PROJECT SPECIAL PROVISION

(10-18-95) Z-1

PERMITS

The Contractor's attention is directed to the following permits, which have been issued to the Department of Transportation by the authority granting the permit.

PERMIT	AUTHORITY GRANTING THE PERMIT
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Environmental Management, DENR State of North Carolina

The Contractor shall comply with all applicable permit conditions during construction of this project. Those conditions marked by * are the responsibility of the department and the Contractor has no responsibility in accomplishing those conditions.

Agents of the permitting authority will periodically inspect the project for adherence to the permits.

The Contractor's attention is also directed to Articles 107-10 and 107-14 of the *Standard Specifications* and the following:

Should the Contractor propose to utilize construction methods (such as temporary structures or fill in waters and/or wetlands for haul roads, work platforms, cofferdams, etc.) not specifically identified in the permit (individual, general, or nationwide) authorizing the project it shall be the Contractor's responsibility to coordinate with the Engineer to determine what, if any, additional permit action is required. The Contractor shall also be responsible for initiating the request for the authorization of such construction method by the permitting agency. The request shall be submitted through the Engineer. The Contractor shall not utilize the construction method until it is approved by the permitting agency. The request normally takes approximately 60 days to process; however, no extensions of time or additional compensation will be granted for delays resulting from the Contractor's request for approval of construction methods not specifically identified in the permit.

Where construction moratoriums are contained in a permit condition which restricts the Contractor's activities to certain times of the year, those moratoriums will apply only to the portions of the work taking place in the waters or wetlands provided that activities outside those areas is done in such a manner as to not affect the waters or wetlands.

Added 12-21-07

196

Faulner

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1890
WILMINGTON, NORTH CAROLINA 28402-1890

IN REPLY REFER TO

November 29, 2007

Regulatory Division

SUBJECT: Action ID 2007-03114-292; TIP No. R-2809

Gregory J. Thorpe, Ph.D.
Environmental Management Director, PDEA
N.C. Department of Transportation
1598 Mail Service Center
Raleigh, NC 27699-1598

Dear Dr. Thorpe:

Reference the Department of the Army (DA) permit issued on April 4, 2002, and subsequently modified, to authorize the discharge of dredged and fill material into the waters of United States, for construction of Sections A, B, and C of the NC 98 Wake Forest Bypass (T.I.P.No. R-2809), located generally south of Wake Forest, in Wake County, North Carolina. Reference also your September 10, 2007 letter requesting modification of the permit to authorize additional impacts for Section A of R-2809 based on final design, as well as revised plans for the restoration of the temporary stream and wetland impacts at Site 5 of Section C.

We have reviewed your proposal, issued a public notice for the proposal on October 11, 2007, and have determined that the proposed modification is reasonable and justified. Therefore, the permit is hereby modified to include the revised impacts to an additional 264 linear feet of stream, for total impacts to 354 linear feet of stream and 0.01 acre of wetlands for Section A, as shown on the attached drawings, subject to additional Special Conditions 1) and 2) below.

1) Within 270 days from the date of this permit modification, the permittee shall complete the restoration of the temporary stream and wetland impacts at Site 5 in Section C (Station 85+20 –L- LT), as shown in the revised construction plans for Section C at Buffer Sites 4 and 5, in the September 10, 2007 permit modification application.

*2) Compensatory mitigation for the unavoidable impacts to 0.01 acre of non- riparian wetlands, and 95 linear feet of stream associated with Section A of the proposed project shall be provided by the Ecosystem Enhancement Program (EEP), as outlined in the letter dated August 29, 2007 from William D. Gilmore, EEP Director. Pursuant to the EEP Memorandum of Agreement (MOA) between the State of North Carolina and the US Army Corps of Engineers signed on July 22, 2003, the EEP will provide

0.02 acre of restoration equivalent non- riparian wetlands, and 190 linear feet of restoration equivalent warm water stream channel in the Neuse River basin (Hydrologic Cataloging Unit 03020201) by one year of the date of this permit. For wetlands, a minimum of 1:1 (impact to mitigation) must be in the form of wetland restoration. The NCDOT shall, within 30 days of the issue date of this permit, certify that sufficient funds have been provided to EEP to complete the required mitigation, pursuant to Paragraph V. of the MOA.

It is understood that all other conditions of the modified permit, including the extended expiration date of December 31, 2010, remain applicable.

If you have questions, please contact Eric Alsmeyer of the Raleigh Regulatory Field Office, at telephone (919) 876-8441, extension 25.

Sincerely,

S. Kenneth Jolley

for John E. Pulliam, Jr.
Colonel, U.S. Army
District Commander

Copies Furnished:

Mr. Clarence Coleman
Federal Highway Administration
310 New Bern Ave., Rm. 410
Raleigh, North Carolina 27601-1442

Mr. Brian Wrenn
Division of Water Quality
North Carolina Department of
Environment and
Natural Resources
1650 Mail Service Center
Raleigh, NC 27699-1650

198

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1890
WILMINGTON, NORTH CAROLINA 28402-1890

IN REPLY REFER TO

April 4, 2002

APR 10

APR 10

Regulatory Division

Action ID. 199601836

Mr. William D. Gilmore, P.E., Manager
Project Development & Environmental Anaylsis
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, North Carolina 27699-1548

Dear Mr. Gilmore:

In accordance with the written request of March 23, 2001, and the ensuing administrative record, enclosed is a permit to authorize the discharge of dredged and fill material into waters of the United States, for construction of a new bypass alignment for NC 98 (T.I.P. No. R-2809), crossing Richland Creek, Smith Creek, unnamed tributaries, and adjacent wetlands, generally south of Wake Forest, in Wake County, North Carolina.

If any change in the authorized work is required because of unforeseen or altered conditions or for any other reason, the plans revised to show the change must be sent promptly to this office. Such action is necessary, as revised plans must be reviewed and the permit modified.

Carefully read your permit. The general and special conditions are important. Your failure to comply with these conditions could result in a violation of Federal law. Certain significant general conditions require that:

a. You must complete construction before December 31, 2005.

b. You must notify this office in advance as to when you intend to commence and complete work.

c. You must allow representatives from this office to make periodic visits to your worksite as deemed necessary to assure compliance with permit plans and conditions.

Should you have questions, contact Mr. Eric Alsmeyer of my Raleigh Field Office regulatory staff at telephone (919) 876-8441, extention 23.

Sincerely,

James W. DeLony
Colonel, U.S. Army
District Engineer

Enclosures

Copy Furnished with enclosures:

Chief, Source Data Unit
NOAA/National Ocean Service
ATTN: Sharon Tear N/CS261
1315 East-West Hwy., Rm 7316
Silver Spring, MD 20910-3282

Copies Furnished with special conditions and plans:

Mr. Garland Pardue, Field Supervisor
U.S. Fish and Wildlife Service
Fish and Wildlife Enhancement
Post Office Box 33726
Raleigh, North Carolina 27636-3726

Mr. Ron Sechler
National Marine Fisheries
Service, NOAA
Pivers Island
Beaufort, North Carolina 28516

Mr. David Rackley
National Marine Fisheries
Service, NOAA
219 Fort Johnson Road
Charleston, South Carolina 29412-9110

Mr. Ronald Mikulak, Chief
Wetlands Section - Region IV
Water Management Division
U.S. Environmental Protection Agency
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303

Mr. Dug Huggett
Division of Coastal Management
North Carolina Department of
Environment and Natural Resources
1638 Mail Service Center
Raleigh, North Carolina 27699-1638

United States Coast Guard
Marine Safety Office Wilmington
1502 North 23rd Street
Wilmington, North Carolina 28405

Commander, Aoww
Coast Guard, Atlantic Area
ATTN: Tom Flynn
431 Crawford Street
Portsmouth, Virginia 23704

Mr. Ronald E. Ferrell
Wetlands Restoration Program
Division of Water Quality/NCDENR
1650 Mail Service Center
Raleigh, NC 27699-1650

201

RECEIVED
MAR 28 2007

DEPARTMENT OF THE ARMY PERMIT

Permittee NC Department of Transportation

Permit No. 199601836

Issuing Office CESAW-RG-R

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

Place fill material impacting wetlands and streams, for construction of a new bypass alignment for NC 98 (T.I.P. No. R-2809), crossing Richland Creek, Smith Creek, unnamed tributaries, and adjacent wetlands.

Project Location:

Generally south of Wake Forest, in Wake County, North Carolina.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on December 31, 2005. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

See enclosed sheet.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(x) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

William D. Gilmore — 3/19/02

(PERMITTEE) — *(DATE)*

NC DEPARTMENT OF TRANSPORTATION

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

for — 4/4/02

(DISTRICT ENGINEER) — *(DATE)*

JAMES W. DELONY, COLONEL

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) — *(DATE)*

☆U.S. GOVERNMENT PRINTING OFFICE: 1988 — 717-425

State of North Carolina
Department of Environment
and Natural Resources
Division of Water Quality

Michael F. Easley, Governor
William G. Ross, Jr., Secretary
Gregory J. Thorpe, Ph.D., Acting Director

NCDENR
NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

February 26, 2002

Mr. William D. Gilmore, P.E., Manager
Planning and Environmental Branch
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, North Carolina, 27699-1548

Dear Mr. Gilmore:

Re: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act,
Wake Forest Bypass, on NC 98 from (Jones Dairy Road) to just west of SR 1923 (Thompson Mill Road) in Wake County (TIP R-2809).
WQC Project No. 010550
Wake County

Attached hereto is a modification to Certification No. 3343 issued to The North Carolina Department of Transportation dated February 4, 2002. The attached certification supercedes the original 401 Water Quality Certification issued on February 4, 2002.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Gregory J. Thorpe, Ph.D.
Acting Director

Attachments

cc: Wilmington District Corps of Engineers
Corps of Engineers Raleigh Field Office
DWQ Raleigh Regional Office
Ron Ferrell, Wetlands Restoration Program
Central Files
File Copy

State of North Carolina
Department of Environment
and Natural Resources
Division of Water Quality

Michael F. Easley, Governor
William G. Ross, Jr., Secretary
Gregory J. Thorpe, Ph.D., Acting Director

205

NCDENR
NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

APPROVAL OF 401 Water Quality Certification and ADDITIONAL CONDITIONS and the Neuse River Buffer Rules

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (DWQ) Regulations in 15 NCAC 2H, Section .0500, and 15A NCAC 2B .233. Attached hereto is a modification to Certification No. 3343 issued to The North Carolina Department of Transportation dated February 4, 2002. This certification supercedes the original 401 Water Quality Certification issued on February 4, 2002. This certification authorizes the NCDOT to place fill material in 1.09 acres of jurisdictional wetlands, 3708 linear feet of streams, and 7.19 acres of protected riparian buffers in Wake County. The project shall be constructed pursuant to the application dated March 23, 2001, and the addendums dated August 7, 2001, October 3, 2001, November 2, 2001, and November 30, 2001to construct the Wake Forest Bypass from west of SR 1923 (Thompson Mill Road) to east of SR 2053 (Jones Dairy Road), State Project Number 8.1402501, Federal Aid Number STP-98(1), TIP R-2809).

The application provides adequate assurance that the discharge of fill material into the waters of Neuse River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your application, as described in the Public Notice. Should your project change, you are required to notify the DWQ and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire three years from the date of the cover letter from DWQ or on the same day as the expiration date of the corresponding Corps of Engineers Permit, whichever is sooner.

Condition(s) of Certification:

1. Appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the "North Carolina Sediment and Erosion Control Planning and Design Manual" or the "North Carolina Surface Mining Manual" whichever is more appropriate (available from the Division of Land Resources (DLR) in the DENR Regional or Central Offices) shall be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to assure compliance with

Feb 26

State of North Carolina
Department of Environment
and Natural Resources
Division of Water Quality

-206

Michael F. Easley, Governor
William G. Ross, Jr., Secretary
Gregory J. Thorpe, Ph.D., Acting Director

the appropriate turbidity water quality standard (50 NTUs in all fresh water streams and rivers not designated as trout waters; 25 NTUs in all lakes and reservoirs, and all saltwater classes; and 10 NTUs in trout waters);

2. All sediment and erosion control measures shall not be placed in wetlands or waters to the maximum extent practicable. If placement of sediment and erosion control devices in wetlands and waters is unavoidable, they shall be removed and the natural grade restored after the Division of Land Resources has released the project;

3. If an environmental document is required, this Certification is not valid until a FONSI or ROD is issued by the State Clearinghouse. All water quality-related conditions of the FONSI or ROD shall become conditions of this Certification;

4. Measures shall be taken to prevent live or fresh concrete from coming into contact with waters of the state until the concrete has hardened;

5. There shall be no excavation from or waste disposal into jurisdictional wetlands or waters associated with this permit without appropriate modification of this permit. Should waste or borrow sites be located in wetlands or stream, compensatory mitigation will be required since it is a direct impact from road construction activities.

6. All channel relocations will be constructed in a dry work area, and stabilized before stream flows are diverted. Channel relocations will be completed and stabilized prior to diverting water into the new channel. Whenever possible, channel relocations shall be allowed to stabilize for an entire growing season. Vegetation used for bank stabilization shall be limited to native woody species, and should include establishment of a 30 foot wide wooded and an adjacent 20 foot wide vegetated buffer on both sides of the relocated channel to the maximum extent practical. A transitional phase incorporating coir fiber and seedling establishment is allowable. Also, rip-rap may be allowed if it is necessary to maintain the physical integrity of the stream, but the applicant must provide written justification and any calculations used to determine the extent of rip-rap coverage requested.

* 7. Compensatory mitigation shall be done for impacts to 2.09 acres of jurisdictional wetlands (1.04 acres of non-riparian, 0.04 acres of riparian) at a replacement ratio of 2:1. Thus, 2.10 acres of mitigation for non-riparian wetlands, and 0.08 acres of riparian wetlands shall be provided. In addition, compensatory mitigation shall be done for impacts to 1522 linear feet of streams at a replacement ratio of 1:1. Therefore, 2970 linear feet of stream mitigation shall be provided. We understand that you have chosen to perform mitigation through an in lieu payment to the North Carolina Wetland Restoration Program (NCWRP), and that the WRP has agreed to implement mitigation for the project. In accordance with 15A NCAC 2R.0500, the contribution will satisfy our compensatory mitigation requirements under 15A NCAC 2H.0506(h). Until the Wetland Restoration Program receives and clears your check (made payable to DENR – Wetland Restoration Program), wetland or stream fill shall not occur. Mr. Ron Ferrell should be contacted at 919-733-5083 ext. 358 if you have any questions concerning the Wetland Restoration Program. The payment to NCWRP shall be sent within two months of issuance of the 404 permit.

Wetlands/401 Unit 1621 Mail Service Center Raleigh, North Carolina 27699-1621
Telephone 919-733-1786 FAX 733-9959

Feb 26

State of North Carolina
Department of Environment
and Natural Resources
Division of Water Quality

207

Michael F. Easley, Governor
William G. Ross, Jr., Secretary
Gregory J. Thorpe, Ph.D., Acting Director

NCDENR
North Carolina Department of
Environment and Natural Resources

* 8. Compensatory mitigation for impacts to Neuse Riparian Buffers shall be provided for as described below.

Zone of Impact	Impacts (Acres)	Replacement Ratio	Total Acres of Mitigation Required
Zone 1	4.37	3:1	13.11
Zone 2	2.82	1.5:1	4.23
Total			**17.34**

Mitigation for unavoidable impacts to Neuse Riparian Buffers shall be provided through an in-lieu payment to the North Carolina Wetlands Restoration Program (NCWRP) at a rate of $41,625 per acre for 17.25 acres of buffer impact. Therefore, a total payment of $718,031 shall be submitted to the NCWRP to offset the impacts for the project. No construction activities in buffers shall begin until payment for buffer mitigation is made to the NCWRP.

* 9. Upon completion of the project, the NCDOT shall complete and return the enclosed "Certification of Completion Form" to notify DWQ when all work included in the 401 Certification has been completed. The responsible party shall complete the attached form and return it to the 401/Wetlands Unit of the Division of Water Quality upon completion of the project.

10. This certification only authorizes construction activities in Segment C of the referenced project. No construction activities are authorized in Segment A or B until a modification request with final project design, appropriate fees, and number of copies is submitted to, and approved by, the North Carolina Division of Water Quality.

11. The proposed stream relocation in Segment B located at Y2 Station Number 11+25 will require approval by the NCDWQ prior to it being accepted as appropriate on-site mitigation. The final design for the referenced stream relocation will need to be presented. In addition, the reference reach used to design the stream segment will need NCDWQ approval. Until the proposed relocation is approved the NCDWQ, no construction activities can occur for Segment B of the project.

12. Construction activities for Segment C shall strictly adhere to sediment and erosion control Best Management Practices as described for High Quality Waters entitled "Design Standards in Sensitive Watersheds" (15A NCAC 04B .0024) throughout design and construction of the project.

13. Future modifications for Segment A shall include the design for Hazardous Spill Catch Basins for any stormwater that drains to Horse Shoe Creek (WS-IV NSW CA) and any of its tributaries. The design shall be such that no stormwater from the project site, either during construction or after the project is opened to the traveling public, shall discharge directly into Horse Shoe Creek. Instead, all stormwater shall be designed to discharge first into a Hazardous Spill Catch Basin.

Wetlands/401 Unit 1621 Mail Service Center Raleigh, North Carolina 27699-1621
Telephone 919-733-1786 FAX 733-9959

Feb 26

State of North Carolina
Department of Environment
and Natural Resources
Division of Water Quality

208

Michael F. Easley, Governor
William G. Ross, Jr., Secretary
Gregory J. Thorpe, Ph.D., Acting Director

NCDENR
NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

14. Placement of culverts and other structures in waters, streams, and wetlands must be placed below the elevation of the streambed to allow low flow passage of water and aquatic life unless it can be shown to DWQ that providing passage would be impractical. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or stream beds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium shall be maintained if requested in writing by DWQ.

Violations of any condition herein set forth shall result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If this Certification is unacceptable to you have the right to an adjudicatory hearing upon written request within sixty (60) days following receipt of this Certification. This request must be in the form of a written petition conforming to Chapter 150B of the North Carolina General Statutes and filed with the Office of Administrative Hearings, P.O. Box 27447, Raleigh, N.C. 27611-7447. If modifications are made to an original Certification, you have the right to an adjudicatory hearing on the modifications upon written request within sixty (60) days following receipt of the Certification. Unless such demands are made, this Certification shall be final and binding.

This the 26th day of February 2002

DIVISION OF WATER QUALITY

Gregory J. Thorpe, Ph.D.
Acting Director

WQC No. 3343

State of North Carolina
Department of Environment
and Natural Resources
Division of Water Quality

209

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES

Michael F. Easley, Governor
William G. Ross, Jr., Secretary
Gregory J. Thorpe, Ph.D., Acting Director

DWQ Project No.: _____ **County:** _____

Applicant: _____

Project Name: _____

Date of Issuance of 401 Water Quality Certification: _____

Certificate of Completion

Upon completion of all work approved within the 401 Water Quality Certification or applicable Buffer Rules, and any subsequent modifications, the applicant is required to return this certificate to the 401/Wetlands Unit, North Carolina Division of Water Quality, 1621 Mail Service Center, Raleigh, NC, 27699-1621. This form may be returned to DWQ by the applicant, the applicant's authorized agent, or the project engineer. It is not necessary to send certificates from all of these.

Applicant's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

Agent's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

Engineer's Certification

_____ Partial _____ Final

I, _____, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (periodically, weekly, full time) the construction of the project,for the Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature _____ Registration No. _____

Date _____

Wetlands/401 Unit 1621 Mail Service Center Raleigh, North Carolina 27699-1621
Telephone 919-733-1786 FAX 733-9959

State of North Carolina
Department of Environment
and Natural Resources
Division of Water Quality

210

Michael F. Easley, Governor
William G. Ross, Jr., Secretary
Gregory J. Thorpe, Ph.D., Acting Director

NCDENR
NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

NORTH CAROLINA – DIVISION OF WATER QUALITY
401 WATER QUALITY CERTIFICATION
SUMMARY OF PERMITTED IMPACTS AND MITIGATION REQUIREMENTS

In accordance with 15A NCAC 2H.0500, the North Carolina Department of Transportation is authorized to impact the waters of the State of North Carolina as indicated below for the purpose of constructing the Wake Forest Bypass from west of SR 1923 (Thompson Mill Road) to east of SR 2053 (Jones Dairy Road) in Wake County (TIP No. R-2809, DWQ No. 010550). All activities associated with these authorized impacts must be conducted in accordance with the conditions listed in the attached certification transmittal letter. **THIS CERTIFICATION IS NOT VALID WITHOUT THE ATTACHMENTS.**

COMPENSATORY MITIGATION REQUIREMENTS FOR WETLAND RESTORATION:

LOCATION:	Wake Forest Bypass from west of SR 1923 (Thompson Mill Road) to east of SR 2053 (Jones Dairy Road)
COUNTY:	Wake
BASIN/SUBBASIN:	Neuse River, Cataloging Unit 03020201
DWQ No.:	010550

As required by 15A NCAC 2H.0506, and the conditions of this certification, you are required to compensate for the above impacts through the restoration, creation, enhancement or preservation of wetlands and surface waters as outlined below prior to conducting any activities that impact or degrade waters of the state. Note: Acreage requirements proposed to be mitigated through the Wetland Restoration Program must be rounded to one-quarter increments according to 15A 2R.0503(b).

2.18 acres of Class WL wetlands
- 0.08 acres of riparian wetlands
- 2.10 acres of non-riparian wetlands

17.34 acres of Neuse Riparian Buffers

2970 linear feet of stream channel

One of the options you have available to satisfy the compensatory mitigation requirements is through payment of a fee to the Wetland Restoration Fund per 15A NCAC 2R.0503. If you choose this option, please sign this form and mail it to the Wetlands Restoration Fund at the address listed below. An invoice for the appropriate amount of payment will be sent to you upon receipt of this form. PLEASE NOTE, THE ABOVE IMPACTS ARE NOT AUTHORIZED UNTIL YOU RECEIVE NOTIFICATION THAT YOUR PAYMENT HAS BEEN PROCESSED BY THE WETLANDS RESTORATION PROGRAM.

Signature _____ Date _____

WETLANDS RESTORATION PROGRAM
DIVISION OF WATER QUALITY
P.O. BOX 29535
RALEIGH, NC, 27626-0535
(919) 733-5208

Pg 2 of 26

SPECIAL CONDITIONS (Action ID. 199601836; NCDOT/TIP R-2809)

a. All work authorized by this permit must be completed in strict compliance with the attached plans, which are a part of this permit.

b. The permittee shall mitigate for 2,970 linear feet of important stream impact and 1.1 acre of wetland impact for this project, as described below (384 linear feet of onsite stream relocation, and 5,172 linear feet of stream mitigation and 2.2 acres of wetland mitigation through the North Carolina Wetlands Restoration Program (NCWRP), in the upper Neuse River basin (Cataloging Unit 03020201)).

ONSITE STREAM RELOCATION

c. The permittee shall mitigate for 384 linear feet of unavoidable impacts to important stream channel associated with this project by completing 384 linear feet of onsite stream relocation, as described in the permit application. The stream relocation shall be constructed in accordance with the North Carolina Wildlife Resources Commission's (NCWRC) "Stream Relocation Guidelines", and with the attached permit drawings, and the attached "Natural Channel Design; ~~Long Branch~~", ~~dated August 17, 1999~~. NCDOT shall consult with NCWRC on all stream relocations and implement all practicable recommendations in the design of specific site requirements for re-establishment of bank vegetation, and placement of meanders and habitat structures. Vegetation shall be used to the maximum extent practicable to stabilize banks, and riprap and other man-made structural measures shall be minimized. NCDOT shall ensure that the stream channel is sufficiently stabilized prior to the diversion of water into the new channel.

d. The permittee shall visually monitor the vegetative plantings on all mitigation stream banks to assess and insure complete stabilization of the mitigation stream segments. This monitoring shall include adequate visual monitoring of planted vegetation quarterly for a minimum of one year after final planting, and appropriate remedial actions (e.g., replanting, streambank grading, etc.). If within any monitoring year, bank stabilization is not acceptable as determined by the Corps of Engineers, and remedial action required by the Corps of Engineers is performed, the one year monitoring of the affected portions of the stream will begin again. The permittee will coordinate stream mitigation activities with the Corps of Engineers, Raleigh Regulatory Field Office Project Manager, and will report verbally on the status of the stream mitigation within thirty days of the quarterly monitoring. The permittee will submit a brief written report with representative photographs within 90 days after the monitoring year is completed.

NCWRP STREAM MITIGATION

e. The permittee shall mitigate for 2,586 linear feet of unavoidable impacts to important stream channel associated with this project by payment to the North Carolina Wetlands Restoration Program (NCWRP) in an amount determined by the NCWRP sufficient to perform 5,172 linear feet of warm water stream mitigation, or the equivalent

water quality improvement projects, as approved by the Corps of Engineers, in the upper Neuse River basin (Cataloging Unit 03020201). Construction within streams on the permitted highway project shall begin only after the permittee has made full payment to the NCWRP, and the NCWRP has made written confirmation to the District Engineer, that it agrees to accept responsibility for the mitigation work required, pursuant to Paragraph IV.D. of the Memorandum of Understanding between the North Carolina Department of Environment and Natural Resources and the U.S. Army Corps of Engineers, Wilmington District, dated November 4, 1998.

NCWRP WETLANDS MITIGATION

f. The permittee shall mitigate for 1.1 acres of unavoidable impacts to wetlands associated with this project by payment to the North Carolina Wetlands Restoration Program (NCWRP) in an amount determined by the NCWRP sufficient to perform 2.2 acres of riparian, palustrine forested wetland mitigation in the Cape Fear River basin (Cataloging Unit 03020201). Construction within wetlands on the permitted highway project shall begin only after the permittee has made full payment to the NCWRP, and the NCWRP has made written confirmation to the District Engineer, that it agrees to accept responsibility for the mitigation work required, pursuant to Paragraph IV.D. of the Memorandum of Understanding between the North Carolina Department of Environment and Natural Resources and the U.S. Army Corps of Engineers, Wilmington District, dated November 4, 1998.

g. Failure to institute and carry out the details of special conditions a. - f., above, may result in a directive to cease all ongoing and permitted work within waters and/or wetlands associated with R-2809, or such other remedy as the District Engineer or his authorized representatives may seek.

OTHER CONDITIONS

h. When final design plans are completed for Sections R-2809A and R-2809B, any necessary permit modifications shall be submitted to the District Engineer and the North Carolina Division of Water Quality (NCDWQ). If necessary, a public notice will be circulated for review. Final designs shall reflect all appropriate avoidance, minimization and mitigation for impacts within streams and wetlands. Construction within streams and wetlands on Sections R-2809A and R-2809B shall begin only after approval by the District Engineer of the modified impacts.

i. NCDOT shall restore the temporary wetland impact area at Site 5 in Section C (Station 85+20 –L- LT) to original contours and seed it with appropriate wetland species.

j. Prior to commencing construction within jurisdictional waters of the United States, the permittee shall forward the latest version of project construction drawings to the Corps of Engineers, Raleigh Regulatory Field Office NCDOT Regulatory Project Manager. Half-size drawings are acceptable.

