



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

July 24, 2009

US Army Corps of Engineers
Wilmington Regulatory Office
69 Darlington Avenue
Wilmington, NC 28402

Attn: Ms. Kimberly Garvey
NCDOT Coordinator, Division 8

Dear Ms. Garvey:

Subject: **Permit Extension Request for Section 404 permit and Application for Modification to Section 404 and Section 401 permits** for the US 421/NC 87 (Sanford Bypass) from west of SR 1400 to west of US 1/15/501 in Lee County, Division 8. Federal Aid Project No. STPNHF-421(2), State Project No. 8.T540402, WBS Element No. 34431.1.1, TIP No. R-2417AA.

Debit \$570.00 from WBS 34431.1.1

Reference: Section 404 Individual Permit, issued May 28, 2002, USACE Action ID 2002-20899
Section 404 Individual Permit Modification for R-2417C, issued March 25, 2009, USACE Action ID 2002-20899
Section 401 Individual Water Quality Certification, issued April 10, 2002, NCDENR-DWQ Water Quality Certification Project No. 001432.
Section 401 Individual Water Quality Certification Modification for Section R-2417C, issued January 21, 2009, NCDENR-DWQ Water Quality Certification Project No. 001432.

The North Carolina Department of Transportation (NCDOT) proposes to construct a four-lane median divided freeway with full control access, on new location to serve as a US 421/NC 87 bypass of Sanford, North Carolina. NCDOT submitted an Individual Section 404 Permit Application to the U.S. Army Corps of Engineers (USACE) for R-2417 (final design for R-2417AB, R-2417BA, and R-2417BB; preliminary design for R-2417AA and R-2417C) on June 11, 2001. Additional information was submitted on June 22, 2001, August 31, 2001, and September 28, 2001. On May 28, 2002, the Section 404 Permit was issued by the USACE (Action ID No. 2002-20899) and on April 10, 2002, a Section 401 Water Quality Certification was issued by the N.C. Division of Water Quality (DWQ Project 001432). A modification to the Section 404 Permit for Section R-2417C was recently issued on March 25, 2009 while the modification to the Section 401 Water Quality Certification for R-2417C was issued on January 21, 2009. Table 1 below lists the construction schedule for each section.

MAILING ADDRESS:

NC DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS
NATURAL ENVIRONMENT UNIT
1598 MAIL SERVICE CENTER
RALEIGH NC 27699-1598

TELEPHONE: 919-431-2000
FAX: 919-431-2001 or
919-431-2002

WEBSITE: WWW.NCDOT.ORG

LOCATION:

4701 ATLANTIC AVE.
SUITE 116
RALEIGH NC 27604

Table 1. Construction Schedule for R-2417

Section	Project Description	Let Date Schedule
R-2417AB	West of US 1/15/501 to East of US 1/15/501	Completed
R-2417BA	East of US 1/15/501 to East of SR 1521	Completed
R-2417BB	East of SR 1521 to East of NC 42	Completed
R-2417C	East of 42 to NC 87 near SR 1138	December 15, 2009
R-2417AA	West of SR 1400 to West of US 1/15/501	January 18, 2011

The purpose of this submittal is to request a modification to the Section 404 permit and Section 401 Water Quality Certification reflecting final design for Section R-2417AA. Another purpose of this submittal is to request a four-year extension for construction completion for the original Section 404/401 permit for Section R-2417AA. The expiration date for the original Section 404 permit for all R-2417 sections is December 31, 2009. The current LET date for R-2417AA is January 18, 2011 (formerly February 16, 2010); therefore the proposed expiration date would be approximately January 18, 2015. The current LET date is subject to be advanced pending on allocated funding. Please see the enclosed copies of the permit drawings, design plans, EEP acceptance letter, Merger Concurrence Point 4C minutes, and USFWS concurrence letter.

The revised design does not compromise NCDOT's compliance with the existing permit conditions. The revision has been evaluated for compliance with the avoidance/minimization criteria and is in compliance with all previous issues, including the following:

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

Summary of Jurisdictional Impacts

After issuance of the original permit (preliminary design for R-2417AA), an overall increase to jurisdictional waters and wetlands occurred in the Cape Fear River basin (HUC 03030003) during final design. The overall increase is most contributed by increases occurring at Site 2. Jurisdictional impacts actually decreased at most of the other sites during final design. Please refer to Table 2 for a summary of impact increases and to the Wetland Permit Impact Summary Table (permit drawings) for detail site comparisons between the original and permit modification. Since the original permit for Section R-2417AA was for preliminary design, temporary impacts were not available at that time. Total temporary impacts include 477 linear feet of stream impact.

Table 2. Jurisdictional Impacts Comparison Summary Table

Permitted Impact Types	Permanent Impacts
Original Permit Wetland Impacts (OPWI)	1.38 acres
Permit Modification Wetland Impacts (PMWI)	1.58 acres
PMWI – OPWI	0.2 acres increase for Permit Modification
Original Permit Total Stream Impact (OPTSI)	2,602 linear feet
Permit Modification Total Stream Impact (PMTSI)	2,771 linear feet
PMTSI – OPTSI	169 linear feet increase for Permit Modification

Jurisdictional Resources Status

No changes were made to the wetland and stream delineations for Section R-2417AA from the original permit (valid until December 31, 2009). As stated in the Merger Concurrence Point 4C (CP 4C) minutes, the stream determination call at Permit Site 2B has been changed from intermittent to perennial since the original permit. This was confirmed by Richard Spencer of the USACE and Polly Lespinasse of NCDWQ by personal communication on October 1, 2008.

The CP 4C minutes stated that one of the streams (UT2 to Buffalo Creek) at Permit Site 6 should be changed from jurisdictional (intermittent requiring no mitigation) to non-jurisdictional and that the other stream (UT3 to Buffalo Creek) should be changed from perennial to intermittent requiring no mitigation. However, this determination was made during severe drought conditions on August 7, 2008 prior to the CP 4C meeting (held on August 20, 2008). During a follow-up field visit on October 1, 2008, it was determined that both streams should maintain the same jurisdictional status as stated in the original permit.

Summary of Utility Impacts

No utility impacts to jurisdictional areas are anticipated from project construction.

Federally Protected Species

As of January 31, 2008, the US Fish and Wildlife Service (USFWS) lists three federally protected species for Lee County: Cape Fear shiner (*Notropis mekistocholas*), red-cockaded woodpecker (*Picoides borealis*), and harperella (*Ptilimnium nodosum*). While the bald eagle (*Haliaeetus leucocephalus*) is not listed, it remains protected under the Bald and Golden Eagle Protection Act. No suitable habitat is available for the bald eagle within a 1.0 mile radius of the project study area.

The biological conclusion of “No Effect” has been rendered for the red-cockaded woodpecker and harperella species for Section R-2417AA due to no habitat. A biological conclusion of “May Affect – Not Likely to Adversely Affect” for Cape Fear shiner was rendered for the entire R-2417 project in the original permit. This same biological conclusion still remains valid for Section R-2417AA due to a Cape Fear shiner survey conducted on April 16, 2009 (Patterson Creek) and April 22, 2009 (Big Buffalo Creek) by NCDOT biologists. No specimens were found but habitat was determined to be marginal due to the close vicinity of these creeks to the Deep River. A review of the Natural Heritage Program database in April 2009 revealed no occurrences of these species within 1.0 mile of the project study area. NCDOT received the USFWS concurrence letter, dated April 28, 2009 supporting all the biological conclusions.

Mitigation

The remaining mitigation from the original permit for HUC 03030003 includes 1.38 acres of riparian wetland mitigation and 1,116 linear feet of stream mitigation. The final mitigatable riparian wetland (1.58 acres) and stream (1,130 linear feet) impacts for Section R-2417AA exceeded the original permit mitigation requirement by 0.2 acre and 15 linear feet (including perennial section of stream at Site 2B), respectively, within HUC 03030003 (Table 3). Streams located at Sites 2a, 6, 7, 9, and 10, totaling 1,403 linear feet, will not require mitigation. These streams were determined to be intermittent by the USACE and not to be providing significant aquatic uses. Also 238 linear feet of permanent stream impacts are due to bank stabilization (Sites 1, 4, 5, 6, and 9) which will not be proposed for mitigation. Stabilizing the bank of a stream does not require fill in the stream bed and, therefore, under Section 404 of the Clean Water Act, does not constitute Loss of Waters of the U.S. and is not subject to compensatory mitigation. Furthermore, the proposed bank stabilization activities are necessary to prevent erosion and

sedimentation, i.e. preventing bank destabilization and minimizing impacts to the environment. The NCDOT is proposing to make payment to the EEP (Ecosystem Enhancement Program) for the increased impacts to wetlands and streams. The acceptance letter from EEP for the wetland mitigation is enclosed with this application.

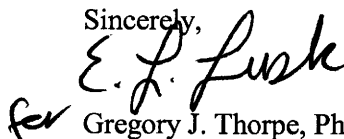
Table 3. Mitigatable Impacts Comparison Summary Table

Mitigatable Impact Types	Mitigatable Impacts
Original Permit Mitigatable Wetland Impacts (OPMWI)	1.38 acres
Permit Modification Mitigatable Wetland Impacts (PMMWI)	1.58 acres
PMMWI – OPMWI	0.2 acres of additional mitigation
Original Permit Mitigatable Stream Impact (OPMSI)	1,116 linear feet
Permit Modification Mitigatable Stream Impact (PMMSI)	1,130 linear feet
PMMSI – OPMSI	15 linear feet of additional mitigation

Regulatory Approvals

Application is hereby made for the modification of the Section 404 Permit from USACE and Section 401 Water Quality Certification from DWQ. The NCDOT is also requesting a 4-year permit expiration from the LET date (January 18, 2011). In compliance with Section 143-215.3D(e) of the NCAC we have provided a method of debiting \$570, as noted in the subject line of this application, as payment for processing the Section 401 Water Quality Certification modification application. We are providing five copies of this application to DWQ, for their use.

A copy of this permit modification will be posted on the NCDOT website at: <http://www.ncdot.org/doh/preconstruct/pe/>. If you have any questions or need additional information, please call Greg Price at (919) 431-1587.

Sincerely,

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

cc: w/attachment

Mr. Brian Wrenn, NCDWQ (5 Copies)

Ms. Kathy Matthews, USEPA

w/o attachment

Dr. David Chang, P.E., Hydraulics

Mr. Mark Staley, Roadside Environmental

Mr. Greg Perfetti, P.E., Structure Design

Mr. Jay Bennett, P.E., Roadway Design

Mr. Tim Johnson, P.E., Division 8 Engineer

Mr. Victor Barbour, P.E., Project Services Unit

Mr. Art King, Division 8 Environmental Officer

Mr. Majed Alghandour, P. E., Programming and TIP

Mr. Art McMillan, P.E., Highway Design

Mr. Scott McLendon, USACE, Wilmington

Mr. Travis Wilson, NCWRC

Mr. Gary Jordan, USFWS

Ms. Beth Harmon, EEP

Mr. Todd Jones, NCDOT External Audit Branch

Mr. Drew Joyner, PE, Human Environment Unit Head

Mr. Clarence W. Coleman, P.E., FHWA

Mr. Jay McInnis, P.E., PDEA Project Planning Engineer



May 4, 2009

Mr. Richard Spencer
U. S. Army Corps of Engineers
Wilmington Regulatory Field Office
Post Office Box 1890
Wilmington, North Carolina 28402-1890

Dear Mr. Spencer:

Subject: EEP Mitigation Acceptance Letter:

R-2417AA, US 421/NC 87 (Sanford Bypass) West of SR 1400 to Near
US 1/15/50I, Lee County; Cape Fear River Basin (Cataloging Unit 03030003);
Southern Piedmont (SP) Eco-Region

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the compensatory stream and riparian wetland mitigation for the unavoidable impact associated with the above referenced project. As indicated in the NCDOT's mitigation request dated April 17, 2009, stream and riparian wetland mitigation from EEP is required for 15 feet of warm stream impact and 0.20 acre of riparian wetland impact.

Mitigation associated with this project will be provided in accordance with Section X of Amendment No. 2 to the Memorandum of Agreement between the N. C. Department of Environment and Natural Resources, the N. C. Department of Transportation, and the U. S. Army Corps of Engineers fully executed on March 8, 2007 (Tri-Party MOA). EEP commits to implement sufficient stream and riparian wetland mitigation up to 30 warm stream credits and 0.40 riparian wetland credits to offset the impacts associated with this project by the end of the MOA year in which this project is permitted. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from EEP.

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

Sincerely,

A handwritten signature in black ink that reads "William D. Gilmore for". The signature is written in a cursive, flowing style.

William D. Gilmore, P.E.
EEP Director

cc: Mr. Gregory J. Thorpe, Ph.D., NCDOT-PDEA
Mr. Brian Wrenn, Division of Water Quality, Wetlands/401 Unit
File: R-2417AA

Restoring... Enhancing... Protecting Our State





May 4, 2009

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

Dear Dr. Thorpe:

Subject: EEP Mitigation Acceptance Letter:

R-2417AA, NC 421/NC 87 (Sanford Bypass) from West of SR 1400 to near
US 1/15/501, Lee County

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the stream and riparian wetland mitigation for the subject project. Based on the information supplied by you dated April 17, 2009, the impacts are located in CU 03030003 of the Cape Fear River Basin in the Southern Piedmont (SP) Eco-Region, and are as follows:

Stream (warm):	15 feet
Riparian Wetland:	0.20 acre

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

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

Sincerely,

William D. Gilmore, P.E.
EEP Director

cc: Mr. Richard Spencer, USACE – Washington Regulatory Field Office
Mr. Brian Wrenn, Division of Water Quality, Wetlands/401 Unit
File: R-2417AA

Restoring... Enhancing... Protecting Our State



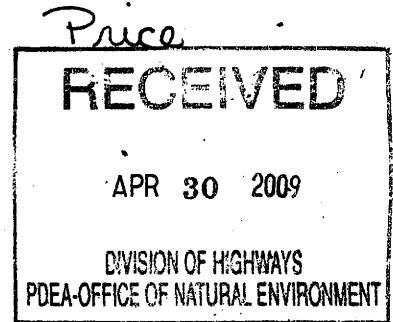
CD 4 2009
CC: L.W. Wams



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

April 28, 2009



Gregory J. Thorpe, Ph.D.
North Carolina Department of Transportation
Project Development and Environmental Analysis
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Dr. Thorpe:

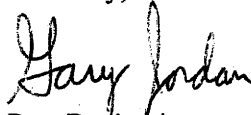
This letter is in response to your letter of April 24, 2009 which provided the U.S. Fish and Wildlife Service (Service) with the biological determination of the North Carolina Department of Transportation (NCDOT) that the construction of US 421/NC 87 (Sanford Bypass) from west of SR 1400 to west of US 1/15/501 in Lee County (TIP No. R-2417AA) may affect, but is not likely to adversely affect the federally endangered Cape Fear shiner (*Notropis nodosum*). In addition, NCDOT has determined that the project will have no effect on the federally endangered red-cockaded woodpecker (*Picoides borealis*) and harperella (*Ptilimnium nodosum*). These comments are provided in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543).

According to information provided, fish surveys were conducted within the project area in Patterson Creek and Big Buffalo Creek on April 16, 2009 and April 22, 2009, respectively. No specimens of Cape Fear shiners were observed. Habitat in Patterson Creek and Big Buffalo Creek was observed to be poor to marginal. However, due to the presence of Cape Fear shiners in the Deep River (of which both streams flow into), NCDOT has rendered a biological conclusion of may affect, not likely to adversely affect for the Cape Fear shiner. Based on the survey results and other available information, the Service concurs with this determination. Also, due to the lack of habitat, the Service concurs with the NCDOT determination that the project will have no effect on the red-cockaded woodpecker and harperella.

We believe that the requirements of section 7(a)(2) of the ESA have been satisfied. We remind you that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered in this review; (2) this action is subsequently modified in a manner that was not considered in this review; or (3) a new species is listed or critical habitat determined that may be affected by this identified action.

The Service appreciates the opportunity to review this project. If you have any questions regarding our response, please contact Mr. Gary Jordan at (919) 856-4520 (Ext. 32).

Sincerely,


for Pete Benjamin
Field Supervisor

cc: Richard Spencer, USACE, Wilmington, NC
Travis Wilson, NCWRC, Creedmoor, NC
Chris Militscher, USEPA, Raleigh, NC
John Sullivan, FHWA, Raleigh, NC
David Harris, NCDOT, Raleigh, NC

Subject: Minutes from Interagency 4C Permit Drawing Review Meeting
on August 20, 2008 for R-2417AA in Lee County

Team Members:

Richard Spencer-USACE	(absent)
Gary Jordan-USFWS	(present)
Travis Wilson-NCWRC	(absent)
Polly Lespinasse-NCDWQ	(present)
Chris Militscher-EPA	(present)
Donnie Brew-FHWA	(present)
David Harris-REU	(absent)
Cathy Houser-Roadway	(absent)
Betsy Cox, Structures	(absent)
Jay McInnis-PDEA	(absent)
Rachelle Beauregard-NEU	(present)
John Olinger-Division 8	(present)

Participants:

Marshall Clawson, NCDOT Hydraulics
Herb Turner, Ko & Associates
Robert Stroup, NCDOT Roadway
Clayton Walston, NCDOT Roadway
Karen McCauley, NCDOT Roadway
Theo Beach, NCDOT Structure Design
Mark Staley, NCDOT – REU
Jennifer Parish, NCDOT – REU
Greg Price, NCDOT - NEU

1. The 4B Hydraulic Design Review Meeting was held on June 15, 2005 for R-2417AA.
2. A general comment was made to update decimal accuracy to the hundredth for area impacts shown on the Wetland Permit Impact Summary.
3. On Title Sheet and Plan Sheets, increase font size for site labels.
4. Per NEU, the jurisdictional determinations for the wetlands were updated approximately two years ago. The jurisdictional determinations for the streams are currently being updated. Modification to four of the previous determinations is proposed. NEU anticipates completing these updates to the jurisdictional determination within a month from this meeting.
5. The project limits for R-2417AA will be extended to include grading repairs and final paving for the US 1-15-501 interchange (R-2417AB), east of the current project limits. Based on the Division's comments, there is at least one jurisdictional stream along Ramp B which may be impacted. NEU will provide jurisdictional determinations for this area. Any impacted sites will be incorporated into this permit package.

Title Sheet (11x17):

Revise title sheet to indicate "Wetland & Stream Impacts".

Sheet 5:

SITE 1 (Sta 22+30 to 26+80 LT): NEU requested that the impacts for the two wetland pockets be labeled as Site 1 to be consistent with the Wetland Permit Impact Summary.

Sheet 6A:

SITE 2:

- a) Remove and add note for “additional wetland impacts due to drawdown” to Wetland Permit Impact Summary sheet.
- b) Station 33+65 RT (South side of 421): The UT to Patterson Creek is perennial on south side of 421. Therefore, label intermittent and perennial stream sections as Site 2A and Site 2B, respectively. Update Wetland Permit Impact Summary.
- c) Station 33+65 RT: Verify or modify proposed alignment for smooth transition to existing channel.
- d) Sta 33+25 RT: Remove fill shading from existing 15” CMP to UT. That part is non-jurisdictional.

SITE 3 (Sta 35+20 RT): Impacts are for wetland, only. Remove leader to SITE 2.

Sheet 6B:

SITE 4 (Sta 52+08): There are no impacts from the proposed Dual, Single-Span Bridges. Add surface water impacts as a result of the riprap on embankments for the two system outfalls along Big Buffalo Creek.

Sheet 9:

SITE 5 (Sta 87+90): There was discussion stormwater treatment prior to tying to the 54” crosspipe. Marshall clarified that the roadway runoff is treated via grassed swales prior to entering the drainage system.

Sheet 12:

SITE 6: Per NEU, the jurisdictional determinations are being updated.

- a) Sta 120+20: UT2 to Big Buffalo Creek (smaller one) is non-jurisdictional. Remove impact hatching.
- b) Sta 120+57: The larger stream (UT3 to Big Buffalo Creek) is intermittent and should not require mitigation.
- c) Station 120+20 RT: Verify or modify proposed alignment from overflow channel for smooth transition to existing channel.

Sheet 14:

SITE 7 (Sta 142+67): Per NEU, the jurisdictional determination is being updated.

- a) The stream (UT4 to Big Buffalo Creek) scored as ephemeral (non-jurisdictional) instead of intermittent. Site may be eliminated.

- b) There was discussion regarding the lateral ditch ties to the inlet channel. No riprap is recommended for these tie locations.

Sheet 14-15:

SITE 8 (Sta 153+50 – 160+00):

- a) Culvert through wetland is a 54" RCP with inverts buried 1-foot. This culvert has a drainage area of 84.2 acres and is placed in the existing channel (3' base by 1' depth).
- b) On summary sheet, provide additional area for "Total Take" of wetland left of center (Sta 153+50 – 154+50 LT).
- c) Add 54" RCP for structure size on Wetland Permit Impact Summary sheet.
- d) No jurisdictional stream has been determined. NEU will confirm during their field visit.

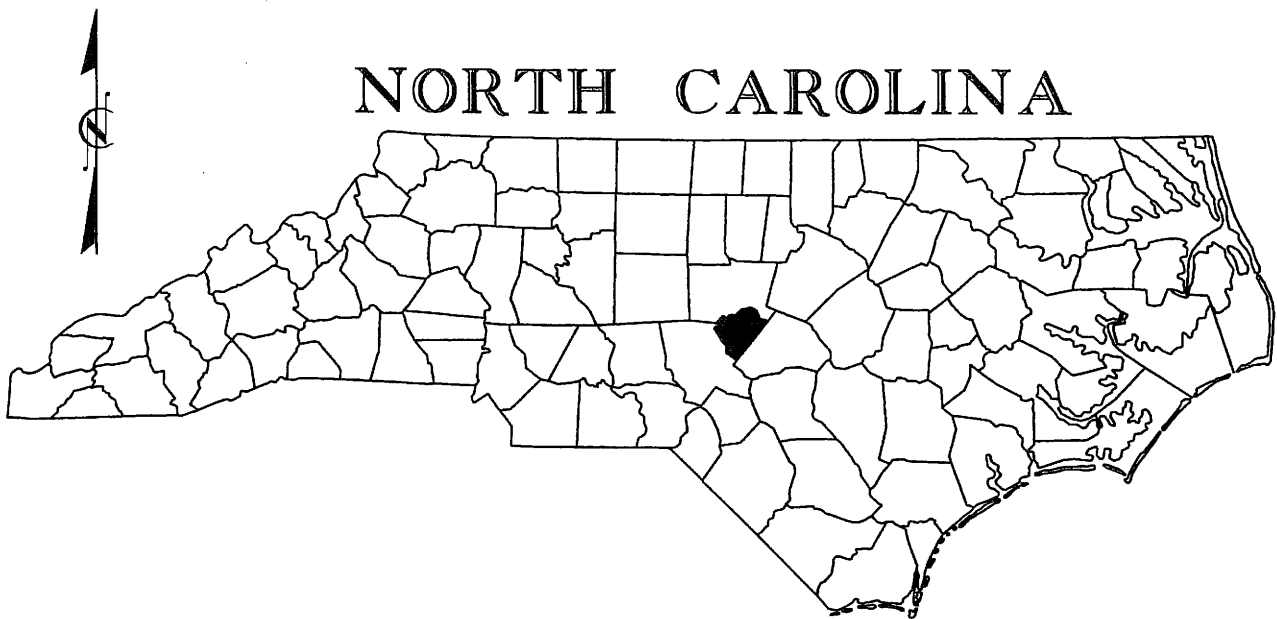
Sheet 16:

SITE 9 (Sta 177+29 RT): Within the TDE, add mechanized clearing of wetlands right of center for the construction of box culvert.

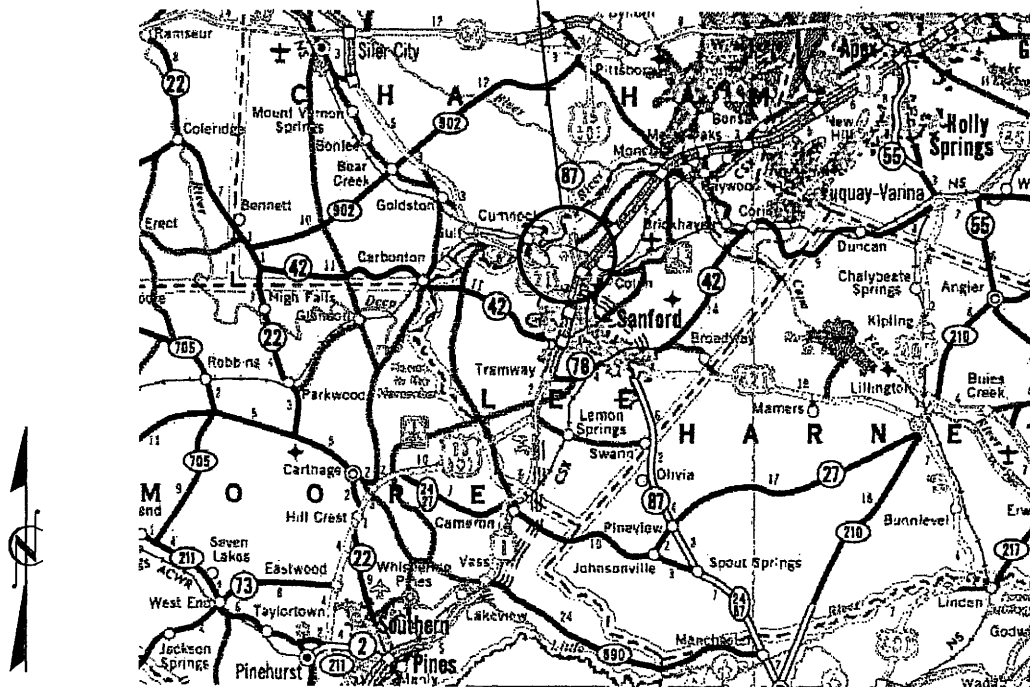
Sheet 18:

SITE 10 (Sta 194+60 to 196+10): It was stated to follow NCDOT's pond drawdown guidelines during construction to minimize downstream channel erosion.

The meeting was adjourned



SITE



VICINITY MAP

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET 1 OF 41

SUMMARY OF AFFECTED PROPERTY OWNERS

TRACT NO.	PROPERTY OWNER	ADDRESS	SITE NO.
(1)	ERNEST MILLER	PO BOX 20561 GREENSBORO NC 27330	1 & 2
(2)	ERNEST MILLER	PO BOX 20561 GREENSBORO NC 27330	3
(3)	PHYLLIS McKOY HEIRS	3707 CRAIGHOLM CT CHARLOTTE NC 28262	4
(5)	JOSEPHINE WOMACK D.C. HOLLER JR & INEZ J. HOLLER	710 ERWIN RD SANFORD NC 27330 PO BOX 399 SANFORD NC 27331	4
(8)	HELENA EDWARDS	115 180TH ST JAMAICA NY 11434	5
(15)	ROBERT STRICKLAND	2394 COTTON RD SANFORD NC 27330	6
(17)	RONALD GARTIN	4240 FOX RUN DR SANFORD NC 27330	7
(20)	CHARLES GANTT	1606 LORD ASHLEY DR SANFORD NC 27330	8
(21)	REXINE LLOYD	511 MAPLEWOOD DR SANFORD NC 27330	9
(23)	SAN-LEE BUILDERS	PO BOX 3367 SANFORD NC 27331	9
(24)	ROGER & LILLIAN THOMAS	3212 GREEN VALLEY DR SANFORD NC 27330	10



NCDOT

**DIVISION OF HIGHWAYS
LEE COUNTY**

PROJECT: 34431.1.2 (R-2417AA)

**US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501**

SHEET 2 OF 41

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS				
			Permanent Fill in Wetlands (ac)	Temp. Fill in Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW Impacts (ac)	Temp. SW Impacts (ac)	Existing Channel Impacts (ft)	Existing Channel Temp. Impacts (ft)	Natural Stream Design (ft)
1	-L- 22+30/26+80 (LT)	Roadway Embankment	0.02	---	< 0.01	0.02	---	< 0.01	< 0.01	10	---	---
2	-L- 23+32 (RT)	Bank Stabilization	---	---	---	---	---	---	---	---	---	---
2a**	-L- 33+00/33+65 (LT)	Roadway Embankment	0.16	---	0.21	0.05	---	0.08	< 0.01	816	14	---
2b	-L- 33+00/33+65 (RT)	42" CMP w/ 54" STL Suppl	---	---	---	---	---	0.03	0.01	274	15	---
3	-L- 35+20/36+30 (RT)	Roadway Embankment	0.11	---	---	0.01	---	---	---	---	---	---
4	-L- 52+08 (LT/RT) & L- 63+00 (RT)	Bank Stabilization	---	---	---	---	---	0.01	0.01	44	57	---
5	-L- 87+90 (LT/RT)	54" RCP	---	---	---	---	---	0.02	< 0.01	265	47	---
6**	-L- 120+20 (LT)	Bank Stabilization	---	---	---	---	---	< 0.01	< 0.01	30	---	---
6	-L- 120+57 (LT/RT)	8' x 6' RCBC	---	---	---	---	---	0.01	< 0.01	140	55	---
7**	-L- 142+67 (LT/RT)	Bank Stabilization	---	---	---	---	---	0.02	< 0.01	104	---	---
8	-L- 153+50/160+00 (RT)	8' x 6' RCBC	0.73	---	0.01	0.08	---	---	---	351	66	---
9	-L- 177+29 (LT/RT)	(2) 9' x 7' RCBC	0.12	---	0.03	0.03	---	0.04	0.01	375	60	---
9**	-L- 178+82 (LT)	Bank Stabilization	---	---	---	---	---	0.01	---	50	---	---
10	-L- 194+60/196+10 (LT/RT)	54" RCP	---	---	---	---	---	< 0.01	< 0.01	80	30	---
10**	-L- 195+65 (RT)	36" RCP	---	---	---	---	---	0.66	---	---	---	---
TOTALS:			1.14	---	0.25	0.19	---	0.91	0.04	2771	477	---

** Intermittent Stream - No Mitigation Required

Perennial & Intermittent Total - Mitigation Req'd: 1130 ft
 Perennial & Intermittent Total - Bank Stabilization: 236 ft
 ** Intermittent Total - Not Requiring Mitigation: 1403 ft

NOTES:
 SITE 2 - ADDITIONAL IMPACT DUE TO DRAWDOWN = 0.10 AC.
 SITE 4 - ADDITIONAL IMPACT DUE TO TEMPORARY CONSTRUCTION BENTS [2 @ 55' x 5'] = 0.01 AC (550 SF).
 SITE 8 - ADDITIONAL IMPACT DUE TO TOTAL TAKE AT L- STA 154+00 LT = 0.02 AC.

WETLAND PERMIT IMPACT SUMMARY

ORIGINAL PERMIT IMPACTS					PERMIT MODIFICATION IMPACTS							
Site No.	Fill In Wetlands (ac)	Mechanized Clearing (Method III) (ac)	Fill In SW (Natural) (ac)	Fill In SW (Pond) (ac)	Existing Channel Impacted (ft)	Permanent Fill In Wetlands (ac)	Excavation In Wetlands (ac)	Mechanized Clearing In Wetlands (ac)	Fill In SW (Pond) (ac)	Temp. SW Impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)
1	0.05					0.02	<0.01	0.02			10*	20
2	0.05				561**	0.16	0.21	0.05			816**	14
3	0.13					0.11		0.01			274	15
4											44*	57
5					377						265	47
6					322						216	83
					190**						140**	55
7					331**						104*	
											351**	66
8	0.96					0.73	0.01	0.08				
9	0.19				417	0.12	0.03	0.03			375	60
					345**						80**	30
10				0.54	59**				0.66		16**	30
TOTALS:	1.38			0.54	2602	1.14	0.25	0.19	0.66	0.00	2771	477

NOTES:

* Bank stabilization requiring no mitigation

** Intermittent stream requiring no mitigation

Mitigatable stream impacts for original permit = 1116 linear feet

Mitigatable stream impacts for permit modification = 1130 linear feet

Mitigatable wetland impacts for original permit = 1.38 acres

Mitigatable wetland impacts for permit modification = 1.58 acres

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

LEE COUNTY
WBS - 34431.1.1 (R-2417AA)

SHEET

4 of 41

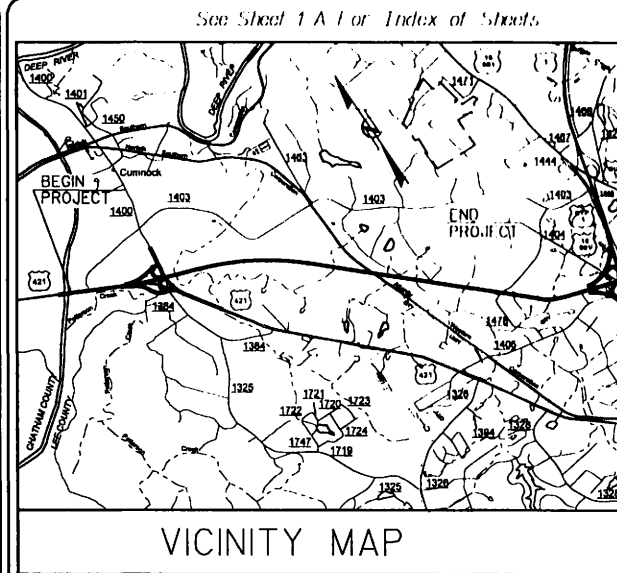
4/14/2009

4/2/2009
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KO & Associates, P.C.

09/08/99

CONTRACT:

TIP PROJECT: R-2417AA



VICINITY MAP

THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES

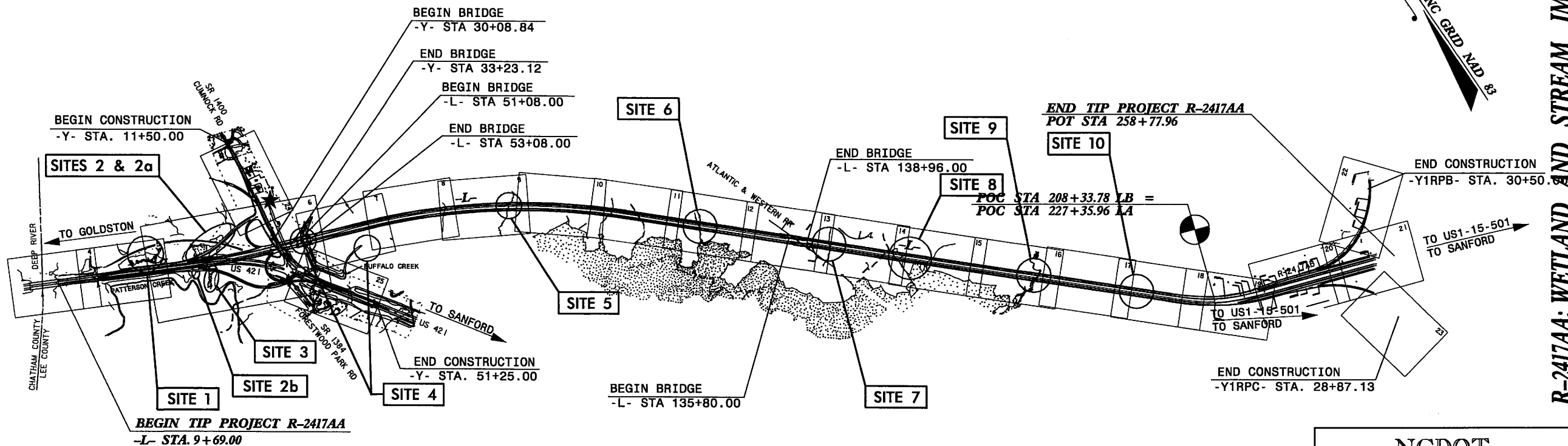
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

LEE COUNTY

LOCATION: US 421 - NC 87 SANFORD BYPASS FROM WEST
OF SR 1400 TO WEST OF US 1-15-501

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES
AND SIGNAL.

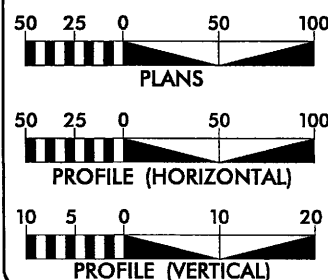
R-2417AA: WETLAND AND STREAM IMPACTS PLAN



NCDOT CONTACT: DOUG TAYLOR, P.E.
ROADWAY DESIGN - ENGINEERING COORDINATION

THIS IS A CONTROLLED - ACCESS PROJECT WITH
ACCESS BEING LIMITED TO INTERCHANGES.
CLEARING ON THIS PROJECT SHALL BE PERFORMED
TO THE LIMITS ESTABLISHED BY METHOD III

GRAPHIC SCALES



DESIGN DATA

ADT 2008 = 13,300
ADT 2028 = 20,800
DHV = 10 %
D = 60 %
T = 9 % *
V = 70 MPH
* TTST 5% DUAL 4%

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2417AA = 4.259 MI.
LENGTH STRUCTURES TIP PROJECT R-2417AA = 0.098 MI.
TOTAL LENGTH OF TIP PROJECT R-2417AA = 4.357 MI.

Prepared in the Office of:
KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 831-0066

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
February 17, 2006

LETTING DATE:
February 16, 2010

David C. Waller, P.E.
PROJECT ENGINEER

Michael A. Young, P.E.
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN
ENGINEER

SIGNATURE: _____ P.E.

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET OF

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA



STATE HIGHWAY DESIGN ENGINEER

Permit Drawing
Sheet 5 of 41

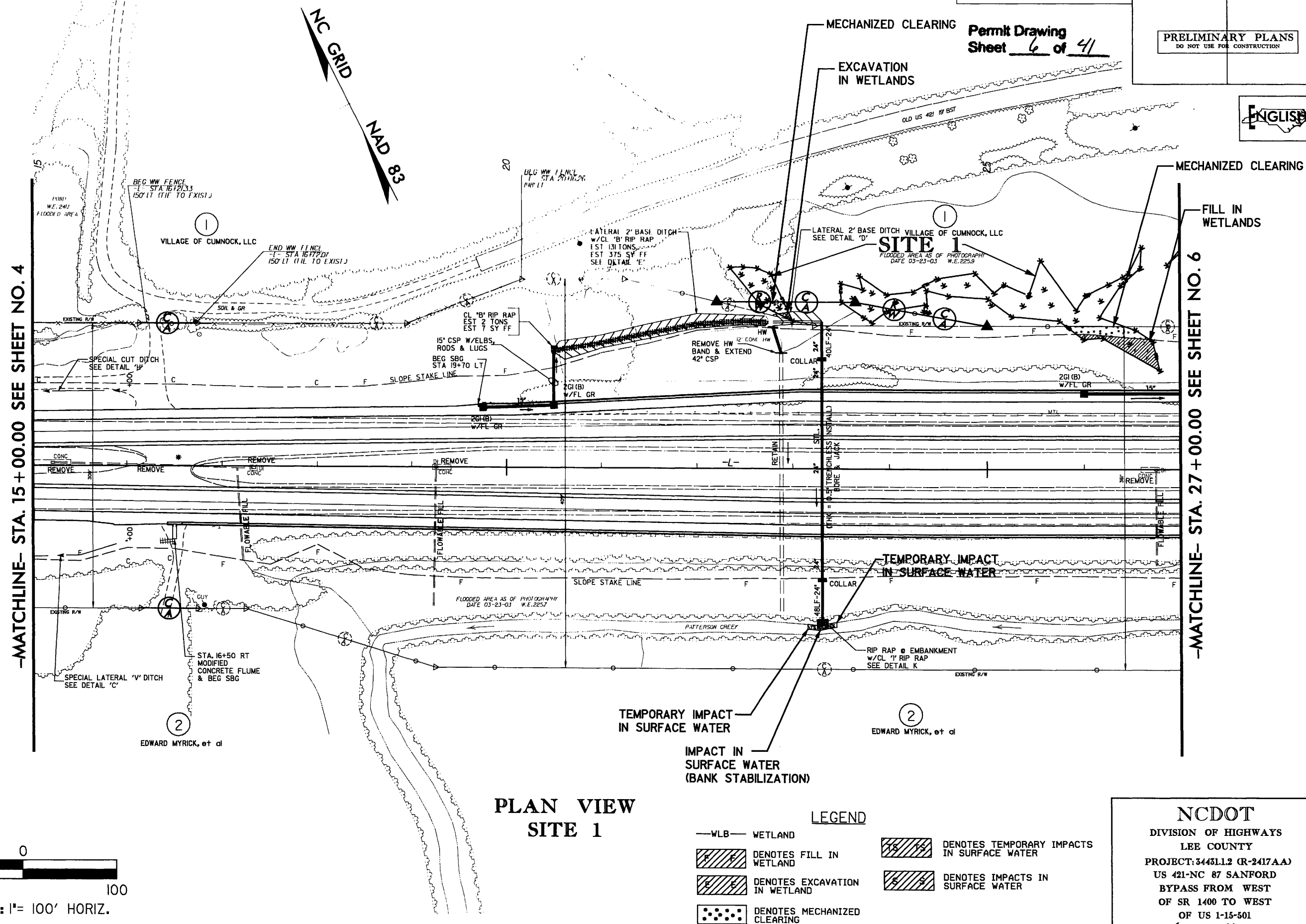
LEGEND:
★ PROPOSED SIGNAL

R-2417AA: WETLAND AND STREAM IMPACTS PLAN

4/5/2009
R:\Hydraulics\dgn\Permits\r2417aa-hyd-prm-05.dgn

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Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	5
RW SHEET NO.	
5	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 6 OF 41

8/17/99

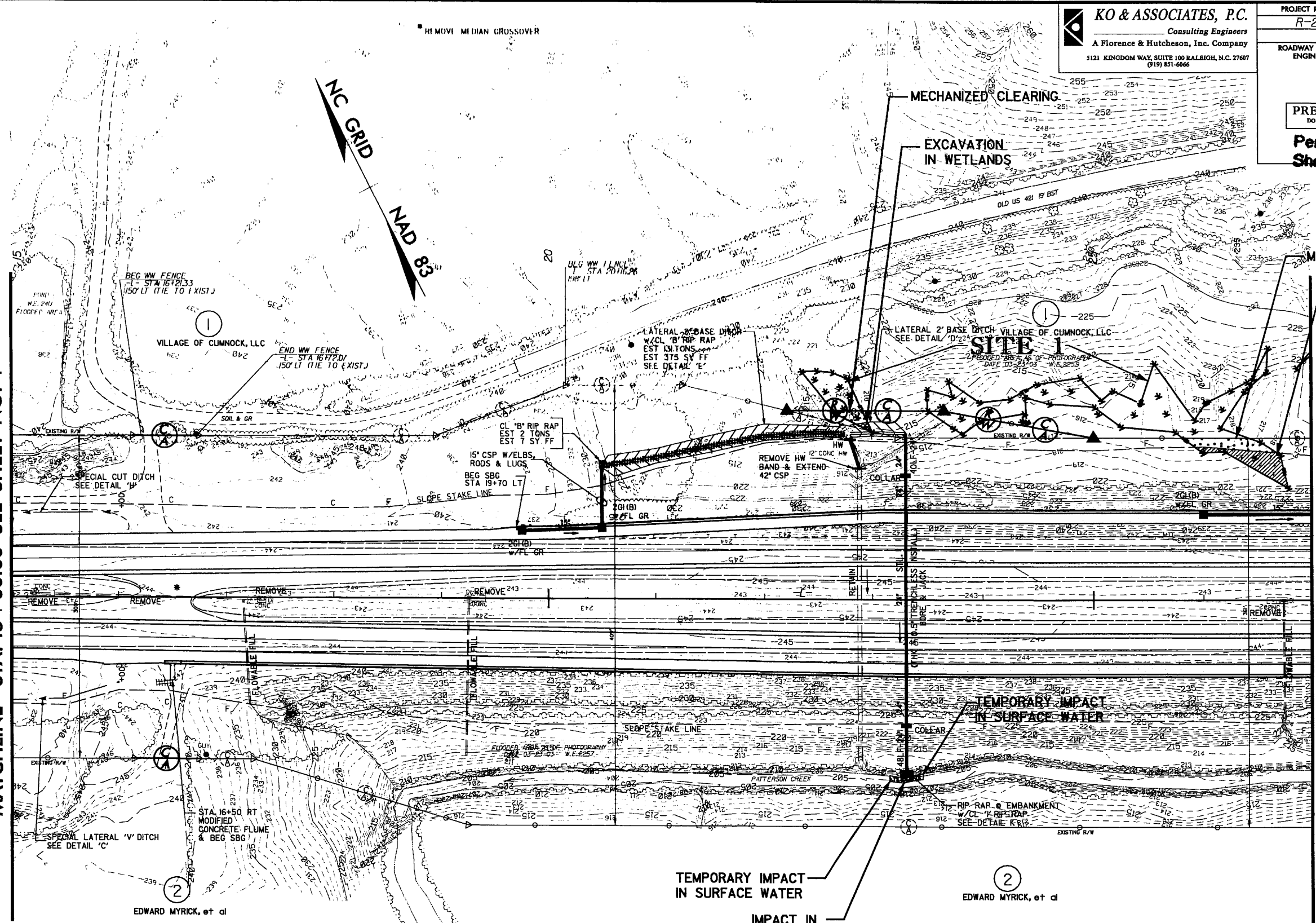
KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6666

PROJECT REFERENCE NO. R-2417AA		SHEET NO. 5	
RW SHEET NO. 5		HYDRAULICS ENGINEER	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
Permit Drawing Sheet 7 of 41			



-MATCHLINE- STA. 15 + 00.00 SEE SHEET NO. 4

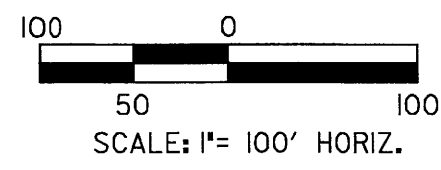
-MATCHLINE- STA. 27 + 00.00 SEE SHEET NO. 6



**PLAN VIEW
SITE 1**

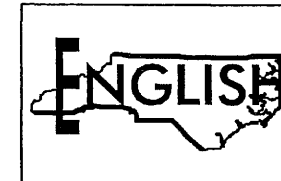
LEGEND

—WLB—	WETLAND		DENOTES TEMPORARY IMPACTS IN SURFACE WATER
	DENOTES FILL IN WETLAND		DENOTES MECHANIZED CLEARING
	DENOTES EXCAVATION IN WETLAND		DENOTES IMPACTS IN SURFACE WATER



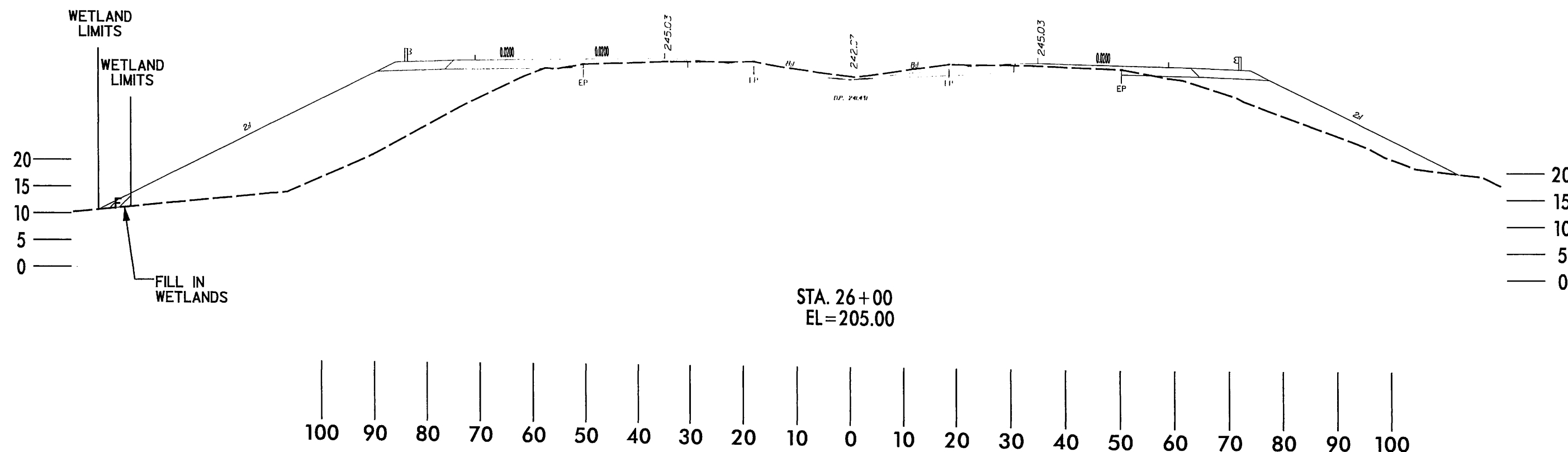
NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **7** OF **41**

REVISIONS
12-6-06 Parcel 1 & 2 Name Change
5-2-08 Added CA to existing access points - parcels 1 & 2
4/3/2009 R:\Hydraulics\NCDOT\Permits\R-2417\ao_hyd_prm_05.dgn
KO & ASSOCIATES, P.C.

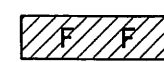


PROJECT REFERENCE NO.		SHEET NO.	
R-2417AA		I-XPL	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS		DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 8 of 41



LEGEND

- WLB— WETLAND
-  DENOTES FILL IN WETLAND

TYPICAL X-SECTIONS SITE 1

NCDOT

DIVISION OF HIGHWAYS
LEE COUNTY

PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET 8 OF 41

2/8/2009
R:\Hydraulics\Permits\2417\00-site1-xpl.dgn
K. G. Associates, P.C.

