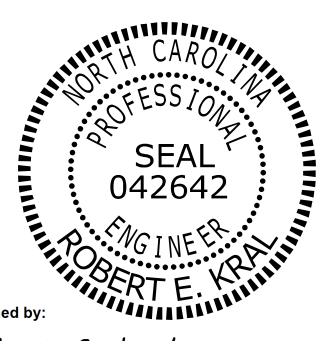
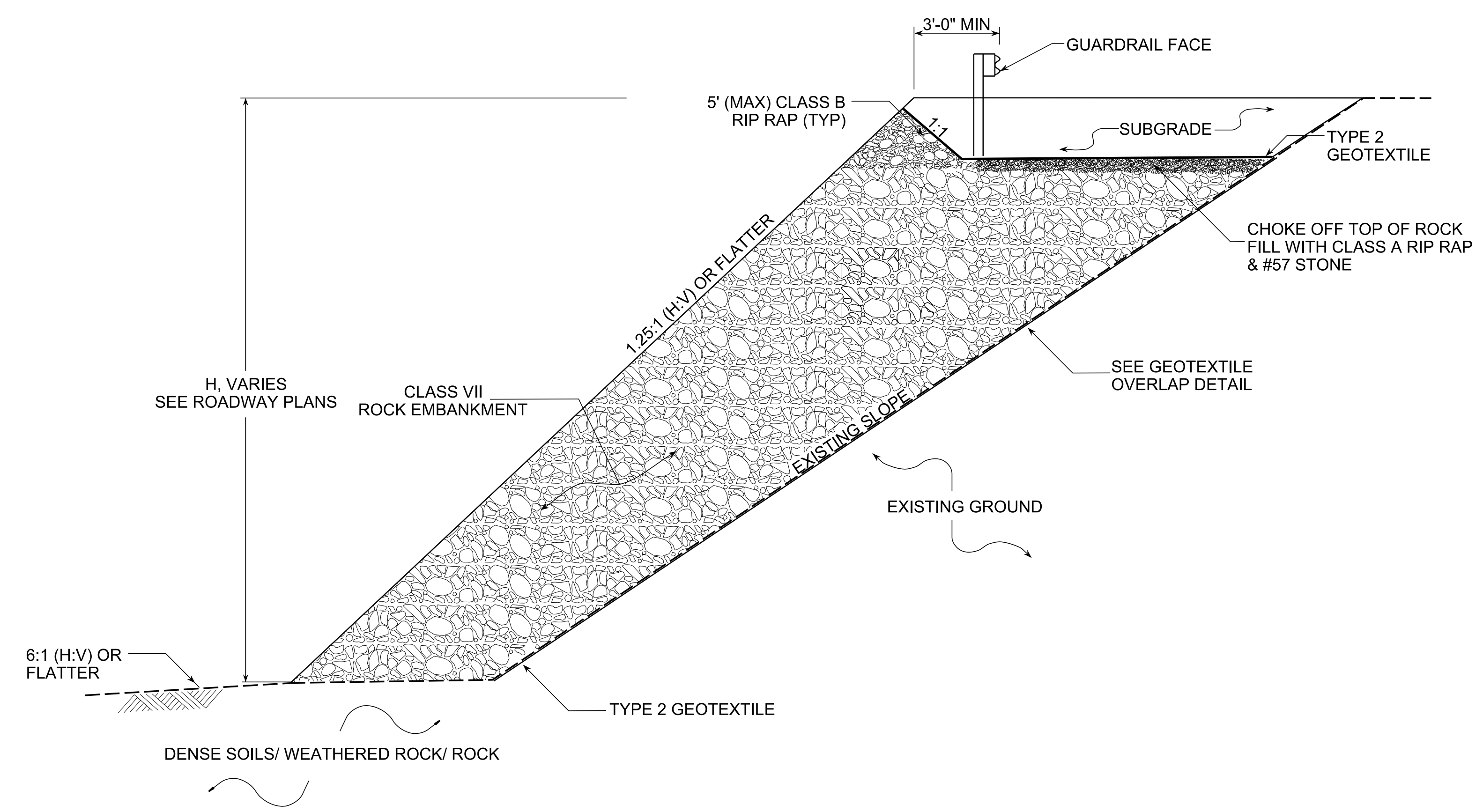


GEOTECHNICAL ENGINEER
 ENGINEER

 Signed by: Robert E. Kral
 AAF88FF73CE4B1 05/19/2026
 SIGNATURE DATE SIGNATURE DATE
 DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



PARTIALLY GROUTED ROCK EMBANKMENT DETAIL
 -L944- STA. 12+00.00 TO 14+25.00, RT
 -L944- STA. 18+00.00 TO 18+50.00, RT

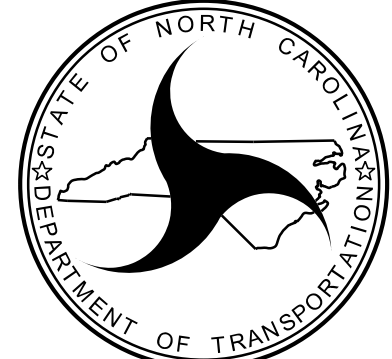
- NOTES:**
1. THE MAXIMUM ALLOWABLE HEIGHT FOR THE ROCK EMBANKMENT DETAIL IS 80'.
 2. FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
 3. FOR PARTIALLY GROUTED ROCK EMBANKMENTS, SEE RETAINING WALLS SPECIAL PROVISION AND ROCK FILL DETAILS ON SHEETS W-4 AND W-5.

PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L944- STA. 12+00.00 TO 18+50.00, RT
 SHEET 2 OF 5

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684


 NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SITE 944 RETAINING WALL
ROCK EMBANKMENT &
ROCK EMBANKMENT WITH
MICROPILE KNEE WALL

