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GEOTECHNICAL ENGINEER

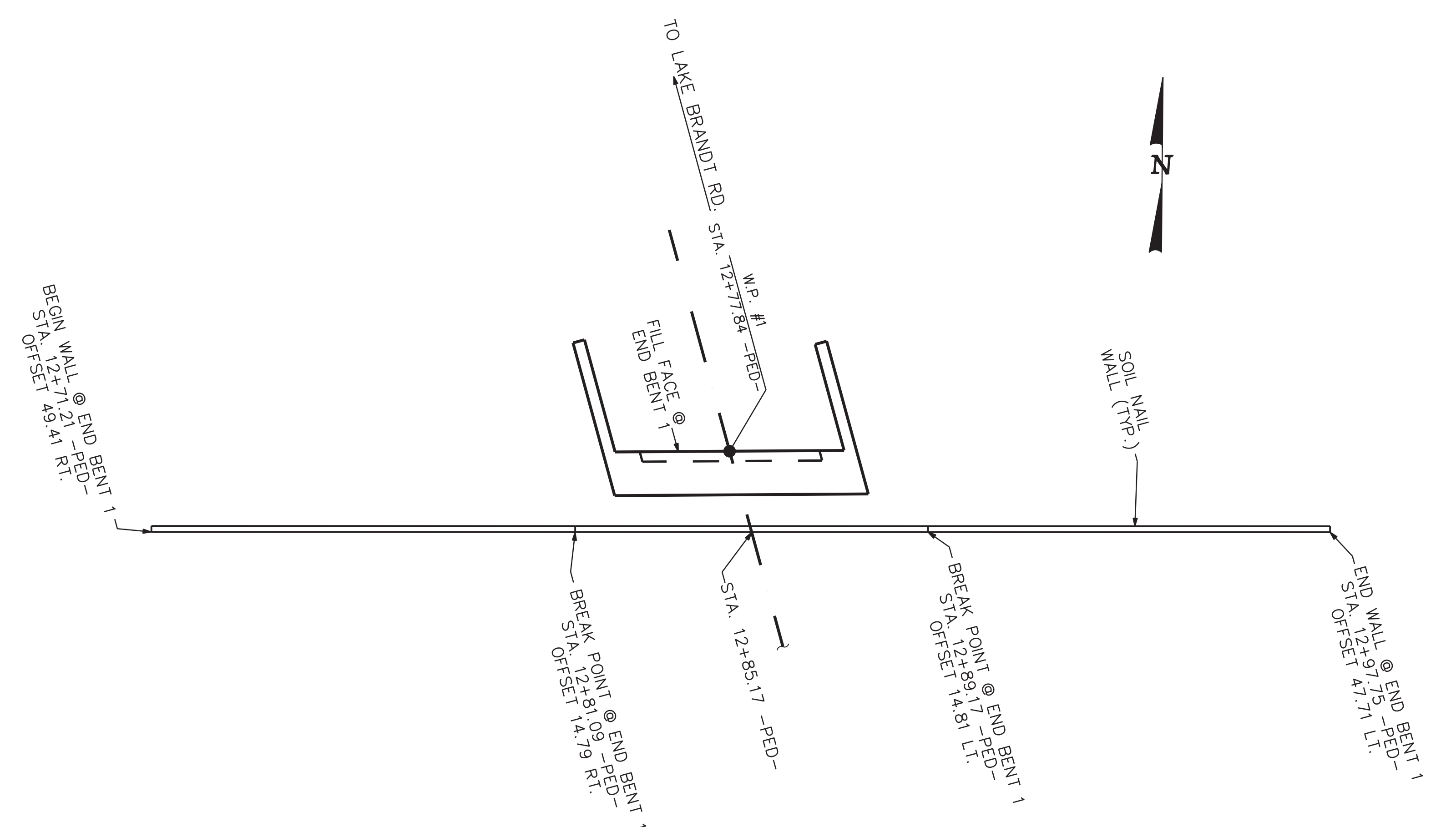
ENGINEER

SEAL
09551

HAROLD D. PRUITT

DATE: 3/29/2016

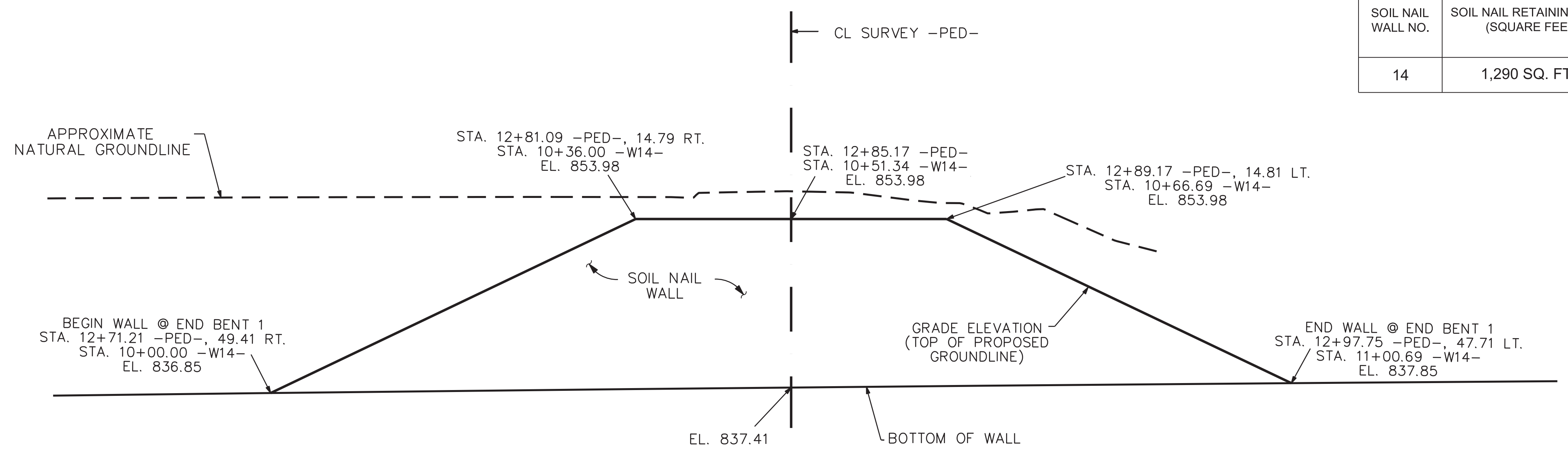
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SOIL NAIL WALL NO. 14 PLAN

ESTIMATED SOIL NAIL WALL QUANTITIES

SOIL NAIL WALL NO.	SOIL NAIL RETAINING WALL (SQUARE FEET)	SOIL NAIL VERIFICATION TESTS	SOIL NAIL PROOF TESTS
14	1,290 SQ. FT.	2	4



SOIL NAIL WALL NO. 14 WALL ELEVATION

PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: 13+62.84 -PED-
 SHEET 1 OF 3

PREPARED BY: HDP DATE: 3/17/16
 REVIEWED BY: DCD DATE: 3/17/16

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SOIL NAIL WALL ENVELOPE AT END BENT 1 PEDESTRIAN BRIDGE

REVISIONS						SHEET NO. W-1
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

GEOTECHNICAL ENGINEER

ENGINEER

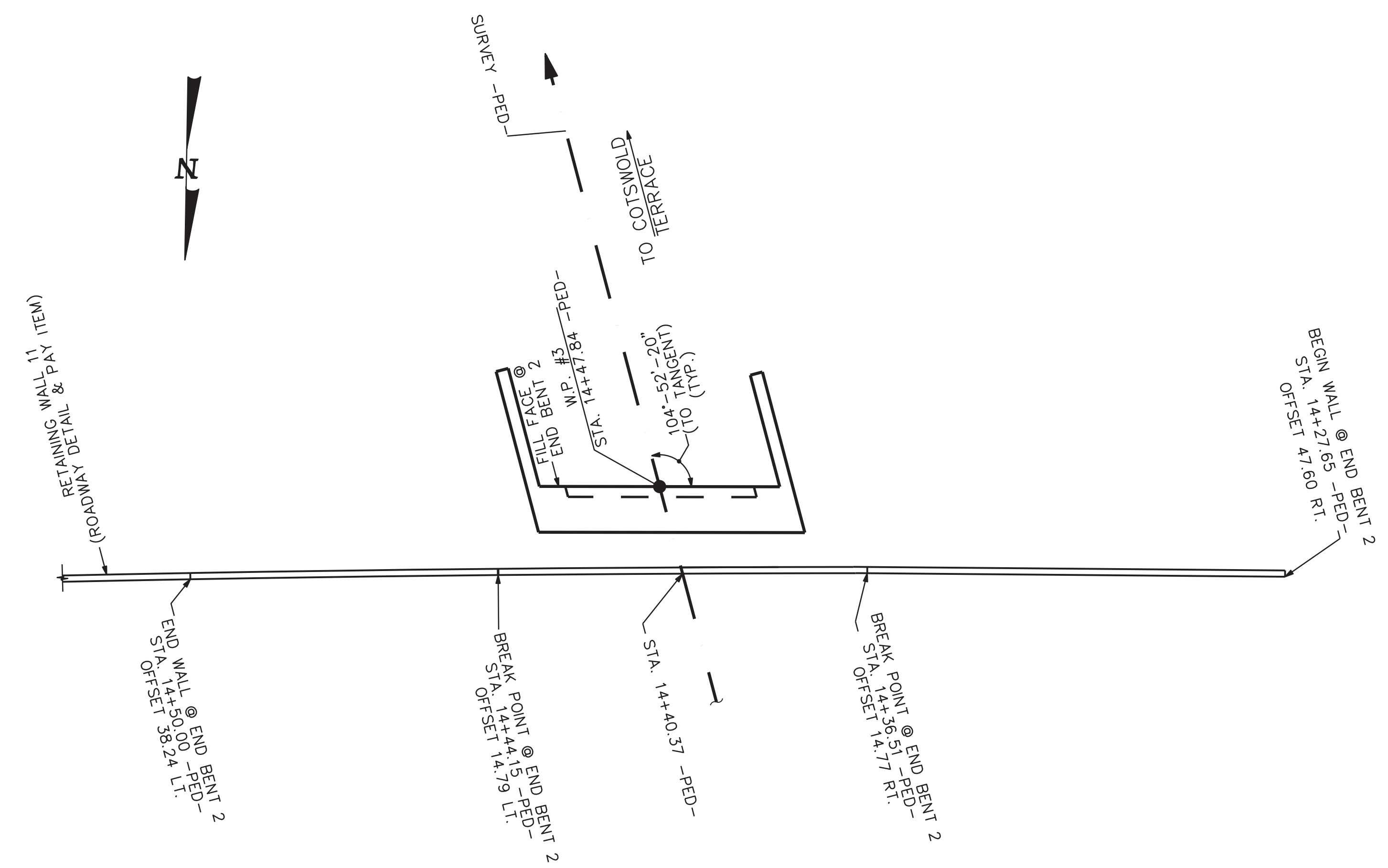
SEAL
09551

HAROLD D. PRUITT

DocuSign
Harold Pruitt
03/29/2016

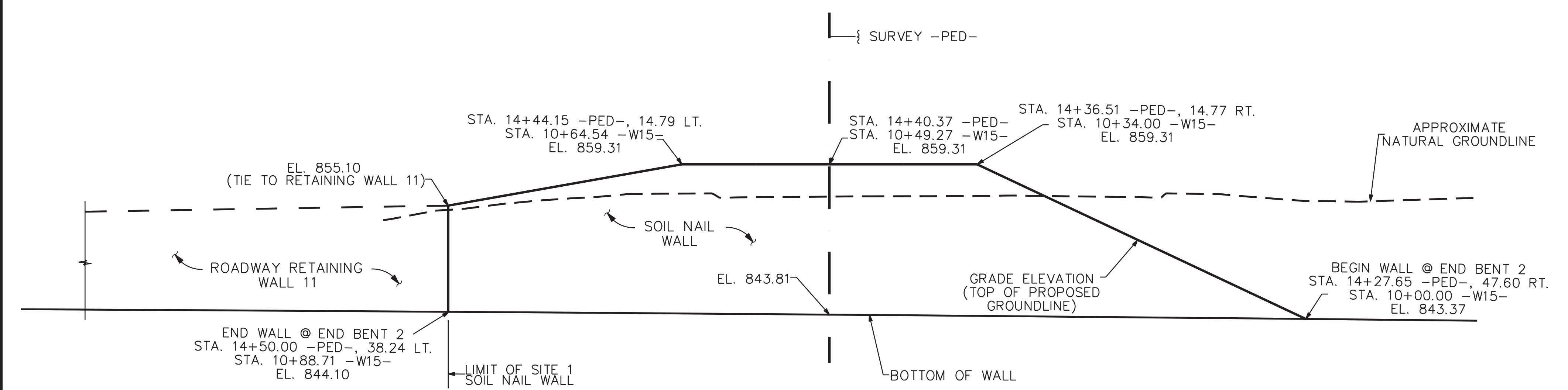
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UNLESS ALL SIGNATURES COMPLETED**



SOIL NAIL WALL NO. 15 PLAN

ESTIMATED SOIL NAIL WALL QUANTITIES			
SOIL NAIL WALL NO.	SOIL NAIL RETAINING WALL (SQ. FEET)	SOIL NAIL VERIFICATION TESTS	SOIL NAIL PROOF TESTS
15	1,230 SQ. FT.	2	4



SOIL NAIL WALL NO. 15 WALL ELEVATION

PROJECT NO.: U-2524D
 _____ COUNTY
 STATION: 13+62.84 -PED-
 SHEET 2 OF 3

PREPARED BY: HDP DATE: 3/17/16
 REVIEWED BY: DCD DATE: 3/17/16

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

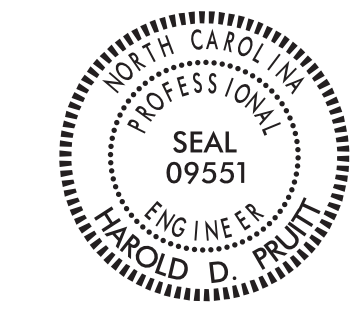
SOIL NAIL WALL ENVELOPE AT END BENT 2 PEDESTRIAN BRIDGE

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

SHEET NO. W-2

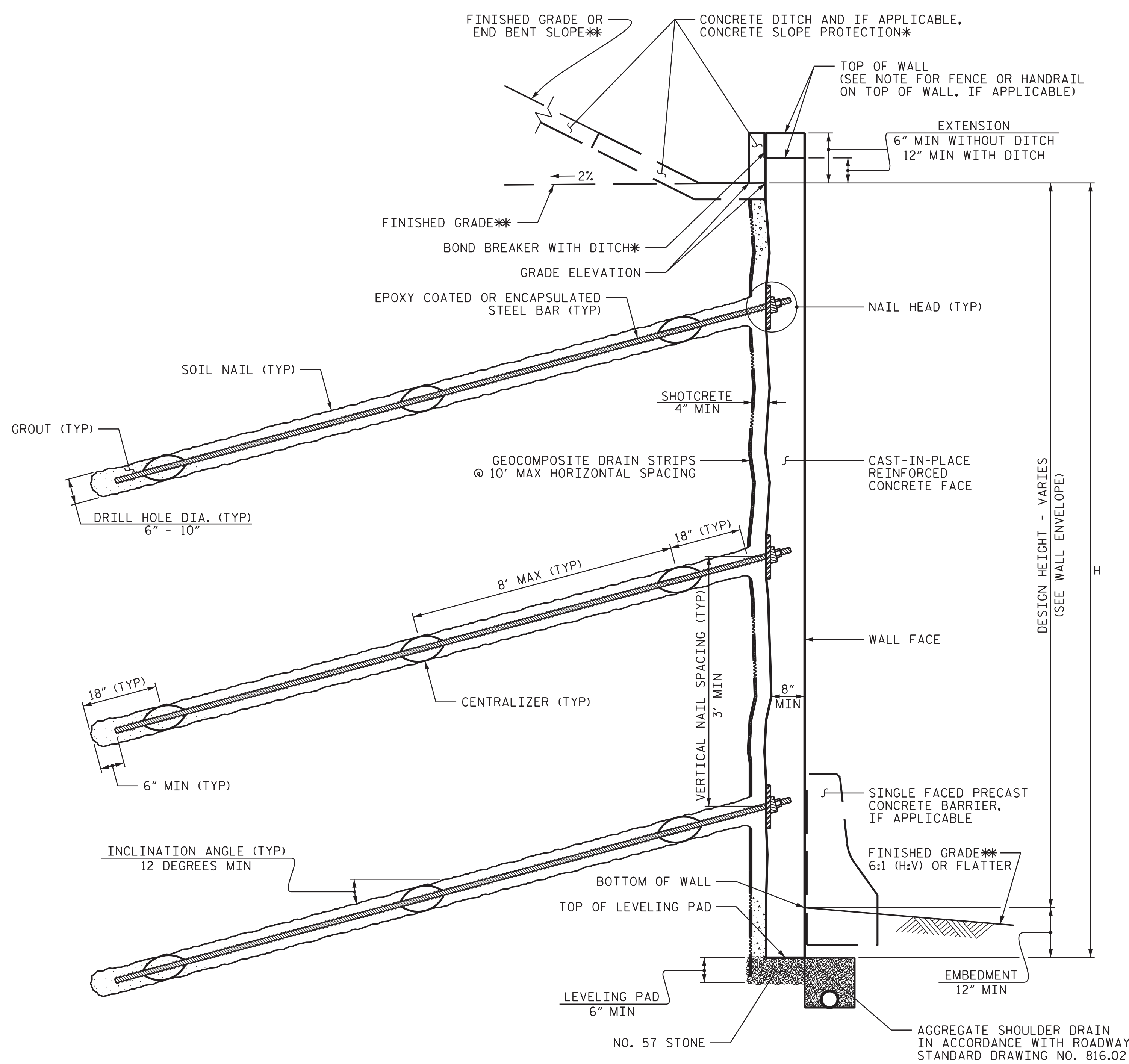
GEOTECHNICAL ENGINEER

ENGINEER



DocuSigned by: Harold Pruitt 4/29/2016

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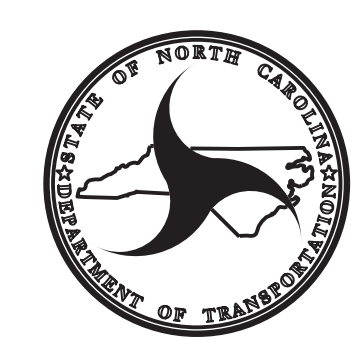
SOIL NAIL WALL - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.

NOTES:

- FOR SOIL NAIL RETAINING WALLS, SEE SOIL NAIL RETAINING WALLS PROVISION.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.
- A FENCE OR HANDRAIL IS REQUIRED ON TOP OF RETAINING WALLS NO. 14 AND NO. 15. SEE ROADWAY PLANS FOR FENCE OR HANDRAIL ATTACHMENT DETAILS.
- BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR RETAINING WALLS NO. 14 AND NO. 15, SURVEY WALL LOCATIONS AND SUBMIT REVISED WALL PROFILE VIEWS (WALL ENVELOPES) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPES ARE ACCEPTED.
- DESIGN RETAINING WALL NO. 14 & NO. 15 FOR THE FOLLOWING:
 - H = DESIGN HEIGHT + EMBEDMENT = 18.0 FT.
 - DESIGN LIFE = 100 YEARS
 - MINIMUM EMBEDMENT DEPTH = 1.0 FT
 - IN-SITU ASSUMED MATERIAL PARAMETERS ABOVE ELEVATION 849.0 FT:
 - UNIT WEIGHT, $\gamma = 110$ LB/CF
 - FRICTION ANGLE, $\phi = 10$ DEGREES
 - COHESION, $c = 1000$ LB/SF
 - IN-SITU ASSUMED MATERIAL PARAMETERS BETWEEN ELEVATION 849.0 FT AND ELEVATION 841.0 FT:
 - UNIT WEIGHT, $\gamma = 120$ LB/CF
 - FRICTION ANGLE, $\phi = 25$ DEGREES
 - COHESION, $c = 200$ LB/SF
 - IN-SITU ASSUMED MATERIAL PARAMETERS BELOW ELEVATION 841.0 FT:
 - UNIT WEIGHT, $\gamma = 120$ LB/CF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 100$ LB/SF
- DESIGN RETAINING WALLS NO. 14 AND NO. 15 FOR A 100 PSF LIVE LOAD SURCHARGE.
- FOUNDATIONS FOR END BENT NO. 1 LOCATED AT STATION 12+77.84 -PED- MAY INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. 14. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.
- FOUNDATIONS FOR END BENT NO. 2 LOCATED AT STATION 14+47.84 -PED- MAY INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. 15. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: 13+62.84 -PED-
 SHEET 3 OF 3



NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GEOTECHNICAL
 ENGINEERING UNIT

SOIL NAIL WALL WITH OR WITHOUT BACK SLOPE - TYPICAL & NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-3
2			4			

PREPARED BY: HDP DATE: 3/17/16
 REVIEWED BY: DCD DATE: 3/17/16

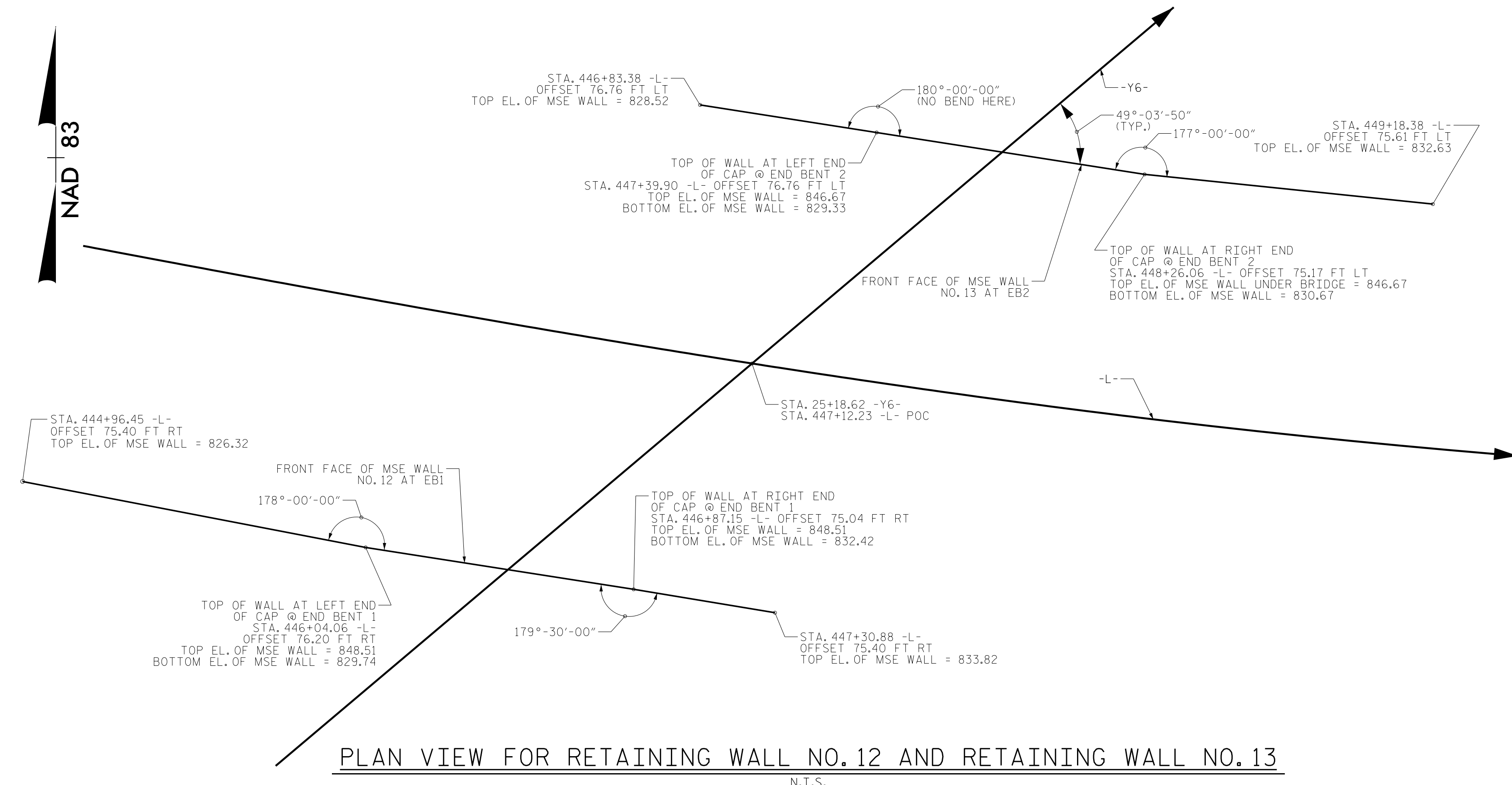
GEOTECHNICAL ENGINEER

ENGINEER

DocuSigned by:
Donald W. Brown Jr. 5/12/2016

SIGNATURE DATE SIGNATURE DATE

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UNLESS ALL SIGNATURES COMPLETED**