* k. The permittee shall schedule an onsite preconstruction meeting between its representatives, the contractor's representatives, and the Corps of Engineers, Raleigh Regulatory Field Office NCDOT Regulatory Project Manager, prior to any work within jurisdictional waters and wetlands to ensure that there is a mutual understanding of all of the terms and conditions contained within this Department of the Army Permit. The permittee shall notify the Corps of Engineers Project Manager a minimum of thirty (30) days in advance of the scheduled meeting in order to provide that individual with ample opportunity to schedule and participate in the required meeting.

l. The permittee and its contractors and/or agents shall not excavate, fill, or perform mechanized landclearing at any time in the construction or maintenance of this project within waters and/or wetlands, except as authorized by this permit, or any modification to this permit. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification of this permit, including appropriate compensatory mitigation. This prohibition applies to all borrow and fill activities connected with this project.

m. To ensure that all borrow and waste activities occur on high ground, except as authorized by this permit, the permittee shall require its contractors and/or agents to identify all areas to be used to borrow material, or to dispose of dredged, fill, or waste material. The permittee shall ensure that all such areas comply with the preceding condition (~~m~~ l.) of this permit, and shall require and maintain documentation of the location and characteristics of all borrow and disposal sites associated with this project. This information will include data regarding soils, vegetation and hydrology sufficient to clearly demonstrate compliance with the preceding condition (~~m~~ l). All information will be available to the Corps of Engineers upon request.

n. The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit.

o. If the permittee discovers any previously unknown historic or archeological remains while accomplishing the authorized work, he will immediately notify the Wilmington District Engineer who will initiate the required State/Federal coordination.

p. No excavated or fill material will be placed at any time in waters or wetlands outside the permitted construction areas, nor will it be placed in any location or in any manner so as to impair surface water flow into or out of any wetland area.

q. The permittee will maintain the authorized work in good condition and in conformance with the terms and conditions of this permit. The permittee is not relieved of this requirement if he abandons the permitted activity without transferring it to a third party.

r. All fill material will be clean and free of any pollutants except in trace quantities. Metal products, organic materials, or unsightly debris will not be used.

214

s. This Department of the Army permit does not obviate the need to obtain other Federal, State or local authorizations required by law.

t. This permit does not grant any property rights or exclusive privileges.

u. In issuing this permit, the Federal Government does not assume any liability for:

1. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

2. Damages to the permitted project or uses thereof as a result of current or future Federal activities initiated on behalf of the general public.

3. Damages to other permitted or unpermitted activities or structures caused by the authorized activity.

4. Design and construction deficiencies associated with the permitted work.

5. Damage claims associated with any future modification, suspension, or revocation of this permit.

Michael F. Easley, Governor
William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Coleen Sullins, Director
Division of Water Quality

October 29, 2007

Feulner

RECEIVED
NOV 1 2007
DIVISION OF HIGHWAYS
PDEA-OFFICE OF NATURAL ENVIRONMENT

Dr. Greg Thorpe, PhD., Manager
Planning and Environmental Branch
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, North Carolina, 27699-1548

Subject: Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and NEUSE BUFFER RULES, with ADDITIONAL CONDITIONS for Proposed construction of NC 98 Bypass in Wake County, Federal Aid Project No. HPSTP-55(12), State Project No. 8.1402501, TIP No. R-2809A & R-2809C, US COE Action ID No. 2007-03114.
DWQ Project No. 20010550 version 7.

Dear Dr. Thorpe:

Attached hereto is a modification of Certification No. 3343 issued to The North Carolina Department of Transportation dated February 4, 2002 and subsequent modifications dated September 25, 2002; October 22, 2003; October 13, 2004; September 30, 2005; and February 28, 2006. This modification is applicable only to the additional proposed activities in Section A and proposed modification in Section C. All the authorized activities and conditions of certification associated with the original Water Quality Certification and subsequent modifications still apply except where superceded by this certification.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Coleen Sullins
Director

Attachments

cc: Eric Alsmeyer, US Army Corps of Engineers, Raleigh Field Office
Brett Feulner, NCDOT PDEA
Chris Murray, Division 5 Environmental Officer
Kathy Matthews, Environmental Protection Agency
Travis Wilson, NC Wildlife Resources Commission
Gary Jordan, US Fish and Wildlife Service
Beth Harmon, Ecosystem Enhancement Program
File Copy

William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Coleen Sullins, Director
Division of Water Quality

Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and NEUSE BUFFER RULES, with ADDITIONAL CONDITIONS

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (DWQ) Regulations in 15 NCAC 2H .0500 and 15A NCAC 2B.0233. This certification authorized the NCDOT to impact 0.01acres of jurisdictional wetlands, 354 linear feet of jurisdictional streams and 43,382 square feet of protected riparian buffers in Wake County. The project shall be constructed pursuant to the modification dated received September 18, 2007. The revised authorized impacts for Section A of the project are as described below:

Revised Stream Impacts in the Neuse River Basin (R-2809A)

Site	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)
1	0	0	95	23	118
2	62	20	0	0	82
3	118	36	0	0	154
Total	**180**	**56**	**95**	**23**	**354**

Total Stream Impact for Project: 354 linear feet.

Revised Wetland Impacts in the Neuse River Basin (R-2809A)

Site	Fill (ac)	Fill (temporary) (ac)	Total Wetland Impact (ac)
1	0.01	0	0.01
Total	**0.01**	**0**	**0.01**

Total Wetland Impact for Project: 0.01 acres.

Revised Neuse Riparian Buffer Impacts (R-2809A)

Site	Zone 1 Impact (sq ft)	*minus* Wetlands in Zone 1 (sq ft)	= Zone 1 Buffers (not wetlands) (sq ft)	Zone 1 Buffer Mitigation Required (using 3:1 ratio)	Zone 2 Impact (sq ft)	*minus* Wetlands in Zone 2 (sq ft)	= Zone 2 Buffers (not wetlands) (sq ft)	Zone 2 Buffer Mitigation Required (using 1.5:1 ratio)
1	5,651	0	5,651	N/A	3,283	0	3,283	N/A
2	4,338	0	4,338	N/A	2,788	0	2,788	N/A
3	7,556	0	7,556	22,668	4,198	0	4,198	6,297
Totals	**25,814**	**0**	**25,814**	**22,668**	**17,568**	**0**	**17,568**	**6,297**

* n/a = Total for Site is less than 1/3 acre and 150 linear feet of impact, no mitigation required

Total Buffer Impact for Project: 43,382 square feet.

The application provides adequate assurance that the discharge of fill material into the waters, wetlands and buffers of the Neuse River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
Phone: 919-733-1786 / FAX 919-733-6893 / Internet: http://h2o.enr.state.nc.us/ncwetlands

William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources
Coleen Sullins, Director
Division of Water Quality

This approval is only valid for the purpose and design that you submitted in your modified application dated received September 18, 2007. All the authorized activities and conditions of certification associated with the original Water Quality Certification dated February 4, 2002 and all subsequent modifications still apply except where superceded by this certification. The revised impact tables above apply for project Section A only, and does not change the jurisdictional impacts of Sections B or C. However, the proposed design changes for Section C, sites 4 and 5, are also covered by this modification. Should your project make additional changes, you are required to notify the DWQ and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Conditions of Certification:

1. All other conditions written into previous Water Quality Certifications and modifications for this project still apply except where superceded by this modification.

2. Compensatory mitigation for impacts to 7,556 square feet of protected riparian buffers in Zone 1 and 4,198 square feet of protected riparian buffers in Zone 2 shall be required at the following rates:

Zone of Impact	Impacts (Square Feet)	Replacement Ratio	Total Square Feet of Mitigation Required
Zone 1	7,556	3:1	22,668
Zone 2	4,198	1.5:1	6,297
Total	**11,754**		**28,965**

We understand that you have chosen to perform compensatory mitigation for impacts to protected buffers through use of the North Carolina Ecosystem Enhancement Program (EEP). Mitigation for unavoidable impacts to Neuse Riparian Buffers shall be provided in the Neuse River Basin and done in accordance with 15A NCAC 2B. EEP has indicated in a letter dated August 29, 2007 that they will assume responsibility for satisfying the compensatory mitigation requirements for the above-referenced project, in accordance with the Tri-Party MOA signed on July 22, 2003 and the Dual-Party MOA signed on April 12, 2004.

3. Placement of culverts and other structures in waters, streams, and wetlands shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NC DWQ for guidance on how to proceed and to determine whether or not a permit modification will be required.

5. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed.

6. For any streams being impacted due to site dewatering activties, the site shall be graded to its preconstruction contours and revegetated with appropriate native species.

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
Phone: 919-733-1786 / FAX 919-733-6893 / Internet: http://h2o.enr.state.nc.us/ncwetlands

William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources
Coleen Sullins, Director
Division of Water Quality

7. All stormwater runoff shall be directed as sheetflow through stream buffers at nonerosive velocities, unless otherwise approved by this certification.

8. All riparian buffers impacted by the placement of temporary fill or clearing activities shall be restored to the preconstruction contours and revegetated. Maintained buffers shall be permanently revegetated with non-woody species by the end of the growing season following completion of construction. For the purpose of this condition, maintained buffer areas are defined as areas within the transportation corridor that will be subject to regular DOT maintenance activities including mowing. The area with non-maintained buffers shall be permanently revegetated, with native woody species before the next growing season following completion of construction.

9. Pursuant to NCAC15A 2B.0233(6), sediment and erosion control devices shall not be placed in Zone 1 of any Neuse Buffer without prior approval by the NCDWQ. At this time, the NCDWQ has approved no sediment and erosion control devices in Zone 1, outside of the approved project impacts, anywhere on this project. Moreover, sediment and erosion control devices shall be allowed in Zone 2 of the buffers provided that Zone 1 is not compromised and that discharge is released as diffuse flow.

10. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.

11. During the construction of the project, no staging of equipment of any kind is permitted in waters of the U.S., or protected riparian buffers.

12. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions.

13. The use of rip-rap above the Normal High Water Mark shall be minimized. Any rip-rap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage.

14. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval.

15. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.

16. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream.

17. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.

18. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.

19. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.

20. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If DWQ determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, DWQ may reevaluate and modify this certification.

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
Phone: 919-733-1786 / FAX 919-733-6893 / Internet: http://h2o.enr.state.nc.us/ncwetlands

William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources
Coleen Sullins, Director
Division of Water Quality

21. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification..

22. A copy of this Water Quality Certification shall be maintained on site at the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.

23. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification.

24. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (i.e. local, state, and federal) having jurisdiction, including but not limited to applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.

25. The Permittee shall report any violations of this certification to the Division of Water Quality within 24 hours of discovery.

26. Upon completion of the project (including any impacts at associated borrow or waste site), the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" to notify DWQ when all work included in the 401 Certification has been completed.

27. Native riparian vegetation (trees and shrubs native to the project's geographic region) must be reestablished within the construction limits of the project by the end of the growing season following completion of construction.

28. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards:

a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual.*
b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual.* The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual.*
d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.

29. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.

30. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
Phone: 919-733-1786 / FAX 919-733-6893 / Internet: http://h2o.enr.state.nc.us/ncwetlands

William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Coleen Sullins, Director
Division of Water Quality

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If this Certification is unacceptable to you have the right to an adjudicatory hearing upon written request within sixty (60) days following receipt of this Certification. This request must be in the form of a written petition conforming to Chapter 150B of the North Carolina General Statutes and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, N.C. 27699-6714. If modifications are made to an original Certification, you have the right to an adjudicatory hearing on the modifications upon written request within sixty (60) days following receipt of the Certification. Unless such demands are made, this Certification shall be final and binding.

This the 29th day of October 2007

DIVISION OF WATER QUALITY

John E. Hennessy

Coleen Sullins
Director

WQC No. 3343

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
Phone: 919-733-1786 / FAX 919-733-6893 / Internet: http://h2o.enr.state.nc.us/ncwetlands

William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources
Coleen Sullins, Director
Division of Water Quality

DWQ Project No.: _____ **County:** _____

Applicant: _____

Project Name: _____

Date of Issuance of 401 Water Quality Certification: _____

Certificate of Completion
Upon completion of all work approved within the 401 Water Quality Certification or applicable Buffer Rules, and any subsequent modifications, the applicant is required to return this certificate to the 401 Transportation Permitting Unit, North Carolina Division of Water Quality, 1650 Mail Service Center, Raleigh, NC, 27699-1650. This form may be returned to DWQ by the applicant, the applicant's authorized agent, **or** the project engineer. It is not necessary to send certificates from all of these.

Applicant's Certification
I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

Agent's Certification
I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

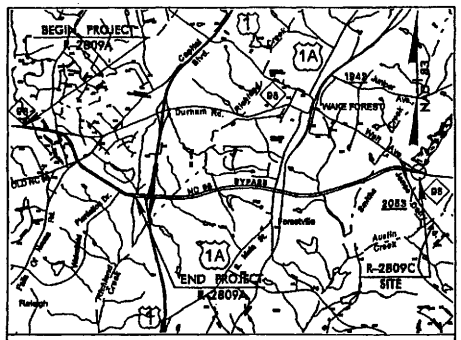
Engineer's Certification
_____ Partial _____ Final
I, _____, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (periodically, weekly, full time) the construction of the project,for the Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature _____ Registration No. _____

Date _____

CONTRACT: C201737 TIP PROJECT: R-2809A

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

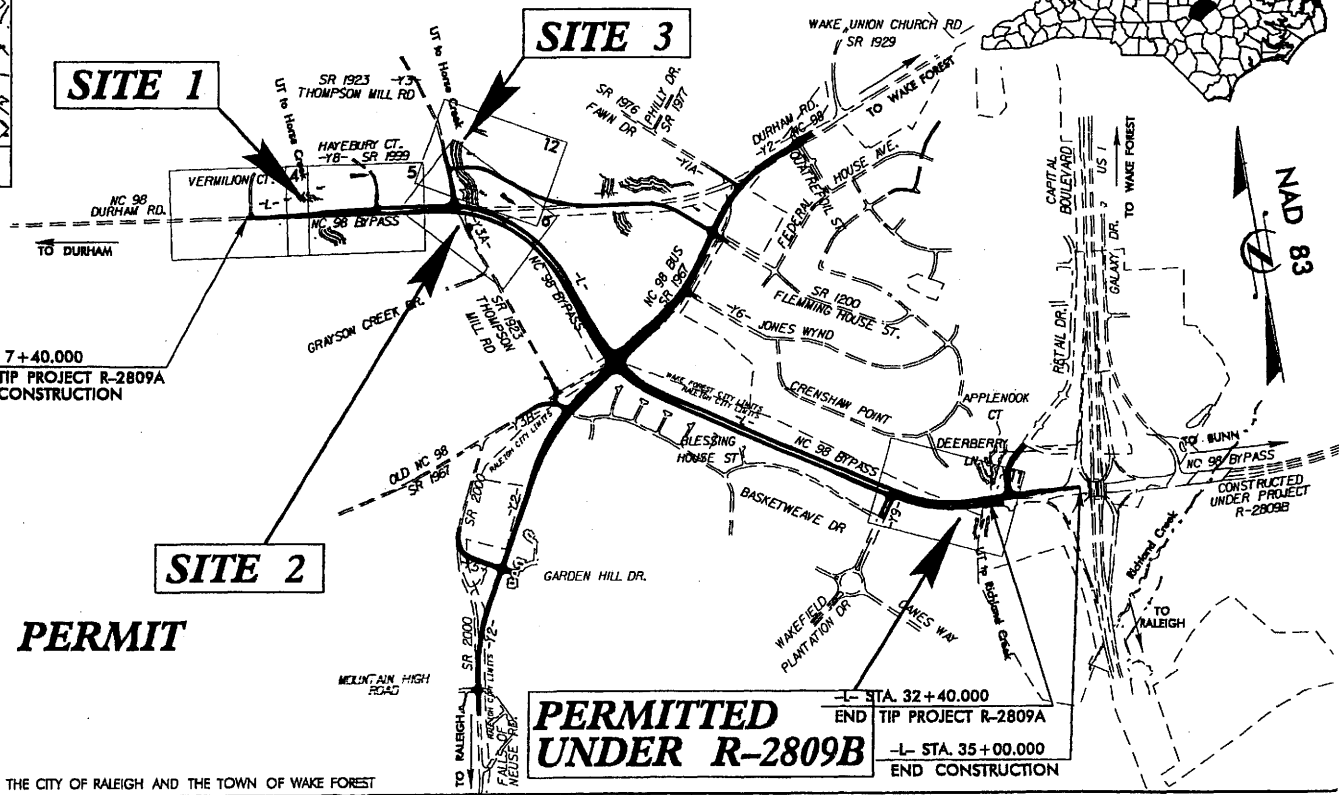
METRIC

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

WETLAND\STREAM PERMIT

PERMITTED UNDER R-2809B

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

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

GRAPHIC SCALES
PLANS 5 0 10
PROFILE (HORIZONTAL) 5 0 10
PROFILE (VERTICAL) 1 0 2

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 HIGHWAY DESIGN ENGINEER
P.E.

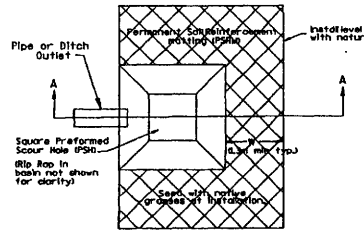
222

Sheet 1 of 19

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

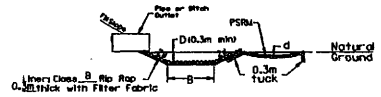
PREFORMED SCOUR HOLE

PLAN VIEW



B	1.2 m
D	0.6 m
W	1.3 m
d	0.15 m

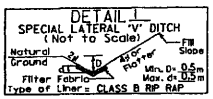
SECTION A-A



4/4/02

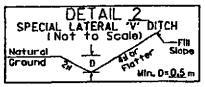
STA. 9+50 -L- LT
STA. 9+99 -L- RT
STA. 13+75 -L- LT
STA. 14+30 -L- LT
STA. 18+73 -L- LT
STA. 19+95 -L- LT

DETAIL 1
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



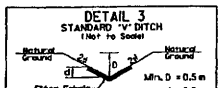
STA. 10+70 TO 11+11 -L- LT
STA. 8+20 TO 8+60 -L- RT
STA. 19+40 TO 19+80 -L- RT
STA. 23+60 TO 23+90 -L- LT
STA. 18+82 TO 19+00 -Y2- RT

DETAIL 2
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



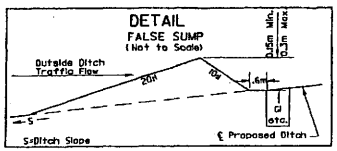
STA. 15+40 TO 15+76 -L- RT
STA. 15+80 TO 19+20 -L- RT
STA. 30+80 TO 31+20 -L- LT
STA. 8+06 TO 8+60 -Y2- LT
STA. 19+20 TO 19+46 -Y2- RT
STA. 26+60 TO 27+00 -Y2- LT
STA. 10+70 TO 10+40 -Y38- RT
STA. 10+20 TO 10+50 -Y4- LT

DETAIL 3
STANDARD 'V' DITCH
(Not to Scale)

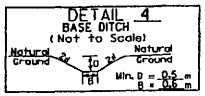


STA. 27+00 TO 27+17 -Y2- LT
STA. 27+17 TO 27+70 -Y2- LT

DETAIL
FALSE SUMP
(Not to Scale)

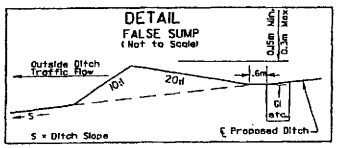


DETAIL 4
BASE DITCH
(Not to Scale)

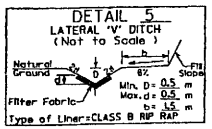


STA. 15+73 -L- LT
STA. 15+78 -L- RT
STA. 17+35 TO 17+55 -L- RT
STA. 24+55 -L- LT
STA. 15+30 -Y2- LT
STA. 12+04 -Y5- LT

DETAIL
FALSE SUMP
(Not to Scale)

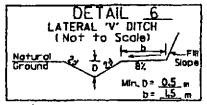


DETAIL 5
LATERAL 'V' DITCH
(Not to Scale)



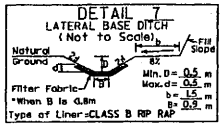
STA. 17+00 TO 17+80 -L- LT
STA. 24+20 TO 24+40 -L- RT
STA. 24+60 TO 25+20 -L- LT
STA. 8+40 TO 8+69 -Y3- LT
STA. 15+20 TO 16+00 -Y2- LT
STA. 16+20 TO 16+80 -Y2- LT

DETAIL 6
LATERAL 'V' DITCH
(Not to Scale)



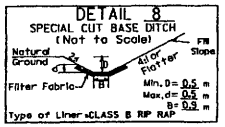
STA. 16+70 TO 17+33 -L- RT
STA. 25+80 TO 28+20 -L- LT

DETAIL 7
LATERAL BASE DITCH
(Not to Scale)



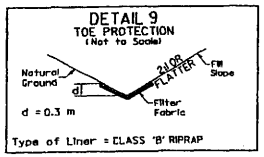
STA. 16+42 TO 17+00 -L- LT

DETAIL 8
SPECIAL CUT BASE DITCH
(Not to Scale)



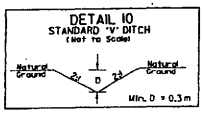
STA. 23+00 TO 23+60 -L- LT

DETAIL 9
TOE PROTECTION
(Not to Scale)



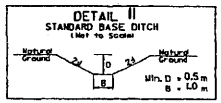
STA 8+35 TO STA 8+50 -L- RT.
STA 9+20 TO STA 9+80 -L- LT.
STA. 23+60 TO 24+10 -L- RT
STA. 12+60 TO 13+00 -Y1- RT
STA. 16+30 TO 17+20-Y1- RT
STA. 26+80 TO 27+20 -Y2- RT

DETAIL 10
STANDARD 'V' DITCH
(Not to Scale)



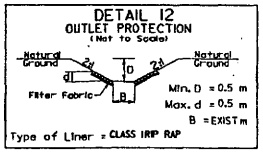
STA. 10+30 -Y14- RT

DETAIL 11
STANDARD BASE DITCH
(Not to Scale)



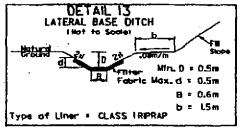
STA. 16+42 -Y2- RT

DETAIL 12
OUTLET PROTECTION
(Not to Scale)



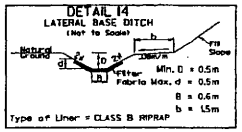
STA. 9+45 -L- LT
STA. 13+95 -L- LT
STA. 8+50 -Y3- RT

DETAIL 13
LATERAL BASE DITCH
(Not to Scale)



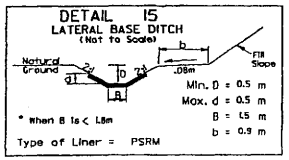
STA. 9+00 TO 9+12 -L- LT

DETAIL 14
LATERAL BASE DITCH
(Not to Scale)



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

DETAIL 15
LATERAL BASE DITCH
(Not to Scale)



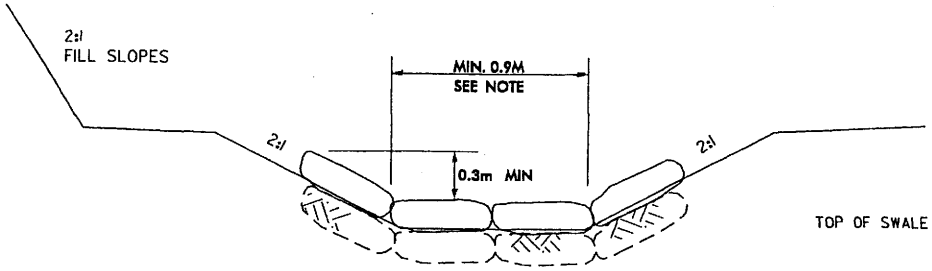
STA. 31+00 TO 31+38 -L- RT

Permit Drawing Sheet 2 of 3

223

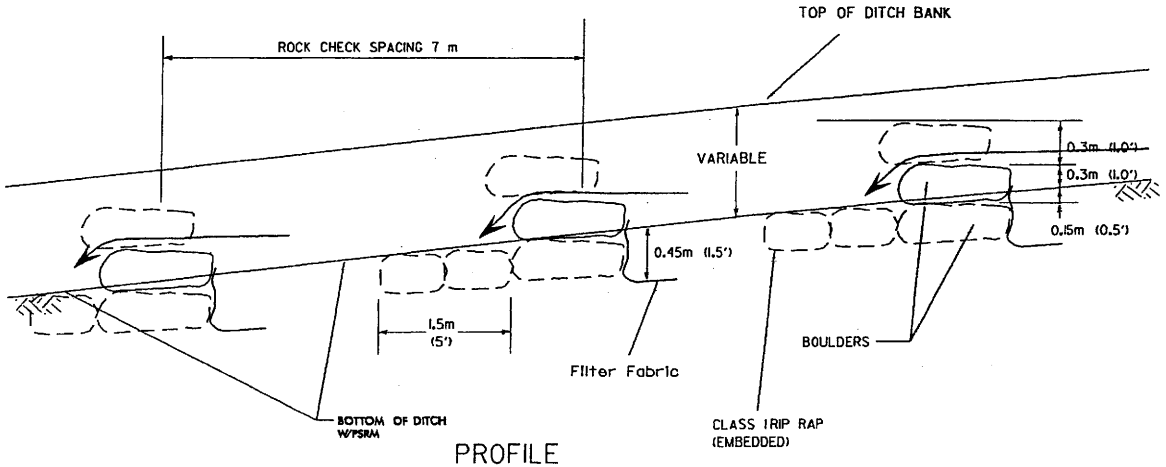
METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-2809A	2-G
ROADWAY DESIGN ENGINEER		PAVEMENT DESIGN ENGINEER

