STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

August 11, 2004

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

ATTN: Mr. Eric Alsmeyer
NCDOT Coordinator

Dear Sir:

SUBJECT: **Permit Modification Request for TIP No. R-2809B,** Wake County, NC DOT Division 5, Federal Aid No. STP-98(1), State Project No. 8.1402501, USACE Action ID 199601836, and DWQ Project No. 010550, $475 Debit Work Order WBS Element 34503.1.1

On October 30, 2003 and October 22, 2003 respectively, the USACE 404 Individual Permit and the NCDWQ 401 Water Quality Certification and Neuse River Riparian Certification were issued for the subject project. The North Carolina Department of Transportation (NCDOT) proposes to modify the construction plans for the abovementioned project. The purpose of this letter is to request a modification to the Department of the Army Individual Permit, the 401 Water Quality Certification as well as the Buffer Certification from the NC Division of Water Quality. The revised sheets of the original permit drawings are attached.

Summary of Impact Changes

Revisions were made to the permit drawings in order to be consistent with the construction plans. Changes in impacts result from expanding the construction areas to allow sufficient access for equipment, realignment of a ramp, impacts due to the relocation of a stream and culvert extensions, decrease in impacts due to a third party having filled an UT to Richland Creek, and the contractor clearing a buffer outside of the permitted area.

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS
1598 MAIL SERVICE CENTER
RALEIGH NC 27699-1598

TELEPHONE: 919-715-1500
FAX: 919-715-1501
WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
2728 CAPITAL BOULEVARD
PARKER LINCOLN BUILDING, SUITE 168
RALEIGH, NC 27699

Streams: Additional stream channel impacts total 358 feet of permanent impacts and 143 feet of temporary impacts. Onsite natural stream design increased by 351 ft.

Buffers: Buffer impacts have increased by 30,905ft^2, allowable buffer impacts have decreased by 13,874ft^2 and mitigable buffer impacts have increased by 44,779ft^2. Onsite Buffer replacement will increase by 45,616ft^2 at Site 4. Specific revisions are summarized in Table 1 and Table 2 and are listed below, site by site. Site numbers correspond to the original permit drawing sheets. Sheet numbers also correspond to the original permit drawings with a date that the drawing has been revised.

Table 1: Permanent Jurisdictional Stream Impact Changes				
Site #	Station #	Original Impacts	Revised Impacts	Increase
1	-L- 31+96 / -Y2- 11+38	790	797	7
4	-L- 37+74L / 38+34L	0	351	351
Total				**358**

Table 2: Buffer Impact Changes (Mitigatable and Allowable)				
Site #	Station #	Original Impacts (sq. ft.)	Revised Impacts (sq. ft.)	Increase (sq. ft.)
1	-L- 31+96/ -Y2-11+38	68747	72127	3380
2	-Y2- 10+42L/-Y2- 10+89L	7484	14036	6552
3	-Y1 16+88L/-RPB- 11+01L	14981	19449	4468
3	-Y1- 16+98R/17+70R	5370	10150	4780
4	-Y3-10+77R/11+05R	23847	2476	-21371
4	-L-38+24.5/39+44.5	17674	46466	28792
4	-L- 40+00 L	0	1324	1324
5	-L- 47+09L/47+70R	27287	30267	2980
Totals		**165,390**	**196,295**	**30,905**

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

- Protected Species,
- Cultural Resources,
- Aquatic Life passage,
- FEMA compliance, and
- Utilities.

REVISIONS **RESULTING IN** 404 and 401 JURISDICTIONAL CHANGES

Site 1, Sheet 4 of 26
Station -L-31+96
The impacts to the stream were previously calculated by measuring to the end of the rip rap and are now calculated by measuring to the edge of the Right-of-way.
Impact change: increase of 7 ft of permanent Stream Impacts

Site 4, Sheets 17 and 18 of 26
Station -L-38+84
The original survey of Richland Creek was inaccurate and did not take into account a bend to the west. The project was originally designed so that all bents would not be placed in Richland Creek. However, due to the inaccuracy of the survey, piers 1 and 2 of the bent 2 would fall in the stream. An onsite field meeting was held on June 17 between NCDOT officials, USACE and NCDWQ. During the meeting it was agreed that the banks of Richland Creek were not stable and that Richland Creek could be relocated using natural stream design. Approximately 351 feet of Richland Creek will be relocated. Due to the limited amount of space between the bents and an existing below ground sewer line the relocation of Richland Creek will require two phases of temporary diversion channels. The sequencing of the stream relocation is as follows:

- Isolate diversion (secondary diversion) with dikes
- Dig diversion (secondary diversion)
- Install dikes in Richland Creek around proposed piers 1 and 2 and take out dikes isolating temporary secondary diversion
- Drill and install piers 1 and 2
- Construct main diversion, establish vegetation and reroute water
- Construct stream relocation, establish vegetation and reroute water

Impact change: increase of 351 ft of permanent Stream Impacts
Increase of 351 ft of Natural Stream Design
Increase of 82 feet of temporary Stream Impacts

Site 5, Sheet 21 of 26
Station -L-47+09L / 47+70R
The entire temporary drainage easement will be required to allow equipment access so that the contractor has sufficient room to install the culvert.
Impact change: increase of 61 ft of temporary Stream Impacts

REVISIONS **RESULTING IN** BUFFER CHANGES

Site 1, Sheet 4 of 20
Station -L- 31+96/ Y2- 11+38
The entire temporary drainage easement north of the proposed road will be required to allow equipment access for the placement of the pipes in the stream.
Impact change: increase of 3,380 ft^2 of Mitigable Buffer Impacts

Site 2, Sheet 5 of 20
Station –Y2- 10+42L / -Y2- 10 +89L
Additional area is required to allow equipment access for construction of stream relocation and to allow for a larger bankfull bench in the natural stream design. NCDOT requested prior approval because construction had already begun at this site and waiting on written approval would require the NCDOT to pay the contractor to go back and construct the stream relocation twice. These impacts were verbally authorized by John Hennessy on May 7, 2004.
Impact change: increase of 6,552 ft^2 of Mitigable Buffer Impacts

Site 3, Sheet 6 of 20
Station –Y1- 16+88L/ -RPB- 11+01L
Station –Y1- 16+98R/ 17+70R
The entire temporary drainage easement will be required to allow equipment access for the construction of the bridge.
Impact change: increase of 9,248 ft^2 of Mitigable Buffer Impacts

Site 4, Sheet 7, 8 and 9 of 20
Station –Y3- 10+84R/ 11+05 R
A portion of the stream at this location has been filled by Lowe's. Impacts incurred by NCDOT at this site have decreased from 23,847ft^2 to 2,467ft^2. The buffer replacement of 7,045ft^2 cannot be accomplished since the stream has been filled. Buffer impacts are now below the 1/3 acre threshold and impacts are now considered "allowable" at this site.
Impact change: decrease of 21,371ft^2 of Buffer Impacts/ decrease of 23,847ft^2 of Mitigable Impacts

Station –L- 38+24.5/ 39+44.5
The contractor cleared outside of the permitted impact area. The ramp has also been realigned to allow for a grade change.
Impact change: increase of 28,792ft^2 of Mitigable Buffer Impacts
increase of 45,616ft^2 of Buffer Replacement

Station –40+00 L
The Permanent Drainage Easement area was extended to allow access for equipment to build the Extended Dry Detention Basin and to allow future maintenance.
Impact change: increase of 1,324ft^2 of Allowable Buffer Impacts

Site 5, Sheet 10 of 20
Station –L- 47 + 09L/ 47 + 70R
The entire temporary drainage easement will be required to allow equipment access for the placement of the pipes in the stream.
Impact change: increase of 2,980 ft^2 of Mitigable Buffer Impacts

Mitigation Strategy

Based upon the agreements stipulated in the "Memorandum of Agreement Among the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the U.S. Army Corps of Engineers, Wilmington District" (MOA), it is understood that the North Carolina Department of Environment and Natural Resources Ecosystem Enhancement Program (EEP), will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for NCDOT projects that are listed in Exhibit 1 of the subject MOA during the EEP transition period which ends on June 30, 2005.

Since the subject project is listed in Exhibit 1, the necessary compensatory mitigation to offset unavoidable impacts to waters that are jurisdictional under the federal Clean Water Act will be provided by the EEP. The offsetting mitigation will derive from an inventory

of assets already in existence within the same 8-digit cataloguing unit. The Department has avoided and minimized impacts to jurisdictional resources to the greatest extent possible as described above.

Streams: The increase in permanent stream impacts total 358 feet; 351 feet will be mitigated on site via Natural Stream Design at Site 4. The remaining, unavoidable impacts to seven (7) feet of jurisdictional streams will be offset by compensatory mitigation provided by the EEP program. The NCDOT request letter to EEP is attached.

Buffers: No additional mitigation to Neuse River Buffer Areas is proposed because the increase in onsite buffer replacement (45,616f sqft.) offsets the increase in mitigable buffer impacts (44,779 sqft).

Regulatory Approval

The NCDOT respectfully requests that the referenced 404 Permit, 401 Water Quality Certification, and Neuse River Riparian Certification be modified to reflect the revisions outlined in this letter. In compliance with Section 143-215.3D(e) of the NCAC we will provide $475 to act as payment for processing the Section 401 permit application previously noted in this application (see Subject line).

If you have any questions or need additional information, please contact Brett Feulner at (919) 715-1488.

Respectfully,

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

Cc:
Mr. David Franklin, COE, Wilmington (Cover Letter only)
Mr. John Hennessy, DWQ (7 copies)
Mr. Travis Wilson, NCWRC
Mr. A.W. Roper, P.E., Div. 4 Engineer
Ms. Becky Fox, EPA
Mr. Ronald Mikulak, EPA
Mr. Gary Jordan, USFWS
Mr. John Sullivan III, P.E., FHWA
Mr. Omar Sullivan, P.E., Prog. Develop.
Mr. Greg Perfetti, P.E., Structure Design
Mr. Mark Staley, Roadside Environmental
Mr. Art McMillan, P.E., Highway Design
Mr. Bill Gilmore, NC EEP
Mr. Jamie Shern, DEO, Div 4
Mr. James Bridges, PDEA
Mr. David Chang, P.E., Hydraulics
Mr. Jay Bennett, P.E., Roadway

File: R-2809B

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

August 11, 2004

Mr. William D. Gilmore, P.E.
EEP Transition Manager
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Gilmore:

Subject: **Revised Mitigation Request,** Wake Forest Bypass, Wake County, Federal Project No. STP-98(1), State Project No. 81402501, TIP No. R-2809B.

The purpose of this letter is to request that the North Carolina Ecosystem Enhancement Program (EEP) provide confirmation that the EEP is willing to provide compensatory mitigation for the project in accordance with the Memorandum of Agreement (MOA) signed July 22, 2003 by the USACE, the NCDENR and the NCDOT.

The North Carolina Department of Transportation has begun the construction of the Wake Forest Bypass. Jurisdictional impacts on this project have increased since the original permits were received and occur in the Neuse River Basin. NC WRP committed to provide mitigation for the impacts previously permitted. This project is on the list of projects covered by EEP.

RESOURCES UNDER THE JURISDICTION OF SECTION 404 AND 401 OF THE CLEAN WATER ACT.

We have avoided and minimized the impacts to jurisdictional resources to the greatest extent possible as described in the permit application. A copy of the permit application can be found at http://www.ncdot.org/planning/pe/naturalunit/Applications.html. The remaining impacts to jurisdictional resources will be compensated for by mitigation provided by the EEP program.

The project is located in the Piedmont Physiographic Province in Wake County in the Neuse River basin in Hydrological Cataloguing Unit 03020201.

- The stream impacts requiring offsite mitigation have increased by 7 feet.

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS
1548 MAIL SERVICE CENTER
RALEIGH NC 27699-1548

TELEPHONE: 919-733-3141
FAX: 919-733-9794
WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH NC

Please send the letter of confirmation to Eric Alsmeyer (USACE Coordinator) at U. S. Army Corps of Engineers Raleigh Regulatory Field Office, (6508 Falls of the Neuse Road/ Suite 120, Raleigh, NC, 27615). Mr. Alsmeyer's FAX number is 876-5823. This project is currently under construction.

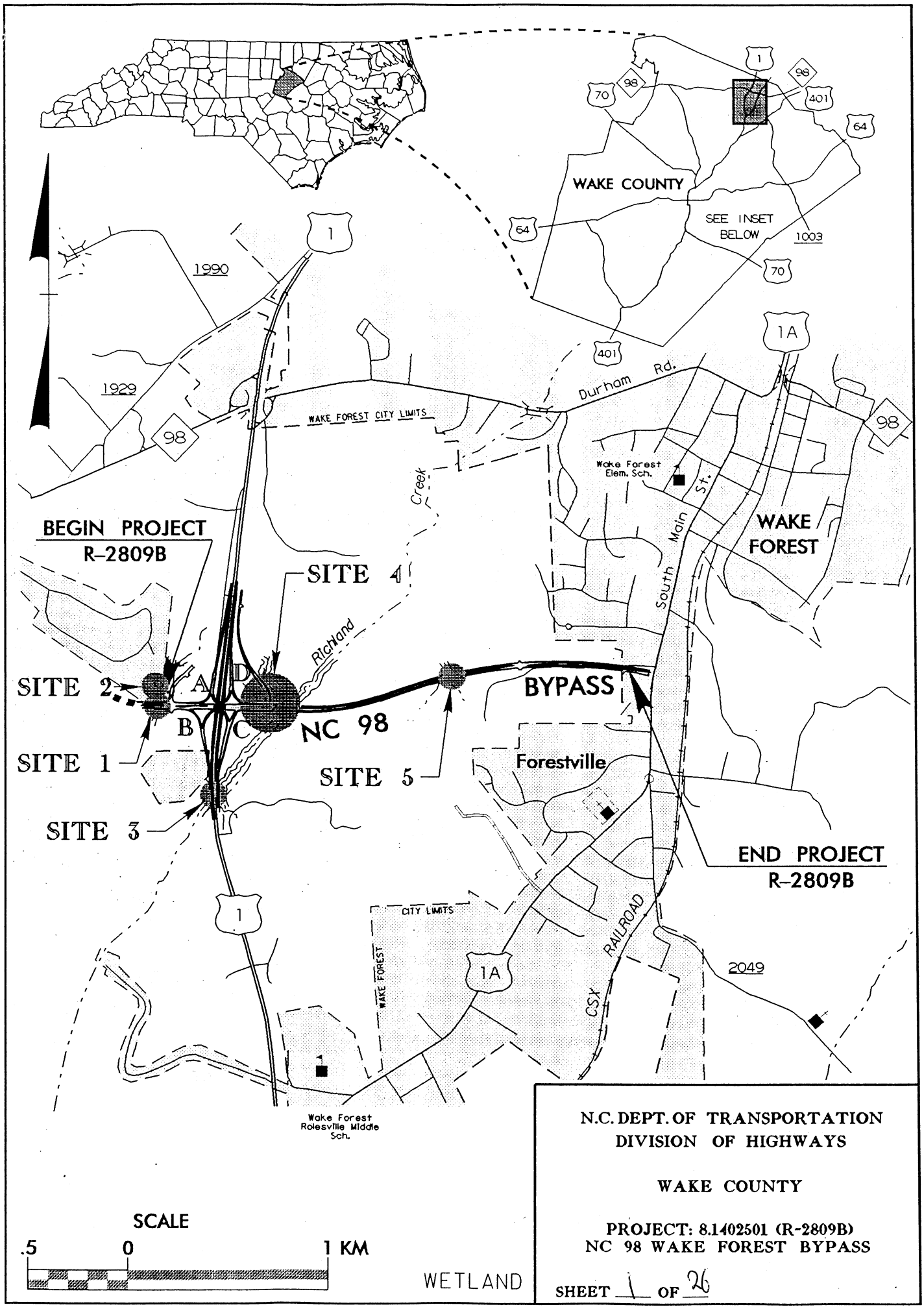
In order to satisfy regulatory assurances that mitigation will be performed; the NCDWQ requires a formal letter from EEP indicating their willingness and ability to provide the mitigation work requested by NCDOT. The NCDOT requests such a letter of confirmation be addressed to Mr. John Hennessy of NCDWQ, with copies submitted to NCDOT.

If you have any questions or need additional information please call Brett Feulner at 715-1488.

Sincerely,

for Gregory J. Thorpe, Ph.D.,
Environmental Management Director
Project Development & Environmental Analysis Branch

cc: Mr. David Franklin, USACE, Wilmington
Mr. John Dorney, Division of Water Quality
Mr. Travis Wilson, NCWRC
Mr. Jay Bennett, P.E., Roadway Design
Mr. Omar Sultan, Programming and TIP
Ms. Debbie Barbour, P.E., Design Services
Mr. David Chang, P.E., Hydraulics
Mr. Greg Perfetti, P.E., Structure Design
Mr. Mark Staley, Roadside Environmental
Mr. Terry Gibson, P.E., Division 6 Engineer
Mr. James Bridges, Project Planning Engineer
Mr. Jim Rerko, Division 6 Environmental Officer

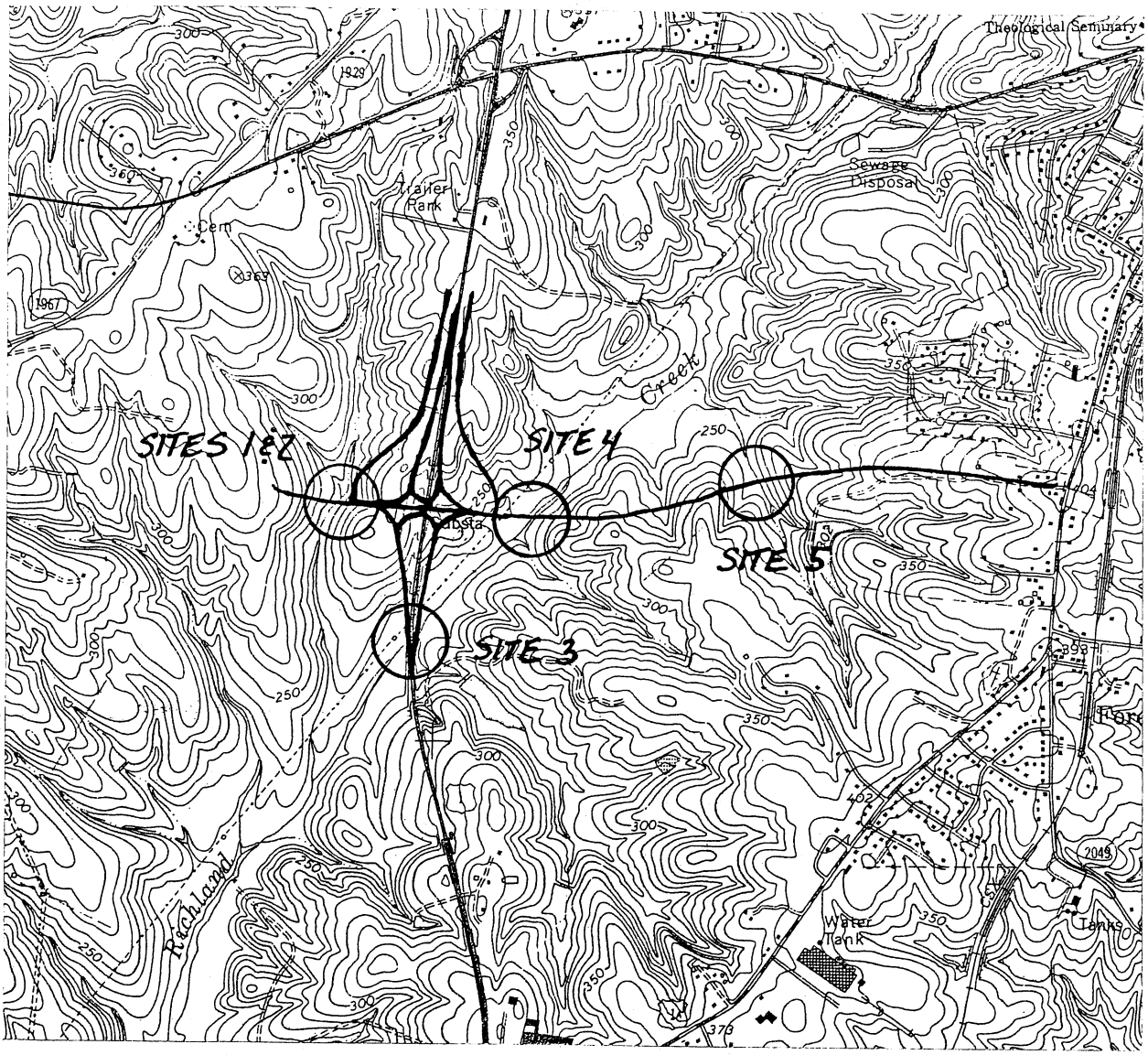


N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

SHEET 1 OF 26



1000 0 2000

WETLAND

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

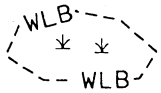
WAKE COUNTY

PROJECT: 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

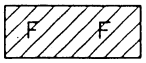
SHEET 2 **OF** 26

LEGEND

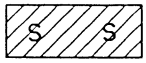
---WLB---- WETLAND BOUNDARY



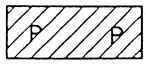
WETLAND



DENOTES FILL IN WETLAND



DENOTES FILL IN SURFACE WATER



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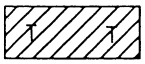
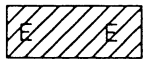


DENOTES TEMPORARY FILL IN WETLAND



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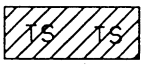
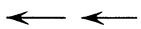
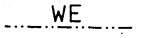


DENOTES TEMPORARY FILL IN SURFACE WATER

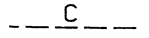

DENOTES MECHANIZED CLEARING


FLOW DIRECTION

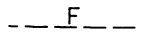
TOP OF BANK



EDGE OF WATER



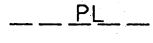
PROP. LIMIT OF CUT



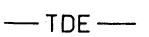
PROP. LIMIT OF FILL


PROP. RIGHT OF WAY

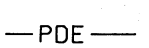

NG NATURAL GROUND



PROPERTY LINE

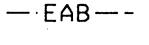


TEMP. DRAINAGE EASEMENT

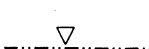


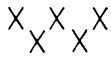
PERMANENT DRAINAGE EASEMENT

EXIST. ENDANGERED ANIMAL BOUNDARY



EXIST. ENDANGERED PLANT BOUNDARY

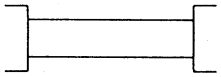

WATER SURFACE

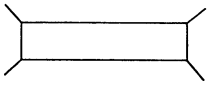

LIVE STAKES


BOULDER

COIR FIBER ROLLS

ADJACENT PROPERTY OWNER OR PARCEL NUMBER


PROPOSED BRIDGE


PROPOSED BOX CULVERT

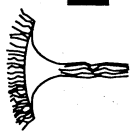

PROPOSED PIPE CULVERT

(DASHED LINES DENOTE EXISTNG STRUCTURES)


SINGLE TREE

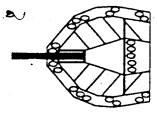
WOODS LINE


DRAINAGE INLET


ROOTWAD


VANE


RIP RAP


RIP RAP ENERGY DISSIPATOR BASIN

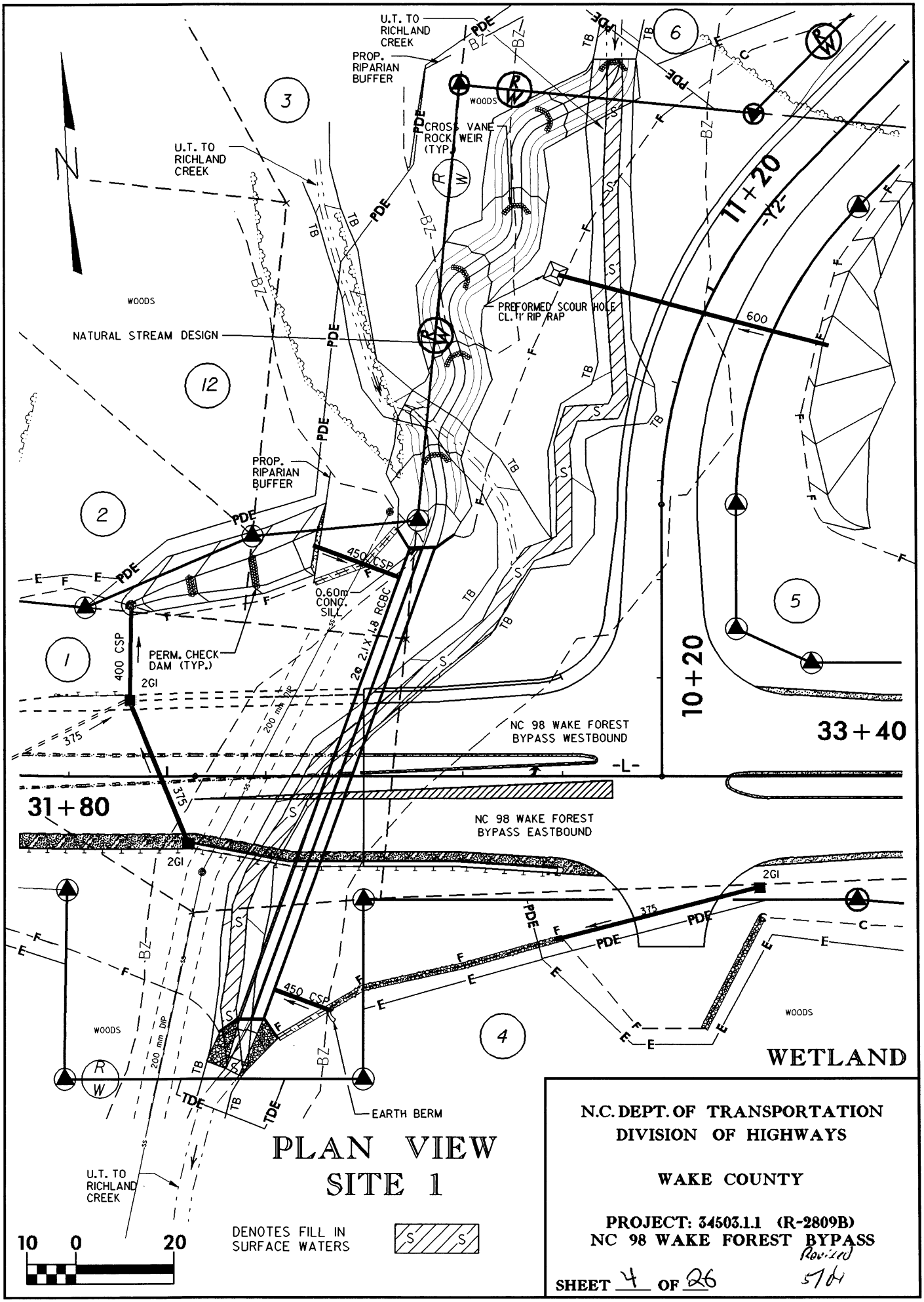
WETLAND

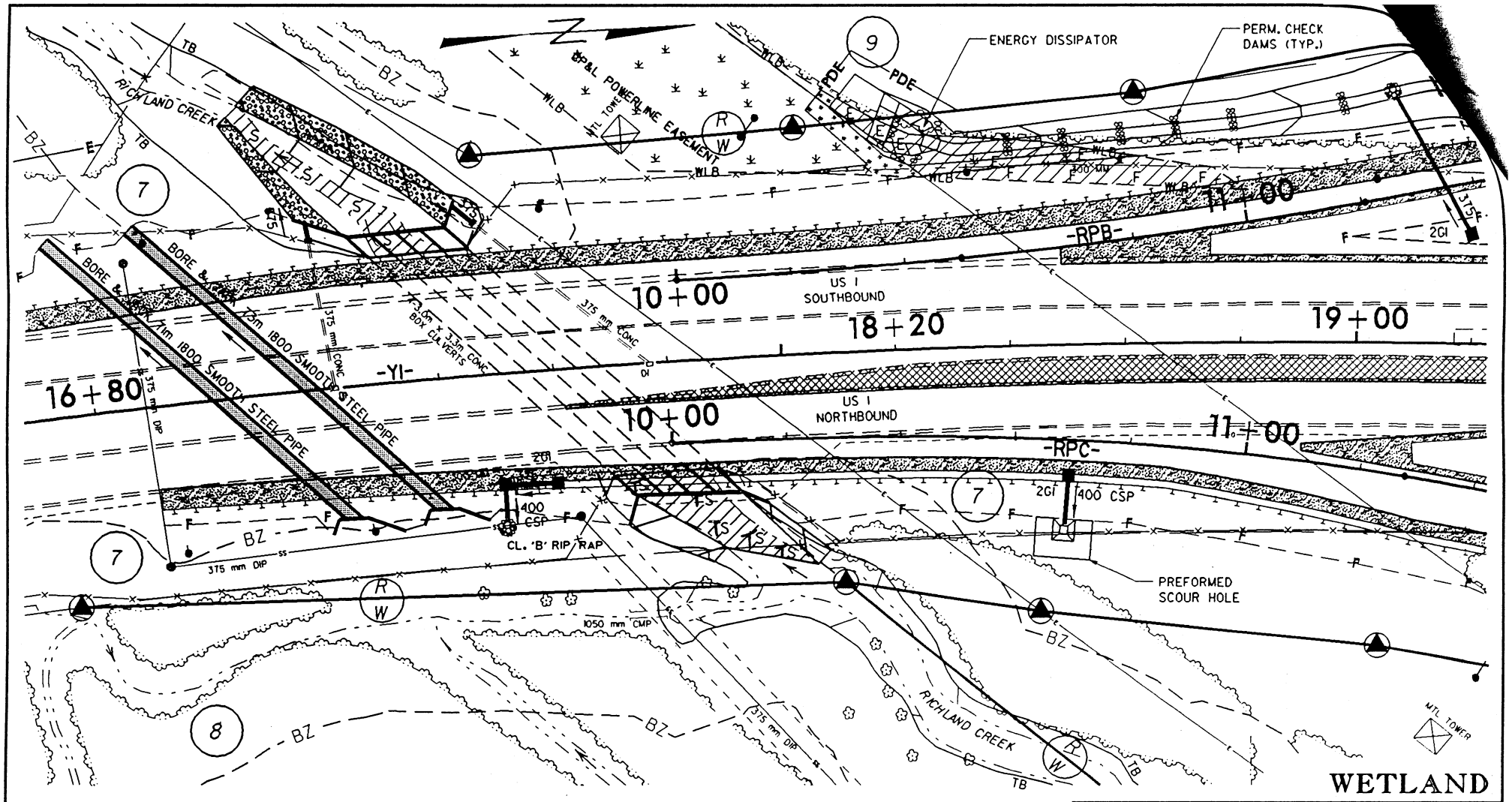
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.1402501 (R-2809B)
NC-98 WAKE FOREST BYPASS

SHEET 3 **OF** 26


U.T. TO RICHLAND CREEK
PROP. RIPARIAN BUFFER
CROSS VANE ROCK WEIR (TYP.)
U.T. TO RICHLAND CREEK
WOODS
NATURAL STREAM DESIGN
PREFORMED SCOUR HOLE CL. 1' RIP RAP
PROP. RIPARIAN BUFFER
450 CSP
0.60m CONC. SILL
2@ 2.1'X1.8' RCBC
400 CSP
PERM. CHECK DAM (TYP.)
200 mm DIP
375
NC 98 WAKE FOREST BYPASS WESTBOUND
NC 98 WAKE FOREST BYPASS EASTBOUND
31+80
33+40
10+20
11+20
600
EARTH BERM
WETLAND
PLAN VIEW
SITE 1
DENOTES FILL IN SURFACE WATERS
10 0 20
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT: 34503.1.1 (R-2809B)
NC 98 WAKE FOREST BYPASS
Revised
SHEET 4 OF 26



PLAN VIEW
SITE 3

DENOTES MECHANIZED CLEARING

DENOTES EXCAVATION IN WETLAND

DENOTES FILL IN WETLAND

DENOTES FILL IN SURFACE WATERS

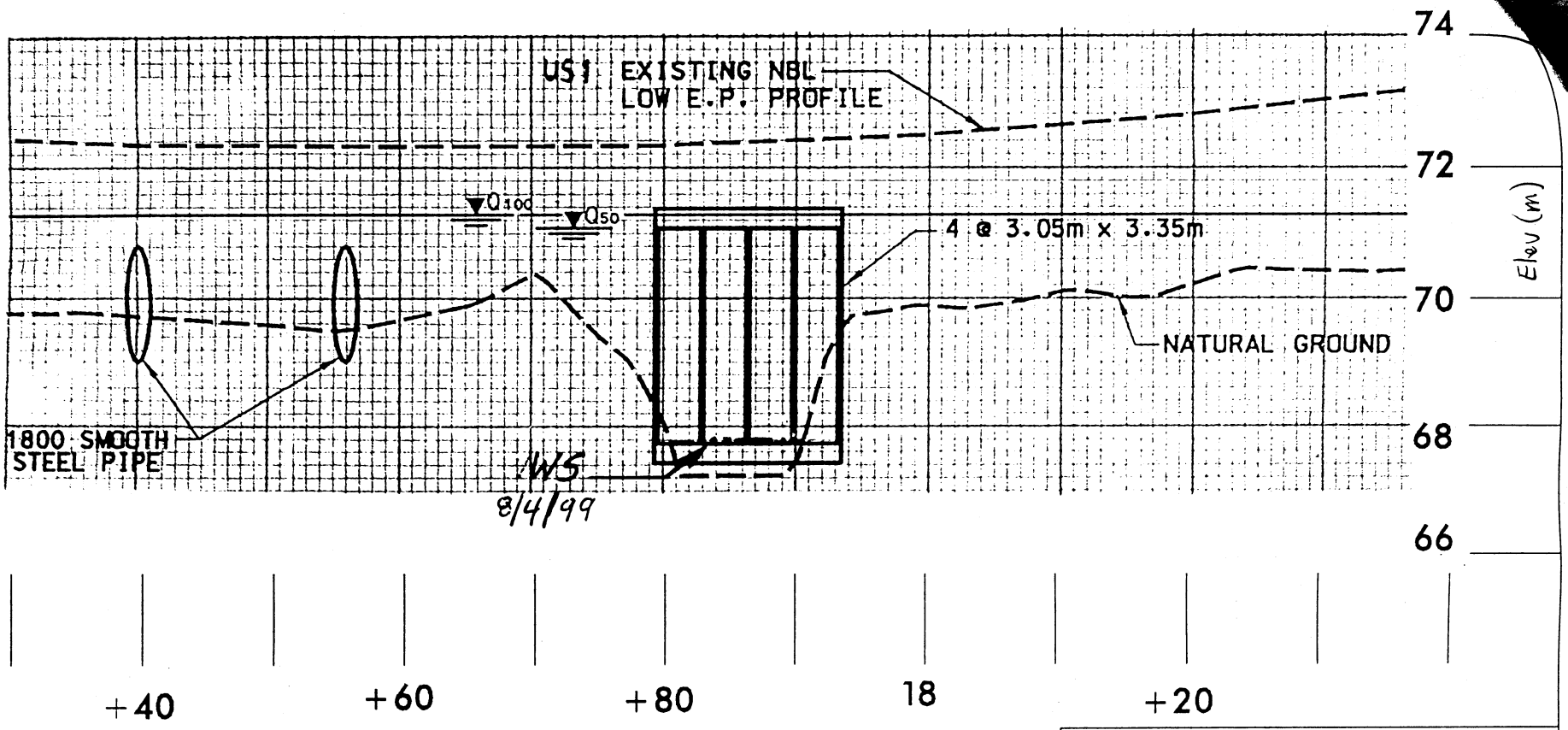
10 0 20

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 34503.1.1 (R-2809B)
NC 98 WAKE FOREST BYPASS