5/28/99

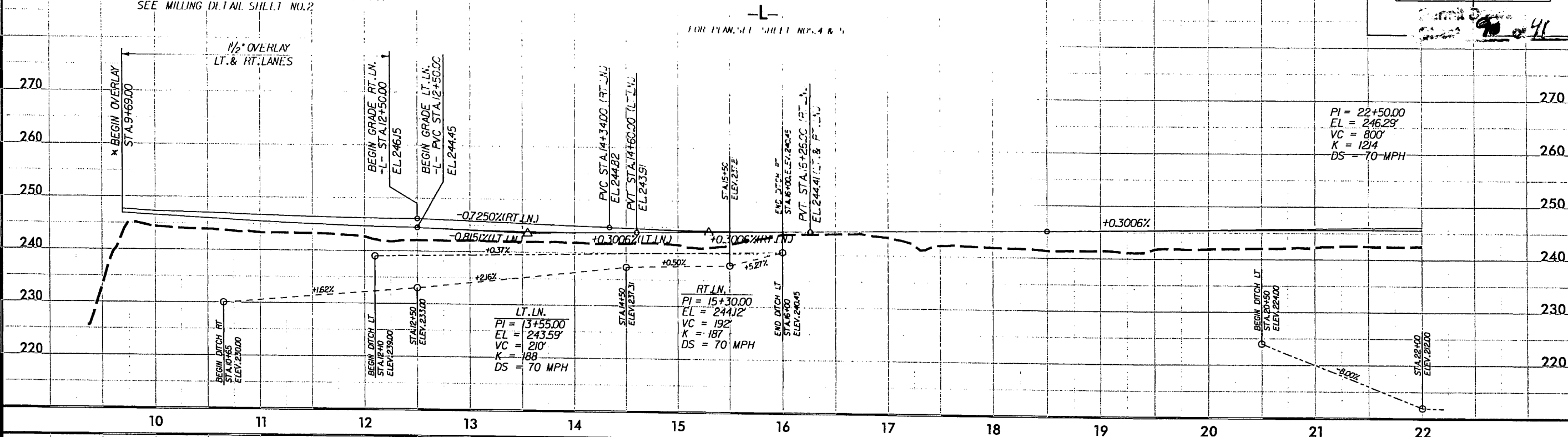
PK NAIL IN END OF SOUTHEAST WINGWALL
OF BRIDGE OVER DEEP RIVER (NH)
1 STA 9+80.82 60.44' LT
ELEV = 246.84'

KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066

PROJECT REFERENCE NO. **R-2417AA**
ROADWAY DESIGN ENGINEER
SHEET NO. **26**
HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

* MILL EXISTING PAVEMENT ADJACENT TO BRIDGE
SEE MILLING DETAIL SHEET NO. 2

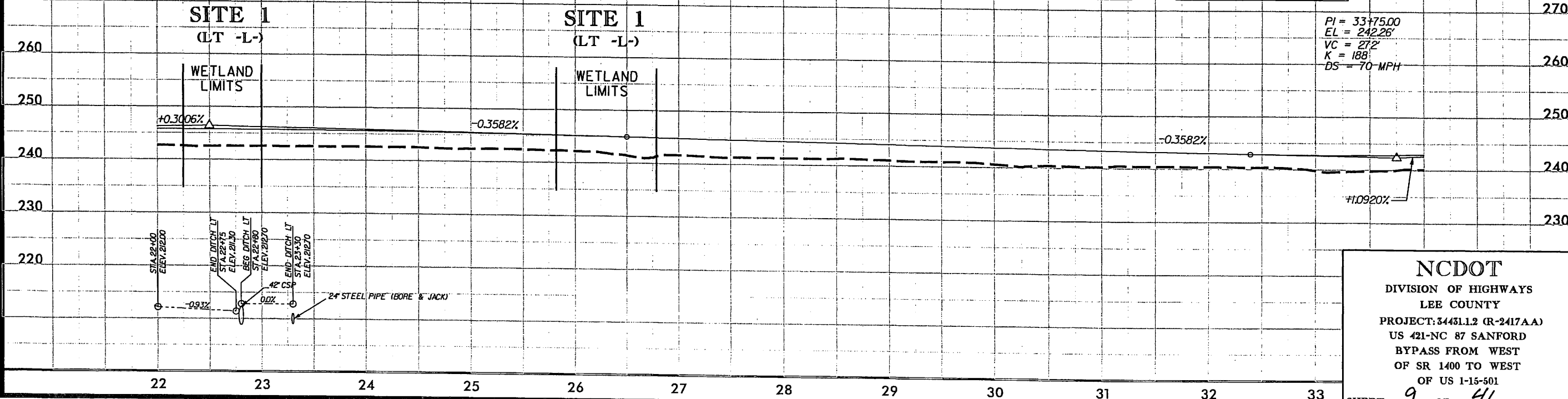


PIPE HYDRAULIC DATA STA-L- 22+80	
DRAINAGE AREA	= 31.99 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 60.87 CFS
DESIGN HW ELEVATION	= 215.20 FT
100 YEAR DISCHARGE	= 68.51 CFS
100 YEAR HW ELEVATION	= 215.61 FT
500+ YRS	
OVERTOPPING DISCHARGE	= 242 CFS
OVERTOPPING ELEVATION	= 245.62 FT
42" CSP INV In= 211.30 INV out= 206.18	

PIPE HYDRAULIC DATA STA-L- 23+30	
DRAINAGE AREA	= 31.99 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 141.3 CFS
DESIGN HW ELEVATION	= 213.70 FT
100 YEAR DISCHARGE	= 164.9 CFS
100 YEAR HW ELEVATION	= 213.94 FT
500+ YRS	
OVERTOPPING DISCHARGE	= 242 CFS
OVERTOPPING ELEVATION	= 245.62 FT
24" STEEL PIPE (BORE & JACK) INV In= 211.70 INV out= 206.18	

PIPE HYDRAULIC DATA STA-L- 33+50	
DRAINAGE AREA	= 73.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 117.95 CFS
DESIGN HW ELEVATION	= 219.63 FT
100 YEAR DISCHARGE	= 137.61 CFS
100 YEAR HW ELEVATION	= 220.79 FT
500+ YRS	
OVERTOPPING DISCHARGE	= 516 CFS
OVERTOPPING ELEVATION	= 242.72 FT
54" STL INV In= 214.39 INV out= 211.60	

PIPE HYDRAULIC DATA STA-L- 33+65	
DRAINAGE AREA	= 73.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 62.05 CFS
DESIGN HW ELEVATION	= 221.72 FT
100 YEAR DISCHARGE	= 72.39 CFS
100 YEAR HW ELEVATION	= 224.00 FT
500+ YRS	
OVERTOPPING DISCHARGE	= 516 CFS
OVERTOPPING ELEVATION	= 242.72 FT
EXIST 42" CMP INV In= 215.39 INV out= 211.60	



NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

8/17/99

4/9/2009
R:\Hydraulics\adgn\Permits\2417aa_hyd_prm_06a.dgn
KO & ASSOCIATES, P.C.

(1)
VILLAGE OF CUMMACK, LLC

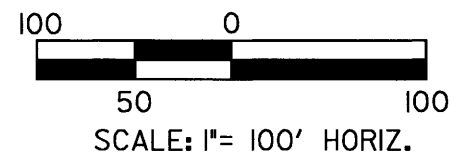
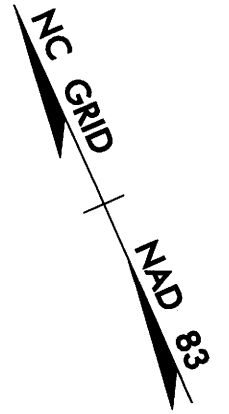
5' BASE CHANNEL CHANGE W/
CLASS 1 RIP RAP
EST 1446 TONS
EST 2484 SY FF
SEE DETAIL 'U'

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5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-0066

PROJECT REFERENCE NO. R-2417AA		SHEET NO. 6A	
RW SHEET NO. 6			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

Permit Drawing
Sheet 10 of 41

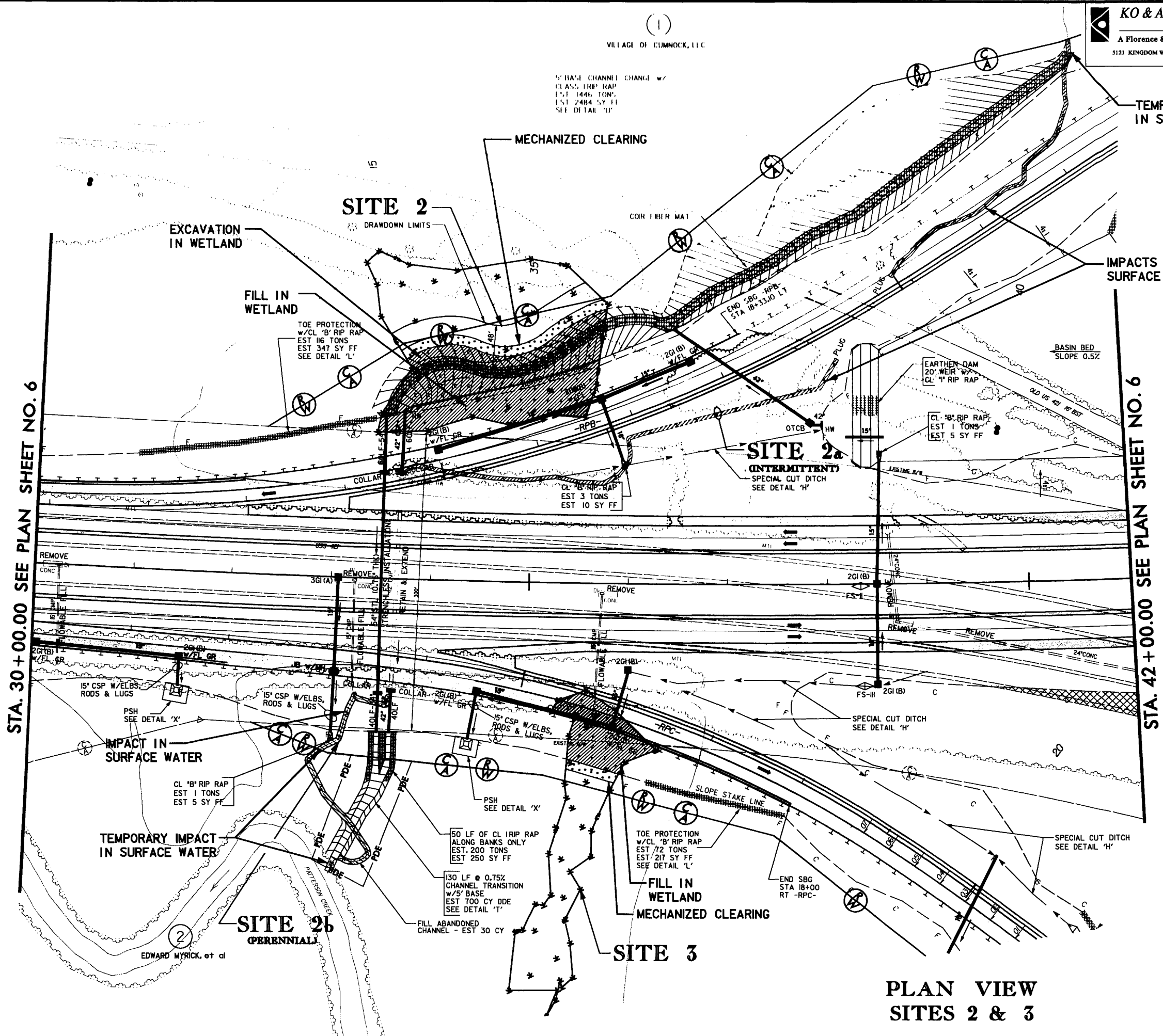
- LEGEND**
- WLB WETLAND
 - Denotes Fill in Wetland
 - Denotes Excavation in Wetland
 - Denotes Impacts in Surface Water
 - Denotes Temporary Impacts in Surface Water
 - Denotes Mechanized Clearing



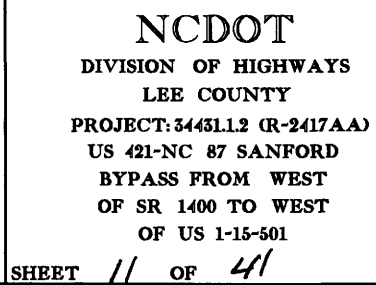
NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 3443L1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 10 OF 41

STA. 30+00.00 SEE PLAN SHEET NO. 6

STA. 42+00.00 SEE PLAN SHEET NO. 6



**PLAN VIEW
SITES 2 & 3**



5/28/99

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Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-0666

PROJECT REFERENCE NO. **R-2417AA** SHEET NO. **39**

ROADWAY DESIGN ENGINEER HYDRAULICS ENGINEER

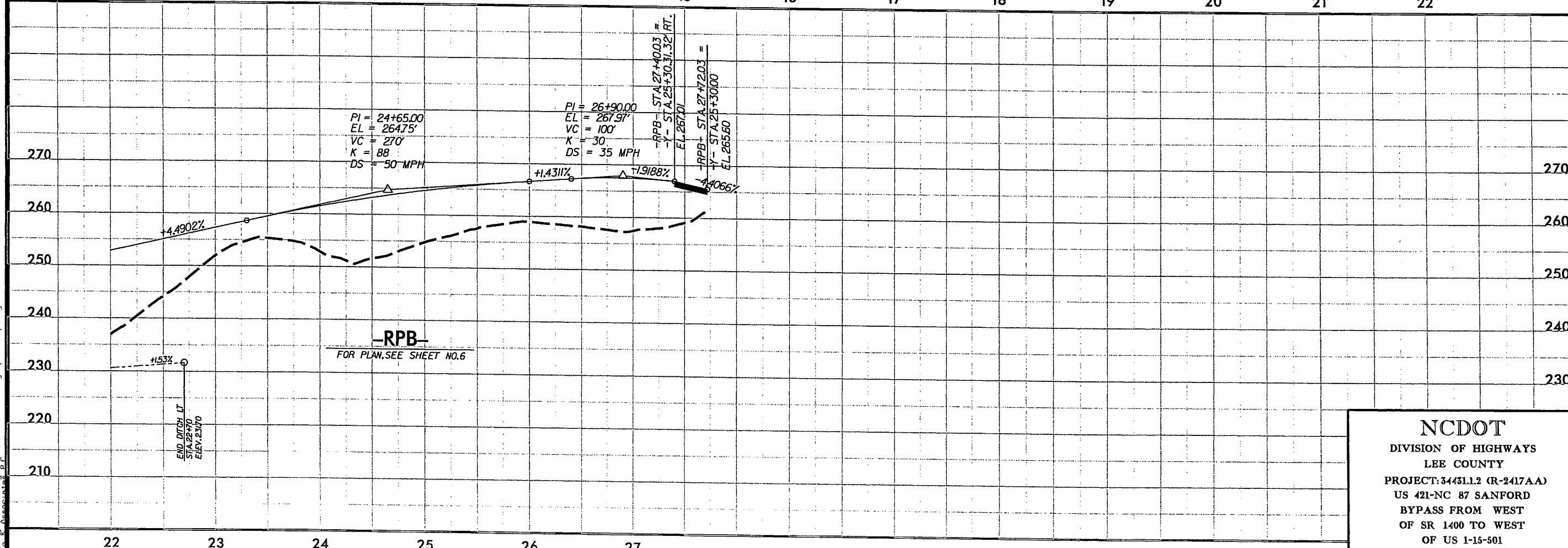
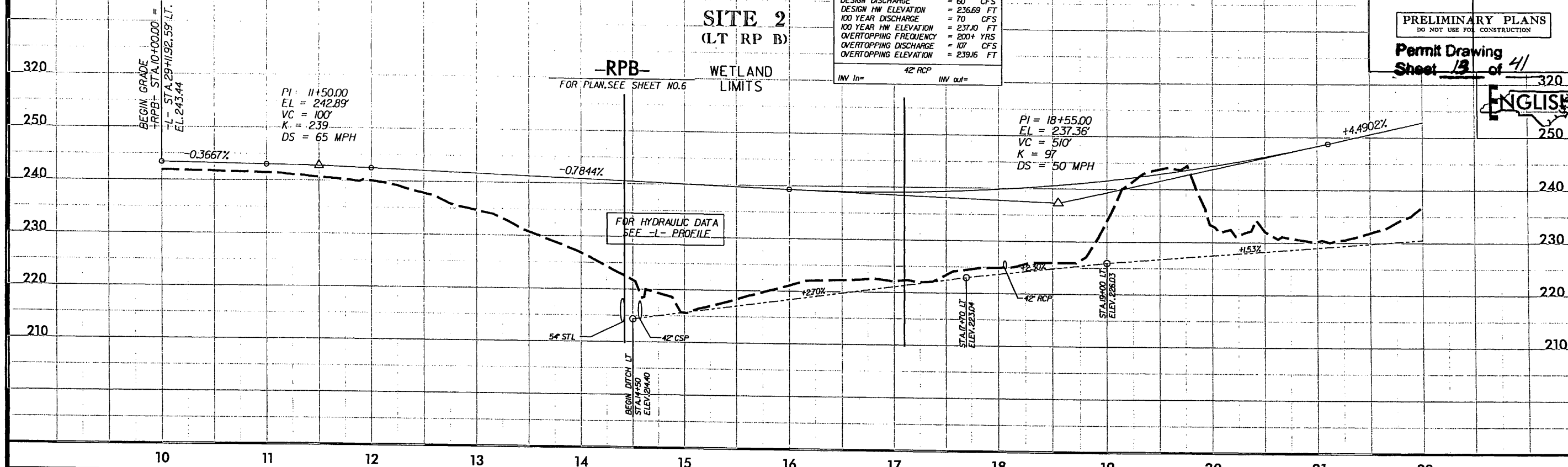
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet **13** of **41**

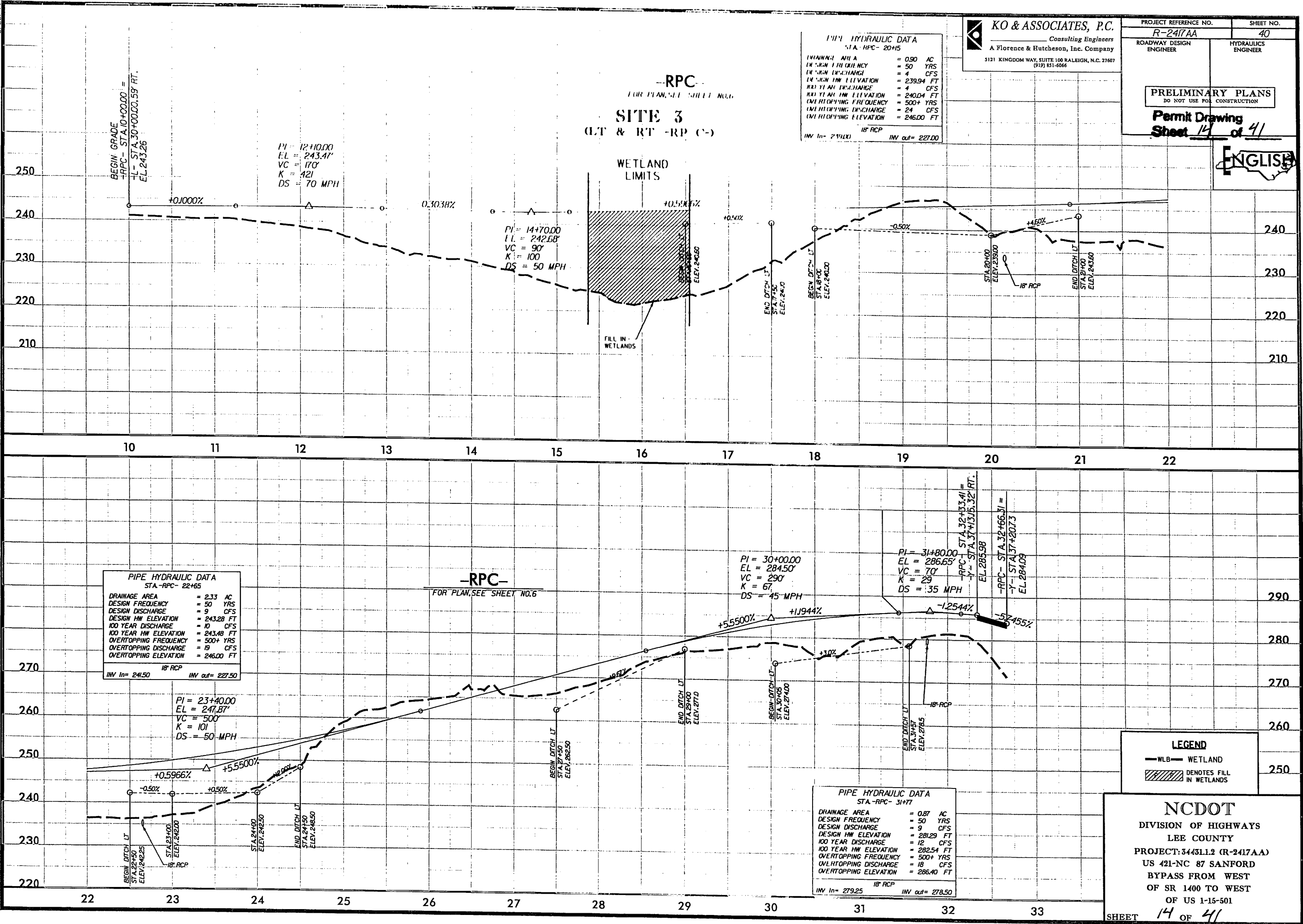
ENGLISH

PIPE HYDRAULIC DATA	
STA - RPB - 18+06	
DRAINAGE AREA	= 25.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 60 CFS
DESIGN HW ELEVATION	= 236.69 FT
100 YEAR DISCHARGE	= 70 CFS
100 YEAR HW ELEVATION	= 237.10 FT
OVERTOPPING FREQUENCY	= 200+ YRS
OVERTOPPING DISCHARGE	= 107 CFS
OVERTOPPING ELEVATION	= 239.16 FT
INV In=	42" RCP
INV Out=	

SITE 2
(LT RP B)
WETLAND LIMITS



NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **13** OF **41**



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Consulting Engineers
 A Florence & Hutcheson, Inc. Company
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27606
 (919) 851-6066

PROJECT REFERENCE NO.		SHEET NO.	
R-2417AA		40	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 14 of

ENGLISH

--RPC--
FOR PLAN, SET SHEET NO. 6
SITE 3
(LT & RT -RP C-)

```

1111 HYDRAULIC DATA
STA. HPC - 2015
DRAINAGE AREA = 0.90 AC
DRAIN FREQUNCY = 50 YRS
DRAIN INCHARGE = 4 CFS
DRAIN INV ELEVATION = 2339.4 FT
WADIAN INCHARGE = 4 CFS
WADIAN INV ELEVATION = 2400.4 FT
INTERRUPTING FREQUNCY = 500 YRS
INTERRUPTING INCHARGE = 2 CFS
INTERRUPTING ELEVATION = 246.00 FT
15' RCP
INV In= 239.00 INV out= 227.00

```

BEGIN GRADE
+APC - STA
+L - STA
EL 243.26

PI = 12+10.00
EL = 243.47'
VC = 170'
K = 421
DS = 70 MPH

PI = 14+70.00
LL = 242.68'
VC = 90'
K = 100
DS = 50 MPH

PIPE HYDRAULIC DATA	
STA-RPC- 22+65	
DRAINAGE AREA	= 2.33 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 9 CFS
DESIGN HW ELEVATION	= 243.28 FT
100 YEAR DISCHARGE	= 10 CFS
100 YEAR HW ELEVATION	= 243.48 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 19 CFS
OVERTOPPING ELEVATION	= 246.00 FT
18" RCP	
INV In= 241.50	INV out= 227.50

-RPC-

FOR PLAN, SEE SHEET NO. 6

$PI = 30+00.00$
 $EL = 284.50'$
 $VC = 290'$
 $K = 67$
 $DS = 45 \text{ MPH}$

$PI = 31+80.00$
 $EL = 286.65'$
 $VC = 70'$
 $K = 29$
 $DS = 35 \text{ MPH}$

H	-RPC	STA 32+33.41 =
	-Y-	STA 37+35.32 RT.
	EL	285.98
	-RPC-	STA 32+66.31 =
	-Y-	STA 37+20.73
	EL	284.09

$PI = 23+40.00$
 $EL = 247.87'$
 $VC = 500'$
 $K = 101$
 $DS = 50 \text{ MPH}$

PIPE HYDRAULIC DATA	
STA-RPC- 31+77	
DRAINAGE AREA	= 0.87 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 9 CFS
DESIGN HW ELEVATION	= 281.29 FT
100 YEAR DISCHARGE	= 28.25 CFS
100 YEAR HW ELEVATION	= 282.54 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVLTOPPING DISCHARGE	= 18 CFS
OVERTOPPING ELEVATION	= 286.40 FT
18" RCP	
INV In= 279.25	INV Out= 278.50

LEGEND

—WLB— WETLAND
DENOTES F
IN WETLAND

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 3443LL2 (R-2417AA
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET 14 OF 41

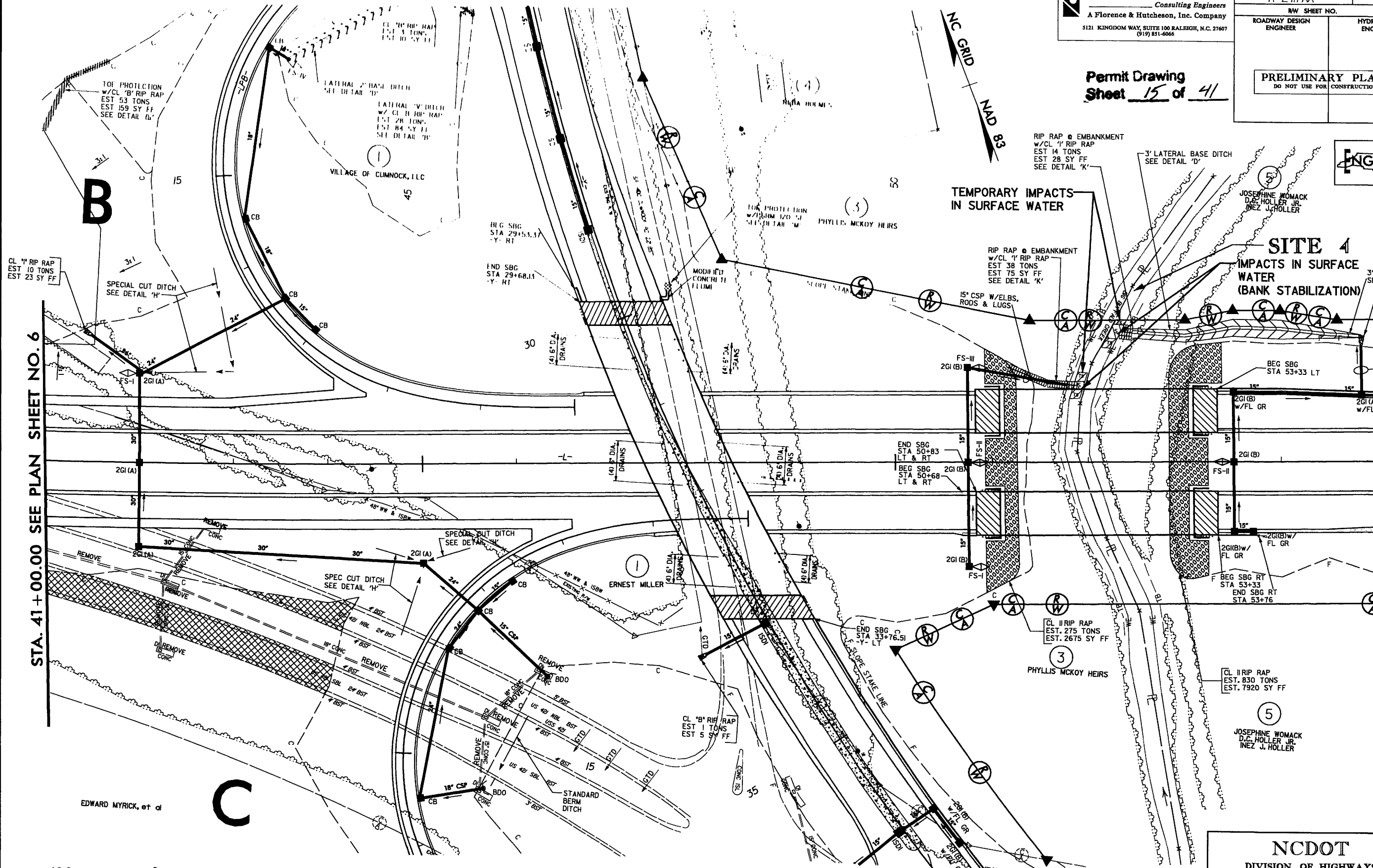
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KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	6B
RW SHEET NO.	6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

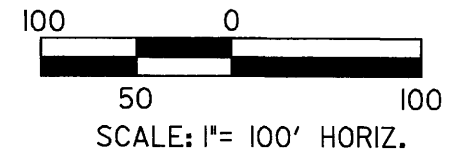
Permit Drawing
Sheet 15 of 41



STA. 41+00.00 SEE PLAN SHEET NO. 6

STA. 55+00.00 SEE PLAN SHEET NO. 7

PLAN VIEW
SITE 4



- LEGEND**
- WLB — WETLAND
 - [Hatched pattern] DENOTES TEMPORARY IMPACTS IN SURFACE WATER
 - [Hatched pattern] DENOTES IMPACTS IN SURFACE WATER

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 15 OF 41

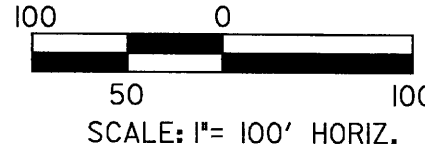
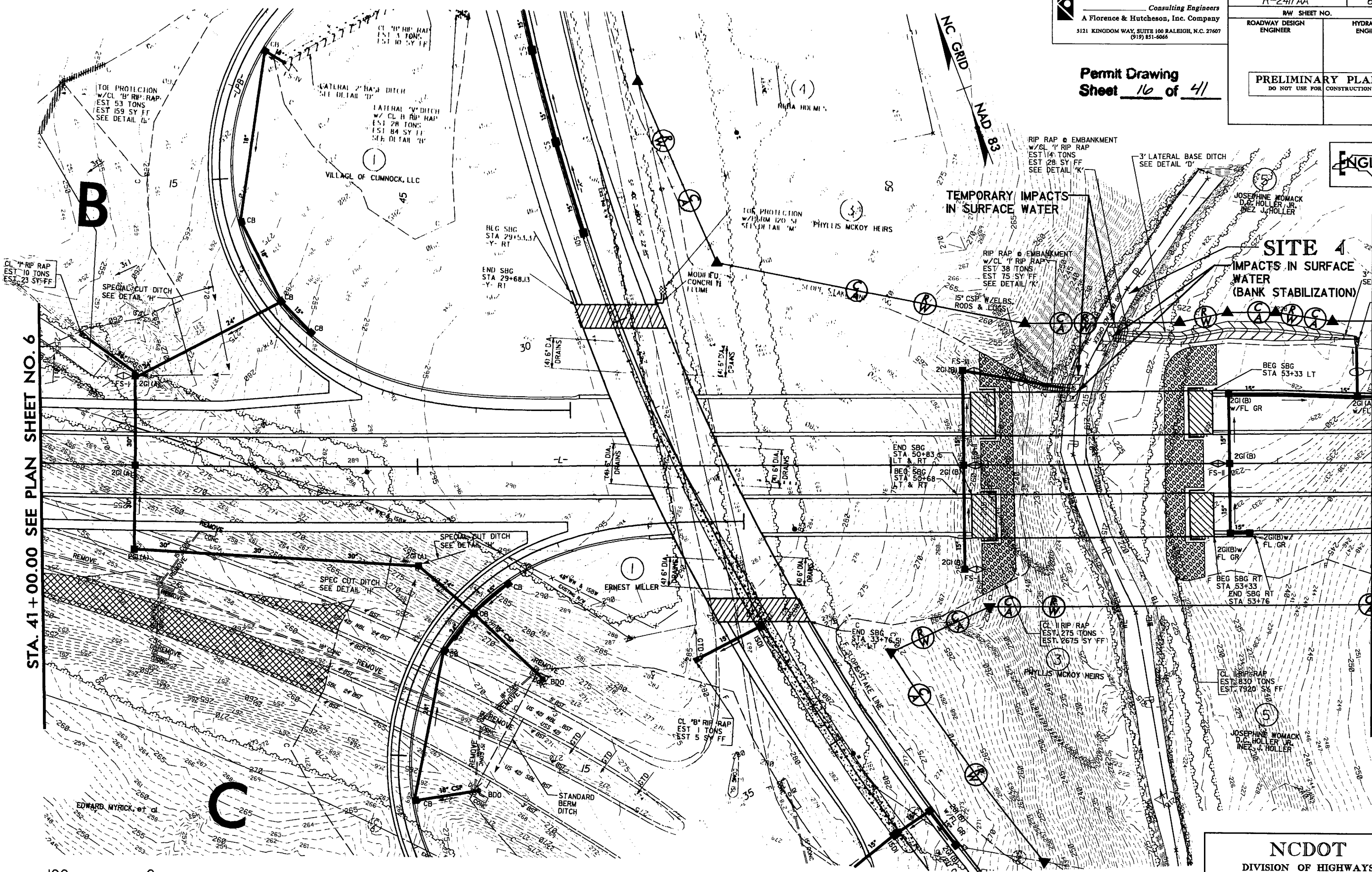
4/8/2009
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8/17/99
4/6/2009
R:\Hydraulics\Drawings\Permits\2417aa_hyd_perm_06b.dgn
KO & ASSOCIATES, P.C.

KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-8066

PROJECT REFERENCE NO. R-2417AA		SHEET NO. 6B
RW SHEET NO. 6		
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		

Permit Drawing
Sheet 16 of 41



PLAN VIEW
SITE 4

- LEGEND**
- WLB— WETLAND
 - [Hatched pattern] DENOTES TEMPORARY IMPACTS IN SURFACE WATER
 - [Hatched pattern] DENOTES IMPACTS IN SURFACE WATER

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 344311.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 16 OF 41



8/17/99

4/6/2009
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KO & ASSOCIATES, P.C.

KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066

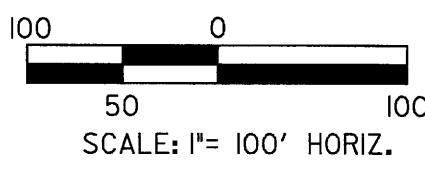
PROJECT REFERENCE NO. R-2417AA		SHEET NO. 7	
RAW SHEET NO. 7			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

Permit Drawing
Sheet 18 of 41



-MATCHLINE- STA. 54 + 50.00 SEE SHEET NO. 6

-MATCHLINE- STA. 65 + 00.00 SEE SHEET NO. 8



(5)
JOSEPHINE WOMACK
D.C. HOLLER JR.
INEZ J. HOLLER
DB 95 PG 74

(5)
JOSEPHINE WOMACK
D.C. HOLLER JR.
INEZ J. HOLLER

**PLAN VIEW
SITE 4**

SITE 4

- LEGEND**
- WLB— WETLAND
 - [Hatched Box] DENOTES TEMPORARY IMPACTS IN SURFACE WATER
 - [Hatched Box] DENOTES IMPACTS IN SURFACE WATER
- TEMPORARY IMPACTS IN SURFACE WATER**
- RIP RAP EMBANKMENT
CL 1' RIP RAP
EST 16 TONS
EST 32 SY FF
SEE DETAIL 'K'
- IMPACTS IN SURFACE WATER (BANK STABILIZATION)**
- PHYLLIS MCROY

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 18 OF 41

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PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	7
RW SHEET NO.	7
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

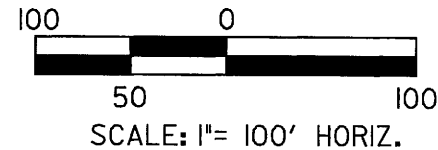
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 19 of 41



-MATCHLINE- STA. 54 + 50.00 SEE SHEET NO. 6

-MATCHLINE- STA. 65 + 00.00 SEE SHEET NO. 8



PLAN VIEW
SITE 4

SITE 4

TEMPORARY IMPACTS
IN SURFACE WATER

RIP RAP EMBANKMENT
CL 1' RIP RAP
EST 16 TONS
EST 32 SY FF
SEE DETAIL 'K'

IMPACTS IN SURFACE
WATER
(BANK STABILIZATION)

TEMPORARY IMPACTS
IN SURFACE WATER

LEGEND

WLB WETLAND

5 15 DENOTES TEMPORARY
IMPACTS IN SURFACE WATER

5 5 DENOTES IMPACTS IN
SURFACE WATER

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DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 344311.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET 19 OF 41

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4/5/2009
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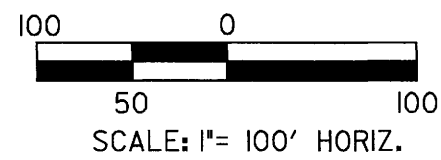
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RW SHEET NO. 9			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

Permit Drawing
Sheet **20** of **41**



-MATCHLINE- STA. 77+00.00 SEE SHEET NO. 8

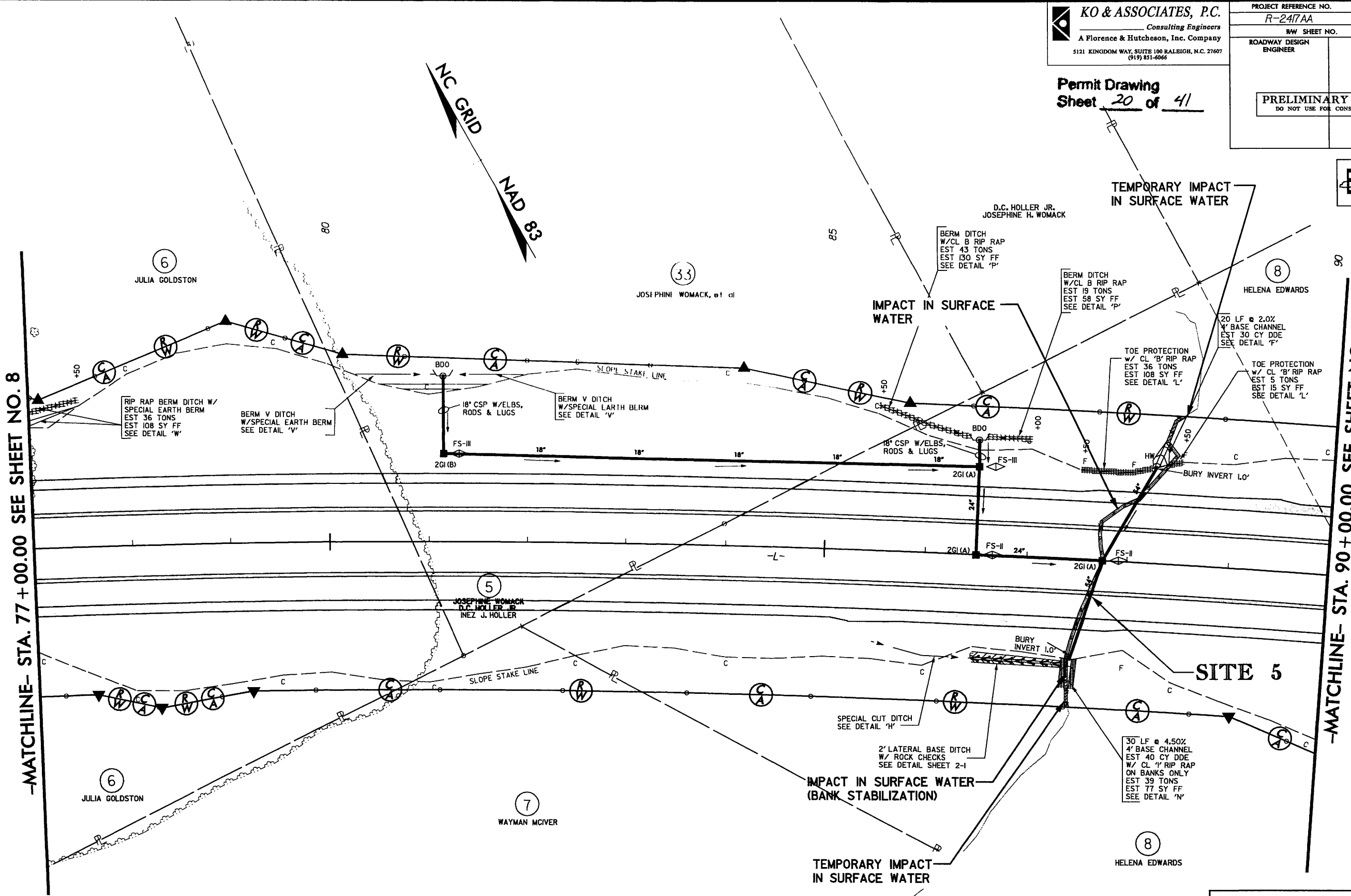
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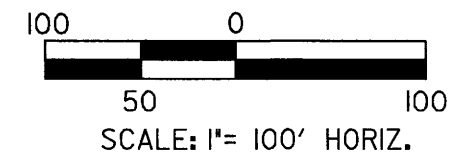
PLAN VIEW SITE 5

- LEGEND**
- WLB — WETLAND
 - [Hatched box] DENOTES IMPACTS IN SURFACE WATER
 - [Hatched box] DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **20** OF **41**



PRELIMINARY PLANS
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PLAN VIEW
SITE 5

— WLB — WETLAND

 DENOTES IMPACTS IN SURFACE WATER

 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 3443L12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET 21 OF 41

4/5/2009
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5/28/99

BM#7
RR SPIKE IN BASE OF 6" CEDAR TREE LEFT
BASELINE
L- STA 84+79.65 310.58' RT
ELEV = 256.56'

CULVERT HYDRAULIC DATA	
DESIGN DISCHARGE	= 370 CFS
DESIGN FREQ	= 50 YRS
DESIGN HW ELEVATION	= 243.7 FT
BASE DISCHARGE	= 420 CFS
BASE FREQ	= 100 YRS
BASE HW ELEVATION	= 244.2 FT
OVERTOPPING DISCHARGE	= 830 CFS
OVERTOPPING FREQ	= 500+ YRS
OVERTOPPING ELEVATION	= 251.5 FT

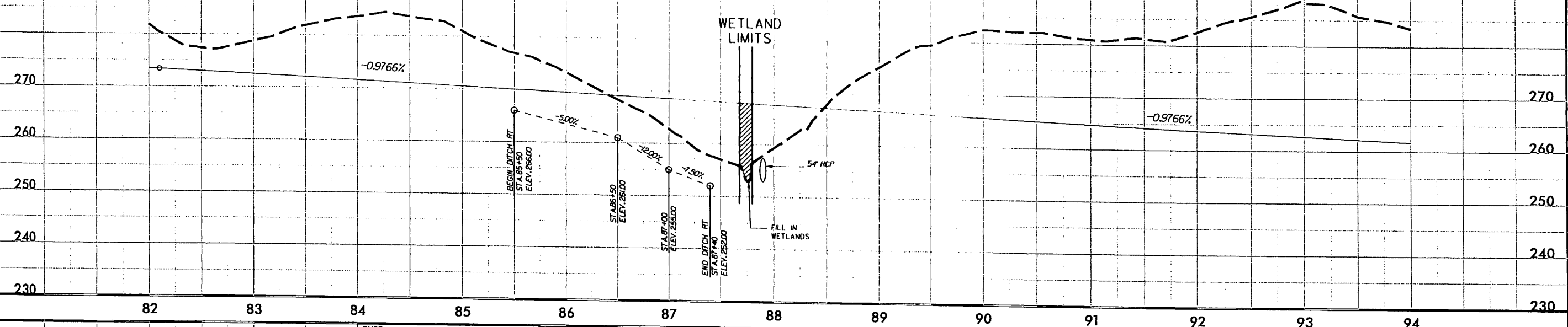
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PROJECT REFERENCE NO. R-2417AA	SHEET NO. 29
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet **22** of **41**

SITE 5
(LT & RT -1-)



BM#7
RR SPIKE IN BASE OF 6" CEDAR TREE LEFT
BASELINE
L- STA 96+40.78 311.78' LT
ELEV = 290.50'

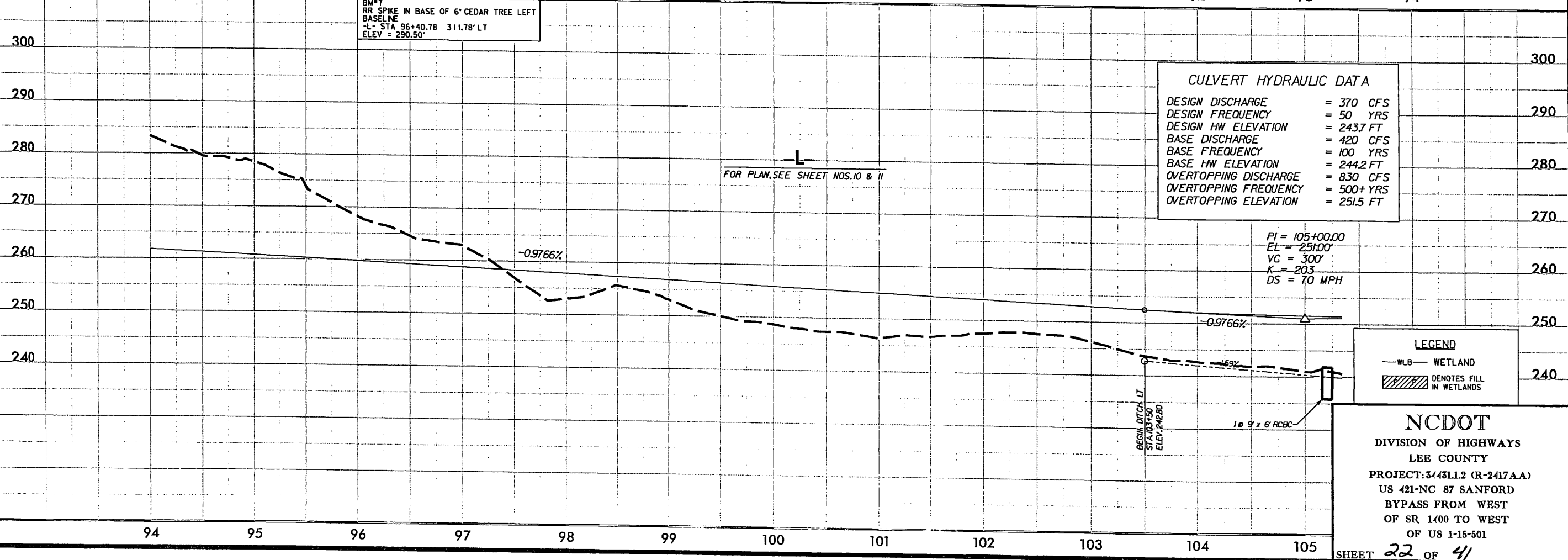
CULVERT HYDRAULIC DATA	
DESIGN DISCHARGE	= 370 CFS
DESIGN FREQ	= 50 YRS
DESIGN HW ELEVATION	= 243.7 FT
BASE DISCHARGE	= 420 CFS
BASE FREQ	= 100 YRS
BASE HW ELEVATION	= 244.2 FT
OVERTOPPING DISCHARGE	= 830 CFS
OVERTOPPING FREQ	= 500+ YRS
OVERTOPPING ELEVATION	= 251.5 FT

PI = 105+00.00
EL = 251.00'
VC = 300'
K = 203
DS = 70 MPH

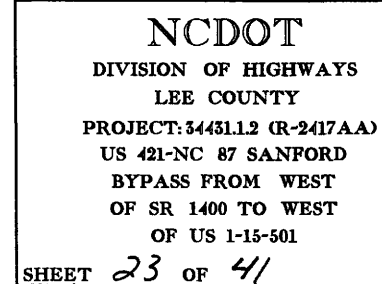
FOR PLAN, SEE SHEET NOS. 10 & 11

LEGEND
— WLB — WETLAND
HATCHED DENOTES FILL IN WETLANDS

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DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 3443L1.2 (R-2417AA)
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BYPASS FROM WEST
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OF US 1-15-501
SHEET **22** OF **41**



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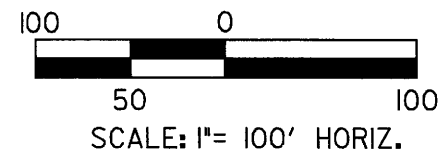
PROJECT REFERENCE NO. R-2417AA		SHEET NO. 12	
RW SHEET NO. 12			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

Permit Drawing
Sheet 24 of 41

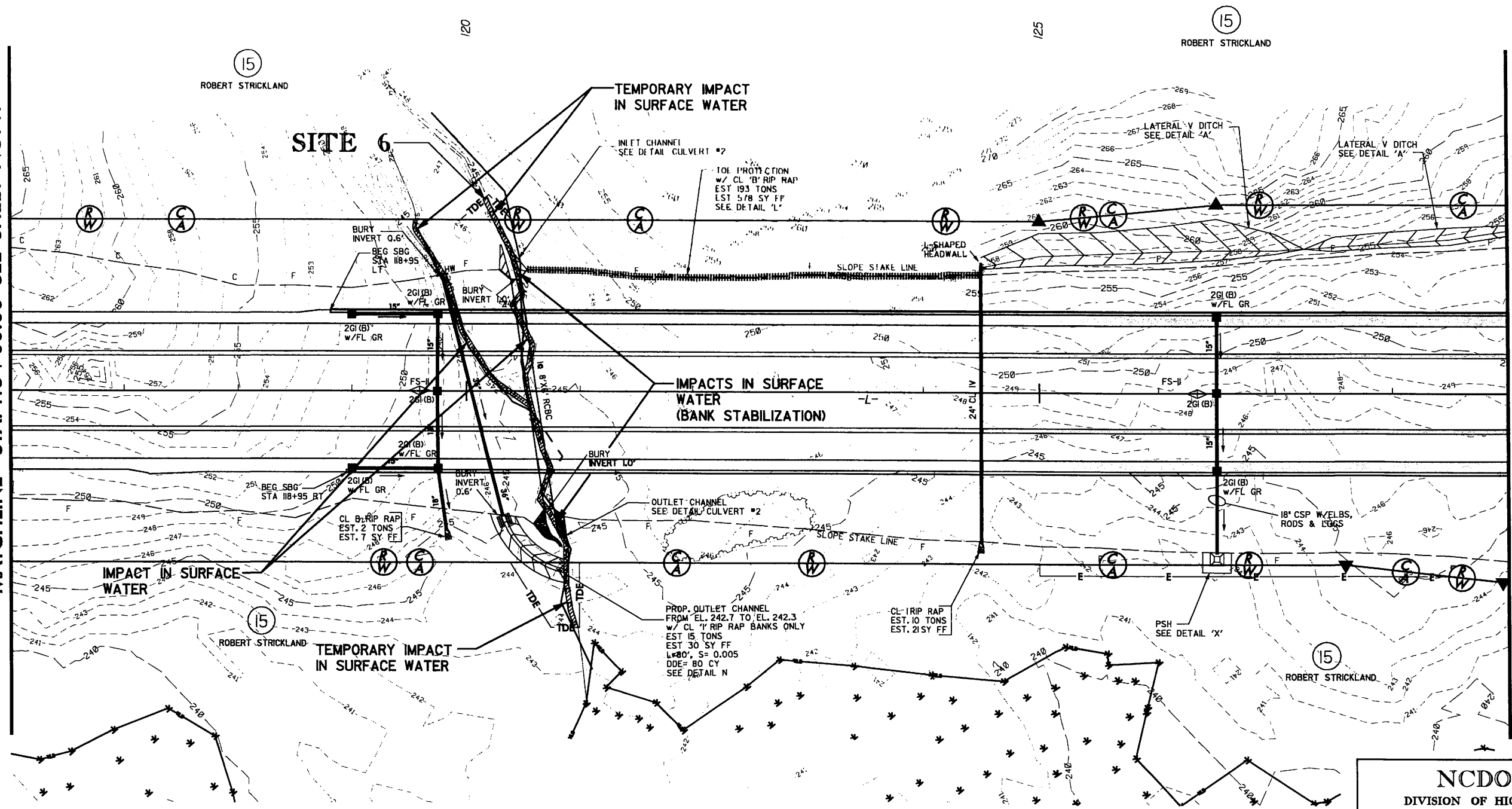


-MATCHLINE- STA. 116+00.00 SEE SHEET NO. 11

-MATCHLINE- STA. 129+00.00 SEE SHEET NO. 13



**PLAN VIEW
SITE 6**



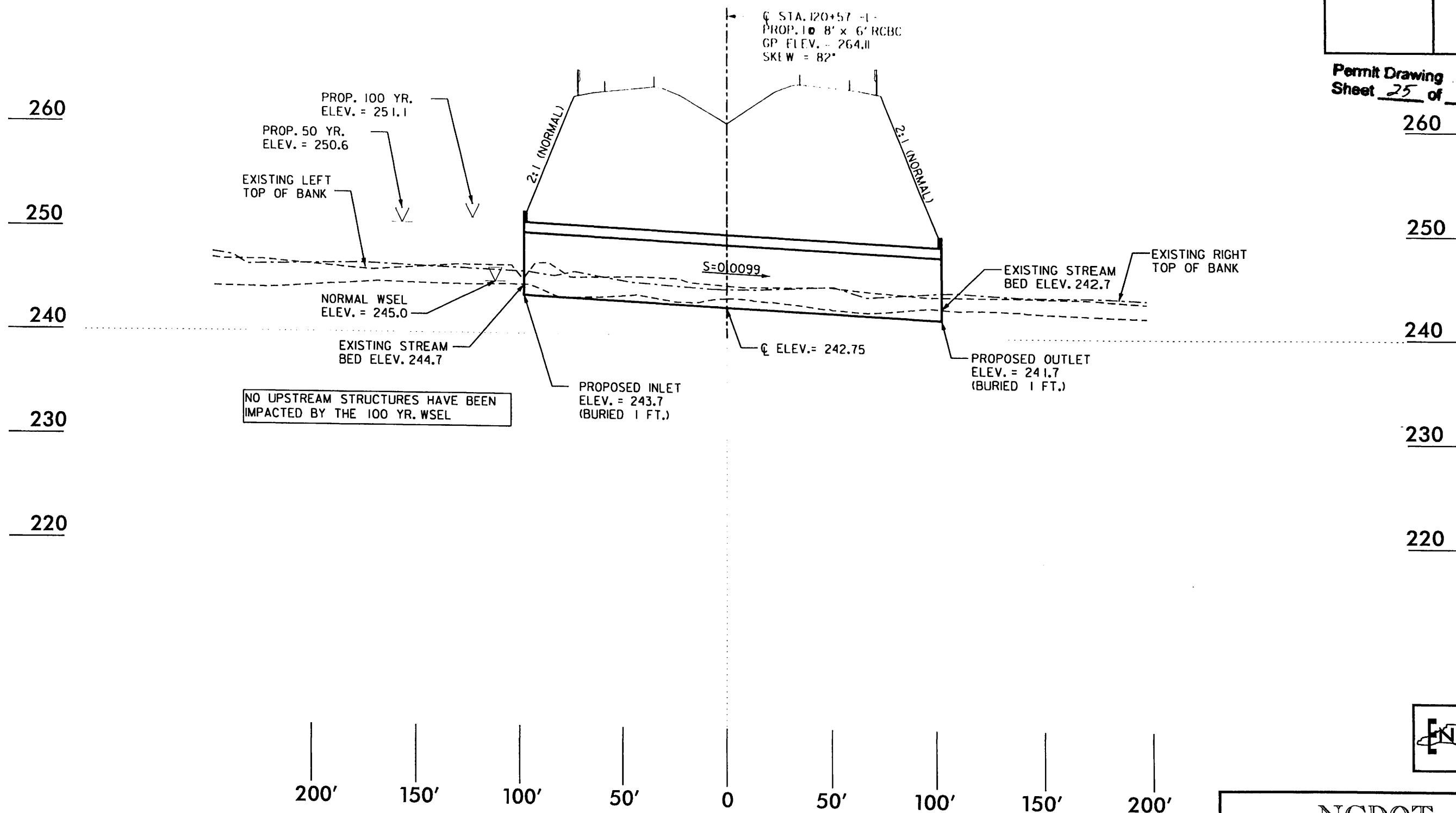
- LEGEND**
- WLB WETLAND
 - [Hatched box symbol] DENOTES IMPACTS IN SURFACE WATER
 - [Hatched box symbol] DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 24 OF 41