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



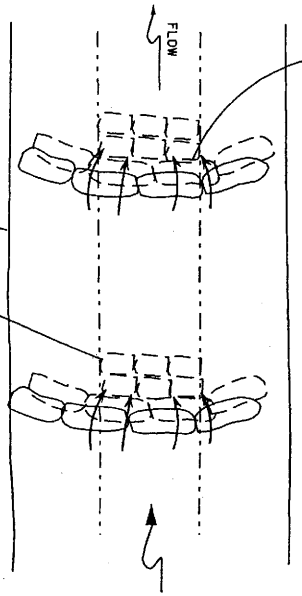
TYPICAL CROSS SECTION

NOT TO SCALE



PROFILE

NOT TO SCALE



PLAN VIEW

NOT TO SCALE

224

FILTER FABRIC = 20m²

BOULDERS/FOOTER ROCK = 60 MTN

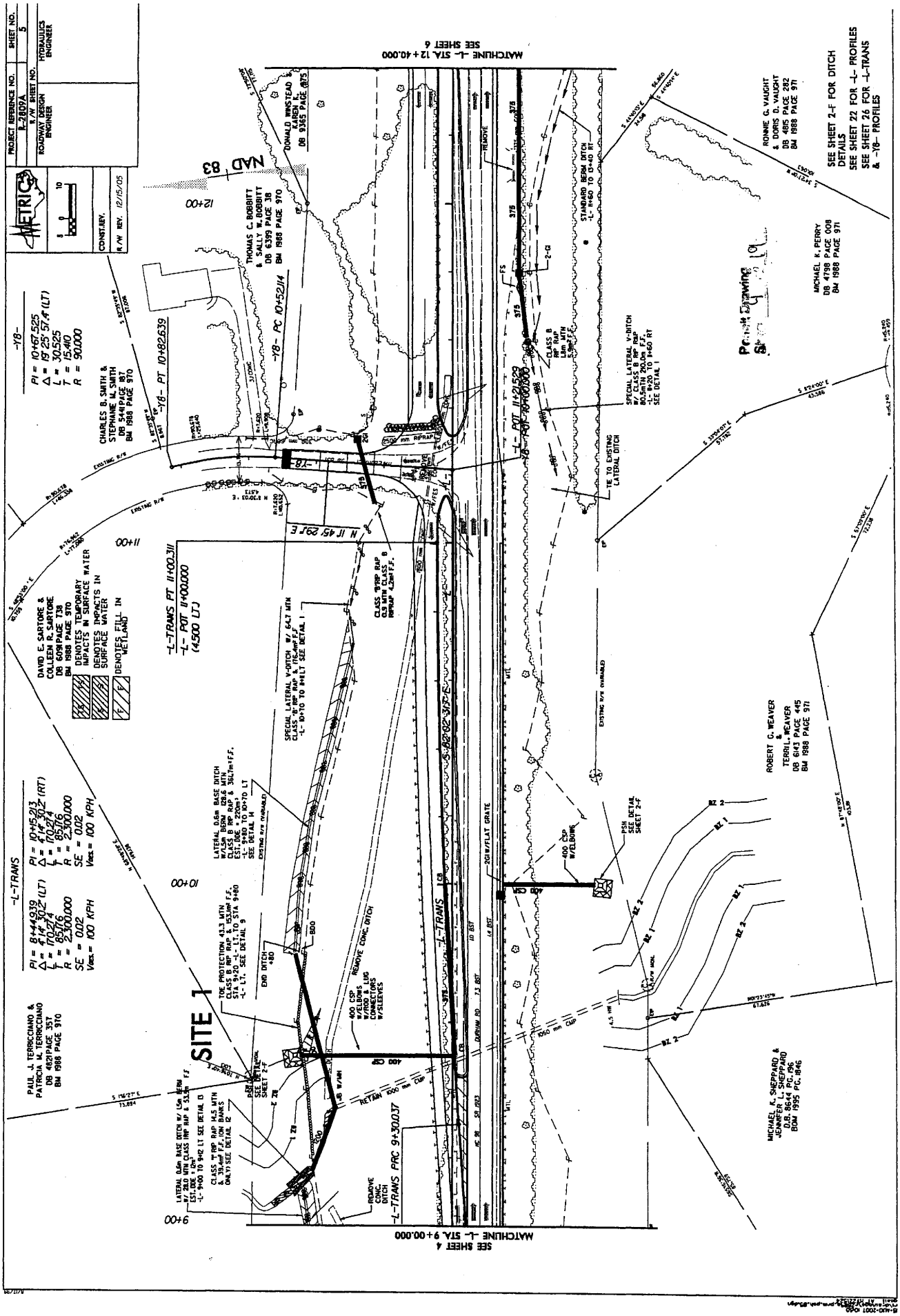
CLASS IRIP RAP = 5 MTN

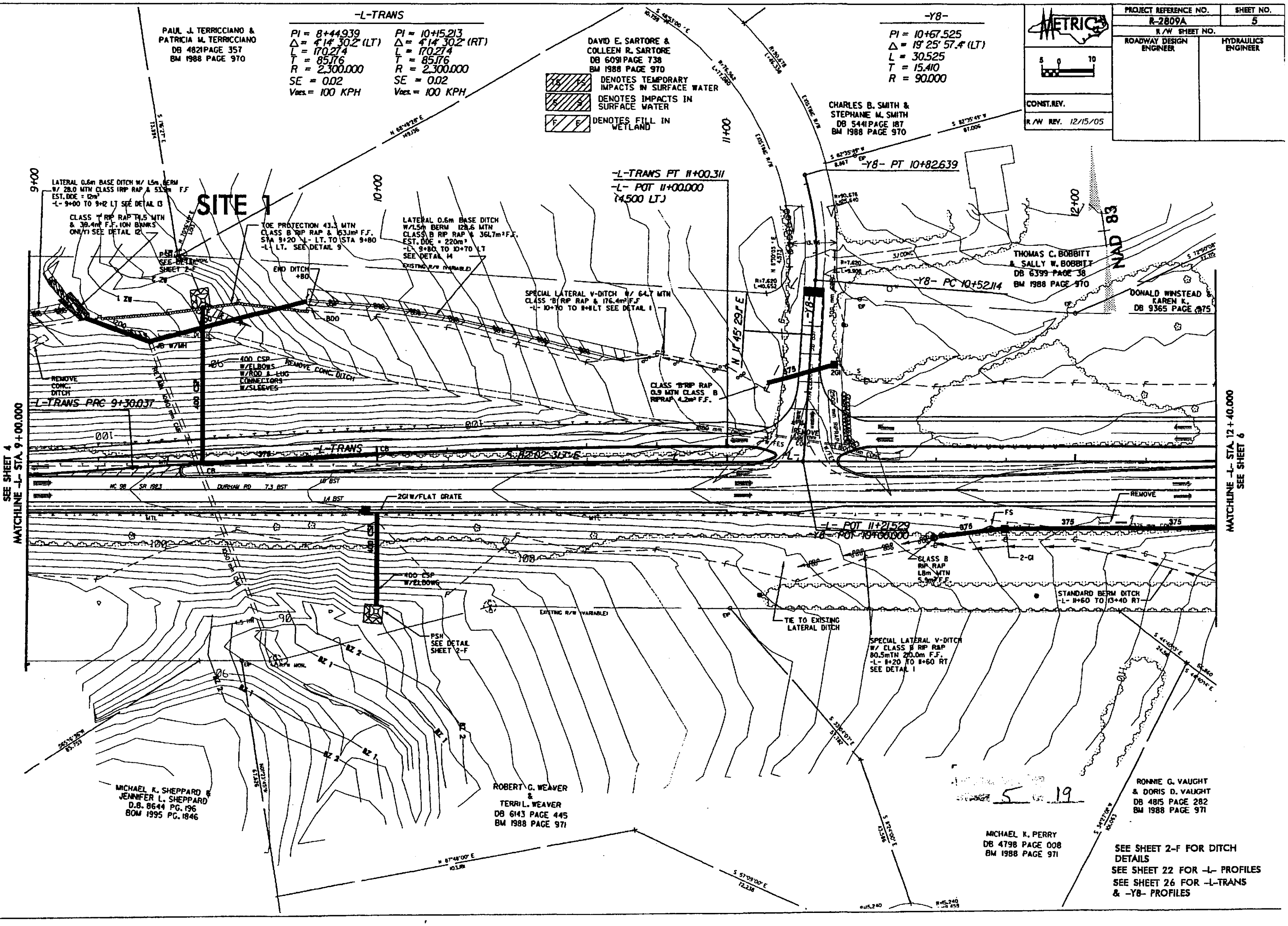
NOTE:

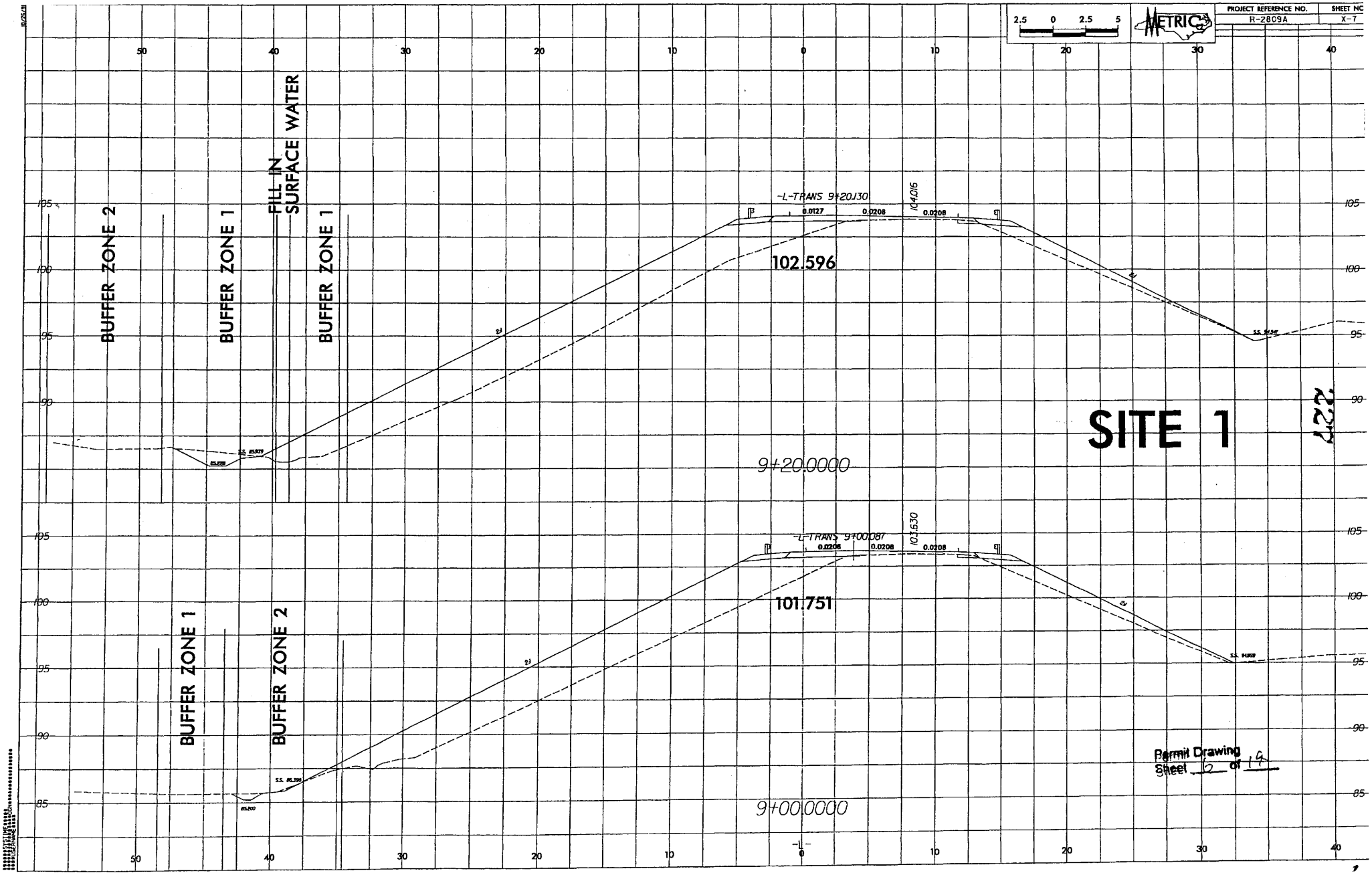
BOULDERS SHOULD BE ANGULAR AND OBLONG WITH APPROXIMATE DIMENSIONS OF 0.6m x 0.45m x 0.45m (2' x 1.5' x 1.5'). ROCK SHOULD FIT TIGHTLY TOGETHER WITH MINIMAL VOIDS. STAGGER BOULDER JOINTS.

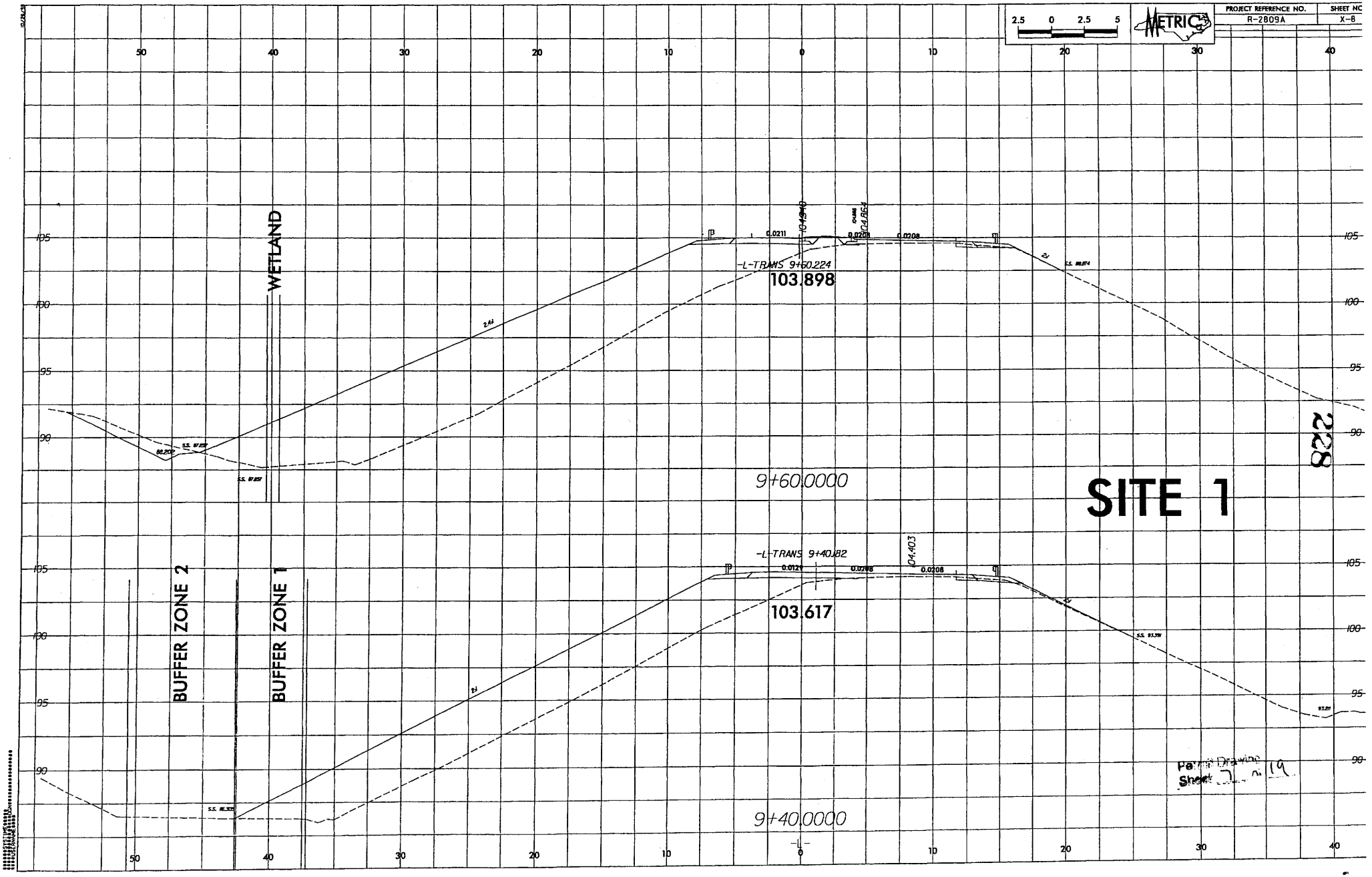
ROCK CHECK SPACING IS DEPENDENT ON DITCH GRADES AT 1' DROP INTERVALS OR SLOPE CONTROL.

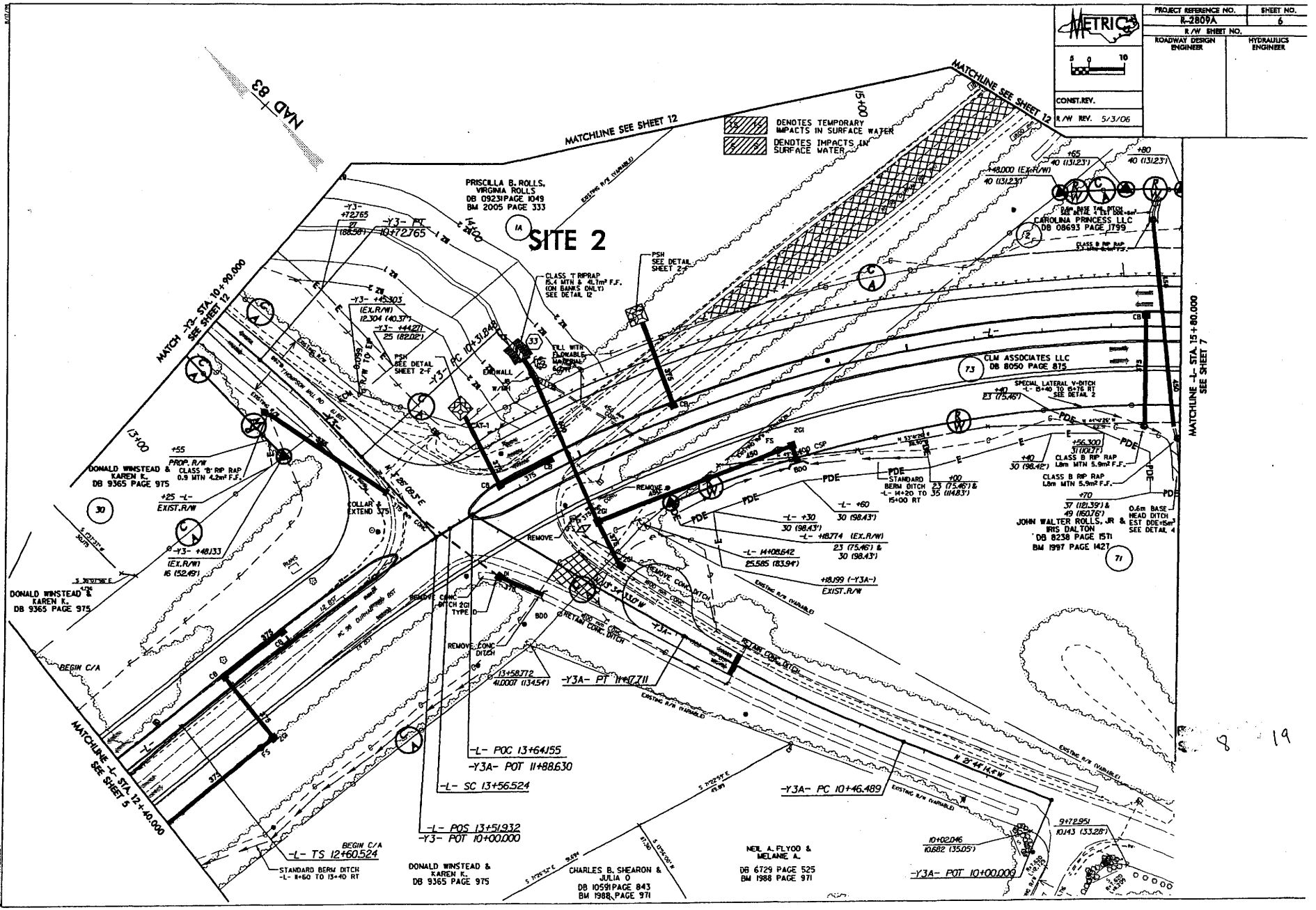
Permit Drawing
Sheet 3 of 19

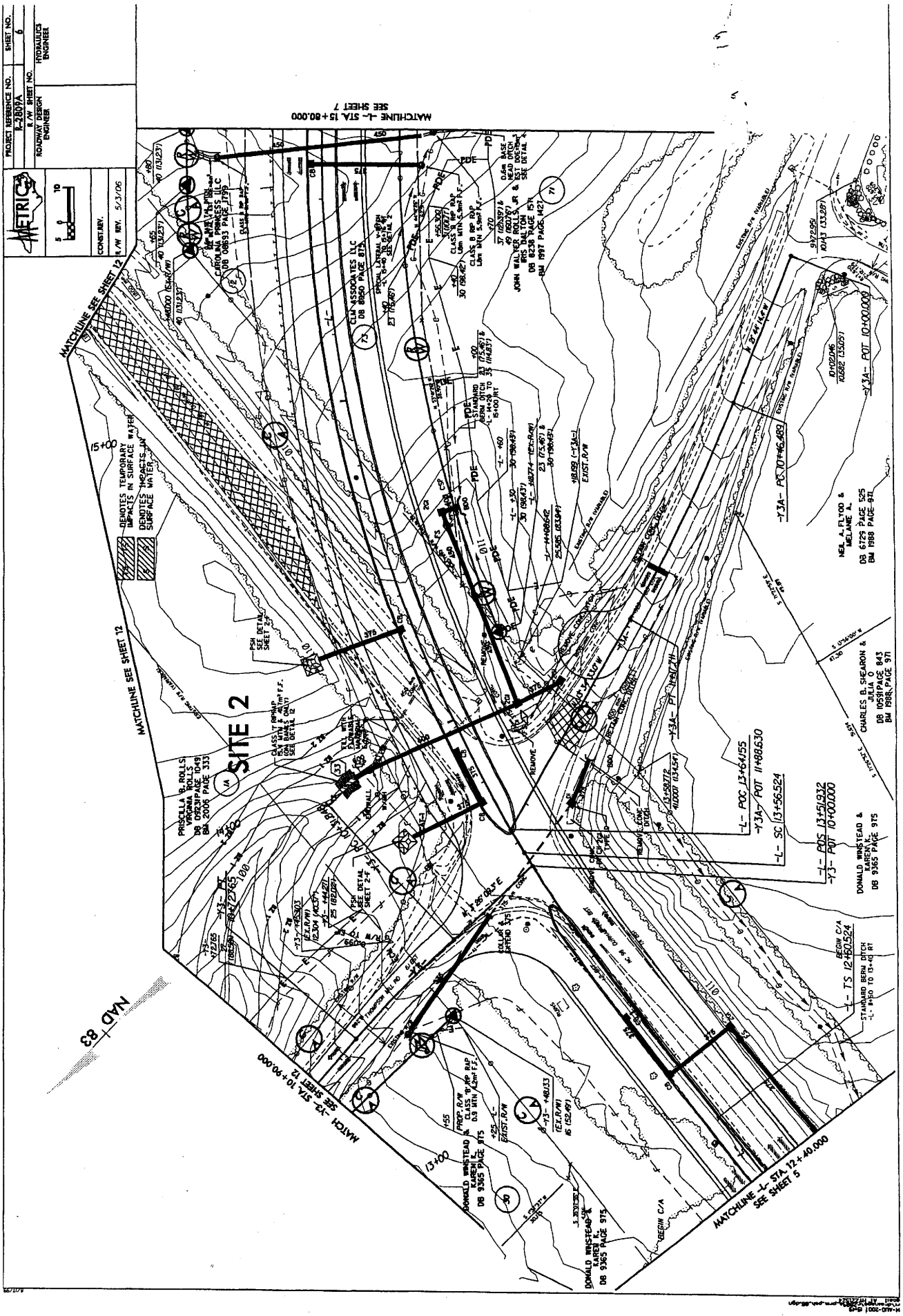

METRIC
PROJECT REFERENCE NO. R-2809A
R/W SHEET NO. 5
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV.
R/W REV. 12/15/05
NAD 83
-L-TRANS
PI = 8144939
PI = 10415.213
-Y8-
PI = 10467.525
Δ = 19° 25' 57.4" (LT)
L = 30.525
T = 15.440
R = 90.000
-Y8- PT 10+82.639
-Y8- PC 10+52.14
-L- POT 11+21.529
-L-TRANS PT 11+00.311
-L- POT 11+00.000
(4.500 LT)
-L-TRANS PRC 9+30.037
MATCHLINE -L- STA. 12+40.000
SEE SHEET 6
MATCHLINE -L- STA. 9+00.000
SEE SHEET 4
SITE 1
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR -L- PROFILES
SEE SHEET 26 FOR -L-TRANS & -Y8- PROFILES
DAVID E. SARTORE & COLLEEN R. SARTORE DB 6094 PAGE 736 BM 1988 PAGE 970
CHARLES B. SMITH & STEPHANIE M. SMITH DB 5448 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 9345 PAGE 875
RONNIE G. VAUGHT & DORIS D. VAUGHT DB 4815 PAGE 282 BM 1988 PAGE 971
MICHAEL K. PERRY DB 4798 PAGE 008 BM 1988 PAGE 971
ROBERT G. WEAVER & TERRIL. WEAVER DB 6143 PAGE 445 BM 1988 PAGE 971
MICHAEL K. SHEPPARD & JENNIFER L. SHEPPARD D.B. 8644 PG. 196 BOM 1995 PG. 1846
PAUL J. TERRICCIANO & PATRICIA M. TERRICCIANO DB 4821 PAGE 357 BM 1988 PAGE 970
SPECIAL LATERAL V-DITCH W/ CLASS B RIP RAP 80.5m TO 260.0m F.F. -L- 10+60.00 TO 11+60.00 RT SEE DETAIL I
TIE TO EXISTING LATERAL DITCH
CLASS B RIP RAP 5.0m F.F.
CLASS 'B' RIP RAP 0.9 MTH CLASS B RIPRAP 4.2m F.F.
SPECIAL LATERAL V-DITCH W/ CLASS 'B' RIP RAP & 116.4m F.F. -L- 10+70 TO 11+41 SEE DETAIL I
LATERAL 0.6m BASE DITCH W/ 1.5m BERM 124.6 MTH CLASS B RIP RAP & 361.7m F.F. EST. DIC. = 220m -L- STA 9+60 TO 10+70 LT SEE DETAIL H
TOE PROTECTION 43.3 MTH CLASS B RIP RAP & 155.1m F.F. -L- STA 9+20 TO STA 9+60 -L- LT SEE DETAIL J
END DITCH
REMOVE CONC. DITCH
400 CSP W/ ELBOWS
PSH DETAIL SEE SHEET 2-F
400 CSP W/ELBOWS
20 W/FLAT GRATE
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ CLASS RIP RAP & 53.5m F.F. 20.0 MTH EST. DIC. = 0m -L- 9+00 TO 9+42 LT SEE DETAIL D
CLASS 'I' RIP RAP 14.5 MTH & 39.4m F.F. (ON BANKS ONLY) SEE DETAIL I2
REMOVE CONC. DITCH
RETAIN 600 mm CMP
1000 mm CMP
SEE SHEET 2-G
SEE SHEET 2-H
SEE SHEET 2-I
SEE SHEET 2-J
SEE SHEET 2-K
SEE SHEET 2-L
SEE SHEET 2-M
SEE SHEET 2-N
SEE SHEET 2-O
SEE SHEET 2-P
SEE SHEET 2-Q
SEE SHEET 2-R
SEE SHEET 2-S
SEE SHEET 2-T
SEE SHEET 2-U
SEE SHEET 2-V
SEE SHEET 2-W
SEE SHEET 2-X
SEE SHEET 2-Y
SEE SHEET 2-Z
SEE SHEET 2-AA
SEE SHEET 2-BB
SEE SHEET 2-CC
SEE SHEET 2-DD
SEE SHEET 2-EE
SEE SHEET 2-FF
SEE SHEET 2-GG
SEE SHEET 2-HH
SEE SHEET 2-II
SEE SHEET 2-JJ
SEE SHEET 2-KK
SEE SHEET 2-LL
SEE SHEET 2-MM
SEE SHEET 2-NN
SEE SHEET 2-OO
SEE SHEET 2-PP
SEE SHEET 2-QQ
SEE SHEET 2-RR
SEE SHEET 2-SS
SEE SHEET 2-TT
SEE SHEET 2-UU
SEE SHEET 2-VV
SEE SHEET 2-WW
SEE SHEET 2-XX
SEE SHEET 2-YY
SEE SHEET 2-ZZ
SEE SHEET 2-AAA
SEE SHEET 2-BBB
SEE SHEET 2-CCC
SEE SHEET 2-DDD
SEE SHEET 2-EEE
SEE SHEET 2-FFF
SEE SHEET 2-GGG
SEE SHEET 2-HHH
SEE SHEET 2-III
SEE SHEET 2-JJJ
SEE SHEET 2-KKK
SEE SHEET 2-LLL
SEE SHEET 2-MMM
SEE SHEET 2-NNN
SEE SHEET 2-OOO
SEE SHEET 2-PPP
SEE SHEET 2-QQQ
SEE SHEET 2-RRR
SEE SHEET 2-SSS
SEE SHEET 2-TTT
SEE SHEET 2-UUU
SEE SHEET 2-VVV
SEE SHEET 2-WWW
SEE SHEET 2-XXX
SEE SHEET 2-YYY
SEE SHEET 2-ZZZ
SEE SHEET 2-AAAA
SEE SHEET 2-BBBB
SEE SHEET 2-CCCC
SEE SHEET 2-DDDD
SEE SHEET 2-EEEE
SEE SHEET 2-FFFF
SEE SHEET 2-GGGG
SEE SHEET 2-HHHH
SEE SHEET 2-IIII
SEE SHEET 2-JJJJ
SEE SHEET 2-KKKK
SEE SHEET 2-LLLL
SEE SHEET 2-MMMM
SEE SHEET 2-NNNN
SEE SHEET 2-OOOO
SEE SHEET 2-PPPP
SEE SHEET 2-QQQQ
SEE SHEET 2-RRRR
SEE SHEET 2-SSSS
SEE SHEET 2-TTTT
SEE SHEET 2-UUUU
SEE SHEET 2-VVVV
SEE SHEET 2-WWWW
SEE SHEET 2-XXXX
SEE SHEET 2-YYYY
SEE SHEET 2-ZZZZ

