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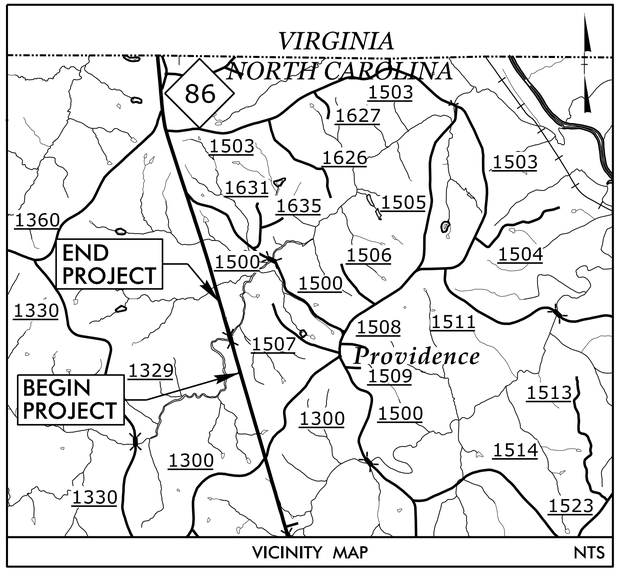
This file or an individual page shall not be considered a certified document.

09/08/99

TIP PROJECT: BR-0070

CONTRACT: C204769



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

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CASWELL COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0070	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
67070.1.1	N/A	PE
67070.2.1	N/A	RIGHT-OF-WAY
67070.2.1	N/A	UTILITIES
67070.3.1	N/A	CONSTRUCTION

LOCATION: ***REPLACE BRIDGE No. 160061 ON NC 86 OVER HOGAN'S CREEK***

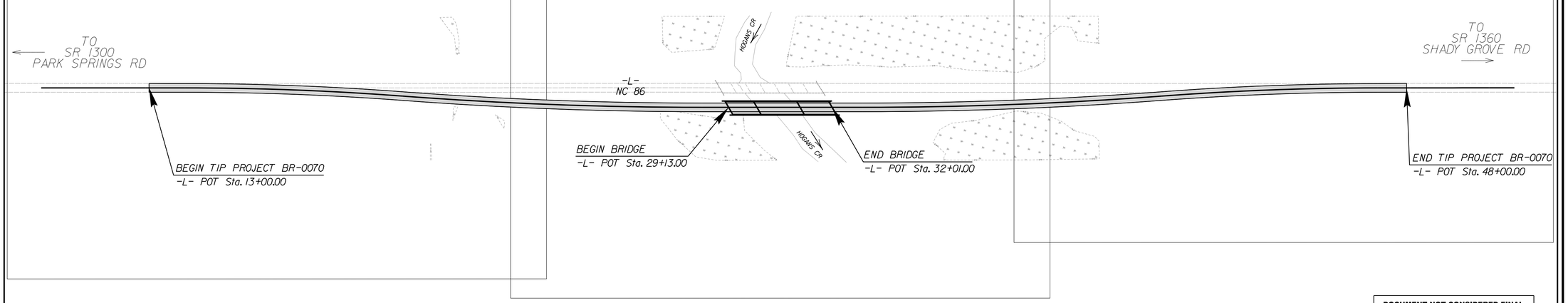
TYPE OF WORK: ***DRAINAGE, GRADING, PAVING, AND STRUCTURE***

NAD 83/NA 2011

4

5

6



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

PLANS: 50 25 0 50 100

PROFILE (HORIZONTAL): 50 25 0 50 100

PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

2023 ADT = 9,320 VPD
2043 ADT = 11,650 VPD
K = 9%
D = 55%
T = 6% *
V = 60 MPH
* (TTST 3% + DUAL 3%)
FUNC. CLASS. = MINOR ARTERIAL
REGIONAL TIER

PROJECT LENGTH

LENGTH OF ROADWAY TIP PROJECT BR-0070	=	0.608 mi.
LENGTH OF STRUCTURE TIP PROJECT BR-0070	=	0.055 mi.
TOTAL LENGTH TIP PROJECT BR-0070	=	0.663 mi.

Prepared in the Offices of:

STEWART
223 S. WEST ST, STE 1100
RALEIGH, NC 27603
T 919.380.8750
Firm License #: C-1051
www.stewartfirm.com

vhb
VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
JANUARY 18, 2022

LETTING DATE:
JANUARY 17, 2023

ANDY YOUNG, PE
PROJECT ENGINEER

MICHAEL BURNS, PE
PROJECT DESIGN ENGINEER

BRIAN KETNER, PE
NCDOT CONTACT

HYDRAULICS ENGINEER

10/26/2022

DocuSigned by:
Reid B. Robel
BE3E5A38E0B84F4...
P.E.

NORTH CAROLINA PROFESSIONAL SEAL 043870 ENGINEER REID B. ROBEL

SIGNATURE:

ROADWAY DESIGN ENGINEER

10/20/2022

DocuSigned by:
Michael S. Burns, Jr.
D425CBCC006F437...
P.E.

NORTH CAROLINA PROFESSIONAL SEAL 045230 ENGINEER MICHAEL S. BURNS JR

SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

9/28/2022
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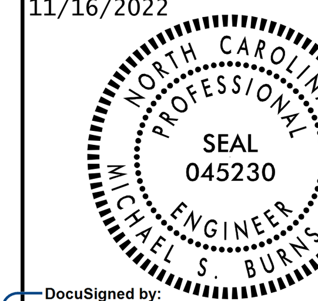
USER:dhowe

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	1A

ROADWAY DESIGN ENGINEER

11/16/2022



DocuSigned by:
Michael S. Burns, Jr.
D425C8CC006F437...

Firm License No. C-1051
223 S. West St,
Suite 1100
Raleigh, NC 27603
T 919.380.8750
www.stewartinc.com

STEWART

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INDEX OF SHEETS

EFF. 01-16-2018
REV.

2018 ROADWAY ENGLISH STANDARD DRAWINGS

The following Roadway Standards as appear in "Roadway Standard Drawings" Highway Design Branch - N. C. Department of Transportation - Raleigh, N. C., Dated January, 2018 are applicable to this project and by reference hereby are considered a part of these plans:

STD.NO.	TITLE
DIVISION 2 - EARTHWORK	
200.02	Method of Clearing - Method II
225.02	Guide for Grading Subgrade - Secondary and Local
225.04	Method of Obtaining Superelevation - Two Lane Pavement
235.01	Embankment Monitoring
240.01	Guide for Berm Ditch Construction
275.01	Rock Plating
DIVISION 3 - PIPE CULVERTS	
300.01	Method of Pipe Installation
DIVISION 4 - MAJOR STRUCTURES	
422.01	Bridge Approach Fills - Type I Standard Approach Fill
DIVISION 5 - SUBGRADE, BASES AND SHOULDERS	
560.01	Method of Shoulder Construction - High Side of Superelevated Curve - Method I
DIVISION 6 - ASPHALT BASES AND PAVEMENTS	
654.01	Pavement Repairs
DIVISION 8 - INCIDENTALS	
815.02	Subsurface Drain
838.01	Concrete Endwall for Single and Double Pipe Culverts - 15" thru 48" Pipe 90 Skew
838.11	Brick Endwall for Single and Double Pipe Culverts - 15" thru 48" Pipe 90 Skew
840.00	Concrete Base Pad for Drainage Structures
840.17	Concrete Grated Drop Inlet Type 'A' - 12" thru 72" Pipe
840.18	Concrete Grated Drop Inlet Type 'B' - 12" thru 36" Pipe
840.24	Frames and Narrow Slot Sag Grates
840.25	Anchorage for Frames - Brick or Concrete or Precast
840.26	Brick Grated Drop Inlet Type 'A' - 12" thru 72" Pipe
840.27	Brick Grated Drop Inlet Type 'B' - 12" thru 36" Pipe
840.29	Frames and Narrow Slot Flat Grates
840.31	Concrete Junction Box - 12" thru 66" Pipe
840.32	Brick Junction Box - 12" thru 66" Pipe
840.45	Precast Drainage Structure
840.54	Manhole Frame and Cover
840.66	Drainage Structure Steps
840.72	Pipe Collar
846.01	Concrete Curb, Gutter and Curb & Gutter
850.01	Concrete Paved Ditches
850.10	Guide for Berm Drainage Outlet - 15" and 18" Pipe
862.01	Guardrail Placement
862.02	Guardrail Installation (Special Detail in lieu of Sheet 6 of 8)
862.03	Structure Anchor Units (Special Detail in lieu of Sheet 1 of 7 and Sheet 2 of 7)
876.02	Guide For Rip Rap At Pipe Outlets
876.04	Drainage Ditches With Class 'B' Rip Rap

GENERAL NOTES:

2018 SPECIFICATIONS
EFFECTIVE: 01-16-2018
REVISED:

GRADE LINE:
GRADING AND SURFACING:

THE GRADE LINES SHOWN DENOTE THE FINISHED ELEVATION OF THE PROPOSED SURFACING AT GRADE POINTS SHOWN ON THE TYPICAL SECTIONS. GRADE LINES MAY BE ADJUSTED AT THEIR BEGINNING AND ENDING AND AT STRUCTURES AS DIRECTED BY THE ENGINEER IN ORDER TO SECURE A PROPER TIE-IN.

CLEARING:

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

SUPERELEVATION:

ALL CURVES ON THIS PROJECT SHALL BE SUPERELEVATED IN ACCORDANCE WITH STD. NO. 225.04 USING THE RATE OF SUPERELEVATION AND RUNOFF SHOWN ON THE PLANS. SUPERELEVATION IS TO BE REVOLVED ABOUT THE GRADE POINTS SHOWN ON THE TYPICAL SECTIONS.

SHOULDER CONSTRUCTION:

ASPHALT, EARTH, AND CONCRETE SHOULDER CONSTRUCTION ON THE HIGH SIDE OF SUPERELEVATED CURVES SHALL BE IN ACCORDANCE WITH STD. NO. 560.01

BERM DITCHES:

BERM DITCHES SHALL BE CONSTRUCTED IN ACCORDANCE WITH STD. NO. 240.01 AT LOCATIONS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

SUBSURFACE DRAINS:

SUBSURFACE DRAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STD. NO. 815.02 AT LOCATIONS DIRECTED BY THE ENGINEER.

GUARDRAIL:

THE GUARDRAIL LOCATIONS SHOWN ON THE PLANS MAY BE ADJUSTED DURING CONSTRUCTION AS DIRECTED BY THE ENGINEER. THE CONTRACTOR SHOULD CONSULT WITH THE ENGINEER PRIOR TO ORDERING GUARDRAIL MATERIAL.

TEMPORARY SHORING:

SHORING REQUIRED FOR THE MAINTENANCE OF TRAFFIC WILL BE PAID FOR AS "EXTRA WORK" IN ACCORDANCE WITH SECTION 104-7.

END BENTS:

THE ENGINEER SHALL CHECK THE STRUCTURE END BENT PLANS, DETAILS, AND CROSS-SECTION PRIOR TO SETTING OF THE SLOPE STAKES FOR THE EMBANKMENT OR EXCAVATION APPROACHING A BRIDGE.

UTILITIES:

UTILITY OWNERS ON THIS PROJECT ARE

Lumen - Telecommunications

ANY RELOCATION OF EXISTING UTILITIES WILL BE ACCOMPLISHED BY OTHERS.

RIGHT-OF-WAY MARKERS:

ALL RIGHT-OF-WAY MARKERS ON THIS PROJECT SHALL BE PLACED BY OTHERS.

11/16/2022
...\BR0070_RDY_PSH01A.dgn

9/10/2021

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	1B

STATE OF NORTH CAROLINA, DIVISION OF HIGHWAYS

CONVENTIONAL PLAN SHEET SYMBOLS

Note: Not to Scale

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin (EIP) — EIP
- Computed Property Corner
- Existing Concrete Monument (ECM) — ECM
- Parcel/Sequence Number — 123
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary — WLB
- Proposed Wetland Boundary — WLB
- Existing Endangered Animal Boundary — EAB
- Existing Endangered Plant Boundary — EPB
- Existing Historic Property Boundary — HPB
- Known Contamination Area: Soil — S
- Potential Contamination Area: Soil — S
- Known Contamination Area: Water — W
- Potential Contamination Area: Water — W
- Contaminated Site: Known or Potential

BUILDINGS AND OTHER CULTURE:

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

HYDROLOGY:

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

RAILROADS:

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

RIGHT OF WAY & PROJECT CONTROL:

- Primary Horiz Control Point
- Primary Horiz and Vert Control Point
- Secondary Horiz and Vert Control Point
- Vertical Benchmark
- Existing Right of Way Monument
- Proposed Right of Way Monument (Rebar and Cap)
- Proposed Right of Way Monument (Concrete)
- Existing Permanent Easement Monument
- Proposed Permanent Easement Monument (Rebar and Cap)
- Existing C/A Monument
- Proposed C/A Monument (Rebar and Cap)
- Proposed C/A Monument (Concrete)
- Existing Right of Way Line
- Proposed Right of Way Line — RW
- Existing Control of Access Line — CA
- Proposed Control of Access Line — CA
- Proposed ROW and CA Line — RW CA
- Existing Easement Line — E
- Proposed Temporary Construction Easement — E
- Proposed Temporary Drainage Easement — TDE
- Proposed Permanent Drainage Easement — PDE
- Proposed Permanent Drainage/Utility Easement — DUE
- Proposed Permanent Utility Easement — PUE
- Proposed Temporary Utility Easement — TUE
- Proposed Aerial Utility Easement — AUE

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut — C
- Proposed Slope Stakes Fill — F
- Proposed Curb Ramp — CR
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

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

EXISTING STRUCTURES:

MAJOR:

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

MINOR:

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

UTILITIES:

** SUE – Subsurface Utility Engineering*
LOS – Level of Service – A,B,C or D (Accuracy)

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole — P
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole — HH
- H–Frame Pole
- U/G Power Line Test Hole (SUE – LOS A)*
- U/G Power Line (SUE – LOS B)* — P
- U/G Power Line (SUE – LOS C)* — P
- U/G Power Line (SUE – LOS D)* — P

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole — T
- Telephone Pedestal — T
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole — HH
- U/G Telephone Test Hole (SUE – LOS A)*
- U/G Telephone Cable (SUE – LOS B)* — T
- U/G Telephone Cable (SUE – LOS C)* — T
- U/G Telephone Cable (SUE – LOS D)* — T
- U/G Telephone Conduit (SUE – LOS B)* — TC
- U/G Telephone Conduit (SUE – LOS C)* — TC
- U/G Telephone Conduit (SUE – LOS D)* — TC
- U/G Fiber Optics Cable (SUE – LOS B)* — T FO
- U/G Fiber Optics Cable (SUE – LOS C)* — T FO
- U/G Fiber Optics Cable (SUE – LOS D)* — T FO

WATER:

- Water Manhole — W
- Water Meter
- Water Valve
- Water Hydrant
- U/G Water Line Test Hole (SUE – LOS A)*
- U/G Water Line (SUE – LOS B)* — W
- U/G Water Line (SUE – LOS C)* — W
- U/G Water Line (SUE – LOS D)* — W
- Above Ground Water Line — A/G Water

TV:

- TV Pedestal — C
- TV Tower
- U/G TV Cable Hand Hole — HH
- U/G TV Test Hole (SUE – LOS A)*
- U/G TV Cable (SUE – LOS B)* — TV
- U/G TV Cable (SUE – LOS C)* — TV
- U/G TV Cable (SUE – LOS D)* — TV
- U/G Fiber Optic Cable (SUE – LOS B)* — TV FO
- U/G Fiber Optic Cable (SUE – LOS C)* — TV FO
- U/G Fiber Optic Cable (SUE – LOS D)* — TV FO

GAS:

- Gas Valve
- Gas Meter
- U/G Gas Line Test Hole (SUE – LOS A)*
- U/G Gas Line (SUE – LOS B)* — G
- U/G Gas Line (SUE – LOS C)* — G
- U/G Gas Line (SUE – LOS D)* — 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
- SS Force Main Line Test Hole (SUE – LOS A)*
- SS Force Main Line (SUE – LOS B)* — FSS
- SS Force Main Line (SUE – LOS C)* — FSS
- SS Force Main Line (SUE – LOS D)* — FSS

MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box — S
- Utility Unknown U/G Line (SUE – LOS B)* — ?UTL
- U/G Tank; Water, Gas, Oil
- Underground Storage Tank, Approx. Loc. — UST
- A/G Tank; Water, Gas, Oil
- Geoenvironmental Boring
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	2A-I

ROADWAY DESIGN ENGINEER 10/20/2022 — SEAL 045230 — NORTH CAROLINA PROFESSIONAL ENGINEER — MICHAEL S. BURNS, JR. — Michael S. Burns, Jr.