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PROJECT REFERENCE NO. R-2417AA	SHEET NO. S6-PAS
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet **25** of **41**
260



PROFILE ALONG STRUCTURE SITE 6

SCALE:
1" = 50' HORIZONTAL
1" = 10' VERTICAL

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **25** OF **41** 5/5/06

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2/8/2009
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BM#1
RR SPIKE IN BASE OF 12" MAPLE TREE LEFT
OF BL-124
+L- STA 108+17.57 ELEV 248.26 LT
ELEV = 246.91'

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PROJECT REFERENCE NO. R-2417AA	SHEET NO. 30
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet **26** of **41**

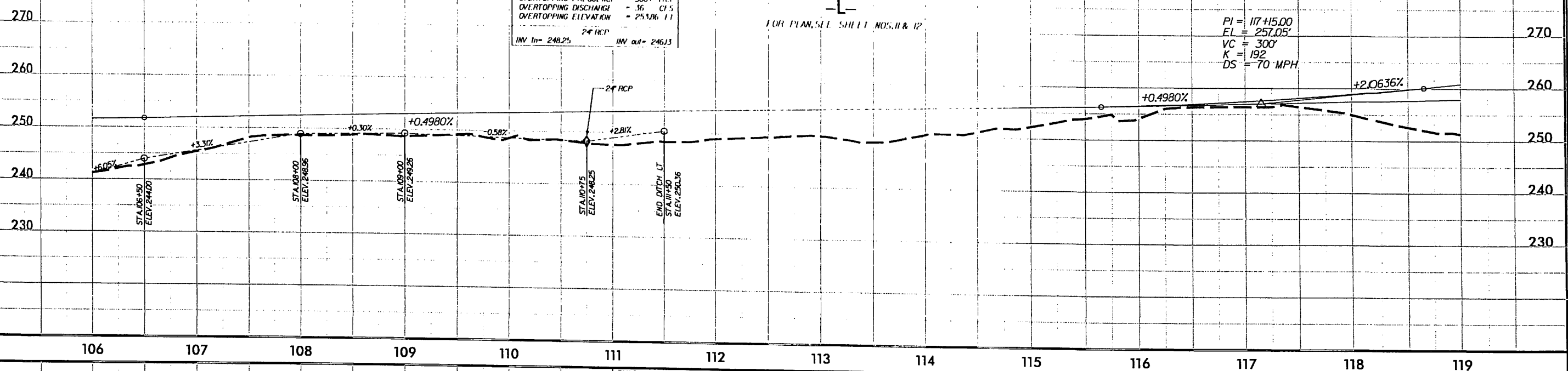
PIPE HYDRAULIC DATA
STA -L- 107+75

DRAINAGE AREA	= 4.50 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 17.00 CFS
DESIGN HW ELEVATION	= 250.54 FT
100 YEAR DISCHARGE	= 19.00 CFS
100 YEAR HW ELEVATION	= 250.71 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 36 CFS
OVERTOPPING ELEVATION	= 252.06 FT

24" RCP
INV In= 248.25 INV out= 246.13

-L-
FOR PLAN, SEE SHEET NOS. 11 & 12

PI = 117+15.00
EL = 257.05'
VC = 300'
K = 192
DS = 70 MPH



PIPE HYDRAULIC DATA
STA -L- 120+20

DRAINAGE AREA	= 10.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 340.00 CFS
DESIGN HW ELEVATION	= 250.60 FT
100 YEAR DISCHARGE	= 380.00 CFS
100 YEAR HW ELEVATION	= 251.00 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 710 CFS
OVERTOPPING ELEVATION	= 258.00 FT

36" RCP
INV In= 244.0 INV out= 242.1

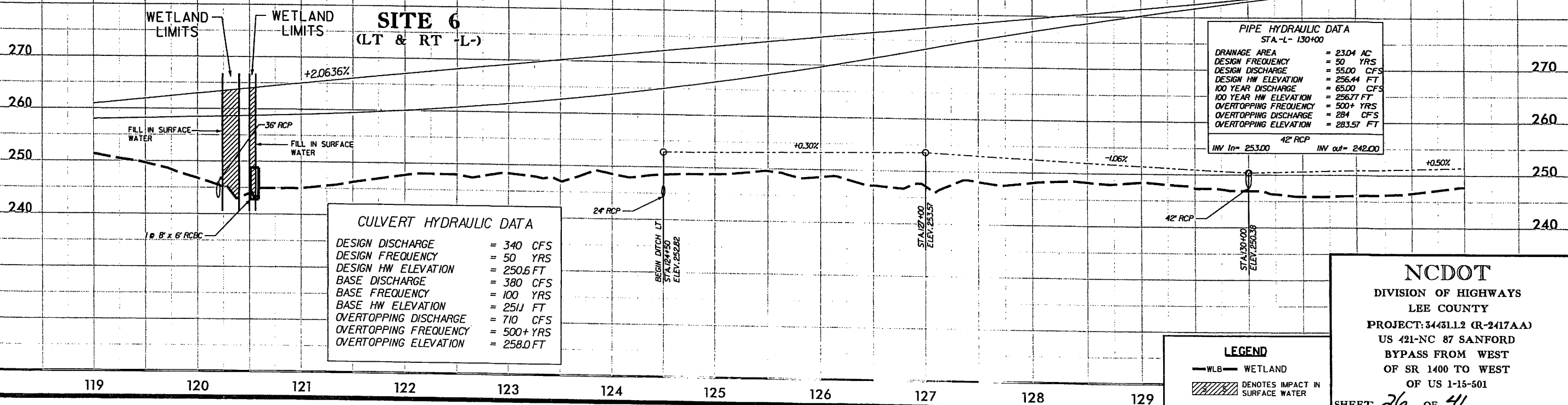
PIPE HYDRAULIC DATA
STA -L- 124+50

DRAINAGE AREA	= 3.18 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 12.00 CFS
DESIGN HW ELEVATION	= 254.63 FT
100 YEAR DISCHARGE	= 13.00 CFS
100 YEAR HW ELEVATION	= 254.79 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 65 CFS
OVERTOPPING ELEVATION	= 268.72 FT

24" RCP
INV In= 252.80 INV out= 243.00

BM#9
RR SPIKE IN BASE OF 15" PINE TREE LEFT
OF BL-124
+L- STA 120+44.24 ELEV 248.14' LT
ELEV = 256.13'

-L-
FOR PLAN, SEE SHEET NOS. 12 & 13



WETLAND LIMITS

FILL IN SURFACE WATER

36" RCP

8' x 6' RCBC

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 340 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 250.6 FT
BASE DISCHARGE	= 380 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 251.1 FT
OVERTOPPING DISCHARGE	= 710 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 258.0 FT

PIPE HYDRAULIC DATA
STA -L- 130+00

DRAINAGE AREA	= 23.04 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 55.00 CFS
DESIGN HW ELEVATION	= 256.44 FT
100 YEAR DISCHARGE	= 65.00 CFS
100 YEAR HW ELEVATION	= 256.77 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 284 CFS
OVERTOPPING ELEVATION	= 283.57 FT

42" RCP
INV In= 253.00 INV out= 242.00

LEGEND

— WLB — WETLAND

▨ DENOTES IMPACT IN SURFACE WATER

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **26** OF **41**

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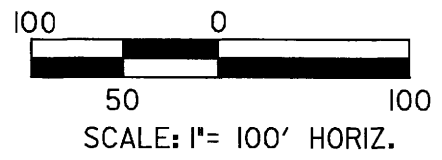
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RW SHEET NO. 14			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

Permit Drawing
Sheet 27 of 41



-MATCHLINE- STA. 142 + 00.00 SEE SHEET NO. 13

-MATCHLINE- STA. 155 + 00.00 SEE SHEET NO. 15

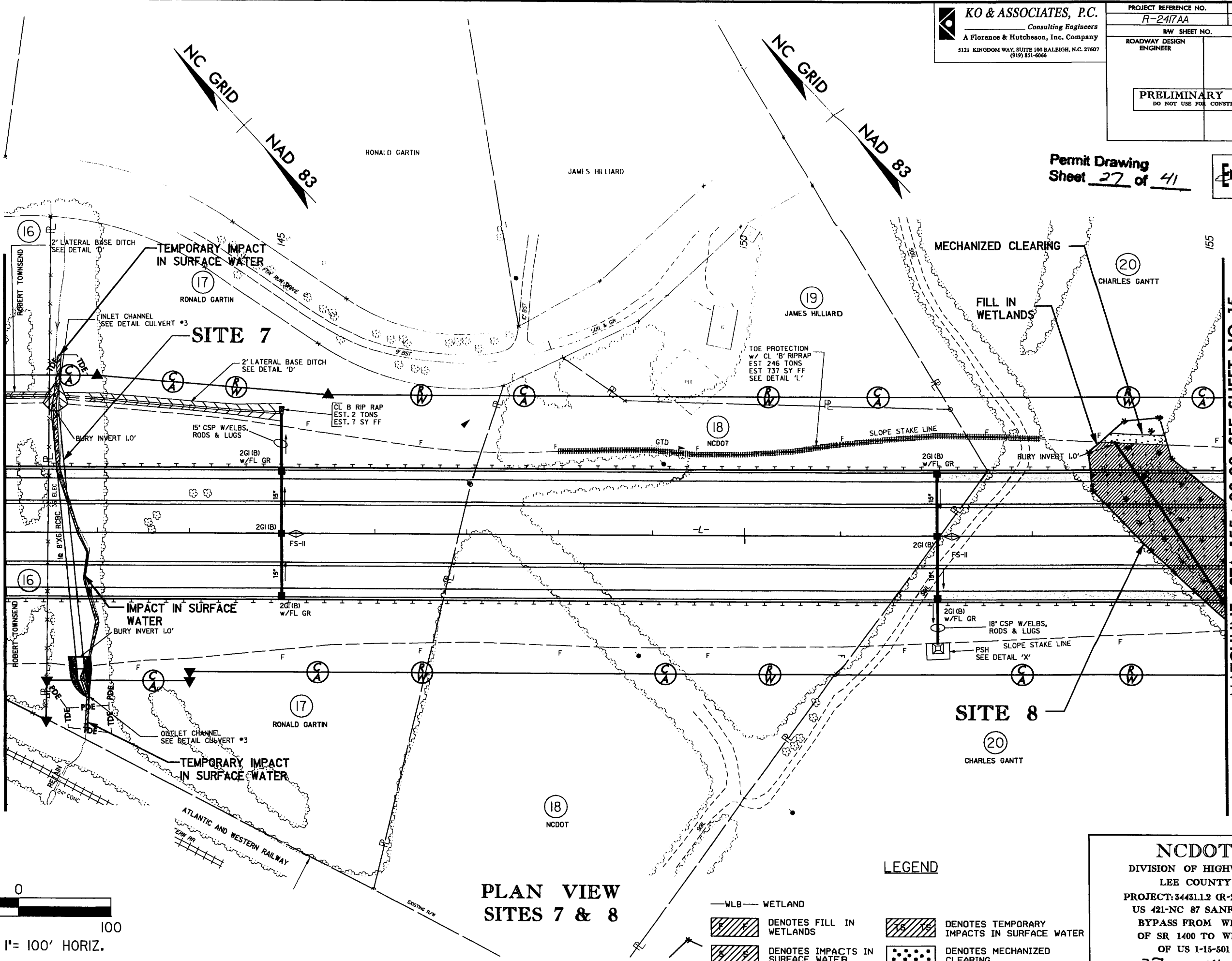


**PLAN VIEW
SITES 7 & 8**

LEGEND

- WLB - WETLAND
- [Hatched box] DENOTES FILL IN WETLANDS
- [Dotted box] DENOTES MECHANIZED CLEARING
- [Diagonal lines box] DENOTES IMPACTS IN SURFACE WATER
- [Cross-hatched box] DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 27 OF 41



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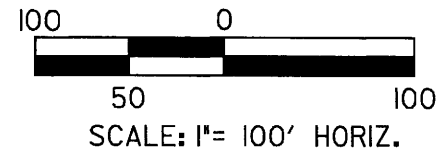
PROJECT REFERENCE NO. <i>R-2417AA</i>		SHEET NO. <i>14</i>	
RW SHEET NO. <i>14</i>			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

Permit Drawing
Sheet **28** of **41**

ENGLISH

-MATCHLINE- STA. 142 + 00.00 SEE SHEET NO. 13

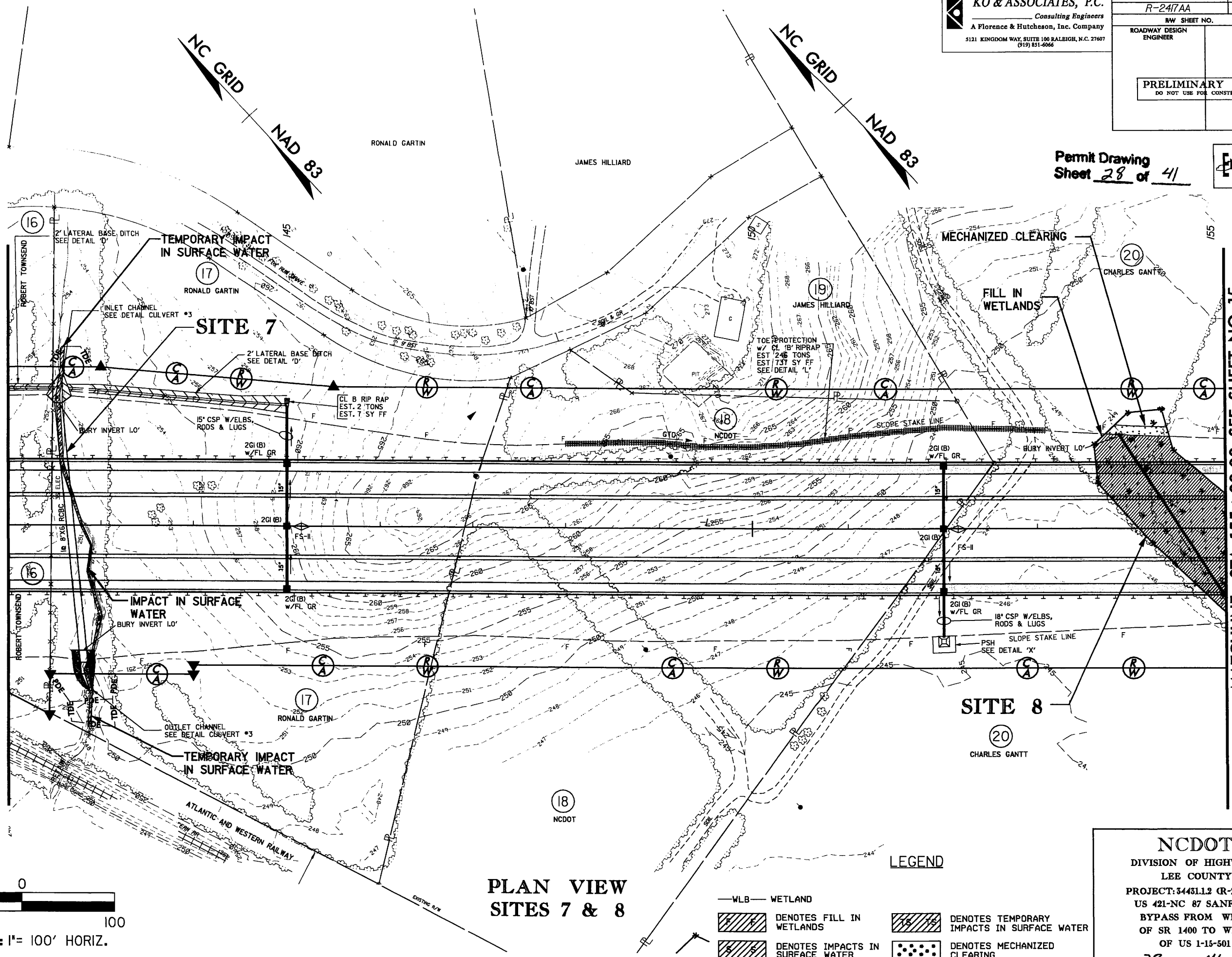
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PLAN VIEW SITES 7 & 8

- LEGEND**
- WLB - WETLAND
 - [Hatched Box] DENOTES FILL IN WETLANDS
 - [Dotted Box] DENOTES IMPACTS IN SURFACE WATER
 - [Hatched Box] DENOTES TEMPORARY IMPACTS IN SURFACE WATER
 - [Dotted Box] DENOTES MECHANIZED CLEARING

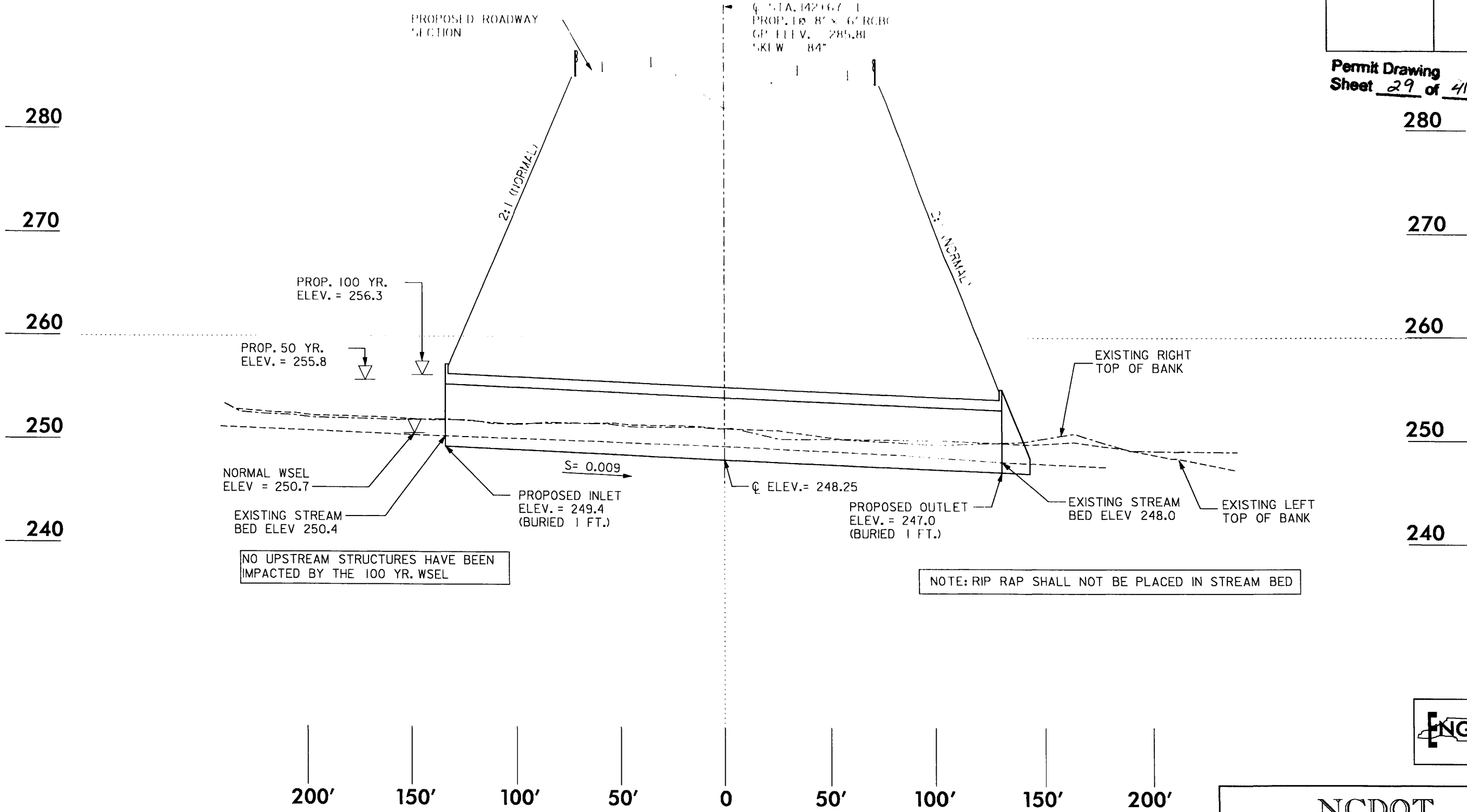
NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **28** OF **41**



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PROJECT REFERENCE NO. <i>R-2417AA</i>	SHEET NO. <i>S7-PAS</i>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 29 of 41



NO UPSTREAM STRUCTURES HAVE BEEN
IMPACTED BY THE 100 YR. WSEL

NOTE: RIP RAP SHALL NOT BE PLACED IN STREAM BED



SCALE:
1" = 50' HORIZONTAL
1" = 10' VERTICAL

PROFILE ALONG STRUCTURE SITE 7

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 29 OF 41 5/5/06

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5/28/99

4/5/2009 R:\Hydraulics\gdn\Permits\2417aa-hyd.plt_1.s7&8.dgn KO & Associates, P.C.

BM#10
RR SPIKE IN BASE OF 12" PINE TREE RIGHT
OF BL-127
-L- STA 134+35.80 294.46' RT
ELEV = 243.36'

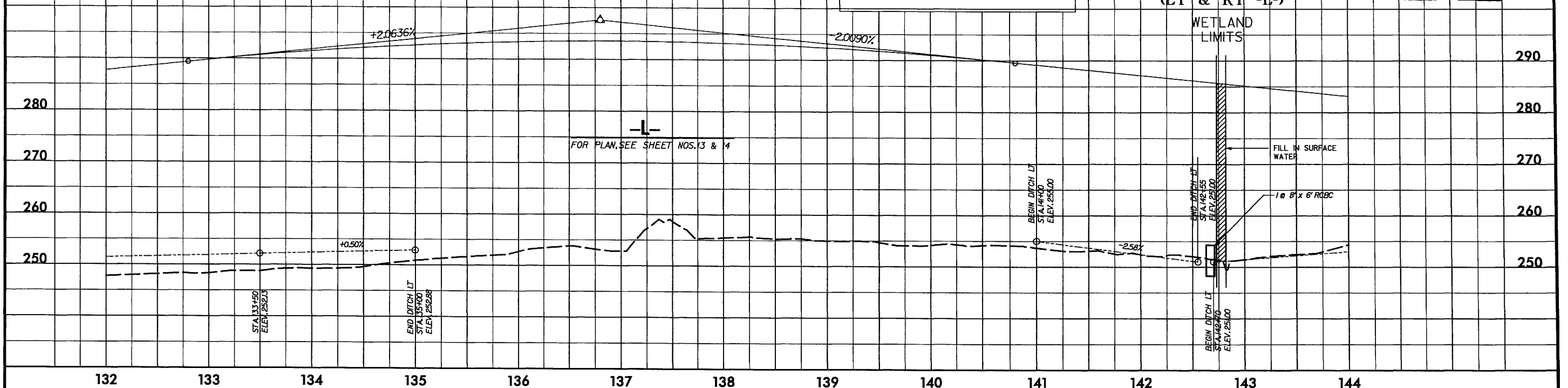
PI = 136+80.00
EL = 297.61'
VC = 800'
K = 196
DS = 65 MPH

CULVERT HYDRAULIC DATA	
DESIGN DISCHARGE	= 300 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 255.8 FT
BASE DISCHARGE	= 340 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 256.3 FT
OVERTOPPING DISCHARGE	= 590 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 260.0 FT

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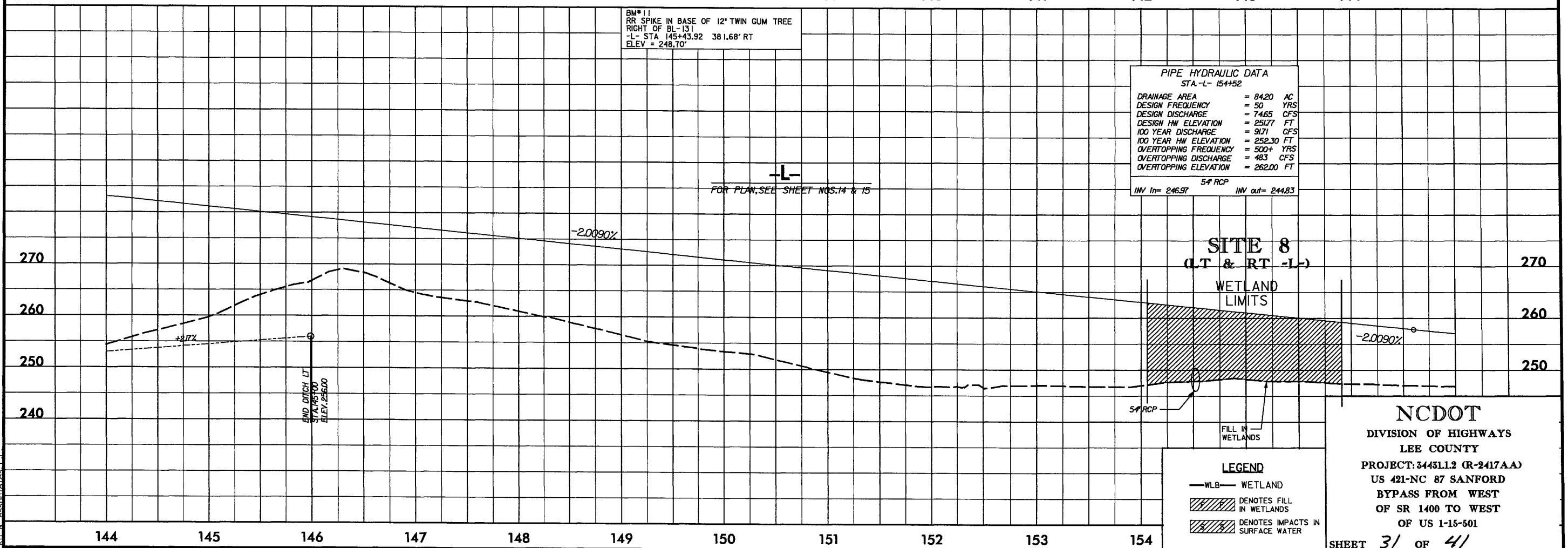
PROJECT REFERENCE NO. R-2417AA	SHEET NO. 31
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet **31** of **41**



BM#11
RR SPIKE IN BASE OF 12" TWIN GUM TREE
RIGHT OF BL-131
-L- STA 145+43.92 381.68' RT
ELEV = 248.70'

PIPE HYDRAULIC DATA	
STA -L- 154+52	
DRAINAGE AREA	= 84.20 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 7465 CFS
DESIGN HW ELEVATION	= 251.77 FT
100 YEAR DISCHARGE	= 9171 CFS
100 YEAR HW ELEVATION	= 252.30 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 483 CFS
OVERTOPPING ELEVATION	= 262.00 FT
5' RCP	
INV In= 246.97	INV out= 244.83



LEGEND	
WLB	WETLAND
(Hatched Area)	DENOTES FILL IN WETLANDS
(Hatched Area)	DENOTES IMPACTS IN SURFACE WATER

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **31** OF **41**

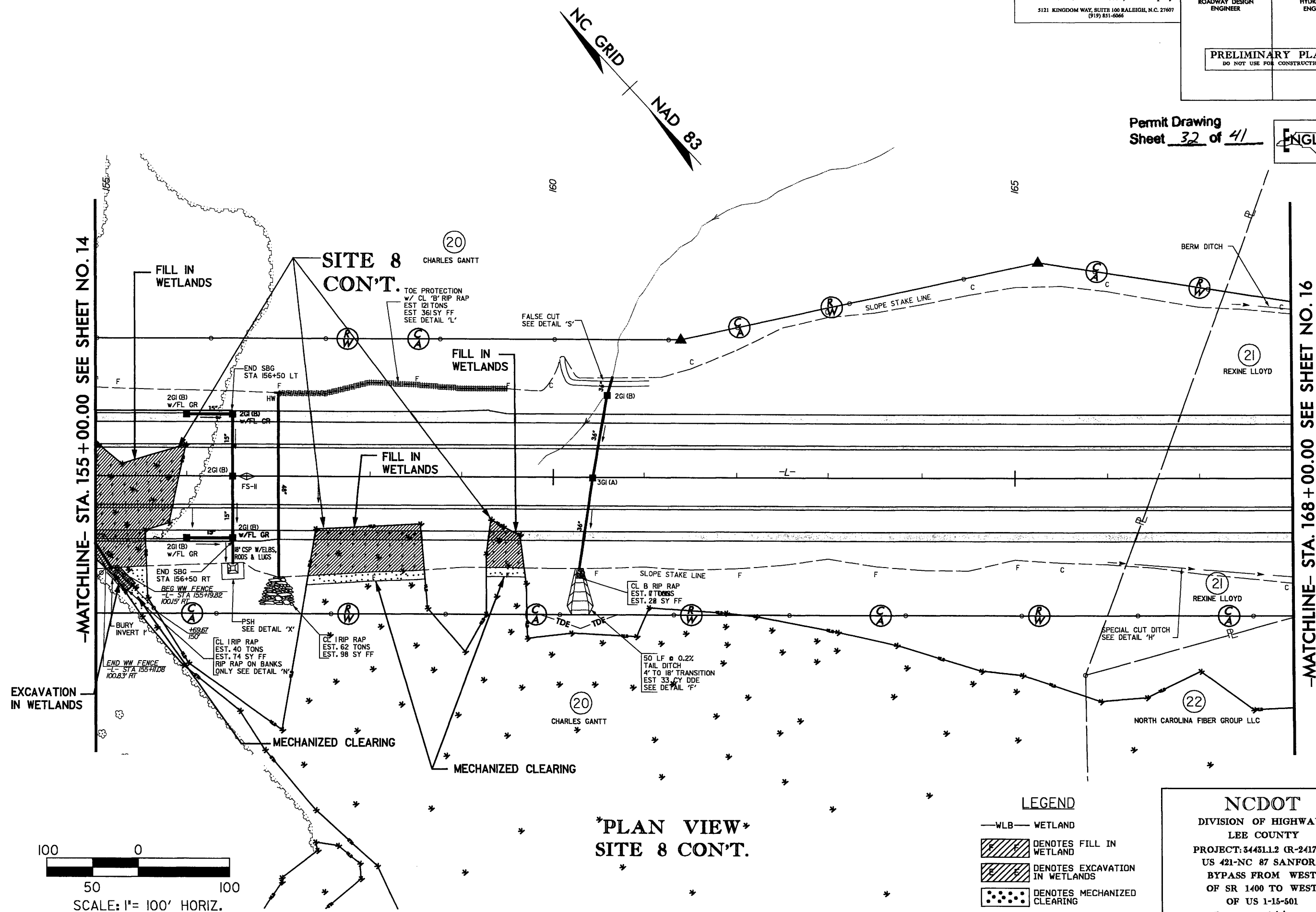
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PROJECT REFERENCE NO. R-2417AA		SHEET NO. 15	
RW SHEET NO. 15			
ROADWAY DESIGN ENGINEER			HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet **32** of **41**
 ENGLISH



PLAN VIEW
SITE 8 CON'T.

LEGEND

- WLB— WETLAND
- DENOTES FILL IN WETLAND
- DENOTES EXCAVATION IN WETLANDS
- DENOTES MECHANIZED CLEARING

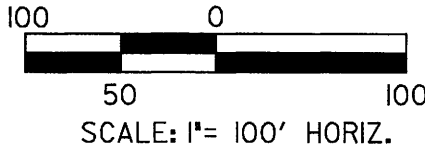
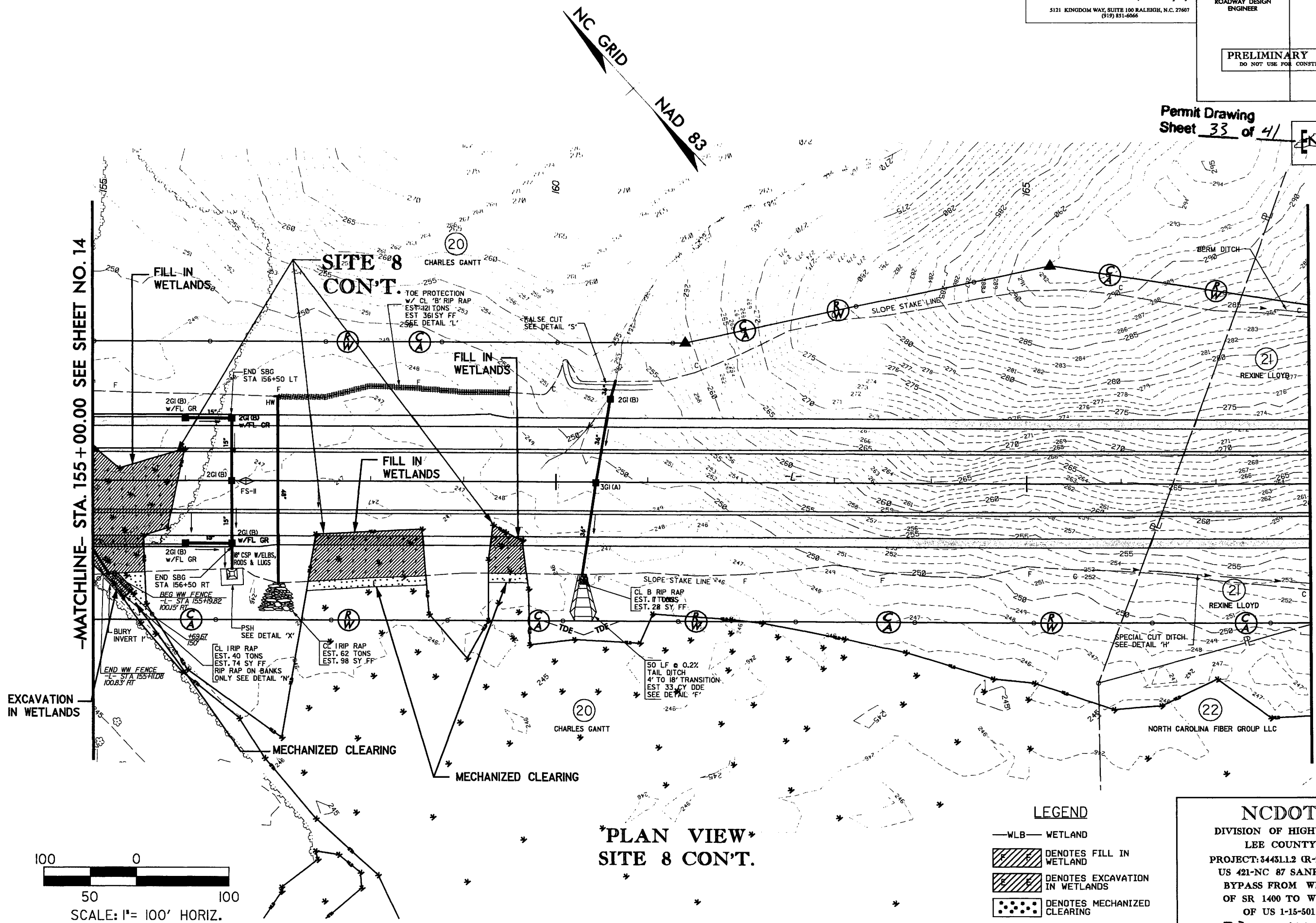
NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **32** OF **41**

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5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6666

PROJECT REFERENCE NO. R-2417AA		SHEET NO. 15
RW SHEET NO. 15		
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		

Permit Drawing
Sheet **33** of **41**
[ENGLISH]



**PLAN VIEW
SITE 8 CON'T.**

LEGEND

—WLB—	WETLAND
[Hatched Box]	DENOTES FILL IN WETLAND
[Cross-hatched Box]	DENOTES EXCAVATION IN WETLANDS
[Dotted Box]	DENOTES MECHANIZED CLEARING

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **33** OF **41**

4/5/2009
R:\Hydraulics\Ncdot\Permits\2417\241702_hyd.prm-15.dgn
KO & ASSOCIATES, P.C.

8/17/99

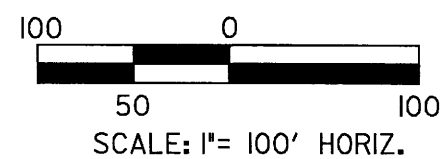
KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6046

PROJECT REFERENCE NO. R-2417AA		SHEET NO. 16
RW SHEET NO. 16		
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		

Permit Drawing
Sheet 34 of 41 [ENGLISH]

-MATCHLINE- STA. 168+00.00 SEE SHEET NO. 15

-MATCHLINE- STA. 180+50.00 SEE SHEET NO. 17



PLAN VIEW SITE 9

LEGEND

- WLB WETLAND
- [Hatched Box] DENOTES FILL IN WETLAND
- [Hatched Box] DENOTES EXCAVATION IN WETLAND
- [Hatched Box] DENOTES IMPACTS IN SURFACE WATER
- [Hatched Box] DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- [Dotted Box] DENOTES MECHANIZED CLEARING

REVISIONS

12-6-06 Changed Portion of Parcel 23 to Parcel 35 - Revised RW & TCE on Parcel 35

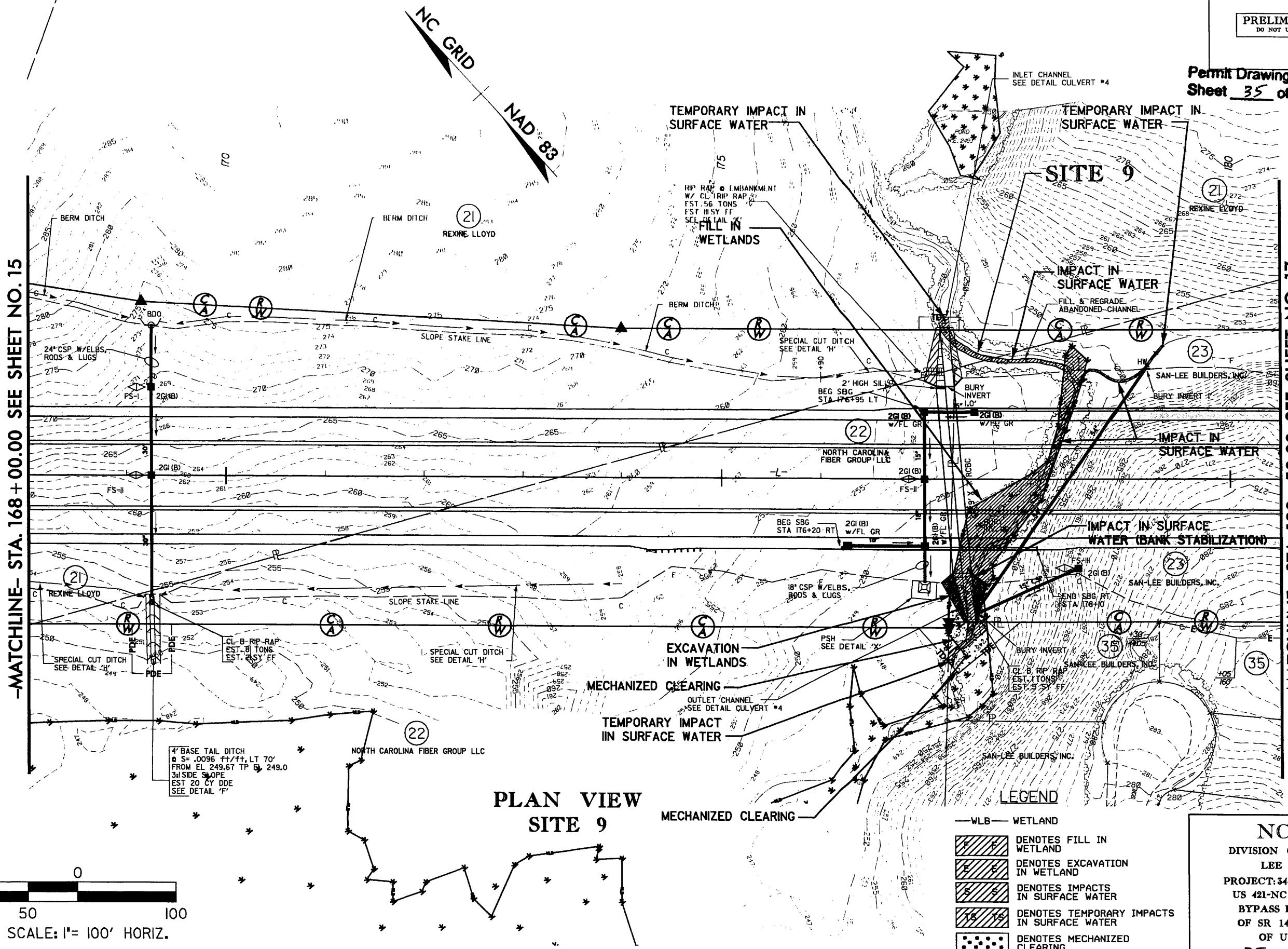
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KO & Associates, P.C.

8/17/99
12-4-06 Changed Portion of Parcel 23 to Parcel 35 - Revised R/W & TCE on Parcel 35
4/5/2009
K:\Projects\2009\2417aa\2417aa-hyd-prm-16.dgn
KO & Associates, P.C.

KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6666

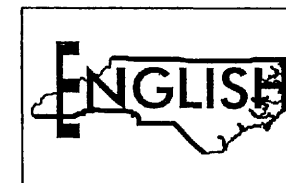
PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	16
R/W SHEET NO.	16
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 35 of 41
[ENGLISH]



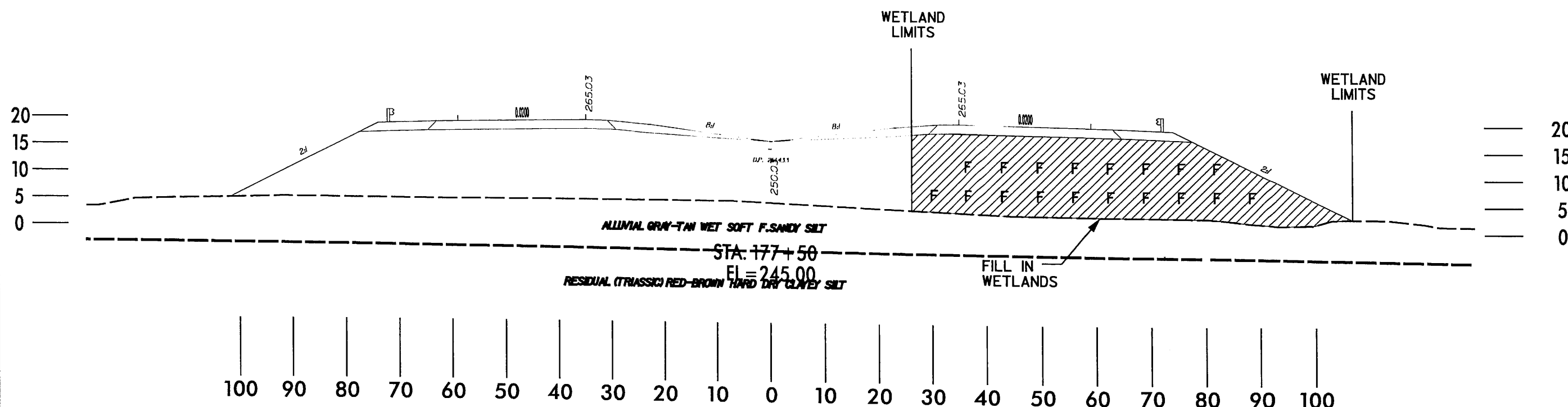
PLAN VIEW
SITE 9

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 35 OF 41



PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	9-XPL
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 36 of 41



LEGEND

- WLB— WETLAND
-  DENOTES FILL IN WETLAND

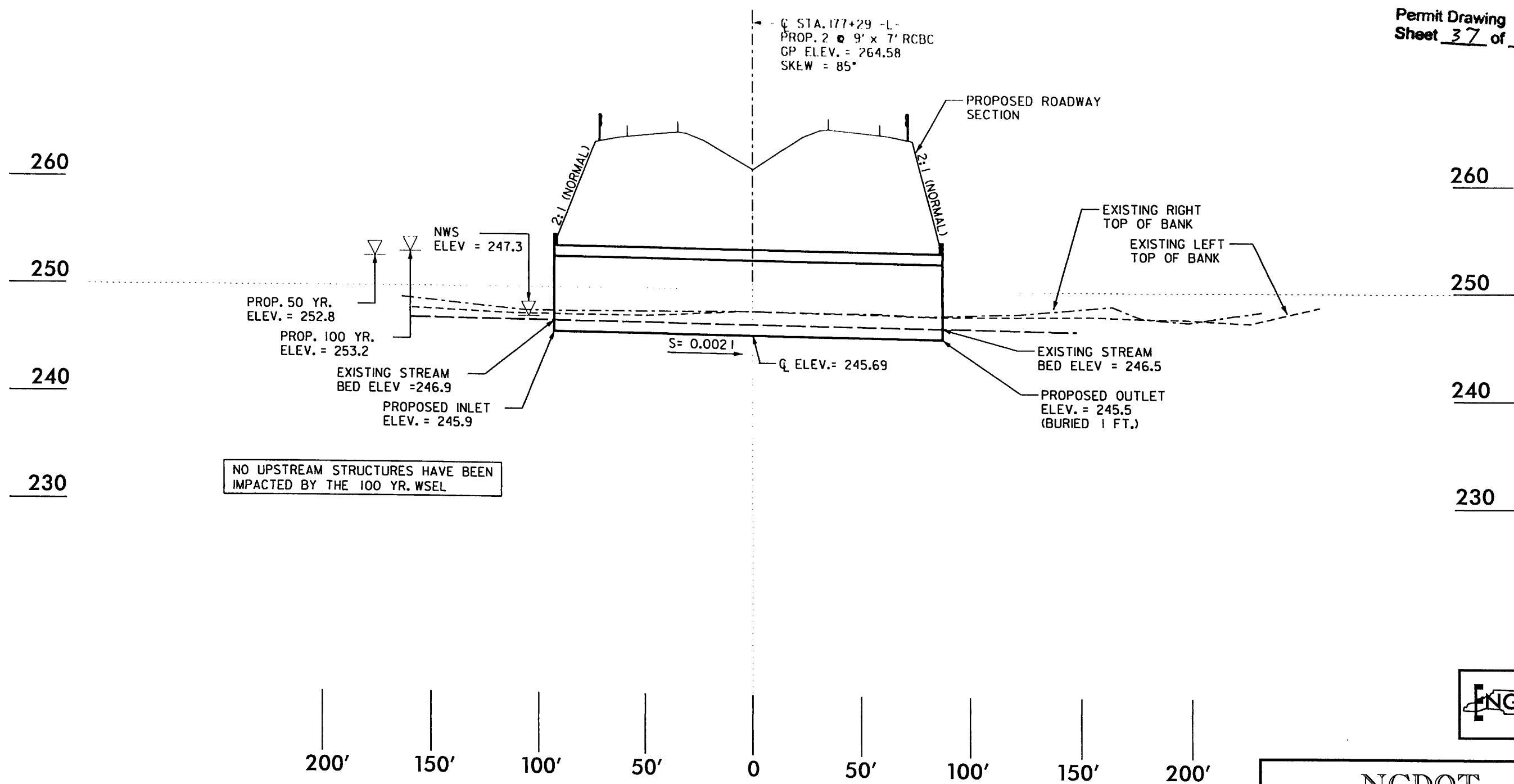
TYPICAL X-SECTIONS SITE 9

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET 36 OF 41

PROJECT REFERENCE NO. R-2417AA	SHEET NO. S9-PAS
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet **37** of **41**



NO UPSTREAM STRUCTURES HAVE BEEN
IMPACTED BY THE 100 YR. WSEL



SCALE:
1" = 50' HORIZONTAL
1" = 10' VERTICAL

PROFILE ALONG STRUCTURE SITE 9

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **37** OF **41** 5/5/06

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2/8/2009 8:00:33 PM

5/28/99

BM*13
RR SPIKE IN BASE OF 6" TWIN OAK TREE
LEFT OF BL-134
L- STA 157+40.55 254.50' RT
ELEV = 265.20'

KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066

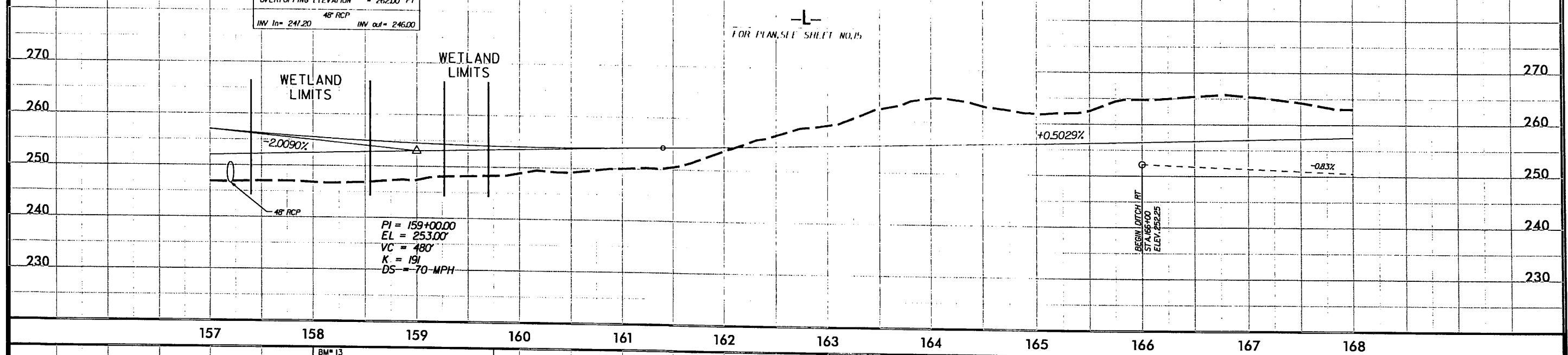
PROJECT REFERENCE NO. **R-2417AA**
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO. **32**
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SITE 8 CONT. (RT -L-)

PIPE HYDRAULIC DATA
STA L- 157+20

DRAINAGE AREA	= 84.20 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 95.35 CFS
DESIGN HW ELEVATION	= 251.71 FT
100 YEAR DISCHARGE	= 108.29 CFS
100 YEAR HW ELEVATION	= 252.30 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 483 CFS
OVERTOPPING ELEVATION	= 262.00 FT

48" RCP
INV In= 247.20 INV out= 246.00



BM*13
RR SPIKE IN BASE OF 12" PINE TREE
RIGHT OF BL-138
L- STA 173+46.58 254.45' RT
ELEV = 254.19'

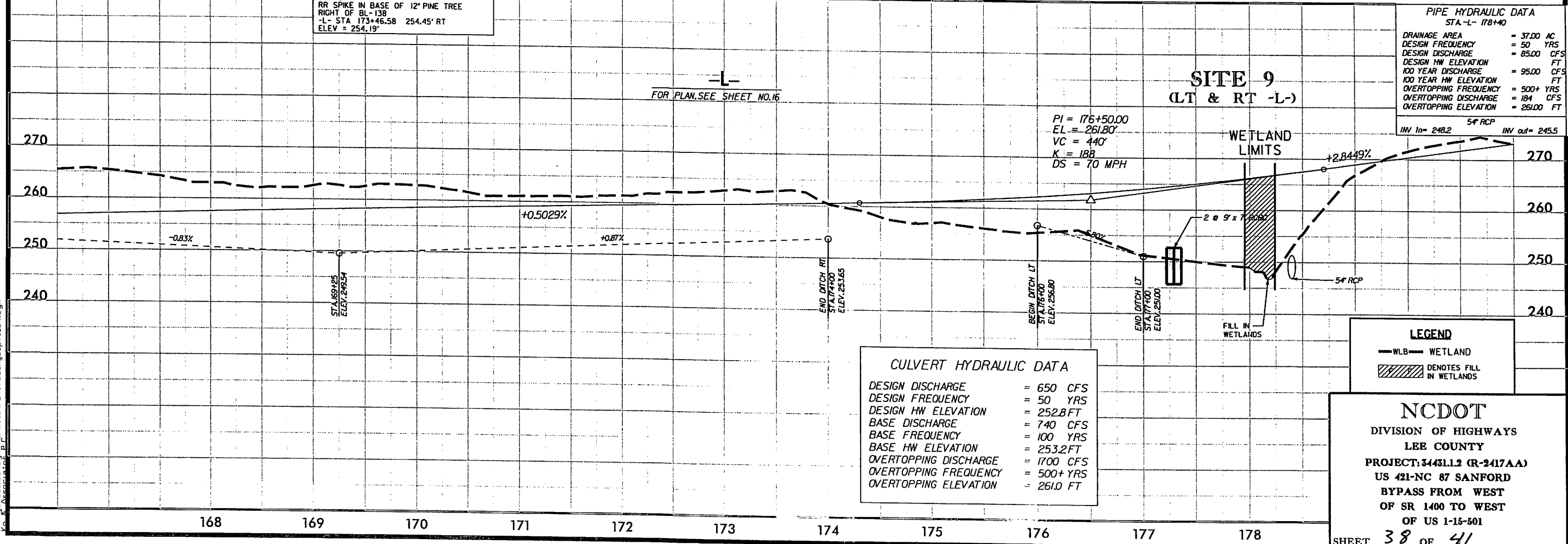
-L-
FOR PLAN, SEE SHEET NO. 16

SITE 9 (LT & RT -L-)

PIPE HYDRAULIC DATA
STA -L- 178+40

DRAINAGE AREA	= 37.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 85.00 CFS
DESIGN HW ELEVATION	= 95.00 FT
100 YEAR DISCHARGE	= 95.00 CFS
100 YEAR HW ELEVATION	= 104.00 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 184 CFS
OVERTOPPING ELEVATION	= 261.00 FT

54" RCP
INV In= 248.2 INV out= 245.5



CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 650 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 252.8 FT
BASE DISCHARGE	= 740 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 253.2 FT
OVERTOPPING DISCHARGE	= 1700 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 261.0 FT

LEGEND
-WLB- WETLAND
DENOTES FILL IN WETLANDS

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET **38** OF **41**

2/8/2009
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8/17/99

KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6065

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 18
R/W SHEET NO. 18	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 39 of 41



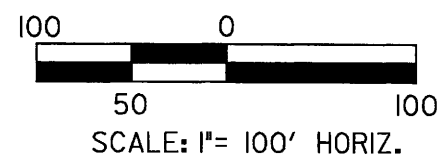
REVISIONS

12-4-06 Parcel 24 Name Change

4/5/2009
C:\Users\johndoe\Documents\Projects\2417\ao_hyd.prm_18.dgn
John Doe

-MATCHLINE- STA. 193+00.00 SEE SHEET NO. 17

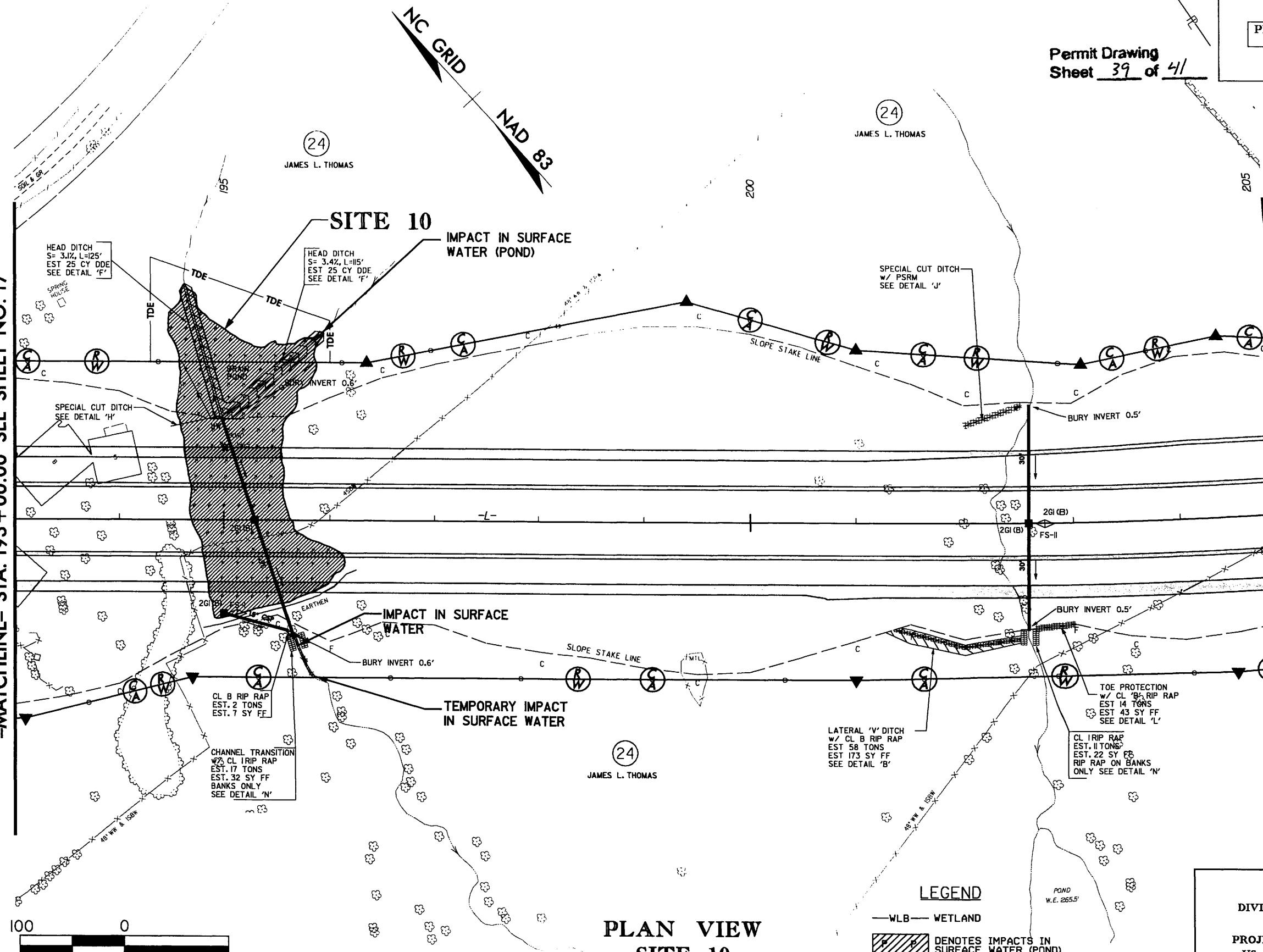
-MATCHLINE- STA. 205+00.00 SEE SHEET NO. 19



PLAN VIEW SITE 10

LEGEND

- WLB WETLAND
- [Hatched Box] DENOTES IMPACTS IN SURFACE WATER (POND)
- [Hatched Box] DENOTES TEMPORARY IMPACT IN SURFACE WATER
- [Hatched Box] DENOTES IMPACTS IN SURFACE WATER



NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 39 OF 41

8/17/99
12-4-06 Parcel 24 Name Change
4/5/2009
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KO & ASSOCIATES, P.C.