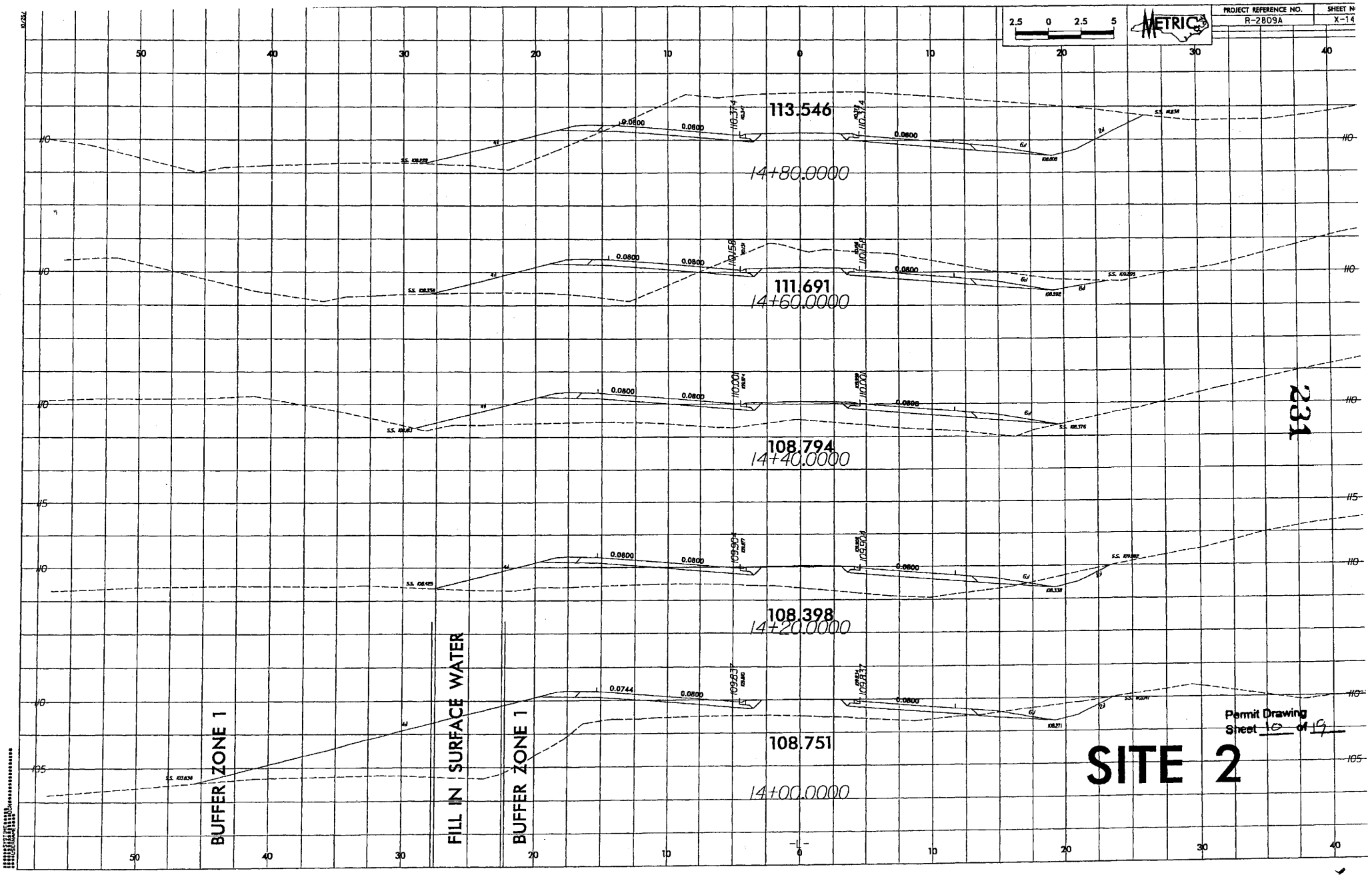

PROJECT REFERENCE NO.
R-2809A
SHEET NO.
5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
5 0 10
CONST.REV.
R/W REV. 12/15/05
-L-TRANS
PI = 8+44.939
Δ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes = 100 KPH
PI = 10+15.213
Δ = 4°14' 30.2" (RT)
L = 170.274
T = 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
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
THOMAS C. BOBBITT & SALLY W. BOBBITT DB 6399 PAGE 38 BM 1988 PAGE 970
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
NAD 83
SITE 1
9+00
10+00
11+00
12+00
-L-TRANS PT 11+00.311
-L- POT 11+00.000 (4.500 LT)
-Y8- PT 10+82.639
-Y8- PC 10+52.114
-Y8-
N 11°45' 29.5" E
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 28.0 MTN CLASS I RIP RAP & 51.9m F.F. EST. DDE = 12m³ -L- 9+00 TO 9+12 LT SEE DETAIL 13
CLASS I RIP RAP 11.5 MTN & 39.4m² F.F. (ON BANKS ONLY) SEE DETAIL 12
PSH SEE DETAIL SHEET 2-F
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
END DITCH +80
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
EXISTING R/W (VARIABLE)
SPECIAL LATERAL V-DITCH W/ 64.7 MTN CLASS 'B' RIP RAP & 176.4m² F.F. -L- 10+10 TO 11+11 LT SEE DETAIL 1
CLASS 'B' RIP RAP 0.9 MTN CLASS B RIPRAP 4.2m² F.F.
JB W/MH
400 CSP W/ELBOWS W/ROD & LUG CONNECTORS W/SLEEVES
REMOVE CONC. DITCH
REMOVE CONC. DITCH
-L-TRANS PRC 9+30.037
-L-TRANS
NC 98 SR 1983 DURHAM RD 7.3 BST
10 BST
14 BST
2GI W/FLAT GRATE
400 CSP W/ELBOWS
PSH SEE DETAIL SHEET 2-F
EXISTING R/W (VARIABLE)
-L- POT 11+21.529
-Y8- POT 10+00.000
FS
375
REMOVE
2-GI
2GI
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
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
5 19
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR -L- PROFILES
SEE SHEET 26 FOR -L-TRANS & -Y8- PROFILES
MATCHLINE -L- STA. 9+00.000 SEE SHEET 4
MATCHLINE -L- STA. 12+40.000 SEE SHEET 6

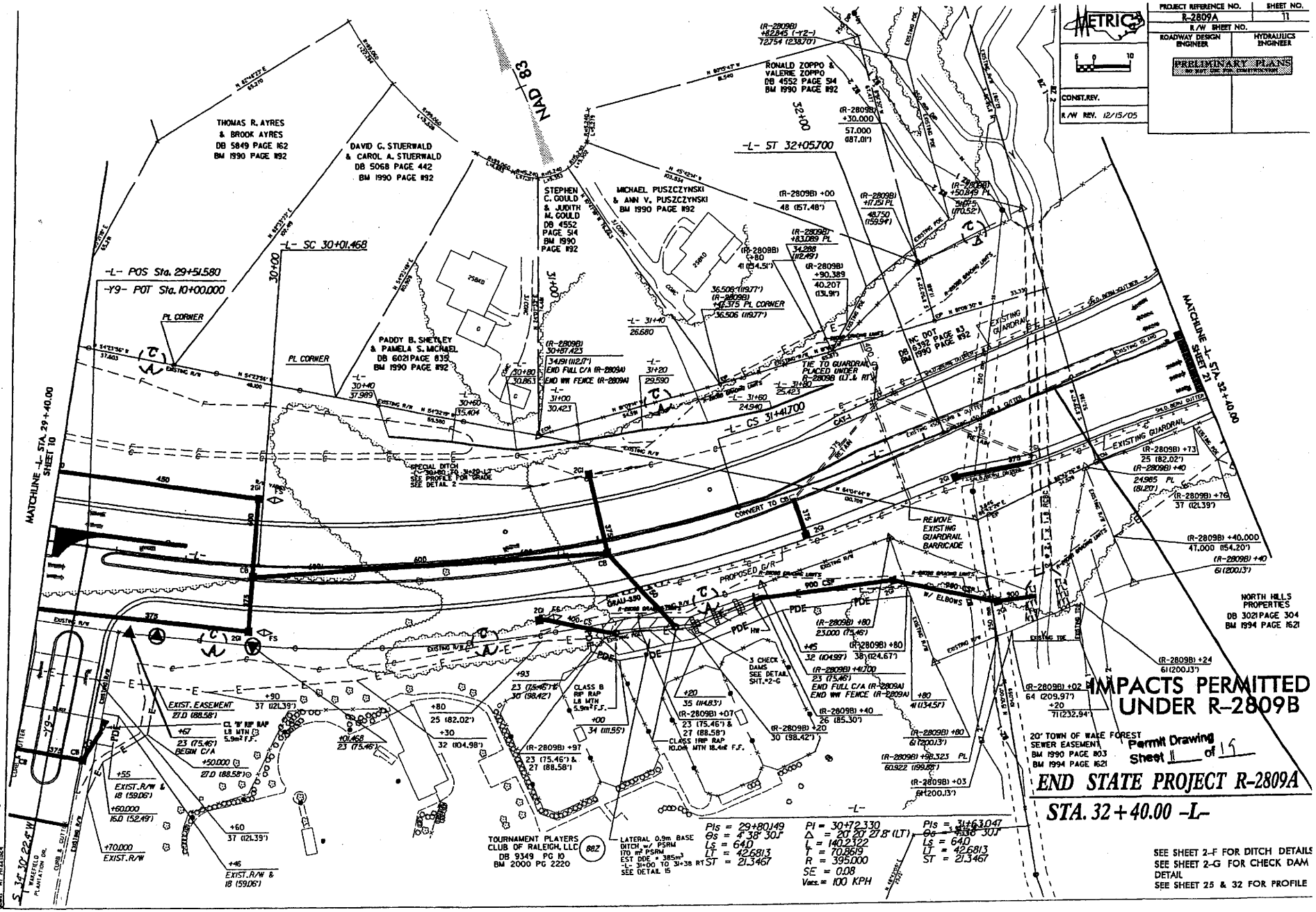

2.5 0 2.5 5
METRIC
PROJECT REFERENCE NO.
R-2809A
SHEET NO.
X-7
BUFFER ZONE 2
BUFFER ZONE 1
FILL IN SURFACE WATER
BUFFER ZONE 1
-L-TRANS 9+20.30
104.016
0.0127
0.0208
0.0208
102.596
9+20.0000
SITE 1
227
-L-TRANS 9+00.087
103.630
0.0208
0.0208
0.0208
101.751
9+00.0000
BUFFER ZONE 1
BUFFER ZONE 2
Permit Drawing
Sheet 12 of 14

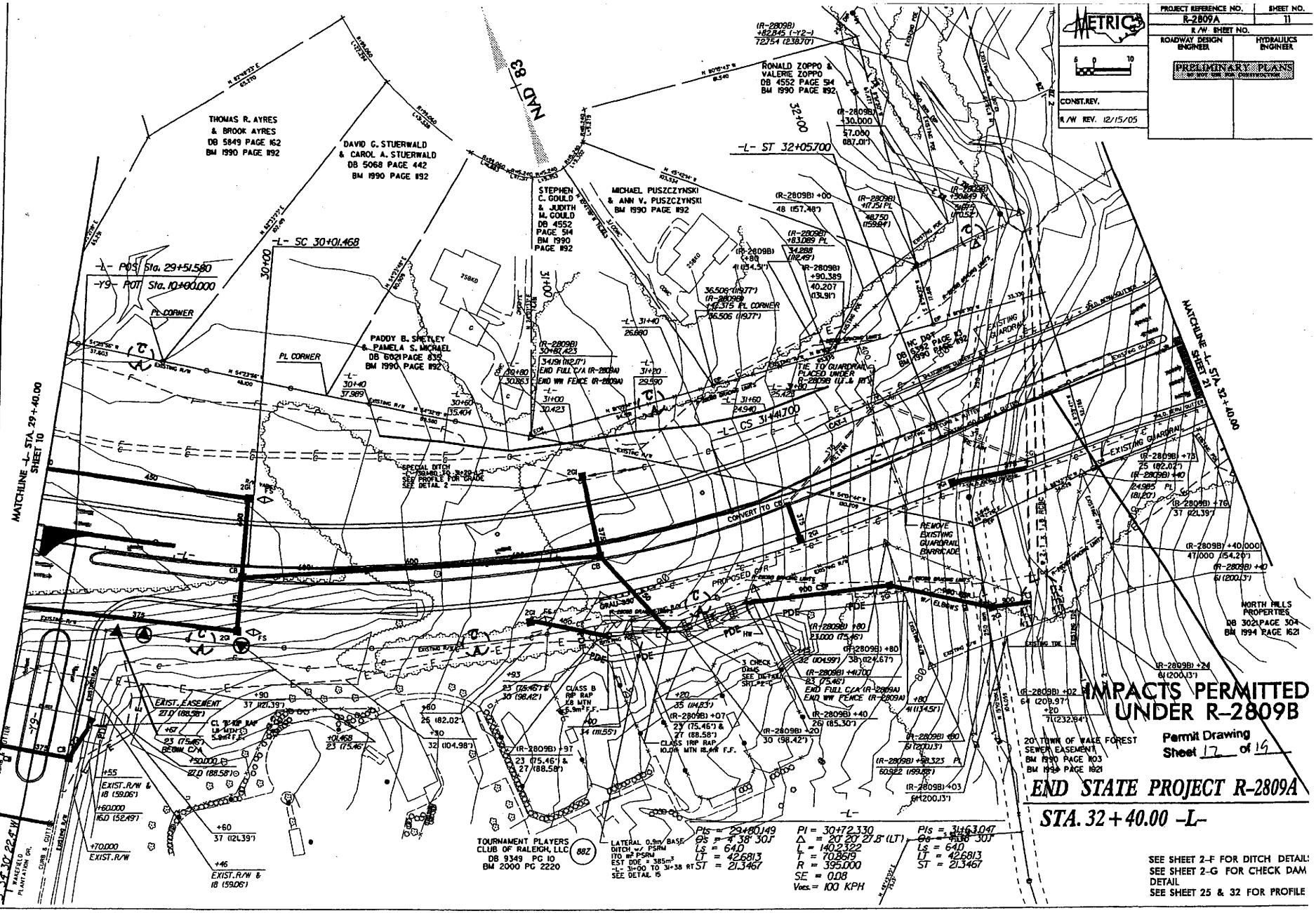

PROJECT REFERENCE NO.
R-2809A
SHEET NO
X-8
2.5 0 2.5 5
METRIC
WETLAND
BUFFER ZONE 2
BUFFER ZONE 1
-L-TRANS 9+60.224
103.898
9+60.0000
-L-TRANS 9+40.82
103.617
9+40.0000
SITE 1
228

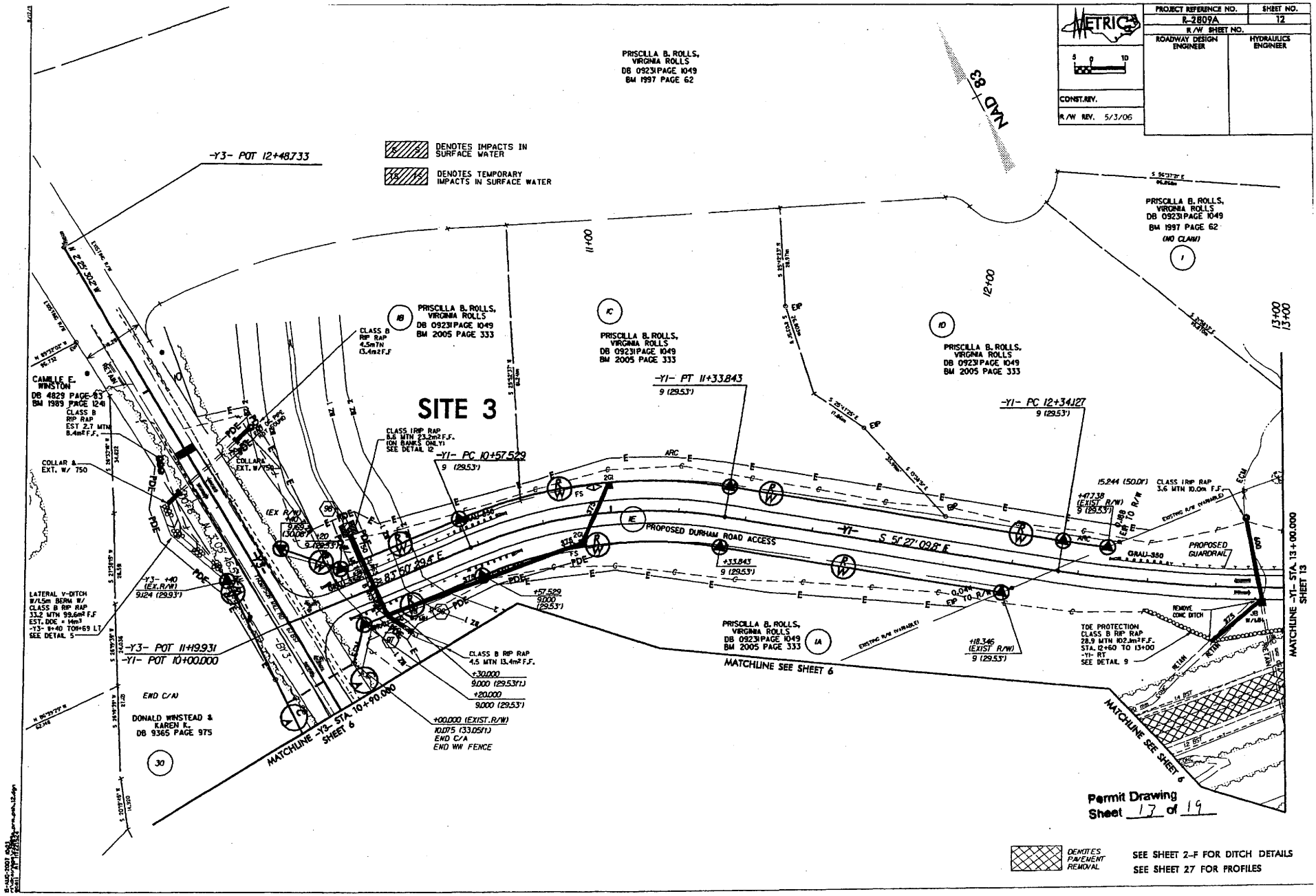

METRIC
PROJECT REFERENCE NO.
R-2809A
SHEET NO.
6
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV.
R/W REV. 5/3/06
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
NAD 83
SITE 2
MATCHLINE SEE SHEET 12
MATCH -Y3- STA. 10+90.000 SEE SHEET 12
MATCHLINE -L- STA. 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
-L- TS 12+60.524
-L- POS 13+51.932
-Y3- POT 10+00.000
-L- SC 13+56.524
-L- POC 13+64.155
-Y3A- POT 11+88.630
-Y3A- PT 11+77.11
-Y3A- PC 10+46.489
-Y3A- POT 10+00.009
-L- PC 10+31.848
-Y3- PT 10+72.765
-Y3- +72.765
-Y3- +45.303
-Y3- +44.211
-Y3- +48.133
-L- +18.99 (-Y3A-)
EXIST.R/W
EXISTING R/W (VARIABLE)
PROP. R/W
CLASS 'B' RIP RAP 0.9 MTN 4.2m² F.F.
CLASS 'I' RIPRAP 15.4 MTN & 41.1m² F.F. (ON BANKS ONLY) SEE DETAIL 12
CLASS B RIP RAP L8m MTN 5.9m² F.F.
SPECIAL LATERAL V-DITCH -L- 8+40 TO 8+76 RT SEE DETAIL 2
STANDARD BERM DITCH -L- 14+20 TO 15+00 RT
-L- 11+60 TO 13+40 RT
0.6m BASE HEAD DITCH EST DIS=15m³ SEE DETAIL 4
REMOVE CONC. DITCH
RETAIN CONC. DITCH
CONC DITCH 2GI TYPE D
COLLAR & EXTEND 375
FILL WITH CLOSABLE MATERIAL
ENDWALL W/GR
PSN SEE DETAIL SHEET 2-F
PSN SEE DETAIL SHEET 2-A
BEGIN C/A
STANDARD BERM DITCH -L- 11+60 TO 13+40 RT
N 21°44'15.8" W
S 37°25'57" E
S 37°25'01" W
9+72.951
10143 (33.28')
10+02.046
10.682 (35.05')

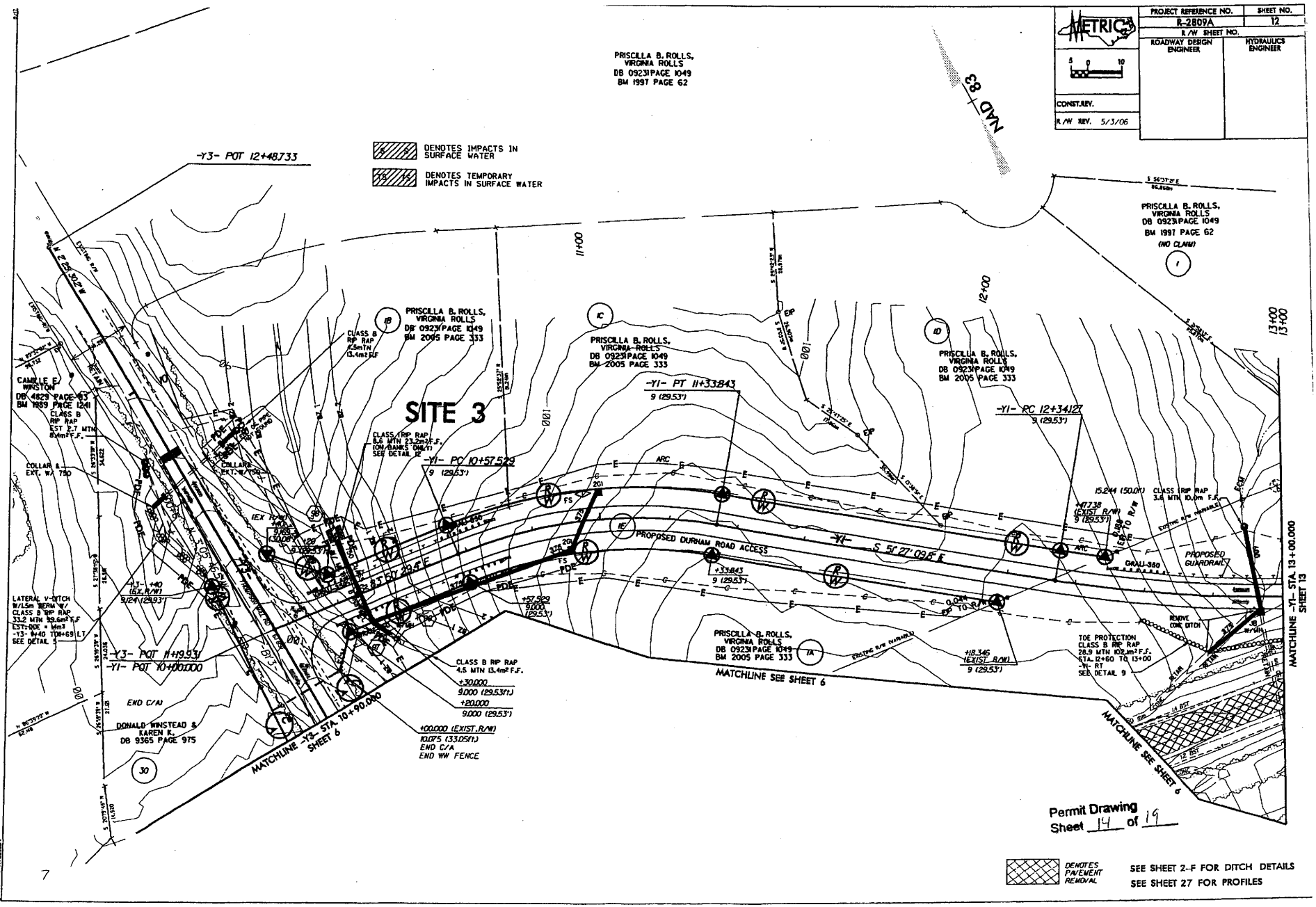

PROJECT REFERENCE NO. R-2809A
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO. 6
METRIC
CONSTR. REV.
R/W REV. 5/31/06
MATCHLINE -L- STA. 15+80.000 SEE SHEET 7
MATCHLINE SEE SHEET 12
MATCH -Y3- STA. 10+90.000 SEE SHEET 12
MATCHLINE -L- STA. 12+40.000 SEE SHEET 5
SITE 2
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
-L- POC 13+64.55 -Y3A- POT 11+88.630
-L- SC 13+56.524
-L- POS 13+51.932 -Y3- POT 10+00.000
-Y3A- PC 10+46.489
-Y3A- POT 10+00.000
-Y3A- PT 11+31.74
-L- TS 12+60.524
BEGIN C/A
PRISCILLA B. ROLLS VIRGINIA R. ROLLS DB 0923 PAGE 1049 BM 2006 PAGE 333
DONALD WINSTEAD & KAREN L. KEPPLE DB 9365 PAGE 975
CLN ASSOCIATES LLC DB 8850 PAGE 873
CARONA PRINCESS, LLC DB 08693 PAGE 1799
JOHN WALTER ROLLS, JR & IRIS DALTON ROLLS DB 8238 PAGE 154 BM 1997 PAGE 1421
NEIL A. FLOYD & MELANIE A. DB 6725 PAGE 525 BM 1988 PAGE 971
CHARLES B. SHEARON & JULIA O DB 1059 PAGE 843 BM 1988, PAGE 971
NAD 83