PAVEMENT DESIGN ENGINEER 10/21/2022 — SEAL 022896 — NORTH CAROLINA PROFESSIONAL ENGINEER — CLARK S. MORRISON — Clark S. Morrison

STEWART

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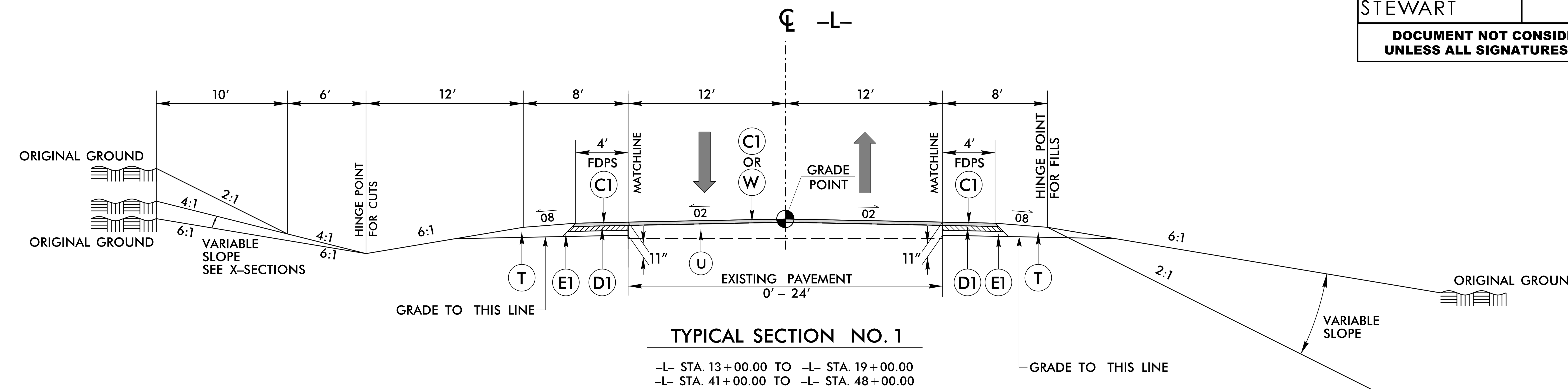
PAVEMENT SCHEDULE

(FINAL PAVEMENT DESIGN)

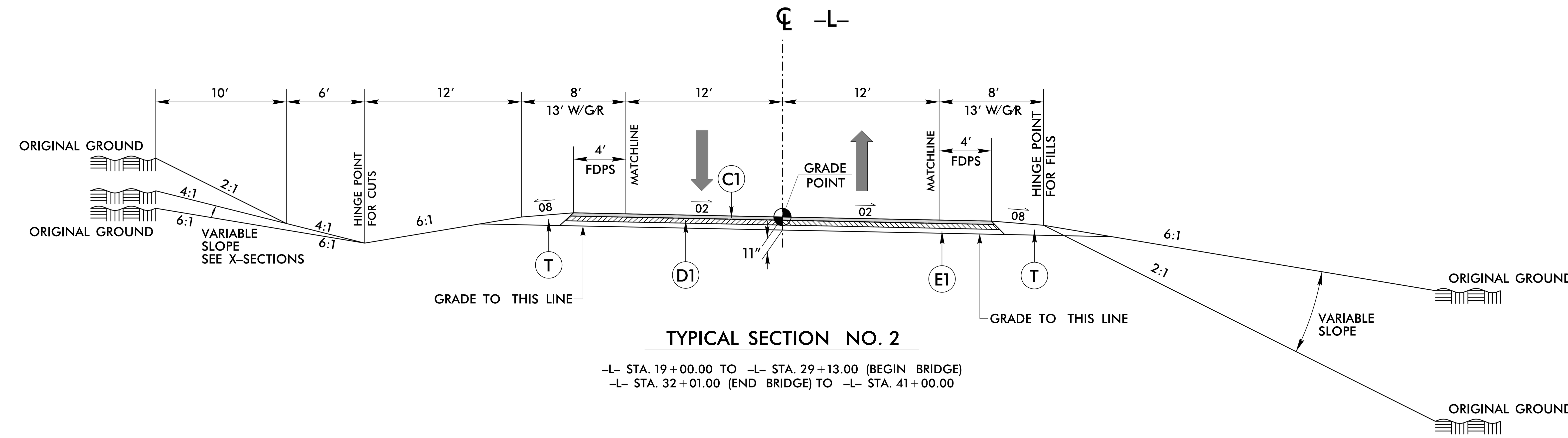
C1	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 165 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.
C2	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 110 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT TO EXCEED 1½" IN DEPTH.
D1	PROP. APPROX. 4" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.
D2	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 2½" IN DEPTH OR GREATER THAN 4" IN DEPTH.
E1	PROP. APPROX. 4" ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.
E2	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 4" IN DEPTH OR GREATER THAN 5½" IN DEPTH.
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
W	VARIABLE DEPTH ASPHALT PAVEMENT (SEE STANDARD WEDGING DETAIL).

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



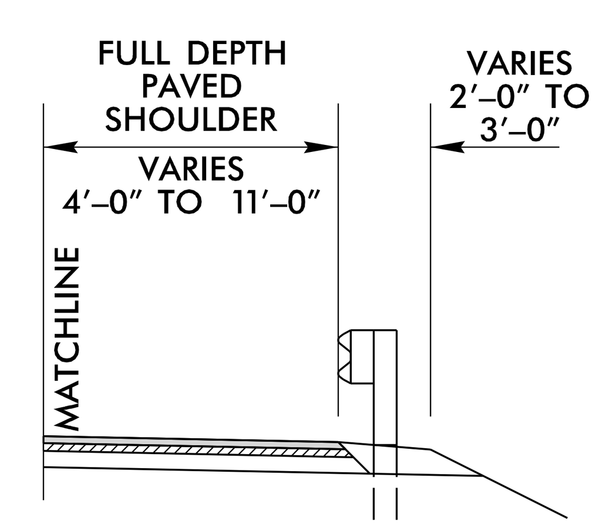
TYPICAL SECTION NO. 1

-L- STA. 13+00.00 TO -L- STA. 19+00.00
-L- STA. 41+00.00 TO -L- STA. 48+00.00

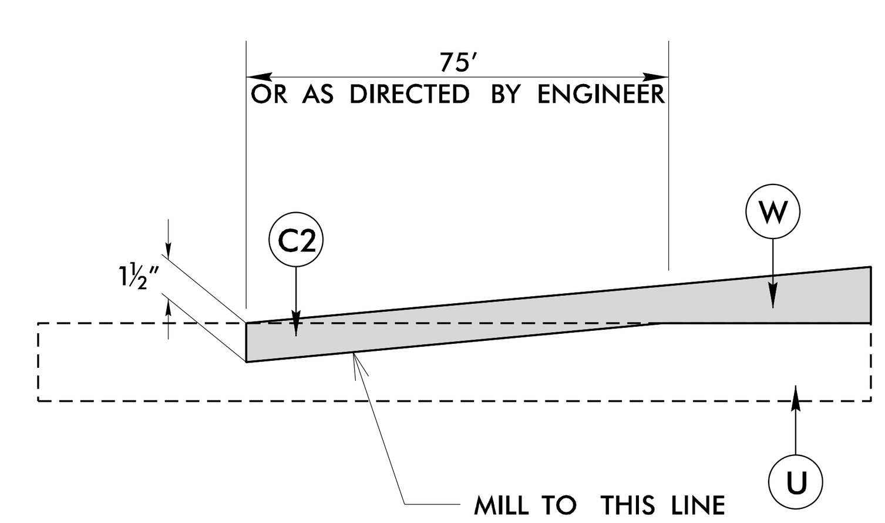


TYPICAL SECTION NO. 2

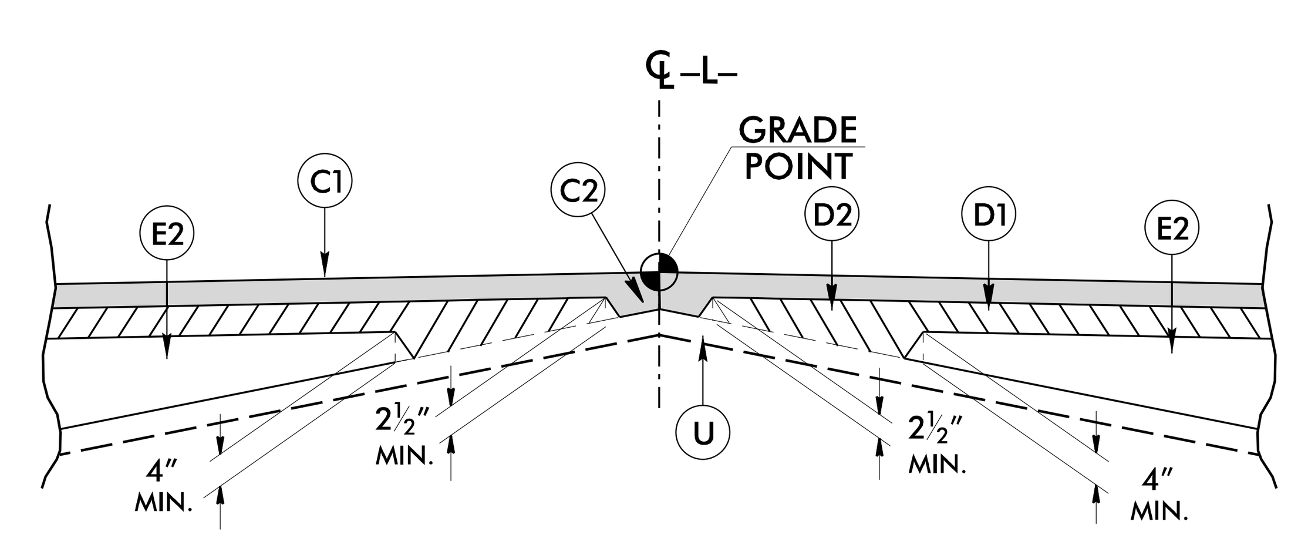
-L- STA. 19+00.00 TO -L- STA. 29+13.00 (BEGIN BRIDGE)
-L- STA. 32+01.00 (END BRIDGE) TO -L- STA. 41+00.00



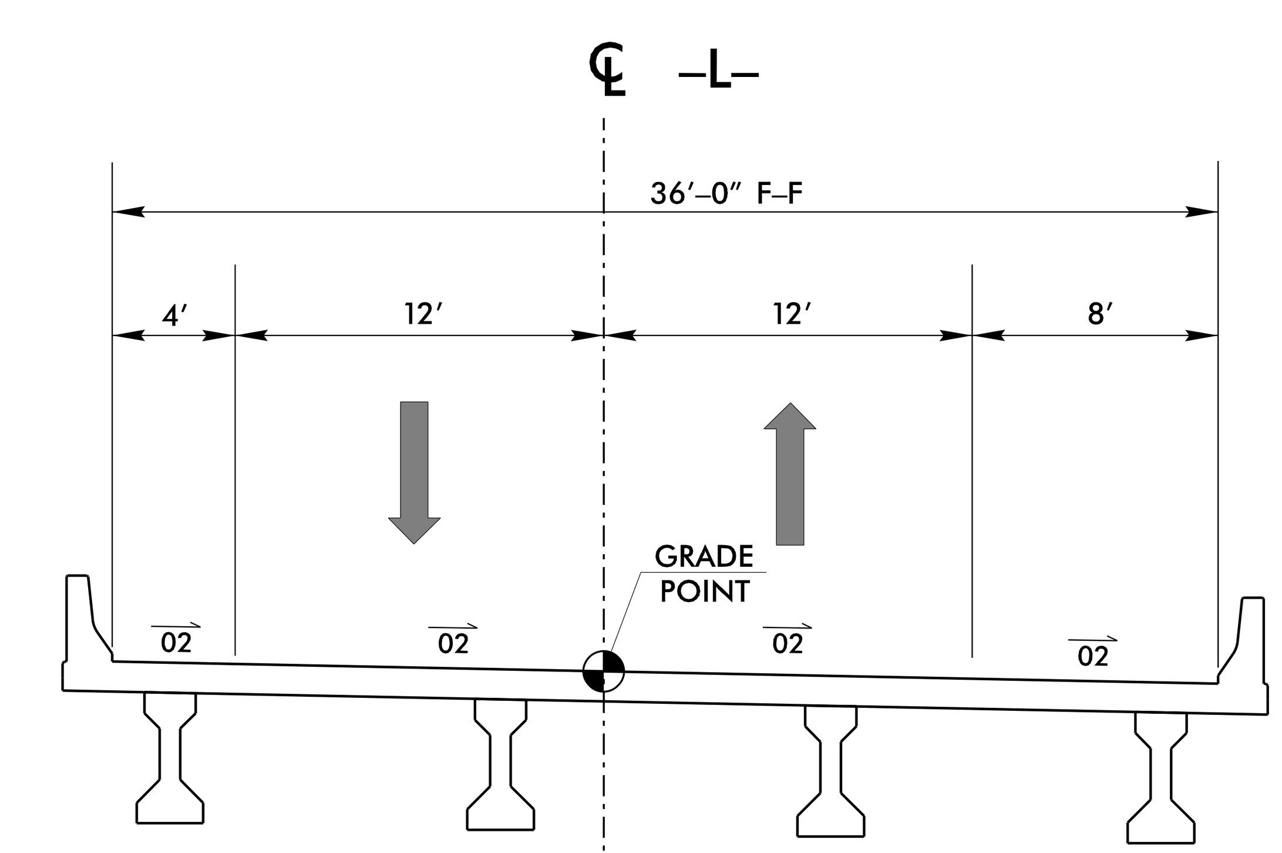
DETAIL SHOWING PAVING TO THE FACE OF GUARDRAIL



DETAIL SHOWING INCIDENTAL MILLING



DETAIL SHOWING METHOD OF WEDGING



TYPICAL SECTION NO. 3

-L- STA. 29+13.00 TO -L- STA. 32+01.00
63" CONCRETE GIRDER

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	2C-1

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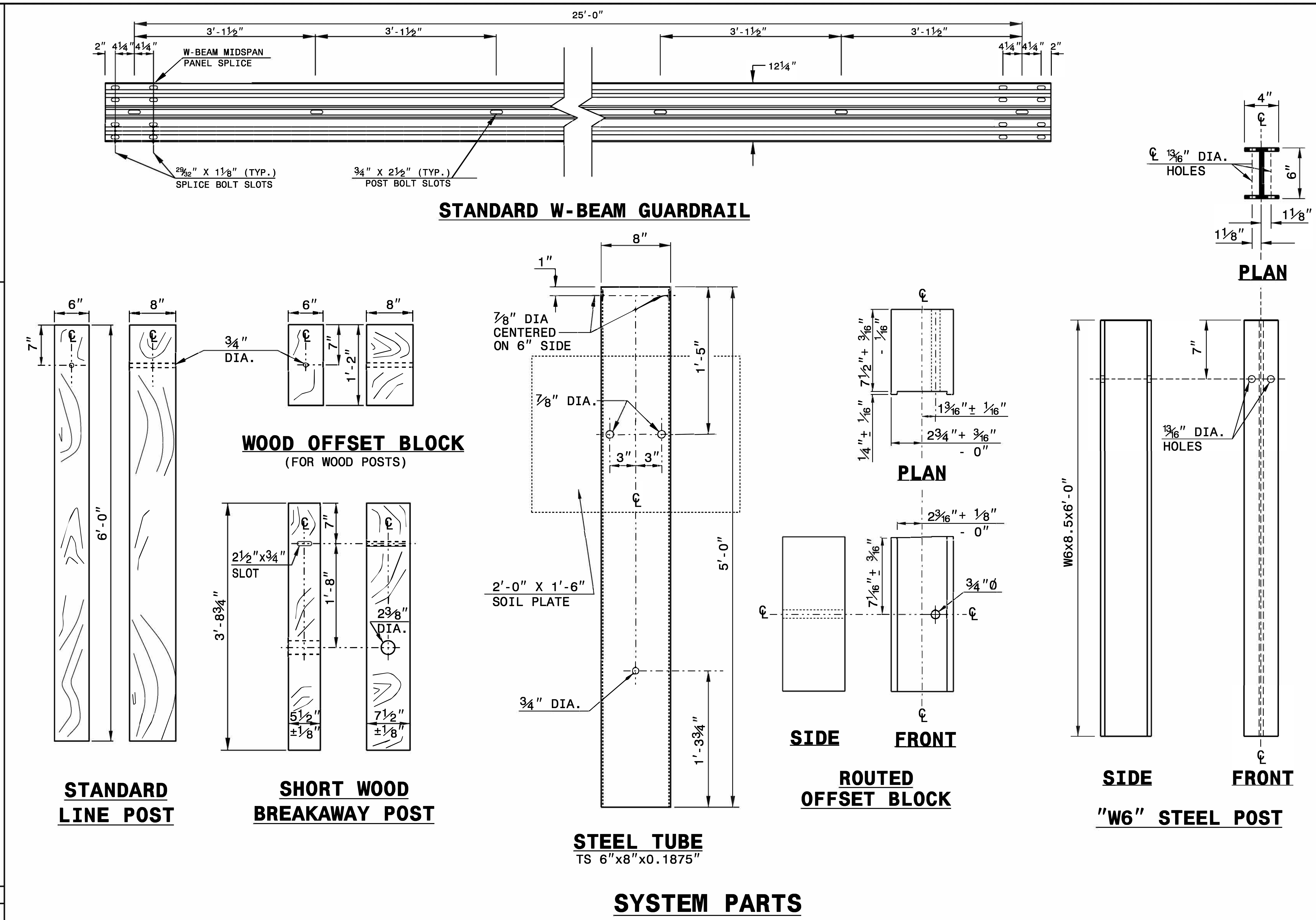
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION



STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 6 OF 8

862D02

SHEET 6 OF 8

862D02

10/20/2022

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 33144 NICOLE M. HECKLER

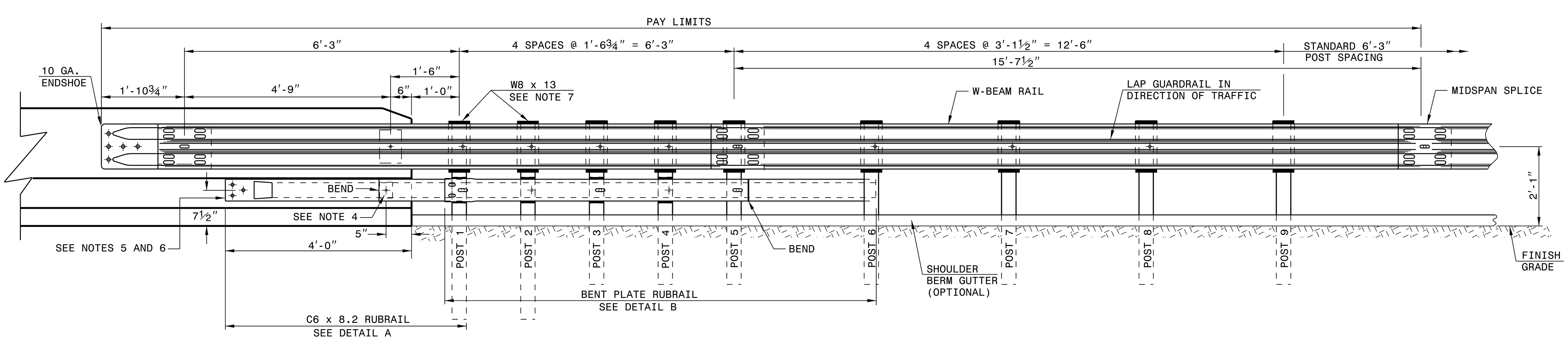
DocuSigned by: Nicole M. Heckler

CONTRACTS STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

SEE TITLE BLOCK

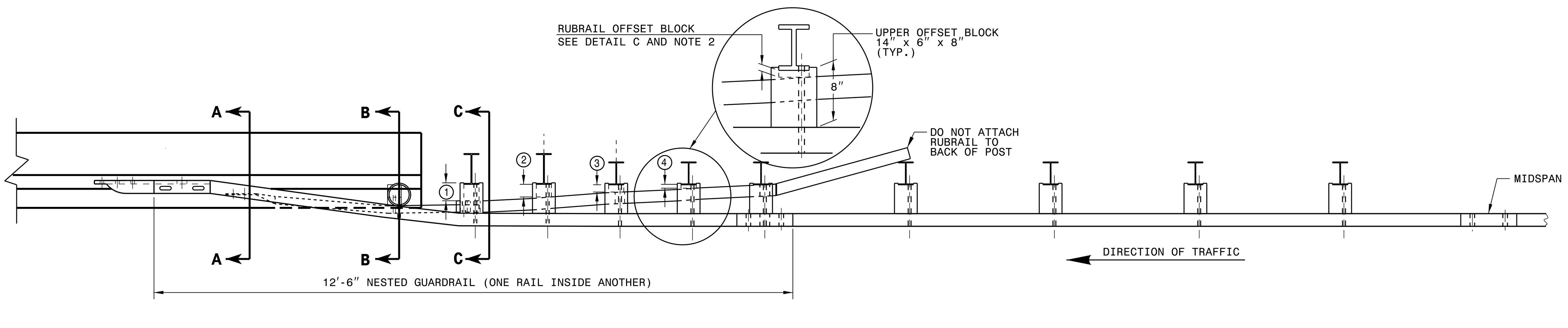
ORIGINAL BY: J.HOWERTON DATE: 3-7-2018
MODIFIED BY: DATE:
CHECKED BY: DATE:
FILE SPEC.:

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	2C-2



ELEVATION

GENERAL NOTES:
1) POSTS 1 THROUGH 5 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER BLOCKOUTS AND/OR RUBRAIL.
2) RUBRAIL BLOCKOUTS LOCATED ON POSTS 1 THROUGH 4 ARE OFFSET DRILLED AND SECURED WITH ⅝" BUTTONHEAD BOLTS (SEE CHART FOR BOLT LENGTHS). SECURE BLOCKS ONLY TO POSTS 2 AND 4. SECURE RUBRAIL AND BLOCKOUTS TO POSTS 1 AND 3. RUBRAIL IS SECURED TO POST 5 WITH A ⅝" x 4½" BUTTONHEAD BOLT. RUBRAIL IS FLARED TO BACK OF POST 6 AND NOT SECURED.
3) STEEL SPACER TUBE IS A SCHEDULE 40 GALVANIZED PIPE 6" INSIDE DIAMETER x 9" LONG. ATTACH TUBE TO GUARDRAIL ONLY WITH ⅝" x 1¼" LONG BUTTONHEAD BOLT AND RECTANGULAR PLATE WASHER.
4) SEE DETAIL D FOR SLOPED RUBRAIL BLOCKOUT. BLOCKOUT IS ATTACHED TO RAIL ELEMENT ONLY. USE ⅜" x 3" LAG BOLT WITH FLAT WASHER.
5) SHOP FABRICATE THE C6 x 8.2 RUBRAIL END TO BE CONSISTENT WITH THE SLOPE OF THE F SHAPE AND ATTACH FLUSH WITH THE SLOPED TOE OF THE BARRIER OR BRIDGE RAIL.
6) ANCHORAGE:
   (a) AT EXISTING BRIDGE RAIL AND NEW OR EXISTING BARRIERS, ANCHOR RUBRAIL USING THREE ⅝" x 6" CHEMICALLY ANCHORED BOLTS WITH WASHERS. MAXIMUM PROJECTION FOR BOLTS IS ½".
   (b) AT EXISTING BRIDGE RAIL AND NEW OR EXISTING BARRIERS, ANCHOR THE W-BEAM END SHOE USING A 4 BOLT HOLD DOWN PLATE (SEE STD. DWG. 862.04). A 4 BOLT INSERT ASSEMBLY IS ALLOWED ON PRECAST REINFORCED CONCRETE BARRIER (SEE STD. DWG. 857.01). INSTALL THE W-BEAM END SHOE BEHIND THE NESTED W-BEAM ELEMENTS.
   (c) AT NEW BRIDGE RAIL, ANCHOR THE W-BEAM END SHOE AND RUBRAIL AS DETAILED ON THE STRUCTURE PLANS.
7) POSTS 1 AND 2 ARE W8 x 13, 7'-6" LONG. ALL OTHER POSTS IN THE ANCHOR UNIT ARE W6 x 8.5.



PLAN

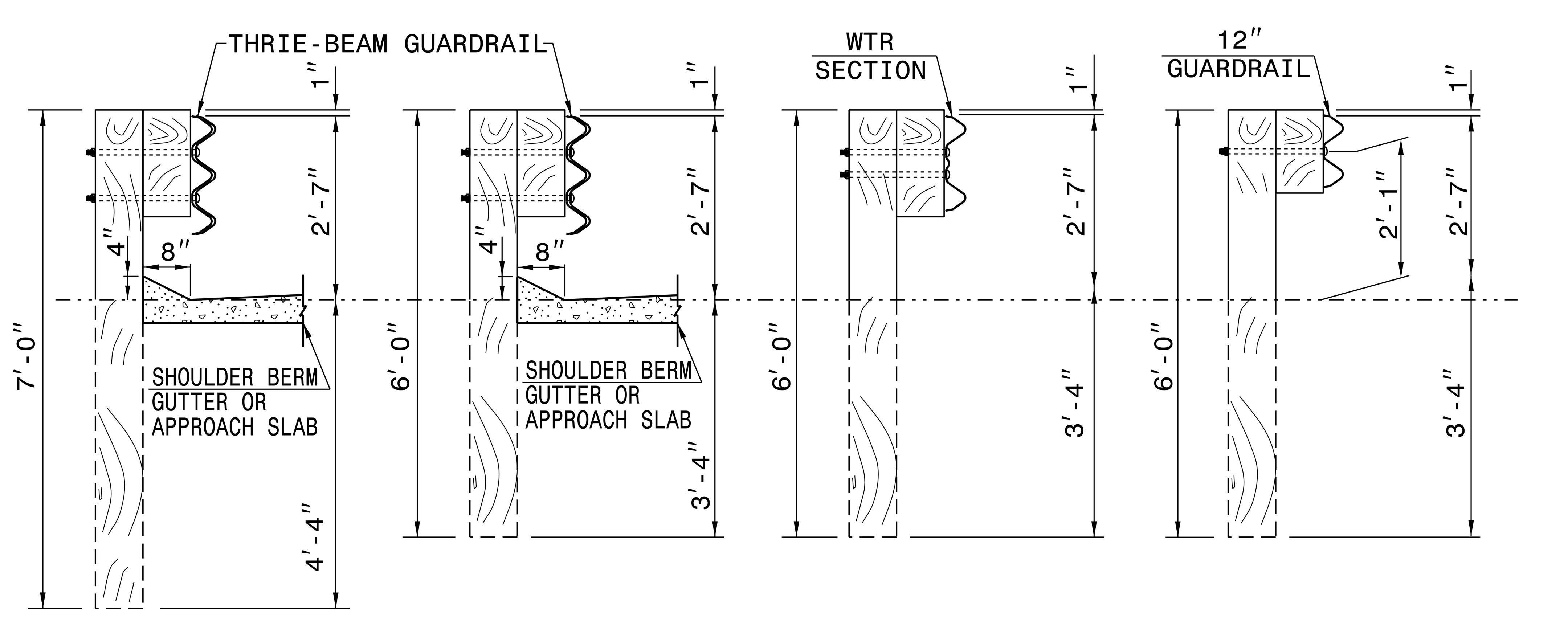
GUARDRAIL ANCHOR UNIT TYPE B-77

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL ANCHOR UNIT
GUARDRAIL ANCHOR UNIT TYPE B-77
FOR F-SHAPE BARRIER

SHEET 4 OF 7
862D03

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.
ROADWAY DETAIL DRAWING FOR GUARDRAIL ANCHOR UNIT GUARDRAIL ANCHOR UNIT TYPE B-77 FOR F-SHAPE BARRIER
SHEET 4 OF 7 862D03