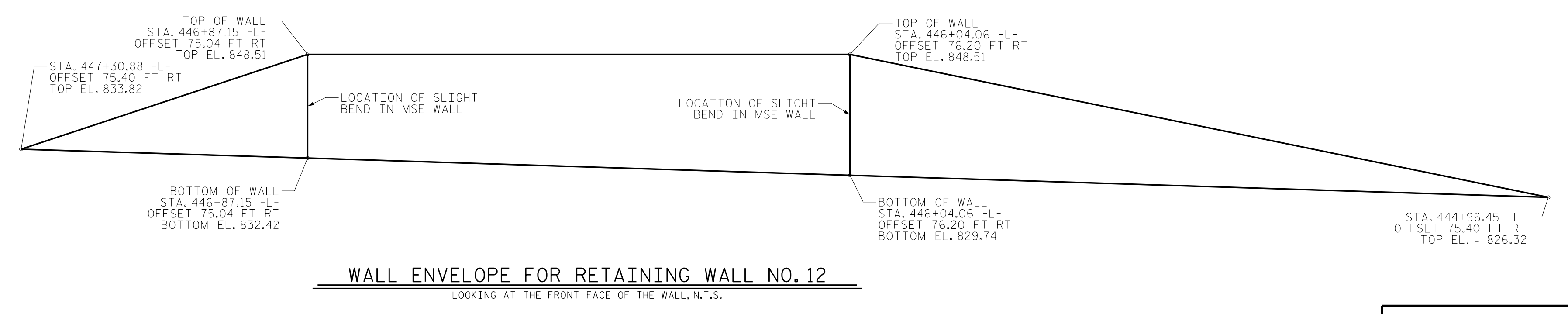
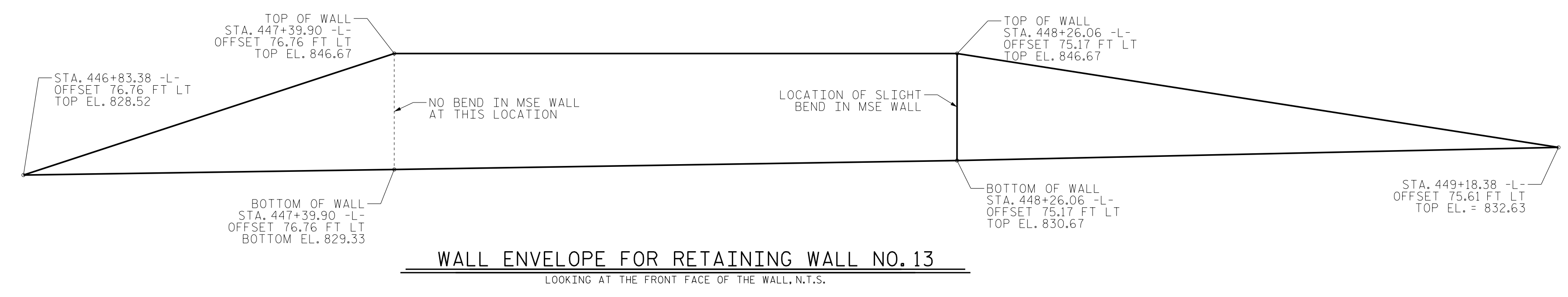


ESTIMATED SOIL NAIL WALL QUANTITIES

RETAINING WALL NO.	SOIL NAIL RETAINING WALLS (SQ. FEET)	SOIL NAIL VERIFICATION TESTS	SOIL NAIL PROOF TESTS
12	3090	2	6
13	2840	2	6
TOTAL QUANTITIES	5930	4	12

ALTERNATE ESTIMATED MSE WALL QUANTITIES (SQ. FEET)

MSE RETAINING WALL NO. 12	3330
MSE RETAINING WALL NO. 13	3080



PROJECT NO.: U-2524D (34820.1.2)
GUILFORD COUNTY
STATION: -Y6- 25+18.62
SHEET 1 OF 5

**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

**GEOTECHNICAL
ENGINEERING UNIT**

**RETAINING WALL NO. 12 AND
RETAINING WALL NO. 13
PLAN VIEW AND ENVELOPES**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-4
2			4			

PREPARED BY: N. MOHS DATE: 5/02/2016
REVIEWED BY: D. BROWN DATE: 5/10/2016

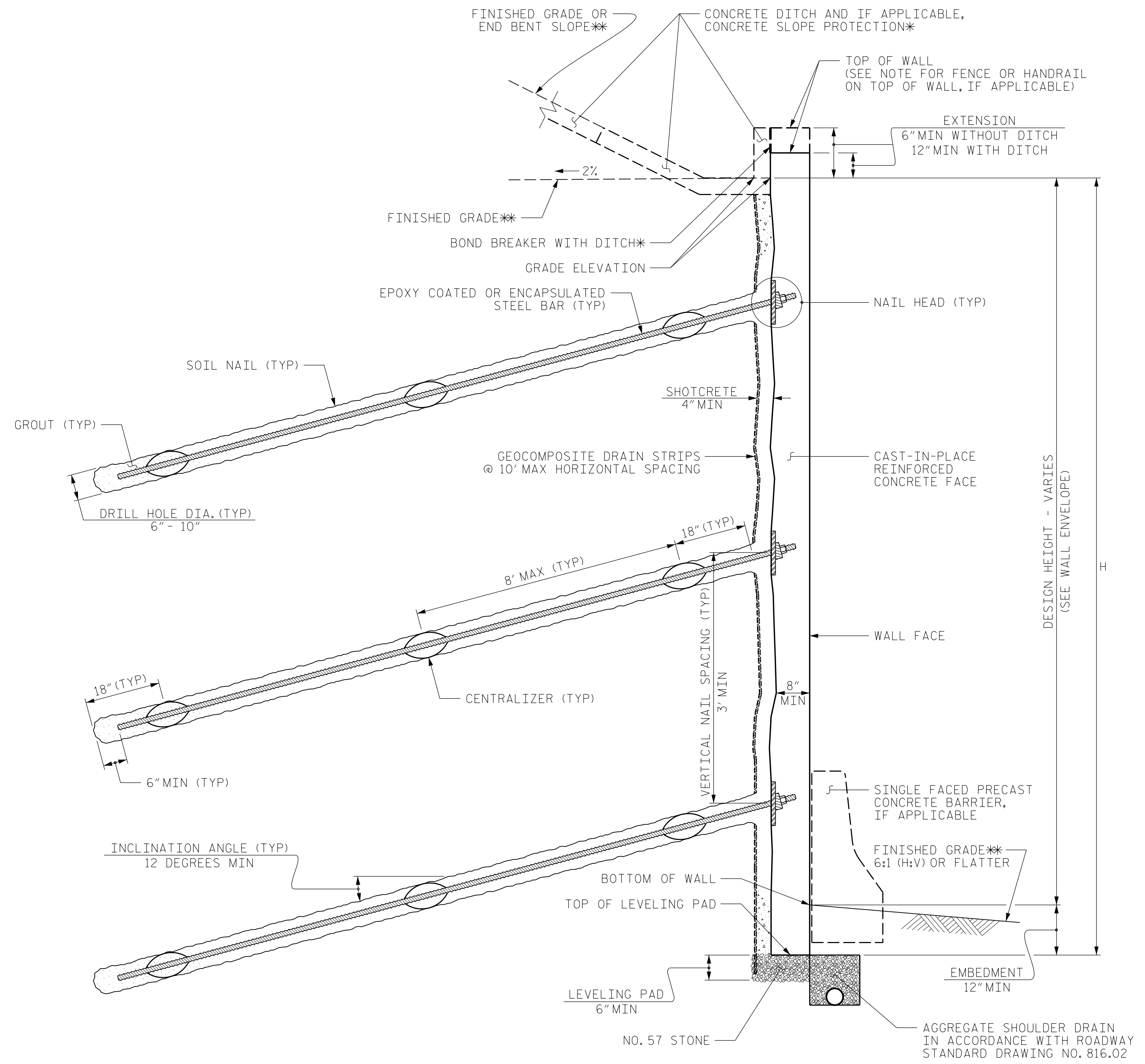
GEOTECHNICAL ENGINEER

ENGINEER

SEAL 028422

Donald W. Brown Jr. 5/12/2016

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SOIL NAIL WALL - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL DETAILS.
 **SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.

PROJECT NO.: U-2524D (34820.1.2)
 GUILFORD COUNTY
 STATION: -Y6- 25+18.62
 SHEET 2 OF 5

PREPARED BY: N. MOHS DATE: 5/02/2016
 REVIEWED BY: D. BROWN DATE: 5/10/2016

NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS

GEOTECHNICAL
 ENGINEERING UNIT

RETAINING WALL NO. 12 AND
 RETAINING WALL NO. 13
 TYPICAL SECTIONS

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

SHEET NO. W-5

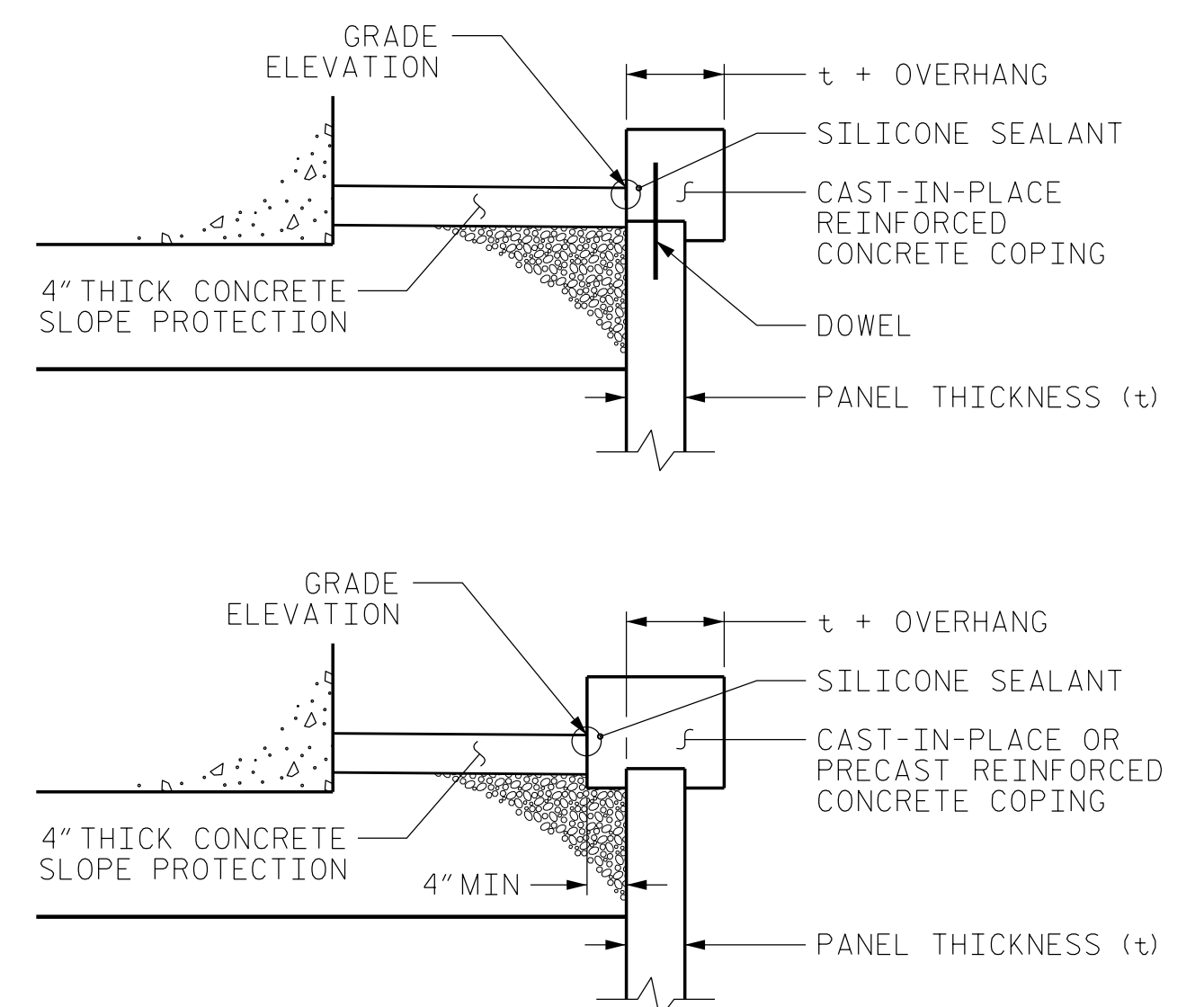
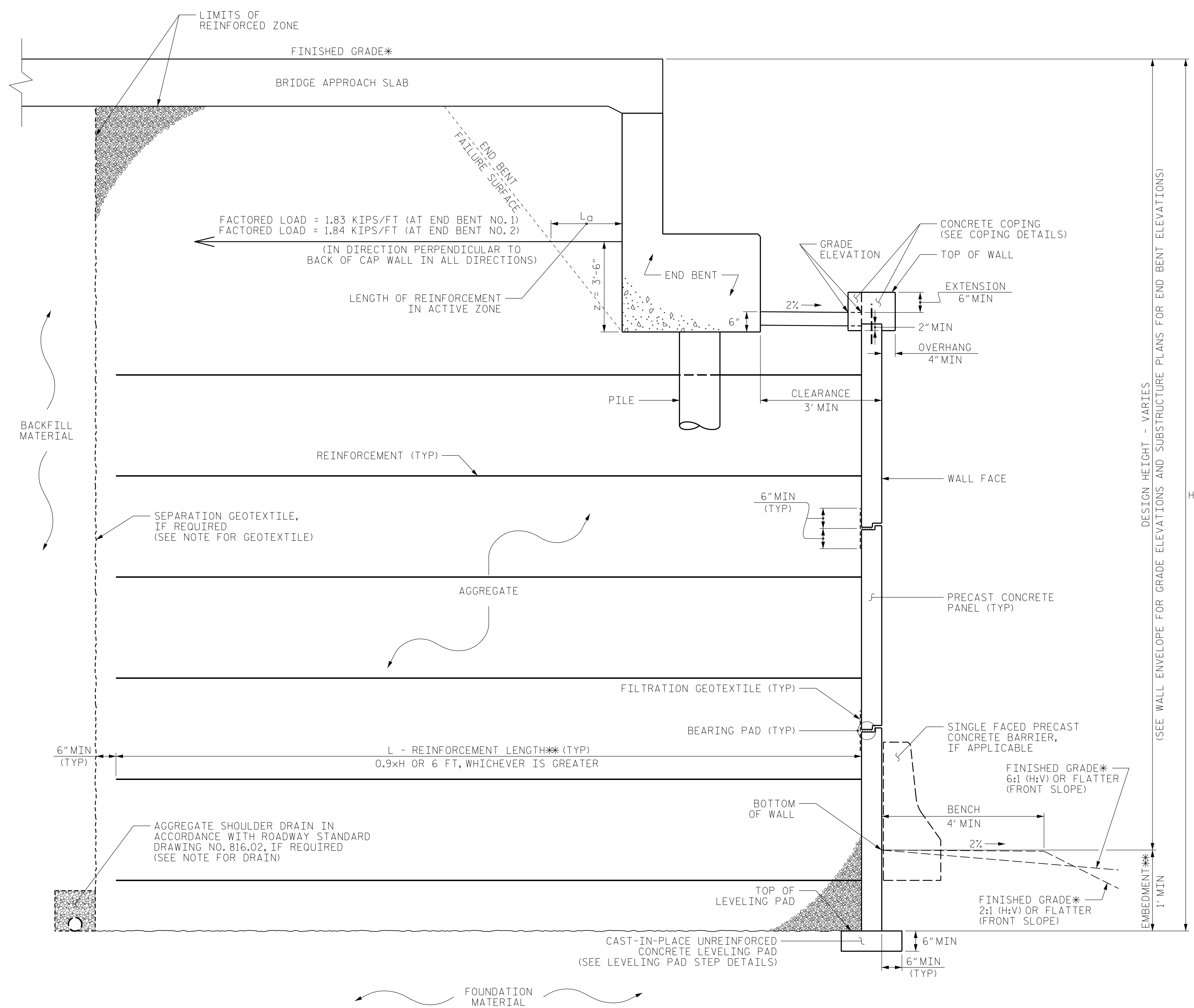
GEOTECHNICAL ENGINEER

ENGINEER

DocuSigned by:
Donald W. Brown Jr. 5/12/2016

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COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.

MSE ABUTMENT WALL WITH PRECAST PANELS - TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
**SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.

PROJECT NO.: U-2524D (34820.1.2)
GUILFORD COUNTY
STATION: -Y6- 25+18.62
SHEET 3 OF 5

**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

**GEOTECHNICAL
ENGINEERING UNIT**

**RETAINING WALL NO. 12 AND
RETAINING WALL NO. 13
TYPICAL SECTION & DETAILS
(ALTERNATE)**

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

SHEET NO. W-6

PREPARED BY: N. MOHS	DATE: 5/02/2016
REVIEWED BY: D. BROWN	DATE: 5/10/2016

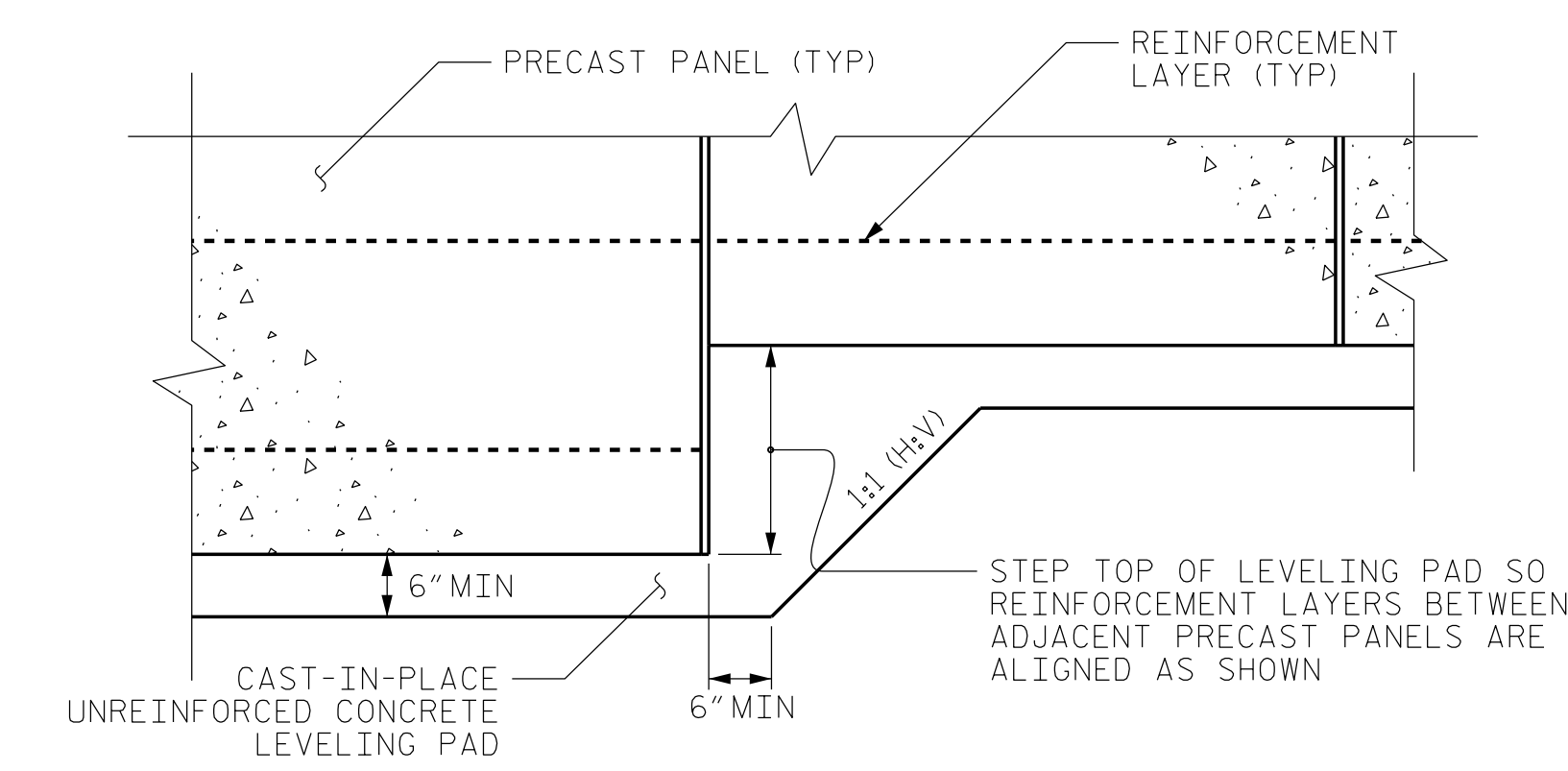
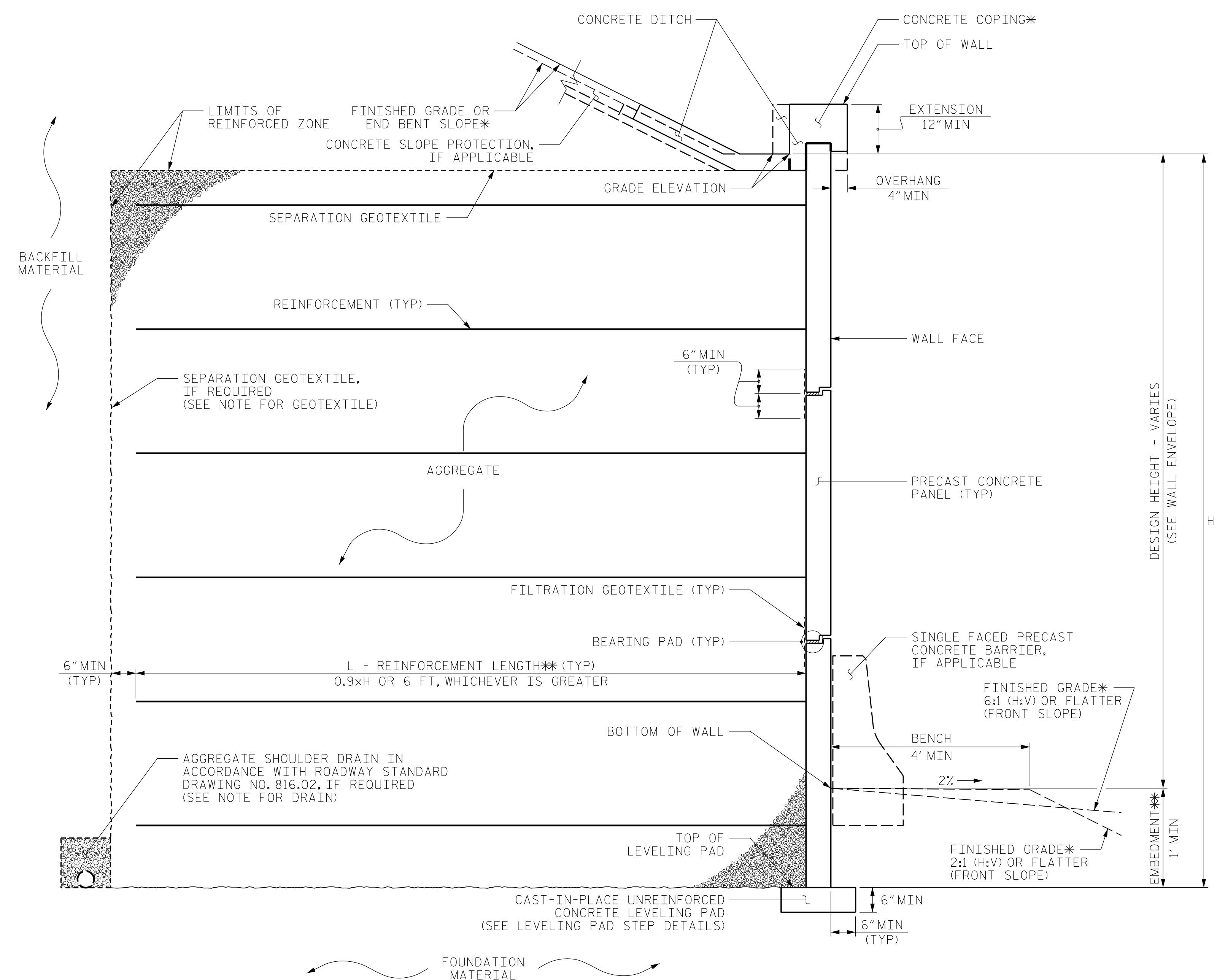
GEOTECHNICAL ENGINEER