SHEET 15 OF 26 Rev. Aug 2004

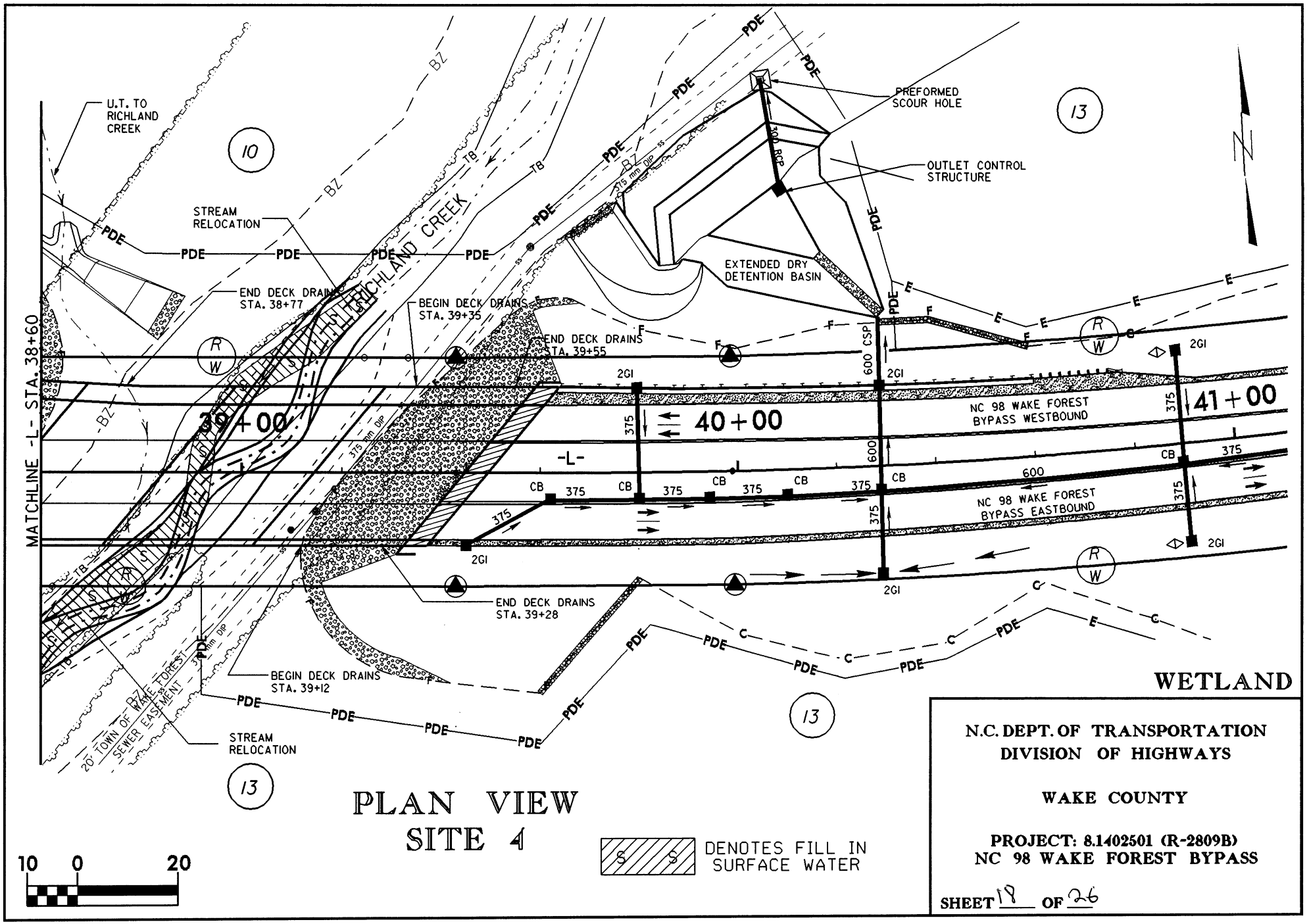


PROFILE
SITE 3

NCDOT
DIVISION OF HIGHWAYS

PROJECT: 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

SHEET 16 OF 26 Rev. Aug 2004



PLAN VIEW
SITE 4

10 0 20

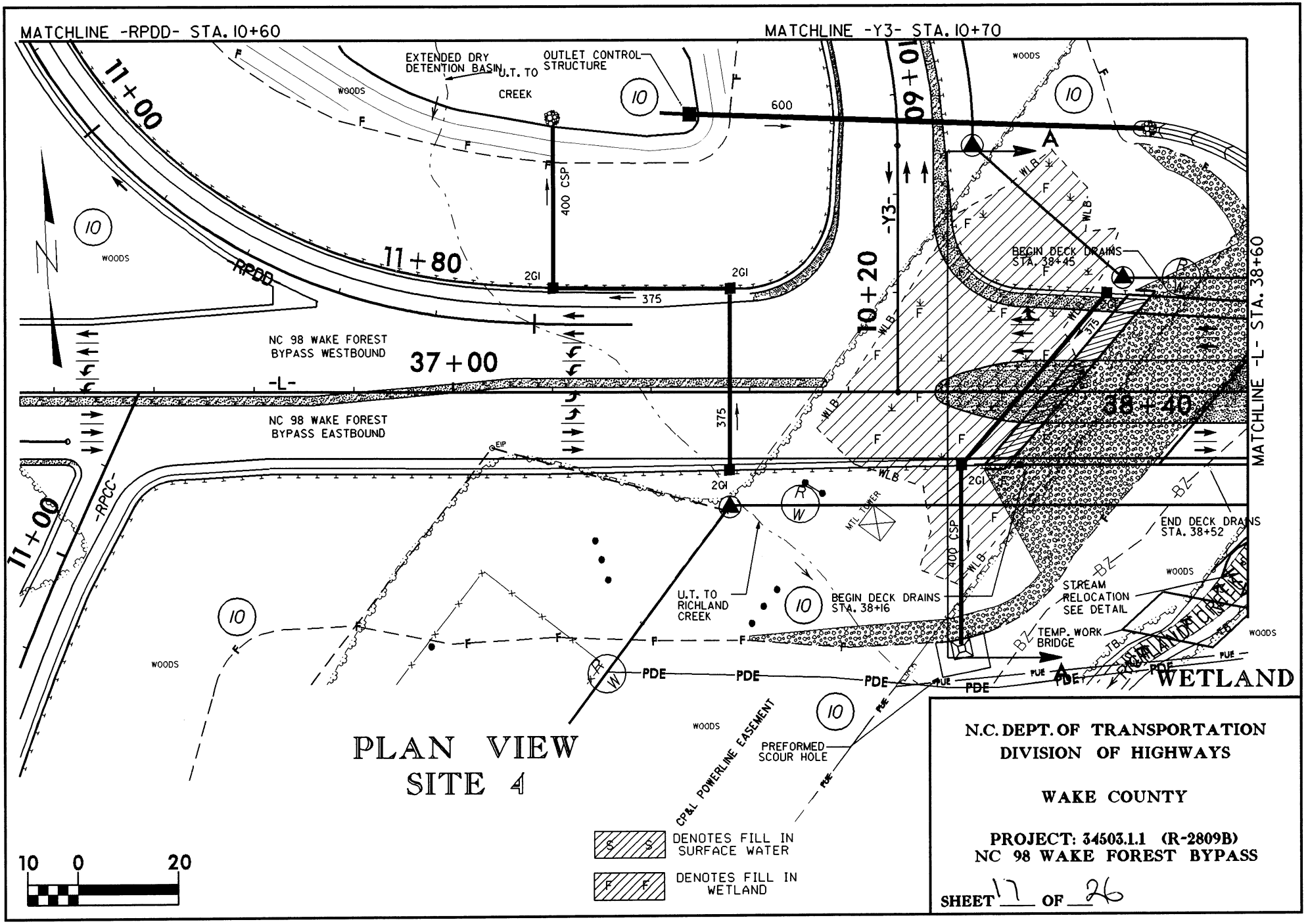
S S DENOTES FILL IN SURFACE WATER

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

SHEET 18 **OF** 26



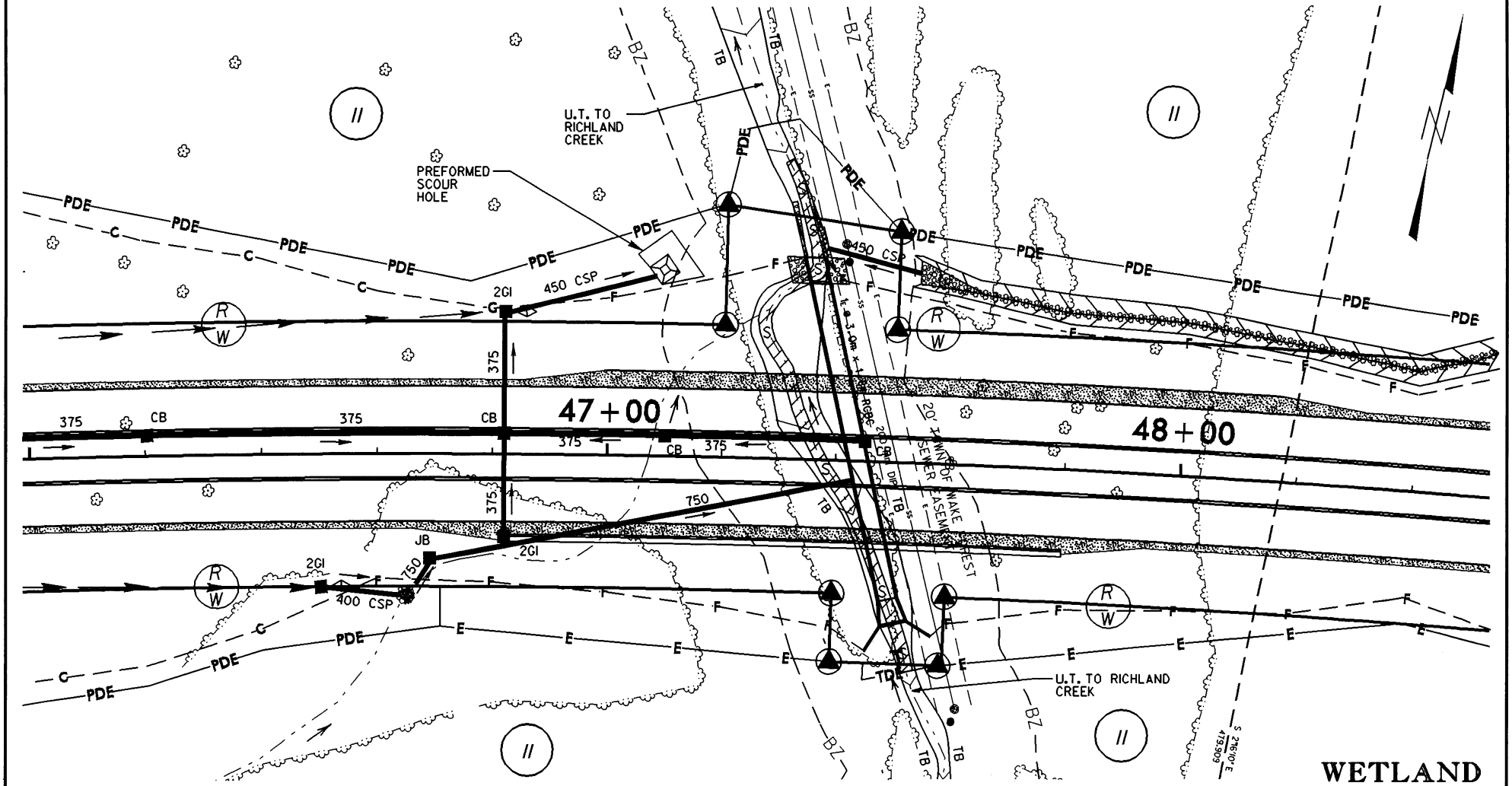
PLAN VIEW
SITE 4

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 34503.1.1 (R-2809B)
NC 98 WAKE FOREST BYPASS

SHEET 17 OF 26



PLAN VIEW
SITE 5

10 0 20

DENOTES FILL IN SURFACE WATERS

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

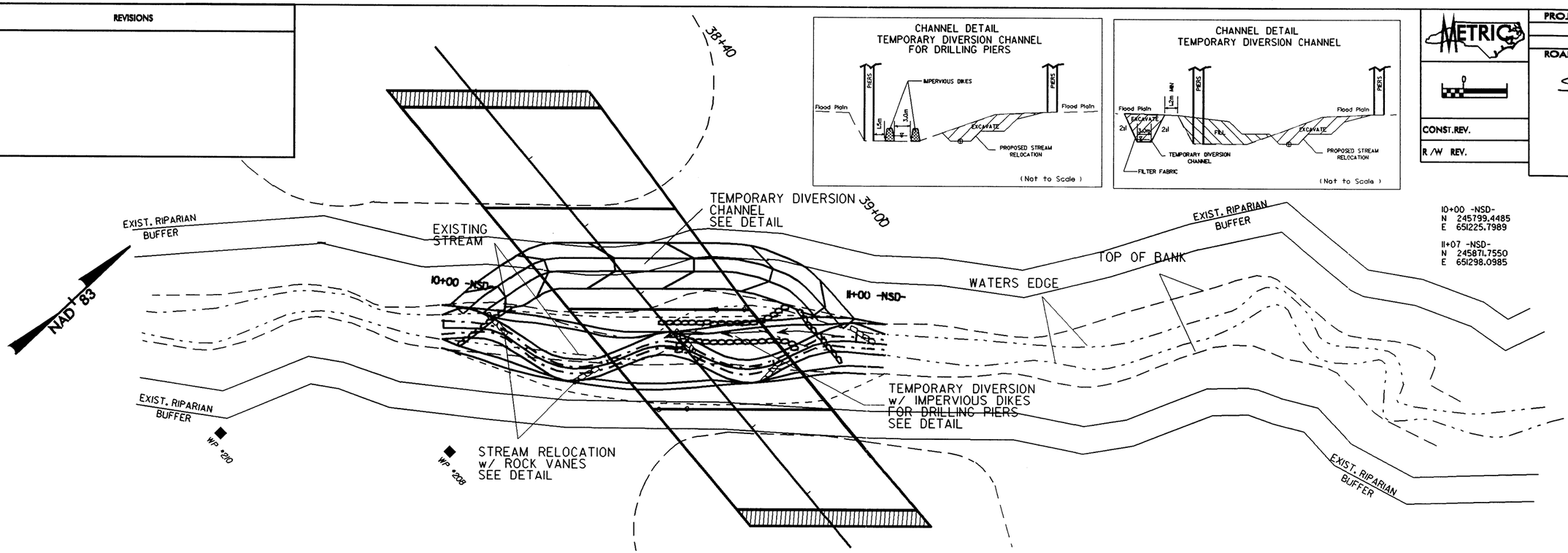
PROJECT: 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

Revised

SHEET 21 OF 26 **4/04**

050197

REVISIONS



CHANNEL DETAIL
TEMPORARY DIVERSION CHANNEL
FOR DRILLING PIERS

(Not to Scale)

CHANNEL DETAIL
TEMPORARY DIVERSION CHANNEL

(Not to Scale)

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-2809B	
	R/W SHEET NO.	
	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
	Stream Supplement	
	1 of 13	
CONST. REV.		
R/W REV.		

10+00 -NSD-
N 245799.4485
E 651225.7989

11+07 -NSD-
N 245871.7550
E 651298.0985

PI Sta 10+12.27 -NSD-
N 245808.3787
E 651234.2214
Δ = 36.1910°
L = 9.69m
T = 5.00m
R = 14.00m

PI Sta 10+32.12-NSD-
N 245812.1464
E 651254.1575
Δ = 59.5734°
L = 18.00m
T = 10.00m
R = 14.00m

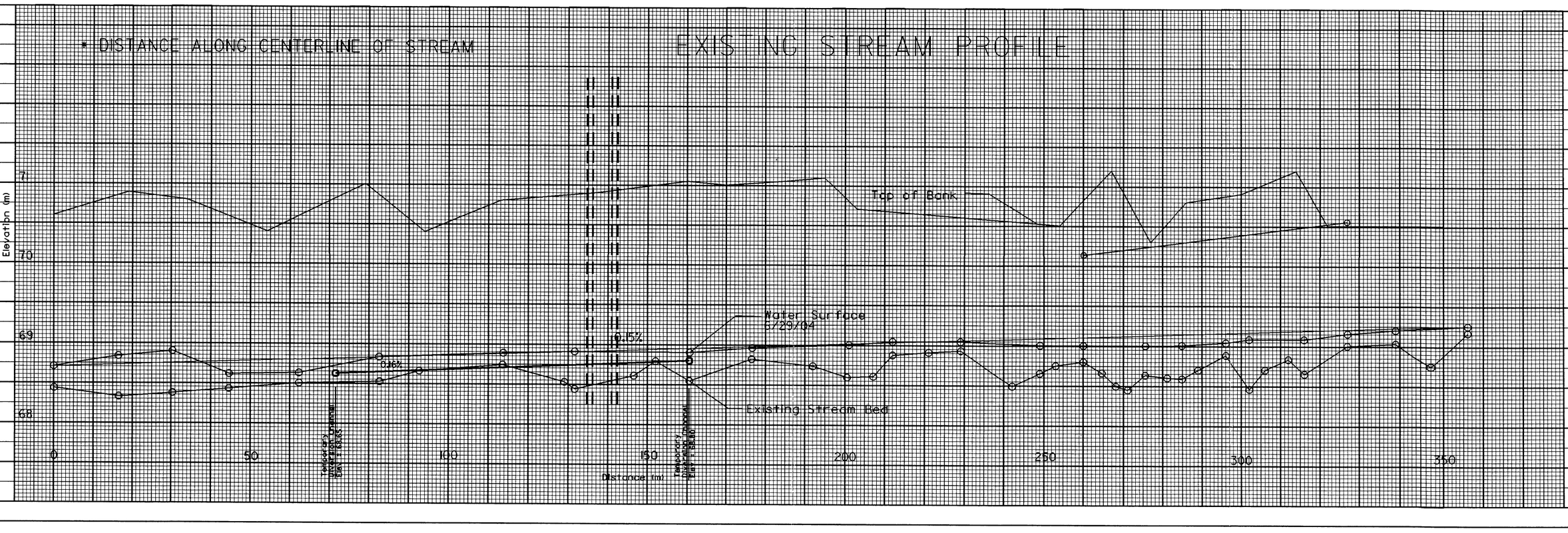
PI Sta 10+54.15-NSD-
N 245834.9059
E 651262.2664
Δ = 47.5385°
L = 15.22m
T = 8.00m
R = 16.50m

PI Sta 10+74.95-NSD-
N 245843.3258
E 651282.2467
Δ = 52.7131°
L = 16.73m
T = 9.00m
R = 18.00m

PI Sta 10+92.95-NSD-
N 245861.9940
E 651287.0522
Δ = 34.5337°
L = 11.56m
T = 6.00m
R = 22.00m

* DISTANCE ALONG CENTERLINE OF STREAM

EXISTING STREAM PROFILE



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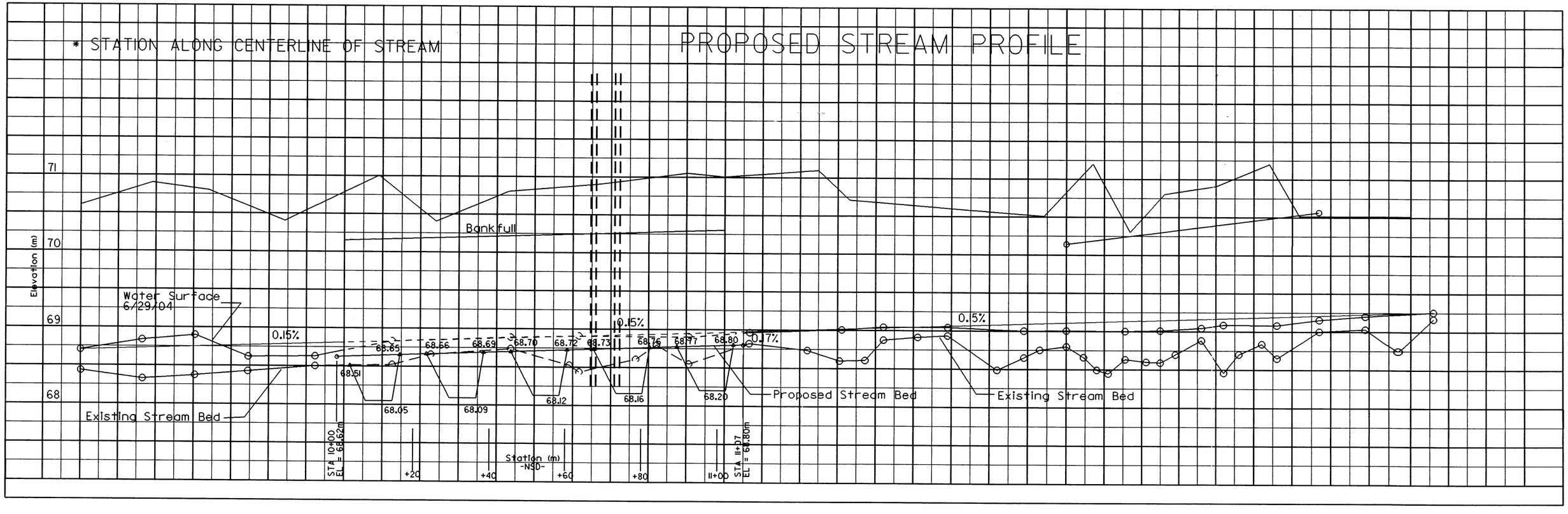
* STATION ALONG CENTERLINE OF STREAM

PROPOSED STREAM PROFILE



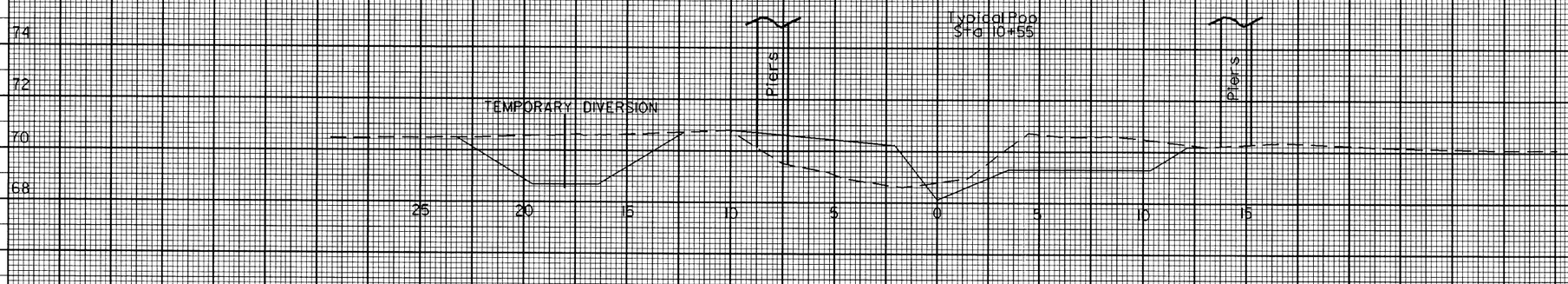
040397

* X-SECTIONS SHOWN PERPENDICULAR TO BANKFULL CHANNEL

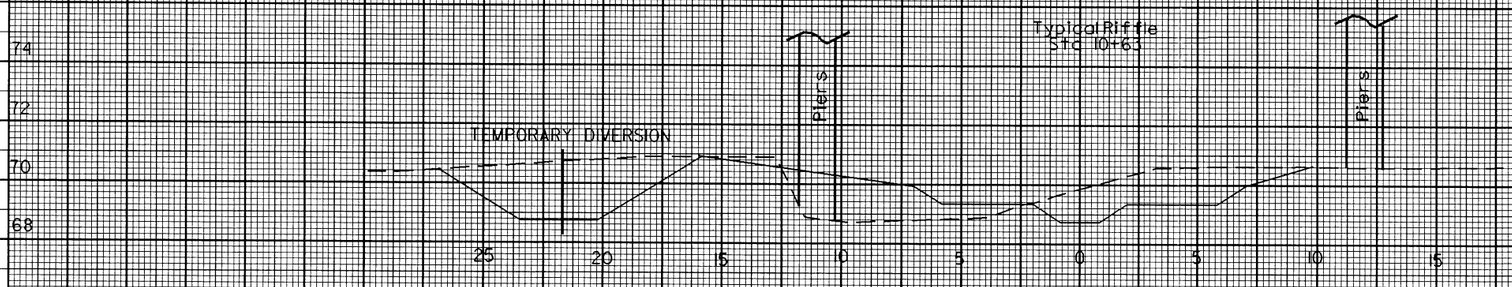
PROJECT REFERENCE NO.	SHEET NO.
R-2809B	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.	Stream Supplement 1
R/W REV.	3 of 13

Typical Riffle
Sta 10+20

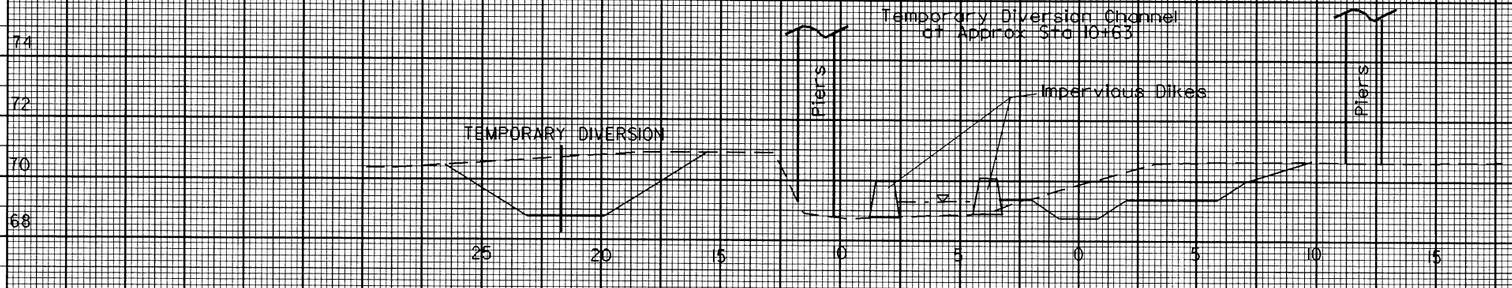
Typical Pool
Sta 10+55



Typical Riffle
Sta 10+63



Temporary Diversion Channel
at Approx Sta 10+63



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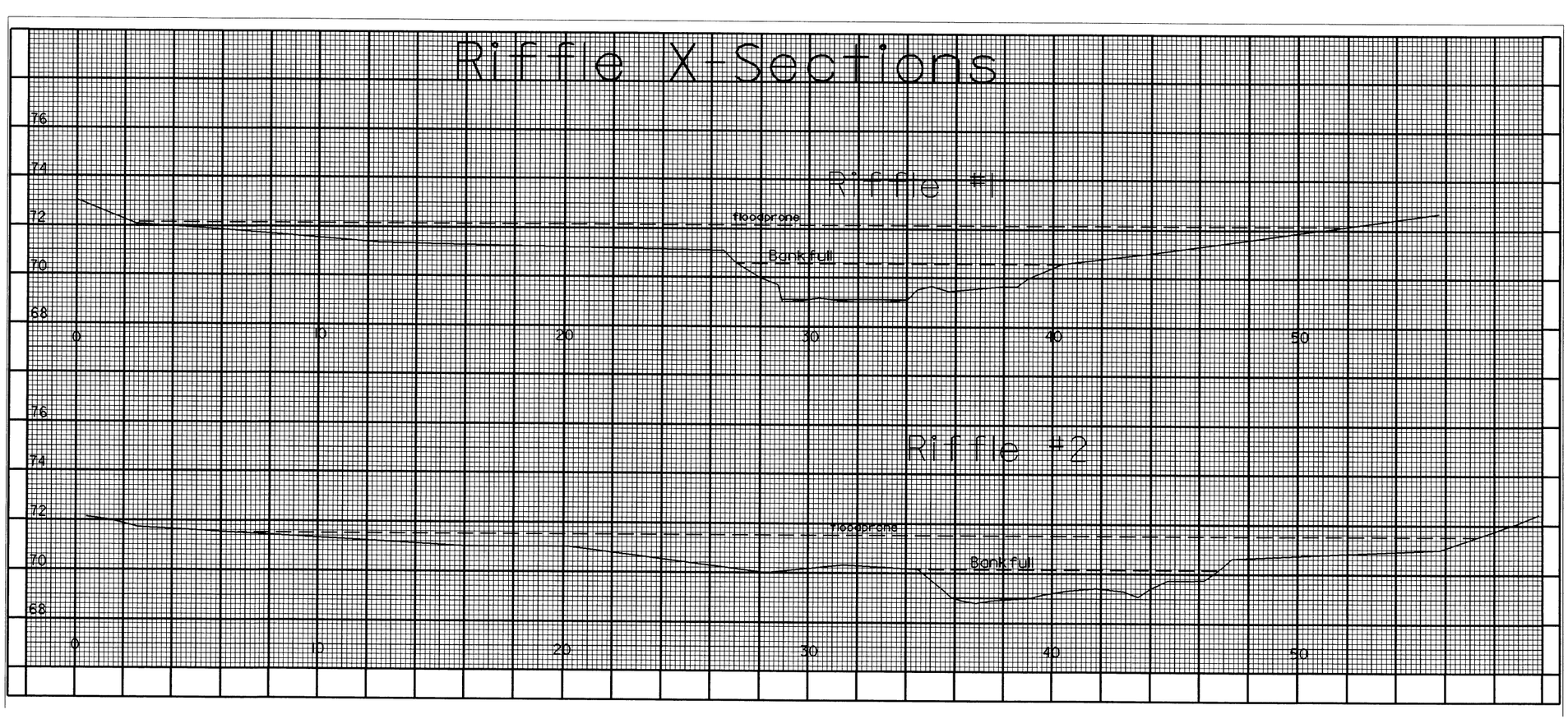
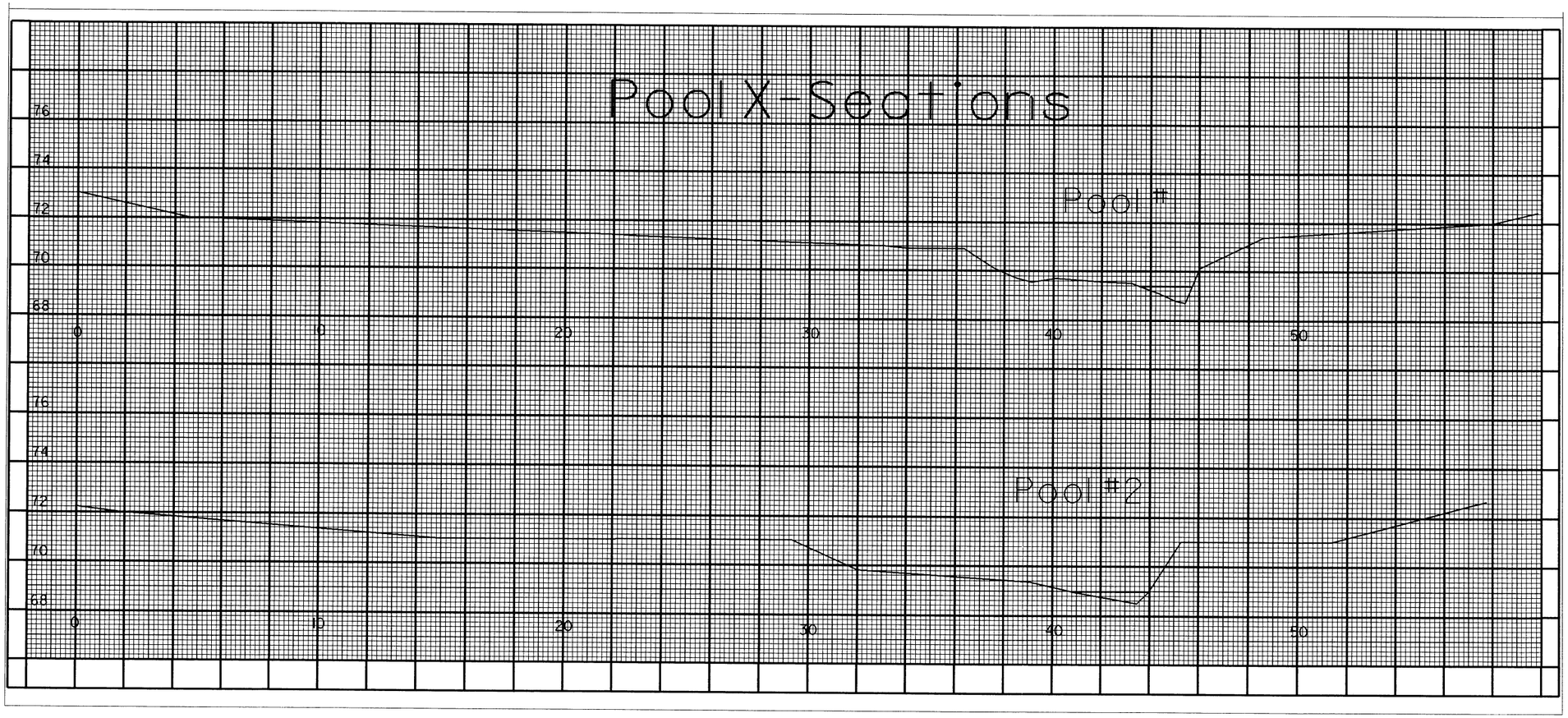
Riffle X-Sections

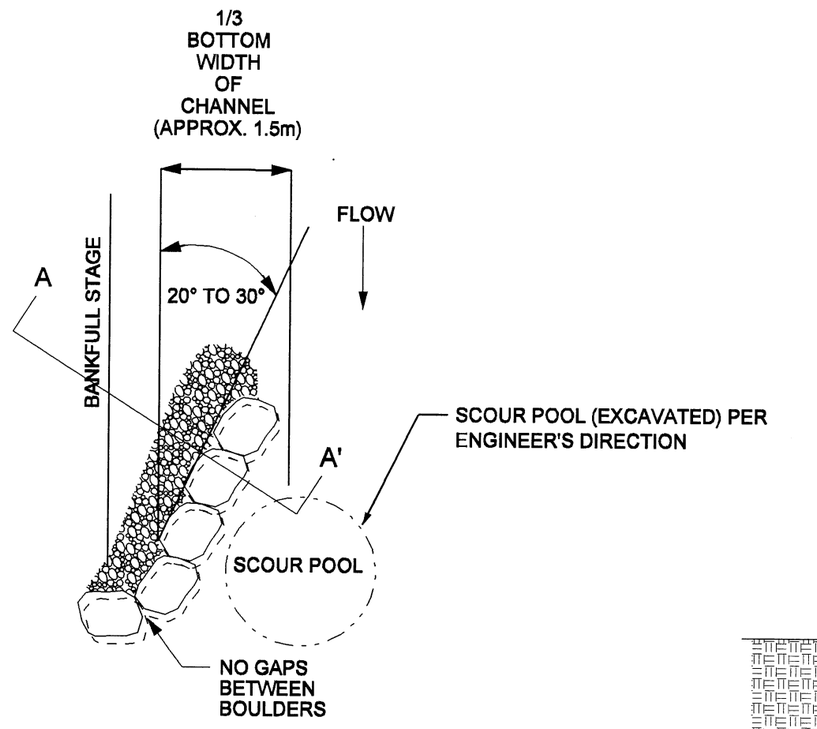


Pool X-Sections

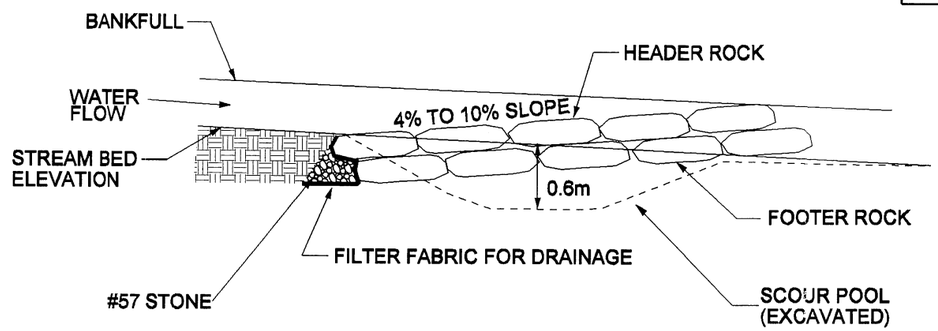


REVISIONS

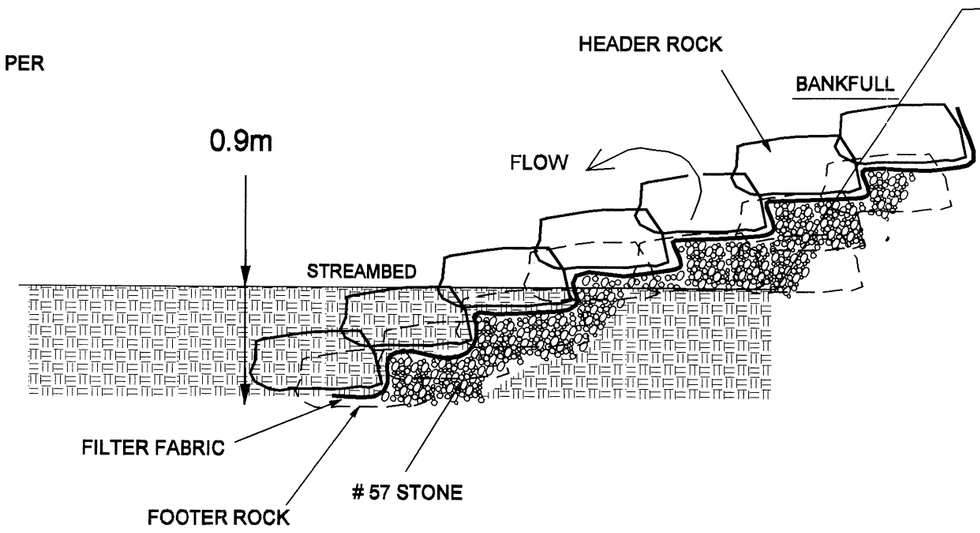
METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-2809B	
	R /W SHEET NO.	
CONST.REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R /W REV.		6 of 13



PLAN VIEW



PROFILE VIEW



SECTION A-A'

Rock Vane

SCALE: NTS

HEADER AND FOOTER ROCK SHOULD BE OBLONG AND HAVE MINIMAL DIMENSIONS OF 0.9m x 0.6m x 0.6m

PROJECT #: R-2809B
COUNTY: Wake
DESCRIPTION: Stream Relocation at Richland Creek Bridge Crossing
STREAM: Richland Creek

NATURAL STREAM DESIGN
Sta 39+00 –L-

A stream relocation design is proposed on the Wake Forest Bypass project. The site is on Richland Creek and is located at the proposed bridge crossing just East of US 1. The design is proposed due to the unforeseen circumstances that 2 of the 7 bridge piers at Bent #2 are located in the stream. Based on original survey data these piers were not shown to be in the stream. However, construction layout and updated topo surveys revealed otherwise. Presently, it is proposed to relocate the stream to the East away from these piers.

The existing stream was resurveyed to provide updated topo and morphological information. The stream/topo survey included floodplain, top of bank, bankfull, water surface and thalweg data. The "as-built" and "staked" bridge piers were also located. The morphological information included cross sections at riffles, to observe bankfull characteristics, and at pool. A pebble count was also taken at riffle and pool sections.

The basin is suburban and is located in the Blue-Ridge/Piedmont hydrologic region. The crossing is located downstream of the Town of Wake Forest. Basin discharges were computed and prorated using the USGS equations (007-00) and the NC Stream Restoration Institute's Piedmont Regional equations. Data was also analyzed using the HEC-RAS modeling system to compare the accuracy of all the characteristics between the surveyed reference and the regional equations. The basin character (and bankfull morphology) was determined to be suburban. That is, the stream morphology, observed in the field, seemed to fall between those characteristics generated on the NCSRI rural and urban regional curves. The bankfull indicators were close (within 2') to the top of bank to access the floodplain.