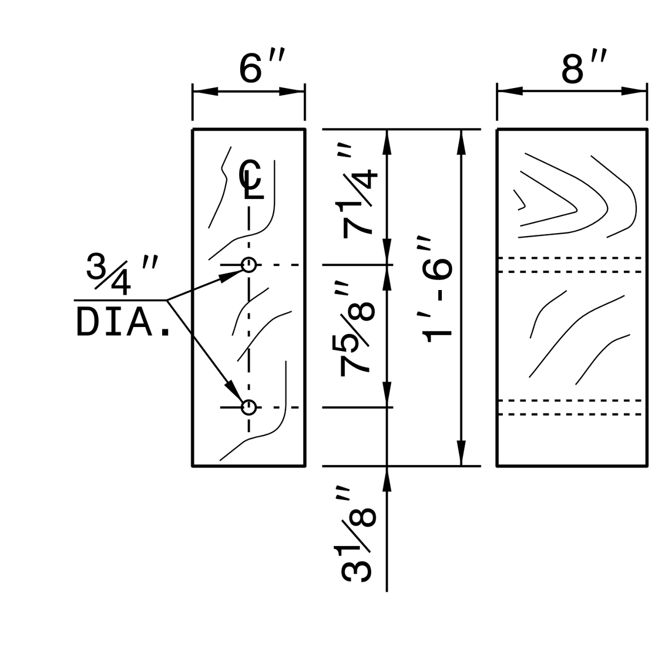


SECTION OF THRIE BEAM POSTS 1 THRU 6

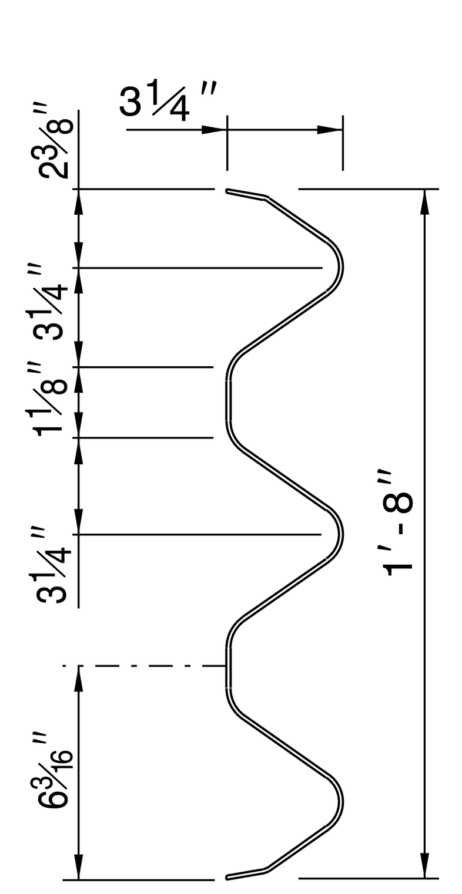
SECTION OF THRIE BEAM POST 7

SECTION OF WTR BEAM POST 8

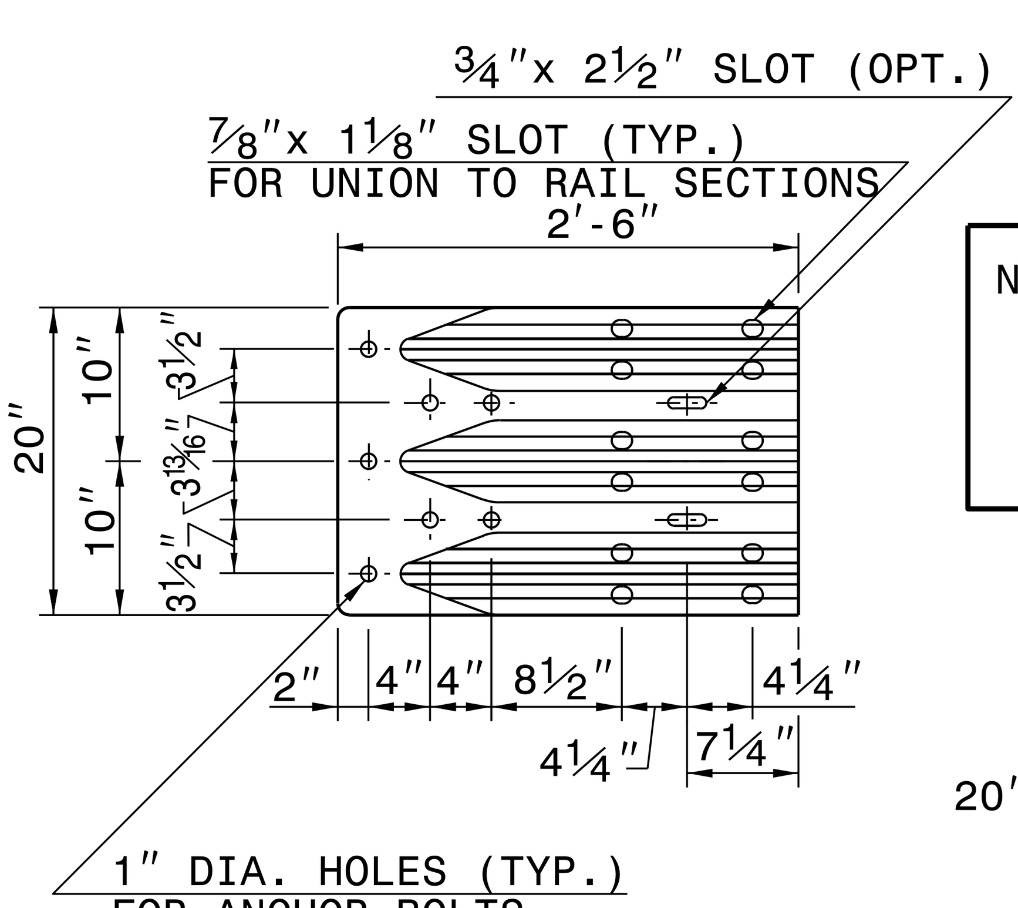
SECTION OF 'W' BEAM POST 9



THRIE BEAM OFFSET BLOCK

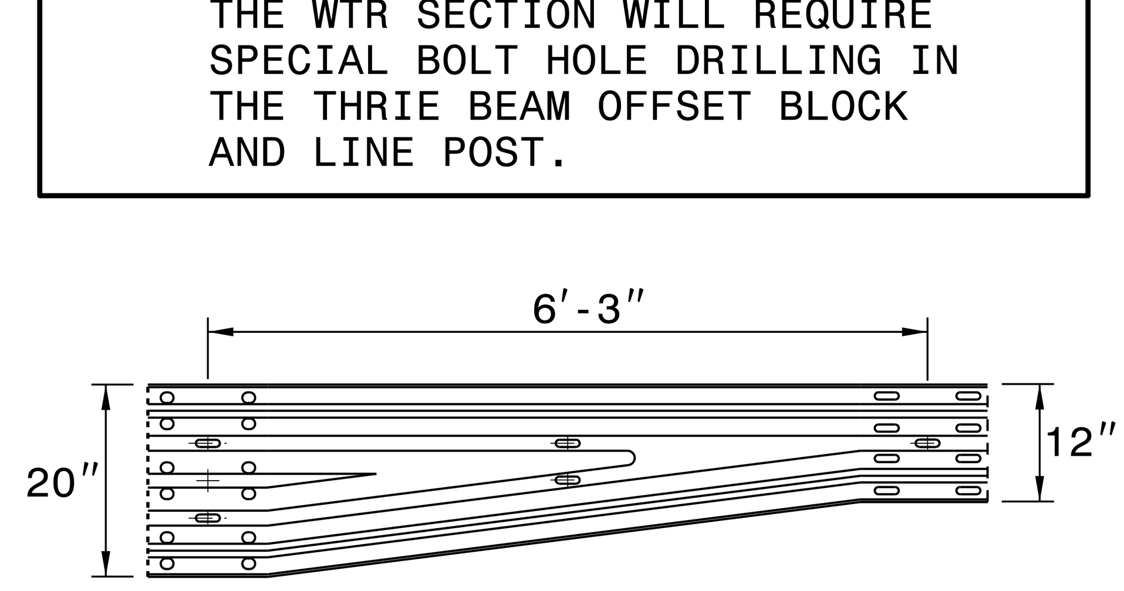


THRIE-BEAM SECTION

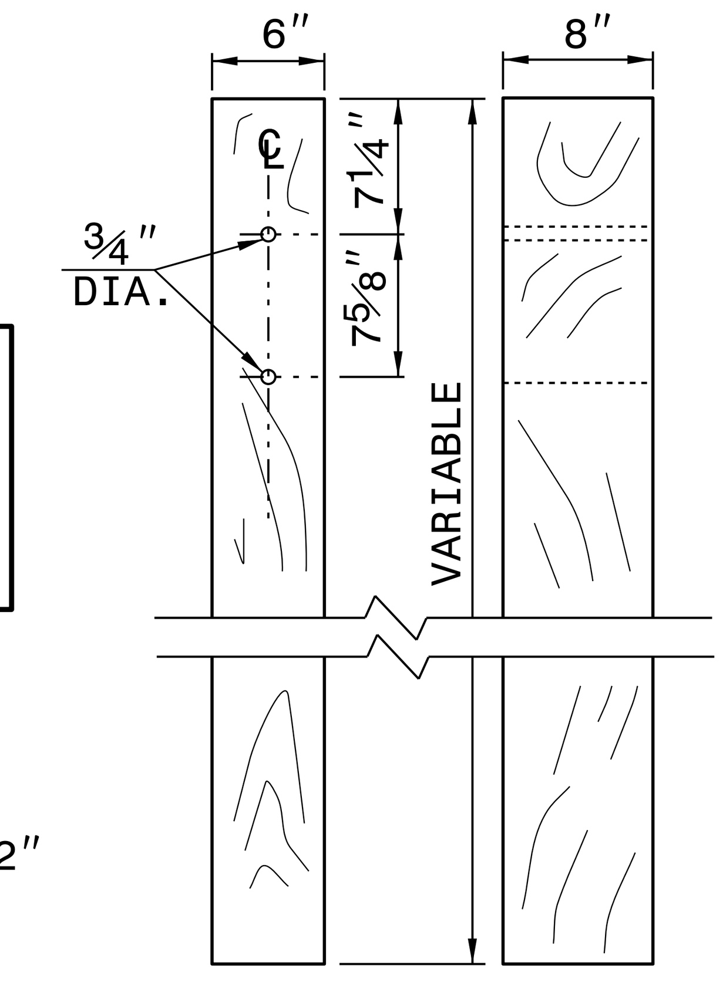


END SHOE

NOTE: THE MID POST AND OFFSET BLOCK OF THE WTR SECTION WILL REQUIRE SPECIAL BOLT HOLE DRILLING IN THE THRIE BEAM OFFSET BLOCK AND LINE POST.



WTR SECTION
ELEVATION VIEW



THRIE BEAM LINE POST

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT, TYPE III

SHEET 3 OF 7
862D03

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.
ROADWAY DETAIL DRAWING FOR STRUCTURE ANCHOR UNITS GUARDRAIL ANCHOR UNIT, TYPE III
SHEET 3 OF 7 862D03

10/20/2022
SEAL 33144 NORTH CAROLINA PROFESSIONAL ENGINEER
Nicole M. Hackler

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

CONTRACT STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

SEE TITLE BLOCK

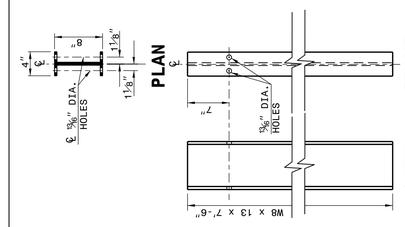
ORIGINAL BY: J HOWERTON DATE: 06-22-12
MODIFIED BY: DATE:
CHECKED BY: DATE:
FILE SPEC.:

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	2C-3

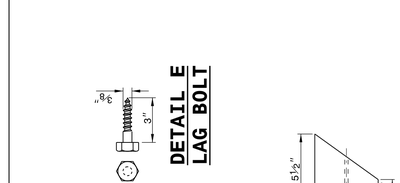
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNIT
GUARDRAIL ANCHOR UNIT TYPE B-77
FOR F-SHAPE BARRIER

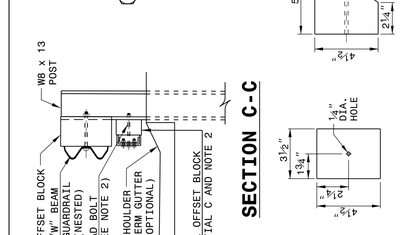
SHEET 5 OF 7
862D03



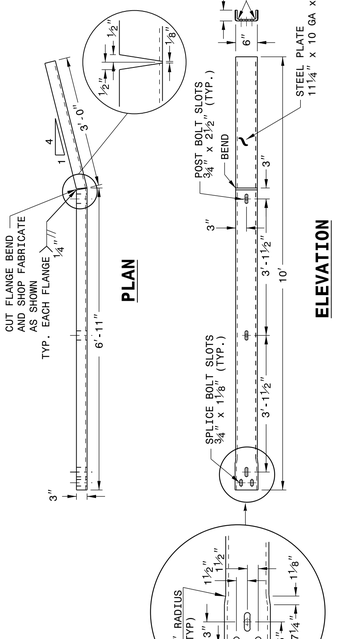
DETAIL F STEEL POST "W8 X 13 X 7'-6"



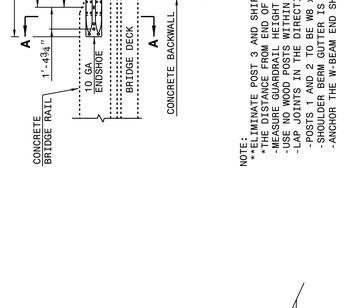
DETAIL E LAG BOLT



DETAIL D SLOPED RUBRAIL BLOCKOUT

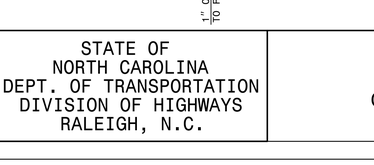


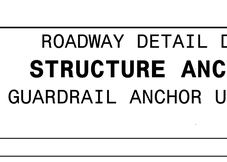
GUARDRAIL ANCHOR UNIT TYPE B-77



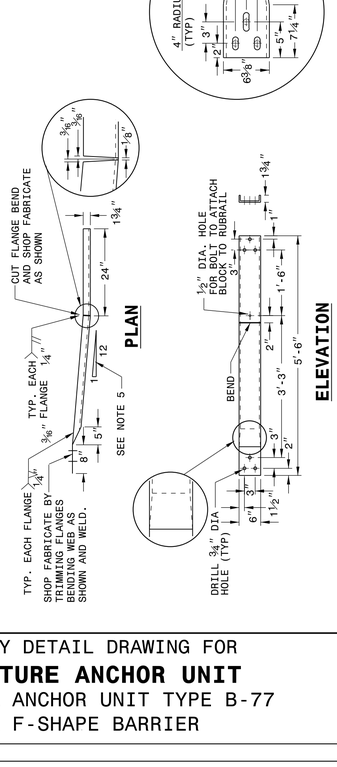
RUBRAIL BLOCKS 7" HIGH x 4" WIDE			
POST	THICKNESS	BOLT LENGTH	
①	4¼"	9"	
②	3¼"	5"*	
③	2"	6"	
④	1"	3"*	

* BOLTS FOR POSTS 2 AND 4 ARE USED TO ATTACH BLOCK TO POST. RUBRAIL NOT ATTACHED TO BLOCK.





DETAIL C RUBRAIL BLOCKOUT



GUARDRAIL ANCHOR UNIT TYPE B-77

10/20/2022

NORTH CAROLINA PROFESSIONAL SEAL 33144 ENGINEER NICOLE M. HUCHLER

DocuSigned by:
Nicole M. Huchler
588432D34164C5...

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

CONTRACT STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

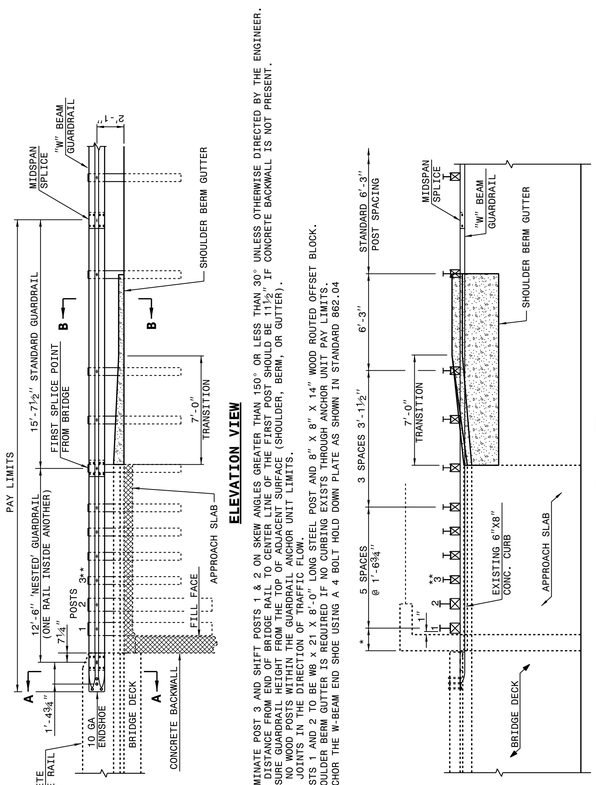
SEE TITLE BLOCK

ORIGINAL BY: J HOWERTON DATE: 06-22-12
MODIFIED BY: DATE:
CHECKED BY: DATE:
FILE SPEC.:

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

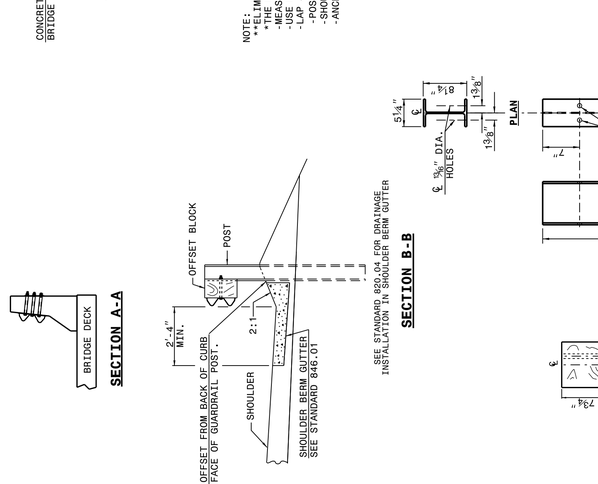
ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT TYPE B-83

SHEET 6 OF 7
862D03



NOTE:
* ELIMINATE POST 3 AND SHIFT POSTS 1 & 2 ON SKEW ANGLES GREATER THAN 150° OR LESS THAN 30° UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
* THE DISTANCE FROM END OF BRIDGE RAIL TO CENTER LINE OF THE FIRST POST SHOULD BE 1'-11½" IF CONCRETE BACKWALL IS NOT PRESENT.
- MEASURE GUARDRAIL HEIGHT FROM THE TOP OF ADJACENT SURFACE (SHOULDER, BERM, OR GUTTER).
- USE 50 WOOD POSTS WITHIN THE ANCHOR UNIT LIMITS.
- LAP JOINTS IN THE DIRECTION OF TRAFFIC FLOW.
- POSTS 1 AND 2 TO BE W8 x 21 X 8'-0" LONG STEEL POST AND 8" X 14" WOOD ROUTED OFFSET BLOCK.
- SHOULDER BERM GUTTER IS REQUIRED IF NO CURBING EXISTS THROUGH ANCHOR UNIT PAY LIMITS.
- ANCHOR THE W-BEAM END SHOE USING A 4 BOLT HOLD DOWN PLATE AS SHOWN IN STANDARD 862.04

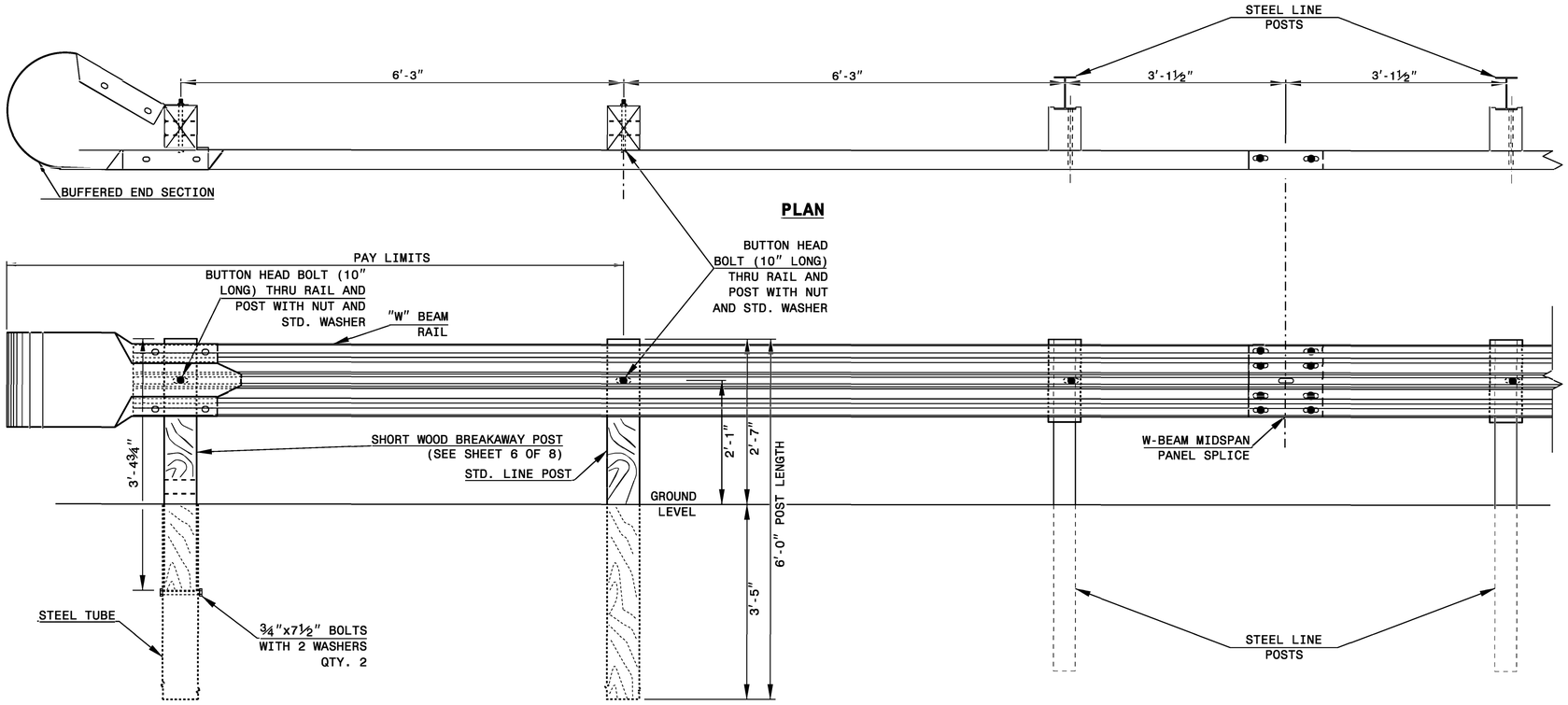
GUARDRAIL ANCHOR UNIT TYPE B-83



PROJECT REFERENCE NO.	SHEET NO.
BR-0070	2C-4

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION



TRAILING END UNIT ASSEMBLY

A.T.-1 SYSTEM

SHEET OF

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET OF

10/20/2022

NORTH CAROLINA PROFESSIONAL SEAL 33144 ENGINEER NICOLE M. HUCKLER

DocuSigned by:
Nicole M. Huckler
5884323D34164C5...