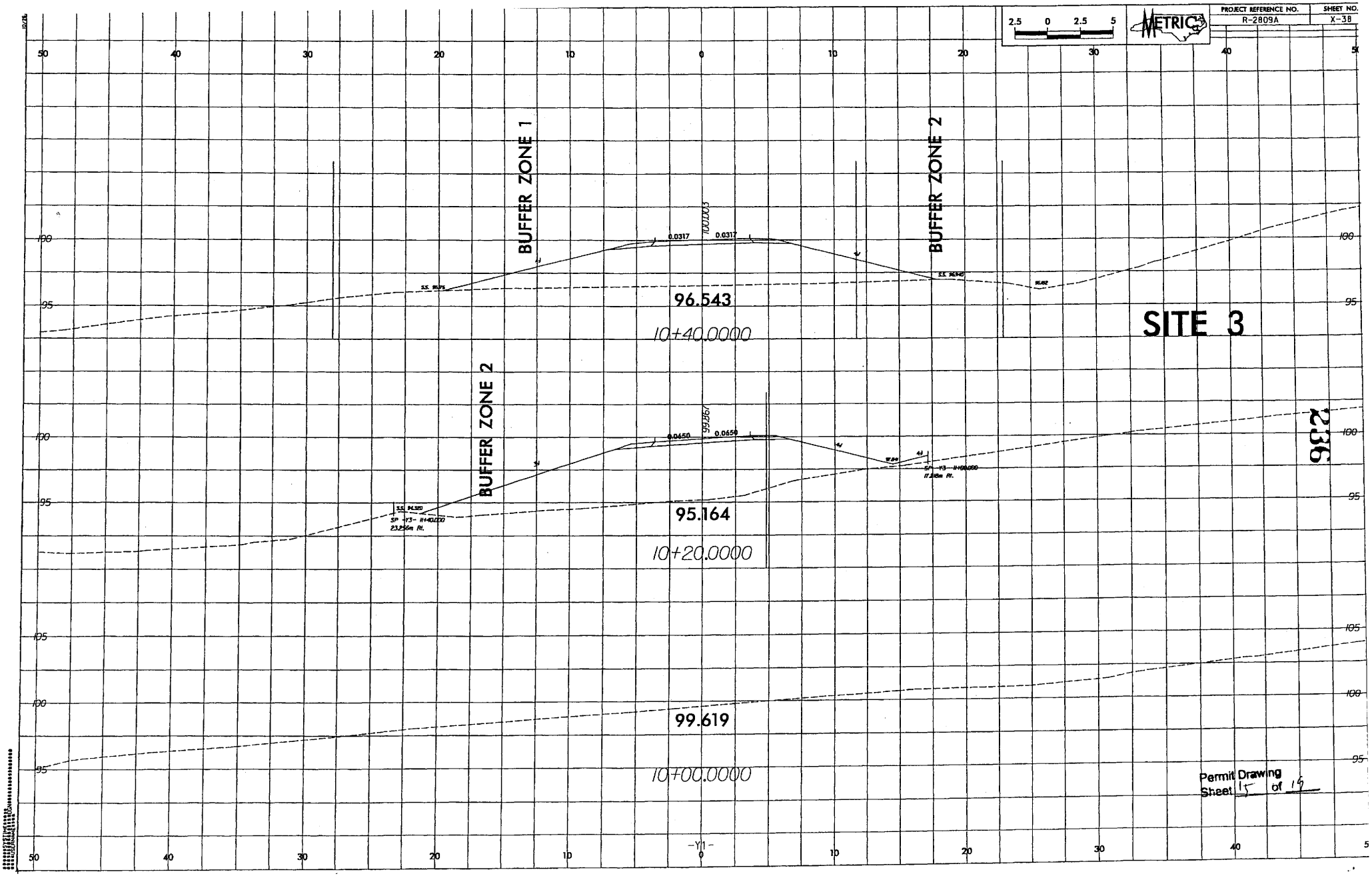

PROJECT REFERENCE NO.
R-2809A
SHEET NO.
X-14
2.5 0 2.5 5
METRIC
113.546
14+80.0000
111.691
14+60.0000
108.794
14+40.0000
108.398
14+20.0000
108.751
14+00.0000
BUFFER ZONE 1
FILL IN SURFACE WATER
BUFFER ZONE 1
SITE 2
Permit Drawing
Sheet 16 of 17
221

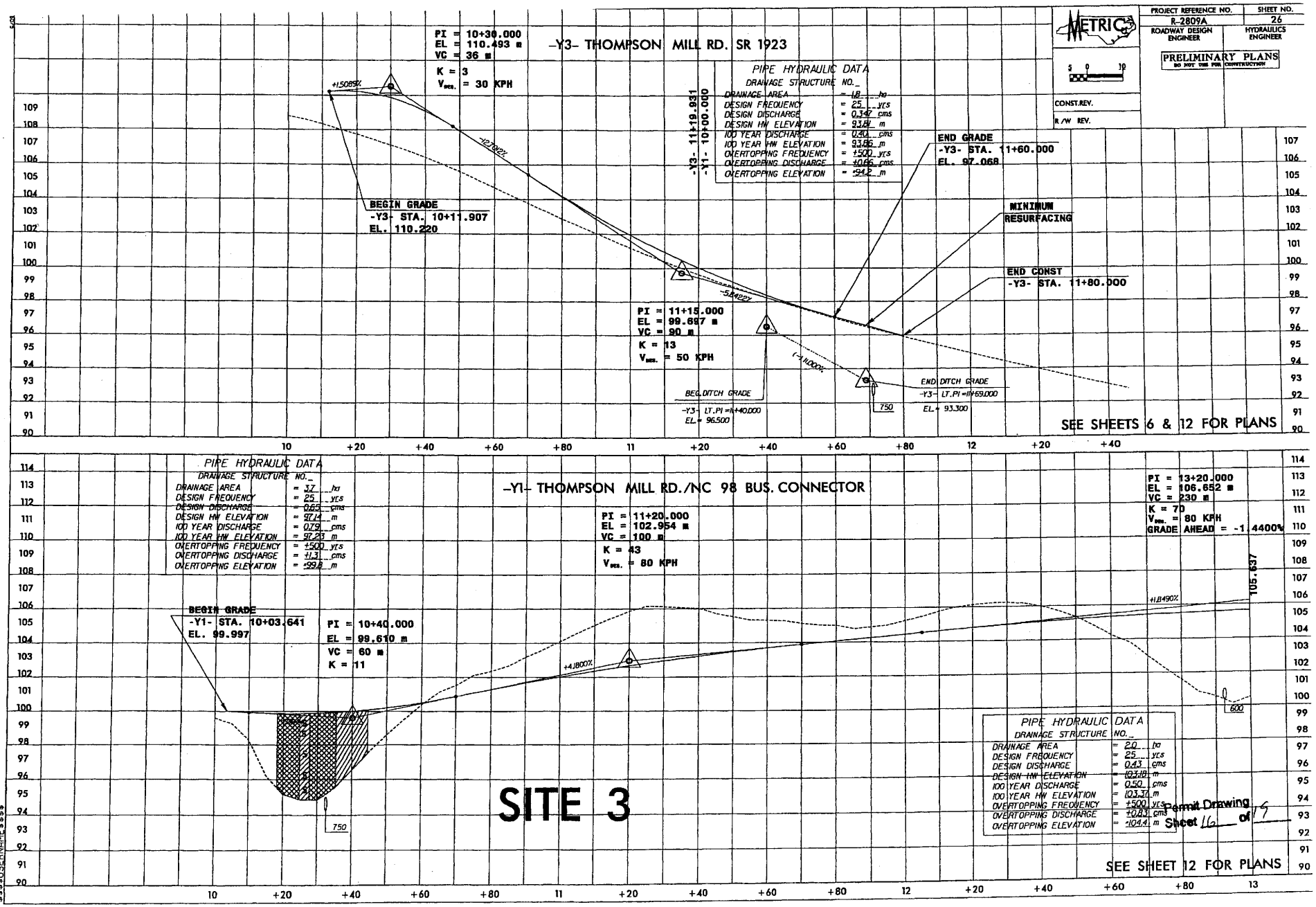

METRIC
PROJECT REFERENCE NO. R-2809A
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
CONST.REV.
R/W REV. 12/15/05
NAD 83
THOMAS R. AYRES & BROOK AYRES DB 5849 PAGE 162 BM 1990 PAGE 192
DAVID C. STUERWALD & CAROL A. STUERWALD DB 5068 PAGE 442 BM 1990 PAGE 192
STEPHEN C. GOULD & JUDITH M. GOULD DB 4552 PAGE 514 BM 1990 PAGE 192
MICHAEL PUSZCZYNSKI & ANN V. PUSZCZYNSKI BM 1990 PAGE 192
RONALD ZOPPO & VALERIE ZOPPO DB 4552 PAGE 514 BM 1990 PAGE 192
PADDY B. SHETLEY & PAMELA S. MICHAEL DB 6021 PAGE 635 BM 1990 PAGE 192
NC DOT DB 6392 PAGE 83 BM 1990 PAGE 192
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
RAKEFIELD PLANTATION DR.
-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
PL CORNER
EXISTING GUARDRAIL
REMOVE EXISTING GUARDRAIL BARRICADE
CONVERT TO CS
PROPOSED G/R
SPECIAL DITCH SEE PROFILE FOR GRADE SEE DETAIL 2
3 CHECK DAMS SEE DETAIL SHT.#2-G
CLASS B RIP RAP LB MTN 5.5m² 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 27.0 (88.58')
EXIST.R/W & 18 (59.06')
EXIST.R/W
20' TOWN OF WAKE FOREST SEWER EASEMENT BM 1990 PAGE 803 BM 1994 PAGE 1621
Pis = 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
Pis = 31+63.047 Θs = 4° 38' 30" Ls = 64.0 LT = 42.6813 ST = 21.3467
IMPACTS PERMITTED UNDER R-2809B
Permit Drawing Sheet 11 of 15
END STATE PROJECT R-2809A
STA. 32+40.00 -L-
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. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
CONST.REV.
R/W REV. 12/15/05
NAD 83
-L- ST 32+05.700
-L- SC 30+01.468
-L- POT Sta. 29+51.580
-Y9- POT Sta. 10+60.000
-L- CS 31+41.700
MATCHLINE -L- STA. 29+40.00 SHEET 10
MATCHLINE -L- STA. 32+40.00 SHEET 21
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 832 BM 1990 PAGE 1192
NC DOT DB 5552 PAGE 1 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
PL CORNER
EXISTING GUARDRAIL
TIE TO GUARDRAIL PLACED UNDER R-2809B (LT. & RT.)
REMOVE EXISTING GUARDRAIL BARRICADE
CONVERT TO CB
SPECIAL DITCH SEE PROFILE FOR GRADE SEE DETAIL 2
CLASS B RIP RAP 1.0 MTH
CLASS I RIP RAP 10.0m MTH BLANK F.F.
EXIST. EASEMENT
EXIST. R/W & I8 (59.06')
20' TOWN OF WAKE FOREST SEWER EASEMENT BM 1990 PAGE 1103 BM 1994 PAGE 1621
LATERAL 0.9m BASE DITCH w/ PSRM TO 2nd PSRM EST DOE = 385m³ -L- 31+00 TO 31+38 RT SEE DETAIL 15
Pts = 29+80.149 Ds = 4° 38' 30" Ls = 640 Lt = 42.6813 St = 21.3467
PI = 30+72.330 Δ = 20° 20' 27.8" (LT) L = 140.2322 Lt = 70.8619 R = 395.000 SE = 0.08 Vdes = 100 KPH
Pts = 31+63.047 Ds = 4° 38' 30" Ls = 640 Lt = 42.6813 St = 21.3467
IMPACTS PERMITTED UNDER R-2809B
Permit Drawing Sheet 12 of 14
END STATE PROJECT R-2809A
STA. 32+40.00 -L-
SEE SHEET 2-F FOR DITCH DETAIL
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
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 3
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923I PAGE 1049 BM 1997 PAGE 62
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923I PAGE 1049 BM 2005 PAGE 333
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923I PAGE 1049 BM 1997 PAGE 62 (NO CLAIM)
CAMILLE F. WINSTON DB 4829 PAGE 83 BM 1989 PAGE 1241
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
-Y3- POT 12+48.733
-Y1- PT 11+33.843
-Y1- PC 12+34.127
-Y1- PC 10+57.529
-Y3- POT 11+19.931
-Y1- POT 10+00.000
-Y1- S 51°27'09.8" E
PROPOSED DURHAM ROAD ACCESS
PROPOSED GUARDRAIL
MATCHLINE -Y3- STA. 10+90.000 SHEET 6
MATCHLINE SEE SHEET 6
MATCHLINE -Y1- STA. 13+00.000 SHEET 13
CLASS B RIP RAP 4.5MTN (3.4m²F.F.
CLASS I RIP RAP 8.6 MTN 23.2m²F.F. (ON BANKS ONLY) SEE DETAIL 12
CLASS I RIP RAP 3.6 MTN 10.0m F.F.
TOE PROTECTION CLASS B RIP RAP 28.9 MTN 102.3m²F.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- 9+40 TOH=69 LT SEE DETAIL 5
REMOVE EXIST. DITCH
GRAD-350
DENOTES PAVEMENT REMOVAL
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 27 FOR PROFILES
Permit Drawing Sheet 13 of 19


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
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 3
-Y3- POT 12+48.733
-Y3- POT 11+99.31
-Y1- POT 10+06.000
-Y1- PC 10+57.529
-Y1- PT 11+33.843
-Y1- PC 12+34.127
-Y1- S 51° 27' 09.8" E
PROPOSED DURHAM ROAD ACCESS
PROPOSED GUARDRAIL
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923/PAGE 1049 BM 1997 PAGE 62
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923/PAGE 1049 BM 2005 PAGE 333
CAMILLE F. WINSTON DB 4829 PAGE 83 BM 1989 PAGE 1241
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
CLASS B RIP RAP
CLASS I RIP RAP
LATERAL V-DITCH
TOE PROTECTION CLASS B RIP RAP
REMOVE CONC DITCH
MATCHLINE SEE SHEET 6
MATCHLINE -Y3- STA. 10+90.000 SHEET 6
MATCHLINE -Y1- STA. 13+00.000 SHEET 13
END C/A
END WW FENCE
NAD 83
Permit Drawing Sheet 14 of 19
DENOTES PAVEMENT REMOVAL
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 27 FOR PROFILES


PROJECT REFERENCE NO.
R-2809A
SHEET NO.
X-38
METRIC
2.5 0 2.5 5
BUFFER ZONE 1
BUFFER ZONE 2
BUFFER ZONE 2
SITE 3
96.543
10+40.0000
95.164
10+20.0000
99.619
10+00.0000
0.0317
0.0317
0.0650
0.0650
-Y1-
Permit Drawing
Sheet 15 of 16



Permit Drawing Sheet 16 of 16

237

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS				
			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:

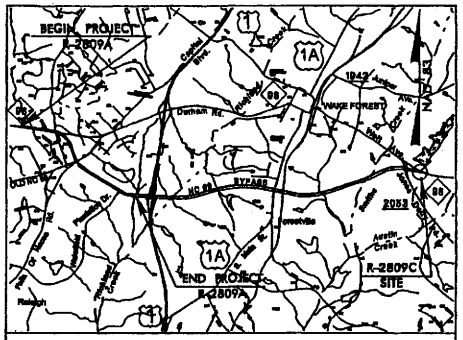
SITE #	PROPERTY OWNER	ADDRESSES
1	NCDOT	
2	NCDOT	
3	PRISCILLA ROLLS	7104 THOMPSON MILL ROAD WAKE FOREST, NC 27587

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

Sheet 19 of 19 August-07

CONTRACT: C201737 TIP PROJECT: R-2809A

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

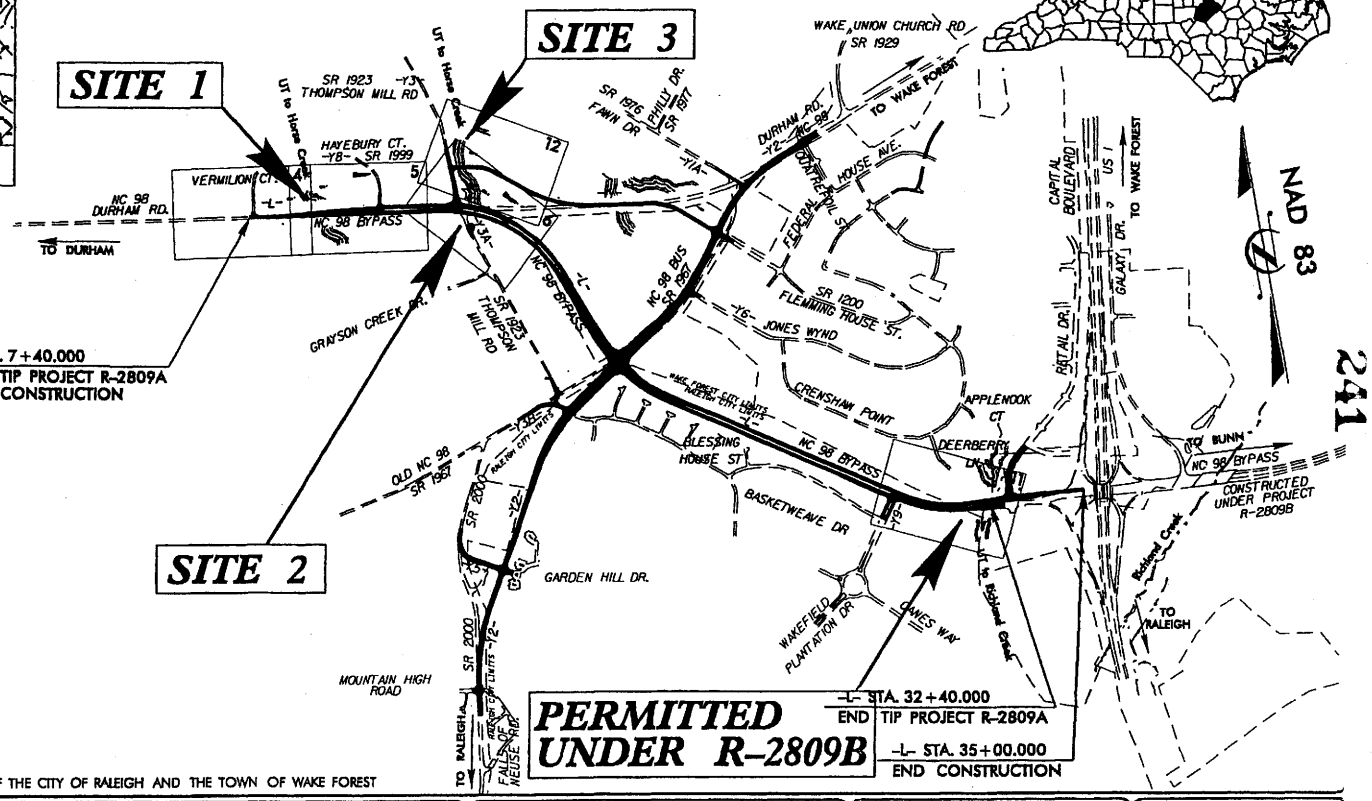
WAKE COUNTY

METRIC

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

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

BUFFER PERMIT

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

GRAPHIC SCALES
PLANS 5 0 10
PROFILE (HORIZONTAL) 5 0 10
PROFILE (VERTICAL) 1 0 2

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 HIGHWAY DESIGN ENGINEER P.E.

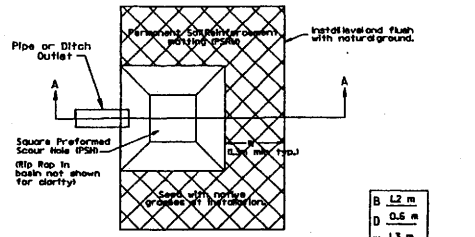
Plan Drawing
Sheet 1 of 23

241

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

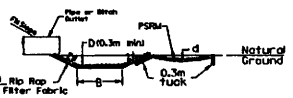
PREFORMED SCOUR HOLE

PLAN VIEW



B	L2 m
D	0.6 m
W	L3 m
d	0.15 m

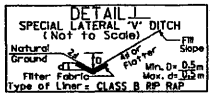
SECTION A-A



4/4/02

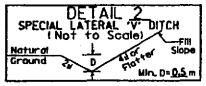
STA. 9+50 -L- LT
STA. 9+99 -L- RT
STA. 13+75 -L- LT
STA. 14+30 -L- LT
STA. 18+73 -L- LT
STA. 19+95 -L- LT

DETAIL 1
SPECIAL LATERAL "V" DITCH
(Not to Scale)



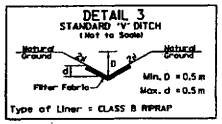
STA. 10+70 TO 11+8 -L- LT
STA. 11+20 TO 11+60 -L- RT
STA. 19+40 TO 19+80 -L- RT
STA. 23+60 TO 23+90 -L- LT
STA. 18+82 TO 19+00 -Y2- RT

DETAIL 2
SPECIAL LATERAL "V" DITCH
(Not to Scale)



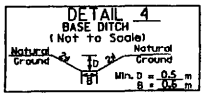
STA. 15+40 TO 15+76 -L- RT
STA. 18+80 TO 19+20 -L- RT
STA. 30+80 TO 31+20 -L- LT
STA. 8+06 TO 8+60 -Y2- LT
STA. 19+20 TO 19+46 -Y2- RT
STA. 26+60 TO 27+00 -Y2- LT
STA. 10+70 TO 10+40 -Y38- RT
STA. 10+20 TO 10+50 -Y4- LT

DETAIL 3
STANDARD "V" DITCH
(Not to Scale)



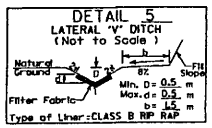
STA. 27+00 TO 27+17 -Y2- LT
STA. 27+17 TO 27+70 -Y2- LT

DETAIL 4
BASE DITCH
(Not to Scale)



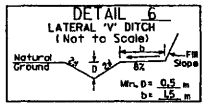
STA. 15+73 -L- LT
STA. 15+78 -L- RT
STA. 17+35 TO 17+55 -L- RT
STA. 24+55 -L- LT
STA. 15+30 -Y2- LT
STA. 12+04 -Y5- LT

DETAIL 5
LATERAL "V" DITCH
(Not to Scale)



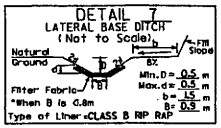
STA. 17+00 TO 17+80 -L- LT
STA. 24+20 TO 24+40 -L- RT
STA. 24+60 TO 25+20 -L- LT
STA. 8+40 TO 8+69 -Y3- LT
STA. 15+20 TO 16+00 -Y2- LT
STA. 16+20 TO 16+80 -Y2- LT

DETAIL 6
LATERAL "V" DITCH
(Not to Scale)



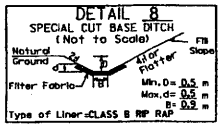
STA. 16+70 TO 17+33 -L- RT
STA. 25+80 TO 28+20 -L- LT

DETAIL 7
LATERAL BASE DITCH
(Not to Scale)



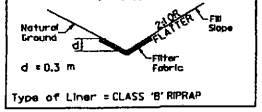
STA. 16+42 TO 17+00 -L- LT

DETAIL 8
SPECIAL CUT BASE DITCH
(Not to Scale)



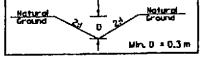
STA. 23+00 TO 23+60 -L- LT

DETAIL 9
TOE PROTECTION
(Not to Scale)



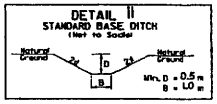
STA 8+35 TO STA 8+50 -L- RT.
STA 9+20 TO STA 9+80 -L- LT.
STA. 23+60 TO 24+10 -L- RT
STA. 12+60 TO 13+00 -Y1- RT
STA. 16+30 TO 17+20-Y1- RT
STA. 26+80 TO 27+20 -Y2- RT

DETAIL 10
STANDARD "V" DITCH
(Not to Scale)



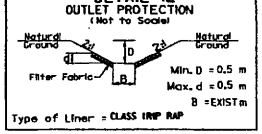
STA. 10+30 -Y1A- RT

DETAIL 11
STANDARD BASE DITCH
(Not to Scale)



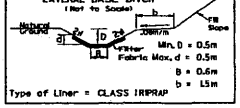
STA. 16+42 -Y2- RT

DETAIL 12
OUTLET PROTECTION
(Not to Scale)



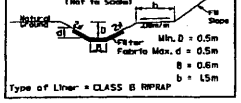
STA. 9+15 -L- LT
STA. 13+95 -L- LT
STA. 8+50 -Y3- RT

DETAIL 13
LATERAL BASE DITCH
(Not to Scale)



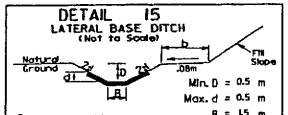
STA. 9+00 TO 9+12 -L- LT

DETAIL 14
LATERAL BASE DITCH
(Not to Scale)



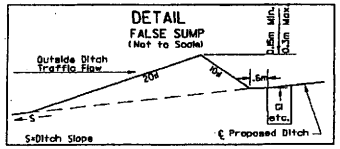
STA. 9+80 TO 10+70 -L- LT

DETAIL 15
LATERAL BASE DITCH
(Not to Scale)

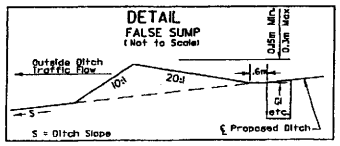


STA. 31+00 TO 31+38 -L- RT

DETAIL
FALSE SUMP
(Not to Scale)



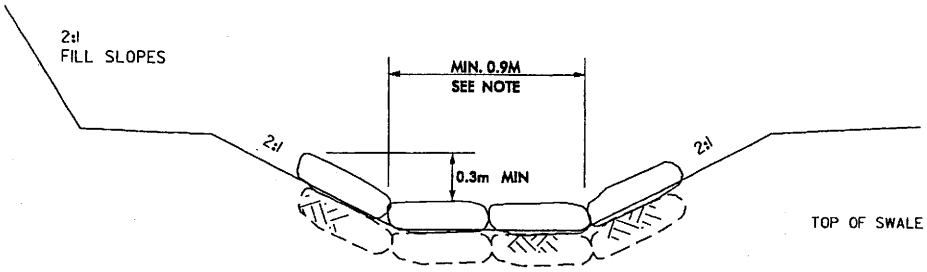
DETAIL
FALSE SUMP
(Not to Scale)



242

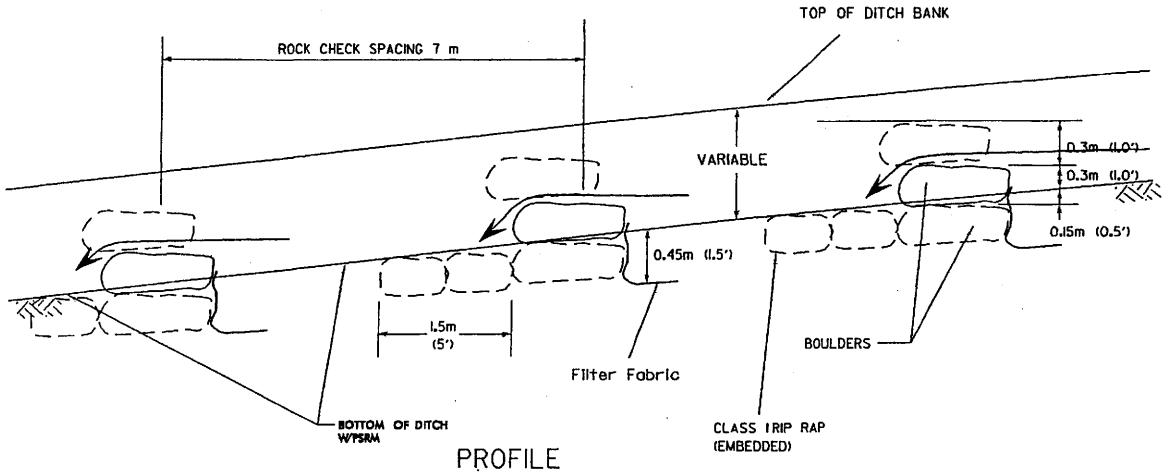
LATERAL SWALE/DITCH W/ROCK CHECKS
STA 31+16 TO 31+38 -L- RT