The existing stream was observed to change character from the beginning of the survey down through the project and to the end of the survey reach. The upper portion had more sinuosity, better bankfull indicators and more vegetated banks. The downstream portion had little to no sinuosity, poor bankfull indicators, trapezoidal channel dimension and unstable/unvegetated banks, especially at bends. Most of the floodplain has minimal vegetation due to recent utility clearing. The stream was observed to have a meandering thalweg within the main channel banks. While the main stream channel is slightly meandering the thalweg has more significant meandering. The stream was observed to have a significant sediment supply and deposition. Based on the observed field data, NCSRI regional information and hydraulic modeling the existing stream was classified as a C4/E4 stream.

The proposed stream was designed to improve conveyance of the bankfull discharge. These improvements propose to maintain the bankfull area while at the same time flattening side slopes, improving the low flow channel conveyance, providing improved sinuosity and excavating the high banks in certain areas so the floodplain can be accessed more efficiently. A meandering thalweg is also proposed within the main stream channel. To aid in bank stability, rock vanes are proposed in the bend/pool areas. Also, coir fiber mat will be placed on the banks. This will assist in stabilizing the banks and thus assist in establishing vegetation along the stream banks. The stream profile will be at or near that of the existing stream. With the modifications to the stream pattern and dimension it is believed an improved C4/E4 stream will be provided.

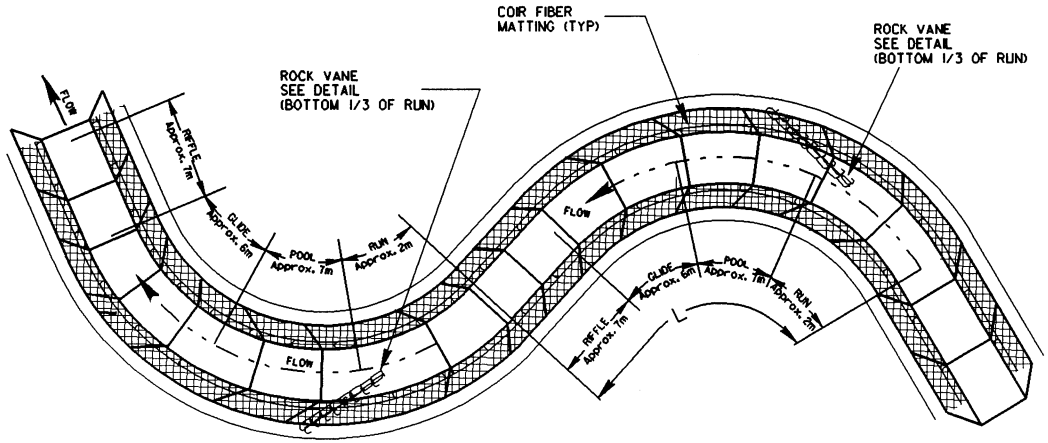
The bed material was found to be fine gravel in the riffles and coarse sand in the pools. Shear stress, sediment transport and stream power properties for fine gravel were analyzed. Shear stresses were calculated based on velocities and flow depths generated from the HEC-RAS modeling system. This information was then compared to values for critical velocity and shear stress for fine gravel in the HEC-15 and HDS-5 manuals from the FHA. The Shields Diagram was also used to observe the size of particle moved by the stream energy. The comparison showed the proposed stream to be within acceptable velocity and shear stress limits that would allow proper sediment transport under bankfull conditions.

Appendix B Morphological Measurement Table

Variables	Existing Channel	Proposed Reach	USGS Station	** Reference Reach	** Reference Reach
1. Stream type	C4/E4	C4/E4	N/A	N. Potts Crd (Rural E)	McMullen Crk (Urban E)
2. Drainage area	9.72 mi^2 (25.2 km^2)	9.72 mi^2 (25.2 km^2)		9.6 mi^2 (24.9 km^2)	7.0 mi^2 (18 km^2)
3. Bankfull width	13.1m (43ft)	15.2m (50ft)		8m (25.4ft)	14m (47ft)
4. Bankfull mean depth	1.06m (3.5ft)	0.91m (3.0ft)		1.1m (3.5ft)	1.5m (4.5ft)
5. Width/depth ratio	12.4	16.7		7.3	9.3
6. Bankfull cross-sectional area	13.9 m^2 (150 ft^2)	13.9m^2 (150ft^2)		8.3m^2 (89.6ft^2)	21.0m^2 (227ft^2)
7. Bankfull mean velocity	1.6 m/s (5.2 ft/s)	0.9m/s (3.0 ft/s)		1.7m/s (5.5 ft/s)	1.3m/s (4.4 ft/s)
8. Bankfull discharge, cfs	22 cms (780 cfs)	22 cms (780 cfs)		14 cms (507 cfs)	28 cms (990 cfs)
9. Bankfull max depth	1.59m (5.2ft)	1.5m (5.0ft)			
10. Width of floodprone area	47m (154ft)	60m (197ft)			
11. Entrenchment ratio	3.6	4.0			
12. Meander length	28m-45m	39m			
13. Ratio of meander length to bankfull width	2.1-3.4	2.6			
14. Radius of curvature	7.3m-29m	14m-22m			
15. Ratio of radius of curvature to bankfull width	0.6-2.2	1.2			
16. Belt width	12m-22m	18m			
17. Meander width ratio	1.2	1.3			
18. Sinuosity (stream length/valley length)	1.09	1.09			
19. Valley slope	0.11%	0.11%			
20. Average slope	0.15%	0.17%		0.12%	0.40%
21. Pool slope	0.00%	0.00%			
22. Ratio of pool slope to average slope	0.00	0.00			
23. Maximum pool depth	1.8m (6.0ft)	2.1m (7.0ft)			
24. Ratio of pool depth to average bankfull depth	1.70	2.3			
25. Pool width	13.3m (44ft)	15.2m (50ft)			
26. Ratio of pool width to bankfull width	1.01	1.00			
27. Pool to pool spacing	20m-30m	22m (72ft)			
28. Ratio of pool to pool spacing to bankfull width	1.5-2.3	1.5			
29. Ratio of lowest bank height to bankfull height (or max bankfull depth)	0.57	0.66			

STREAM DETAIL

L= LENGTH ALONG STREAM CENTERLINE



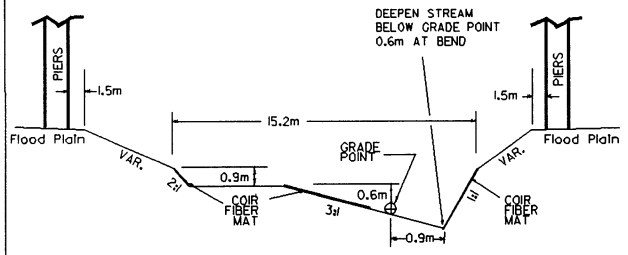
NOTES:

PLANTINGS SHOULD BE PLACED ABOVE BANKFULL DEPTH.

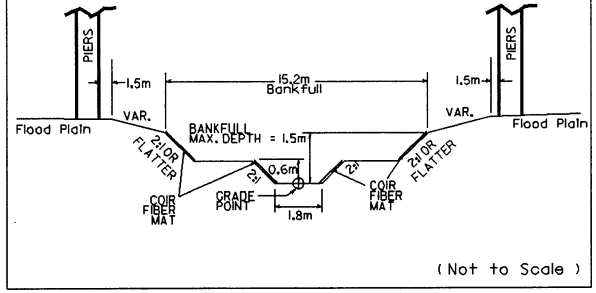
ROCK VANES TO BE PLACED IN BOTTOM ONE THIRD OF RUN

ROCK SHOULD BE OBLONG IN SHAPE AND HAVE MINIMUM DIMENSIONS OF 0.9mX0.6mX0.6m (SEE ROCK VANE DETAIL)

CHANNEL DETAIL
PROPOSED TYPICAL POOL SECTION
@ BEND (MEANDER)



CHANNEL DETAIL
PROPOSED TYPICAL RIFFLE SECTION



NATURAL CHANNEL DESIGN TYPICALS

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.1402501 (R-2809B)

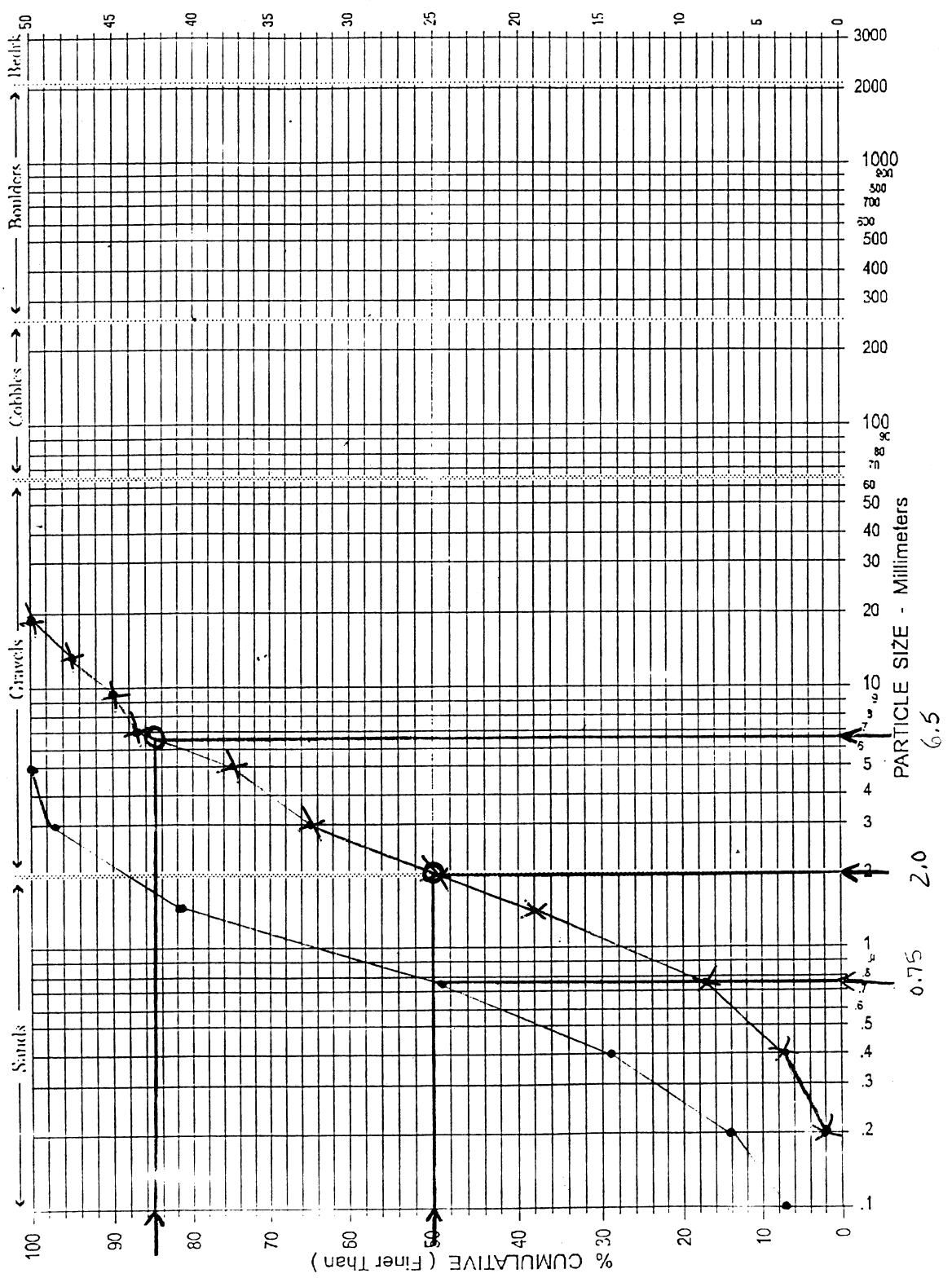
NC 98 WAKE FOREST BYPASS

SHEET 16 **OF** 13

PEBBLE COUNT DATA

GAGE: No:

Reach: Date:



Richland Creek
R-2809B

* * Riffle
— Pool

© Wildland Hydrology 2002

Richland Creek Stream Site (R-2809B)
Sta 39+00 -L-

SEDIMENT TRANSPORT ANALYSIS

Station/Description	Flow Depth (ft)	Flow Slope (ft/ft)	Shear Stress (lb/ft^2)	Bed Material	Velocity (ft/s)
Proposed	3.0	0.0017	0.312	Gravel/Sand	4.7
Existing	3.5	0.0015	0.299	Sand/Silt	5.7

Note: Velocities determined from HEC-RAS Model

Proposed Morphology

**** Critical Shear Stress** 0.23 lb/ft^2

***** Permissable Velocity** 3.7 ft/s Fine Gravel w/ Water Carrying Sand and Gravel

*** Shields:**

Particle Size	15.0	mm	
Dimensionless Shear Stress	0.0618	lb/ft^2	
Kinematic Viscosity	0.00001400	ft^2/s	at 50° F
Mass Density	1.94	$slugs/ft^3$	
Unit Weight (Particle)	165.0	lb/ft^3	
Unit Weight (Water)	62.4	lb/ft^3	
Reynolds Number	1409.7		
Dimensionless Shear Stress from Shields Diagram	0.060	lb/ft^2	

References:

* Shields Diagram
** Hydraulic Engineering (HEC) 15 - Chart 1
*** Hydraulic Design Series (HDS) 3 - Table 2

	Proposed		Existing	
Q_{BKF}	780.0	ft^3/s	780.0	ft^3/s
W/D	16.7		12.4	
Side Slope	2.0		1.0	
Mannings n	0.032		0.032	
Valley Slope	0.0011	ft/ft	0.0011	ft/ft
Sinuosity	1.09		1.09	
Valley Slope/Sinuosity	0.0010	ft/ft	0.0010	ft/ft
Velocity	**4.7**	ft/s	5.7	ft/s
Area	150.0	ft^2	150.0	ft^2
W_{BKF}	50.0	ft	43.0	ft
Base Width	38.0	ft	33.0	ft
Mean Depth	3.0	ft	3.5	ft
Wetted Perimeter	51.0	ft	47.0	ft
Hydraulic Radius	2.94	ft	3.19	ft
Shear Stress	0.19	lb/ft^2	0.20	lb/ft^2
Particle Moved	13.0	mm	14.0	mm

Stream Power:

Existing:
stream power = 0.040 lb/ft/sec

Proposed:
stream power= 0.029 lb/ft/sec

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From / To)	Structure Size / Type	WETLAND IMPACTS				SURFACE WATER IMPACTS				
			Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation In Wetlands (ac)	Mechanized Clearing (Method III) (ac)	Fill In SW (Natural) (ac)	Fill In SW (Pond) (ac)	Temp. Fill In SW (ac)	Existing Channel Impacted (ft)	Natural Stream Design (ft)
1	-L- 31+96 / -Y2- 11+38	2 @ 2.1m x 1.8m RCBC	-	-	-	-	0.19	-	-	797.20	383.80
2	-Y2- 10+42L / -Y2- 10+89L	-	-	-	-	-	0.01	-	-	132.20	-
3	-Y1- 16+88L / -RPB- 11+01L	4 @ 3.2m x 3.2m RCBC	0.06	-	0.05	0.02	0.05	-		222.40	-
4	-L- 37+74L / 38+34L	4@98' PSG Bridge	0.66	-	-	-	0.15	-	0.03	351.00	351.00
5	-L- 47+09L / 47+70R	1 @ 3.0m X 1.8m RCBC	-	-	-	-	0.04	-	0.01	240.80	-
TOTALS:			0.72	0.00	0.05	0.02	0.43	0.00	0.04	1743.60	734.80

Notes:

Site 4 temporary stream impacts = 82 feet

Site 5 temporary stream impacts = 61 feet

Form Revised 3/22/01

N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

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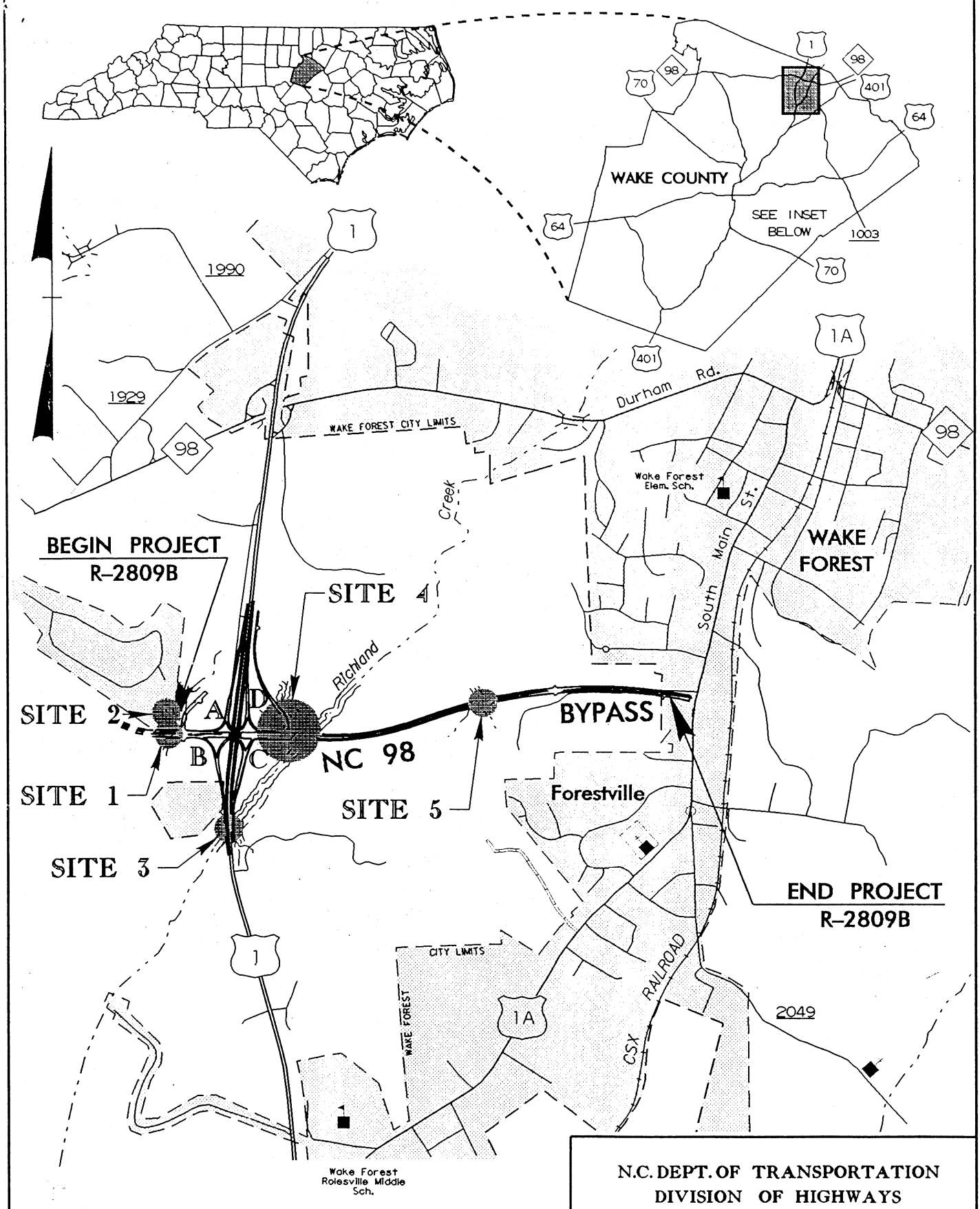
Rev. Aug 2004

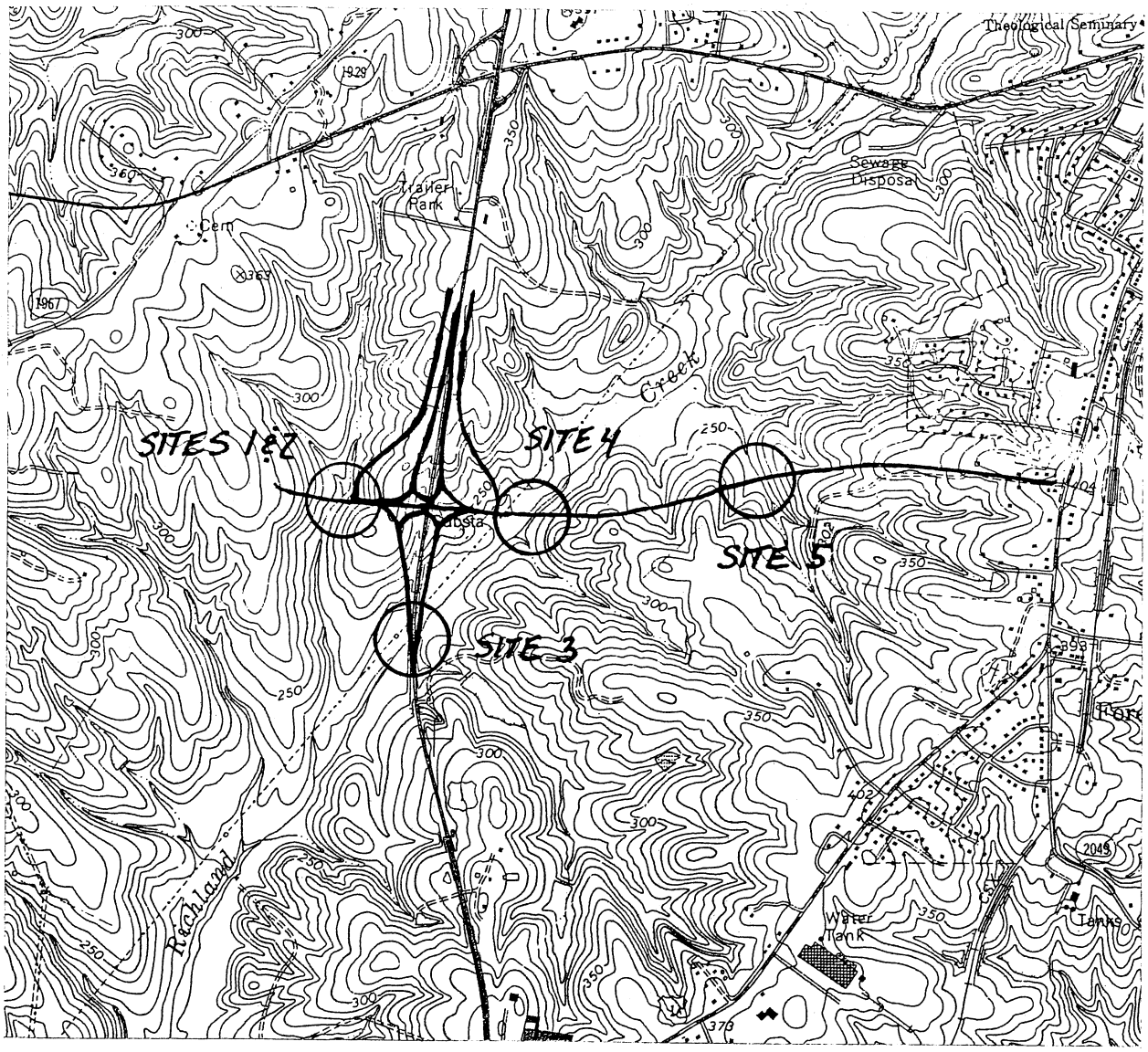


N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

SHEET 1 OF 20



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BUFFER

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

SHEET 2 OF 20

BUFFER LEGEND

WLB WETLAND BOUNDARY

WETLAND

DENOTES ALLOWABLE IMPACTS ZONE 1

DENOTES ALLOWABLE IMPACTS ZONE 2

DENOTES MITIGABLE IMPACTS ZONE 1

DENOTES MITIGABLE IMPACTS ZONE 2

BZ RIPARIAN BUFFER ZONE

BZ1 RIPARIAN BUFFER ZONE 1
30 ft (9.2m)

BZ2 RIPARIAN BUFFER ZONE 2
20 ft (6.1m)

FLOW DIRECTION

TB TOP OF BANK

WE EDGE OF WATER

C PROP. LIMIT OF CUT

F PROP. LIMIT OF FILL

PROP. RIGHT OF WAY

NG NATURAL GROUND

PL PROPERTY LINE

TDE TEMP. DRAINAGE EASEMENT

PDE PERMANENT DRAINAGE EASEMENT

EAB EXIST. ENDANGERED ANIMAL BOUNDARY

EPB EXIST. ENDANGERED PLANT BOUNDARY

WATER SURFACE

LIVE STAKES

BOULDER

CORE FIBER ROLLS

PROPOSED BRIDGE

PROPOSED BOX CULVERT

PROPOSED PIPE CULVERT
12"-48" PIPES
54" PIPES & ABOVE

(DASHED LINES DENOTE EXISTNG STRUCTURES)

SINGLE TREE

WOODS LINE

DRAINAGE INLET

ROOTWAD

RIP RAP

5 ADJACENT PROPERTY OWNER OR PARCEL NUMBER IF AVAILABLE

PREFORMED SCOUR HOLE (PSH)

LEVEL SPREADER (LS)

GRASS SWALE

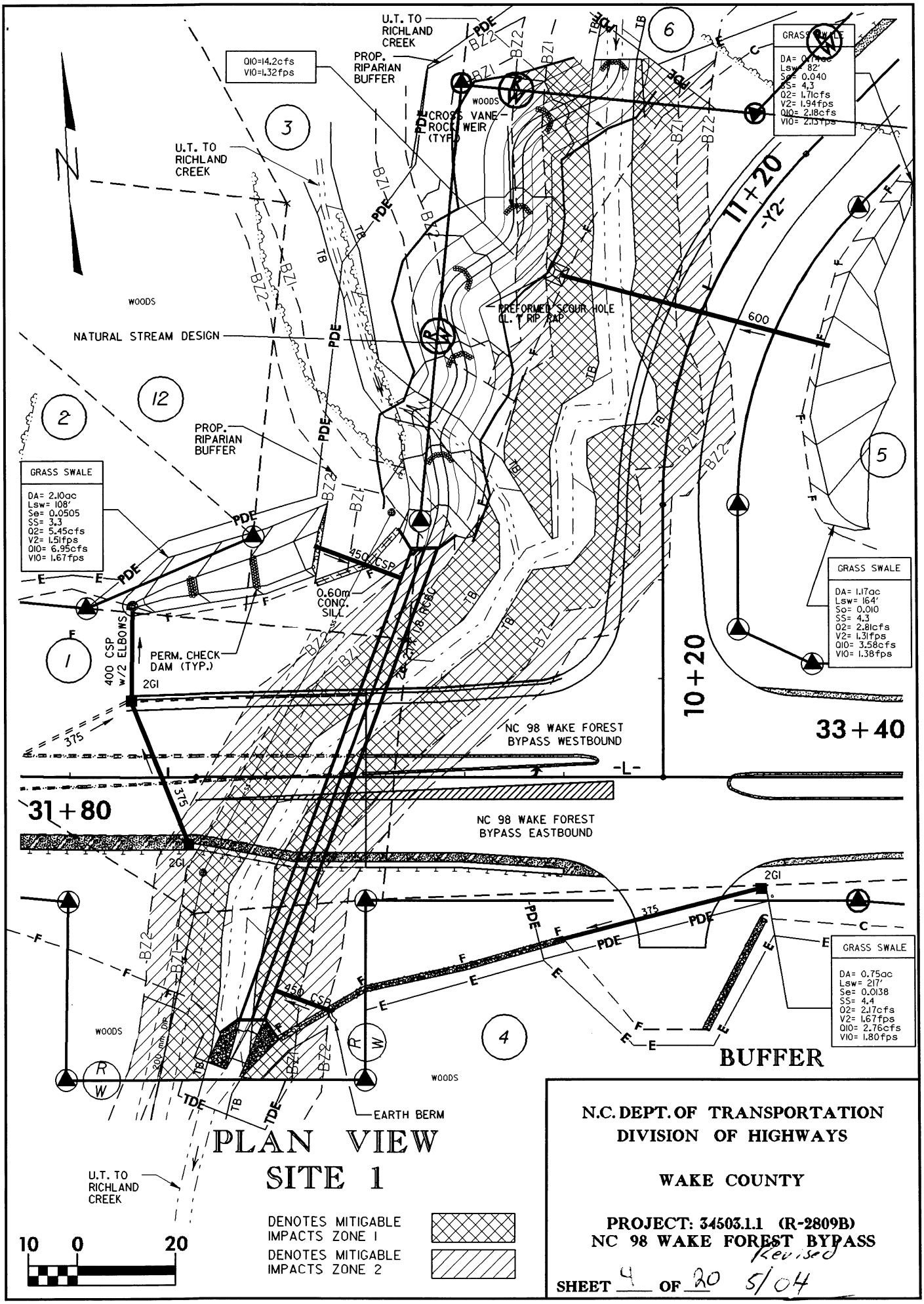
BUFFER

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.1402501 (R-2809B)
NC-98 WAKE FOREST BYPASS

SHEET 3 **OF** 20



PLAN VIEW
SITE 1

DENOTES MITIGABLE IMPACTS ZONE 1

DENOTES MITIGABLE IMPACTS ZONE 2

10 0 20

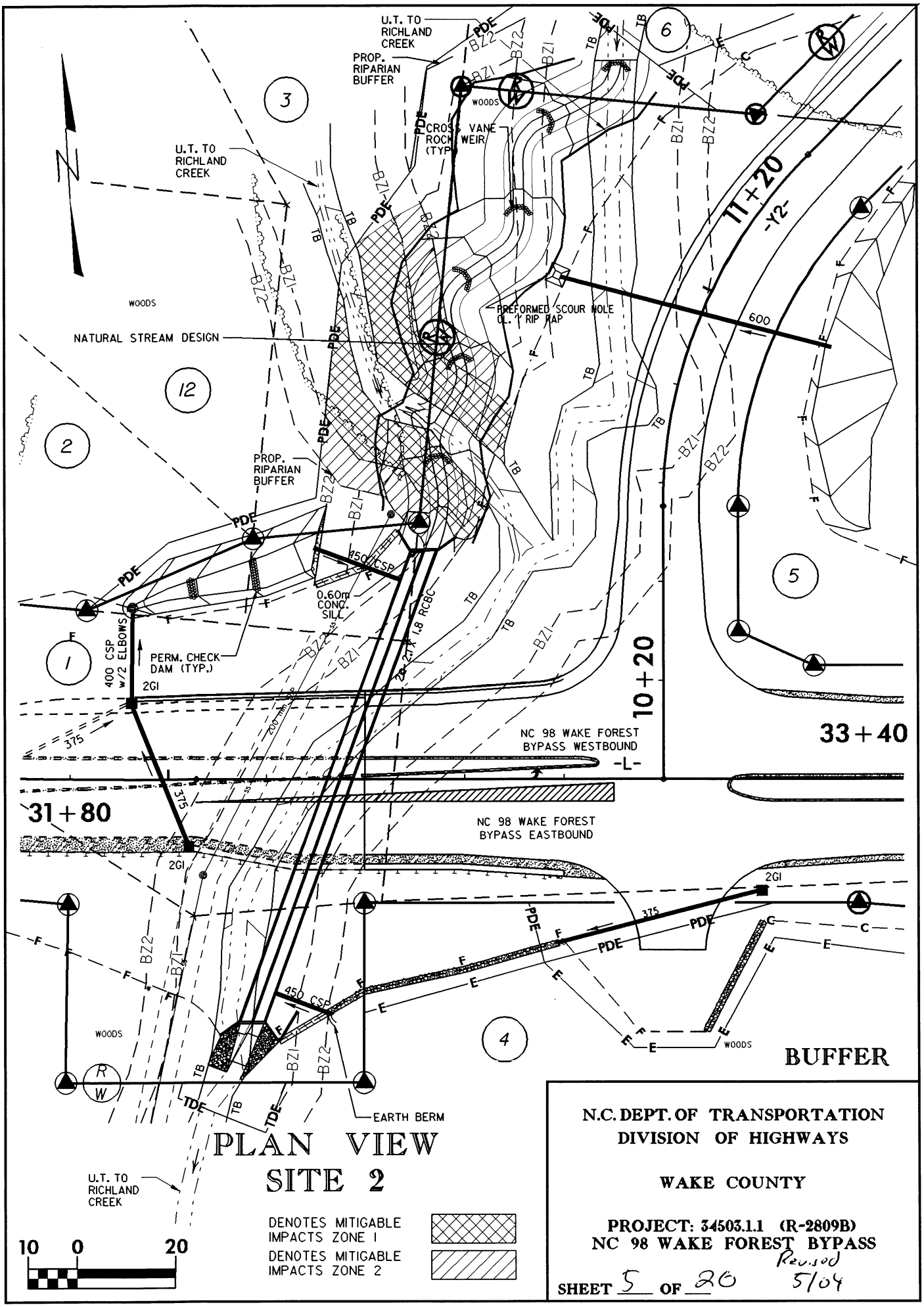
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 34503.1.1 (R-2809B)
NC 98 WAKE FOREST BYPASS

Revised 5/04

SHEET 4 OF 20



PLAN VIEW
SITE 2

DENOTES MITIGABLE IMPACTS ZONE 1

DENOTES MITIGABLE IMPACTS ZONE 2

10 0 20

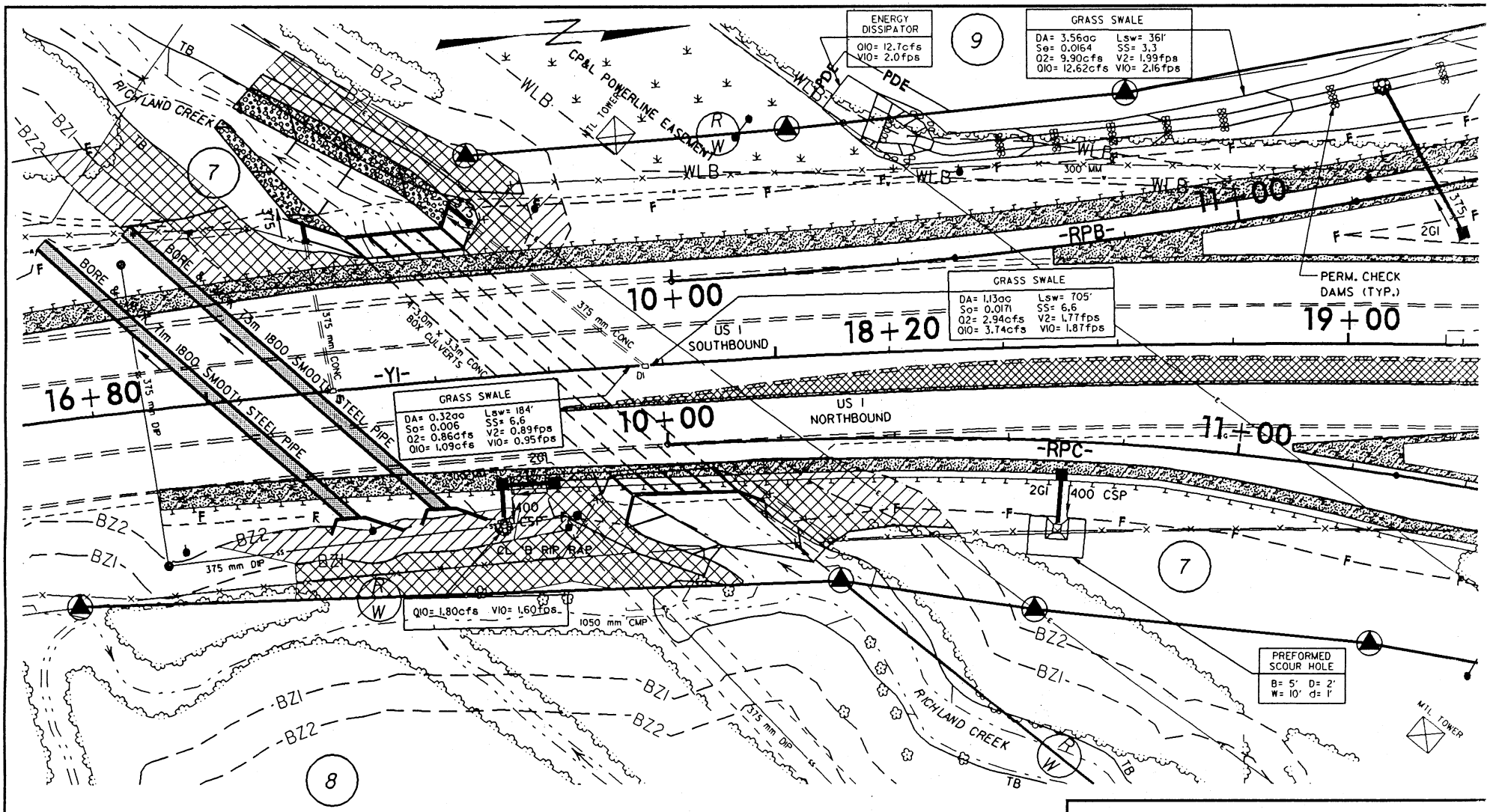
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 34503.1.1 (R-2809B)
NC 98 WAKE FOREST BYPASS