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

CONTRACTS STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

A.T.-1 SYSTEM

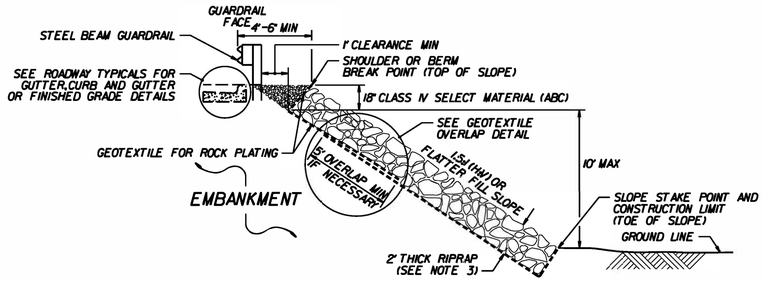
ORIGINAL BY: _____ DATE: _____
MODIFIED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: _____

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	2C-5

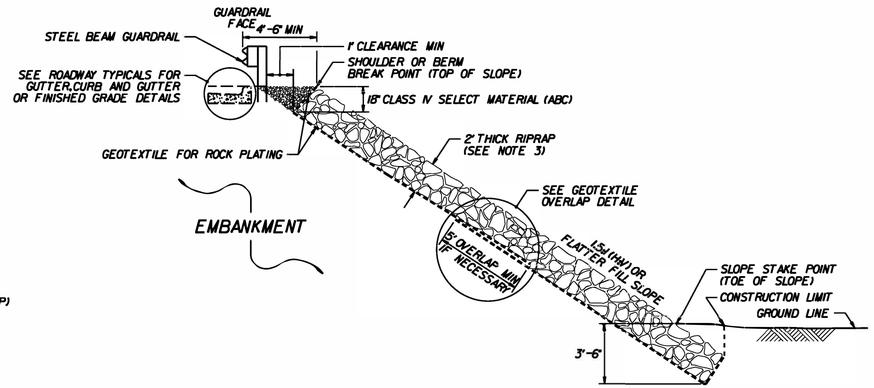
STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR

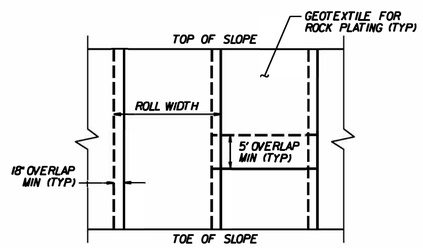
ROCK PLATING



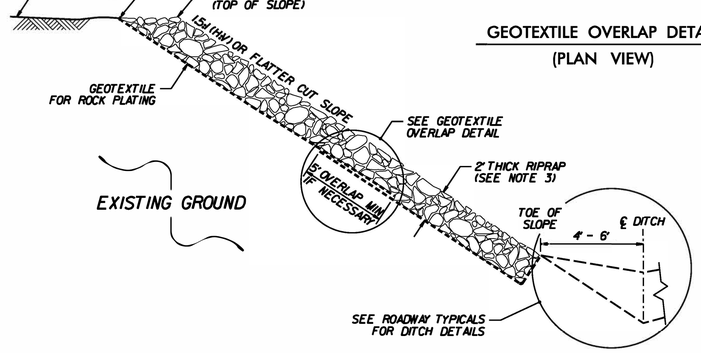
ROCK PLATING DETAIL NO. 1 – TYPICAL SECTION



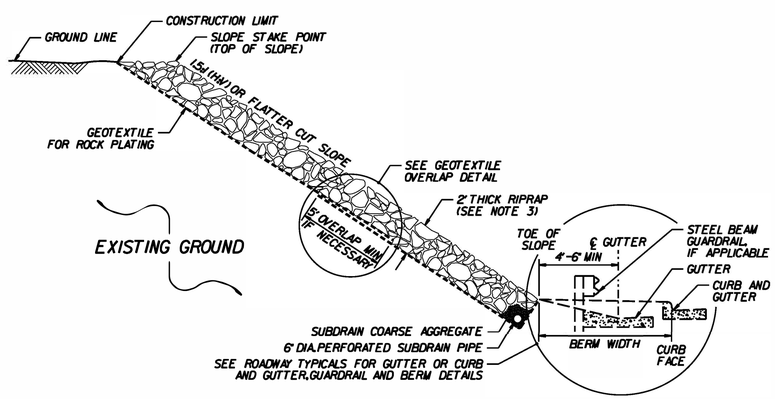
ROCK PLATING DETAIL NO. 2 – TYPICAL SECTION



GEOTEXTILE OVERLAP DETAIL
(PLAN VIEW)



ROCK PLATING DETAIL NO. 3 – TYPICAL SECTION



ROCK PLATING DETAIL NO. 4 – TYPICAL SECTION

NOTES:

1. SEE ROADWAY PLANS AND SUMMARY SHEETS FOR ROCK PLATING LOCATIONS.
2. FOR ROCK PLATING,SEE SECTION 275 OF THE STANDARD SPECIFICATIONS.
3. USE CLASS I,2 OR B RIPRAP UNLESS REQUIRED OTHERWISE IN THE ROADWAY SUMMARY SHEETS.

SHEET 1 OF 1

275D01

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR

ROCK PLATING

SHEET 1 OF 1

275D01

$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

10/20/2022

NORTH CAROLINA PROFESSIONAL SEAL 33144 ENGINEER NICOLE M. HUCKLE

DocuSigned by:
Nicole M. Huckle
588432303416 4C9...

CONTRACT STANDARDS
AND DEVELOPMENT UNIT
Office 919-707-6900 FAX 919-250-4119

SEE TITLE BLOCK

ORIGINAL BY: S. HIDDEN DATE: 03-11-22
MODIFIED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: _____

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	3B-1

SUMMARY OF EARTHWORK

IN CUBIC YARDS

Station	Station	Uncl. Excav.	Embank. +%	Borrow	Waste
PHASE 1					
-L- Sta. 13+00.00	-L- Sta. 20+50.00	8,763	2,077	0	6686
-L- Sta. 40+50.00	-L- Sta. 48+00.00	11,339	314	0	11025
-L- Sta. 20+50.00	-L- Sta. 29+13.08 (BR)	4,574	21,224	16,650	0
-L- Sta. 32+01.08 (BR)	-L- Sta. 40+50.00	973	30,757	29,784	0
SUBTOTAL:		25,649	54,372	46,434	17,711
PHASE 2					
-L- Sta. 20+50.00	-L- Sta. 29+13.08 (BR)	348	0	0	348
-L- Sta. 32+01.08 (BR)	-L- Sta. 40+50.00	414	0	0	414
SUBTOTAL:		762	0	0	762
TOTAL:		26,411	54,372	46,434	18,473
MATERIAL FOR SHOULDER CONSTRUCTION			1,200	1,200	0
WASTE IN LIEU OF BORROW				-17,711	-17,711
PROJECT TOTAL:		26,411	55,572	29,923	762
EST. 5% REPLACE TOPSOIL ON BORROW PIT				1,496	
GRAND TOTAL:		26,411	55,572	31,419	762
SAY:		**27,730**		**32,990**	

EST. DDE = 160 CUBIC YARDS
EST. GEOTEXTILE FOR SOIL STABILIZATION = 400 SQUARE YARDS
EST. SELECT GRANULAR MATERIAL = 400 CUBIC YARDS
EST. ADDITIONAL UNDERCUT = 450 CUBIC YARDS

Note: Approximate quantities only. Unclassified Excavation, Borrow Excavation, Fine Grading, Clearing and Grubbing, and Removal of Existing Pavement will be paid for at the contract lump sum price for grading.
Note: These earthwork quantities are based in part on subsurface data provided by the Geotechnical Engineering Unit.

PAVEMENT REMOVAL SUMMARY

IN SQUARE YARDS

SURVEY LINE	Station	Station	LOCATION LT/RT/CL	ASPHALT REMOVAL	ASPHALT BREAKUP	CONCRETE REMOVAL	CONCRETE BREAKUP
-L-	18+83	28+96	LT	2,217			
-L-	31+59	43+08	LT	2,226			
		TOTAL:		4,443			
		SAY:		**4,450**			

SHOULDER BERM GUTTER SUMMARY

IN LINEAR FEET

LINE	Station	Station	LENGTH
-L- RT	21+00	22+52	152
-L- RT	26+00	29+00 (BR)	300
-L- RT	32+36 (BR)	39+67	731
		TOTAL:	1183
		SAY:	**1190**

COMPUTED BY: Joshua Roemer **DATE:** 12/8/2021
CHECKED BY: Michael Burns, PE **DATE:** 12/8/2021

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

GUARDRAIL SUMMARY

"N" = DISTANCE FROM EDGE OF LANE TO FACE OF GUARDRAIL
TOTAL SHOULDER WIDTH = DISTANCE FROM EDGE OF TRAVEL LANE TO SHOULDER BREAK POINT.
FLARE LENGTH = DISTANCE FROM LAST SECTION OF PARALLEL GUARDRAIL TO END OF GUARDRAIL
W = TOTAL WIDTH OF FLARE FROM BEGINNING OF TAPER TO END OF GUARDRAIL

G = GATING IMPACT ATTENUATOR TYPE 350
NG = NON-GATING IMPACT ATTENUATOR TYPE 350

SURVEY LINE	BEG. STA.	END STA.	LOCATION	LENGTH			WARRANT POINT		"N" DIST. FROM E.O.L.	TOTAL SHOUL WIDTH	FLARE LENGTH		W		ANCHORS									IMPACT ATTENUATOR TYPE 350		SINGLE FACED CONCRETE BARRIER	REMOVE EXISTING GUARDRAIL	REMOVE & STOCKPILE EXISTING GUARDRAIL	REMARKS
				STRAIGHT	SHOP CURVED	DOUBLE FACED	APPROACH END	TRAILING END			APPROACH END	TRAILING END	APPROACH END	TRAILING END	B-77	XI	GREU TL-3	M-350	AT-1	CAT-1	TYPE II	BIC		G	NG				
-L-	13+00.00	15+53.00	RT	253.00				14+28.00	10'	13'		50'		1'			1										101.6		TIE TO EXISTING GUARDRAIL
-L-	13+00.00	18+53.00	LT	553.00			17+28.00		8'	11'	50'		1'				1										189.5		TIE TO EXISTING GUARDRAIL
-L-	24+75.36	29+15.70	RT	440.34			26+00.36		10'	13'	50'		1'		1		1												
-L-	27+56.55	28+94.05	LT	137.50				28+94.05	4'	7'		50'		1'	1		1												
-L-	32+00.61	35+00.61	LT	300.00			32+00.61		10'	13'	50'		1'		1		1												
-L-	32+22.26	39+84.55	RT	738.29	24.00			38+59.55	10'	13'		50'		1'	1				1										
			SUBTOTAL:	2,422.13	24.00										4		5		1								291.1		
			LESS ANCHOR DEDUCTIONS:																										
			TYPE B-77 (4@22.875')	91.50																									
			GREU, TL-3 (5@50')	250.00																									
			AT-1 (1@6.25')		6.25																								
			TOTAL:	2,080.63	17.75										4		5		1								291.1		
			SAY:	2,150.00	25.00										4		5		1								873.3		
			ADDITIONAL GUARDRAIL POSTS= 10 EA																										

11/16/2022
...\Proj\BR0070_Rdy_sum_3b-1.dgn
USER:mburns

Z2403

COMPUTED BY: VHB DATE: 10/20/2022

CHECKED BY: VHB DATE: 10/20/2022

PROJECT NO.	SHEET NO.
BR-0070	3D-1

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

Note: Invert Elevations indicated are for Bid Purposes only and shall not be used for project construction stakeout. See "Standard Specifications For Roads and Structures, Section 300-5".

LIST OF PIPES, ENDWALLS, ETC. (FOR PIPES 48 INCHES & UNDER)

LINE & STATION	OFFSET	STRUCTURE NUMBER		TOP ELEVATION	INVERT ELEVATION	INVERT ELEVATION	MINIMUM REQUIRED SLOPE	Drainage Pipe (RCP, CSP, CAAP, HDPE, PVC, or PP PIPE)											R. C. PIPE CLASS III					R. C. PIPE CLASS IV						ENDWALLS STD. 838.01 OR STD. 838.11 (UNLESS NOTED OTHERWISE)	REINFORCED ENDWALLS	DRAINAGE STRUCTURE	QUANTITIES FOR DRAINAGE STRUCTURES NOTE: TOTAL LIN. FT. FOR PAY QUANTITY SHALL BE A + (1.3 X B)			C.B. STD. 840.01 OR STD. 840.02	FRAME, GRATES, AND HOOD STD. 840.03 GRATE TYPE			
SIZE / THICKNESS OR GAUGE		FROM	TO	FT.	FT.	FT.	%	12	15	18	24	30	DO NOT USE RCP	DO NOT USE CSP	DO NOT USE CAAP	DO NOT USE HDPE	DO NOT USE PVC	DO NOT USE PP PIPE	12	15	18	24	30	12	15	18	24	30	36	CY	CY	MASONRY CY	0' THRU 5' EACH	A 5' THRU 10' LIN. FT.	B 10' AND ABOVE LIN. FT.		E	F	G	
L 13+12	72 RT	0401		439.6																										2.300										
		0401	0402		437.1	436.5																						12												
L 13+16	64 RT	0402		443.5																													1	3.9						
L 13+43	80 LT	0403		431.1																													1	5.0	1.6					
		0403	0404		419.5	418.8																						16												
L 16+40	44 RT	0407		456.5																																				
		0407	0408		455.0	454.9																				16														
L 16+41	29 RT	0408		459.9																													1	4.3						
L 16+60	53 LT	0409		446.6																													1	1.3						
		0409	0410		440.3	439.9																				12														
L 18+50	32 RT	0411		450.9																													1							
		0411	0412		448.2	441.3			196					X	X																									
L 20+50	32 RT	0412		444.1																													1							
		0412	0414		441.3	434.5	0.8		80					X	X																									
L 21+21	81 RT	0413		430.9																																				
		0413	0414		428.9	428.3																					36													
L 21+28	47 RT	0414		438.2																													1	4.9						
		0414	0415		428.3	428.2																					28													
L 21+56	55 RT	0415		436.4																													1	5.0	1.7					
		0415	0416		424.7	421.0	0.4																				40													
L 21+56	16 RT	0416		423.0																																				
L 22+50	15 RT	0418		437.4																													1							
		0418	0419		433.8	433.7			16					X	X																									
L 22+50	33 RT	0419		437.4																													1	2.4						
		0419	0415		430.0	428.4	0.7		96					X	X																									
L 22+86	50 RT	0420		431.8																																				
		0420	0419		430.6	430.0	0.4		40					X	X																									
L 25+00	38 RT	0501		428.7																													1							
		0501	0502		426.0	421.4			148					X	X																									
L 26+50	37 RT	0502		424.2																													1							
		0502	0503		421.2	421.1				16				X	X																									
L 26+50	21 RT	0503		426.5																													1	0.4						
		0503	0505		421.1	418.5																				244														
L 28+70	33 LT	0504		416.3																													1							
		0504	0505		413.3	413.1																				56														
L 28+94	19 RT	0505		422.0																													1	4.0						
		0505	0506		413.1	397.0	0.9			56			X																											
L 32+43	19 RT	0507		416.4																													1							
		0507	0508		413.2	412.8																			20															
L 32+65	19 RT	0508		416.0																													1							
		0508	0509		412.8	397.7			44				X																											
L 34+75	21 RT	0510		413.9																													1	3.3						
		0510	0511		405.6	396.4	1.3			44			X																											
L 35+35	43 LT	0512		409.2																													1							
		0512	0513		406.2	405.9																				64														
L 35+35	21 RT	0513		413.8																													1	2.9						
		0513	0510		405.9	405.6																				60														
L 36+00	21 RT	0514		413.9																													1							
		0514	0513		410.7	410.3																			64															
L 37+50	21 RT	0515		415.2																													1							
SHEET TOTALS									620	116															84	452	104	28		2.300			22	37.4	3.3					