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	KND	05/26	3		
2			4		

SHEET NO. W-2

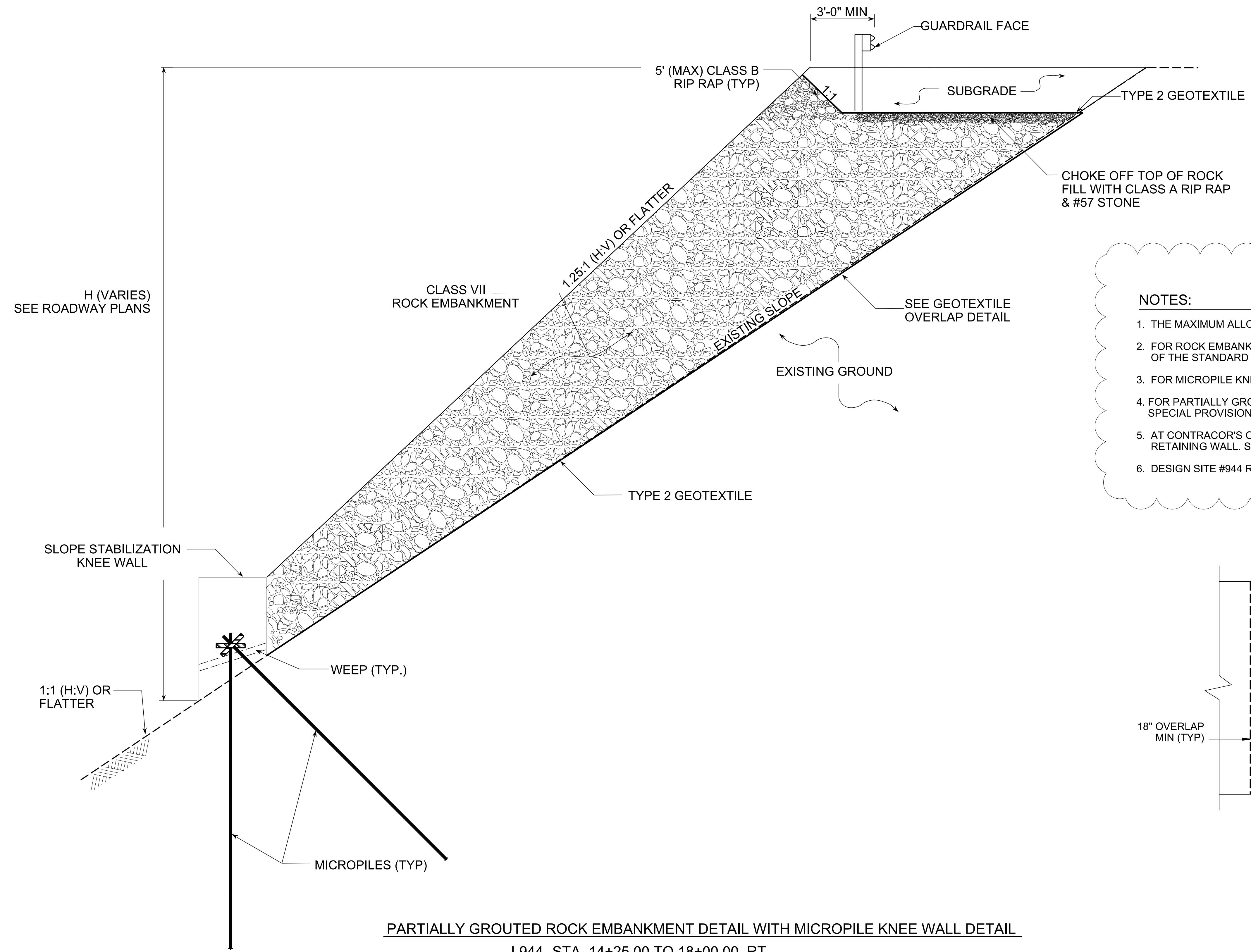
GEOTECHNICAL ENGINEER

ENGINEER

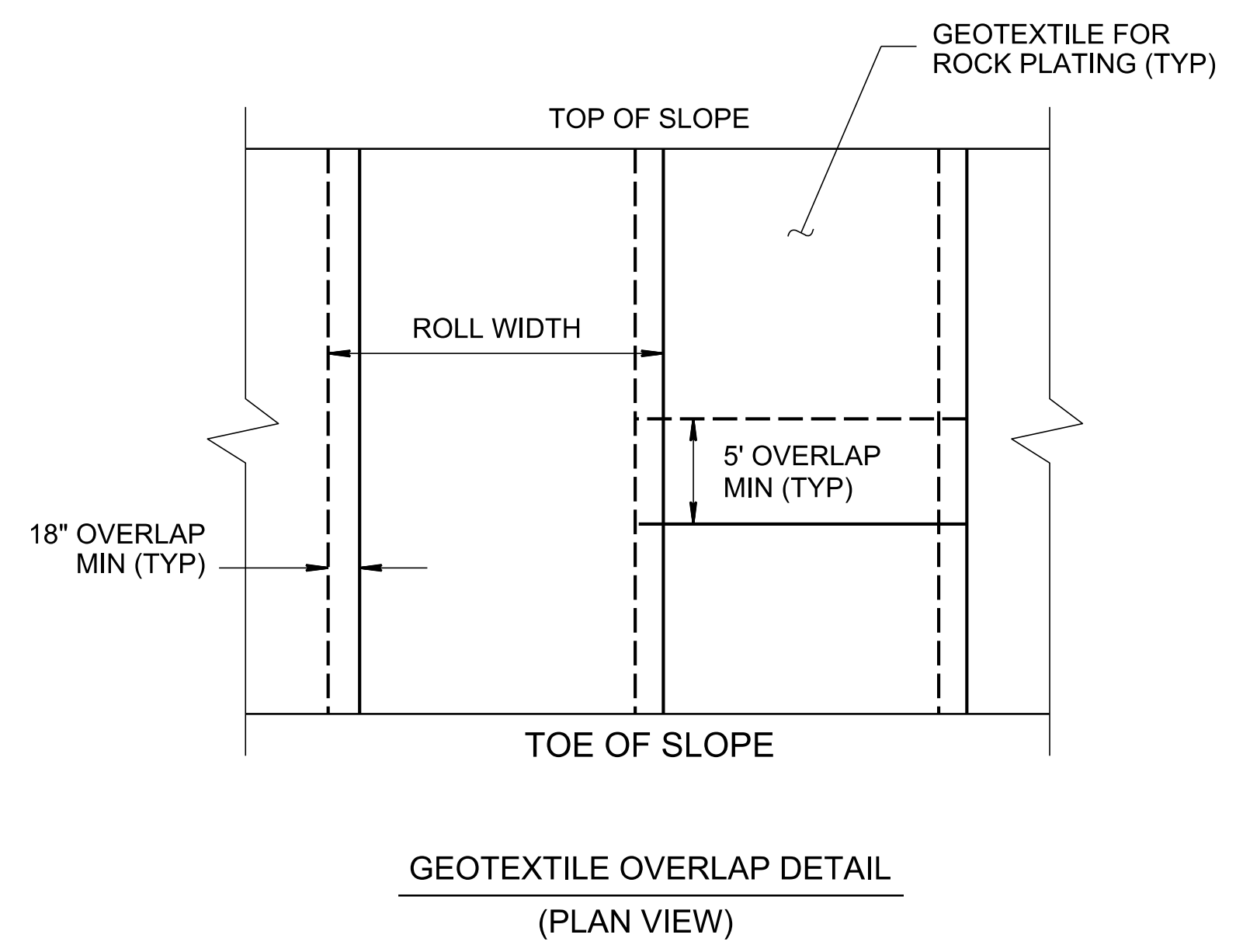
Signed by: Robert E. Kral
 AAF88FF73CE4B1
 05/19/2026

DATE: 05/19/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



- NOTES:**
1. THE MAXIMUM ALLOWABLE HEIGHT FOR THE ROCK EMBANKMENT DETAIL IS 80'.
 2. FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
 3. FOR MICROPILE KNEE WALL, SEE RETAINING WALLS SPECIAL PROVISION.
 4. FOR PARTIALLY GROUTED ROCK EMBANKMENTS, SEE RETAINING WALLS SPECIAL PROVISION AND ROCK FILL DETAILS ON SHEETS W-4 AND W-5.
 5. AT CONTRACTOR'S OPTION, ALTERNATIVE DESIGN MAY BE USED FOR SITE #944 RETAINING WALL. SEE RETAINING WALLS SPECIAL PROVISION.
 6. DESIGN SITE #944 RETAINING WALL FOR INTERNAL, EXTERNAL, AND GLOBAL STABILITY.



PARTIALLY GROUTED ROCK EMBANKMENT DETAIL WITH MICROPILE KNEE WALL DETAIL
 -L944- STA. 14+25.00 TO 18+00.00, RT

PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L944- STA. 12+00.00 TO 18+50.00, RT
 SHEET 3 OF 5