Revised 5/04

SHEET 5 OF 20



PLAN VIEW
SITE 3

DENOTES MITIGABLE IMPACTS ZONE 1

DENOTES MITIGABLE IMPACTS ZONE 2

10 0 20

BUFFER

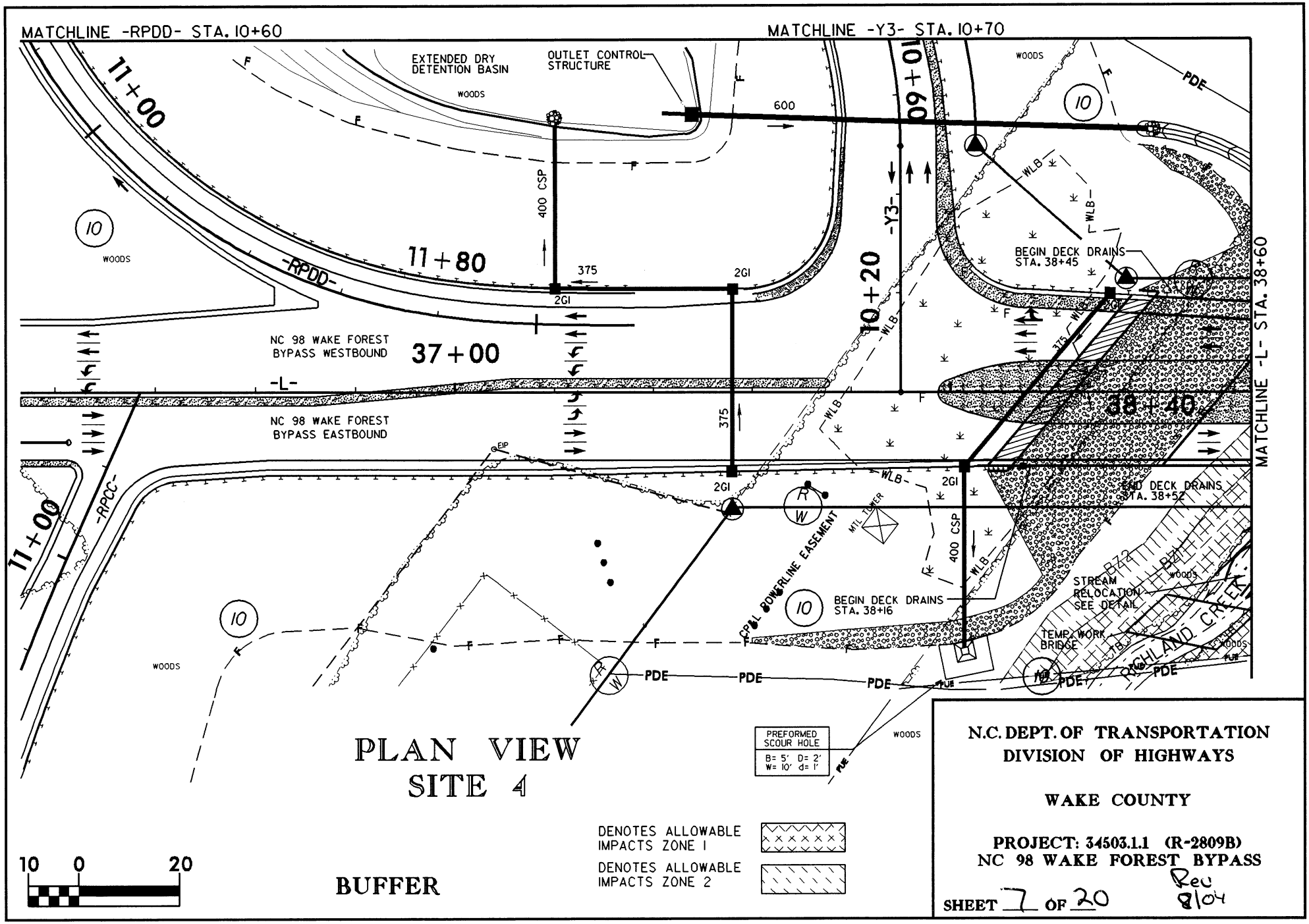
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 34503.1.1 (R-2809B)
NC 98 WAKE FOREST BYPASS

SHEET 6 OF 20

Rev 4/04



PLAN VIEW
SITE 4

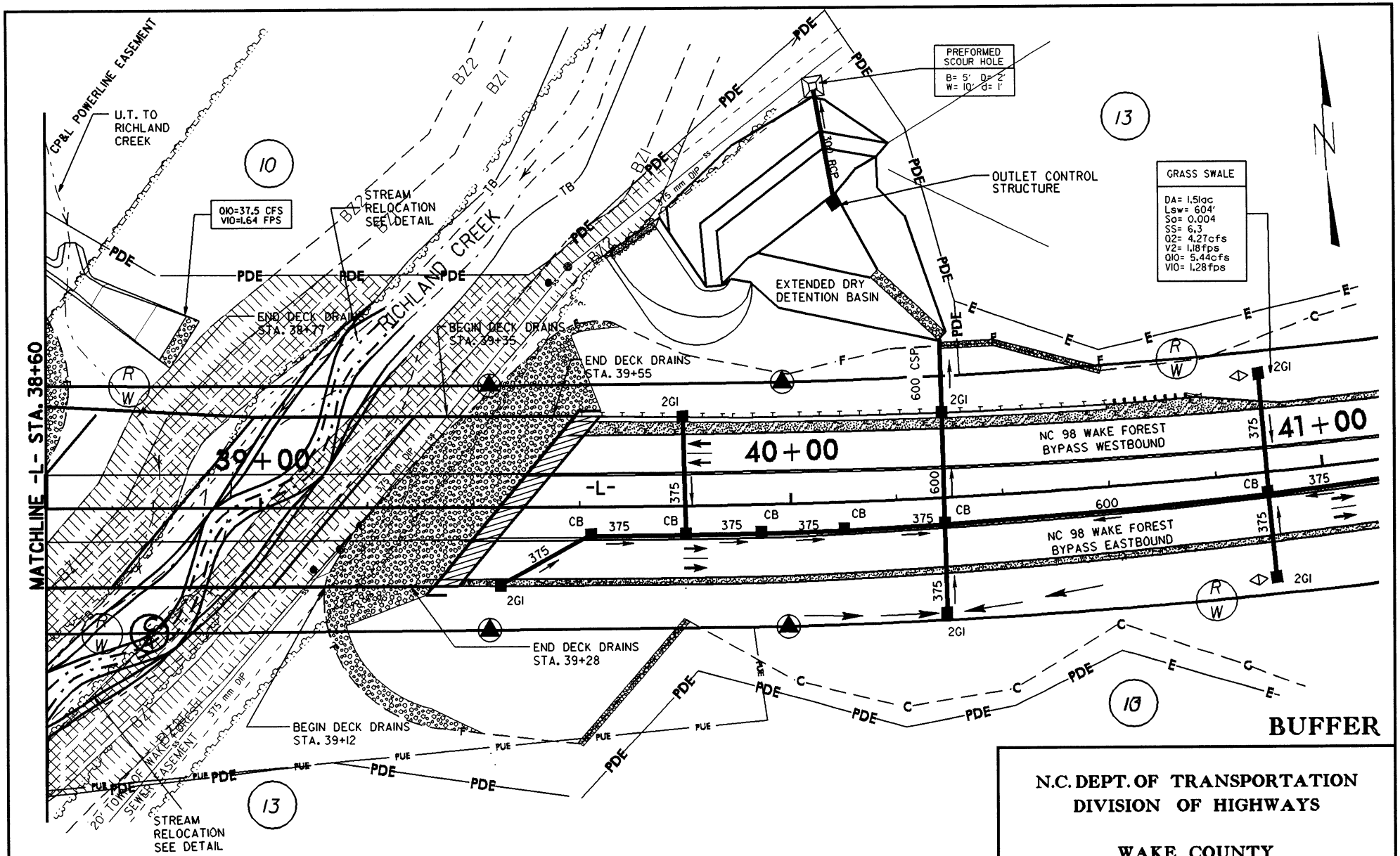
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 34503.1.1 (R-2809B)
NC 98 WAKE FOREST BYPASS

SHEET 7 OF 20

Rev 8/04



PLAN VIEW
SITE 4

10 0 20

DENOTES ALLOWABLE IMPACTS ZONE 1

DENOTES ALLOWABLE IMPACTS ZONE 2

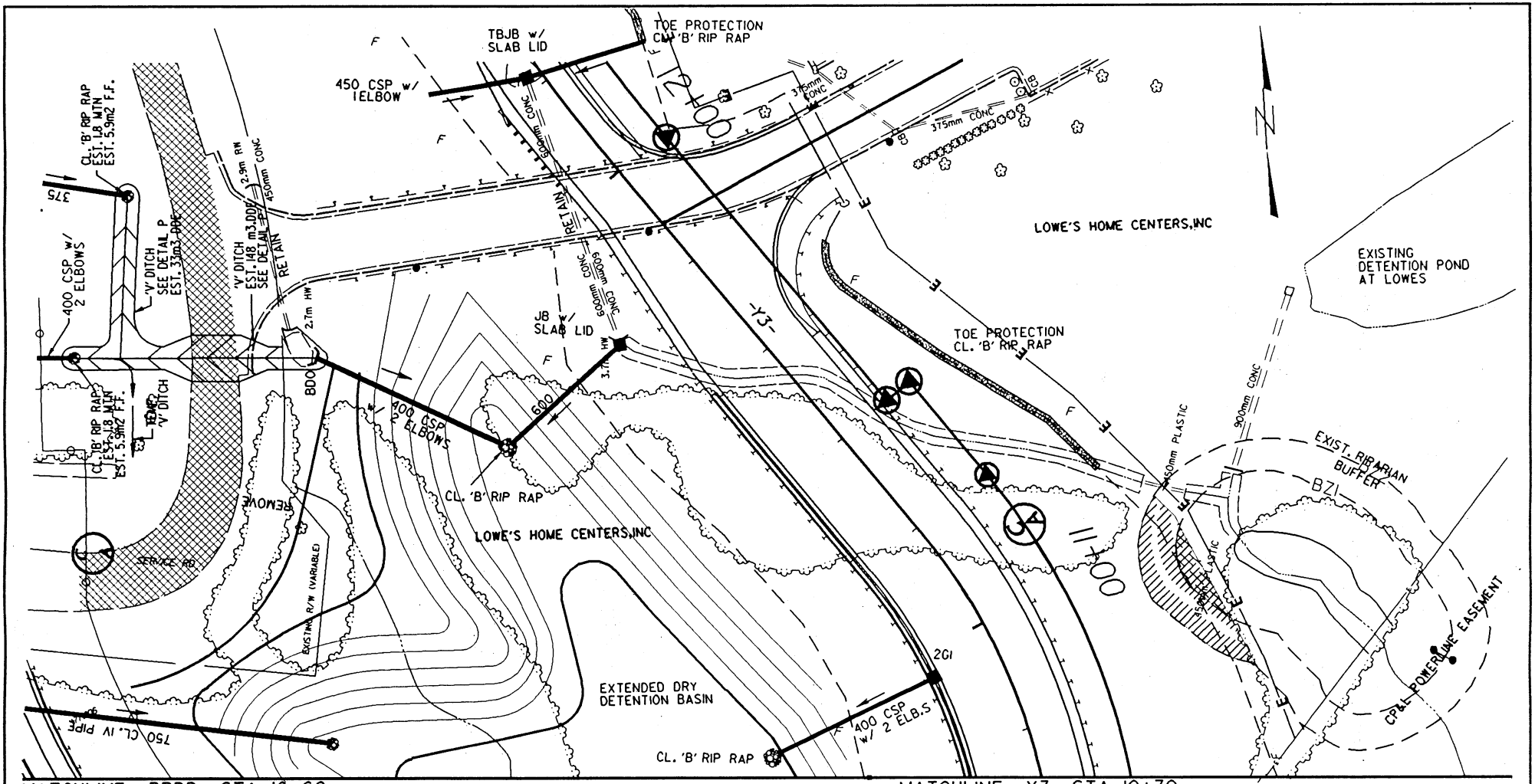
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

Rev 8/04

SHEET 8 OF 20



PLAN VIEW
SITE 4

10 0 20

BUFFER

DENOTES ALLOWABLE IMPACTS ZONE 1

DENOTES ALLOWABLE IMPACTS ZONE 2

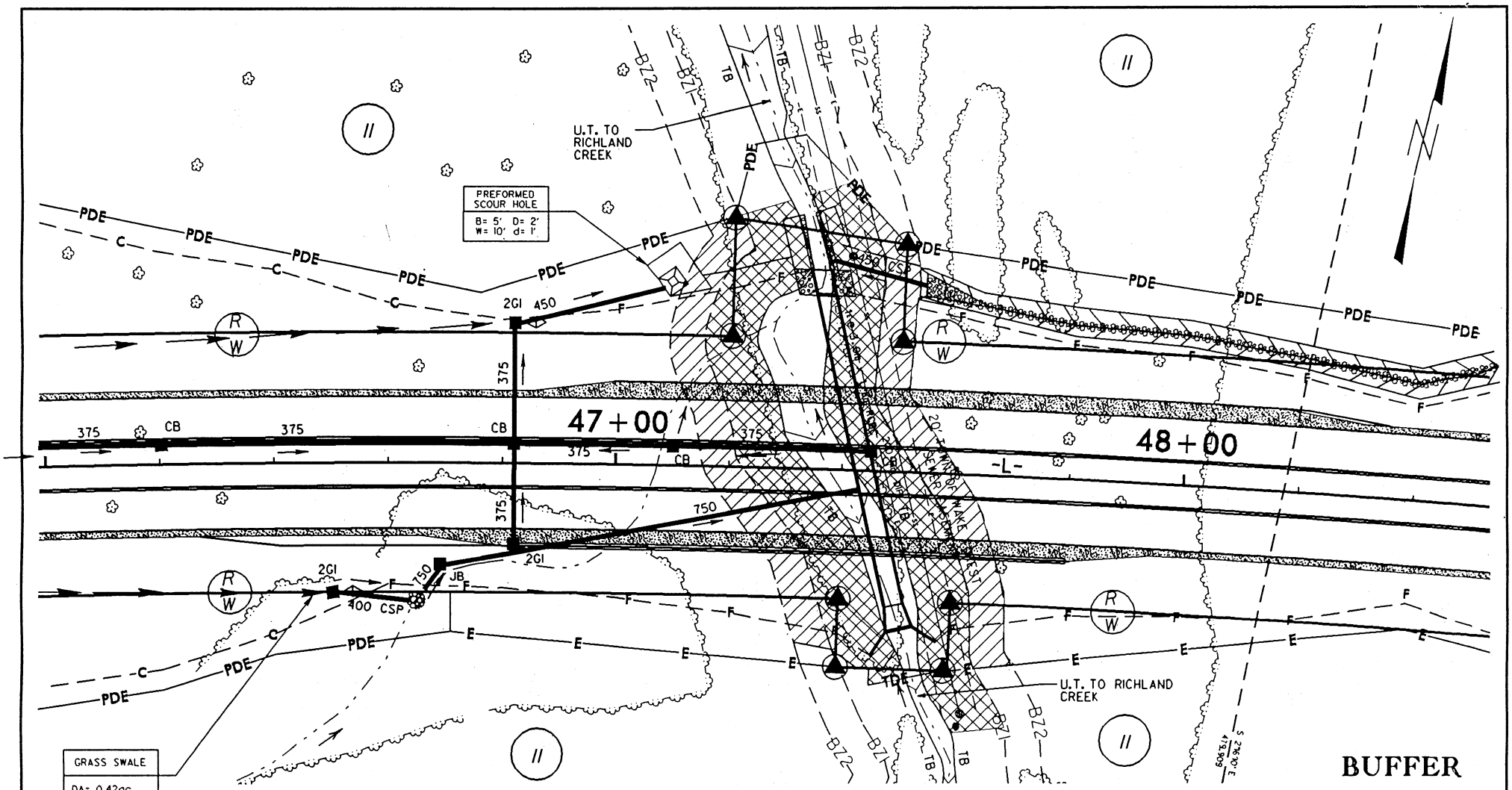
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 34503.1.1 (R-2809B)
NC 98 WAKE FOREST BYPASS

Revised 5/1/04

SHEET 9 OF 20



PLAN VIEW
SITE 5

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 34503.1.1 (R-2809B)
NC 98 WAKE FOREST BYPASS

Revised 4/04

SHEET 10 OF 20

Site No.	STRUCTURE (SIZE / TYPE)	STATION (FROM / TO)	IMPACT								BUFFER REPLACEMENT	
			TYPE		ALLOWABLE			MITIGABLE				
			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	2 @ 2.1m x 1.8m RCBC	-L- 31+96 / -Y2- 11+38	X	X	-	-	-	4105.0	2596.0	6701.0	459.8	370.1
2	-	-Y2- 10+42L / -Y2- 10+89L		X	-	-	-	873.0	431.0	1304.0	-	-
3	4 @ 3.0m x 3.3m RCBC	-Y1- 16+88L / -RPB- 11+01L	X		-	-	-	1452.0	354.9	1806.9	-	-
	2 @ 1800 Overflow Outlets	-Y1-16+98R / 17+70R		X				529.0	414.0	943.0		
4	-	-Y3- 10+77R / 11+05 R		X	42.0	188.0	230.0					
	4 @ 30m 1372mm PPC Bridge	-L- 38+24.5 / 39+44.5	X					2474.0	1843.0	4317.0	2474.0	1764.0
	Extended Dry Detention Basin	-L- 40+00 L		X		123.0	123.0					
5	1 @ 3.0m X 1.8m RCBC	-L- 47+09L / 47+70R	X		-	-	-	1806.0	1006.0	2812.0	-	-
TOTALS:					42.0	311.0	353.0	11239.0	6644.9	17883.9	2933.8	2134.1

N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

BUFFER IMPACT SUMMARY

Site No.	STRUCTURE (SIZE / TYPE)	STATION (FROM / TO)	IMPACT								BUFFER REPLACEMENT	
			TYPE		ALLOWABLE			MITIGABLE				
			ROAD CROSSING	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	2 @ 7' x 6'RCBC	-L- 31+96 / -Y2- 11+38	X	X	-	-	-	44185.0	27942.0	72127.0	4949.1	3983.6
2	-	-Y2- 10+42L / -Y2- 10+89L		X	-	-	-	9397.0	4639.0	14036.0	-	-
3	4 @ 10' x 11' RCBC	-Y1- 16+88L / -RPB- 11+01L	X		-	-	-	15629.0	3820.0	19449.0	-	-
	2 @ 72" Overflow Outlets	-Y1- 16+98R / 17+70R		X				5694.0	4456.0	10150.0		
4	-	-Y3- 10+77R / 11+05 R		X	452.0	2024.0	2476.0					
	4 @ 30m 1372mm PPC Bridge	-L- 38+24.5 / 39+44.5	X					26629.0	19837.0	46466.0	26629.0	18987.0
	Extended Dry Detention Basin	-L- 40+00 L		X		1324.0	1324.0					
5	1 @ 3.0m X 1.8m RCBC	-L- 47+09L / 47+70R	X		-	-	-	19439.0	10828.0	30267.0	-	-
TOTALS:					452	3348	3800	120973	71522	192495	31578	22971

N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

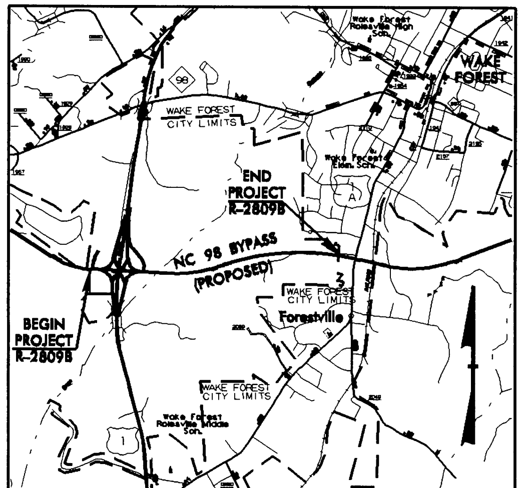
WAKE COUNTY

PROJECT 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS

TIP PROJECT: R-2809B

CONTRACT: C200778

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WAKE COUNTY

METRIC

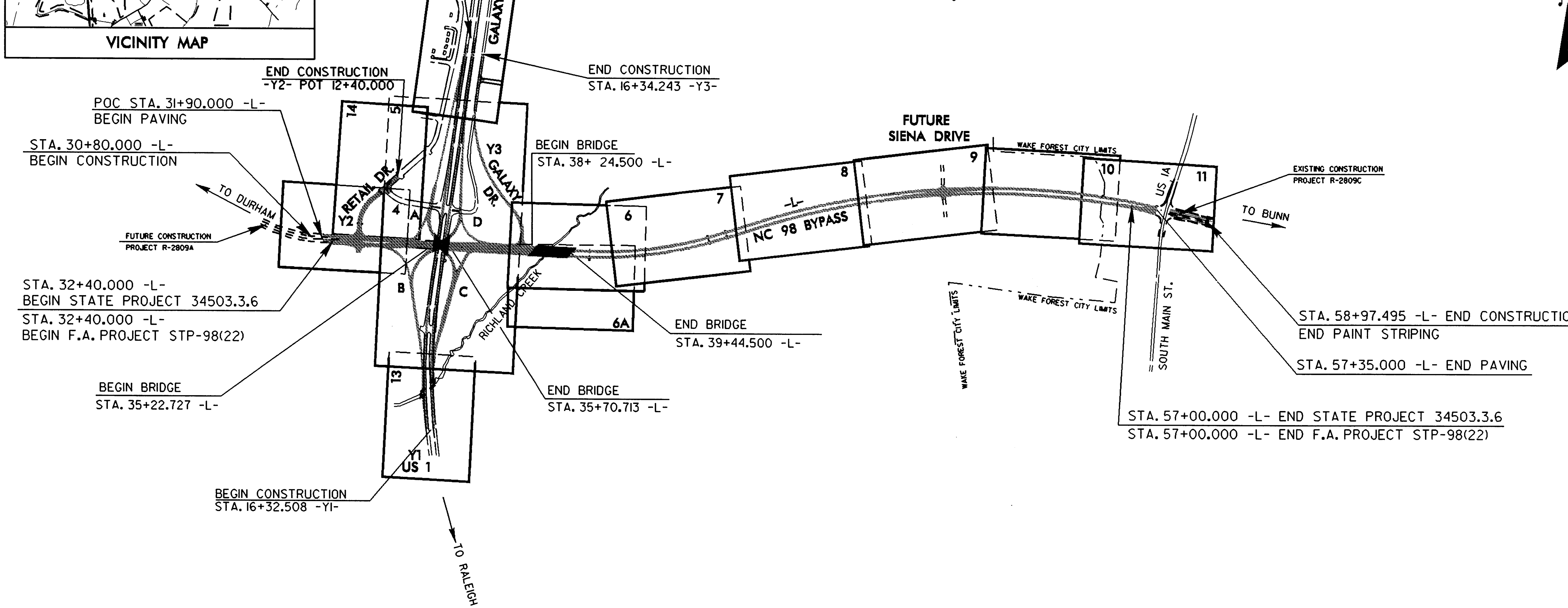
ALL DIMENSIONS IN THESE PLANS ARE IN METERS AND/OR MILLIMETERS UNLESS OTHERWISE SHOWN

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2809B	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34503.1.1	STP-98(1)	PE
34503.2.1	STP-98(3)	R/W & UTILITY
34503.3.6	STP-98(22)	CONSTRUCTION

LOCATION: NC 98, WAKE FOREST BYPASS FROM WEST OF US 1 TO WEST OF US 1A (SOUTH MAIN STREET)

TYPE OF WORK: WIDEING, DRAINAGE, GRADING, PAVING, SIGNALS, STRUCTURES, AND CULVERTS



NAD -83

THIS IS A PARTIAL CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITIED TO POINTS AS SHOWN ON THE PLANS.

GRAPHIC SCALES

PLANS (5 0 10)

PROFILE (HORIZONTAL) (5 0 10)

PROFILE (VERTICAL) (1 0 2)

DESIGN DATA

ADT 2003	=	23,795
ADT 2025	=	38,400
DHV	=	10%
D	=	65%
T	=	7% *
V	=	100 km/h

* (TTST 5 % & DUAL 2 %)

PROJECT LENGTH

LENGTH ROADWAY F. A. PROJECT STP-98(22) = 2.292 km

LENGTH STRUCTURE F. A. PROJECT STP-98(22) = 0.168 km

TOTAL LENGTH STATE PROJECT 34503.3.6 = 2.460 km

Prepared In the Office of:

DIVISION OF HIGHWAYS

1000 Birch Ridge Dr., NC, 27610

2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: OCTOBER 25, 2001

LETTING DATE: NOVEMBER 18, 2003

RONALD D. ALLEN, PE
PROJECT ENGINEER

PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

TRANSITE CONSULTING ENGINEERS, INC
1300 PADDOCK DR. STE. G-10
RALEIGH, NC 27609

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, ON AUGUST 25, 2003 P.E.

SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.

SIGNATURE:

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

P.E.

STATE DESIGN ENGINEER

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR DATE

9/09/99

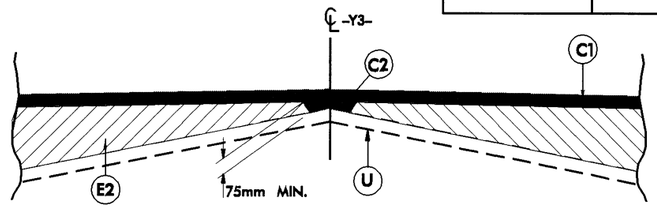
02-APR-2004 07:44

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

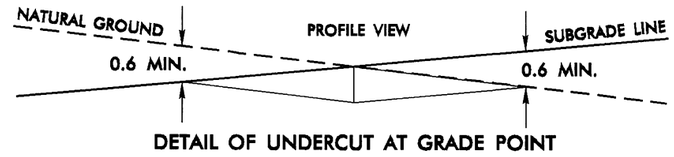
PAVEMENT SCHEDULE

C1	PROPOSED APPROX. 60 mm ASPHALT CONC. SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 72 kg PER SQ. METER IN EACH OF TWO LAYERS.
C2	PROPOSED VARIABLE DEPTH ASPHALT CONC. SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 2.40 kg PER SQ. METER PER 1 mm DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 25 mm OR GREATER THAN 40 mm. IN DEPTH.
C3	PROPOSED APPROX. 70 mm ASPHALT CONC. SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 84 kg PER SQ. METER IN EACH OF TWO LAYERS.
C4	PROPOSED APPROX. 40 mm ASPHALT CONC. SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 96 kg PER SQ. METER.
D1	PROPOSED APPROX. 60 mm ASPHALT CONC. BINDER COURSE, TYPE 119.0B, AT AN AVERAGE RATE OF 147 kg PER SQ. METER.
D2	PROPOSED APPROX. 80 mm ASPHALT CONC. BINDER COURSE, TYPE 119.0C, AT AN AVERAGE RATE OF 196 kg PER SQ. METER.
D3	PROPOSED APPROX. 110 mm ASPHALT CONC. BINDER COURSE, TYPE 119.0C, AT AN AVERAGE RATE OF 269.5 kg PER SQ. METER.
E1	PROPOSED APPROX. 200 mm ASPHALT CONC. BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 245 kg PER SQ. METER IN EACH OF TWO LAYERS.
E2	PROPOSED VARIABLE DEPTH ASPHALT CONC. BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 2.45 kg PER SQ. METER PER 1 mm DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 75 mm IN DEPTH OR GREATER THAN 140 mm IN DEPTH.
E3	PROPOSED APPROX. 100 mm ASPHALT CONC. BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 245 kg PER SQ. METER.
J1	PROPOSED 200 mm AGGREGATE BASE COURSE.
J2	PROPOSED 250 mm AGGREGATE BASE COURSE.
J3	PROPOSED 110 mm AGGREGATE BASE COURSE.
J4	PROPOSED VARIABLE DEPTH AGGREGATE BASE COURSE.
K	SUBBASE TO BE TREATED WITH LIME TO A DEPTH OF 200mm, AT A RATE OF 11 KG. PER SQ. METER, AS DIRECTED BY THE ENGINEER. OR SUBBASE TO BE TREATED WITH CEMENT TO A DEPTH OF 180mm, AT A RATE OF 30 KG. PER SQ. METER, AS DIRECTED BY THE ENGINEER. OR SUBBASE TO BE TREATED WITH AGGREGATE AT A RATE OF 135 KG.PER SQ.METER AND CEMENT AT A RATE OF 30 KG.PER SQ.METER TO A DEPTH OF 180mm, AS DIRECTED BY THE ENGINEER.
P	PRIME COAT
R1	450 mm CONCRETE CURB AND GUTTER.
R2	CONCRETE EXPRESSWDAY GUTTER.
R3	125 mm MONOLITHIC CONCRETE ISLAND.
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	INCIDENTAL MILLING ASPHALT PAVEMENT VARIABLE DEPTH.
W	VARIABLE DEPTH ASPHALT PAVEMENT. (SEE STANDARD WEDGING DETAIL)

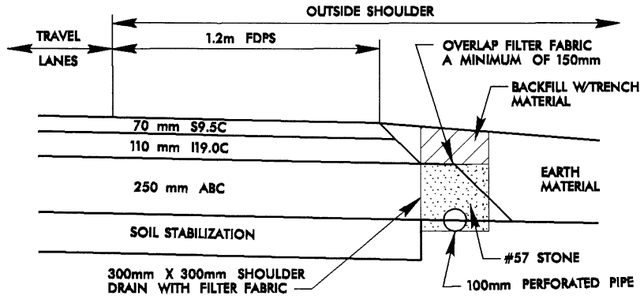
NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.



DETAIL SHOWING METHOD OF WEDGING NO. 1

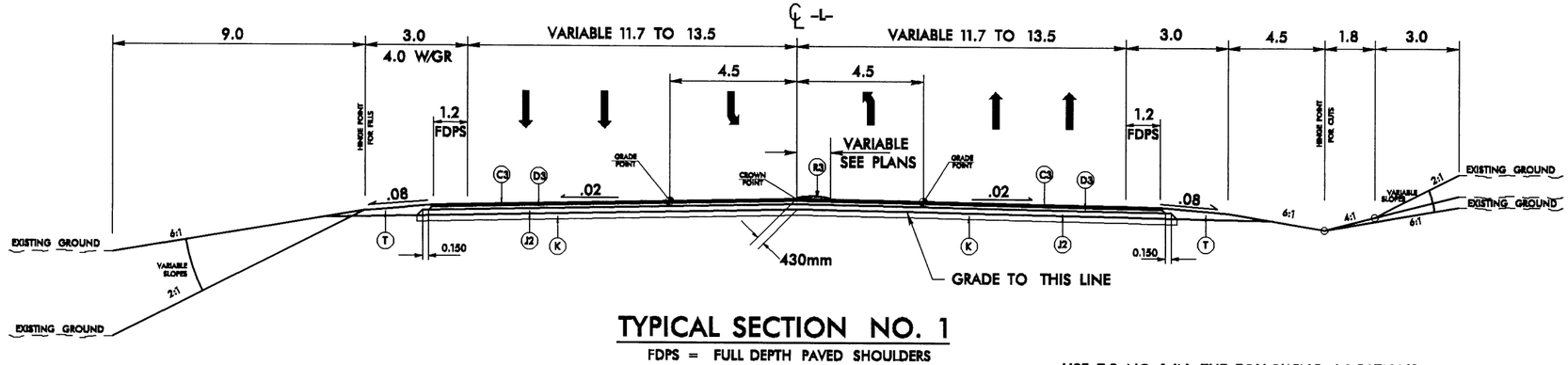


DETAIL OF UNDERCUT AT GRADE POINT



SHOULDER DRAIN DETAIL

NOTE : ALL OUTLET PIPES SHALL USE A 1 % GRADE
USE IN CONJUNCTION WITH TYPICAL SECTION NO.s 1 & 2

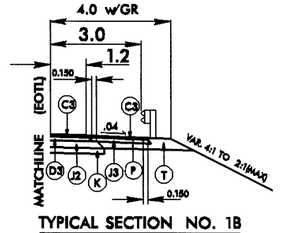


TYPICAL SECTION NO. 1

FDPS = FULL DEPTH PAVED SHOULDERS

USE T.S. NO. 1 IN THE FOLLOWING LOCATIONS:

-L- STA. 34+80.519 TO BEGIN BRIDGE STA. 35+22.727
-L- END BRIDGE STA. 35+70.713 TO BEGIN BRIDGE STA. 38+23.750



TYPICAL SECTION NO. 1B

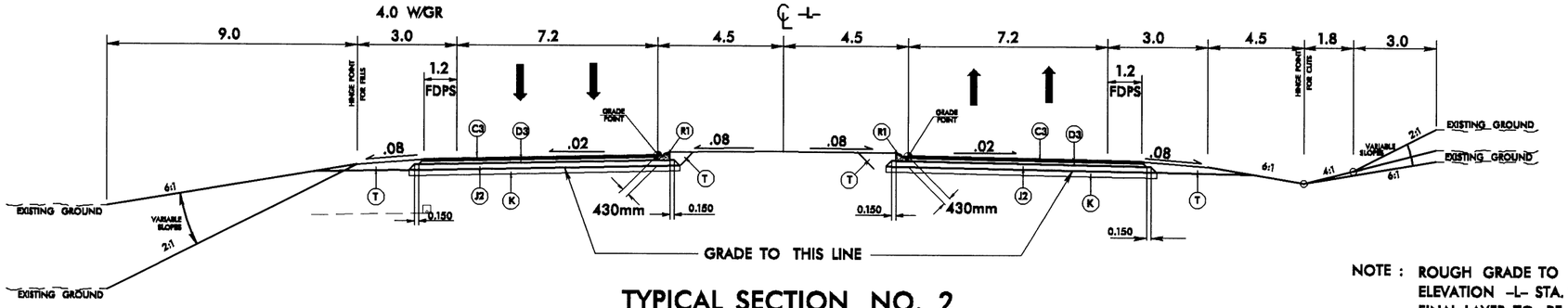
USE TYPICAL SECTION NO. 1B IN CONJUNCTION WITH TYPICAL SECTIONS NO. 1 & 2 AT GUARDRAIL LOCATIONS

CONST. REVISION : 2/20/04 R2 OF PAVEMENT SCHEDULE CONC. EXPRESSWAY GUTTER REVISED TO SHOULDER BERM GUTTER HLE

5/26/99

02-APR-2004 07:44
H:\Secure\Projects\2809b.dgn

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

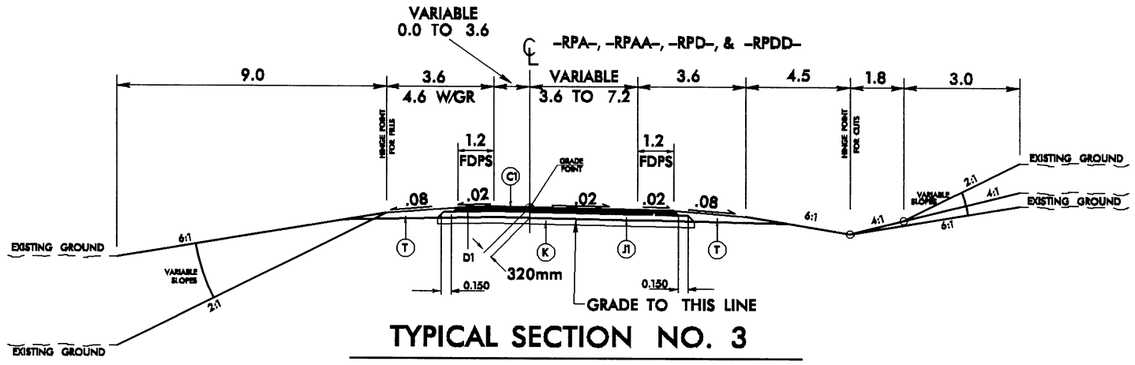


TYPICAL SECTION NO. 2

FDPS = FULL DEPTH PAVED SHOULDERS

USE T.S. NO. 2 IN THE FOLLOWING LOCATIONS:
–L– STA. 31+90.000 TO 34+80.519
–L– END BRIDGE STA. 39+45.250 TO 57+35.000

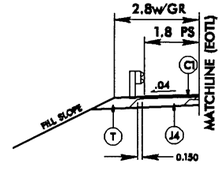
NOTE : ROUGH GRADE TO AN ELEVATION 125mm ABOVE PROPOSED SUBGRADE ELEVATION –L– STA. 31+00.000 TO STA. 31+90.000
FINAL LAYER TO BE PLACE UNDER R-2809A CONTRACT –L– STA. 31+90.000 TO STA. 32+80.000
USE DITCH DETAIL Q IN CONJUNCTION WITH TYPICAL SECTION NO. 2
–L– LT. STA. 45+30 TO STA. 45+80 & –L– RT. STA. 45+90 TO STA. 46+50



TYPICAL SECTION NO. 3

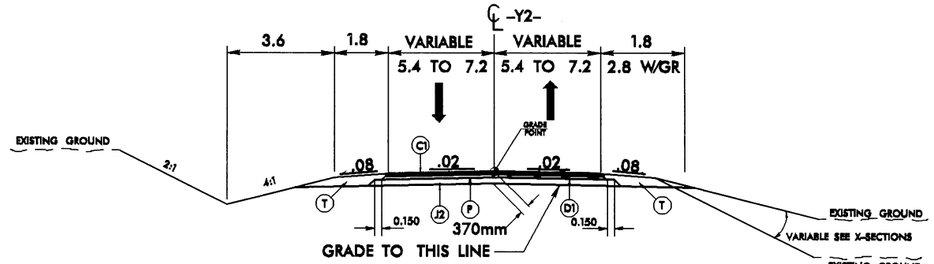
FDPS = FULL DEPTH PAVED SHOULDERS

USE T.S. NO. 3 IN THE FOLLOWING LOCATIONS:
–RPA– STA. 10+00.000 TO 15+43.699
–RPAA– STA. 10+00.000 TO 11+65.618
(REVERSE) –RPD– STA. 10+00.000 TO 14+53.723
(REVERSE) –RPDD– STA. 10+39.450 TO 11+89.010



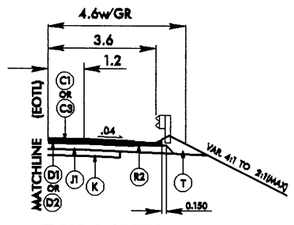
TYPICAL SECTION NO. 4A

USE TYPICAL SECTION NO. 4A IN CONJUNCTION WITH TYPICAL SECTIONS NO. 4 & 7 AT GUARDRAIL LOCATIONS



TYPICAL SECTION NO. 4

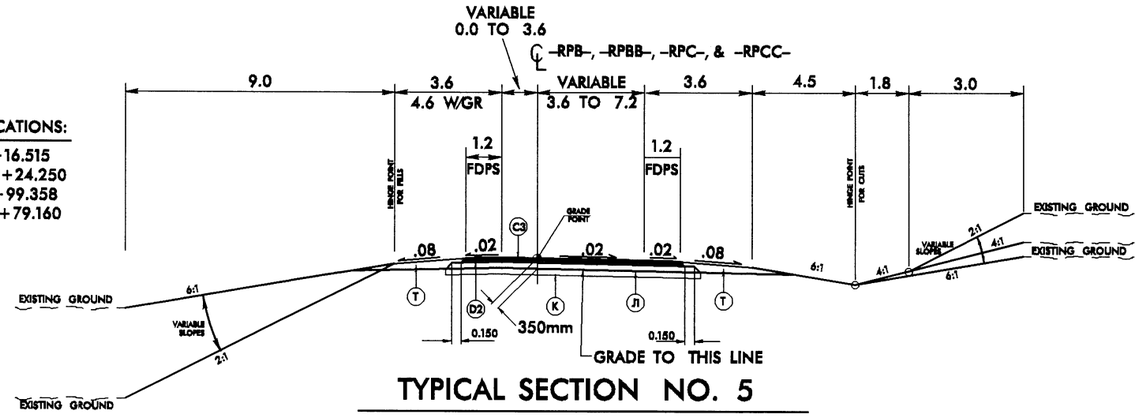
USE T.S. NO. 4 IN THE FOLLOWING LOCATIONS:
–Y2– STA. 10+11.940 TO 11+71.100
NOTE: MINIMUM RESURFACING –Y2– STA. 11+71.100 TO 12+40.000
NOTE: USE DITCH DETAIL F IN CONJUNCTION WITH TS NO.4
–Y2– STA. 11+50 TO STA. 11+60 RT.