ENGINEER

SEAL 028422

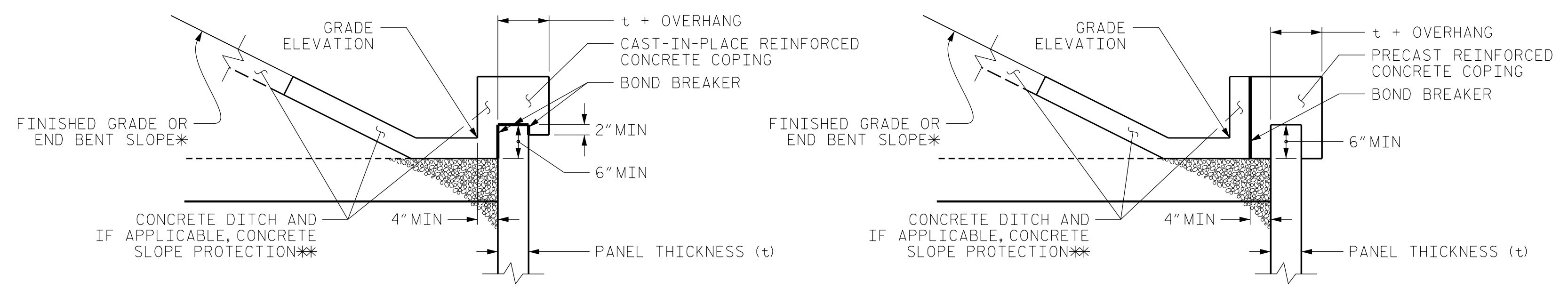
Donald W. Brown Jr. 5/12/2016

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MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

*SEE COPING DETAILS AND PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.
 **SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.



COPING DETAILS

*SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.
 **SEE CONCRETE DITCH BEHIND WALL DETAILS.

PROJECT NO.: U-2524D (34820.1.2)
 GUILFORD COUNTY
 STATION: -Y6- 25+18.62
 SHEET 4 OF 5

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

RETAINING WALL NO. 12 AND RETAINING WALL NO. 13 TYPICAL SECTIONS (ALTERNATE)

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

SHEET NO. W-7

PREPARED BY: N. MOHS	DATE: 5/02/2016
REVIEWED BY: D. BROWN	DATE: 5/10/2016

MSE ABUTMENT WALL WITH PRECAST PANELS - NOTES (ALTERNATE)

NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION. AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 12 AND 13.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

CAST-IN-PLACE REINFORCED CONCRETE COPING IS REQUIRED AT VERTICAL EDGES ONLY OF THE ALTERNATE MSE RETAINING WALL NO. 12 AND NO. 13.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 12 AND NO. 13.

A DRAIN IS REQUIRED FOR RETAINING WALL NO. 12 AND NO. 13.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 12 AND NO. 13, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. 12 AND NO. 13 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 6500 LB/SF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.9xH OR 6 FT, WHICHEVER IS LONGER
- 5) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) LB/CF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) LB/SF
COARSE	110	38	0
FINE	115	34	0

*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) LB/CF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) LB/SF
BACKFILL	120	30	0
FOUNDATION	120	32	0

DESIGN RETAINING WALL NO. 12 AND NO. 13 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OF REINFORCEMENT IN ACTIVE ZONE (L) SHOWN. CAST REINFORCEMENT CONNECTORS INTO CAP BACKWALL FOR END BENT NO. 1 LOCATED AT STATION 24+10.12 -Y6- AND END BENT NO. 2 LOCATED AT STATION 26+29.62 -Y6-. MAINTAIN A CLEARANCE OF AT LEAST 3" BETWEEN CONNECTORS AND REINFORCING STEEL IN CAP.

FOUNDATIONS FOR SIGNS, LIGHTING or SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. 12 AND RETAINING WALL NO. 13 AND MAY INTERFERE WITH REINFORCEMENT. BEFORE BEGINNING MSE WALL CONSTRUCTION, SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS FOR APPROVAL.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 12 AND NO. 13.

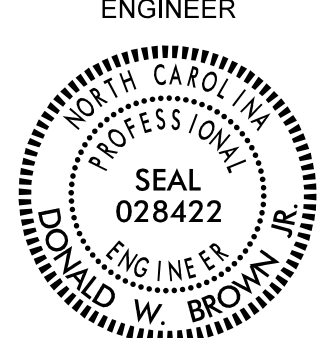
FOUNDATIONS FOR END BENT NO. 1 LOCATED AT STATION 24+10.12 -Y6- WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 12. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

FOUNDATIONS FOR END BENT NO. 2 LOCATED AT STATION 26+29.62 -Y6- WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 13. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 12 AND NO. 13 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

AT THE CONTRACTOR'S OPTION, "TEMPORARY SHORING FOR WALL CONSTRUCTION" MAY BE USED TO CONSTRUCT RETAINING WALL NO. 12 AND NO. 13. SEE MSE RETAINING WALLS PROVISION FOR TEMPORARY SHORING FOR WALL CONSTRUCTION.

REINFORCED BRIDGE APPROACH FILL IS NOT REQUIRED AT END BENTS FOR MSE WALLS.

GEOTECHNICAL ENGINEER  SEAL 028422 ENGINEER DONALD W. BROWN	ENGINEER
DocuSigned by: Donald W. Brown Jr. 5/12/2016 056848203967464 SIGNATURE	DATE
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SOIL NAIL WALL - NOTES

NOTES:

FOR SOIL NAIL RETAINING WALLS, SEE SOIL NAIL RETAINING WALLS PROVISION.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR RETAINING WALL NO. 12 AND NO. 13, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. 12 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) IN-SITU ASSUMED MATERIAL PARAMETERS ABOVE ELEVATION 835 FT:
UNIT WEIGHT, $\gamma = 120$ LB/CF
FRICTION ANGLE, $\phi = 30$ DEGREES
COHESION, c = 0 LB/SF
- 4) IN-SITU ASSUMED MATERIAL PARAMETERS BELOW ELEVATION 835 FT:
UNIT WEIGHT, $\gamma = 120$ LB/CF
FRICTION ANGLE, $\phi = 32$ DEGREES
COHESION, c = 0 LB/SF

DESIGN RETAINING WALL NO. 13 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) IN-SITU ASSUMED MATERIAL PARAMETERS ABOVE ELEVATION 825 FT:
UNIT WEIGHT, $\gamma = 120$ LB/CF
FRICTION ANGLE, $\phi = 30$ DEGREES
COHESION, c = 0 LB/SF
- 4) IN-SITU ASSUMED MATERIAL PARAMETERS BELOW ELEVATION 825 FT:
UNIT WEIGHT, $\gamma = 120$ LB/CF
FRICTION ANGLE, $\phi = 34$ DEGREES
COHESION, c = 0 LB/SF

DESIGN RETAINING WALL NO. 12 AND NO. 13 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

FOUNDATIONS FOR SIGNS, LIGHTING or SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. 12 AND NO. 13 AND MAY INTERFERE WITH SOIL NAILS. SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS WITH THE SOIL NAIL WALL CONSTRUCTION PLAN.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. 12 AND NO. 13.

FOUNDATIONS FOR END BENT NO. 1 LOCATED AT STATION 24+10.12 -Y6- WILL INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. 12. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

FOUNDATIONS FOR END BENT NO. 2 LOCATED AT STATION 26+29.62 -Y6- WILL INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. 13. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.


REINFORCED BRIDGE APPROACH FILL IS REQUIRED AT END BENTS FOR SOIL NAIL WALLS.

PROJECT NO.: U-2524D (34820.1.2)

GUILFORD COUNTY

STATION: -Y6- 25+18.62

SHEET 5 OF 5

	NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS
	GEOTECHNICAL ENGINEERING UNIT

**RETAINING WALL NO. 12 AND
RETAINING WALL NO. 13 NOTES**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-8
2			4			

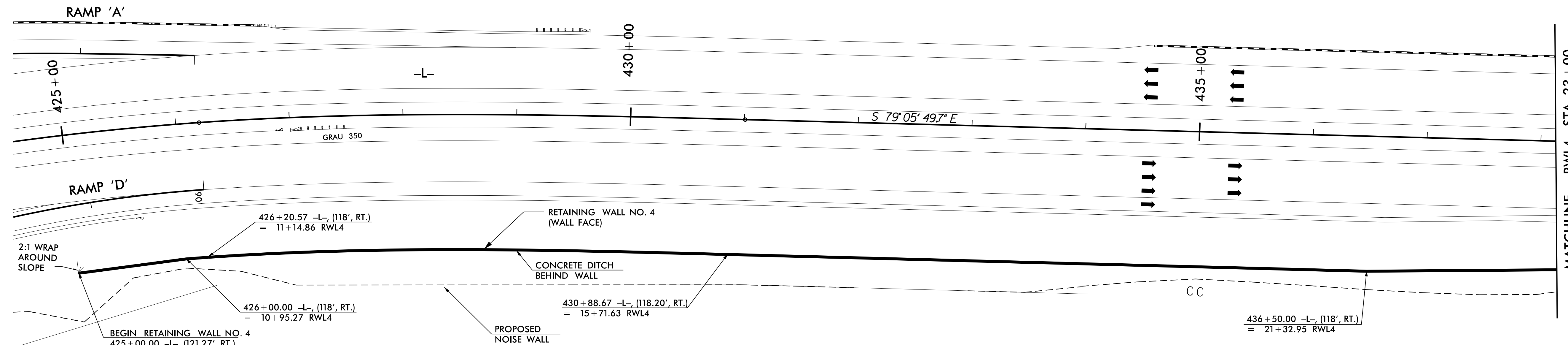
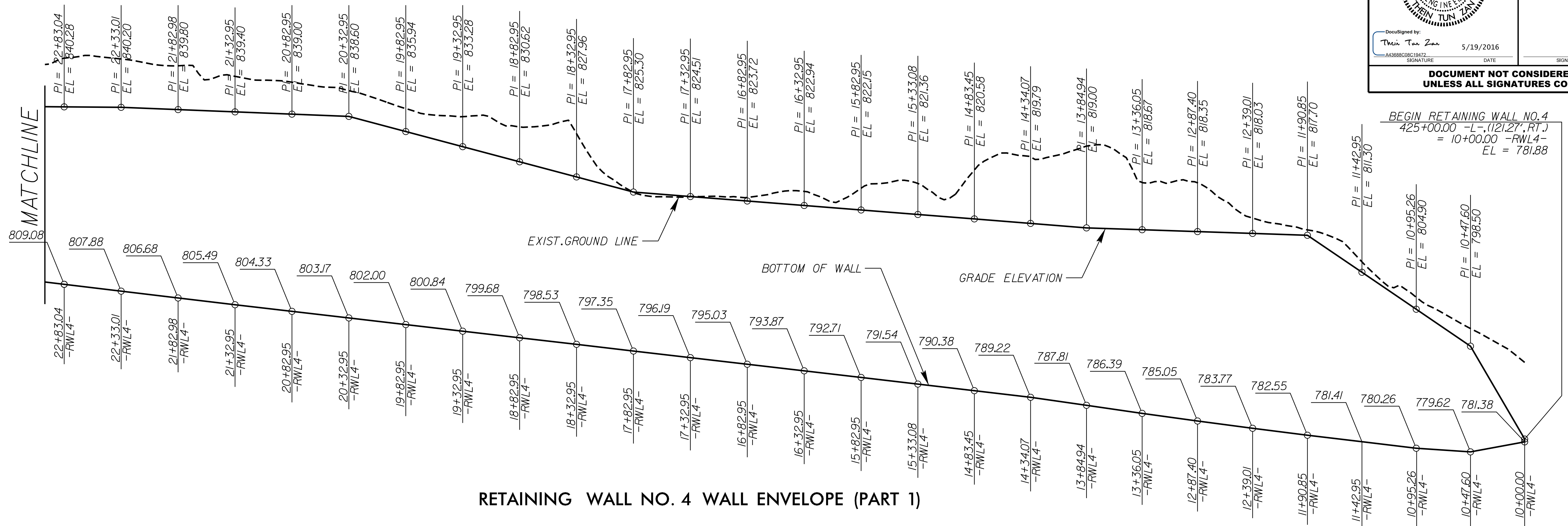
PREPARED BY: N. MOHS	DATE: 5/02/2016
REVIEWED BY: D. BROWN	DATE: 5/10/2016

GEOTECHNICAL ENGINEER

ENGINEER

DocuSigned by:
Thein T. Zan
5/19/2016

**DOCUMENT NOT CONSIDERED FINAL
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-RWL4-

PI Sta 11+05.07	PIs Sta 12+67.25
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$D = 2^\circ 24' 30.7\"$	$L_s = 456.77'$
$L = 19.59'$	$LT = 304.66'$
$T = 9.80'$	$ST = 152.39'$
$R = 2,378.86'$	

PREPARED BY: THEIN T. ZAN DATE: 05-2016
REVIEWED BY: JAMES R. BATTS DATE: 05-2016

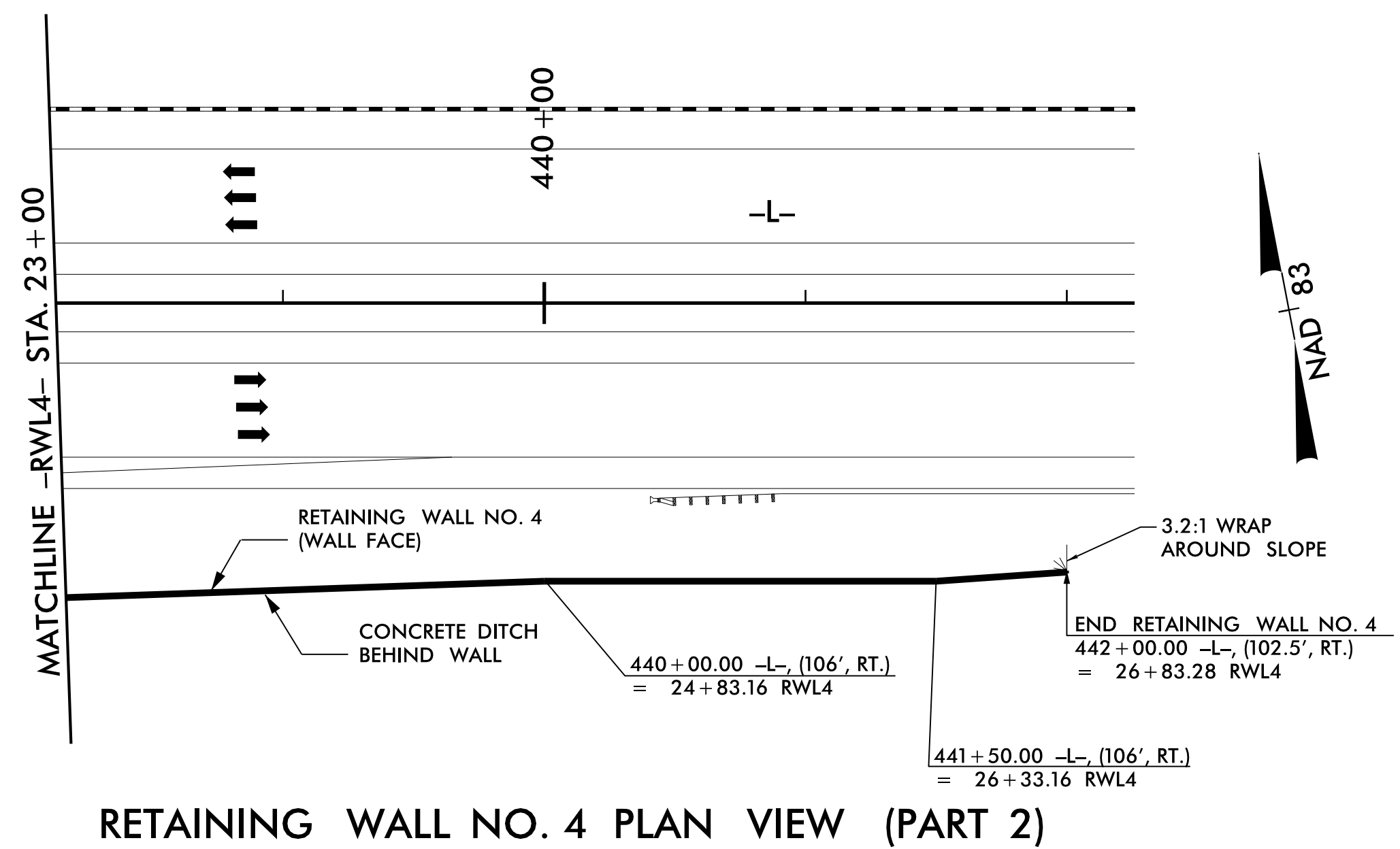
**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

**GEOTECHNICAL
ENGINEERING UNIT**

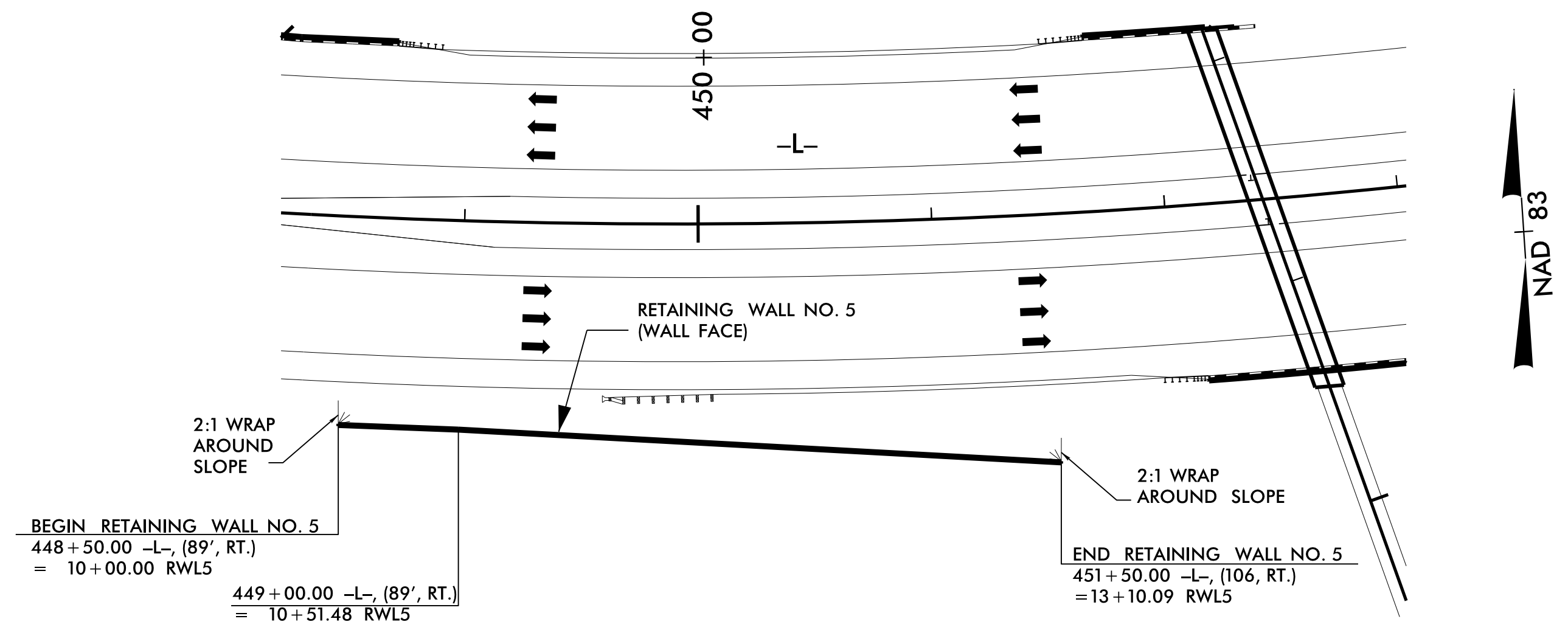
PROJECT NO.: U-2524D
GUILFORD COUNTY
STATION: 425+00 -L- (10+00 -RWL4-)
SHEET 1 OF 12