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684


NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS

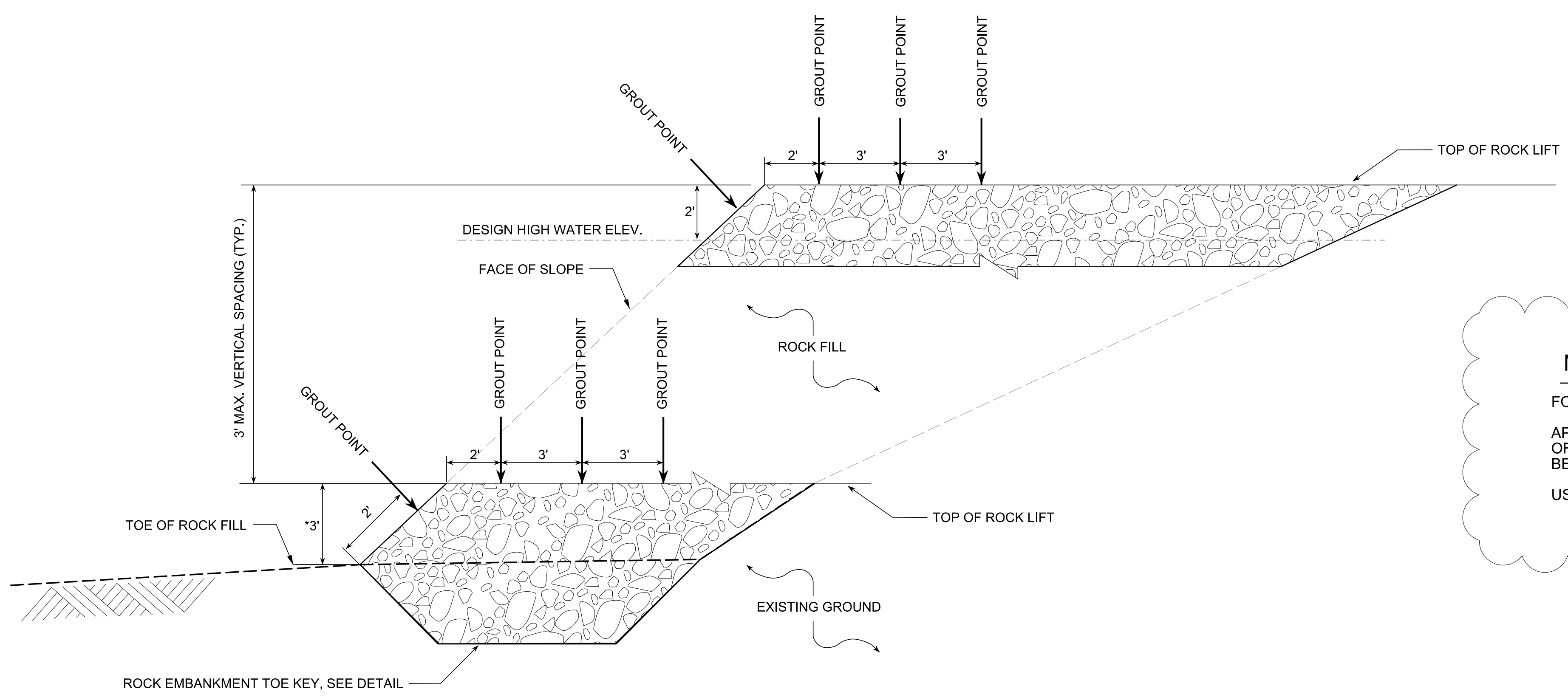
GEOTECHNICAL ENGINEERING UNIT

**SITE 944 RETAINING WALL
 ROCK EMBANKMENT &
 ROCK EMBANKMENT WITH
 MICROPILE KNEE WALL**

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	KND	05/26	3		
2			4		

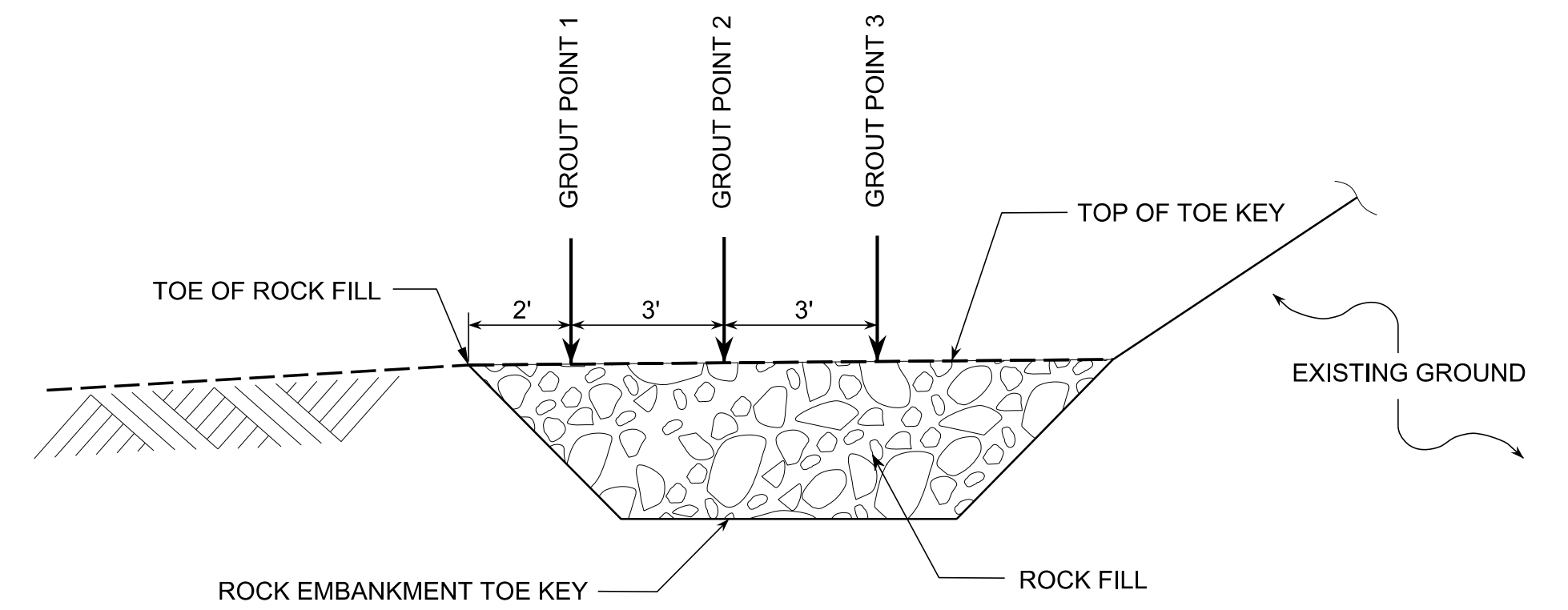
SHEET NO. W-3

GEOTECHNICAL ENGINEER
 ENGINEER

 Signed by: Robert E. Kral
 AAF88FF73CE4B1
 DATE: 05/19/2026
 SIGNATURE: _____ DATE: _____
 DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

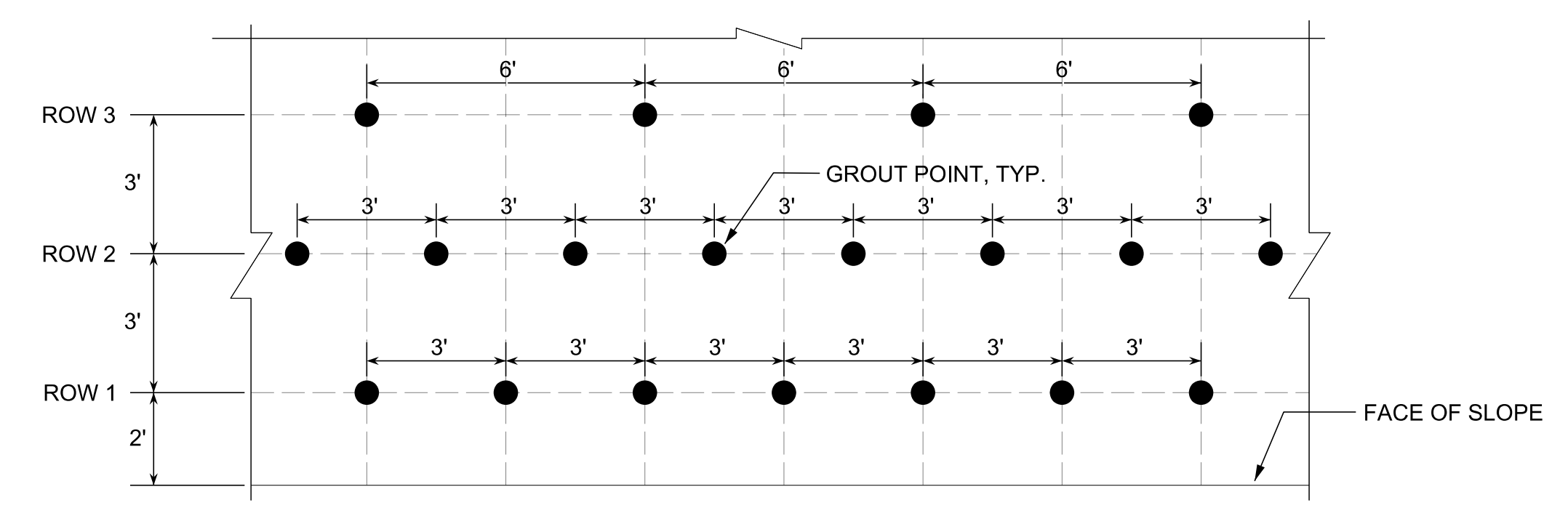


PARTIALLY GROUTED ROCK FILL - ROCK FILL SECTION
 * IF NO TOE KEY, START GROUTING AT THE TOP OF THE FIRST 3-FT LIFT

NOTES:
 FOR PARTIALLY GROUTED ROCK FILL, SEE RETAINING WALLS SPECIAL PROVISION.
 APPLY GROUT ON THE SLOPE FACE AND AT THE TOP OF EACH 3 FT LIFT OF ROCK FILL. APPLY 3 CUBIC FEET OF GROUT AT EACH GROUT POINT IN THE PATTERNS SHOWN ON PAGE 2. THE HIGHEST GROUT POINT WILL BE THE TOP OF THE ROCK EMBANKMENT.
 USE PARTIALLY GROUTED ROCK FILL FROM TOE TO AT LEAST 2FT ABOVE THE 500-YR FLOOD ELEVATION.



PARTIALLY GROUTED ROCK FILL - TOE KEY DETAIL



PARTIALLY GROUTED ROCK FILL - PLAN VIEW GROUT POINTS
 VIEW FROM FRONT TOP

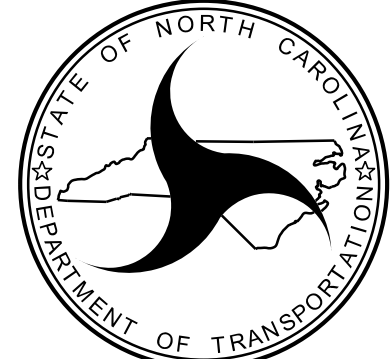
PARTIALLY GROUTED ROCK FILL DETAILS

PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L944- STA. 12+00.00 TO 18+50.00, RT
 SHEET 4 OF 5

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

Prepared in the Office of:


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 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684