TYPICAL SECTION NO. 3A

USE TYPICAL SECTION NO. 3A IN CONJUNCTION WITH TYPICAL SECTIONS NO. 3 & 5 AT GUARDRAIL LOCATIONS

USE T.S. NO. 5 IN THE FOLLOWING LOCATIONS:
(REVERSE) –RPB– STA. 10+00.000 TO 14+16.515
(REVERSE) –RPBB– STA. 10+49.760 TO 12+24.250
–RPC– STA. 10+00.000 TO 13+99.358
–RPCC– STA. 10+00.000 TO 11+79.160



TYPICAL SECTION NO. 5

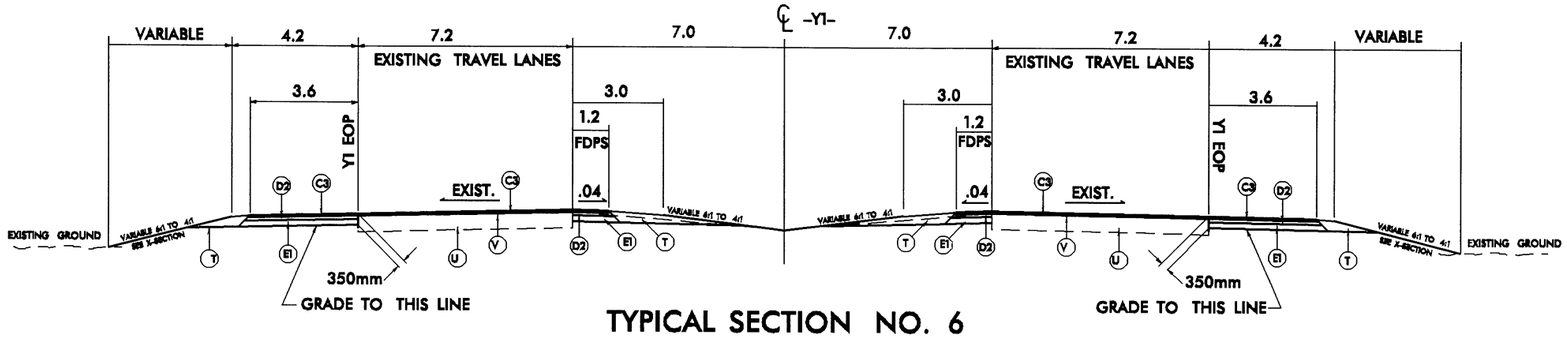
FDPS = FULL DEPTH PAVED SHOULDERS

C1	60mm S9.5B
C2	VARIABLE S9.5B
C3	70mm S9.5C
C4	40mm S9.5B
D1	60mm 119.0B
D2	80mm 119.0C
D3	110mm 119.0C
E1	200mm B25.0C
E2	VARIABLE B25.0C
E3	100mm B25.0B
J1	200mm ABC
J2	250mm ABC
J3	110mm ABC
J4	VARIABLE ABC
K	LIME OR CEMENT OR AGGREGATE STAB.
P	PRIME COAT
R1	450 CONC. CURB
R2	EXPRESSWAY GUTTER
R3	125mm MONO. ISLAND
T	EARTH MAT.
U	EXISTING
V	MILLING
W	WEDGING

CONST. REVISION : 2/20/04 CONC. T.S. NO. 3A EXPRESSWAY GUTTER
REVISED TO SHOULDER BERM GUTTER HLE

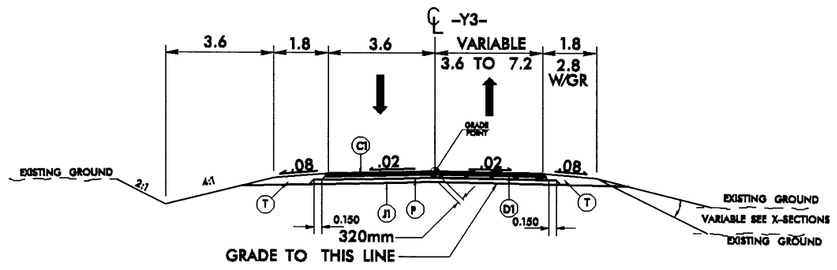
02-APR-2004 07:44

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



TYPICAL SECTION NO. 6

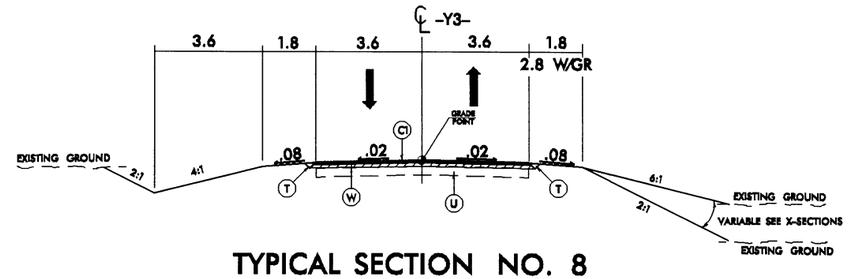
USE T.S. NO. 6 IN THE FOLLOWING LOCATIONS:
-Y1- STA. 16+32 +/- TO 28+32 +/-



TYPICAL SECTION NO. 7

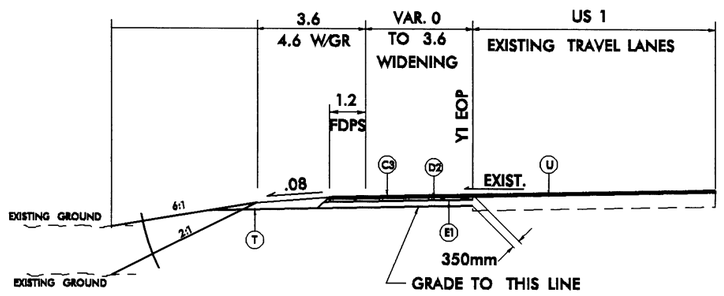
USE T.S. NO. 7 IN THE FOLLOWING LOCATIONS:
-Y3- STA. 10+16.990 TO 15+40.000

NOTE: USE DITCH DETAIL F IN CONJUNCTION WITH T.S. NO.S 7 & 8 -Y3- STA. 14+00 TO 15+43 RT. USE T.S. NO. 4A IN CONJUNCTION T.S. NO. 7 AT GUARDRAIL LOCATIONS



TYPICAL SECTION NO. 8

USE T.S. NO. 8 IN THE FOLLOWING LOCATIONS:
-Y3- STA. 15+40.000 TO 16+34.243

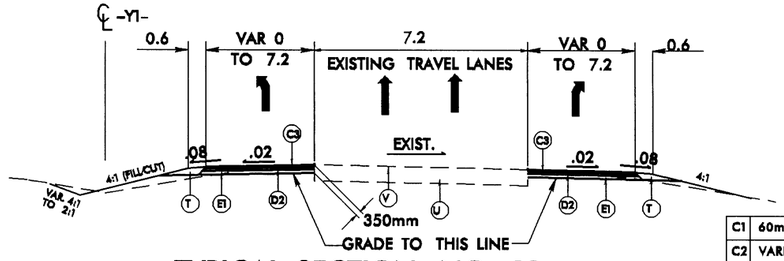


TYPICAL SECTION NO. 9

FDPS = FULL DEPTH PAVED SHOULDERS

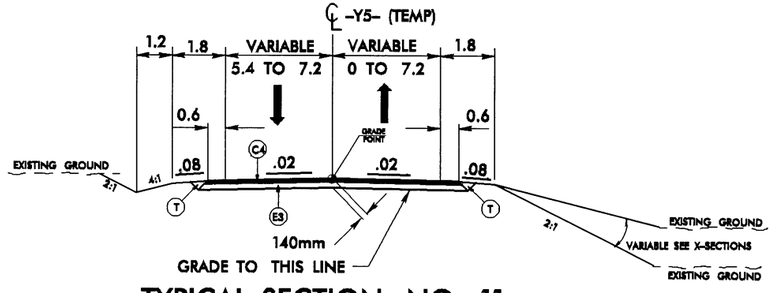
USE T.S. NO. 9 IN CONJUNCTION WITH T.S. NO.S 3 & 6:
LT. -Y1- STA. 16+23.559 TO 17+82.508
(REVERSE) RT. -Y1- STA. 27+60.000 TO 28+11.528
LT. -Y1- STA. 16+90.343 TO 17+80.350
(REVERSE) RT. -Y1- STA. 26+82.111 TO 28+32.111

NOTE: STATION RANGES INCLUDE TAPERS



TYPICAL SECTION NO. 10

USE T.S. NO. 10 IN THE FOLLOWING LOCATIONS:
-Y1- STA. 20+81 TO 21+47 (NBL MED.)
-Y1- STA. 24+57 TO 25+60 (NBL MED.)
-Y1- STA. 25+90 TO 27+50 (SBL MED.)
-Y1- STA. 25+92 TO 26+37 (SBL OUTSIDE)



TYPICAL SECTION NO. 11

SEE TRAFFIC CONTROL PLANS TCP-13 & 2-V

USE T.S. NO. 11 IN THE FOLLOWING LOCATIONS:
-Y5- STA. 10+64.044 TO 11+01.402
-Y5- STA. 11+08.643 TO 11+22.630
-Y5- STA. 11+36.904 TO 11+54.497
-Y5- STA. 11+65.620 TO 11+84.147 (WIDENING RT. SIDE ONLY)

C1	60mm S9.5B
C2	VARIABLE S9.5B
C3	70mm S9.5C
C4	40mm S9.5B
D1	60mm I19.0B
D2	80mm I19.0C
D3	110mm I19.0C
E1	200mm B25.0C
E2	VARIABLE B25.0C
E3	100mm B25.0B
J1	200mm ABC
J2	250mm ABC
J3	110mm ABC
J4	VARIABLE ABC
K	LIME OR CEMENT OR AGGREGATE STAB.
P	PRIME COAT
R1	450 CONC. CURB
R2	EXPRESSWAY GUTTER
R3	125mm MONO. ISLAND
T	EARTH MAT.
U	EXISTING
V	MILLING
W	WEDGING

6/16/22
02-APR-2004 07:44
HEdwards

CURVE DATA SHEET

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	2-C

ROADWAY DESIGN ENGINEER

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 15356 ON AUGUST 22, 2003

-L-

PIs Sta 29+80.149
Es = 4° 38' 30.1"
Ls = 64.000
LT = 42.681
ST = 21.347

PI Sta 30+72.330
Δ = 20° 20' 27.8" (LT)
L = 140.232
T = 70.862
R = 395.000
SE = SEE PLANS
V = 100 km/h

PIs Sta 31+63.047
Es = 4° 38' 30.1"
Ls = 64.000
LT = 42.681
ST = 21.347

PIs Sta 39+80.278
Es = 1° 22' 37.4"
Ls = 56.000
LT = 37.334
ST = 18.668

PI Sta 41+80.849
Δ = 17° 44' 57.4" (LT)
L = 360.898
T = 181.906
R = 1165.000
SE = SEE PLANS
V = 100 km/h

PIs Sta 43+78.509
Es = 1° 22' 37.4"
Ls = 56.000
LT = 37.334
ST = 18.668

PI Sta 51+49.627
Δ = 30° 16' 49.1" (RT)
L = 1231.384
T = 630.434
R = 2330.000
SE = SEE PLANS
V = 100 km/h

-Y1-

PI Sta 16+96.995
Δ = 21° 27' 04.2" (RT)
L = 655.189
T = 331.475
R = 1750.000
SE = SEE PLANS

PIs Sta 20+40.708
Es = 0° 58' 56.0"
Ls = 60.000
LT = 40.001
ST = 20.001

-RPA-

PIs Sta 14+81.874
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

PI Sta 15+58.228
Δ = 67° 13' 28.7" (LT)
L = 105.596
T = 59.824
R = 90.000
SE = SEE PLANS
V = 50 km/h

PIs Sta 16+20.791
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

-RPAA-

PIs Sta 10+48.900
Es = 4° 20' 26.1"
Ls = 50.000
LT = 33.343
ST = 16.676

PI Sta 11+13.710
Δ = 16° 36' 13.6" (RT)
L = 95.631
T = 48.153
R = 330.000
SE = SEE PLANS
V = 50 km/h

-RPB-

PIs Sta 10+27.308
Es = 0° 48' 42.5"
Es = 1° 25' 56.7"
Ls = 50.000
LT = 27.308
ST = 22.699

PI Sta 10+85.364
Δ = 4° 03' 02.8" (LT)
L = 70.699
T = 35.364
R = 1,000.000
SE = SEE PLANS
V = 100 km/h

PIs Sta 11+37.367
Es = 1° 25' 56.6"
Ls = 50.000
LT = 33.334
ST = 16.668

PIs Sta 12+92.240
Es = 13° 01' 18.4"
Ls = 50.000
LT = 33.424
ST = 16.749

PI Sta 13+93.848
Δ = 75° 24' 33.2" (RT)
L = 144.775
T = 85.032
R = 110.000
SE = SEE PLANS
V = 50 km/h

PIs Sta 14+70.340
Es = 13° 01' 18.4"
Ls = 50.000
LT = 33.424
ST = 16.749

-RPBB-

PIs Sta 11+91.040
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

PI Sta 11+39.737
Δ = 46° 42' 58.6" (LT)
L = 73.382
T = 38.868
R = 90.000
SE = SEE PLANS
V = 50 km/h

PIs Sta 10+84.337
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

-RPC-

PIs Sta 10+33.338
Es = 2° 51' 53.2"
Ls = 50.000
LT = 33.338
ST = 16.671

PI Sta 10+88.964
Δ = 8° 54' 42.8" (RT)
L = 77.771
T = 38.964
R = 500.000
SE = SEE PLANS
V = 100 km/h

PIs Sta 11+44.442
Es = 2° 51' 53.2"
Ls = 50.000
LT = 33.338
ST = 16.671

PIs Sta 13+24.887
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

PI Sta 14+04.922
Δ = 70° 24' 49.0" (LT)
L = 110.605
T = 63.504
R = 90.000
SE = SEE PLANS
V = 50 km/h

PIs Sta 14+68.813
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

-RPCC-

PI Sta 10+50.573
Δ = 11° 33' 03.9" (RT)
L = 100.802
T = 50.573
R = 500.000
SE = 0.03
V = 50 km/h

-RPD-

PI Sta 11+43.200
Δ = 6° 33' 23.9" (LT)
L = 286.088
T = 143.200
R = 2,500.000
SE = SEE PLANS
V = 100 km/h

PIs Sta 13+95.573
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

PI Sta 14+63.720
Δ = 59° 40' 12.1" (RT)
L = 93.729
T = 51.617
R = 90.000
SE = SEE PLANS
V = 50 km/h

PIs Sta 15+22.623
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

-RPDD-

PIs Sta 10+33.469
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

PI Sta 10+98.529
Δ = 56° 40' 04.8" (LT)
L = 89.014
T = 48.529
R = 90.000
SE = SEE PLANS
V = 50 km/h

PIs Sta 11+55.804
Es = 15° 54' 55.8"
Ls = 50.000
LT = 33.469
ST = 16.790

-Y2-

PI Sta 10+93.797
Δ = 44° 44' 04.4" (RT)
L = 78.077
T = 41.150
R = 100.000
SE = SEE PLANS
V = 30 km/h

-Y5-

PI Sta 11+97.785
Δ = 56° 13' 02.4" (LT)
L = 167.428
T = 91.146
R = 170.640

-Y3-

PI Sta 10+85.954
Δ = 39° 50' 27.1" (LT)
L = 69.535
T = 36.240
R = 100.000
SE = SEE PLANS
V = 30 km/h

PI Sta 13+56.260
Δ = 44° 53' 57.5" (RT)
L = 297.784
T = 157.010
R = 380.000
SE = SEE PLANS
V = 60 km/h

2/20/04 CONST. REVISION ; REVISED CURVE DATA FOR -RPAA- HLE

02-APR-2004 07:44
MEdwards

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	2-D
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

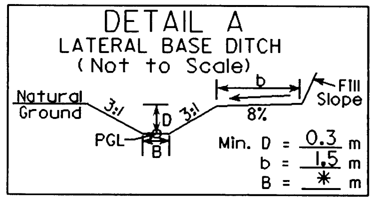
METRIC

CONST.REV. 2/20/04

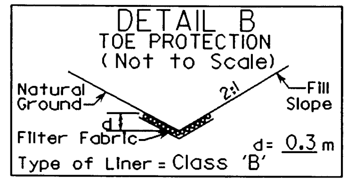
R/W REV.

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003

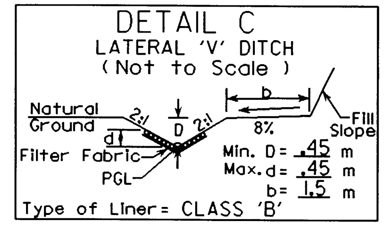
CONST.REVISION 2/20/04 : ADDED DITCH DETAIL Y FOR INLET & OULET END OF CULVERT CHANNELS.
REVISED USAGE FOR DETAIL E hle 2/18/04



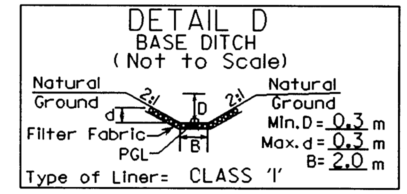
-L- 31+92 to 32+29 LT
* VARIES 0.9m to 9.0m



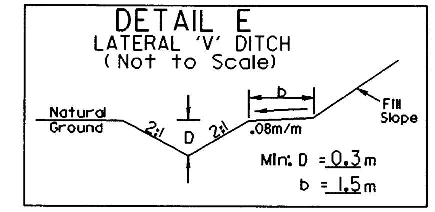
-L- 32+20 to 32+80 RT
-L- 33+08 to 33+20 RT
-L- 39+60 to 39+80 RT
-L- 40+30 to 40+60 LT
-L- 49+60 to 50+40 LT
-L- 32+30 to 32+46 LT



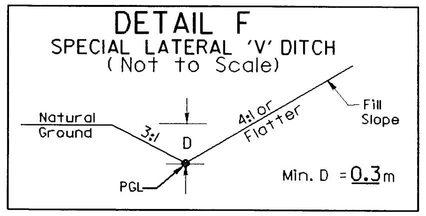
-Y3- 12+00 to 12+85 LT



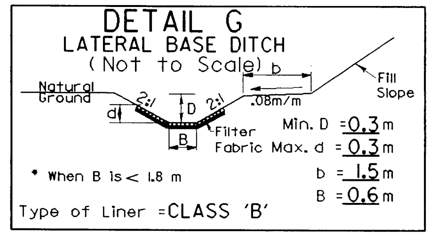
-L- 40+17 to 40+28 LT



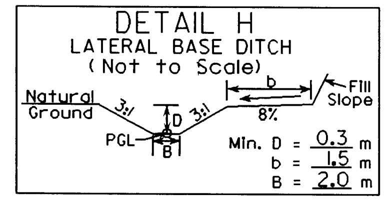
-L- 34+10 to 34+50 LT
-RPA- 12+20 to 14+70 RT
-RPAA- 10+70 to 11+55 RT
-Y3- 12+85 to 13+40 LT



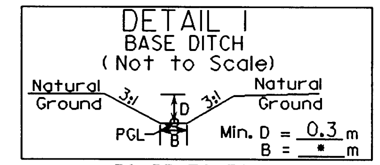
-Y1- 22+80 to 23+40 LT
(SEE X-SECTION SHEETS X-50 & X-51 FOR ELEVATIONS)
-Y2- 10+50 to 11+60 RT
-Y3- 14+00 to 15+43 RT



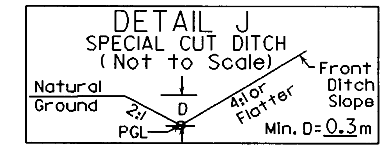
-Y3- 11+00 to 13+20 RT



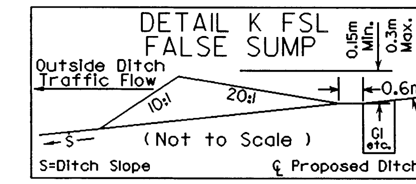
-RPB- 10+50 to 11+60 LT



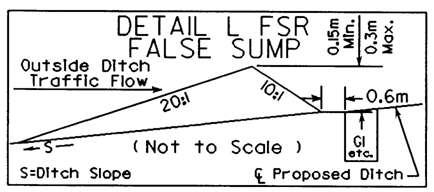
-L- 38+55 TO 38+84 LT
* w= 0.9m TO 10.0m



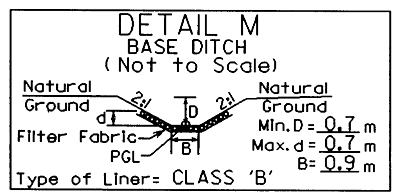
-L- 40+00 to 40+60 RT
-L- 43+40 to 43+60 RT
-L- 45+80 to 46+81 LT
-RPBB- 10+09 to 11+20 LT
-Y3- 13+20 to 13+50 RT
-Y1- 21+00 to 21+35 RT
(SEE X-SECTION SHEET X-65 FOR ELEVATIONS)



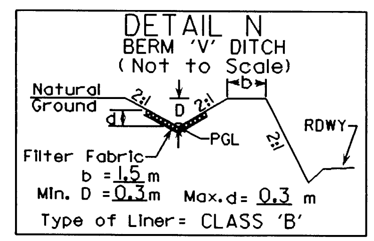
-L- 40+90 LT
-L- 42+74 LT
-L- 44+10 LT
-L- 46+80 LT
-L- 48+60 LT
-L- 51+20 LT
-L- 53+20 LT
-RPD- 13+10 LT
-Y1- 20+00 LT
-Y1- 22+92 LT



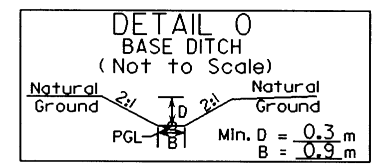
-L- 40+90 RT
-L- 42+74 RT
-L- 46+50 RT
-L- 48+60 RT
-L- 49+27 RT
-L- 49+64 RT
-L- 51+20 RT
-RPA- 11+66 RT
-RPB- 11+80 LT
-RPBB- 11+00 LT
-Y1- 26+15 RT
-Y1- 22+89 RT



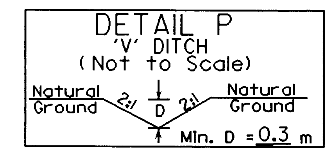
-L- 43+60 RT



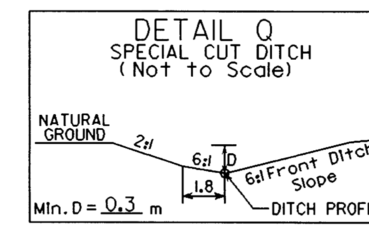
-L- 43+60 to 44+00 RT



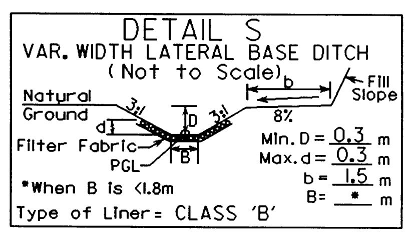
-L- 43+85 LT
-L- 38+40 TO 38+55 LT



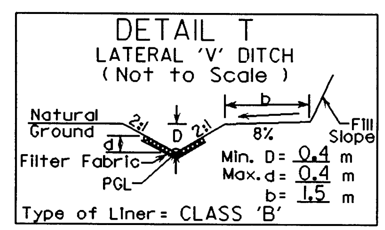
-L- 44+05 LT
-L- 53+23 RT
-RPD- 13+40 LT
-RPD- 13+10 to 13+40 LT
-RPD- 13+24 to 13+40 LT



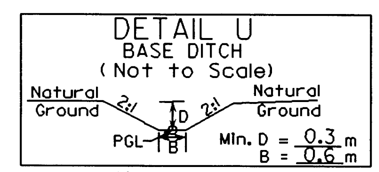
-L- 45+30 to 45+80 LT
-L- 45+90 to 46+50 RT



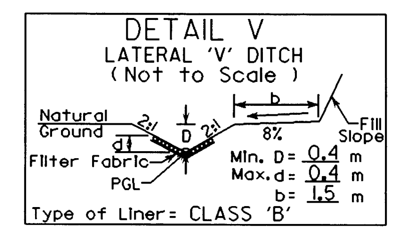
-L- 47+53 to 47+65 LT (*B=0 to 3.0)



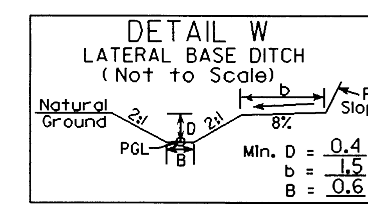
-L- 47+65 to 48+53 LT



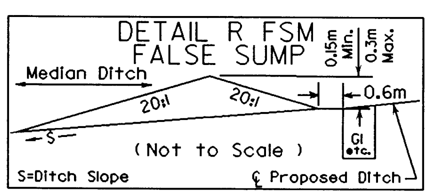
-L- 49+50 to 49+58 LT



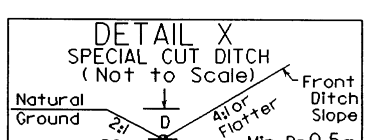
-L- 55+10 to 57+40 LT



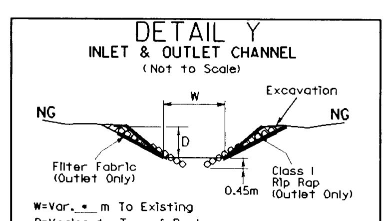
-L- 54+60 to 55+20 RT



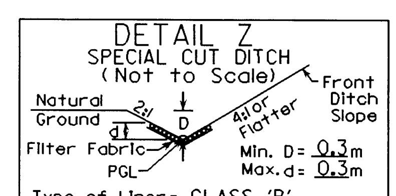
-Y1- 19+93 MED
-Y1- 22+86 MED



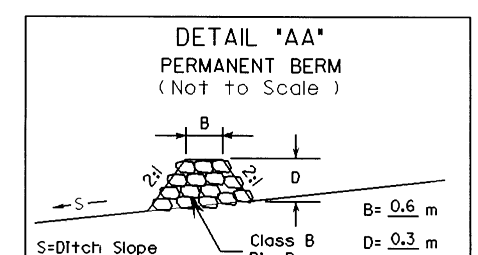
-L- 43+60 to 44+60 RT



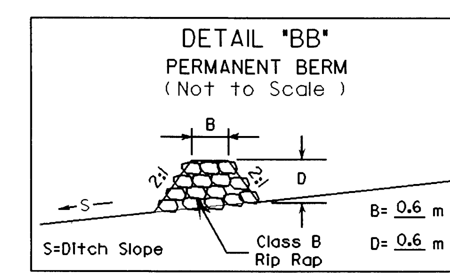
* = 2.1m @ RCBC Sta 32+35 -L-
* = 12.8m @ RCBC Sta 17+59.78 -Y1-
* = 3.0m @ RCBC Sta 47+44.3 -L-



-L- 55+20 to 55+60 RT
-L- 53+24 to 53+80 RT



-L- 32+04 LT EST 4 TONS
-L- 32+18 LT EST 4 TONS
-RPB- 10+60 LT EST 2 TONS
-RPB- 10+70 LT EST 2 TONS
-RPB- 10+80 LT EST 2 TONS
-RPB- 10+90 LT EST 2 TONS



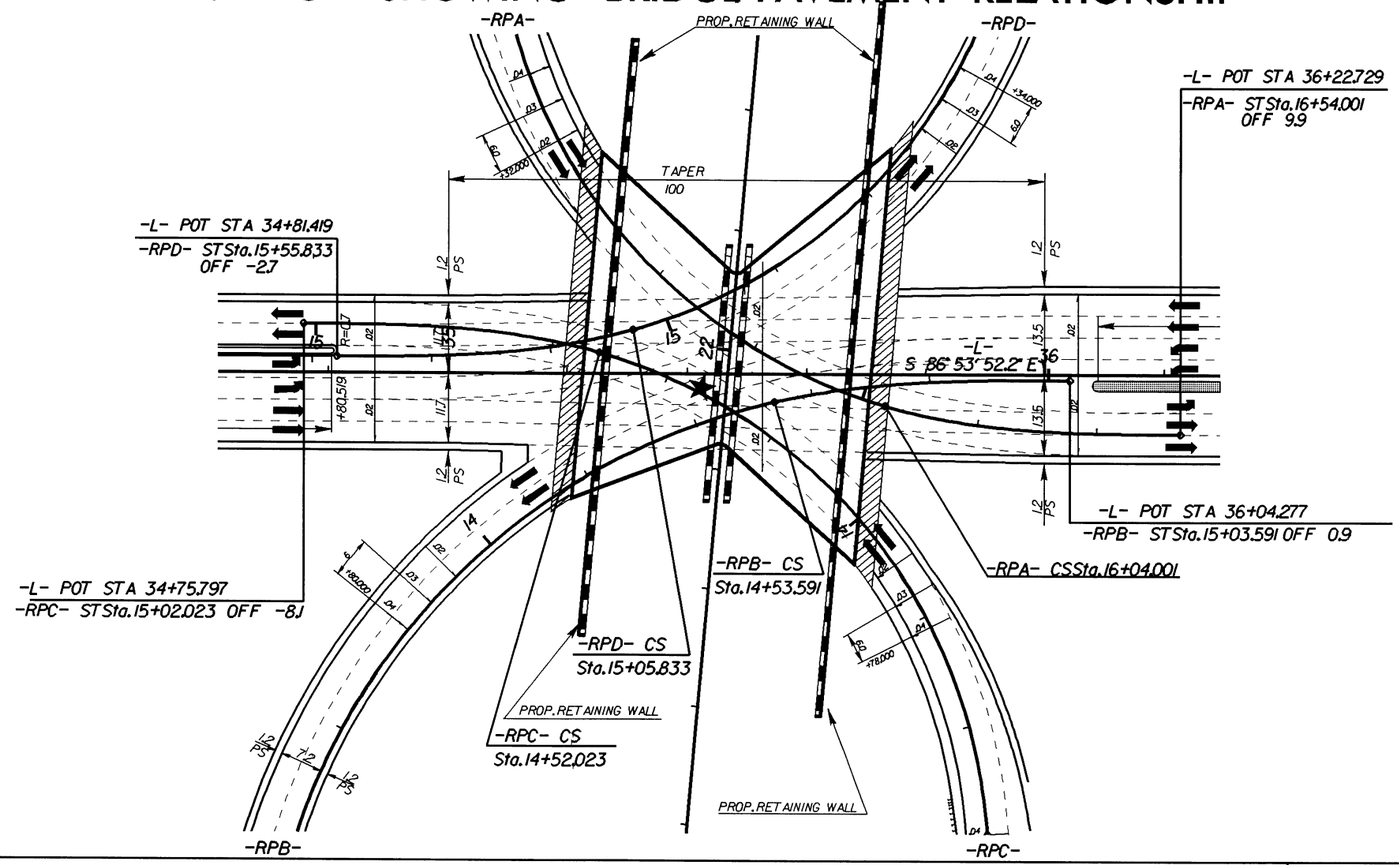
-RPB- 11+00 LT EST 11 TONS
-RPB- 11+20 LT EST 13 TONS
-RPB- 11+40 LT EST 16 TONS

REVISIONS

CONST. REVISION : REVISED SKETCH OF BRIDGE/PAVEMENT RELATIONSHIP FOR -L- & -Y1- TO MATCH STR.PLANS HLE 12/5/03

8/11/03

SKETCH SHOWING BRIDGE/PAVEMENT RELATIONSHIP



METRIC

5 0 10

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	2-E
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER	ROADWAY DESIGN REVISIONS
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 15356 ON AUGUST 22, 2003	

CONST. REV.

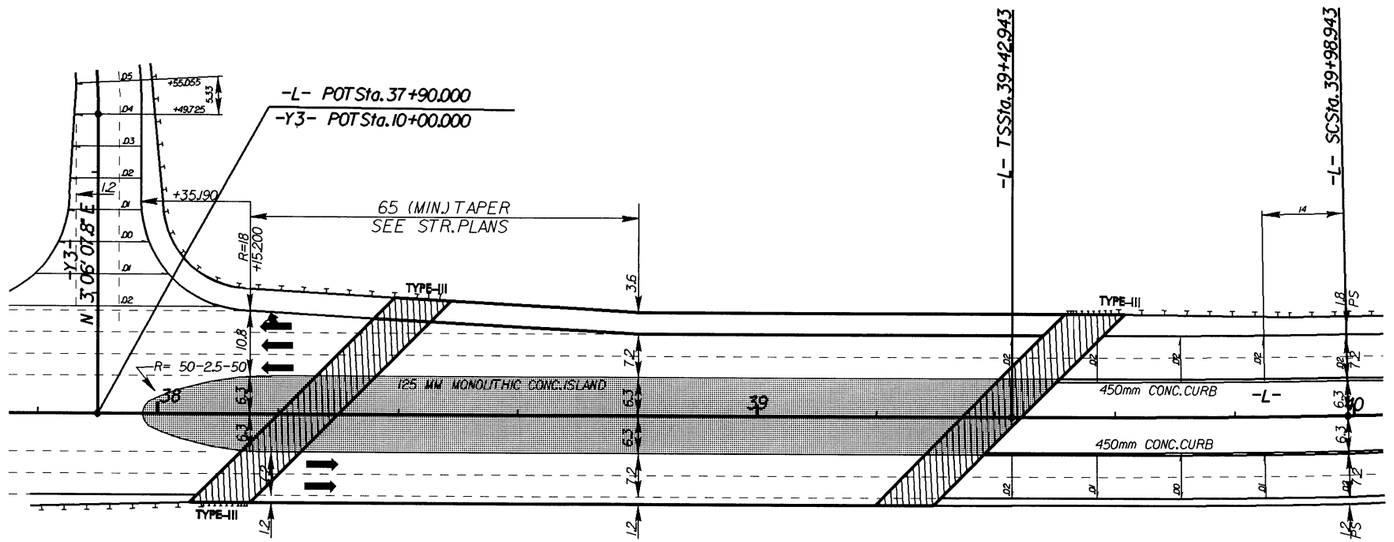
R/W REV.

-L- OVER US-1

SEE PLAN SHEET 5

SKETCH SHOWING BRIDGE/PAVEMENT RELATIONSHIP

-L- OVER RICHLAND CREEK



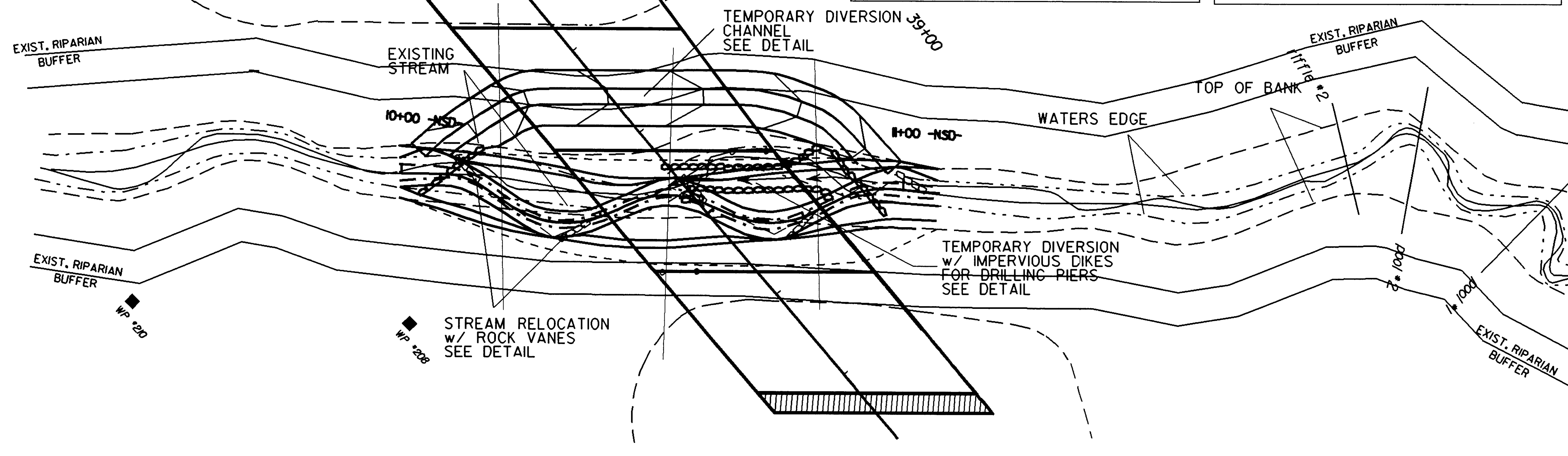
SEE PLAN SHEET 6

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	2-Z
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

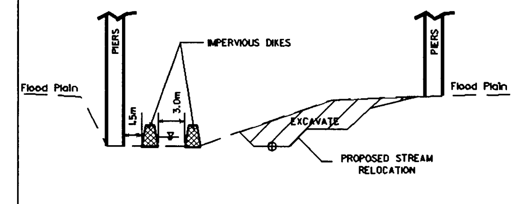
METRIC

CONST.REV. 8/??/04

R/W REV.