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

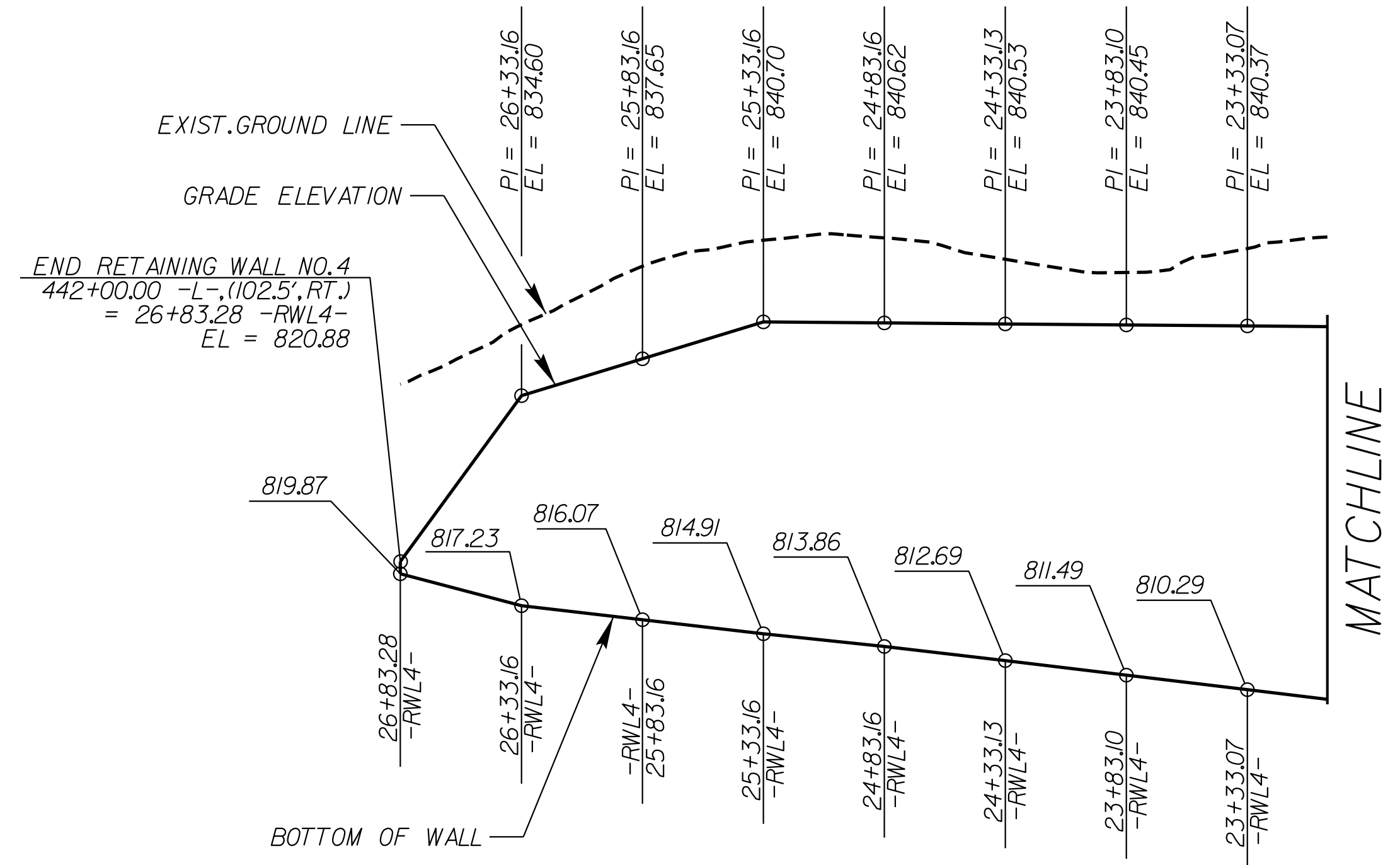
SHEET NO. W-9



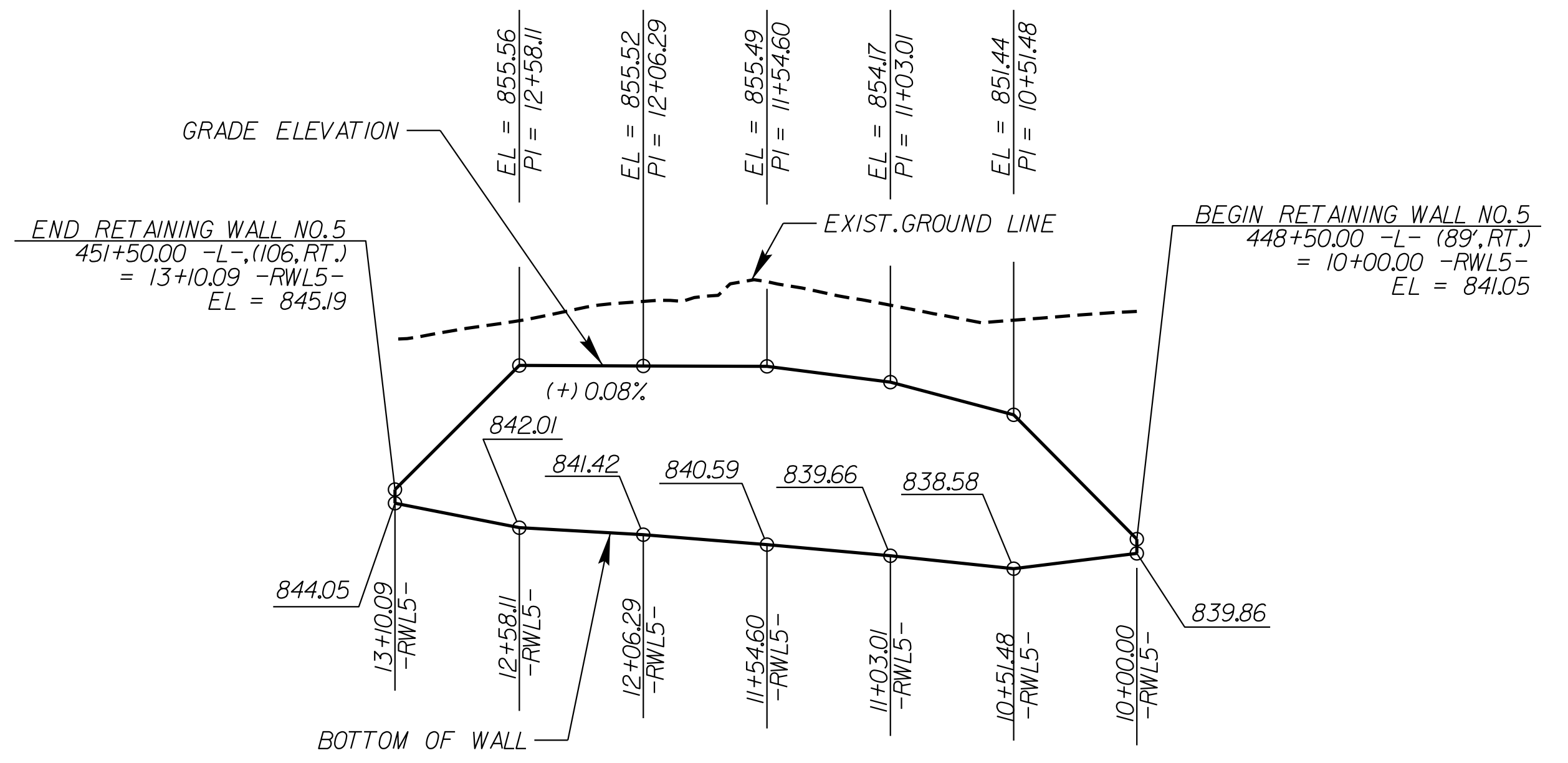
RETAINING WALL NO. 4 PLAN VIEW (PART 2)



RETAINING WALL NO. 5 PLAN VIEW

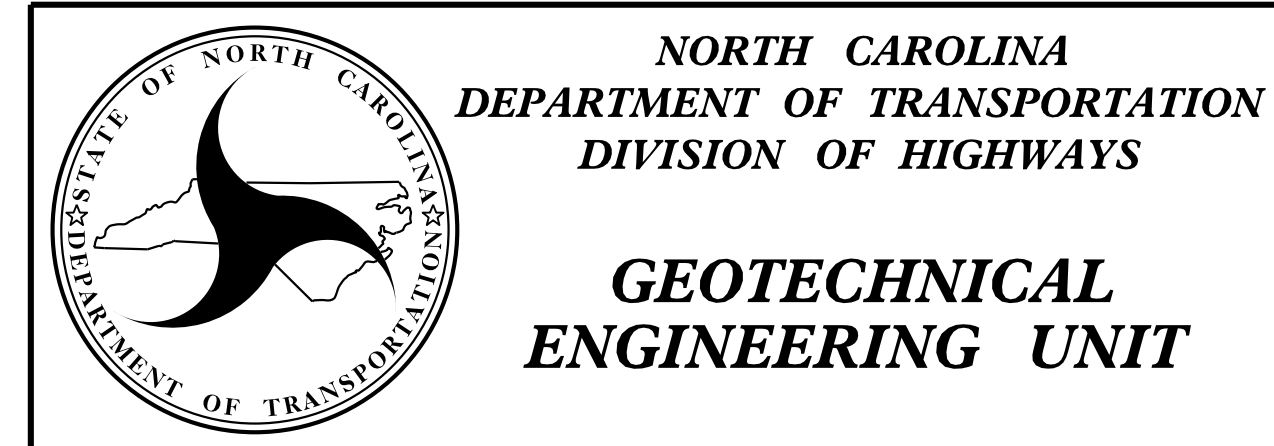


RETAINING WALL NO. 4 WALL ENVELOPE (PART 2)



RETAINING WALL NO. 5 WALL ENVELOPE

ESTIMATED SOIL NAIL WALL QUANTITIES			
RETAINING WALL NO.	SOIL NAIL RETAINING WALLS (SQUARE FEET)	SOIL NAIL VERIFICATION TESTS	SOIL NAIL PROOF TESTS
4	53,585	6	75
5	4,265	2	7



PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: 425+00 -L- (10+00 -RWL4-) &
 448+50 -L- (10+00 -RWL5-)

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

RETAINING WALL NO. 4 (PART 2) &
 RETAINING WALL NO. 5
 SOIL NAIL RETAINING WALLS
 PLAN VIEW & WALL ENVELOPES

GEOTECHNICAL ENGINEER

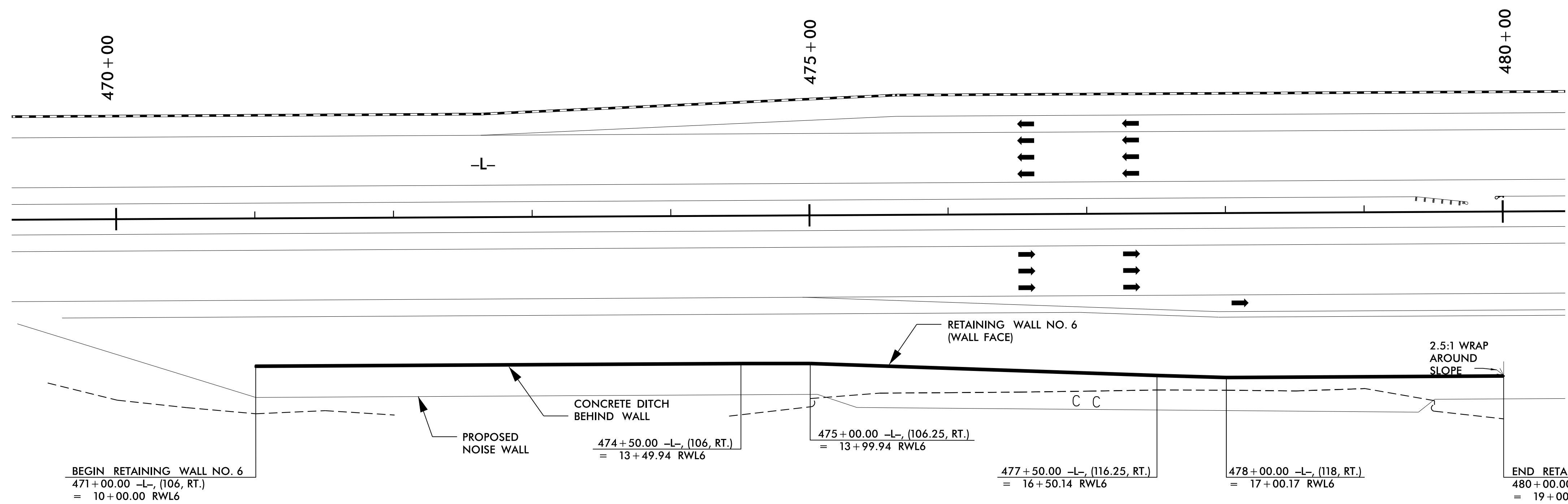
ENGINEER

SEAL 030943

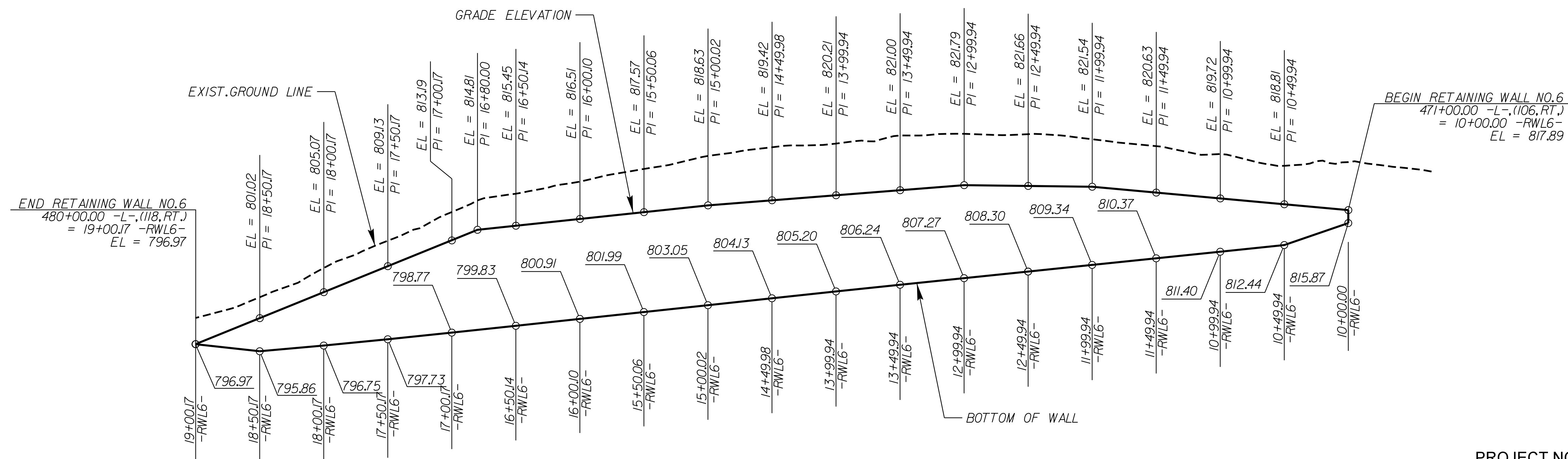
DocuSigned by: *Thein T. Zan* 5/19/2016

DATE SIGNATURE DATE

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RETAINING WALL NO. 6 PLAN VIEW



RETAINING WALL NO. 6 WALL ENVELOPE

PROJECT NO.: U-2524D

GUILFORD COUNTY

STATION: 471+00 -L- (10+00 -RWL6-)

SHEET 3 OF 12

ESTIMATED SOIL NAIL WALL QUANTITY			
RETAINING WALL NO.	SOIL NAIL RETAINING WALLS (SQUARE FEET)	SOIL NAIL VERIFICATION TESTS	SOIL NAIL PROOF TESTS
6	12,460	2	20

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

RETAINING WALL NO. 6 SOIL NAIL RETAINING WALL PLAN VIEW & WALL ENVELOPES

SHEET NO. W-11

PREPARED BY: THEIN T. ZAN DATE: 05-2016

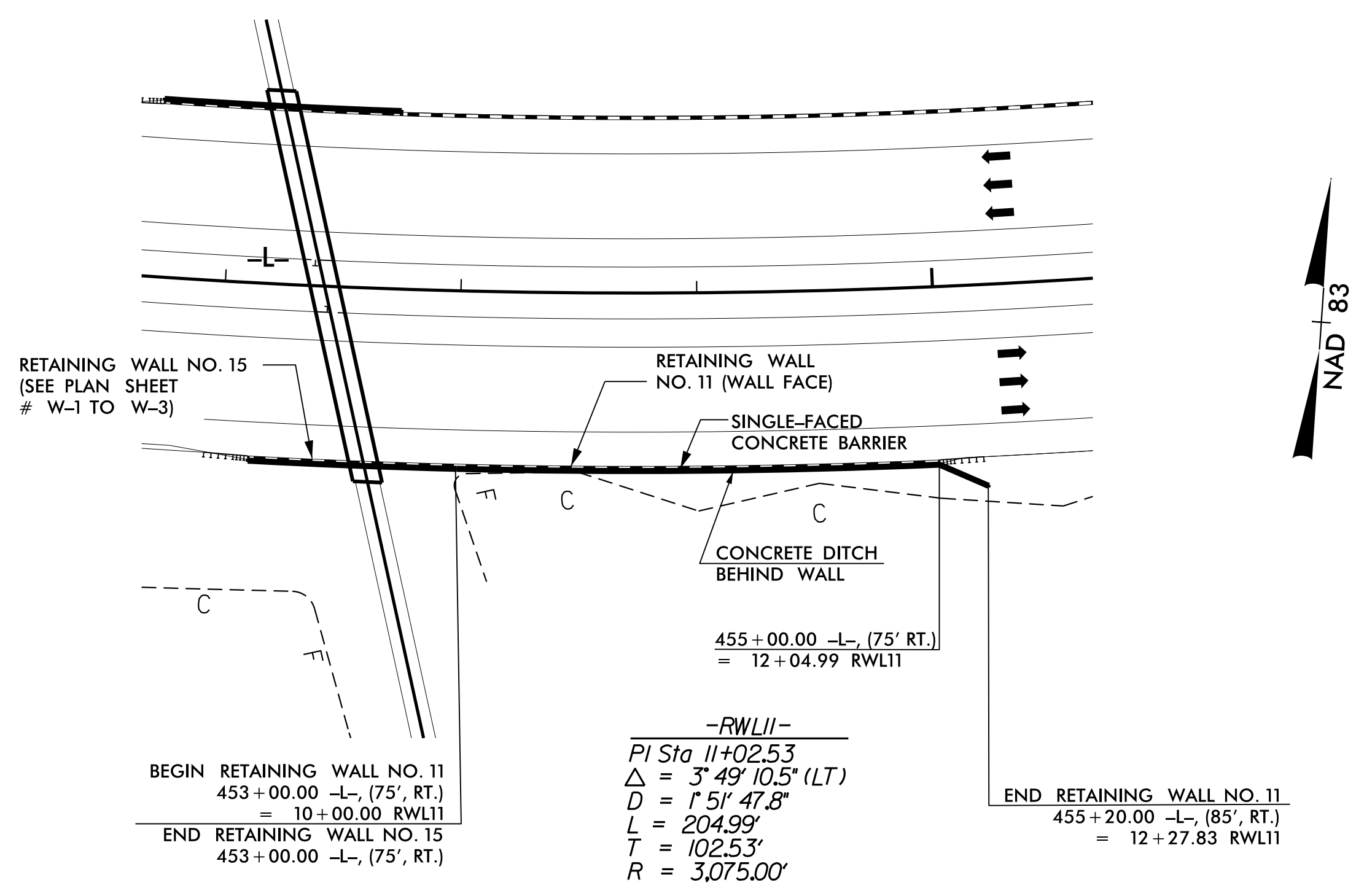
REVIEWED BY: JAMES R. BATTS DATE: 05-2016

GEOTECHNICAL ENGINEER

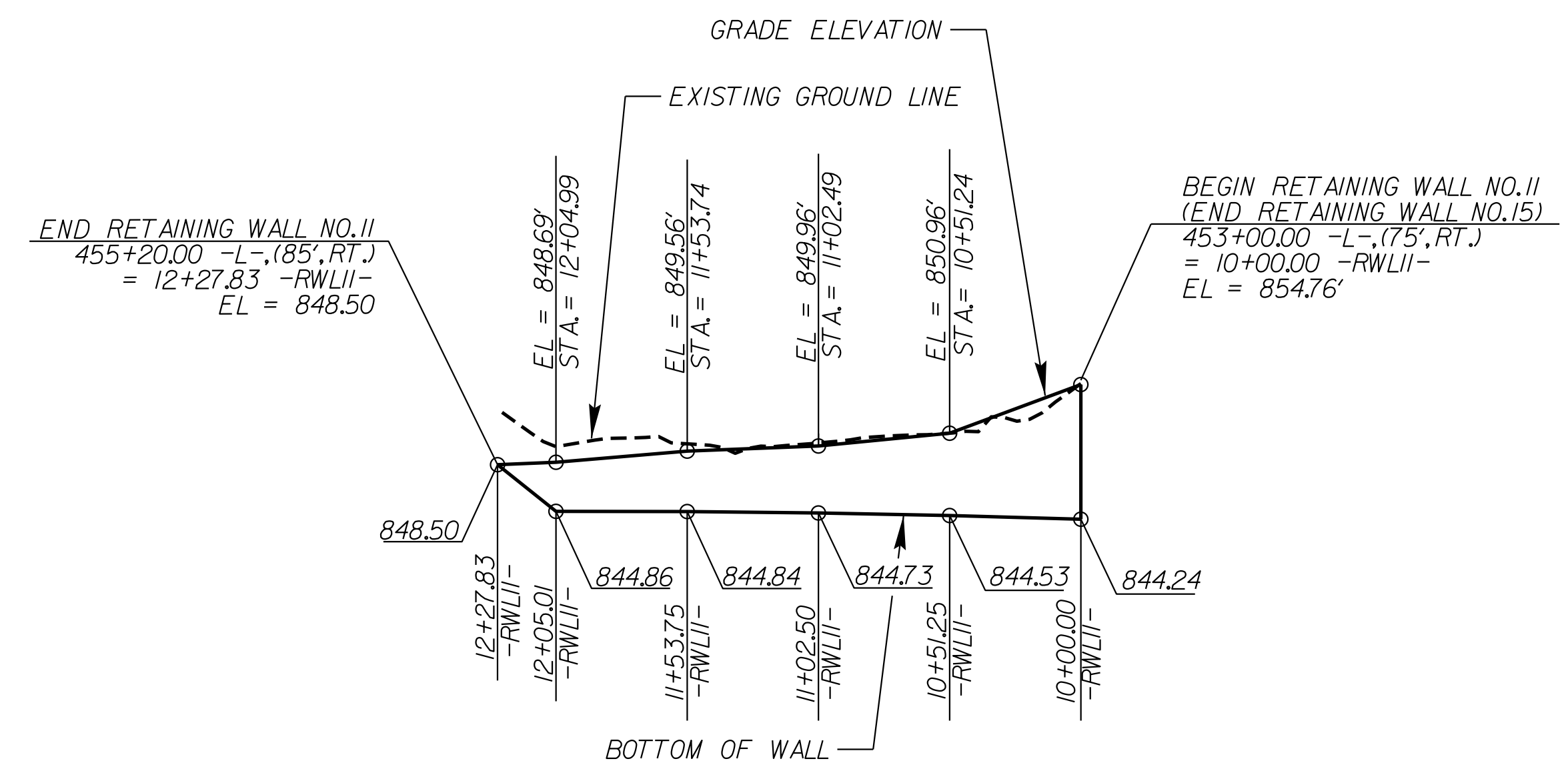
ENGINEER

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Thein Tun Zan 5/19/2016

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RETAINING WALL NO. 11 PLAN VIEW



RETAINING WALL NO. 11 WALL ENVELOPE

ESTIMATED SOIL NAIL WALL QUANTITY			
RETAINING WALL NO.	SOIL NAIL RETAINING WALLS (SQ. FEET)	SOIL NAIL VERIFICATION TESTS	SOIL NAIL PROOF TESTS
11	1,715	1	5

PROJECT NO.: U-2524D (34820.1.2)

GUILFORD COUNTY

STATION: 453+00 -L- (10+00 -RWL11-)

SHEET 4 OF 12

PREPARED BY: THEIN T. ZAN DATE: 05-2016

REVIEWED BY: JAMES R. BATTS DATE: 05-2016

**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

**GEOTECHNICAL
ENGINEERING UNIT**

RETAINING WALL NO. 11 SOIL NAIL RETAINING WALL PLAN VIEW & WALL ENVELOPE					
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