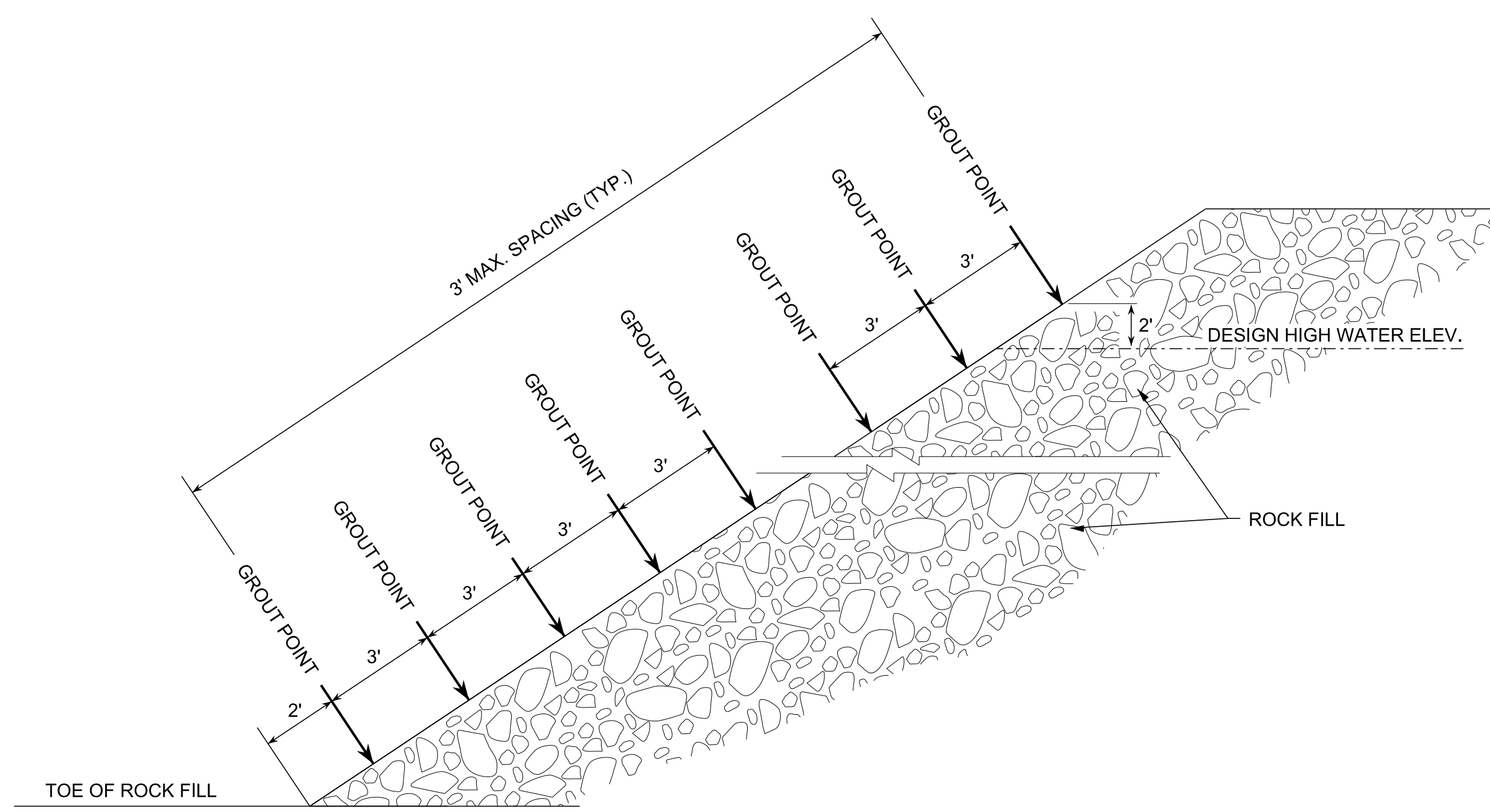

 NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SITE 944 RETAINING WALL
 ROCK EMBANKMENT &
 ROCK EMBANKMENT WITH
 MICROPILE KNEE WALL

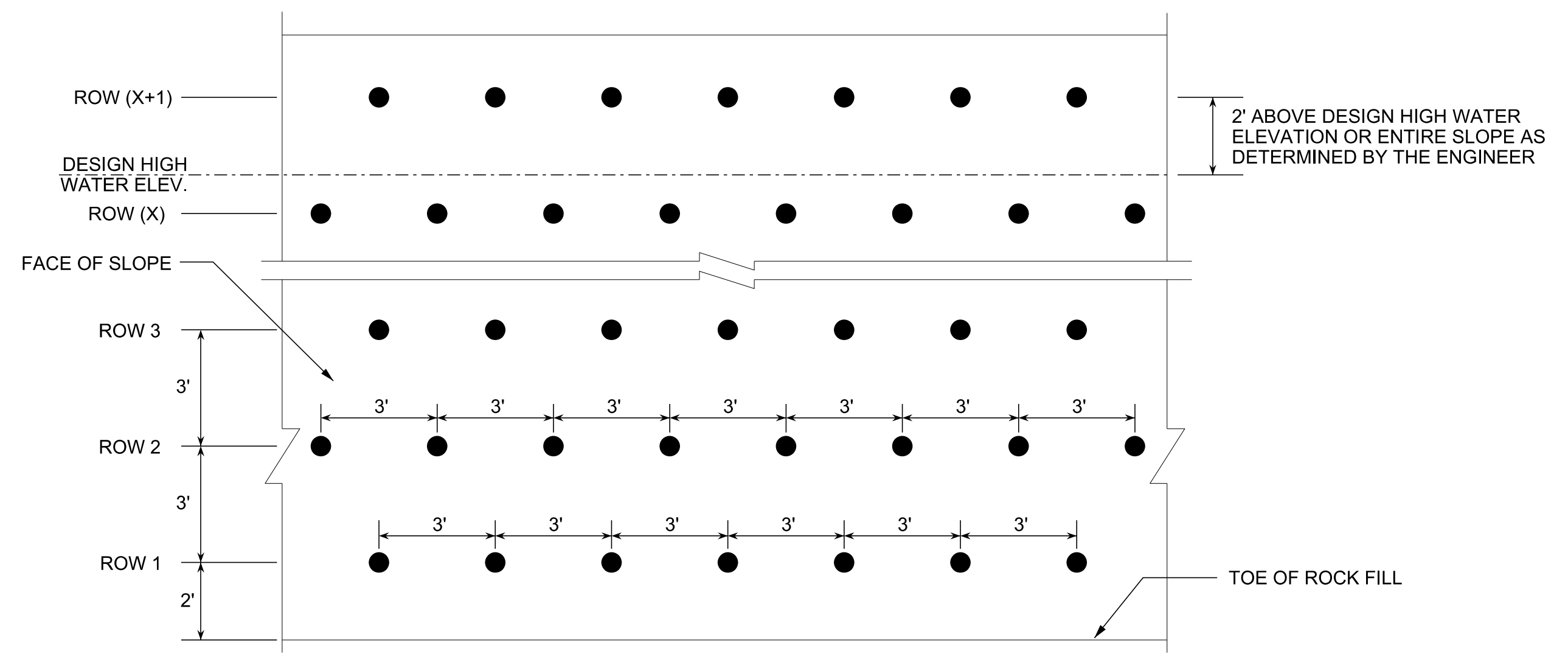
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	KND	05/26	3		
2			4		

SHEET NO. W-4

GEOTECHNICAL ENGINEER
 ENGINEER

 Signed by: *Robert E. Kral* 05/19/2026
 AAF88FF73CE4B91
 SIGNATURE DATE SIGNATURE DATE
 DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED



PARTIALLY GROUTED ROCK FILL - SLOPE FACE DETAIL



PARTIALLY GROUTED ROCK FILL - SLOPE FACE GROUT POINTS
VIEW FROM FRONT SLOPE FACE

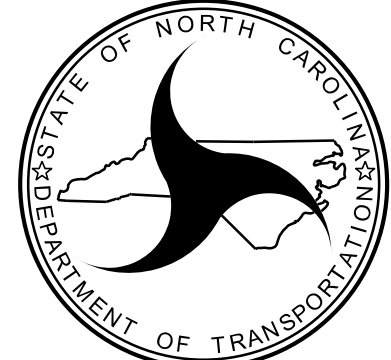
PARTIALLY GROUTED ROCK FILL DETAILS

PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L944- STA. 12+00.00 TO 18+50.00, RT
 SHEET 5 OF 5

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

Prepared in the Office of:

**CARLINAS
 GEOTECHNICAL
 GROUP**
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684

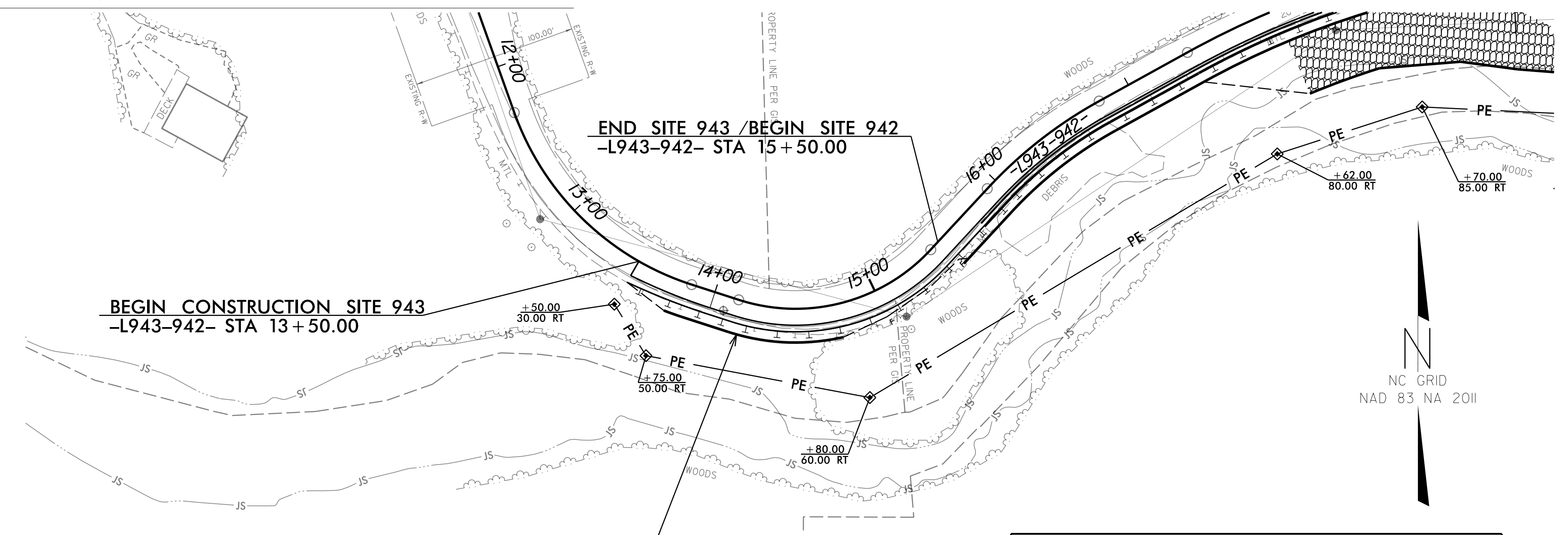

 NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
**GEOTECHNICAL
 ENGINEERING UNIT**