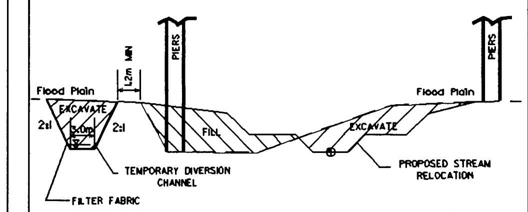


CHANNEL DETAIL
TEMPORARY DIVERSION CHANNEL
FOR DRILLING PIERS



(Not to Scale)

CHANNEL DETAIL
TEMPORARY DIVERSION CHANNEL



(Not to Scale)

10+00 -NSD-
N 245799.4485
E 651225.7989

11+07 -NSD-
N 245871.7550
E 651298.0985

PI Sta 10+12.27 -NSD-
N 245808.3787
E 651234.2214
Δ = 36.1910°
L = 9.69m
T = 5.00m
R = 14.00m

PI Sta 10+32.12-NSD-
N 245812.1464
E 651254.1575
Δ = 59.5734°
L = 18.00m
T = 10.00m
R = 14.00m

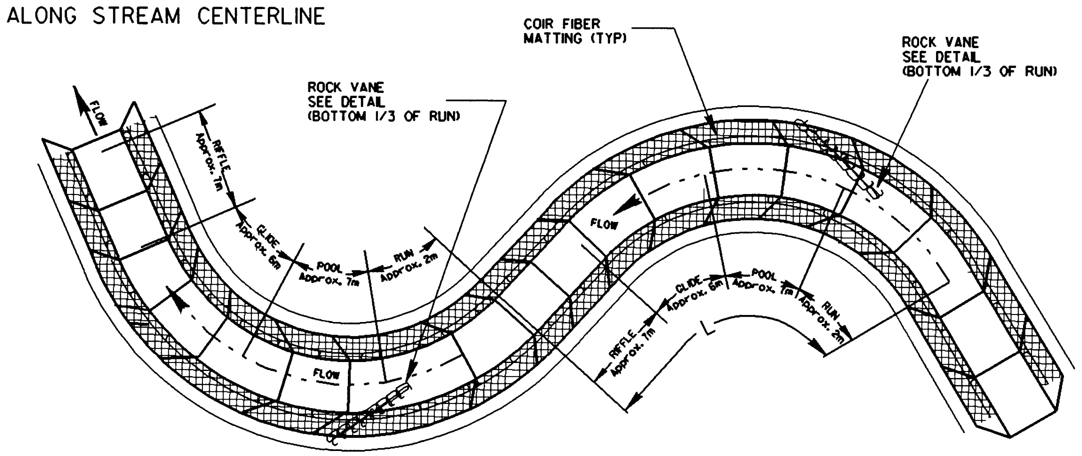
PI Sta 10+54.15-NSD-
N 245834.9059
E 651262.2664
Δ = 47.5385°
L = 15.22m
T = 8.00m
R = 16.50m

PI Sta 10+74.95-NSD-
N 245843.3258
E 651282.2467
Δ = 52.7131°
L = 16.73m
T = 9.00m
R = 18.00m

PI Sta 10+92.95-NSD-
N 245861.9940
E 651287.0522
Δ = 34.5337°
L = 11.56m
T = 6.00m
R = 22.00m

STREAM DETAIL

L= LENGTH ALONG STREAM CENTERLINE



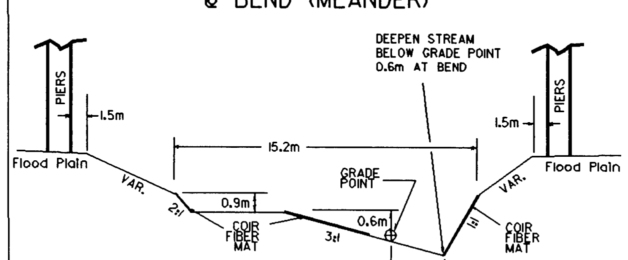
QUANTITIES:
(Temp. Diversions)

FILTER FABRIC = 1000 sq.m.
EXCAVATION = 1900 cu.m.

QUANTITIES:

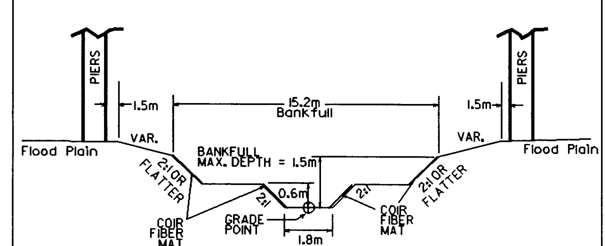
COIR FIBER MAT = 750 sq.m.
EXCAVATION = 900 cu.m.

CHANNEL DETAIL
PROPOSED TYPICAL POOL SECTION
@ BEND (MEANDER)



(Not to Scale)

CHANNEL DETAIL
PROPOSED TYPICAL RIFFLE SECTION



(Not to Scale)

NOTES:

PLANTINGS SHOULD BE PLACED ABOVE BANKFULL DEPTH.

ROCK VANES TO BE PLACED IN BOTTOM ONE THIRD OF RUN

ROCK SHOULD BE OBLONG IN SHAPE AND HAVE MINIMUM DIMENSIONS OF 0.9mX0.6mX0.6m (SEE ROCK VANE DETAIL)

NATURAL CHANNEL DESIGN TYPICALS

NCDOT
DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT: 8.1402501 (R-2809B)
NC 98 WAKE FOREST BYPASS
SHEET OF

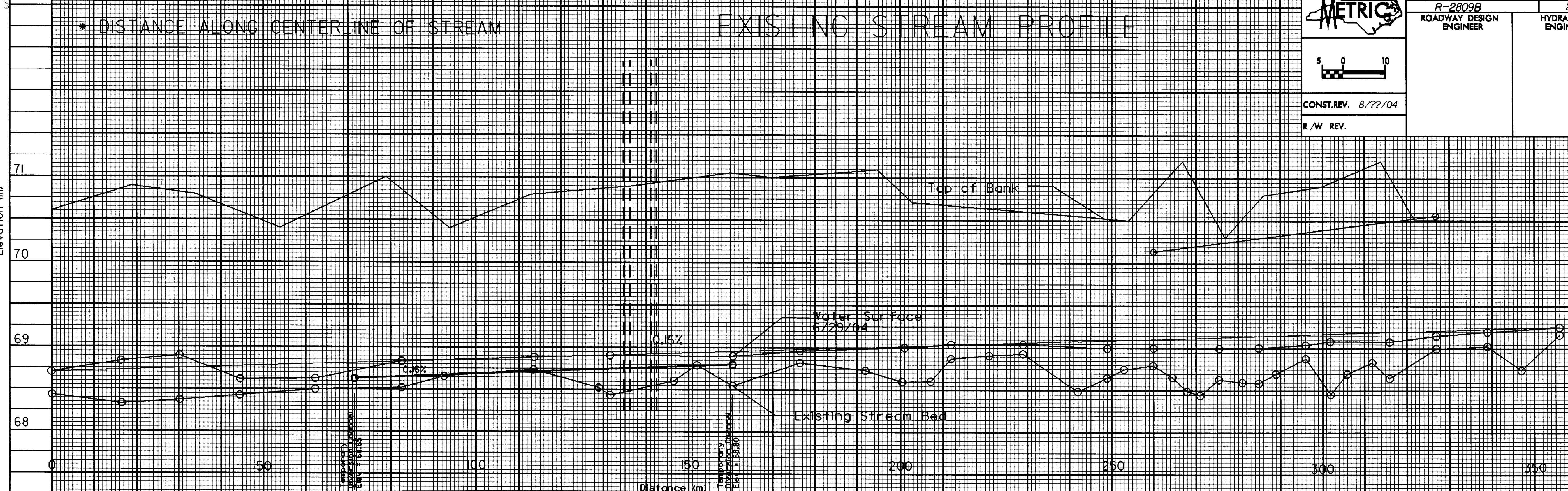
CONST.REVISION: 8/??/04 ADDED SHT. 2-Z RICHLAND CREEK STREAM RELOCATION DETAILS

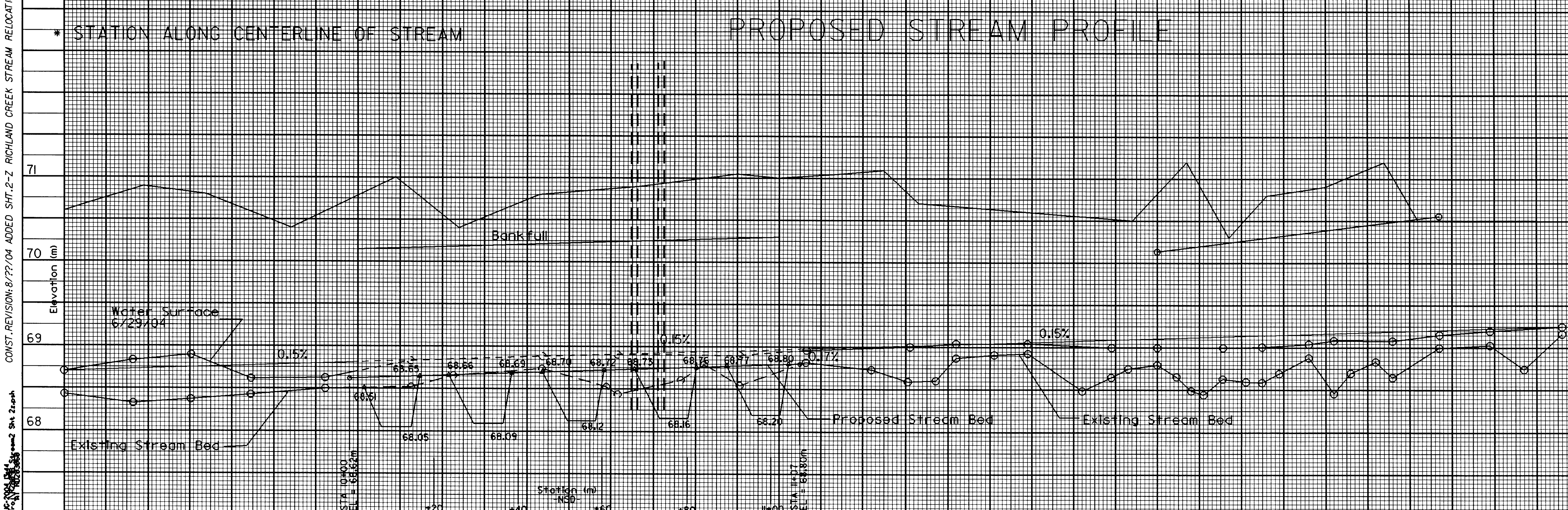
PROJECT REFERENCE NO.	SHEET NO.
R-2809B	2-AA
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST.REV. 8/??/04

R/W REV.





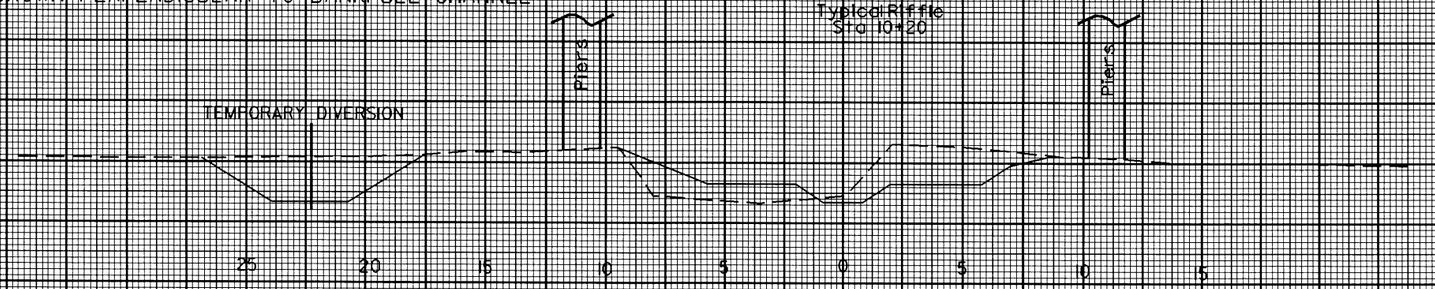
CONST.REVISION:8/??/04 ADDED SHT.2-Z RICHLAND CREEK STREAM RELOCATION PROFILES

METRIC	PROJECT REFERENCE NO.	SHEET NO.
0	R-2809B	2-BB
CONST.REV. 8/??/04	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R/W REV.		

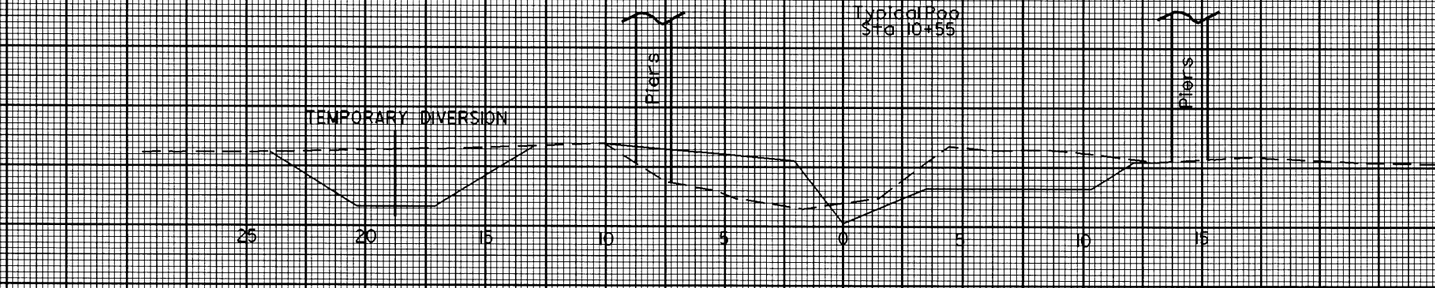
6/10/99

* X-SECTIONS SHOWN PERPENDICULAR TO BANKFULL CHANNEL

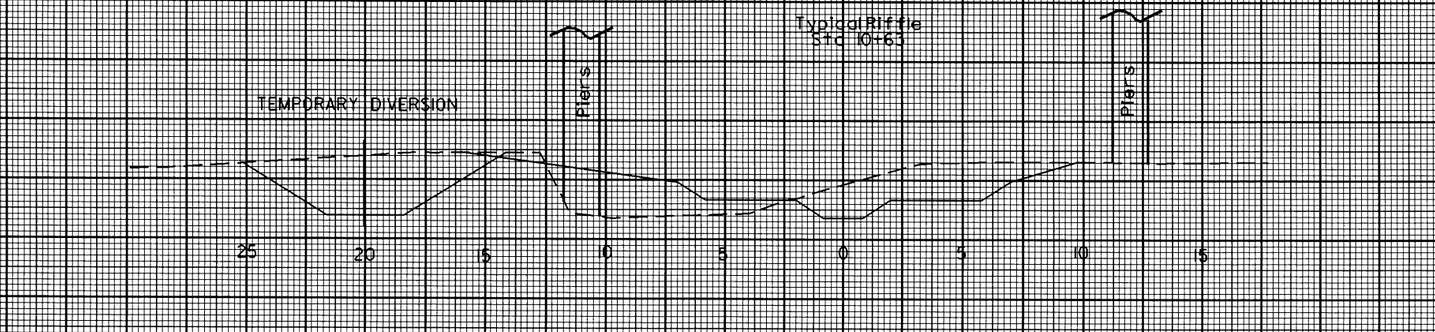
Typical Riffle
Sta. 10+20



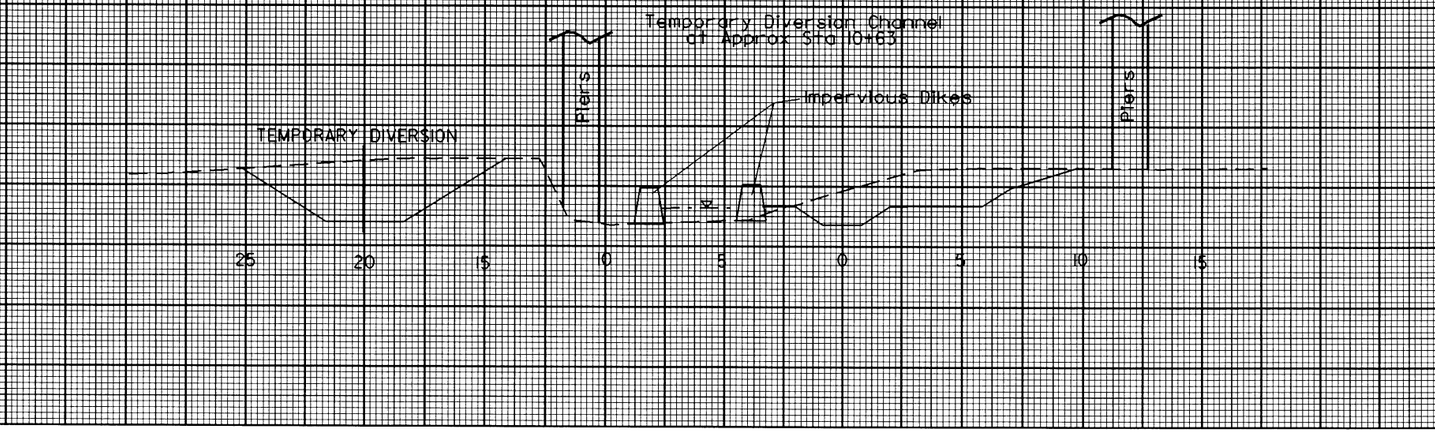
Typical Pool
Sta. 10+55



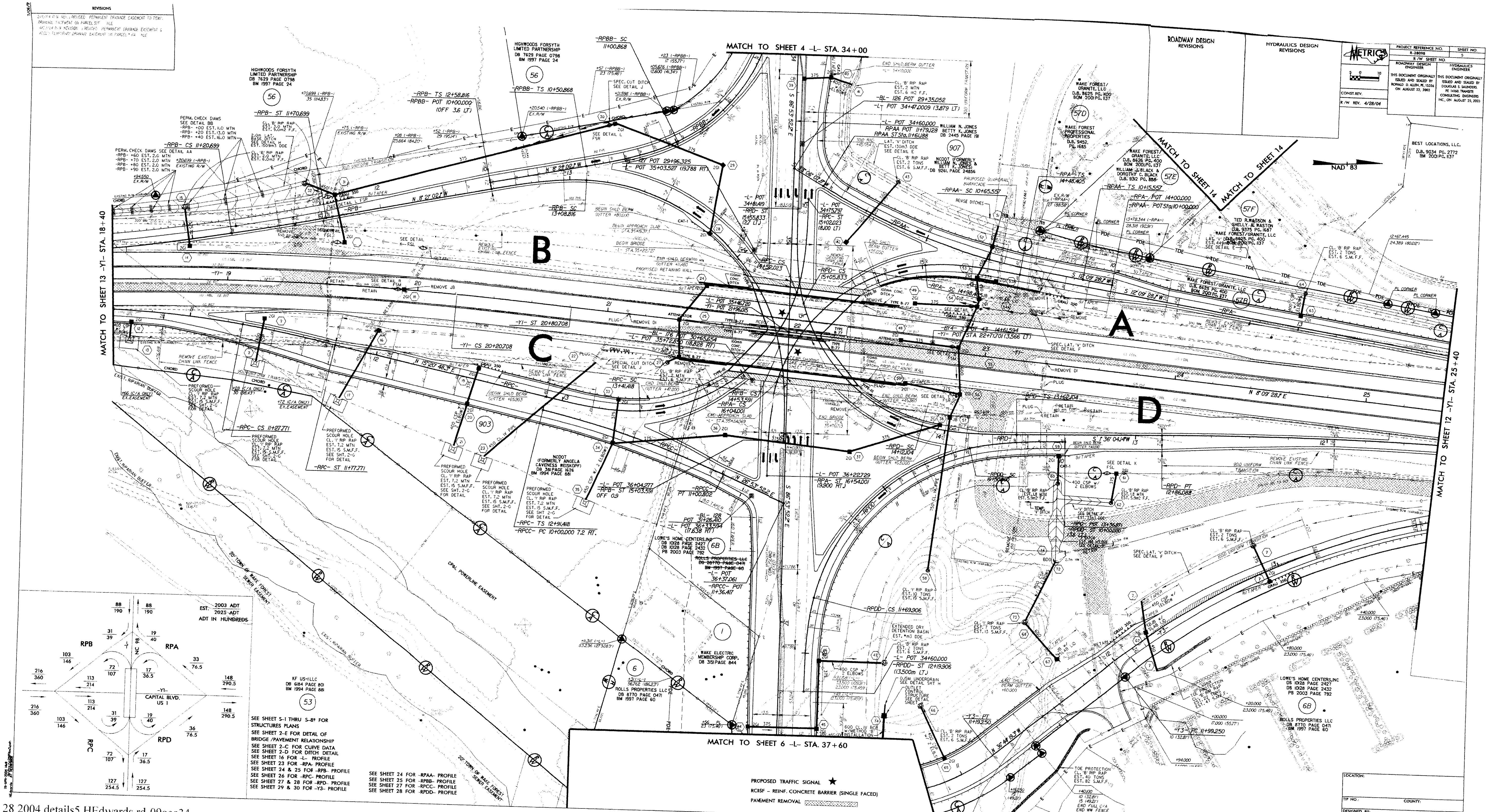
Typical Riffle
Sta. 10+63



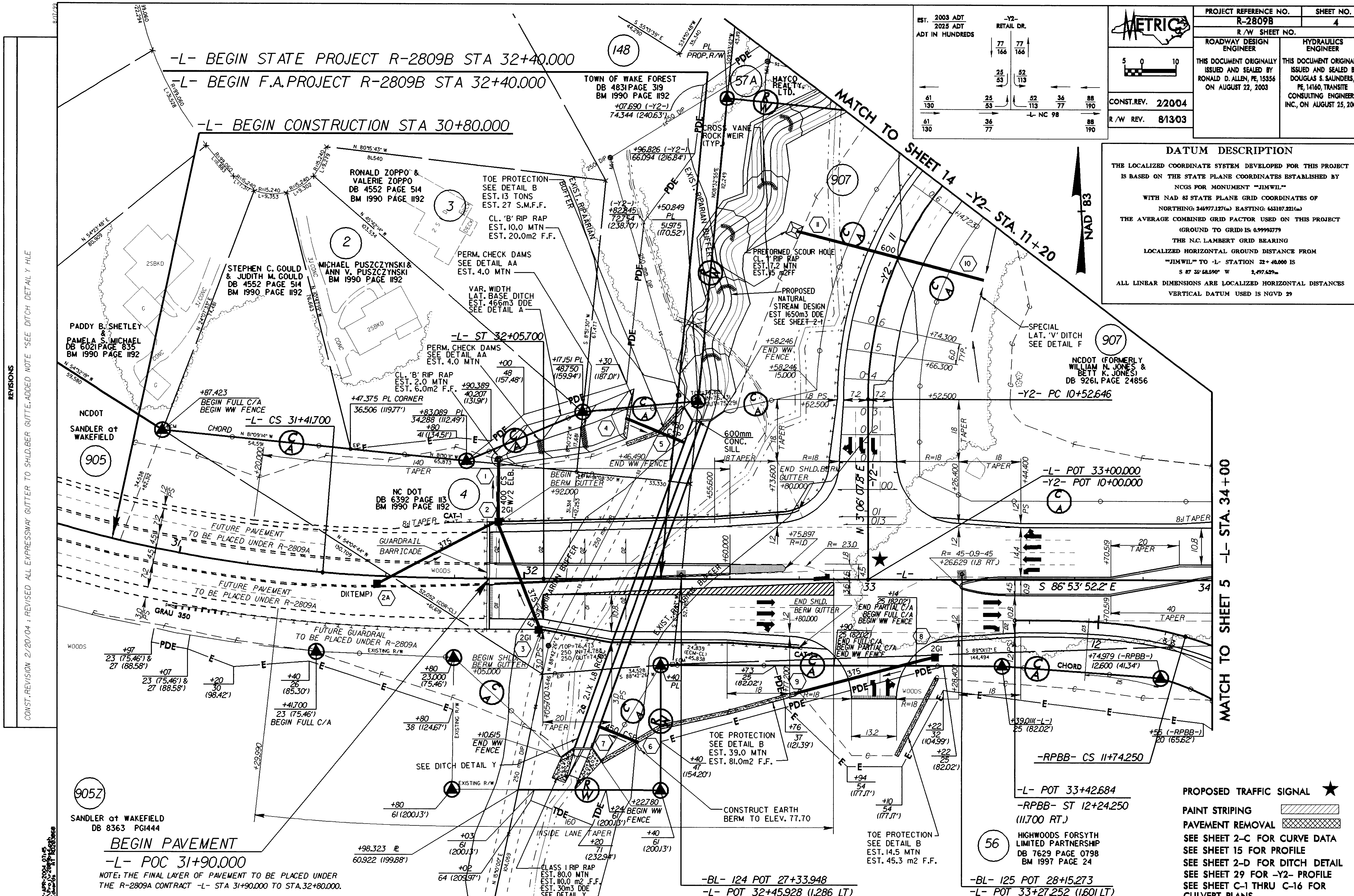
Temporary Diversion Channel
at Approx Sta. 10+63



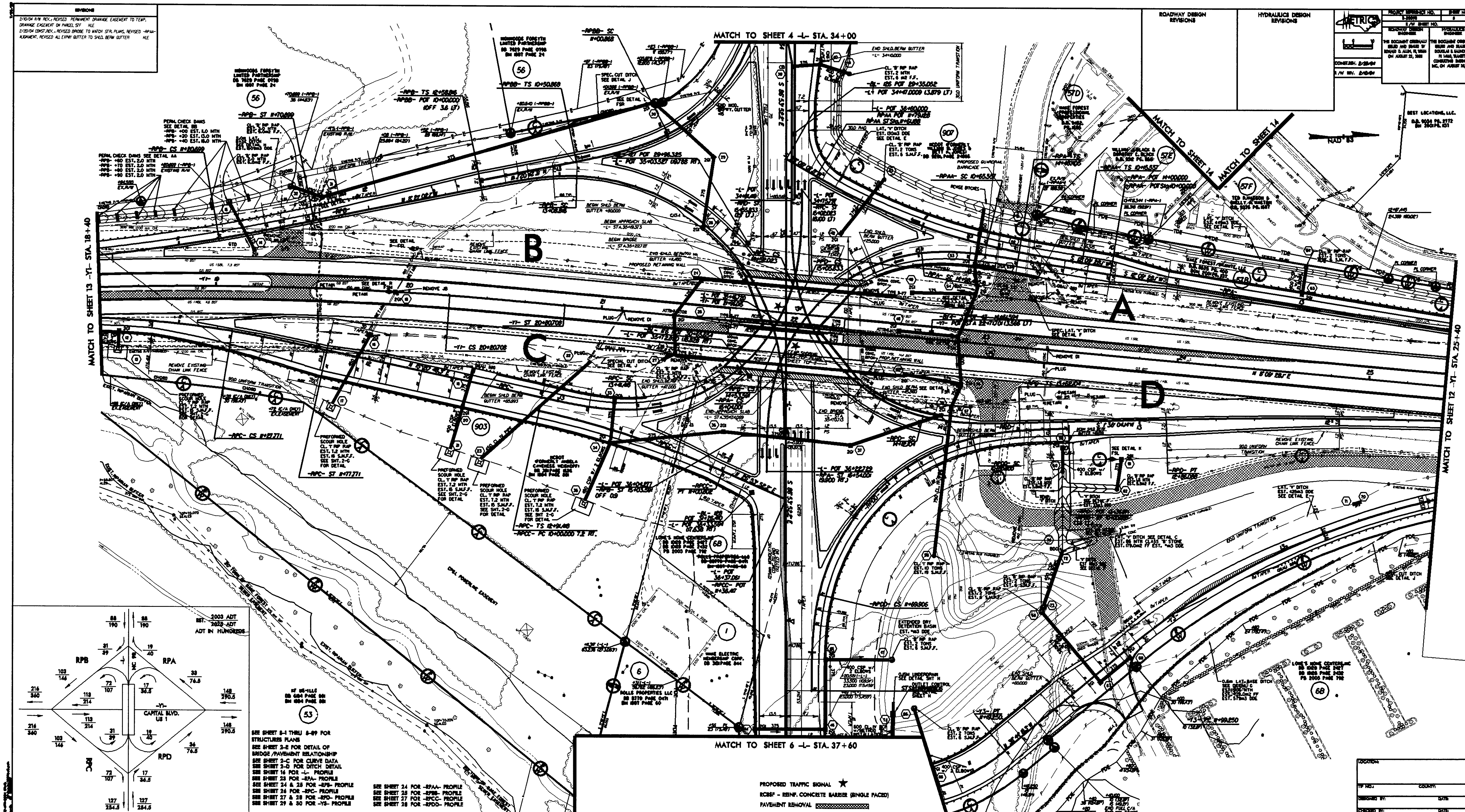
CONST. REVISION: 8/??/04 ADDED SHT. 2-Z RICHLAND CREEK STREAM RELOCATION X-SECTIONS



060 Wednesday April 28 2004 details5 HEdwards rd-09oce34



PROJECT REFERENCE NO. R-2809B
SHEET NO. 4
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 15356 ON AUGUST 22, 2003
HYDRAULICS ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003
METRIC
CONST. REV. 2/20/04
R/W REV. 8/13/03
EST. 2003 ADT
2025 ADT
ADT IN HUNDREDS
-Y2- RETAIL DR.
-L- NC 98
DATUM DESCRIPTION
THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCGS FOR MONUMENT "JIMWIL"
WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 246977.127(m) EASTING: 663107.221(m)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99993779
THE N.C. LAMBERT GRID BEARING LOCALIZED HORIZONTAL GROUND DISTANCE FROM "JIMWIL" TO -L- STATION 32+40.000 IS S 87 35' 58.590" W 2,497.629m
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NGVD 29
NAD 83
-L- BEGIN STATE PROJECT R-2809B STA 32+40.000
-L- BEGIN F.A.PROJECT R-2809B STA 32+40.000
-L- BEGIN CONSTRUCTION STA 30+80.000
MATCH TO SHEET 14 -Y2- STA. 11+20
MATCH TO SHEET 5 -L- STA. 34+00
TOWN OF WAKE FOREST DB 4831 PAGE 319 BM 1990 PAGE 1192
HAYCO REALTY, LTD.
RONALD ZOPPO & VALERIE ZOPPO DB 4552 PAGE 514 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
PADDY B. SHETLEY & PAMELA S. MICHAEL DB 6021 PAGE 835 BM 1990 PAGE 1192
NCDOT SANDLER at WAKEFIELD
NC DOT DB 6392 PAGE 113 BM 1990 PAGE 1192
NCDOT (FORMERLY WILLIAM N. JONES & BETT K. JONES) DB 9261, PAGE 24856
SANDLER at WAKEFIELD DB 8363 PG1444
HIGHWOODS FORSYTH LIMITED PARTNERSHIP DB 7629 PAGE 0798 BM 1997 PAGE 24
TOE PROTECTION SEE DETAIL B EST. 13 TONS EST. 27 S.M.F.F.
CL. 'B' RIP RAP EST. 10.0 MTN EST. 20.0m2 F.F.
PERM. CHECK DAMS SEE DETAIL AA EST. 4.0 MTN
VAR. WIDTH LAT. BASE DITCH EST. 466m3 DDE SEE DETAIL A
CROSS VANE ROCK WEIR (TYP.)
PREFORMED SCOUR HOLE CL. 'I' RIP RAP EST. 7.2 MTN EST. 15 m2FF
PROPOSED NATURAL STREAM DESIGN EST 1650m3 DDE SEE SHEET 2-I
SPECIAL LAT. 'V' DITCH SEE DETAIL F
CL. 'B' RIP RAP EST. 2.0 MTN EST. 6.0m2 F.F.
-L- ST 32+05.700
-L- CS 31+41.700
-Y2- PC 10+52.646
-L- POT 33+00.000
-Y2- POT 10+00.000
S 86° 53' 52.2" E
FUTURE PAVEMENT TO BE PLACED UNDER R-2809A
FUTURE GUARDRAIL TO BE PLACED UNDER R-2809A
GUARDRAIL BARRICADE
TOE PROTECTION SEE DETAIL B EST. 39.0 MTN EST. 81.0m2 F.F.
CONSTRUCT EARTH BERM TO ELEV. 77.70
TOE PROTECTION SEE DETAIL B EST. 14.5 MTN EST. 45.3 m2 F.F.
CLASS I RIP RAP EST. 80.0 MTN EST. 110.0 m2 F.F. EST. 30m3 DDE SEE DETAIL Y
SEE DITCH DETAIL Y
-RPBB- CS 11+74.250
-L- POT 33+42.684
-RPBB- ST 12+24.250 (11.700 RT.)
-BL- 124 POT 27+33.948
-L- POT 32+45.928 (1.286 LT)
-BL- 125 POT 28+15.273
-L- POT 33+27.252 (1.601 LT)
BEGIN PAVEMENT
-L- POC 31+90.000
NOTE: THE FINAL LAYER OF PAVEMENT TO BE PLACED UNDER THE R-2809A CONTRACT -L- STA 31+90.000 TO STA. 32+80.000.
PROPOSED TRAFFIC SIGNAL
PAINT STRIPING
PAVEMENT REMOVAL
SEE SHEET 2-C FOR CURVE DATA
SEE SHEET 15 FOR PROFILE
SEE SHEET 2-D FOR DITCH DETAIL
SEE SHEET 29 FOR -Y2- PROFILE
SEE SHEET C-1 THRU C-16 FOR CULVERT PLANS
REVISIONS
CONST. REVISION 2/20/04 : REVISED ALL EXPRESSWAY GUTTER TO SHLD.BER GUTTE, ADDED NOTE "SEE DITCH DETAIL Y HLE


REVISIONS
2/10/04 R/W REV.; REVISED PERMANENT DRAINAGE EASEMENT TO TEMP. DRAINAGE EASEMENT ON PARCEL 57F HLE
2/20/04 CONST.REV.; REVISED BRIDGE TO MATCH STR. PLANS. REVISED -RPAA- ALIGNMENT. REVISED ALL EXPWY GUTTER TO SHLD. BERM GUTTER HLE
ROADWAY DESIGN REVISIONS
HYDRAULICS DESIGN REVISIONS
MATCH TO SHEET 4 -L- STA. 34+00
MATCH TO SHEET 14
MATCH TO SHEET 13 -Y1- STA. 18+40
MATCH TO SHEET 12 -Y1- STA. 25+40
MATCH TO SHEET 6 -L- STA. 37+60
A
B
C
D
EST. 2003 ADT
ADT IN HUNDREDS
RPB
RPA
RPC
RPD
CAPITAL BLVD. US 1
SEE SHEET S-1 THRU S-89 FOR STRUCTURES PLANS
SEE SHEET 2-E FOR DETAIL OF BRIDGE /PAVEMENT RELATIONSHIP
SEE SHEET 2-C FOR CURVE DATA
SEE SHEET 2-D FOR DITCH DETAIL
SEE SHEET 16 FOR -L- PROFILE
SEE SHEET 23 FOR -RPA- PROFILE
SEE SHEET 24 & 25 FOR -RPB- PROFILE
SEE SHEET 26 FOR -RPC- PROFILE
SEE SHEET 27 & 28 FOR -RPD- PROFILE
SEE SHEET 29 & 30 FOR -Y3- PROFILE
SEE SHEET 24 FOR -RPAA- PROFILE
SEE SHEET 25 FOR -RPBB- PROFILE
SEE SHEET 27 FOR -RPCC- PROFILE
SEE SHEET 28 FOR -RPDD- PROFILE
PROPOSED TRAFFIC SIGNAL ★
RCBSF - REINF. CONCRETE BARRIER (SINGLE FACED)
PAVEMENT REMOVAL
ROLLS PROPERTIES LLC
LOCATION:
TIP NO.:
COUNTY:
DESIGNED BY:
DATE:
CHECKED BY:
DATE:

MATCH TO SHEET 6A

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

METRIC 5 0 10

CONST. REV. 7/20/04

R/W REV. 8/6/04

EST. 2003 ADT / 2025 ADT

ADT IN HUNDREDS

38 77.5 | 38 77.5

127 254.5 | 30 61.5 | 8 16 | 8 16 | 92 193 | 101 209

127 254.5 | 30 61.5 | 92 193 | 101 209

MATCH TO SHEET 5 -Y3- STA. 10+80

MATCH TO SHEET 5 -L- STA. 37+60

LOWE'S HOME CENTERS, INC
DB 10128 PAGE 2427
DB 10128 PAGE 2432
PB 2003 PAGE 792

EXIST. RIPARIAN BUFFER

CP&L POWERLINE EASEMENT
MTL TOWER

ROLLS PROPERTIES LLC
DB 8770 PAGE 0471
BM 1997 PAGE 60

SNOW WHITE ENTERPRISES
DB 10106 PAGE 282

BENNETT PROPERTIES LLC
DB 8652 PAGE 2481
BM 1997 PAGE 60

-L- TS 39+42.943 23 (75.46')

-L- SC 39+98.943 23 (75.46')

110.0 UNIFORM TRANSITION LEFT & RIGHT LANES

PREFORMED SCOUR HOLE CLASS 'I' RIP RAP EST. 7.2 MTN EST. 15 m2FF SEE SHT. 2-G FOR DETAIL

OUTLET CONTROL STRUCTURE SEE DETAIL SHEET

EXTENDED DRY DETENTION BASIN EST. 731m3 DDE

BASE DITCH SEE DETAIL D EST. 25 MTN CL IRIP RAP EST. 52m2 FF

TOE PROTECTION SEE DETAIL B EST. 20 TONS EST. 42 S.M.F.F.

