 72.238

S 55°15'36" W 85.759

N 43°51'43" W 63.613

S 33°16'40" E 37.182

S 11°24'00" E 83.586

S 34°27'09" W 101.083

S 44°40'13" E 24.586

S 44°40'14" E 54.860

R=15.240

R=15.240

SEE SHEET 4
MATCHLINE -L- STA. 9+00.000

SEE SHEET 6
MATCHLINE -L- STA. 12+40.000

SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR -L- PROFILES
SEE SHEET 26 FOR -L-TRANS & -Y8- PROFILES

5 of 19

5-MAR-2007 10:50
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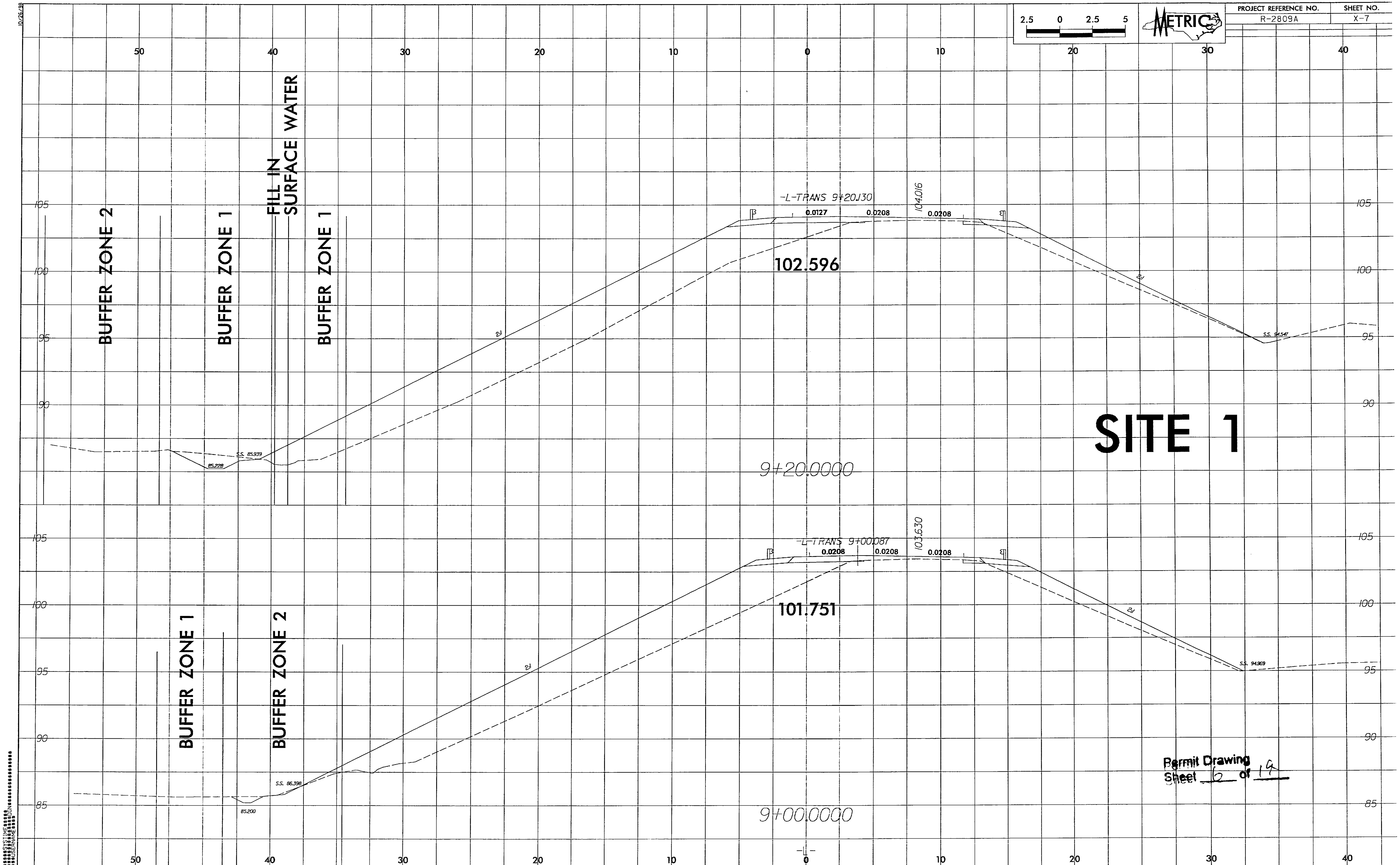
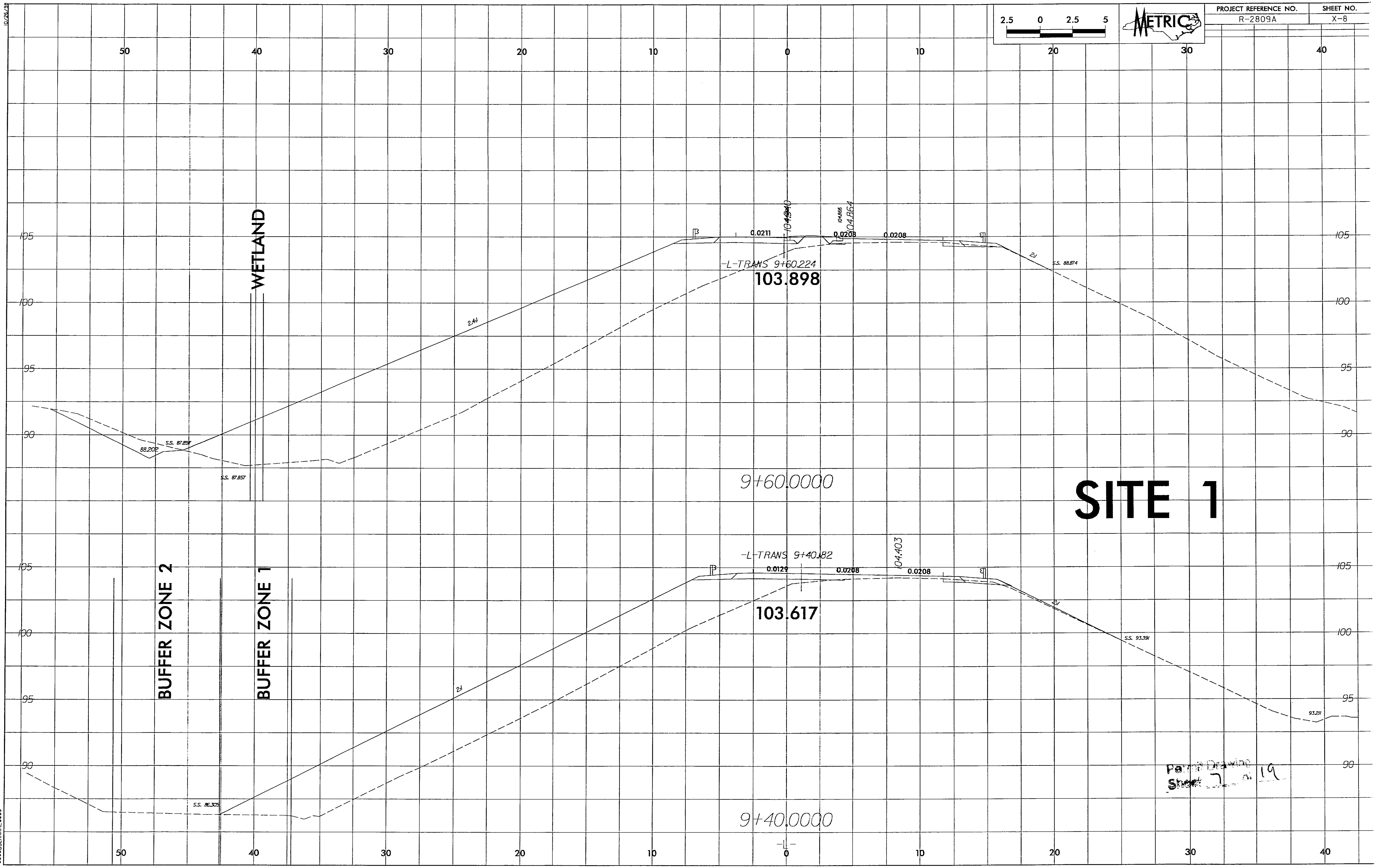
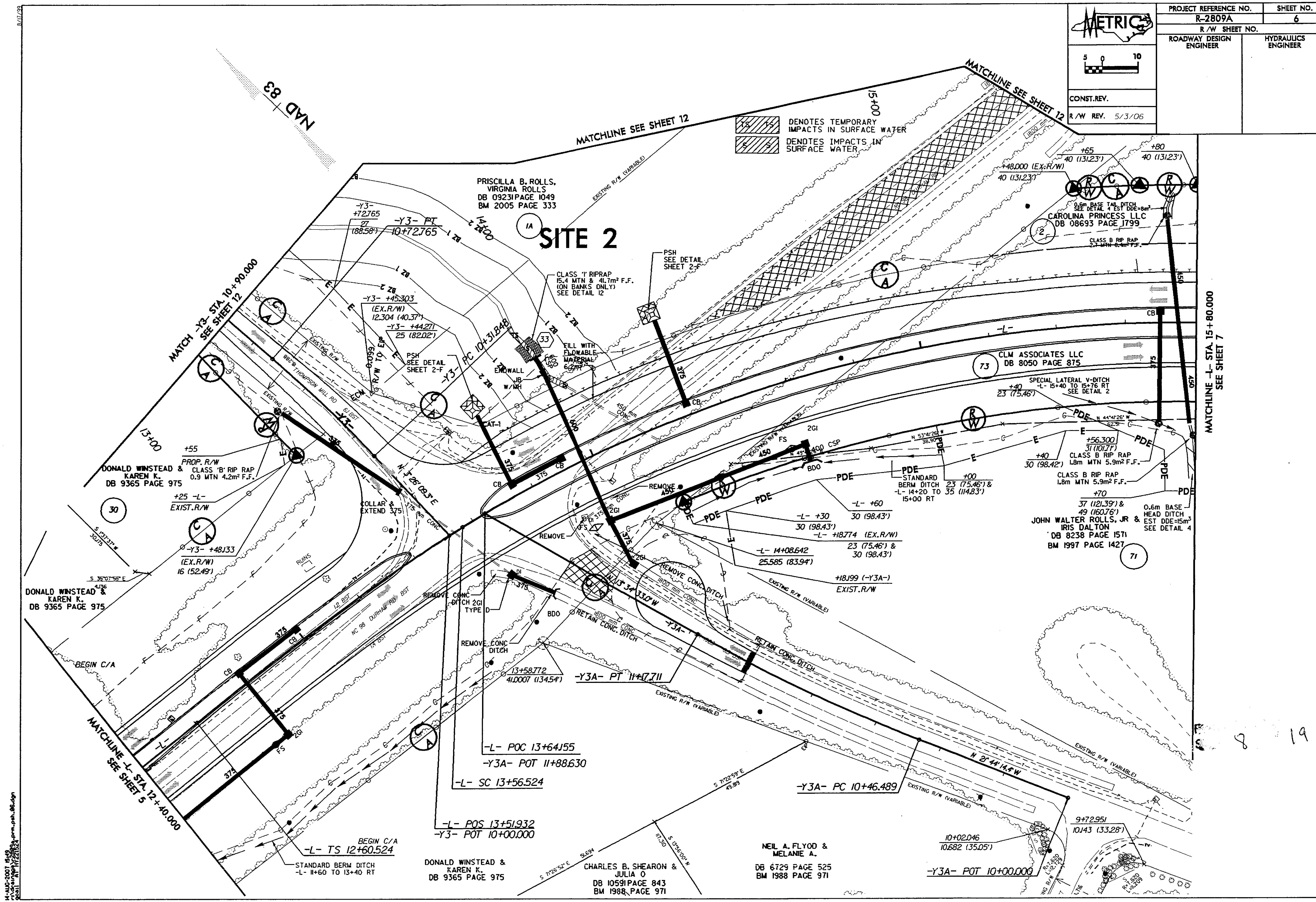
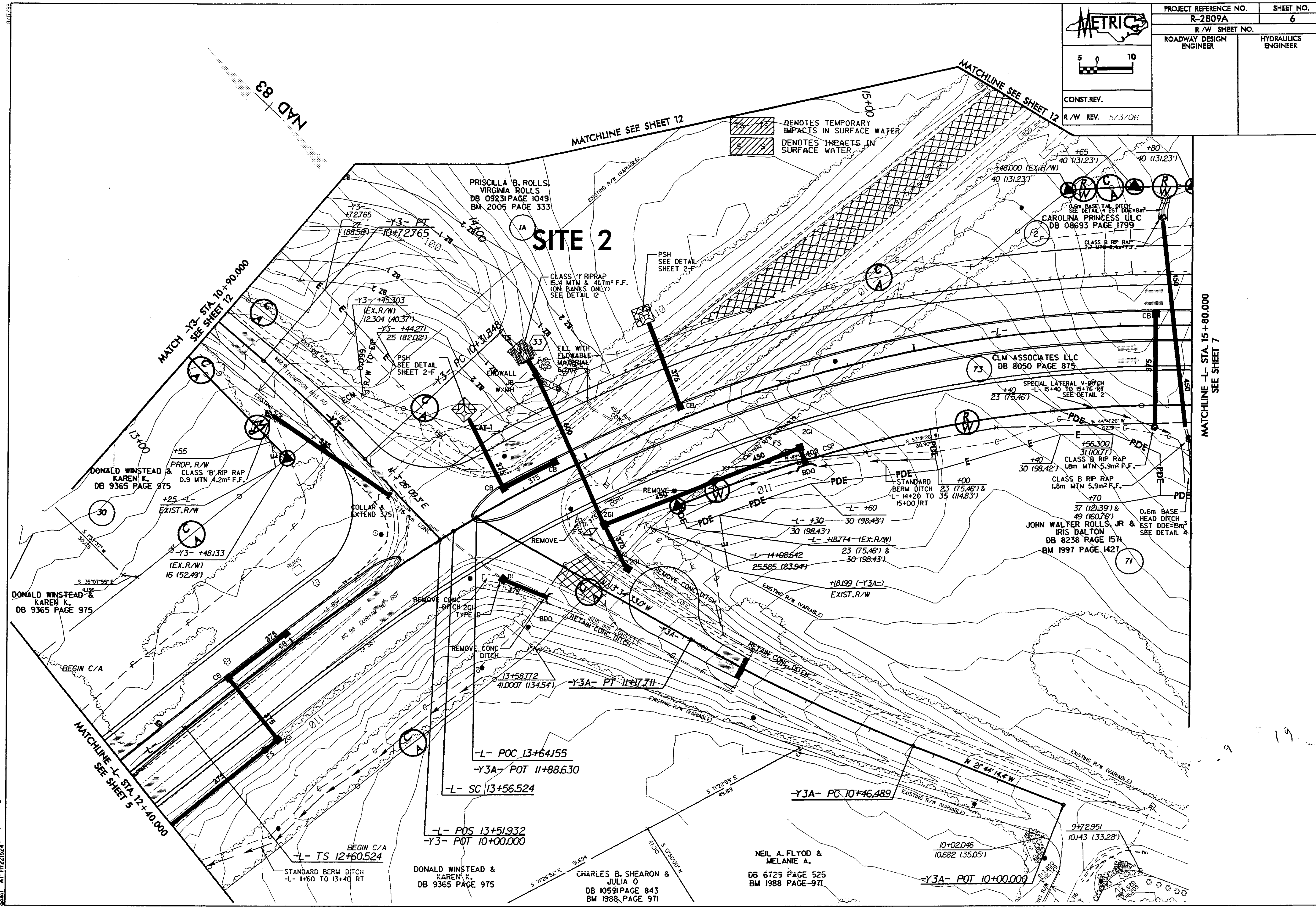


PROJECT REFERENCE NO.
R-2809A
SHEET NO.
X-7
METRIC
2.5 0 2.5 5
SITE 1
BUFFER ZONE 2
BUFFER ZONE 1
FILL IN SURFACE WATER
BUFFER ZONE 1
-L-TRANS 9+20.130
104.016
0.0127
0.0208
0.0208
102.596
S.S. 85.939
85.228
S.S. 94.547
9+20.0000
-L-TRANS 9+00.087
103.630
0.0208
0.0208
0.0208
101.751
BUFFER ZONE 1
BUFFER ZONE 2
S.S. 86.398
85.200
S.S. 94.969
9+00.0000
-L-
Permit Drawing
Sheet 6 of 19


METRIC
2.5 0 2.5 5
WETLAND
-L-TRANS 9+60.224
103.898
9+60.0000
SITE 1
-L-TRANS 9+40.182
103.617
BUFFER ZONE 2
BUFFER ZONE 1
9+40.0000
-L-
Permit Drawing
Sheet 7 of 19


PROJECT REFERENCE NO.
R-2809A
SHEET NO.
6
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST. REV.
R/W REV. 5/3/06
NAD 83
MATCHLINE SEE SHEET 12
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
PRISCILLA B. ROLLS, VIRGINIA ROLLS
DB 09231 PAGE 1049
BM 2005 PAGE 333
SITE 2
CAROLINA PRINCESS LLC
DB 08693 PAGE 1799
CLM ASSOCIATES LLC
DB 8050 PAGE 875
MATCH -Y3- STA. 10+90.000 SEE SHEET 12
MATCHLINE -L- STA. 15+80.000 SEE SHEET 7
MATCHLINE -L- STA. 12+40.000 SEE SHEET 5
DONALD WINSTEAD & KAREN K.
DB 9365 PAGE 975
JOHN WALTER ROLLS, JR & IRIS DALTON
DB 8238 PAGE 1571
BM 1997 PAGE 1427
CHARLES B. SHEARON & JULIA O
DB 10591 PAGE 843
BM 1988 PAGE 971
NEIL A. FLYOD & MELANIE A.
DB 6729 PAGE 525
BM 1988 PAGE 971
-Y3- PT 10+72.765
-Y3- PC 10+31.848
-Y3A- PT 11+17.711
-L- POC 13+64.155
-Y3A- POT 11+88.630
-L- SC 13+56.524
-L- POS 13+51.932
-Y3- POT 10+00.000
-L- TS 12+60.524
-Y3A- PC 10+46.489
-Y3A- POT 10+00.000
STANDARD BERM DITCH -L- 11+60 TO 13+40 RT
BEGIN C/A
CLASS 'I' RIPRAP 15.4 MTN & 41.7m² F.F. (ON BANKS ONLY) SEE DETAIL 12
PSH SEE DETAIL SHEET 2-F
FILL WITH FLOWABLE MATERIAL
SPECIAL LATERAL V-DITCH -L- 15+40 TO 15+76 RT SEE DETAIL 2
STANDARD BERM DITCH -L- 14+20 TO 15+00 RT
CLASS B RIP RAP 1.8m MTN 5.9m² F.F.
0.6m BASE HEAD DITCH EST DDE=15m³ SEE DETAIL 4
REMOVE CONC DITCH
RETAIN CONC. DITCH
EXISTING R/W (VARIABLE)
N 21° 44' 14.4" W

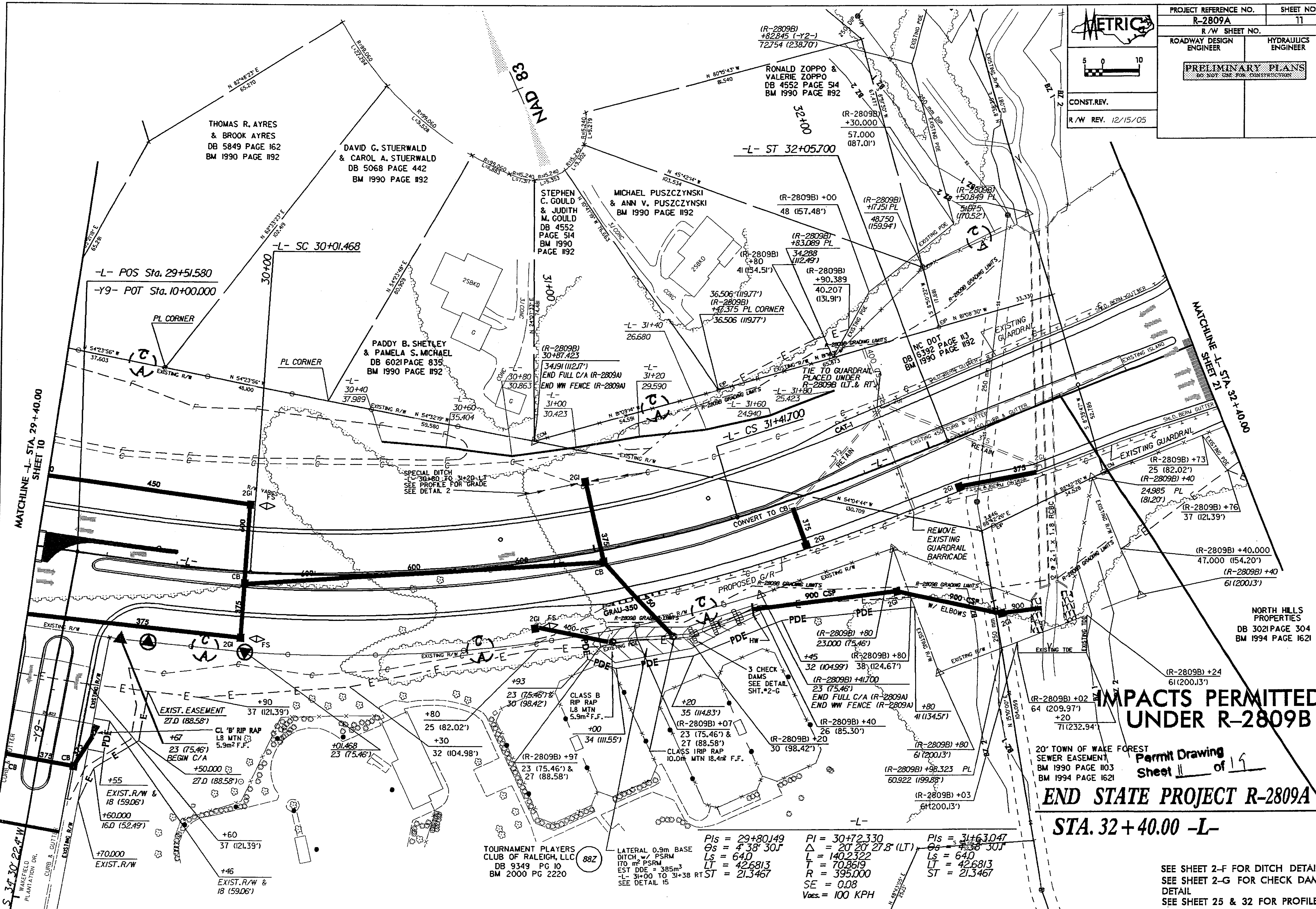


PROJECT REFERENCE NO.
R-2809A
SHEET NO.
6
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST.REV.
R/W REV. 5/3/06
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
MATCHLINE SEE SHEET 12
MATCHLINE SEE SHEET 12
NAD 83
SITE 2
PRISCILLA B. ROLLS, VIRGINIA ROLLS
DB 09231 PAGE 1049
BM 2005 PAGE 333
CAROLINA PRINCESS LLC
DB 08693 PAGE 1799
CLM ASSOCIATES LLC
DB 8050 PAGE 875
JOHN WALTER ROLLS, JR & IRIS DALTON
DB 8238 PAGE 1571
BM 1997 PAGE 1427
DONALD WINSTEAD & KAREN K.
DB 9365 PAGE 975
CHARLES B. SHEARON & JULIA O
DB 10591 PAGE 843
BM 1988 PAGE 971
NEIL A. FLYOD & MELANIE A.
DB 6729 PAGE 525
BM 1988 PAGE 971
MATCH -Y3- STA 10+90.000 SEE SHEET 12
MATCHLINE -L- STA. 15+80.000 SEE SHEET 7
MATCHLINE -L- STA. 12+40.000 SEE SHEET 5
-Y3- PT 10+72.765
-Y3- PC 10+31.848
-Y3A- PT 11+17.711
-Y3A- PC 10+46.489
-Y3A- POT 10+00.000
-L- POC 13+64.155
-Y3A- POT 11+88.630
-L- SC 13+56.524
-L- POS 13+51.932
-Y3- POT 10+00.000
-L- TS 12+60.524
CLASS 'I' RIPRAP 15.4 MTN & 41.7m² F.F. (ON BANKS ONLY) SEE DETAIL 12
PSH SEE DETAIL SHEET 2-F
SPECIAL LATERAL V-DITCH -L- 15+40 TO 15+76 RT SEE DETAIL 2
STANDARD BERM DITCH -L- 14+20 TO 15+00 RT
STANDARD BERM DITCH -L- 11+60 TO 13+40 RT
CLASS B RIP RAP 1.8m MTN 5.9m² F.F.
0.6m BASE HEAD DITCH EST DDE=15m³ SEE DETAIL 4
COLLAR & EXTEND 375
REMOVE CONC DITCH
RETAIN CONC DITCH
BEGIN C/A
EXISTING R/W (VARIABLE)
NC 98 DURHAM RD
THOMPSON HILL RD

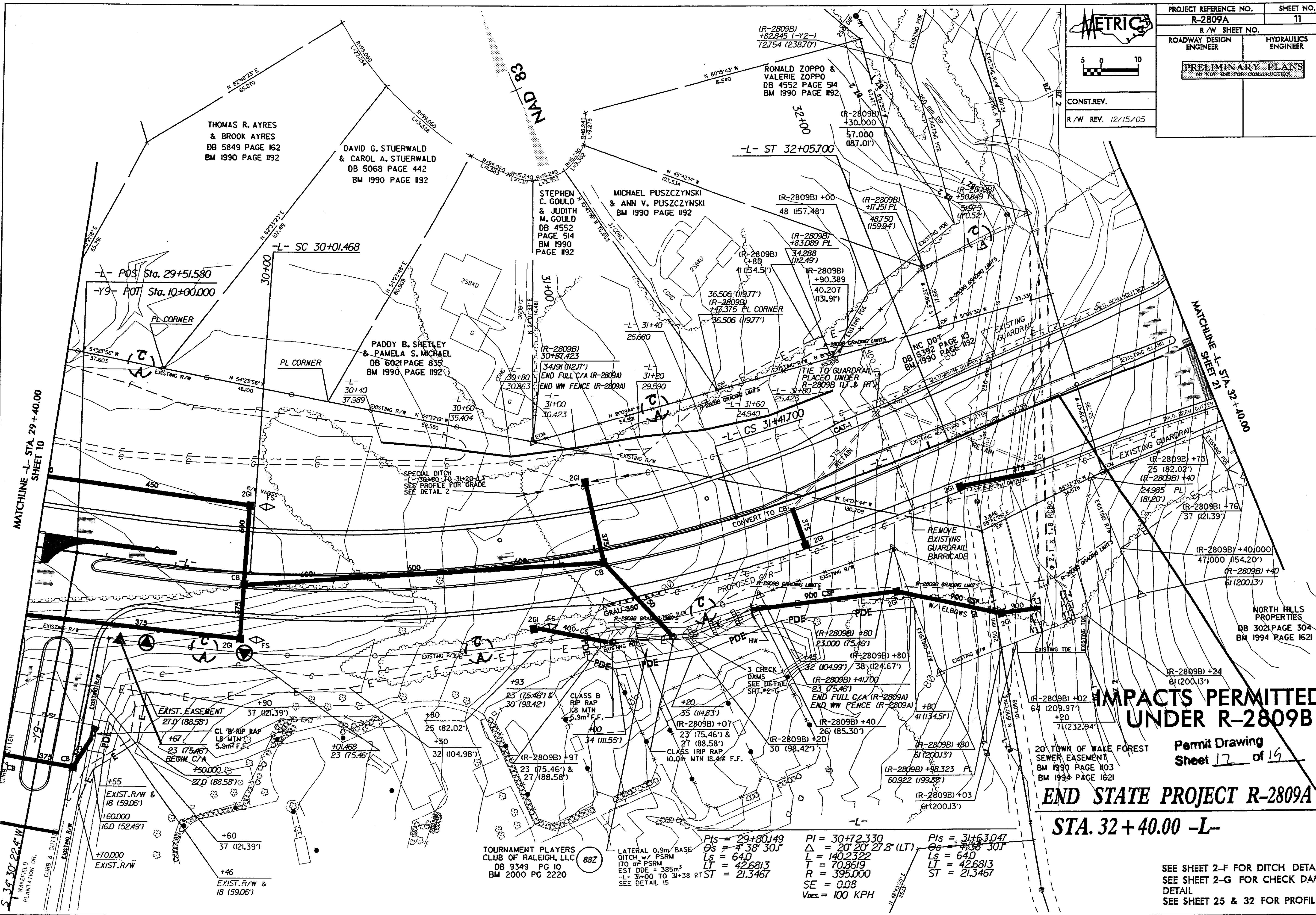
PROJECT REFERENCE NO.	SHEET NO.
R-2809A	X-14

Permit Drawing
Sheet 10 of 19

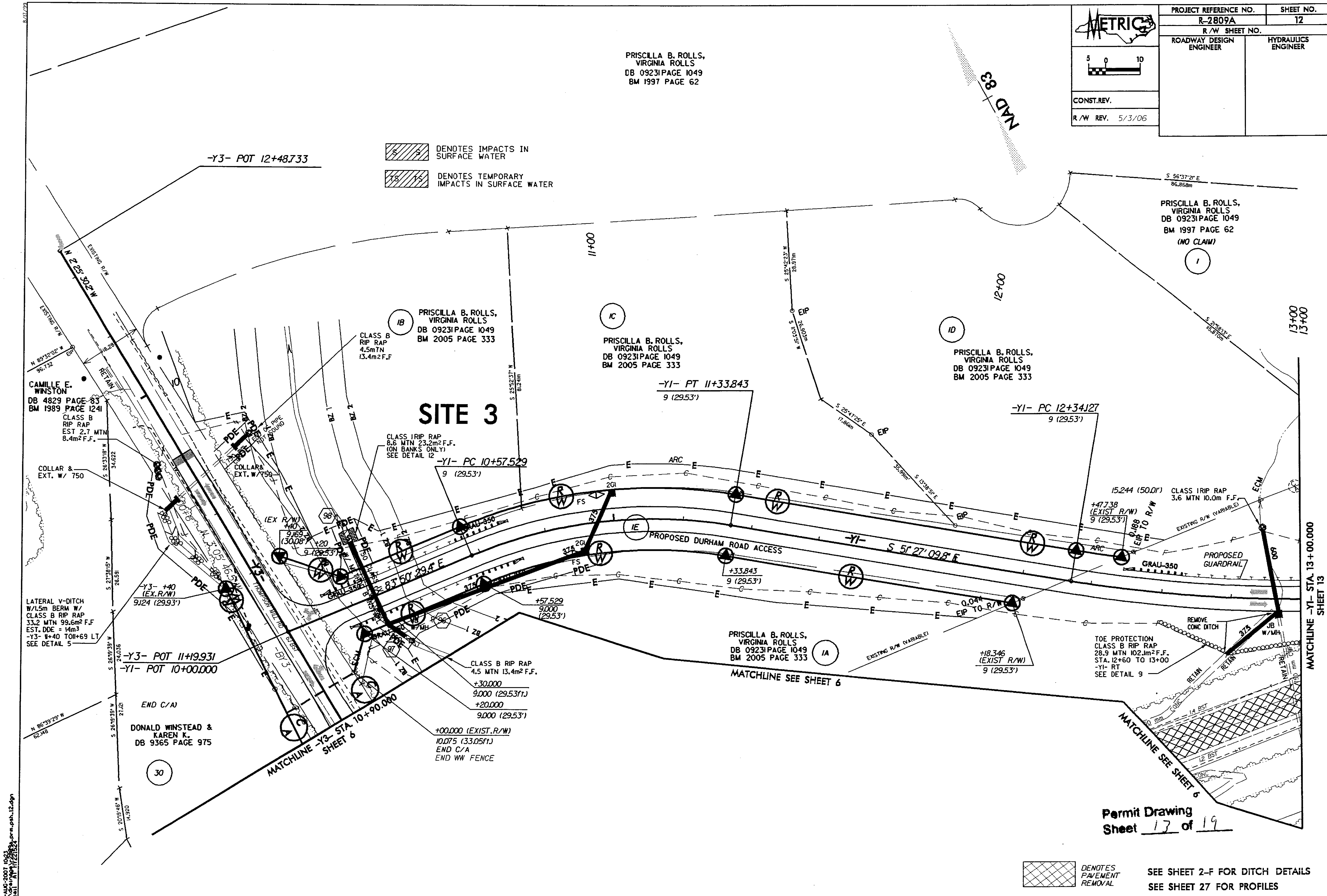
SITE 2



PROJECT REFERENCE NO. R-2809A
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
CONST.REV.
R/W REV. 12/15/05
NAD 83
THOMAS R. AYRES & BROOK AYRES DB 5849 PAGE 162 BM 1990 PAGE 1192
DAVID G. STUERWALD & CAROL A. STUERWALD DB 5068 PAGE 442 BM 1990 PAGE 1192
STEPHEN C. GOULD & JUDITH M. GOULD DB 4552 PAGE 514 BM 1990 PAGE 1192
MICHAEL PUSZCZYNSKI & ANN V. PUSZCZYNSKI BM 1990 PAGE 1192
RONALD ZOPPO & VALERIE ZOPPO DB 4552 PAGE 514 BM 1990 PAGE 1192
PADDY B. SHETLEY & PAMELA S. MICHAEL DB 6021 PAGE 835 BM 1990 PAGE 1192
NC DOT DB 6392 PAGE 113 BM 1990 PAGE 1192
NORTH HILLS PROPERTIES DB 3021 PAGE 304 BM 1994 PAGE 1621
TOURNAMENT PLAYERS CLUB OF RALEIGH, LLC DB 9349 PG 10 BM 2000 PG 2220
-L- POS Sta. 29+51.580
-Y9- POT Sta. 10+00.000
-L- SC 30+01.468
-L- ST 32+05.700
-L- CS 31+41.700
MATCHLINE -L- STA 29+40.00 SHEET 10
MATCHLINE -L- STA 32+40.00 SHEET 21
SPECIAL DITCH -L- 30+80 TO 31+20 LT SEE PROFILE FOR GRADE SEE DETAIL 2
TIE TO GUARDRAIL PLACED UNDER R-2809B (LT.& RT)
REMOVE EXISTING GUARDRAIL BARRICADE
CONVERT TO CB
PROPOSED G/R
3 CHECK DAMS SEE DETAIL SHT. 2-G
CLASS B RIP RAP 1.8 MTN 5.9m² F.F.
CL 'B' RIP RAP 1.8 MTN 5.9m² F.F.
CLASS I RIP RAP 10.0m MTN 18.4m² F.F.
LATERAL 0.9m BASE DITCH w/ PSRM 170 m² PSRM EST DDE = 385m³ -L- 31+00 TO 31+38 RT SEE DETAIL 15
EXIST. EASEMENT
20' TOWN OF WAKE FOREST SEWER EASEMENT BM 1990 PAGE 1103 BM 1994 PAGE 1621
IMPACTS PERMITTED UNDER R-2809B
Permit Drawing Sheet 11 of 15
END STATE PROJECT R-2809A
STA. 32+40.00 -L-
PIs = 29+80.149 Θs = 4° 38' 30.1" Ls = 64.0 LT = 42.6813 ST = 21.3467
PI = 30+72.330 Δ = 20° 20' 27.8" (LT) L = 140.2322 T = 70.8619 R = 395.000 SE = 0.08 Vdes = 100 KPH
PIs = 31+63.047 Θs = 4° 38' 30.1" Ls = 64.0 LT = 42.6813 ST = 21.3467
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 2-G FOR CHECK DAM DETAIL
SEE SHEET 25 & 32 FOR PROFILE



PROJECT REFERENCE NO. R-2809A
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION
CONST.REV.
R/W REV. 12/15/05
THOMAS R. AYRES & BROOK AYRES DB 5849 PAGE 162 BM 1990 PAGE 1192
DAVID G. STUERWALD & CAROL A. STUERWALD DB 5068 PAGE 442 BM 1990 PAGE 1192
STEPHEN C. GOULD & JUDITH M. GOULD DB 4552 PAGE 514 BM 1990 PAGE 1192
MICHAEL PUSZCZYNSKI & ANN V. PUSZCZYNSKI BM 1990 PAGE 1192
RONALD ZOPPO & VALERIE ZOPPO DB 4552 PAGE 514 BM 1990 PAGE 1192
PADDY B. SHETLEY & PAMELA S. MICHAEL DB 6021 PAGE 835 BM 1990 PAGE 1192
NC DOT DB 5392 PAGE 113 BM 1990 PAGE 1192
NORTH HILLS PROPERTIES DB 3021 PAGE 304 BM 1994 PAGE 1621
TOURNAMENT PLAYERS CLUB OF RALEIGH, LLC DB 9349 PG 10 BM 2000 PG 2220
20' TOWN OF WAKE FOREST SEWER EASEMENT BM 1990 PAGE 1103 BM 1994 PAGE 1621
NAD 83
-L- SC 30+01.468
-L- POS Sta. 29+51.580
-Y9- POT Sta. 10+00.000
-L- ST 32+05.700
-L- CS 31+41.700
MATCHLINE -L- STA 29+40.00 SHEET 10
MATCHLINE -L- STA 32+40.00 SHEET 21
IMPACTS PERMITTED UNDER R-2809B
Permit Drawing Sheet 12 of 19
END STATE PROJECT R-2809A
STA. 32+40.00 -L-
-L-
PIs = 29+80.149
Θs = 4° 38' 30.5"
Ls = 64.0
LT = 42.6813
ST = 21.3467
PI = 30+72.330
Δ = 20° 20' 27.8" (LT)
L = 140.2322
T = 70.8619
R = 395.000
SE = 0.08
Vdes = 100 KPH
PIs = 31+63.047
Θs = 4° 38' 30.5"
Ls = 64.0
LT = 42.6813
ST = 21.3467
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 2-G FOR CHECK DAM DETAIL
SEE SHEET 25 & 32 FOR PROFILE



PROJECT REFERENCE NO. R-2809A
SHEET NO. 12
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST.REV.
R/W REV. 5/3/06
NAD 83
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 09231 PAGE 1049 BM 1997 PAGE 62
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
-Y3- POT 12+48.733
SITE 3
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 09231 PAGE 1049 BM 2005 PAGE 333
CAMILLE E. WINSTON DB 4829 PAGE 83 BM 1989 PAGE 1241
-Y1- PT 11+33.843
-Y1- PC 12+34.127
-Y1- PC 10+57.529
PROPOSED DURHAM ROAD ACCESS
-Y1- S 51° 27' 09.8" E
-Y3- POT 11+19.931
-Y1- POT 10+00.000
MATCHLINE -Y3- STA. 10+90.000 SHEET 6
MATCHLINE SEE SHEET 6
MATCHLINE -Y1- STA. 13+00.000 SHEET 13
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
END C/A
TOE PROTECTION CLASS B RIP RAP 28.9 MTN 102.1m2 F.F. STA. 12+60 TO 13+00 -Y1- RT SEE DETAIL 9
LATERAL V-DITCH W/1.5m BERM W/ CLASS B RIP RAP 33.2 MTN 99.6m2 F.F EST. DDE = 14m3 -Y3- 11+40 TO 11+69 LT SEE DETAIL 5
CLASS B RIP RAP 4.5 MTN 13.4m2 F.F.
CLASS I RIP RAP 8.6 MTN 23.2m2 F.F. (ON BANKS ONLY) SEE DETAIL 12
CLASS I RIP RAP 3.6 MTN 10.0m F.F.
PROPOSED GUARDRAIL
Permit Drawing Sheet 13 of 19
DENOTES PAVEMENT REMOVAL
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 27 FOR PROFILES

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2809A	12
CONST.REV.	R/W SHEET NO.	
R/W REV. 5/3/06	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NAD 83

-Y3- POT 12+48.733

PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 09231 PAGE 1049 BM 1997 PAGE 62

PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 09231 PAGE 1049 BM 1997 PAGE 62 (NO CLAIM)

PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 09231 PAGE 1049 BM 2005 PAGE 333

CAMILLE E. WINSTON DB 4829 PAGE 83 BM 1989 PAGE 1241

CLASS B RIP RAP EST 2.7 MTN 8.4m² F.F.

COLLAR & EXT. W/ 750

LATERAL V-DITCH W/1.5m BERM W/ CLASS B RIP RAP 33.2 MTN 89.6m² F.F EST-DDE = Mm³ -Y3- 0+40 TO 11+69 LT SEE DETAIL 5

-Y3- POT 11+19.931

-Y1- POT 10+00.000

END C/A

DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975

MATCHLINE -Y3- STA. 10+90.000 SHEET 6

SITE 3

CLASS I RIP RAP 8.6 MTN 23.2m² F.F. (ON BANKS ONLY) SEE DETAIL 12

-Y1- PC 10+57.529

9 (29.53')

CLASS B RIP RAP 4.5 MTN 13.4m² F.F.

+30.000

9.000 (29.53ft.)

+20.000

9.000 (29.53')

+00.000 (EXIST. R/W)

10.075 (33.05ft.)

END C/A

END WW FENCE

-Y1- PT 11+33.843

9 (29.53')

PROPOSED DURHAM ROAD ACCESS

+33.843

9 (29.53')

+57.529

9.000 (29.53')

-Y1- S 5° 27' 09.5" E

-Y1- PC 12+34.127

9 (29.53')

+47.738 (EXIST. R/W)

9 (29.53')

15.244 (50.0') CLASS I RIP RAP 3.6 MTN 10.0m F.F.

GRAU-350

PROPOSED GUARDRAIL

REMOVE CONC DITCH

TOE PROTECTION CLASS B RIP RAP 28.9 MTN 102.1m² F.F. STA. 12+60 TO 13+00 -Y1- RT SEE DETAIL 9

+18.346 (EXIST. R/W)

9 (29.53')

PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 09231 PAGE 1049 BM 2005 PAGE 333

MATCHLINE SEE SHEET 6

MATCHLINE -Y1- STA. 13+00.000 SHEET 13

MATCHLINE SEE SHEET 6

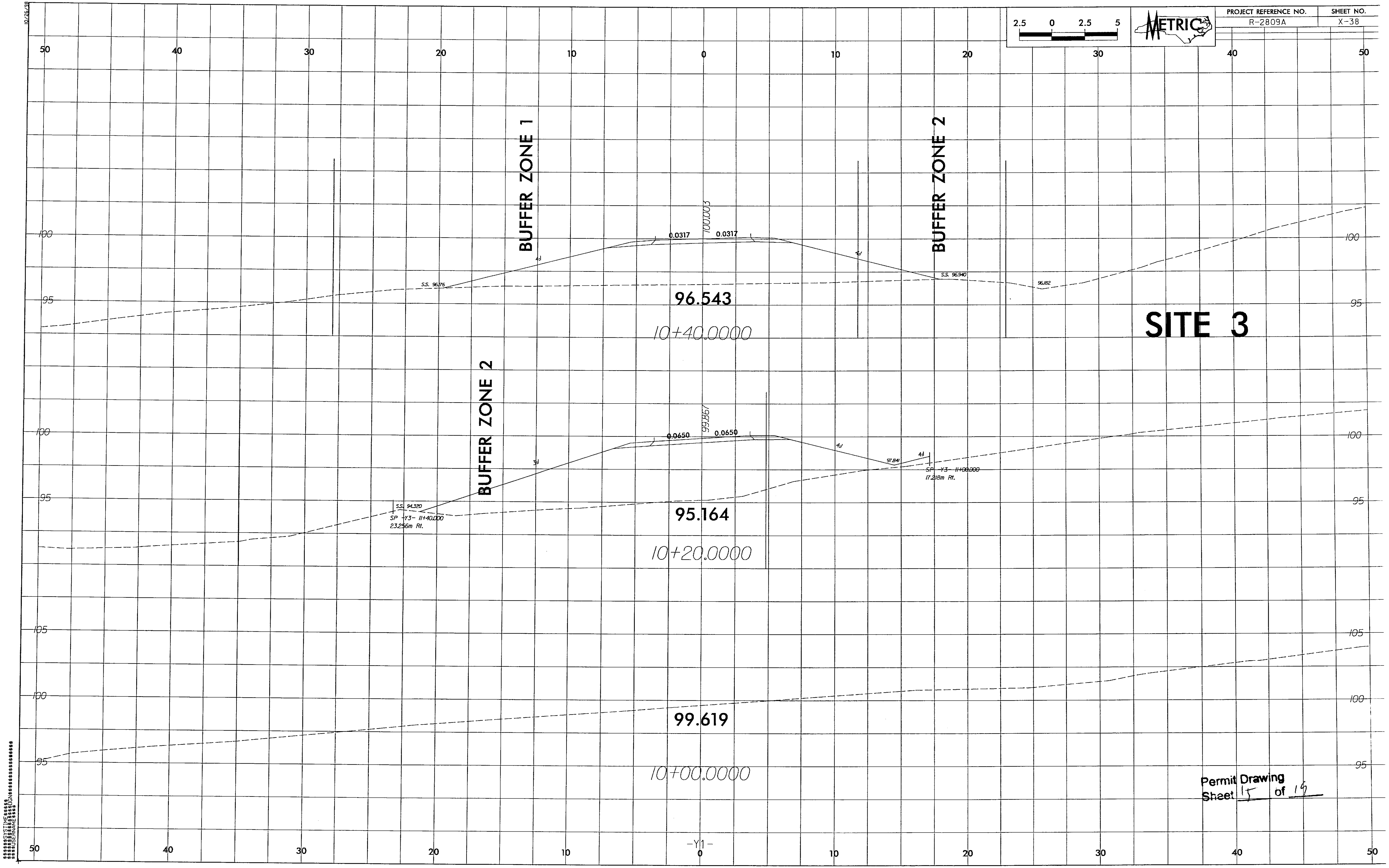
DENOTES PAVEMENT REMOVAL

SEE SHEET 2-F FOR DITCH DETAILS

SEE SHEET 27 FOR PROFILES

Permit Drawing Sheet 14 of 19

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	X-38



Permit Drawing
Sheet 15 of 19

METRIC

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	26

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

CONST.REV.