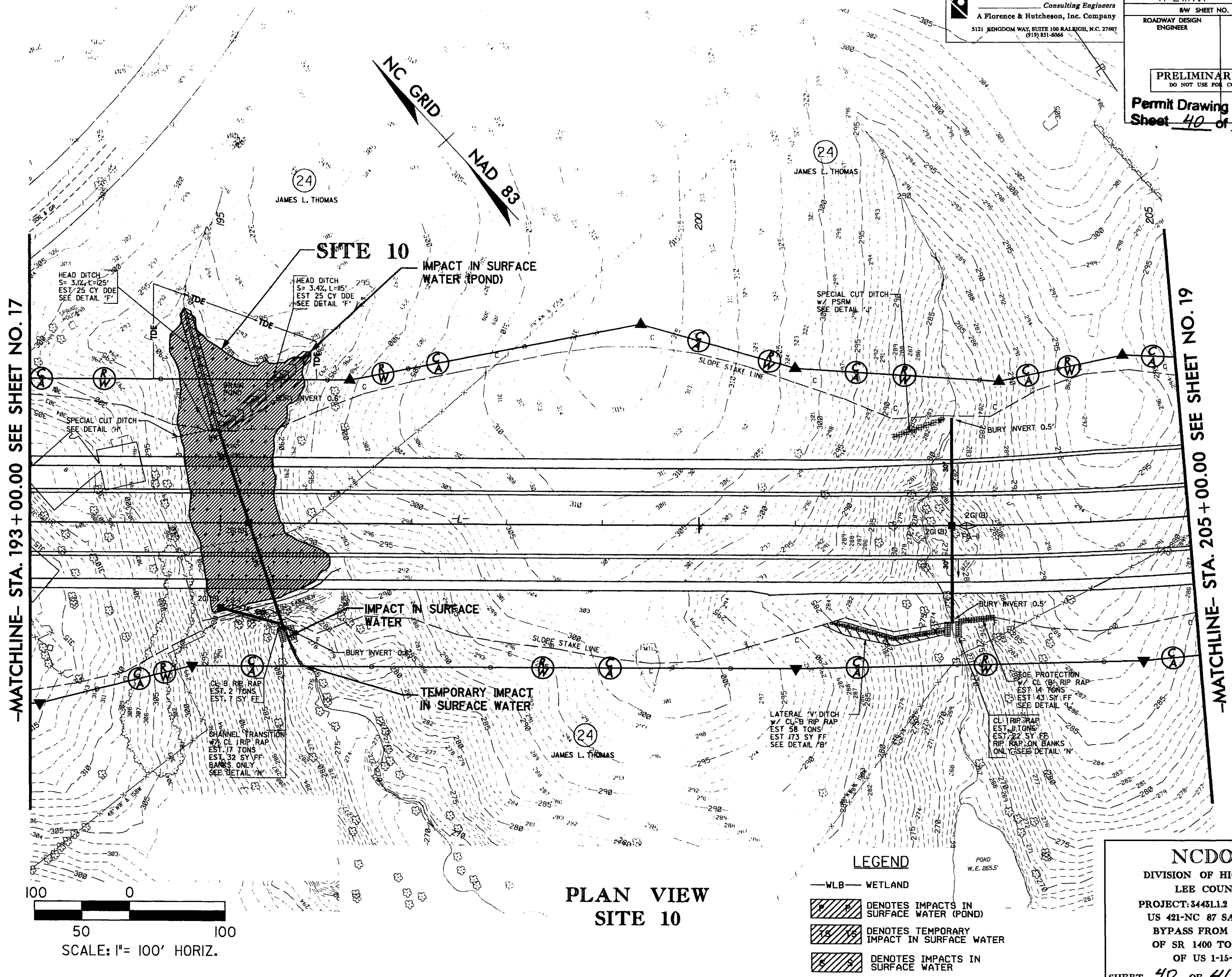
KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	18
RAW SHEET NO.	18
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 40 of 41

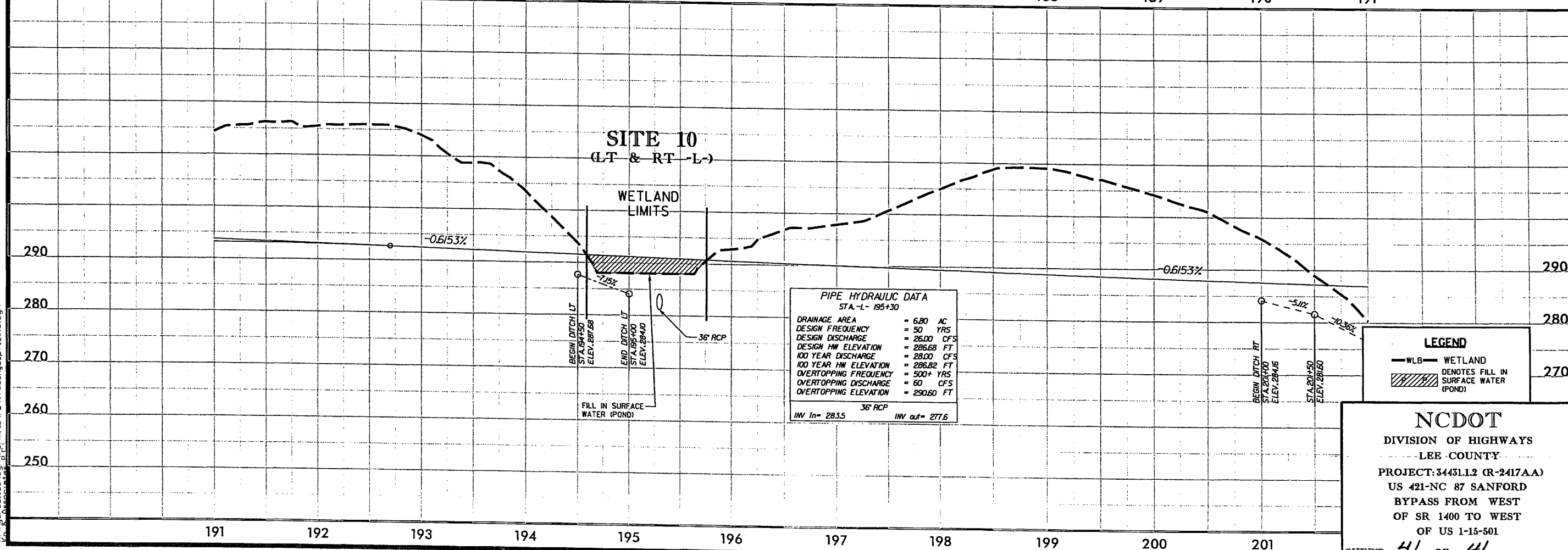
ENGLISH



NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 4431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET 40 OF 41

ENGLISH

-0.6153%



NCDOT
DIVISION OF HIGHWAYS
.....LEE COUNTY.....
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

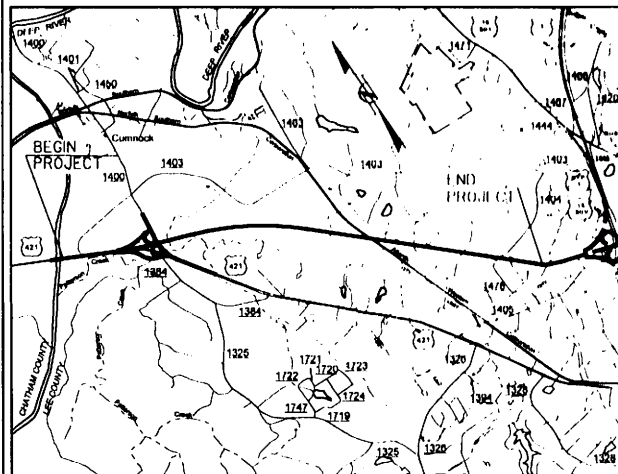
SHEET 41 OF 41

09/28/99

TIP PROJECT: R-2417AA

CONTRACT:

See Sheet 1 A for Index of Sheets



VICINITY MAP

THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

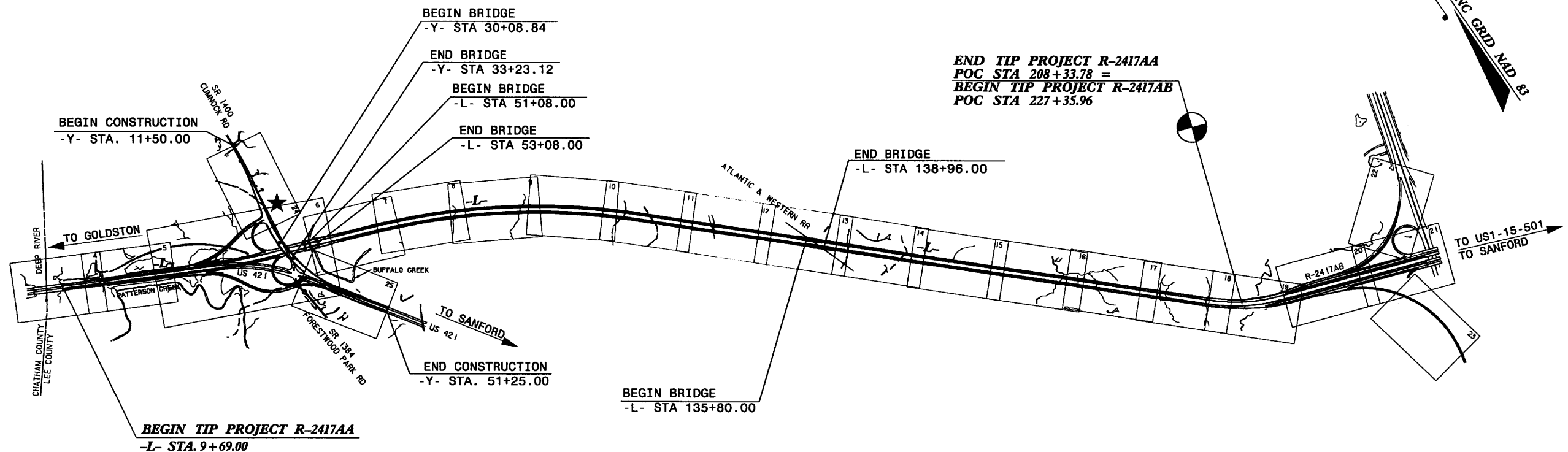
LEE COUNTY

LOCATION: US 421 - NC 87 SANFORD BYPASS FROM WEST
OF SR 1400 TO WEST OF US 1-15-501

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES
AND SIGNAL.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2417AA	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34431.1.2	STP-NHF-421(2)	P.E.	
34431.2.2	STP-NHF-421(2)	RW	

LEGEND:
★ PROPOSED SIGNAL

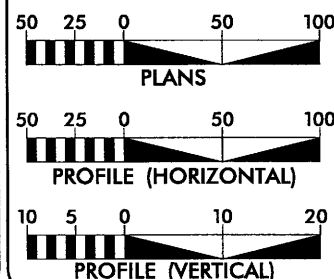


THIS IS A CONTROLLED - ACCESS PROJECT WITH
ACCESS BEING LIMITED TO INTERCHANGES.
CLEARING ON THIS PROJECT SHALL BE PERFORMED
TO THE LIMITS ESTABLISHED BY METHOD III

NCDOT CONTACT: CATHY S. HOUSER, P.E.
ROADWAY DESIGN - ENGINEERING COORDINATION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES



DESIGN DATA

ADT 2008 = 13,300
ADT 2028 = 20,800
DHV = 10 %
D = 60 %
T = 9 % *
V = 70 MPH
* TTST 5% DUAL 4%

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2417AA = 3.664 MI.
LENGTH STRUCTURES TIP PROJECT R-2417AA = 0.098 MI.
TOTAL LENGTH OF TIP PROJECT R-2417AA = 3.762 MI.

Prepared In the Office of:
KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINLOCH WAY, SUITE 100 RALPH, N.C. 27607
(919) 851-0066

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
February 17, 2006

LETTING DATE:
May 20, 2008

David C. Waller, P.E.
PROJECT ENGINEER

PROJECT DESIGN ENGINEER

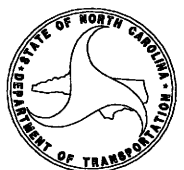
HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN
ENGINEER

SIGNATURE: P.E.

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA



STATE HIGHWAY DESIGN ENGINEER P.E.

2/9/2009
I:\roadway\proj\2417aa_rdy_tsh.dgn
Ko & Associates, P.C.

Note: Not to Scale***S.U.E. = Subsurface Utility Engineering**STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CONVENTIONAL PLAN SHEET SYMBOLS

BOUNDARIES AND PROPERTY:

State Line	_____
County Line	_____
Township Line	_____
City Line	_____
Reservation Line	_____
Property Line	_____
Existing Iron Pin	○ IP
Property Corner	_____ X
Property Monument	□ EGM
Parcel/Sequence Number	①23
Existing Fence Line	-X-X-X-
Proposed Woven Wire Fence	-○-○-○-
Proposed Chain Link Fence	-□-□-□-
Proposed Barbed Wire Fence	-◇-◇-◇-
Existing Wetland Boundary	-W.B.-
Proposed Wetland Boundary	-W.B.-
Existing Endangered Animal Boundary	-EAB-
Existing Endangered Plant Boundary	-EPB-

BUILDINGS AND OTHER CULTURE:

Gas Pump Vent or U/G Tank Cap	○
Sign	○ S
Well	○ W
Small Mine	✕
Foundation	□
Area Outline	□
Cemetery	□ †
Building	□
School	□
Church	□
Dam	□

HYDROLOGY:

Stream or Body of Water	_____
Hydro, Pool or Reservoir	□
Jurisdictional Stream	-JS-
Buffer Zone 1	-BZ 1-
Buffer Zone 2	-BZ 2-
Flow Arrow	←
Disappearing Stream	→
Spring	○
Wetland	≡
Proposed Lateral, Tail, Head Ditch	_____
False Sump	◇

RAILROADS:

Standard Gauge	_____
RR Signal Milepost	①
Switch	SWITCH
RR Abandoned	_____
RR Dismantled	_____

RIGHT OF WAY:

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

ROADS AND RELATED FEATURES:

Existing Edge of Pavement	_____
Existing Curb	_____
Proposed Slope Stakes Cut	C
Proposed Slope Stakes Fill	F
Proposed Wheel Chair Ramp	WCR
Existing Metal Guardrail	_____
Proposed Guardrail	_____
Existing Cable Guiderail	_____
Proposed Cable Guiderail	_____
Equality Symbol	⊕
Pavement Removal	⊗

VEGETATION:

Single Tree	☆
Single Shrub	⊙
Hedge	_____
Woods Line	_____
Orchard	⊙
Vineyard	_____

EXISTING STRUCTURES:

MAJOR:	
Bridge, Tunnel or Box Culvert	CONC
Bridge Wing Wall, Head Wall and End Wall	CONC WW
MINOR:	
Head and End Wall	CONC HW
Pipe Culvert	_____
Footbridge	_____
Drainage Box: Catch Basin, DI or JB	CB
Paved Ditch Gutter	_____
Storm Sewer Manhole	⊙
Storm Sewer	S

UTILITIES:

POWER:	
Existing Power Pole	●
Proposed Power Pole	○
Existing Joint Use Pole	●
Proposed Joint Use Pole	○
Power Manhole	⊙
Power Line Tower	⊗
Power Transformer	⊗
U/G Power Cable Hand Hole	PH
H-Frame Pole	●
Recorded U/G Power Line	P
Designated U/G Power Line (S.U.E.*)	P

TELEPHONE:

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

WATER:

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

TV:

TV Satellite Dish	⊙
TV Pedestal	⊙
TV Tower	⊙
U/G TV Cable Hand Hole	PH
Recorded U/G TV Cable	TV
Designated U/G TV Cable (S.U.E.*)	TV
Recorded U/G Fiber Optic Cable	TV FO
Designated U/G Fiber Optic Cable (S.U.E.*)	TV FO

GAS:

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

SANITARY SEWER:

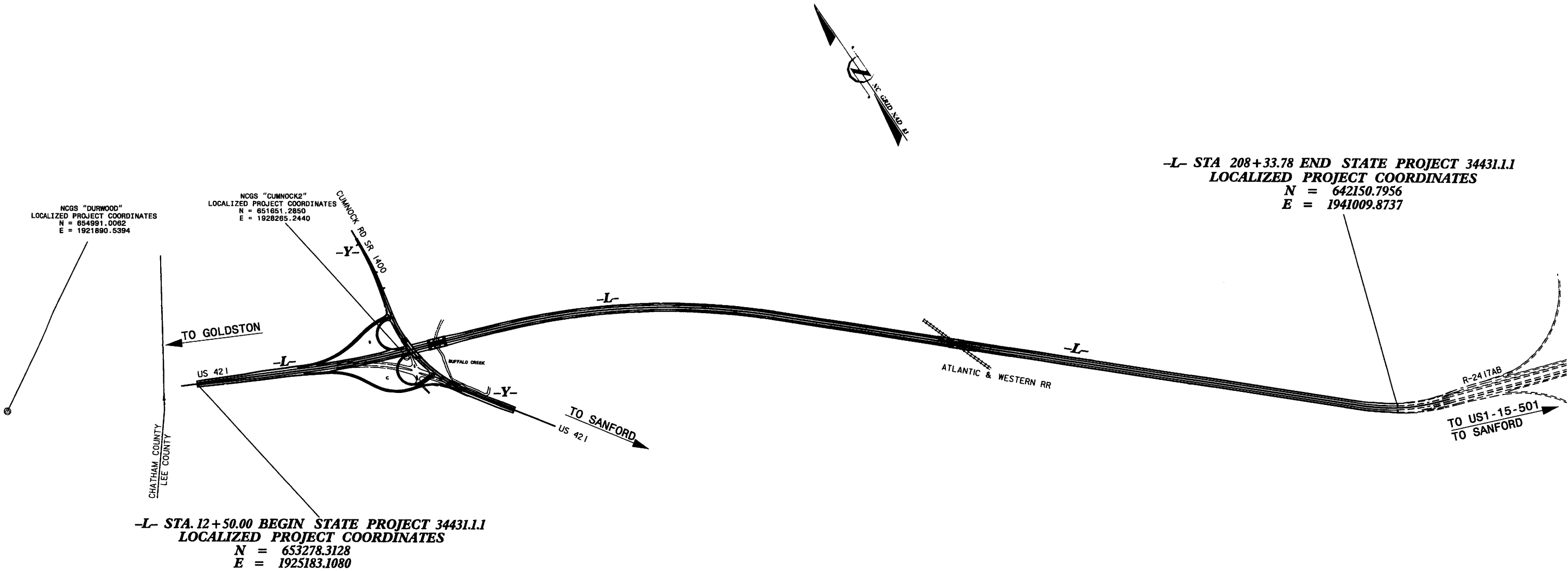
Sanitary Sewer Manhole	⊙
Sanitary Sewer Cleanout	⊙
U/G Sanitary Sewer Line	SS
Above Ground Sanitary Sewer	A/G Sanitary Sewer
Recorded SS Forced Main Line	FSS
Designated SS Forced Main Line (S.U.E.*)	FSS

MISCELLANEOUS:

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

SURVEY CONTROL SHEET R-2417AA

PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	1C
Location and Surveys	



DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCGS FOR MONUMENT "CUMNOCK2" WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 651651.285(ft) EASTING: 1928265.244(ft) THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.999869545 THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "CUMNOCK 2" TO -L- STATION 12+50.00 IS N 62°10'15.20" W 3485.223' ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES VERTICAL DATUM USED IS NAVD 29

NOTES:

THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY BY SELECTING PROJECT CONTROL DATA AT:
[HTTP://WWW.DOH.DOT.STATE.NC.US/PRECONSTRUCT/HIGHWAY/LOCATION/PROJECT](http://www.doh.dot.state.nc.us/preconstruct/highway/location/project)
SITE CALIBRATION INFORMATION HAS NOT BEEN PROVIDED FOR THIS PROJECT. IF FURTHER INFORMATION IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.
⊙ INDICATES GEODETIC CONTROL MONUMENTS USED OR SET FOR HORIZONTAL PROJECT CONTROL BY THE NCDOT LOCATION AND SURVEYS UNIT.
NETWORK ESTABLISHED FROM EXISTING NCGS NAD83 MONUMENTATION.

NOTES

1. THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY BY SELECTING "PROJECT CONTROL DATA" AT:
[HTTP://WWW.DOH.DOT.STATE.NC.US/PRECONSTRUCT/HIGHWAY/LOCATION/PROJECT/](http://www.doh.dot.state.nc.us/preconstruct/highway/location/project/)
THE FILES TO BE FOUND ARE AS FOLLOWS:
r2417aa_ls_control_050308.txt

NOTE: DRAWING NOT TO SCALE

SURVEY CONTROL SHEET R-2417AA

PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	1D
Location and Surveys	

BL	POINT	DESC.	NORTH	EAST	ELEVATION	L STATION	OFFSET
101	BL 101		651671.8810	1929296.1050	241.84	13+76.30	0.51 LT
102	BL 102		651644.4740	1926449.5990	242.25	26+66.24	4.54 LT
103	BL 103		651713.3160	1927308.1710	242.50	36+26.92	5.42 RT
104	BL 104		651959.7680	1927932.8770	278.26	43+01.02	0.66 RT
105	BL 105		651861.4560	1928199.3140	298.16	45+05.01	0.81 RT
106	BL 106		651784.6740	1928415.5520	288.82	48+14.47	0.87 LT
107	BL 107		651722.8540	1928637.8370	270.35	50+44.50	18.67 LT
108	BL 108		651638.6190	1928841.9200	226.38	52+65.08	9.19 LT
109	BL 109		651518.2060	1929156.1190	250.18	56+01.51	3.30 LT
110	BL 110		651395.0330	1929488.9760	257.93	59+56.42	1.20 LT
111	BL 111		651300.8000	1929734.2400	267.73	62+19.13	3.60 RT
112	BL 112		651211.4230	1929965.9800	252.14	64+67.60	5.72 RT
113	BL 113		651096.8870	1930263.6590	264.63	67+86.60	0.30 RT
114	BL 114		650898.2210	1930723.5970	292.99	72+87.49	5.87 LT
115	BL 115		650615.9550	1931228.5160	296.39	78+65.81	18.77 RT
116	BL 116		650508.7820	1931440.2120	292.58	81+03.26	10.68 RT
117	BL 117		650376.3700	1931682.2840	282.71	83+79.28	3.89 RT
118	BL 118		649894.1730	1932468.7170	290.08	93+00.97	21.38 LT
119	BL 119		649516.8220	1932927.0180	252.99	98+93.68	5.54 RT
120	BL 120		649238.0340	1933274.4770	244.28	103+39.26	0.08 LT
121	BL 121		648776.4150	1933788.5370	248.30	110+30.19	2.20 LT
122	BL 122		648523.8550	1934060.0740	249.94	114+01.02	1.67 LT
123	BL 123		648264.8660	1934330.0460	255.54	117+75.08	4.63 RT
124	BL 124		648031.6970	1934585.5760	245.29	121+20.99	1.83 RT
125	BL 125		647776.4630	1934863.0930	248.83	124+98.03	0.25 RT
126	BL 126		647435.4460	1935248.9280	246.85	130+12.82	12.09 LT
127	BL 127		647111.5430	1935576.7200	250.38	134+73.42	2.49 RT
128	BL 128		646918.0590	1935806.7120	255.42	137+73.62	12.05 LT
129	BL 129		646681.6770	1936044.0710	253.56	141+08.39	0.14 LT
130	BL 130		646510.6080	1936234.9600	252.46	143+64.68	4.52 LT
131	BL 131		646315.5540	1936440.9620	268.24	146+48.36	1.59 LT
132	BL 132		646042.1870	1936729.0880	251.49	150+45.51	2.91 RT
133	BL 133		645799.7140	1936990.5540	247.14	154+02.10	2.89 RT
134	BL 134		645585.5080	1937241.6840	246.84	157+31.89	10.83 LT
135	BL 135		645315.8450	1937515.1320	250.00	161+15.76	0.94 RT
136	BL 136		645088.8560	1937761.8840	263.04	164+51.03	0.43 LT
137	BL 137		644755.4380	1938149.2820	263.60	169+61.00	19.41 LT
138	BL 138		644455.8310	1938445.0290	261.30	173+82.38	0.85 LT
139	BL 139		644194.0540	1938725.3470	248.85	177+65.92	0.47 RT
140	BL 140		644039.3270	1938894.5460	272.81	179+95.19	1.15 LT
157	BL 157		643721.8230	1939240.7120	282.04	184+64.91	3.75 LT

BY	POINT	DESC.	NORTH	EAST	ELEVATION	L STATION	OFFSET
104	BL 104		651959.7684	1927932.8779	278.26	43+01.02	0.66 RT

BY	POINT	DESC.	NORTH	EAST	ELEVATION	Y STATION	OFFSET
141	BY 141		651208.0960	1928300.7410	280.04	37+05.44	195.33 RT
142	BY 142		650716.5280	1928759.0570	280.65	43+23.31	7.89 LT
143	BY 143		649383.9690	1929676.4430	256.46	OUTSIDE PROJECT LIMITS	

BY1	POINT	DESC.	NORTH	EAST	ELEVATION	Y STATION	OFFSET
144	BY1-144		653171.8842	1928577.5129	269.85	17+70.46	9.57 RT
106	BL 106		651784.6740	1928415.5520	288.82	48+14.47	0.87 LT
141	BY 141		651208.0960	1928300.7410	280.04	37+05.44	195.32 RT

BY2	POINT	DESC.	NORTH	EAST	ELEVATION	L STATION	OFFSET
145	BY2-145		647248.1090	1935651.1840	260.99	134+35.15	148.28 LT
128	BL 128		646918.0590	1935806.7120	255.42	137+73.62	12.05 LT
146	BY2-146		646529.1530	1935911.5260	252.91	141+14.93	201.82 RT

BM1 ELEVATION = 246.84
N 651654 E 1929120
L STATION 10+00
RR SPIKE IN BASE OF 12" PINE
ON NAIL IN 4" WINGWALL OF BRIDGE OVER
DEEP RIVER

BM2 ELEVATION = 266.96
N 651772 E 1927724
L STATION 41+25 251 RIGHT
RR SPIKE IN BASE OF 15" PINE

BM3 ELEVATION = 254.49
N 651739 E 1929077
L STATION 56+22 286 RIGHT
RR SPIKE IN BASE OF 6" PINE

BM4 ELEVATION = 297.16
N 651994 E 1930018
L STATION 64+50 183 LEFT
RR SPIKE IN BASE OF 10" OAK

BM5 ELEVATION = 304.25
N 651205 E 1930853
L STATION 72+74 339 LEFT
RR SPIKE IN BASE OF 10" PINE

BM6 ELEVATION = 256.56
N 650063 E 1931610
L STATION 84+80 310 RIGHT
RR SPIKE IN BASE OF 10" PINE

BM7 ELEVATION = 290.50
N 649925 E 1932919
L STATION 96+41 312 LEFT
RR SPIKE IN BASE OF 6" CEDAR

BM8 ELEVATION = 256.97
N 649102 E 1933800
L STATION 108+18 249 LEFT
RR SPIKE IN BASE OF 12" MAPLE

BM9 ELEVATION = 256.13
N 648267 E 1934700
L STATION 120+45 248 LEFT
RR SPIKE IN BASE OF 15" PINE

BM10 ELEVATION = 243.36
N 646923 E 1935351
L STATION 134+36 294 RIGHT
RR SPIKE IN BASE OF 12" PINE

BM11 ELEVATION = 248.70
N 646106 E 1936104
L STATION 145+44 381 RIGHT
RR SPIKE IN BASE OF TWIN 12" GUM

BM12 ELEVATION = 265.20
N 645702 E 1937447
L STATION 157+49 294 LEFT
RR SPIKE IN BASE OF TWIN 6" OAK

BM13 ELEVATION = 254.19
N 644293 E 1938246
L STATION 173+47 254 RIGHT
RR SPIKE IN BASE OF 12" PINE

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT
IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY
NCGS FOR MONUMENT "CUMNOCK2"
WITH NAD 83 STATE PLANE GRID COORDINATES OF
NORTHING: 651651.285(ft) EASTING: 1928265.244(ft)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT
(GROUND TO GRID) IS: 0.999869545
THE N.C. LAMBERT GRID BEARING AND
LOCALIZED HORIZONTAL GROUND DISTANCE FROM
"CUMNOCK 2" TO L- STATION 12+50.00 IS
N 62°10'15.20" W 3485.223'
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NAVD 29

NOTES

1. THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY
BY SELECTING "PROJECT CONTROL DATA" AT:
[HTTP://WWW.DOH.DOT.STATE.NC.US/PRECONSTRUCT/HIGHWAY/LOCATION/PROJECT/](http://www.doh.dot.state.nc.us/preconstruct/highway/location/project/)
THE FILES TO BE FOUND ARE AS FOLLOWS:
r2417aa_ls_control.050308.txt

6/2/99

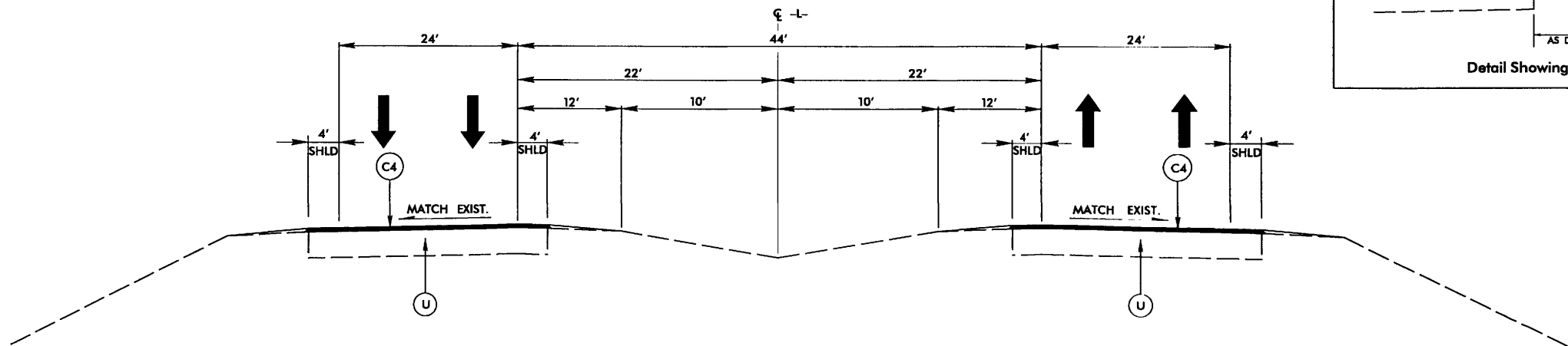
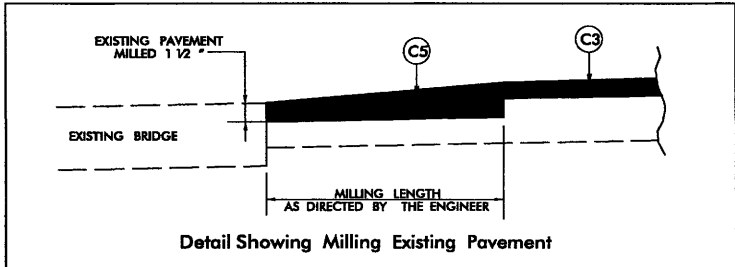
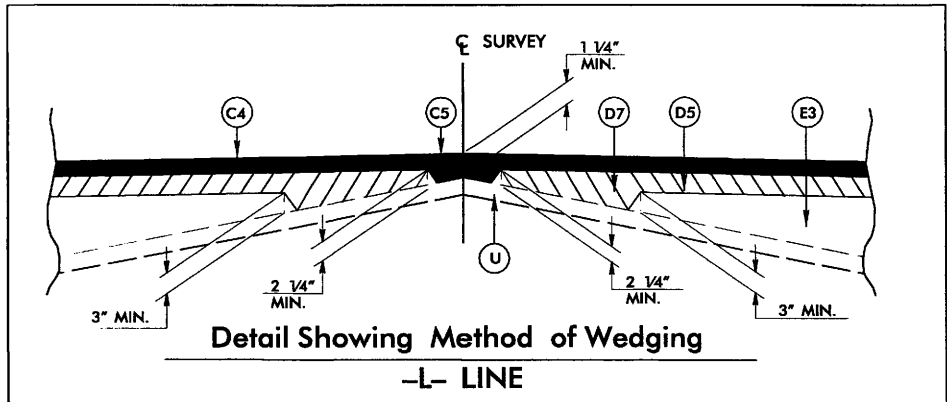
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KO & ASSOCIATES, P.C.



KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066

PROJECT REFERENCE NO. R-2417AA		SHEET NO. 2	
ROADWAY DESIGN ENGINEER		PAVEMENT DESIGN ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

PAVEMENT SCHEDULE			
C1	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE TYPE S9.5B, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.	E3	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5 1/2" IN DEPTH.
C2	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT TO EXCEED 1 1/2" IN DEPTH.	J1	PROP. 6" AGGREGATE BASE COURSE.
C3	PROP. APPROX. 1 1/2" ASPHALT CONCRETE SURFACE COURSE TYPE S9.5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD.	J2	PROP. 8" AGGREGATE BASE COURSE.
C4	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE TYPE S9.5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.	J3	PROP. 10" AGGREGATE BASE COURSE.
C5	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT TO EXCEED 1 1/2" IN DEPTH.	J4	PROP. VAR. DEPTH AGGREGATE BASE COURSE.
D1	PROP. APPROX. 2 1/2" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 285 LBS. PER SQ. YD.	K1	BASE TO BE TREATED WITH LIME TO A DEPTH OF 8", AT A RATE OF 20 LBS. PER. SQ. YD. AS DIRECTED BY THE ENGINEER.
D2	PROP. APPROX. 3 1/2" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 399 LBS. PER SQ. YD.		OR BASE TO BE TREATED WITH CEMENT TO A DEPTH OF 7", AT A RATE OF 55 LBS. PER. SQ. YD. AS DIRECTED BY THE ENGINEER.
D3	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 2 1/4" IN DEPTH OR GREATER THAN 4" IN DEPTH.	R1	2'-6" CONCRETE CURB AND GUTTER.
D4	PROP. APPROX. 3" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 342 LBS. PER SQ. YD.	R2	PROP. 5" MONOLITHIC CONCRETE ISLAND (SURFACE MOUNTED)
D5	PROP. APPROX. 3 1/2" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 399 LBS. PER SQ. YD.	R3	PROP. SHOULDER BERM GUTTER.
D6	PROP. APPROX. 4" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.	T	EARTH MATERIAL.
D7	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 2 1/4" IN DEPTH OR GREATER THAN 4" IN DEPTH.	U	EXISTING PAVEMENT.
E1	PROP. APPROX. 3" ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 342 LBS. PER SQ. YD.	W	VARIABLE DEPTH ASPHALT PAVEMENT (SEE STANDARD WEDGING DETAIL)
E2	PROP. APPROX. 8" ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.		



USE TYPICAL SECTION NO. 1 AS FOLLOWS:

TYPICAL SECTION NO. 1

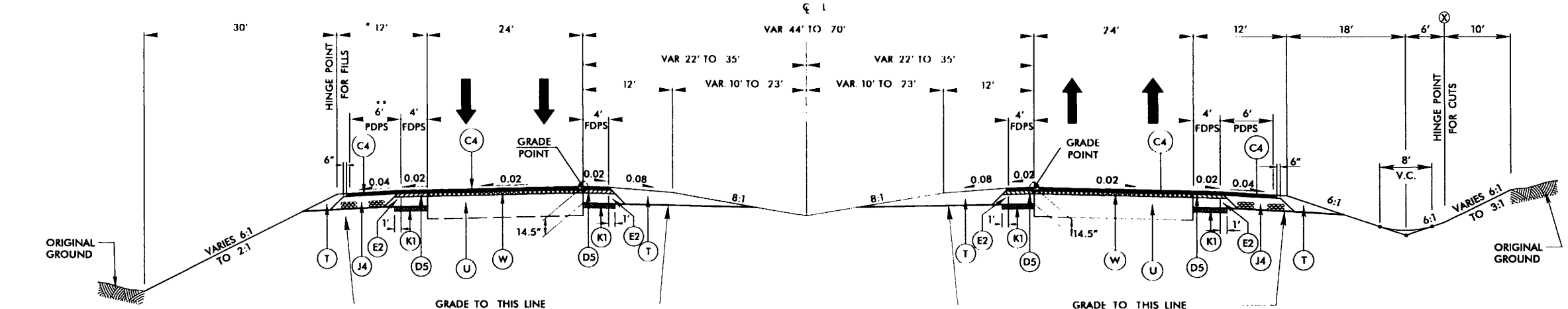
-L- STA. 9+69.00 TO -L- STA 12+50.00

-L-LINE

6/2/99

2/9/2009
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KO & ASSOCIATES, P.C.

(X) WHEN THESE DISTANCES INDICATE SLOPES OUTSIDE THE LIMITS 2:1 TO 6:1, THE DISTANCE BECOMES VARIABLE AND THE MAXIMUM OR MINIMUM SLOPE MAINTAINED.

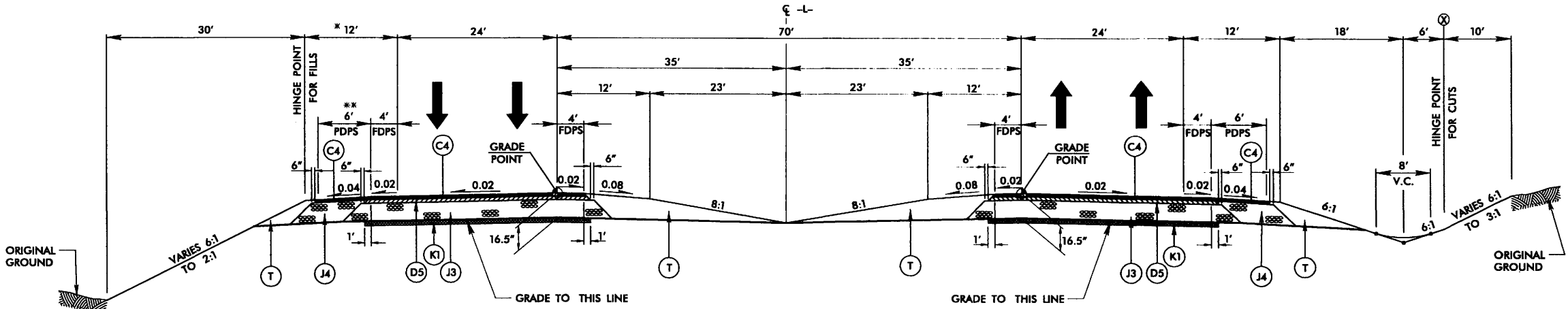


USE TYPICAL SECTION NO. 2 AS FOLLOWS:

-L- STA. 12+50.00 TO -L- STA 36+50.00

TYPICAL SECTION NO. 2

-L-LINE

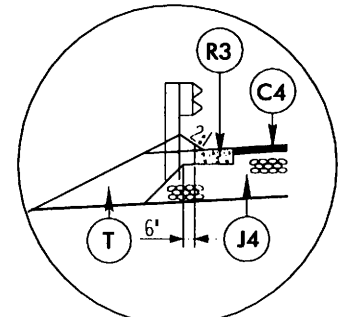


USE TYPICAL SECTION NO. 3 AS FOLLOWS:

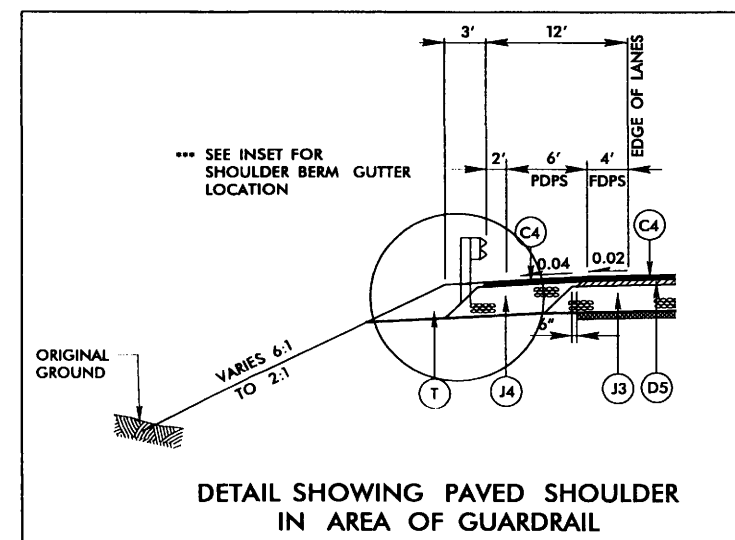
-L- STA. 36+50.00 TO -L- STA 50+83.00 (APPROACH SLAB)
-L- STA. 53+33.00 (APPROACH SLAB) TO -L- STA 135+55.00 (APPROACH SLAB)
-L- STA. 139+21.00 (APPROACH SLAB) TO -L- STA 208+33.78

TYPICAL SECTION NO. 3

-L-LINE



INSET SHOWING SHOULDER BERM GUTTER



DETAIL SHOWING PAVED SHOULDER IN AREA OF GUARDRAIL

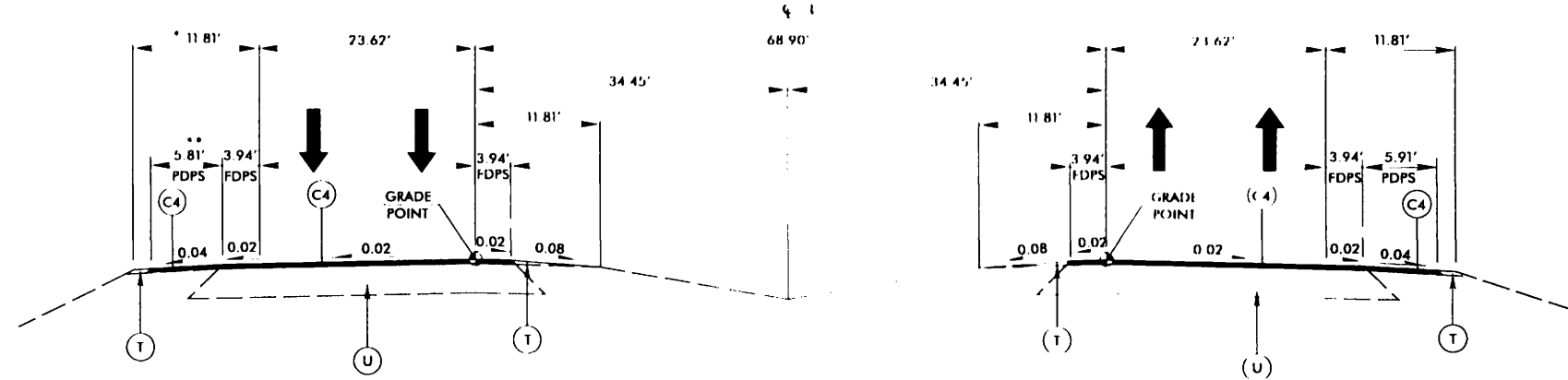
PAVEMENT SCHEDULE	
C1	3" S9.5B
C2	VAR. DEPTH S9.5B
C3	1 1/2" S9.5C
C4	3" S9.5C
C5	VAR. DEPTH S9.5C
D1	2 1/2" I19.0B
D2	3 1/2" I19.0B
D3	VAR. DEPTH I19.0B
D4	3" I19.0C
D5	3 1/2" I19.0C
D6	4" I19.0C
D7	VAR. DEPTH I19.0C
E1	3" B25.0C
E2	8" B25.0C
E3	VAR. DEPTH B25.0C
J1	6" ABC
J2	8" ABC
J3	10" ABC
J4	VAR. DEPTH ABC
K1	8" LIME STABILIZATION OR 7" CEMENT STABILIZATION
R1	2'-6" CURB & GUTTER
R2	6" MONOLITHIC CONC ISLAND (KEYED IN)
R3	CONC. SHOULDER BERM GUTTER
T	EARTH MATERIAL
U	EXIST. PAVEMENT
W	WEDGING

NOTE: SEE SHEET 2 FOR DETAILED DESCRIPTION OF PAVEMENT SCHEDULE

NOTES:
TYPICAL SECTIONS SHOWN ARE FOR TANGENT SECTIONS ONLY. SEE PLANS AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS AND LANE ADDITIONS/WIDENING AT INTERSECTIONS. MAXIMUM ROLLOVER = 0.05.
WHEN WEDGING SURFACE AND INTERMEDIATE COURSES, DO NOT INTERCHANGE COURSE TYPES.
ALL PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.
ALL SUBGRADE SLOPES PARALLEL TO PAVEMENT SURFACE SLOPES
FDPS - FULL DEPTH PAVED SHOULDER
PDPS - PARTIAL DEPTH PAVED SHOULDER
* ADD 3'-0" WITH GUARDRAIL
** IN AREA OF GUARDRAIL, PAVE TO FACE OF GUARDRAIL. (SEE DETAIL)

6/2/99

2/9/2009
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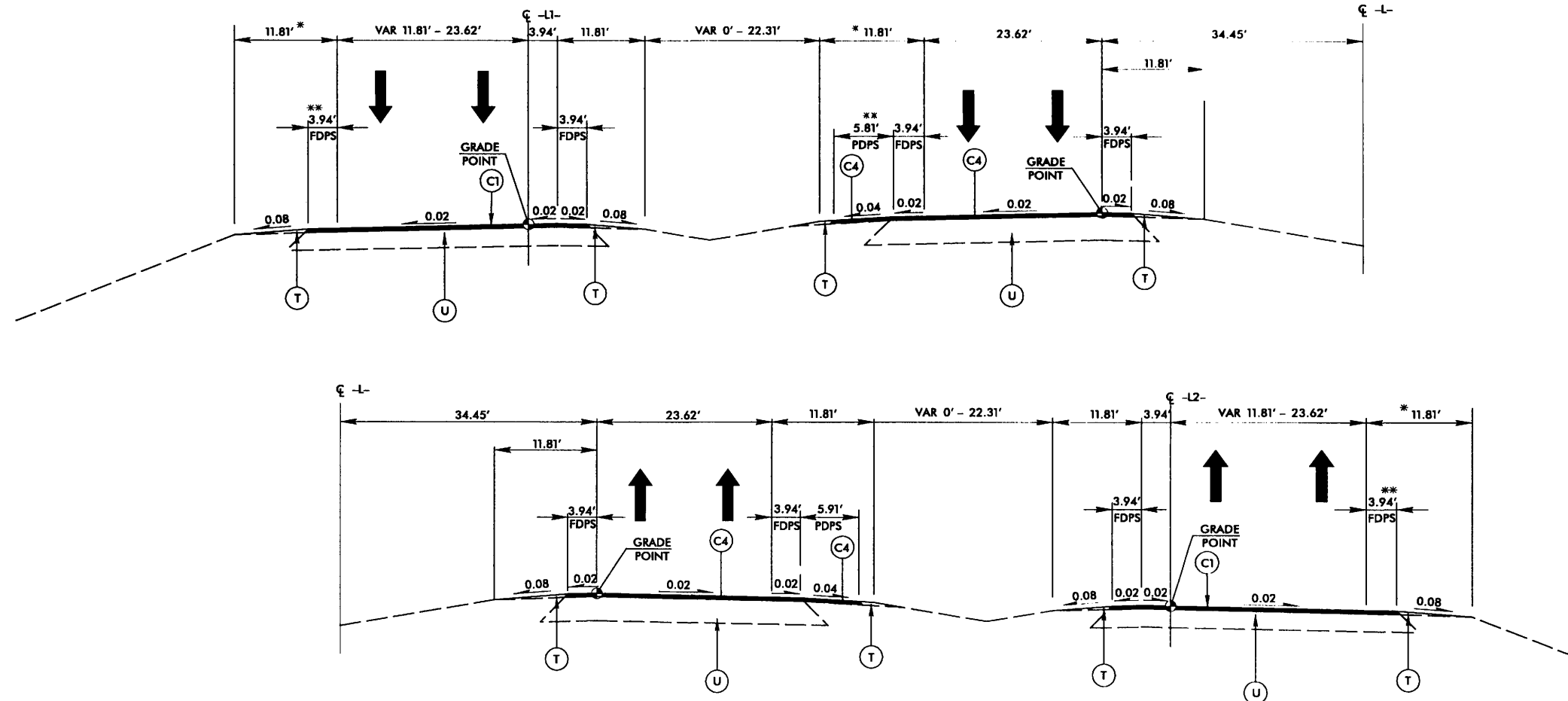


USE TYPICAL SECTION NO. 4 AS FOLLOWS:

-L- STA. 227+35.96 L.A. TO -L- STA. 236+86.30 LT.
-L- STA. 227+35.96 L.A. TO -L- STA. 232+32.52 RT.