SHEET NO.
W-12

GEOTECHNICAL ENGINEER

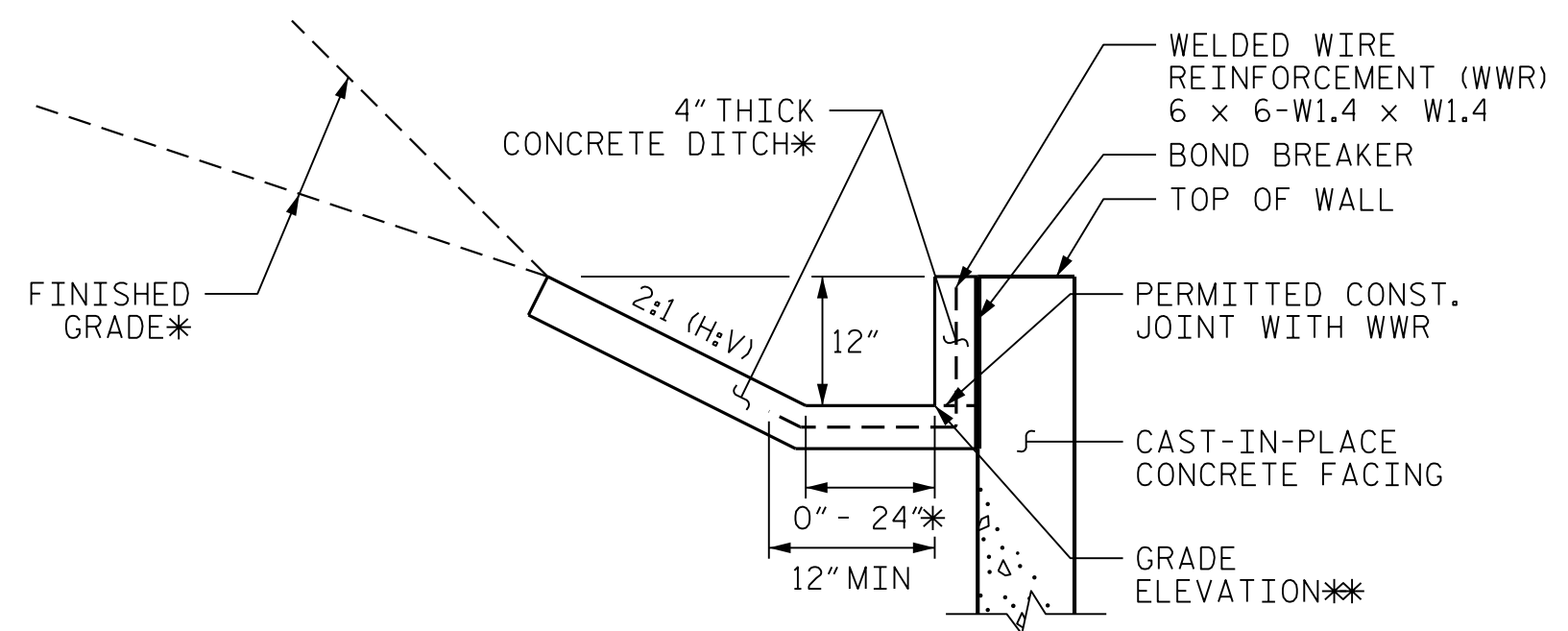
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SEAL 030943

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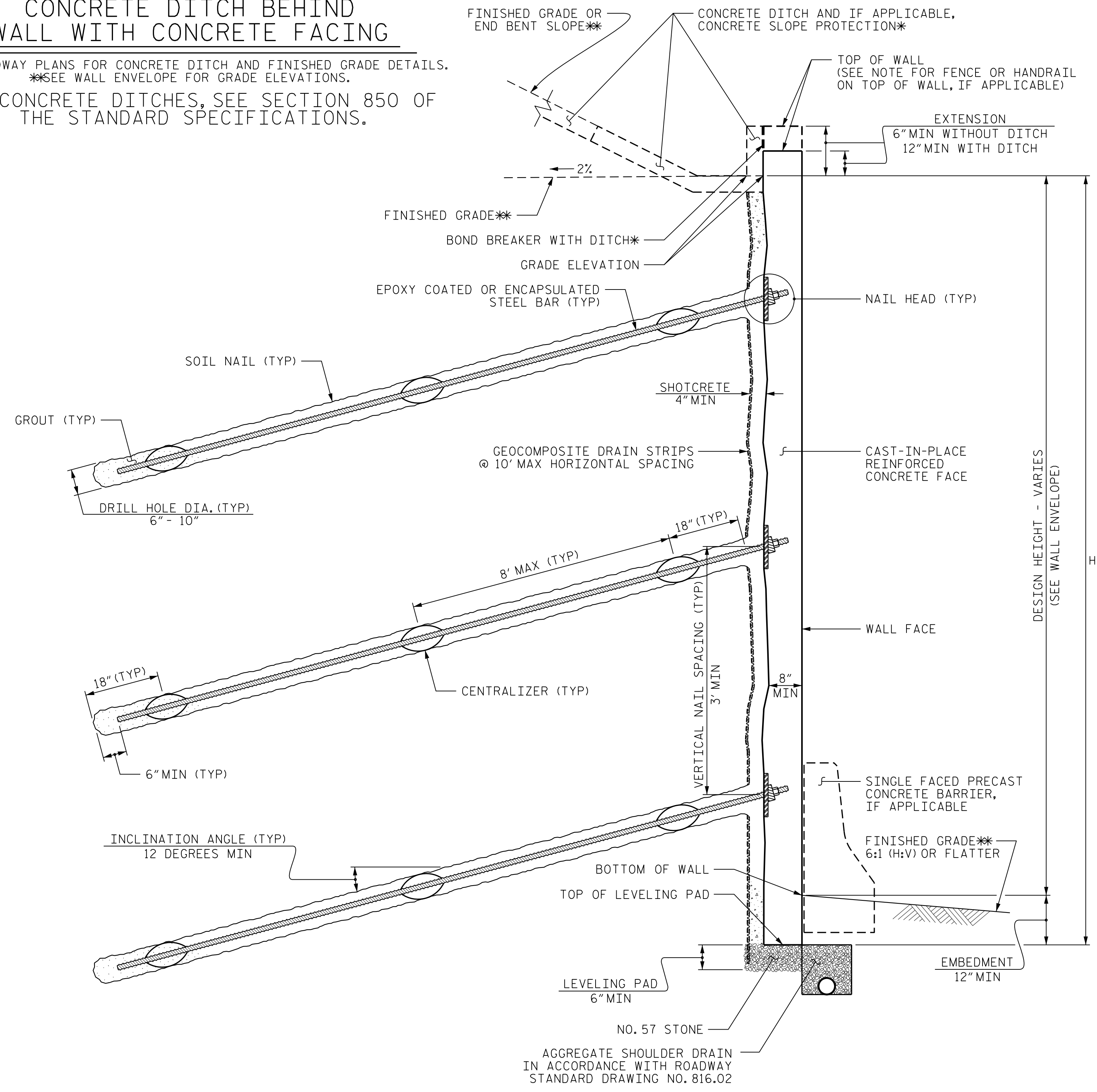
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CONCRETE DITCH BEHIND WALL WITH CONCRETE FACING

*SEE ROADWAY PLANS FOR CONCRETE DITCH AND FINISHED GRADE DETAILS.
 *SEE WALL ENVELOPE FOR GRADE ELEVATIONS.
 FOR CONCRETE DITCHES, SEE SECTION 850 OF THE STANDARD SPECIFICATIONS.



SOIL NAIL WALL - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL DETAILS.
 *SEE PLANS FOR FINISHED GRADE OR END BENT SLOPE DETAILS.

NOTES FOR SOIL NAIL RETAINING WALLS NO. 4, NO. 5, NO. 6 & NO. 11:

FOR SOIL NAIL RETAINING WALLS, SEE SOIL NAIL RETAINING WALLS PROVISION.
 FOR SINGLE FACED PRECAST CONCRETE BARRIER FOR RETAINING WALL NO. 11, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.
 BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR RETAINING WALL NO. 4, NO. 5, NO. 6 & NO. 11, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.
 FOUNDATIONS FOR NOISE WALLS WILL BE LOCATED BEHIND RETAINING WALL NO. 4 AND MAY INTERFERE WITH SOIL NAILS. SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS WITH THE SOIL NAIL WALL CONSTRUCTION PLAN.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. 4, NO. 5, NO. 6 & NO. 11.

DESIGN RETAINING WALL NO. 4, NO. 5, NO. 6 & NO. 11 FOR THE FOLLOWING:
 1) H = DESIGN HEIGHT + EMBEDMENT
 2) DESIGN LIFE = 100 YEARS

3) IN-SITU ASSUMED MATERIAL PARAMETERS FOR RETAINING WALL NO. 4
 FROM STA. 10+00 -RWL4- TO 11+50 -RWL4-:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $\phi = 30$ DEGREES
 COHESION, $c = 0$ LB/SF

FROM STA. 11+50 -RWL4- TO 13+75 -RWL4- (ABOVE ELEVATION 805 FT):
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $\phi = 30$ DEGREES
 COHESION, $c = 0$ LB/SF

FROM STA. 11+50 -RWL4- TO 13+75 -RWL4- (BELOW ELEVATION 805 FT):
 UNIT WEIGHT, $\gamma = 140$ LB/CF
 FRICTION ANGLE, $\phi = 40$ DEGREES
 COHESION, $c = 0$ LB/SF

FROM STA. 13+50 -RWL4- TO 26+83.28 -RWL4-:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $\phi = 30$ DEGREES
 COHESION, $c = 0$ LB/SF

4) IN-SITU ASSUMED MATERIAL PARAMETERS FOR RETAINING WALL NO. 5
 FROM STA. 10+00 -RWL5- TO 11+50 -RWL5-:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $\phi = 0$ DEGREES
 COHESION, $c = 1,500$ LB/SF

FROM STA. 11+50 -RWL5- TO 13+10.19 -RWL5-:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $\phi = 30$ DEGREES
 COHESION, $c = 0$ LB/SF

5) IN-SITU ASSUMED MATERIAL PARAMETERS FOR RETAINING WALL NO. 6:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $\phi = 30$ DEGREES
 COHESION, $c = 0$ LB/SF

6) IN-SITU ASSUMED MATERIAL PARAMETERS FOR RETAINING WALL NO. 11:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $\phi = 30$ DEGREES
 COHESION, $c = 0$ LB/SF

EXCAVATION FOR SOIL NAIL RETAINING WALL NO. 4 FROM -L- STA. 11+50± TO STA. 13+75± WILL INCLUDE EXCAVATION IN WEATHERED ROCK AND/OR CRYSTALLINE ROCK.

BLASTING OF ROCK FOR EXCAVATION MAY BE REQUIRED TO CONSTRUCT RETAINING WALL NO. 4 FROM -L- STA. 11+50± TO STA. 13+75±. THE ENGINEER WILL REVIEW AND DETERMINE THE NEED FOR ADDITIONAL PROOF TESTING OF NAILS INSTALLED PRIOR TO BLASTING. ALL MATERIALS AND WORK NECESSARY TO ACCESS NAILS TO PERFORM PROOF TESTS IS INCIDENTAL TO THE COST OF SOIL NAIL PROOF TESTING.

PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: RETAINING WALL NO. 4, 5, 6 & 11
 SHEET 5 OF 12

PREPARED BY: THEIN T. ZAN DATE: 05-2016
 REVIEWED BY: JAMES R. BATTS DATE: 05-2016

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

RETAINING WALL NO. 4, 5, 6 & 11 SOIL NAIL RETAINING WALLS TYPICAL SECTION & NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-13
2			4			

GEOTECHNICAL ENGINEER

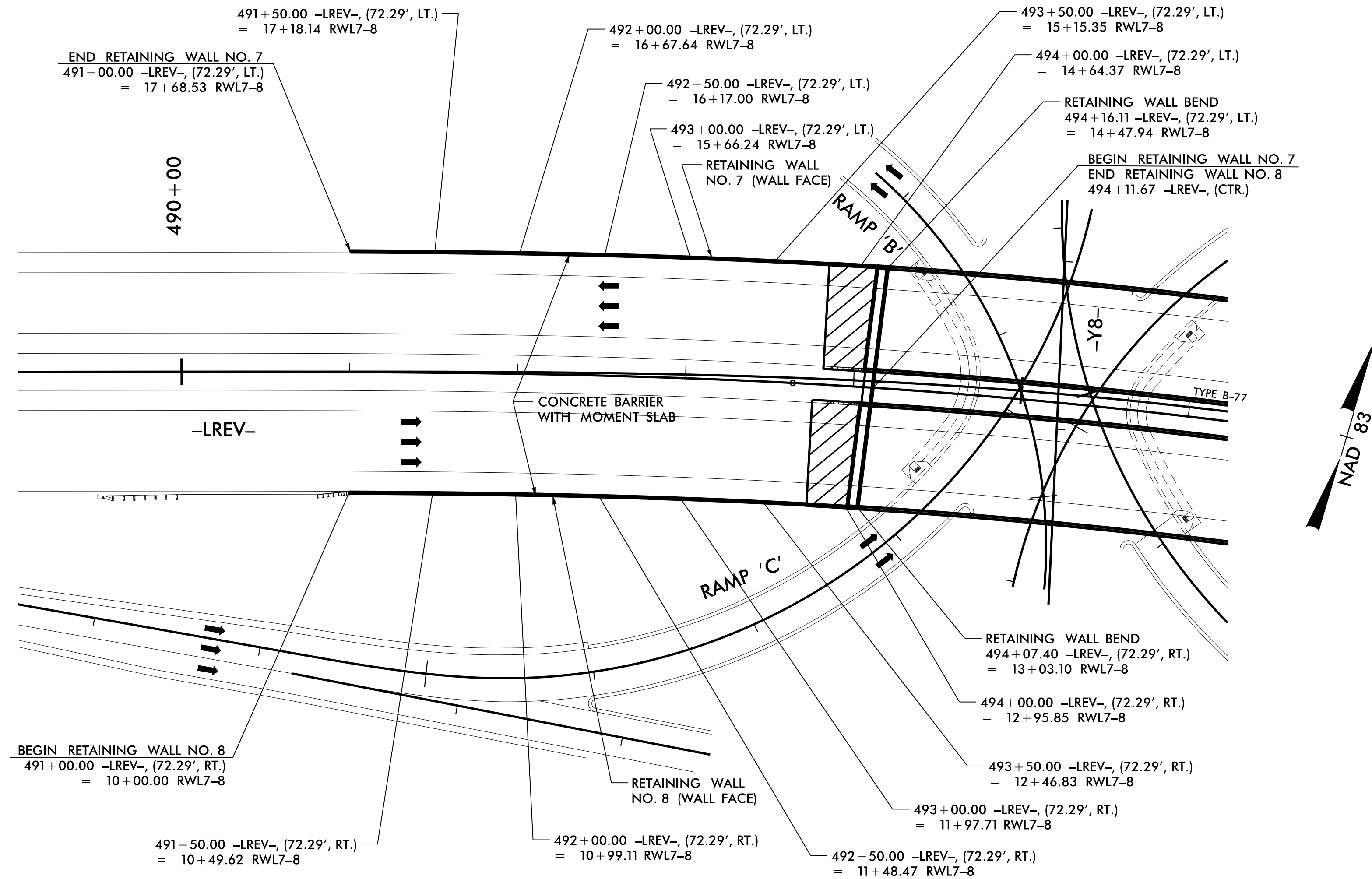
ENGINEER

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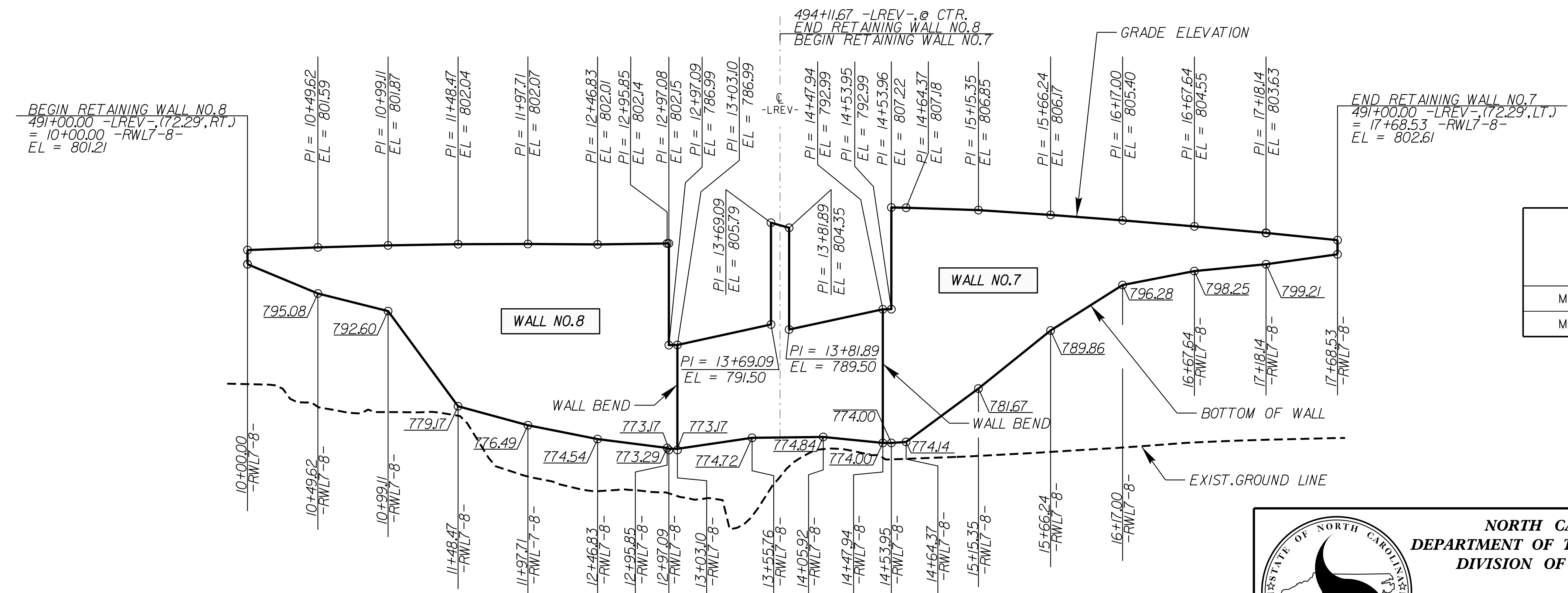
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RETAINING WALL NO. 7 & NO. 8 PLAN VIEW



ESTIMATED MSE WALL QUANTITIES (SQ. FEET)	
MSE RETAINING WALL NO. 7	6,665 SF
MSE RETAINING WALL NO. 8	7,475 SF

RETAINING WALL NO. 7 & NO. 8 WALL ENVELOPE

PROJECT NO.: U-2524D

GUILFORD COUNTY

STATION: 495+22.00 -LREV- (18+84.00 -Y8-)

SHEET 6 OF 12

PREPARED BY: THEIN T. ZAN DATE: 05-2016

REVIEWED BY: JAMES R. BATTS DATE: 05-2016

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
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GEOTECHNICAL ENGINEER

THEIN TUN ZAN

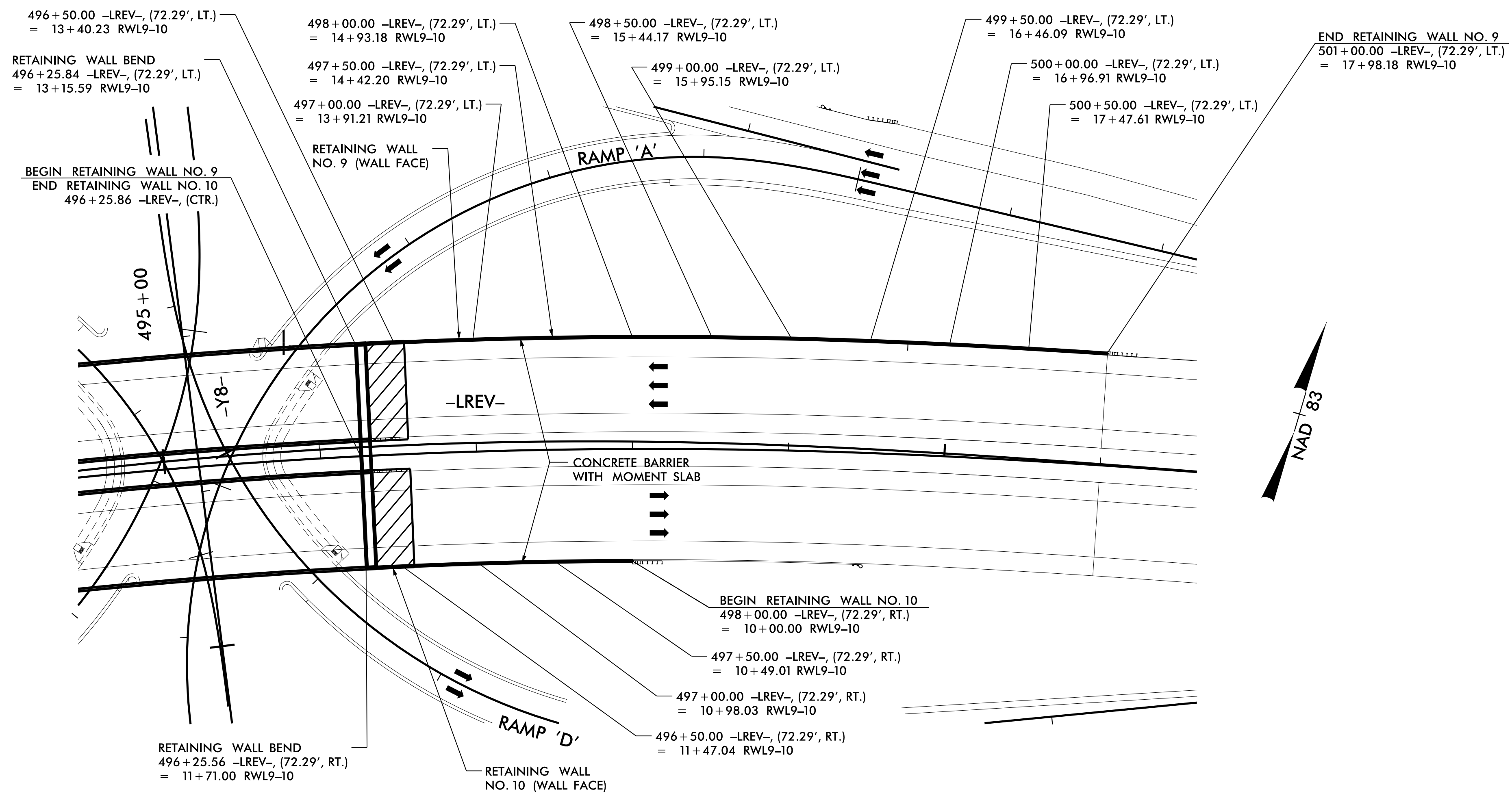
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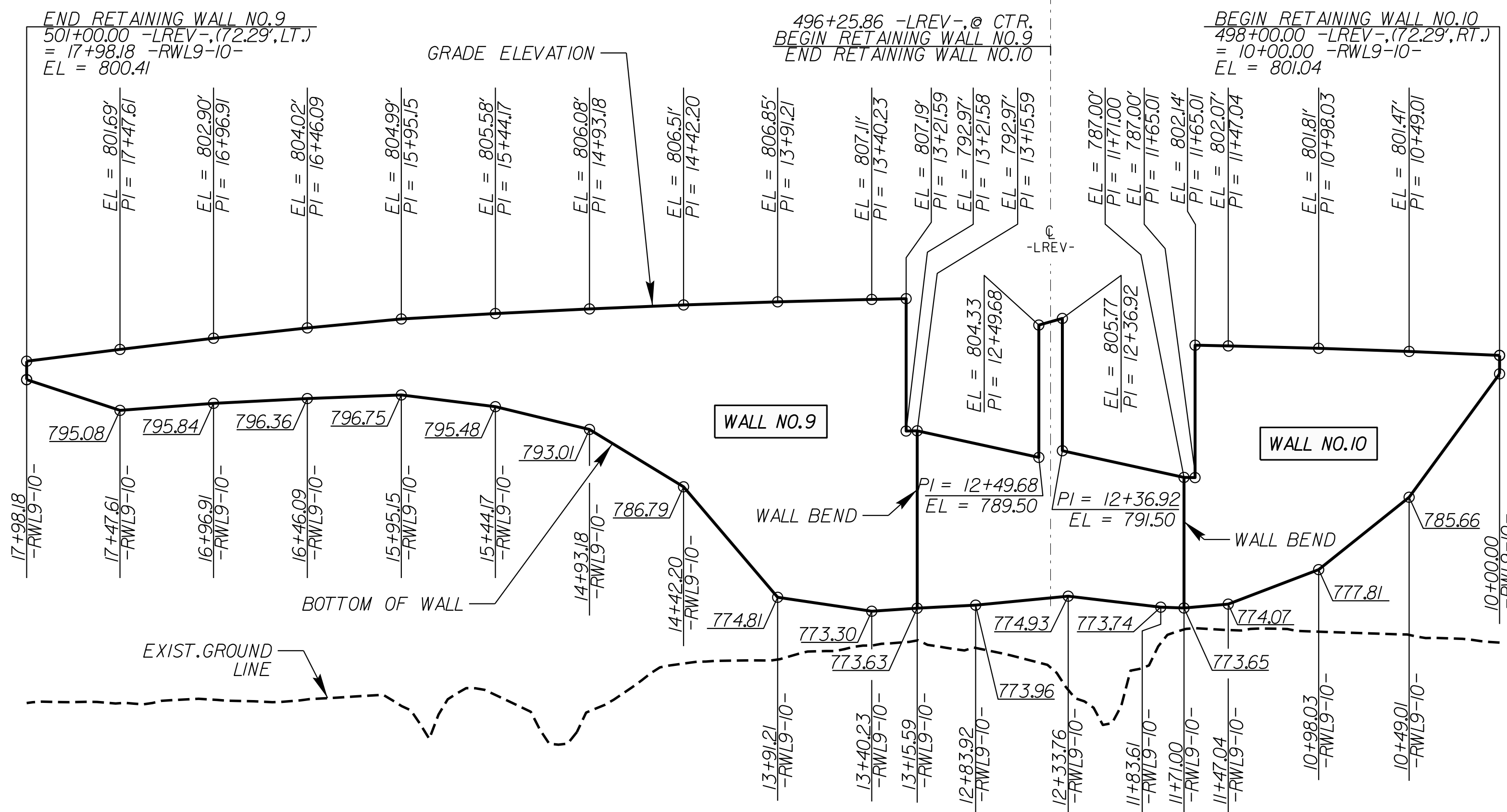
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RETAINING WALL NO. 9 & NO. 10 PLAN VIEW