R /W REV.

6/09/99

-Y3- THOMPSON MILL RD. SR 1923

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO._

DRAINAGE AREA	= 1.8 ha
DESIGN FREQUENCY	= 25 yrs
DESIGN DISCHARGE	= 0.347 cms
DESIGN HW ELEVATION	= 93.81 m
100 YEAR DISCHARGE	= 0.40 cms
100 YEAR HW ELEVATION	= 93.86 m
OVERTOPPING FREQUENCY	= +500 yrs
OVERTOPPING DISCHARGE	= +0.66 cms
OVERTOPPING ELEVATION	= *94.2 m

-Y1- THOMPSON MILL RD./NC 98 BUS. CONNECTOR

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO._

DRAINAGE AREA	= 3.7 ha
DESIGN FREQUENCY	= 25 yrs
DESIGN DISCHARGE	= 0.65 cms
DESIGN HW ELEVATION	= 97.14 m
100 YEAR DISCHARGE	= 0.79 cms
100 YEAR HW ELEVATION	= 97.23 m
OVERTOPPING FREQUENCY	= +500 yrs
OVERTOPPING DISCHARGE	= +1.3 cms
OVERTOPPING ELEVATION	= *99.8 m

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO._

DRAINAGE AREA	= 2.0 ha
DESIGN FREQUENCY	= 25 yrs
DESIGN DISCHARGE	= 0.43 cms
DESIGN HW ELEVATION	= 103.18 m
100 YEAR DISCHARGE	= 0.50 cms
100 YEAR HW ELEVATION	= 103.37 m
OVERTOPPING FREQUENCY	= +500 yrs
OVERTOPPING DISCHARGE	= +0.83 cms
OVERTOPPING ELEVATION	= *104.4 m

SITE 3

Permit Drawing
Sheet 16 of 19

WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	9+25 -L- LT	48" RCP	0.01					0.01	<0.01	95	23	
2	14+00 -L- LT	24" CSP						0.01	<0.01	62	20	
3	10+30 -Y1-	30" RCP						0.01	<0.01	118	36	
TOTALS:			0.01		0.00		0.00	0.03	0.00	275	79	

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY
PROJECT: 34503.1.1 (R-2809A)

SHEET 17 of 19 Jul-07

ATN Revised 3/31/05

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS			
			Permanent Fill In Wetlands (ha)	Temp. Fill In Wetlands (ha)	Excavation in Wetlands (ha)	Mechanized Clearing In Wetlands (ha)	Hand Clearing in Wetlands (ha)	Permanent SW Impacts (ha)	Temp. SW Impacts (ha)	Existing Channel Impacts Permanent (m)	Temp. SW Impacts (m)
1	9+26 -L- LT	1200 RCP	0.003					0.003	0.001	29	7
2	14+00 -L- LT	600 CSP						0.002	0.001	19	6
3	10+30 -Y8-	750 RCP						0.004	0.001	36	11
TOTALS:								0.009	0.003	84	24

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY
WBS - 34503.1.1 (R-2809A)

SHEET 18 OF 19 July-07

JMD Revised 2/03/05

List of Property Owners:

SITE #	PROPERTY OWNER	ADDRESSES
1	NCDOT	
2	NCDOT	
3	PRISCILLA ROLLS	7104 THOMPSON MILL ROAD WAKE FOREST, NC 27587

NC DEPARTMENT OF TRANSPORTION
DIVISION OF HIGHWAYS
WAKE COUNTY
34503.1.1 (R-2809A)
WAKE FOREST BYPASS

August-07

CONTRACT: C201737 TIP PROJECT: R-2809A

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbology
See Sheet 1-C & 1-D For Survey Control Sheets

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

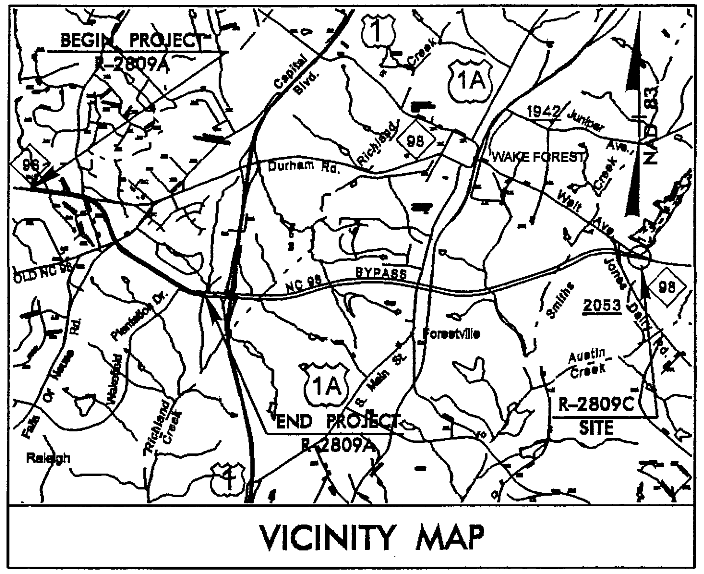
WAKE COUNTY

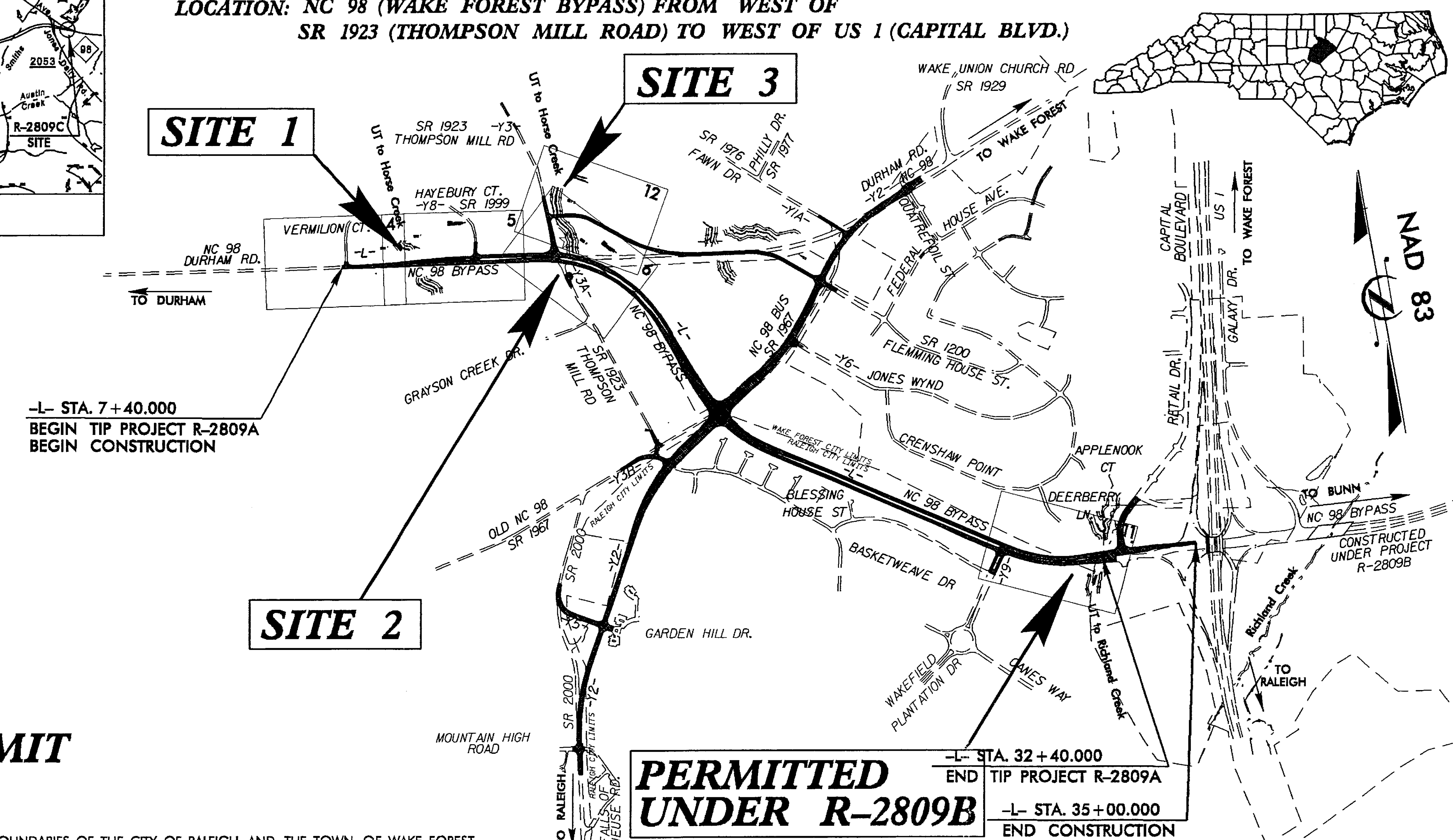
METRIC

ALL DIMENSIONS IN THESE PLANS ARE IN METERS OR MILLIMETERS UNLESS OTHERWISE SHOWN

STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	R-2809A		1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION		
34503.1.1	STP-98(1)	PE		
34503.2.5	STP-98(2)	R/W & UTIL		
34503.3.7	STP-98(23)	CONST.		

LOCATION: NC 98 (WAKE FOREST BYPASS) FROM WEST OF SR 1923 (THOMPSON MILL ROAD) TO WEST OF US 1 (CAPITAL BLVD.)





BUFFER PERMIT

PORTIONS OF THIS PROJECT FALLS WITHIN THE BOUNDARIES OF THE CITY OF RALEIGH AND THE TOWN OF WAKE FOREST

GRAPHIC SCALES

5 0 10 PLANS

5 0 10 PROFILE (HORIZONTAL)

1 0 2 PROFILE (VERTICAL)

DESIGN DATA

ADT 2007 = 24,100
ADT 2025 = 36,500
DHV = 10 %
D = 60 %
T = 6 % *
V = 100 km/h

* (TTST 2% & DUAL 4%)

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2809A = 2.500 km
TOTAL LENGTH OF TIP PROJECT R-2809A = 2.500 km

Prepared in the Office of:

DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh, NC 27610

2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JUNE 30, 2005

LETTING DATE: DECEMBER 18, 2007

JASON MOORE, PE
PROJECT ENGINEER

KEVIN E. MOORE, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

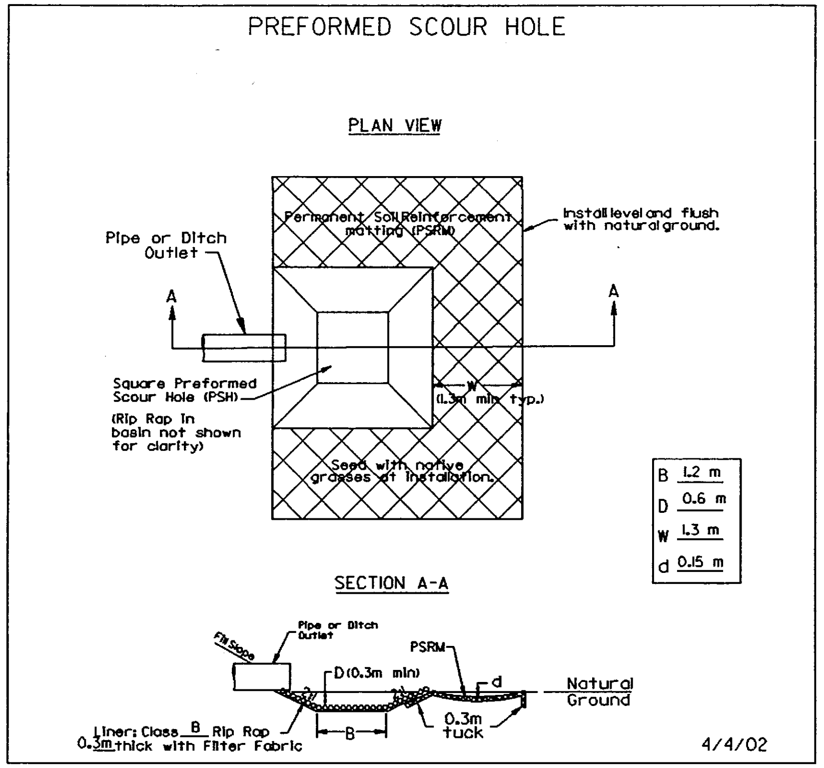
P.E.
STATE HIGHWAY DESIGN ENGINEER

9/09/99

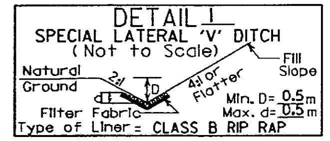
15-AUG-2007 12:47
r:\drainage\r2809a_prm_tsh.dgn

Buffer Drawing
Sheet 1 of 23

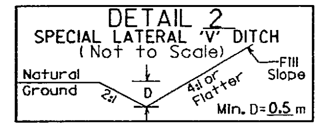
METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-2809A	2-F
	ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER



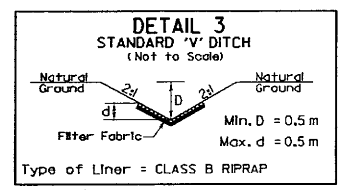
STA. 9+50 -L- LT
STA. 9+99 -L- RT
STA. 13+75 -L- LT
STA. 14+30 -L- LT
STA. 18+73 -L- LT
STA. 19+95 -L- LT



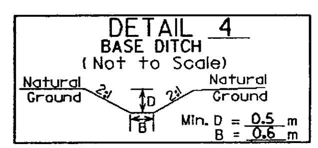
STA. 10+70 TO 11+11 -L- LT
STA. 11+20 TO 11+60 -L- RT
STA. 19+40 TO 19+80 -L- RT
STA. 23+60 TO 23+90 -L- LT
STA. 18+82 TO 19+00 -Y2- RT



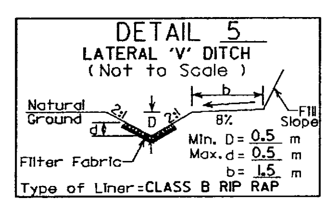
STA. 15+40 TO 15+76 -L- RT
STA. 18+80 TO 19+20 -L- RT
STA. 30+80 TO 31+20 -L- LT
STA. 11+06 TO 11+60 -Y2- LT
STA. 19+20 TO 19+46 -Y2- RT
STA. 26+60 TO 27+00 -Y2- LT
STA. 10+70 TO 10+40 -Y3B- RT
STA. 10+20 TO 10+50 -Y4- LT



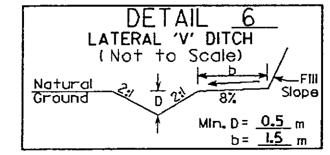
STA. 27+00 TO 27+17 -Y2- LT
STA. 27+17 TO 27+70 -Y2- LT



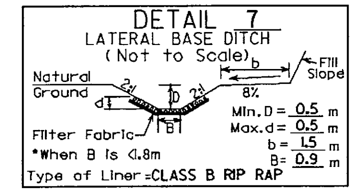
STA. 15+73 -L- LT
STA. 15+78 -L- RT
STA. 17+35 TO 17+55 -L- RT
STA. 24+55 -L- LT
STA. 15+30 -Y2- LT
STA. 12+04 -Y5- LT



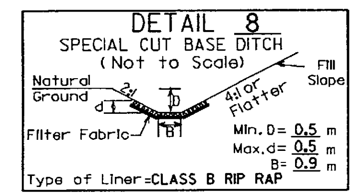
STA. 17+00 TO 17+80 -L- LT
STA. 24+20 TO 24+40 -L- RT
STA. 24+60 TO 25+20 -L- LT
STA. 11+40 TO 11+69 -Y3- LT
STA. 15+20 TO 16+00 -Y2- LT
STA. 16+20 TO 16+80 -Y2- LT



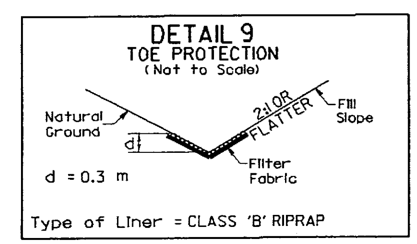
STA. 16+70 TO 17+33 -L- RT
STA. 25+80 TO 28+20 -L- LT



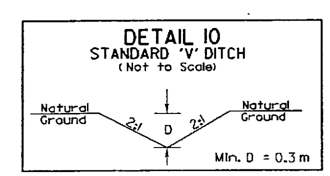
STA. 16+42 TO 17+00 -L- LT



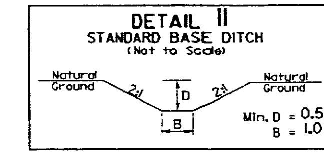
STA. 23+00 TO 23+60 -L- LT



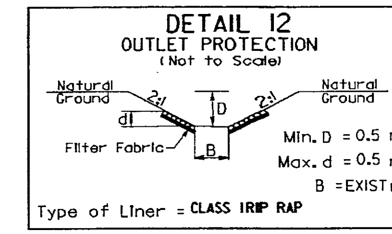
STA 8+35 TO STA 8+50 -L- RT.
STA 9+20 TO STA 9+80 -L- LT.
STA. 23+60 TO 24+10 -L- RT
STA. 12+60 TO 13+00 -Y1- RT
STA. 16+30 TO 17+20-Y1- RT
STA. 26+80 TO 27+20 -Y2- RT



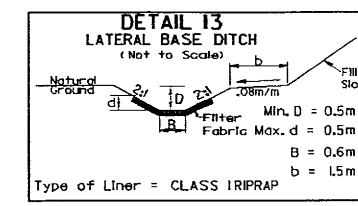
STA. 10+30 -Y1A- RT



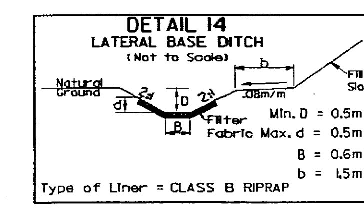
STA. 16+42 -Y2- RT



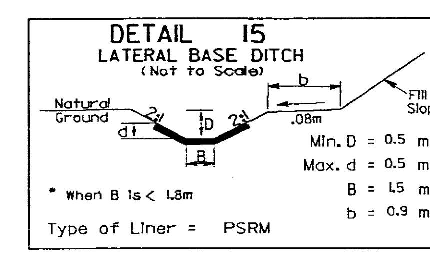
STA. 9+15 -L- LT
STA. 13+95 -L- LT
STA. 11+50 -Y3- RT



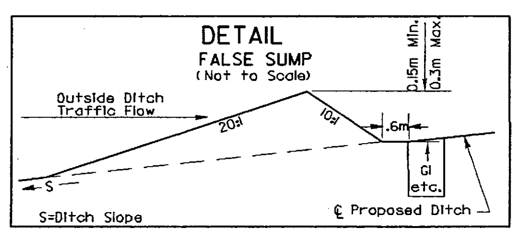
STA. 9+00 TO 9+12 -L- LT

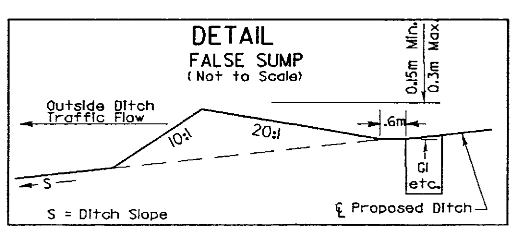


STA. 9+80 TO 10+70 -L- LT



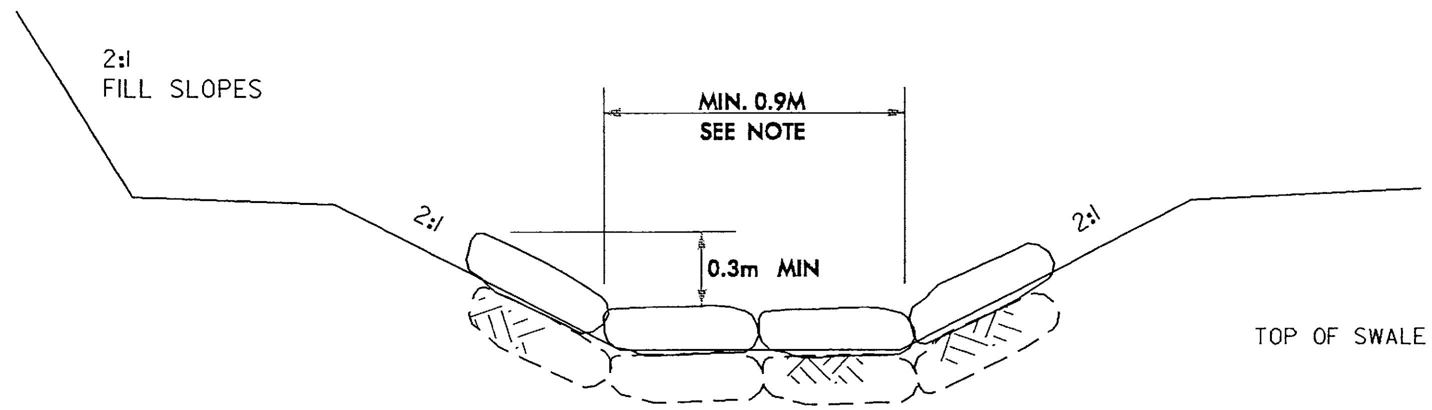
STA. 31+00 TO 31+38 -L- RT





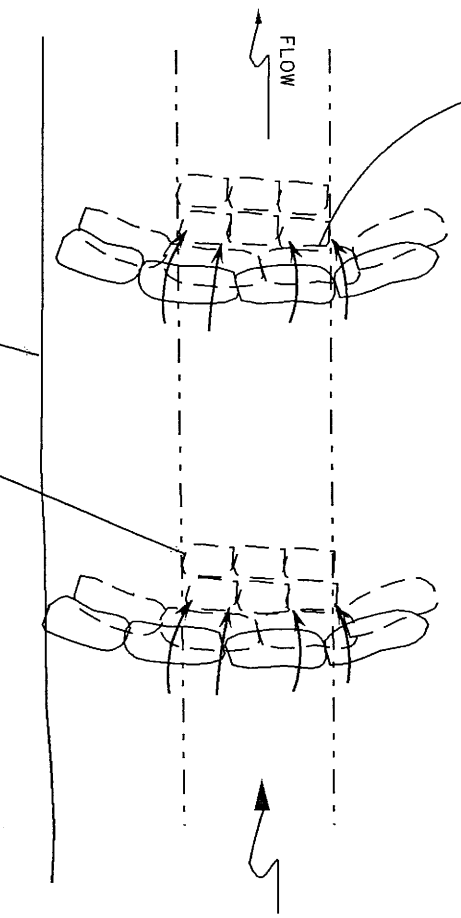
PROJECT REFERENCE NO.	SHEET NO.
R-2809A	2-G
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

LATERAL SWALE/DITCH W/ROCK CHECKS
STA 31+16 TO 31+38 -L- RT



TYPICAL CROSS SECTION

NOT TO SCALE



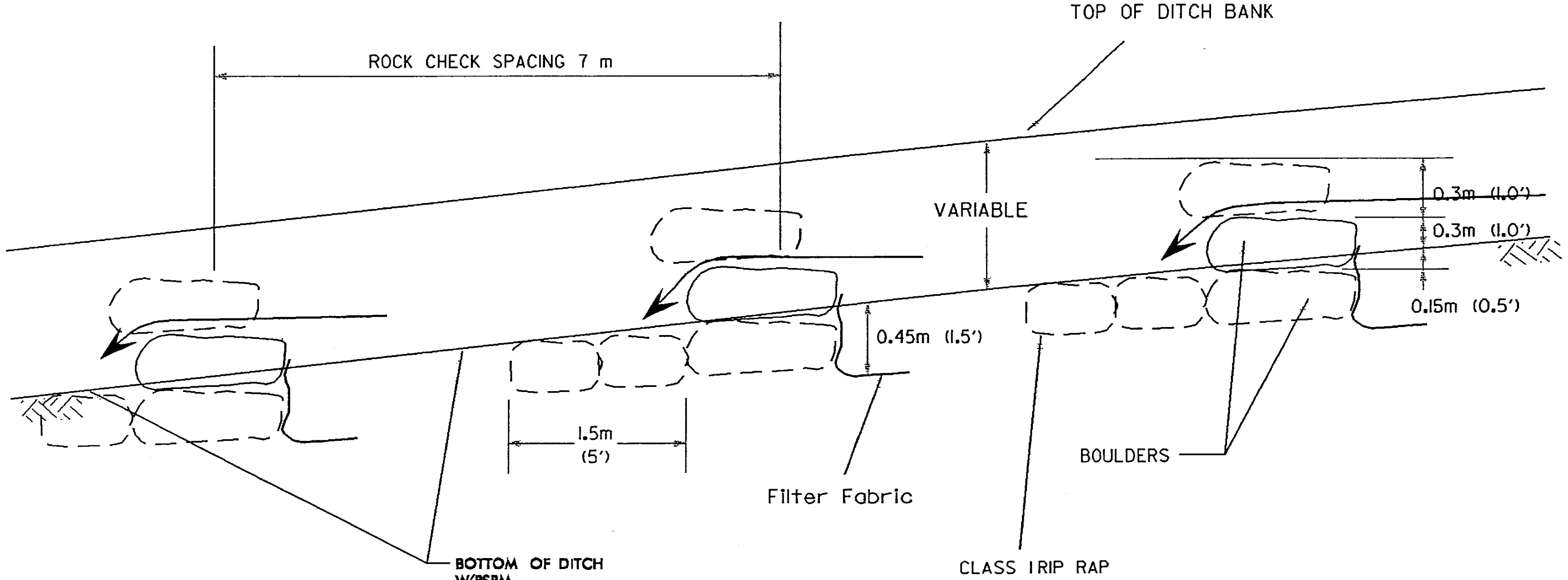
PLAN VIEW

NOT TO SCALE

FILTER FABRIC = $20m^2$

BOULDERS/FOOTER ROCK = 60 MTN

CLASS I RIP RAP = 5 MTN



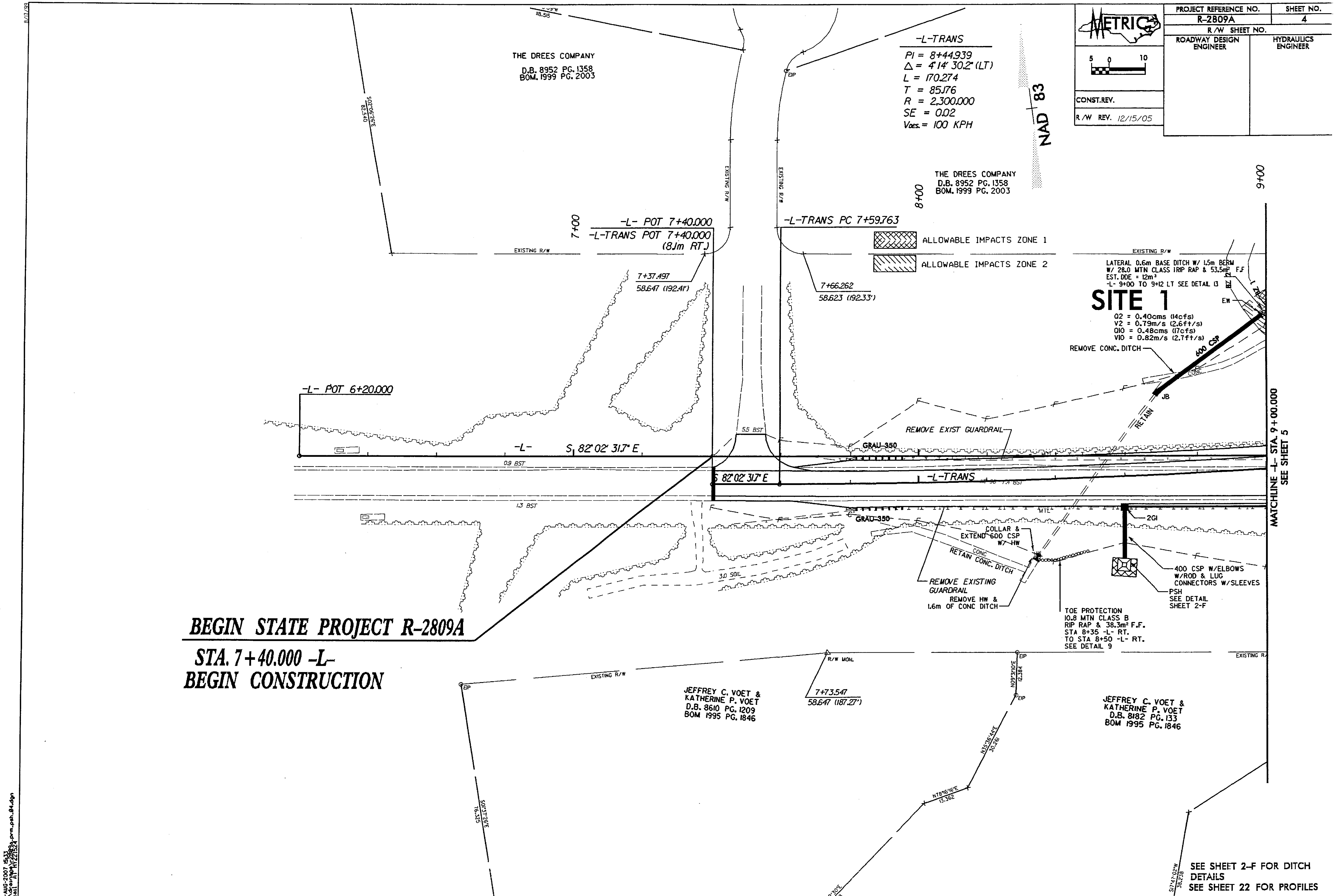
PROFILE

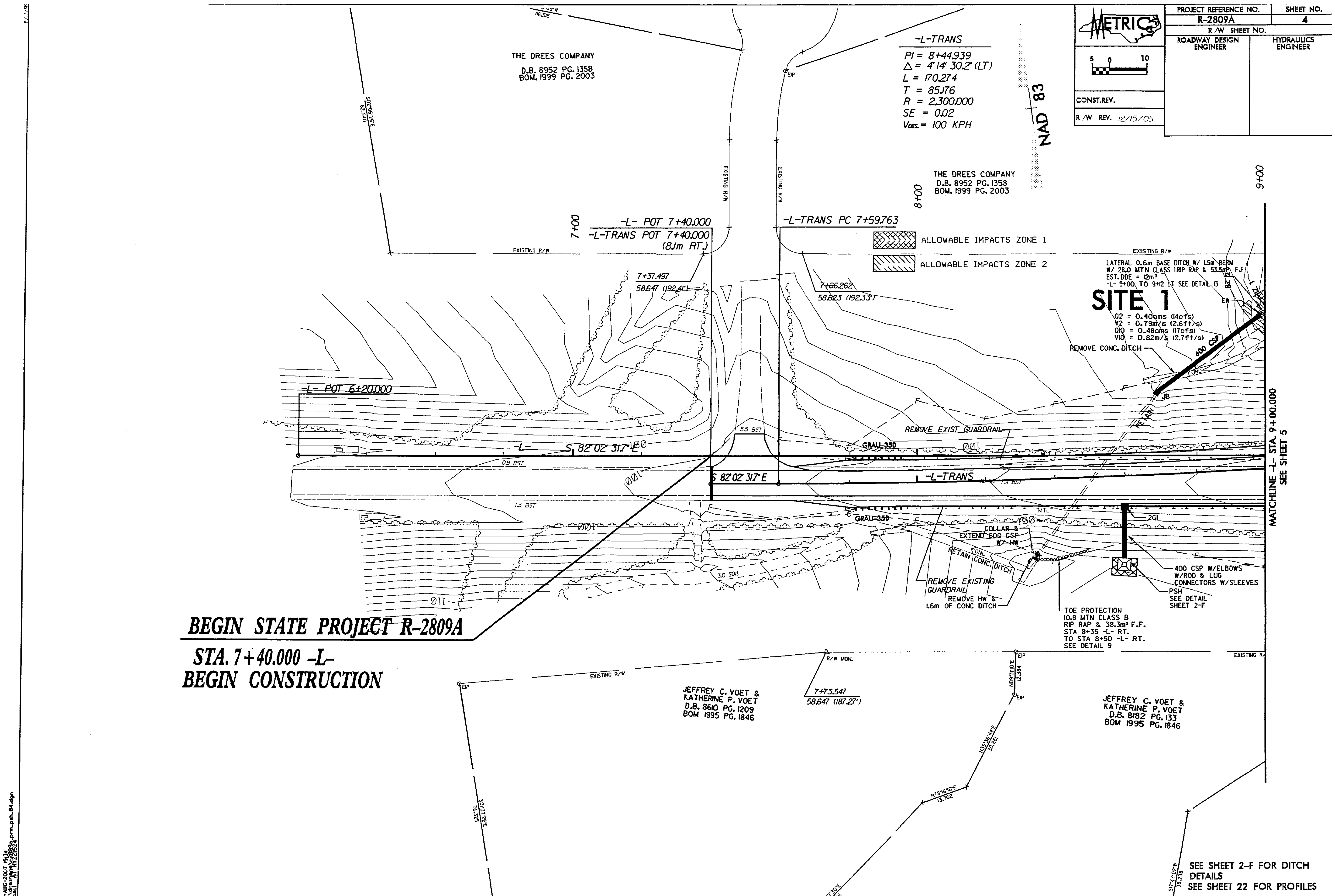
NOT TO SCALE

NOTE:

BOULDERS SHOULD BE ANGULAR AND OBLONG WITH APPROXIMATE DIMENSIONS OF 0.6m x 0.45m x 0.45m (2' x 1.5' x 1.5'). ROCK SHOULD FIT TIGHTLY TOGETHER WITH MINIMAL VOIDS. STAGGER BOULDER JOINTS.

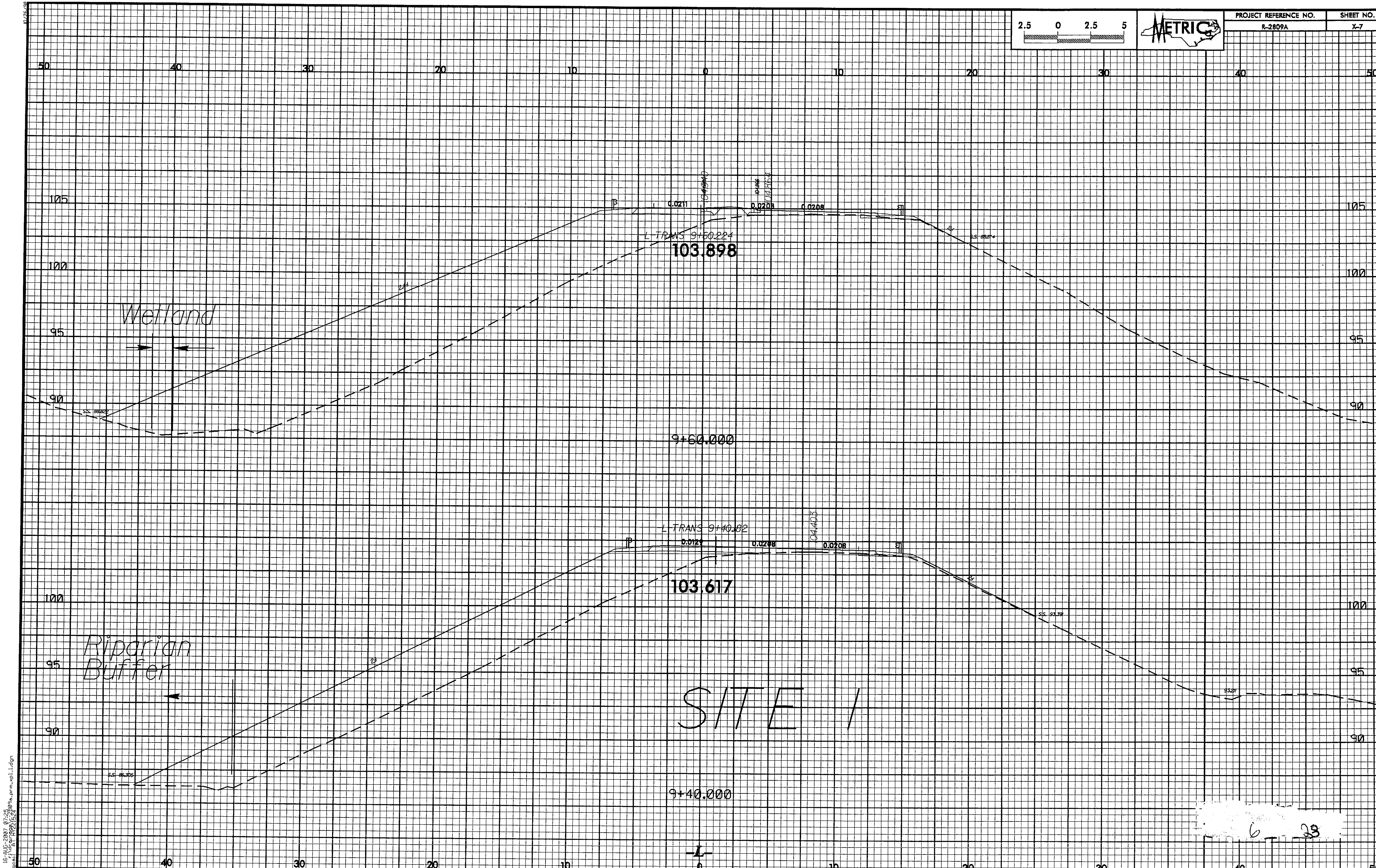
ROCK CHECK SPACING IS DEPENDENT ON DITCH GRADES AT 1' DROP INTERVALS OR SLOPE CONTROL.