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



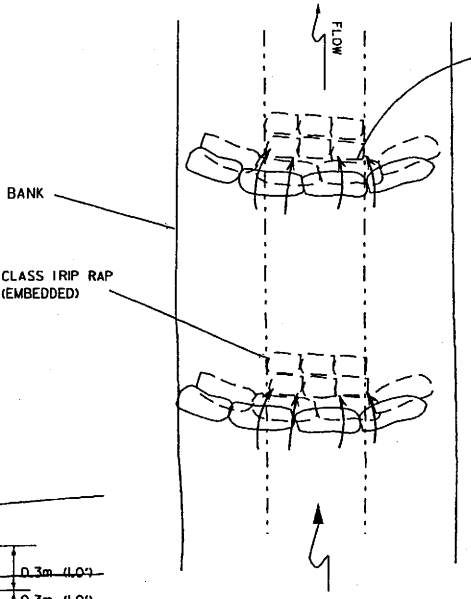
TYPICAL CROSS SECTION

NOT TO SCALE



PROFILE

NOT TO SCALE



PLAN VIEW

NOT TO SCALE

FILTER FABRIC = 20m²

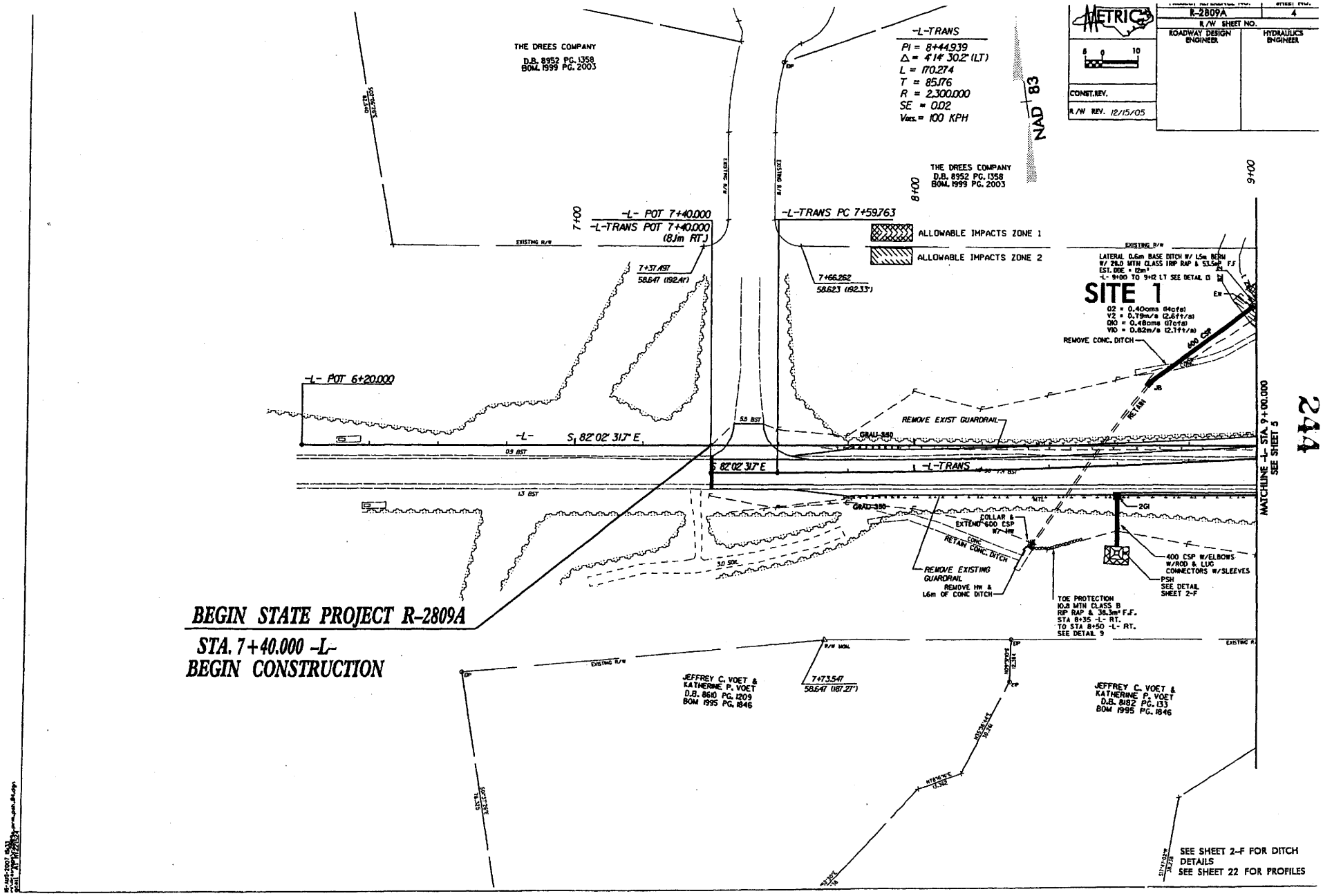
BOULDERS/FOOTER ROCK = 60 MTN

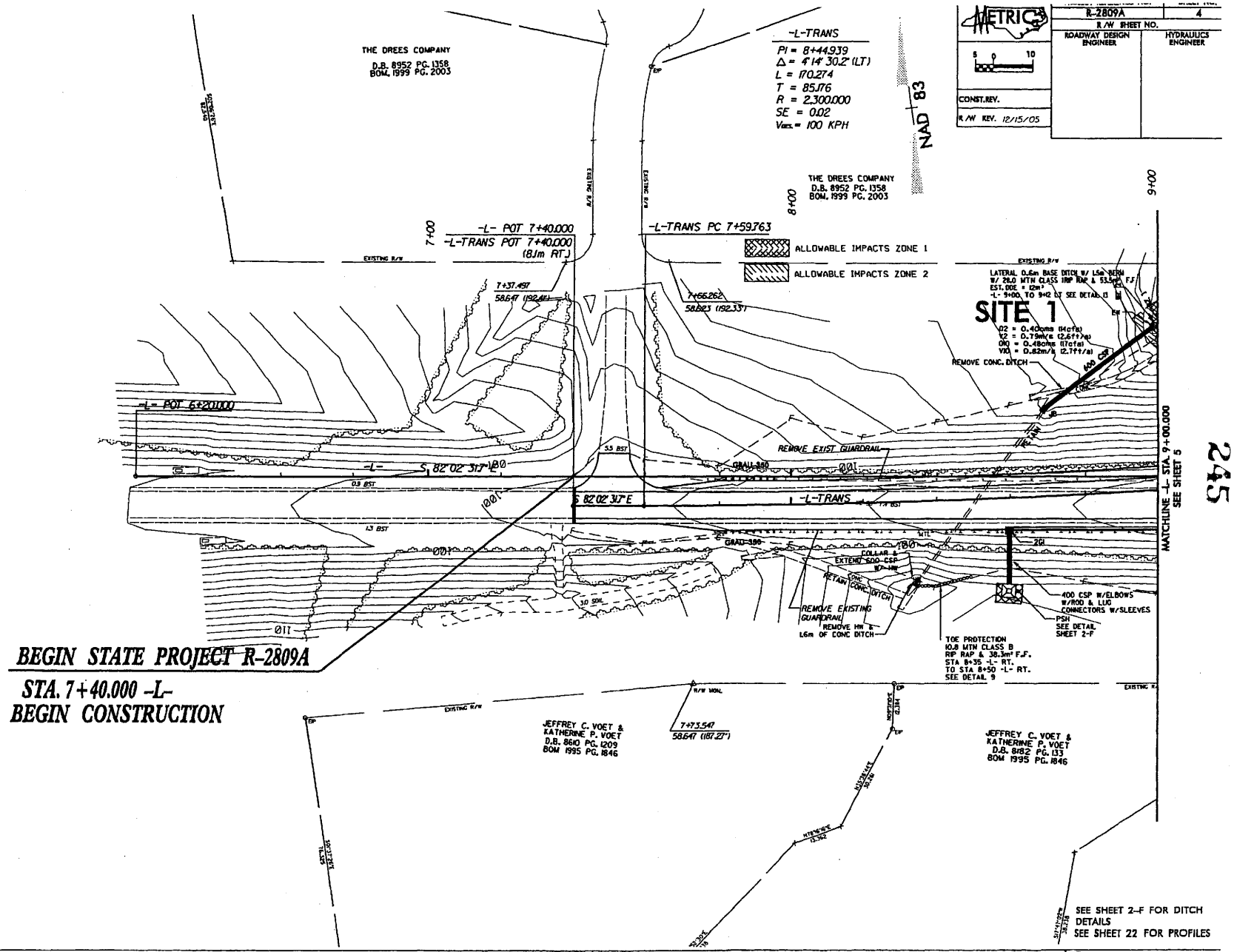
CLASS I RIP RAP = 5 MTN

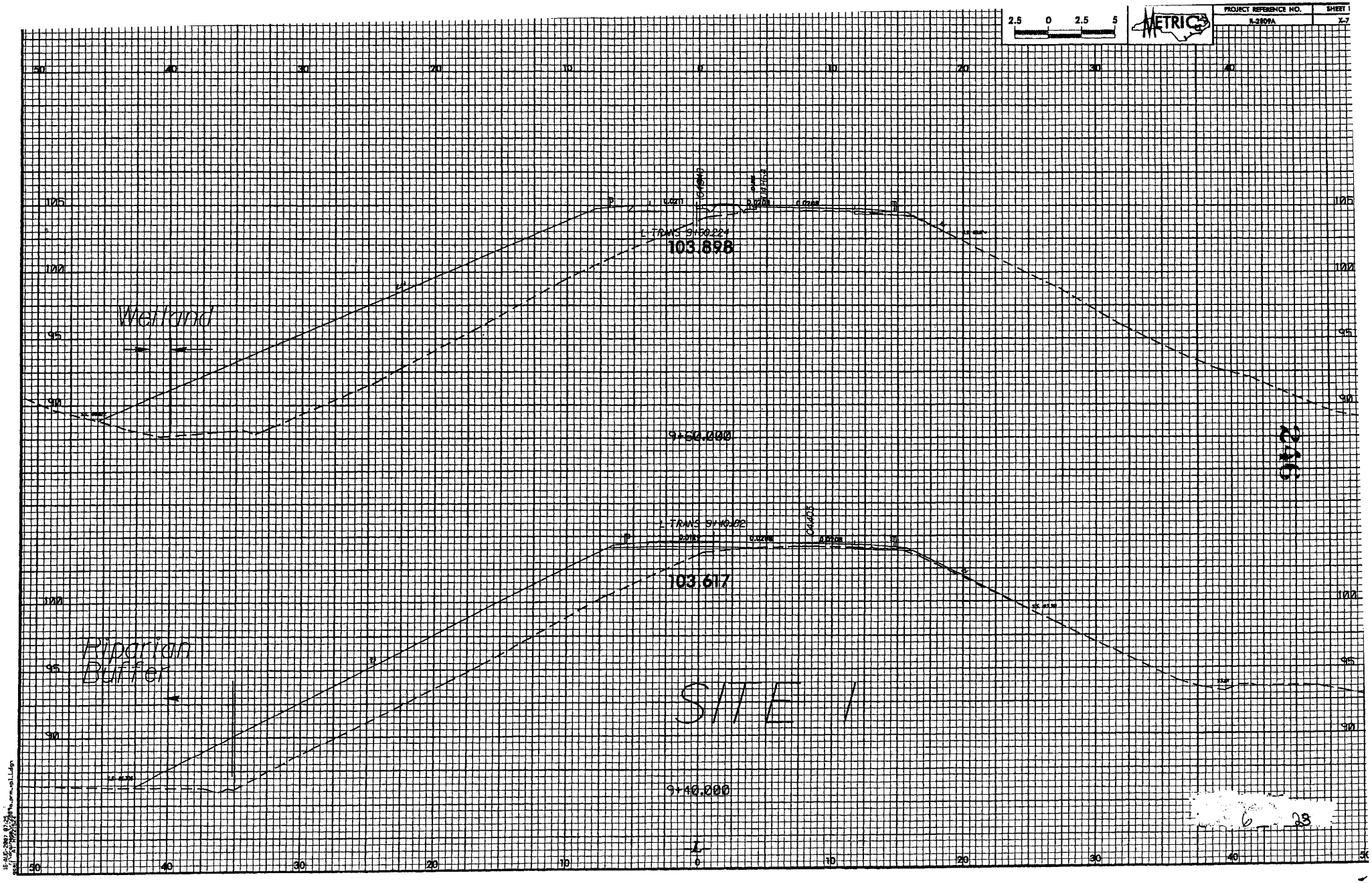
NOTE:

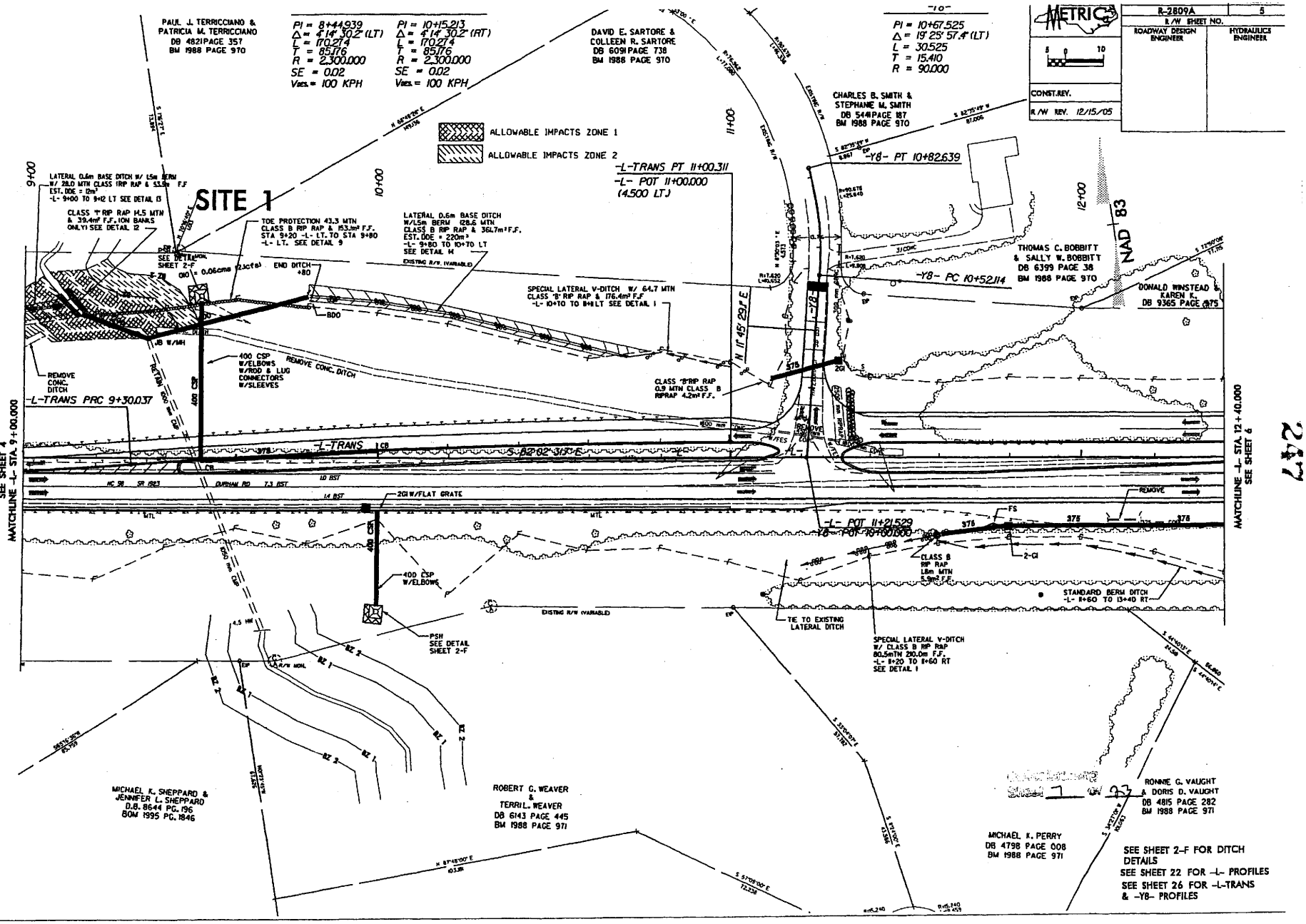
BOULDERS SHOULD BE ANGULAR AND OBLONG WITH APPROXIMATE DIMENSIONS OF 0.6m x 0.45m x 0.45m (2' x 1.5' x 1.5'). ROCK SHOULD FIT TIGHTLY TOGETHER WITH MINIMAL VOIDS. STAGGER BOULDER JOINTS.

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

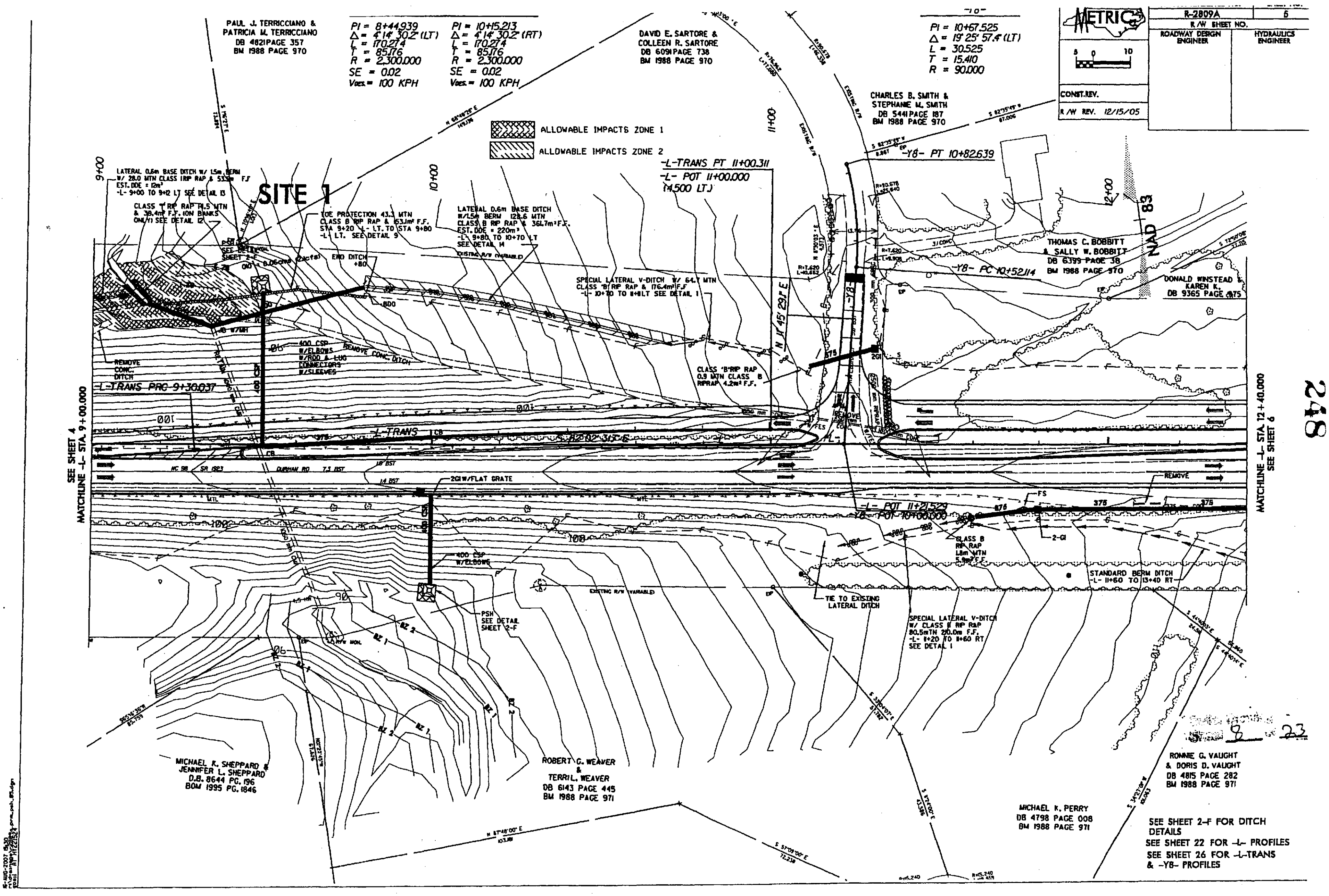

METRIC
R-2809A
R/W SHEET NO. 4
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV. 12/15/05
-L-TRANS
PI = 8+44.939
Δ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
Vdes. = 100 KPH
NAD 83
THE DREES COMPANY
D.B. 8952 PG. 1358
BOM. 1999 PG. 2003
-L- POT 7+40.000
-L-TRANS POT 7+40.000
(8.1m RT.)
-L-TRANS PC 7+59.763
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
7+37.491
58.647 (192.41')
7+66.262
58.623 (192.33')
SITE 1
Q2 = 0.40cms (14cfs)
V2 = 0.79m/s (2.6ft/s)
Q10 = 0.48cms (17cfs)
V10 = 0.82m/s (2.7ft/s)
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 2H:1V MTN CLASS IRP RAP & 53.5m² F.F
EST. DDE = 12m³
-L- 9+00 TO 9+12 LT SEE DETAIL D
REMOVE CONC. DITCH
600 CSP
JB
RETAIN
REMOVE EXIST GUARDRAIL
-L- POT 6+20.000
-L- S 82° 02' 31.7" E
-L-TRANS
GRAD-SB
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
1.0 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
JEFFREY C. VOET & KATHERINE P. VOET
D.B. 8610 PG. 1209
BOM 1995 PG. 1846
7+73.547
58.647 (187.27')
JEFFREY C. VOET & KATHERINE P. VOET
D.B. 8682 PG. 133
BOM 1995 PG. 1846
MATCHLINE -L- STA. 9+00.000
SEE SHEET 5
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR PROFILES
7+00
8+00
9+00

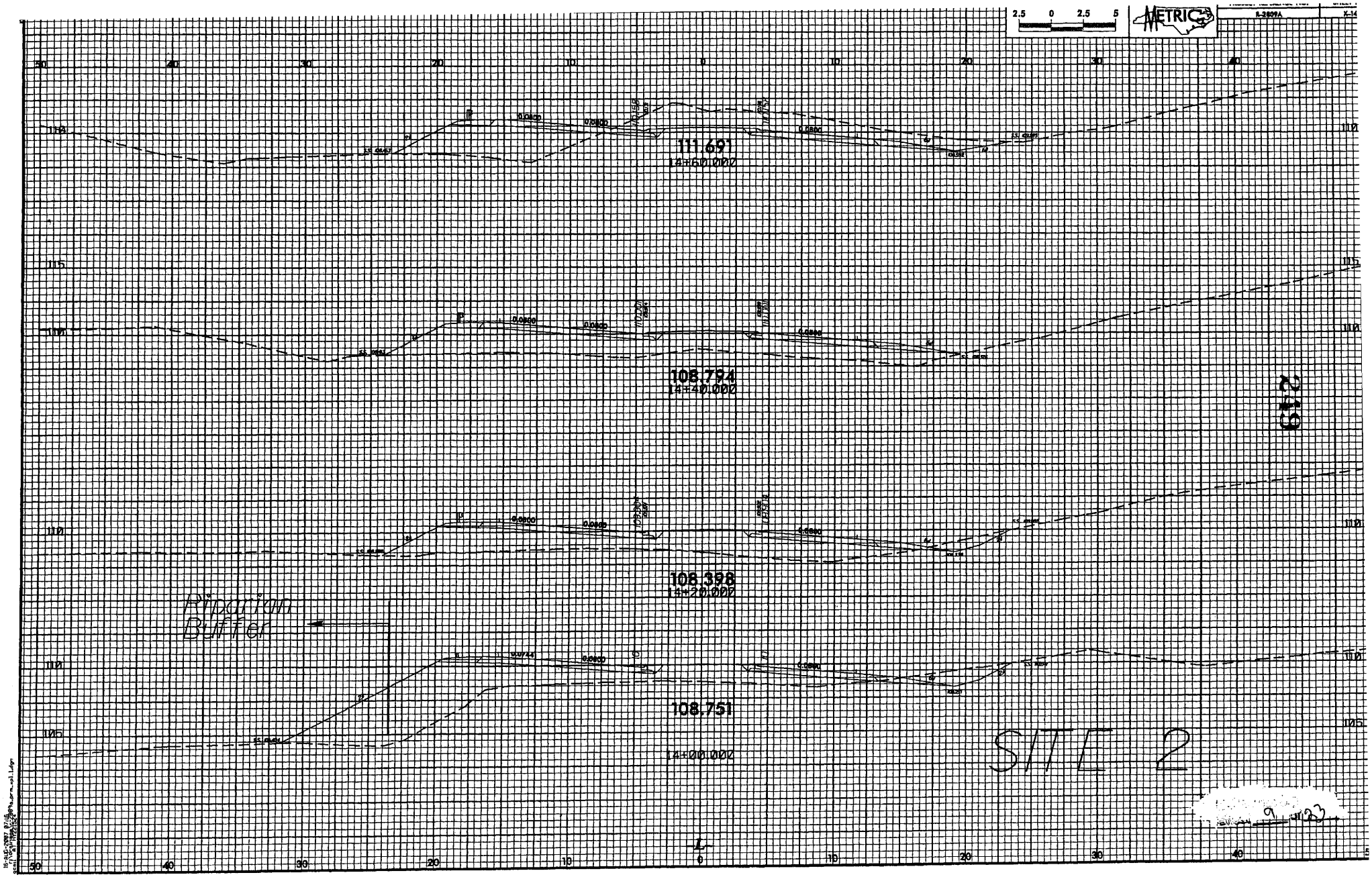

METRIC
R-2809A
4
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV.
R/W REV. 12/15/05
-L-TRANS
PI = 8+44.939
Δ = 4°14' 30.2" (LT)
L = 170.274
T = 85.176
R = 2,300.000
SE = 0.02
VDES. = 100 KPH
NAD 83
THE DREES COMPANY
D.B. 8952 PG. 1358
BOM, 1999 PG. 2003
-L- POT 7+40.000
-L-TRANS POT 7+40.000
(8.1m RT.)
-L-TRANS PC 7+59.763
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
SITE 1
-L- POT 6+20.000
-L-
S 82°02'31"E
-L-TRANS
REMOVE EXIST GUARDRAIL
REMOVE CONC. DITCH
REMOVE EXISTING GUARDRAIL
REMOVE HW & L6m 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
MATCHLINE -L- STA. 9+00.000
SEE SHEET 5
BEGIN STATE PROJECT R-2809A
STA. 7+40.000 -L-
BEGIN CONSTRUCTION
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

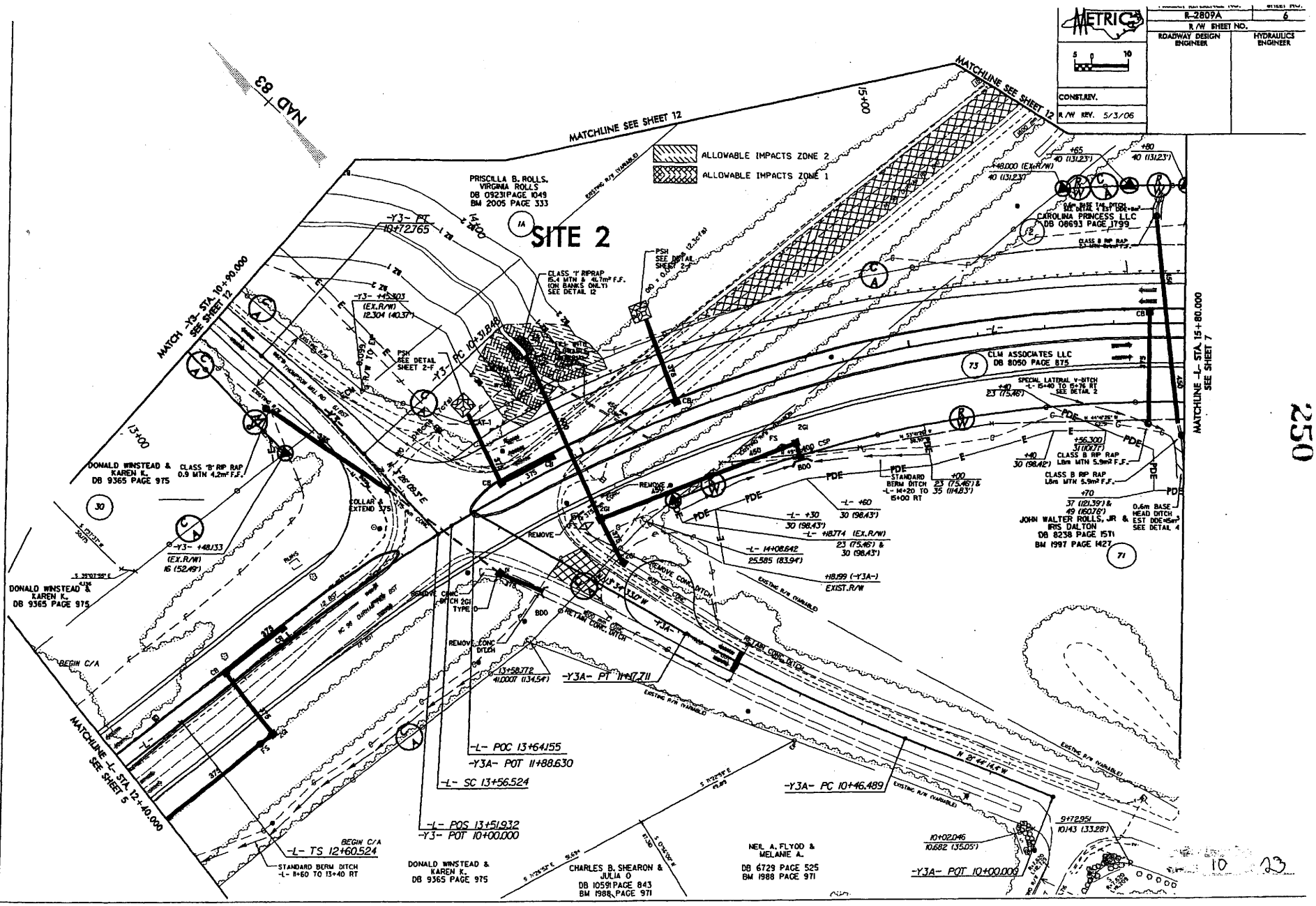

2.5 0 2.5 5
METRIC
PROJECT REFERENCE NO.
R-2809A
SHEET
X-7
Wetland
Riparian Buffer
SITE
9+60.000
9+40.000
103.898
103.617
L TRANS 9+00.224
L TRANS 9+40.00
CAUTION
L