LINE & STATION	OFFSET	STRUCTURE NUMBER FROM	STRUCTURE NUMBER TO	CONCRETE TRANSITIONAL SECTION D.I. STD. 852.04 OR STD. 852.06	CONCRETE TRANSITIONAL SECTION C.B. STD. 852.05	OPEN THROAT C.B. STD. 840.04 OR STD. 840.05	CONCRETE BRIDGE APPROACH D.I. STD. 840.13	D.I. STD. 840.14 OR STD. 840.15	D.I. FRAME AND GRATES STD. 840.16	G.D.I. TYPE "A" STD. 840.17 OR STD. 840.26	G.D.I. TYPE "B" STD. 840.18 OR STD. 840.27	G.D.I. TYPE "D" STD. 840.19 OR STD. 840.28	G.D.I. (W.S. FLAT) FRAME WITH GRATE STD. 840.20	G.D.I. (W.S. FLAT) FRAME W/ 2 GRATES STD. 840.20	G.D.I. (W.S. SAG) FRAME W/ GRATE STD. 840.22	G.D.I. (W.S. SAG) FRAME W/ 2 GRATES STD. 840.22	G.D.I. (N.S. SAG) FRAME W/ GRATE STD. 840.24	G.D.I. (N.S. SAG) FRAME W/ 2 GRATES STD. 840.24	G.D.I. (N.S. FLAT) FRAME W/ GRATE STD. 840.29	G.D.I. (N.S. FLAT) FRAME W/ 2 GRATES STD. 840.29	DRIVEWAY D.I. STD. 840.30	FRAME W/ GRATE FOR DRIVEWAY STD. 840.30	J.B. STD. 840.31 OR STD. 840.32	ANGLED VANE GRATES AND FRAMES STD. 840.33	T.B.J.B. STD. 840.34	T.B.D.I. STD. 840.35	T.B.D.I. FOR STEEL GRATES STD. 840.36	STEEL FRAME WITH TWO GRATES STD. 840.37	TEMP STEEL PLATE COVER MASONRY DRAINAGE	##" SPRING BOX PIPE	SPRING BOX STD. 840.41		M.H. STD. 840.51, STD. 840.52, OR STD. 840.53	M.H. FRAME AND COVER STD. 840.54	15" DRAINAGE PIPE ELBOW	18" DRAINAGE PIPE ELBOW	BERM DRAINAGE OUTLET STD. 850.10 (4" CONC PAVE DITCH SY)	BERM DITCH OUTLET STD. 850.11 (PER EACH)		##" SLUICE GATE (##" SIZE SLUICE GATE)		MODIFIED CONC. FLUME	PREFORMED SCOUR HOLE (PER EACH)	ENERGY DISSIPATION BASIN		FLOWABLE FILL CY	CONCRETE COLLARS CL. "B" STD. 840.72 CY	CONCRETE AND BRICK PIPE PLUG STD. 840.71 CY	PIPE REMOVAL LIN. FT.	REMARKS
L 13+12	72 RT	0401																																																
		0401	0402																																															
L 13+16	64 RT	0402																					1											1																
L 13+43	80 LT	0403																					1											1																
		0403	0404																																															
L 16+40	44 RT	0407																																																
		0407	0408																																															
L 16+41	29 RT	0408																					1											1																
L 16+60	53 LT	0409																					1											1																
		0409	0410																																															
L 18+50	32 RT	0411									1							1																																
		0411	0412																																															
L 20+50	32 RT	0412									1							1																																
		0412	0414																																															
L 21+21	81 RT	0413																																																
		0413	0414																																															
L 21+28	47 RT	0414																					1											1																
		0414	0415																																															
L 21+56	55 RT	0415																					1											1																
		0415	0416																																															
L 21+56	16 RT	0416																																													0.5526			
L 22+50	15 RT	0418									1									1																														
		0418	0419																																															
L 22+50	33 RT	0419																					1											1																
		0419	0415																																															
L 22+86	50 RT	0420																																																
		0420	0419																																															
L 25+00	38 RT	0501									1							1																																
		0501	0502																																															
L 26+50	37 RT	0502									1							1																																
		0502	0503																																															
L 26+50	21 RT	0503									1									1																														
		0503	0505																																															
L 28+70	33 LT	0504									1							1																																
		0504	0505																																															
L 28+94	19 RT	0505									1									1																														
		0505	0506																															2														
L 32+43	19 RT	0507									1									1																														
		0507	0508																																															
L 32+65	19 RT	0508									1									1																														
		0508	0509																														2															
L 34+75	21 RT	0510									1									1																														
		0510	0511																															2														
L 35+35	43 LT	0512									1							1																																
		0512	0513																																															
L 35+35	21 RT	0513									1									1																														
		0513	0510																																															
L 36+00	21 RT	0514									1									1																														
		0514	0513																																															
L 37+50	21 RT	0515									1									1																														
SHEET TOTALS											15							6		9			7											7	2	4											0.5526			

ABBREVIATIONS

C.A.A.	CORRUGATED ALUMINIUM ALLOY
C.B.	CATCH BASIN
C.S.	CORRUGATED STEEL
D.I.	DROP INLET
G.D.I.	GRATED DROP INLET
H.D.P.E.	HIGH DENSITY POLYETHYLENE
J.B.	JUNCTION BOX
M.H.	MANHOLE
N.S.	NARROW SLOT
P.V.C.	POLYVINYL CHLORIDE
R.C.	REINFORCED CONCRETE
T.B.D.I.	TRAFFIC BEARING DROP INLET
T.B.J.B.	TRAFFIC BEARING JUNCTION BOX
W.S.	WIDE SLOT

Z2403

COMPUTED BY:	VHB	DATE:	10/20/2022
CHECKED BY:	VHB	DATE:	10/20/2022

PROJECT NO.	SHEET NO.
BR-0070	3D-2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

Note: Invert Elevations indicated are for Bid Purposes only and shall not be used for project construction stakeout.
See "Standard Specifications For Roads and Structures, Section 300-5".

LIST OF PIPES, ENDWALLS, ETC. (FOR PIPES 48 INCHES & UNDER)

LINE & STATION / SIZE / THICKNESS OR GAUGE	OFFSET	STRUCTURE NUMBER FROM	STRUCTURE NUMBER TO	TOP ELEVATION FT.	INVERT ELEVATION FT.	INVERT ELEVATION FT.	MINIMUM REQUIRED SLOPE %	Drainage Pipe (RCP, CSP, CAAP, HDPE, PVC, or PP PIPE) 12	15	18	24	30	DO NOT USE RCP	DO NOT USE CSP	DO NOT USE CAAP	DO NOT USE HDPE	DO NOT USE PVC	DO NOT USE PP PIPE
		0515	0514		411.9	410.7												
L 39+00	45 RT	0602		409.0														
		0602	0601		399.0	398.0	0.6		20					X	X			
L 40+20	32 RT	0603		417.7														
		0603	0602		414.9	405.4	0.6		120					X	X			
L 41+00	32 RT	0604		419.2														
		0604	0603		416.4	414.9	0.5		80					X	X			
		0605	0604		437.6	416.4			52				X					
L 43+50	38 LT	0607		422.3														
		0607	0606		418.8	418.6												
L 43+80	32 RT	0608		424.2														
		0608	0607		420.7	418.8												
		0609	0608		443.2	421.4			52				X					
L 46+00	31 RT	0610		428.3														
		0610	0608		425.3	421.2	1.6			216				X	X			
L 48+00	28 LT	0611		432.5														
		0611	0612		429.5	428.5												
L 48+00	31 RT	0612		431.6														
		0612	0610		428.5	425.3				196				X	X			
L 43+17	12 LT																	
L 39+75	1 RT																	
							SHEET TOTALS		324	412								
							PROJECT TOTALS		944	528								

LINE & STATION	OFFSET	FROM	TO	R. C. PIPE CLASS III 12	15	18	24	30	R. C. PIPE CLASS IV 12	15	18	24	30	36	ENDWALLS STD. 838.01 OR STD. 838.11 (UNLESS NOTED OTHERWISE) CY	REINFORCED ENDWALLS CY	DRAINAGE STRUCTURE MASONRY CY	QUANTITIES FOR DRAINAGE STRUCTURES (NOTE: TOTAL LIN. FT. FOR PAY QUANTITY SHALL BE A + (1.3 X B)) 0' THRU 5' EACH	A 5' THRU 10' LIN. FT.	B 10' AND ABOVE LIN. FT.	C.B. STD. 840.01 OR STD. 840.02	FRAME, GRATES, AND HOOD STD. 840.03 GRATE TYPE E	F	G	
		0515	0514							148															
L 39+00	45 RT	0602																1	5.0						
		0602	0601																						
L 40+20	32 RT	0603																1							
		0603	0602																						
L 41+00	32 RT	0604																1							
		0604	0603																						
		0605	0604																						
L 43+50	38 LT	0607																1							
		0607	0606									40													
L 43+80	32 RT	0608																1							
		0608	0607									76													
		0609	0608																						
L 46+00	31 RT	0610																1							
		0610	0608																						
L 48+00	28 LT	0611																1							
		0611	0612								60														
L 48+00	31 RT	0612																1							
		0612	0610																						
L 43+17	12 LT																								
L 39+75	1 RT																								
SHEET TOTALS										148	60	116						8	5.0						
PROJECT TOTALS										232	512	220	28		2.300			30	46.7						

LINE & STATION	OFFSET	FROM	TO	CONCRETE TRANSITIONAL SECTION D.I. STD. 852.04 OR STD. 852.06	CONCRETE TRANSITIONAL SECTION C.B. STD. 852.05	OPEN THROAT C.B. STD. 840.04 OR STD. 840.05	CONCRETE BRIDGE APPROACH D.I. STD. 840.13	D.I. STD. 840.14 OR STD. 840.15	D.I. FRAME AND GRATES STD. 840.16	G.D.I. TYPE "A" STD. 840.17 OR STD. 840.26	G.D.I. TYPE "B" STD. 840.18 OR STD. 840.27	G.D.I. TYPE "D" STD. 840.19 OR STD. 840.28	G.D.I. (W.S. FLAT) FRAME WITH GRATE STD. 840.20	G.D.I. (W.S. FLAT) FRAME W/ 2 GRATES STD. 840.20	G.D.I. (W.S. SAG) FRAME W/ GRATE STD. 840.22	G.D.I. (W.S. SAG) FRAME W/ 2 GRATES STD. 840.22	G.D.I. (N.S. SAG) FRAME W/ GRATE STD. 840.24	G.D.I. (N.S. SAG) FRAME W/ 2 GRATES STD. 840.24	G.D.I. (N.S. FLAT) FRAME W/ GRATE STD. 840.29	G.D.I. (N.S. FLAT) FRAME W/ 2 GRATES STD. 840.29	DRIVEWAY D.I. STD. 840.30	FRAME W/ GRATE FOR DRIVEWAY STD. 840.30	J.B. STD. 840.31 OR STD. 840.32
		0515	0514																				
L 39+00	45 RT	0602																					1
		0602	0601																				
L 40+20	32 RT	0603									1							1					
		0603	0602																				
L 41+00	32 RT	0604									1							1					
		0604	0603																				
		0605	0604																				
L 43+50	38 LT	0607								1								1					
		0607	0606																				
L 43+80	32 RT	0608									1							1					
		0608	0607																				
		0609	0608																				
L 46+00	31 RT	0610									1							1					
		0610	0608																				
L 48+00	28 LT	0611									1							1					
		0611	0612																				
L 48+00	31 RT	0612									1							1					
		0612	0610																				
L 43+17	12 LT																						
L 39+75	1 RT																						
SHEET TOTALS										1	6							7					1
PROJECT TOTALS										1	21							13		9			8

LINE & STATION	OFFSET	FROM	TO	ANGLED VANE GRATES AND FRAMES STD. 840.33	T.B.J.B. STD. 840.34	T.B.D.I. STD. 840.35	T.B.D.I. FOR STEEL GRATES STD. 840.36	STEEL FRAME WITH TWO GRATES STD. 840.37	TEMP STEEL PLATE COVER MASONRY DRAINAGE	##" SPRING BOX PIPE	SPRING BOX STD. 840.41		M.H. STD. 840.51, STD. 840.52, OR STD. 840.53	M.H. FRAME AND COVER STD. 840.54	15" DRAINAGE PIPE ELBOW	18" DRAINAGE PIPE ELBOW	BERM DRAINAGE OUTLET STD. 850.10 (4" CONC PAVE DITCH SY)	BERM DITCH OUTLET STD. 850.11 (PER EACH)		##" SLUICE GATE (##" SIZE SLUICE GATE)		MODIFIED CONC. FLUME	PREFORMED SCOUR HOLE (PER EACH)	ENERGY DISSIPATION BASIN		FLOWABLE FILL CY	CONCRETE COLLARS CL. "B" STD. 840.72 CY	CONCRETE AND BRICK PIPE PLUG STD. 840.71 CY	PIPE REMOVAL LIN. FT.	REMARKS
		0515	0514																											
L 39+00	45 RT	0602												1																
		0602	0601																											
L 40+20	32 RT	0603																												
		0603	0602																											
L 41+00	32 RT	0604																												
		0604	0603																											
		0605	0604												2		11													
L 43+50	38 LT	0607																												
		0607	0606																											
L 43+80	32 RT	0608																												
		0608	0607																											
		0609	0608												2		11													
L 46+00	31 RT	0610																												
		0610	0608																											
L 48+00	28 LT	0611																												
		0611	0612																											
L 48+00	31 RT	0612																												
		0612	0610																											
L 43+17	12 LT																									9				
L 39+75	1 RT																												35	
SHEET TOTALS														1	4		22									9			35	
PROJECT TOTALS														8	6	4	22									9	0.5526		35	

ABBREVIATIONS

C.A.A.	CORRUGATED ALUMINIUM ALLOY
C.B.	CATCH BASIN
C.S.	CORRUGATED STEEL
D.I.	DROP INLET
G.D.I.	GRATED DROP INLET
H.D.P.E.	HIGH DENSITY POLYETHYLENE
J.B.	JUNCTION BOX
M.H.	MANHOLE
N.S.	NARROW SLOT
P.V.C.	POLYVINYL CHLORIDE
R.C.	REINFORCED CONCRETE
T.B.D.I.	TRAFFIC BEARING DROP INLET
T.B.J.B.	TRAFFIC BEARING JUNCTION BOX
W.S.	WIDE SLOT

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

SUMMARY OF SUBSURFACE DRAINAGE

LINE	Station	Station	Location LT/RT/CL	Drain Type* UD/BD/SD	LF
	CONTINGENCY			SD	200
				TOTAL LF:	200

*UD = Underdrain
*BD = Blind Drain
*SD = Subsurface Drain

SUMMARY OF AGGREGATE SUBGRADE/ STABILIZATION

LINE	Station	Station	Aggregate Type* ASU(1/2)/ AST	Aggregate Thickness INCHES [8" for ASU(2)]	Shallow Undercut CY	Class IV Subgrade Stabilization TONS	Geotextile for Soil Stabilization SY	Stabilizer Aggregate TONS	Class IV Aggregate Stabilization TONS
	CONTINGENCY		ASU (1)	12	100	200	300		
			TOTAL CY/TONS/SY:		100	200**	300**	0	0

*ASU(1/2) = Aggregate Subgrade (Type 1 or 2)
*AST = Aggregate Stabilization
**Total tons of "Class IV Subgrade Stabilization" and total square yards of "Geotextile for Soil Stabilization" are only the estimated quantities for ASU(1/2)/AST and may only represent a portion of the subgrade stabilization and geotextile quantities shown in the Item Sheets of the Proposal.