TYPICAL SECTION NO. 4

-L-LINE



USE TYPICAL SECTION NO. 5 AS FOLLOWS:

-L- STA. 236+86.30 L.A. TO -L- STA. 258+77.96 LT.
-L- STA. 232+32.52 L.A. TO -L- STA. 258+77.96 RT.

TYPICAL SECTION NO. 5

-L-LINE

PAVEMENT SCHEDULE	
C1	3" S9.5B
C2	VAR. DEPTH S9.5B
C3	1 1/2" S9.5C
C4	3" S9.5C
C5	VAR. DEPTH S9.5C
D1	2 1/2" I19.0B
D2	3 1/2" I19.0B
D3	VAR. DEPTH I19.0B
D4	3" I19.0C
D5	3 1/2" I19.0C
D6	4" I19.0C
D7	VAR. DEPTH I19.0C
E1	3" B25.0C
E2	8" B25.0C
E3	VAR. DEPTH B25.0C
J1	6" ABC
J2	8" ABC
J3	10" ABC
J4	VAR. DEPTH ABC
K1	8" LIME STABILIZATION OR 7" CEMENT STABILIZATION
R1	2'-6" CURB & GUTTER
R2	6" MONOLITHIC CONC ISLAND (KEYED IN)
R3	CONC. SHOULDER BERM GUTTER
T	EARTH MATERIAL
U	EXIST. PAVEMENT
W	WEDGING

NOTE: SEE SHEET 2 FOR DETAILED
DESCRIPTION OF PAVEMENT SCHEDULE

NOTES:
TYPICAL SECTIONS SHOWN ARE FOR TANGENT SECTIONS ONLY. SEE PLANS
AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS AND LANE
ADDITIONS/WIDENING AT INTERSECTIONS. MAXIMUM ROLLOVER = 0.05.

WHEN WEDGING SURFACE AND INTERMEDIATE COURSES, DO NOT
INTERCHANGE COURSE TYPES.

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

ALL SUBGRADE SLOPES PARALLEL TO PAVEMENT SURFACE SLOPES

FDPS - FULL DEPTH PAVED SHOULDER

PDPS - PARTIAL DEPTH PAVED SHOULDER

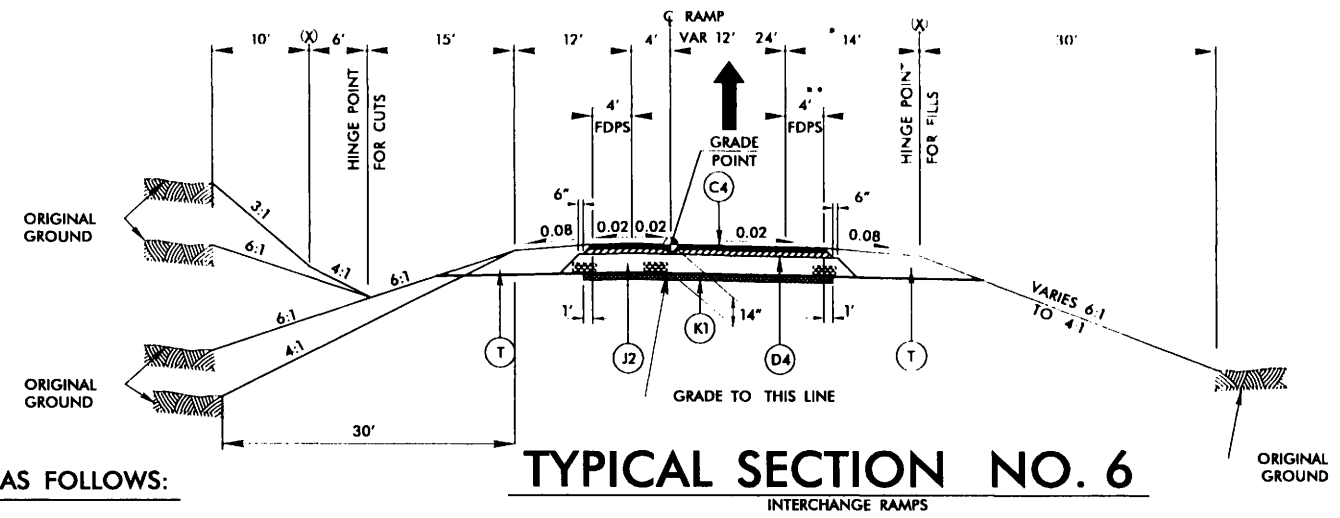
* ADD 3'-0" WITH GUARDRAIL

6/2/99

(X) WHEN THESE DISTANCES INDICATE SLOPES OUTSIDE THE LIMITS 2:1 TO 6:1, THE DISTANCE BECOMES VARIABLE AND THE MAXIMUM OR MINIMUM SLOPE MAINTAINED.

**KO & ASSOCIATES, P.C.**
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066

PROJECT REFERENCE NO.		SHEET NO.	
R-2417AA		2-C	
ROADWAY DESIGN ENGINEER		PAVEMENT DESIGN ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			



USE TYPICAL SECTION NO. 6 AS FOLLOWS:

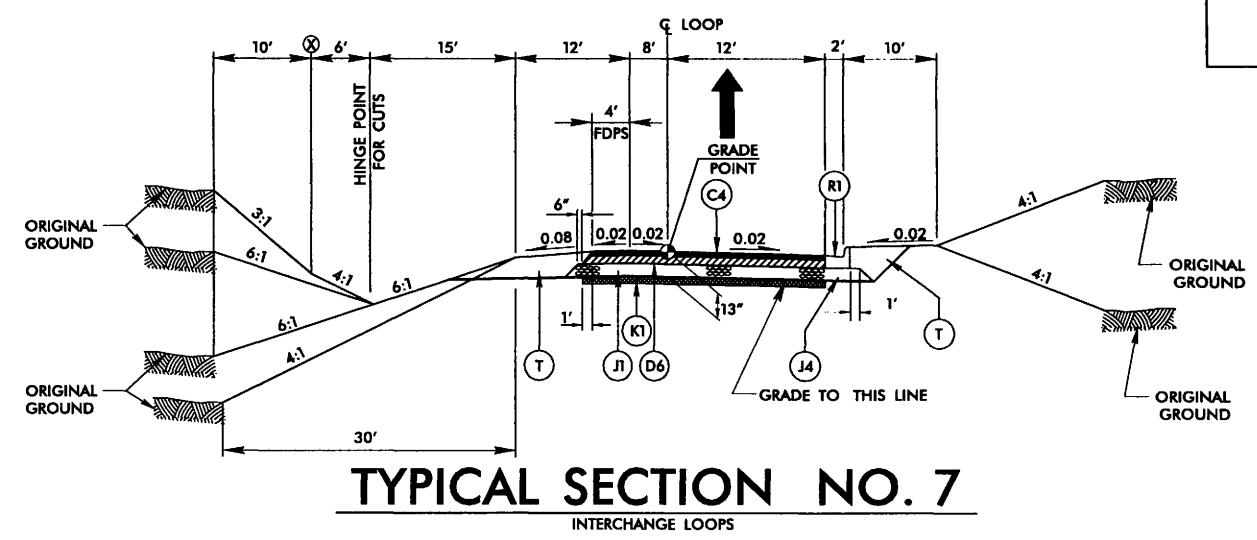
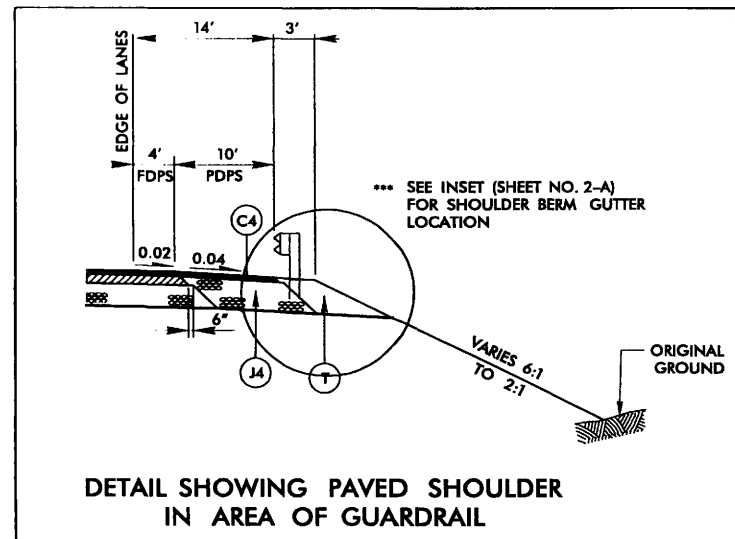
- RPB- STA. 14+00.00 TO

-RPC- STA. 15+10.29 TO

-RPCA- STA. 10+00.00 TO
- RPB- STA. 27+40.03

-RPC- STA. 32+33.41

-RPCA- STA. 15+77.10



USE TYPICAL SECTION NO. 7 AS FOLLOWS:

- LPB- STA. 13+19.28 TO

-LPC- STA. 12+28.92 TO
- LPB- STA. 17+91.70

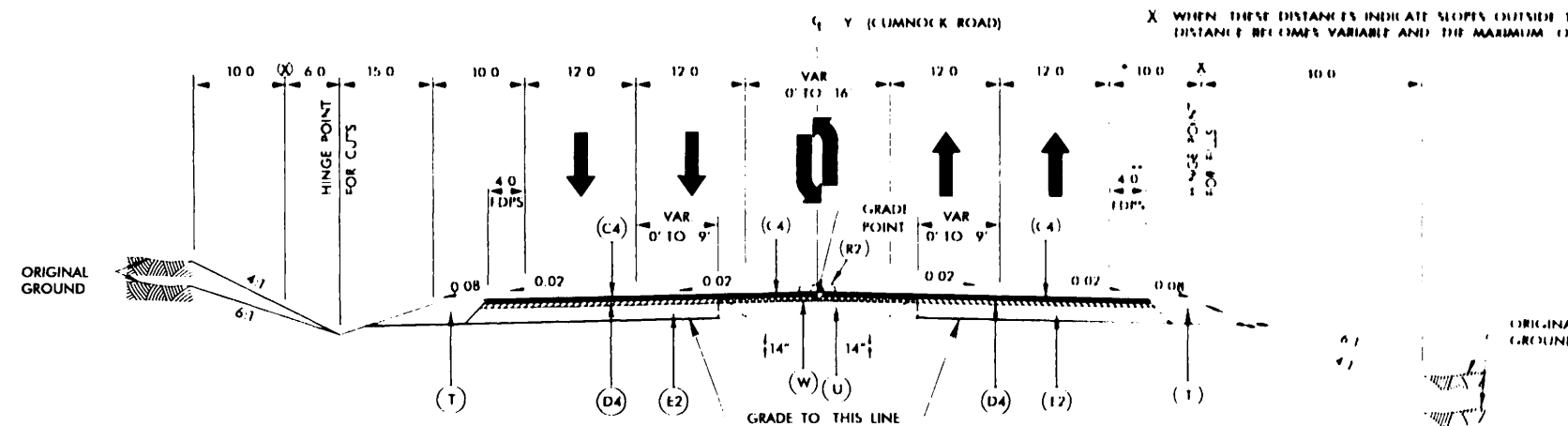
-LPC- STA. 19+20.82

PAVEMENT SCHEDULE	
C1	3" S9.5B
C2	VAR. DEPTH S9.5B
C3	1 1/2" S9.5C
C4	3" S9.5C
C5	VAR. DEPTH S9.5C
D1	2 1/2" I19.0B
D2	3 1/2" I19.0B
D3	VAR. DEPTH I19.0B
D4	3" I19.0C
D5	3 1/2" I19.0C
D6	4" I19.0C
D7	VAR. DEPTH I19.0C
E1	3" B25.0C
E2	8" B25.0C
E3	VAR. DEPTH B25.0C
J1	6" ABC
J2	8" ABC
J3	10" ABC
J4	VAR. DEPTH ABC
K1	8" LIME STABILIZATION OR 7" CEMENT STABILIZATION
R1	2'-6" CURB & GUTTER
R2	6" MONOLITHIC CONC ISLAND (KEYED IN)
R3	CONC. SHOULDER BERM GUTTER
T	EARTH MATERIAL
U	EXIST. PAVEMENT
W	WEDGING

NOTE: SEE SHEET 2 FOR DETAILED DESCRIPTION OF PAVEMENT SCHEDULE

- NOTES:
- TYPICAL SECTIONS SHOWN ARE FOR TANGENT SECTIONS ONLY. SEE PLANS AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS AND LANE ADDITIONS/WIDENING AT INTERSECTIONS. MAXIMUM ROLLOVER = 0.05.
 - WHEN WEDGING SURFACE AND INTERMEDIATE COURSES, DO NOT INTERCHANGE COURSE TYPES.
 - ALL PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.
 - ALL SUBGRADE SLOPES PARALLEL TO PAVEMENT SURFACE SLOPES
 - FDPS - FULL DEPTH PAVED SHOULDER
 - PDPS - PARTIAL DEPTH PAVED SHOULDER
 - * ADD 3'-0" WITH GUARDRAIL
 - ** IN AREA OF GUARDRAIL, PAVE TO FACE OF GUARDRAIL. (SEE DETAIL)

2/9/2009
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KO & Associates, P.C.

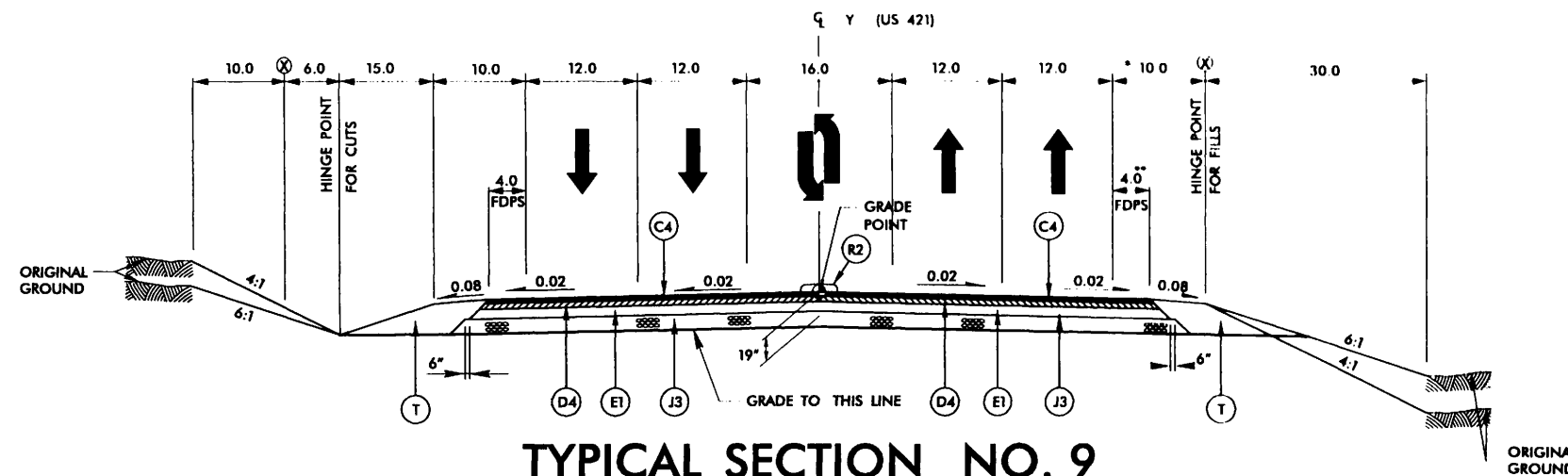


TYPICAL SECTION NO. 8

CUMNOCK ROAD (SR 1400)

USE TYPICAL SECTION NO. 8 AS FOLLOWS:

-Y- STA. 11+50.00 TO -Y- STA. 21+00.00

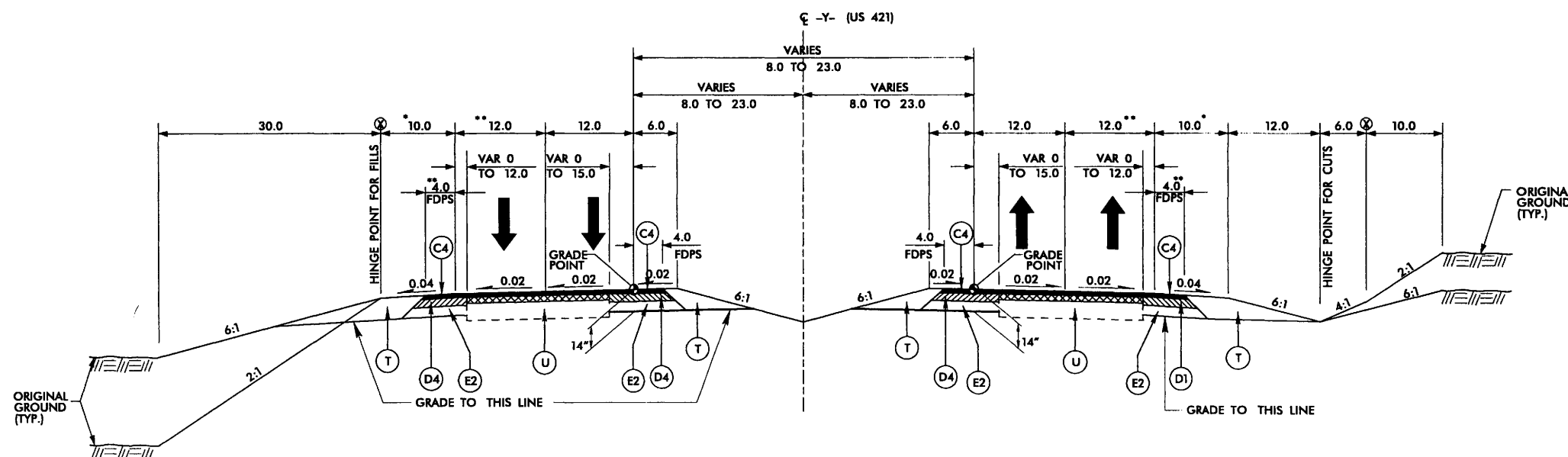


TYPICAL SECTION NO. 9

US 421 (BOONE TRAIL)

USE TYPICAL SECTION NO. 9 AS FOLLOWS:

-Y- STA. 21+00.00 TO -Y- STA. 29+83.84 (APPROACH SLAB)
-Y- STA. 33+48.12 (APPROACH SLAB) TO -Y- STA. 40+00.00

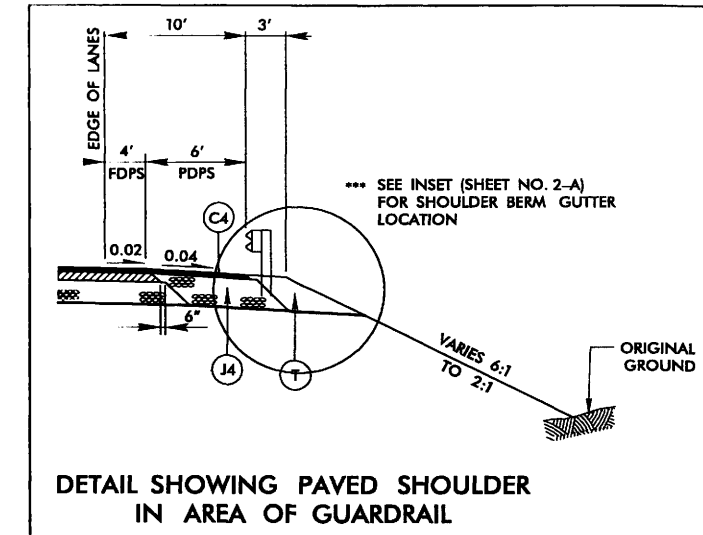


TYPICAL SECTION NO. 10

US 421 (BOONE TRAIL)

USE TYPICAL SECTION NO. 10 AS FOLLOWS:

-Y- STA. 40+00.00 TO -Y- STA. 49+00.00



DETAIL SHOWING PAVED SHOULDER
IN AREA OF GUARDRAIL

PAVEMENT SCHEDULE	
C1	3" S9.5B
C2	VAR. DEPTH S9.5B
C3	1 1/2" S9.5C
C4	3" S9.5C
C5	VAR. DEPTH S9.5C
D1	2 1/2" I19.0B
D2	3 1/2" I19.0B
D3	VAR. DEPTH I19.0B
D4	3" I19.0C
D5	3 1/2" I19.0C
D6	4" I19.0C
D7	VAR. DEPTH I19.0C
E1	3" B25.0C
E2	8" B25.0C
E3	VAR. DEPTH B25.0C
J1	6" ABC
J2	8" ABC
J3	10" ABC
J4	VAR. DEPTH ABC
K1	8" LIME STABILIZATION OR 7" CEMENT STABILIZATION
R1	2'-6" CURB & GUTTER
R2	6" MONOLITHIC CONC ISLAND (KEYED IN)
R3	CONC. SHOULDER BERM GUTTER
T	EARTH MATERIAL
U	EXIST. PAVEMENT
W	WEDGING

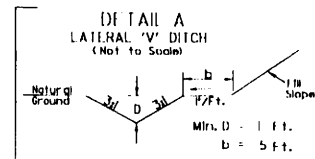
NOTE: SEE SHEET 2 FOR DETAILED
DESCRIPTION OF PAVEMENT SCHEDULE

NOTES:
TYPICAL SECTIONS SHOWN ARE FOR TANGENT SECTIONS ONLY. SEE PLANS
AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS AND LANE
ADDITIONS/WIDENING AT INTERSECTIONS. MAXIMUM ROLLOVER = 0.05.
WHEN WEDGING SURFACE AND INTERMEDIATE COURSES, DO NOT
INTERCHANGE COURSE TYPES.

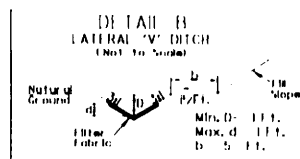
ALL PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.

ALL SUBGRADE SLOPES PARALLEL TO PAVEMENT SURFACE SLOPES

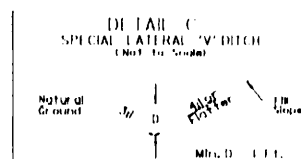
FDPS - FULL DEPTH PAVED SHOULDER
PDPS - PARTIAL DEPTH PAVED SHOULDER
* ADD 3'-0" WITH GUARDRAIL
** IN AREA OF GUARDRAIL, PAVE TO FACE OF GUARDRAIL. (SEE DETAIL)



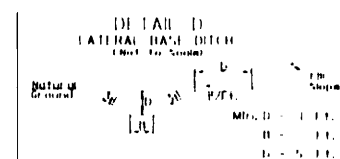
SHEET	RDWY	STATION - STATION	SIDE
4	-L-	10+65 - 14+50	RT
6	-RPC-	30+05 - 31+57	LT
11	-L-	105+74 - 106+50	LT
12	-L-	124+50 - 127+00	LT
12,13	-L-	127+00 - 130+00	LT
19	-L-	206+00 - 207+50	LT



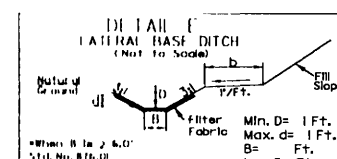
SHEET	RDWY	STATION - STATION	SIDE
6	-RPC-	24+00 - 24+50	LT
6	-Y-	26+13 - 26+54	RT
18	-L-	201+00 - 202+60	RT



SHEET	RDWY	STATION - STATION	SIDE
4,5	-L-	14+50 - 16+00	RT

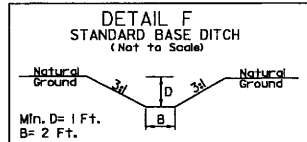


SHEET	RDWY	STATION - STATION	SIDE	BASE
5	-L-	27+80 - 23+30	LT	2'
6	-LPB-	16+50 - 18+50	RT	2'
6,7	-L-	52+50 - 54+85	LT	3'
11	-L-	103+50 - 105+57	LT	2'
13	-L-	130+00 - 135+00	LT	2'
13,14	-L-	141+00 - 142+55	LT	2'
14	-L-	142+70 - 145+00	LT	2'

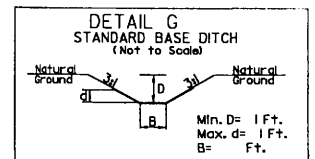


SHEET	RDWY	STATION - STATION	SIDE	BASE
5	-L-	20+50 - 22+75	LT	2'
6	-RPC-	22+50 - 24+00	LT	2'

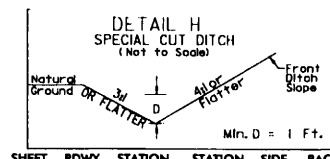
KO & ASSOCIATES, P.C.
Consulting Engineers
A Florence & Hutcheson, Inc. Company
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066



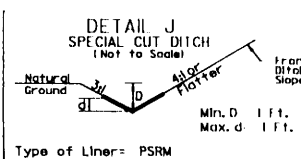
SHEET	RDWY	STATION - STATION	SIDE	MIN. D	BASE
7	-L-	62+50	RT	1'	2'
9	-L-	88+20	LT	3'	4'
13	-L-	130+00	RT	1'	18'
15	-L-	160+00	RT	1'	4'
16	-L-	169+25	RT	1'	4'
18	-L-	194+60 - 195+00	LT	1'	2'
18	-L-	195+00 - 195+90	LT	1'	2'
24	-Y-	22+50	RT	1'	3'



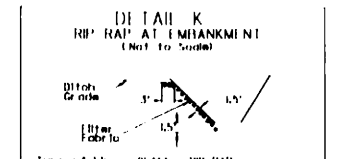
SHEET	RDWY	STATION - STATION	SIDE	BASE
10	-L-	100+00	RT	4' TO 30'



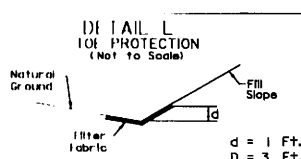
SHEET	RDWY	STATION - STATION	SIDE	BACK SLOPE
4,5	-L-	12+10 - 16+00	LT	6:1
6	-RPC-	16+50 - 17+50	LT	4:1
6	-RPC-	18+00 - 21+00	LT	4:1
6	-RPC-	10+75 - 13+00	RT	6:1
6	-L-	35+00 - 38+00	LT	3:1
6	-L-	36+00 - 39+00	RT	6:1
6	-L-	42+00 - 43+00	LT	6:1
6	-L-	44+50 - 45+50	RT	6:1
6	-LPB-	13+30 - 14+00	LT	6:1
6	-LPC-	13+20 - 14+00	RT	4:1
6	-Y-	25+00 - 27+00	LT	6:1
7	-L-	55+00 - 56+50	RT	3:1
8	-Y-	69+00 - 70+00	RT	6:1
9	-L-	85+50 - 86+50	RT	6:1
11	-L-	106+50 - 108+00	LT	3:1
11	-L-	108+00 - 109+00	LT	6:1
11	-L-	109+00 - 111+50	LT	3:1
15,16	-L-	166+00 - 174+00	RT	3:1
16	-L-	176+00 - 177+00	LT	3:1
18	-L-	194+50 - 195+00	LT	3:1
24	-Y-	11+50 - 13+00	RT	3:1
24	-Y-	22+30 - 23+50	RT	3:1
25	-Y-	44+50 - 48+00	RT	3:1



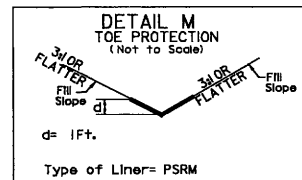
SHEET	RDWY	STATION - STATION	SIDE
6	-RPC-	27+50 - 29+00	RT
18	-L-	202+00 - 202+60	LT



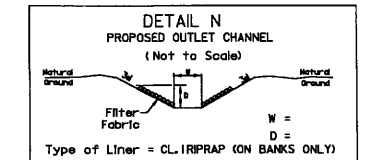
SHEET	RDWY	STATION - STATION	SIDE	CLASS
5	-L-	23+37	RT	I
6	-RPC-	17+80	LT	I
6	-RPC-	22+48 - 23+68	LT	I
6	-L-	51+18 - 51+88	LT	I
6	-L-	52+44	LT	I
7	-L-	63+00	RT	I
16	-L-	177+00	LT	I
19	-L-	205+00 - 205+50	RT	B
25	-Y-	44+90 - 45+50	LT	B



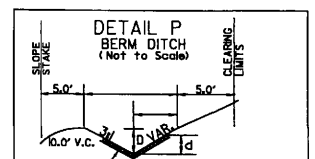
SHEET	RDWY	STATION - STATION	SIDE
6	-L-	31+00 - 33+40	LT
6	-RPC-	16+50 - 18+00	RT
6	-RPC-	21+00 - 22+50	RT
6	-RPC-	22+00 - 23+00	RT
9	-L-	87+50 - 88+50	LT
10,11	-L-	101+50 - 103+50	LT
12	-L-	120+50 - 124+50	LT
13	-L-	137+30 - 141+00	LT
14	-L-	148+00 - 153+00	LT
15	-L-	157+50 - 159+50	LT
17	-L-	183+50 - 185+00	LT
17	-L-	187+50 - 188+50	LT
18	-L-	202+60 - 203+00	RT
19	-L-	207+50 - 208+34	LT
21	-YIRPB-	17+50 - 19+50	RT



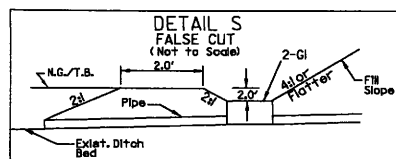
SHEET	RDWY	STATION - STATION	SIDE
5	-L-	16+40 - 16+50	RT
6	-Y-	29+80 - 29+90	LT



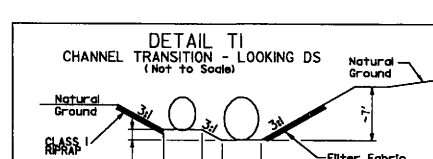
SHEET	RDWY	STATION - STATION	SIDE	W =	D =
8	-L-	68+00	RT		
8	-L-	76+55	RT		
9	-L-	87+55	RT	4'	3'
12	-L-	120+30	RT	3'	2.5'
15	-L-	155+20	RT	3'	1'
18	-L-	195+70	RT	2'	1.5'
18	-L-	202+60	RT	2'	2'



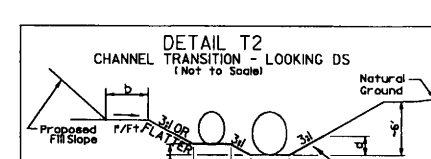
SHEET	RDWY	STATION - STATION	SIDE
8	-L-	66+50 - 69+00	LT
8	-L-	70+50 - 72+50	LT
9	-L-	85+50 - 87+00	LT



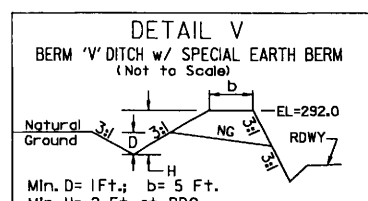
SHEET	RDWY	STATION - STATION	SIDE
15	-L-	160+50	LT



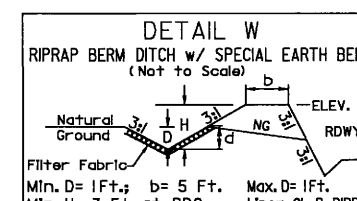
SHEET	RDWY	STATION - STATION	SIDE
6	-L-	33+60	RT



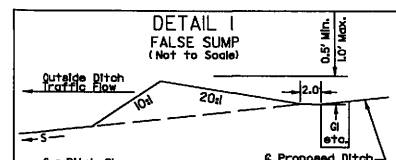
SHEET	RDWY	STATION - STATION	SIDE
6	-RPC-	14+60 - 15+70	LT



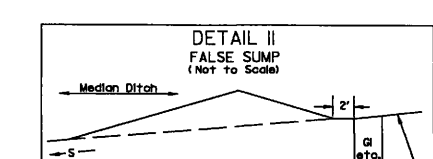
SHEET	RDWY	STATION - STATION	SIDE
9	-L-	80+50 - 81+50	LT



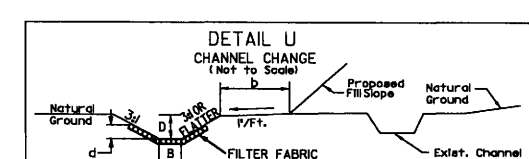
SHEET	RDWY	STATION - STATION	SIDE	ELEV.
8	-L-	69+00 - 70+50	LT	278.0
8,9	-L-	76+00 - 77+50	LT	281.0



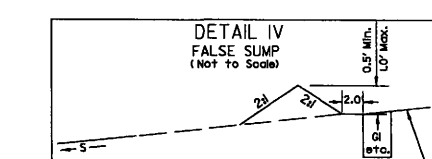
SHEET	RDWY	STATION - STATION	SIDE
6	-L-	42+00	LT
6	-L-	50+75	LT
7	-L-	56+50	LT
7	-L-	62+50	LT
8	-L-	70+00	LT
8	-L-	76+70	LT
10	-L-	95+50	RT
16	-L-	169+25	LT
18	-L-	195+00	RT
25	-Y-	47+00	RT



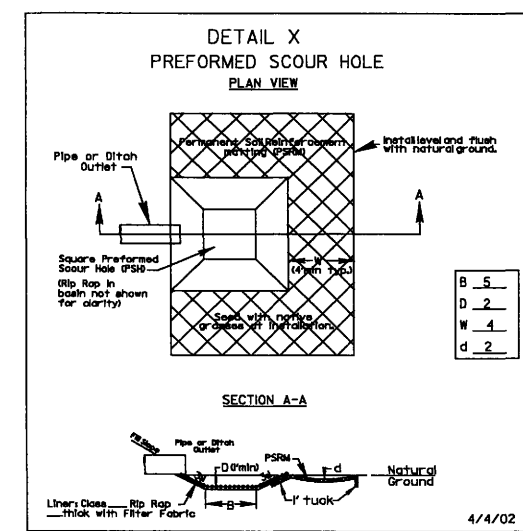
SHEET	RDWY	STATION - STATION	SIDE
6	-L-	38+50	MED
6	-L-	50+75	MED
7	-L-	53+50	MED
7	-L-	56+50	MED
8	-L-	62+50	MED
8	-L-	69+10	MED
9	-L-	76+50	MED
9	-L-	86+50	MED
9	-L-	87+80	MED
10	-L-	95+50	MED
10	-L-	100+00	MED
11	-L-	110+75	MED
12	-L-	119+75	MED
12	-L-	126+50	MED
13	-L-	131+00	MED
14	-L-	145+00	MED
14	-L-	152+00	MED
15	-L-	156+50	MED
16	-L-	169+25	MED
16	-L-	177+00	MED
17	-L-	184+10	MED
18	-L-	195+30	MED
18	-L-	202+60	MED
25	-Y-	46+68	MED



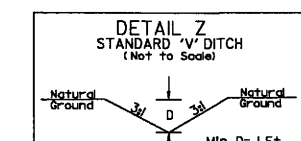
SHEET	RDWY	STATION - STATION	SIDE
6	-RPC-	15+70 - 22+70	LT



SHEET	RDWY	STATION - STATION	SIDE
6	-LPB-	16+50	RT
20	-YIRPB-	12+00	LT



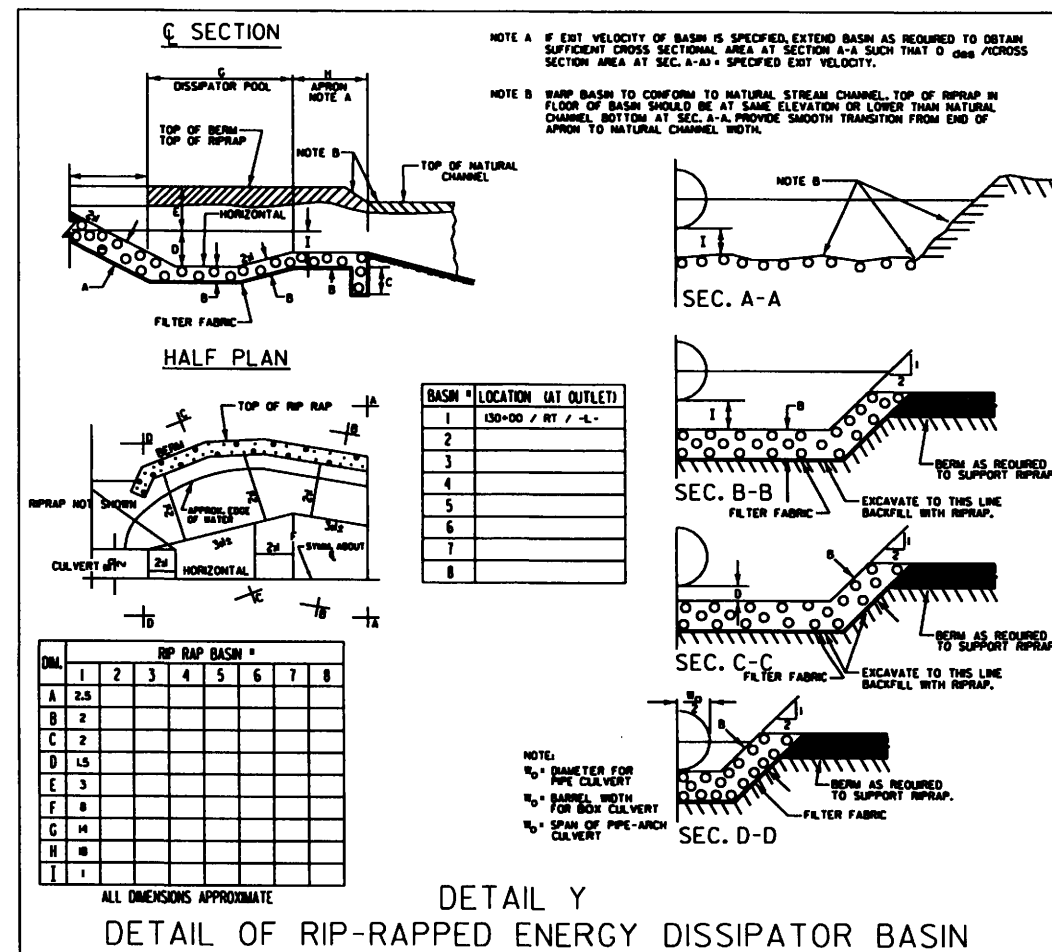
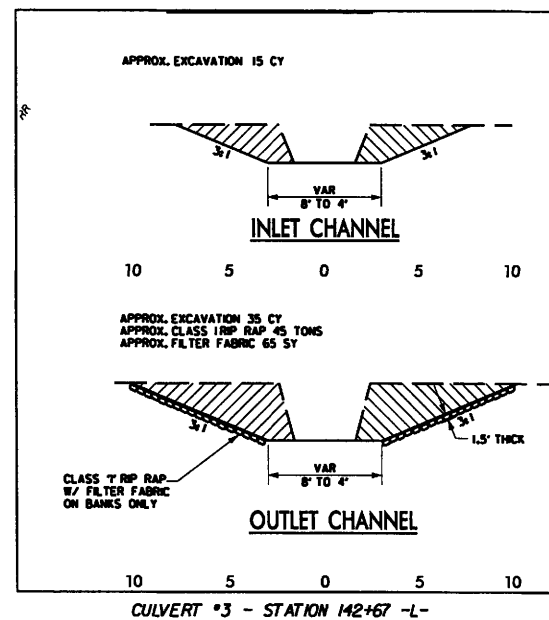
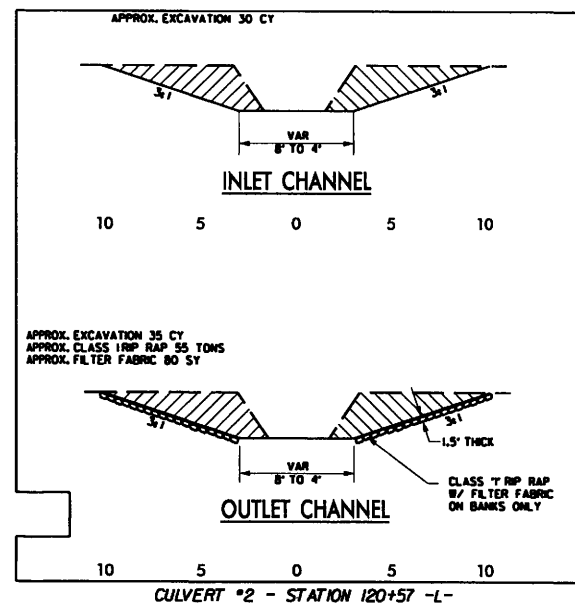
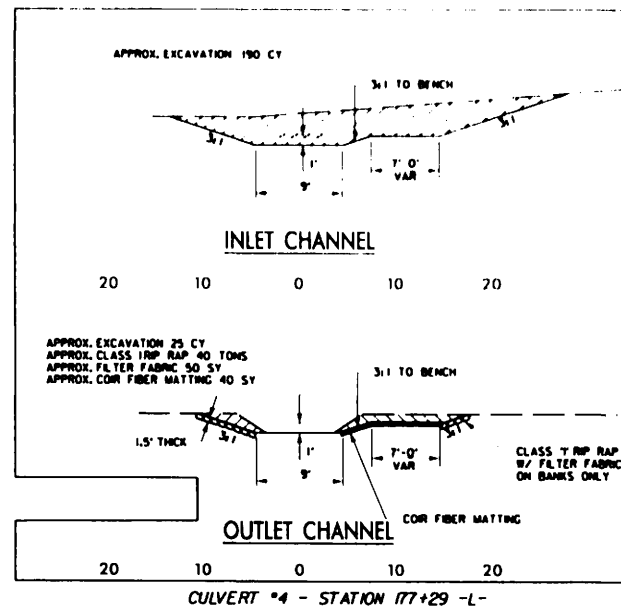
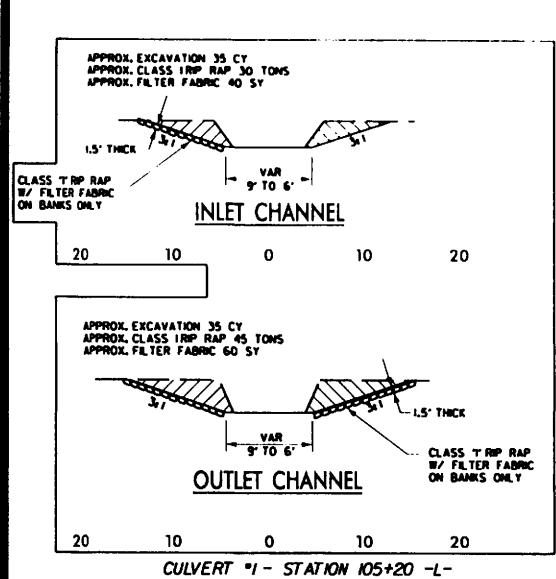
SHEET	RDWY	STATION - STATION	SIDE
6	-L-	29+25	LT
6	-L-	31+50	RT
6	-RPC-	14+55	RT
7	-L-	62+20	RT
10	-L-	100+50	RT
11	-L-	105+49	RT
12	-L-	126+50	RT
13	-L-	131+00	RT
14	-L-	152+00	RT
15	-L-	156+50	RT
16	-L-	177+00	RT
25	-Y-	44+50	LT



SHEET	RDWY	STATION - STATION	SIDE
6	-LPC-	19+64	LT
6	-LPC-	19+00 - 20+00	LT

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 54431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET OF



SHEET RDWY STATION - STATION SIDE BASIN

13 L 130+00 RT 1

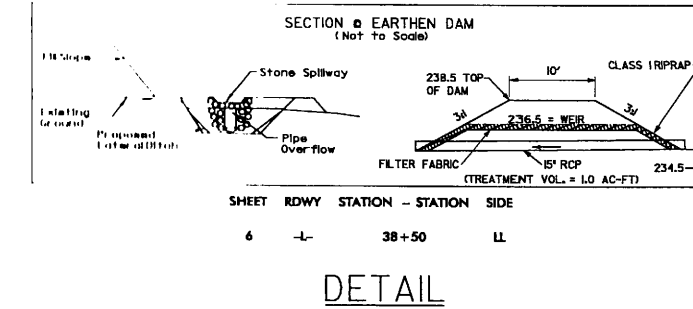
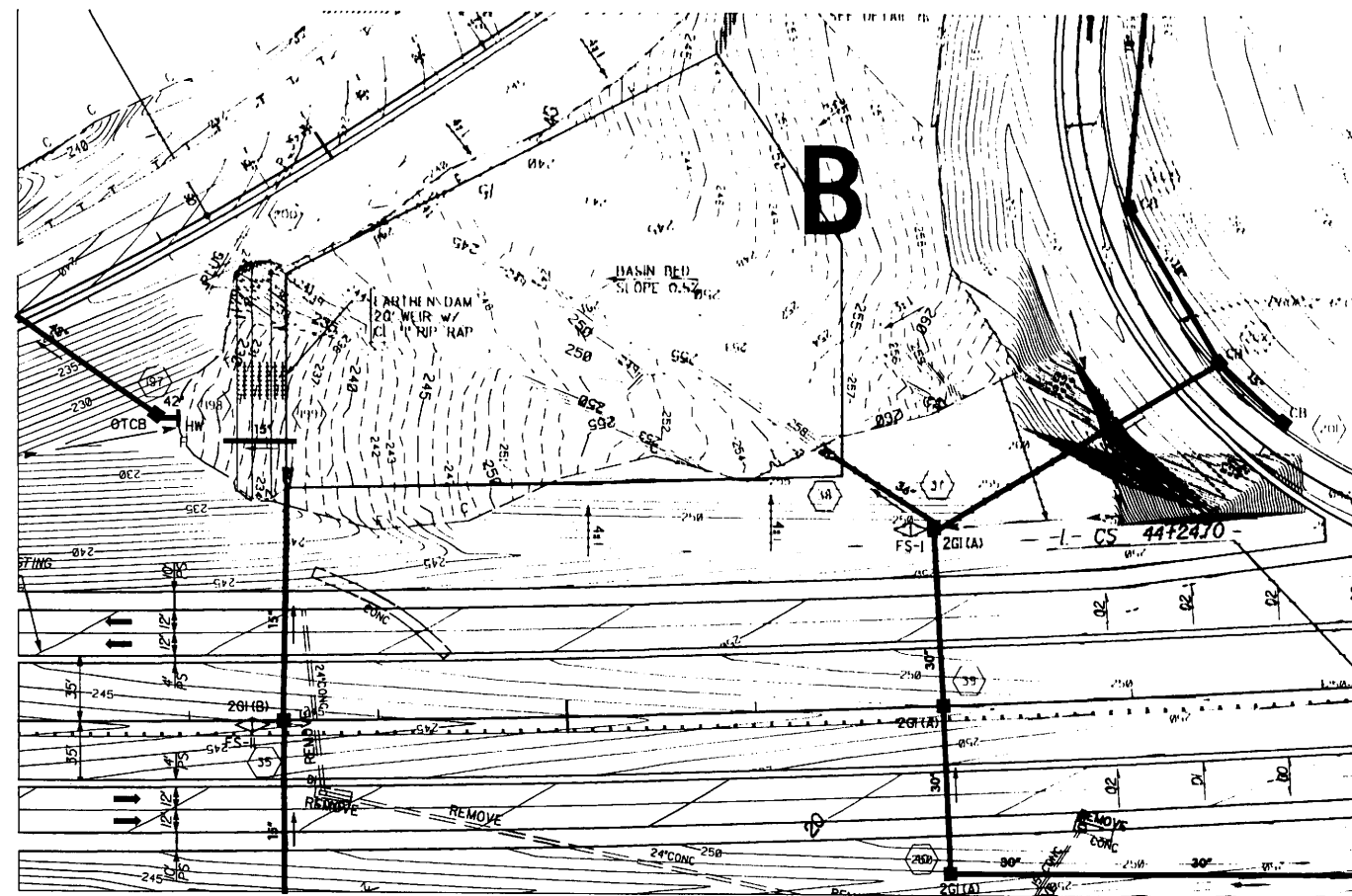
NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET OF

8/17/99

KO & ASSOCIATES, P.C.
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5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607
(919) 851-6066

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 2-H
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