RETAINING WALL NO. 9 & NO. 10 WALL ENVELOPE

ESTIMATED MSE WALL QUANTITIES (SQURE FEET)	
MSE RETAINING WALL NO. 9	9,585 SF
MSE RETAINING WALL NO. 10	5,050 SF

PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: 495.22.00 -LREV- (18+84.00 -Y8-)
 SHEET 7 OF 12

PREPARED BY: THEIN T. ZAN
 DATE: 05-2016
 REVIEWED BY: JAMES R. BATTS
 DATE: 05-2016

NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS

GEOTECHNICAL
 ENGINEERING UNIT

REVISIONS						SHEET NO. W-15
NO.	BY	DATE	NO.	BY	DATE	
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2			4			

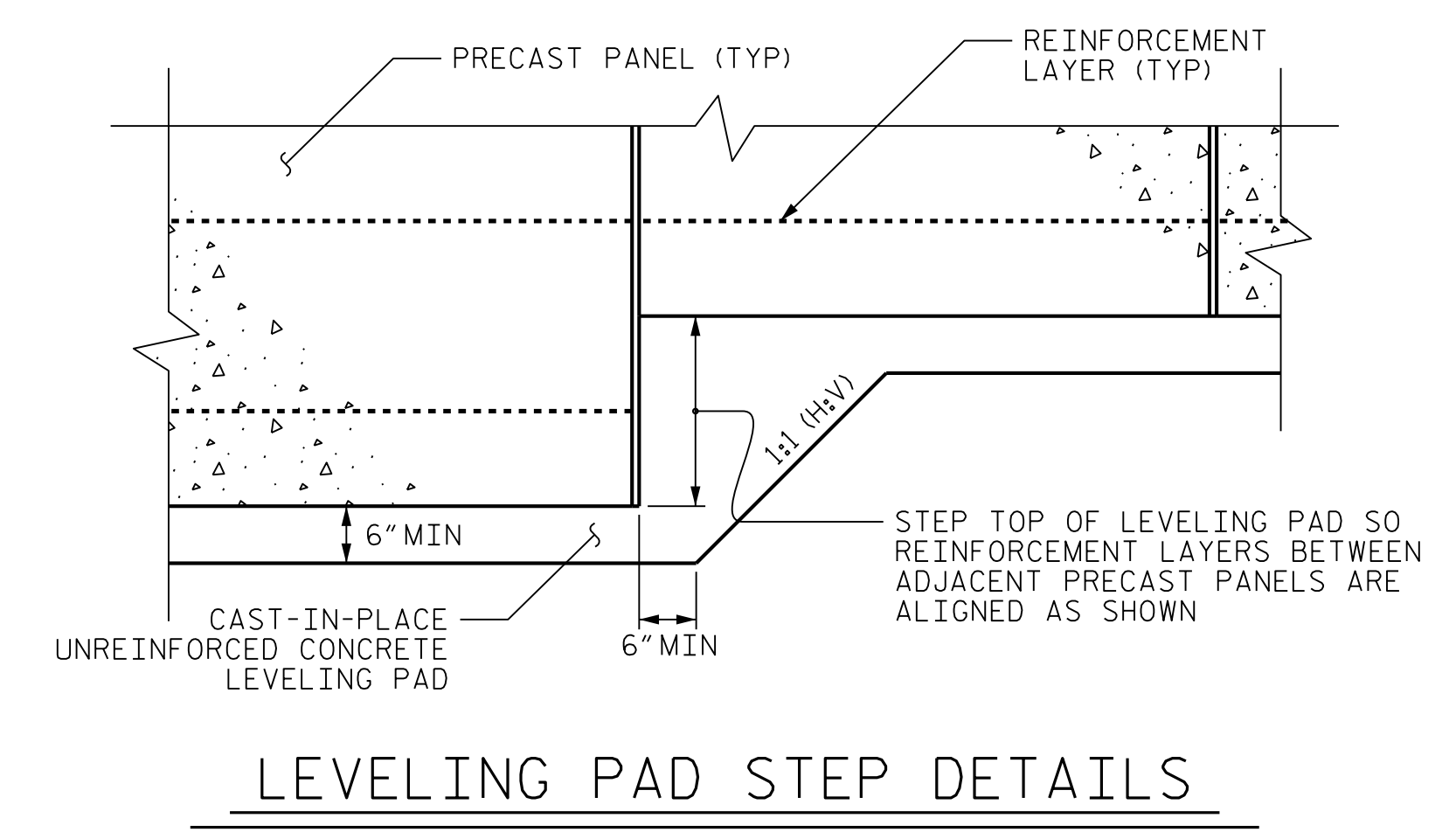
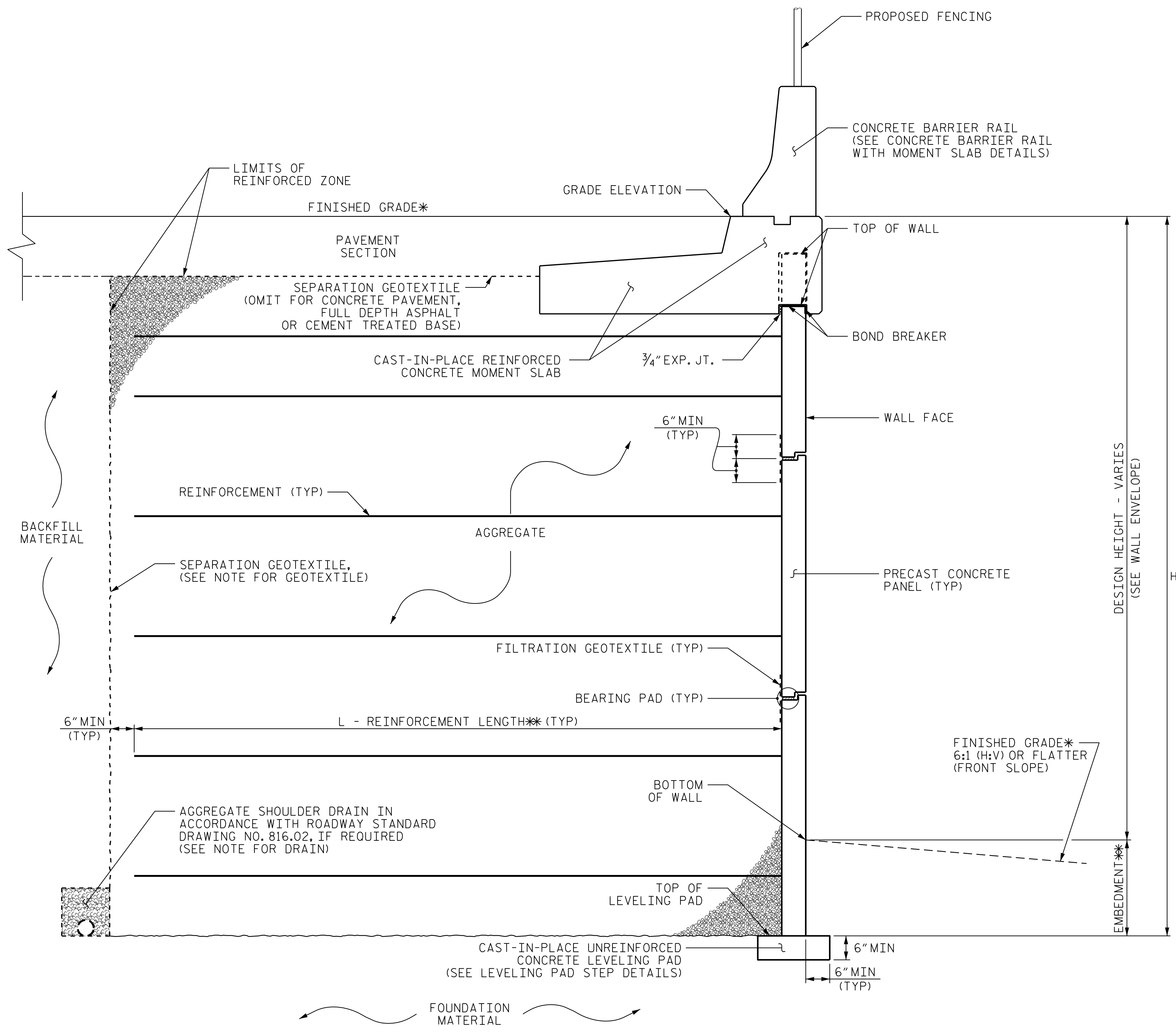
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Thein Tun Zan
5/19/2016

ENGINEER

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MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
**SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.

PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: 495+22.00 -LREV- (18+84.00 -Y8-)
 SHEET 8 OF 12


NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

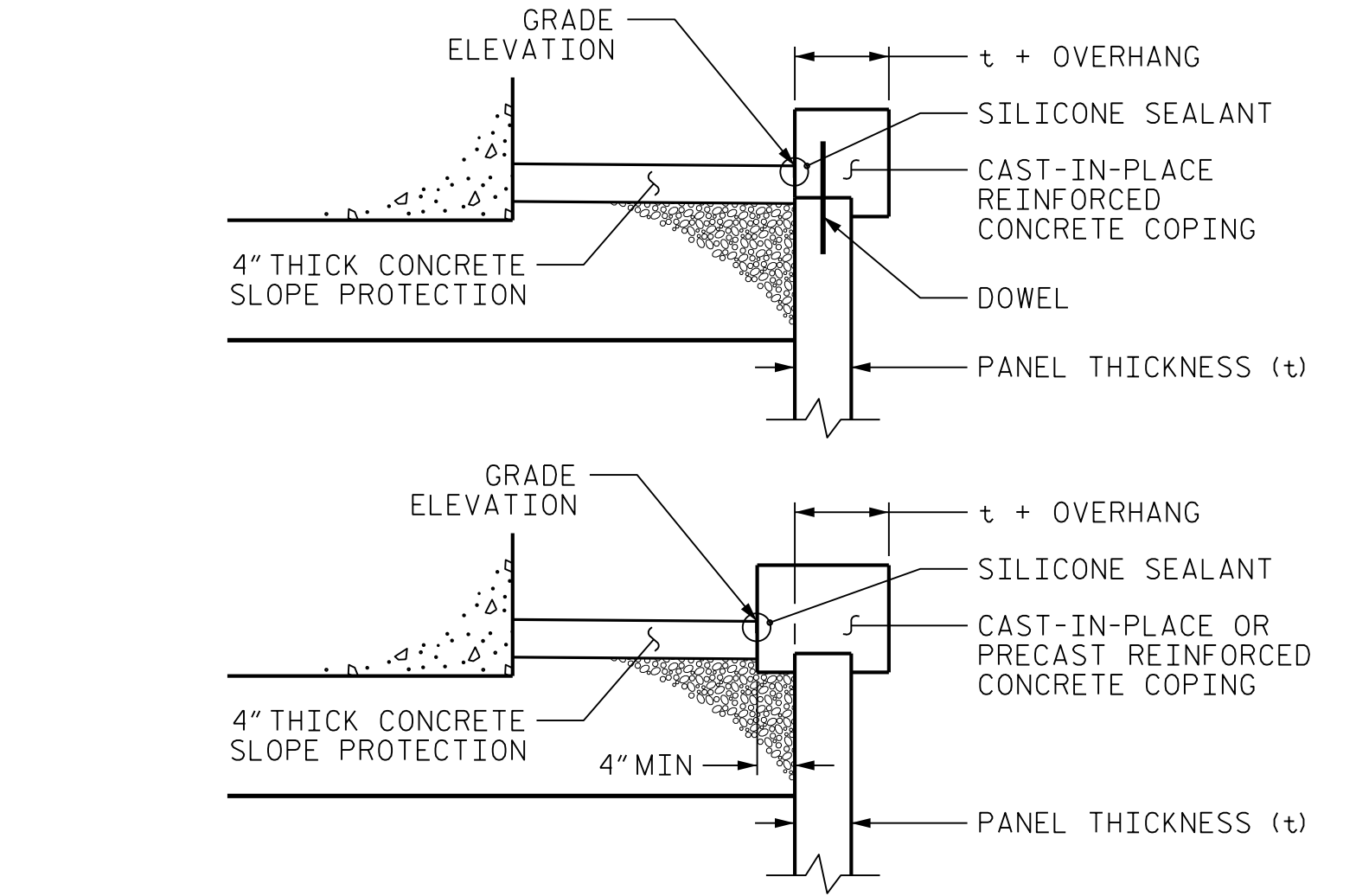
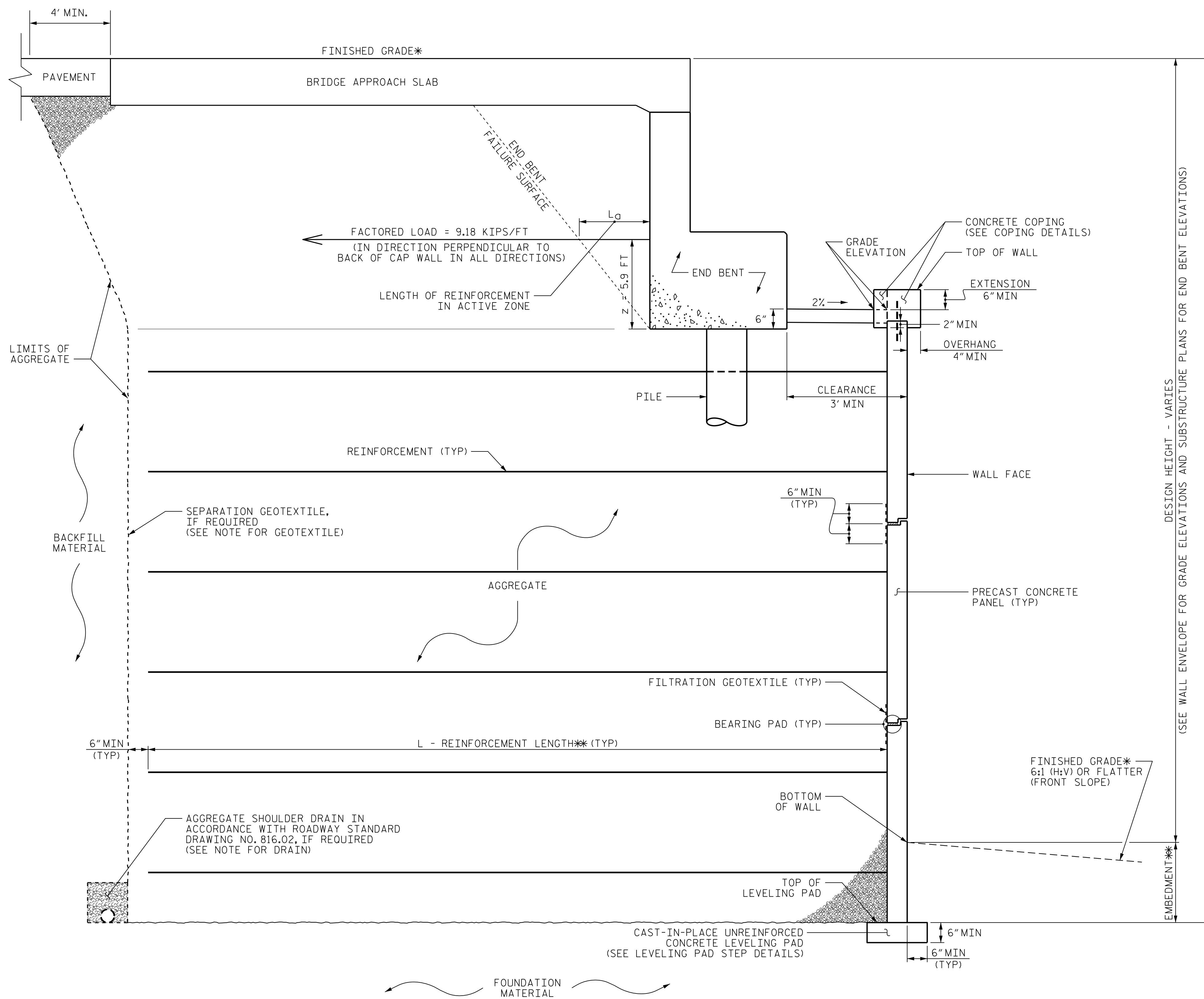
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REVISIONS					
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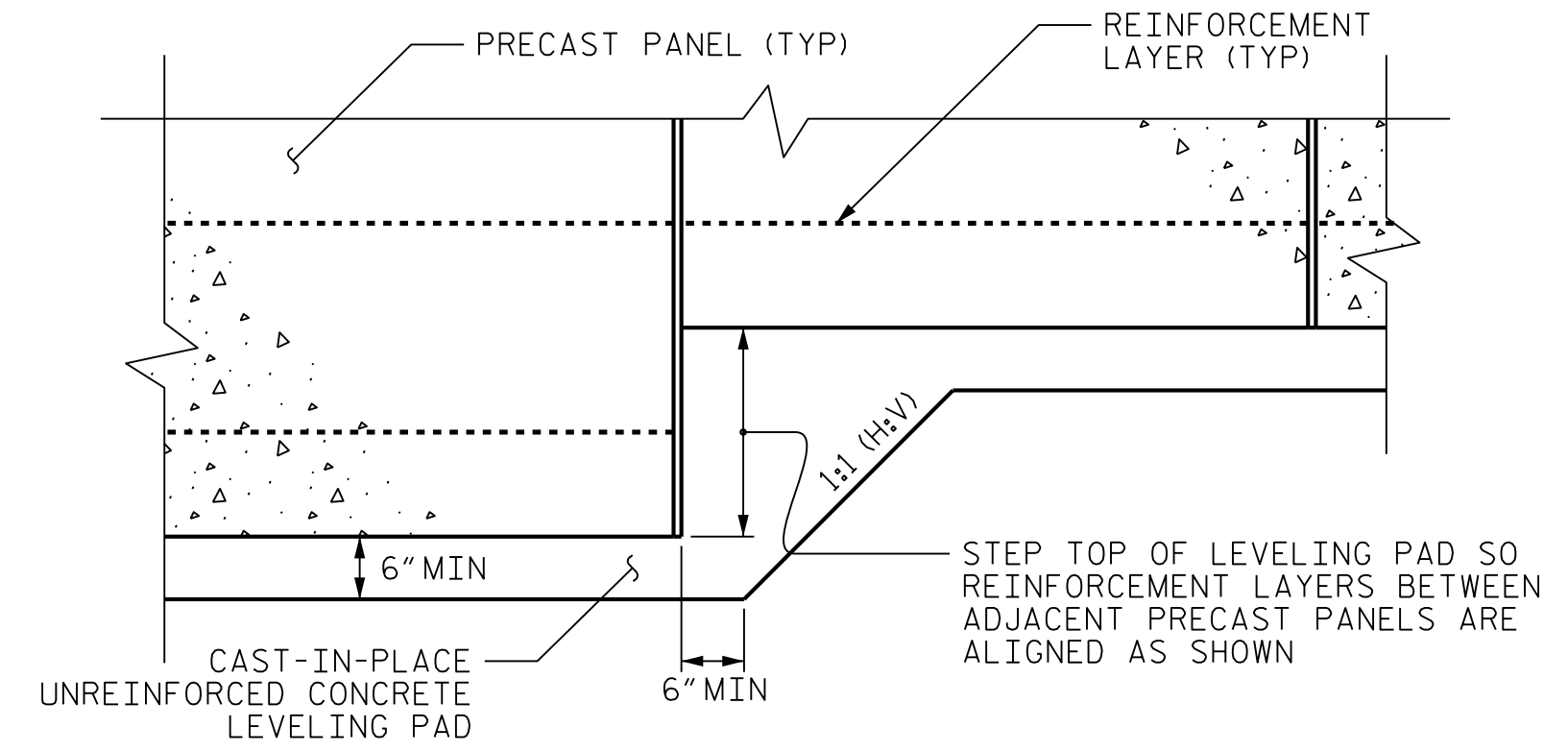
SHEET NO. W-16

PREPARED BY: THEIN T. ZAN DATE: 05-2016
 REVIEWED BY: JAMES R. BATTS DATE: 05-2016

GEOTECHNICAL ENGINEER
 ENGINEER

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 Thein T. Zan
 5/19/2016
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COPING DETAILS
 AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.