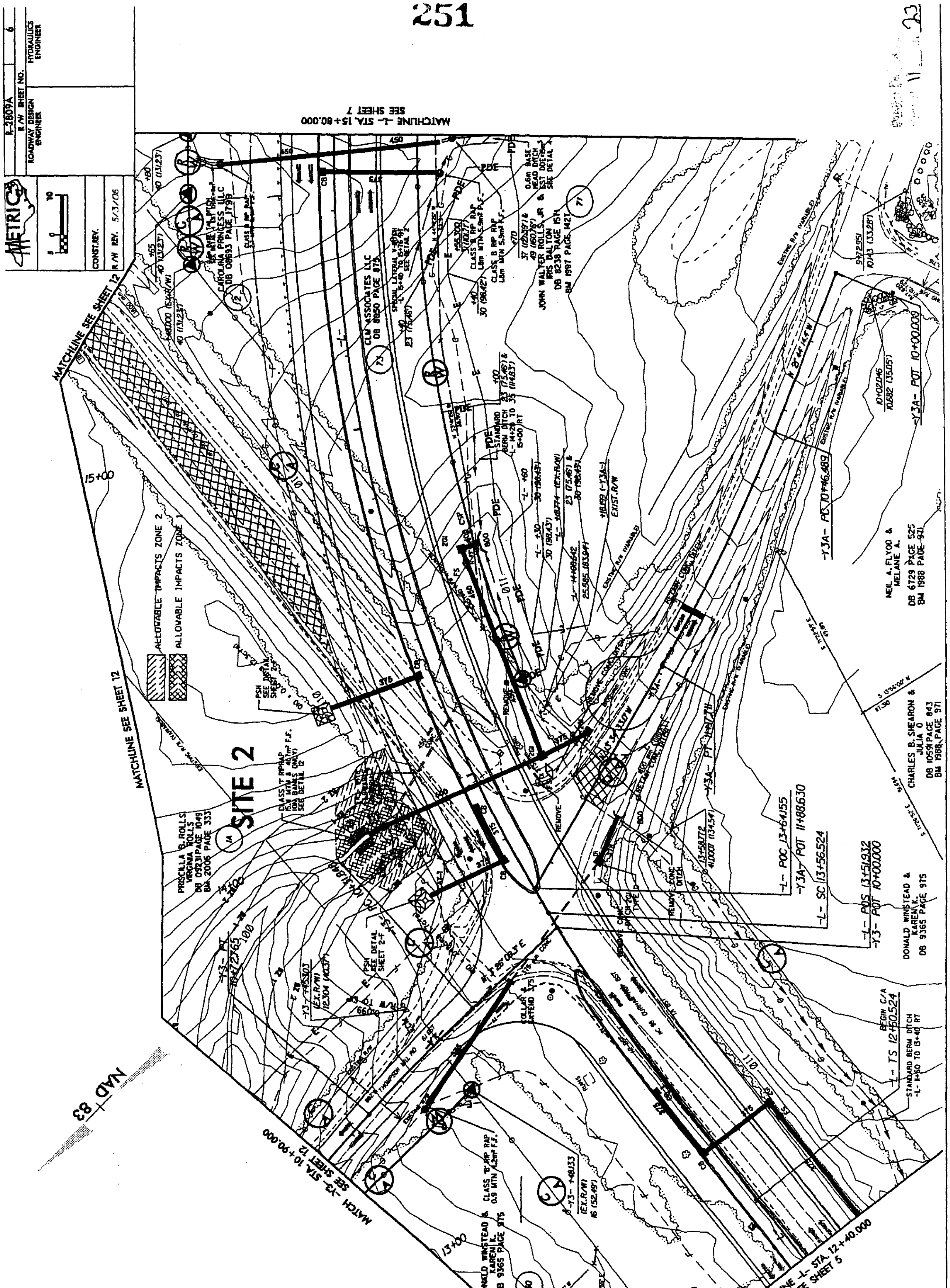

SITE 1
PAUL J. TERRICCIANO & PATRICIA M. TERRICCIANO DB 4821 PAGE 357 BM 1988 PAGE 970
DAVID E. SARTORE & COLLEEN R. SARTORE DB 6091 PAGE 738 BM 1988 PAGE 970
CHARLES B. SMITH & STEPHANIE M. SMITH DB 5441 PAGE 187 BM 1988 PAGE 970
THOMAS C. BOBBITT & SALLY W. BOBBITT DB 6399 PAGE 38 BM 1988 PAGE 970
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
MICHAEL K. SHEPPARD & JENNIFER L. SHEPPARD D.B. 8644 PG. 196 BOM 1995 PG. 1846
ROBERT C. WEAVER & TERRIL. WEAVER DB 6143 PAGE 445 BM 1988 PAGE 971
RONNIE G. VAUGHT & DORIS D. VAUGHT DB 4815 PAGE 282 BM 1988 PAGE 971
MICHAEL K. PERRY DB 4798 PAGE 008 BM 1988 PAGE 971
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
PI = 10+67.525
Δ = 19°25'57.4" (LT)
L = 305.25
T = 154.10
R = 90.000
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
-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
N 11°45'29" E
S 82°02'35" E
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 28.0 MTH CLASS 1RIP RAP & 53.5m F.F EST. DOE = 0m³ -L- 9+00 TO 9+12 LT SEE DETAIL 13
CLASS 1 RIP RAP M.5 MTH & 39.4m² F.F. ION BANKS ONLY! SEE DETAIL 12
TOE PROTECTION 43.3 MTH 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 MTH CLASS B RIP RAP & 361.7m² F.F. EST. DOE = 220m³ -L- 9+80 TO 10+70 LT SEE DETAIL 14
SPECIAL LATERAL V-DITCH W/ 64.7 MTH CLASS 'B' RIP RAP & 176.4m² F.F -L- 10+70 TO 11+48 LT SEE DETAIL 1
CLASS 'B' RIP RAP 0.9 MTH CLASS B RIPRAP 4.2m² F.F.
400 CSP W/ELBOWS W/ROD & LUG CONNECTORS W/SLEEVES
REMOVE CONC. DITCH
JB W/MH
PSH SEE DETAIL SHEET 2-F
END DITCH +80
2CI W/FLAT GRATE
400 CSP W/ELBOWS
CLASS B RIP RAP 1.8m MTH 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 80.5mTH 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
NC 58 SR 1523 DURHAM RD 7.3 BST 10 BST 14 BST
METRIC
R-2809A
R/W SHEET NO. 5
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV.
R/W REV. 12/15/05
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR -L- PROFILES
SEE SHEET 26 FOR -L-TRANS & -Y8- PROFILES
NAD 83

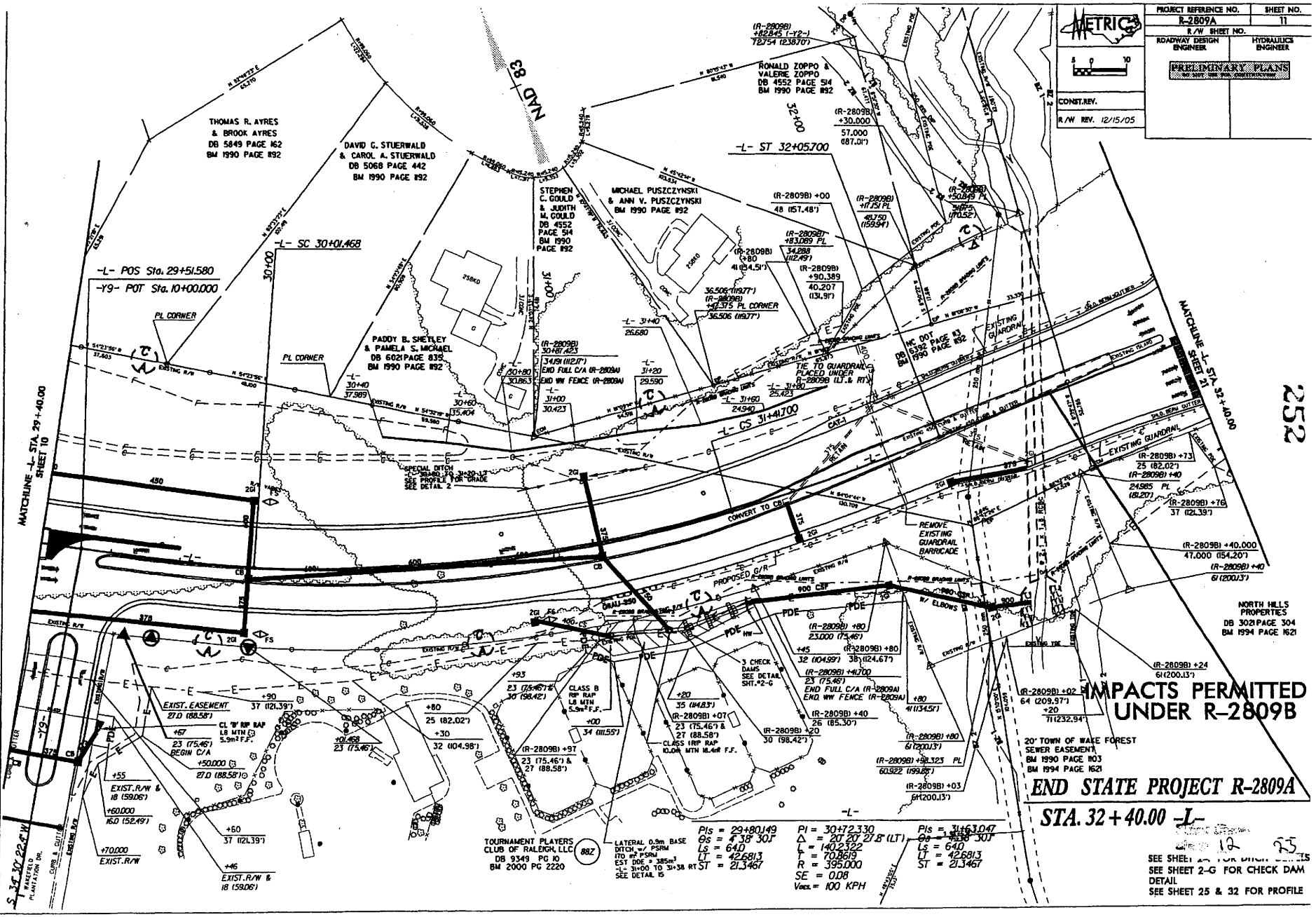
247


R-2809A
5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
5 0 10
CONST.REV.
R/W REV. 12/15/05
PAUL J. TERRICCIANO &
PATRICIA M. TERRICCIANO
DB 4821PAGE 357
BM 1988 PAGE 970
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
DAVID E. SARTORE &
COLLEEN R. SARTORE
DB 6091PAGE 738
BM 1988 PAGE 970
-Y8-
PI = 10+67.525
Δ = 19°25' 57.4" (LT)
L = 30.525
T = 15.410
R = 90.000
CHARLES B. SMITH &
STEPHANIE M. SMITH
DB 5441PAGE 187
BM 1988 PAGE 970
ALLOWABLE IMPACTS ZONE 1
ALLOWABLE IMPACTS ZONE 2
SITE 1
9+00
10+00
11+00
12+00
LATERAL 0.6m BASE DITCH W/ 1.5m BERM W/ 28.0 MTN CLASS I RIP RAP & 53.3m² F.F EST. DDE = 12m³ -L- 9+00 TO 9+12 LT SEE DETAIL 13
CLASS 'I' RIP RAP 11.5 MTN & 38.4m² F.F. (ON BANKS ONLY) SEE DETAIL 12
PSH SEE DETAIL SHEET 2-F
Q10 = 0.06cms (2cfs)
END DITCH +80
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
EXISTING R/W (VARIABLE)
SPECIAL LATERAL V-DITCH W/ 64.7 MTN CLASS 'B' RIP RAP & 176.4m² F.F -L- 10+70 TO 11+11LT SEE DETAIL 1
-L-TRANS PT 11+00.311
-L- POT 11+00.000
(14.500 LT)
-Y8- PT 10+82.639
-Y8- PC 10+52.114
N 11°45' 29.1" E
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 875
NAD 83
EXISTING R/W
REMOVE CONC. DITCH
400 CSP W/ELBOWS W/ROD & LUG CONNECTORS W/SLEEVES
-L-TRANS PRC 9+30.037
-L-TRANS
CB
NC 98
SR 1923
DURHAM RD
7.3 BST
10 BST
14 BST
2GI W/FLAT GRATE
400 CSP W/ELBOWS
PSH SEE DETAIL SHEET 2-F
MTL
375
2GI
FS
W/FES
REMOVE
RIPRAP
-L- POT 11+21.529
-Y8- POT 10+00.000
CLASS B RIP RAP 1.8m MTN 5.9m² F.F.
2-GI
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
MATCHLINE -L- STA. 9+00.000
SEE SHEET 4
MATCHLINE -L- STA. 12+40.000
SEE SHEET 6
BZ 1
BZ 2
R/W MON.
EP
MICHAEL R. 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
8 23
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 22 FOR -L- PROFILES
SEE SHEET 26 FOR -L-TRANS & -Y8- PROFILES

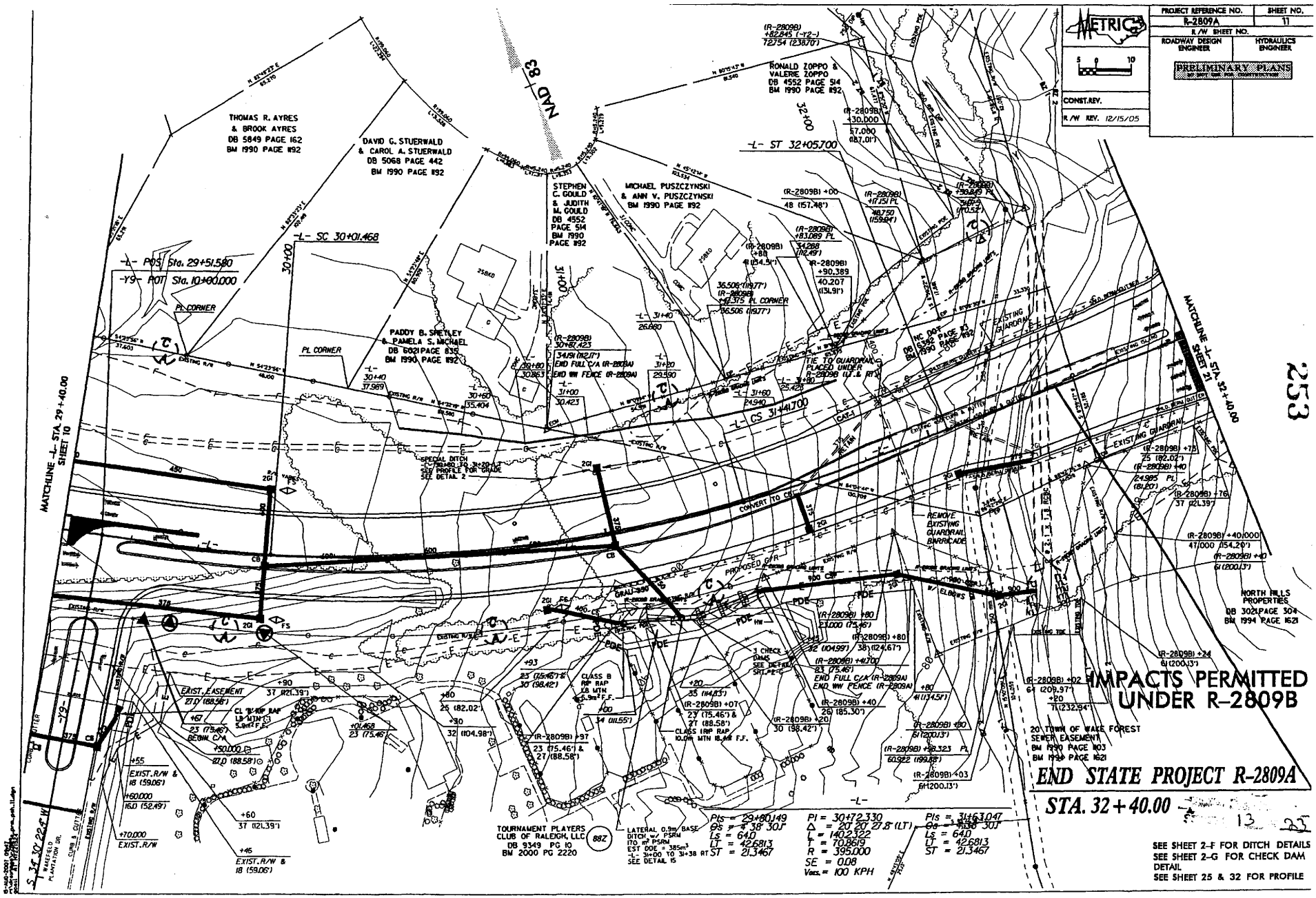

2.5 0 2.5 5
METRIC
R-2809A
X-14
111.691
14+60.000
108.794
14+40.000
108.398
14+20.000
108.751
14+00.000
Riparian Buffer
SITE 2
L


METRIC
R-2809A
R/W SHEET NO. 6
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV.
R/W REV. 5/3/06
NAD 83
SITE 2
ALLOWABLE IMPACTS ZONE 2
ALLOWABLE IMPACTS ZONE 1
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 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
-Y3- PT 10+72.765
-Y3- PC 10+31.848
-Y3- +45.303 (EX.R/W) 12.304 (40.37')
-Y3- +48.133 (EX.R/W) 16 (52.49')
-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- PT 11+47.711
-Y3A- PC 10+46.489
-Y3A- POT 10+00.000
BEGIN C/A
STANDARD BERM DITCH -L- 8+60 TO 13+40 RT
CLASS 'B' RIP RAP 0.9 MTN 4.2m² F.F.
CLASS 1' RIPRAP 15.4 MTN & 46.7m² F.F. ION BANKS ONLY!! SEE DETAIL 12
CLASS B RIP RAP L8m MTN 5.9m² F.F.
0.6m BASE HEAD DITCH EST DDE=5m² SEE DETAIL 4
SPECIAL LATERAL V-DITCH -L- 15+40 TO 15+76 RT SEE DETAIL 2
REMOVE CONC. DITCH
RETAIN CONC. DITCH
COLLAR & EXTEND 375
PSH SEE DETAIL SHEET 2-F
EXISTING R/W (VARIABLE)
EXIST.R/W
N 81°44'14.9" W
S 77°27'52" E
S 01°41'00" W
S 77°27'52" E 35.69'
S 01°41'00" W 47.89'
9+72.951 10.143 (33.28')
10+02.046 10.682 (35.051')

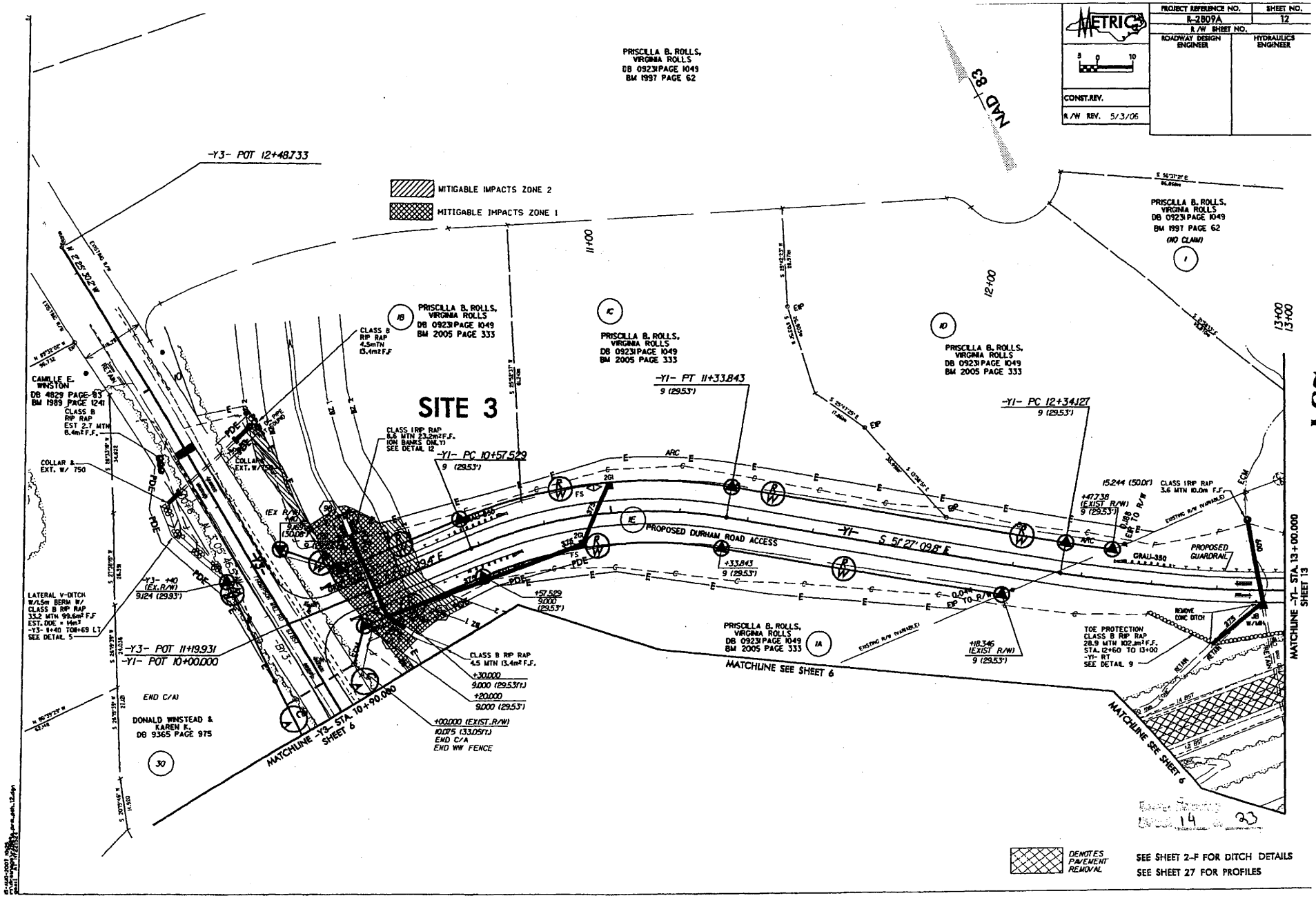

METRIC
R-2809A
6
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV.
R/W REV. 5/3/06
MATCHLINE -L- STA. 15+60.000
SEE SHEET 7
MATCHLINE SEE SHEET 12
MATCHLINE SEE SHEET 12
SITE 2
ALLOWABLE IMPACTS ZONE 2
ALLOWABLE IMPACTS ZONE 1
NAD 83
MATCH -Y3- STA. 10+90.000
SEE SHEET 12
MATCHLINE -L- STA. 12+40.000
SEE SHEET 5
CAROLINA PRINCESS LLC
DB 08693 PAGE 1799
CLM ASSOCIATES LLC
DB 8650 PAGE 875
JOHN WALTER ROLLS JR &
IRIS DALTON
DB 8238 PAGE 1511
BM 1997 PAGE 1427
NEIL A. FLYOD &
MELANIE A.
DB 6729 PAGE 525
BM 1988 PAGE 971
CHARLES B. SHEARON &
JULIA O
DB 10591 PAGE 843
BM 1988 PAGE 971
DONALD WINSTEAD &
KAREN K.
DB 9365 PAGE 975
PRISCILLA B. ROLLS
VIRGINIA ROLLS
DB 09231 PAGE 1049
BM 2006 PAGE 333
-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+50.524
BEGIN C/A
-Y3A- PC 10+46.489
-Y3A- POT 10+00.000
15+00
14+00
13+00
PDE
REMOVE
STANDARD BERM DITCH
-L- 8+50 TO 13+40 RT


METRIC
PROJECT REFERENCE NO. R-2809A
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
CONST.REV.
R/W REV. 12/15/05
THOMAS R. AYRES & BROOK AYRES DB 5849 PAGE 162 BM 1990 PAGE 192
DAVID G. STUERWALD & CAROL A. STUERWALD DB 5068 PAGE 442 BM 1990 PAGE 192
STEPHEN C. GOULD & JUDITH M. GOULD DB 4552 PAGE 514 BM 1990 PAGE 192
MICHAEL PUSZCZYNSKI & ANN V. PUSZCZYNSKI BM 1990 PAGE 192
RONALD ZOPPO & VALERIE ZOPPO DB 4552 PAGE 514 BM 1990 PAGE 192
PADDY B. SHETLEY & PAMELA S. MICHAEL DB 6021 PAGE 839 BM 1990 PAGE 192
NC DOT DB 6392 PAGE 83 BM 1990 PAGE 192
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- ST 32+05.700
-L- SC 30+01.468
-L- POS Sta. 29+51.580
-Y9- POT Sta. 10+00.000
-L- CS 31+41.700
MATCHLINE -L- STA. 29+40.00 SHEET 10
MATCHLINE -L- STA. 32+40.00 SHEET 21
EXISTING GUARDRAIL
REMOVE EXISTING GUARDRAIL BARRICADE
PROPOSED G/R
CONVERT TO CB
SPECIAL DITCH
CLASS B RIP RAP L8 MTN 5.9m² F.F.
CLASS I RIP RAP 10.0m MTN 16.4m² F.F.
3 CHECK DAMS SEE DETAIL SHT.#2-G
EXIST. EASEMENT
EXIST. R/W & I8 (59.06')
EXIST. R/W
PL CORNER
TIE TO GUARDRAIL PLACED UNDER R-2809B (LT. & RT.)
END FULL C/A (R-2809A) END WW FENCE (R-2809A)
Pls = 29+80.149 Θs = 4°38'30" Ls = 640 LT = 42.6813 ST = 21.3467
PI = 30+72.330 Δ = 20°20'21.8" (LT) L = 140.2122 T = 70.8619 R = 395.000 SE = 0.08 Vdes = 100 KPH
Pls = 31+63.047 Θs = 4°38'30" Ls = 640 LT = 42.6813 ST = 21.3467
IMPACTS PERMITTED UNDER R-2809B
END STATE PROJECT R-2809A
STA. 32+40.00 -L-
SEE SHEET 2-G FOR CHECK DAM DETAIL
SEE SHEET 25 & 32 FOR PROFILE