METRIC
PROJECT REFERENCE NO. R-2809A
SHEET NO. 4
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV. 12/15/05
NAD 83
-L-TRANS
PI = 8+44.939
Δ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes = 100 KPH
THE DREES COMPANY
D.B. 8952 PG. 1358
BOM. 1999 PG. 2003
-L- POT 7+40.000
-L-TRANS POT 7+40.000 (8.1m RT.)
-L-TRANS PC 7+59.763
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
7+37.497
58.647 (192.41')
7+66.262
58.623 (192.33')
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 28.0 MTN CLASS I RIP RAP & 53.5m² F.F
EST. DDE = 12m³
-L- 9+00 TO 9+12 LT SEE DETAIL 13
SITE 1
Q2 = 0.40cms (14cfs)
V2 = 0.79m/s (2.6ft/s)
Q10 = 0.48cms (17cfs)
V10 = 0.82m/s (2.7ft/s)
REMOVE CONC. DITCH
600 CSP
RETAIN
-L- POT 6+20.000
-L- S 82° 02' 31.7" E
S 82° 02' 31.7" E
-L-TRANS
REMOVE EXIST GUARDRAIL
GRAU-350
MATCHLINE -L- STA. 9+00.000 SEE SHEET 5
2GI
COLLAR & EXTEND 600 CSP W/ HW
RETAIN CONC. DITCH
REMOVE EXISTING GUARDRAIL
REMOVE HW & 1.6m OF CONC DITCH
400 CSP W/ELBOWS W/ROD & LUG CONNECTORS W/SLEEVES
PSH SEE DETAIL SHEET 2-F
TOE PROTECTION 10.8 MTN CLASS B RIP RAP & 38.3m² F.F. STA 8+35 -L- RT. TO STA 8+50 -L- RT. SEE DETAIL 9
BEGIN STATE PROJECT R-2809A
STA. 7+40.000 -L-
BEGIN CONSTRUCTION
EXISTING R/W
R/W MON.
7+73.547
58.647 (187.27')
JEFFREY C. VOET & KATHERINE P. VOET D.B. 8610 PG. 1209 BOM 1995 PG. 1846
JEFFREY C. VOET & KATHERINE P. VOET D.B. 8182 PG. 133 BOM 1995 PG. 1846
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR PROFILES


PROJECT REFERENCE NO.
R-2809A
SHEET NO.
4
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST.REV.
R/W REV. 12/15/05
NAD 83
-L-TRANS
PI = 8+44.939
Δ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes = 100 KPH
THE DREES COMPANY
D.B. 8952 PG. 1358
BOM. 1999 PG. 2003
THE DREES COMPANY
D.B. 8952 PG. 1358
BOM. 1999 PG. 2003
-L- POT 7+40.000
-L-TRANS POT 7+40.000
(8.1m RT.)
-L-TRANS PC 7+59.763
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
EXISTING R/W
7+37.497
58.647 (192.41')
7+66.262
58.623 (192.33')
SITE 1
LATERAL 0.6m BASE DITCH W/ 1.5m BERM
W/ 28.0 MTN CLASS I RIP RAP & 53.5m² F.F.
EST. DDE = 12m³
-L- 9+00 TO 9+12 LT SEE DETAIL 13
Q2 = 0.40cms (14cfs)
V2 = 0.79m/s (2.6ft/s)
Q10 = 0.48cms (17cfs)
V10 = 0.82m/s (2.7ft/s)
REMOVE CONC. DITCH
600 CSP
-L- POT 6+20.000
-L-
S 82°02' 31.7" E
S 82°02' 31.7" E
-L-TRANS
REMOVE EXIST GUARDRAIL
GRAU-350
RETAIN
MATCHLINE -L- STA. 9+00.000
SEE SHEET 5
2GI
COLLAR &
EXTEND 600 CSP
W/ HW
RETAIN CONC. DITCH
REMOVE EXISTING
GUARDRAIL
REMOVE HW &
1.6m OF CONC DITCH
400 CSP W/ELBOWS
W/ROD & LUG
CONNECTORS W/SLEEVES
PSH
SEE DETAIL
SHEET 2-F
TOE PROTECTION
10.8 MTN CLASS B
RIP RAP & 38.3m² F.F.
STA 8+35 -L- RT.
TO STA 8+50 -L- RT.
SEE DETAIL 9
BEGIN STATE PROJECT R-2809A
STA. 7+40.000 -L-
BEGIN CONSTRUCTION
R/W MON.
7+73.547
58.647 (187.27')
JEFFREY C. VOET &
KATHERINE P. VOET
D.B. 8610 PG. 1209
BOM 1995 PG. 1846
JEFFREY C. VOET &
KATHERINE P. VOET
D.B. 8182 PG. 133
BOM 1995 PG. 1846
SEE SHEET 2-F FOR DITCH
DETAILS
SEE SHEET 22 FOR PROFILES

Sheet 5 23

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	X-7



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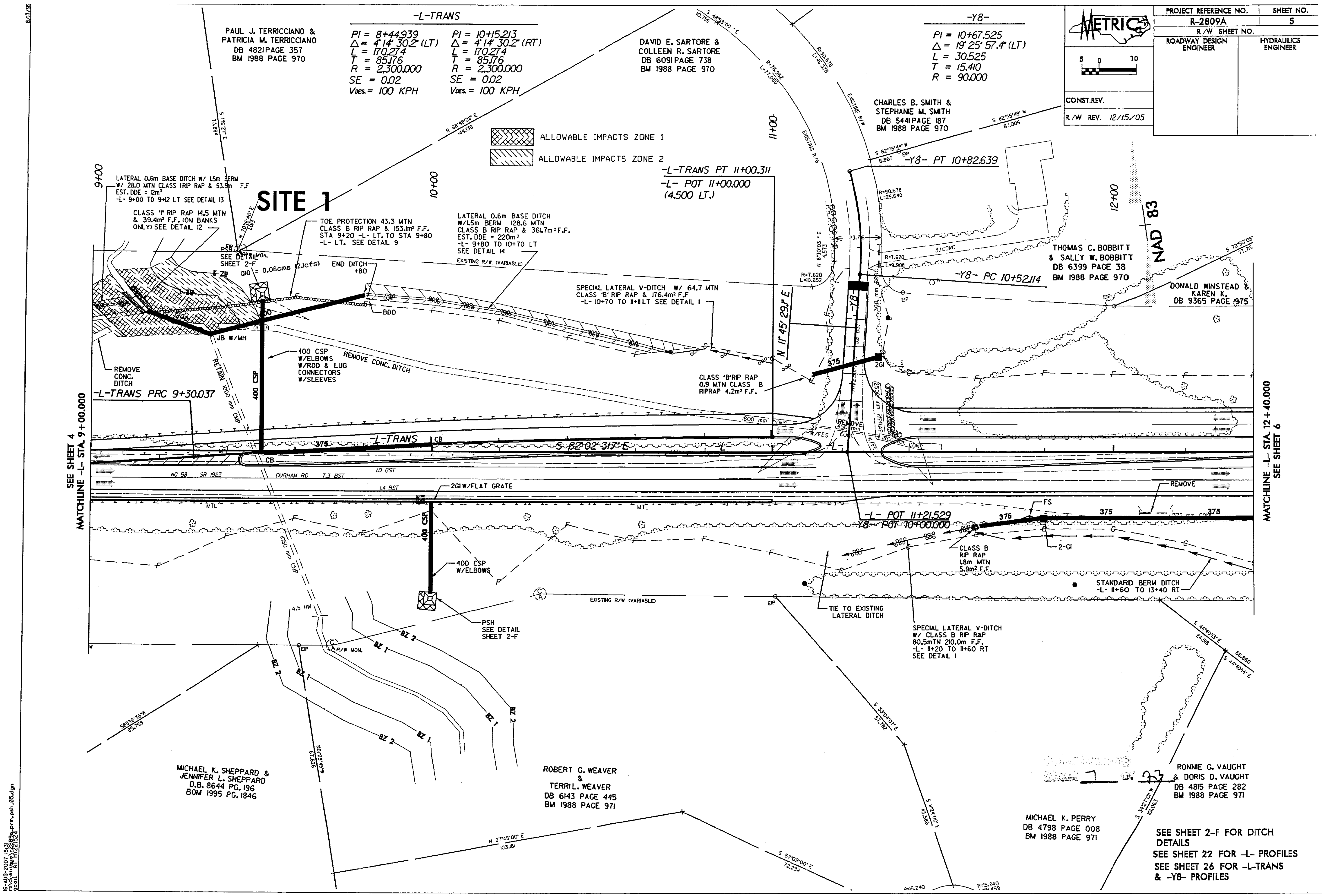
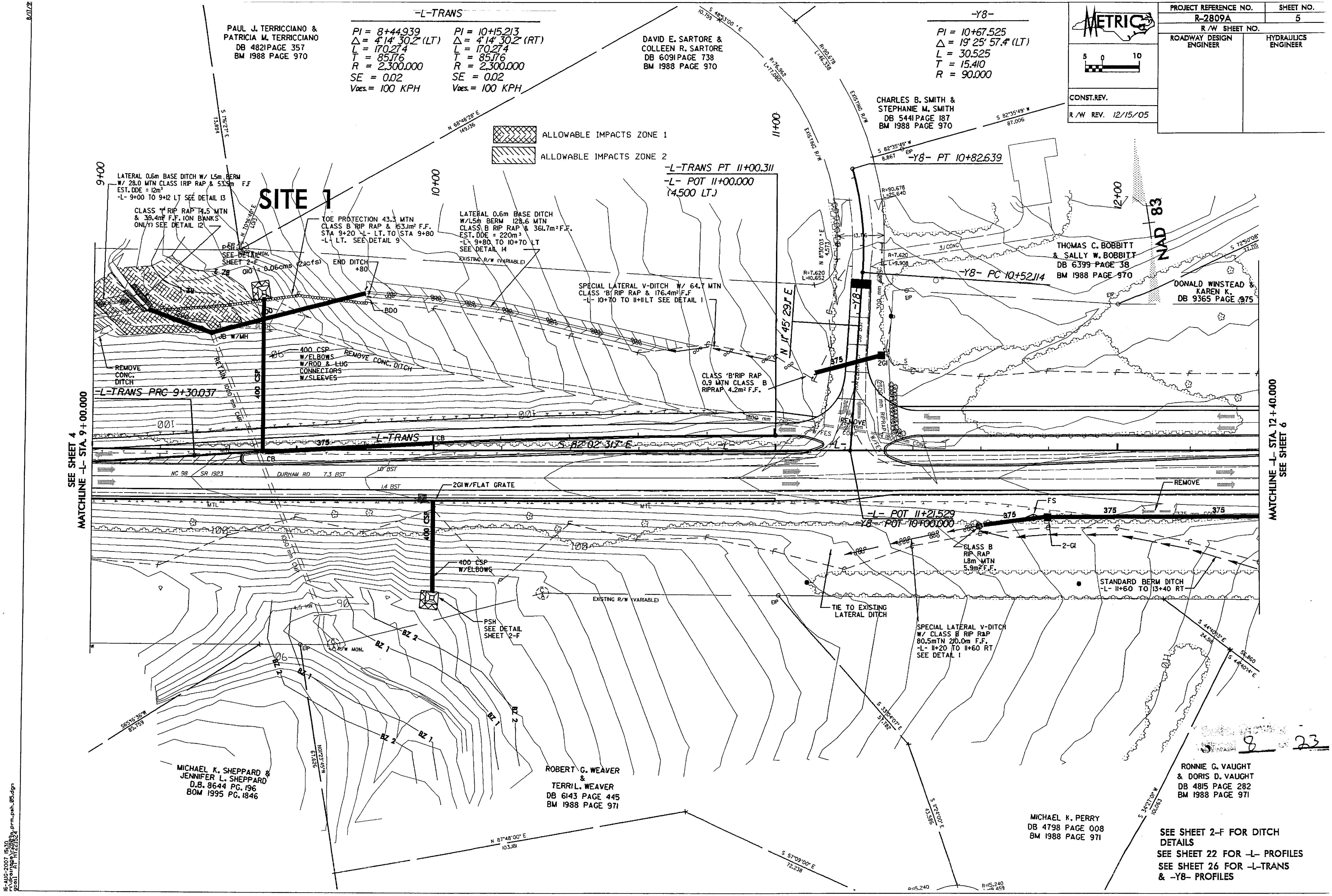
gcail AT HY221524


PROJECT REFERENCE NO. R-2809A
SHEET NO. 5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST.REV.
R/W REV. 12/15/05
-L-TRANS
PI = 8+44.939
Δ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes = 100 KPH
PI = 10+15.213
Δ = 4°14' 30.2" (RT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes = 100 KPH
-Y8-
PI = 10+67.525
Δ = 19° 25' 57.4" (LT)
L = 30.525
T = 15.410
R = 90.000
PAUL J. TERRICCIANO & PATRICIA M. TERRICCIANO DB 4821 PAGE 357 BM 1988 PAGE 970
DAVID E. SARTORE & COLLEEN R. SARTORE DB 6091 PAGE 738 BM 1988 PAGE 970
CHARLES B. SMITH & STEPHANIE M. SMITH DB 5441 PAGE 187 BM 1988 PAGE 970
THOMAS C. BOBBITT & SALLY W. BOBBITT DB 6399 PAGE 38 BM 1988 PAGE 970
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 375
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
SITE 1
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 28.0 MTN CLASS I RIP RAP & 53.9m² F.F. EST. DDE = 12m³ -L- 9+00 TO 9+12 LT SEE DETAIL 13
CLASS "I" RIP RAP 14.5 MTN & 39.4m² F.F. (ON BANKS ONLY) SEE DETAIL 12
TOE PROTECTION 43.3 MTN CLASS B RIP RAP & 153.1m² F.F. STA 9+20 -L- LT. TO STA 9+80 -L- LT. SEE DETAIL 9
LATERAL 0.6m BASE DITCH W/1.5m BERM 128.6 MTN CLASS B RIP RAP & 361.7m² F.F. EST. DDE = 220m³ -L- 9+80 TO 10+70 LT SEE DETAIL 14
PSH SEE DETAIL SHEET 2-F
Q10 = 0.06cms (2.1cfs)
END DITCH +80
BDO
JB W/MH
REMOVE CONC. DITCH
400 CSP W/ELBOWS W/ROD & LUG CONNECTORS W/SLEEVES
RETAIN 1000 mm CMP
SPECIAL LATERAL V-DITCH W/ 64.7 MTN CLASS 'B' RIP RAP & 176.4m² F.F -L- 10+70 TO 11+11 LT SEE DETAIL 1
-L-TRANS PT 11+00.311
-L- POT 11+00.000 (4.500 LT.)
-Y8- PT 10+82.639
-Y8- PC 10+52.114
CLASS 'B' RIP RAP 0.9 MTN CLASS B RIPRAP 4.2m² F.F.
N 11° 45' 29.1" E
-L-TRANS PRC 9+30.037
-L-TRANS
S 82°02' 31.7" E
NC 98 SR 1923 DURHAM RD
2GI W/FLAT GRATE
400 CSP W/ELBOWS
1050 mm CMP
PSH SEE DETAIL SHEET 2-F
-L- POT 11+21.529
-Y8- POT 10+00.000
CLASS B RIP RAP 1.8m MTN 5.9m² F.F.
2-GI
FS
REMOVE
STANDARD BERM DITCH -L- 11+60 TO 13+40 RT
TIE TO EXISTING LATERAL DITCH
SPECIAL LATERAL V-DITCH W/ CLASS B RIP RAP 80.5mTN 210.0m F.F. -L- 11+20 TO 11+60 RT SEE DETAIL 1
EXISTING R/W (VARIABLE)
NAD 83
SEE SHEET 4 MATCHLINE -L- STA. 9+00.000
MATCHLINE -L- STA. 12+40.000 SEE SHEET 6
MICHAEL K. SHEPPARD & JENNIFER L. SHEPPARD D.B. 8644 PG. 196 BOM 1995 PG. 1846
ROBERT G. WEAVER & TERRI L. WEAVER DB 6143 PAGE 445 BM 1988 PAGE 971
MICHAEL K. PERRY DB 4798 PAGE 008 BM 1988 PAGE 971
RONNIE G. VAUGHT & DORIS D. VAUGHT DB 4815 PAGE 282 BM 1988 PAGE 971
BZ 1
BZ 2
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR -L- PROFILES
SEE SHEET 26 FOR -L-TRANS & -Y8- PROFILES



PROJECT REFERENCE NO. R-2809A
SHEET NO. 5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST. REV.
R/W REV. 12/15/05
-L-TRANS
PI = 8+44.939
Δ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes = 100 KPH
PI = 10+15.213
Δ = 4°14' 30.2" (RT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes = 100 KPH
-Y8-
PI = 10+67.525
Δ = 19° 25' 57.4" (LT)
L = 30.525
T = 15.410
R = 90.000
PAUL J. TERRICCIANO & PATRICIA M. TERRICCIANO DB 4821 PAGE 357 BM 1988 PAGE 970
DAVID E. SARTORE & COLLEEN R. SARTORE DB 6091 PAGE 738 BM 1988 PAGE 970
CHARLES B. SMITH & STEPHANIE M. SMITH DB 5441 PAGE 187 BM 1988 PAGE 970
THOMAS C. BOBBITT & SALLY W. BOBBITT DB 6399 PAGE 38 BM 1988 PAGE 970
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
SITE 1
-L-TRANS PT 11+00.311
-L- POT 11+00.000 (4.500 LT.)
-Y8- PT 10+82.639
-Y8- PC 10+52.114
NAD 83
-L-TRANS PRC 9+30.037
-L-TRANS
S 82°02' 31.7" E
-L- POT 11+21.529
-Y8- POT 10+00.000
MATCHLINE -L- STA. 9+00.000 SEE SHEET 4
MATCHLINE -L- STA. 12+40.000 SEE SHEET 6
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 28.0 MTN CLASS I RIP RAP & 53.9m F.F EST. DDE = 12m³ -L- 9+00 TO 9+12 LT SEE DETAIL 13
CLASS "I" RIP RAP 14.5 MTN & 39.4m² F.F. (ON BANKS ONLY) SEE DETAIL 12
TOE PROTECTION 43.3 MTN CLASS B RIP RAP & 153.1m² F.F. STA 9+20 -L- LT. TO STA 9+80 -L- LT. SEE DETAIL 9
LATERAL 0.6m BASE DITCH W/1.5m BERM 128.6 MTN CLASS B RIP RAP & 361.7m² F.F. EST. DDE = 220m³ -L- 9+80 TO 10+70 LT SEE DETAIL 14
SPECIAL LATERAL V-DITCH W/ 64.7 MTN CLASS 'B' RIP RAP & 176.4m² F.F -L- 10+70 TO 11+11 LT SEE DETAIL 1
CLASS 'B' RIP RAP 0.9 MTN CLASS B RIPRAP 4.2m² F.F.
PSH SEE DETAIL SHEET 2-F
END DITCH +80
400 CSP W/ELBOWS W/ROD & LUG CONNECTORS W/SLEEVES
REMOVE CONC. DITCH
2GI W/FLAT GRATE
400 CSP W/ELBOWS
PSH SEE DETAIL SHEET 2-F
CLASS B RIP RAP 1.8m MTN 5.9m² F.F.
STANDARD BERM DITCH -L- 11+60 TO 13+40 RT
TIE TO EXISTING LATERAL DITCH
SPECIAL LATERAL V-DITCH W/ CLASS B RIP RAP 80.5mTN 210.0m F.F. -L- 11+20 TO 11+60 RT SEE DETAIL 1
NC 98 SR 1923 DURHAM RD
EXISTING R/W (VARIABLE)
MICHAEL K. SHEPPARD & JENNIFER L. SHEPPARD D.B. 8644 PG. 196 BOM 1995 PG. 1846
ROBERT G. WEAVER & TERRI L. WEAVER DB 6143 PAGE 445 BM 1988 PAGE 971
MICHAEL K. PERRY DB 4798 PAGE 008 BM 1988 PAGE 971
RONNIE G. VAUGHT & DORIS D. VAUGHT DB 4815 PAGE 282 BM 1988 PAGE 971
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR -L- PROFILES
SEE SHEET 26 FOR -L-TRANS & -Y8- PROFILES

2.5	0	2.5	5

METRIC

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	X-14

50 40 30 20 10 0 10 20 30 40 50

115
110

0.0800 0.0800 0.0800

SS 106.463

108.592

SS 109.295

111.691
14+60.000

0.0800 0.0800 0.0800

SS 106.413

SS 108.176

108.794
14+40.000

110
105

0.0800 0.0800 0.0800

SS 106.288

108.338

SS 109.962

108.398
14+20.000

Riparian Buffer

0.0744 0.0800 0.0800

SS 106.414

108.271

SS 110.114

108.751

14+00.000

SITE 2

-L-

50 40 30 20 10 0 10 20 30 40 50

16-NOV-2007 07:16
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$USER
$DATE
$TIME

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2809A	6
CONST.REV.	R /W SHEET NO.	
R /W REV. 5/3/06	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

NAD 83

MATCHLINE SEE SHEET 12

MATCHLINE SEE SHEET 12

ALLOWABLE IMPACTS ZONE 2

ALLOWABLE IMPACTS ZONE 1

SITE 2

PRISCILLA B. ROLLS,
VIRGINIA ROLLS
DB 09231 PAGE 1049
BM 2005 PAGE 333

1A

-Y3- PT
10+72.765

CLASS 'I' RIPRAP
15.4 MTN & 41.7m² F.F.
(ON BANKS ONLY)
SEE DETAIL 12

PSH
SEE DETAIL
SHEET 2-F
Q/Q = 0.65

-Y3- +45.303
(EX.R/W)
12.304 (40.37')

PSH
SEE DETAIL
SHEET 2-F

-Y3- PC 10+31.848

FILL WITH
SUITABLE
MATERIAL
COMPACTED

ENDWALL

CAT-1

MATCH -Y3- STA. 10+90.000
SEE SHEET 12

13+00

15+00

DONALD WINSTEAD &
KAREN K.
DB 9365 PAGE 975

30

CLASS 'B' RIP RAP
0.9 MTN 4.2m² F.F.

-Y3- +48.133
(EX.R/W)
16 (52.49')

S 13°37'17" W
30.175

S 35°07'55" E

DONALD WINSTEAD &
KAREN K.
DB 9365 PAGE 975

4136

BEGIN C/A

MATCHLINE -L- STA. 12+40.000
SEE SHEET 5

COLLAR &
EXTEND 375

N 13° 34' 33.0" W

-L- POC 13+64.155
-Y3A- POT 11+88.630

-L- SC 13+56.524

-L- POS 13+51.932
-Y3- POT 10+00.000

-L- TS 12+60.524

BEGIN C/A

STANDARD BERM DITCH
-L- 11+60 TO 13+40 RT

DONALD WINSTEAD &
KAREN K.
DB 9365 PAGE 975

CHARLES B. SHEARON &
JULIA O
DB 10591 PAGE 843
BM 1988 PAGE 971

NEIL A. FLYOD &
MELANIE A.
DB 6729 PAGE 525
BM 1988 PAGE 971

S 17°26'52" E 51.694

S 17°22'59" E 49.889

S 17°56'00" W 87.300

-Y3A- PT 11+17.711

-Y3A- PC 10+46.489

-Y3A- POT 10+00.000

13+58.772
41.000T (134.54')

9+72.951
10.143 (33.28')

10+02.046
10.682 (35.05')

EXISTING R/W (VARIABLE)

REMOVE CONC DITCH 2GI TYPE D

REMOVE CONC DITCH

REMOVE CONC DITCH
1800 mm CONC

RETAIN CONC. DITCH

REMOVE
450

REMOVE
375

BDO

CB

375

450

400 CSP

2GI

FS

PDE

E

-L-

-Y3-

-Y3A-

862'B THOMPSON MILL RD

NC 98 DURHAM RD BST

12 BST

14 BST

CAROLINA PRINCESS LLC
DB 08693 PAGE 1799

72

+48.000 (EX.R/W)
40 (131.23')

+65
40 (131.23')

+80
40 (131.23')

0.6m BASE TAIL DITCH
SEE DETAIL 4 EST DDE=8m³

CLASS B RIP RAP
2.2 MTN 6.4m² F.F.

CLM ASSOCIATES LLC
DB 8050 PAGE 875

73

SPECIAL LATERAL V-DITCH
-L- 15+40 TO 15+76 RT
SEE DETAIL 2

+40
23 (75.46')

N 44°41'26" W
62.5'

+56.300
31 (101.7')

CLASS B RIP RAP
1.8m MTN 5.9m² F.F.

+40
30 (98.42')

STANDARD
BERM DITCH
-L- 14+20 TO
15+00 RT

+00
23 (75.46') &
35 (114.83')

N 53°41'26" E
38.50'

-L- +60
30 (98.43')

-L- +30
30 (98.43')

-L- +18.774 (EX.R/W)
23 (75.46') &
30 (98.43')

-L- 14+08.642
25.585 (83.94')

+18.199 (-Y3A-)
EXIST.R/W

+70
37 (121.39') &
49 (160.76')

0.6m BASE
HEAD DITCH
EST DDE=15m³
SEE DETAIL 4

JOHN WALTER ROLLS, JR &
IRIS DALTON
DB 8238 PAGE 1571
BM 1997 PAGE 1427

71

MATCHLINE -L- STA. 15+80.000
SEE SHEET 7

N 2° 44' 14.4" W

EXISTING R/W (VARIABLE)

15-AUG-2007 15:34
r:\data\hydro\r2809a\prm_plsh_06.dgn
jcahill

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST.REV.

R/W REV. 5/3/06

11 23

METRIC

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	11
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

CONST.REV.
R/W REV. 12/15/05

-L-		
PIs = 29+80.149	PI = 30+72.330	PIs = 31+63.047
θs = 4°38′30.1″	Δ = 20°20′27.8″ (LT)	~~θs = 4°38′30.1″~~
Ls = 64.0	L = 140.2322	Ls = 64.0
LT = 42.6813	T = 70.8619	LT = 42.6813
ST = 21.3467	R = 395.000	ST = 21.3467
	SE = 0.08	
	Vdes. = 100 KPH	

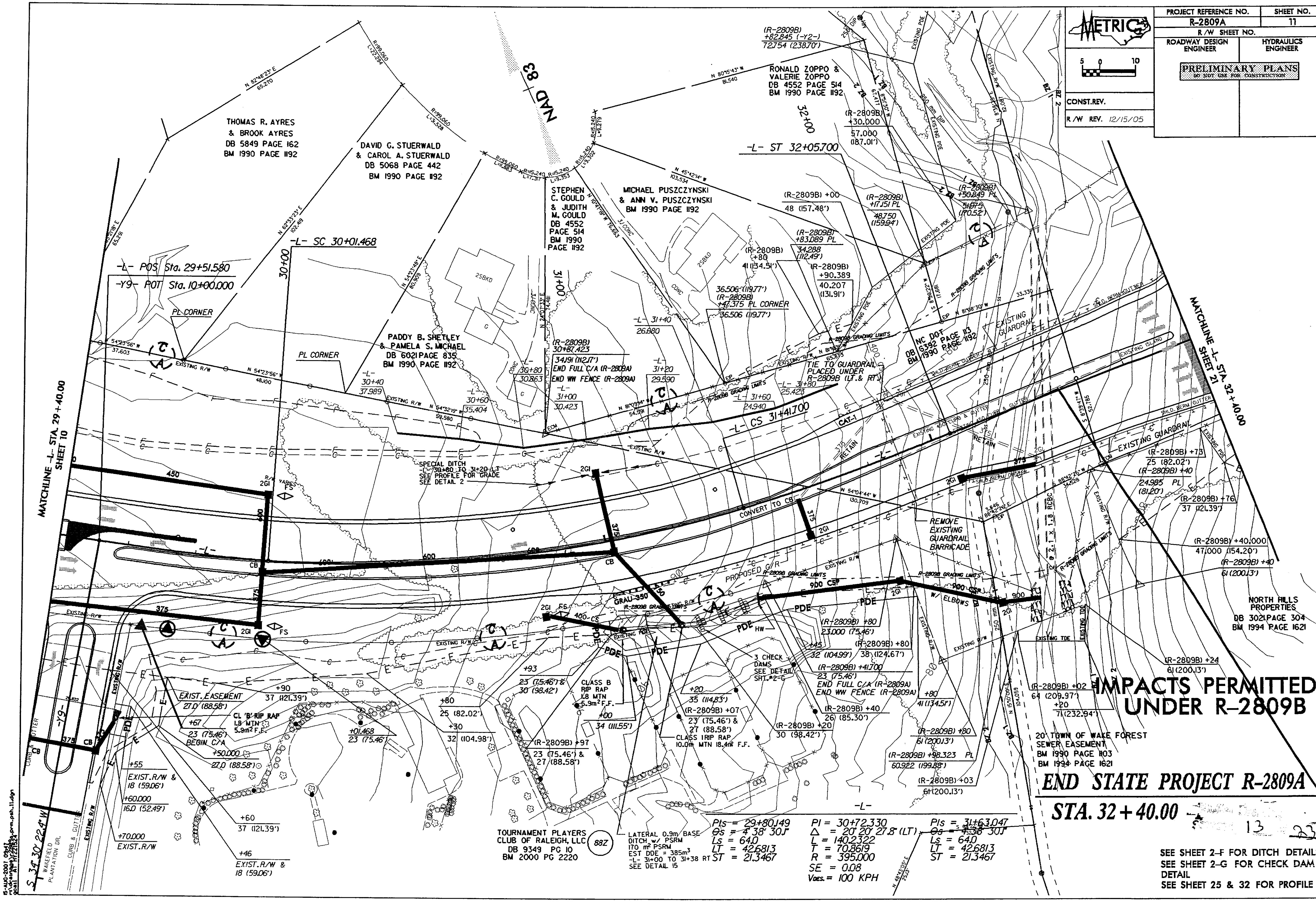
IMPACTS PERMITTED UNDER R-2809B

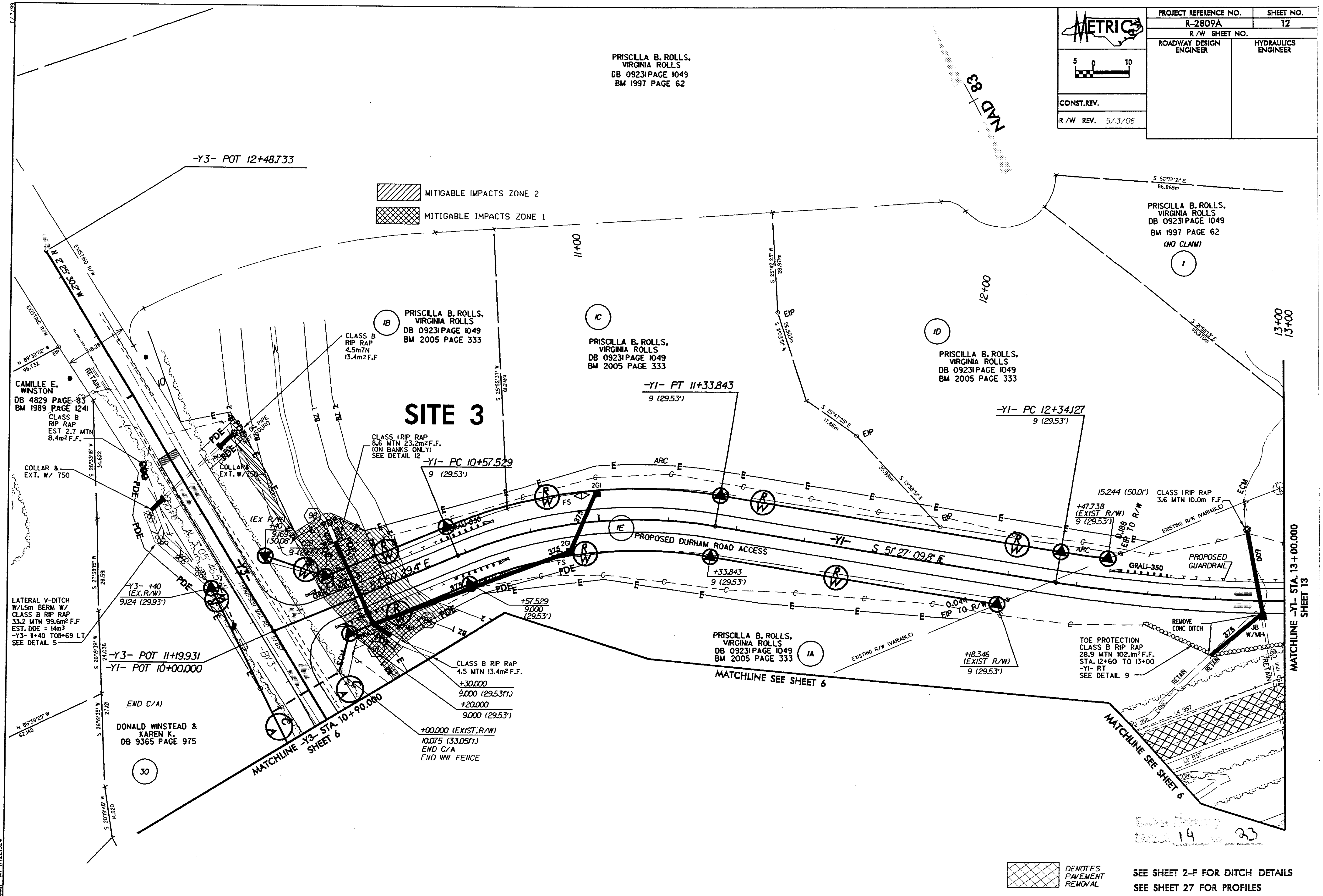
END STATE PROJECT R-2809A

STA. 32+40.00 -L-

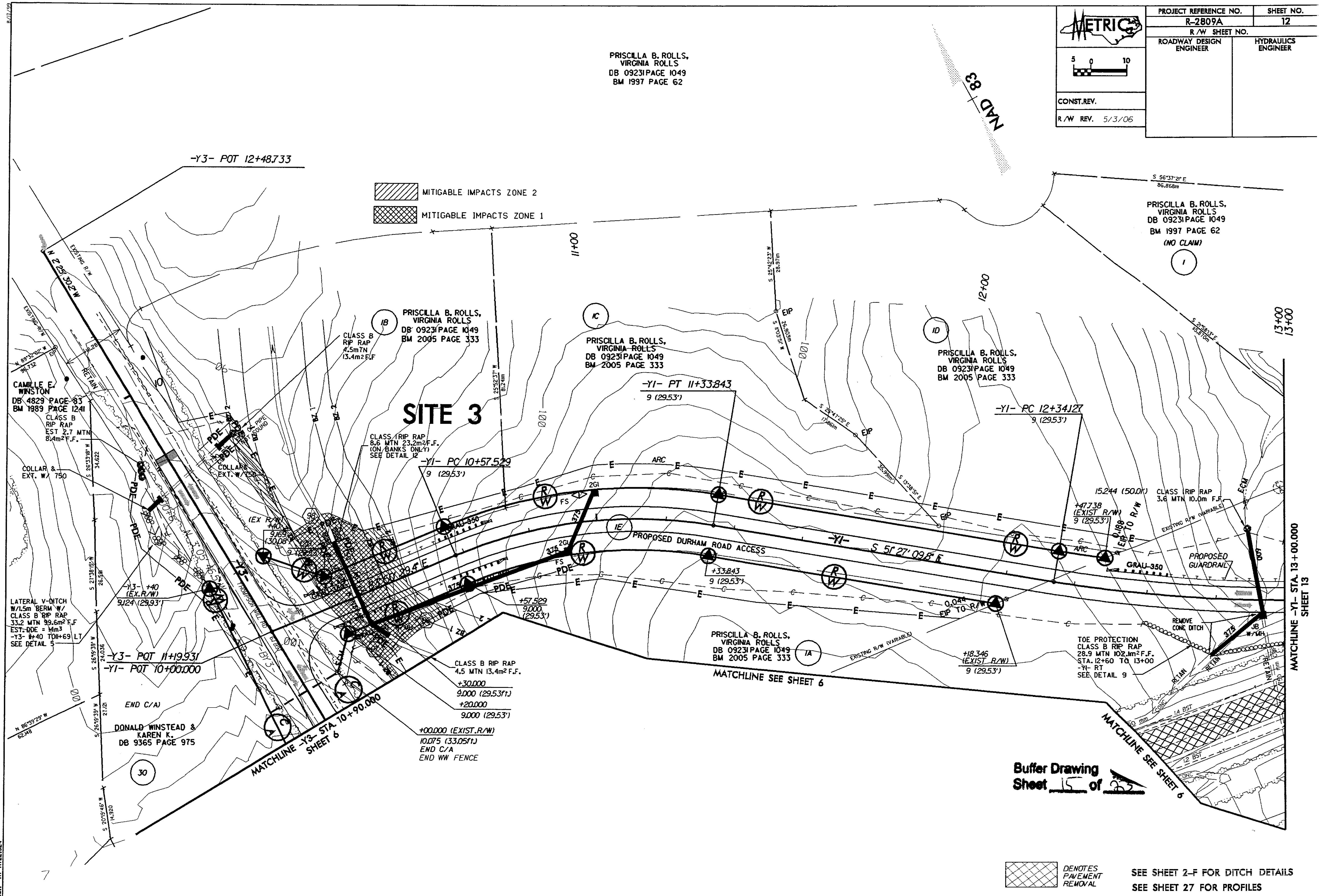
12 25

SEE SHEET 2-[illegible] FOR DITCH [illegible]
SEE SHEET 2-G FOR CHECK DAM DETAIL
SEE SHEET 25 & 32 FOR PROFILE

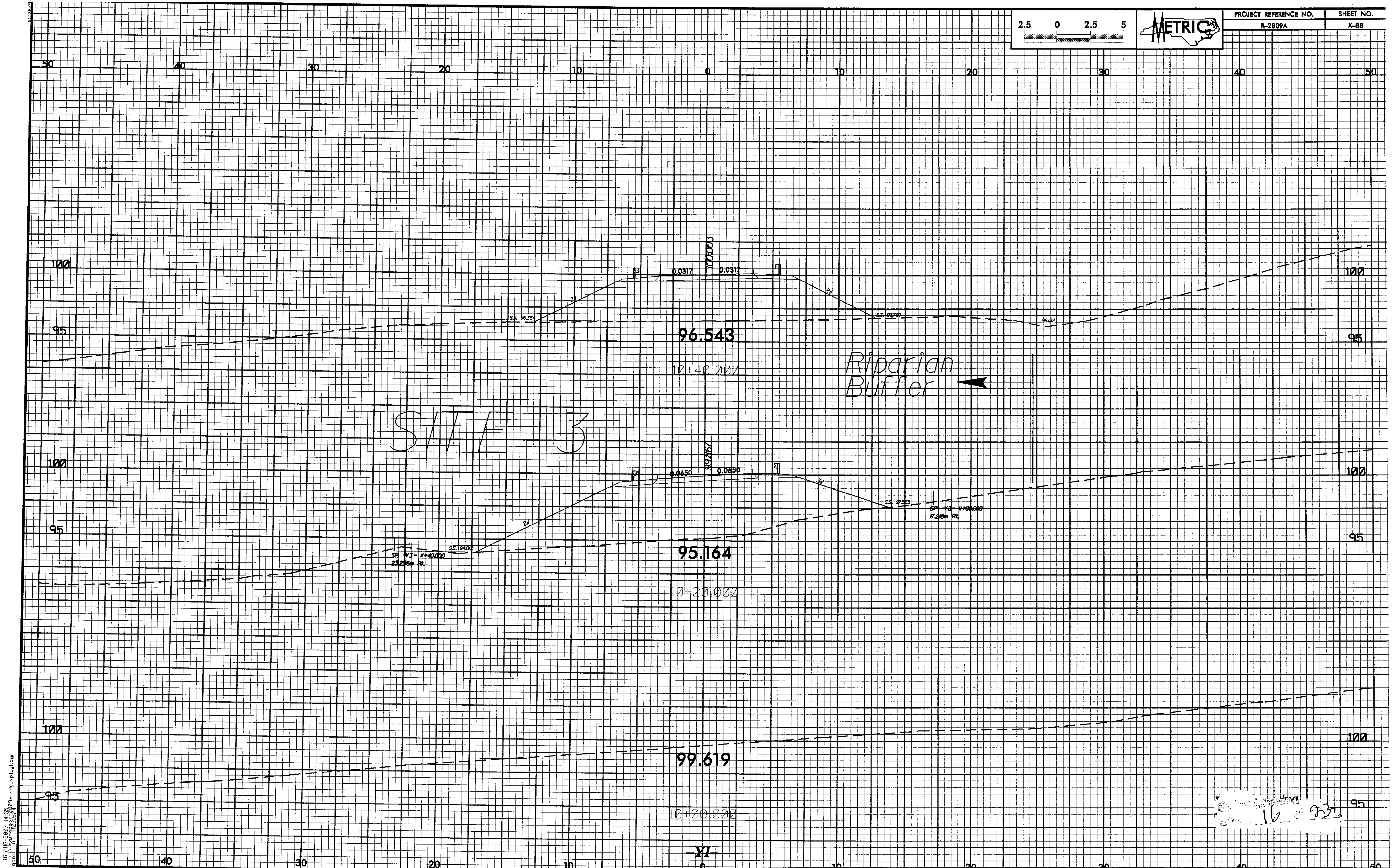

PROJECT REFERENCE NO. R-2809A
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
CONST.REV.
R/W REV. 12/15/05
NAD 83
THOMAS R. AYRES
& BROOK AYRES
DB 5849 PAGE 162
BM 1990 PAGE 1192
DAVID G. STUERWALD
& CAROL A. STUERWALD
DB 5068 PAGE 442
BM 1990 PAGE 1192
STEPHEN C. GOULD
& JUDITH M. GOULD
DB 4552 PAGE 514
BM 1990 PAGE 1192
MICHAEL PUSZCZYNSKI
& ANN V. PUSZCZYNSKI
BM 1990 PAGE 1192
RONALD ZOPPO &
VALERIE ZOPPO
DB 4552 PAGE 514
BM 1990 PAGE 1192
PADDY B. SHETLEY
& PAMELA S. MICHAEL
DB 6021 PAGE 835
BM 1990 PAGE 1192
NC DOT
DB 6392 PAGE 113
BM 1990 PAGE 1192
NORTH HILLS PROPERTIES
DB 3021 PAGE 304
BM 1994 PAGE 1621
TOURNAMENT PLAYERS
CLUB OF RALEIGH, LLC
DB 9349 PG 10
BM 2000 PG 2220
20' TOWN OF WAKE FOREST
SEWER EASEMENT
BM 1990 PAGE 1103
BM 1994 PAGE 1621
-L- POS Sta. 29+51.580
-Y9- POT Sta. 10+00.000
-L- SC 30+01.468
-L- ST 32+05.700
-L- CS 31+41.700
MATCHLINE -L- STA. 29+40.00 SHEET 10
MATCHLINE -L- STA. 32+40.00 SHEET 21
TIE TO GUARDRAIL PLACED UNDER R-2809B (LT. & RT.)
REMOVE EXISTING GUARDRAIL BARRICADE
SPECIAL DITCH -L- 30+80 TO 31+20 LT SEE PROFILE FOR GRADE SEE DETAIL 2
3 CHECK DAMS SEE DETAIL SHT. 2-G
CLASS B RIP RAP
CL 'B' RIP RAP
CLASS I RIP RAP
LATERAL 0.9m BASE DITCH w/ PSRM
170 m² PSRM
EST DDE = 385m³
-L- 31+00 TO 31+38 RT
SEE DETAIL 15
END FULL C/A (R-2809A)
END WW FENCE (R-2809A)
IMPACTS PERMITTED UNDER R-2809B
END STATE PROJECT R-2809A
STA. 32+40.00
PI = 29+80.149
Θs = 4°38'30"
Ls = 64.0
LT = 42.6813
ST = 21.3467
PI = 30+72.330
Δ = 20°20'27.8" (LT)
L = 140.2322
T = 70.8619
R = 395.000
SE = 0.08
Vdes = 100 KPH
PI = 31+63.047
Θs = 4°38'30"
Ls = 64.0
LT = 42.6813
ST = 21.3467
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 2-G FOR CHECK DAM DETAIL
SEE SHEET 25 & 32 FOR PROFILE



METRIC
PROJECT REFERENCE NO. R-2809A
SHEET NO. 12
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV. 5/3/06
NAD 83
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923I PAGE 1049 BM 1997 PAGE 62
-Y3- POT 12+48.733
MITIGABLE IMPACTS ZONE 2
MITIGABLE IMPACTS ZONE 1
SITE 3
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923I PAGE 1049 BM 2005 PAGE 333
(NO CLAIM)
CAMILLE E. WINSTON DB 4829 PAGE 83 BM 1989 PAGE 1241
CLASS B RIP RAP EST 2.7 MTN 8.4m² F.F.
COLLAR & EXT. W/ 750
CLASS B RIP RAP 4.5mTN 13.4m² F.F.
CLASS I RIP RAP 8.6 MTN 23.2m² F.F. (ON BANKS ONLY) SEE DETAIL 12
-Y1- PC 10+57.529
-Y1- PT 11+33.843
-Y1- PC 12+34.127
PROPOSED DURHAM ROAD ACCESS
-Y1- S 51° 27' 09.8" E
CLASS I RIP RAP 3.6 MTN 10.0m F.F.
PROPOSED GUARDRAIL
LATERAL V-DITCH W/1.5m BERM W/ CLASS B RIP RAP 33.2 MTN 99.6m² F.F EST. DDE = 14m³ -Y3- 11+40 TO 11+69 LT SEE DETAIL 5
-Y3- POT 11+19.931
-Y1- POT 10+00.000
END C/A
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
CLASS B RIP RAP 4.5 MTN 13.4m² F.F.
+00.000 (EXIST. R/W) 10.075 (33.05ft.) END C/A END WW FENCE
MATCHLINE -Y3- STA. 10+90.000 SHEET 6
MATCHLINE SEE SHEET 6
TOE PROTECTION CLASS B RIP RAP 28.9 MTN 102.1m² F.F. STA. 12+60 TO 13+00 -Y1- RT SEE DETAIL 9
REMOVE CONC DITCH
MATCHLINE -Y1- STA. 13+00.000 SHEET 13
DENOTES PAVEMENT REMOVAL
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 27 FOR PROFILES


METRIC
PROJECT REFERENCE NO.
R-2809A
SHEET NO.
12
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV. 5/3/06
NAD 83
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923I PAGE 1049 BM 1997 PAGE 62
-Y3- POT 12+48.733
MITIGABLE IMPACTS ZONE 2
MITIGABLE IMPACTS ZONE 1
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923I PAGE 1049 BM 1997 PAGE 62 (NO CLAIM)
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923I PAGE 1049 BM 2005 PAGE 333
CAMILLE E. WINSTON DB 4829 PAGE 83 BM 1989 PAGE 1241
SITE 3
-Y1- PT 11+33.843
-Y1- PC 12+34.127
-Y1- PC 10+57.529
PROPOSED DURHAM ROAD ACCESS
-Y1- S 51° 27' 09.8" E
PROPOSED GUARDRAIL
CLASS B RIP RAP 4.5 MTN 13.4m² F.F.
CLASS I RIP RAP 8.6 MTN 23.2m² F.F. (ON BANKS ONLY) SEE DETAIL 12
CLASS I RIP RAP 3.6 MTN 10.0m F.F.
LATERAL V-DITCH W/1.5m BERM W/ CLASS B RIP RAP 33.2 MTN 99.6m² F.F EST. DDE = 14m3 -Y3- 11+40 TO 11+69 LT SEE DETAIL 5
TOE PROTECTION CLASS B RIP RAP 28.9 MTN 102.1m² F.F. STA. 12+60 TO 13+00 -Y1- RT SEE DETAIL 9
-Y3- POT 11+19.931
-Y1- POT 10+00.000
END C/A
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
+00.000 (EXIST. R/W) 10.075 (33.05ft) END C/A END WW FENCE
MATCHLINE -Y3- STA. 10+90.000 SHEET 6
MATCHLINE SEE SHEET 6
MATCHLINE -Y1- STA. 13+00.000 SHEET 13
Buffer Drawing Sheet 15 of 23
DENOTES PAVEMENT REMOVAL
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 27 FOR PROFILES

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	X-88



BUFFER IMPACTS SUMMARY

SITE NO.	STRUCTURE SIZE / TYPE	STATION (FROM/TO)	IMPACT									BUFFER REPLACEMENT	
			TYPE			ALLOWABLE			MITIGABLE				
			ROAD CROSSING	BRIDGE	PARALLEL IMPACT	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)
1	48" RCP	-L- 9+25 LT	X			5651	3283	8934					
2	24" CSP	-L- 14+00 LT	X			4338	2788	7126					
3	30" RCP	-Y1- 10+30	X						7556	4198	11754		
TOTAL:						9989	6071	16060	7556	4198	11754		

Site 3 Impacts 154' of stream

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY
PROJECT: 34503.1.1 (R-2809A)

August-07
SHEET 17 OF 23

Rev. May 2006

BUFFER IMPACTS SUMMARY

			IMPACT								BUFFER REPLACEMENT	
			TYPE		ALLOWABLE			MITIGABLE				
SITE NO.	STRUCTURE SIZE / TYPE	STATION (FROM/TO)	ROAD CROSSING	PARALLEL IMPACT	ZONE 1 (m^2)	ZONE 2 (m^2)	TOTAL (m^2)	ZONE 1 (m^2)	ZONE 2 (m^2)	TOTAL (m^2)	ZONE 1 (m^2)	ZONE 2 (m^2)
1	1200 RCP	-L- 9+25 LT	X		525.0	305.0	830.0					
2	600 CSP	-L- 14+00 LT	X		403.0	259.0	662.0					
3	750 RCP	-Y1- 10+30	X					702.0	390.0	1092.0		
TOTAL:					928.0	564.0	1492.0	702.0	390.0	1092.0		

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY
PROJECT: 34503.1.1 (R-2809A)

August-07
SHEET 18 OF 23

R-2809A Wake Forest Bypass. Affected Buffer Areas **Site #1**

Discharge is considered to be treated if it meets the following criteria:
100 ft. of grass swale for every 1 acre of drainage area. AND
2 yr. velocity is less than or equal to 2 ft./sec.

Date: 8/15/2007
Dsn. By: FFF
Check: SDG

SHT.	Structure	Station	Type	Total D.A. ha	(ac)	Required length for treatment (ft.)	(m.)	Actual Length (m)	Channel Slope (m/m)	Side Slopes	Treated Discharge?	Q2 cfs	Q2 vel. fps	Q10 cfs	Q10 vel. fps	Treatment Provided	Remarks
5	9	8+60 MED	CB	0.17	0.4	40.8	12	0	0	NA	**NO**	0.02	NA	0.03	NA	PSH	
5	10	10+00 MED	2GI	0.29	0.7	71.7	22	0	0	NA	**NO**	2.0	NA	2.65	NA	PSH	

2GI = 2 GRATED INLET
SBG = SHOULDER BERM GUTTER
CB = CATCH BASIN
DDB = DRY DETENTION BASIN
B = BASIN
GS = GRASS SWALE

BDOS = BERM DRAINAGE OUTLET STRUCTURE
OTCB = OPEN THROAT CATCH BASIN
OPEN = OPEN END PIPE
PSH = PRE FORMED SCOUR HOLE
LS = LEVEL SPREADER

R-2809A Wake Forest Bypass. Affected Buffer Areas **Site #2**

Date: 8/15/2007
Dsn. By: FFF
Check: SDG

Discharge is considered to be treated if it meets the following criteria:
100 ft. of grass swale for every 1 acre of drainage area. AND
2 yr. velocity is less than or equal to 2 ft./sec.