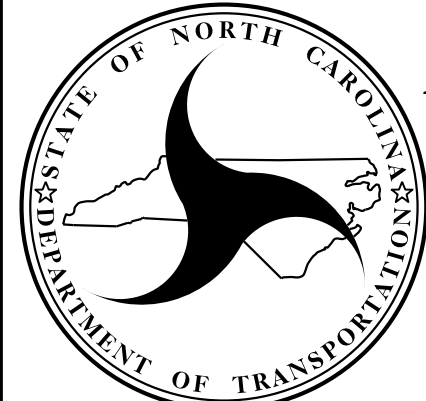


LEVELING PAD STEP DETAILS

MSE ABUTMENT WALL WITH PRECAST PANELS - TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
 **SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.

PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: -495+22.00 -LREV- (18+84.00 -Y8-)
 SHEET 9 OF 12



 NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

**RETAINING WALL NO. 7, 8, 9 & 10
 MSE ABUTMENT WALL
 TYPICAL & DETAILS**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-17
2			4			

PREPARED BY: THEIN T. ZAN	DATE: 05-2016
REVIEWED BY: JAMES R. BATTS	DATE: 05-2016

GEOTECHNICAL ENGINEER



THEIN TUN ZAN
ENGINEER

ENGINEER

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Thein Tun Zan 5/19/2016

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NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.

A CONCRETE BARRIER RAIL WITH MOMENT SLAB IS REQUIRED ABOVE RETAINING WALL NO. 7, 8, 9 & 10. SEE PLANS FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 7, 8, 9 & 10.

CAST-IN-PLACE REINFORCED CONCRETE COPING IS REQUIRED AT VERTICAL EDGES ONLY AT RETAINING WALL NO. 7, 8, 9 & 10.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 7, 8, 9 & 10.

A DRAIN IS REQUIRED FOR RETAINING WALL NO. 7, 8, 9 & 10.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 7, 8, 9 & 10, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. 7, 8, 9 & 10 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 7,850 LB/SF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.8H OR 6 FT, WHICHEVER IS LONGER
- 5) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) LB/CF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) LB/SF
COARSE	110	38	0
FINE	115	34	0

*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

6) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) LB/CF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) LB/SF
BACKFILL	120	30	0
FOUNDATION	120	30	0

DESIGN RETAINING WALL NO. 7, 8, 9 & 10 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OF REINFORCEMENT IN ACTIVE ZONE (L_a) SHOWN CAST REINFORCEMENT CONNECTORS INTO CAP BACKWALL FOR END BENT NO. 1 LOCATED AT STATION 494+06.25 AND 494+03.39 -LREV- AND END BENT NO. 2 LOCATED AT STATION 496+32.70 AND 496+32.70 -LREV- AND MAINTAIN A CLEARANCE OF AT LEAST 3" BETWEEN CONNECTORS AND REINFORCING STEEL IN CAP.

FOUNDATIONS FOR SIGNS, LIGHTING or SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. 7, 8, 9 & 10 AND MAY INTERFERE WITH REINFORCEMENT. BEFORE BEGINNING MSE WALL CONSTRUCTION, SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS FOR APPROVAL.


EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 7, 8, 9 & 10.

FOUNDATIONS FOR END BENT NO. 1 LOCATED AT STATION 494+06.25 AND STATION 494+03.39 -LREV- AND END BENT NO. 2 AT STATION 496+32.70 AND 496+32.70 -LREV- WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 7, 8, 9 & 10. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 7, 8, 9 & 10 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

AT THE CONTRACTOR'S OPTION, "TEMPORARY SHORING FOR WALL CONSTRUCTION" MAY BE USED TO CONSTRUCT RETAINING WALL NO. 7, 8, 9 & 10. SEE MSE RETAINING WALLS PROVISION FOR TEMPORARY SHORING FOR WALL CONSTRUCTION.

PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: 495+22.00 -LREV- (18+84.00 -Y8-)
 SHEET 10 OF 12



**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

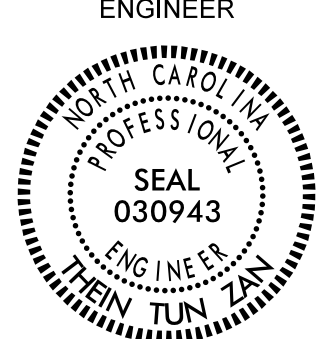
**GEOTECHNICAL
ENGINEERING UNIT**

**WALL NO. 7, 8, 9 & 10
MSE RETAINING WALL
NOTES**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-18
2			4			

PREPARED BY: THEIN T. ZAN	DATE: 05-2016
REVIEWED BY: JAMES R. BATTS	DATE: 05-2016

GEOTECHNICAL ENGINEER



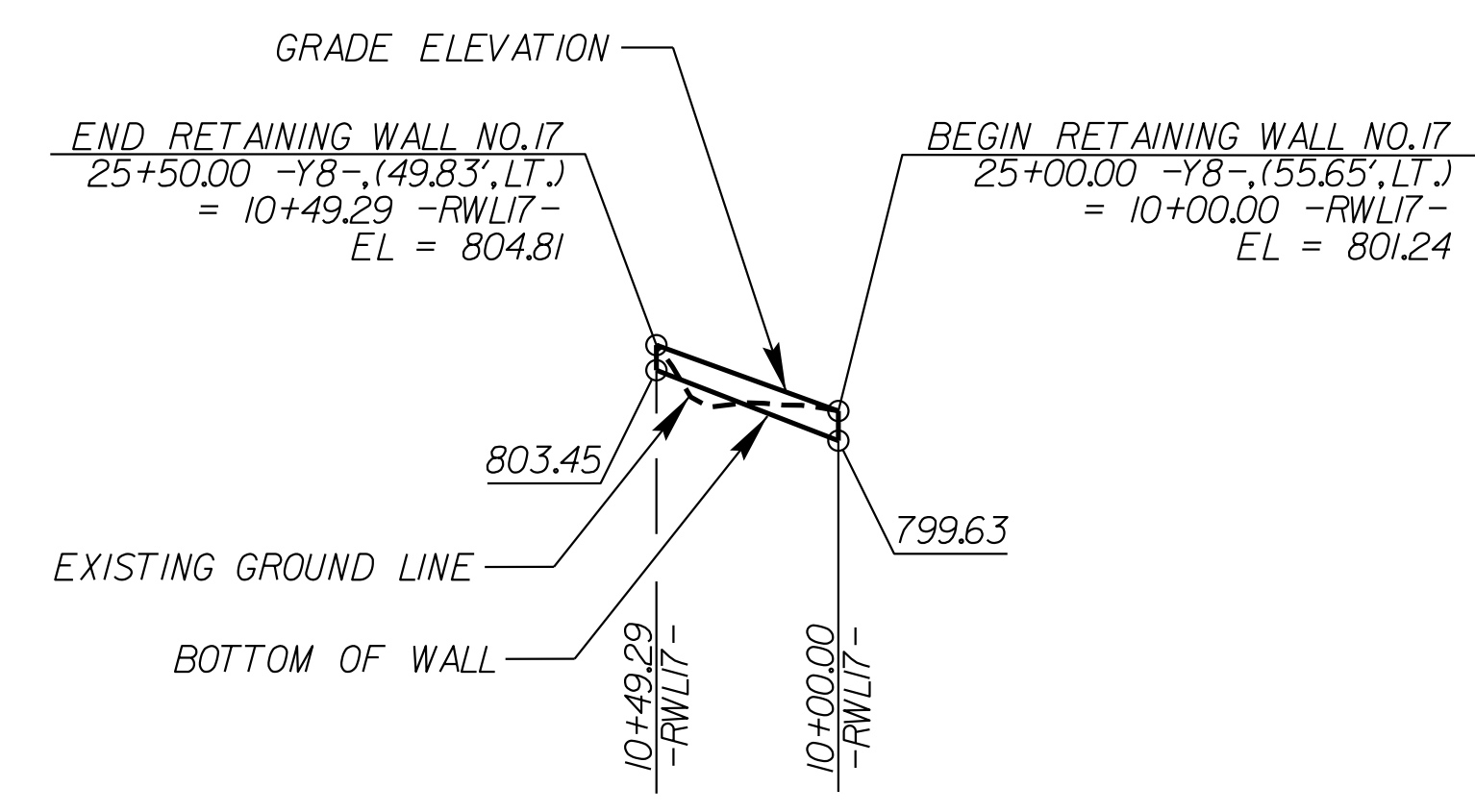
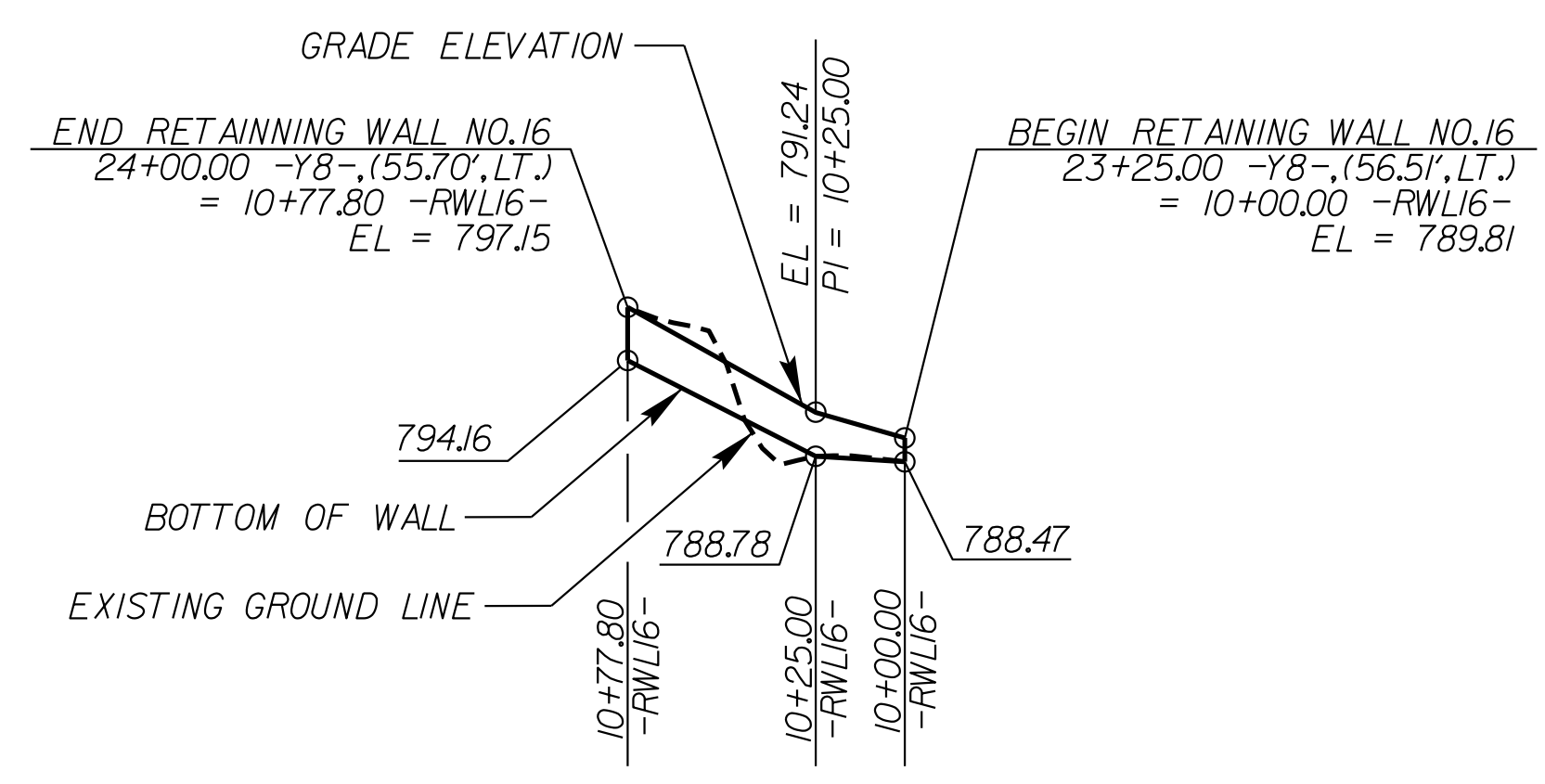
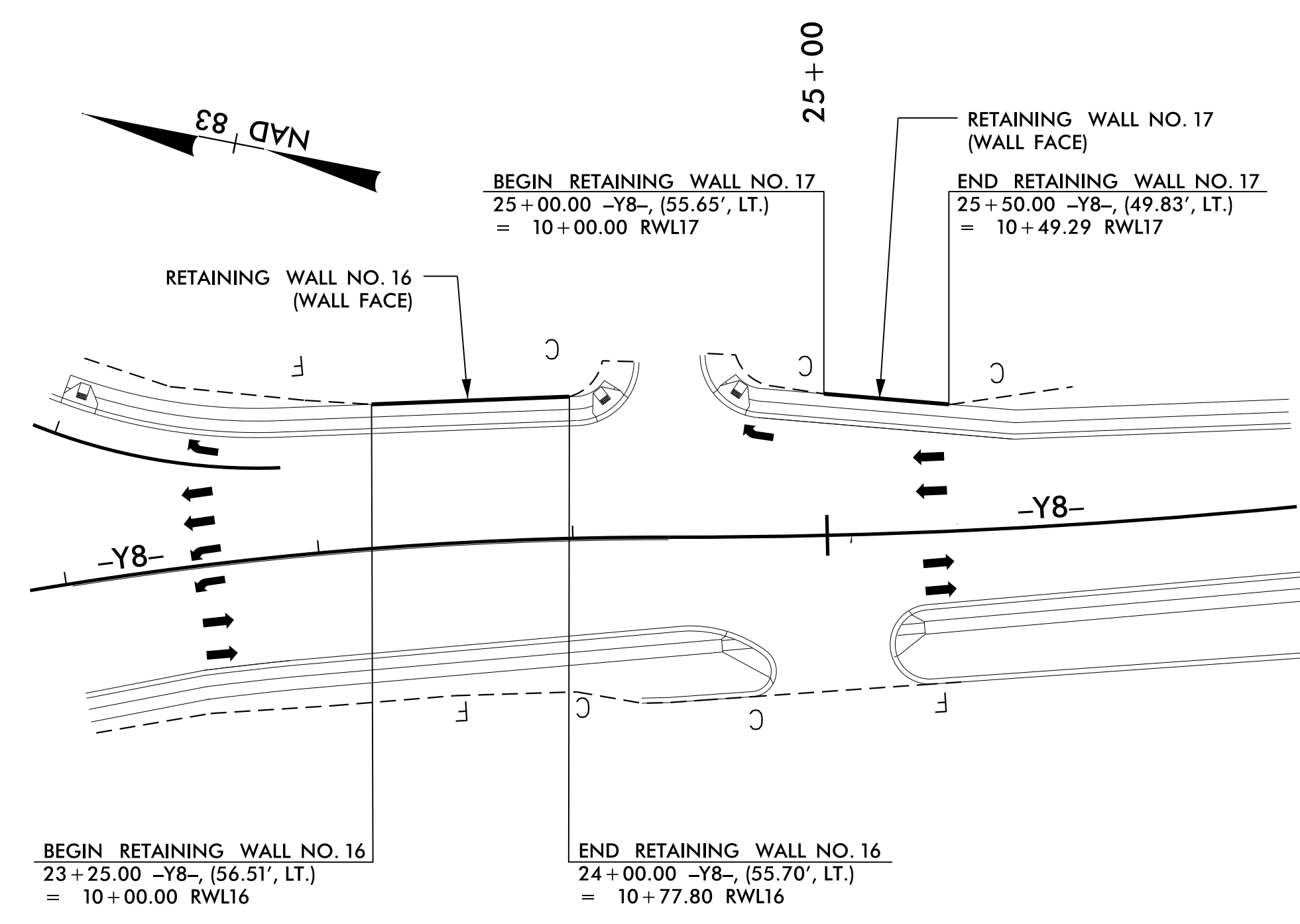
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Thein Tun Zan 5/19/2016

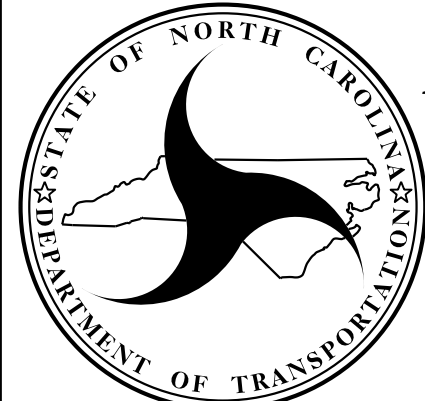
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ESTIMATED STANDARD SEGMENTAL GRAVITY RETAINING WALL QUANTITIES	
RETAINING WALL NO.	STANDARD SEGMENTAL GRAVITY RETAINING WALLS (SQ. FEET)
16	275
17	125
TOTAL QUANTITY = 400 SF	

PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: 23+30 -Y8- (10+00 -RWL16-) & 25+00 -Y8- (10+00 -RWL17-)
 SHEET 11 OF 12



**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

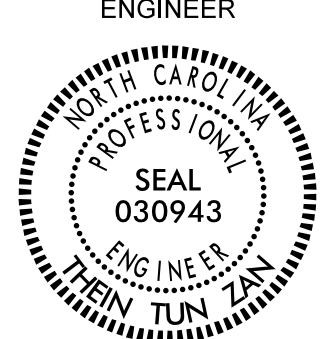
**GEOTECHNICAL
ENGINEERING UNIT**

RETAINING WALL NO. 16 & NO. 17 STANDARD SEGMENTAL GRAVITY RETAINING WALLS PLAN VIEW & WALL ENVELOPES					
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

SHEET NO. W-19

PREPARED BY: THEIN T. ZAN DATE: 05-2016
 REVIEWED BY: JAMES R. BATTS DATE: 05-2016

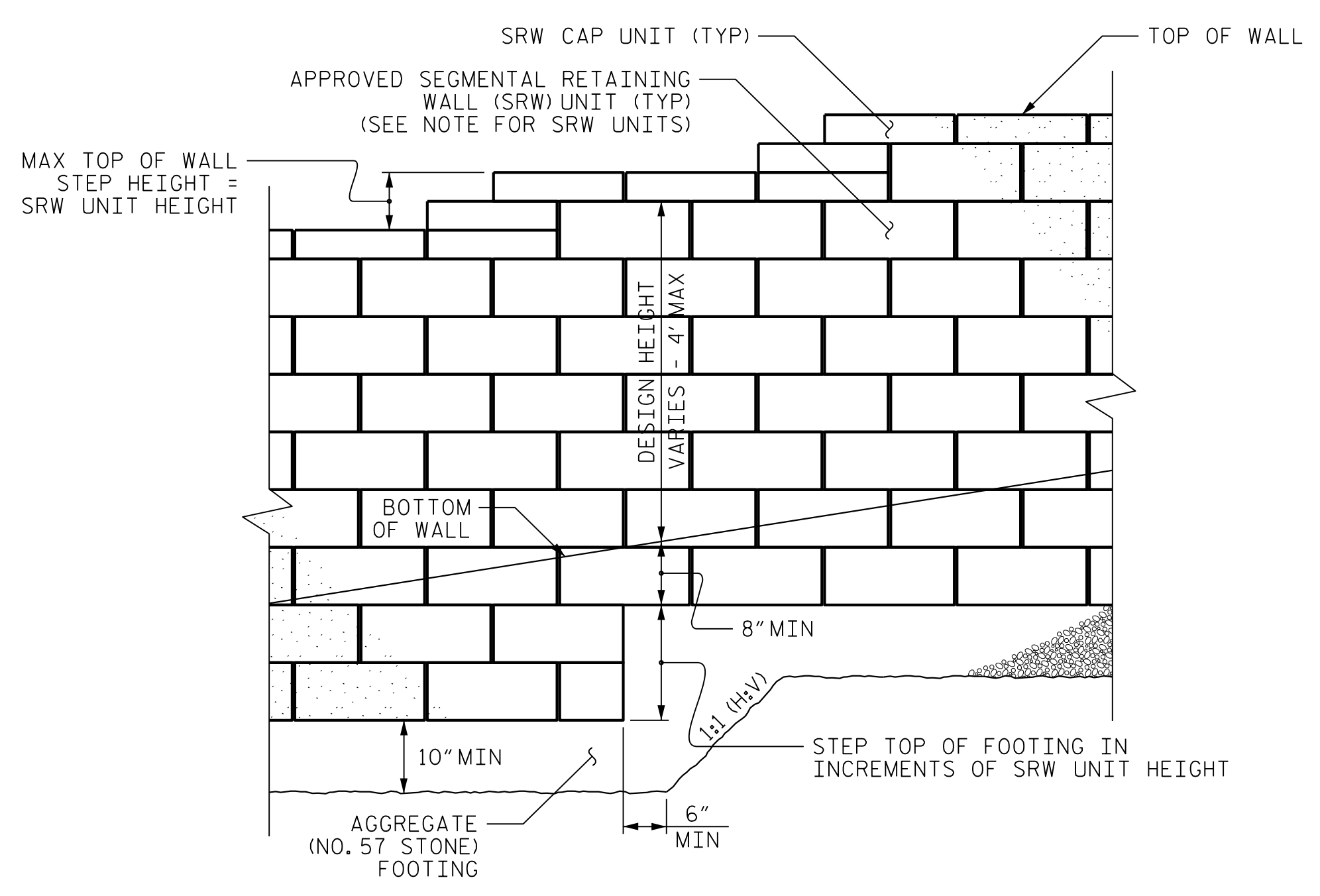
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DocuSigned by:
Thein T. Zan 5/19/2016

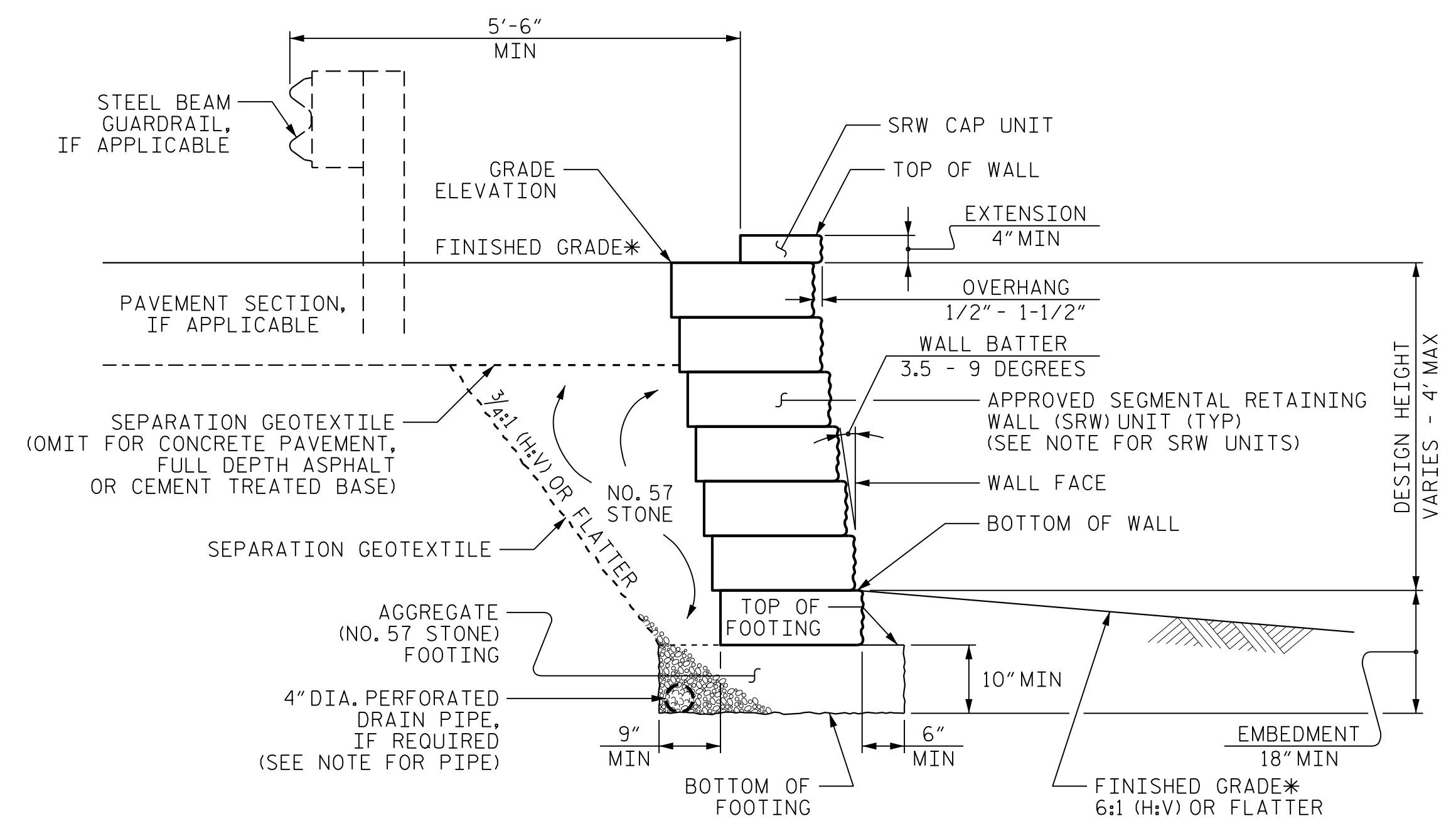
**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**