SUMMARY OF ROCK PLATING

LINE	Beginning Slope (H:V)	Approx. Station	Ending Slope (H:V)	Approx. Station	Location LT/RT	Rock Plating Detail No. 1/2/3/4**	Riprap Class* 1/2/B	Rock Plating SY
-L-	2:1	13+00	2:1	14+00	LT	2	1, 2 or B	850
-L-	2:1	13+00	2:1	13+50	RT	2	1, 2 or B	310
							TOTAL SY:	1160

*Use Class 1, 2 or B riprap if riprap class is not shown for rock plating location.

**See sheet 2C-4 for Rock Plating details.

SUMMARY OF SETTLEMENT GAUGES

Gauge No.	LINE and Station	Offset	
		Distance FT	Direction LT/RT
1	-L- 29+00		CL
2	-L- 32+15		CL
		TOTAL GAUGES:	2

SUMMARY OF BRIDGE WAITING PERIODS

Bridge Description	End Bent/ Bent No.	MONTHS
Bridge 0061	End Bent No. 1	2
Bridge 0061	End Bent No. 2	2

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	3P-1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

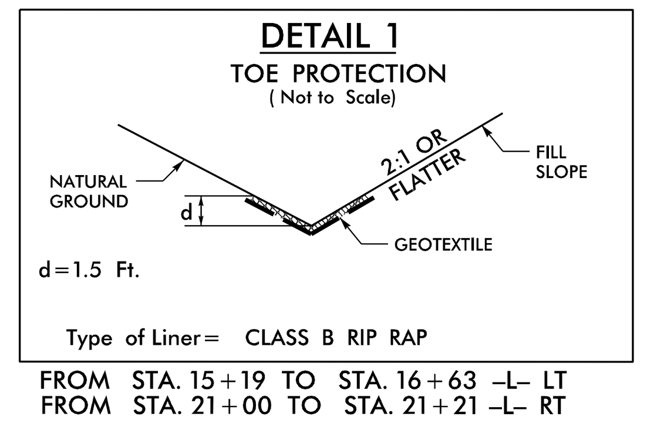
PARCEL INDEX SHEET

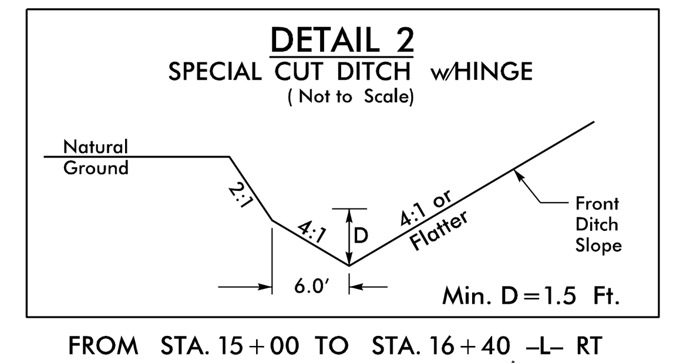
PARCEL No.	SHEET No.	PROPERTY OWNER NAME
1	4	MARY DAMERON FOWLKES
2	4, 5	W MAYNARD AND DELOIS D. GREGORY
3	5, 6	JAN C. LESTER

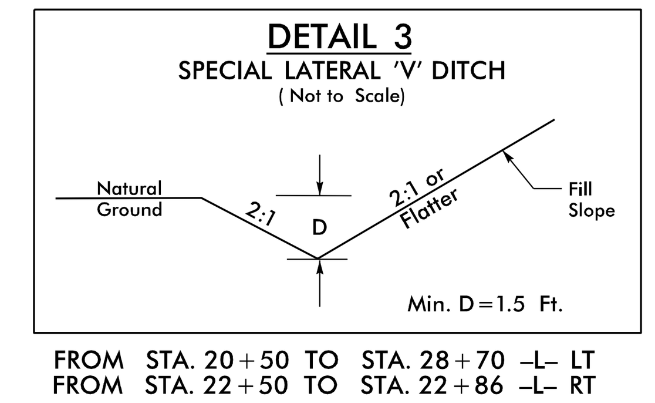
9/8/2022
K:\DOT\BR0070_Rdy_sum_3p-1.dgn
USER:burns

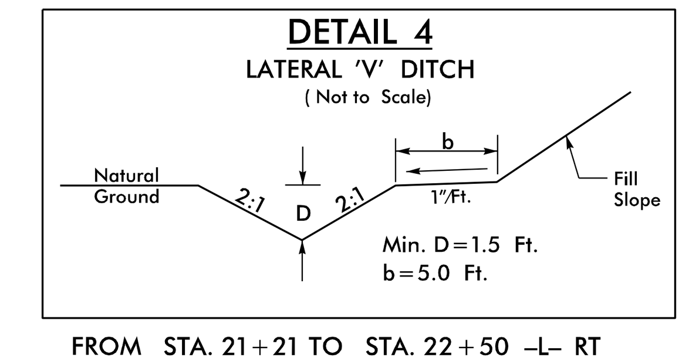
-L-

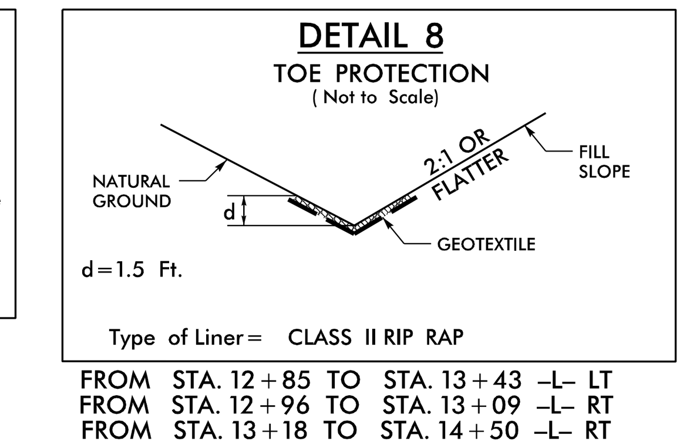
PI Sta 17+02.78	PI Sta 24+22.25
Δ = 4° 18' 09.6" (RT)	Δ = 4° 18' 09.6" (LT)
D = 0° 42' 39.1"	D = 0° 30' 58.2"
L = 605.27'	L = 833.56'
T = 302.78'	T = 416.98'
R = 8,060.00'	R = 11,100.00'
S_e = RC	S_e = NC
Runoff = 54'	











PROJECT REFERENCE NO.	SHEET NO.
BR-0070	4

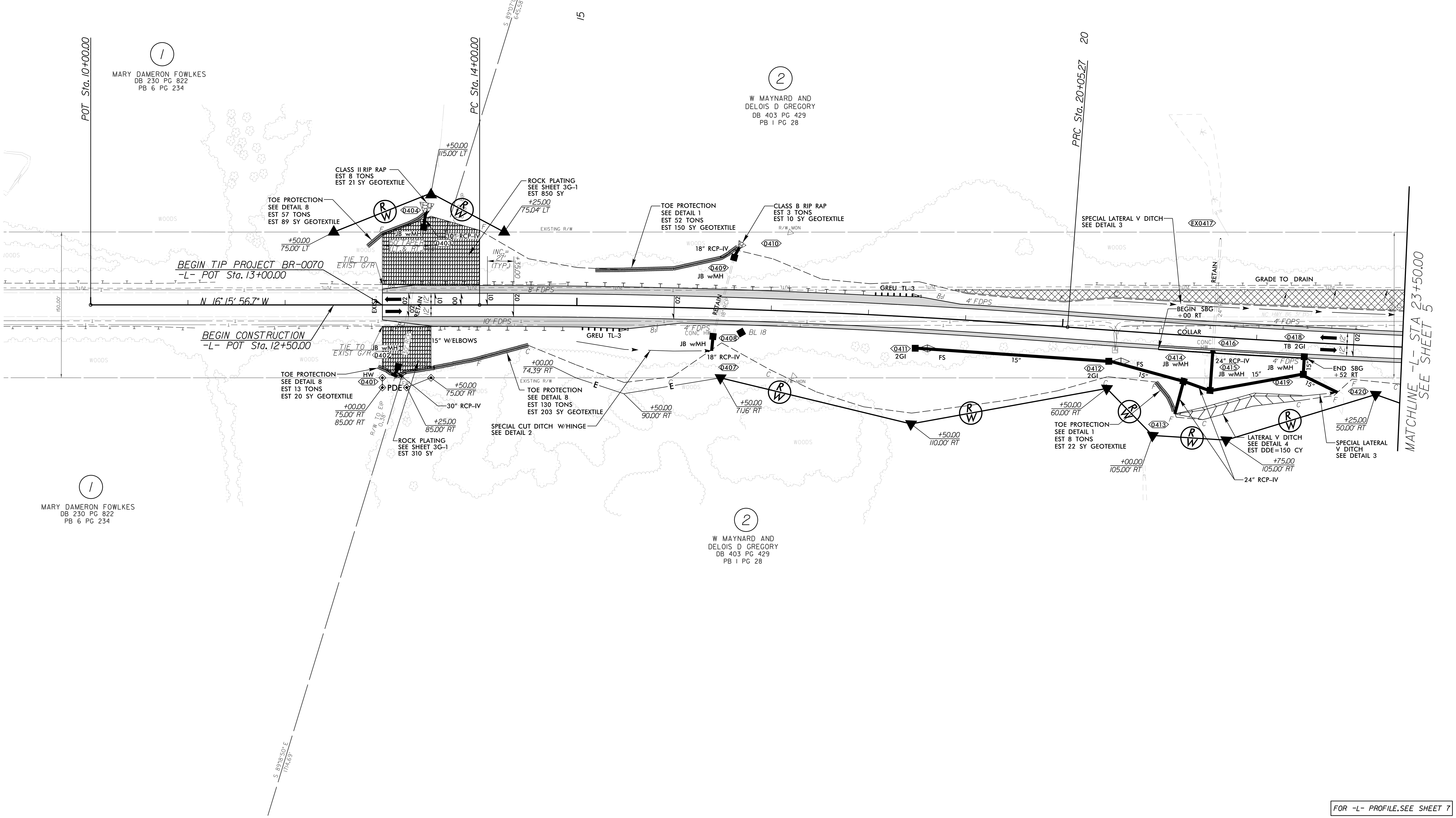
ROADWAY DESIGN ENGINEER — 10/20/2022 — SEAL 045230 — Michael S. Burns, Jr.

HYDRAULICS ENGINEER — 10/26/2022 — SEAL 043870 — Reid B. Robol

STEWART — 223 S. West St. Suite 1100 Raleigh, NC 27603

VHB Engineering NC, P.C. (C-3705) 940 Main Campus Drive, Suite 500 Raleigh, NC 27606

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



FOR -L- PROFILE, SEE SHEET 7

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	5

ROADWAY DESIGN ENGINEER — 10/20/2022 — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 045230 MICHAEL S. BURNS, JR. — DocuSigned by: Michael S. Burns, Jr.

HYDRAULICS ENGINEER — 10/26/2022 — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043870 REID B. ROBOL — DocuSigned by: Reid B. Robol

STEWART — Firm License No. C-1051, 223 S. West St., Suite 1100, Raleigh, NC 27603, T 919.380.8750, www.stewartinc.com

vhb — VHB Engineering NC, P.C. (C-3705), 940 Main Campus Drive, Suite 500, Raleigh, NC 27606

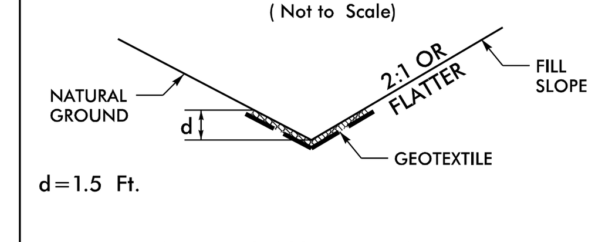
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83/NA 2011

-L-

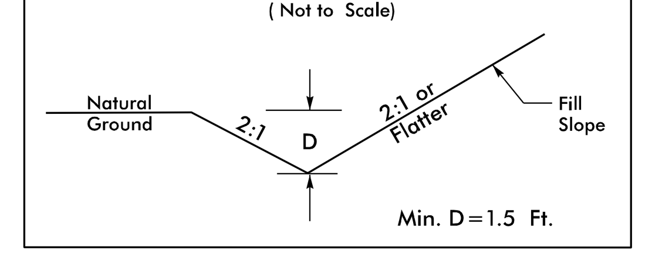
PI Sta 24+22.25	PI Sta 37+01.89
Δ = 4° 18' 09.6" (LT)	Δ = 4° 18' 06.7" (LT)
D = 0° 30' 58.2"	D = 0° 30' 58.2"
L = 833.56'	L = 833.41'
T = 416.98'	T = 416.90'
R = 11,100.00'	R = 11,100.00'
S_e = NC	S_e = NC

DETAIL 1
TOE PROTECTION
(Not to Scale)



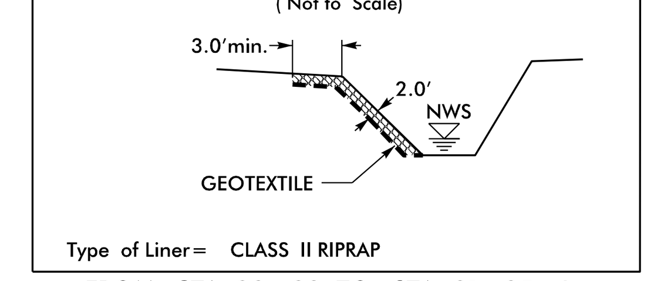
FROM STA. 27+00 TO STA. 29+06 -L- RT
FROM STA. 34+50 TO STA. 38+60 -L- RT

DETAIL 3
SPECIAL LATERAL 'V' DITCH
(Not to Scale)

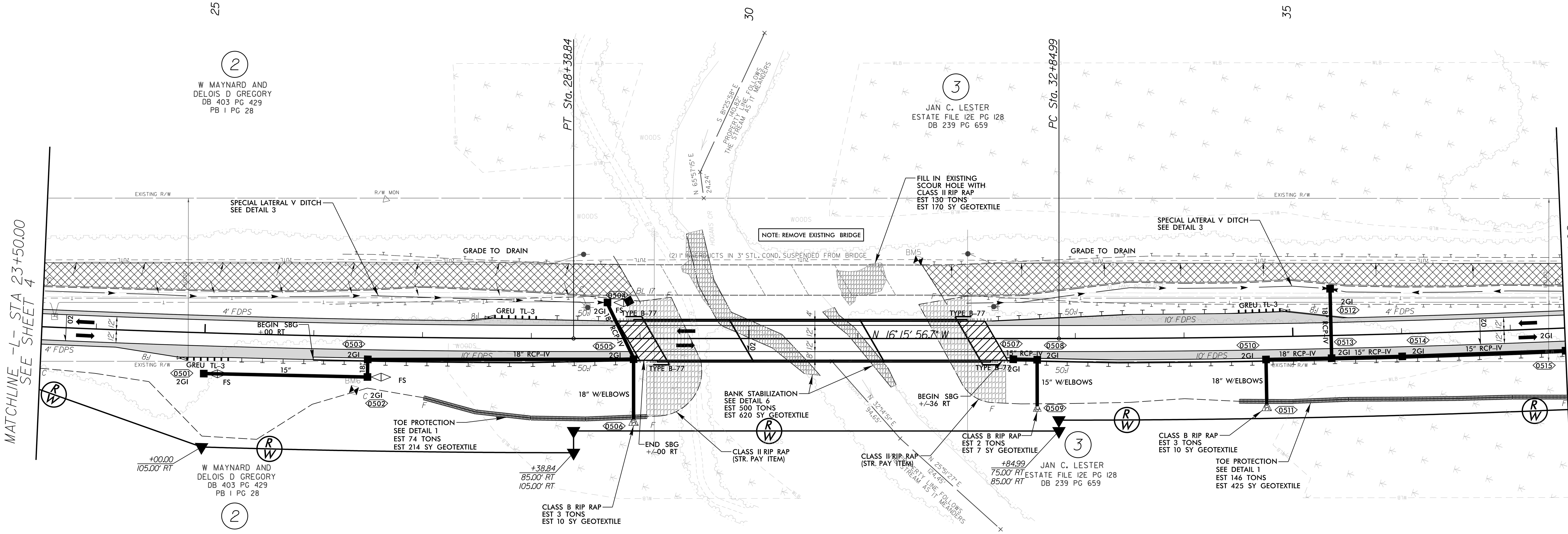


FROM STA. 20+50 TO STA. 28+70 -L- LT
FROM STA. 32+00 TO STA. 40+50 -L- LT

DETAIL 6
BANK STABILIZATION
(Not to Scale)



FROM STA. 29+38 TO STA 31+35 -L-



FOR -L- PROFILE,SEE SHEET 7

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	6

ROADWAY DESIGN ENGINEER 10/20/2022 — SEAL 045230 — NORTH CAROLINA PROFESSIONAL ENGINEER — MICHAEL S. BURNS, JR. — DocuSigned by: Michael S. Burns, Jr.