0.15M UNDERDRAIN SEE DETAIL SHT H

CLASS 'I' RIP-RAP EST. 9 MTN EST. 19.0m2 FF

0.9m LAT. BASE DITCH SEE DETAIL O EST. 72m3 DDE

VAR. WIDTH BASE DITCH SEE DETAIL I

CL. 'B' RIP RAP EST. 10 MTN EST. 20.0 m2 FF

END APPROACH SLAB -L- STA 39+49.999

END BRIDGE -L- STA 39+45.250

STREAM RELOCATION DDE = 900 m3 SEE DETAIL

600 (CL IV) W/METHOD B INSTALLATION

-Y3- PC 10+49.715 BEGIN SHLD.BERM GUTTER +0.95

65.0 UNIFORM TRANSITION

END SHLD.BERM GUTTER +36

TYPE III

SEE STRUCTURE PLANS

END WW FENCE 125 MM MONOLITHIC CONCRETE LAND

N 3°06'07.8" E

S 86°53'52.2" E

R= 50-2.5-50

600 CSP w/ 2 ELBOWS

END SHLD.BERM GUTTER +0.0

-L- POT 37+90.000
-Y3- POT 10+00.000

END WW FENCE

CLASS 'II' RIP RAP SEE STRUCTURE PLANS

PREFORMED SCOUR HOLE CLASS 'I' RIP-RAP EST. 7.2 TONS EST. 15 S.M.F.F. SEE SHT. 2-G FOR DETAIL

BEGIN BRIDGE -L- STA 38+23.750

BEGIN APPROACH SLAB -L- STA 38+19.001

-BL- 130 POT 34+25.681
-L- POT 39+32.823 (12.619 RT)

-BL- 129 POT 32+65.847
-L- POT 37+73.009 (15.172 RT)

-BL- 131 POT 34+89.312
-L- POS 39+96.185 (10.958 RT)

-BL- 132 POT 35+82.343
-L- POC 40+88.370 (11.060 RT)

BEGIN WW FENCE

STREAM RELOCATION SEE DETAIL

CLASS 'II' RIP RAP SEE STRUCTURE PLANS

SPEC. CUT DITCH SEE DETAIL J

450 CONC. CURB

GRAU 350

SEE DETAIL K FSL

SEE DETAIL L FSR

NOTE: PLACE 150mm DECK DRAINS @ 4m CENTERS IN ACCORDANCE WITH THE FOLLOWING:
-L- 38+45 to 38+77 LT
-L- 39+35 to 39+55 LT
-L- 38+16 to 38+52 RT
-L- 39+12 to 39+28 RT

APPROACH SLAB

PROPOSED TRAFFIC SIGNAL ★

SEE SHEET 2-C FOR CURVE DATA
SEE SHEET 2-D FOR DITCH DETAIL
SEE SHEET 17 FOR -L- PROFILE
SEE SHEET 29 & 30 FOR -Y3- PROFILE
SEE SHEETS S-1 THRU S-89 FOR STRUCTURES PLANS
SEE SHEET 2-E DETAIL FOR BRIDGE /ROAD RELATIONSHIP

REVISIONS
CONST. REVISION 7/20/04 : REVISED ALL EXWY GUTTER TO SHLD BERM GUTTER REVISED TOPO & ADDED MATCH LINES FOR SHT. 6-A Me
R/W REVISION 8/6/04 : REVISED PERMANENT DRAINAGE EASEMENTS DUE TO CONSTRUCTION REVISION ON PARCEL 6 & 6A Me

8/17/99

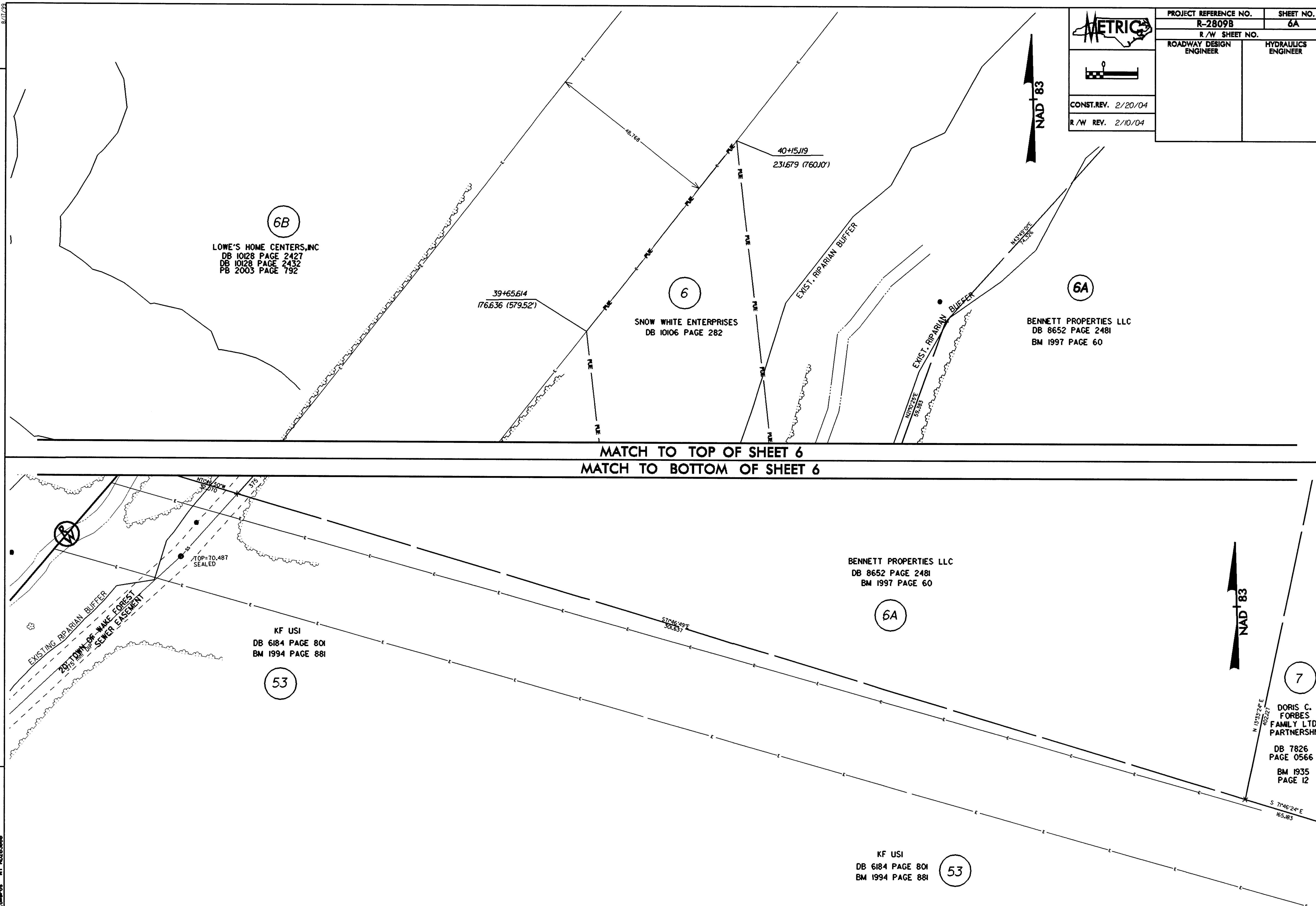
MATCH TO SHEET 6A

REVISIONS

2/10/04 R/W REVISION: PER MEMO DATED 1/21/03 REVISED THE PERMANENT UTILITY EASEMENT FOR PARCELS # 6, #6A & #53 hle
2/20/04 CONST. REVISION: ADDED SHT. 6A TO CONST. PLANS hle

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

CONST. REV. 2/20/04
R/W REV. 2/10/04



PROJECT REFERENCE NO.	SHEET NO.
R-2809B	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 15356 ON AUGUST 22, 2003	THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003

METRIC

5 0 10

CONST.REV.

R/W REV. 2/18/03

REVISIONS

8/11/03

BENNETT PROPERTIES LLC
BM 1997 PAGE 60
DB 8652 PAGE 2481

6A

7

DORIS C. FORBES
FAMILY LTD. PARTNERSHIP
DB 7826 PAGE 0566
BM 1935 PAGE 12

NAD 83

MATCH TO SHEET 6 -L- STA. 41+20

MATCH TO SHEET 8 -L- STA. 44+80

-L- CS 43+59.841

-L- ST 44+15.841

N 72° 35' 55.5" E

0.9m BASE DITCH
SEE DETAIL O
EST. 48 m3 DDE

CL. 'B' RIP RAP
EST. 2 MTN
EST. 6 m2 FF
EST. 4 m3 DDE

CL. 'I' RIP RAP
EST. 14 TONS
EST. 26 S.M. F.F.

V-DITCH
SEE DETAIL P

SEE DETAIL K FSL

SEE DETAIL L FSR

SPEC. CUT DITCH
SEE DETAIL J

SPEC. CUT DITCH
SEE DETAIL X

BERM V-DITCH
SEE DETAIL N
EST. 25 MTN
EST. 77 m3 DDE

0.9m BASE DITCH
SEE DETAIL M
EST. 29 MTN
EST. 69 m2 FF
EST. 30 m3 DDE

450 CONC.CURB

450 CONC.CURB

900 CSP

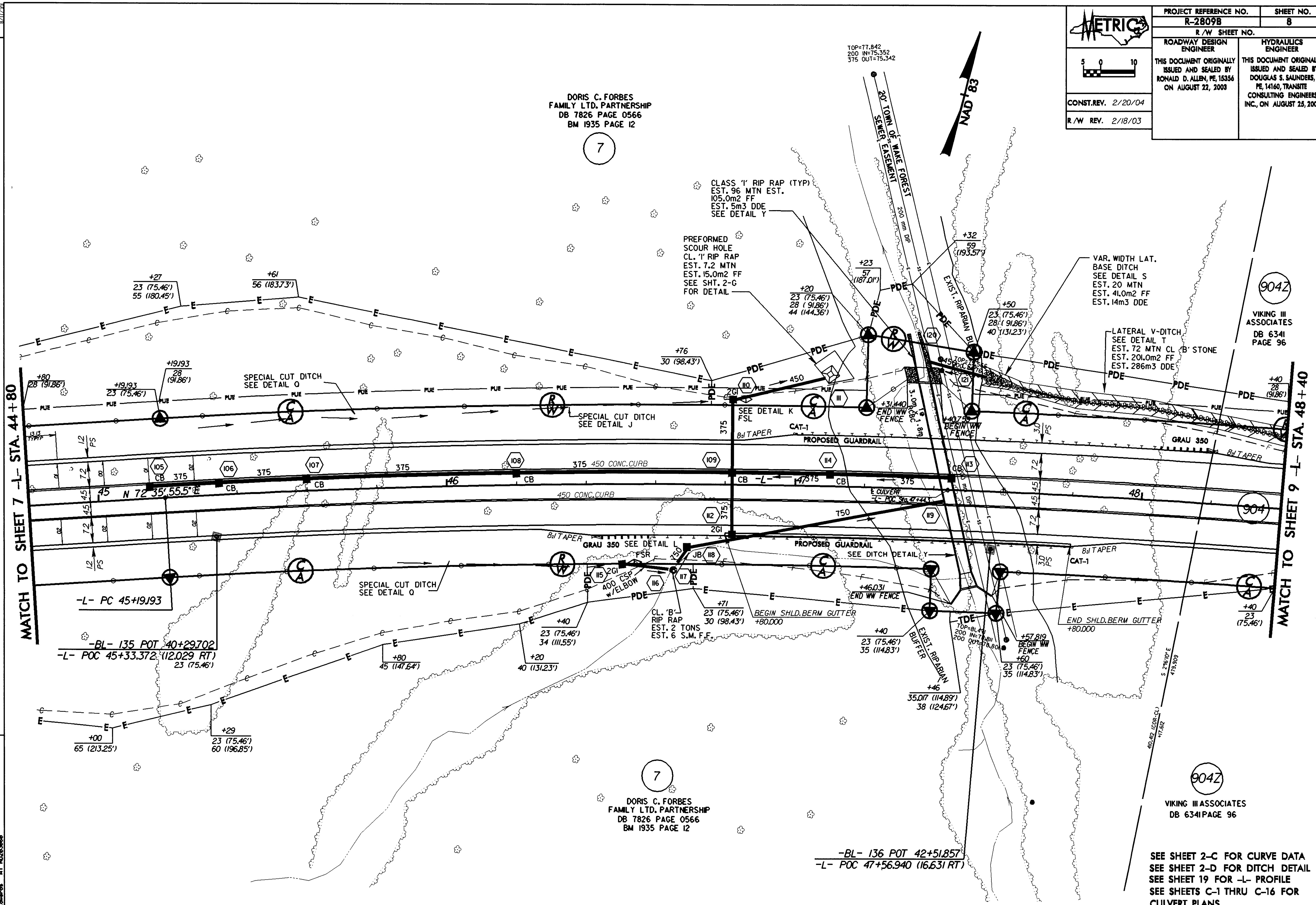
450 CSP

-BL- 133 POT 36+73.705
-L- POC 41+78.906 (10.768 RT)

-BL- 134 POT 37+27.463
-L- POC 42+32.189 (9.946 RT)

SEE SHEET 2-C FOR CURVE DATA
SEE SHEET 2-D DITCH DETAIL
SEE SHEET 18 FOR -L- PROFILE

02-APR-2004 01:45



REVISIONS

2/20/03 CONST.REVISION: REVISED ALL EWPRESSWAY GUTTER TO SHLD.BERM GUTTER, ADDED NOTE SEE DITCH DETAIL Y

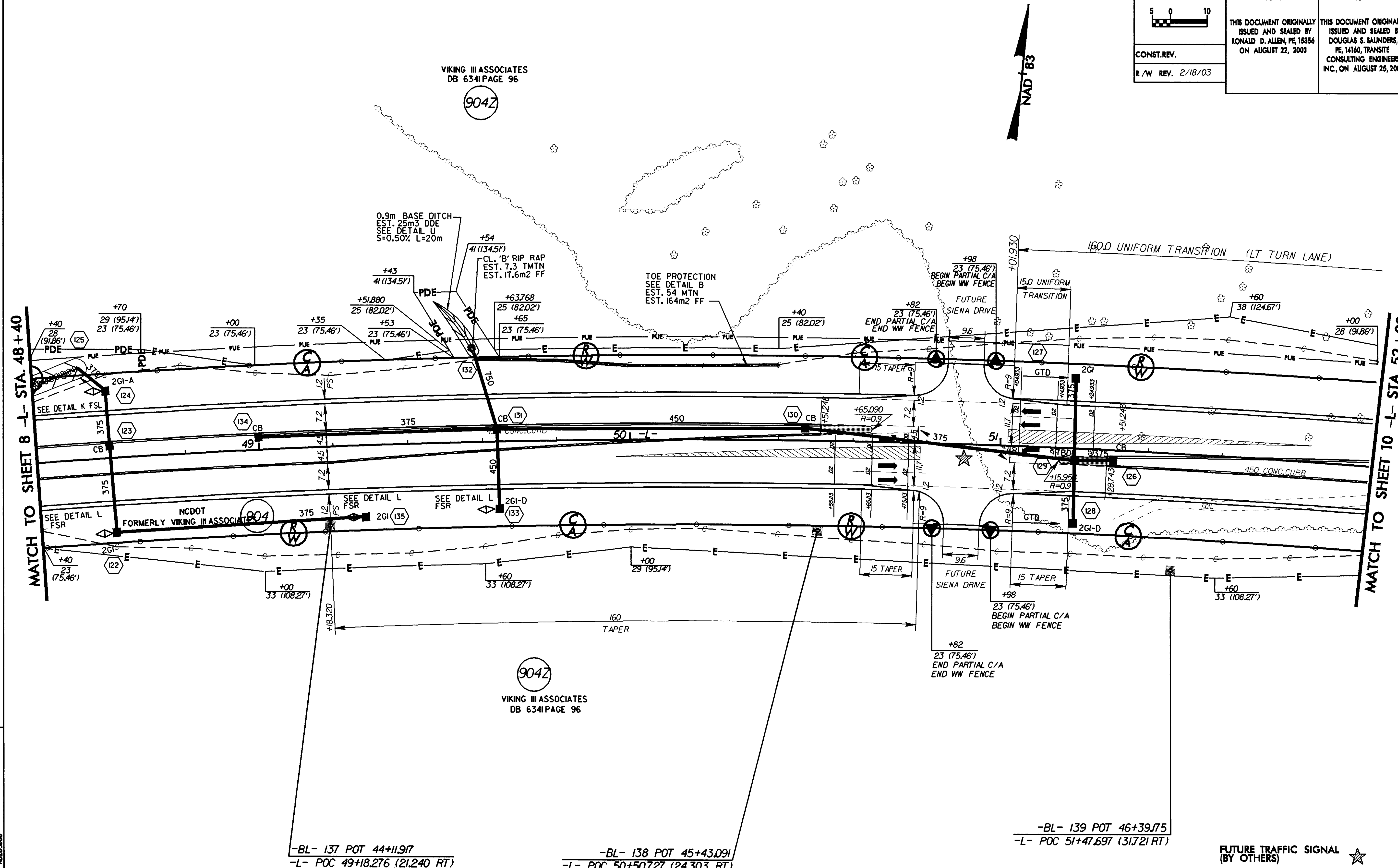
PROJECT REFERENCE NO.	SHEET NO.
R-2809B	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 15356 ON AUGUST 22, 2003	THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003

METRIC

CONST.REV.

R/W REV. 2/18/03

REVISIONS



FUTURE TRAFFIC SIGNAL (BY OTHERS)

PAINT STRIPING

SEE SHEET 2-C FOR CURVE DATA

SEE SHEET 2-D FOR DITCH DETAIL

SEE SHEET 20 FOR -L- PROFILE

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	10
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 15356 ON AUGUST 22, 2003	THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003

METRIC

5 0 10

CONST.REV.

R/W REV. 2/10/04

REVISIONS

2/10/04 R/W REVISION: REVISED THE PROPERTY OWNER NAME ON PARCEL • 9 hle

8/27/03

NAD 83

46.85' N 53°13' E

WAKE FOREST CITY LIMITS

AXLE

ECM

S 86°41'32" E
304.188

VIKING III ASSOCIATES
DB 6341 PAGE 96
9042

160.0 UNIFORM TRANSITION
(LEFT TURN LANE)

+61.930

LATERAL V-DITCH
SEE DETAIL V
EST. 93 TONS
EST. 260 S.M. F.F.

MATCH TO SHEET 9 -L- STA. 52+00

+00
28 (91.86')

+60
27 (88.56')

NCDOT
FORMERLY VIKING III ASSOCIATES

904

SEE DETAIL K FSL

2GI-D

136

137

375

CB

450 CONC.CURB

52

53

-L-

54

55

+80
27 (88.59')

+00
23 (75.46')

+40
30 (98.43')

+60
28 (91.86')

PDE

139

140 CB

S 84°45'34" E
134.078

MATCH TO SHEET 11 -L- STA. 55+60

DRIVE SHAFT

0.423
+55.690

600

0.6m LAT. BASE DITCH
SEE DETAIL W

138

CL. 'B' RIP RAP
EST. 2 MTN
EST. 6.0m2 FF
V-DITCH
SEE DETAIL P
EST. 20m3 DDE

+60
23 (75.46')

+18
23 (75.46')
35 (114.83')

+30
23 (75.46')
25 (82.02')
35 (114.83')

VIKING III ASSOCIATES
DB 6341 PAGE 96
9042

SPECIAL CUT DITCH
SEE DETAIL Z
EST. 36 TONS
EST. 108 S.M. F.F.

+40
29 (95.14')

+03
29 (95.14')

+70
23 (75.46')

+50
23 (75.46')
30 (98.43')

N 5°38'05" E
65.480

141

CL. 'B' RIP RAP
EST. 3 TONS
EST. 10 S.M. F.F.

+30
23 (75.46')
30 (98.43')

SPECIAL CUT DITCH
SEE DETAIL Z
EST. 25 TONS
EST. 77 S.M. F.F.

ASB PARTNERSHIP
DB 2974 PAGE 554

9

S 86°58'09" E
132.076

N 6°05'28" E
11.863

ASB PARTNERSHIP
DB 4688 PAGE 563
BM 1990 PAGE 248

S 84°59'57" E
111.886

IRENE C. ESTES (DECEASED)
CALVIN C. ESTES (SON)
DB 1920 PAGE 356

N 6°05'28" E
104.591

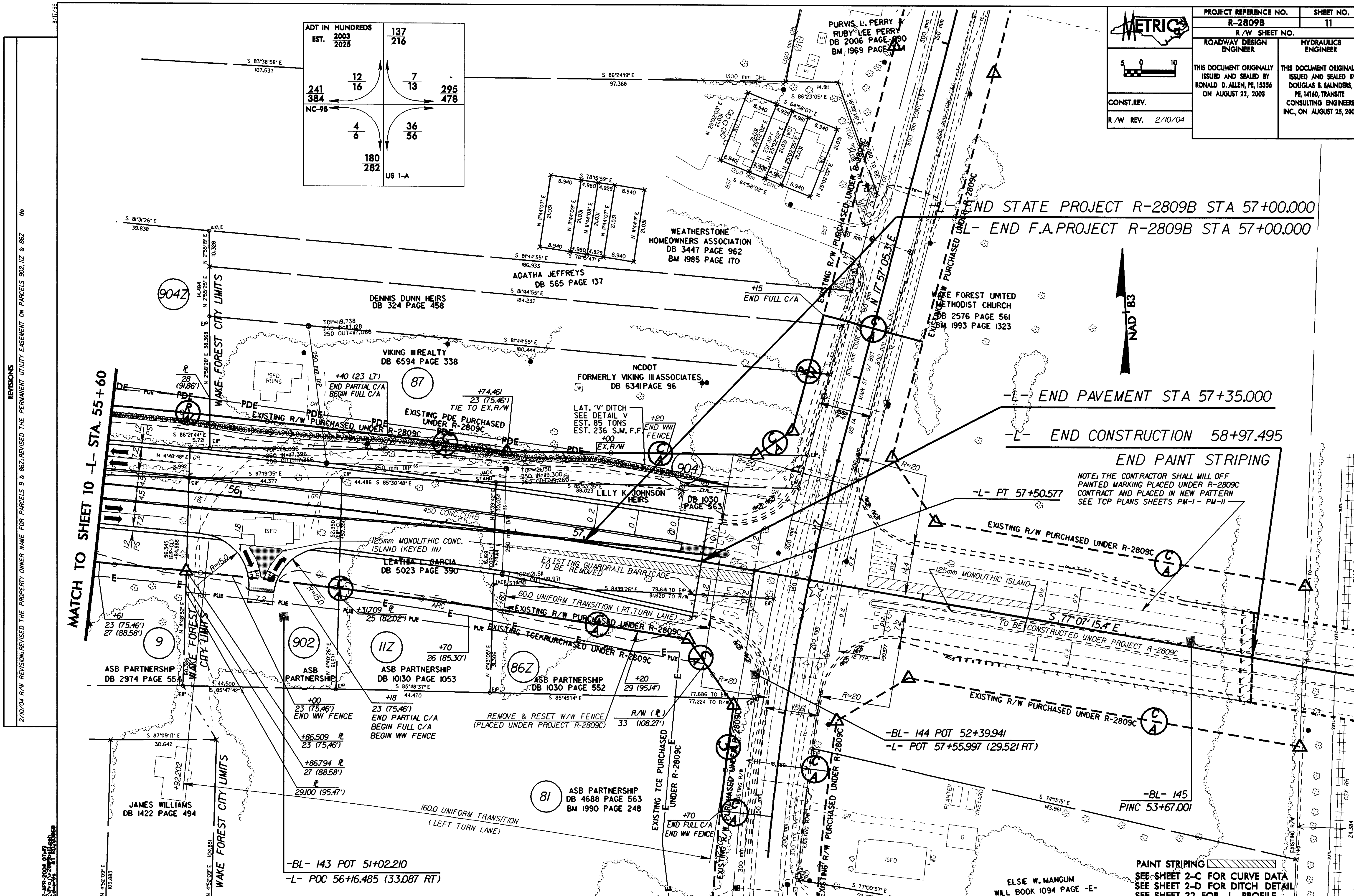
-BL- 140 POT 48+16.822
-L- POC 53+27.733 (29.377 RT)

-BL- 141 POT 49+10.741
-L- POC STA 54+22.837 (28.529 RT)

-BL- 142 POT 50+35.528
-L- POC 55+49.156 (27.549 RT)

SEE SHEET 2-C FOR CURVE DATA
SEE SHEET 2-D FOR DITCH DETAIL
SEE SHEET 21 FOR -L- PROFILE

02-APR-2004 07:49



METRIC
PROJECT REFERENCE NO. R-2809B
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 13356 ON AUGUST 22, 2003
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003
CONST.REV.
R/W REV. 2/10/04
ADT IN HUNDREDS EST. 2003 2025
NC-98
US 1-A
-L- END STATE PROJECT R-2809B STA 57+00.000
-L- END F.A.PROJECT R-2809B STA 57+00.000
-L- END PAVEMENT STA 57+35.000
-L- END CONSTRUCTION 58+97.495
END PAINT STRIPING
NOTE: THE CONTRACTOR SHALL MILL OFF PAINTED MARKING PLACED UNDER R-2809C CONTRACT AND PLACED IN NEW PATTERN SEE TCP PLANS SHEETS PM-1 - PM-11
-L- PT 57+50.577
NAD 83
MATCH TO SHEET 10 -L- STA. 55+60
WAKE FOREST CITY LIMITS
WEATHERSTONE HOMEOWNERS ASSOCIATION DB 3447 PAGE 962 BM 1985 PAGE 170
AGATHA JEFFREYS DB 565 PAGE 137
DENNIS DUNN HEIRS DB 324 PAGE 458
VIKING III REALTY DB 6594 PAGE 338
NCDOT FORMERLY VIKING III ASSOCIATES DB 6341 PAGE 96
WAKE FOREST UNITED METHODIST CHURCH DB 2576 PAGE 561 BM 1993 PAGE 1323
PURVIS U. PERRY RUBY LEE PERRY DB 2006 PAGE 990 BM 1969 PAGE 14
LILLY K. JOHNSON HEIRS DB 1030 PAGE 563
LEATHIA L. GARCIA DB 5023 PAGE 390
ASB PARTNERSHIP DB 2974 PAGE 554
ASB PARTNERSHIP DB 10130 PAGE 1053
ASB PARTNERSHIP DB 1030 PAGE 552
ASB PARTNERSHIP DB 4688 PAGE 563 BM 1990 PAGE 248
JAMES WILLIAMS DB 1422 PAGE 494
ELSIE W. MANGUM WILL BOOK 1094 PAGE -E-
EXISTING R/W PURCHASED UNDER R-2809C
EXISTING PDE PURCHASED UNDER R-2809C
EXISTING GUARDRAIL BARRICADE TO BE REMOVED
125mm MONOLITHIC CONC. ISLAND (KEYED IN)
60.0 UNIFORM TRANSITION (RT. TURN LANE)
160.0 UNIFORM TRANSITION (LEFT TURN LANE)
TO BE CONSTRUCTED UNDER PROJECT R-2809C
REMOVE & RESET W/W FENCE (PLACED UNDER PROJECT R-2809C)
LAT. 'V' DITCH SEE DETAIL V EST. 85 TONS EST. 236 S.M. F.F.
-BL- 143 POT 51+02.210
-L- POC 56+16.485 (33.087 RT)
-BL- 144 POT 52+39.941
-L- POT 57+55.997 (29.521 RT)
-BL- 145 PINC 53+67.001
S 77°07'15.4" E
N 17°57'05.3" E
CSX RAILROAD
PAINT STRIPING
SEE SHEET 2-C FOR CURVE DATA
SEE SHEET 2-D FOR DITCH DETAIL
SEE SHEET 22 FOR -L- PROFILE
REVISIONS
2/10/04 R/W REVISION: REVISED THE PROPERTY OWNER NAME FOR PARCELS 9 & 86Z; REVISED THE PERMANENT UTILITY EASEMENT ON PARCELS 902, 11Z & 86Z

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	12
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 15356 ON AUGUST 22, 2003	THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003

METRIC 5 0 10

CONST.REV. 2/20/04

R/W REV. 8/13/03

REVISIONS

2/20/04 CONST. REVISION: REVISED ALL EXPRESSWAY GUTTER TO SHLD. BERM GUTTER He

8/17/99

MATCH TO SHEET 5 -Y1- STA. 25+40

BEST LOCATIONS, LLC.
D.B. 9034 PG. 2772
BM 2001 PG. 1137

WAKE FOREST/GRANITE, LLC
D.B. 8625 PG. 400
BOM 2001 PG. 1137

NAD 83

57

NOTE: TIE FUTURE -RPA- TYPICAL CUT DITCH (10+00 to 12+00) WITH "RETAIL DRIVE" CUT DITCH AS SHOWN ON CROSS SECTION SHEETS X-55 THRU X-57

HOME DEPOT U.S.A., INC.
D.B. 8830 PG. 370
BM 2001 PG. 1138

-Y1- POT 27+60.000 BST
-RPA- POT 10+00.000
(14.200 LT.)

+00 (-RPA-)
21.014 (68.94') PL
& 22 (65.62')
WW FENCE

+00 (-RPA-)
12.600 (41.34')
PL CORNER

CL. 'B' RIP RAP
EST. 5 TONS
EST. 12 S.M.F.F.

8.395
N32°43'49"W

CONVERT 2GI TO JB W/ SLAB LID

375 BEGIN SHLD. BERM GUTTER +00.000

TEMP 2GI GRAU 350

SEE DETAIL ESR

2GI

REMOVE EXISTING CHAIN LINK FENCE

S 12°09'28.1"W

-BY4- 4 POT 18+40.828
-Y1- POT 26+50.933 RT(3.54lm)

PL CORNER EXISTING R/W

RETAIL DRIVE 14,450 BST

200mm WATER

END WW FENCE TIE TO EXISTING CHAIN LINK FENCE +20

RETAIN EXISTING CHAIN LINK FENCE

-RPA-

PLUG

US 1 SBL

-Y1- 28+32.111
END CONSTRUCTION

N 8°09'28.1" E

RETAIN 450 mm CONC

RETAIN 375 mm CONC

CONVERT 2GI TO JB w/ SLAB LID -RPD-

US 1 NBL

REMOVE EXISTING CHAIN LINK FENCE

60.0 FULL LANE

90.0 UNIFORM TRANSITION TAPER

+32 (-Y1)
TIE PROP. WW FENCE TO EX. CL FENCE

RETAIN EXISTING CHAIN LINK FENCE

SEE DETAIL L
OFSR

-Y3-

N 8°09'38.2" E

30mm RESURF. TO END OF GALAXY DR. (APPROX. 253m)

GALAXY DR. 7.4 BST

+65.273 (-Y3-)
EX. R/W

+36.119

+40 (-Y3-)
EX. R/W
13 (42.65')
20 (65.62')

+70 (-Y3-)
20 (65.62')

+30 (-Y3-)
EX. R/W
14 (45.93')

TEMP 400 CSP

SPEC. LAT. 'V' DITCH
SEE DETAIL F

-Y3- PT 14+97.034

-Y1- POT 26+82.111
-RPD- PC 10+00.000
(14.200 RT.)

-Y3- POT 16+34.243

-BY6- 1 POT 5+00.000
-Y3- POT 15+51.505 (6.809 LT)

LOWE'S HOME CENTERS, INC
DB 10128 PAGE 2427
DB 10128 PAGE 2432
PB 2003 PAGE 792

FREEMAN & COMPANY
OF GREENSBORO
DB 7842 PAGE 908

SEE SHEET 2-C FOR CURVE DATA
SEE SHEET 2-D FOR DITCH DETAIL
SEE SHEET 23 FOR -RPA- PROFILE
SEE SHEET 27 & 28 FOR -RPD- PROFILE
SEE SHEET 29 & 30 FOR -Y3- PROFILE

02-APR-2004 07:49

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	13
R/W SHEET NO.	

METRIC

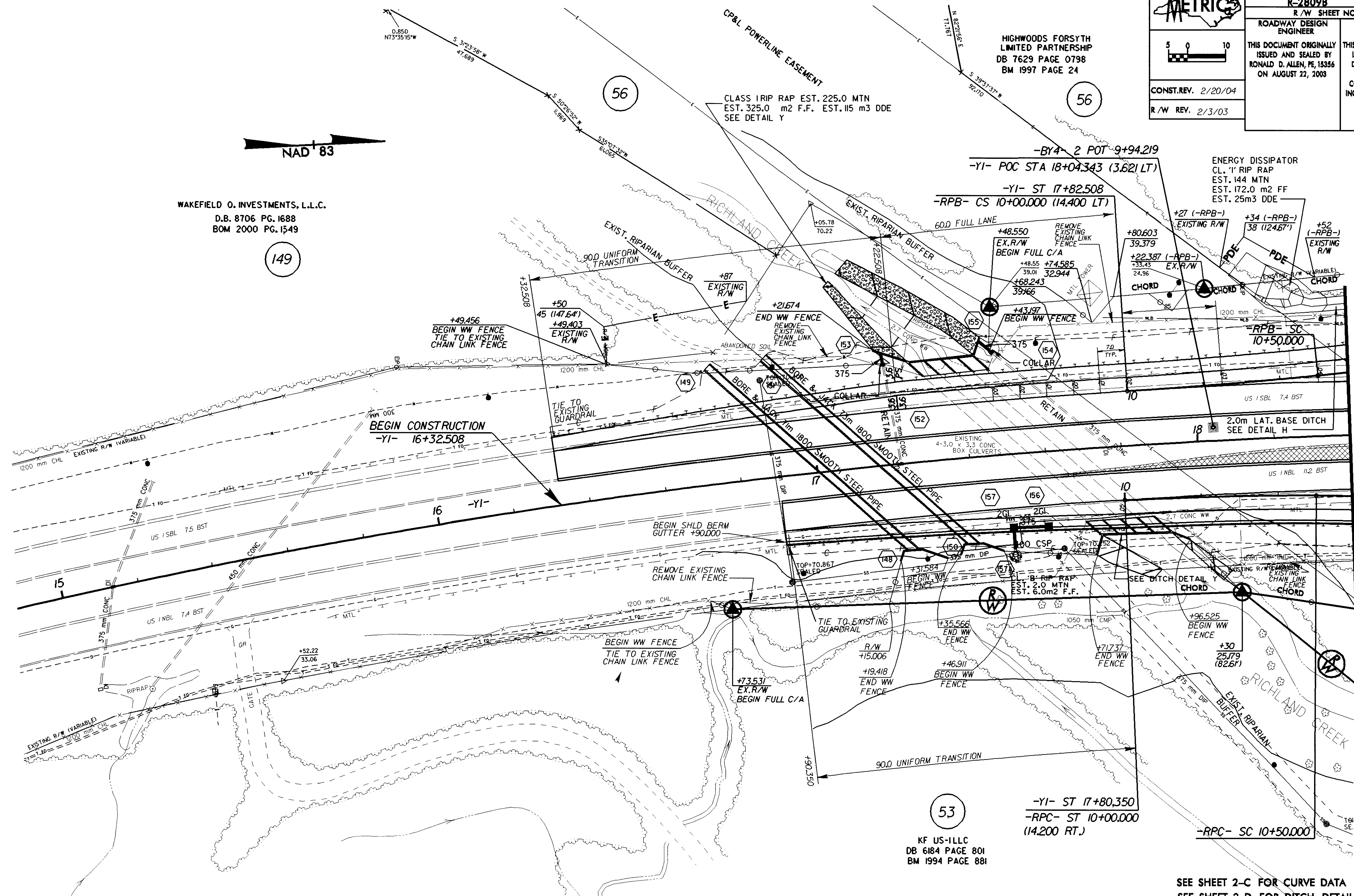
CONST.REV. 2/20/04

R/W REV. 2/3/03

ROADWAY DESIGN ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 15356 ON AUGUST 22, 2003

HYDRAULICS ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003

REVISIONS
2/20/03 CONST. REVISION: REVISED ALL EXPRESSWAY GUTTER TO SHLD.BERM GUTTER



SEE SHEET 2-C FOR CURVE DATA
SEE SHEET 2-D FOR DITCH DETAIL
SEE SHEETS 24 & 25 FOR -RPB- PROFILE
SEE SHEET 26 FOR -RPC- PROFILE
SEE SHEETS C-1 THRU C-16 FOR CULVERT PLANS

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	19

METRIC

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
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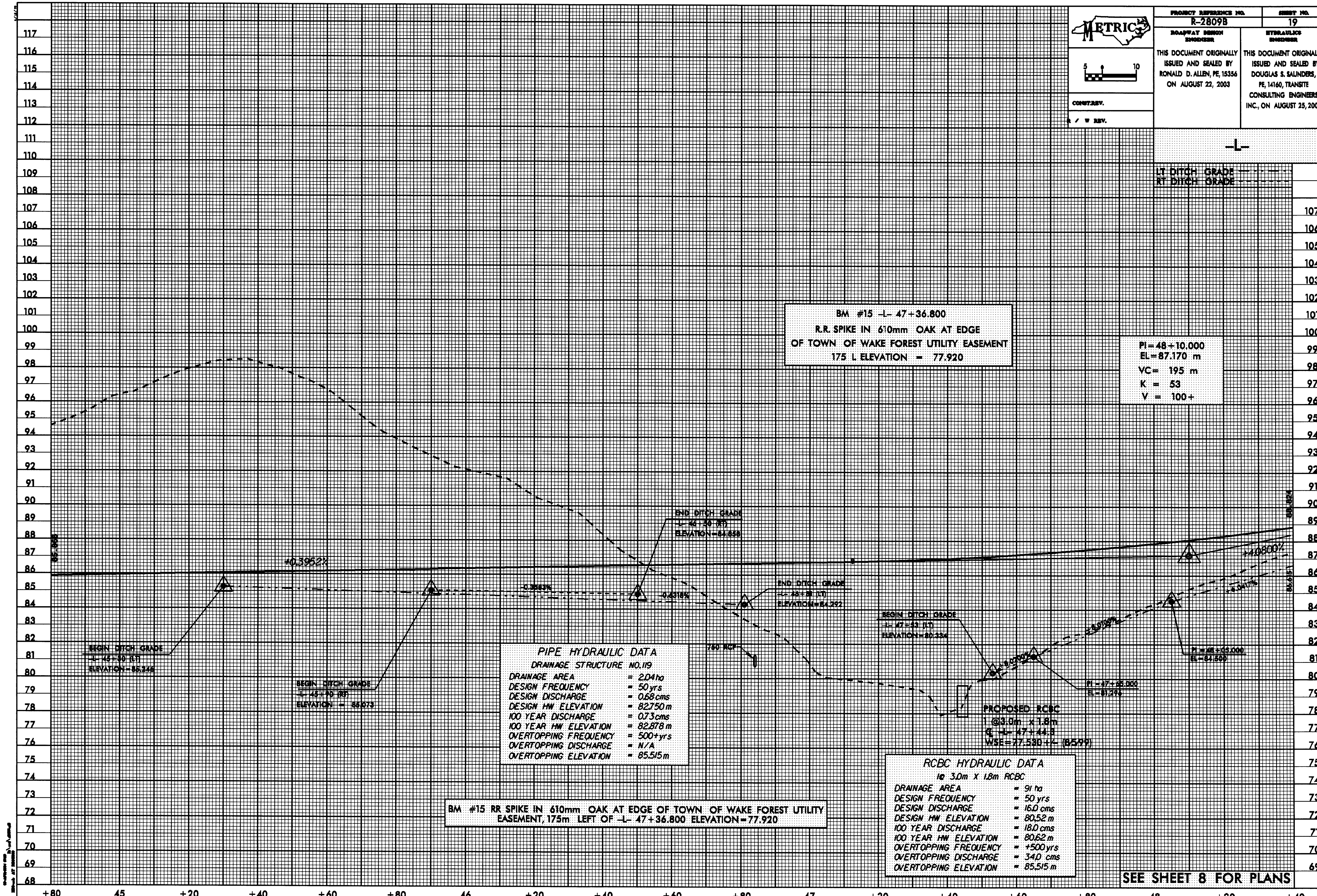
CONST.REV.