SHT.	Structure	Station	Type	Total D.A. ha	Total D.A. (ac)	Required length for treatment (ft.)	Required length for treatment (m.)	Actual Length (m)	Channel Slope (m/m)	Side Slopes	Treated Discharge?	Q2 cfs	Q2 vel. fps	Q10 cfs	Q10 vel. fps	Treatment Provided	Remarks
6	25	13+90 Med.	CB	0.09	0.2	22.2	7	NA	NA	NA	**NO**	0.94	NA	1.30	NA	PSH	
6	26	13+75 Med	CB	0.04	0.1	9.9	3	NA	NA	NA	**NO**	0.42	NA	0.58	NA	PSH	
6	30	13+60 RT	2GI	0.51	1.3	126.0	38	75	0.003	4:/6:1	**YES**	2.38	0.43	3.27	0.52	GS	
6	31	13+95 RT	2GI	0.16	0.4	40.3	12	60	0.003	4:/6:1	**YES**	1.23	0.85	1.70	1.02	GS	
6	28	13+95 RT	2GI	0.50	1.2	123.6	38	OFFSITE OR CROSS DRAINAGE									
6	34	14+30 RT	CB	0.18	0.4	44.5	14	NA	NA	NA	**NO**	1.89	1.51	2.60	1.57	GS	

2GI = 2 GRATED INLET
SBG = SHOULDER BERM GUTTER
CB = CATCH BASIN
DDB = DRY DETENTION BASIN
B = BASIN
GS = GRASS SWALE

BDOS = BERM DRAINAGE OUTLET STRUCTURE
OTCB = OPEN THROAT CATCH BASIN
OPEN = OPEN END PIPE
PSH = PRE FORMED SCOUR HOLE
LS = LEVEL SPREADER

20 23

R-2809A Wake Forest Bypass. Affected Buffer Areas **Site #3**

Date: 8/15/2007
Dsn. By: FFF
Check: SDG

Discharge is considered to be treated if it meets the following criteria:
100 ft. of grass swale for every 1 acre of drainage area. AND
2 yr. velocity is less than or equal to 2 ft./sec.

SHT.	Structure	Station	Type	Total D.A. ha	Total D.A. (ac)	Required length for treatment (ft.)	Required length for treatment (m.)	Actual Length (m)	Channel Slope (m/m)	Side Slopes	Treated Discharge?	Q2 cfs	Q2 vel. fps	Q10 cfs	Q10 vel. fps	Treatment Provided	Remarks
12	95	11+00	2GI	0.2	0.5	46.5	14	60	.029	4:1/6:1	**YES**	0.12	1.97	0.17	2.03	GS	
12	96	10+90	2GI	0.2	0.6	56.8	17	75	.029	4:1/6:1	**YES**	0.15	1.97	0.21	2.03	GS	

2GI = 2 GRATED INLET
SBG = SHOULDER BERM GUTTER
CB = CATCH BASIN
DDB = DRY DETENTION BASIN
B = BASIN
GS = GRASS SWALE

BDOS = BERM DRAINAGE OUTLET STRUCTURE
OTCB = OPEN THROAT CATCH BASIN
OPEN = OPEN END PIPE
PSH = PRE FORMED SCOUR HOLE
LS = LEVEL SPREADER

R-2809A Wake Forest Bypass. Affected Buffer Areas

Discharge is considered to be treated if it meets the following criteria:
100 ft. of grass swale for every 1 acre of drainage area. AND
2 yr. velocity is less than or equal to 2 ft./sec.

Site @ End R-2809A &Begin R-2809B @ Existing RCBC

Dsn. By: FFF
Check: SDG
Date: 8/15/2007

SHT.	Structure	Station	Type	Total D.A. ha	Total D.A. (ac)	Required length for treatment (ft.)	Required length for treatment (m.)	Actual Length (m)	Channel Slope (m/m)	Side Slopes	Treated Discharge?	Q2 cfs	Q2 vel. fps	Q10 cfs	Q10 vel. fps	Treatment Provided	Remarks
10	72	26+60 rt	2GI	0.42	1.0	103.8	32	160	0.018	4:1/2:1	**YES**	0.19	1.5	0.26	2.2	GS	
10	73	26+60 lt.	2GI	0.79	2.0	195.2	60	160	0.018	4:1/2:1	**YES**	0.26	1.8	0.35	2.2	GS	
10	74	27+70 lt.	2GI	0.44	1.1	108.7	33	110	0.018	4:1/2:1	**YES**	0.21	1.7	0.29	2.2	GS	
10	75	27+70 lt.	Open	OFFSITE DRAINAGE								0.00		0.00			
10	76	27+70 rt.	2GI	0.44	1.1	108.7	33	110	0.018	4:1/2:1	**YES**	0.14	0.9	0.20	1.1	GS	
10	169	29+20 rt.	2GI	0.46	1.1	113.7	35	140	0.018	4:1/2:1	**YES**	0.15	0.9	0.21	1.1	GS	
11	77	30+00 Lt.	2GI	0.33	0.8	81.5	25	200	0.018	4:1/2:1	**YES**	0.13	1.8	0.17	2.2	GS	
11	78	30+00 Med	CB	0.09	0.2	21.5	7	0			**NO**	0.05		0.06		CD	*
11	79	30+00 Rt.	2GI	0.69	1.7	170.5	52	200	0.018	4:1/2:1	**YES**	0.34	2.0	0.46	2.3	GS	
11	83	30+80 Rt.	2GI	0.12	0.3	29.7	9	100	0.003	4:1/2:1	**YES**	0.06	0.3	0.09	0.8	GS	
11	80	31+02 Med	CB	0.15	0.4	37.1	11	0			**NO**	0.08		0.11		CD	*
11	81	31+02 Lt.	2GI	0.33	0.8	81.5	25	100	0.003	4:1/2:1	**YES**	0.23	0.4	0.31	0.9	GS	
11	170	10+60 -Y9-RT	CB	0.18	0.4	44.5	14	0			**	0.00	0.0	0.00	0.0	**SEE 172	
11	171	10+60 -Y9-LT	CB	0.03	0.1	7.4	2	0			**	0.00	0.0	0.00	0.0	**SEE 172	
11	172	10+50-Y9-LT	OUTLET	0.21	0.5	51.9	16	57	0.018	4:1/2:1	**YES**	0.20	0.4	3.03	0.9	GS	

*STRUCTURE NO.'S 78 & 83 OUTLET INTO A DITCH WITH THREE PROPOSED CHECK DAMS. THESE DAMS REDUCE THE SLOPE OF THE DITCH TO ACHIEVE 2.0'/SEC AND THEREFORE TREATMENT OF THESE INLETS. THE REQUIRED LENGTH OF TREATMENT FOR THESE TWO INLETS IS 18M. THE ACTUAL LENGTH IS 23M.

2GI = 2 GRATED INLET
SBG = SHOULDER BERM GUTTER
CB = CATCH BASIN
DDB = DRY DETENTION BASIN
B = BASIN
GS = GRASS SWALE

BDOS = BERM DRAINAGE OUTLET STRUCTURE
OTCB = OPEN THROAT CATCH BASIN
OPEN = OPEN END PIPE
PSH = PRE FORMED SCOUR HOLE
LS = LEVEL SPREADER
CD= CHECK DAMS

List of Property Owners:

SITE #	PROPERTY OWNER	ADDRESSES
1	NCDOT	
2	NCDOT	
3	PRISCILLA ROLLS	7104 THOMPSON MILL ROAD WAKE FOREST, NC 27587

NC DEPARTMENT OF TRANSPORTION
DIVISION OF HIGHWAYS
WAKE COUNTY
34503.1.1 (R-2809A)
WAKE FOREST BYPASS

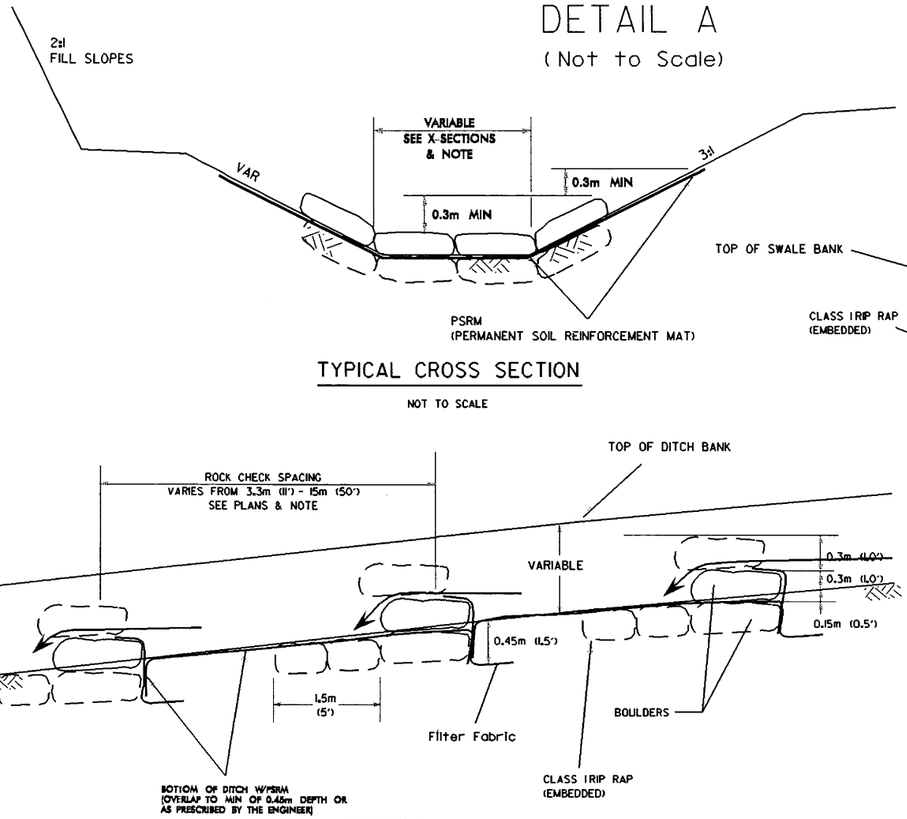
R-2809C - Revised

REVISIONS

	SHEET NO.
R-2809A	2-L
	HYDRAULICS ENGINEER

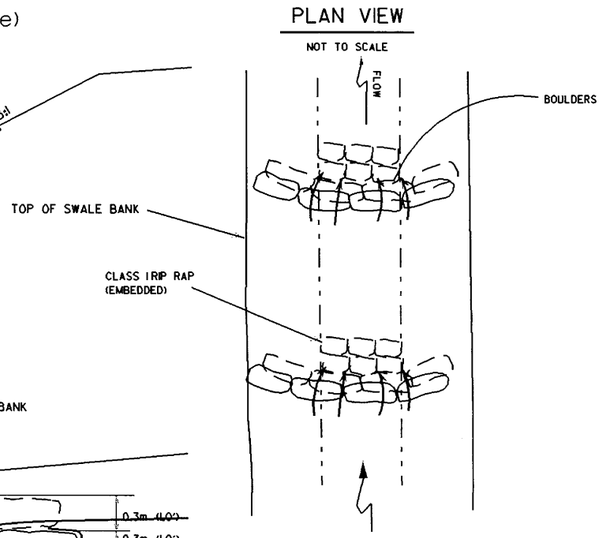
LATERAL SWALE/DITCH W/ROCK CHECKS
STA 82+21 TO 82+95 -L- RT
& STA 83+80 TO STA 84+20 -L- LT

DETAIL A
(Not to Scale)



TYPICAL CROSS SECTION

NOT TO SCALE



PROFILE

NOT TO SCALE

NOTE:

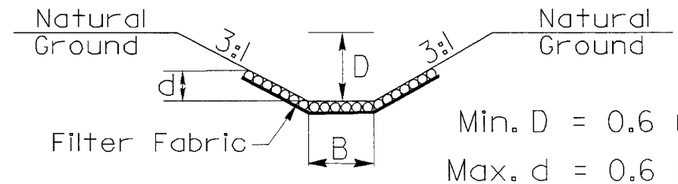
BOULDERS SHOULD BE ANGULAR AND OBLONG WITH APPROXIMATE DIMENSIONS OF 0.6m x 0.45m x 0.45m (2' x 1.5' x 1.5'). ROCK SHOULD FIT TIGHTLY TOGETHER WITH MINIMAL VOIDS. STAGGER BOULDER JOINTS.

ROCK CHECK SPACING IS DEPENDENT ON DITCH GRADES AT 1' DROP INTERVALS OR SLOPE CONTROL.

DITCH WIDTHS VARY. WIDEN TO EXTENT PRACTICAL WITHIN R/W LIMITS. SEE X-SECTIONS.

STANDARD BASE DITCH
STA 85+36 TO 85+51 -L- LT
STA 85+80 TO 86+36 -L- LT

DETAIL B
STANDARD BASE DITCH
(Not to Scale)



Min. D = 0.6 m

Max. d = 0.6 m

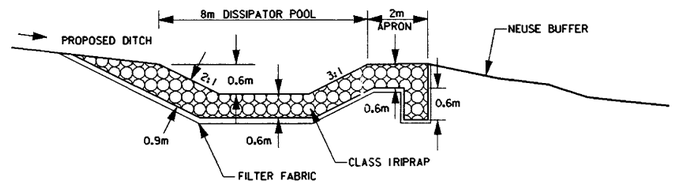
B = 1.5-2.4 m

* When B is < 1.8m

Type of Liner = CLASS IRIP RAP

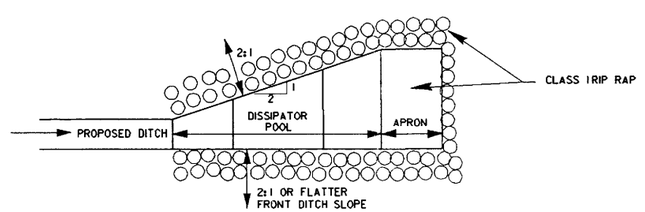
NOT TO SCALE

DETAIL C
ENERGY DISSIPATOR



PROFILE

NOT TO SCALE



PLAN VIEW

NOT TO SCALE

Sta 84+30-L-LT.

7/2/99

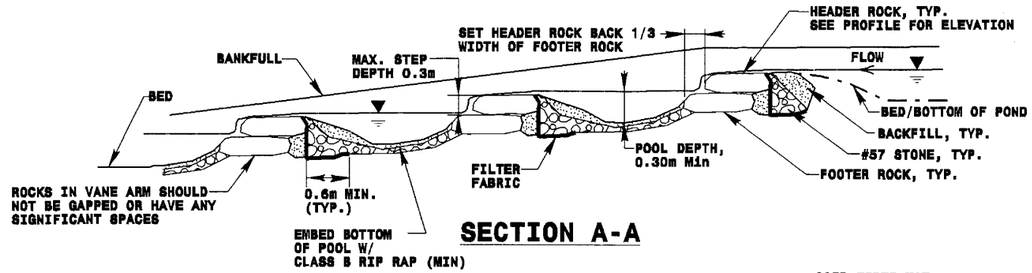
REVISIONS

R-2809C
Sta 84+63 to 84+80 -L- Lt

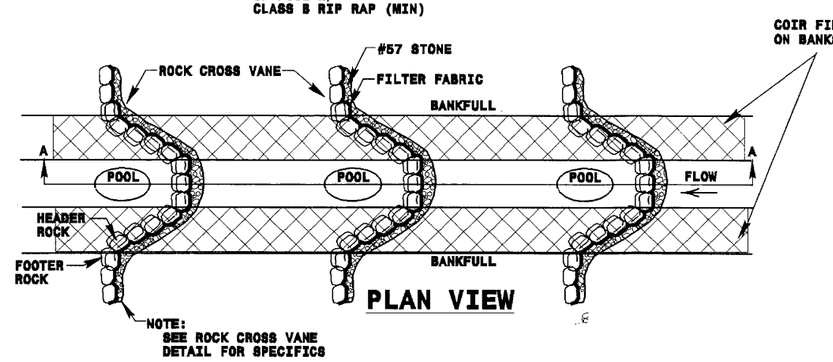
PROJECT REFERENCE NO.	SHEET NO.
R-2809A	2-M
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

STEP POOL DETAIL

NOT TO SCALE



SECTION A-A

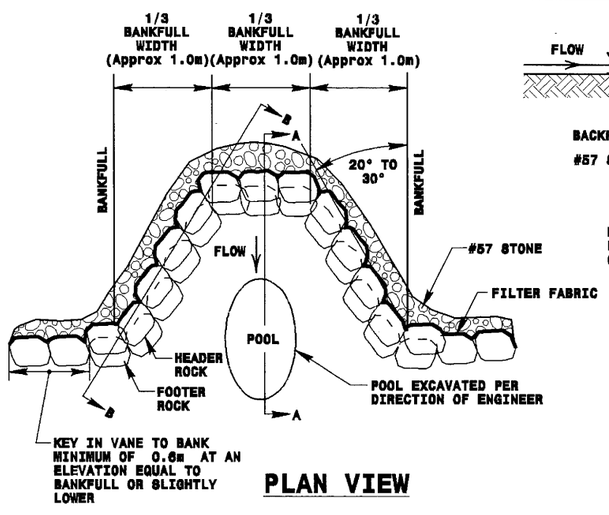


PLAN VIEW

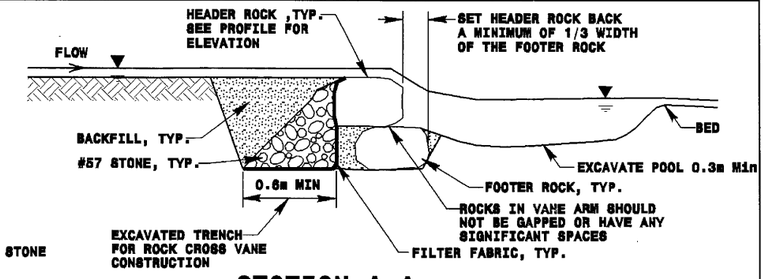
NOTES:
1. STEPS TO BE SHORT, FREQUENT, AND CLOSELY SPACED.
2. POOL SPACING SHALL BE INVERSELY PROPORTIONAL TO STREAM SLOPE, AND DIRECTLY PROPORTIONAL TO BANKFULL WIDTH. (APPROX 6.4m)
3. POOL DEPTHS AT BANKFULL ELEVATION SHALL BE TYPICALLY 2 TO 3 TIMES DEEPER THAN STEP DEPTHS AT BANKFULL ELEVATION.
4. ADEQUATE NUMBER OF FOOTER BOULDERS TO BE USED IN ORDER TO HOLD UP THE BOULDERS AT HEAD OF STEPS DURING HIGH ENERGY/HIGH FLOW EVENTS.
5. STEP POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

ROCK CROSS VANE DETAIL FOR STEP POOL

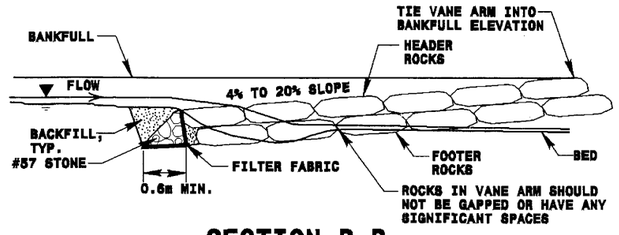
NOT TO SCALE



PLAN VIEW



SECTION A-A



SECTION B-B

	BOULDER DIMENSIONS (meters)		
STATION	HEIGHT	LENGTH	WIDTH
PER VANE	0.6m	0.9m	0.6m

NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BANKFULL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

14-AUG-2007 16:15
r:\drainage\r-2809c supp work\step pool.dgn
$$$$USERNAME$$$$

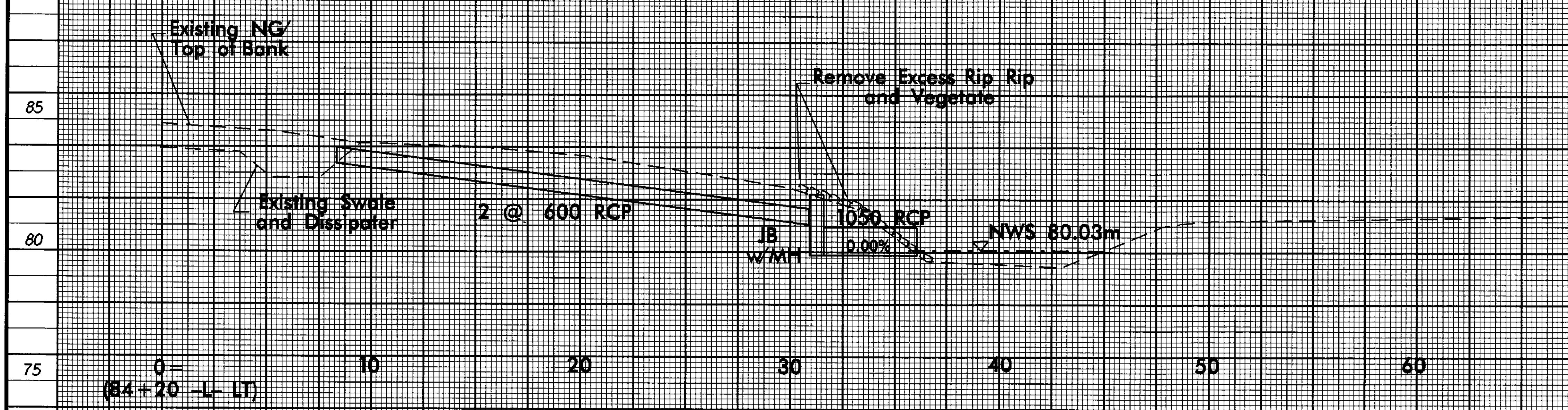
PROJECT REFERENCE NO.	SHEET NO.
R-2809A	2-N
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

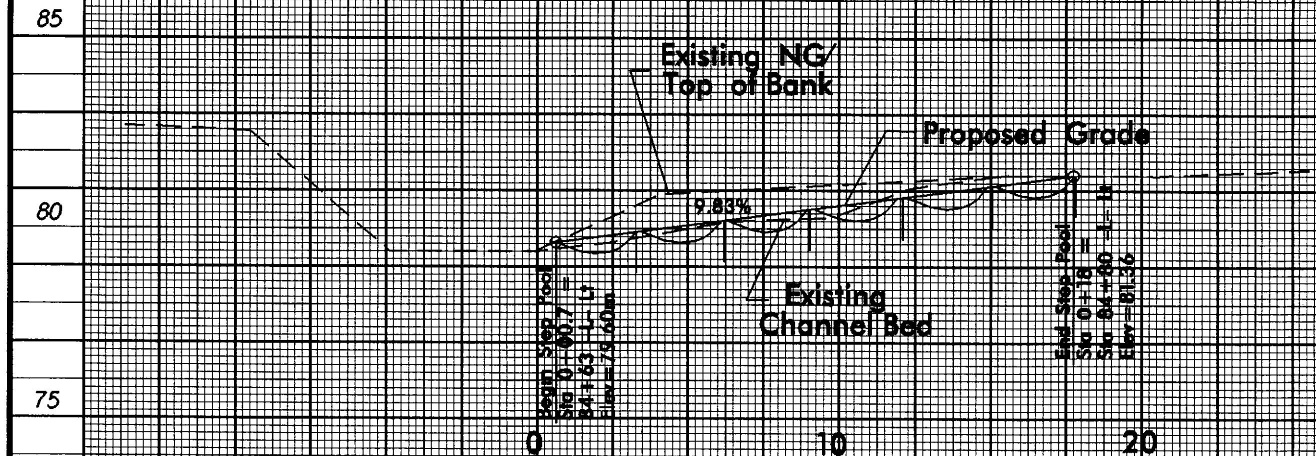
CONST.REV.

R /W REV.

Section at West Bank Drainage System



Stream Step Pool Profile



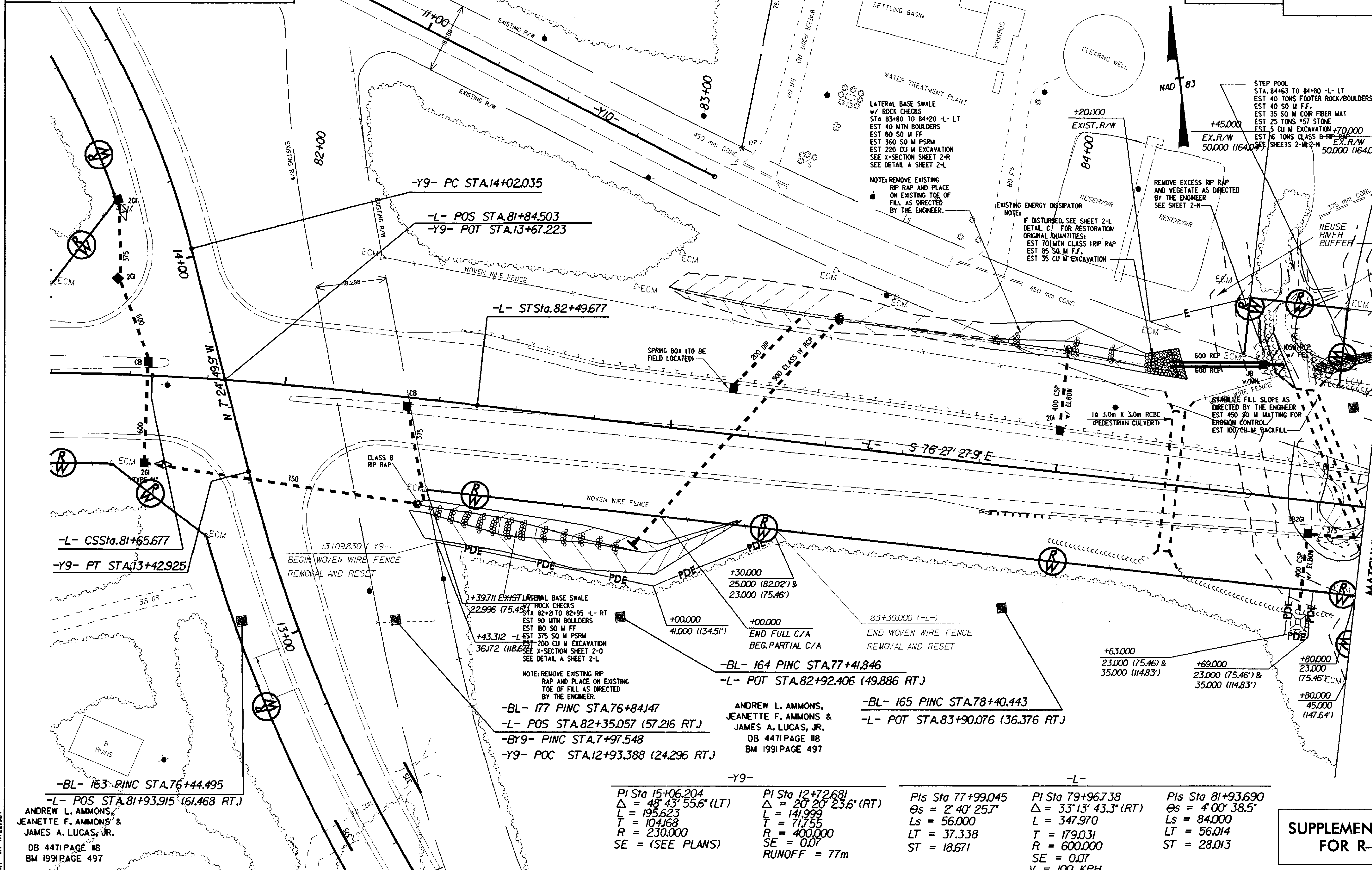
PROJECT REFERENCE NO.	SHEET NO.
R-2809A	2-O
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST.REV.

R/W REV.

REVISIONS



JACK E. NORWOOD &
GLORIA A. NORWOOD
DB 3744 PAGE 80
BM 192 PAGE 212
TOWN OF WAKE FOREST
DB 1400 PAGE 227
BM 1962 PAGE 212
SETTLING BASIN
CLEARING WELL
WATER TREATMENT PLANT
WATER PLANT RD
NAD 83
EXISTING R/W
-Y10-
450 mm CONC
82+00
83+00
84+00
14+00
13+00
11+00
N 7° 24' 49.5" W
S 76° 27' 27.9" E
-L-
LATERAL BASE SWALE
w/ ROCK CHECKS
STA 83+80 TO 84+20 -L- LT
EST 40 MTN BOULDERS
EST 80 SQ M FF
EST 360 SQ M PSRM
EST 220 CU M EXCAVATION
SEE X-SECTION SHEET 2-R
SEE DETAIL A SHEET 2-L
NOTE: REMOVE EXISTING RIP RAP AND PLACE ON EXISTING TOE OF FILL AS DIRECTED BY THE ENGINEER.
STEP POOL
STA. 84+63 TO 84+80 -L- LT
EST 40 TONS FOOTER ROCK/BOULDERS
EST 40 SQ M F.F.
EST 35 SQ M COIR FIBER MAT
EST 25 TONS #57 STONE
EST 5 CU M EXCAVATION
EST 16 TONS CLASS B RIP RAP
SEE SHEETS 2-M, 2-N
+20.000
EXIST. R/W
+45.000
EX. R/W
50.000 (164.04')
+70.000
EX. R/W
50.000 (164.04')
REMOVE EXCESS RIP RAP AND VEGETATE AS DIRECTED BY THE ENGINEER
SEE SHEET 2-N
RESERVOIR
EXISTING ENERGY DISSIPATOR
NOTE:
IF DISTURBED, SEE SHEET 2-L DETAIL C FOR RESTORATION
ORIGINAL QUANTITIES:
EST 70 MTN CLASS I RIP RAP
EST 85 SQ M F.F.
EST 35 CU M EXCAVATION
NEUSE RIVER BUFFER
375 mm CONC
-Y9- PC STA.14+02.035
-L- POS STA.81+84.503
-Y9- POT STA.13+67.223
-L- ST Sta.82+49.677
WOVEN WIRE FENCE
SPRING BOX (TO BE FIELD LOCATED)
200 DIP
900 CLASS IV RCP
600 RCP
1 @ 3.0m X 3.0m RCBC (PEDESTRIAN CULVERT)
STABILIZE FILL SLOPE AS DIRECTED BY THE ENGINEER
EST 450 SQ M MATTING FOR EROSION CONTROL
EST 100 CU M BACKFILL
MATCHLINE -L- STA. 84+80.000
SEE SHEET 2-O
CLASS B RIP RAP
-L- CS Sta.81+65.677
-Y9- PT STA.13+42.925
13+09.830 (-Y9-)
BEGIN WOVEN WIRE FENCE REMOVAL AND RESET
+39.711 EXIST
22.996 (75.45')
+43.312 -L-
36.172 (118.67')
LATERAL BASE SWALE
w/ ROCK CHECKS
STA 82+21 TO 82+95 -L- RT
EST 90 MTN BOULDERS
EST 180 SQ M FF
EST 375 SQ M PSRM
EST 200 CU M EXCAVATION
SEE X-SECTION SHEET 2-O
SEE DETAIL A SHEET 2-L
NOTE: REMOVE EXISTING RIP RAP AND PLACE ON EXISTING TOE OF FILL AS DIRECTED BY THE ENGINEER.
+00.000
41.000 (134.51')
+30.000
25.000 (82.02') &
23.000 (75.46')
+00.000
END FULL C/A
BEG. PARTIAL C/A
83+30.000 (-L-)
END WOVEN WIRE FENCE REMOVAL AND RESET
+63.000
23.000 (75.46') &
35.000 (114.83')
+69.000
23.000 (75.46') &
35.000 (114.83')
+80.000
23.000
(75.46')
+80.000
45.000
(147.64')
-BL- 164 PINC STA.77+41.846
-L- POT STA.82+92.406 (49.886 RT.)
-BL- 165 PINC STA.78+40.443
-L- POT STA.83+90.076 (36.376 RT.)
-BL- 177 PINC STA.76+84.147
-L- POS STA.82+35.057 (57.216 RT.)
-BY9- PINC STA.7+97.548
-Y9- POC STA.12+93.388 (24.296 RT.)
ANDREW L. AMMONS,
JEANETTE F. AMMONS &
JAMES A. LUCAS, JR.
DB 4471 PAGE 118
BM 1991 PAGE 497
-BL- 163 PINC STA.76+44.495
-L- POS STA.81+93.915 (61.468 RT.)
ANDREW L. AMMONS,
JEANETTE F. AMMONS &
JAMES A. LUCAS, JR.
DB 4471 PAGE 118
BM 1991 PAGE 497
B RUINS

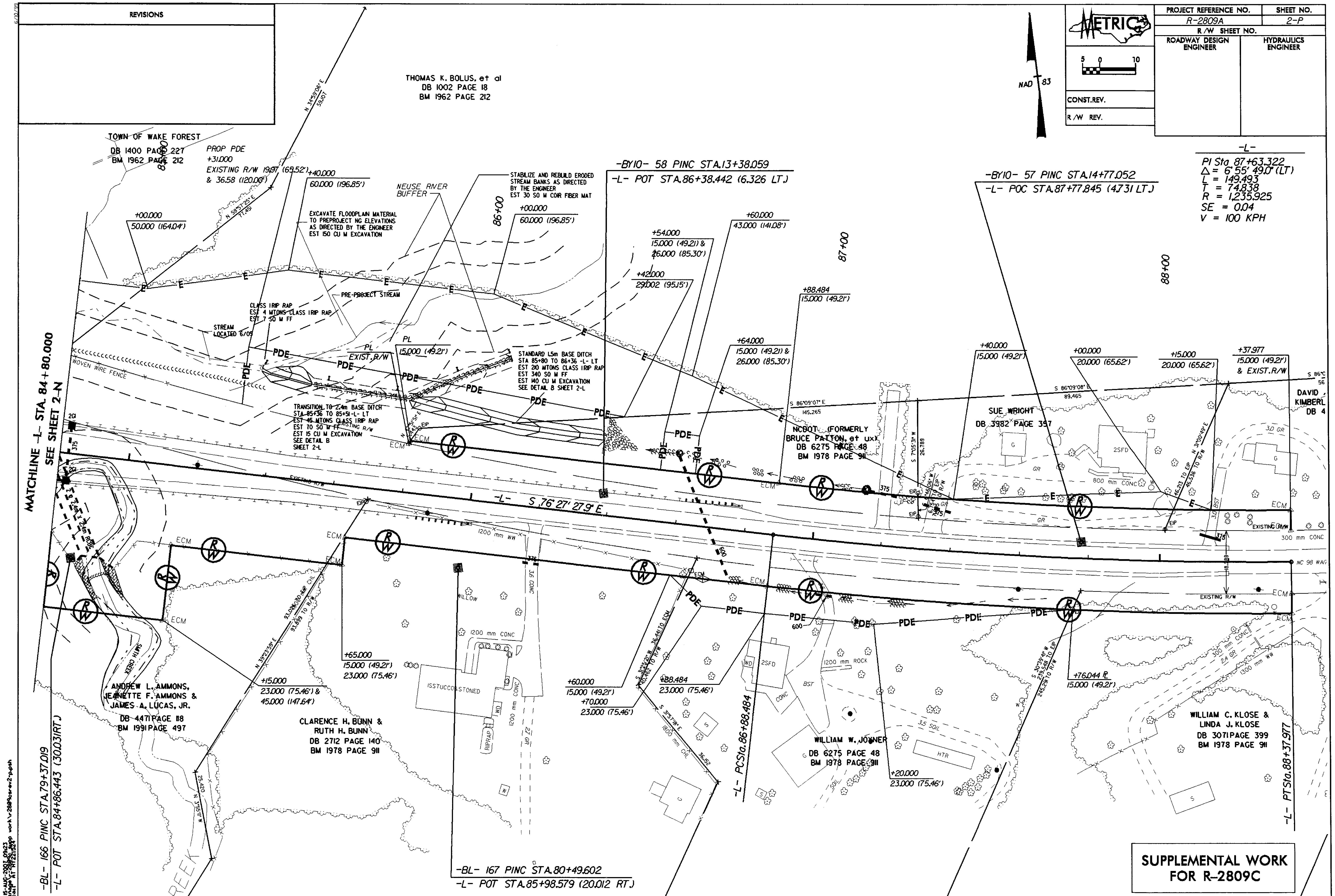
-Y9-

PI Sta 15+06.204	PI Sta 12+72.681
Δ = 48° 43' 55.6" (LT)	Δ = 20° 20' 23.6" (RT)
L = 195.623	L = 141.999
T = 104.168	T = 71.755
R = 230.000	R = 400.000
SE = (SEE PLANS)	SE = 0.07
	RUNOFF = 77m

-L-

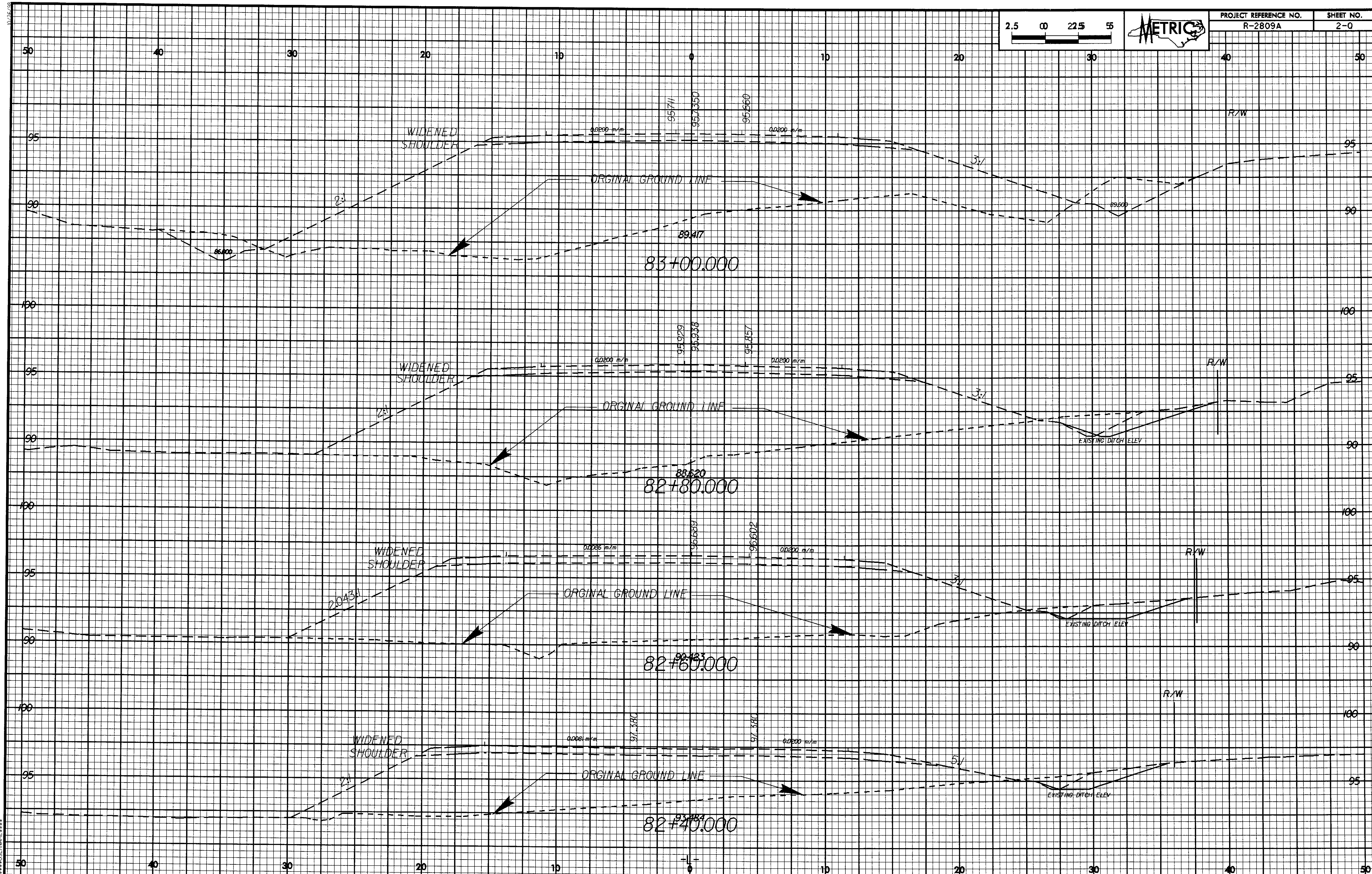
PIs Sta 77+99.045	PI Sta 79+96.738	PIs Sta 81+93.690
θs = 2° 40' 25.7"	Δ = 33° 13' 43.3" (RT)	θs = 4° 00' 38.5"
Ls = 56.000	L = 347.970	Ls = 84.000
LT = 37.338	T = 179.031	LT = 56.014
ST = 18.671	R = 600.000	ST = 28.013
	SE = 0.07	
	V = 100 KPH	

SUPPLEMENTAL WORK FOR R-2809C

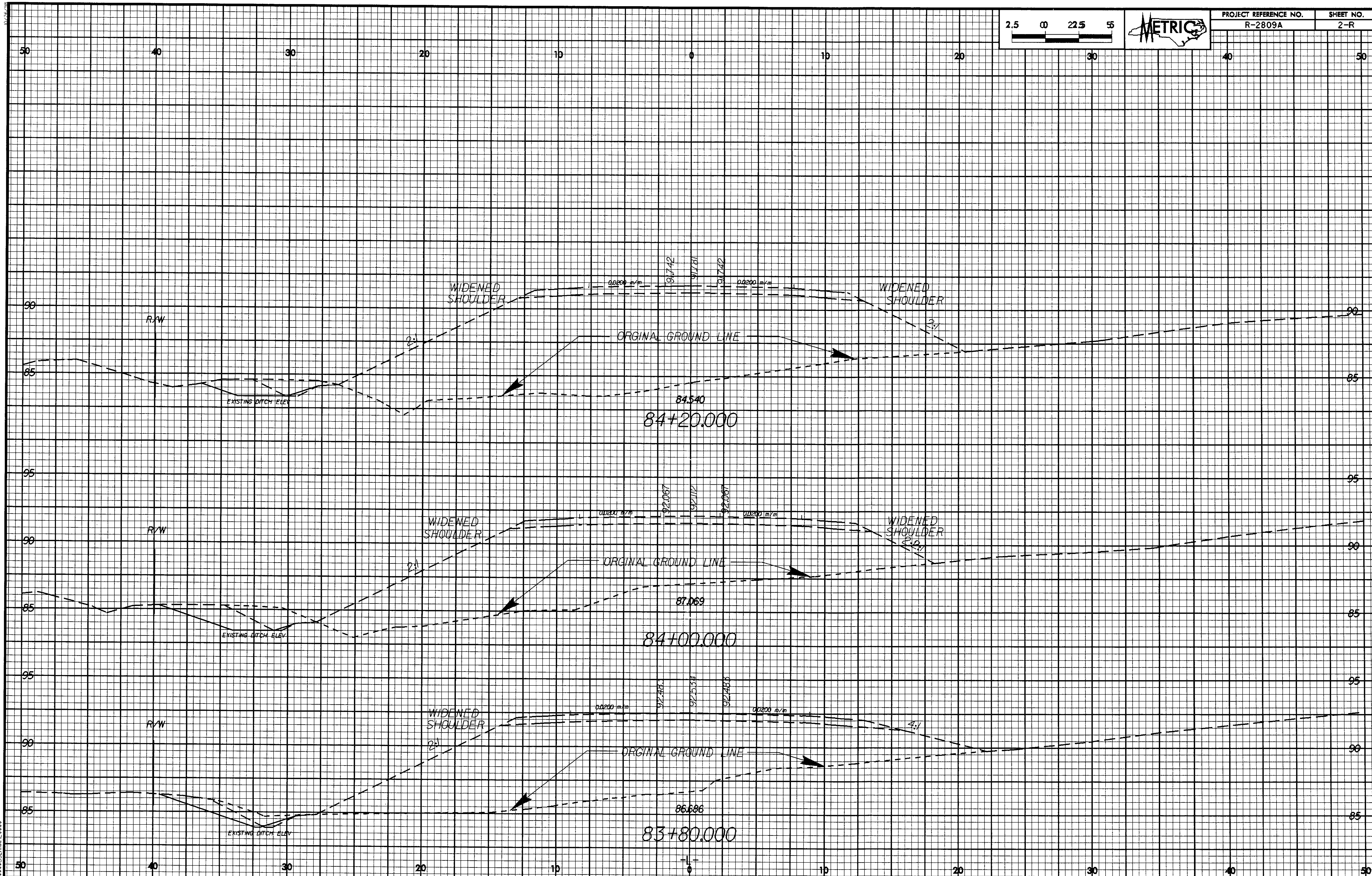

REVISIONS
PROJECT REFERENCE NO. R-2809A
SHEET NO. 2-P
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV.
R/W REV.
NAD 83
THOMAS K. BOLUS, et al
DB 1002 PAGE 18
BM 1962 PAGE 212
TOWN OF WAKE FOREST
DB 1400 PAGE 227
BM 1962 PAGE 212
PROP PDE
EXISTING R/W
NEUSE RIVER BUFFER
STABILIZE AND REBUILD ERODED STREAM BANKS AS DIRECTED BY THE ENGINEER
EST 30 SQ M COIR FIBER MAT
EXCAVATE FLOODPLAIN MATERIAL TO PREPROJECT NG ELEVATIONS AS DIRECTED BY THE ENGINEER
EST 150 CU M EXCAVATION
PRE-PROJECT STREAM
STREAM LOCATED 6/05
WOVEN WIRE FENCE
STANDARD 1.5m BASE DITCH
SEE DETAIL B SHEET 2-L
SEE DETAIL B SHEET 2-L
-BY10- 58 PINC STA.13+38.059
-L- POT STA.86+38.442 (6.326 LT.)
-BY10- 57 PINC STA.14+77.052
-L- POC STA.87+77.845 (4.731 LT.)
-L-
PI Sta 87+63.322
Δ = 6° 55' 49.0" (LT)
L = 149.493
T = 74.838
R = 1,235.925
SE = 0.04
V = 100 KPH
MATCHLINE -L- STA. 84+80.000
SEE SHEET 2-N
-L- S 76° 27' 27.9" E
NCDOT (FORMERLY BRUCE PATTON, et ux)
DB 6275 PAGE 48
BM 1978 PAGE 911
SUE WRIGHT
DB 3982 PAGE 357
DAVID KIMBERL
ANDREW L. AMMONS, JEANETTE F. AMMONS & JAMES A. LUCAS, JR.
DB 4471 PAGE 118
BM 1991 PAGE 497
CLARENCE H. BUNN & RUTH H. BUNN
DB 2712 PAGE 140
BM 1978 PAGE 911
WILLIAM W. JOYNER
DB 6275 PAGE 48
BM 1978 PAGE 911
WILLIAM C. KLOSE & LINDA J. KLOSE
DB 3071 PAGE 399
BM 1978 PAGE 911
-BL- 166 PINC STA.79+37.019
-L- POT STA.84+86.443 (30.031 RT.)
-BL- 167 PINC STA.80+49.602
-L- POT STA.85+98.579 (20.012 RT.)
-L- PCSta.86+88.484
-L- PTSta.88+37.977
SMITH CREEK
NC 98 WAIT
SUPPLEMENTAL WORK FOR R-2809C

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	2-Q

METRIC



14-AUG-2007 16:12


PROJECT REFERENCE NO.
R-2809A
SHEET NO.
2-R
METRIC
2.5 0 2.5 5
WIDENED SHOULDER
ORGINAL GROUND LINE
R/W
2:1
0.0200 m/m
91.742
91.781
91.742
EXISTING DITCH ELEV
84.540
84+20.000
92.067
92.112
92.067
87.069
84+00.000
92.483
92.534
92.483
4:1
86.686
83+80.000
95
90
85
50
40
30
20
10
0

CONTRACT: C201737 TIP PROJECT: R-2809A

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbology
See Sheet 1-C & 1-D For Survey Control Sheets

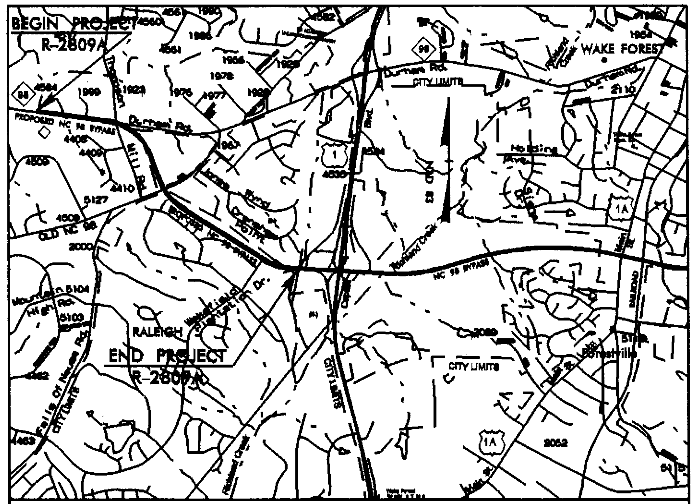
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WAKE COUNTY

METRIC

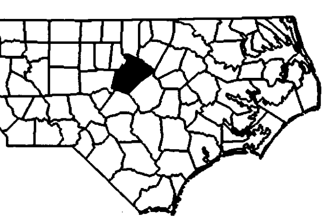
ALL DIMENSIONS IN THESE PLANS ARE IN METERS OR MILLIMETERS UNLESS OTHERWISE SHOWN

STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	R-2809A		1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION		
34503.1.1	STP-98(1)	PE		
34503.2.5	STP-98(2)	R/W & UTIL		
34503.3.7	STP-98(23)	CONST.		