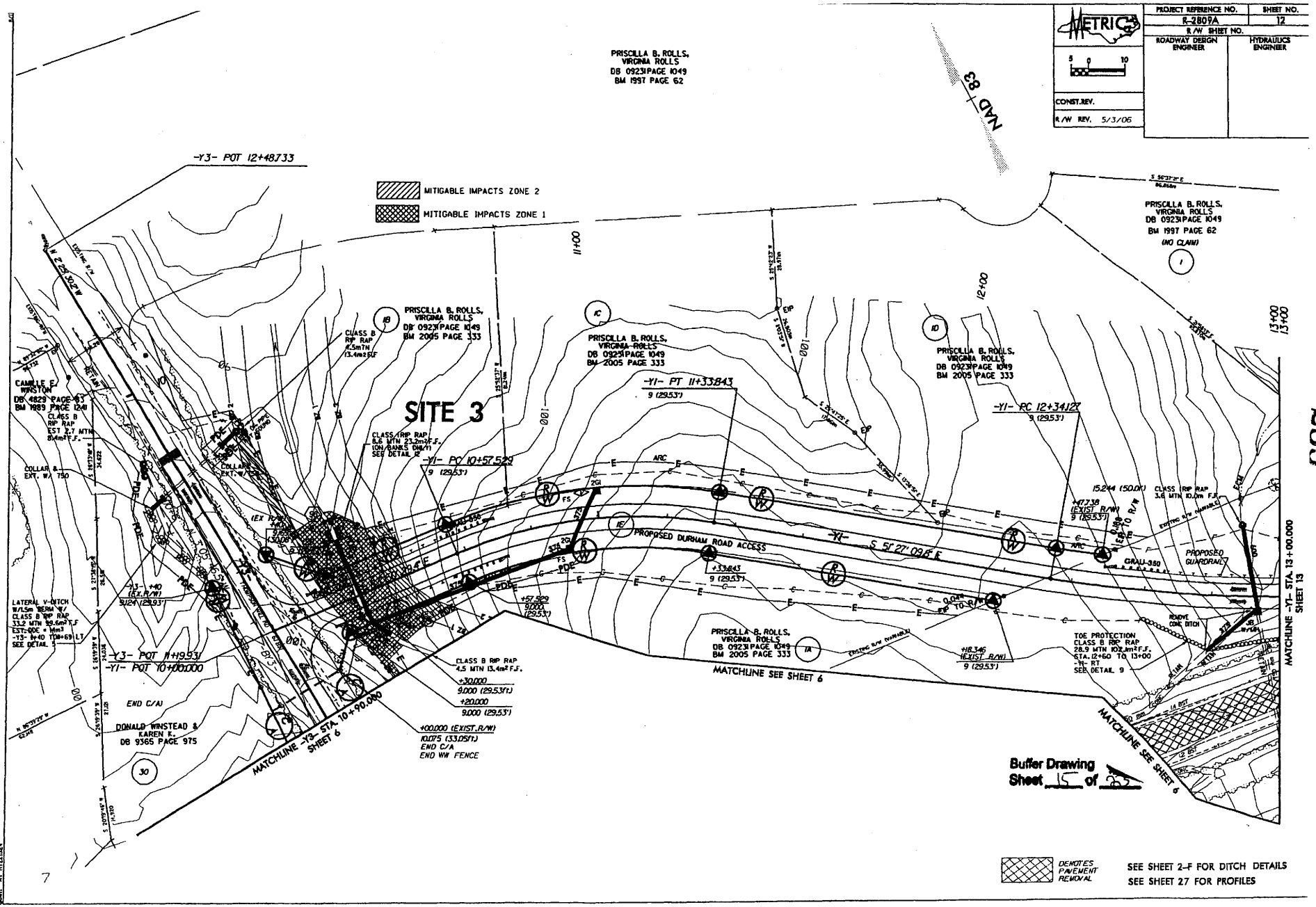
252


METRIC
PROJECT REFERENCE NO. R-2809A
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
CONST.REV.
R/W REV. 12/15/05
NAD 83
THOMAS R. AYRES & BROOK AYRES DB 5849 PAGE 162 BM 1990 PAGE 192
DAVID G. STUERWALD & CAROL A. STUERWALD DB 5068 PAGE 442 BM 1990 PAGE 192
STEPHEN C. GOULD & JUDITH M. GOULD DB 4552 PAGE 514 BM 1990 PAGE 192
MICHAEL PUSZCZYNSKI & ANN V. PUSZCZYNSKI BM 1990 PAGE 192
RONALD ZOPPO & VALERIE ZOPPO DB 4552 PAGE 514 BM 1990 PAGE 192
PADDY B. SHETLEY & PAMELA S. MICHAEL DB 6021 PAGE 835 BM 1990 PAGE 192
NC DOT DB 6342 PAGE 80 BM 1990 PAGE 192
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- ST 32+05.700
-L- SC 30+01.468
-L- POS Sta. 29+51.580
-Y9- POT Sta. 10+00.000
-L- CS 31+41.700
MATCHLINE -L- STA. 29+40.00 SHEET 10
MATCHLINE -L- STA. 32+40.00 SHEET 21
PI CORNER
TIE TO GUARDRAIL PLACED UNDER R-2809B (LT. & RT.)
REMOVE EXISTING GUARDRAIL BARRICADE
CONVERT TO CB
PROPOSED R/R
EXISTING GUARDRAIL
EXIST. EASEMENT
EXIST. R/W & I8 (59.06')
EXIST. R/W & I8 (59.06')
EXIST. R/W
CL 'B' RIP RAP LB MTN 5.9m² F.F.
CLASS B RIP RAP LB MTN 5.9m² F.F.
CLASS IRP RAP 10.0m² MTN I8.4m² F.F.
SPECIAL DITCH -L- 29+80 LFD 31+20 LT SEE PROFILE FOR GRADE SEE DETAIL 2
LATERAL 0.9m BASE DITCH w/ PSRM ITO RP PSRM EST DOE = 385m³ -L- 31+00 TO 31+38 RT SEE DETAIL 15
3 CHECK DAMS SEE DETAIL SHT. 2E-2F
(R-2809B) +82.845 (-Y2-) 12754 (238.70')
(R-2809B) +30.000 57.000 (187.01')
(R-2809B) +17.151 PT 30.750 (159.94')
(R-2809B) +83.089 PC 34.288 (112.49')
(R-2809B) +90.389 40.207 (131.91')
(R-2809B) +48.375 PC CORNER 36.506 (119.77')
(R-2809B) +00 48 (157.48')
(R-2809B) +80 41 (134.51')
(R-2809B) 30+82.423 34.91 (112.17') END FULL C/A (R-2809A) END WW FENCE (R-2809A)
(R-2809B) +75 25 (82.02') (R-2809B) +40 24.995 PT (81.20')
(R-2809B) +76 37 (121.39')
(R-2809B) +40.000 47.000 (154.20')
(R-2809B) +40 61 (200.13')
(R-2809B) +24 61 (200.13')
(R-2809B) +02 64 (209.97') +20 71 (232.94')
(R-2809B) +80 41 (134.51')
(R-2809B) +80 21.000 (75.46')
(R-2809B) +80 38 (124.67')
(R-2809B) +41.700 83 (75.46') END FULL C/A (R-2809A) END WW FENCE (R-2809A)
(R-2809B) +40 26 (85.30')
(R-2809B) +20 30 (98.42')
(R-2809B) +98.323 PT 60.922 (199.88')
(R-2809B) +03 61 (200.13')
(R-2809B) +97 23 (75.46') & 27 (88.58')
(R-2809B) +07 23 (75.46') & 27 (88.58')
(R-2809B) +01.468 23 (75.46')
+93 23 (75.46') 30 (98.42')
+90 37 (121.39')
+80 25 (82.02')
+67 23 (75.46') BEGIN C/A
+50.000 PI 27.0 (88.58')
+30 32 (104.98')
+00 34 (111.55')
+20 35 (114.83')
+55
+60.000 16.0 (52.49')
+70.000
+60 37 (121.39')
+46
Pts = 29+80.149 Θs = 3° 38' 30" Ls = 64.0 LT = 42.6813 ST = 21.3467
PI = 30+72.330 Δ = 20° 20' 27.8" (LT) L = 140.2522 T = 70.8619 R = 395.000 SE = 0.08 Vdes = 100 KPH
Pts = 31+63.047 Θs = 3° 38' 30" Ls = 64.0 LT = 42.6813 ST = 21.3467
-L-
IMPACTS PERMITTED UNDER R-2809B
END STATE PROJECT R-2809A
STA. 32+40.00
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 2-G FOR CHECK DAM DETAIL
SEE SHEET 25 & 32 FOR PROFILE

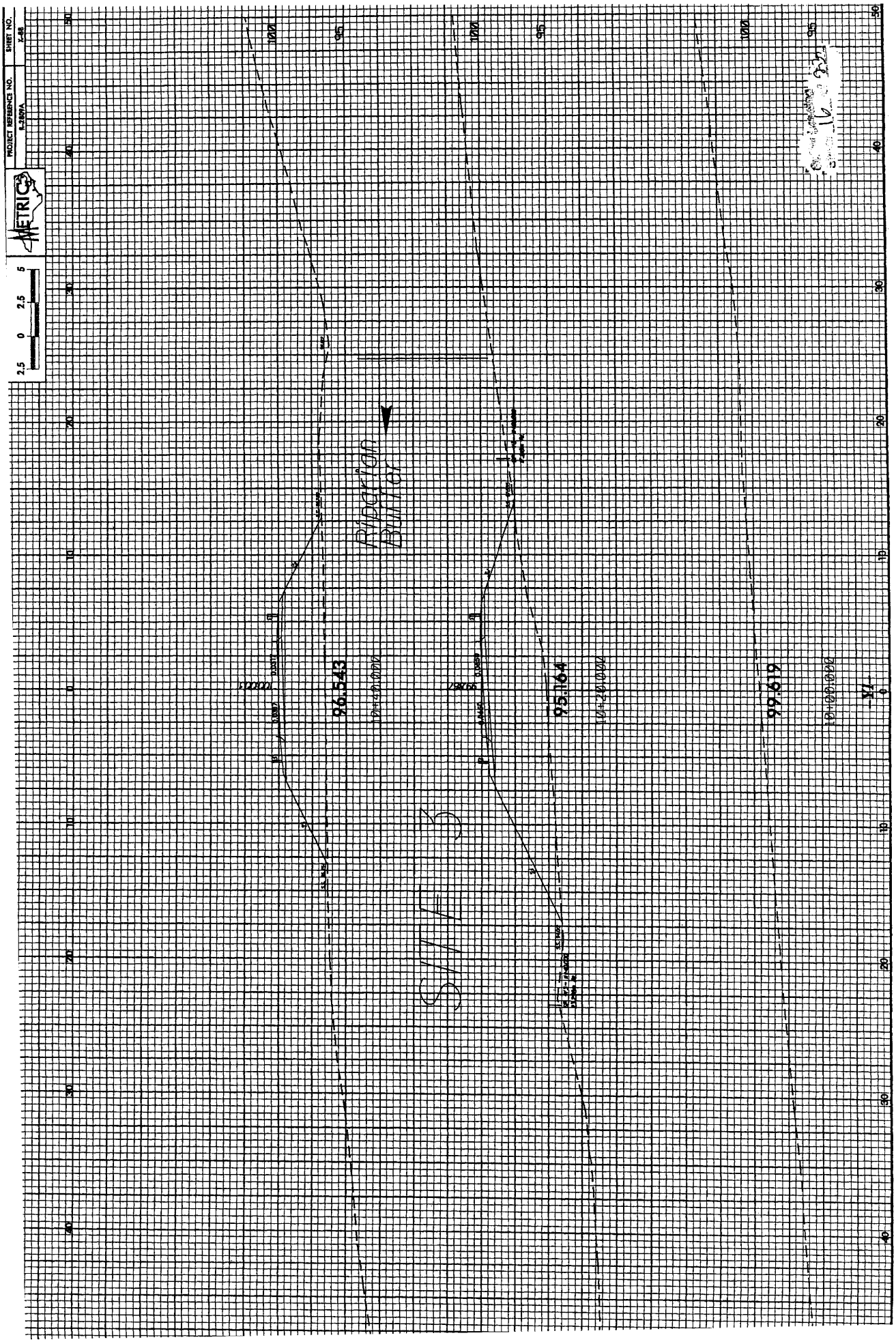
253


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
MITIGABLE IMPACTS ZONE 2
MITIGABLE IMPACTS ZONE 1
SITE 3
-Y3- POT 12+48.733
-Y1- PT 11+33.843
-Y1- PC 12+34.127
-Y1- PC 10+57.529
-Y1- S 51° 27' 09.8" E
-Y3- POT 11+19.931
-Y1- POT 10+00.000
PROPOSED DURHAM ROAD ACCESS
PROPOSED GUARDRAIL
MATCHLINE SEE SHEET 6
MATCHLINE -Y1- STA. 13+00.000 SHEET 13
MATCHLINE -Y3- STA. 10+90.000 SHEET 6
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923/PAGE 1049 BM 1997 PAGE 62 (NO CLAIM)
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923/PAGE 1049 BM 2005 PAGE 333
CAMILLE F. WINSTON DB 4829 PAGE 183 BM 1989 PAGE 1241
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
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 B RIP RAP 4.5 MTN 13.4m² F.F.
LATERAL V-DITCH W/1.5m BERM W/ CLASS B RIP RAP 33.2 MTN 99.6m² F.F. EST. DOE = Mm³ -Y3- 8+40 TOR+69 LT SEE DETAIL 5
TOE PROTECTION CLASS B RIP RAP 28.9 MTN 102.2m² F.F. STA. 12+60 TO 13+00 -Y1- RT SEE DETAIL 9
REMOVE CONC DITCH
EXISTING R/W (VARIABLE)
DENOTES PAVEMENT REMOVAL
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 27 FOR PROFILES

254


METRIC
5 0 10
CONST.REV.
R/W REV. 5/3/06
PROJECT REFERENCE NO.
R-2809A
SHEET NO.
12
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
MITIGABLE IMPACTS ZONE 2
MITIGABLE IMPACTS ZONE 1
SITE 3
-Y3- POT 12+48.733
-Y1- PT 11+33.843
-Y1- PC 12+34.127
-Y1- PC 10+57.529
-Y1- S 51° 27' 09.6" E
-Y3- POT 11+19.931
-Y1- POT 10+00.000
PROPOSED DURHAM ROAD ACCESS
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923/PAGE 1049 BM 1997 PAGE 62
PRISCILLA B. ROLLS, VIRGINIA ROLLS DB 0923/PAGE 1049 BM 2005 PAGE 333
CAMILLE E. WINSTON DB 4829 PAGE 83 BM 1989 PAGE 1240
DONALD WINSTEAD & KAREN K. DB 9365 PAGE 975
CLASS B RIP RAP 4.5 MTN (3.4m² F.F.
CLASS B RIP RAP 4.5m TN (3.4m² 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.
TOE PROTECTION CLASS B RIP RAP 28.9 MTN 102.3m² 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 59.6m² F.F. EST. QDC = 1m3 -Y3- 11+40 TO 11+69 LT SEE DETAIL 5
COLLAR & EXT. W/ 750
PROPOSED GUARDRAIL
GRAU-360
REMOVE CONC DITCH
MATCHLINE SEE SHEET 6
MATCHLINE -Y3- STA. 10+90.000 SHEET 6
MATCHLINE -Y1- STA. 13+00.000 SHEET 13
END C/A
END WW FENCE
Buffer Drawing Sheet 15 of 25
DENOTES PAVEMENT REMOVAL
SEE SHEET 2-F FOR DITCH DETAILS
SEE SHEET 27 FOR PROFILES

255


SHEET NO.
X-48
PROJECT REFERENCE NO.
R-2609A
METRIC
2.5 0 2.5 5
96.543
95.164
99.919
Riparian Buffer
Stream

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

257

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**

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
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

Sheet 22 of 123

262

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

Sheet 23 of 23 August-07

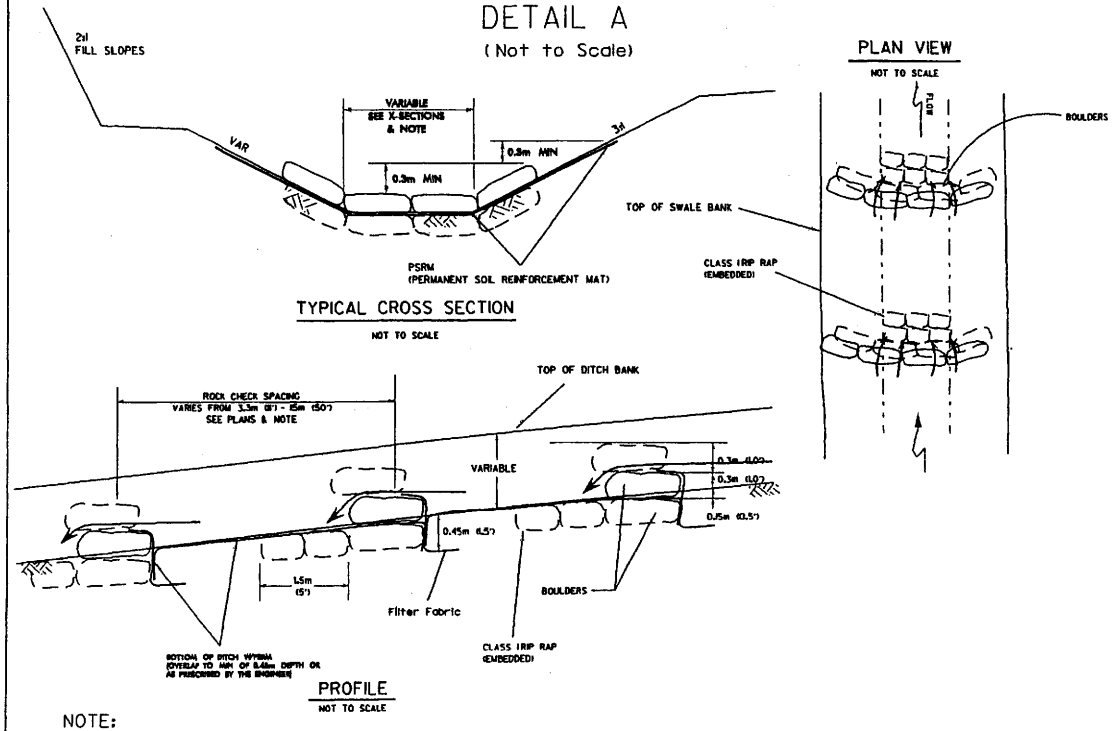
R-2809C - Revised

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)



NOTE:

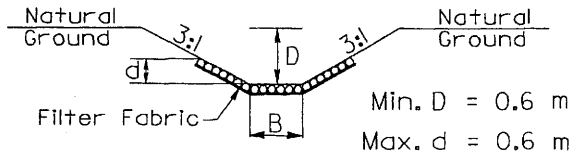
BOULDERS SHOULD BE ANGULAR AND OBLONG WITH APPROXIMATE DIMENSIONS OF 0.6m x 0.45m x 0.45m (2' x 1.5' x 1.5'). ROCK SHOULD FIT TIGHTLY TOGETHER WITH MINIMAL VOIDS. STAGGER BOULDER JOINTS.

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

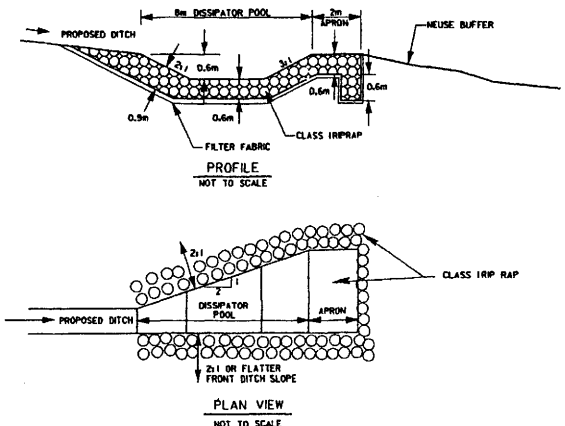
* When B is < 1.8m

Type of Liner = CLASS I RIP RAP

264

NOT TO SCALE

DETAIL C
ENERGY DISSIPATOR



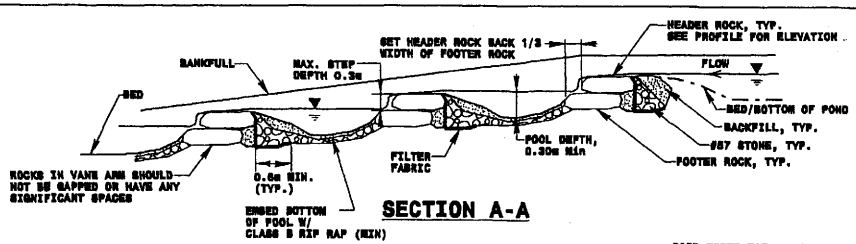
Sta 84+30-L-LT.

REVISIONS

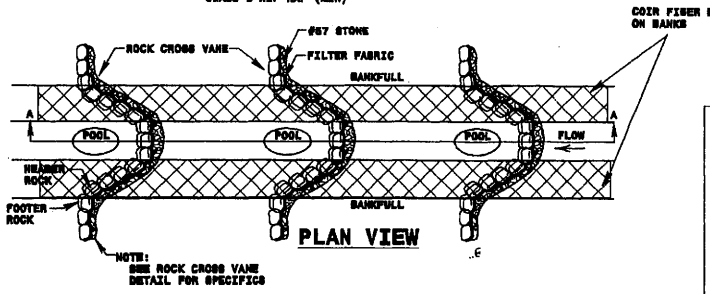
PROJECT REFERENCE NO.	SHEET NO.
R-2809A	2-M
SW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

STEP POOL DETAIL
NOT TO SCALE



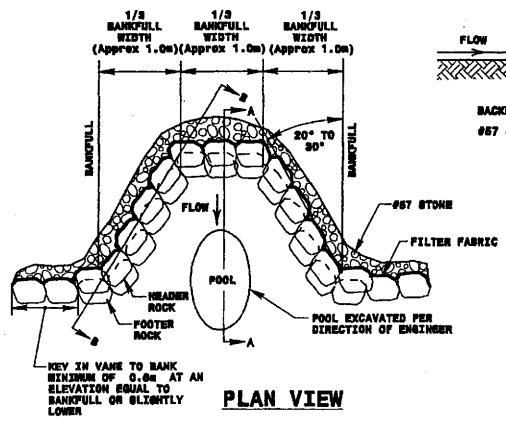
SECTION A-A



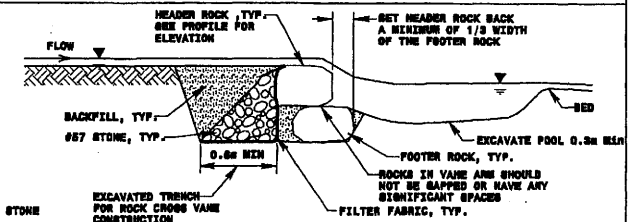
PLAN VIEW

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

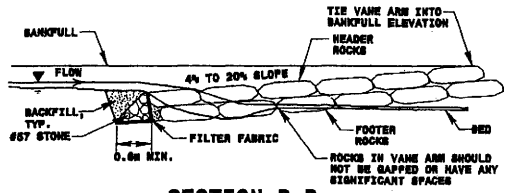


PLAN VIEW



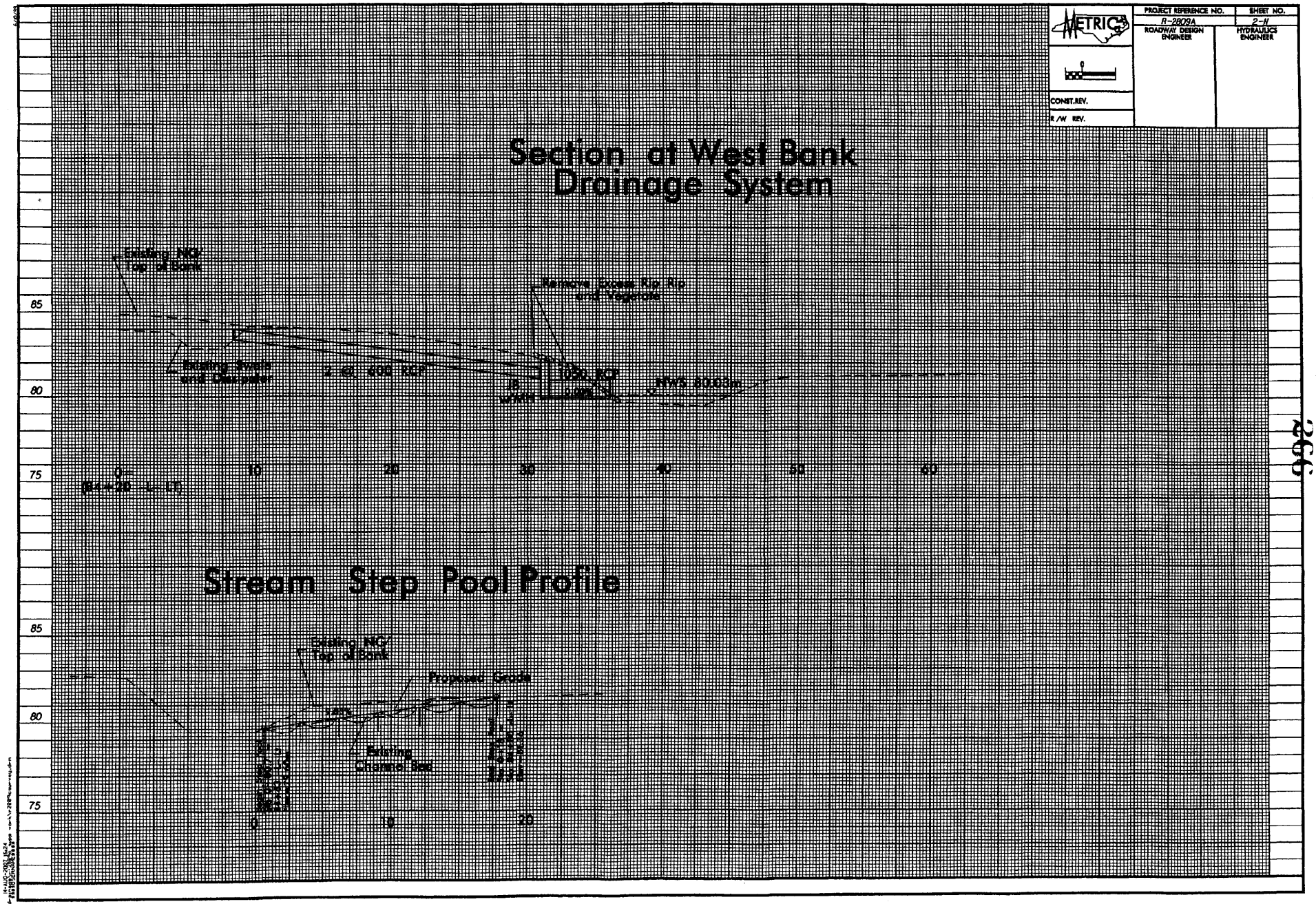
SECTION A-A

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



SECTION B-B

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.


METRIC
PROJECT REFERENCE NO.
R-2809A
SHEET NO.
2-N
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV.
R/W REV.
Section at West Bank Drainage System
Existing NCG Top of Bank
Remove Excess Rip Rap and Vegetate
Existing Swale and Channel
2 @ 400 RCP
105x RCP
HWS 80.03m
85
80
75
0
10
20
30
40
50
60
Stream Step Pool Profile
Existing NCG Top of Bank
Proposed Grade
Existing Channel Bed
85
80
75
0
10
20