SITE 944 RETAINING WALL
 ROCK EMBANKMENT &
 ROCK EMBANKMENT WITH
 MICROPILE KNEE WALL

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

SHEET NO. W-5

SITE 943 RETAINING WALL:



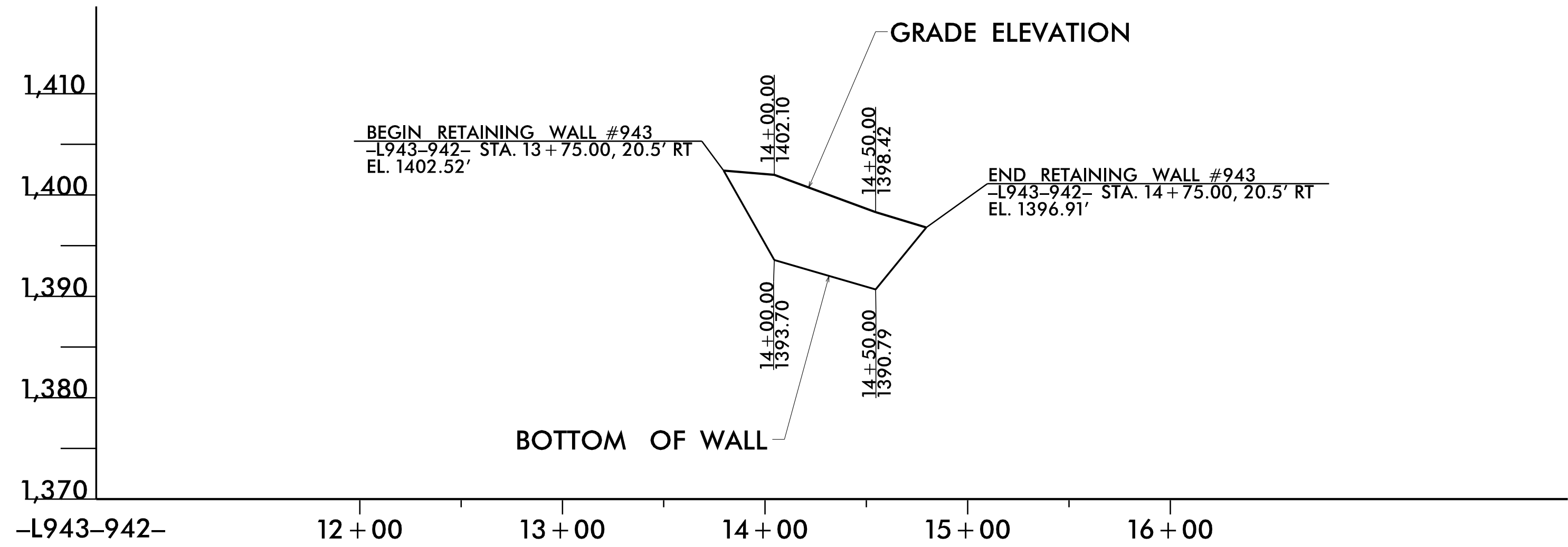
SITE 943 - PLAN
NOT TO SCALE

ESTIMATED QUANTITIES - SITE #943*	
SOIL NAIL RETAINING WALL	610 SF
MICROPILE GRADE BEAM	200 LF

*ESTIMATED QUANTITIES FOR SITE #943 RETAINING WALL ARE FOR BID PURPOSES ONLY.

SITE 943 RETAINING WALL			
STA. -L943-942-	GRADE ELEVATION (FT)	BOTTOM OF WALL ELEVATION (FT)	WALL DESIGN HEIGHT "H" (FT)
13+75.00	1,402.52	1,402.52	0.00
14+00.00	1,402.10	1,393.70	8.40
14+50.00	1,398.42	1,390.79	7.63
14+75.00	1,396.91	1,396.91	0.00

PAY ITEMS	
RETAINING WALLS, SITE #943	LS



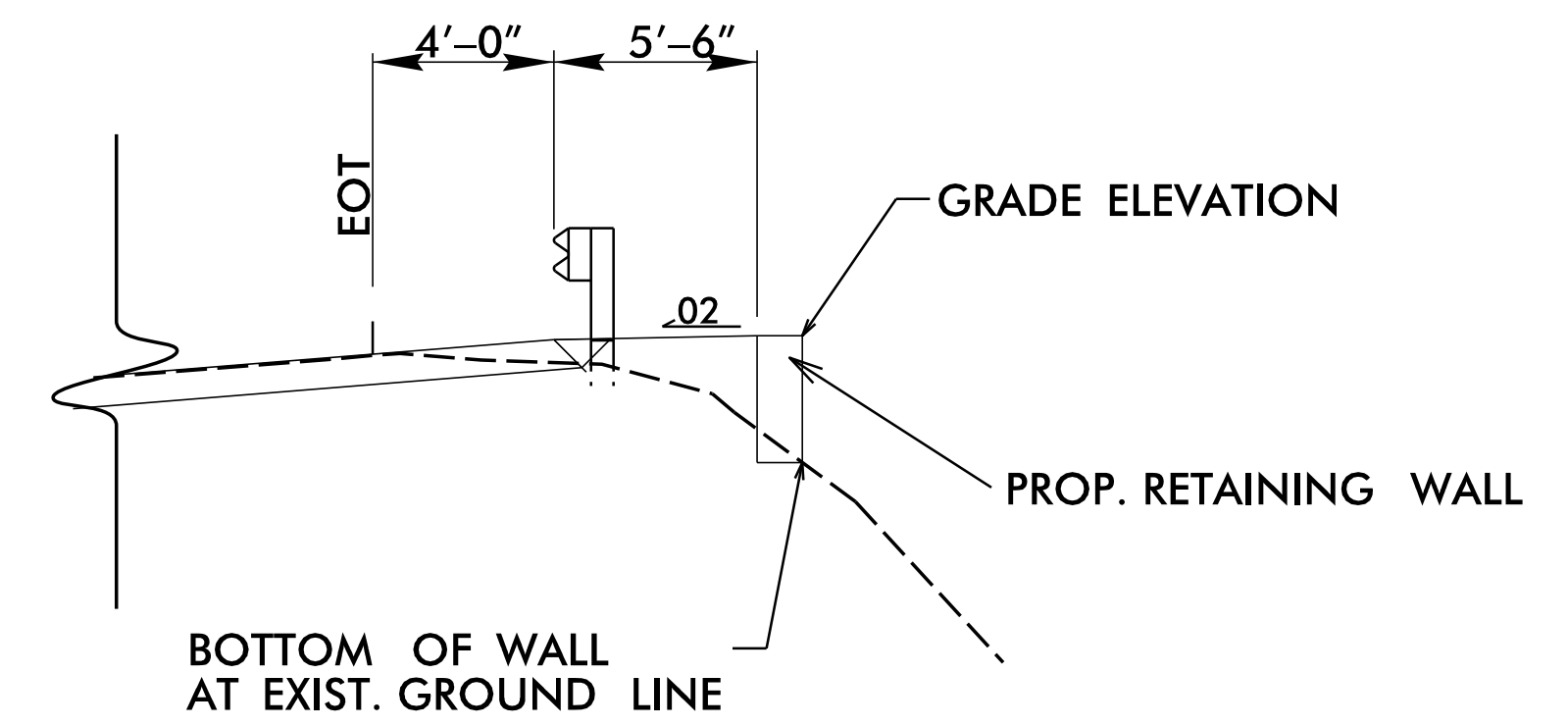
RETAINING WALL #943 - ENVELOPE
NOT TO SCALE
(LOOKING AT FACE OF WALL)

THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL WALL FACE OF WALL #943 AT THE FOLLOWING LOCATIONS:
-L943-942- STA. 13+75.00 TO 13+85.15, RT
AND -L943-942- STA. 14+15.15 TO 14+75.00, RT