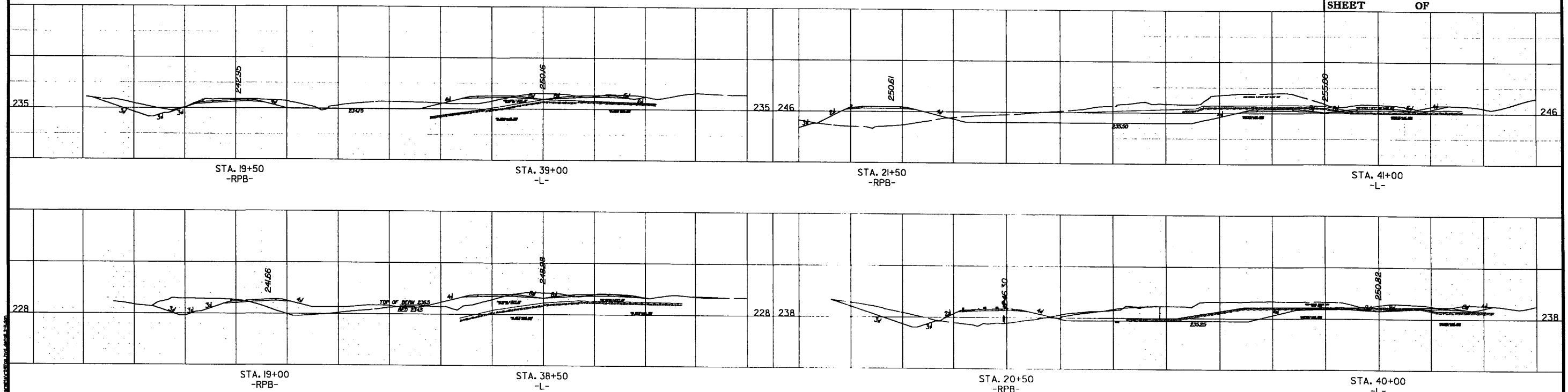


PLAN VIEW

SW TREATMENT BASIN

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 34431.12 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501

SHEET OF



TYPICAL CROSS SECTION

FOR -L- PLAN, SEE SHEET NO. 6

6/2/99
4/1/2009
ulips.dwg
stepool.hyd
rockcheck.edgn

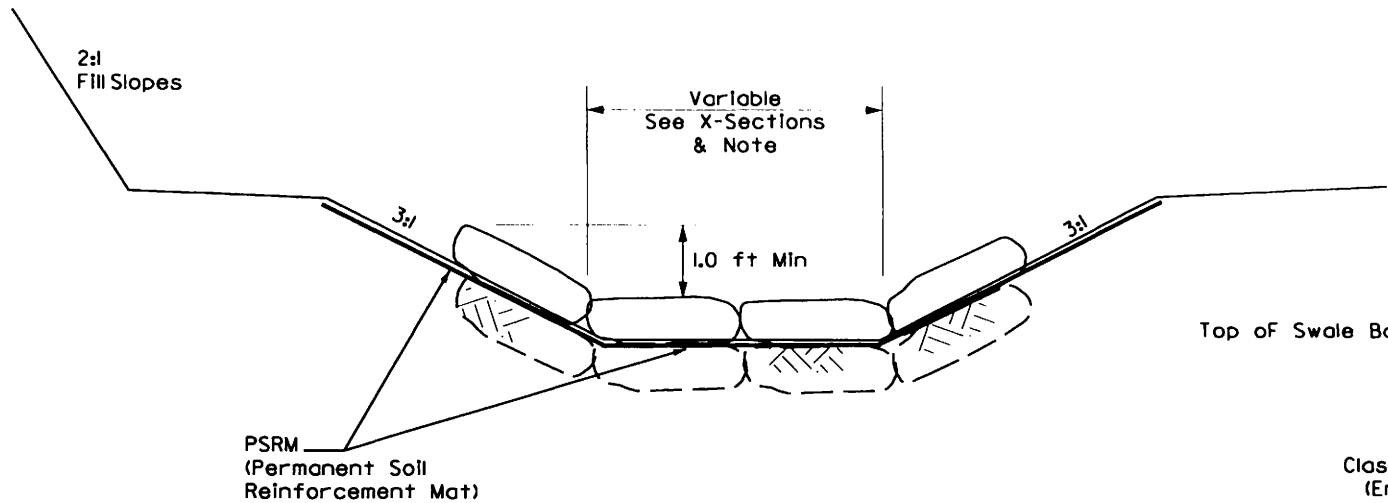
LATERAL SWALEDITCH W/ROCK CHECKS

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(919) 851-6066

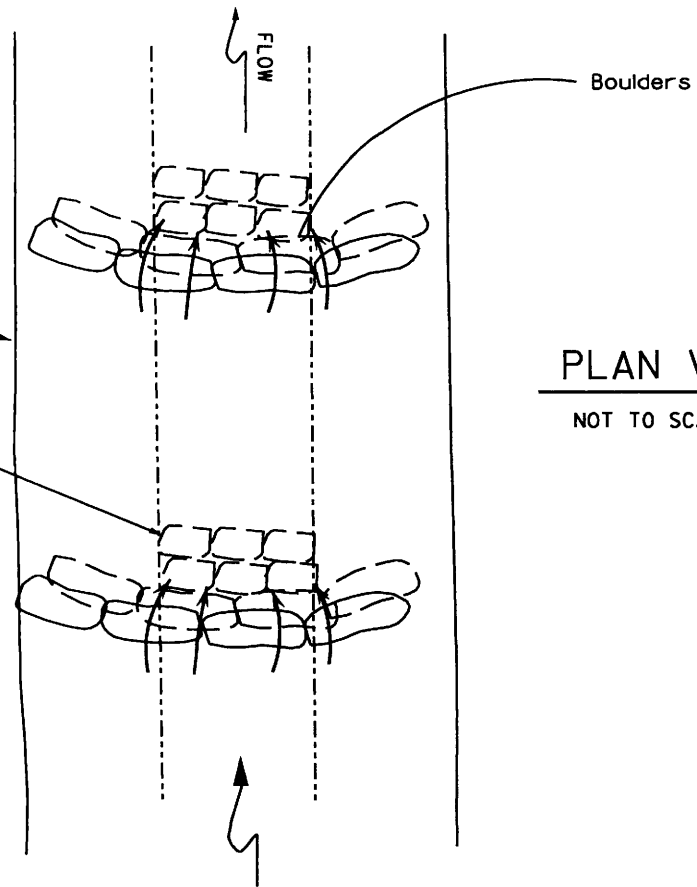
PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	2-1

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

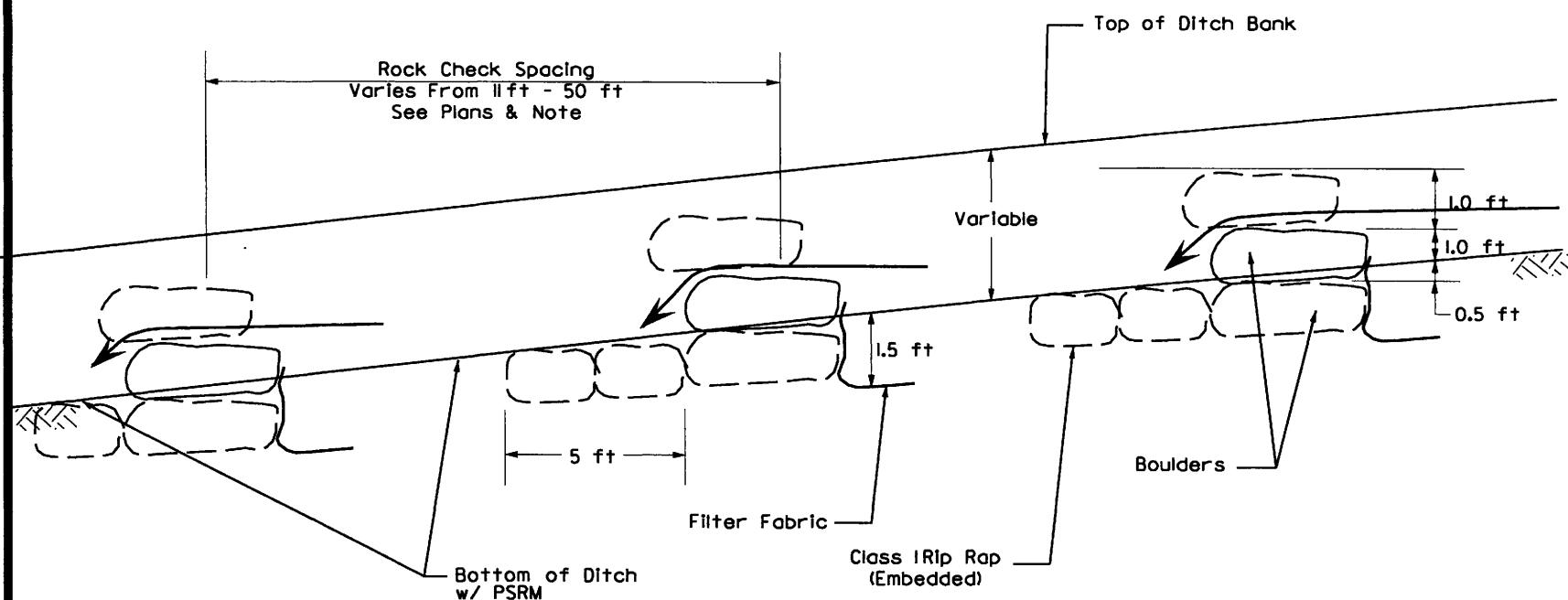
LOCATIONS					
SHEET	ALIGN	STATION	STATION	SIDE	REMARKS
9	-1-	86+50	87+00	RT	11' SPACING
9	-L-	87+00	87+50	RT	13' SPACING



TYPICAL CROSS SECTION
NOT TO SCALE



PLAN VIEW
NOT TO SCALE



PROFILE
NOT TO SCALE

NOTE:
BOULDERS SHOULD BE ANGULAR AND OBLONG WITH APPROXIMATE DIMENSIONS OF 0.6m x 0.45m x 0.45m (2' x 1.5' x 1.5'). ROCK SHOULD FIT TIGHTLY TOGETHER WITH MINIMAL VOIDS. STAGGER BOULDER JOINTS.
ROCK CHECK SPACING IS DEPENDENT ON DITCH GRADES AT 1' DROP INTERVALS OR SLOPE CONTROL.
DITCH WIDTHS VARY. WIDEN TO EXTENT PRACTICAL WITHIN R/W LIMITS. SEE X-SECTIONS.

NCDOT
DIVISION OF HIGHWAYS
LEE COUNTY
PROJECT: 3443L1.2 (R-2417AA)
US 421-NC 87 SANFORD
BYPASS FROM WEST
OF SR 1400 TO WEST
OF US 1-15-501
SHEET OF

PROJECT REFERENCE NO.		SHEET NO.	
R-2417AA		4	
RW SHEET NO.		4	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

-MATCHLINE- STA. 15+00.00 SEE SHEET NO. 5

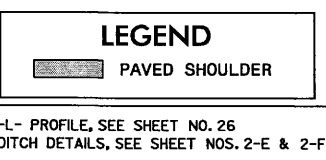
FOR -L- PROFILE, SEE SHEET NO. 26
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

2/9/2009
R:\Roadway\Proj\241700-rdy-psh-04.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-247AA	5
R/W SHEET NO.	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS

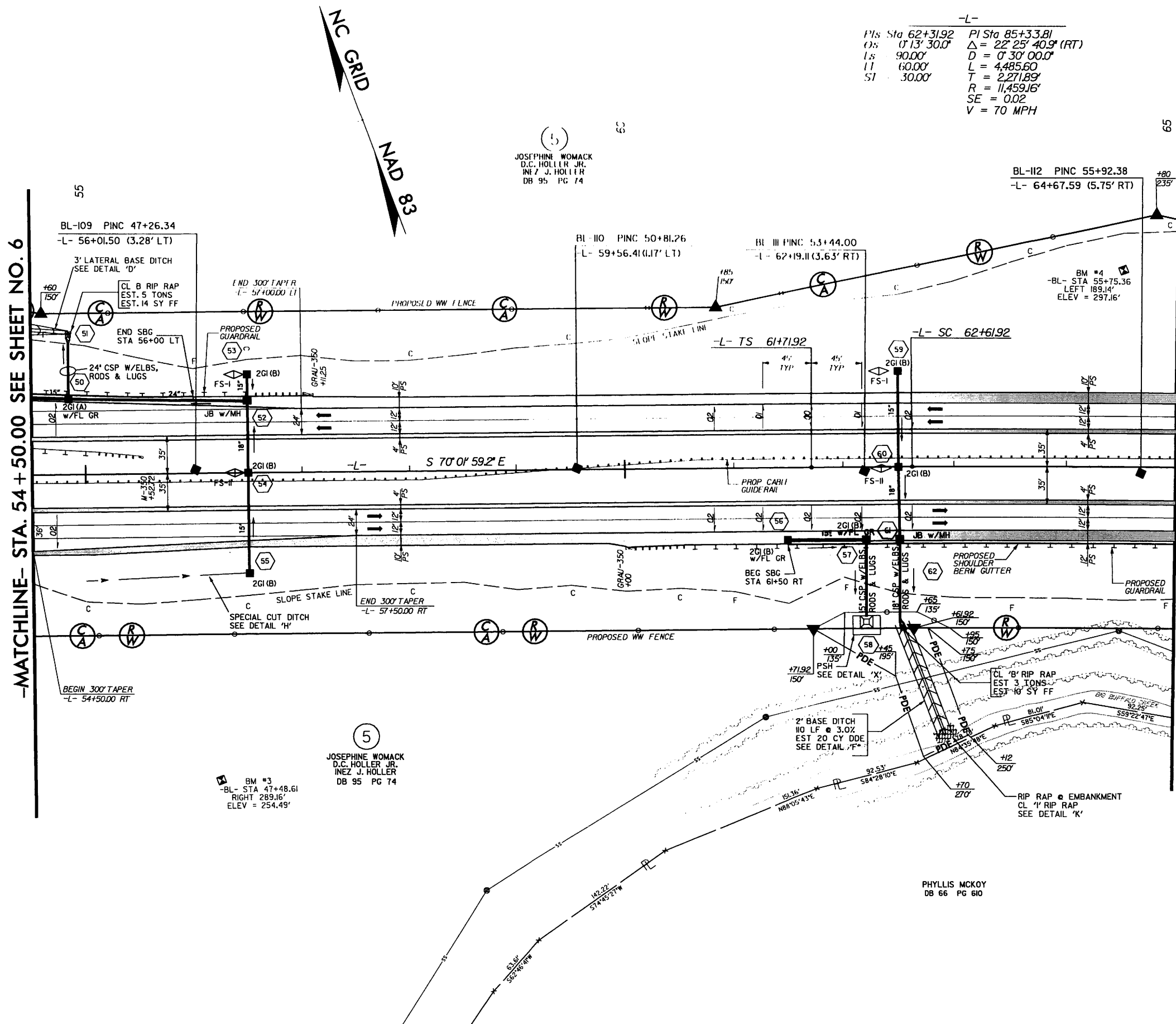
DO NOT USE FOR CONSTRUCTION



-L-
 PIs Sta 62+31.92 PIs Sta 85+33.81
 Os 0'13' 30.0" Δ = 22° 25' 40.9" (RT)
 Is 90.00' D = 0' 30' 00.0"
 Ll 60.00' L = 4,485.60'
 Sl 30.00' T = 2,271.89'
 R = 11,459.16'
 SE = 0.02
 V = 70 MPH

-MATCHLINE- STA. 54 + 50.00 SEE SHEET NO. 6

-MATCHLINE- STA. 65 + 00.00 SEE SHEET NO. 8



LEGEND
 PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NOS. 27 & 28
 FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

8/17/99

REVISIONS

2/9/2008
 r:\roadway\proj\2417aa-rdy-psh.07.dgn
 KO & ASSOCIATES, P.C.

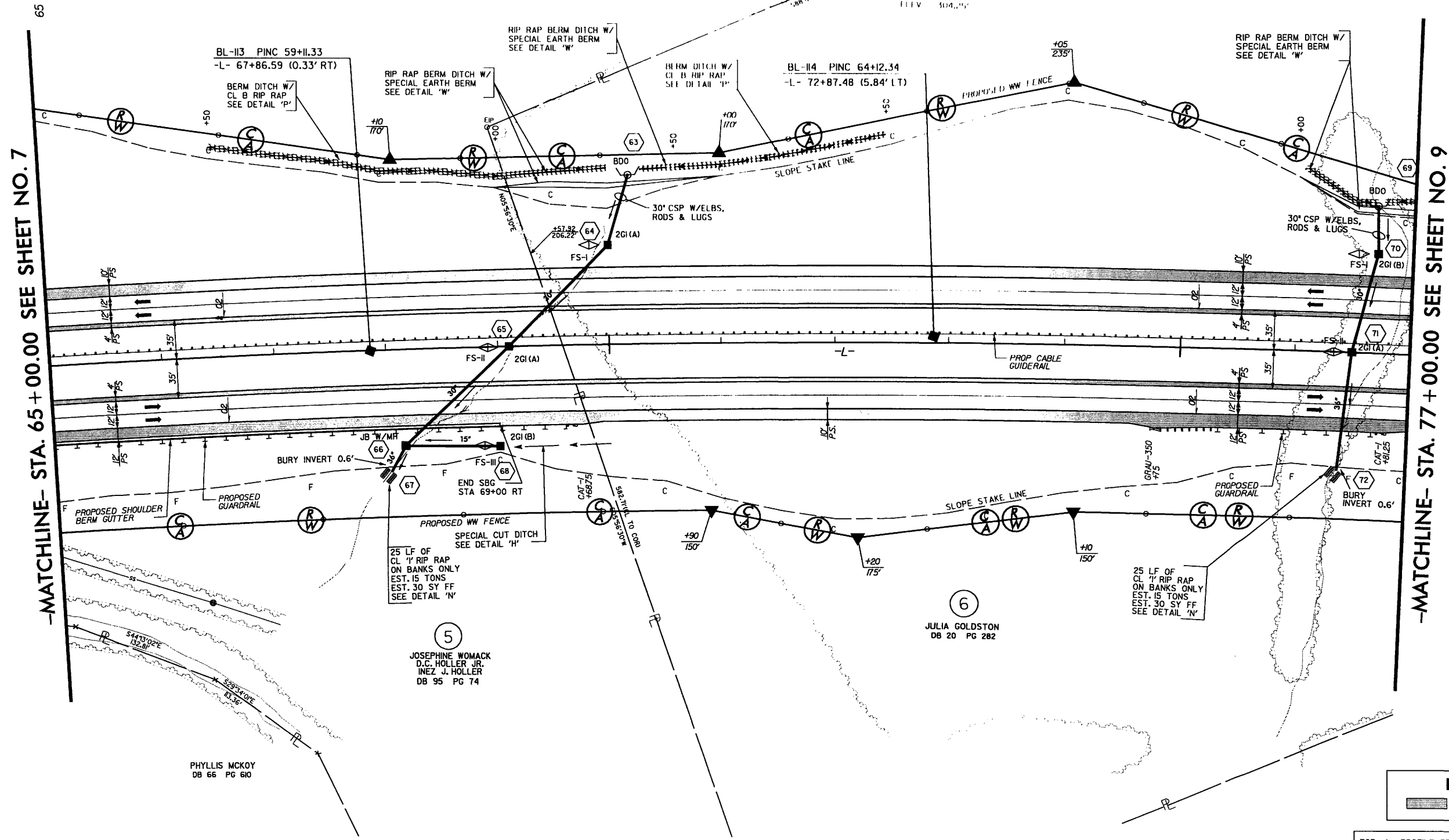
PROJECT REFERENCE NO. R-2417AA		SHEET NO. 8	
RW SHEET NO. 8			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

1
PI STA 85+55.21
Δ 111.15' 40.37' (RT)
D 17.30' (0.01)
L 4,485.60'
T 22.7189'
R 11,459.26'
Δ 0.02'
V 70 MPH

(5)
JOSEPHINE WOMACK
D.C. HOLLER JR.
INEZ J. HOLLER
DB 95 PG 74

(6)
JULIA GOLDSTON
DB 20 PG 282

NC GRID
NAD 83



-MATCHLINE- STA. 65+00.00 SEE SHEET NO. 7

-MATCHLINE- STA. 77+00.00 SEE SHEET NO. 9

LEGEND
PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NO. 28
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

REVISIONS

2/9/2009
r:\roadway\proj\2417aa-rdy-psh-08.dgn
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(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
R-247AA	9
R/W SHEET NO.	9
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

-L-
Sta 85+33.81
Δ 22° 25' 40.9" (RT)
D 0' 30' 00.0"
I 4,485.60
T 2,271.89'
R 11,459.16'
S 0.02
V 70 MPH

ALGERIA STAMPS
DB 346 PG 16

D.C. HOLLER, JR.
JOSEPHINE H. WOMACK
DB 425 PG 216

HELENA EDWARDS
DB 324 PG 943
PLAT SLIDE 4-12

WAYMAN MCIVER
DB 324 PG 945
PLAT SLIDE 4-12

BM #6
BL - STA 76+05.98
RIGHT 305.39'
ELEV = 256.56'

HELENA EDWARDS
DB 324 PG 943
PLAT SLIDE 4-12

LEGEND
PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NOS. 28 & 29
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

-MATCHLINE- STA. 77 + 00.00 SEE SHEET NO. 8

-MATCHLINE- STA. 90 + 00.00 SEE SHEET NO. 10

REVISIONS
12-6-06 Changed Parcel No. 5 to Parcel No. 33 - Revised Owner Name

2/9/2009
K:\projects\pcc\N\2417aa-rdy-bsh.dgn
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8/17/99

2/9/2009
F:\roadway\proj\2417aa-rdy-psh-10.dgn
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PROJECT REFERENCE NO. R-2417AA		SHEET NO. 10	
RW SHEET NO. ROADWAY DESIGN ENGINEER		10 HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

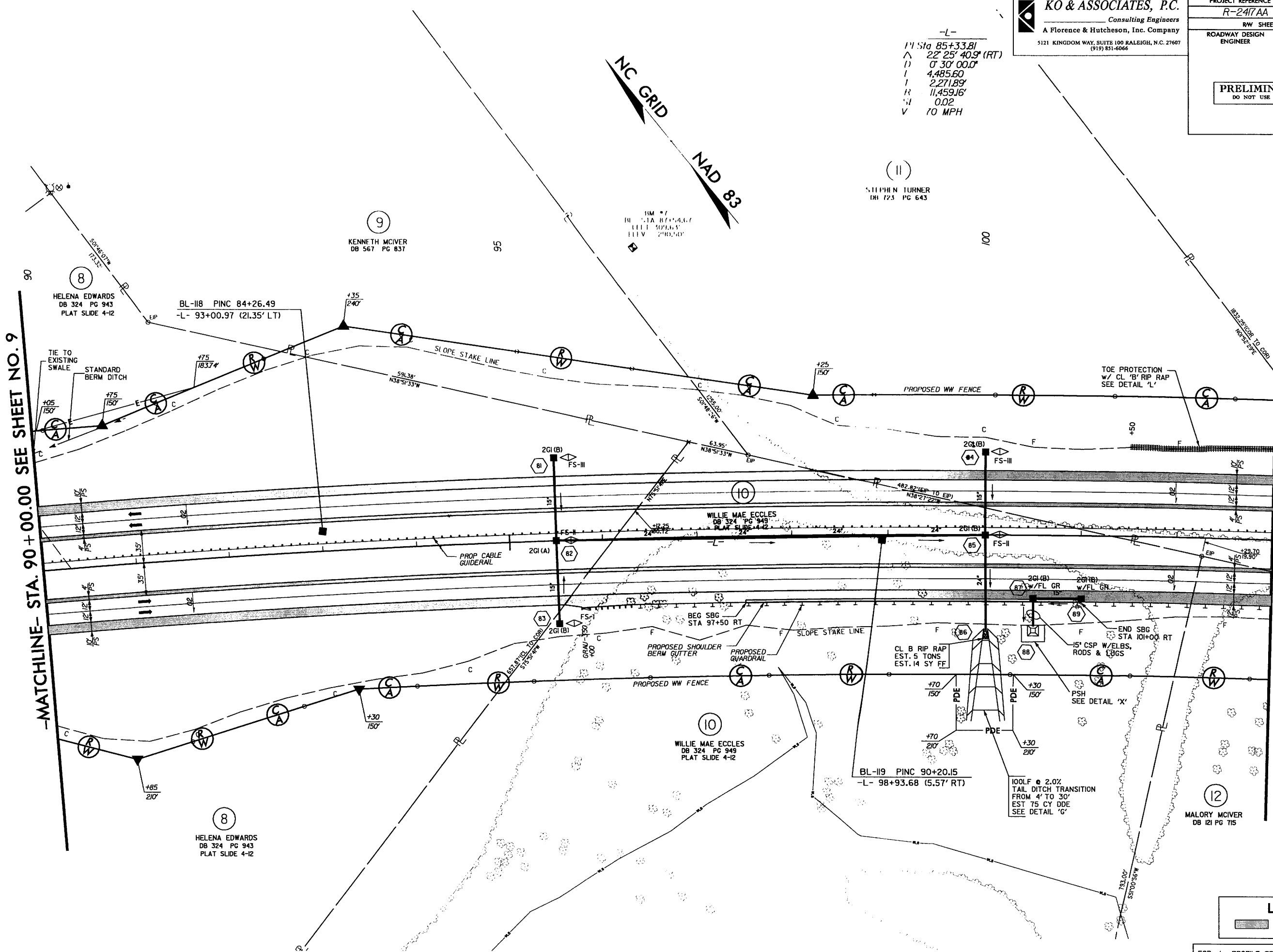
-L-
Sta 85+33.81
22° 25' 40.9" (RT)
0° 30' 00.0"
4,485.60
2,271.89'
11,459.16'
0.02
70 MPH

(11)
STEPHEN TURNER
DB 123 PG 643

BM #7
STA 87+4.67
ELEV 309.65'
ELEV 290.50'

-MATCHLINE- STA. 90+00.00 SEE SHEET NO. 9

-MATCHLINE- STA. 103+00.00 SEE SHEET NO. 11



LEGEND
PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NO. 29
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

8/17/99

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PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	11
R/W SHEET NO.	11
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

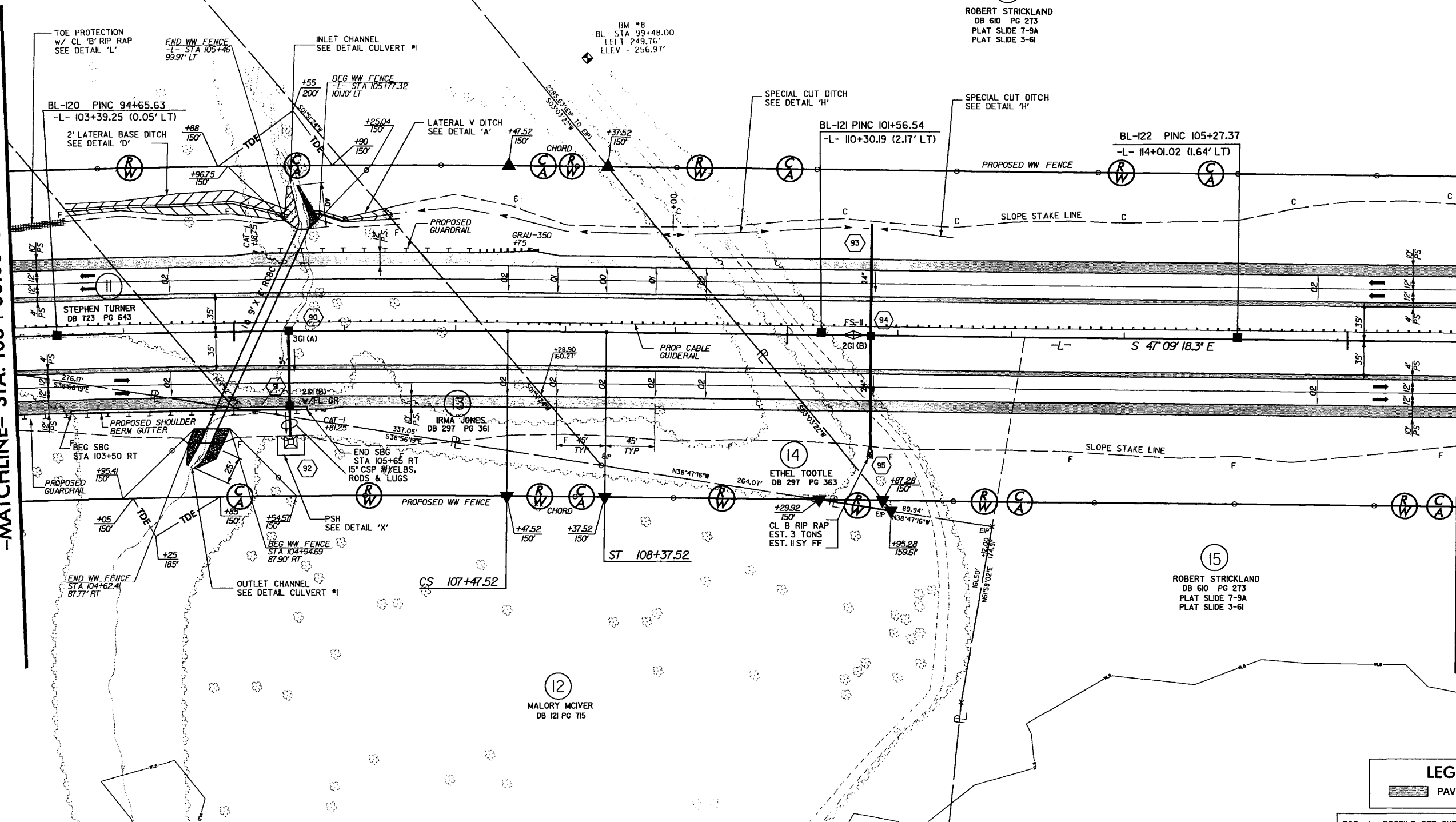
Pls Sta 85+33.81
 $\Delta = 22^\circ 25' 40.3" (RT)$
D = 0' 30' 00.0"
L = 4,485.60
T = 2,271.89
R = 11,459.16'
SF = 0.02
V = 70 MPH

Pls Sta 107+77.52
Os = 0' 15' 30.0"
Ls = 90.00'
LT = 60.00'
ST = 30.00'

NC GRID
NAD 83

-MATCHLINE- STA. 103+00.00 SEE SHEET NO. 10

-MATCHLINE- STA. 116+00.00 SEE SHEET NO. 12



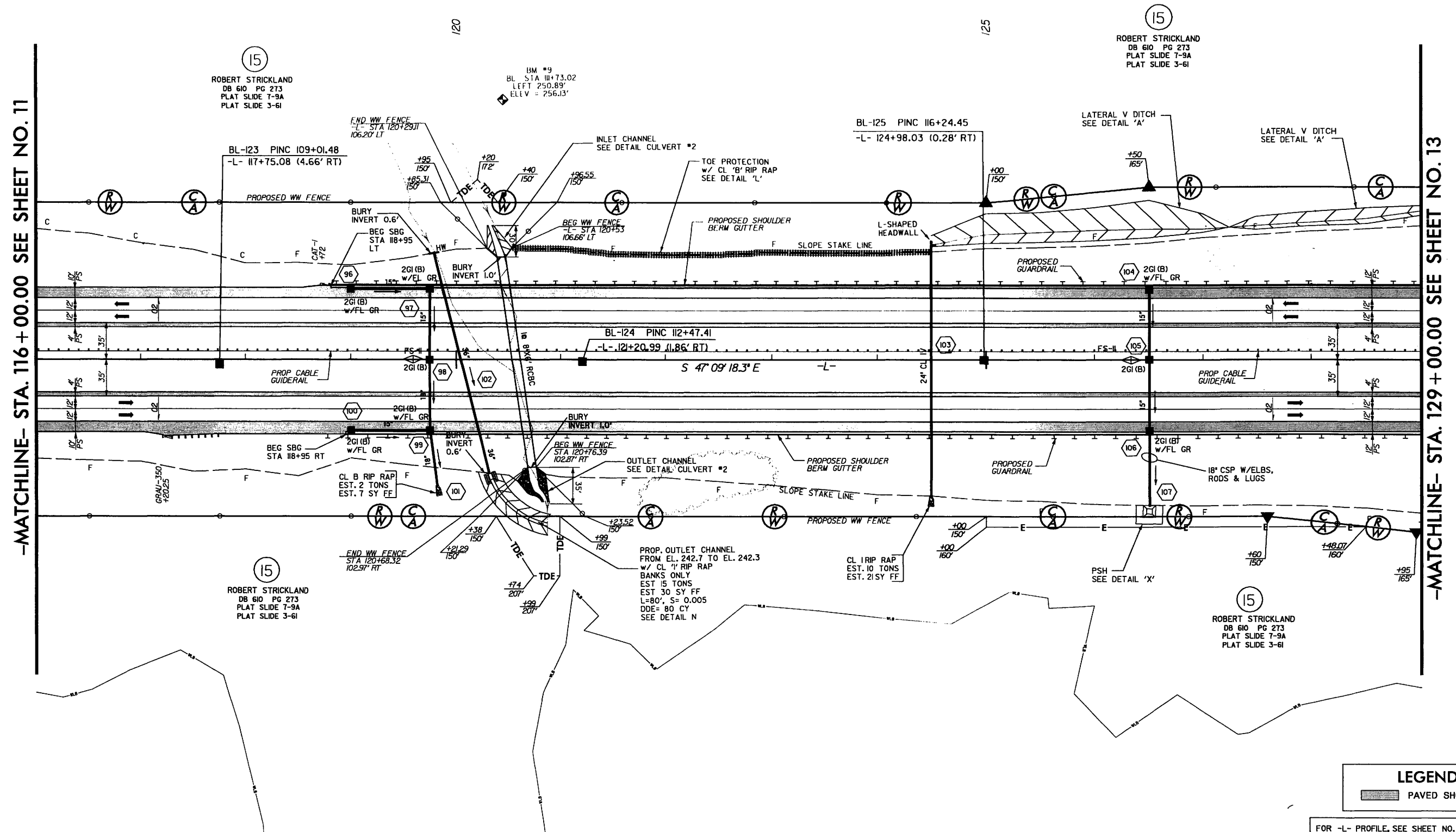
REVISIONS

12-6-06 Added Corner of Parcel 14 to RW

2/9/2009
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KO & Associates, P.C.

LEGEND
PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NOS. 29 & 30
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F



FOR -L- PROFILE, SEE SHEET NO. 30
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

2/9/2009
r:\roadway\proj\2417aa-rdy-psh-12.dgn
K & Associates P.C.

8/17/99

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PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	13
R/W SHEET NO.	13
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

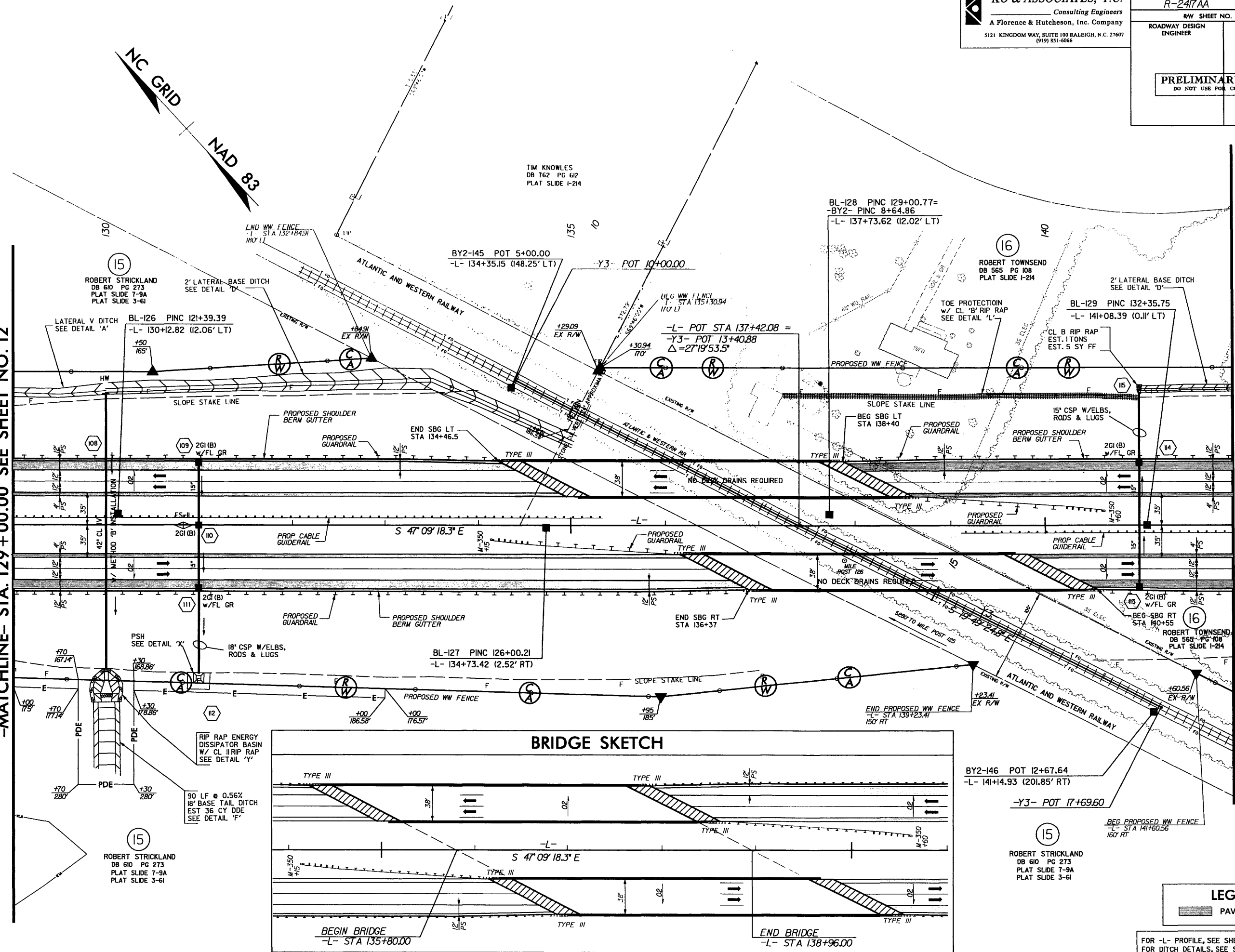
REVISIONS

12-4-06 Added Additional R/W on Parcel 16

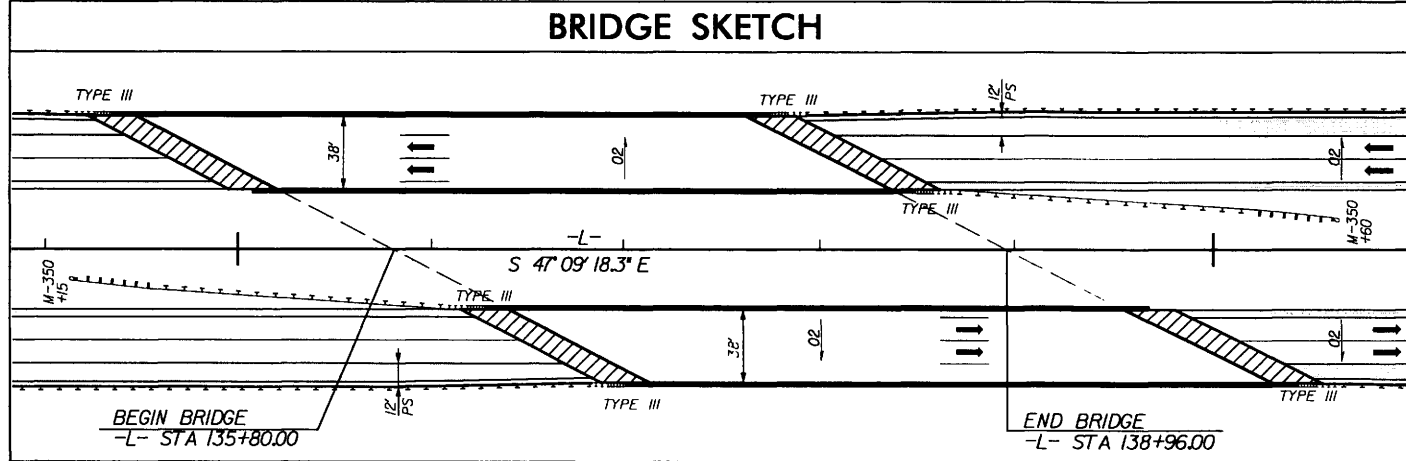
2/9/2009
C:\N\roadway\proj\2417\ao_rdy_psh_13.dgn
KO & ASSOCIATES, P.C.

-MATCHLINE- STA. 129 + 00.00 SEE SHEET NO. 12

-MATCHLINE- STA. 142 + 00.00 SEE SHEET NO. 14



BRIDGE SKETCH



LEGEND

	PAVED SHOULDER
--	----------------

FOR -L- PROFILE, SEE SHEET NOS. 30 & 31
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F



REVISIONS

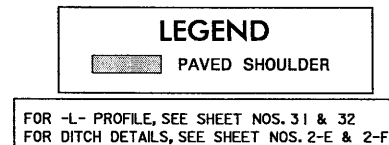
2/9/2009
C:\roadway\proj\2417aa-rdy-psh.14.dgn

8/17/99

LEGEND


PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NO. 31
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F



PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	16
R/W SHEET NO.	16
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



FOR -L- PROFILE, SEE SHEET NO. 32
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

REVISIONS
12-6-06 Changed Portion of Parcel 23 to Parcel 35 - Revised RW & TCE on Parcel 35

2/9/2009
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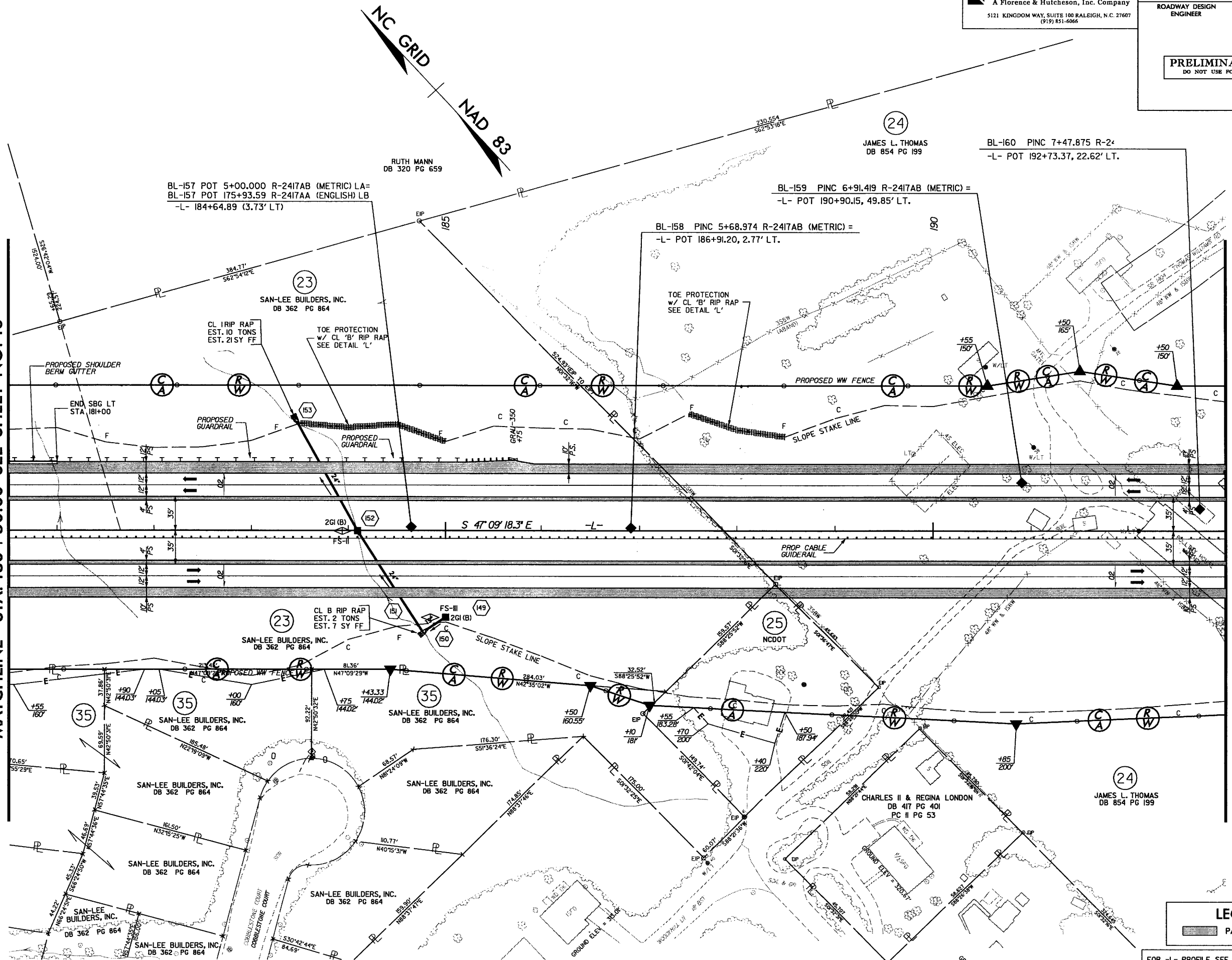
PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	17
RW SHEET NO.	17
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

REVISIONS

12-4-06 Changed Portion of Parcel 23 to Parcel 35 - Revised RW & TCE on Parcel 35
Parcel 24 Name Change

2/9/2009
r:\work\proj\2417aa-rdy-psd-17.dgn
KO & Associates, P.C.

-MATCHLINE- STA. 180 + 50.00 SEE SHEET NO. 16



-MATCHLINE- STA. 193 + 00.00 SEE SHEET NO. 18

LEGEND
PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NO. 33
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

8/17/99

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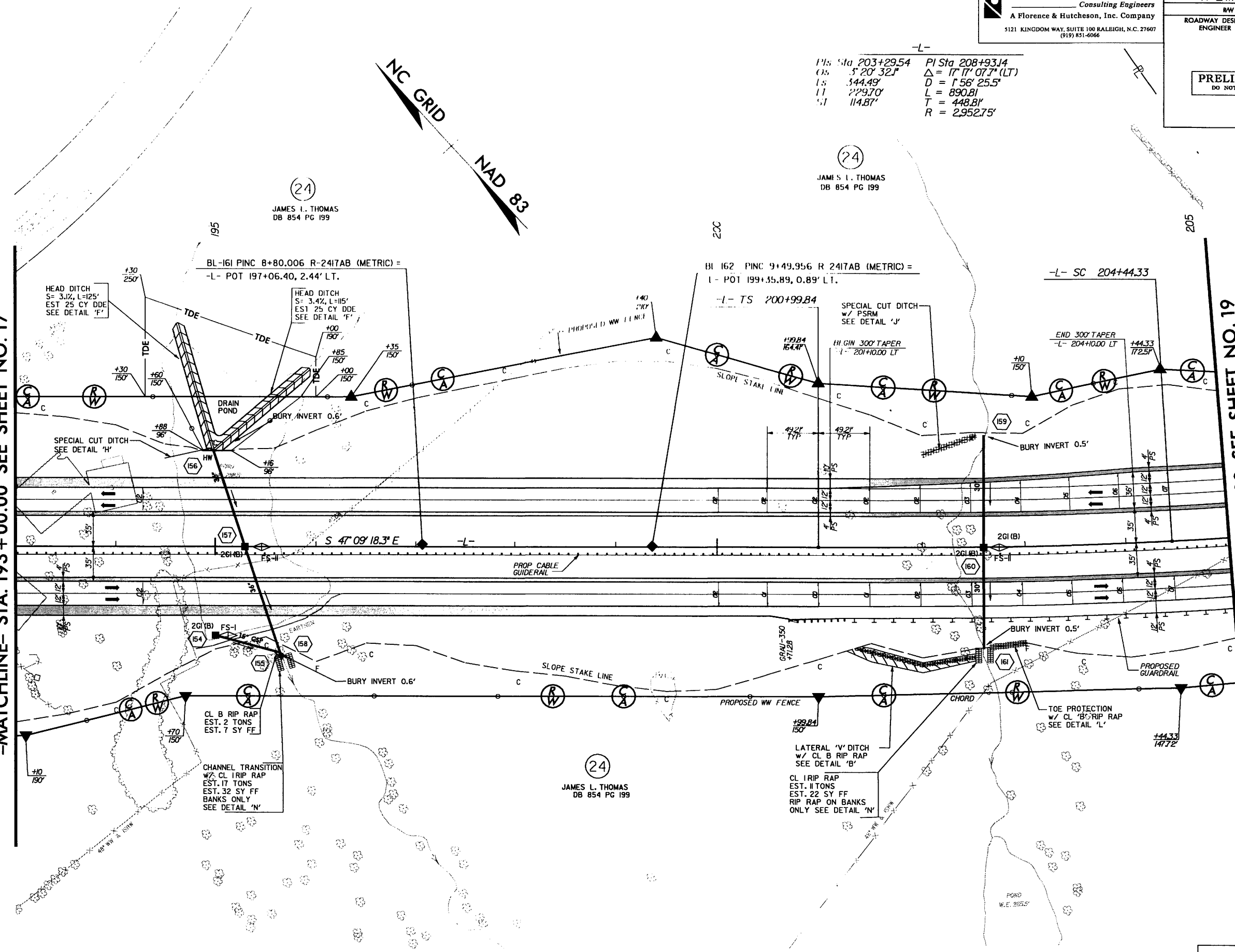
PROJECT REFERENCE NO.	R-2417AA
SHEET NO.	18
R/W SHEET NO.	18
ROADWAY DESIGN ENGINEER	
HYDRAULICS ENGINEER	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L-
PI Sta 203+29.54
OS = 5' 20' 32"
LS = 344.49'
LI = 229.70'
SI = 114.87'
PI Sta 208+93.14
 $\Delta = 17^\circ 17' 07.7" (LT)$
D = 1' 56' 25.5"
L = 890.81'
T = 448.81'
R = 2,952.75'

-MATCHLINE- STA. 193 + 00.00 SEE SHEET NO. 17

-MATCHLINE- STA. 205 + 00.00 SEE SHEET NO. 19



(24)
JAMES L. THOMAS
DB 854 PG 199

(24)
JAMES L. THOMAS
DB 854 PG 199

LEGEND
 PAVED SHOULDER

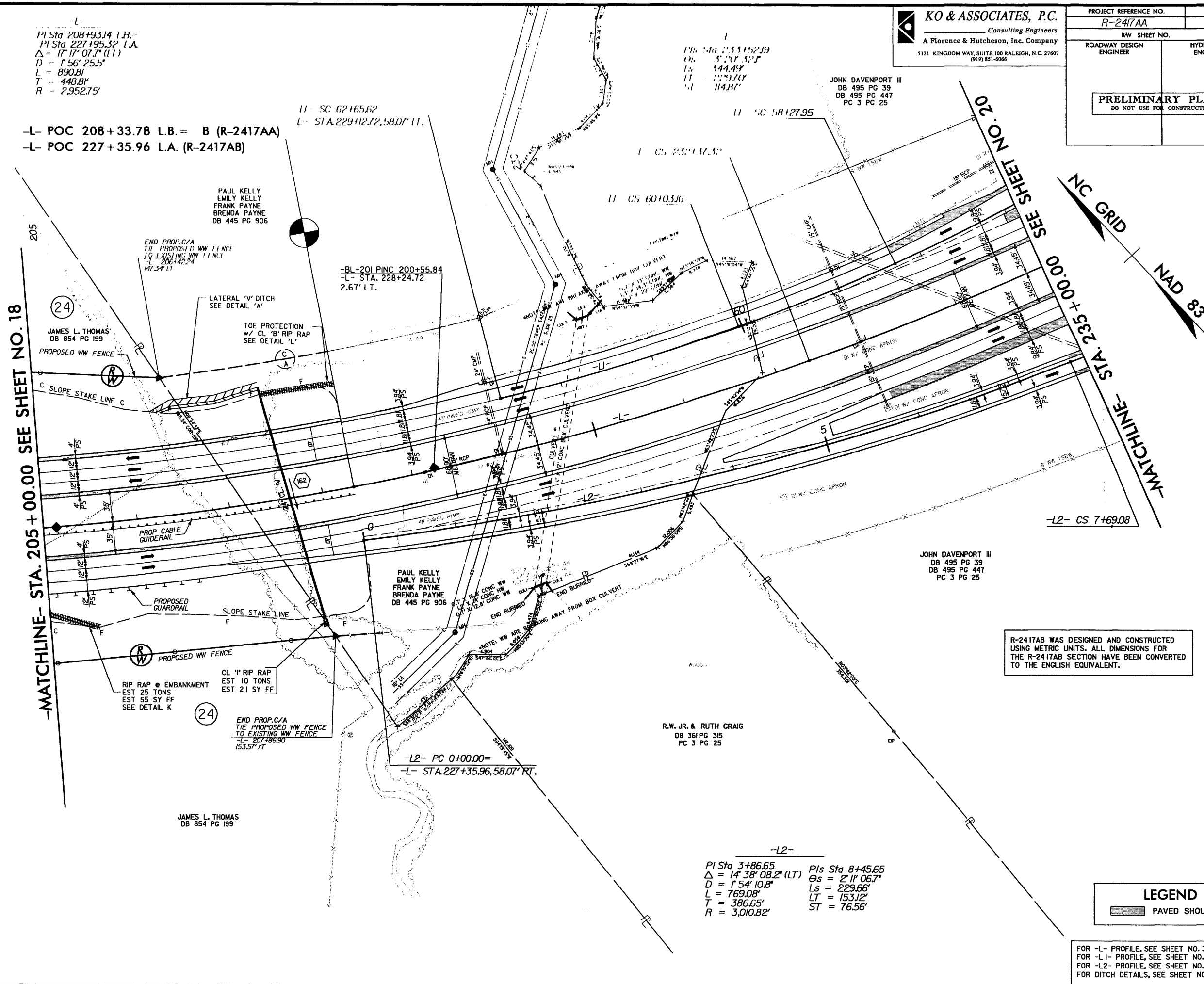
FOR -L- PROFILE, SEE SHEET NOS. 33 & 34
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

REVISIONS

12-6-06 Parcel 24 Name Change

2/9/2009
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KO & Associates, P.C.

PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	19
R/W SHEET NO.	19
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



PI Sta 208+93.14 I.B.
PI Sta 227+95.32 L.A.
 $\Delta = 17' 11'' 07.7'' (11)$
 $D = 156' 25.5''$
 $L = 890.81'$
 $T = 448.81'$
 $R = 2,952.75'$

PI Sta 233+52.9
OS = 5' 07' 32.7
LS = 144.48'
LT = 229.66'
ST = 76.56'

JOHN DAVENPORT III
DB 495 PG 39
DB 495 PG 447
PC 3 PG 25

JOHN DAVENPORT III
DB 495 PG 39
DB 495 PG 447
PC 3 PG 25

R.W. JR. & RUTH CRAIG
DB 361 PG 315
PC 3 PG 25

PI Sta 3+86.65
 $\Delta = 14' 38' 08.2'' (LT)$
 $D = 154' 10.8''$
 $L = 769.08'$
 $T = 386.65'$
 $R = 3,010.82'$

PI Sta 8+45.65
 $OS = 2' 11' 06.7''$
 $LS = 229.66'$
 $LT = 153.12'$
 $ST = 76.56'$

R-2417AB WAS DESIGNED AND CONSTRUCTED USING METRIC UNITS. ALL DIMENSIONS FOR THE R-2417AB SECTION HAVE BEEN CONVERTED TO THE ENGLISH EQUIVALENT.

LEGEND
PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NO. 34
FOR -L1- PROFILE, SEE SHEET NO. 36
FOR -L2- PROFILE, SEE SHEET NO. 37
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

REVISIONS
12-6-06 Parcel 24 Name Change

2/9/2009
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KO & ASSOCIATES, P.C.

8/17/99

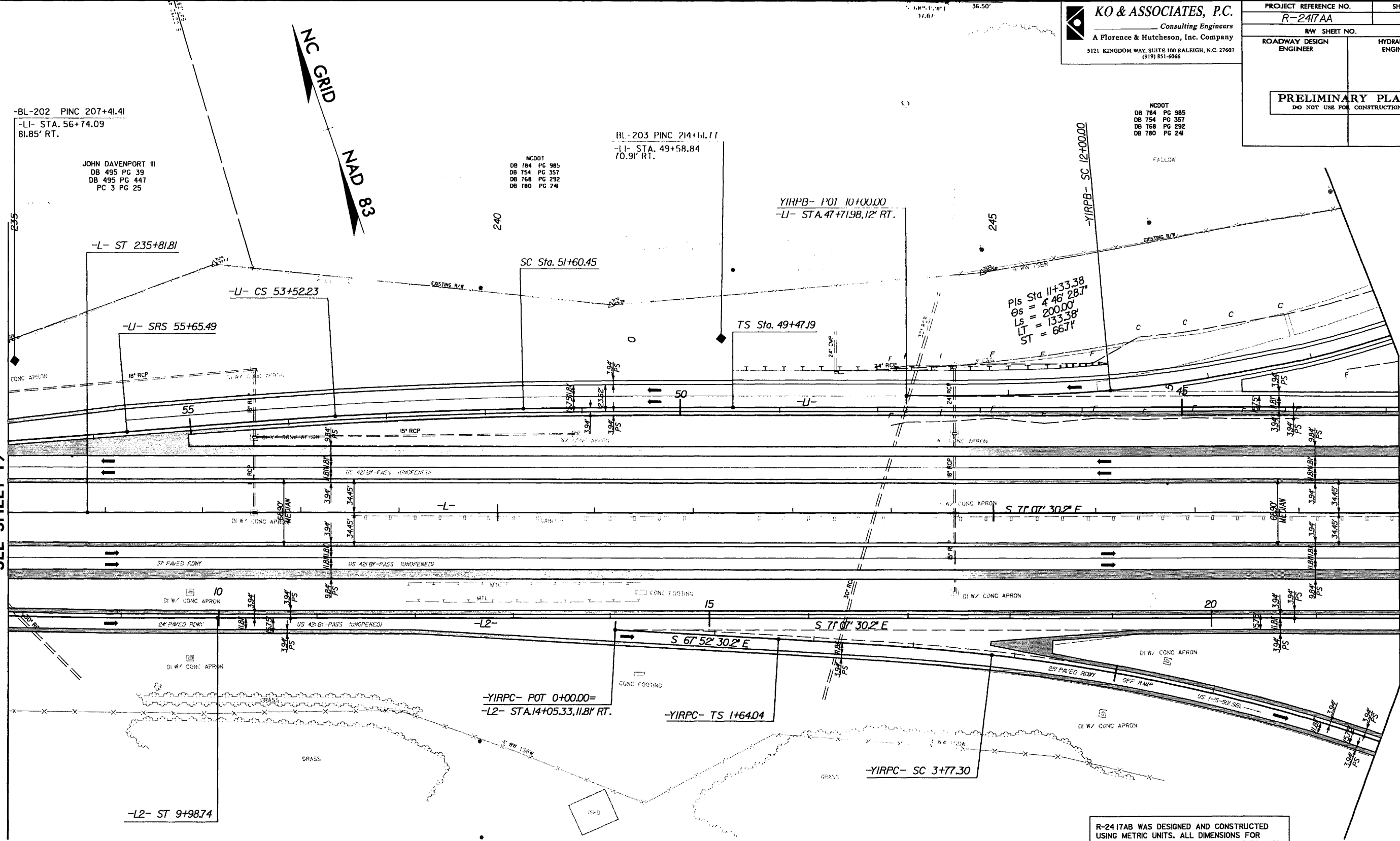
2/9/2009
R:\p\codew\proj\2417\ao-rdy-psh-20.dgn
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(919) 851-6066

PROJECT REFERENCE NO. <i>R-247AA</i>		SHEET NO. <i>20</i>	
RW SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

-MATCHLINE- STA. 235+00.00
SEE SHEET 19

-MATCHLINE- STA. 249+00.00
SEE SHEET 21



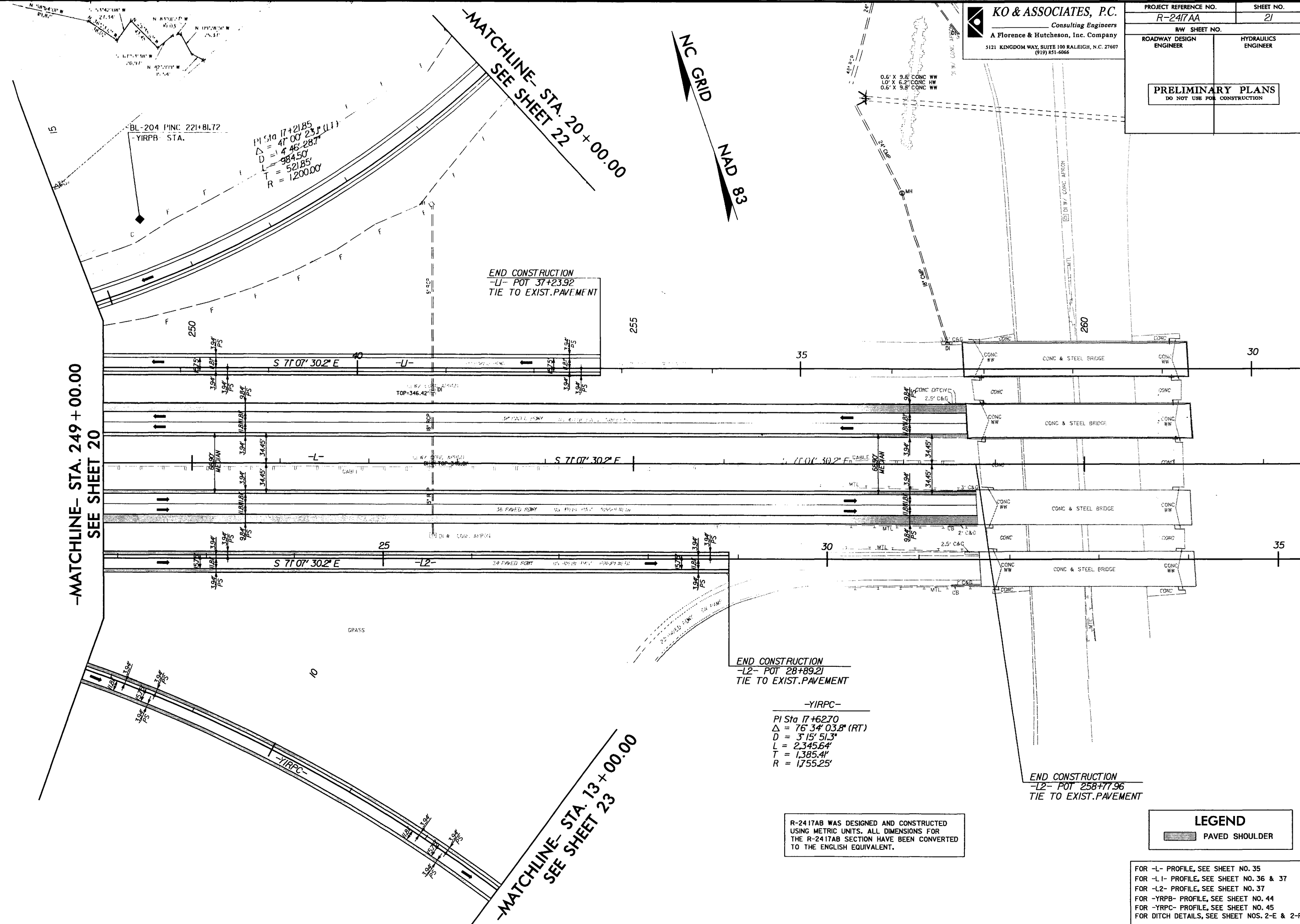
8/17/99

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PROJECT REFERENCE NO.		SHEET NO.
R-2417AA		21
RW SHEET NO.		
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		

REVISIONS

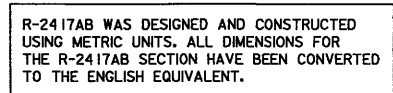
2/9/2009
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KO & ASSOCIATES, P.C.



R-2417AB WAS DESIGNED AND CONSTRUCTED USING METRIC UNITS. ALL DIMENSIONS FOR THE R-2417AB SECTION HAVE BEEN CONVERTED TO THE ENGLISH EQUIVALENT.

LEGEND
PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NO. 35
FOR -L1- PROFILE, SEE SHEET NO. 36 & 37
FOR -L2- PROFILE, SEE SHEET NO. 37
FOR -YIRPB- PROFILE, SEE SHEET NO. 44
FOR -YIRPC- PROFILE, SEE SHEET NO. 45
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

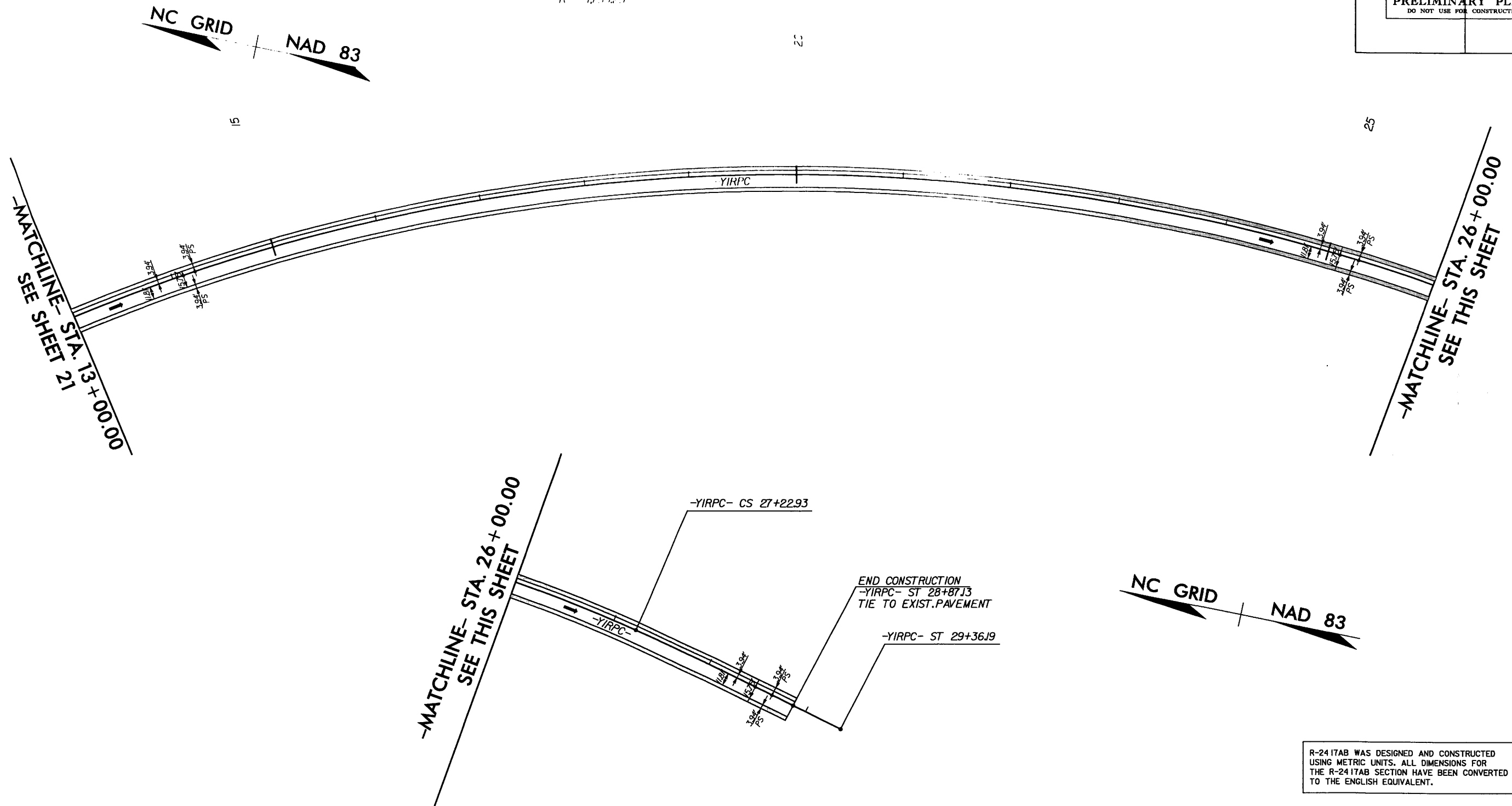


FOR -YRPBREV- PROFILE, SEE SHEET NO. 44
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

2/9/2009
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 Ko & Associates, P.C.

PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	23
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

YIRPC
PI Sta 17+62.70
 $\Delta = 76^{\circ} 34' 03.8''$ (RT)
D = 3' 15' 51.3"
L = 2,345.64'
T = 1,385.41'
R = 1,755.25'



R-2417AB WAS DESIGNED AND CONSTRUCTED USING METRIC UNITS. ALL DIMENSIONS FOR THE R-2417AB SECTION HAVE BEEN CONVERTED TO THE ENGLISH EQUIVALENT.

YIRPC-
PI Sta 17+62.70 PI Sta 27+94.04
 $\Delta = 76^{\circ} 34' 03.8''$ (RT) $\Theta_s = 3^{\circ} 28' 50.1''$
D = 3' 15' 51.3" Ls = 213.25'
L = 2,345.64' LT = 142.20'
T = 1,385.41' ST = 71.11'
R = 1,755.25'

LEGEND
PAVED SHOULDER

FOR -YIRPC- PROFILE, SEE SHEET NO. 45 & 46
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

8/17/99

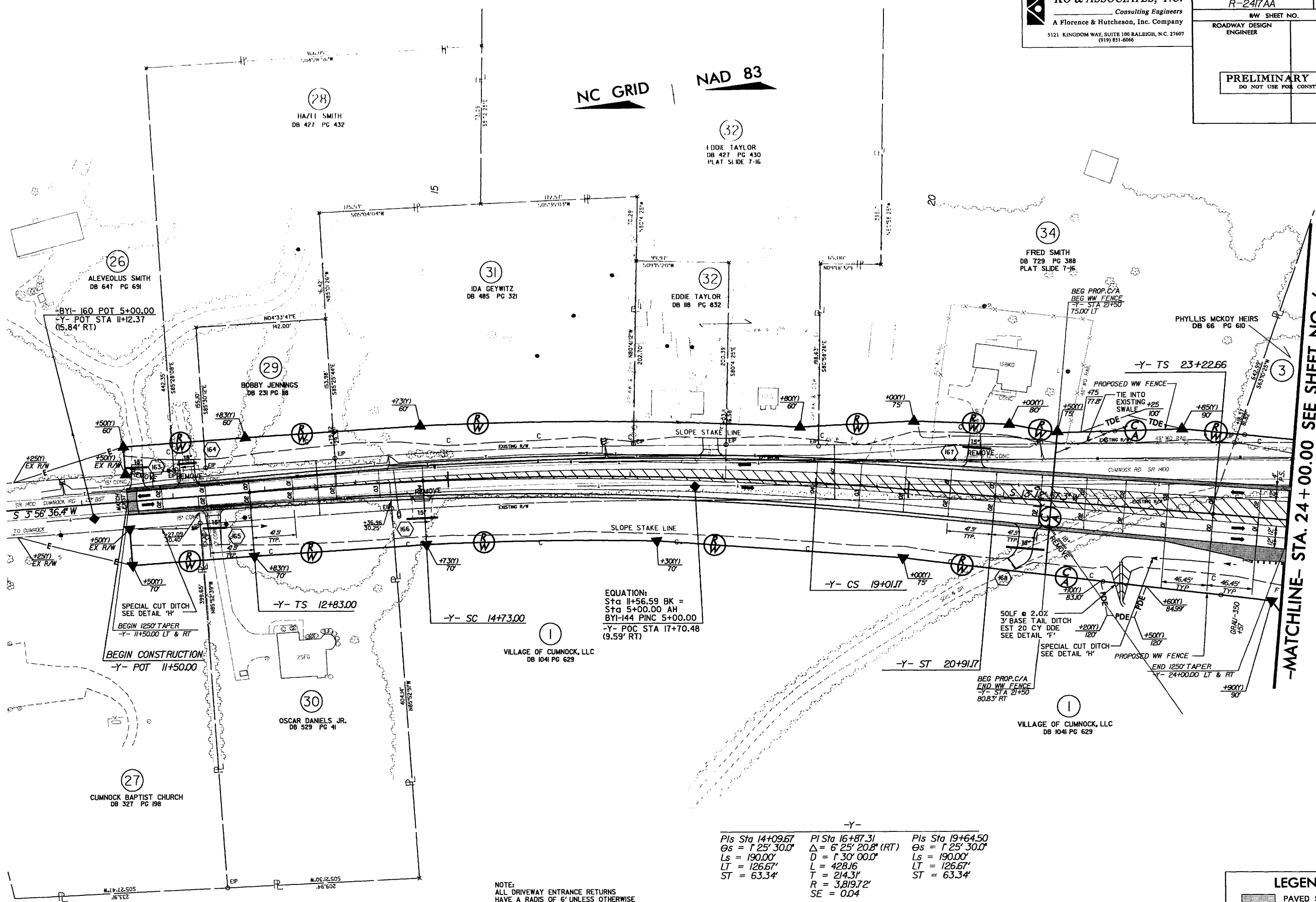
12-6-06 Parcel 1 Name Change
Added TCE to Parcels 26 & 27
Included Parcel 33 in Parcel 32

2/9/2009
K:\Projects\2417\2417.dgn
K:\Projects\2417\2417.dgn

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PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	24
R/W SHEET NO.	20
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

NC GRID | NAD 83



NOTE:
ALL DRIVEWAY ENTRANCE RETURNS
HAVE A RADIUS OF 6' UNLESS OTHERWISE
SHOWN.

Pls Sta 14+09.67	Pl Sta 16+87.31	Pls Sta 19+64.50
Δs = 1' 25' 30.0"	Δs = 1' 25' 30.0" (RT)	Δs = 1' 25' 30.0"
Ls = 190.00'	D = 1' 30' 00.0"	Ls = 190.00'
LT = 126.67'	L = 428.16'	LT = 126.67'
ST = 63.34'	T = 214.31'	ST = 63.34'
	R = 3,819.72'	
	SE = 0.04	

LEGEND

PAVED SHOULDER

FOR -Y- PROFILE, SEE SHEET NO. 42
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

-MATCHLINE- STA. 24 + 00.00 SEE SHEET NO. 6

END CONSTRUCTION
-Y- POT 51+25.00

FOR -Y- PROFILE, SEE SHEET NO. 43
FOR -RPCA- PROFILE, SEE SHEET NO. 43
FOR DITCH DETAILS, SEE SHEET NOS. 2-E & 2-F

2/9/2009
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Ko & Associates, P.C.

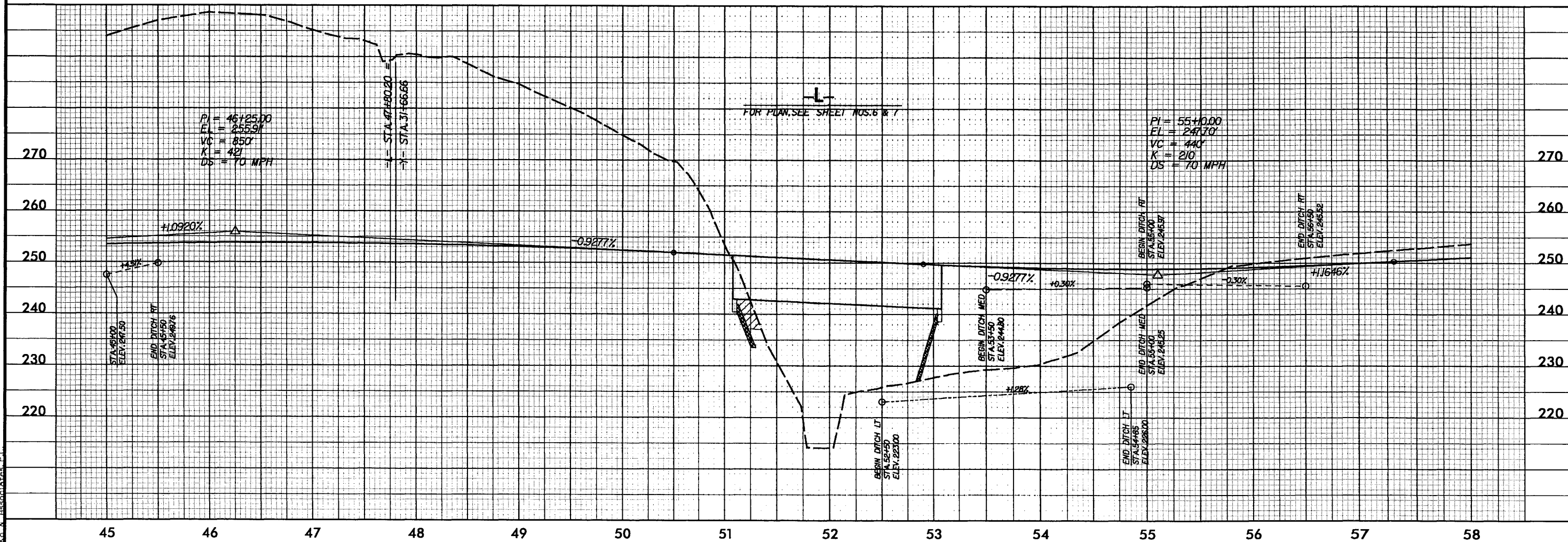
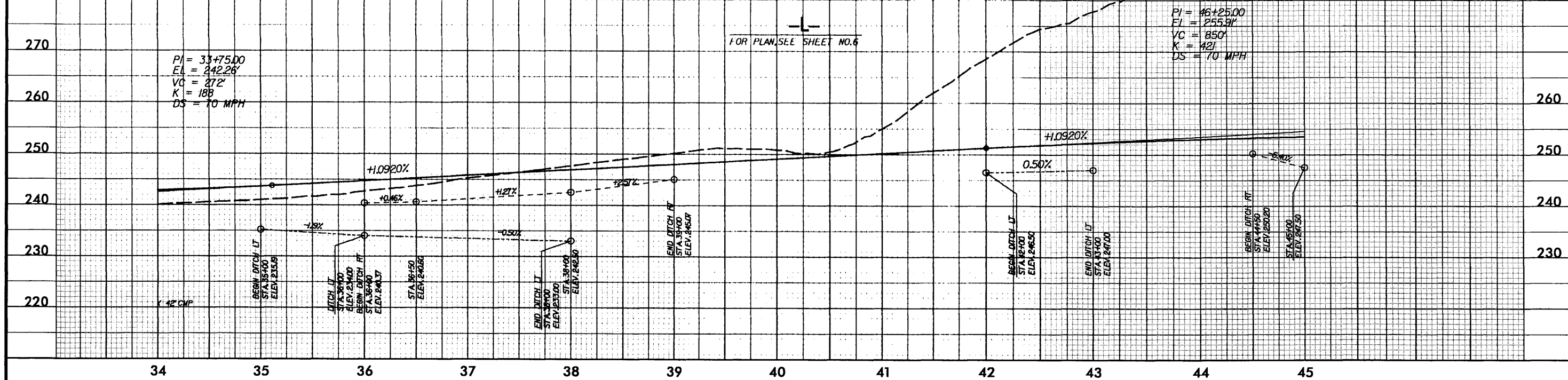
5/28/99

111 V 266.96'
T 1 STA 41+75.05 251.37' RT
RIGHT OF WAY
10' SPIKE IN HAIR OF 15' PINE TREE

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PROJECT REFERENCE NO.	SHEET NO.
R-2417AA	27
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



2/8/2008
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KO & Associates

5/26/99

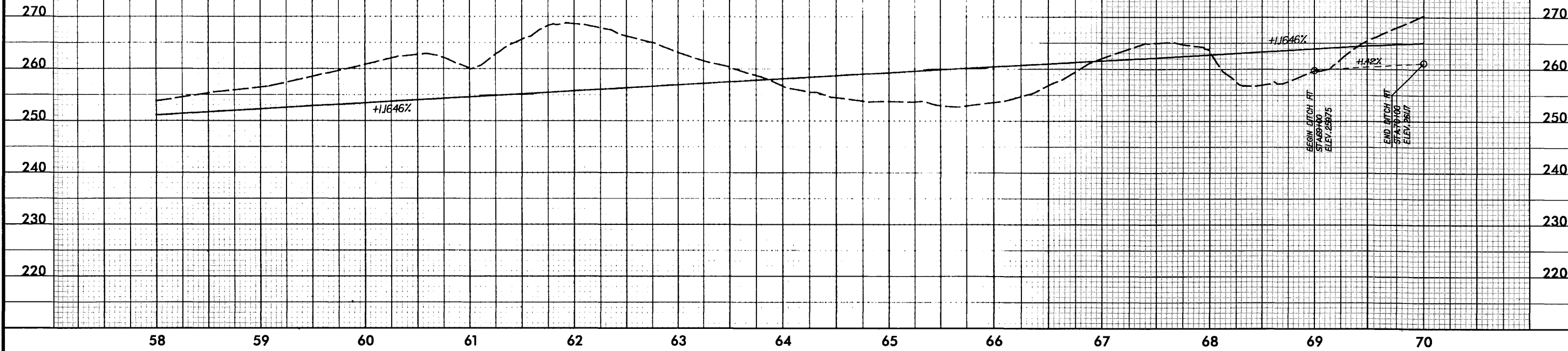
BM#4
RR RPIKE IN BASE OF 10' PINE TREE LEFT
OF -BL- 114
-L- STA 64+50.00 105.27' LT
ELEV = 297.10'

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PROJECT REFERENCE NO. R-2417AA	SHEET NO. 28
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

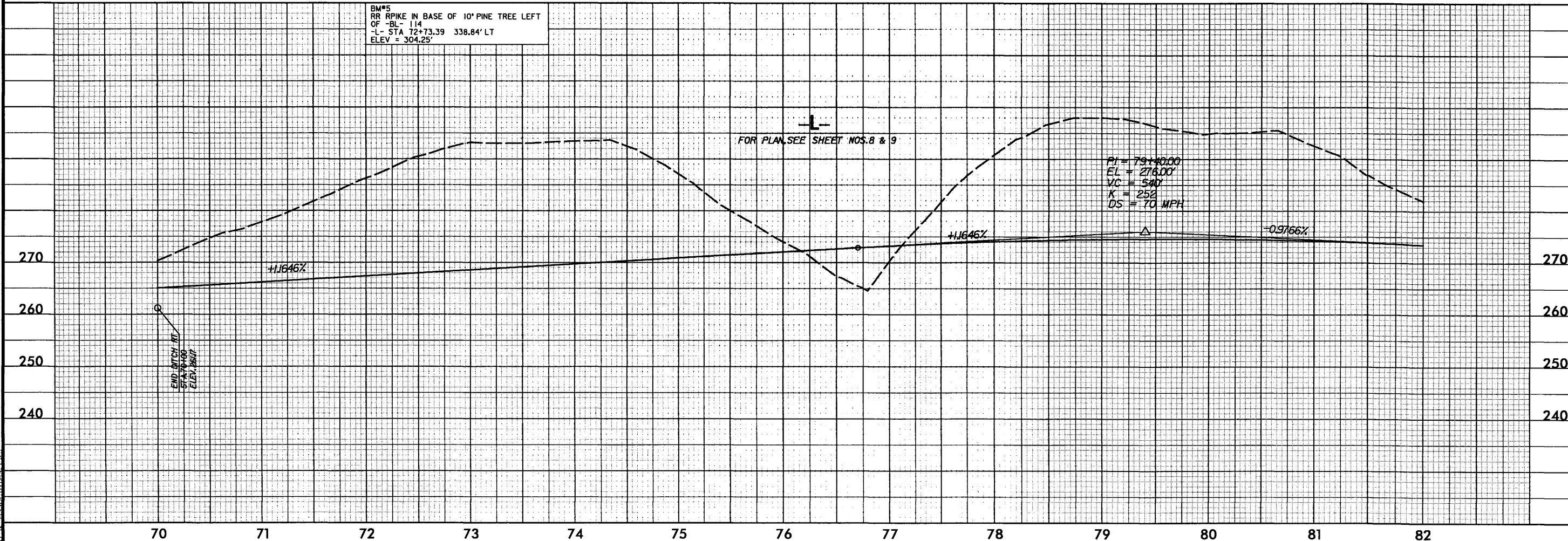
FOR PLAN, SEE SHEET NOS. 7 & 8



BM#5
RR RPIKE IN BASE OF 10' PINE TREE LEFT
OF -BL- 114
-L- STA 72+73.39 338.84' LT
ELEV = 304.25'

FOR PLAN, SEE SHEET NOS. 8 & 9

PI = 79+40.00
EL = 276.00'
VC = 540'
K = 252
DS = 70 MPH



5/28/99

BM#6
RR SPIKE IN BASE OF 10' PINE TREE RIGHT
OF BL 117
L STA 84+79.65 310.38' RT
ELEV 256.56'

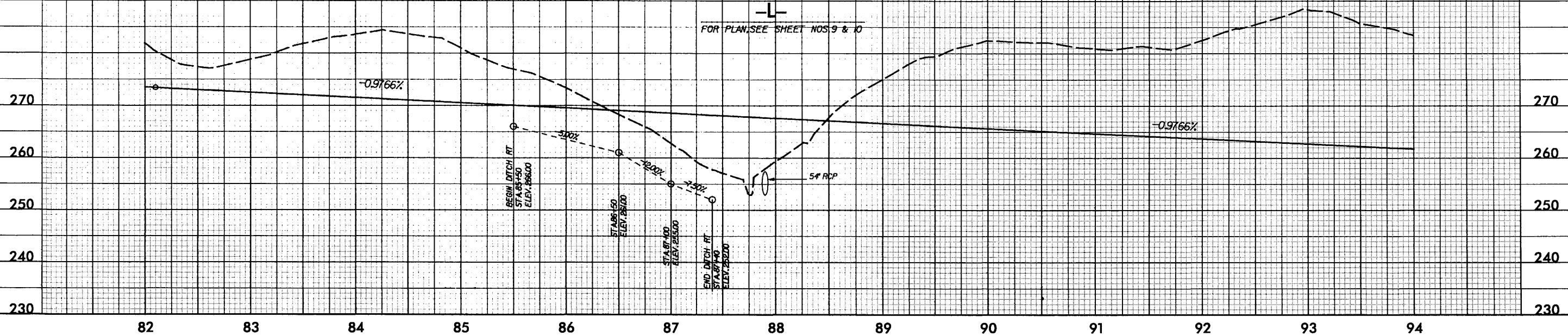
P/P HYDRAULIC DATA	
STA - L- 87+90	
DRAINAGE AREA	= 3172 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 90 CFS
DESIGN HW ELEVATION	= 260.42 FT
100 YEAR DISCHARGE	= 100 CFS
100 YEAR HW ELEVATION	= 260.77 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 204 CFS
OVERTOPPING ELEVATION	= 266.63 FT

5" RCP
INV In= 255.00 INV out= 250.80

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PROJECT REFERENCE NO.		SHEET NO.
R-2417AA		29
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	

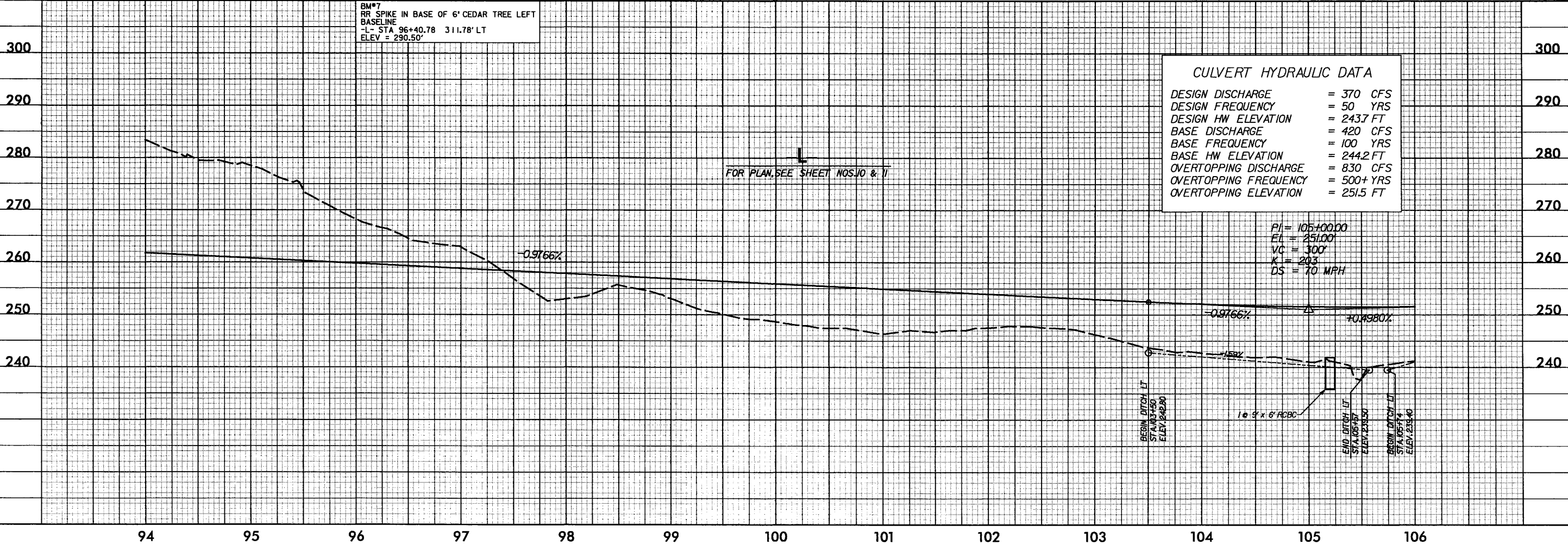
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



BM#7
RR SPIKE IN BASE OF 6' CEDAR TREE LEFT
BASELINE
-L- STA 96+40.78 311.78' LT
ELEV = 290.50'

CULVERT HYDRAULIC DATA	
DESIGN DISCHARGE	= 370 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 243.7 FT
BASE DISCHARGE	= 420 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 244.2 FT
OVERTOPPING DISCHARGE	= 830 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 251.5 FT

PI = 105+100.00
EL = 251.00
VC = 300'
K = 203
DS = 70 MPH



BM#8
RR SPIKE IN HAIR OF 12" MAPLE TREE LEFT
OF BASELINE
L STA 108+17.37 248.26' LT
ELEV = 256.91'

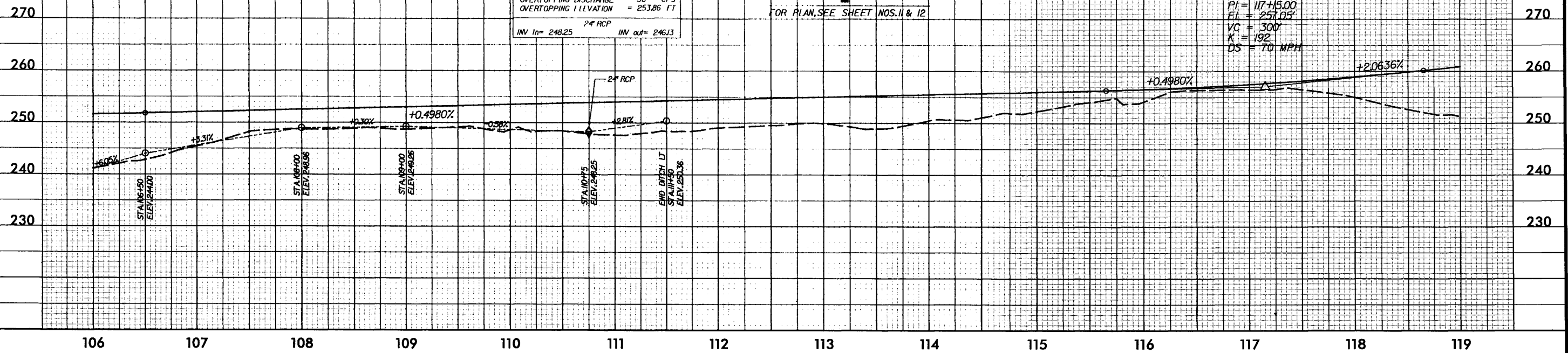
PIPE HYDRAULIC DATA
STA -L- 110+75

DRAINAGE AREA = 450 AC
DESIGN FREQUENCY = 50 YRS
DESIGN DISCHARGE = 17.00 CFS
DESIGN HW ELEVATION = 250.54 FT
100 YEAR DISCHARGE = 19.00 CFS
100 YEAR HW ELEVATION = 250.77 FT
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING DISCHARGE = 36 CFS
OVERTOPPING ELEVATION = 253.86 FT

24" RCP
INV In= 248.25 INV out= 246.13

FOR PLAN, SEE SHEET NOS. 11 & 12

PI = 117+15.00
FI = 257.05'
VC = 300'
K = 192
DS = 70 MPH



PIPE HYDRAULIC DATA
STA -L- 120+20

DRAINAGE AREA = 110.00 AC
DESIGN FREQUENCY = 50 YRS
DESIGN DISCHARGE = 340.00 CFS
DESIGN HW ELEVATION = 250.80 FT
100 YEAR DISCHARGE = 380.00 CFS
100 YEAR HW ELEVATION = 251.10 FT
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING DISCHARGE = 710 CFS
OVERTOPPING ELEVATION = 258.00 FT

36" RCP
INV In= 244.0 INV out= 242.1

PIPE HYDRAULIC DATA
STA -L- 124+50

DRAINAGE AREA = 3.18 AC
DESIGN FREQUENCY = 50 YRS
DESIGN DISCHARGE = 12.00 CFS
DESIGN HW ELEVATION = 254.63 FT
100 YEAR DISCHARGE = 13.00 CFS
100 YEAR HW ELEVATION = 254.79 FT
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING DISCHARGE = 65 CFS
OVERTOPPING ELEVATION = 268.72 FT

24" RCP
INV In= 252.80 INV out= 243.00

BM#9
RR SPIKE IN BASE OF 15" PINE TREE LEFT
OF BL-124
-L- STA 120+44.24 248.14' LT
ELEV = 256.13'

FOR PLAN, SEE SHEET NOS. 12 & 13

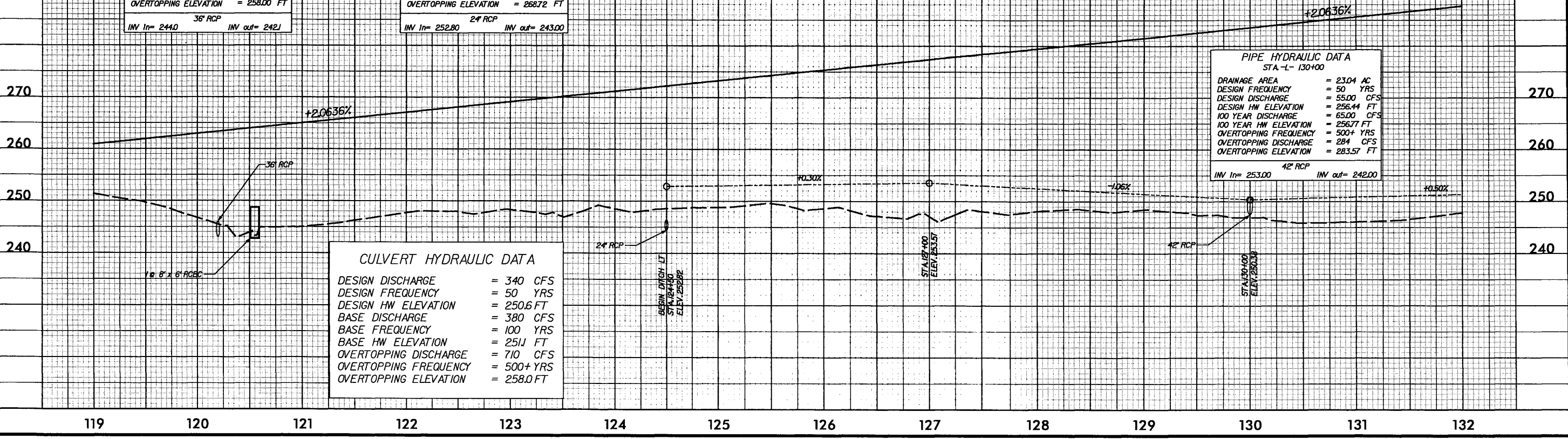
PIPE HYDRAULIC DATA
STA -L- 130+00

DRAINAGE AREA = 23.04 AC
DESIGN FREQUENCY = 50 YRS
DESIGN DISCHARGE = 55.00 CFS
DESIGN HW ELEVATION = 256.44 FT
100 YEAR DISCHARGE = 65.00 CFS
100 YEAR HW ELEVATION = 256.77 FT
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING DISCHARGE = 284 CFS
OVERTOPPING ELEVATION = 283.57 FT

42" RCP
INV In= 253.00 INV out= 242.00

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE = 340 CFS
DESIGN FREQUENCY = 50 YRS
DESIGN HW ELEVATION = 250.6 FT
BASE DISCHARGE = 380 CFS
BASE FREQUENCY = 100 YRS
BASE HW ELEVATION = 251.1 FT
OVERTOPPING DISCHARGE = 710 CFS
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING ELEVATION = 258.0 FT



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BM#10
RR SPIKE IN BASE OF 12" PINE TREE RIGHT
OF BL-127
+L- STA 134+35.80 294.46' RT
ELEV = 243.36'

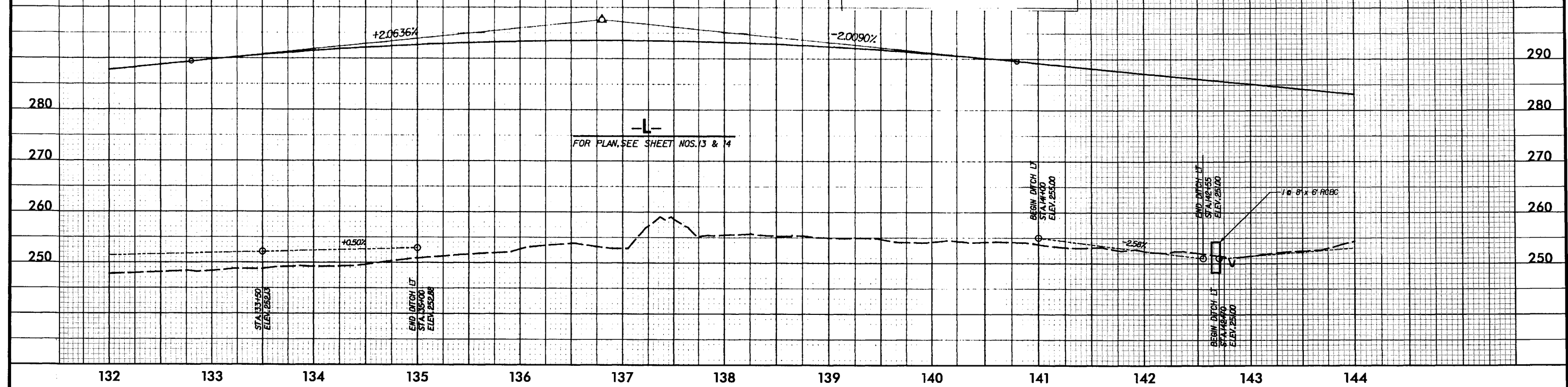
PI = 136+80.00
BL = 297.57
VC = 800'
K = 196
LS = 65 MPH

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	300 CFS
DESIGN FREQUENCY	50 YRS
DESIGN HW ELEVATION	255.8 FT
BASE DISCHARGE	340 CFS
BASE FREQUENCY	100 YRS
BASE HW ELEVATION	256.3 FT
OVERTOPPING DISCHARGE	590 CFS
OVERTOPPING FREQUENCY	500+ YRS
OVERTOPPING ELEVATION	260.0 FT

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PROJECT REFERENCE NO.	R-247AA	SHEET NO.	31
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

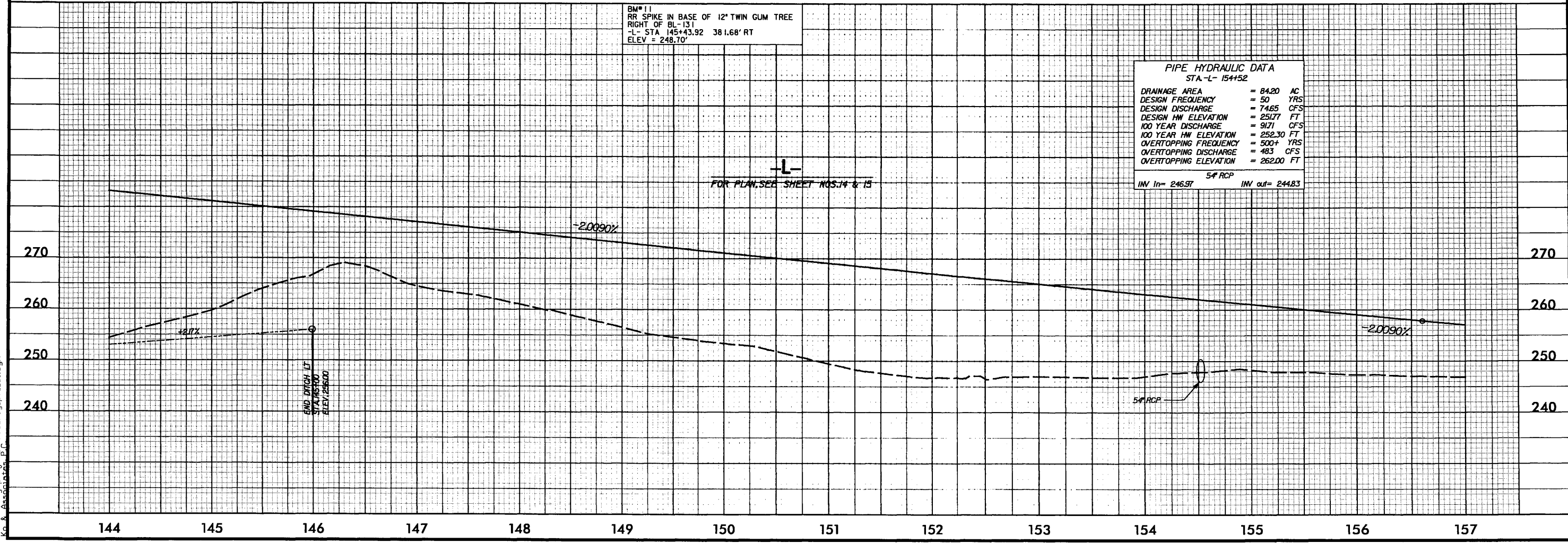


BM#11
RR SPIKE IN BASE OF 12" TWIN GUM TREE
RIGHT OF BL-131
+L- STA 145+43.92 381.68' RT
ELEV = 248.70'

PIPE HYDRAULIC DATA
STA-L- 154+52

DRAINAGE AREA	= 84.20 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 74.65 CFS
DESIGN HW ELEVATION	= 251.77 FT
100 YEAR DISCHARGE	= 91.71 CFS
100 YEAR HW ELEVATION	= 252.30 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 483 CFS
OVERTOPPING ELEVATION	= 262.00 FT

5" RCP
INV In = 246.97 INV Out = 244.83



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PROJECT REFERENCE NO. R-2417AA		SHEET NO. 32
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		

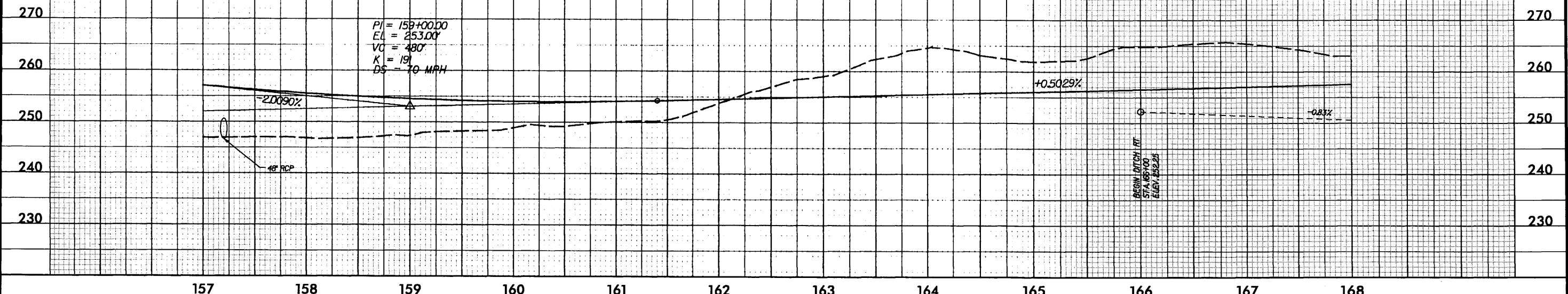
PIPE HYDRAULIC DATA
STA 157+00

DRAINAGE AREA	= 84.20 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 95.15 CFS
DESIGN HW ELEVATION	= 251.77 FT
100 YEAR DISCHARGE	= 108.29 CFS
100 YEAR HW ELEVATION	= 252.50 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 483 CFS
OVERTOPPING ELEVATION	= 262.00 FT