R / W REV.

-L-



PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.119

DRAINAGE AREA	= 2.04 ha
DESIGN FREQUENCY	= 50 yrs
DESIGN DISCHARGE	= 0.68 cms
DESIGN HW ELEVATION	= 82.750 m
100 YEAR DISCHARGE	= 0.73 cms
100 YEAR HW ELEVATION	= 82.878 m
OVERTOPPING FREQUENCY	= 500+ yrs
OVERTOPPING DISCHARGE	= N/A
OVERTOPPING ELEVATION	= 85.515 m

RCBC HYDRAULIC DATA

1@ 3.0m X 1.8m RCBC

DRAINAGE AREA	= 91 ha
DESIGN FREQUENCY	= 50 yrs
DESIGN DISCHARGE	= 16.0 cms
DESIGN HW ELEVATION	= 80.52 m
100 YEAR DISCHARGE	= 18.0 cms
100 YEAR HW ELEVATION	= 80.62 m
OVERTOPPING FREQUENCY	= +500 yrs
OVERTOPPING DISCHARGE	= 34.0 cms
OVERTOPPING ELEVATION	= 85.515 m

SEE SHEET 8 FOR PLANS

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	23

ROADWAY DESIGN ENGINEER
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HYDRAULICS ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003

METRIC

5 0 10

CONST.REV. 4/1/04

R / W REV.

LT DITCH GRADE
RT DITCH GRADE

--RPA--

-1.6175%

BEGIN GRADE
-RPA- 10+00.000
ELEVATION=100.518

PI=10+40.000
EL=99.863 m
VC= 80 m
K = 231
V = 100

-1.9634%

BEGIN DITCH GRADE
-RPA- 12+20 (RT)
ELEVATION=91.000

-2.5000%

PI=12+80.000
EL=89.600

-1.2500%

-1.0000%

PI=13+40.000
EL=88.600

SEE SHEETS 5 & 12 FOR PLANS

PI=14+57.000
EL=91.675 m
VC= 100 m
K = 25
V = 80

--RPA--

LT DITCH GRADE
RT DITCH GRADE

-1.9636%

+2.0000%

END GRADE EL=94.015
ELEVATION=93.415

-1.0000%

-0.5000%

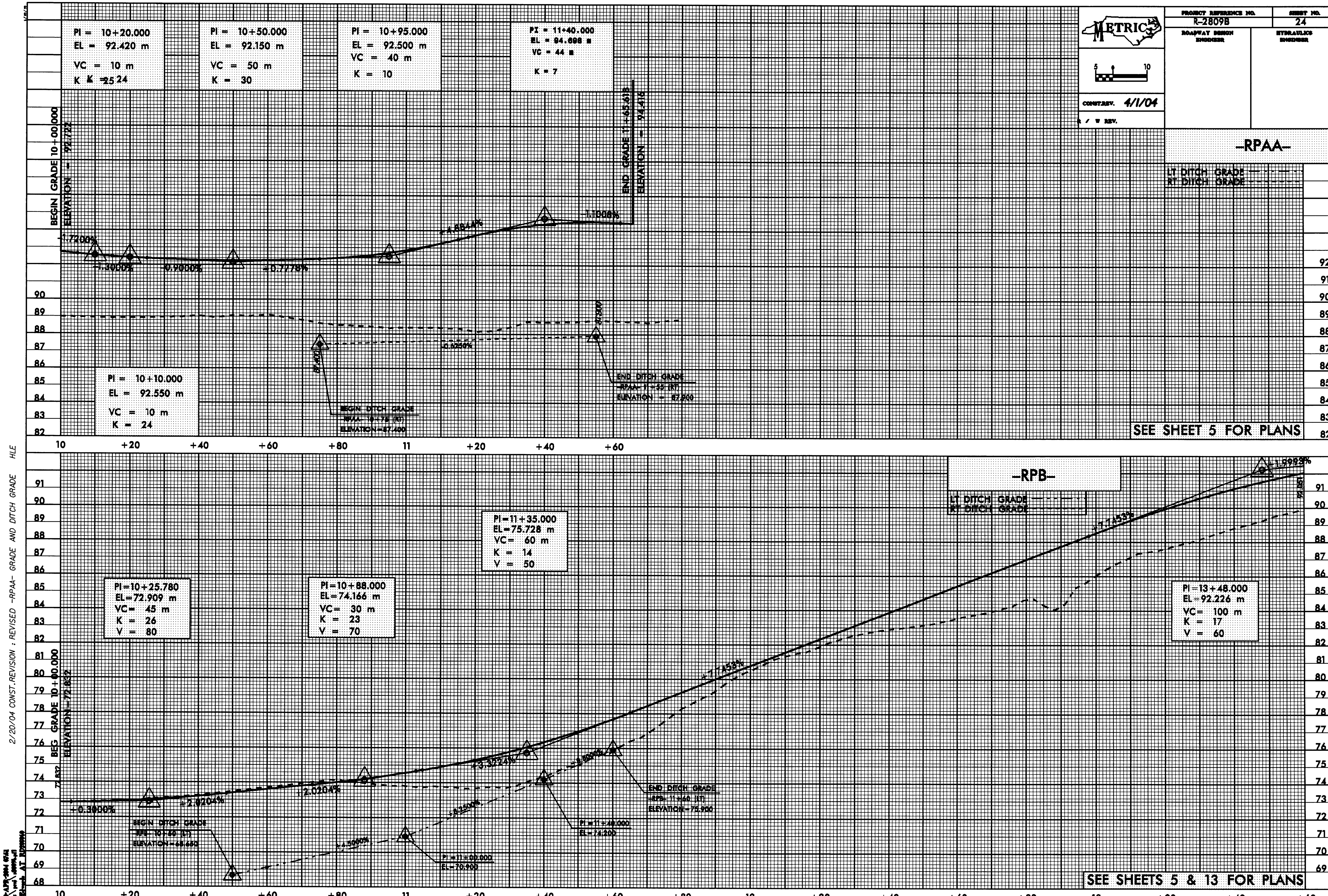
-1.4000%

PI=13+80.000
EL=88.200

PI=88.000
PI=14+20.000

END DITCH GRADE
-RPA- 14+70 (RT)
ELEVATION=87.400

SEE SHEETS 5 & 12 FOR PLANS


METRIC
PROJECT REFERENCE NO.
R-2809B
SHEET NO.
24
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST.REV. 4/1/04
R / W REV.
-RPAA-
LT DITCH GRADE
RT DITCH GRADE
PI = 10+20.000
EL = 92.420 m
VC = 10 m
K = 24
PI = 10+50.000
EL = 92.150 m
VC = 50 m
K = 30
PI = 10+95.000
EL = 92.500 m
VC = 40 m
K = 10
PI = 11+40.000
EL = 94.698 m
VC = 44 m
K = 7
BEGIN GRADE 10+00.000
ELEVATION = 92.722
END GRADE 11+65.618
ELEVATION = 94.416
-1.7200%
-1.3000%
-0.9000%
+0.7778%
+4.8844%
-1.1008%
PI = 10+10.000
EL = 92.550 m
VC = 10 m
K = 24
BEGIN DITCH GRADE
-RPAA- 10+75 (RT)
ELEVATION = 87.400
END DITCH GRADE
-RPAA- 11+55 (RT)
ELEVATION = 87.800
SEE SHEET 5 FOR PLANS
-RPB-
LT DITCH GRADE
RT DITCH GRADE
PI=11+35.000
EL=75.728 m
VC= 60 m
K = 14
V = 50
PI=10+25.780
EL=72.909 m
VC= 45 m
K = 26
V = 80
PI=10+88.000
EL=74.166 m
VC= 30 m
K = 23
V = 70
PI=13+48.000
EL=92.226 m
VC= 100 m
K = 17
V = 60
BEG GRADE 10+00.000
ELEVATION=72.832
+0.3900%
+2.0204%
+3.3224%
+7.7453%
+1.9993%
BEGIN DITCH GRADE
-RPB- 10+50 (LT)
ELEVATION=68.650
PI = 11+00.000
EL=70.900
PI = 11+40.000
EL=74.200
END DITCH GRADE
-RPB- 11+60 (LT)
ELEVATION=75.900
SEE SHEETS 5 & 13 FOR PLANS
2/20/04 CONST.REVISION ; REVISED -RPAA- GRADE AND DITCH GRADE HLE

METRIC

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	25

CONST.REV. 4/1/04

R / W REV.

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
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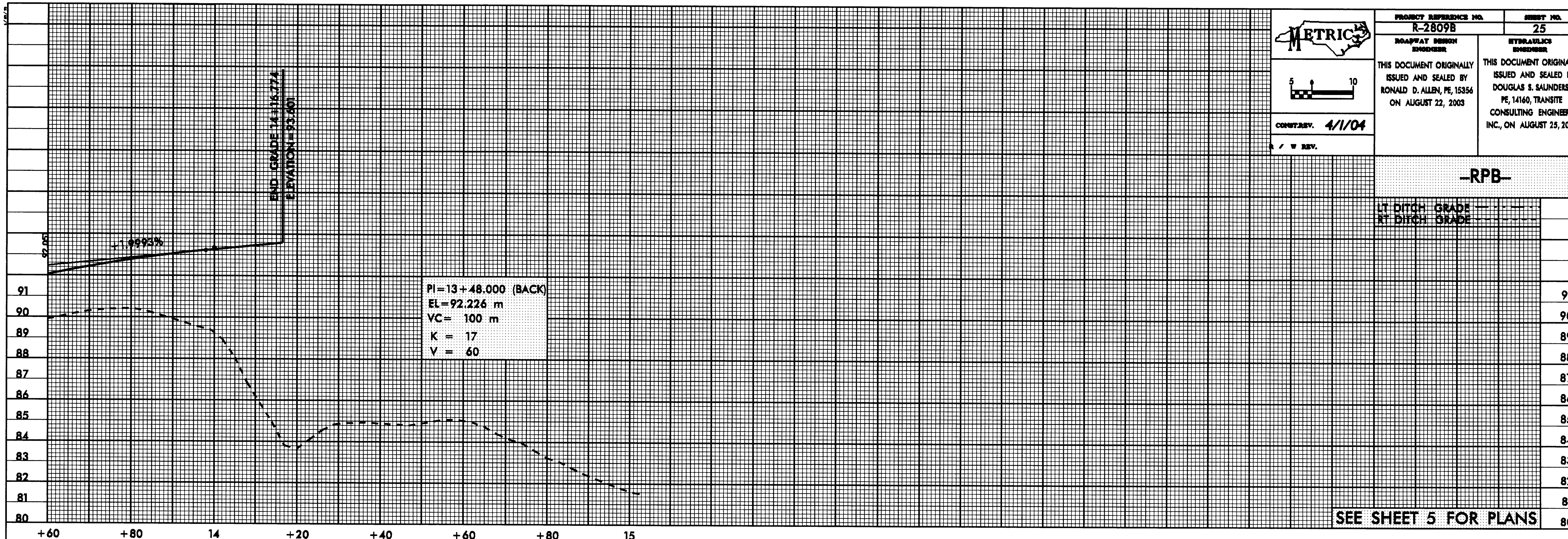
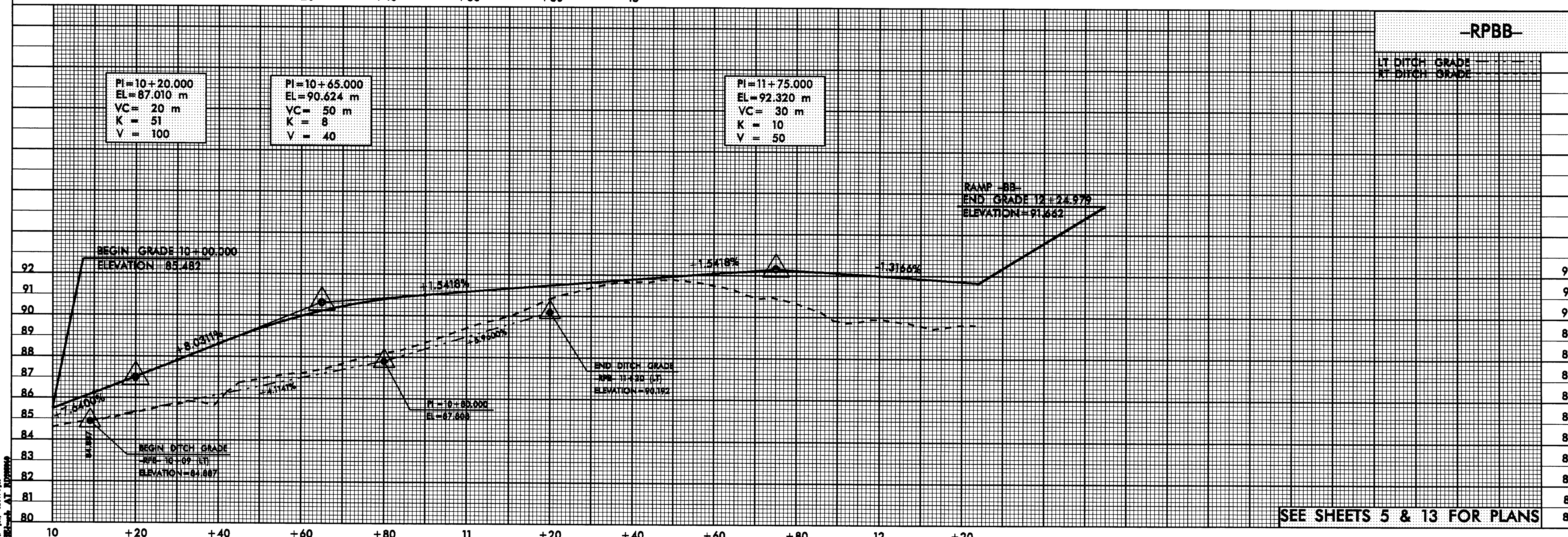
-RPB-



SEE SHEET 5 FOR PLANS

-RPBB-



SEE SHEETS 5 & 13 FOR PLANS

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

METRIC

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
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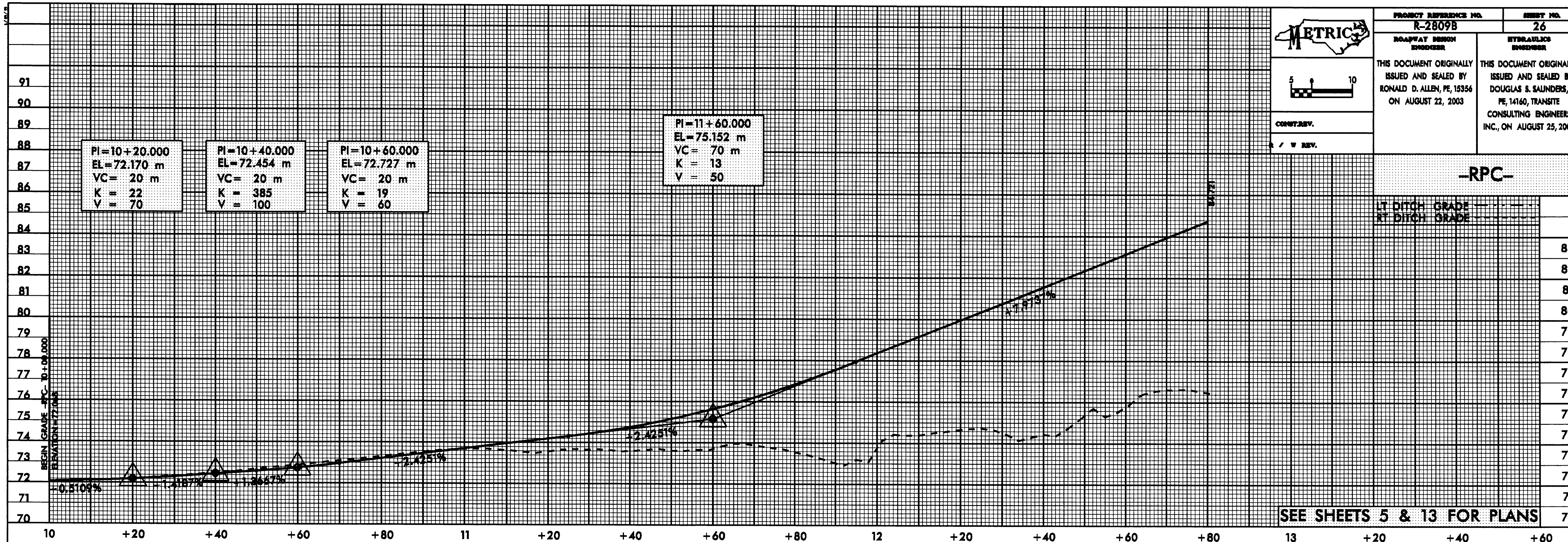
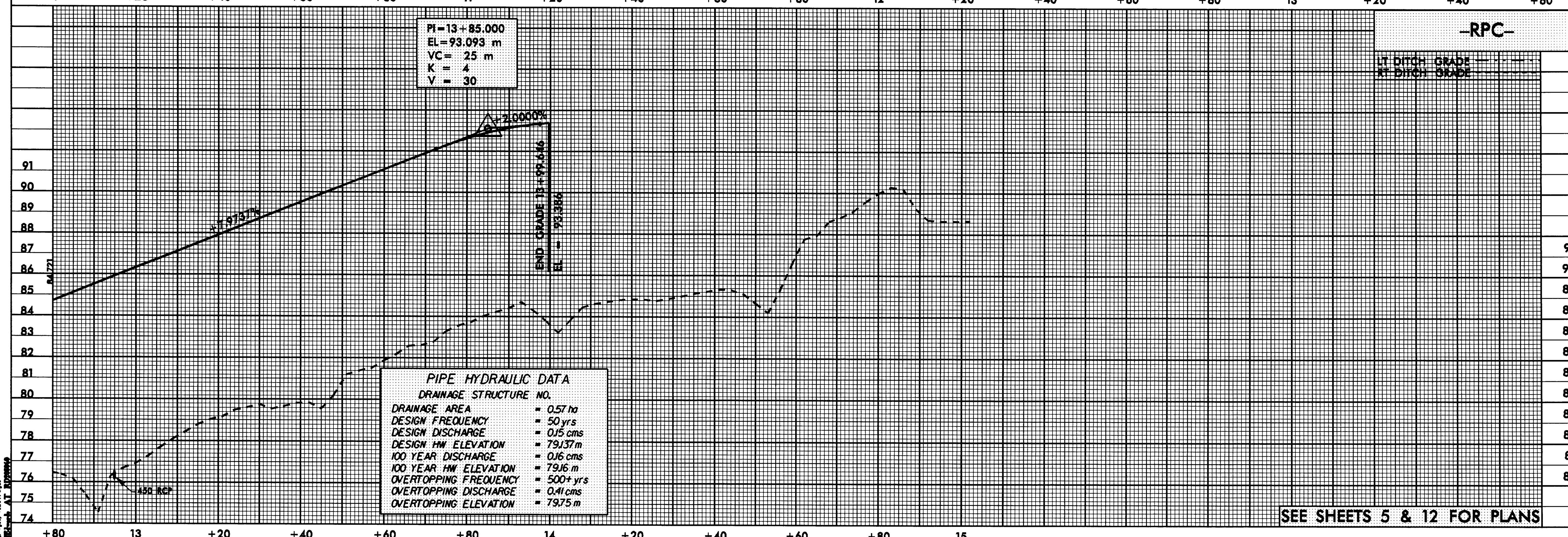
CONST.REV.

R / W REV.





PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 0.57 ha
DESIGN FREQUENCY	= 50 yrs
DESIGN DISCHARGE	= 0.15 cms
DESIGN HW ELEVATION	= 79.137 m
100 YEAR DISCHARGE	= 0.16 cms
100 YEAR HW ELEVATION	= 79.16 m
OVERTOPPING FREQUENCY	= 500+ yrs
OVERTOPPING DISCHARGE	= 0.41 cms
OVERTOPPING ELEVATION	= 79.75 m

PROJECT REFERENCE NO.	SHEET NO.
R-2809B	28

ROADWAY DESIGN ENGINEER

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HYDRAULICS ENGINEER

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003

METRIC

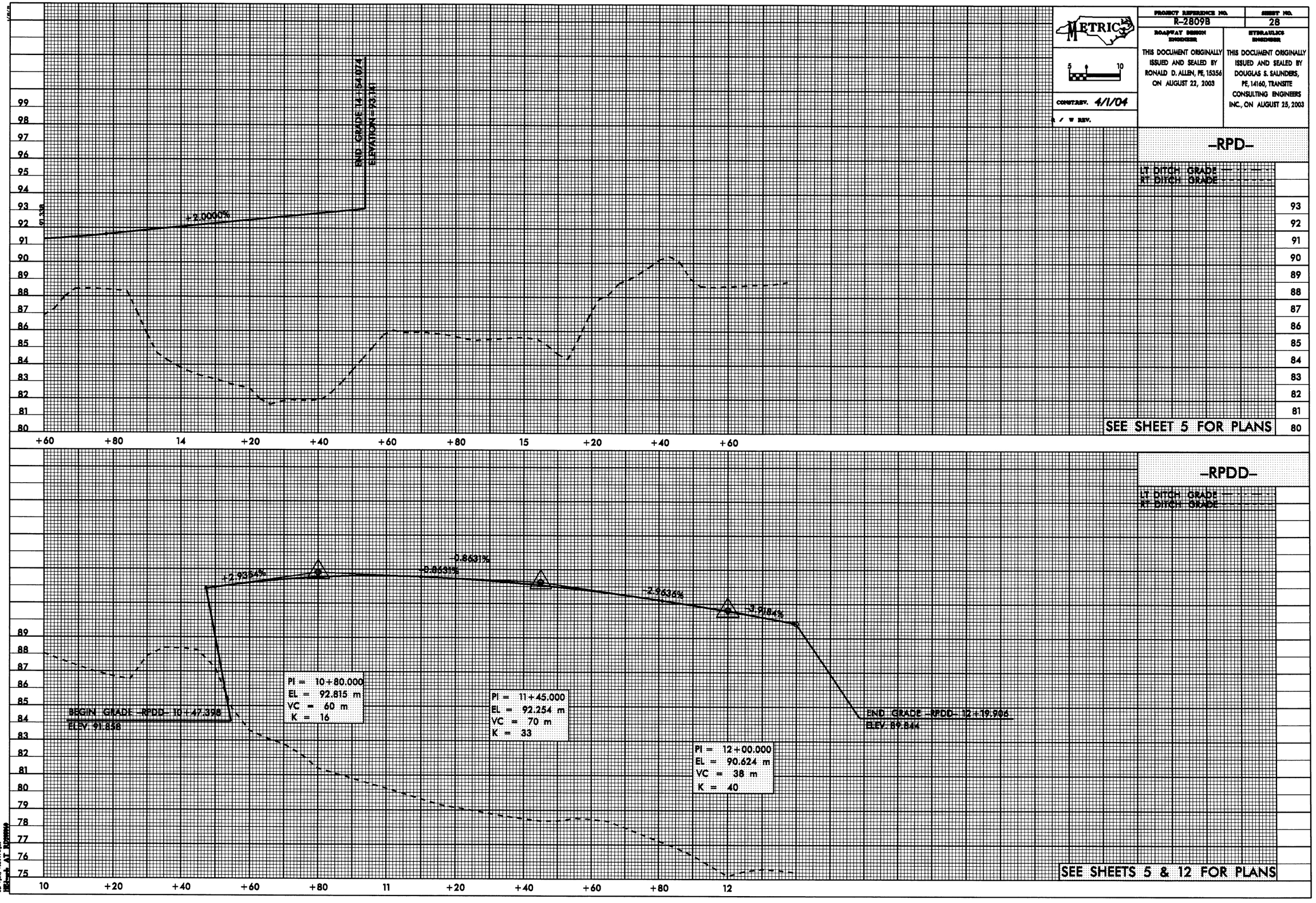
5 10

CONST.REV. 4/1/04

R / W REV.

---RPD---

LT DITCH GRADE
RT DITCH GRADE



PROJECT REFERENCE NO.	SHEET NO.
R-2809B	29

METRIC

CONST.REV. 4/1/04

R / W REV.

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
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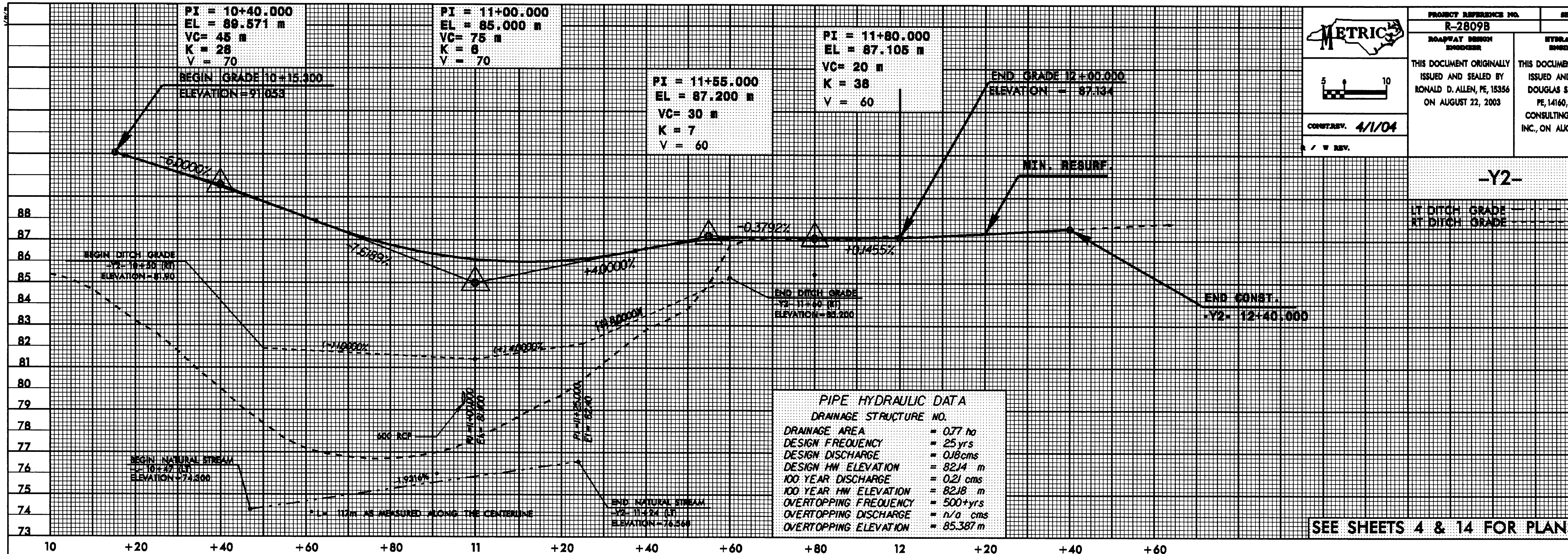
-Y2-

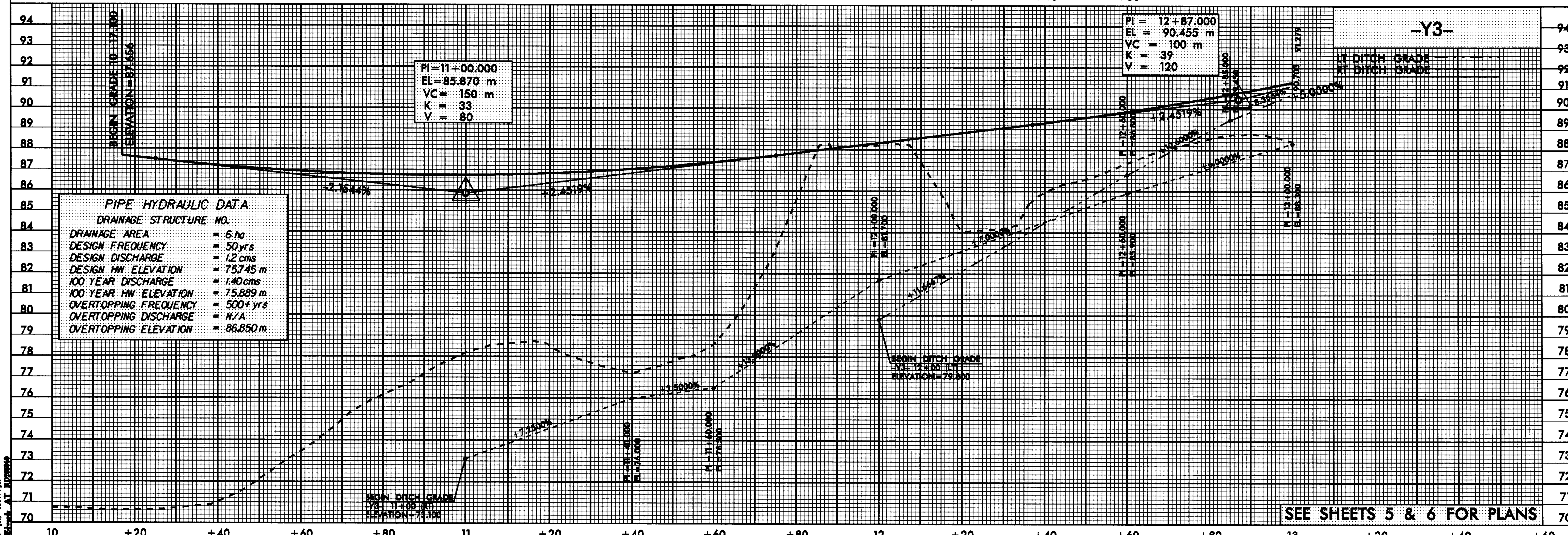


PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 0.77 ha
DESIGN FREQUENCY	= 25 yrs
DESIGN DISCHARGE	= 0.18 cms
DESIGN HW ELEVATION	= 82.14 m
100 YEAR DISCHARGE	= 0.21 cms
100 YEAR HW ELEVATION	= 82.18 m
OVERTOPPING FREQUENCY	= 500+ yrs
OVERTOPPING DISCHARGE	= n/a cms
OVERTOPPING ELEVATION	= 85.387 m

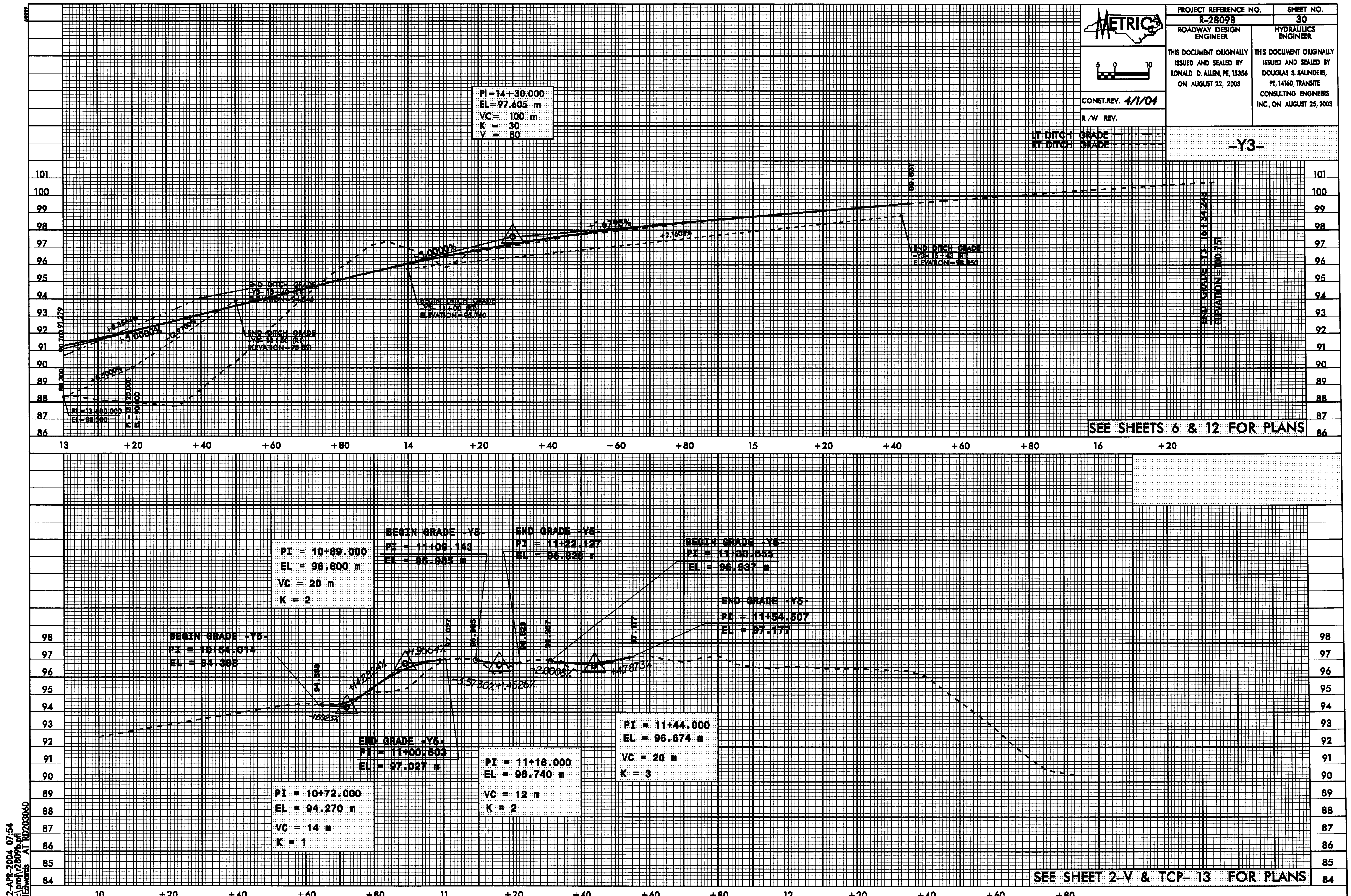
-Y3-



PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.

DRAINAGE AREA	= 6 ha
DESIGN FREQUENCY	= 50 yrs
DESIGN DISCHARGE	= 1.2 cms
DESIGN HW ELEVATION	= 75.745 m
100 YEAR DISCHARGE	= 1.40 cms
100 YEAR HW ELEVATION	= 75.889 m
OVERTOPPING FREQUENCY	= 500+ yrs
OVERTOPPING DISCHARGE	= N/A
OVERTOPPING ELEVATION	= 86.850 m


PROJECT REFERENCE NO.
R-2809B
SHEET NO.
30
ROADWAY DESIGN ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY RONALD D. ALLEN, PE, 15356 ON AUGUST 22, 2003
HYDRAULICS ENGINEER
THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DOUGLAS S. SAUNDERS, PE, 14160, TRANSITE CONSULTING ENGINEERS INC., ON AUGUST 25, 2003
METRIC
CONST.REV. 4/1/04
R /W REV.
LT DITCH GRADE
RT DITCH GRADE
-Y3-
PI = 14+30.000
EL = 97.605 m
VC = 100 m
K = 30
V = 80
-1.6795%
+3.0000%
SEE SHEETS 6 & 12 FOR PLANS
13
14
15
16
PI = 10+89.000
EL = 96.800 m
VC = 20 m
K = 2
BEGIN GRADE -Y5-
PI = 11+09.143
EL = 96.985 m
END GRADE -Y5-
PI = 11+22.127
EL = 96.826 m
BEGIN GRADE -Y5-
PI = 11+30.855
EL = 96.937 m
END GRADE -Y5-
PI = 11+54.507
EL = 97.177
BEGIN GRADE -Y5-
PI = 10+64.014
EL = 94.398
END GRADE -Y5-
PI = 11+00.603
EL = 97.027 m
PI = 11+16.000
EL = 96.740 m
VC = 12 m
K = 2
PI = 11+44.000
EL = 96.674 m
VC = 20 m
K = 3
PI = 10+72.000
EL = 94.270 m
VC = 14 m
K = 1
+14.8824%
+1.9564%
-3.5730%
+1.4526%
-2.0006%
+4.7673%
SEE SHEET 2-V & TCP- 13 FOR PLANS
10
11
12
02-APR-2004 07:54
R:\proj\r2809b.pfl
HEdwards AT RD203060