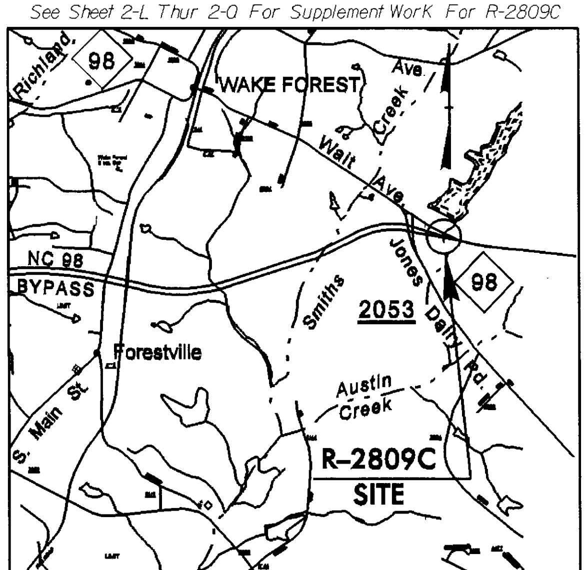


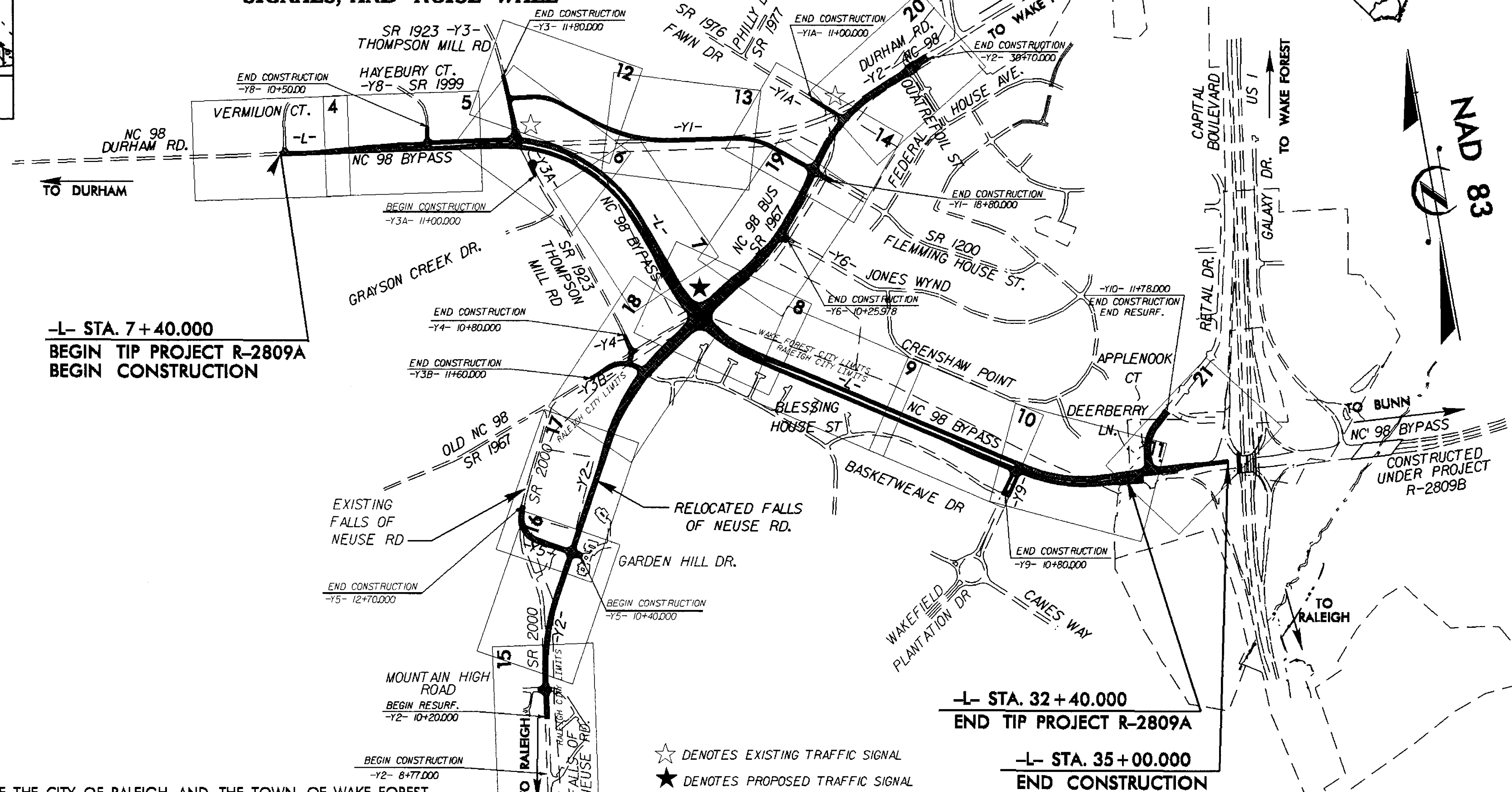
LOCATION: NC 98 (WAKE FOREST BYPASS) FROM WEST OF SR 1923 (THOMPSON MILL ROAD) TO WEST OF US 1 (CAPITAL BLVD.) AND SUPPLEMENTAL WORK FOR R-2809C EAST OF SR 2053 (JONES DAIRY ROAD)

TYPE OF WORK: GRADING, DRAINAGE, PAVING, TRAFFIC SIGNALS, AND NOISE WALL



See Sheet 2-L Thur 2-Q For Supplement Work For R-2809C





PORTIONS OF THIS PROJECT FALLS WITHIN THE BOUNDARIES OF THE CITY OF RALEIGH AND THE TOWN OF WAKE FOREST

GRAPHIC SCALES

5 0 10 — PLANS

5 0 10 — PROFILE (HORIZONTAL)

1 0 2 — PROFILE (VERTICAL)

DESIGN DATA

ADT 2007 = 24,100
ADT 2025 = 36,500
DHV = 10 %
D = 60 %
T = 6 % *
V = 100 km/h

* (TTST 2% & DUAL 4%)

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2809A = 2.500 km
TOTAL LENGTH OF TIP PROJECT R-2809A= 2.500 km

Prepared In the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh, NC 27610

2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JUNE 30, 2005

LETTING DATE: DECEMBER 18, 2007

JASON MOORE, PE
PROJECT ENGINEER

KEVIN E. MOORE, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

P.E.
STATE HIGHWAY DESIGN ENGINEER

14-AUG-2007 07:33
9/09/99

Note: Not to Scale

***S.U.E. = Subsurface Utility Engineering**

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

METRIC

PROJ. REFERENCE NO.	SHEET NO.
R-2809A	1-B

CONVENTIONAL PLAN SHEET SYMBOLS

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin — EIP
- Property Corner
- Property Monument — ECM
- Parcel/Sequence Number — 123
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary — WLB
- Proposed Wetland Boundary — WLB
- Existing Endangered Animal Boundary — EAB
- Existing Endangered Plant Boundary — EPB

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign — S
- Well — W
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream — JS
- Buffer Zone 1 — BZ 1
- Buffer Zone 2 — BZ 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch — FLOW
- False Sump

RAILROADS:

- Standard Gauge — CSX TRANSPORTATION
- RR Signal Milepost — MILEPOST 35
- Switch — SWITCH
- RR Abandoned
- RR Dismantled

RIGHT OF WAY:

- Baseline Control Point
- Existing Right of Way Marker
- Existing Right of Way Line
- Proposed Right of Way Line
- Proposed Right of Way Line with Iron Pin and Cap Marker
- Proposed Right of Way Line with Concrete or Granite Marker
- Existing Control of Access
- Proposed Control of Access
- Existing Easement Line — E
- Proposed Temporary Construction Easement — E
- Proposed Temporary Drainage Easement — TDE
- Proposed Permanent Drainage Easement — PDE
- Proposed Permanent Utility Easement — PUE

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut — C
- Proposed Slope Stakes Fill — F
- Proposed Wheel Chair Ramp — WCR
- Proposed Wheel Chair Ramp Curb Cut — WCC
- Curb Cut for Future Wheel Chair Ramp — CCFR
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard — Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert — CONC
- Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR:

- Head and End Wall — CONC HW
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB — CB
- Paved Ditch Gutter
- Storm Sewer Manhole — S
- Storm Sewer — S

UTILITIES:

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole — P
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole — H
- H-Frame Pole
- Recorded U/G Power Line — P
- Designated U/G Power Line (S.U.E.*) — P

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole — T
- Telephone Booth
- Telephone Pedestal — T
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole — H
- Recorded U/G Telephone Cable — T
- Designated U/G Telephone Cable (S.U.E.*) — T
- Recorded U/G Telephone Conduit — TC
- Designated U/G Telephone Conduit (S.U.E.*) — TC
- Recorded U/G Fiber Optics Cable — T FO
- Designated U/G Fiber Optics Cable (S.U.E.*) — T FO

WATER:

- Water Manhole — W
- Water Meter
- Water Valve
- Water Hydrant
- Recorded U/G Water Line — W
- Designated U/G Water Line (S.U.E.*) — W
- Above Ground Water Line — A/G Water

TV:

- TV Satellite Dish
- TV Pedestal — C
- TV Tower
- U/G TV Cable Hand Hole — H
- Recorded U/G TV Cable — TV
- Designated U/G TV Cable (S.U.E.*) — TV
- Recorded U/G Fiber Optic Cable — TV FO
- Designated U/G Fiber Optic Cable (S.U.E.*) — TV FO

GAS:

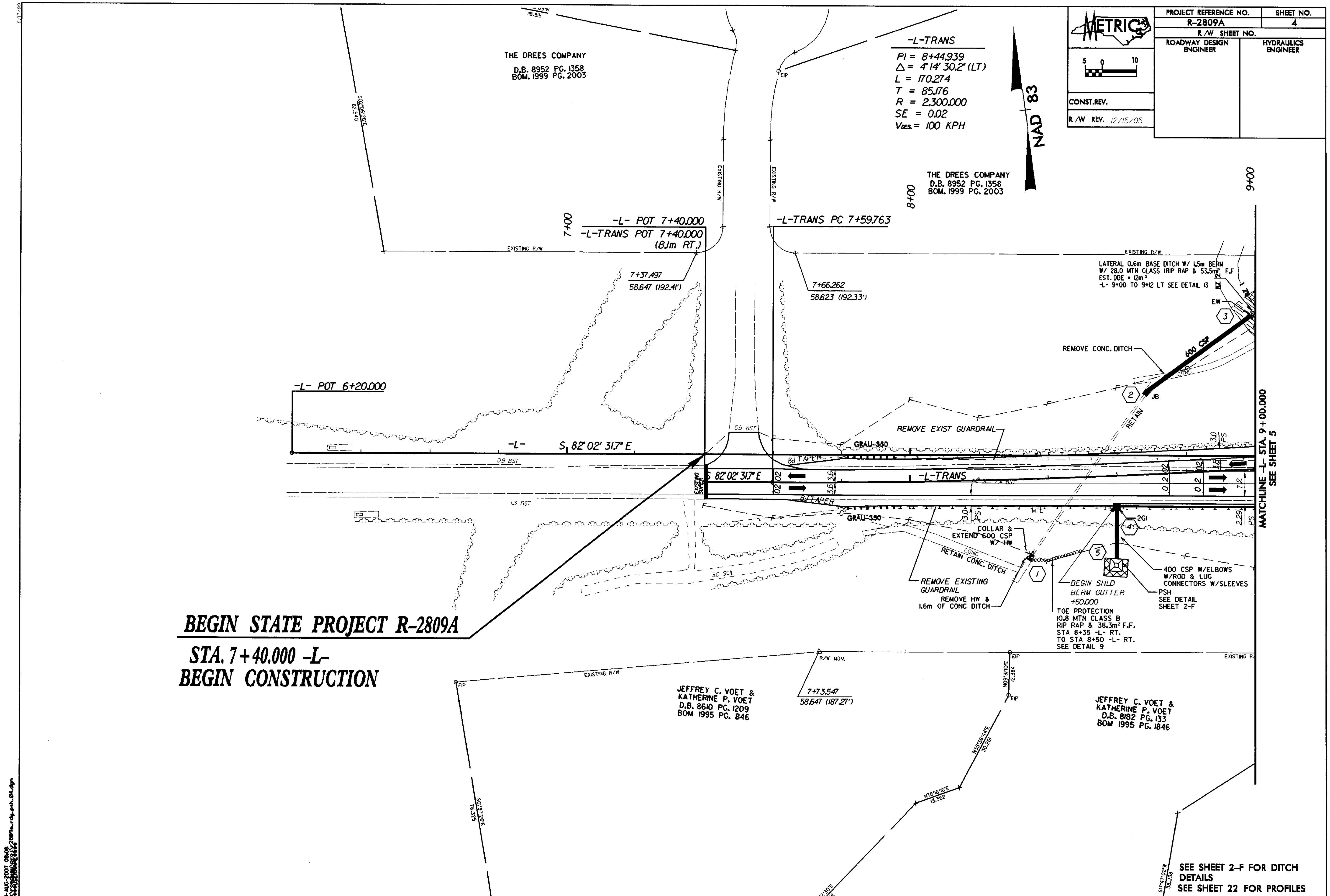
- Gas Valve
- Gas Meter
- Recorded U/G Gas Line — G
- Designated U/G Gas Line (S.U.E.*) — G
- Above Ground Gas Line — A/G Gas

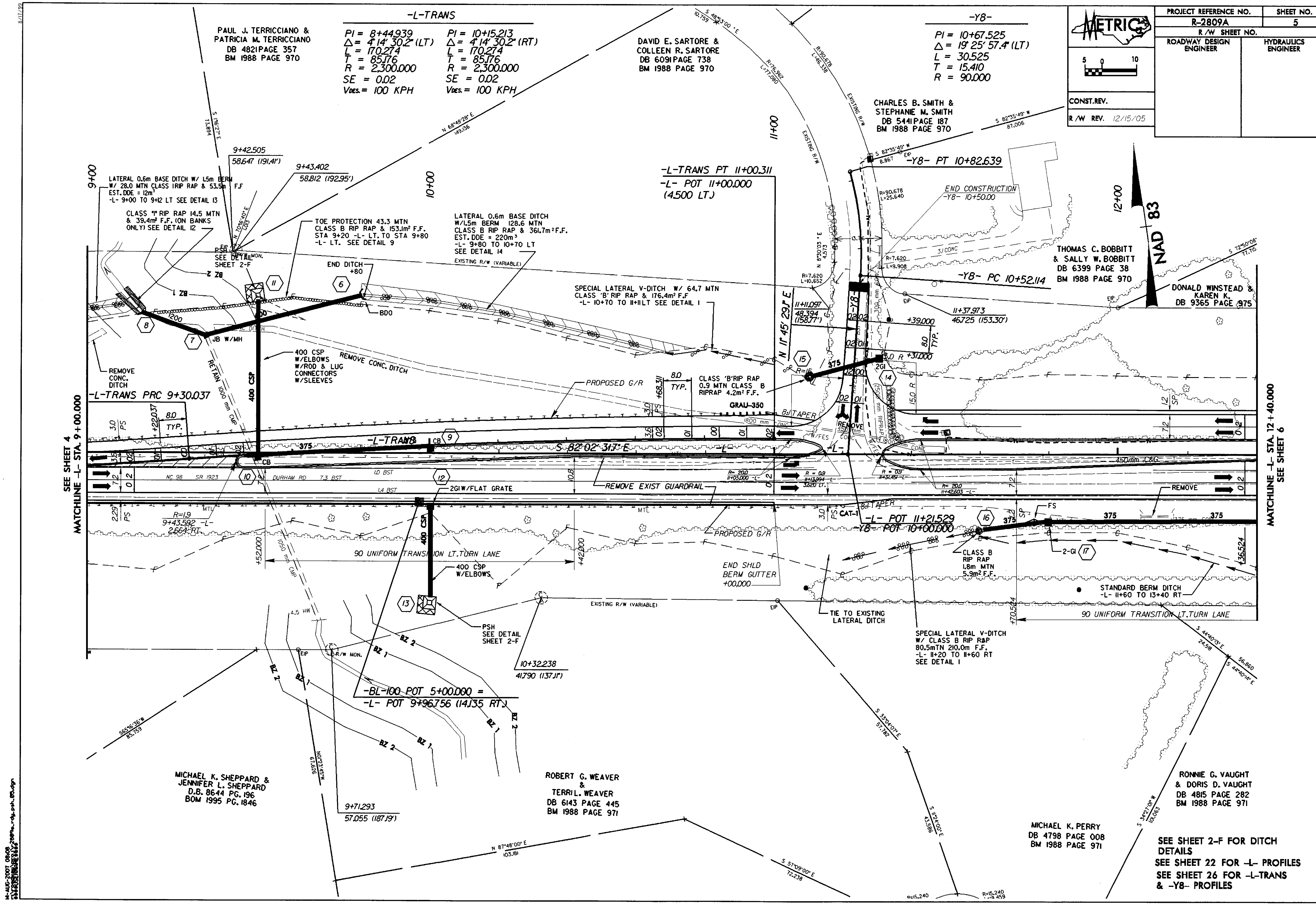
SANITARY SEWER:

- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line — SS
- Above Ground Sanitary Sewer — A/G Sanitary Sewer
- Recorded SS Forced Main Line — FSS
- Designated SS Forced Main Line (S.U.E.*) — FSS

MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box — S
- Utility Unknown U/G Line — ?UTL
- U/G Tank; Water, Gas, Oil
- A/G Tank; Water, Gas, Oil
- U/G Test Hole (S.U.E.*)
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.


METRIC
PROJECT REFERENCE NO.
R-2809A
SHEET NO.
4
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV. 12/15/05
NAD 83
-L-TRANS
PI = 8+44.939
△ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
VDES. = 100 KPH
THE DREES COMPANY
D.B. 8952 PG. 1358
BOM. 1999 PG. 2003
THE DREES COMPANY
D.B. 8952 PG. 1358
BOM. 1999 PG. 2003
-L- POT 7+40.000
-L-TRANS POT 7+40.000
(8.1m RT.)
-L-TRANS PC 7+59.763
7+37.497
58.647 (192.41')
7+66.262
58.623 (192.33')
-L- POT 6+20.000
-L-
S 82° 02' 31.7" E
S 82° 02' 31.7" E
-L-TRANS
EXISTING R/W
LATERAL 0.6m BASE DITCH W/ 1.5m BERM
W/ 28.0 MTN CLASS I RIP RAP & 53.5m² F.F
EST. DDE = 12m³
-L- 9+00 TO 9+12 LT SEE DETAIL 13
REMOVE CONC. DITCH
600 CSP
REMOVE EXIST GUARDRAIL
GRAU-350
RETAIN
MATCHLINE -L- STA. 9+00.000
SEE SHEET 5
COLLAR &
EXTEND 600 CSP
W/ HW
RETAIN CONC. DITCH
REMOVE EXISTING
GUARDRAIL
REMOVE HW &
1.6m OF CONC DITCH
BEGIN SHLD
BERM GUTTER
+60.000
TOE PROTECTION
10.8 MTN CLASS B
RIP RAP & 38.3m² F.F.
STA 8+35 -L- RT.
TO STA 8+50 -L- RT.
SEE DETAIL 9
400 CSP W/ELBOWS
W/ROD & LUG
CONNECTORS W/SLEEVES
PSH
SEE DETAIL
SHEET 2-F
2GI
BEGIN STATE PROJECT R-2809A
STA. 7+40.000 -L-
BEGIN CONSTRUCTION
R/W MON.
7+73.547
58.647 (187.27')
JEFFREY C. VOET &
KATHERINE P. VOET
D.B. 8610 PG. 1209
BOM 1995 PG. 1846
JEFFREY C. VOET &
KATHERINE P. VOET
D.B. 8182 PG. 133
BOM 1995 PG. 1846
SEE SHEET 2-F FOR DITCH
DETAILS
SEE SHEET 22 FOR PROFILES


PROJECT REFERENCE NO. R-2809A
SHEET NO. 5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST. REV.
R/W REV. 12/15/05
-L-TRANS
PI = 8+44.939 Δ = 4° 14' 30.2" (LT) L = 170.274 T = 85.176 R = 2,300.000 SE = 0.02 Vdes = 100 KPH
PI = 10+15.213 Δ = 4° 14' 30.2" (RT) L = 170.274 T = 85.176 R = 2,300.000 SE = 0.02 Vdes = 100 KPH
-Y8-
PI = 10+67.525 Δ = 19° 25' 57.4" (LT) L = 30.525 T = 15.410 R = 90.000
PAUL J. TERRICCIANO & PATRICIA M. TERRICCIANO DB 4821 PAGE 357 BM 1988 PAGE 970
DAVID E. SARTORE & COLLEEN R. SARTORE DB 6091 PAGE 738 BM 1988 PAGE 970
CHARLES B. SMITH & STEPHANIE M. SMITH DB 5441 PAGE 187 BM 1988 PAGE 970
THOMAS C. BOBBITT & SALLY W. BOBBITT DB 6399 PAGE 38 BM 1988 PAGE 970
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
MICHAEL K. SHEPPARD & JENNIFER L. SHEPPARD D.B. 8644 PG. 196 BOM 1995 PG. 1846
ROBERT G. WEAVER & TERRI L. WEAVER DB 6143 PAGE 445 BM 1988 PAGE 971
MICHAEL K. PERRY DB 4798 PAGE 008 BM 1988 PAGE 971
RONNIE G. VAUGHT & DORIS D. VAUGHT DB 4815 PAGE 282 BM 1988 PAGE 971
-L-TRANS PT 11+00.311
-L- POT 11+00.000 (4.500 LT.)
-Y8- PT 10+82.639
-Y8- PC 10+52.114
END CONSTRUCTION -Y8- 10+50.00
-L-TRANS PRC 9+30.037
-L- POT 11+21.529
-Y8- POT 10+00.000
-BL-100 POT 5+00.000 = -L- POT 9+96.756 (14.135 RT.)
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 28.0 MTN CLASS I RIP RAP & 53.5m² F.F. EST. DDE = 12m³ -L- 9+00 TO 9+12 LT SEE DETAIL 13
CLASS "I" RIP RAP 14.5 MTN & 39.4m² F.F. (ON BANKS ONLY) SEE DETAIL 12
TOE PROTECTION 43.3 MTN CLASS B RIP RAP & 153.1m² F.F. STA 9+20 -L- LT. TO STA 9+80 -L- LT. SEE DETAIL 9
LATERAL 0.6m BASE DITCH W/1.5m BERM 128.6 MTN CLASS B RIP RAP & 361.7m² F.F. EST. DDE = 220m³ -L- 9+80 TO 10+70 LT SEE DETAIL 14
SPECIAL LATERAL V-DITCH W/ 64.7 MTN CLASS 'B' RIP RAP & 176.4m² F.F. -L- 10+70 TO 11+11 LT SEE DETAIL 1
400 CSP W/ELBOWS W/ROD & LUG CONNECTORS W/SLEEVES
REMOVE CONC. DITCH
PROPOSED G/R
REMOVE EXIST GUARDRAIL
CLASS 'B' RIP RAP 0.9 MTN CLASS B RIPRAP 4.2m² F.F.
GRAU-350
2GI W/FLAT GRATE
400 CSP W/ELBOWS
PSH SEE DETAIL SHEET 2-F
90 UNIFORM TRANSITION LT. TURN LANE
END SHLD BERM GUTTER +00.000
TIE TO EXISTING LATERAL DITCH
SPECIAL LATERAL V-DITCH W/ CLASS B RIP RAP 80.5 MTN 210.0m F.F. -L- 11+20 TO 11+60 RT SEE DETAIL 1
CLASS B RIP RAP 1.8m MTN 5.9m² F.F.
STANDARD BERM DITCH -L- 11+60 TO 13+40 RT
EXISTING R/W (VARIABLE)
S 82° 02' 31.7" E
N 11° 45' 29.1" E
NC 98 SR 1923 DURHAM RD
MATCHLINE -L- STA. 9+00.000 SEE SHEET 4
MATCHLINE -L- STA. 12+40.000 SEE SHEET 6
NAD 83
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR -L- PROFILES
SEE SHEET 26 FOR -L-TRANS & -Y8- PROFILES

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST.REV.

R/W REV.

-L-

PIs Sta 13+24.573
Θs = 6° 57' 45.1"
Ls = 96.0
LT = 64.0496
ST = 32.0451

PI Sta 15+42.601
Δ = 50° 26' 54.7" (RT)
L = 347.7947
T = 186.0773
R = 395.0000
SE = 0.08
VDES. = 100 KPH

-L-TRANS

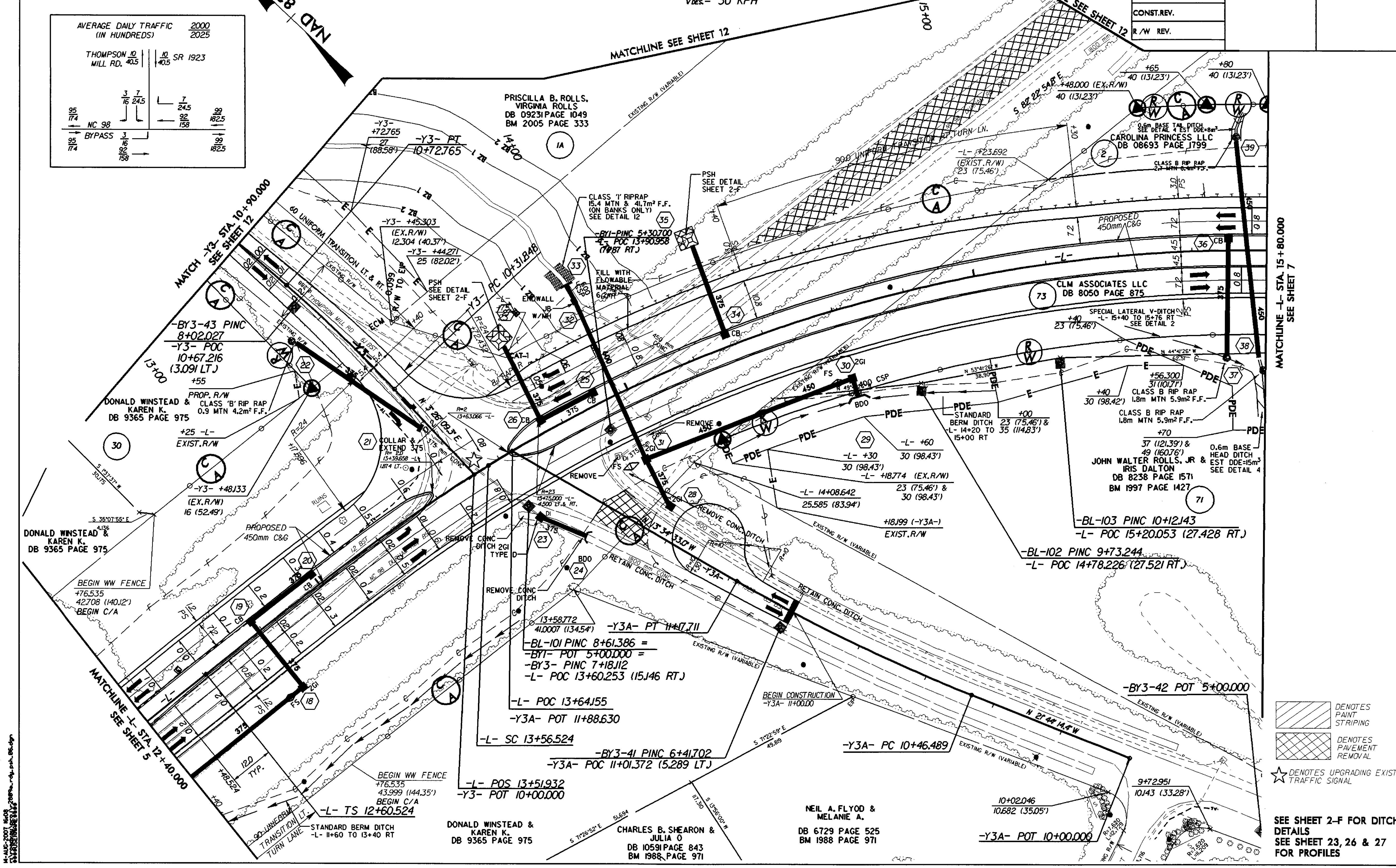
PI Sta 13+22.390
Δ = 10° 02' 47.2" (RT)
L = 70.0497
T = 35.1149
R = 399.5000
SE = 0.08
VDES. = 100 KPH

-Y3-

PI Sta 10+52.324
Δ = 5° 51' 39.5" (LT)
L = 40.9174
T = 20.4765
R = 400.0000
SE = SEE PLANS
VDES. = 30 KPH

-Y3A-

PI Sta 10+82.160
Δ = 8° 09' 41.4" (RT)
L = 71.2225
T = 35.6716
R = 500.0000
SE = SEE PLANS
VDES. = 30 KPH



NAD 83
AVERAGE DAILY TRAFFIC 2000 / 2025 (IN HUNDREDS)
THOMPSON MILL RD.
SR 1923
NC 98 BYPASS
MATCHLINE SEE SHEET 12
MATCHLINE SEE SHEET 12
MATCH -Y3- STA. 10+90.000 SEE SHEET 12
MATCHLINE -L- STA. 15+80.000 SEE SHEET 7
MATCHLINE -L- STA. 12+40.000 SEE SHEET 5
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923 PAGE 1049 BM 2005 PAGE 333
CAROLINA PRINCESS LLC DB 08693 PAGE 1799
CLM ASSOCIATES LLC DB 8050 PAGE 875
JOHN WALTER ROLLS, JR & IRIS DALTON DB 8238 PAGE 1571 BM 1997 PAGE 1427
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
CHARLES B. SHEARON & JULIA O DB 10591 PAGE 843 BM 1988 PAGE 971
NEIL A. FLYOD & MELANIE A. DB 6729 PAGE 525 BM 1988 PAGE 971
-Y3- PT 10+72.765
-BL-103 PINC 10+12.143
-L- POC 15+20.053 (27.428 RT.)
-BL-102 PINC 9+73.244
-L- POC 14+78.226 (27.521 RT.)
-BL-101 PINC 8+61.386 = -BY1- POT 5+00.000 = -BY3- PINC 7+18.112
-L- POC 13+60.253 (15.146 RT.)
-L- POC 13+64.155
-Y3A- POT 11+88.630
-L- SC 13+56.524
-BY3-41 PINC 6+41.702
-Y3A- POC 11+01.372 (5.289 LT.)
-L- POS 13+51.932
-Y3- POT 10+00.000
-L- TS 12+60.524
-Y3A- PT 11+17.711
-Y3A- PC 10+46.489
-Y3A- POT 10+00.000
-BY3-42 POT 5+00.000
-BY3-43 PINC 8+02.027
-Y3- POC 10+67.216 (3.091 LT.)
BEGIN CONSTRUCTION -Y3A- 11+00.00
STANDARD BERM DITCH -L- 11+60 TO 13+40 RT
DENOTES PAINT STRIPING
DENOTES PAVEMENT REMOVAL
DENOTES UPGRADING EXIST. TRAFFIC SIGNAL

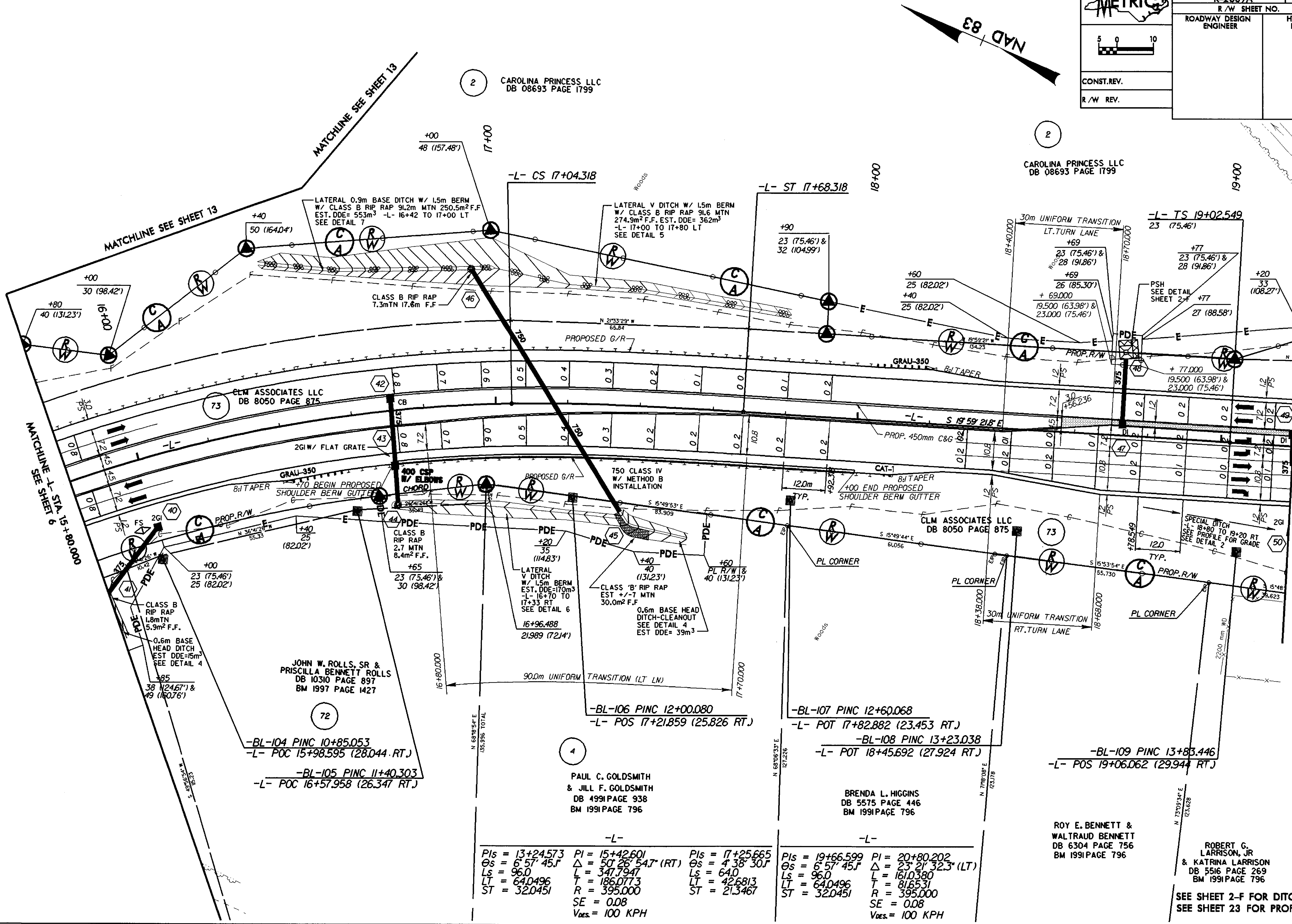
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 23, 26 & 27 FOR PROFILES

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST.REV.

R/W REV.



NAD 83
MATCHLINE SEE SHEET 13
MATCHLINE SEE SHEET 13
CAROLINA PRINCESS LLC
DB 08693 PAGE 1799
CAROLINA PRINCESS LLC
DB 08693 PAGE 1799
-L- CS 17+04.318
-L- ST 17+68.318
-L- TS 19+02.549
LATERAL 0.9m BASE DITCH W/ 1.5m BERM W/ CLASS B RIP RAP 91.2m MTN 250.5m² F.F EST. DDE= 553m³ -L- 16+42 TO 17+00 LT SEE DETAIL 7
LATERAL V DITCH W/ 1.5m BERM W/ CLASS B RIP RAP 91.6 MTN 274.9m² F.F. EST. DDE= 362m³ -L- 17+00 TO 17+80 LT SEE DETAIL 5
CLASS B RIP RAP 7.3mTN 17.6m F.F
30m UNIFORM TRANSITION LT. TURN LANE
PSH SEE DETAIL SHEET 2-F
PROPOSED G/R
CLM ASSOCIATES LLC
DB 8050 PAGE 875
2GI W/ FLAT GRATE
400 CSP W/ ELBOWS
+70 BEGIN PROPOSED SHOULDER BERM GUTTER
750 CLASS IV W/ METHOD B INSTALLATION
+00 END PROPOSED SHOULDER BERM GUTTER
PROP. 450mm C&G
-L- S 19°59'21.8" E
MATCHLINE -L- 19+20.000 SEE SHEET 8
MATCHLINE -L- STA. 15+80.000 SEE SHEET 6
SPECIAL DITCH -L- 18+80 TO 19+20 RT SEE PROFILE FOR GRADE SEE DETAIL 2
CLASS B RIP RAP 1.8mTN 5.9m² F.F.
0.6m BASE HEAD DITCH EST DDE=15m³ SEE DETAIL 4
CLASS B RIP RAP 2.7 MTN 8.4m² F.F.
LATERAL V DITCH W/ 1.5m BERM EST. DDE=170m³ -L- 16+70 TO 17+33 RT SEE DETAIL 6
CLASS 'B' RIP RAP EST +/-7 MTN 30.0m² F.F
0.6m BASE HEAD DITCH-CLEANOUT SEE DETAIL 4 EST DDE= 39m³
PL CORNER
30m UNIFORM TRANSITION RT. TURN LANE
90.0m UNIFORM TRANSITION (LT LN)
JOHN W. ROLLS, SR & PRISCILLA BENNETT ROLLS DB 10310 PAGE 897 BM 1997 PAGE 1427
-BL-104 PINC 10+85.053
-L- POC 15+98.595 (28.044 RT.)
-BL-105 PINC 11+40.303
-L- POC 16+57.958 (26.347 RT.)
-BL-106 PINC 12+00.080
-L- POS 17+21.859 (25.826 RT.)
-BL-107 PINC 12+60.068
-L- POT 17+82.882 (23.453 RT.)
-BL-108 PINC 13+23.038
-L- POT 18+45.692 (27.924 RT.)
-BL-109 PINC 13+83.446
-L- POS 19+06.062 (29.944 RT.)
PAUL C. GOLDSMITH & JILL F. GOLDSMITH DB 4991 PAGE 938 BM 1991 PAGE 796
BRENDA L. HIGGINS DB 5575 PAGE 446 BM 1991 PAGE 796
ROY E. BENNETT & WALTRAUD BENNETT DB 6304 PAGE 756 BM 1991 PAGE 796
ROBERT G. LARRISON, JR & KATRINA LARRISON DB 5516 PAGE 269 BM 1991 PAGE 796

-L-

PIs = 13+24.573	PI = 15+42.601	PIs = 17+25.665
Θs = 6° 57' 45.1"	Δ = 50° 26' 54.7" (RT)	Θs = 4° 38' 30.1"
Ls = 96.0	L = 347.7947	Ls = 64.0
LT = 64.0496	T = 186.0773	LT = 42.6813
ST = 32.0451	R = 395.000	ST = 21.3467
	SE = 0.08	
	V_{DES} = 100 KPH	

-L-

PIs = 19+66.599	PI = 20+80.202
Θs = 6° 57' 45.1"	Δ = 23° 21' 32.3" (LT)
Ls = 96.0	L = 161.0380
LT = 64.0496	T = 81.6531
ST = 32.0451	R = 395.000
	SE = 0.08
	V_{DES} = 100 KPH

SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 23 FOR PROFILE

8-17-99

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST. REV.

R/W REV.

AVERAGE DAILY TRAFFIC (IN HUNDREDS) 2000 / 2025

DURHAM RD. NC 98 BUS — NC 98 BYPASS — SR 2000 — FALLS OF NEUSE RD.

NAD 83

MATCHLINE -L- STA. 19+20.000 SEE SHEET 7

MATCHLINE -Y2- 23+00.000 SEE SHEET 19

MATCHLINE -Y2- 21+00.000 SEE SHEET 18

MATCHLINE -L- STA. 22+60.000 SEE SHEET 9

-BY2-30 PINC 9+00.305
-Y2- POT 22+66.662 (10.961 RT.)

-L- POC 20+40.313
-Y2- POT 21+58.692

-L- CS 21+59.587
PL 36.823 (120.81')

-L- ST 22+55.587
PL 47.451 (155.68')

-BL-110 PINC
Sta.14+43.921

-L- POS
Sta.19+64.932
(31.650 RT.)

-BL-111 PINC 15+08.886 =
-BY2- PINC 7+59.241
-BY2A- PINC 13+74.270
-L- POC 20+25.594 (31.206 RT.)

-BY2-29 PINC 7+39.116
-Y2- POT Sta.21+07.995 (14.847 LT.)