48" RCP
INV In= 247.20 INV out= 246.00

PI= 159+00.00
EL = 253.00'
VC = 480'
K = 19
DS = 70 MPH

FOR PLAN, SEE SHEET NO. 15



BM# 13
RR SPIKE IN BASE OF 12" PINE TREE
RIGHT OF BL-138
L- STA 173+46.58 254.45' RT
ELEV = 254.19'

FOR PLAN, SEE SHEET NO. 16

PIPE HYDRAULIC DATA
STA 178+00

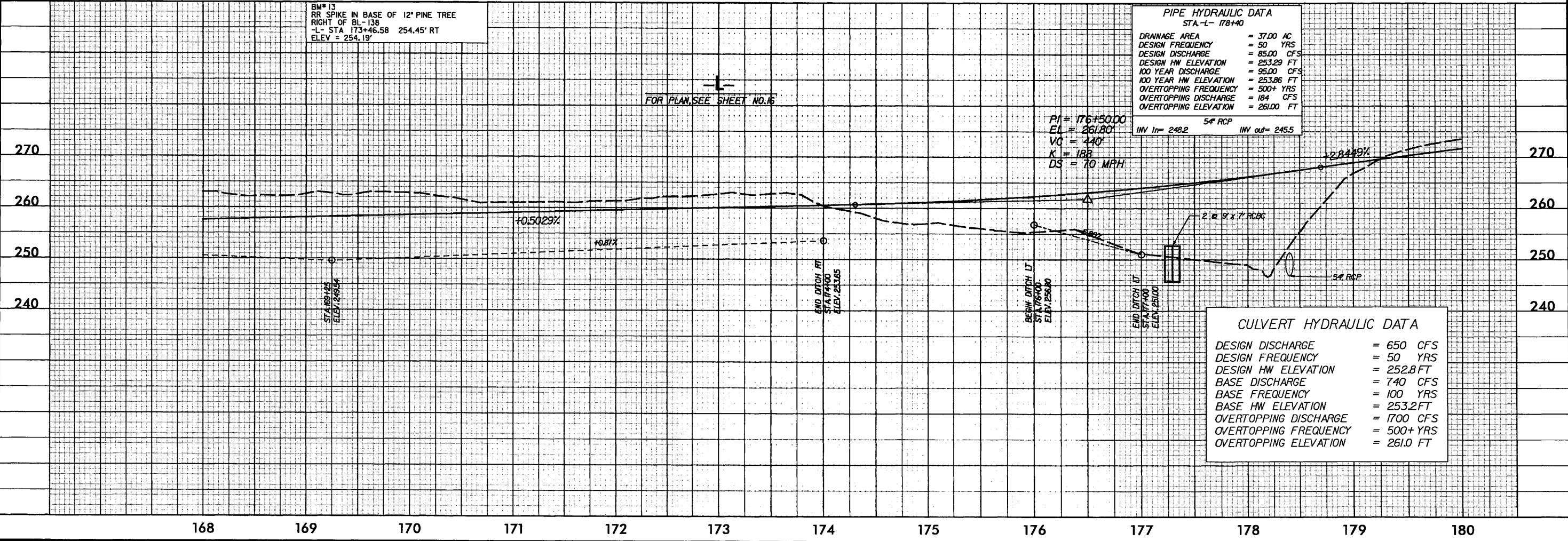
DRAINAGE AREA	= 37.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 85.00 CFS
DESIGN HW ELEVATION	= 253.29 FT
100 YEAR DISCHARGE	= 95.00 CFS
100 YEAR HW ELEVATION	= 253.86 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 184 CFS
OVERTOPPING ELEVATION	= 261.00 FT

54" RCP
INV In= 248.2 INV out= 245.5

PI= 176+50.00
EL = 261.80'
VC = 440'
K = 188
DS = 70 MPH

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 650 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 252.8 FT
BASE DISCHARGE	= 740 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 253.2 FT
OVERTOPPING DISCHARGE	= 1700 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 261.0 FT



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PROJECT REFERENCE NO. R-2417AA		SHEET NO. 33
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		

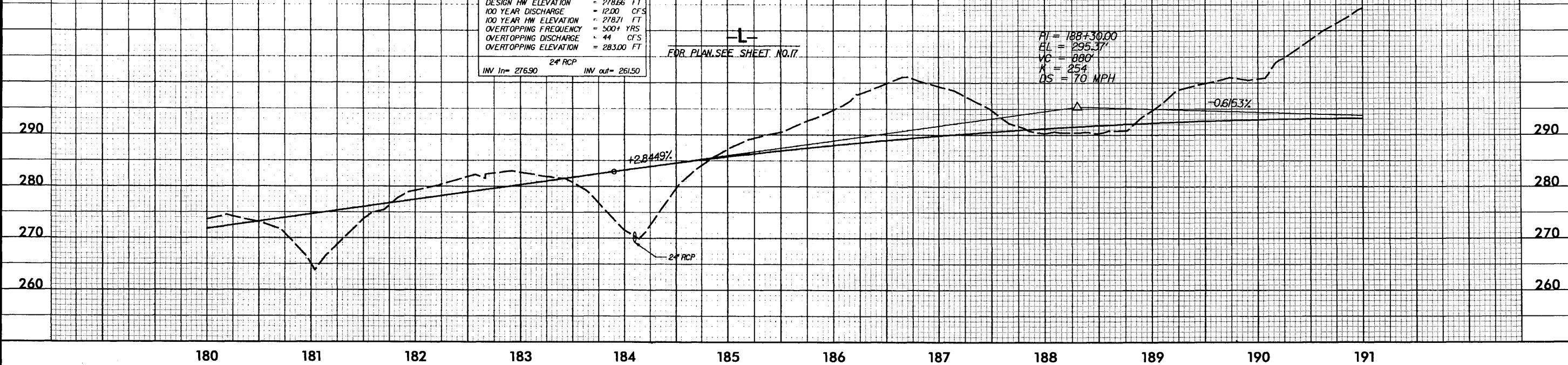
PIPE HYDRAULIC DATA
STA -L- 184+10

DRAINAGE AREA	= 2.90 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 1100 CFS
DESIGN HW ELEVATION	= 278.66 FT
100 YEAR DISCHARGE	= 1200 CFS
100 YEAR HW ELEVATION	= 278.71 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 44 CFS
OVERTOPPING ELEVATION	= 283.00 FT

24" RCP
INV In= 276.90 INV out= 261.50

-L-
FOR PLAN, SEE SHEET NO. 17

PI = 188+30.00
EI = 295.37'
VC = 880'
K = 254
DS = 70 MPH



BEGIN DITCH LT
STA 184+50
ELEV 277.88

END DITCH LT
STA 185+00
ELEV 284.10

36" RCP

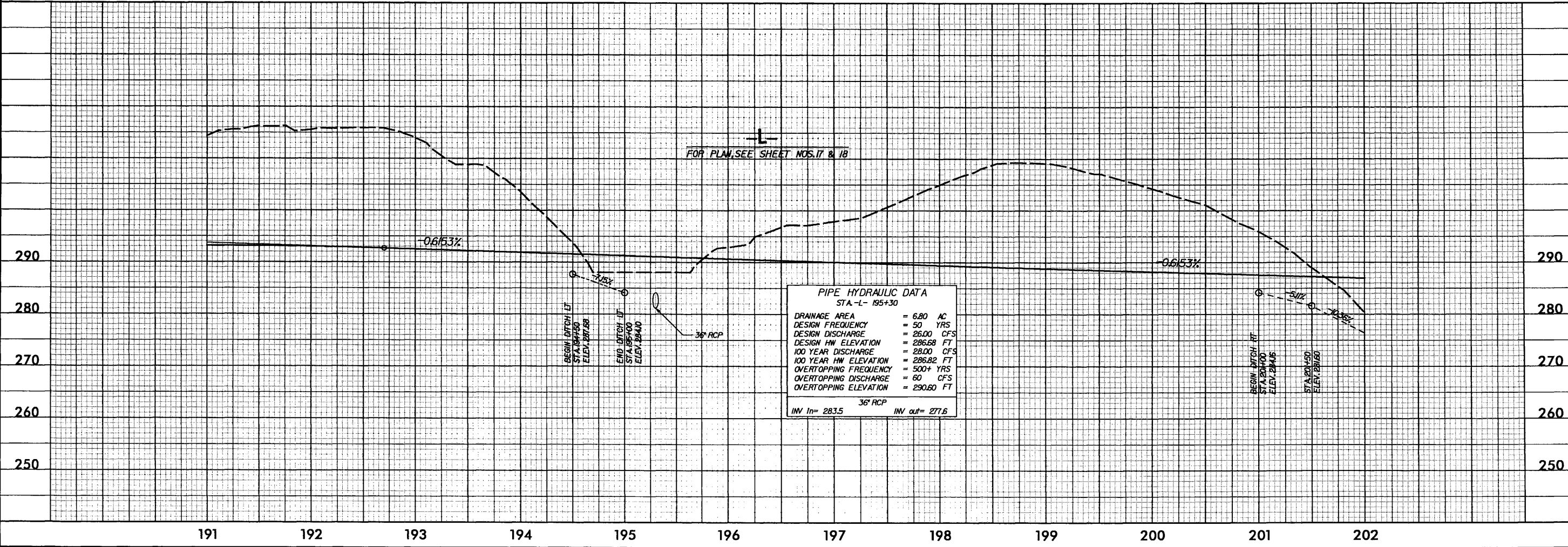
PIPE HYDRAULIC DATA
STA -L- 195+30

DRAINAGE AREA	= 6.80 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 2600 CFS
DESIGN HW ELEVATION	= 286.68 FT
100 YEAR DISCHARGE	= 2800 CFS
100 YEAR HW ELEVATION	= 286.82 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 60 CFS
OVERTOPPING ELEVATION	= 290.60 FT

36" RCP
INV In= 283.5 INV out= 277.6

BEGIN DITCH RT
STA 200+00
ELEV 284.6

STA 201+50
ELEV 281.60



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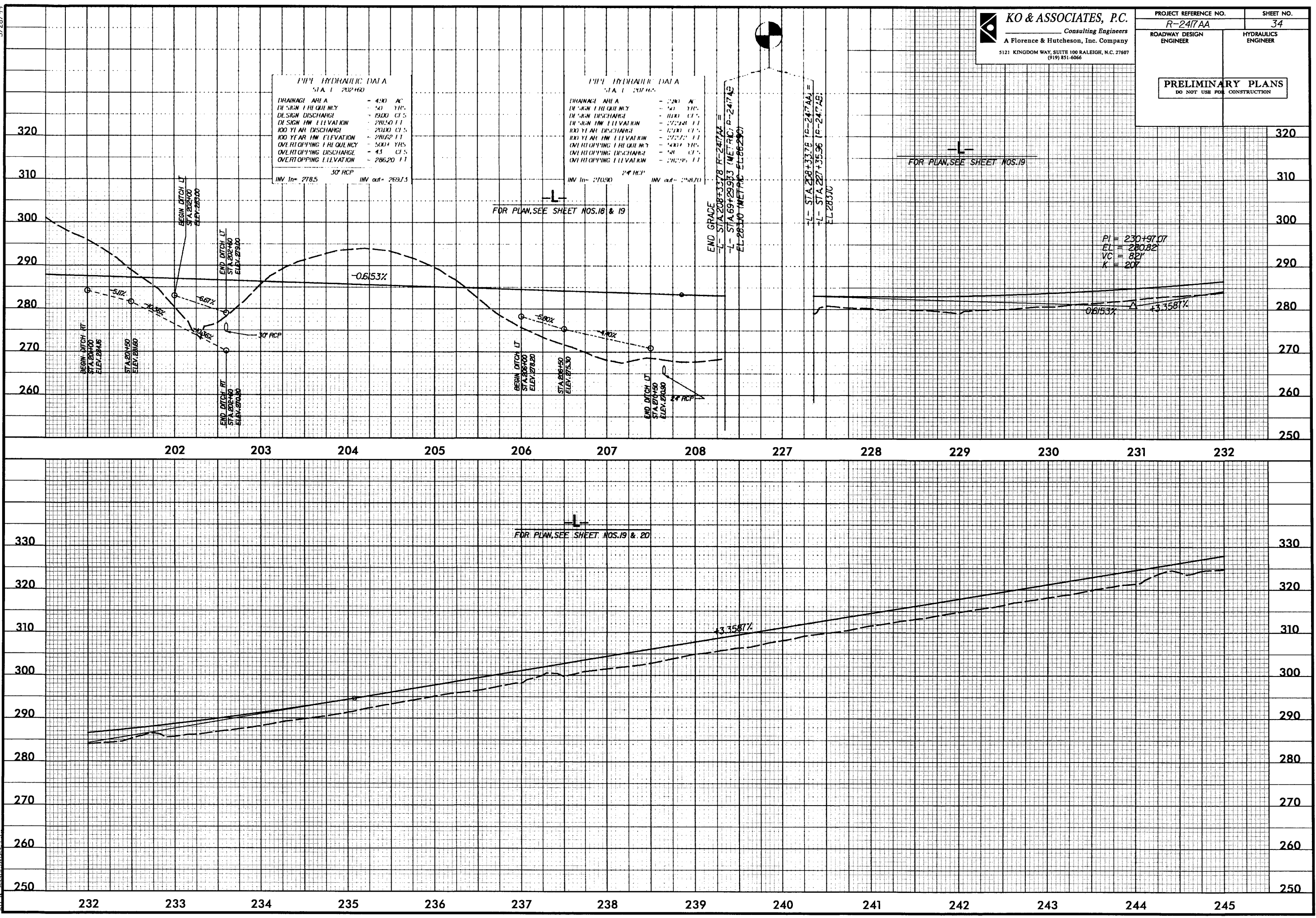
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PROJECT REFERENCE NO. R-2417AA		SHEET NO. 34
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		



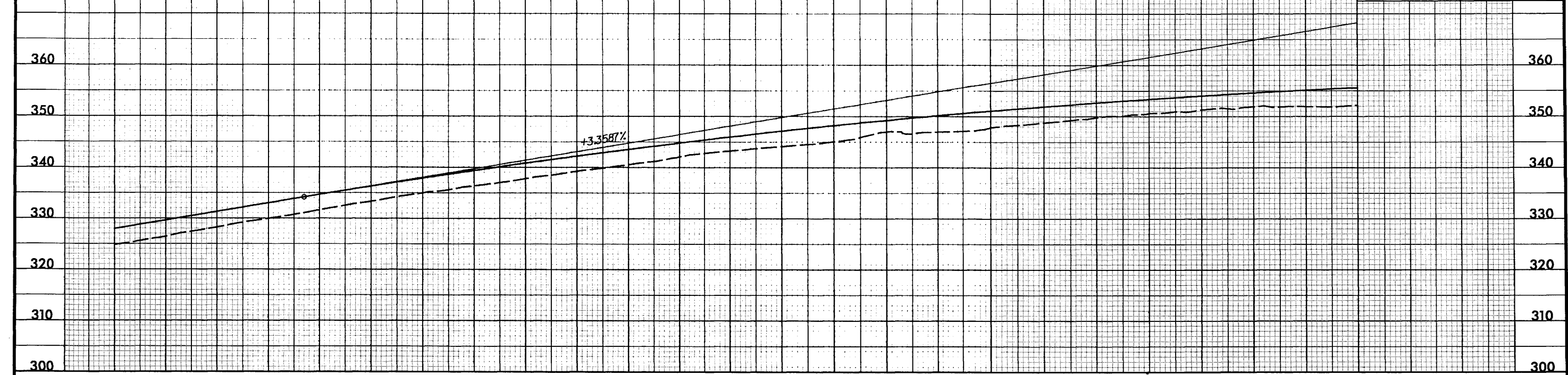
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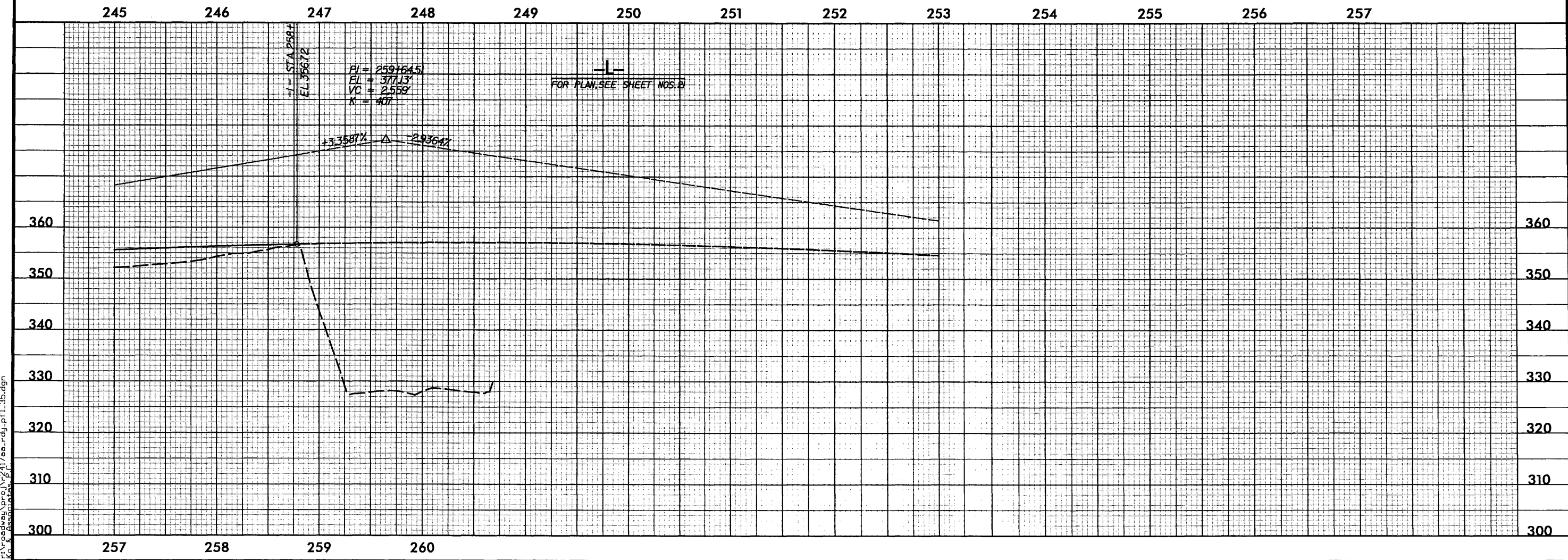
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PROJECT REFERENCE NO.		SHEET NO.
R-247AA		35
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		

FOR PLAN, SEE SHEET NOS. 20 & 21

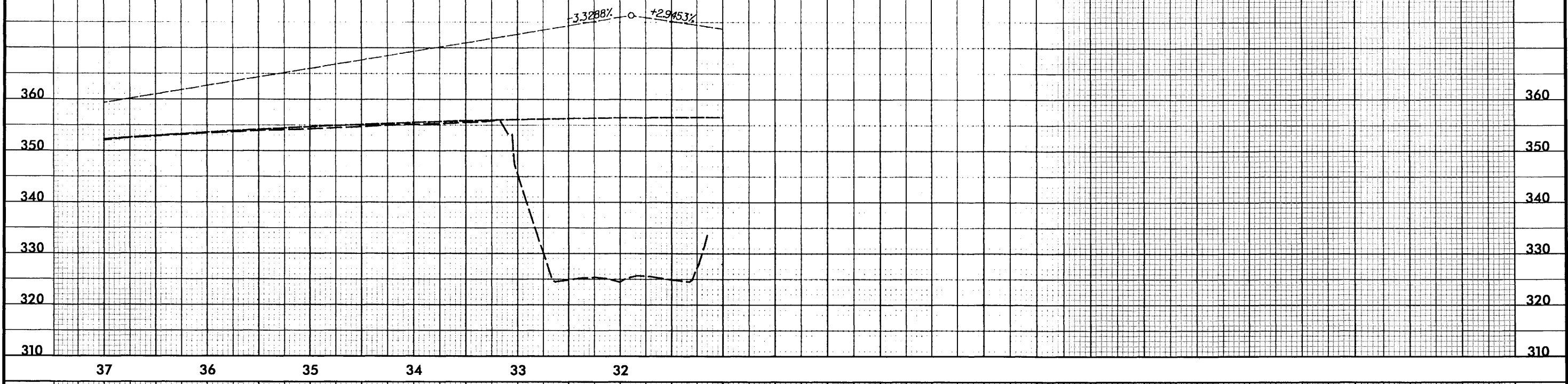


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-L1-
FOR PLAN, SEE SHEET NOS. 20

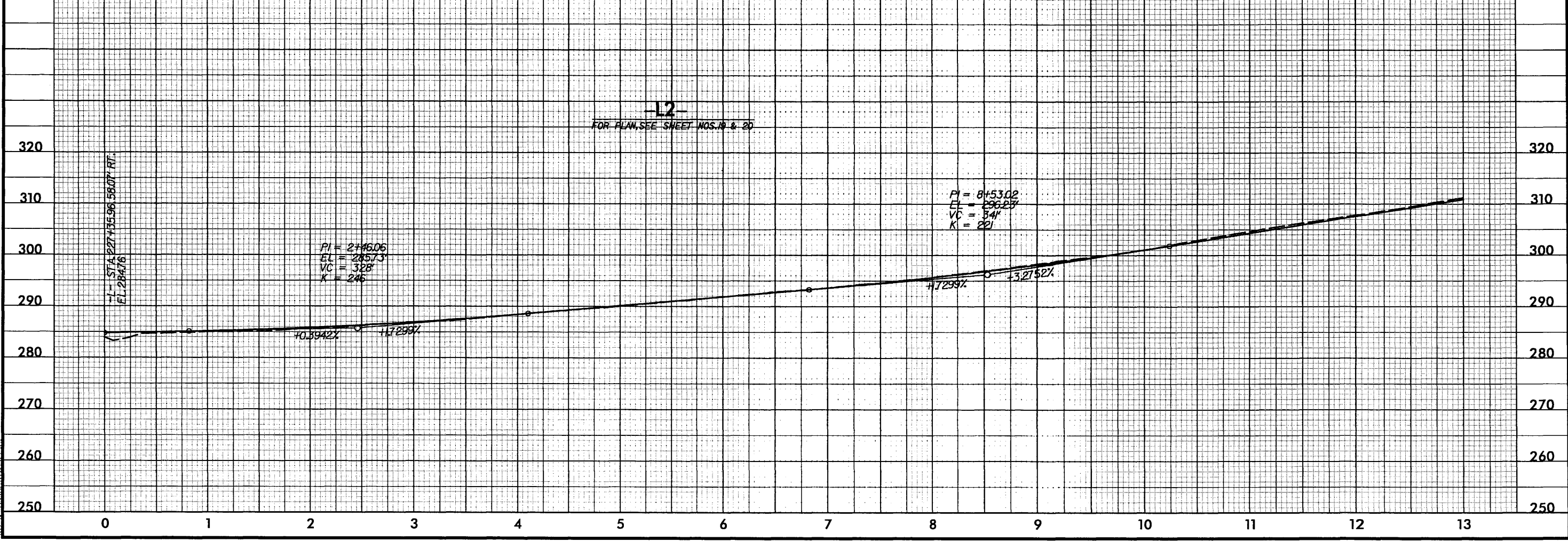
PI = 31+88.57
FI = 376.32
VC = 2533'
K = 404



-L2-
FOR PLAN, SEE SHEET NOS. 19 & 20

PI = 21+60.06
EI = 285.73
VC = 328'
K = 246

PI = 81+53.02
EI = 296.27
VC = 341'
K = 221



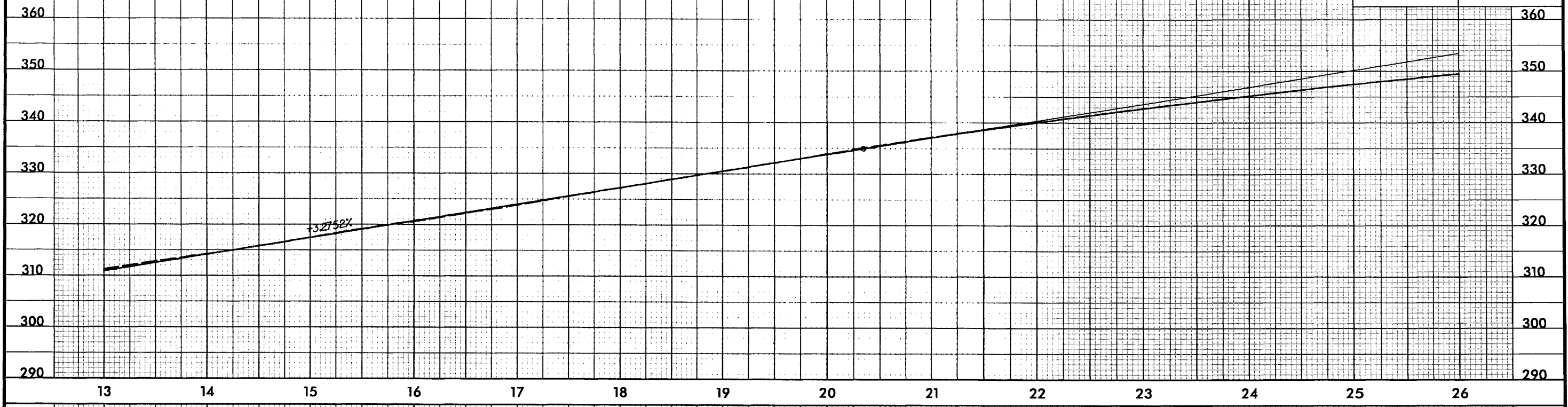
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PROJECT REFERENCE NO. <i>R-2417AA</i>		SHEET NO. <i>38</i>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		

-L2-
FOR PLAN, SEE SHEET NOS. 20 & 21



-L2-
FOR PLAN, SEE SHEET NOS. 21

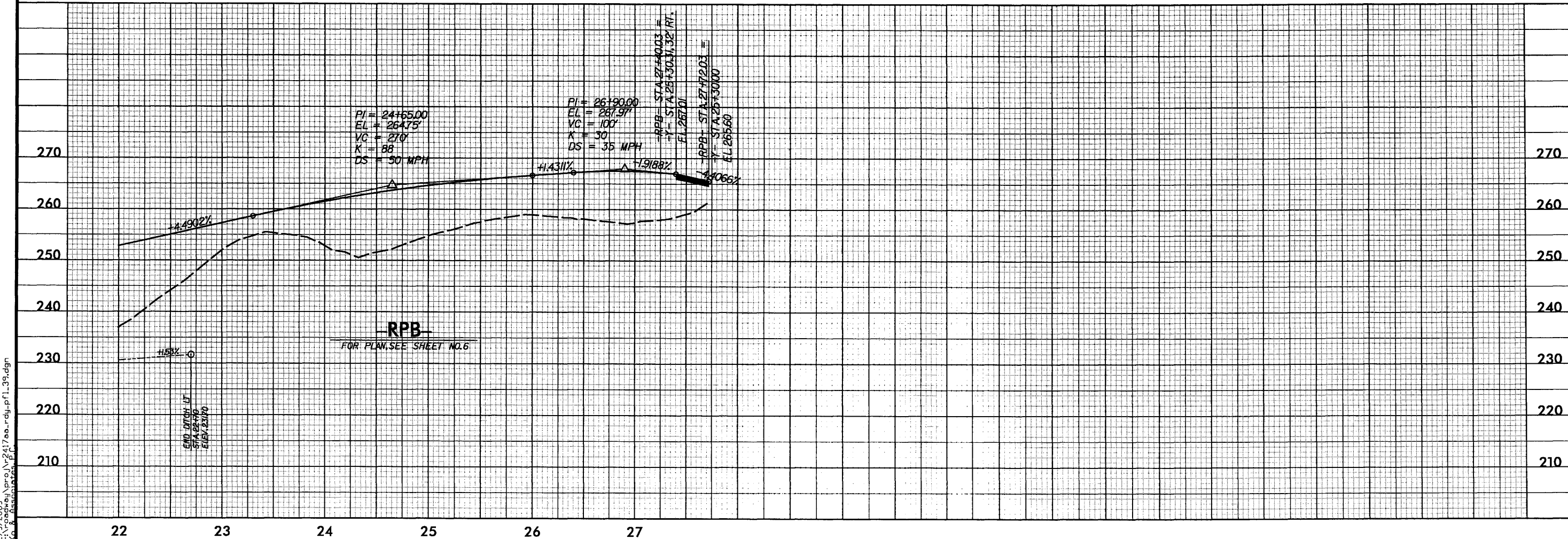
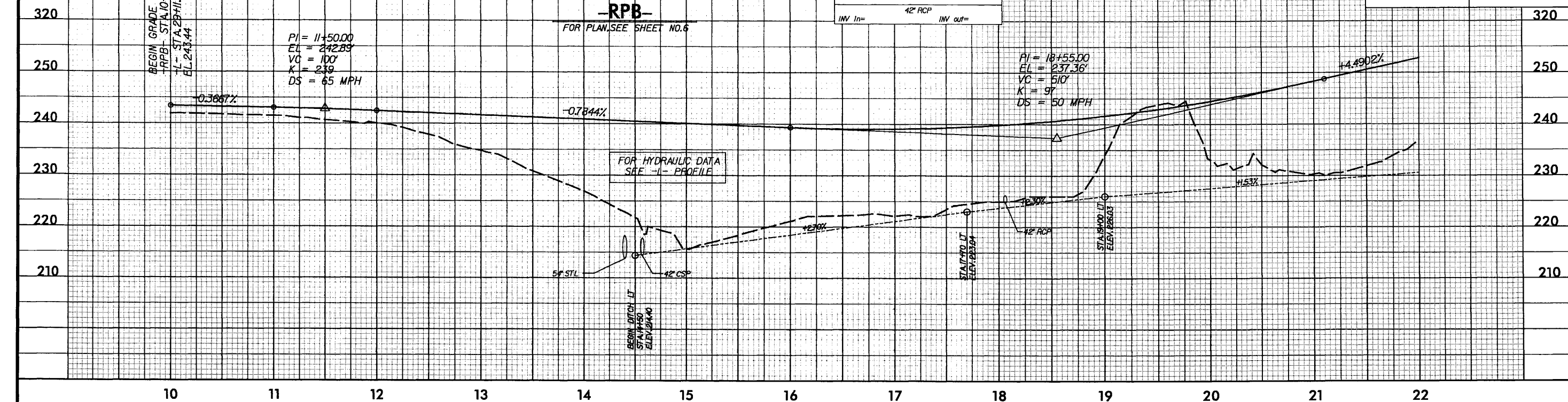
-L2- STA 28+89.21
ELEV 346.76

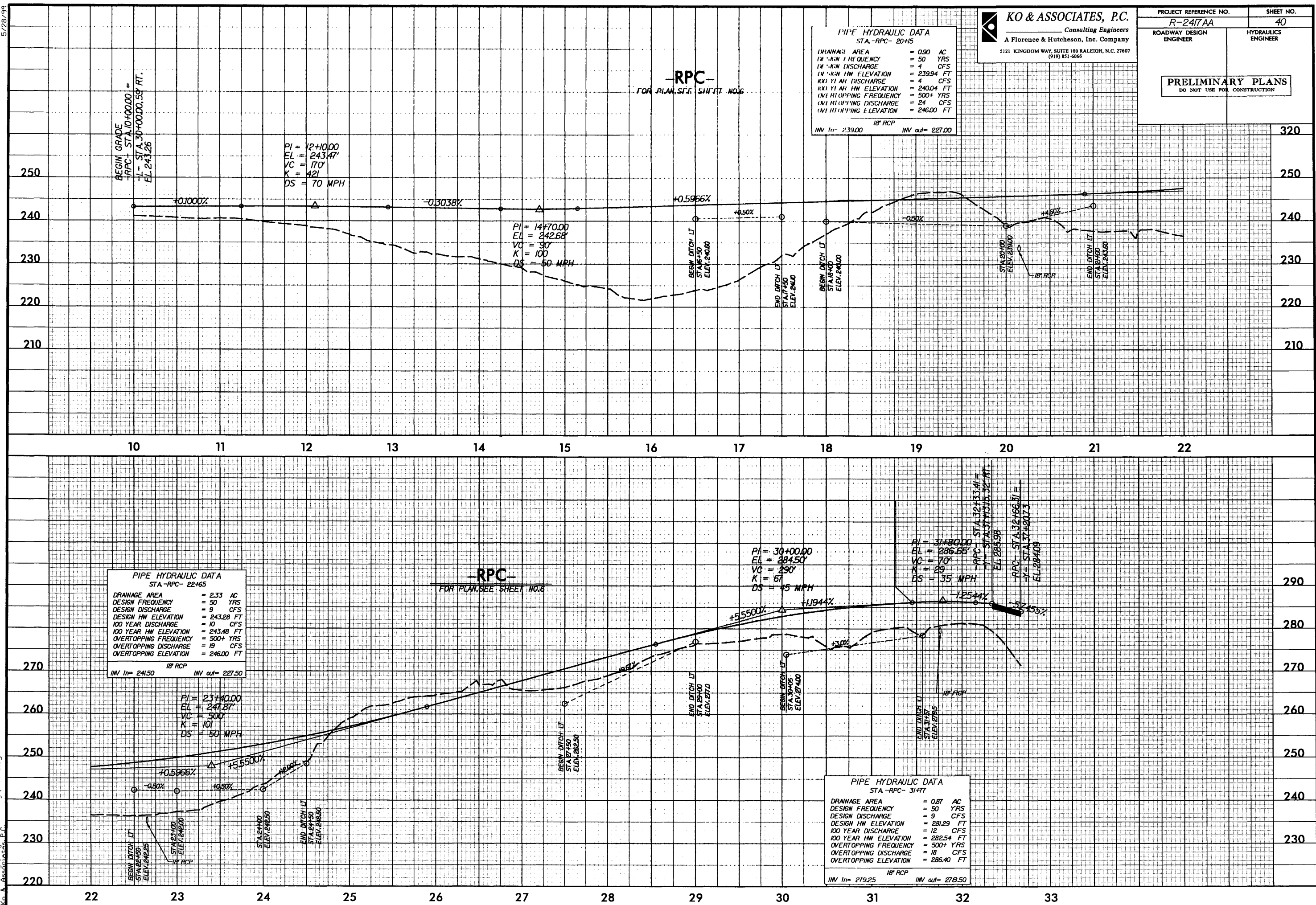
PI = 32+48.02
EL = 374.67'
VC = 214.28'
K = 399

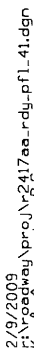
+3.2752% -2.8048%

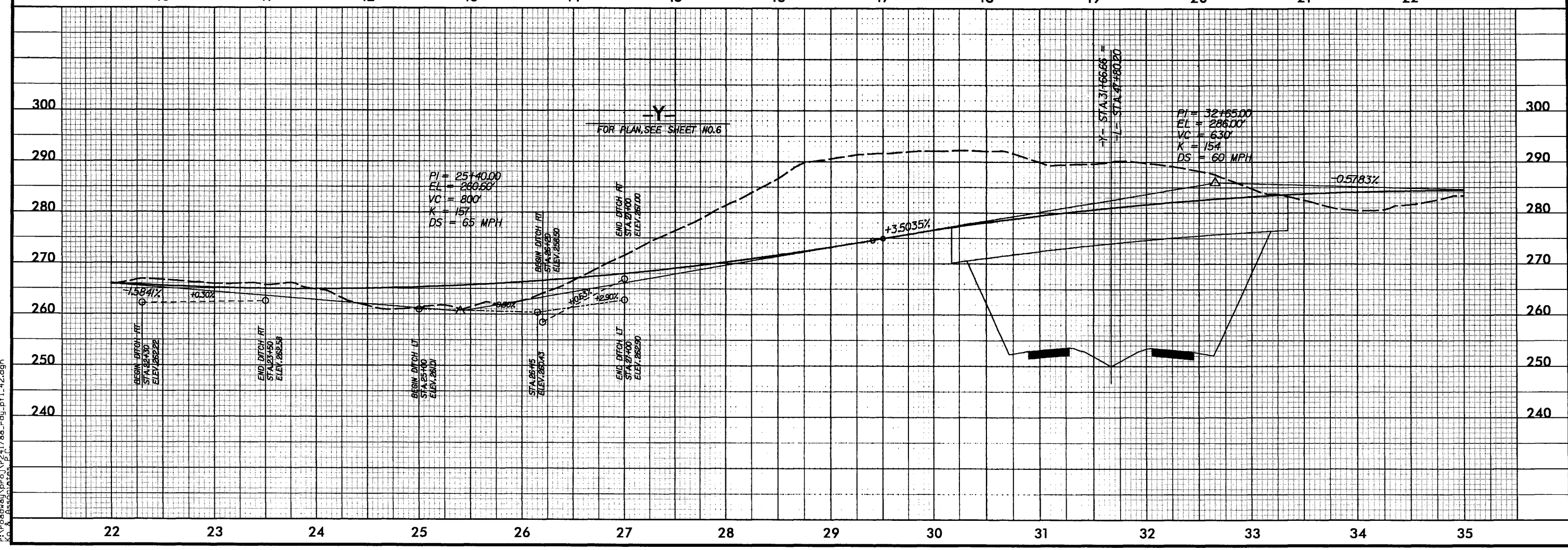
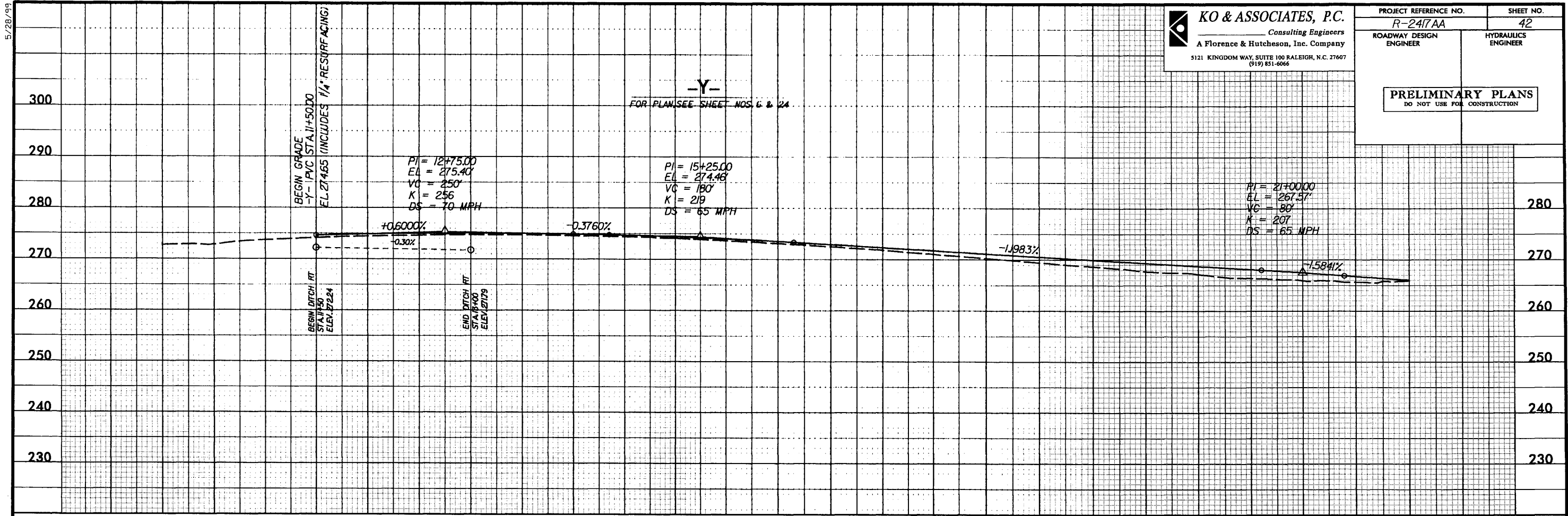


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PROJECT REFERENCE NO. R-2417AA		SHEET NO. 43
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	

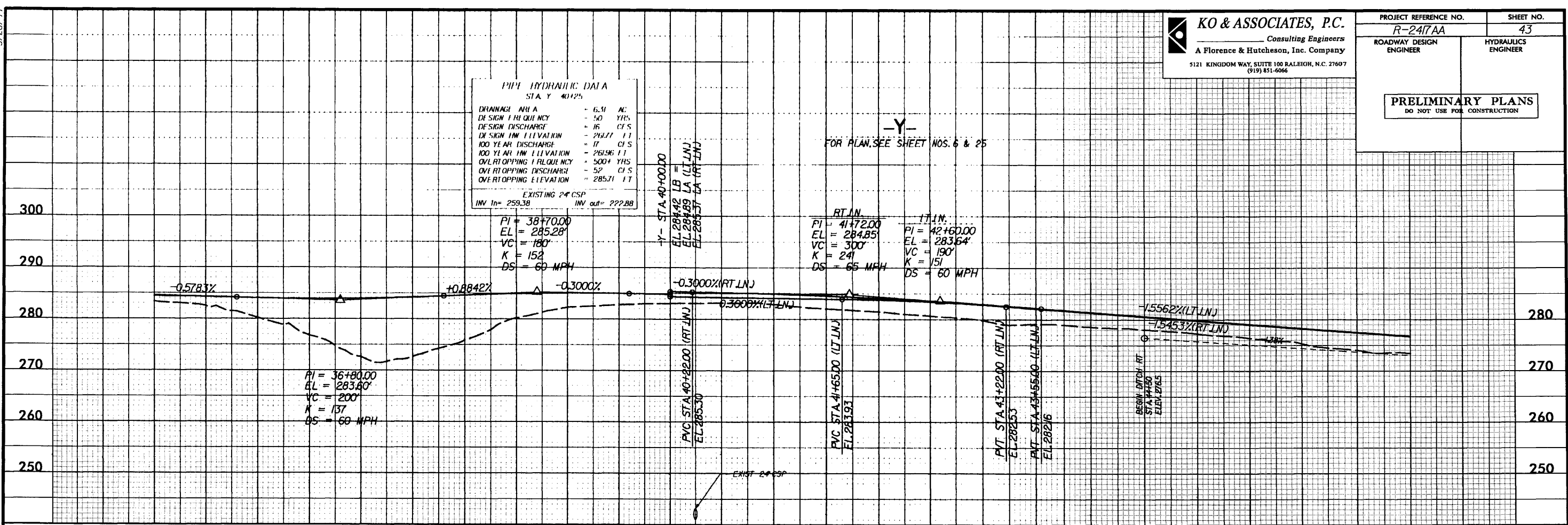
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PIPH HYDRAULIC DATA
STA. Y 40+25

DRAINAGE AREA	= 6.51 AC
DESIGN FREQUENCY	= 10 YRS
DESIGN DISCHARGE	= 16 CFS
DESIGN INW ELEVATION	= 264.77 FT
100 YEAR DISCHARGE	= 17 CFS
100 YEAR INW ELEVATION	= 261.96 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 52 CFS
OVERTOPPING ELEVATION	= 285.21 FT

EXISTING 2" CSP
INV In= 259.38 INV out= ???BB

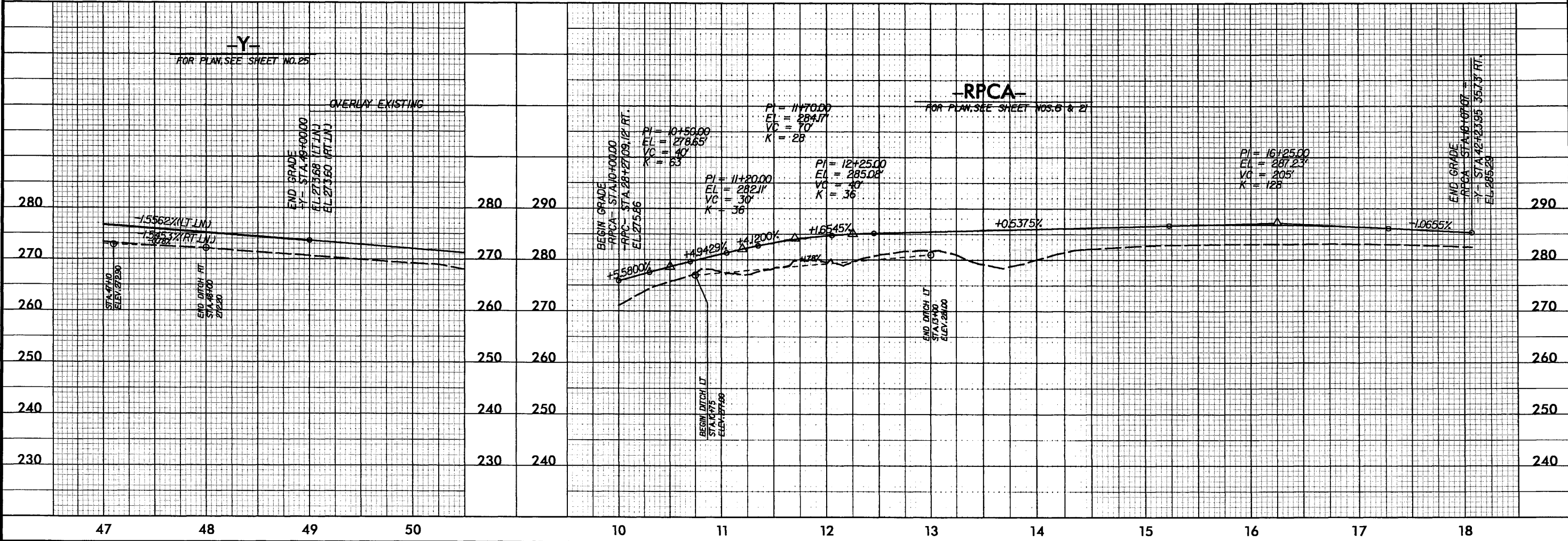
-Y-
FOR PLAN, SEE SHEET NOS. 6 & 25



-Y-
FOR PLAN, SEE SHEET NO. 25

OVERLAY EXISTING

-RPCA-
FOR PLAN, SEE SHEET NOS. 6 & 21

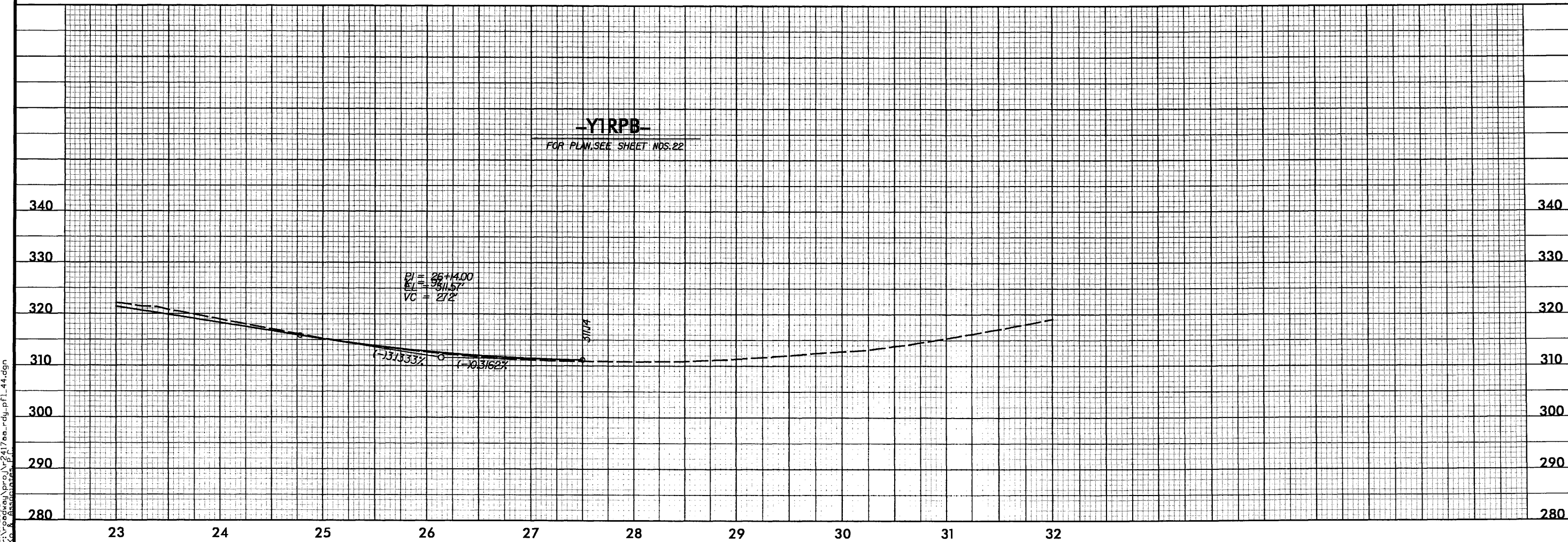
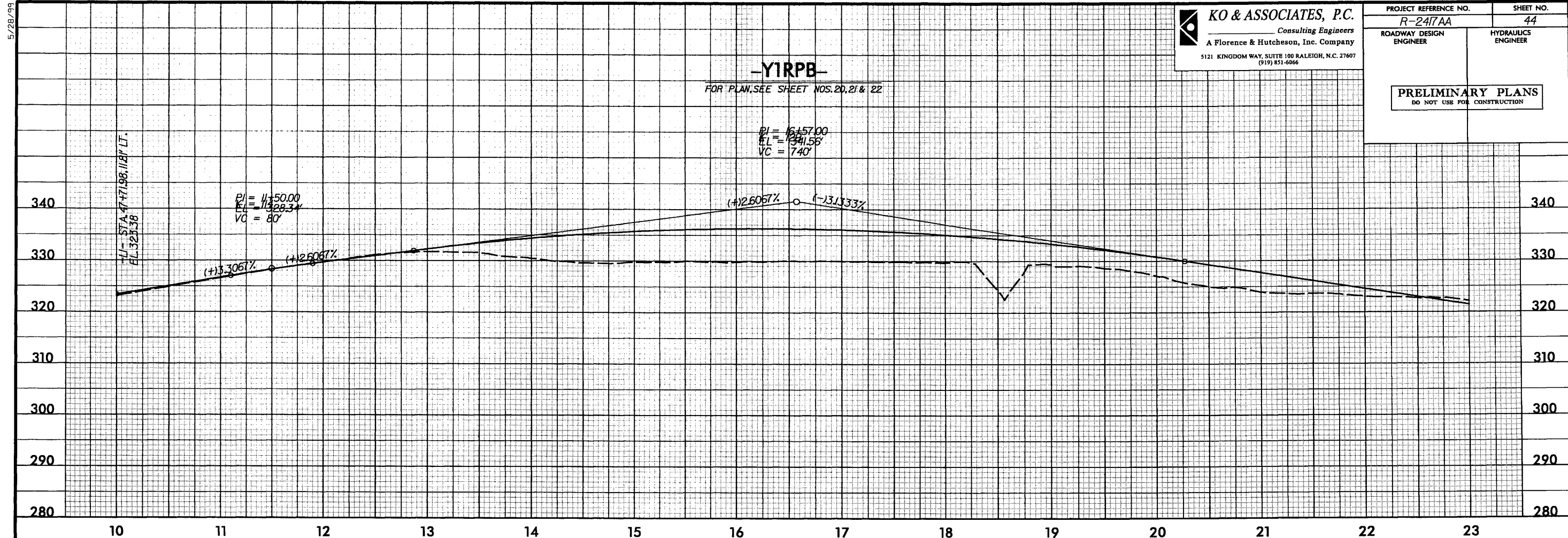


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PROJECT REFERENCE NO. <i>R-2417AA</i>		SHEET NO. <i>44</i>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		



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PROJECT REFERENCE NO. R-2417AA		SHEET NO. 45
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		

-Y1RPC-
FOR PLAN, SEE SHEET NOS. 20 & 21

PI = 9+84.25
EL = 345.80'
VC = 177.2'
K = 357

(+13.2228% (-11.7530%)

12- STA 14+05.33, 1481 FT.
EL 314.08

-Y1RPC-
FOR PLAN, SEE SHEET NOS. 21 & 23

PI = 21+52.54
EL = 325.90'
VC = 164'
K = 450

(-11.7380% (-12.0976%)

PI = 24+93.43
EL = 318.33'
VC = 312'
K = 263

(-12.0976% (-10.9108%)

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R-2417AA-RD-45.dgn

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PROJECT REFERENCE NO.

R-2417AA

SHEET NO.

46

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-YIRPC-
FOR PLAN, SEE SHEET NOS. 23

PI = 28+77.29
EL = 314.14
VC = 102'
K = 148

PI = 27+69.02
EL = 315.82
VC = 105'
K = 164

YIRPC - STA 28+87.13
EL 314.05

313.63

(-10.9108%)

(-11.5517%)

(-11.5517%)

(-10.8659%)

340

340

330

330

320

320

310

310

300

300

290

290