STANDARD SEGMENTAL GRAVITY WALL - PARTIAL ELEVATION

NOTES:

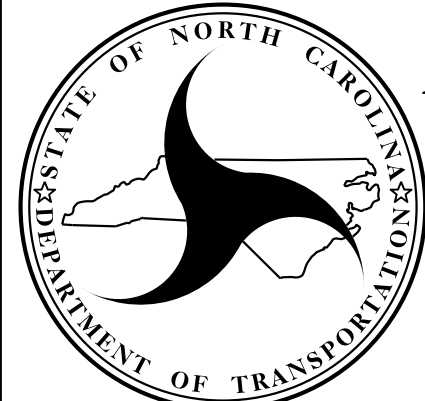
- FOR STANDARD SEGMENTAL GRAVITY RETAINING WALLS, SEE SEGMENTAL GRAVITY RETAINING WALLS PROVISION.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- DO NOT ATTACH FENCES OR HANDRAILS TO STANDARD SEGMENTAL GRAVITY WALLS.
- DO NOT USE STANDARD SEGMENTAL GRAVITY WALLS FOR INTERSTATE HIGHWAY OR RAILROAD PROJECTS.
- DO NOT USE STANDARD SEGMENTAL GRAVITY WALLS WHEN SURCHARGE LOADS WILL BE WITHIN 5'-6" OF THE BACK OF SRW CAP UNITS.
- DO NOT USE STANDARD SEGMENTAL GRAVITY WALLS WHEN VERY LOOSE OR SOFT SOIL OR MUCK IS BELOW WALLS.
- SEGMENTAL RETAINING WALL (SRW) UNITS ARE APPROVED FOR EITHER 2' OR 4' MAXIMUM DESIGN HEIGHTS. FOR DETAILS AND DIMENSIONS OF APPROVED SRW UNITS AND MAXIMUM DESIGN HEIGHTS, SEE connect.ncdot.gov/resources/Geological/Pages/Products.aspx
- DO NOT MIX APPROVED SRW UNITS FROM DIFFERENT VENDORS ON THE SAME STANDARD SEGMENTAL GRAVITY WALL. USE THE SAME SIZE APPROVED SRW UNITS FOR EACH WALL SECTION.
- BEFORE BEGINNING STANDARD SEGMENTAL GRAVITY WALL CONSTRUCTION, SURVEY WALL LOCATIONS AND SUBMIT WALL PROFILE VIEWS (WALL ENVELOPES) FOR REVIEW. FOR WALL ENVELOPES, INCLUDE BOTTOM OF WALL, EXISTING GROUND AND GRADE ELEVATIONS AND OTHER ELEVATIONS AS NEEDED AT INTERVALS OF 25' OR LESS ALONG WALLS. DO NOT START WALL CONSTRUCTION UNTIL WALL ENVELOPES ARE ACCEPTED.
- A DRAIN PIPE IS REQUIRED IF GROUNDWATER IS ABOVE BOTTOM OF FOOTINGS.
- DO NOT PLACE NO. 57 STONE FOR FOOTINGS UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.



STANDARD SEGMENTAL GRAVITY WALL WITHOUT SLOPE

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.

PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: 23+30 -Y8- (10+00 -RWL16-) &
 25+00 -Y8- (10+00 -RWL17-)
 SHEET 12 OF 12



**NORTH CAROLINA
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DIVISION OF HIGHWAYS**

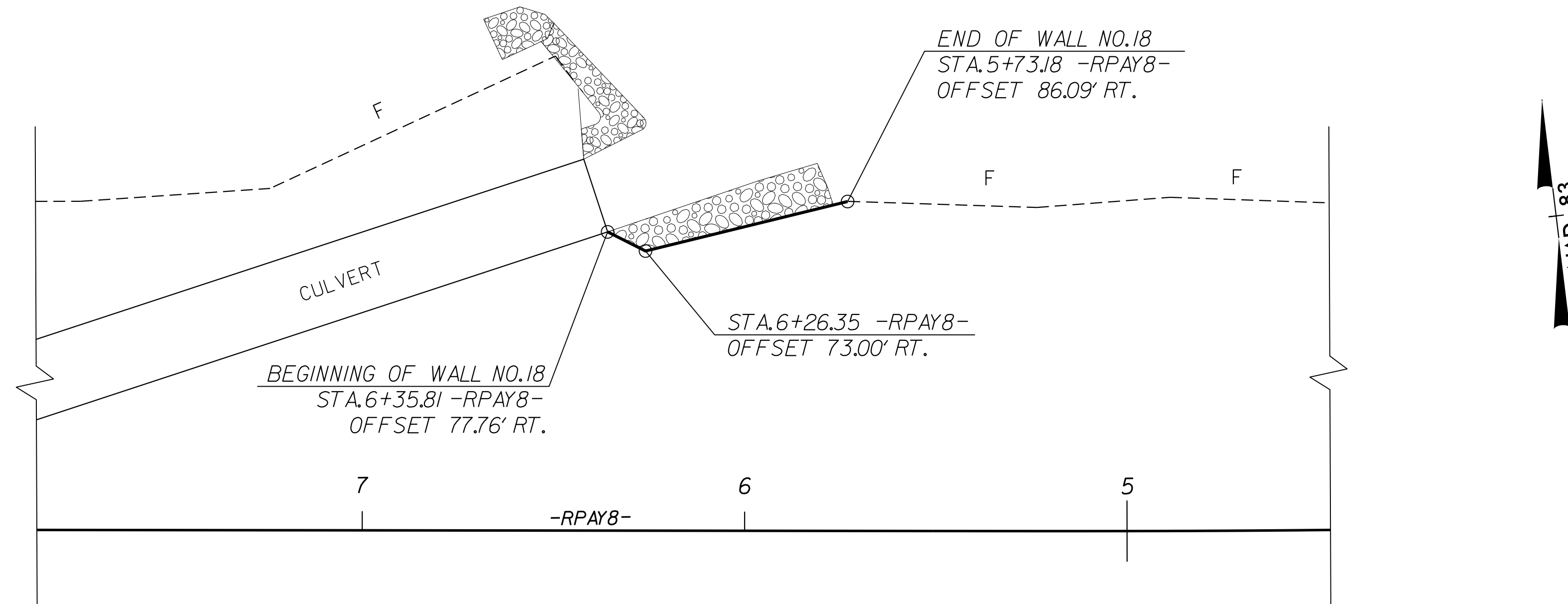
**GEOTECHNICAL
ENGINEERING UNIT**

**RETAINING WALL NO. 16 & NO. 17
STANDARD SEGMENTAL GRAVITY
RETAINING WALLS
STANDARD DETAIL NO. 453.02**

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

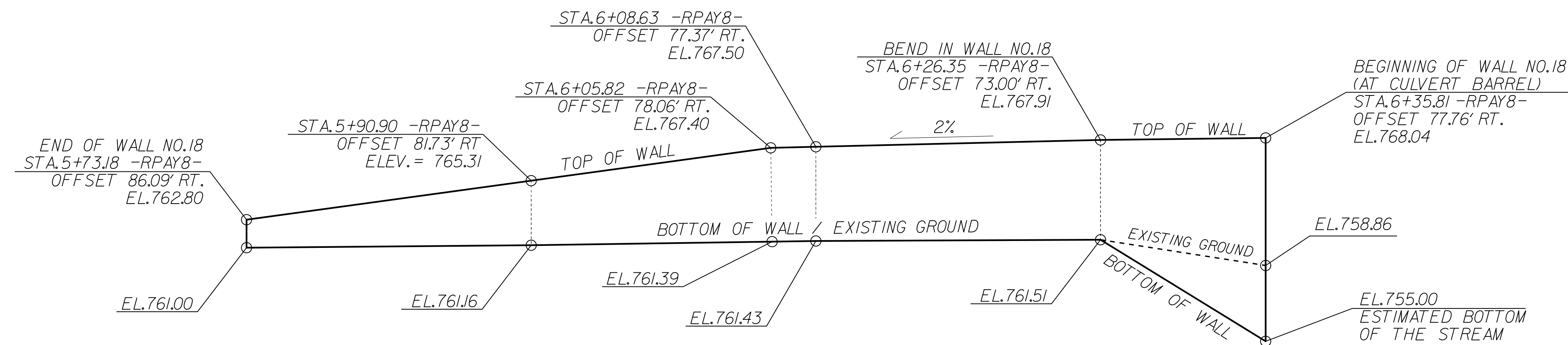
SHEET NO. W-20

PREPARED BY: THEIN T. ZAN	DATE: 05-2016
REVIEWED BY: JAMES R. BATTS	DATE: 05-2016



PLAN VIEW FOR RETAINING WALL NO. 18
 N.T.S.

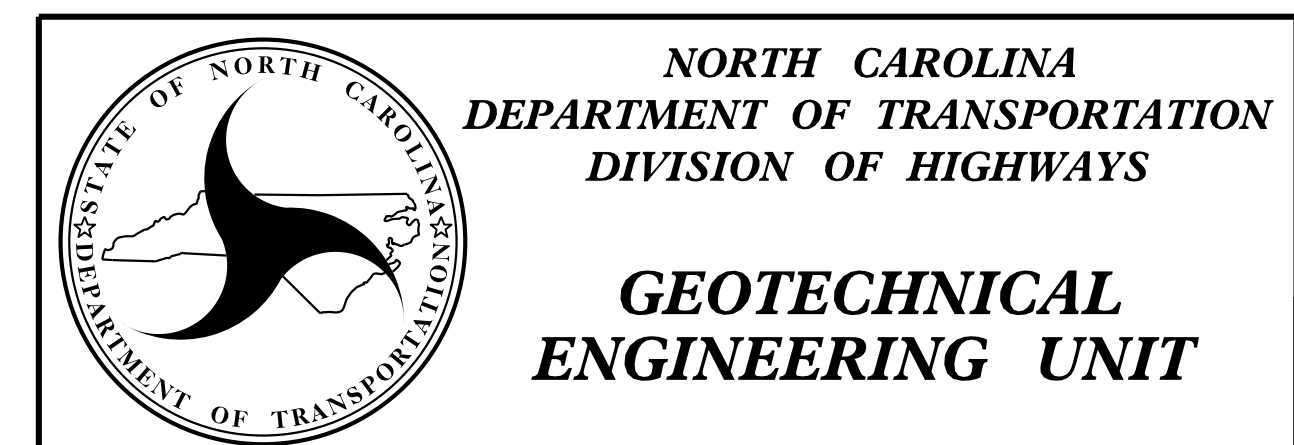
ESTIMATED RETAINING WALL NO. 18 QUANTITY	
STEEL SHEET PILE RETAINING WALLS	370 SF



WALL ENVELOPE FOR RETAINING WALL NO. 18
 EXPOSED WALL FACE VIEW, N.T.S.

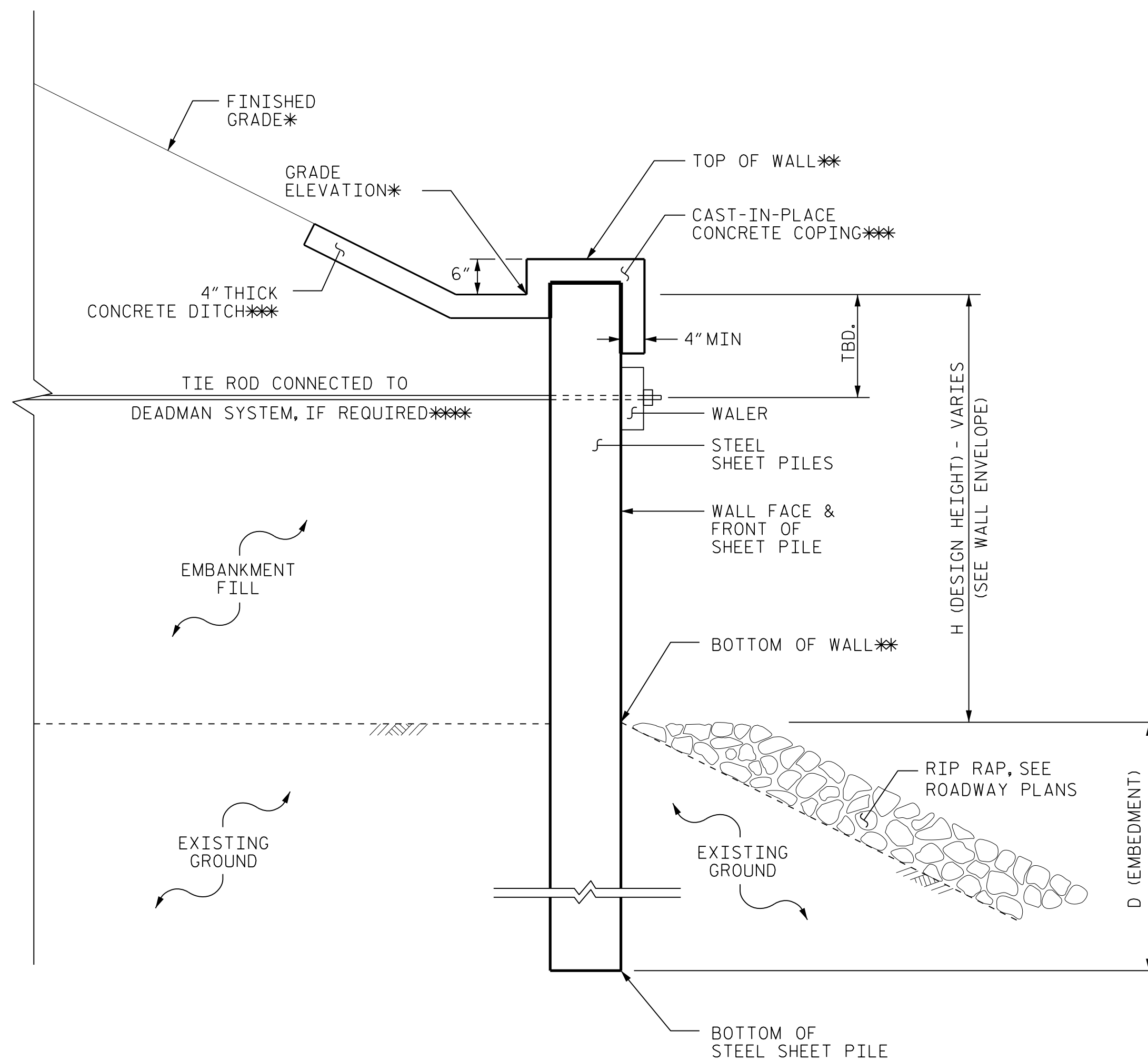
PROJECT NO.: U-2524D
 GUILFORD COUNTY
 STATION: -RPAY8- 6+35
 SHEET 1 OF 2

PREPARED BY: J. PARK DATE: 06 / 2016
 REVIEWED BY: J. BATTS DATE: 06 / 2016



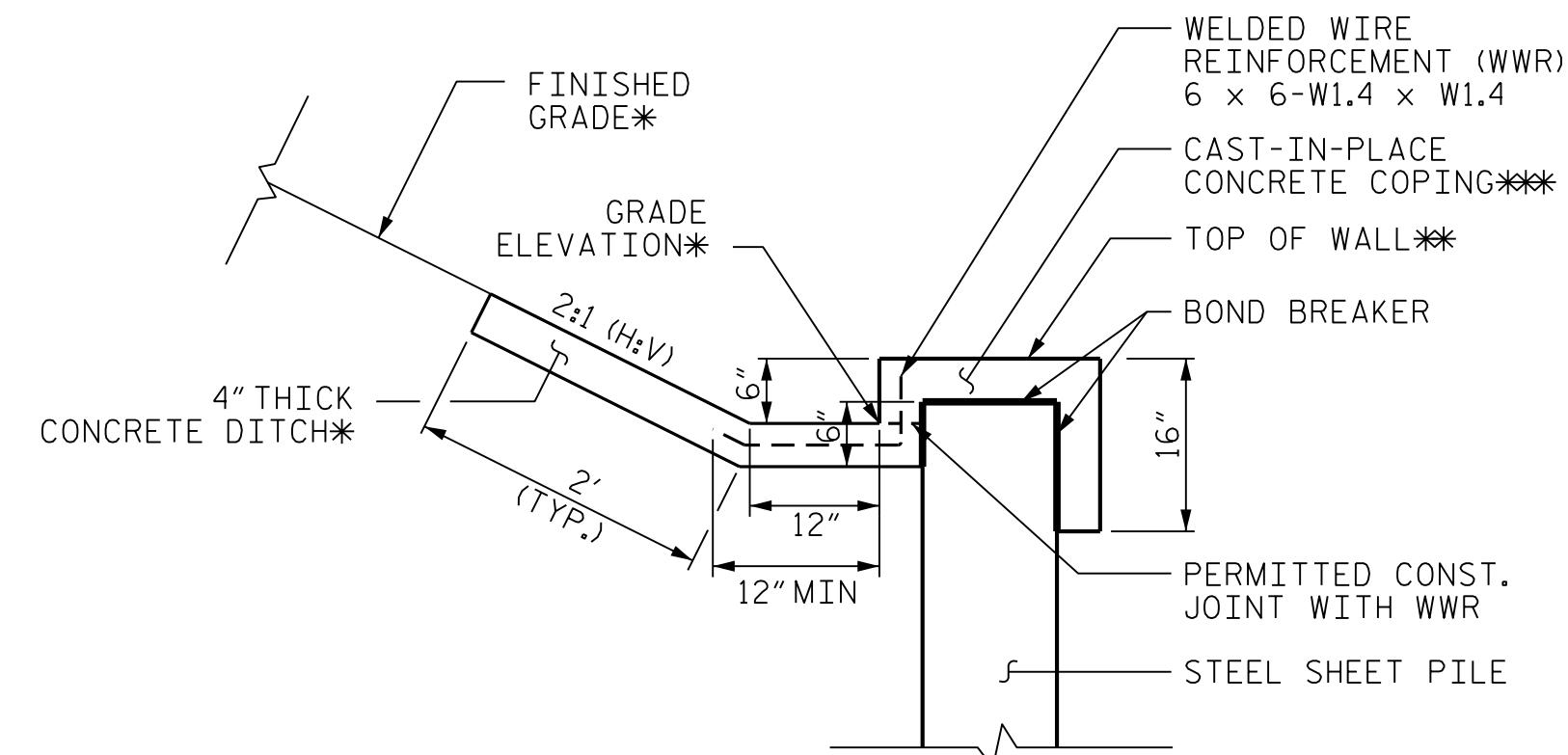
REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-21
2	-	-	4	-	-	

RETAINING WALL NO. 18
PLAN VIEW AND
WALL ENVELOPE



SHEET PILE RETAINING WALL - TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
 **SEE WALL ENVELOPES FOR TOP OF WALL AND BOTTOM OF WALL.
 ***SEE CONCRETE DITCH WITH CONCRETE COPING DETAILS.
 ****SEE STEEL SHEET PILE RETAINING WALLS SPECIAL PROVISION.



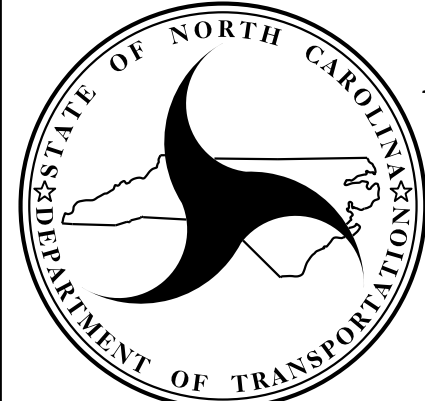
CONCRETE DITCH WITH CONCRETE COPING DETAILS

*SEE ROADWAY PLANS FOR CONCRETE DITCH AND FINISHED GRADE DETAILS.
 **SEE WALL ENVELOPE FOR TOP OF WALL ELEVATIONS.
 ***FOR CAST-IN-PLACE COPING REINFORCEMENT, SEE SHEET NO. C-17.

NOTES:

- FOR SHEET PILE RETAINING WALLS, SEE STEEL SHEET PILE RETAINING WALLS SPECIAL PROVISION.
- TIE RODS CONNECTED TO A DEADMAN SYSTEM ARE REQUIRED WHERE THE RATIO OF D/H (EMBEDMENT / DESIGN HEIGHT) IS LESS THAN 1.5.
- WHEN TIE RODS ARE INSTALLED, REMOVE ANY SAG IN RODS AND STRAIGHTEN RODS AS DIRECTED BY THE ENGINEER.
- OPERATION OF CONSTRUCTION EQUIPMENT OVER TIE RODS SHALL FOLLOW SECTION 300-7 OF STANDARD SPECIFICATIONS.
- FOR SHAPES, PLATES, TIE ROD ASSEMBLIES, BOLTS, NUTS, AND WASHERS, SEE STEEL SHEET PILE RETAINING WALLS SPECIAL PROVISION.
- BEFORE BEGINNING SHEET PILE RETAINING WALL DESIGN, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED. DO NOT BEGIN WALL CONSTRUCTION UNTIL WALL DESIGN IS ACCEPTED BY THE ENGINEER.
- DESIGN RETAINING WALL NO.18 FOR THE FOLLOWING SOIL PARAMETERS:
 1) IN-SITU ASSUMED MATERIAL PARAMETERS ABOVE ELEVATION 756± FT:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $f = 30$ DEGREES
 COHESION, $c = 0$ LB/SF
 2) IN-SITU ASSUMED MATERIAL PARAMETERS BELOW ELEVATION 756± FT AND ABOVE 749± FT:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $f = 36$ DEGREES
 COHESION, $c = 0$ LB/SF
 3) IN-SITU ASSUMED MATERIAL PARAMETERS BELOW ELEVATION 749± FT:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $f = 42$ DEGREES
 COHESION, $c = 0$ LB/SF
- CAST-IN-PLACE REINFORCED CONCRETE PAVED DITCH IS REQUIRED FOR STEEL SHEET PILE RETAINING WALLS. SEE SECTION 850 OF STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES.

PREPARED BY: J. PARK	DATE: 06 / 2016
REVIEWED BY: J. BATTS	DATE: 06 / 2016


NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

PROJECT NO.: U-2524D

GUILFORD COUNTY

STATION: -RPAY8- 6+35

SHEET 2 OF 2

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-22
2	-	-	4	-	-	