-BL-112 PINC 16+10.618
-L- POC 21+17.699
(5.834 LT.)

-BL-113 PINC 17+10.155
-L- POS 22+18.747 (6.889 LT.)

-Y2-

PIs = 20+25.072
Θs = 4° 00' 38.5"
Ls = 84.0
LT = 56.0144
ST = 28.0131

PIs = 19+66.599
Θs = 6° 57' 45.1"
Ls = 96.0
LT = 64.0496
ST = 32.0451

-L-

PI = 20+80.202
Δ = 23° 21' 32.3" (LT)
L = 161.0380
T = 81.6531
R = 395.000
SE = 0.08
V_DES. = 100 KPH

PIs = 21+91.632
Θs = 6° 57' 45.1"
Ls = 96.0
LT = 64.0496
ST = 32.0451

DENOTES 125mm MONOLITHIC CONC. ISLANDS

DENOTES PAINT STRIPING

DENOTES PAVEMENT REMOVAL

SEE WEDGING DETAIL UNDER ISLAND SHEET 2

SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEETS 24 & 31 FOR PROFILES

14-AUG-2001 08:09

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	9
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC 5 0 10

CONST.REV.

R /W REV.

NAD 83

NORTH HILLS PROPERTIES & NORTH HILLS PROPERTIES
DB 3021PAGE 304
DB 3021PAGE 304

CHUNG HYUN YOO & QK JA YOO
DB 5552 PAGE 830
BM 1988 PAGE 842

RONALD O. WILLIAMS & GRACE E. WILLIAMS
DB 6422 PAGE 807
BM 1988 PAGE 842

RANDOLPH S. GUARD & ERIN O. GUARD
DB 7010 PAGE 448
BM 1989 PAGE 633

ALTON V. SHEFFIELD & IRIS M. SHEFFIELD
DB 4552 PAGE 508
BM 1989 PAGE 633

CAROLINA PRINCESS LLC
DB 08748 PAGE 2595

JUDITH U. GOULD
DB 8489 PAGE 2429

-BL-116 PINC 19+53.227
-L- POT 24+61.845
(4.347 LT.)

-BL-117 PINC 20+65.653
-L- POT 25+74.271
(4.320 LT.)

-BL-114 PINC 18+21.985
-L- POT 23+30.686
(8.9953 LT.)

-BL-115 PINC 18+78.071
-L- POT 23+86.728 (6.764 LT.)

24+57.498
62.949 (206.53')

PL CORNER

EXISTING R/W

LATERAL 0.9m BASE DITCH W/ CLASS B RIP RAP
120.6 MTN 311.7m² F.F.
-L- 23+00 TO 23+60 LT
SEE DETAIL 8

LATERAL V DITCH W/ CLASS B RIP RAP
47.4 MTN 129.1m² F.F
-L- 23+60 TO 23+90 LT
SEE DETAIL 1

CLASS B RIP RAP
2.7 MTN
8.4m² F.F

Woods

90.0m UNIFORM TRANSITION (LT LN'S)

450 CSP

HEADWALL

600

0.6m BASE HEAD DITCH
SEE DETAIL 4
EST DDE= 8m³

LATERAL V-DITCH W/ 1.5m BERM
W/ CLASS B RIP RAP
68.7 MTN 206.2m² F.F.
EST. DDE= 13m³
-L- 24+60 TO 25+20 LT
SEE DETAIL 5

PROPOSED EARTH BERM SLOPE STAKES LIMITS

LATERAL V-DITCH W/ 1.5m BERM
-L- 25+80 TO 28+20 LT
SEE DETAIL 6

FS 12 PS

R/W VARIES

-L- S 57°16'24.3" E

PROP. 450mm C&G

MATCHLINE -L-STA. 22+60.000
SHEET 8

MATCHLINE -L-STA. 26+00.000
SHEET 10

SANDLER at WAKEFIELD,LLC.
CEDAR GROVE, PHASE I
DB 11700, PG0005
BM 2005, PG0858

SANDLER at WAKEFIELD LLC
DB 8363 PG1444
BM 2005 PG0858

BEGIN PROPOSED +40 SHOULDER BERM GUTTER

+40 END PROPOSED SHOULDER BERM GUTTER

CLASS B RIP RAP
EST +/- 2.7 MTN
8.4m² F.F.

CLASS B RIP RAP
2.7m TN
9.2m² F.F.

CLASS B RIP RAP
1.8mTN 5.9m² F.F

TOE PROTECTION CLASS B RIP RAP
36.1MTN 127.6m² F.F.
-L- 23+60 TO 24+10 RT
SEE DETAIL 9

LATERAL V-DITCH
W/ 1.5m BERM
W/ CLASS B RIP RAP
22.9 MTN 68.7m² F.F.
EST. DDE= 44m³
-L- 24+20 TO 24+40 RT
SEE DETAIL 5

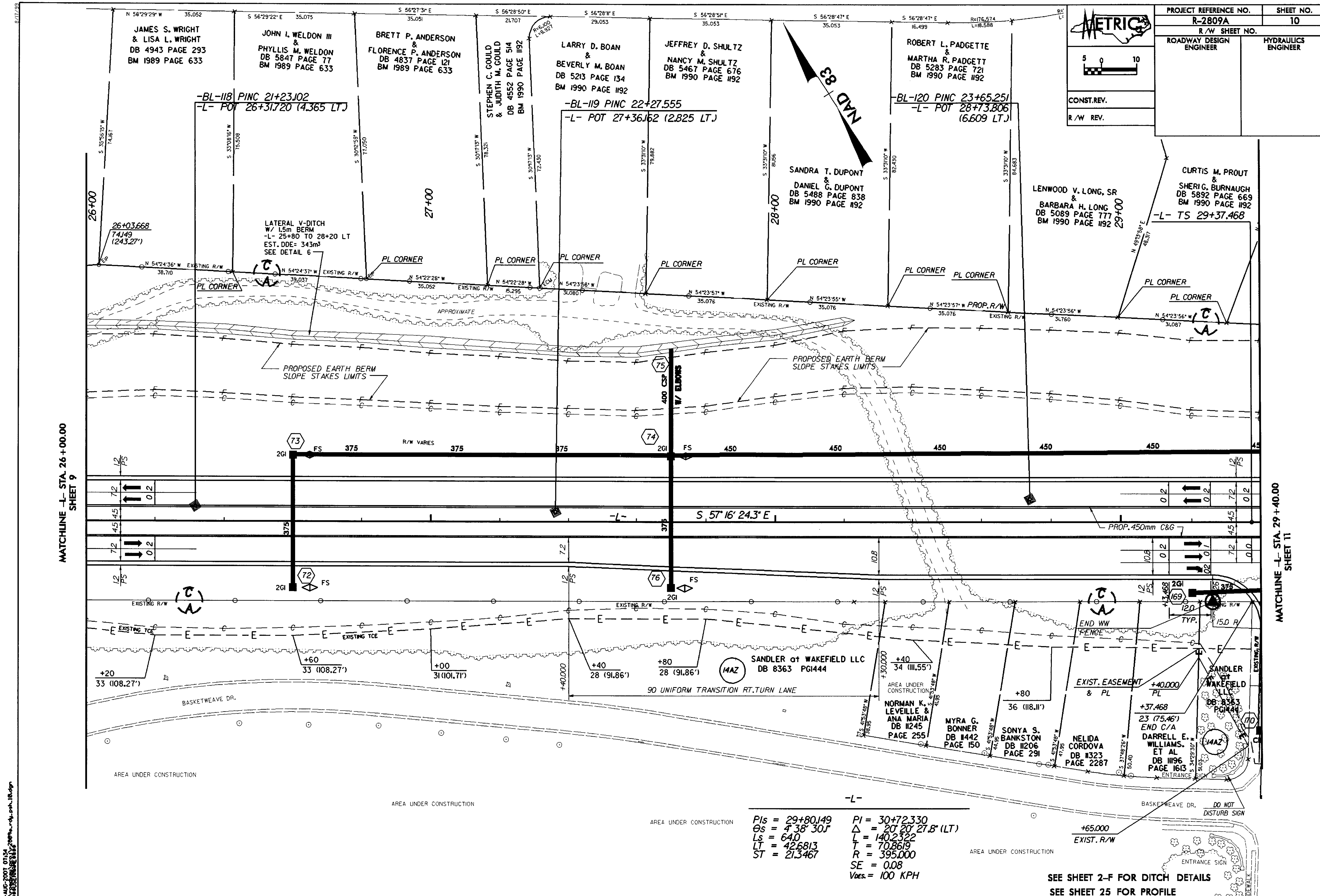
AREA UNDER CONSTRUCTION

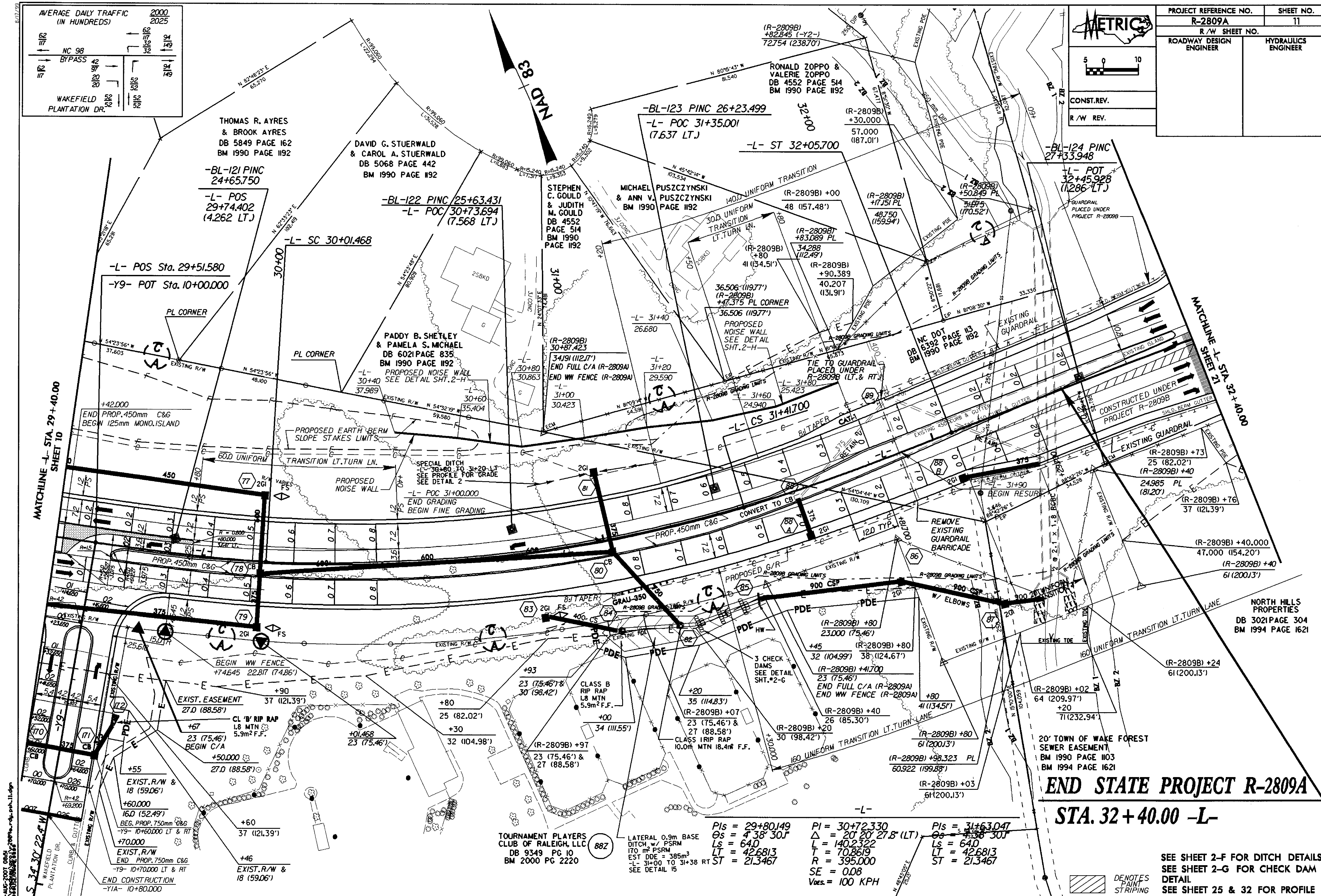
BLESSING HOUSE ST.

BASKETWEAVE DR.

SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 24 FOR PROFILE

4-AUG-2007 07:34


METRIC
PROJECT REFERENCE NO. R-2809A
SHEET NO. 10
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV.
NAD 83
JAMES S. WRIGHT & LISA L. WRIGHT DB 4943 PAGE 293 BM 1989 PAGE 633
JOHN I. WELDON III & PHYLLIS M. WELDON DB 5847 PAGE 77 BM 1989 PAGE 633
BRETT P. ANDERSON & FLORENCE P. ANDERSON DB 4837 PAGE 121 BM 1989 PAGE 633
STEPHEN C. GOULD & JUDITH M. GOULD DB 4552 PAGE 514 BM 1990 PAGE 1192
LARRY D. BOAN & BEVERLY M. BOAN DB 5213 PAGE 134 BM 1990 PAGE 1192
JEFFREY D. SHULTZ & NANCY M. SHULTZ DB 5467 PAGE 676 BM 1990 PAGE 1192
ROBERT L. PADGETTE & MARTHA R. PADGETT DB 5283 PAGE 721 BM 1990 PAGE 1192
SANDRA T. DUPONT & DANIEL G. DUPONT DB 5488 PAGE 838 BM 1990 PAGE 1192
LENWOOD V. LONG, SR & BARBARA H. LONG DB 5089 PAGE 777 BM 1990 PAGE 1192
CURTIS M. PROUT & SHERI G. BURNAUGH DB 5892 PAGE 669 BM 1990 PAGE 1192
-BL-118 PINC 21+23.102 -L- POT 26+31.720 (4.365 LT.)
-BL-119 PINC 22+27.555 -L- POT 27+36.162 (2.825 LT.)
-BL-120 PINC 23+65.251 -L- POT 28+73.806 (6.609 LT.)
-L- TS 29+37.468
26+03.668 74.149 (243.27')
LATERAL V-DITCH W/ 1.5m BERM -L- 25+80 TO 28+20 LT EST. DDE= 343m³ SEE DETAIL 6
PL CORNER
EXISTING R/W
PROP. R/W
APPROXIMATE
PROPOSED EARTH BERM SLOPE STAKES LIMITS
400 CSP W/ ELBOWS
R/W VARIES
2GI FS 375 375 375 450 450 450 450 450
-L- S 57° 16' 24.3" E
PROP. 450mm C&G
MATCHLINE -L- STA. 26+00.00 SHEET 9
MATCHLINE -L- STA. 29+40.00 SHEET 11
EXISTING TCE
+20 33 (108.27')
+60 33 (108.27')
+00 31 (101.71')
+40 28 (91.86')
+80 28 (91.86')
+40.000
90 UNIFORM TRANSITION RT. TURN LANE
SANDLER at WAKEFIELD LLC DB 8363 PG1444
+40 34 (111.55')
+80 36 (118.11')
AREA UNDER CONSTRUCTION
NORMAN K. LEVEILLE & ANA MARIA DB 11245 PAGE 255
MYRA G. BONNER DB 11442 PAGE 150
SONYA S. BANKSTON DB 11206 PAGE 291
NELIDA CORDOVA DB 11323 PAGE 2287
DARRELL E. WILLIAMS. ET AL DB 11196 PAGE 1613
EXIST. EASEMENT & PL
+40.000 PL
+37.468 23 (75.46') END C/A
END WW FENCE
12.0 TYP.
15.0 R
SANDLER at WAKEFIELD LLC DB 8363 PG1444
BASKETWEAVE DR.
ENTRANCE SIGN
DO NOT DISTURB SIGN
+65.000 EXIST. R/W
SIDEWALK
-L-
PIs = 29+80.149
θs = 4° 38' 30.1"
Ls = 64.0
LT = 42.6813
ST = 21.3467
PI = 30+72.330
Δ = 20° 20' 27.8" (LT)
L = 140.2322
T = 70.8619
R = 395.000
SE = 0.08
Vdes. = 100 KPH
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 25 FOR PROFILE



PROJECT REFERENCE NO. R-2809A
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST.REV.
R/W REV.
AVERAGE DAILY TRAFFIC (IN HUNDREDS) 2000 2025
NC 98 BYPASS
WAKEFIELD PLANTATION DR.
NAD 83
THOMAS R. AYRES & BROOK AYRES DB 5849 PAGE 162 BM 1990 PAGE 1192
DAVID G. STUERWALD & CAROL A. STUERWALD DB 5068 PAGE 442 BM 1990 PAGE 1192
STEPHEN C. GOULD & JUDITH M. GOULD DB 4552 PAGE 514 BM 1990 PAGE 1192
MICHAEL PUSZCZYNSKI & ANN V. PUSZCZYNSKI BM 1990 PAGE 1192
RONALD ZOPPO & VALERIE ZOPPO DB 4552 PAGE 514 BM 1990 PAGE 1192
PADDY B. SHETLEY & PAMELA S. MICHAEL DB 6021 PAGE 835 BM 1990 PAGE 1192
NC DOT DB 6392 PAGE 113 BM 1990 PAGE 1192
NORTH HILLS PROPERTIES DB 3021 PAGE 304 BM 1994 PAGE 1621
TOURNAMENT PLAYERS CLUB OF RALEIGH, LLC DB 9349 PG 10 BM 2000 PG 2220
20' TOWN OF WAKE FOREST SEWER EASEMENT BM 1990 PAGE 1103 BM 1994 PAGE 1621
-BL-121 PINC 24+65.750
-L- POS 29+74.402 (4.262 LT.)
-BL-122 PINC 25+63.431
-L- POC 30+73.694 (7.568 LT.)
-BL-123 PINC 26+23.499
-L- POC 31+35.001 (7.637 LT.)
-BL-124 PINC 27+33.948
-L- POT 32+45.928 (1.286 LT.)
-L- SC 30+01.468
-L- ST 32+05.700
-L- CS 31+41.700
-L- POS Sta. 29+51.580
-Y9- POT Sta. 10+00.000
MATCHLINE -L- STA. 29+40.00 SHEET 10
MATCHLINE -L- STA. 32+40.00 SHEET 21
CONSTRUCTED UNDER PROJECT R-2809B
END STATE PROJECT R-2809A
STA. 32+40.00 -L-
-L-
PIs = 29+80.149
Θs = 4° 38' 30.1"
Ls = 64.0
LT = 42.6813
ST = 21.3467
PI = 30+72.330
Δ = 20° 20' 27.8" (LT)
L = 140.2322
T = 70.8619
R = 395.000
SE = 0.08
Vdes = 100 KPH
PIs = 31+63.047
Θs = 4° 38' 30.1"
Ls = 64.0
LT = 42.6813
ST = 21.3467
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 2-G FOR CHECK DAM DETAIL
SEE SHEET 25 & 32 FOR PROFILE
DENOTES PAINT STRIPING

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	12
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST.REV.	
R/W REV.	

METRIC 5 0 10

-Y3-
PI = 10+52.324
Δ = 5° 51' 39.5" (LT)
L = 40.9174
T = 20.4765
R = 400.000
SE = RC
VDES. = 30 KPH

-Y1-
PI = 10+96.735
Δ = 32° 23' 19.6" (RT)
L = 76.3143
T = 39.2068
R = 135.000
SE = 0.03
VDES. = 30 KPH

PI = 13+43.392
Δ = 30° 33' 24.3" (LT)
L = 213.3264
T = 109.2654
R = 400.000
SE = 0.08
VDES. = 80 KPH

PRISCILLA B. ROLLS,
VIRGINIA ROLLS
DB 09231 PAGE 1049
BM 1997 PAGE 62

AVERAGE DAILY TRAFFIC (IN HUNDREDS) 2000 / 2025
SR 1923 — THOMPSON MILL RD. — DURHAM RD. — CONNECTOR

NAD 83

-Y3- POT 12+48.733
-BY3-44 POT 9+59.876
-Y3- POT 12+25.098 (4.978 LT.)

BEGIN CONSTRUCTION -Y3- 11+80.00

CAMILLE E. WINSTON
DB 4829 PAGE 83
BM 1989 PAGE 1241

DONALD WINSTEAD & KAREN K.
DB 9365 PAGE 975

PRISCILLA B. ROLLS, VIRGINIA ROLLS
DB 09231 PAGE 1049
BM 2005 PAGE 333

PRISCILLA B. ROLLS, VIRGINIA ROLLS
DB 09231 PAGE 1049
BM 1997 PAGE 62
(NO CLAIM)

PROPOSED DURHAM ROAD ACCESS

-Y1- PC 12+34.127
9 (29.53')

-Y1- PT 11+33.843
9 (29.53')
16 (52.49')

-Y1- PC 10+57.529
9 (29.53')

-Y1- +23.000
9 (29.53') & 23 (75.46')

-Y1- +30.000
9 (29.53') & 23 (75.46')

-Y1- +35.000
17 (55.77')

-Y1- +24.500
9.000 (29.53')

-Y1- +30.000
18 (59.06')

-Y1- +60
13 (42.65')

-Y3- +78.628
22 (72.18')

-Y3- +81
22 (72.18')

-Y3- +72.507
22 (72.18')

-Y3- +75.869
8.357 (27.42')

-Y3- +86
8.127 (26.66')

-Y3- +69.776
8.495 (27.87') (EX R/W)

-Y3- +70
18 (59.06')

-Y3- +60
20 (65.62')

-Y3- +40 (EX.R/W)
9.124 (29.93')

-Y3- +36.095
12 (39.37')

-Y3- +70
18 (59.055')

-Y3- +05.629
12 (39.37')

-Y3- +34.500
15 (49.21')

-Y3- +57.529
9.000 (29.53')

-Y3- +20.000
9.000 (29.53')

-Y3- +99.432

-Y3- POT 11+19.931
-Y1- POT 10+00.000

-Y3- STA. 10+90.000

+00.000 (EXIST.R/W)
10.075 (33.05ft)
END C/A
END WW FENCE

END WW FENCE
+00 12.47 (40.92')
END C/A

+80 13 (42.65')
+00 16 (52.49')
+00 17 (55.77')
+95 9 (29.53') & 12 (39.37')
+50 20 (65.62')
+33.843 9 (29.53')
+08.772 15 (49.21')
+18.346 (EXIST R/W) 9 (29.53')
+47.738 (EXIST R/W) 9 (29.53')
+59.210 15.244 (50.01')

CLASS B RIP RAP
EST 2.7 MTN
8.4m² F.F.

CLASS B RIP RAP
4.5m TN
13.4m² F.F

CLASS I RIP RAP
8.6 MTN 23.2m² F.F.
(ON BANKS ONLY)
SEE DETAIL 12

CLASS I RIP RAP
3.6 MTN 10.0m F.F.

CLASS I RIP RAP
28.9 MTN 102.1m² F.F.
STA. 12+60 TO 13+00
-Y1- RT
SEE DETAIL 9

LATERAL V-DITCH
W/1.5m BERM W/
CLASS B RIP RAP
33.2 MTN 99.6m² F.F
EST. DDE = 14m³
-Y3- 11+40 TO11+69 LT
SEE DETAIL 5

COLLAR & EXT. W/ 750
-Y3- +80 10.029 (32.91')

COLLAR & EXT. W/ 750
+69.776 8.495 (27.87') (EX R/W)

+40 9.169 (30.08')
+20 9 (29.53')

20 TAPER LT. & RT.

GRAU-350

REMOVE CONC DITCH

TOE PROTECTION
CLASS B RIP RAP
28.9 MTN 102.1m² F.F.
STA. 12+60 TO 13+00
-Y1- RT
SEE DETAIL 9

PROPOSED GUARDRAIL

EXISTING R/W (VARIABLE)

0.188 E/P TO R/W

0.044 E/P TO R/W

MATCHLINE SEE SHEET 6

MATCHLINE -Y3- STA. 10+90.000 SHEET 6

MATCHLINE -Y1- STA. 13+00.000 SHEET 13

MATCHLINE SEE SHEET 6

DENOTES PAVEMENT REMOVAL

SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 27 FOR PROFILES

8/11/23

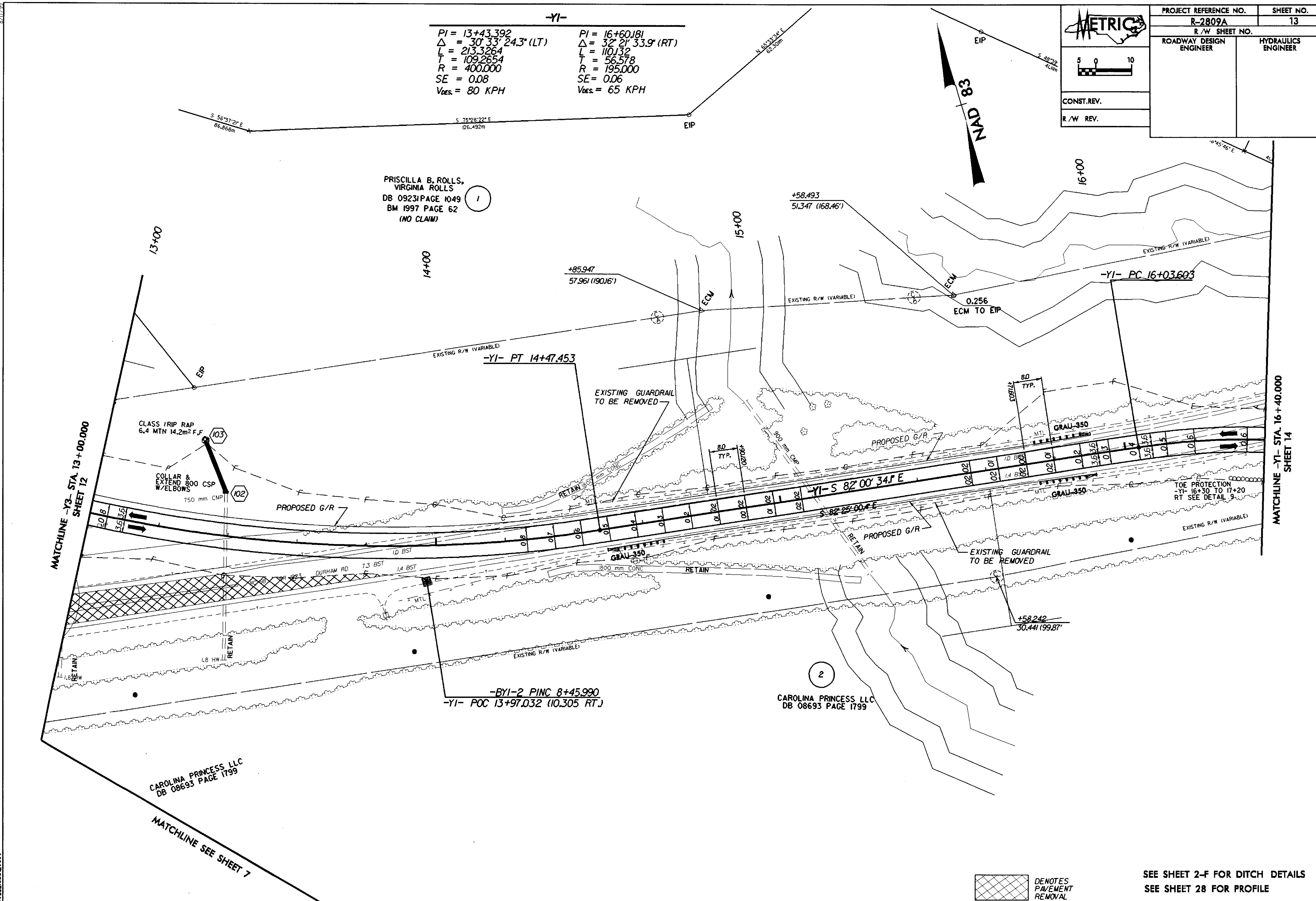
M:\AUC-2007 15.25

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV.

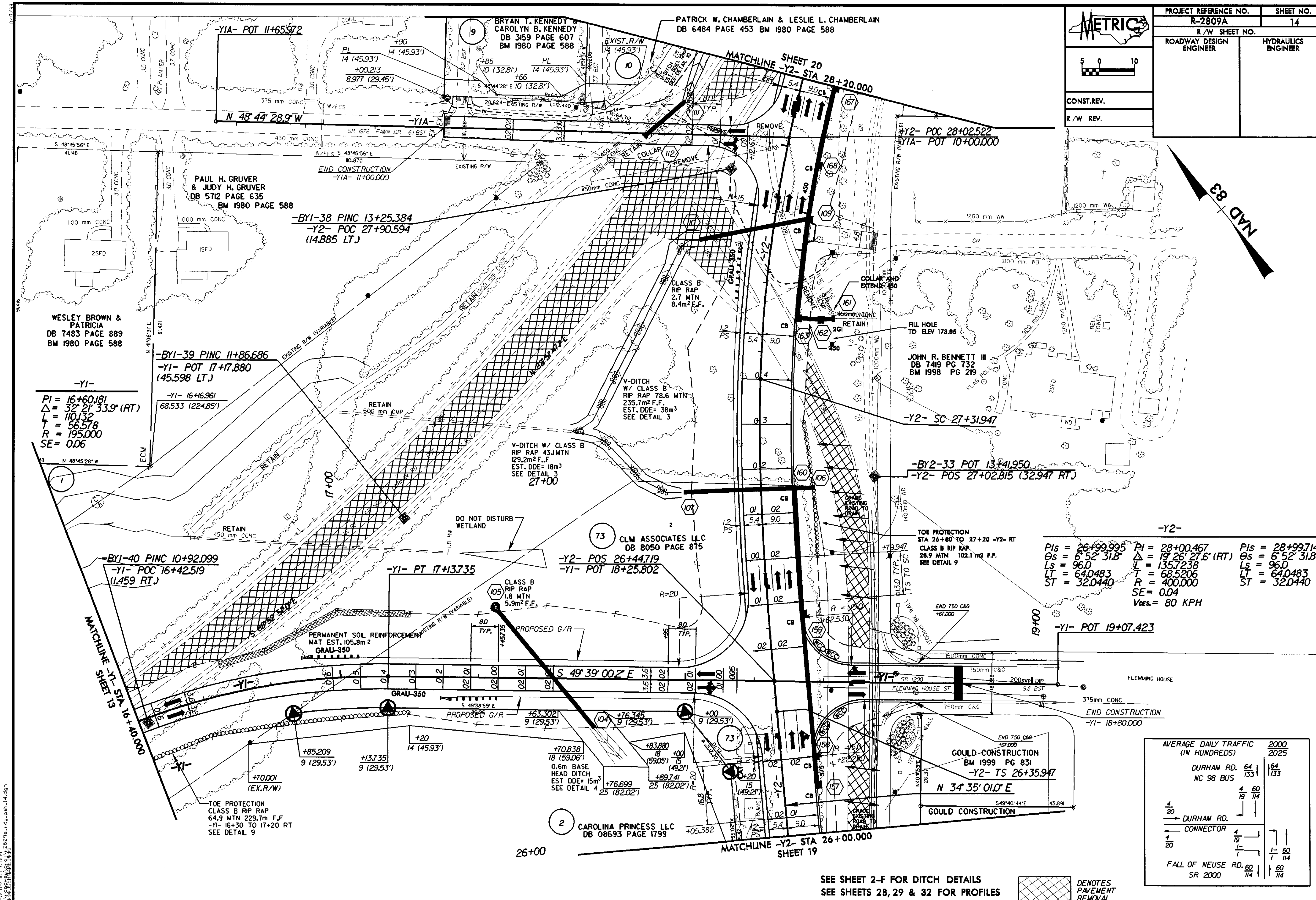


-Y1-
PI = 13+43.392
Δ = 30° 33' 24.3" (LT)
L = 213.3264
T = 109.2654
R = 400.000
SE = 0.08
V DES. = 80 KPH
PI = 16+60.181
Δ = 32° 21' 33.9" (RT)
L = 110.132
T = 56.578
R = 195.000
SE = 0.06
V DES. = 65 KPH
NAD 83
PRISCILLA B. ROLLS,
VIRGINIA ROLLS
DB 09231 PAGE 1049
BM 1997 PAGE 62
(NO CLAIM)
EIP
ECM
+85.947
57.961 (190.16')
+58.493
51.347 (168.46')
0.256
ECM TO EIP
-Y1- PC 16+03.603
-Y1- PT 14+47.453
EXISTING R/W (VARIABLE)
EXISTING GUARDRAIL
TO BE REMOVED
CLASS I RIP RAP
6.4 MTN 14.2m² F.F
COLLAR &
EXTEND 800 CSP
W/ELBOWS
750 mm CMP
PROPOSED G/R
900 mm CMP
GRAU-350
-Y1- S 82° 00' 34.5" E
S 82° 25' 00.4" E
DURHAM RD
TOE PROTECTION
-Y1- 16+30 TO 17+20
RT SEE DETAIL 9
MATCHLINE -Y3- STA. 13+00.000
SHEET 12
MATCHLINE -Y1- STA. 16+40.000
SHEET 14
+58.242
30.441 (99.87')
-BY1-2 PINC 8+45.990
-Y1- POC 13+97.032 (10.305 RT.)
CAROLINA PRINCESS LLC
DB 08693 PAGE 1799
MATCHLINE SEE SHEET 7
13+00
14+00
15+00
16+00
RETAIN
1800 mm CONC

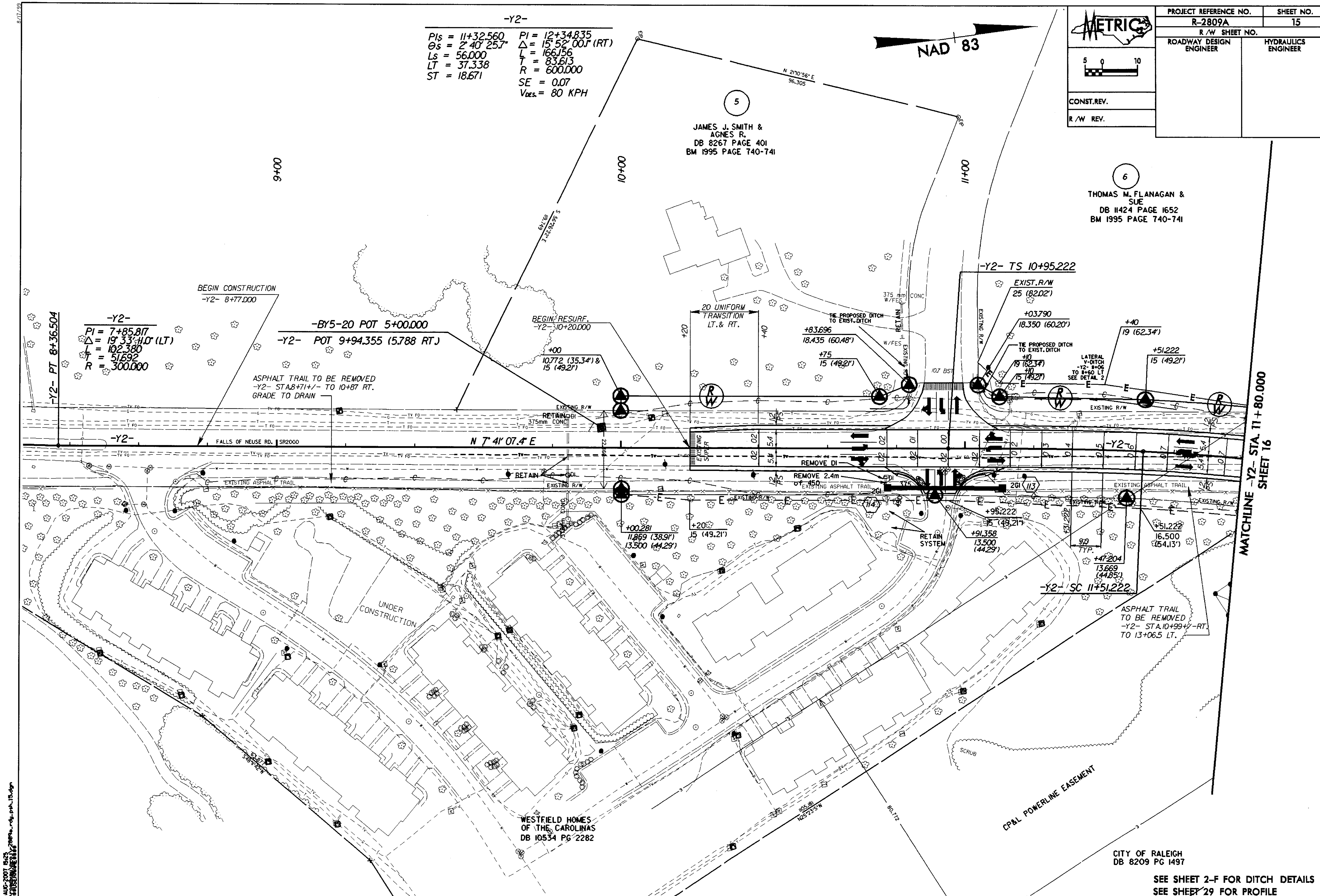
DENOTES PAVEMENT REMOVAL

SEE SHEET 2-F FOR DITCH DETAILS

SEE SHEET 28 FOR PROFILE



PROJECT REFERENCE NO. R-2809A
SHEET NO. 14
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST.REV.
R/W REV.
NAD 83
MATCHLINE -Y2- STA 28+20.000 SHEET 20
MATCHLINE -Y2- STA 26+00.000 SHEET 19
MATCHLINE -Y1- STA 16+40.000 SHEET 13
PATRICK W. CHAMBERLAIN & LESLIE L. CHAMBERLAIN DB 6484 PAGE 453 BM 1980 PAGE 588
BRYAN T. KENNEDY & CAROLYN B. KENNEDY DB 3159 PAGE 607 BM 1980 PAGE 588
PAUL H. GRUVER & JUDY H. GRUVER DB 5712 PAGE 635 BM 1980 PAGE 588
WESLEY BROWN & PATRICIA DB 7483 PAGE 889 BM 1980 PAGE 588
JOHN R. BENNETT III DB 7419 PG 732 BM 1998 PG 219
CLM ASSOCIATES LLC DB 8050 PAGE 875
GOULD CONSTRUCTION BM 1999 PG 831
CAROLINA PRINCESS LLC DB 08693 PAGE 1799
-Y1A- POT 11+65.972
-Y2- POC 28+02.522
-Y1A- POT 10+00.000
END CONSTRUCTION -Y1A- 11+00.000
-BY1-38 PINC 13+25.384
-Y2- POC 27+90.594 (14.885 LT.)
-BY1-39 PINC 11+86.686
-Y1- POT 17+17.880 (45.598 LT.)
-BY1-40 PINC 10+92.099
-Y1- POC 16+42.519 (1.459 RT.)
-Y1- PT 17+13.735
-Y2- POS 26+44.719
-Y1- POT 18+25.802
-Y2- SC 27+31.947
-BY2-33 POT 13+41.950
-Y2- POS 27+02.815 (32.947 RT.)
-Y1- POT 19+07.423
-Y2- TS 26+35.947
END CONSTRUCTION -Y1- 18+80.000
N 48° 44' 28.9" W
S 49° 39' 00.2" E
N 34° 35' 01.0" E
-Y1-
PI = 16+60.181
Δ = 32° 21' 33.9" (RT)
L = 110.132
T = 56.578
R = 195.000
SE = 0.06
-Y2-
PIs = 26+99.995
θs = 6° 52' 31.8"
Ls = 96.0
LT = 64.0483
ST = 32.0440
PI = 28+00.467
Δ = 19° 26' 27.6" (RT)
L = 135.7238
T = 68.5206
R = 400.000
SE = 0.04
Vdes = 80 KPH
PIs = 28+99.714
θs = 6° 52' 31.8"
Ls = 96.0
LT = 64.0483
ST = 32.0440
DO NOT DISTURB WETLAND
PERMANENT SOIL REINFORCEMENT MAT EST. 105.8m² GRAU-350
TOE PROTECTION CLASS B RIP RAP 64.9 MTN 229.7m F.F -Y1- 16+30 TO 17+20 RT SEE DETAIL 9
TOE PROTECTION STA 26+80 TO 27+20 -Y2- RT CLASS B RIP RAP 28.9 MTN 102.1 m2 F.F. SEE DETAIL 9
V-DITCH W/ CLASS B RIP RAP 78.6 MTN 235.7m² F.F. EST. DDE= 38m³ SEE DETAIL 3
V-DITCH W/ CLASS B RIP RAP 43.1 MTN 129.2m² F.F. EST. DDE= 18m³ SEE DETAIL 3
0.6m BASE HEAD DITCH EST DDE= 15m³ SEE DETAIL 4
FILL HOLE TO ELEV 173.85
COLLAR AND EXTEND 450
FLEMMING HOUSE
AVERAGE DAILY TRAFFIC (IN HUNDREDS) 2000 2025
DURHAM RD. NC 98 BUS
DURHAM RD. CONNECTOR
FALL OF NEUSE RD. SR 2000
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEETS 28, 29 & 32 FOR PROFILES
DENOTES PAVEMENT REMOVAL

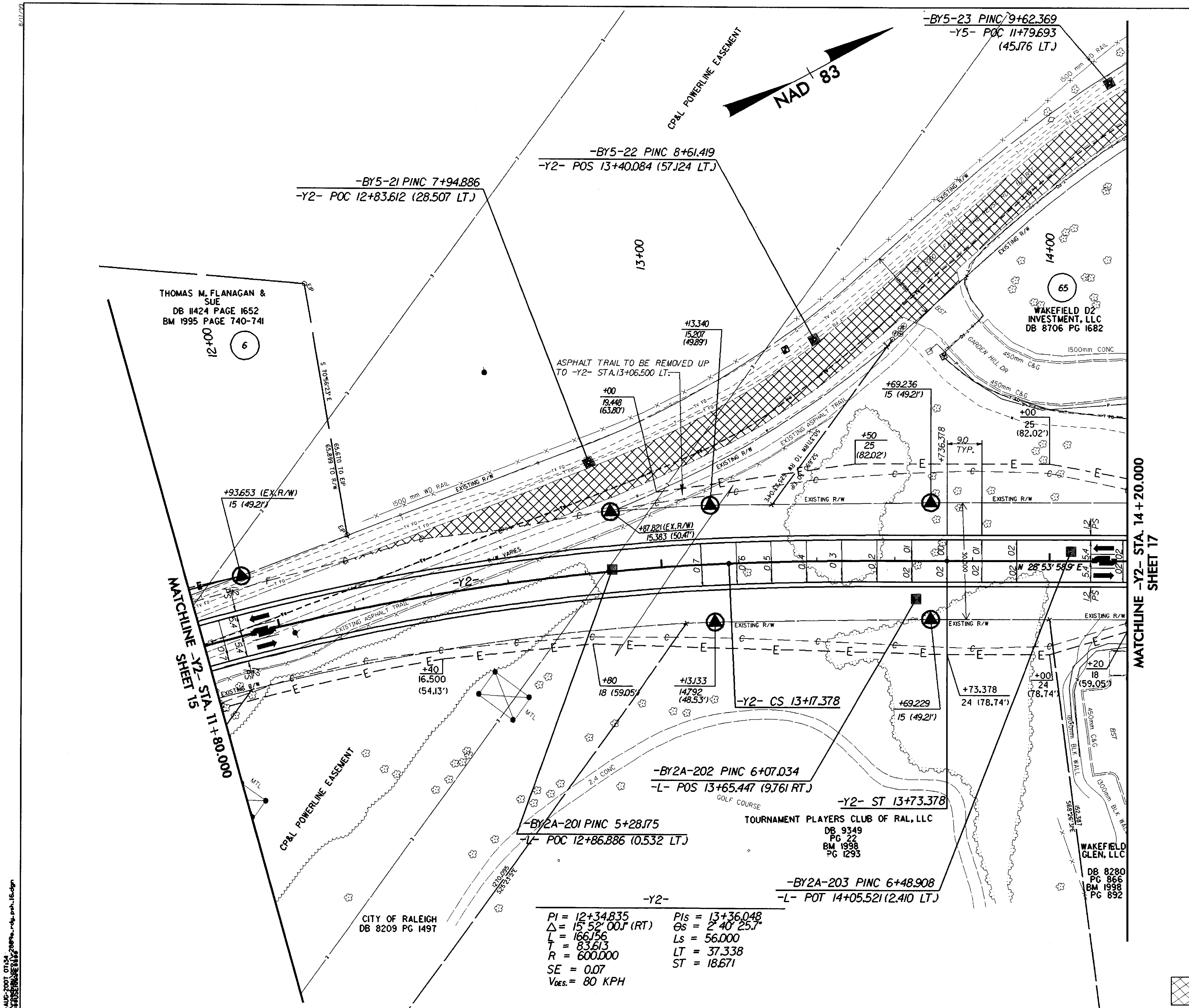

PROJECT REFERENCE NO.
R-2809A
SHEET NO.
15
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV.
R/W REV.
METRIC
NAD 83
-Y2-
PIs = 11+32.560
Θs = 2° 40' 25.7"
Ls = 56.000
LT = 37.338
ST = 18.671
PI = 12+34.835
Δ = 15° 52' 00.1" (RT)
L = 166.156
T = 83.613
R = 600.000
SE = 0.07
VDES = 80 KPH
-Y2-
PI = 7+85.817
Δ = 19° 33' 41.0" (LT)
L = 102.380
T = 51.692
R = 300.000
-Y2- PT 8+36.504
BEGIN CONSTRUCTION
-Y2- 8+77.000
-BY5-20 POT 5+00.000
-Y2- POT 9+94.355 (5.788 RT.)
ASPHALT TRAIL TO BE REMOVED
-Y2- STA.8+71+/- TO 10+87 RT.
GRADE TO DRAIN
BEGIN RESURF.
-Y2- 10+20.000
20 UNIFORM TRANSITION LT.& RT.
FALLS OF NEUSE RD. SR2000
N 7° 41' 07.4" E
-Y2- TS 10+95.222
EXIST. R/W
JAMES J. SMITH & AGNES R.
DB 8267 PAGE 401
BM 1995 PAGE 740-741
THOMAS M. FLANAGAN & SUE
DB 11424 PAGE 1652
BM 1995 PAGE 740-741
TIE PROPOSED DITCH TO EXIST. DITCH
LATERAL V-DITCH -Y2- 11+06 TO 11+60 LT SEE DETAIL 2
REMOVE DI
REMOVE 2.4m
RETAIN SYSTEM
EXISTING ASPHALT TRAIL
UNDER CONSTRUCTION
-Y2- SC 11+51.222
ASPHALT TRAIL TO BE REMOVED
-Y2- STA.10+99+/- RT. TO 13+06.5 LT.
MATCHLINE -Y2- STA. 11+80.000 SHEET 16
WESTFIELD HOMES OF THE CAROLINAS
DB 10534 PG 2282
CP&L POWERLINE EASEMENT
SCRUB
CITY OF RALEIGH
DB 8209 PG 1497
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 29 FOR PROFILE

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	16
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST.REV.