HYDRAULICS ENGINEER 10/26/2022 — SEAL 043870 — NORTH CAROLINA PROFESSIONAL ENGINEER — REID B. ROBOL — DocuSigned by: Reid B. Robol

STEWART

VHB Engineering NC, P.C. (C-3705) 940 Main Campus Drive, Suite 500 Raleigh, NC 27606

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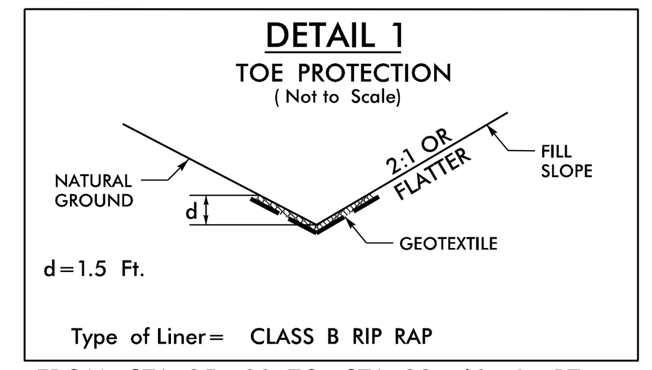
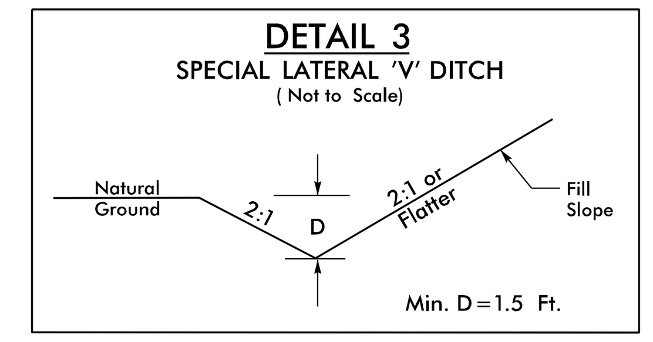
-L-

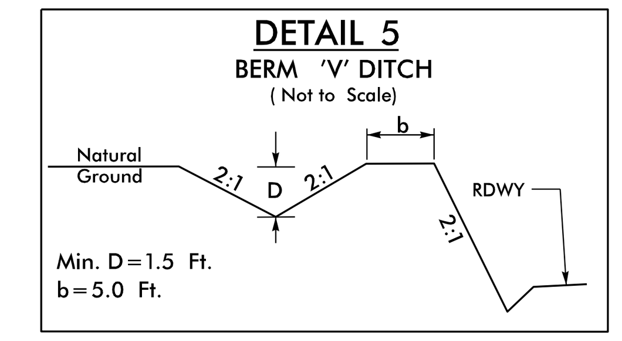
PI Sta 37+01.89	PI Sta 44+19.39	PI Sta 49+29.52
△ = 4° 18' 06.7" (LT)	△ = 4° 16' 38.0" (RT)	△ = 0° 03' 17.2" (LT)
D = 0° 30' 58.2"	D = 0° 42' 39.1"	D = 0° 01' 38.6"
L = 833.41'	L = 601.69'	L = 200.00'
T = 416.90'	T = 300.99'	T = 100.00'
R = 11,100.00'	R = 8,060.00'	R = 209,178.46'
S_e = NC	S_e = RC	S_e = EXIST
	Runoff = 54'	



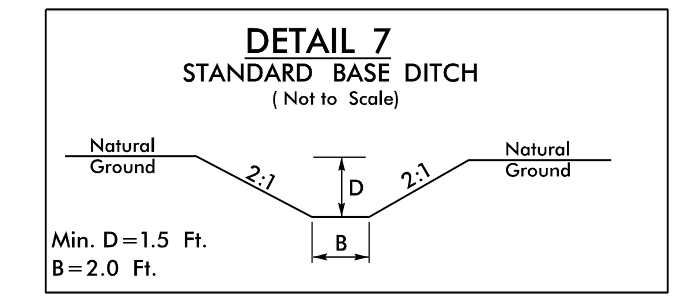
FROM STA. 35+00 TO STA. 38+60 -L- RT



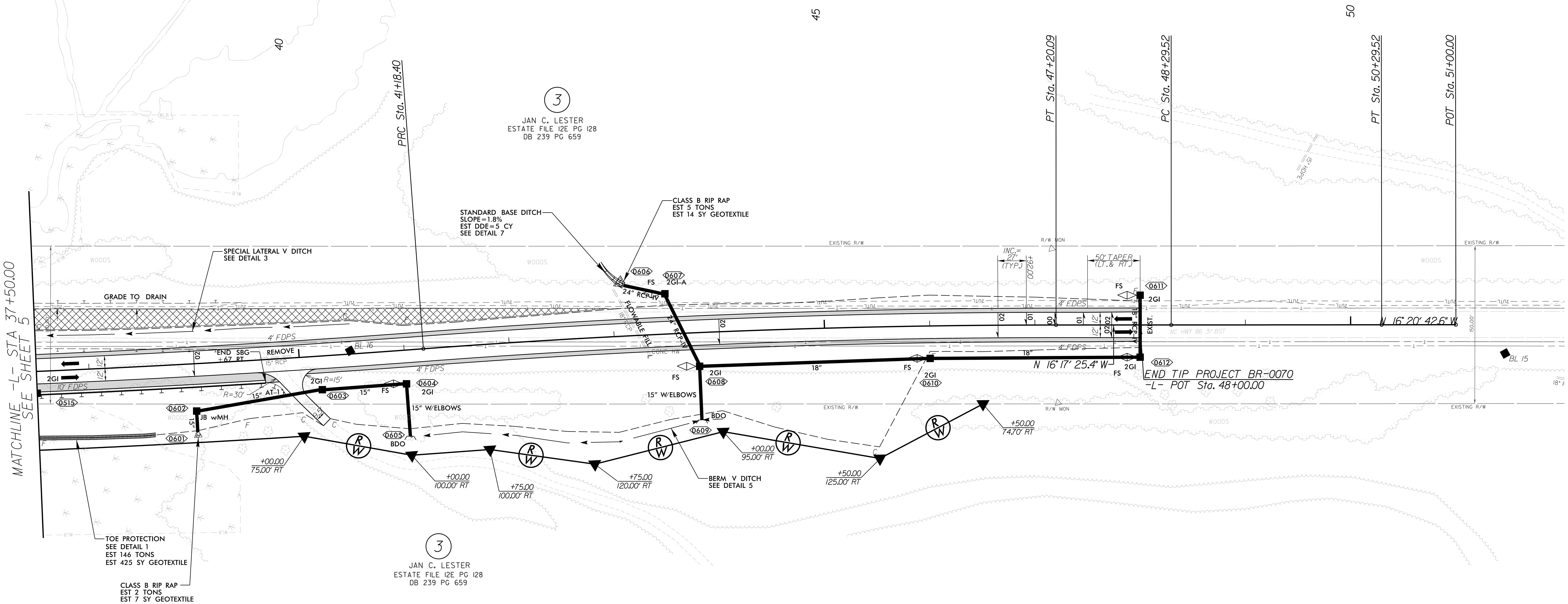
FROM STA. 32+00 TO STA. 40+50 -L- LT



FROM STA. 41+00 TO STA. 44+00 -L- RT



FROM STA. 42+90 TO STA. 43+13 -L- LT



FOR -L- PROFILE,SEE SHEETS 7 & 8

8/17/99

9/8/2022 ...\BR0070_Rdy_psh_06.dgn

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	7

ROADWAY DESIGN ENGINEER
10/20/2022
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 045230 MICHAEL S. BURNS, JR.
DocuSigned by: Michael S. Burns, Jr.
D425C8CC006F437...

HYDRAULICS ENGINEER
10/26/2022
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043870 REID B. ROBOL
DocuSigned by: Reid B. Robol
B63E5A39E6894F4...

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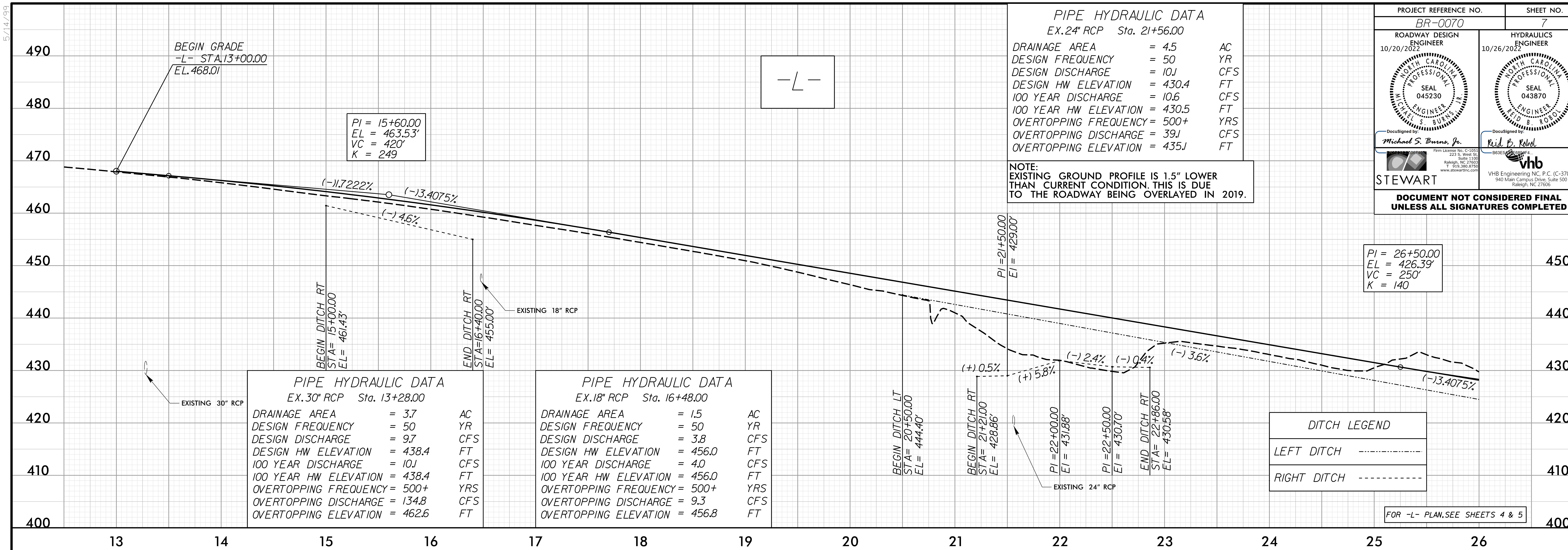
NOTE:
EXISTING GROUND PROFILE IS 1.5" LOWER THAN CURRENT CONDITION. THIS IS DUE TO THE ROADWAY BEING OVERLAYED IN 2019.

PIPE HYDRAULIC DATA

EX.24" RCP Sta. 21+56.00

DRAINAGE AREA	= 4.5	AC
DESIGN FREQUENCY	= 50	YR
DESIGN DISCHARGE	= 10.1	CFS
DESIGN HW ELEVATION	= 430.4	FT
100 YEAR DISCHARGE	= 10.6	CFS
100 YEAR HW ELEVATION	= 430.5	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 39.1	CFS
OVERTOPPING ELEVATION	= 435.1	FT



PIPE HYDRAULIC DATA

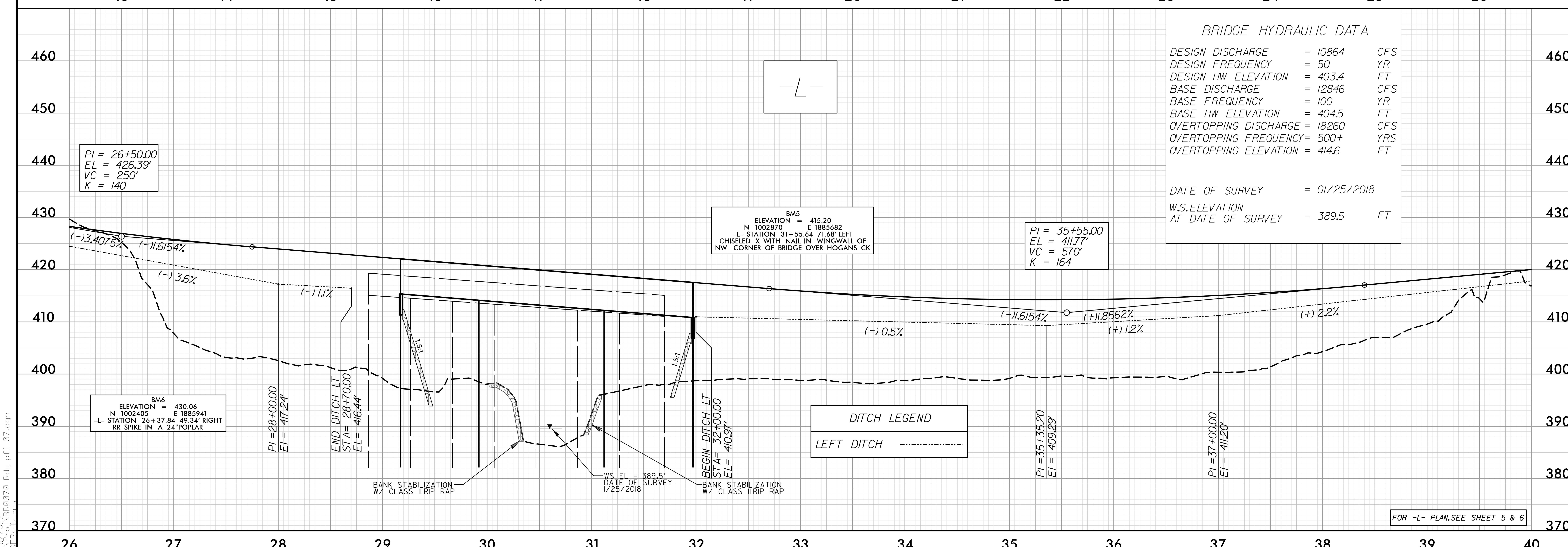
EX.30" RCP Sta. 13+28.00

DRAINAGE AREA	= 3.7	AC
DESIGN FREQUENCY	= 50	YR
DESIGN DISCHARGE	= 9.7	CFS
DESIGN HW ELEVATION	= 438.4	FT
100 YEAR DISCHARGE	= 10.1	CFS
100 YEAR HW ELEVATION	= 438.4	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 134.8	CFS
OVERTOPPING ELEVATION	= 462.6	FT

PIPE HYDRAULIC DATA

EX.18" RCP Sta. 16+48.00

DRAINAGE AREA	= 1.5	AC
DESIGN FREQUENCY	= 50	YR
DESIGN DISCHARGE	= 3.8	CFS
DESIGN HW ELEVATION	= 456.0	FT
100 YEAR DISCHARGE	= 4.0	CFS
100 YEAR HW ELEVATION	= 456.0	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 9.3	CFS
OVERTOPPING ELEVATION	= 456.8	FT



BM5
ELEVATION = 415.20
N 1002870 E 1885682
-L- STATION 31+55.64 71.68' LEFT
CHISELED X WITH NAIL IN WINGWALL OF NW CORNER OF BRIDGE OVER HOGANS CK

BM6
ELEVATION = 430.06
N 1002405 E 1885941
-L- STATION 26+37.84 49.34' RIGHT
RR SPIKE IN A 24"POPLAR

BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	= 10864	CFS
DESIGN FREQUENCY	= 50	YR
DESIGN HW ELEVATION	= 403.4	FT
BASE DISCHARGE	= 12846	CFS
BASE FREQUENCY	= 100	YR
BASE HW ELEVATION	= 404.5	FT
OVERTOPPING DISCHARGE	= 18260	CFS
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING ELEVATION	= 414.6	FT
DATE OF SURVEY	= 01/25/2018	
W.S.ELEVATION AT DATE OF SURVEY	= 389.5	FT

9/8/2022
...\BR0070_Rdy_pfl_07.dgn

PROJECT REFERENCE NO.	SHEET NO.
BR-0070	8

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
10/20/2022	10/26/2022
NORTH CAROLINA PROFESSIONAL SEAL 045230 ENGINEER MICHAEL S. BURNS, JR.	NORTH CAROLINA PROFESSIONAL SEAL 043870 ENGINEER REID B. ROBOL
DocuSigned by: Michael S. Burns, Jr. D425C8CC006F437...	DocuSigned by: Reid B. Robol B63E5A39E6894F4...
STEWART Firm License No. C-1051 223 S. West St, Suite 1100 Raleigh, NC 27603 T 919.380.8750 www.stewartinc.com	vhb VHB Engineering NC, P.C. (C-3705) 940 Main Campus Drive, Suite 500 Raleigh, NC 27606

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