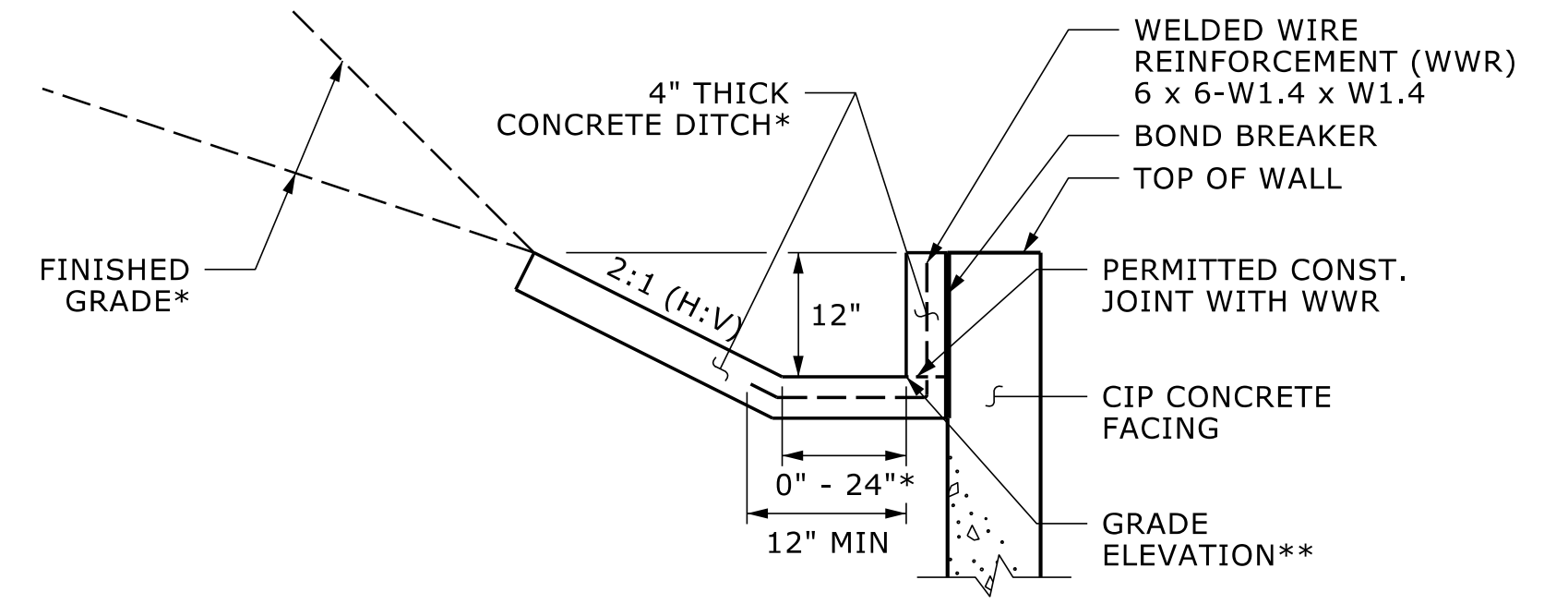
PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

RETAINING WALL ENVELOPE AND WALL LAYOUT PROVIDED BY TGS JULY 29, 2025.

GEOTECHNICAL ENGINEER Signed by: Robert E. Kral AAF88FF73CE4B1 SIGNATURE	ENGINEER DATE: 05/19/2026 SIGNATURE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



SECTION THROUGH RETAINING WALL
-L943-942- STA. 13+50.00, RT TO STA. 15+50.00, RT



CONCRETE DITCH BEHIND WALL WITH CONCRETE FACING

*SEE ROADWAY PLANS FOR CONCRETE DITCH AND FINISHED GRADE DETAILS.
**SEE WALL ENVELOPE FOR GRADE ELEVATIONS.

PROJECT NO.: W03293

POLK COUNTY

RETAINING WALL: -L943-942- STA. 13+75.00 TO 14+75.00, RT

SHEET 1 OF 2

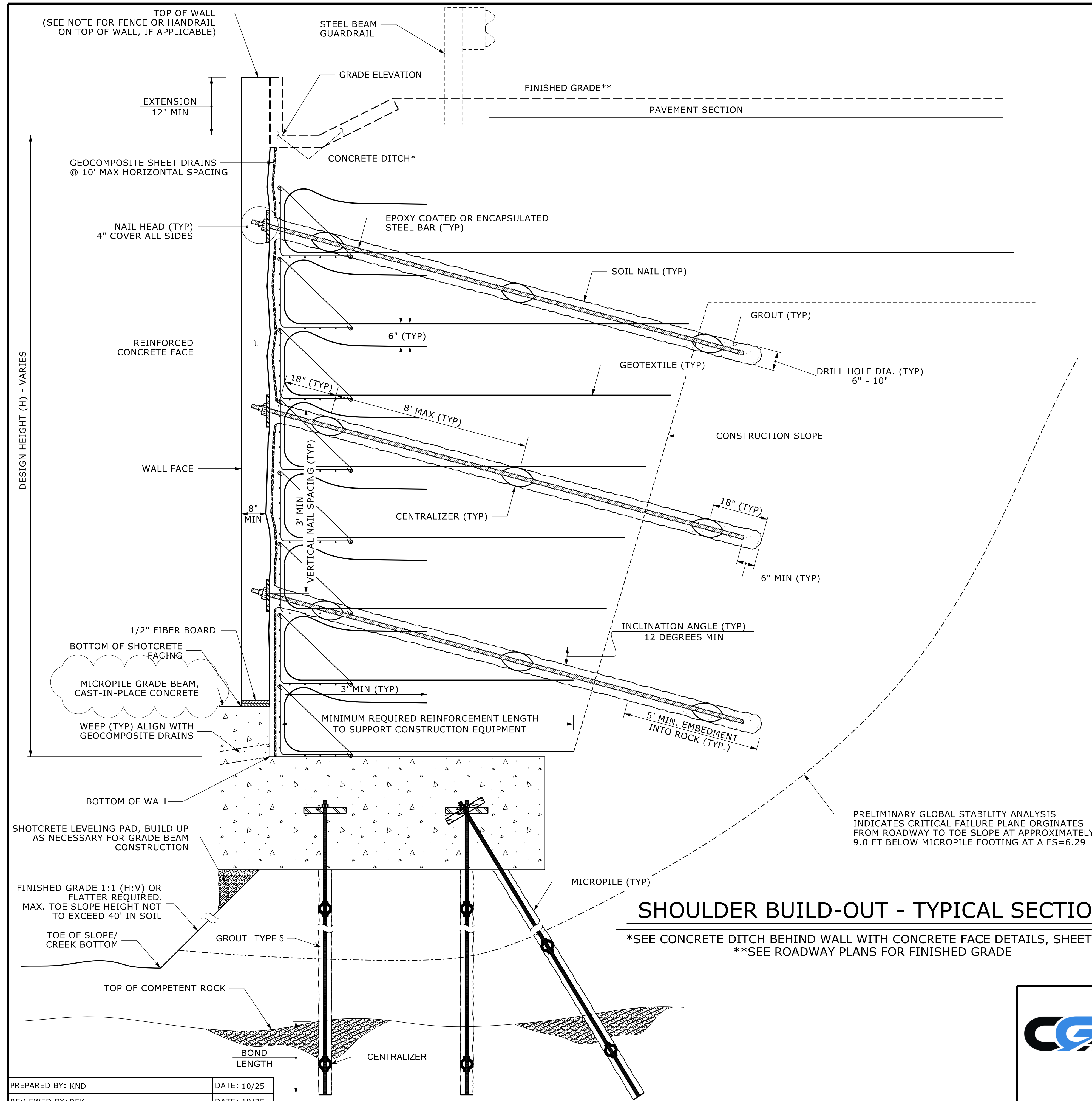
Prepared in the Office of:

CAROLINUS GEOTECHNICAL GROUP
1805 SARDIS ROAD NORTH
SUITE 100
CHARLOTTE, NC 28270
(980) 339-8684

SITE 943 RETAINING WALL
SOIL NAIL SHOULDER BUILD-OUT

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	KND	05/26	3		
2			4		

SHEET NO. W-6



SHOULDER BUILD-OUT - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL WITH CONCRETE FACE DETAILS, SHEET W-1
 **SEE ROADWAY PLANS FOR FINISHED GRADE

GEOTECHNICAL ENGINEER Signed by: Robert E. Kral AAF88FF73CE4B1 SIGNATURE	ENGINEER DATE: 05/19/2026
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

NOTES:

- FOR SOIL NAIL SHOULDER BUILD-OUT, SEE RETAINING WALLS SPECIAL PROVISION.
- FOR MICROPILE GRADE BEAM, SEE RETAINING WALLS SPECIAL PROVISION.
- FOR MICROPILES, SEE RETAINING WALLS SPECIAL PROVISION.
- DESIGN MICROPILE GRADE BEAM FOR A MINIMUM OF 5 FEET OF GROUND LOSS BELOW GRADE BEAM.
- MICROPILE CASING MAY BE REQUIRED.
- ESTABLISH THE BACK OF SOIL NAIL WALL FACE AT A 3.5' OR GREATER OFFSET FROM THE BACK OF THE EXISTING OR PROPOSED GUARDRAIL POST.
- EXTEND THE TOP TWO LAYERS OF GEOTEXTILE TO CENTERLINE OF ROAD.
- FOR SOIL NAIL RETAINING WALLS, SEE RETAINING WALLS SPECIAL PROVISION.
- AT CONTRACTOR'S OPTION, ALTERNATIVE DESIGN MAY BE USED FOR SITE #943 RETAINING WALL. SEE RETAINING WALLS SPECIAL PROVISION.
- DESIGN SITE #943 RETAINING WALL FOR INTERNAL, EXTERNAL, AND GLOBAL STABILITY.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR SITE 943 RETAINING WALL, 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 SITE 943 RETAINING WALL FOR THE FOLLOWING:
 - 1) DESIGN HEIGHT (H) = WALL HEIGHT + WALL EMBEDMENT
 - 2) DESIGN LIFE = 75 YEARS
 - 3) MINIMUM WALL EMBEDMENT DEPTH = 1 FT
 - 4) ASSUMED BORROW MATERIAL PARAMETERS, SEE SECTION 1018 OF THE STANDARD SPECIFICATIONS
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 5) IN-SITU ASSUMED MATERIAL PARAMETERS RESIDUAL SOIL:
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 6) IN-SITU ASSUMED MATERIAL PARAMETERS WEATHERED ROCK:
 - UNIT WEIGHT, $\gamma = 134$ PCF
 - FRICTION ANGLE, $\phi = 32$ DEGREES
 - COHESION, $c = 500$ PSF
 - 7) IN-SITU ASSUMED MATERIAL PARAMETERS CRYSTALLINE ROCK:
 - UNIT WEIGHT, $\gamma = 170$ PCF
 - FRICTION ANGLE, $\phi = 34$ DEGREES
 - COHESION, $c = 1,000$ PSF
- EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH SOIL NAILS FOR SITE 943 RETAINING WALL.
- "TEMPORARY SHORING" MAY BE REQUIRED FOR SITE 943 RETAINING WALL IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY OR TRAFFIC CONTROL PLANS.