R/W REV. 12/15/05



NAD 83
CP&L POWERLINE EASEMENT
-BY5-23 PINC 9+62.369
-Y5- POC 11+79.693 (45.176 LT.)
-BY5-22 PINC 8+61.419
-Y2- POS 13+40.084 (57.124 LT.)
-BY5-21 PINC 7+94.886
-Y2- POC 12+83.612 (28.507 LT.)
THOMAS M. FLANAGAN & SUE
DB 11424 PAGE 1652
BM 1995 PAGE 740-741
ASPHALT TRAIL TO BE REMOVED UP TO -Y2- STA.13+06.500 LT.
WAKEFIELD D2 INVESTMENT, LLC
DB 8706 PG 1682
MATCHLINE -Y2- STA. 11+80.000 SHEET 15
MATCHLINE -Y2- STA. 14+20.000 SHEET 17
-Y2- CS 13+17.378
-BY2A-202 PINC 6+07.034
-L- POS 13+65.447 (9.761 RT.)
-Y2- ST 13+73.378
-BY2A-201 PINC 5+28.175
-L- POC 12+86.886 (0.532 LT.)
TOURNAMENT PLAYERS CLUB OF RAL, LLC
DB 9349
PG 22
BM 1998
PG 1293
-BY2A-203 PINC 6+48.908
-L- POT 14+05.521 (2.410 LT.)
WAKEFIELD GLEN, LLC
DB 8280
PG 866
BM 1998
PG 892
CITY OF RALEIGH
DB 8209 PG 1497
-Y2-
PI = 12+34.835
Δ = 15°52' 00.1" (RT)
L = 166.156
T = 83.613
R = 600.000
SE = 0.07
V DES. = 80 KPH
PIs = 13+36.048
θs = 2°40' 25.7"
Ls = 56.000
LT = 37.338
ST = 18.671

DENOTES PAVEMENT REMOVAL

SEE SHEETS 29 & 30 FOR PROFILE

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	17
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST.REV.	
R /W REV.	

METRIC 5 0 10

-BY5-24 PINC 10+44.036
-Y5- POC 12+33.030 (5.199 LT.)
NORTH HILLS PROPERTIES
DB 4791 PAGE 803

CHARLES T. HOLDEN
DB 6459 PAGE 208

0.6m BASE HEAD DITCH
SEE DETAIL 4
DDE= 25m²

40.0 UNIFORM TRANSITION
-Y5- PCC 12+42.852

-BY5- PINC 11+28.802
-Y5- POT 13+16.367 (4.293 LT.)
N 26° 18' 34.2" E

EXISTING R/W
SR 2000 FALLS OF THE

END CONSTRUCTION
-Y5- 12+70.000

-Y5⊕ PT 12+98.386

-Y5- POT 13+68.236

PI = 12+10.133
Δ = 76° 02' 45.7" (RT)
L = 79.635
T = 46.916
R = 60.000
SE = 0.04
Vdes.= 30 KPH
1.3m CURVE WIDENING

PI = 12+70.710
Δ = 11° 21' 49.7" (RT)
L = 55.534
T = 27.858
R = 280.000
SE = 0.08
Vdes.= 80 KPH

FRANK D. BRANDON
& LISA C. BRANDON
DB 3274 PAGE 700
BM 1984 PAGE 538

ANVIL INVESTMENTS
BM 1998 PG 892

NAD 83

SANDLER at WAKEFIELD
DB 8363 PG1444

-Y2-
PIs = 17+64.561
Θs = 2° 40' 25.7"
Ls = 56.0
LT = 37.3376
ST = 18.6705
SE = 0.07
Vdes.= 80 KPH

LAWRENCE D. BRANDON, JR
& NANCY H. BRANDON
DB 2106 PAGE 630
BM 1984 PAGE 538

CLASS B RIP RAP
1.8mTN
5.9m F.F.

-Y5- PC 11+63.217

WAKEFIELD GLEN, LLC
DB 8280 PG 866
BM 1998 PG 892

LYNN M. LOWERY, et vir
DB 3274 PAGE 698
BM 1984 PAGE 538

-BY2A-206 PINC 8+02.457
-L- POT 15+58.834 (1.503 RT.)
-BY2A-207 PINC 8+39.822
-L- POT 15+96.135 (0.688 LT.)

AVERAGE DAILY TRAFFIC (IN HUNDREDS) 2000 / 2025
FALLS OF NEUSE RD.
SR 2000
RELOCATED FALLS OF NEUSE RD.
GARDEN HILL DR

FRANK D. BRANDON, et ux
(FORMERLY NANNIE B. BRANDON)
95E2183
BM 1984 PAGE 538

LATERAL V-DITCH
W/ 1.5m BERM
W/ CLASS B RIP RAP
68.7 MTN 206.2m² F.F.
EST. DDE= 72m³
-Y2- 16+20 TO 16+80 LT
SEE DETAIL 5

-Y2- TS 17+27.224

-Y2- POT 14+56.539
-Y5- POT 10+68.545

-Y5- POT 10+13.545

-BY2A-204 PINC 7+14.676
-L- POT 14+71.191 (1.181 RT.)

-BY2A-205 PINC 7+59.872
-L- POT 15+16.129 (1.115 LT.)

-BY2A-208 PINC 8+79.004
-L- POT 16+35.314 (1.182 LT.)

-BY2A-209 PINC 9+12.766
-L- POT 16+69.068 (0.447 LT.)

-BY2A-210 PINC 9+57.295
-L- POT 17+13.584 (0.568 RT.)

-BY2A-211 PINC 9+96.053
-L- POS 17+52.321 (2.342 RT.)

WAKEFIELD GLEN, LLC
DB 8280 PG 866
BM 1998 PG 892

TOURNAMENT PLAYERS CLUB OF RALEIGH, LLC
DB 9349 PG 15
PB 2002 PG 113

CLASS I RIP RAP
10.0mTN
18.4m² F.F.

1.0m BASE TAIL DITCH (114.83')
SEE DETAIL 11
DDE= 40m³

SHRUB

DENOTES PAVEMENT REMOVAL

SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEETS 30 & 33 FOR PROFLIES

MATCHLINE -Y2- STA. 14+20.000
SHEET 16

MATCHLINE -Y2- STA. 17+60.000
SHEET 18

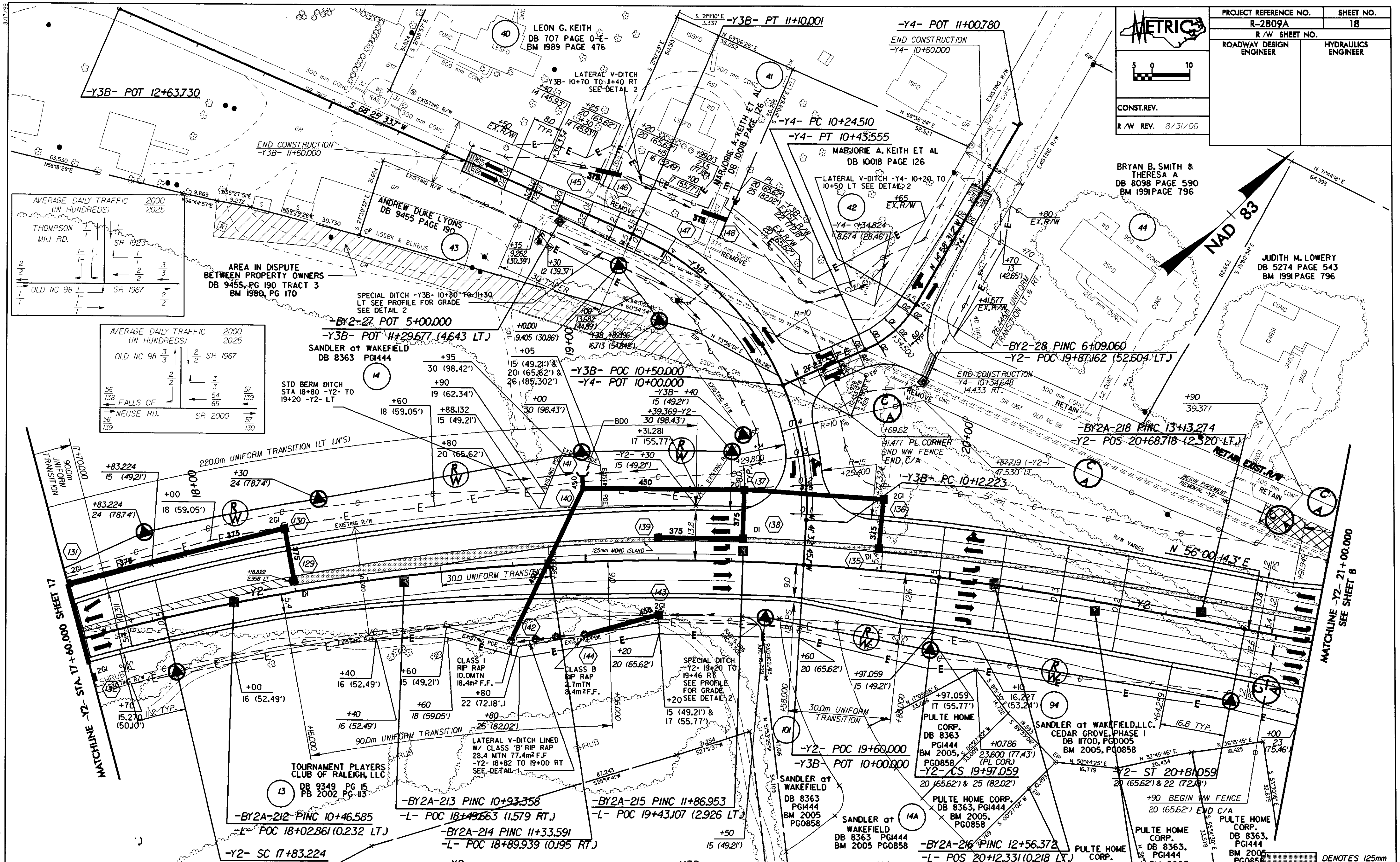
M-AUG-2007 15:25

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	18
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV. 8/31/06



-Y3B- POT 12+63.730
LEON G. KEITH
DB 707 PAGE 0-E-
BM 1989 PAGE 476
-Y3B- PT 11+10.001
-Y4- POT 11+00.780
END CONSTRUCTION
-Y4- 10+80.000
END CONSTRUCTION
-Y3B- 11+60.000
LATERAL V-DITCH
-Y3B- 10+70 TO 11+40 RT
SEE DETAIL 2
-Y4- PC 10+24.510
-Y4- PT 10+43.555
MARJORIE A. KEITH ET AL
DB 10018 PAGE 126
LATERAL V-DITCH -Y4- 10+20 TO 10+50 LT SEE DETAIL 2
BRYAN B. SMITH &
THERESA A
DB 8098 PAGE 590
BM 1991 PAGE 796
NAD 83
JUDITH M. LOWERY
DB 5274 PAGE 543
BM 1991 PAGE 796
AVERAGE DAILY TRAFFIC 2000 2025 (IN HUNDREDS)
THOMPSON MILL RD.
SR 1923
OLD NC 98
SR 1967
ANDREW DUKE LYONS
DB 9455 PAGE 190
AREA IN DISPUTE
BETWEEN PROPERTY OWNERS
DB 9455, PG 190 TRACT 3
BM 1980, PG 170
SPECIAL DITCH -Y3B- 10+80 TO 11+30
LT SEE PROFILE FOR GRADE
SEE DETAIL 2
-BY2-27 POT 5+00.000
-Y3B- POT 11+29.677 (4.643 LT.)
SANDLER at WAKEFIELD
DB 8363 PG1444
AVERAGE DAILY TRAFFIC 2000 2025 (IN HUNDREDS)
FALLS OF NEUSE RD.
SR 2000
STD BERM DITCH
STA 18+80 -Y2- TO 19+20 -Y2- LT
-Y3B- POC 10+50.000
-Y4- POT 10+00.000
-BY2-28 PINC 6+09.060
-Y2- POC 19+87.162 (52.604 LT.)
END CONSTRUCTION
-Y4- 10+34.648
14.433 RT.
-BY2A-218 PINC 13+13.274
-Y2- POS 20+68.718 (2.320 LT.)
-Y3B- PC 10+12.223
220.0m UNIFORM TRANSITION (LT LN'S)
90.0m UNIFORM TRANSITION
30.0 UNIFORM TRANSITION
125mm MONO ISLAND
N 56°00'14.3" E
MATCHLINE -Y2- 21+00.000 SEE SHEET 8
MATCHLINE -Y2- STA. 17+60.000 SHEET 17
CLASS I RIP RAP 10.0MTN 18.4m² F.F.
CLASS B RIP RAP 2.7mTN 8.4m² F.F.
SPECIAL DITCH -Y2- 19+20 TO 19+46 RT SEE PROFILE FOR GRADE SEE DETAIL 2
LATERAL V-DITCH LINED W/ CLASS 'B' RIP RAP 28.4 MTN 77.4m² F.F. -Y2- 18+82 TO 19+00 RT SEE DETAIL 1
90.0m UNIFORM TRANSITION
30.0m UNIFORM TRANSITION
TOURNAMENT PLAYERS CLUB OF RALEIGH, LLC
DB 9349 PG 15
PB 2002 PG 113
-BY2A-212 PINC 10+46.585
-L- POC 18+02.861 (0.232 LT.)
-BY2A-213 PINC 10+93.358
-L- POC 18+49.663 (1.579 RT.)
-BY2A-214 PINC 11+33.591
-L- POC 18+89.939 (0.195 RT.)
-BY2A-215 PINC 11+86.953
-L- POC 19+43.107 (2.926 LT.)
-Y2- SC 17+83.224
-Y2- POC 19+60.000
-Y3B- POT 10+00.000
SANDLER at WAKEFIELD
DB 8363 PG1444
BM 2005 PG0858
PULTE HOME CORP.
DB 8363, PG1444
BM 2005, PG0858
-Y2- CS 19+97.059
SANDLER at WAKEFIELD, LLC.
CEDAR GROVE, PHASE I
DB 11700, PG0005
BM 2005, PG0858
-Y2- ST 20+81.059
BEGIN WW FENCE
END C/A
-BY2A-216 PINC 12+56.372
-L- POS 20+12.331 (0.218 LT.)
-BY2A-217 PINC 12+84.760
-L- POS 20+40.616 (2.558 RT.)

-Y2-		
PIs = 17+64.561	PI = 18+91.288	PIs = 20+25.072
Θs = 2° 40' 25.7"	Δ = 20° 25' 11.2" (RT)	Θs = 4° 00' 38.5"
Ls = 56.0	L = 213.8355	Ls = 84.0
LT = 37.3376	T = 108.0640	LT = 56.0144
ST = 18.6705	R = 600.000	ST = 28.0131
	SE = 0.05	
	Vdes. = 80 KPH	

-Y3B-
PI = 10+68.269
Δ = 70° 01' 41.3" (LT)
L = 97.7777
T = 56.0459
R = 80.000
SE = 0.04
Vdes. = 30 KPH

-Y4-
PI = 10+34.366
Δ = 36° 22' 24.9" (LT)
L = 19.045
T = 9.856
R = 30.000
SE = SEE PLANS
Vdes. = 30 KPH

DENOTES 125mm MONOLITHIC CONC. ISLANDS

DENOTES PAVEMENT REMOVAL

SEE SHEET 2-F FOR DITCH DETAILS

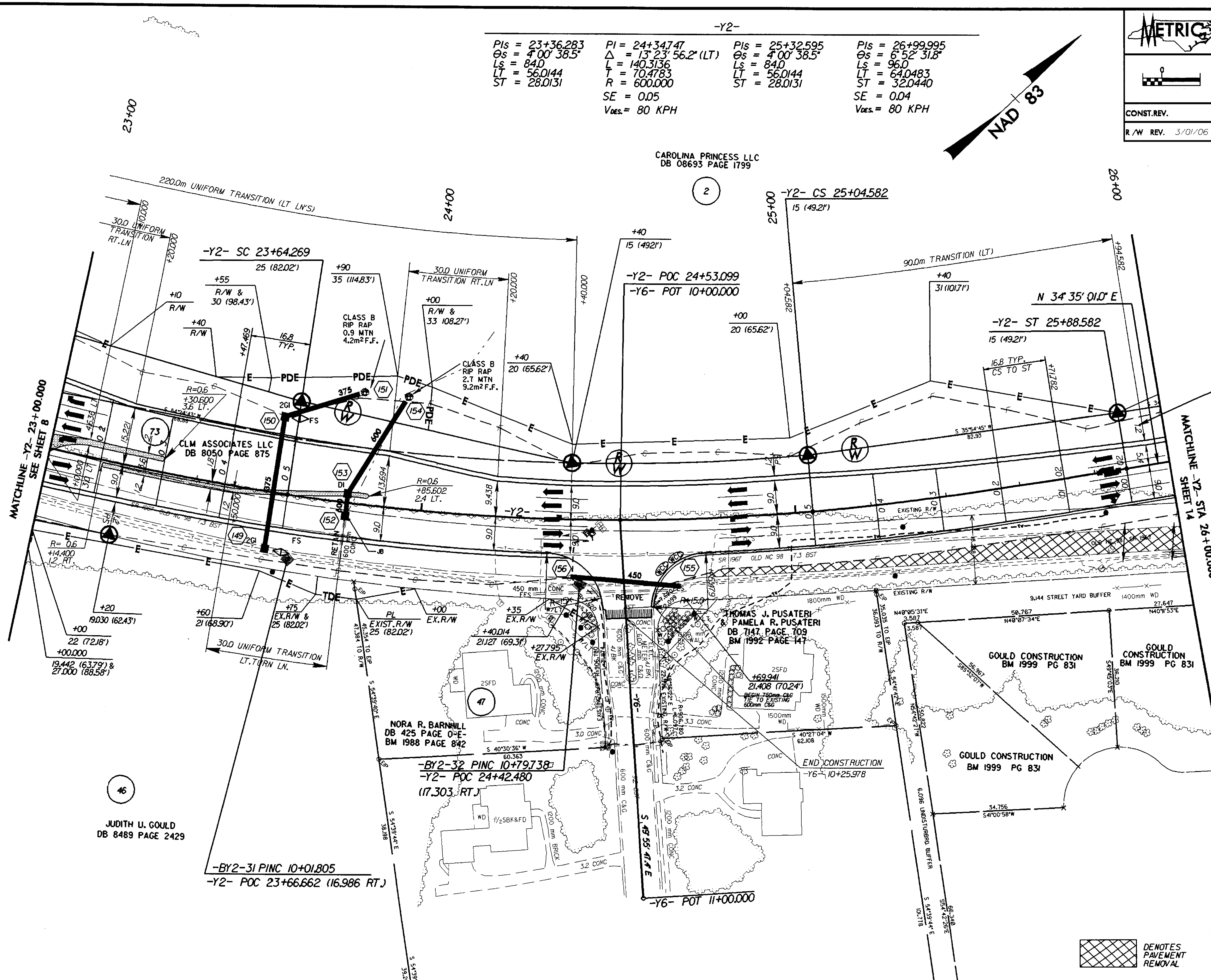
SEE SHEETS 30,31 & 33 FOR PROFILES

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	19
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST.REV.

R/W REV. 3/01/06

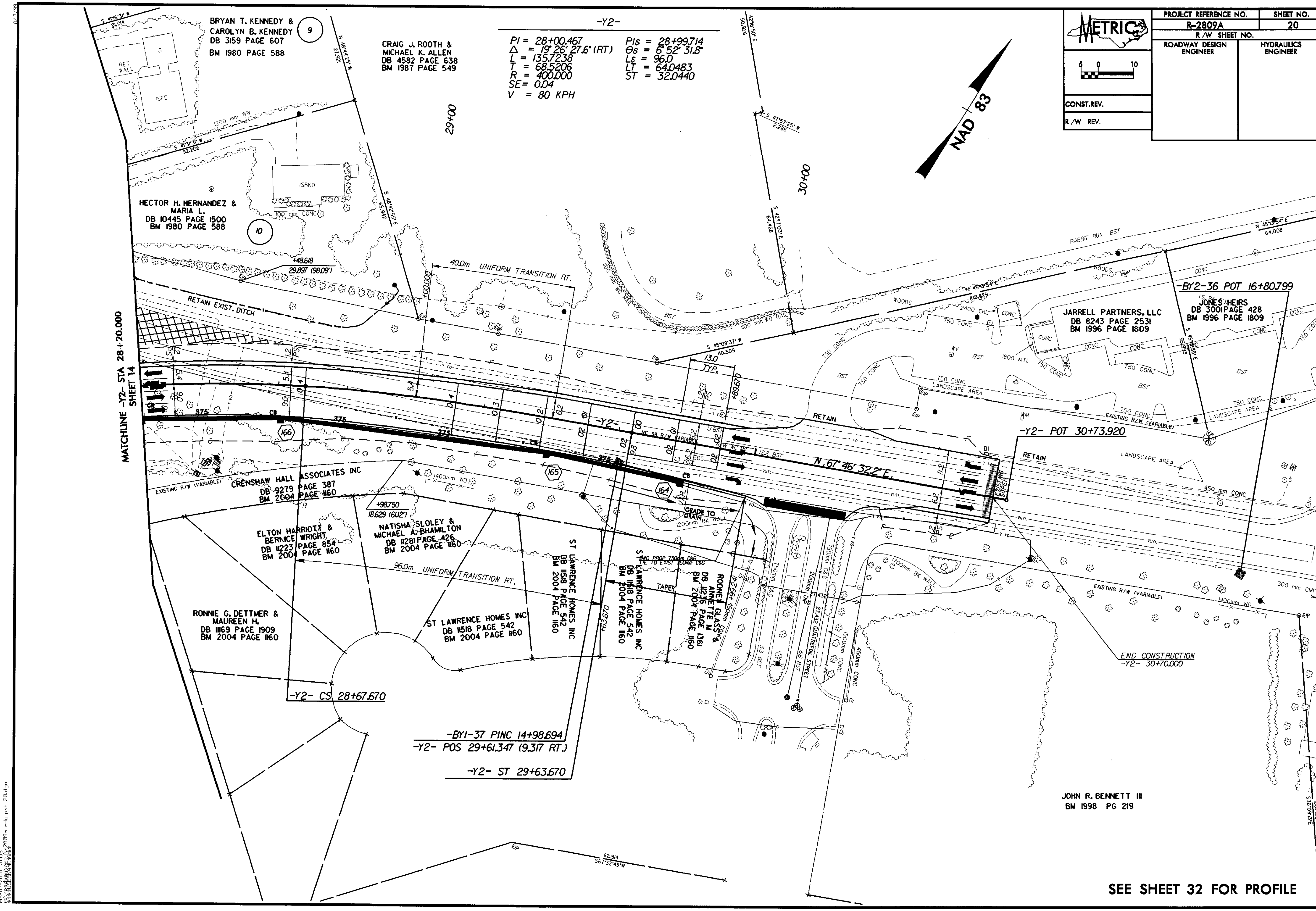


-Y2-
PIs = 23+36.283
θs = 4°00' 38.5"
Ls = 84.0
LT = 56.0144
ST = 28.0131
PI = 24+34.747
Δ = 13°23' 56.2" (LT)
L = 140.3136
T = 70.4783
R = 600.000
SE = 0.05
VDES. = 80 KPH
PIs = 25+32.595
θs = 4°00' 38.5"
Ls = 84.0
LT = 56.0144
ST = 28.0131
PIs = 26+99.995
θs = 6°52' 31.8"
Ls = 96.0
LT = 64.0483
ST = 32.0440
SE = 0.04
VDES. = 80 KPH
NAD 83
CAROLINA PRINCESS LLC
DB 08693 PAGE 1799
220.0m UNIFORM TRANSITION (LT LN'S)
-Y2- SC 23+64.269
-Y2- CS 25+04.582
-Y2- POC 24+53.099
-Y6- POT 10+00.000
-Y2- ST 25+88.582
N 34° 35' 01.0" E
90.0m TRANSITION (LT)
CLM ASSOCIATES LLC
DB 8050 PAGE 875
MATCHLINE -Y2- 23+00.000
SEE SHEET 8
MATCHLINE -Y2- STA 26+00.000
SHEET 14
CLASS B RIP RAP 0.9 MTN 4.2m² F.F.
CLASS B RIP RAP 2.7 MTN 9.2m² F.F.
SR 1967 OLD NC 98 7.3 BST
THOMAS J. PUSATERI
& PAMELA R. PUSATERI
DB 7147 PAGE 709
BM 1992 PAGE 147
GOULD CONSTRUCTION
BM 1999 PG 831
NORA R. BARNHILL
DB 425 PAGE 0-E-
BM 1988 PAGE 842
-BY2-32 PINC 10+79.738
-Y2- POC 24+42.480
(17.303 RT.)
END CONSTRUCTION
-Y6- 10+25.978
JUDITH U. GOULD
DB 8489 PAGE 2429
-BY2-31 PINC 10+01.805
-Y2- POC 23+66.662 (16.986 RT.)
-Y6- POT 11+00.000
S 49° 55' 41.6" E
30.0 UNIFORM TRANSITION LT.TURN LN.
9.144 STREET YARD BUFFER
6.096 UNDISTURBED BUFFER

DENOTES PAVEMENT REMOVAL

SEE SHEET 2-F FOR DITCH DETAILS

SEE SHEETS 31 & 32 FOR PROFILE

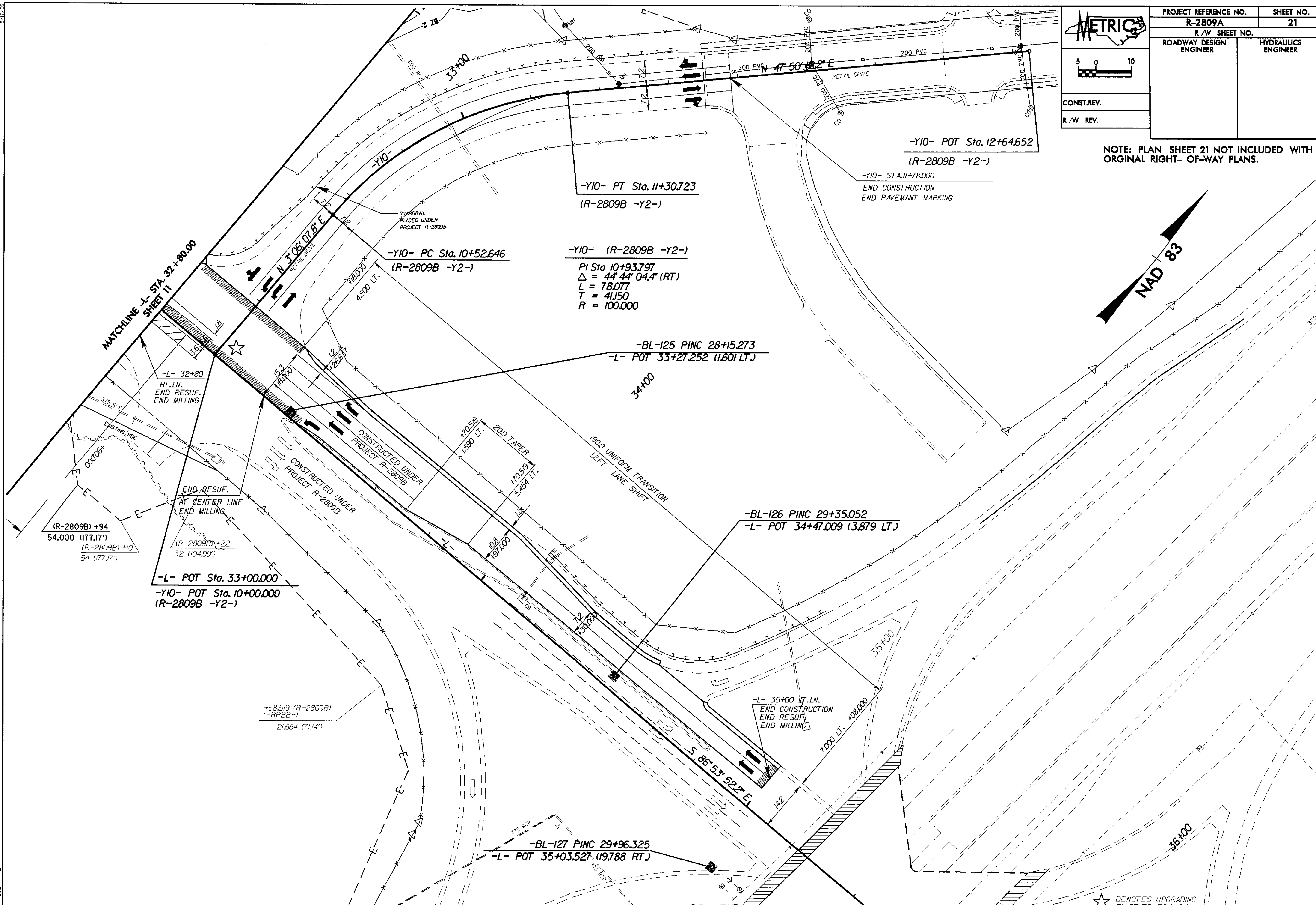

PROJECT REFERENCE NO. R-2809A
SHEET NO. 20
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST. REV.
R/W REV.
NAD 83
-Y2-
PI = 28+00.467
Δ = 19° 26' 27.6" (RT)
L = 135.7238
T = 68.5206
R = 400.000
SE= 0.04
V = 80 KPH
PIs = 28+99.714
θs = 6° 52' 31.8"
Ls = 96.0
LT = 64.0483
ST = 32.0440
BRYAN T. KENNEDY &
CAROLYN B. KENNEDY
DB 3159 PAGE 607
BM 1980 PAGE 588
CRAIG J. ROOTH &
MICHAEL K. ALLEN
DB 4582 PAGE 638
BM 1987 PAGE 549
HECTOR H. HERNANDEZ &
MARIA L.
DB 10445 PAGE 1500
BM 1980 PAGE 588
29+00
30+00
40.0m UNIFORM TRANSITION RT.
RETAIN EXIST. DITCH
MATCHLINE -Y2- STA 28+20.000
SHEET 14
JARRELL PARTNERS, LLC
DB 8243 PAGE 2531
BM 1996 PAGE 1809
JONES HEIRS
DB 3001 PAGE 428
BM 1996 PAGE 1809
-BY2-36 POT 16+80.799
RABBIT RUN BST
-Y2- POT 30+73.920
N 67° 46' 32.2" E
RETAIN
LANDSCAPE AREA
CRENSHAW HALL ASSOCIATES INC
DB 9279 PAGE 387
BM 2004 PAGE 1160
ELTON HARRIOTT &
BERNICE WRIGHT
DB 11223 PAGE 854
BM 2004 PAGE 1160
NATISHA SLOLEY &
MICHAEL A. HAMILTON
DB 11281 PAGE 426
BM 2004 PAGE 1160
96.0m UNIFORM TRANSITION RT.
ST LAWRENCE HOMES INC
DB 11518 PAGE 542
BM 2004 PAGE 1160
RODNEY GLASS &
ANNETTE M
DB 11236 PAGE 1361
BM 2004 PAGE 1160
RONNIE G. DETTMER &
MAUREEN H.
DB 11169 PAGE 1909
BM 2004 PAGE 1160
-Y2- CS 28+67.670
-BY1-37 PINC 14+98.694
-Y2- POS 29+61.347 (9.317 RT.)
-Y2- ST 29+63.670
END CONSTRUCTION
-Y2- 30+70.000
QUATREFOIL STREET
JOHN R. BENNETT III
BM 1998 PG 219
EXISTING R/W (VARIABLE)
SEE SHEET 32 FOR PROFILE

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	21
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST.REV.

R/W REV.

NOTE: PLAN SHEET 21 NOT INCLUDED WITH ORGINAL RIGHT- OF-WAY PLANS.



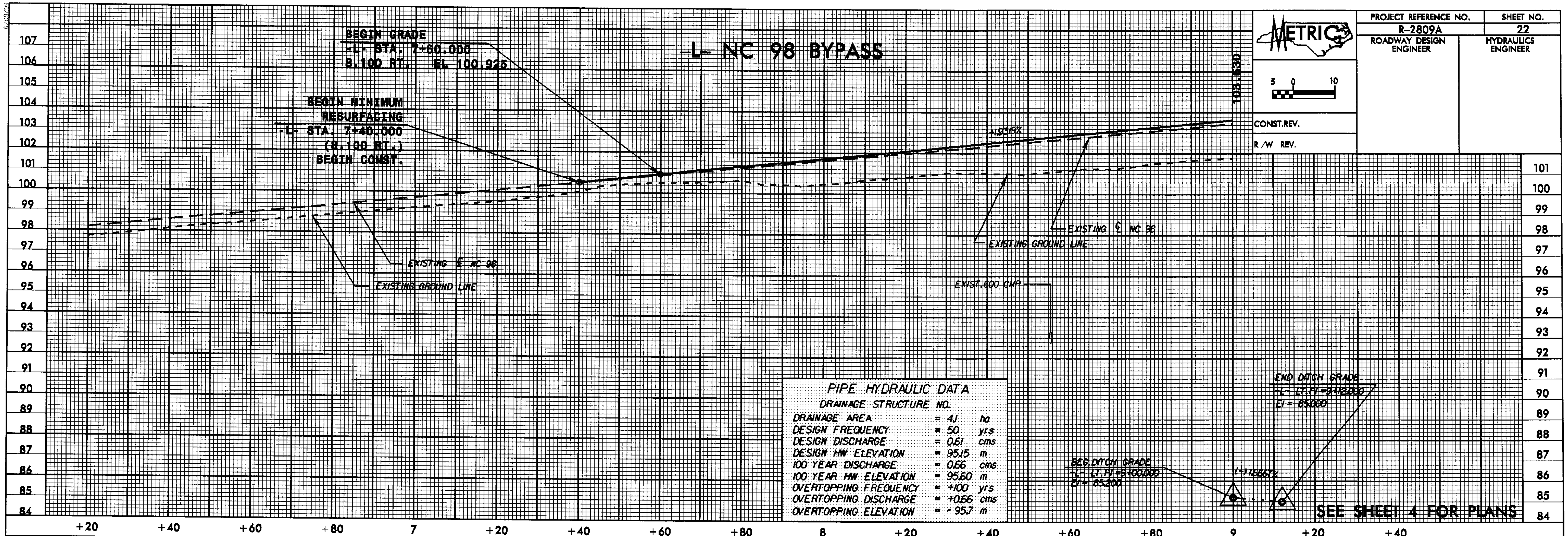
METRIC
5 0 10
MATCHLINE -L- STA. 32+80.00 SHEET 11
-Y10- POT Sta. 12+64.652
(R-2809B -Y2-)
-Y10- STA.11+78.000
END CONSTRUCTION
END PAVEMANT MARKING
-Y10- PT Sta. 11+30.723
(R-2809B -Y2-)
N 47° 50' 18.2" E
-Y10- PC Sta. 10+52.646
(R-2809B -Y2-)
N 3° 06' 07.8" E
-Y10- (R-2809B -Y2-)
PI Sta 10+93.797
Δ = 44° 44' 04.4" (RT)
L = 78.077
T = 41.150
R = 100.000
GUARDRAIL PLACED UNDER PROJECT R-2809B
NAD 83
-BL-125 PINC 28+15.273
-L- POT 33+27.252 (1.601 LT.)
34+00
-L- 32+80
RT.LN.
END RESUF.
END MILLING
CONSTRUCTED UNDER PROJECT R-2809B
20.0 TAPER
190.0 UNIFORM TRANSITION LEFT LANE SHIFT
END RESUF.
AT CENTER LINE
END MILLING
(R-2809B) +94
54.000 (177.17')
(R-2809B) +10
54 (177.17')
(R-2809B) +22
32 (104.99')
-L- POT Sta. 33+00.000
-Y10- POT Sta. 10+00.000
(R-2809B -Y2-)
-BL-126 PINC 29+35.052
-L- POT 34+47.009 (3.879 LT.)
35+00
-L- 35+00 LT.LN.
END CONSTRUCTION
END RESUF.
END MILLING
+58.519 (R-2809B)
(-RPBB-)
21.684 (71.14')
S 86° 53' 52.2" E
-BL-127 PINC 29+96.325
-L- POT 35+03.527 (19.788 RT.)
36+00
DENOTES UPGRADING EXIST. TRAFFIC SIGNAL

METRIC

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	22
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST.REV.

R/W REV.

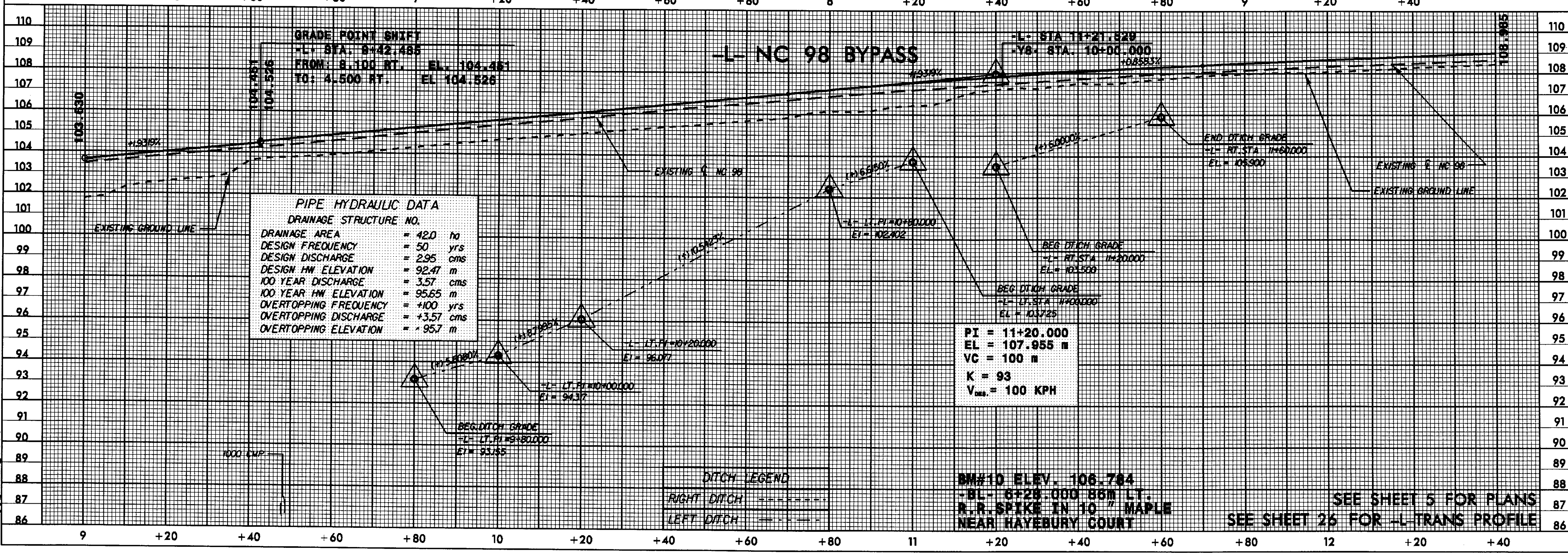


-L- NC 98 BYPASS
BEGIN GRADE
-L- STA. 7+80.000
8.100 RT. EL 100.925
BEGIN MINIMUM RESURFACING
-L- STA. 7+40.000
(8.100 RT.)
BEGIN CONST.
103.630
+.9319%
EXISTING ℄ NC 98
EXISTING GROUND LINE
EXIST.600 CMP
END DITCH GRADE
-L- LT.PI =9+12.000
El = 85.000
BEG.DITCH GRADE
-L- LT.PI =9+00.000
El = 85.200
SEE SHEET 4 FOR PLANS

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 4.1	ha
DESIGN FREQUENCY	= 50	yrs
DESIGN DISCHARGE	= 0.61	cms
DESIGN HW ELEVATION	= 95.15	m
100 YEAR DISCHARGE	= 0.66	cms
100 YEAR HW ELEVATION	= 95.60	m
OVERTOPPING FREQUENCY	= +100	yrs
OVERTOPPING DISCHARGE	= +0.66	cms
OVERTOPPING ELEVATION	= ~95.7	m



-L- NC 98 BYPASS
GRADE POINT SHIFT
-L- STA. 8+42.485
FROM: 8.100 RT. EL. 104.451
TO: 4.500 RT. EL 104.526
103.630
104.451
104.526
108.985
+.9319%
-L- STA 11+21.829
-Y8- STA. 10+00.000
+.6858%
EXISTING ℄ NC 98
EXISTING GROUND LINE
END DITCH GRADE
-L- RT.STA 11+60.000
EL = 105.900
BEG DITCH GRADE
-L- RT.STA 11+20.000
EL = 103.500
BEG DITCH GRADE
-L- LT.STA 11+00.000
EL = 103.725
-L- LT.PI =10+80.000
El = 102.102
-L- LT.PI =10+20.000
El = 96.077
-L- LT.PI =10+00.000
El = 94.37
BEG.DITCH GRADE
-L- LT.PI =9+80.000
El = 93.55
1000 CMP
PI = 11+20.000
EL = 107.955 m
VC = 100 m
K = 93
V = 100 KPH
DITCH LEGEND
RIGHT DITCH
LEFT DITCH
BM#10 ELEV. 106.784
-BL- 6+28.000 86m LT.
R.R.SPIKE IN 10" MAPLE
NEAR HAYEBURY COURT
SEE SHEET 5 FOR PLANS
SEE SHEET 26 FOR -L- TRANS PROFILE

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 42.0	ha
DESIGN FREQUENCY	= 50	yrs
DESIGN DISCHARGE	= 2.95	cms
DESIGN HW ELEVATION	= 92.47	m
100 YEAR DISCHARGE	= 3.57	cms
100 YEAR HW ELEVATION	= 95.65	m
OVERTOPPING FREQUENCY	= +100	yrs
OVERTOPPING DISCHARGE	= +3.57	cms
OVERTOPPING ELEVATION	= ~95.7	m

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r:\roadway\proj\r2809a_rdy_pfl.dgn
$$$$USERNAME$$$$

6/09/98

-L- NC 98 BYPASS

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	23
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST.REV.

R/W REV.

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 1.4	ha
DESIGN FREQUENCY	= 50	yrs
DESIGN DISCHARGE	= 0.32	cms
DESIGN HW ELEVATION	= 109.48	m
100 YEAR DISCHARGE	= 0.347	cms
100 YEAR HW ELEVATION	= 109.52	m
OVERTOPPING FREQUENCY	= +100	yrs
OVERTOPPING DISCHARGE	= +0.347	cms
OVERTOPPING ELEVATION	= +109.69	m

PI = 13+00.000
EL = 109.500 m
VC = 120 m
K = 230
$V_{DES.}$ = 100 KPH

PI = 15+00.000
EL = 110.174 m
VC = 160 m
K = 67
$V_{DES.}$ = 100 KPH

108.985

+0.858%

+0.336%

-L- 13+91.932
Y3 10+00.000

-L- 13+64.156
Y3A 11+88.729

+0.336%

+2.113%

112.347

(+) 2.940%

(+) 0.882%

45°

BEG.RT.DITCH GRADE
-L- RT. PI= 15+40.000
EL= 109.668

-L- RT. PI= 15+60.000
EL= 109.00

END RT.DITCH GRADE
-L- RT. PI= 15+76.000
EL= 108.000

SEE SHEET 6 FOR PLANS

BM#11 ELEV. 116.619
-BL- 11+70.080 57m RT.
R.R.SPIKE IN 12" OAK

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 5.0	ha
DESIGN FREQUENCY	= 50	yrs
DESIGN DISCHARGE	= 1.02	cms
DESIGN HW ELEVATION	= 109.91	m
100 YEAR DISCHARGE	= 1.08	cms
100 YEAR HW ELEVATION	= 109.95	m
OVERTOPPING FREQUENCY	= +500	yrs
OVERTOPPING DISCHARGE	= +1.84	cms
OVERTOPPING ELEVATION	= +112.4	m

-L- NC 98 BYPASS

112.347

+2.113%

(+) 0.300%

118.955 (RT. LN.)

116.682 (LT. LN.)

BEG.RT.DITCH GRADE
-L- RT. PI= 16+80.000
EL= 117.408

END RT.DITCH GRADE
-L- RT. PI= 19+20.000
EL= 117.488

-L- LT IN GRADE
STA 16+82.000 TO 23+18.000

BEG.RT.DITCH GRADE
-L- RT. PI= 16+70.000
EL= 110.400

PI =16+80.000
El= 109.500

-L- LT. PI =17+20.000
El= 110.646

(+) 5.000%

(+) 1.250%

(+) 0.384%

(+) 1.500%

(+) 2.000%

(+) 4.268%

END LT. DITCH GRADE
-L- LT. PI = 17+80.000
EL= 113.316

BEG.LT.DITCH GRADE
-L- LT. PI = 16+42.000
EL= 105.500

-L- LT. PI =17+40.000
El= 111.250

750

-L- LT. PI =17+00.000
El= 108.300

-L- LT. PI =16+80.000
El= 106.000

-L- LT. PI =16+60.000
El= 106.267

-L- RT. PI =17+20.000
El= 109.000

END RT. DITCH GRADE
-L- RT. PI = 17+55.000 RT.
EL= 108.950

DITCH LEGEND
RIGHT DITCH ---------
LEFT DITCH — - — - —

PI = 20+00.000 (LT LANE)
EL = 123.760 m
VC = 636 m
K = 98
$V_{DES.}$ = 100 KPH
GRADE AHEAD = -3.8051%

PI = 20+00.000
EL = 123.760 m
VC = 600 m
K = 92
$V_{DES.}$ = 100 KPH
GRADE AHEAD = -3.8051%

SEE SHEET 7 FOR PLANS

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-L- NC 98 BYPASS

PI = 20+00.000 (LT. LANE)
EL = 123.760 m
VC = 636 m
K = 98
$V_{des.}$ = 100 KPH

+2.713%

-1.805%

(-)2.500%

116.955(RT.-LN.)

118.882(LT.-LN.)

133.780(RT.-LN.)

BEG.RT.DITCH GRADE
-L- RT.PI = 19+40.000
EL = 116.500

END RT.DITCH GRADE
-L- RT.PI = 19+80.000
EL = 115.500

600

-L- 20+40.313
-Y2- 21.58.632

-L- LT LN GRADE
STA 16+82.000 TO 23+18.000

113.694(LT.-LN.)

UNDERCUT EXCAVATION

SEE SHEET 8 FOR PLANS

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 1.62	ha
DESIGN FREQUENCY	= 50	yrs
DESIGN DISCHARGE	= 0.412	cms
DESIGN HW ELEVATION	= 115.83	m
100 YEAR DISCHARGE	= 0.45	cms
100 YEAR HW ELEVATION	= 115.87	m
OVERTOPPING FREQUENCY	= +500	yrs
OVERTOPPING DISCHARGE	= +0.412	cms
OVERTOPPING ELEVATION	= 117.6	m

PI = 20+00.000
EL = 123.760 m
VC = 600 m
K = 92
$V_{des.}$ = 100 KPH

DITCH LEGEND
RIGHT DITCH
LEFT DITCH

-L- NC 98 BYPASS

BM#12 ELEV. 107.828
-BL- 19+42.227 73m LT.
R.R.SPIKE IN 14 " OAK

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 2.35	ha
DESIGN FREQUENCY	= 50	yrs
DESIGN DISCHARGE	= 0.55	cms
DESIGN HW ELEVATION	= 106.28	m
100 YEAR DISCHARGE	= 0.60	cms
100 YEAR HW ELEVATION	= 106.34	m
OVERTOPPING FREQUENCY	= +500	yrs
OVERTOPPING DISCHARGE	= +1.08	cms
OVERTOPPING ELEVATION	= 108.3	m

-L- LT.PI=23+20.000
EL= 105.500

-L- LT.PI=23+60.000
EL= 104.500

-L- LT.PI=25+10.000
EL= 104.900

-L- LT.PI=24+20.000
EL= 102.500

-L- LT.PI=24+90.000
EL= 105.800

-L- LT.PI=25+50.000
EL= 107.282

-L- LT.PI=26+20.000
EL= 107.000

300

600

SEE SHEET 9 FOR PLANS

-L- NC 98 BYPASS

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	25
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST.REV.	
R/W REV.	

METRIC 5 0 10

PI BACK
-L- LT.,PI = 25+90.000
EL = 107.282

-L- LT.,PI=26+20.000
EL= 107.000

PI = 26+40.000
EL = 99.407 m
VC = 125 m
K = 69

-L- LT.,PI=26+60.000
EL= 105.000

-L- LT.,PI=27+00.000
EL= 103.200

-L- LT.,PI=27+20.000
EL= 102.500

-L- LT.,PI=27+60.000
EL= 101.400

-L- LT.,PI=27+70.000
EL= 101.300

END LT.,RT.,CH. GRADE
-L- LT.,PI.= 28+20.000
EL= 102.990

(-) 0.700%
(-) 5.000%
(-) 2.450%
(-) 1.350%
(-) 2.750%
(-) 10.000%
(+) 3.580%
-5.805%
-2.000%

100.966
93.407

SEE SHEET 10 FOR PLANS

-L- NC 98 BYPASS

93.407
-2.000%
-L- STA. 10+00.000
-Y9-
29+50.000

BEG.LT.DITCH GRADE
-L- LT.,PI = 30+80.000
EL= 88.239

-L- LT.,PI=31+00.800
EL= 88.885

BEG.RT.DITCH GRADE
-L- RT.,PI = 31+00.000
EL= 87.800

-L- STA. 31+00.000
END GRADING
BEG. FINE GRADING

(-) 2.700%
(+) 0.500%
(-) 1.500%

END LT.DITCH GRADE
-L- LT.,PI = 31+20.000
EL= 88.96

END RT.DITCH GRADE
-L- RT.,PI = 31+40.000
EL= 86.600

END FINE GRADING
-L- STA. 31+90.000
EL. 90.245

+1.574%

PLACE FINAL LAYER
TO -L- STA. 35+00

90.894

CONSTRUCTED UNDER
PROJECT R-2809B

END CONST.
-L- STA. 35+00.000

ORGINAL GROUND LINE

PI = 31+50.000
EL = 89.207 m
VC = 250 m
K = 74
$V_{DES.}$ = 100 KPH

DITCH LEGEND
RIGHT DITCH ---------
LEFT DITCH — — — —

SEE SHEET 11 FOR PLANS

6/09/93

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	26
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST.REV.

R/W REV.

-L-TRANS NC 98 BYPASS

BEGIN GRADE
-L-TRANS STA. 9+42.673
EL 104.601
-L- STA. 9+42.485
EL 104.526
(3.600 RT.)

PI = 9+80.000
EL = 105.322 m
VC = 60 m
K = 3936
$V_{DES.}$ = 100 KPH

PI = 10+65.311
EL = 106.957 m
VC = 70 m
K = 228
$V_{DES.}$ = 100 KPH

-1.939%
+1.916%
+5.916%
+6.099%

END GRADE
-L-TRANS STA. 11+00.511
EL 107.520
-L- STA. 11+00.000
(4.500 RT.)

SEE SHEET 5 FOR PLANS

-Y8- HAYEBURY CT.

BEGIN GRADE
-Y8- STA. 10+11.726
EL 107.703
-L- STA. 11+22.308
(11.700 LT.)

107.846

MINIMUM RESURFACING

-5.852%
-2.857%

END CONST.
-Y8- STA. 10+50.000

END GRADE
-Y8- STA. 10+40.000
EL 106.636

PI = 10+26.000
EL = 106.970 m
VC = 28 m
K = 10
$V_{DES.}$ = 40 KPH

SEE SHEET 5 FOR PLANS

-Y3A- THOMPSON MILL RD. (SR 1923)

MINIMUM RESURFACING

BEG. CONST.
-Y3A- STA. 11+00.000

END CONST.
-Y3A- STA. 11+40 +/-

SEE SHEET 6 FOR PLANS

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PROJECT REFERENCE NO.	SHEET NO.
R-2809A	27
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST.REV.

R /W REV.

-Y3- THOMPSON MILL RD. SR 1923

PI = 10+30.000
EL = 110.493 m
VC = 36 m
K = 3
$V_{DES.}$ = 30 KPH

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO. -Y3- 11+19.921 10+00.000 -Y3- LT. EL.

DRAINAGE AREA	= 1.8	ha
DESIGN FREQUENCY	= 25	yrs
DESIGN DISCHARGE	= 0.347	cms
DESIGN HW ELEVATION	= 93.81	m
100 YEAR DISCHARGE	= 0.40	cms
100 YEAR HW ELEVATION	= 93.86	m
OVERTOPPING FREQUENCY	= +500	yrs
OVERTOPPING DISCHARGE	= +0.66	cms
OVERTOPPING ELEVATION	= +94.2	m

+1.50%

-3.21%

-5.42%

+1.00%

BEGIN GRADE
-Y3- STA. 10+11.907
EL. 110.220

PI = 11+15.000
EL = 99.697 m
VC = 90 m
K = 13
$V_{DES.}$ = 50 KPH

END GRADE
-Y3- STA. 11+60.000
EL. 97.068

MINIMUM RESURFACING

END CONST
-Y3- STA. 11+86.000

BEG.DITCH GRADE
-Y3- LT. PI=11+40.000
EL.= 96.500

750

END DITCH GRADE
-Y3- LT. PI=11+69.000
EL.= 93.300

SEE SHEETS 6 & 12 FOR PLANS

-Y1- THOMPSON MILL RD./NC 98 BUS. CONNECTOR

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 3.7	ha
DESIGN FREQUENCY	= 25	yrs
DESIGN DISCHARGE	= 0.65	cms
DESIGN HW ELEVATION	= 97.14	m
100 YEAR DISCHARGE	= 0.79	cms
100 YEAR HW ELEVATION	= 97.23	m
OVERTOPPING FREQUENCY	= +500	yrs
OVERTOPPING DISCHARGE	= +1.3	cms
OVERTOPPING ELEVATION	= -99.8	m

PI = 11+20.000
EL = 102.954 m
VC = 100 m
K = 43
$V_{DES.}$ = 80 KPH

PI = 13+20.000
EL = 106.652 m
VC = 230 m
K = 70
$V_{DES.}$ = 80 KPH
GRADE AHEAD = -1.4400%

BEGIN GRADE
-Y1- STA. 10+03.641
EL. 99.997

PI = 10+40.000
EL = 99.610 m
VC = 60 m
K = 11

-1.06%

+1.84%

+4.46%

105.427

600

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 2.0	ha
DESIGN FREQUENCY	= 25	yrs
DESIGN DISCHARGE	= 0.43	cms
DESIGN HW ELEVATION	= 103.18	m
100 YEAR DISCHARGE	= 0.50	cms
100 YEAR HW ELEVATION	= 103.37	m
OVERTOPPING FREQUENCY	= +500	yrs
OVERTOPPING DISCHARGE	= +0.83	cms
OVERTOPPING ELEVATION	= -104.4	m

SEE SHEET 12 FOR PLANS

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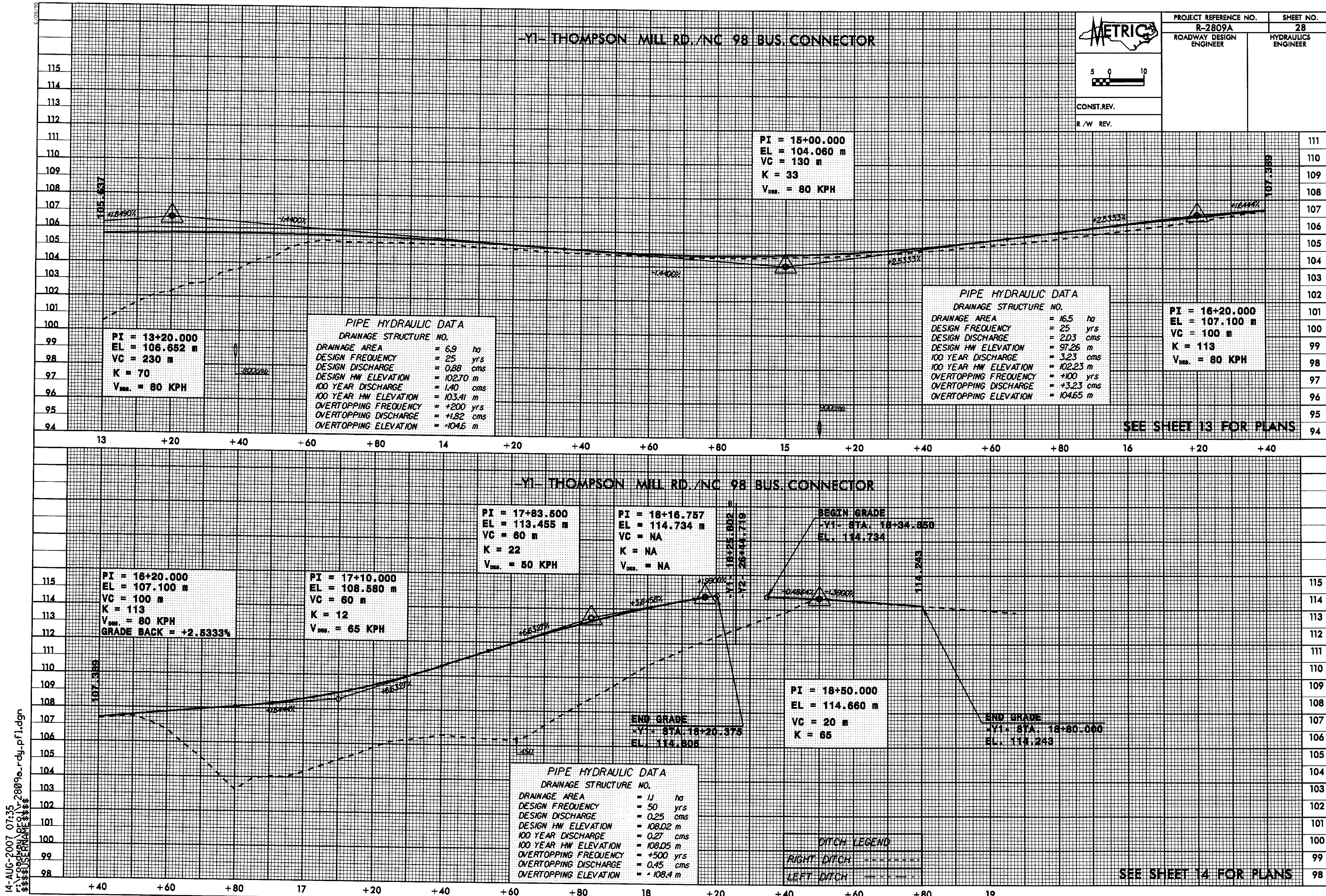
PROJECT REFERENCE NO.
R-2809A
SHEET NO.
28
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
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CONST.REV.
R /W REV.
-Y1- THOMPSON MILL RD./NC 98 BUS. CONNECTOR
PI = 13+20.000
EL = 106.652 m
VC = 230 m
K = 70
V des. = 80 KPH
PI = 15+00.000
EL = 104.060 m
VC = 130 m
K = 33
V des. = 80 KPH
PI = 16+20.000
EL = 107.100 m
VC = 100 m
K = 113
V des. = 80 KPH
105.637
107.389
+1.8490%
-1.4400%
+2.5333%
+1.6444%
PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.
DRAINAGE AREA = 6.9 ha
DESIGN FREQUENCY = 25 yrs
DESIGN DISCHARGE = 0.88 cms
DESIGN HW ELEVATION = 102.70 m
100 YEAR DISCHARGE = 1.40 cms
100 YEAR HW ELEVATION = 103.41 m
OVERTOPPING FREQUENCY = +200 yrs
OVERTOPPING DISCHARGE = +1.82 cms
OVERTOPPING ELEVATION = -104.6 m
PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.
DRAINAGE AREA = 16.5 ha
DESIGN FREQUENCY = 25 yrs
DESIGN DISCHARGE = 2.03 cms
DESIGN HW ELEVATION = 97.26 m
100 YEAR DISCHARGE = 3.23 cms
100 YEAR HW ELEVATION = 102.23 m
OVERTOPPING FREQUENCY = +100 yrs
OVERTOPPING DISCHARGE = +3.23 cms
OVERTOPPING ELEVATION = 104.65 m
SEE SHEET 13 FOR PLANS
13 +20 +40 +60 +80 14 +20 +40 +60 +80 15 +20 +40 +60 +80 16 +20 +40
-Y1- THOMPSON MILL RD./NC 98 BUS. CONNECTOR
PI = 16+20.000
EL = 107.100 m
VC = 100 m
K = 113
V des. = 80 KPH
GRADE BACK = +2.5333%
PI = 17+10.000
EL = 108.580 m
VC = 60 m
K = 12
V des. = 65 KPH
PI = 17+83.500
EL = 113.455 m
VC = 60 m
K = 22
V des. = 50 KPH
PI = 18+16.757
EL = 114.734 m
VC = NA
K = NA
V des. = NA
-Y1- 18+25.802 =
-Y2- 26+44.719
BEGIN GRADE
-Y1- STA. 18+34.850
EL. 114.734
114.243
107.389
+1.6444%
+6.6327%
+3.8458%
+1.9900%
-0.4884%
-1.3900%
PI = 18+50.000
EL = 114.660 m
VC = 20 m
K = 65
END GRADE
-Y1- STA. 18+20.375
EL. 114.806
END GRADE
-Y1- STA. 18+80.000
EL. 114.243
450
PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.
DRAINAGE AREA = 1.1 ha
DESIGN FREQUENCY = 50 yrs
DESIGN DISCHARGE = 0.25 cms
DESIGN HW ELEVATION = 108.02 m
100 YEAR DISCHARGE = 0.27 cms
100 YEAR HW ELEVATION = 108.05 m
OVERTOPPING FREQUENCY = +500 yrs
OVERTOPPING DISCHARGE = 0.45 cms
OVERTOPPING ELEVATION = -108.4 m
DITCH LEGEND
RIGHT DITCH
LEFT DITCH
SEE SHEET 14 FOR PLANS
+40 +60 +80 17 +20 +40 +60 +80 18 +20 +40 +60 +80 19
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PROJECT REFERENCE NO.	SHEET NO.
R-2809A	29
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

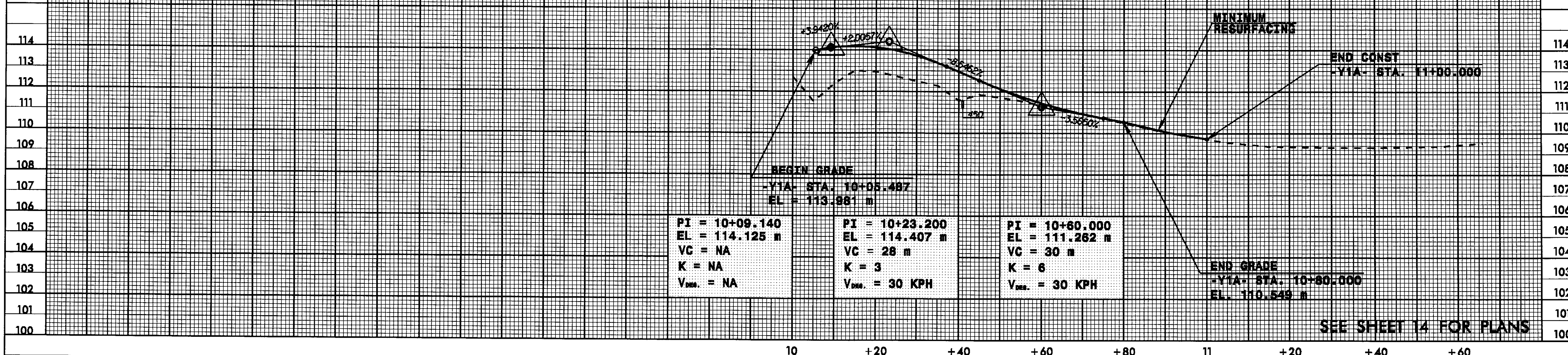
CONST.REV.

R /W REV.

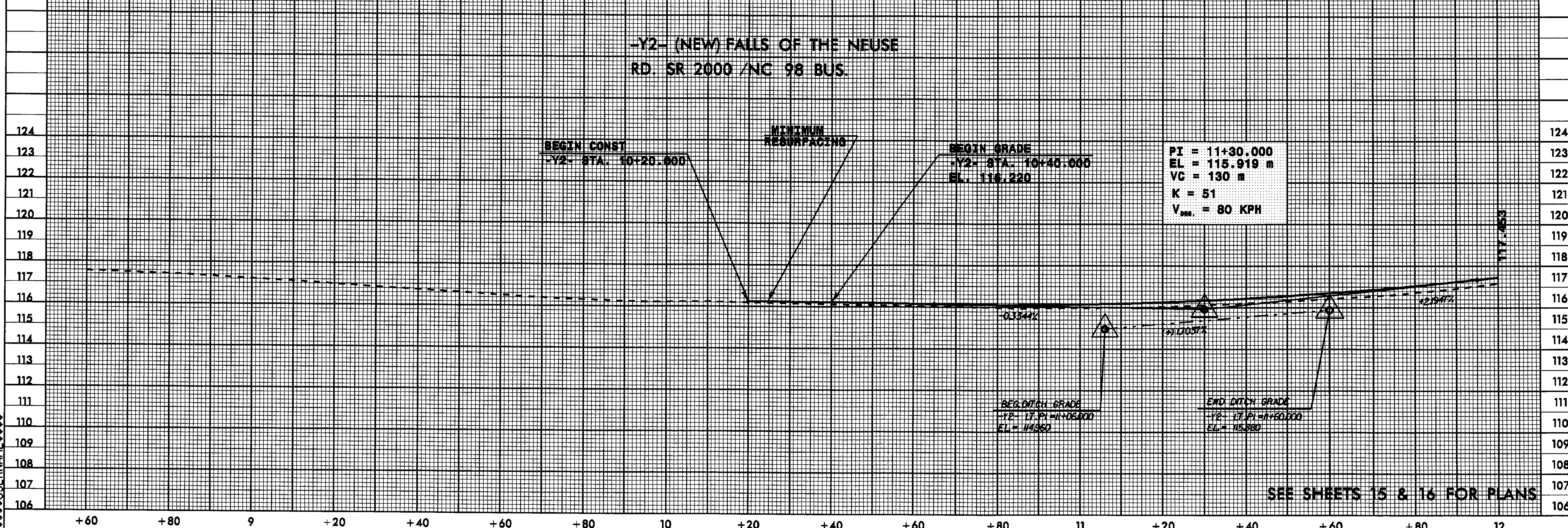
PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 0.37	ha
DESIGN FREQUENCY	= 50	yrs
DESIGN DISCHARGE	= 0.12	cms
DESIGN HW ELEVATION	= 112.11	m
100 YEAR DISCHARGE	= 0.13	cms
100 YEAR HW ELEVATION	= 112.12	m
OVERTOPPING FREQUENCY	= +500	yrs
OVERTOPPING DISCHARGE	= +0.22	cms
OVERTOPPING ELEVATION	= +112.89	m



-Y1A- FAWN DR. SR 1976
MINIMUM RESURFACING
END CONST
-Y1A- STA. 11+00.000
+3.9420%
+2.0057%
-8.5462%
-3.5650%
450
BEGIN GRADE
-Y1A- STA. 10+05.487
EL = 113.981 m
PI = 10+09.140
EL = 114.125 m
VC = NA
K = NA
V des. = NA
PI = 10+23.200
EL = 114.407 m
VC = 28 m
K = 3
V des. = 30 KPH
PI = 10+60.000
EL = 111.262 m
VC = 30 m
K = 6
V des. = 30 KPH
END GRADE
-Y1A- STA. 10+80.000
EL. 110.549 m
SEE SHEET 14 FOR PLANS
114
113
112
111
110
109
108
107
106
105
104
103
102
101
100
10
+20
+40
+60
+80
11
+20
+40
+60



-Y2- (NEW) FALLS OF THE NEUSE
RD. SR 2000 /NC 98 BUS.
BEGIN CONST
-Y2- STA. 10+20.000
MINIMUM RESURFACING
BEGIN GRADE
-Y2- STA. 10+40.000
EL. 116.220
PI = 11+30.000
EL = 115.919 m
VC = 130 m
K = 51
V des. = 80 KPH
117.453
-0.3344%
(+) 1.7057%
+2.1947%
BEG. DITCH GRADE
-Y2- LT. PI =11+06.000
EL.= 114.960
END DITCH GRADE
-Y2- LT. PI =11+60.000
EL.= 115.880
SEE SHEETS 15 & 16 FOR PLANS
124
123
122
121
120
119
118
117
116
115
114
113
112
111
110
109
108
107
106
+60
+80
9
+20
+40
+60
+80
10
+20
+40
+60
+80
11
+20
+40
+60
+80
12

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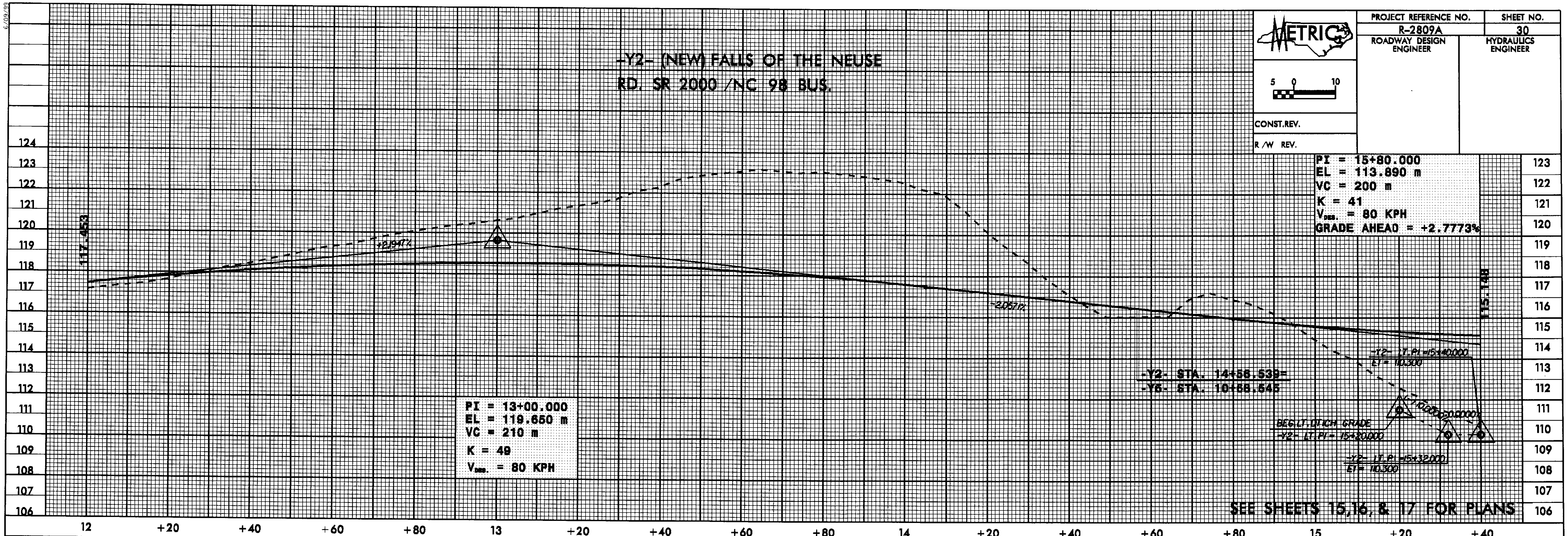
PROJECT REFERENCE NO.	SHEET NO.
R-2809A	30
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV.



-Y2- (NEW) FALLS OF THE NEUSE
RD. SR 2000 /NC 98 BUS.
PI = 13+00.000
EL = 119.650 m
VC = 210 m
K = 49
V des. = 80 KPH
PI = 15+80.000
EL = 113.890 m
VC = 200 m
K = 41
V des. = 80 KPH
GRADE AHEAD = +2.7773%
-Y2- STA. 14+56.539=
-Y6- STA. 10+58.545
BEG. LT. DITCH GRADE
-Y2- LT. PI = 15+20.000
-Y2- LT. PI = 15+32.000
EI = 110.300
-Y2- LT. PI = 15+40.000
EI = 110.300
117.453
115.148
SEE SHEETS 15, 16, & 17 FOR PLANS
12
13
14
15

PIPE HYDRAULIC DATA

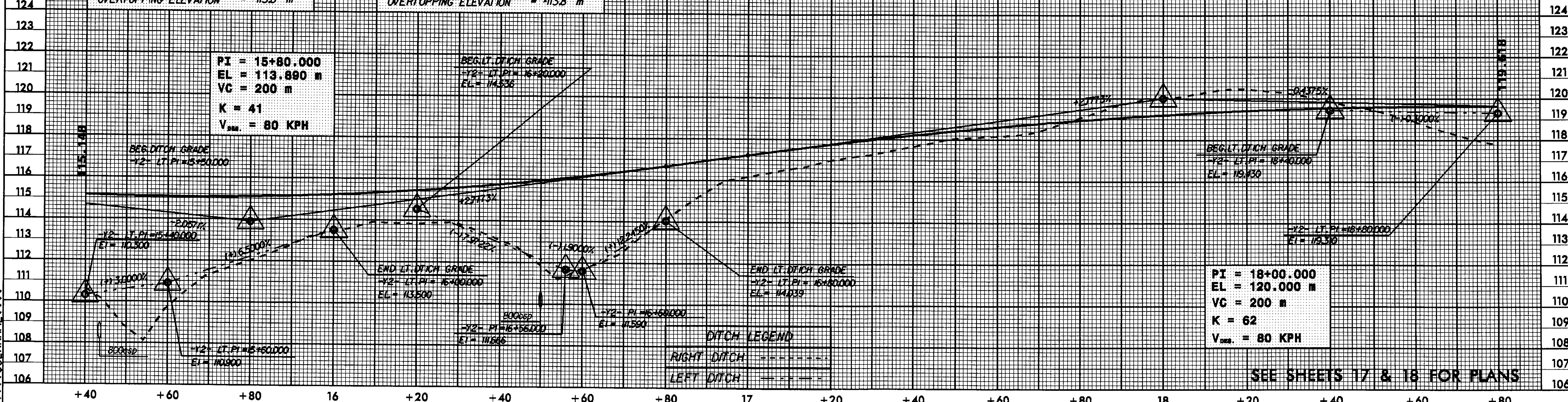
DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 4.6 ha
DESIGN FREQUENCY	= 50 yrs
DESIGN DISCHARGE	= 0.80 cms
DESIGN HW ELEVATION	= 111.58 m
100 YEAR DISCHARGE	= 0.86 cms
100 YEAR HW ELEVATION	= 111.70 m
OVERTOPPING FREQUENCY	= +500 yrs
OVERTOPPING DISCHARGE	= +1.44 cms
OVERTOPPING ELEVATION	= +113.8 m

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 2.85 ha
DESIGN FREQUENCY	= 50 yrs
DESIGN DISCHARGE	= 0.65 cms
DESIGN HW ELEVATION	= 112.39 m
100 YEAR DISCHARGE	= 0.70 cms
100 YEAR HW ELEVATION	= 112.46 m
OVERTOPPING FREQUENCY	= +500 yrs
OVERTOPPING DISCHARGE	= +1.17 cms
OVERTOPPING ELEVATION	= +113.8 m



-Y2- (NEW) FALLS OF THE NEUSE
RD. SR 2000 /NC 98 BUS.
PI = 15+80.000
EL = 113.890 m
VC = 200 m
K = 41
V des. = 80 KPH
PI = 18+00.000
EL = 120.000 m
VC = 200 m
K = 62
V des. = 80 KPH
BEG. DITCH GRADE
-Y2- LT. PI = 15+50.000
BEG. LT. DITCH GRADE
-Y2- LT. PI = 16+20.000
EL = 114.336
END LT. DITCH GRADE
-Y2- LT. PI = 16+00.000
EL = 113.500
END LT. DITCH GRADE
-Y2- LT. PI = 16+80.000
EL = 114.039
BEG. LT. DITCH GRADE
-Y2- LT. PI = 18+40.000
EL = 119.430
-Y2- LT. PI = 18+80.000
EI = 119.330
DITCH LEGEND
RIGHT DITCH
LEFT DITCH
115.148
119.618
SEE SHEETS 17 & 18 FOR PLANS
16
17
18

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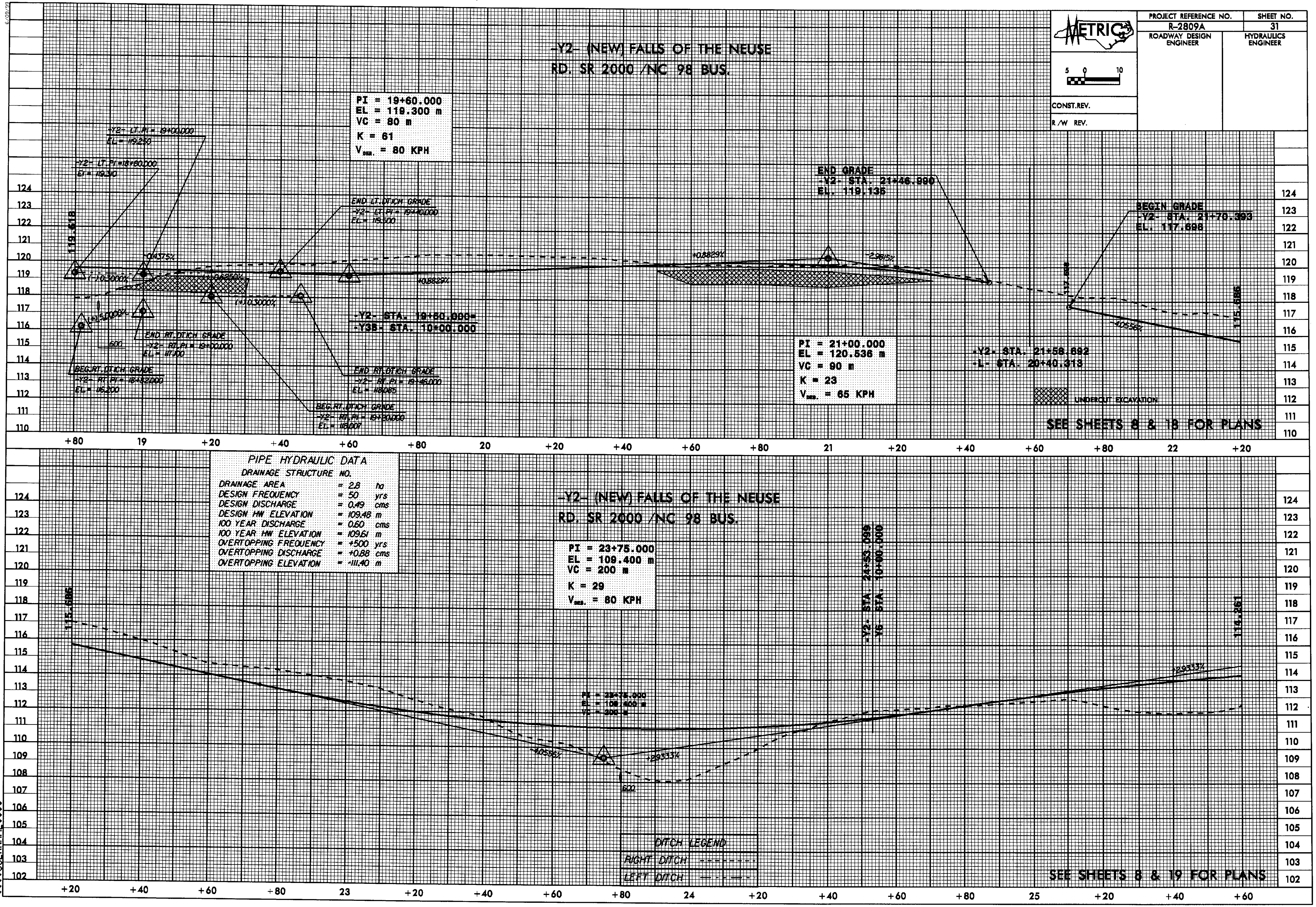
PROJECT REFERENCE NO.	SHEET NO.
R-2809A	31
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST. REV.

R/W REV.



METRIC
5 0 10
-Y2- (NEW) FALLS OF THE NEUSE
RD. SR 2000 /NC 98 BUS.
PI = 19+60.000
EL = 119.300 m
VC = 80 m
K = 61
V des. = 80 KPH
-Y2- LT. PI = 19+00.000
EL = 119.250
-Y2- LT. PI = 18+80.000
El = 119.30
END LT. DITCH GRADE
-Y2- LT. PI = 19+40.000
EL = 119.500
119.618
-Y2- STA. 19+60.000=
-Y3B- STA. 10+00.000
END RT. DITCH GRADE
-Y2- RT. PI = 19+00.000
EL = 117.100
BEG. RT. DITCH GRADE
-Y2- RT. PI = 18+82.000
EL = 116.200
END RT. DITCH GRADE
-Y2- RT. PI = 19+46.000
EL = 118.085
BEG. RT. DITCH GRADE
-Y2- RT. PI = 19+20.000
EL = 118.007
END GRADE
-Y2- STA. 21+46.990
EL. 119.135
BEGIN GRADE
-Y2- STA. 21+70.393
EL. 117.698
PI = 21+00.000
EL = 120.536 m
VC = 90 m
K = 23
V des. = 65 KPH
-Y2- STA. 21+58.692
-L- STA. 20+40.313
+0.4375%
+0.8829%
-2.9815%
+0.8829%
-4.0556%
115.686
UNDERCUT EXCAVATION
SEE SHEETS 8 & 18 FOR PLANS
+80 19 +20 +40 +60 +80 20 +20 +40 +60 +80 21 +20 +40 +60 +80 22 +20
-Y2- (NEW) FALLS OF THE NEUSE
RD. SR 2000 /NC 98 BUS.
PI = 23+75.000
EL = 109.400 m
VC = 200 m
K = 29
V des. = 80 KPH
-Y2- STA. 24+53.099
-Y6 STA. 10+00.000
115.686
114.261
-4.0556%
+2.9533%
+2.9533%
600
DITCH LEGEND
RIGHT DITCH
LEFT DITCH
SEE SHEETS 8 & 19 FOR PLANS
+20 +40 +60 +80 23 +20 +40 +60 +80 24 +20 +40 +60 +80 25 +20 +40 +60

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.		
DRAINAGE AREA	= 2.8	ha
DESIGN FREQUENCY	= 50	yrs
DESIGN DISCHARGE	= 0.49	cms
DESIGN HW ELEVATION	= 109.48	m
100 YEAR DISCHARGE	= 0.60	cms
100 YEAR HW ELEVATION	= 109.61	m
OVERTOPPING FREQUENCY	= +500	yrs
OVERTOPPING DISCHARGE	= +0.88	cms
OVERTOPPING ELEVATION	= 111.40	m

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PROJECT REFERENCE NO.	SHEET NO.
R-2809A	32
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST.REV.

R /W REV.

-Y2- (NEW) FALLS OF THE NEUSE RD. SR 2000 /NC 98 BUS.

-Y2- STA. 28+02.522
-Y1A- STA. 10+00.000

114.261

+2.95% -1.30% -5.00% +0.38% 114.063

PI = 26+00.000
EL = 116.000 m
VC = 240 m
K = 57
$V_{des.}$ = 80 KPH

-Y2- STA. 25+44.719
-Y1- STA. 18+25.802

PI = 27+80.000
EL = 113.645 m
VC = 60 m
K = 47
$V_{des.}$ = 80 KPH

SEE SHEETS 14, 19, & 20 FOR PLANS

-Y2- (NEW) FALLS OF THE NEUSE RD. SR 2000 /NC 98 BUS.

END GRADE
-Y2- STA. 30+80.000
EL. 113.082

114.063

+0.38% -0.66% -0.66% -1.67% MINIMUM RESURFACING

END CONST
-Y2- STA. 30+70.000

PI = 29+20.000
EL = 114.188 m
VC = 100 m
K = 95
$V_{des.}$ = 80 KPH

PI = 30+40.000
EL = 113.398 m
VC = 40 m
K = 39.6
$V_{des.}$ = 80 KPH

SEE SHEET 20 FOR PLANS

-Y9- WAKEFIELD PLANTATION DR.

END CONST.
-Y9- STA. 10+80.000

MINIMUM MILLING & RESURFACING

93.766

-2.37% +5.03% +2.68%

BEGIN GRADE
-Y9- STA. 10+11.707
EL = 93.266 m

END GRADE
-Y9-STA. 10+70.000
EL = 94.678 m

PI = 10+25.000
EL = 92.950 m
VC = 25 m
K = 3
$V_{des.}$ = 20 KPH

PI = 10+52.500
EL = 94.491 m
VC = 30 m
K = 7
$V_{des.}$ = 50 KPH

SEE SHEET 10 & 11 FOR PLANS

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6/09/99

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	33
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC 5 0 10

CONST.REV.

R /W REV.

-Y5- (OLD) FALLS OF THE NEUSE RD. SR 2000

PI = 10+50.000
EL = 116.050 m
VC = 20 m
K = 7
$V_{DES.}$ = 30 KPH

PI = 11+20.000
EL = 115.270 m
VC = 80 m
K = 11
$V_{DES.}$ = 30 KPH

PI = 12+20.000
EL = 121.250 m
VC = 80 m
K = 18
$V_{DES.}$ = 30 KPH

BEGIN GRADE
-Y5- STA. 10+40.000
EL. 116.142

END GRADE
PI = 10+83.145
EL = 116.460 m

BEGIN GRADE
-Y5- STA. 10+73.945
EL. 116.322 m

MINIMUM RESURFACING

END GRADE
-Y5- STA. 12+60.000
EL. 121.830

END CONST
-Y5- STA. 12+70.000

-0.9200% +2.0693% -2.2842% +5.9800% +1.4500%

-Y5- 10+68.645
-Y2- 10+68.645

UNDERCUT EXCAVATION

SEE SHEET 17 FOR PLANS

-Y3B- OLD NC 98 SR 1967

BEGIN GRADE
-Y3B- STA. 10+13.800
EL. 120.122

PI = 10+75.000
EL = 123.182 m
VC = 60 m
K = 10
$V_{DES.}$ = 50 KPH

PI = 11+22.000
EL = 122.751 m
VC = 34 m
K = 63
$V_{DES.}$ = 130 KPH

BEG.LT.DITCH GRADE
-Y3B- LT.PI = 10+80.000
EL = 121.865

-Y3B- LT.PI=10+30.000
EL= 121.970

END LT.DITCH GRADE
-L- LT.PI = 11+30.000
EL = 122.054

END GRADE
-Y3B- STA. 11+40.000
EL. 122.683

MINIMUM RESURFACING

END CONST
-Y3B- STA. 11+80.000

BEGIN RT.DITCH GRADE
-Y3B- RT.PI=10+70.000
EL= 120.287

-Y3B- RT.PI=11+00.000
EL= 120.400

-Y3B- RT.PI=11+40.000
EL= 120.500

END RT.DITCH GRADE
-Y3B- RT.PI=11+90.000
EL= 121.500

+1.5000% -0.9700% (+) 1.0900% (+) 0.5000% -0.3776% (+) 3.3333% -0.5716%

119.432

-Y3B- 10+50.000
-Y4- 10+60.000

DITCH LEGEND
RIGHT DITCH ---------
LEFT DITCH — · — · —

SEE SHEET 18 FOR PLANS

-Y4- THOMPSON MILL RD. SR 1923

BEGIN GRADE
-Y4- STA. 10+04.500
EL. 122.099

PI = 10+50.000
EL = 121.770 m
VC = 18 m
K = 5
$V_{DES.}$ = 30 KPH

PI = 10+25.000
EL = 122.919 m
VC = 18 m
K = 2
$V_{DES.}$ = 30 KPH

END GRADE
-Y4- STA. 10+80.000
EL. 121.690

MINIMUM RESURFACING

BEG.LT.DITCH GRADE
-Y4- LT.PI = 10+20.000
EL= 120.200

END LT.DITCH GRADE
-Y4- LT.PI= 10+50.000
EL= 120.000

END CONST
-Y4- STA. 10+80.000

-1.4000% +5.4286% -0.8000% (-) 0.3333%

SEE SHEET 18 FOR PLANS

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