PRELIMINARY GLOBAL STABILITY ANALYSIS INDICATES CRITICAL FAILURE PLANE ORIGINATES FROM ROADWAY TO TOE SLOPE AT APPROXIMATELY 9.0 FT BELOW MICROPILE FOOTING AT A FS=6.29

PROJECT NO.: W03293
 POLK COUNTY
 RETAINING WALL: -L943-942- STA. 13+75.00 TO 14+75.00, RT
 SHEET 2 OF 2

Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	KND	03/26	3			W-7
2	KND	05/26	4			

PREPARED BY: KND DATE: 10/25
 REVIEWED BY: REK DATE: 10/25

SITE 942 RETAINING WALL:

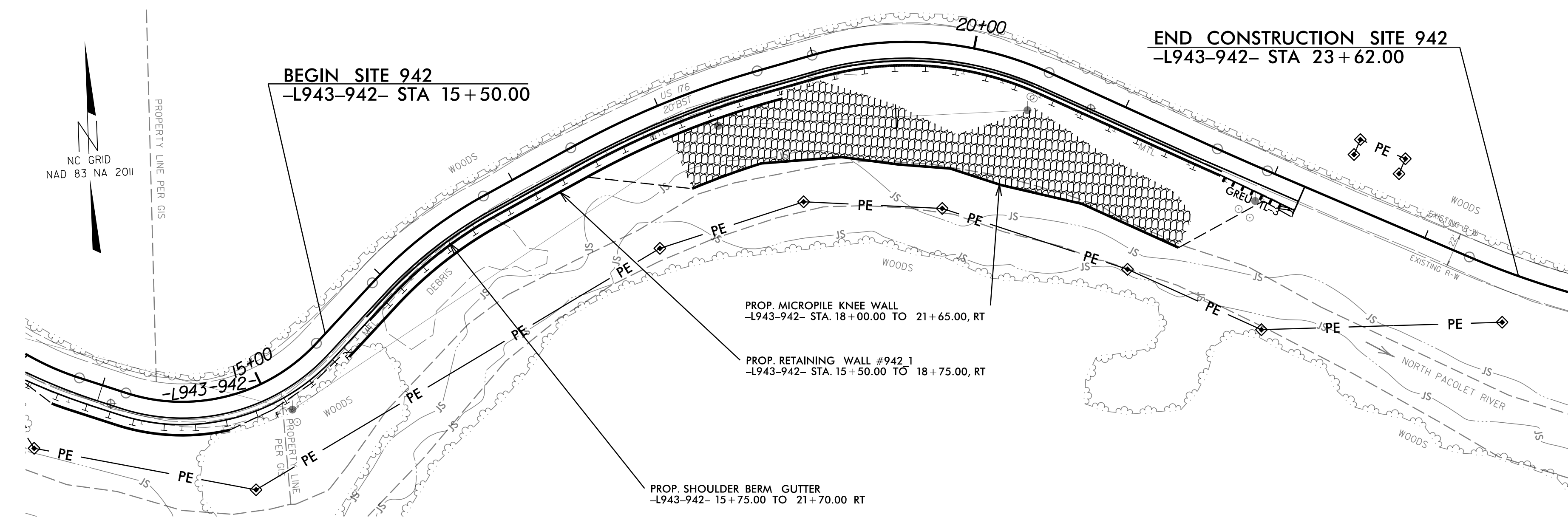
GEOTECHNICAL ENGINEER

ENGINEER

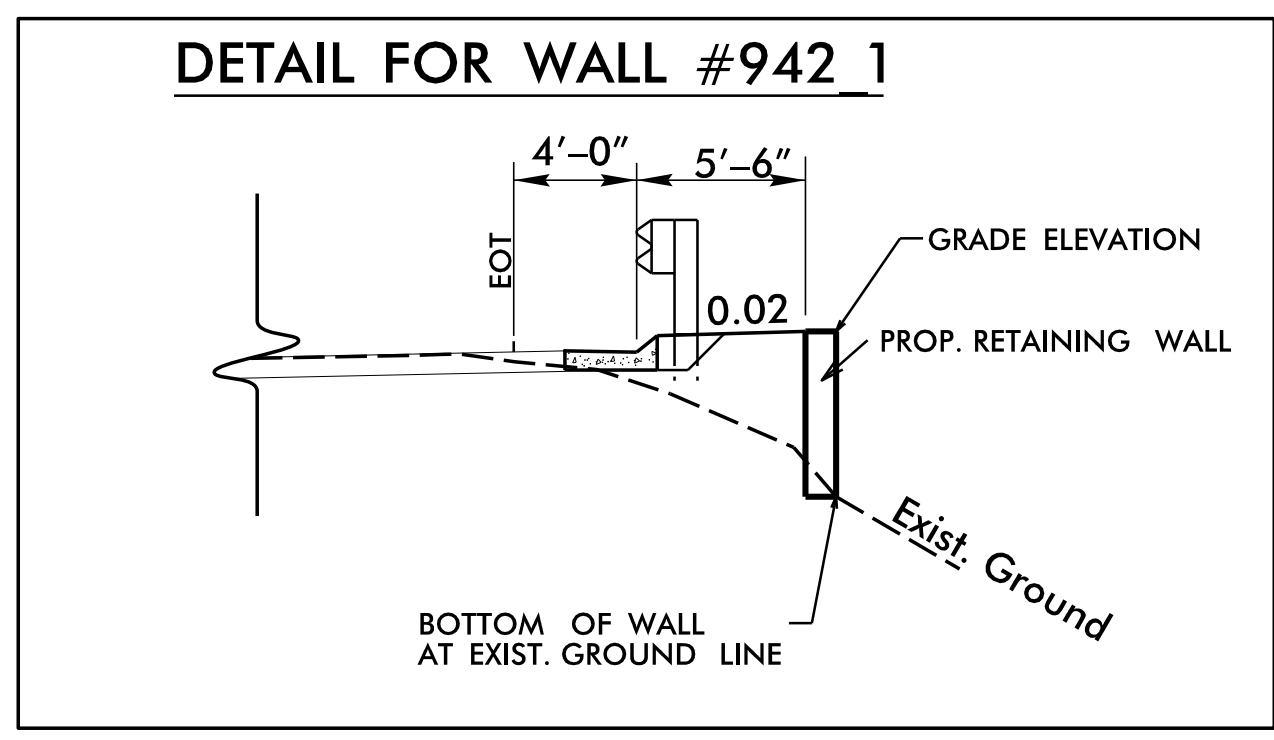
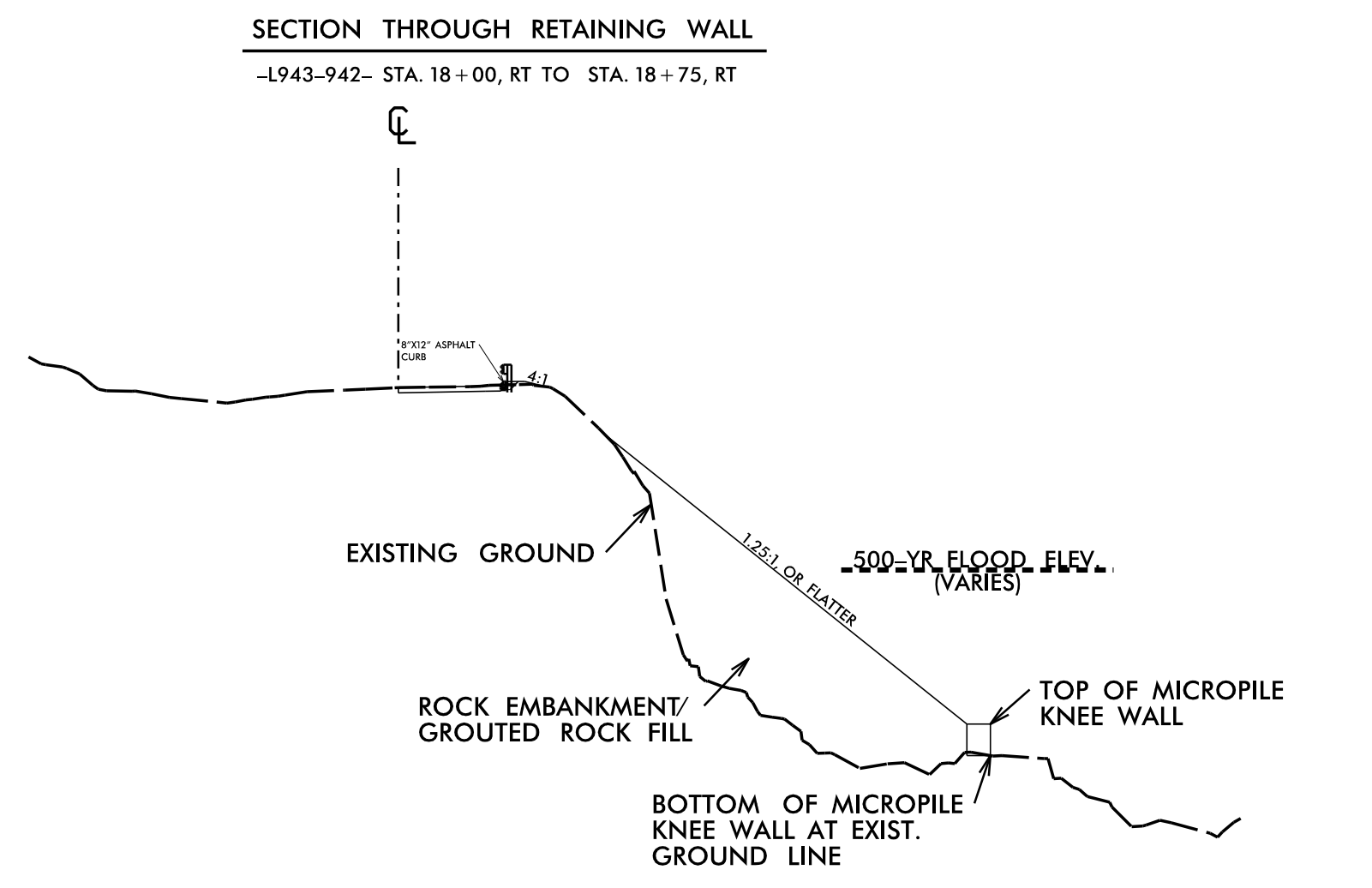
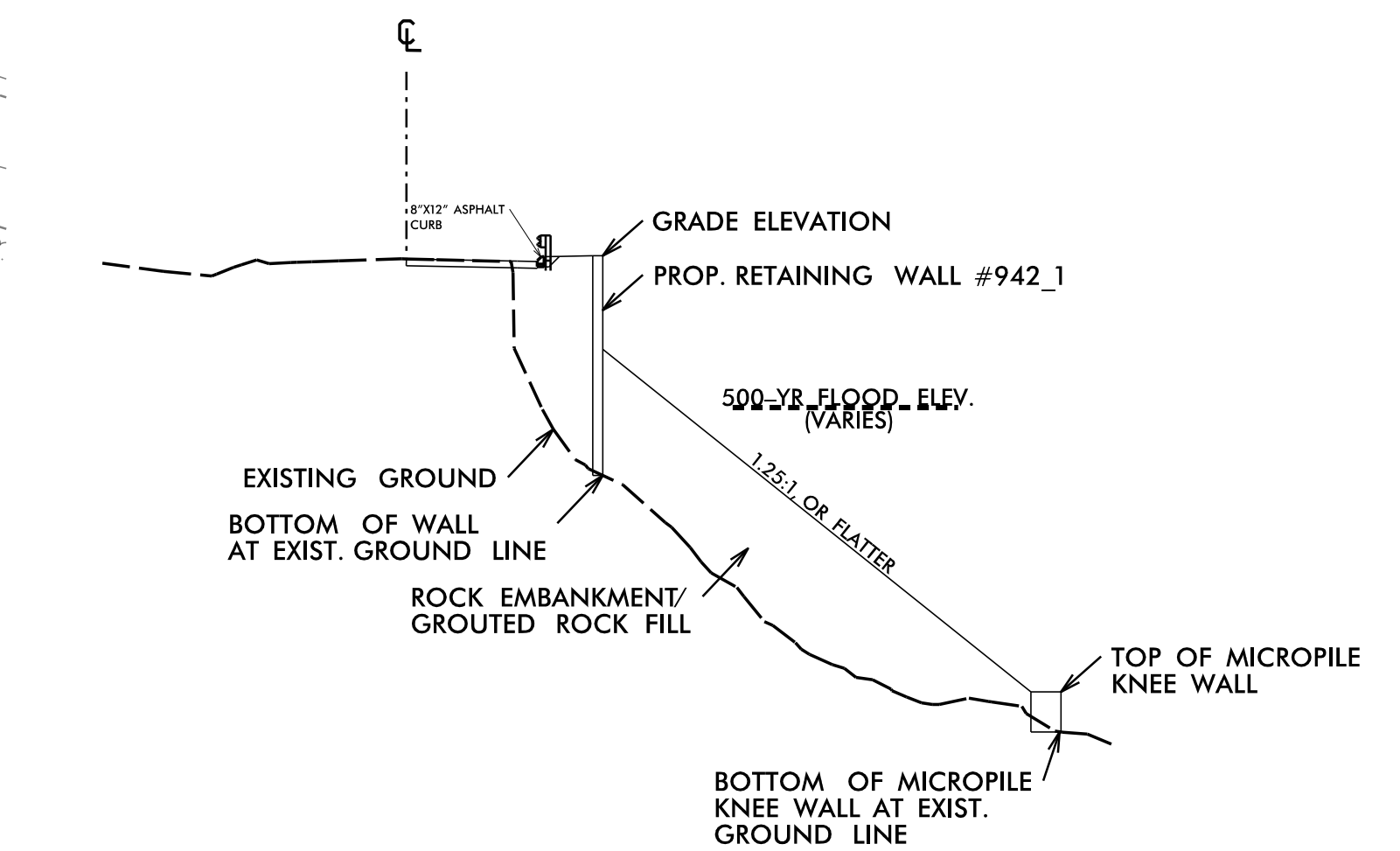
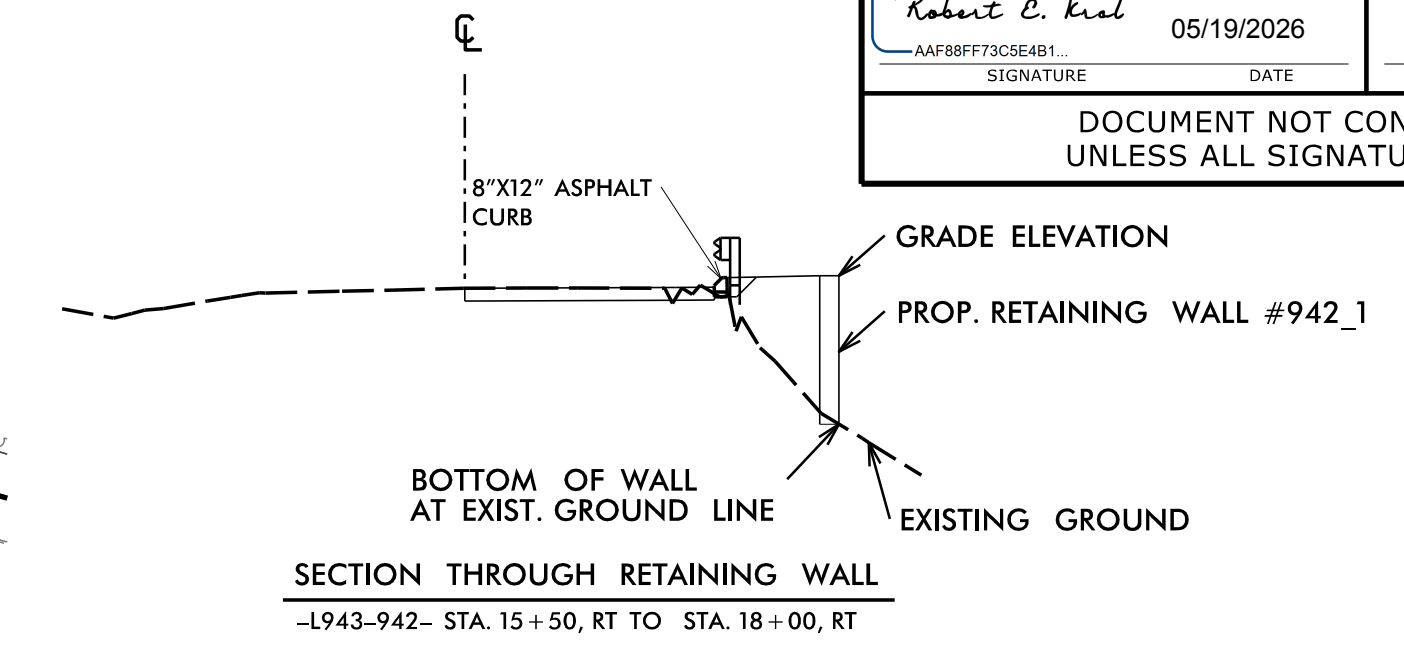
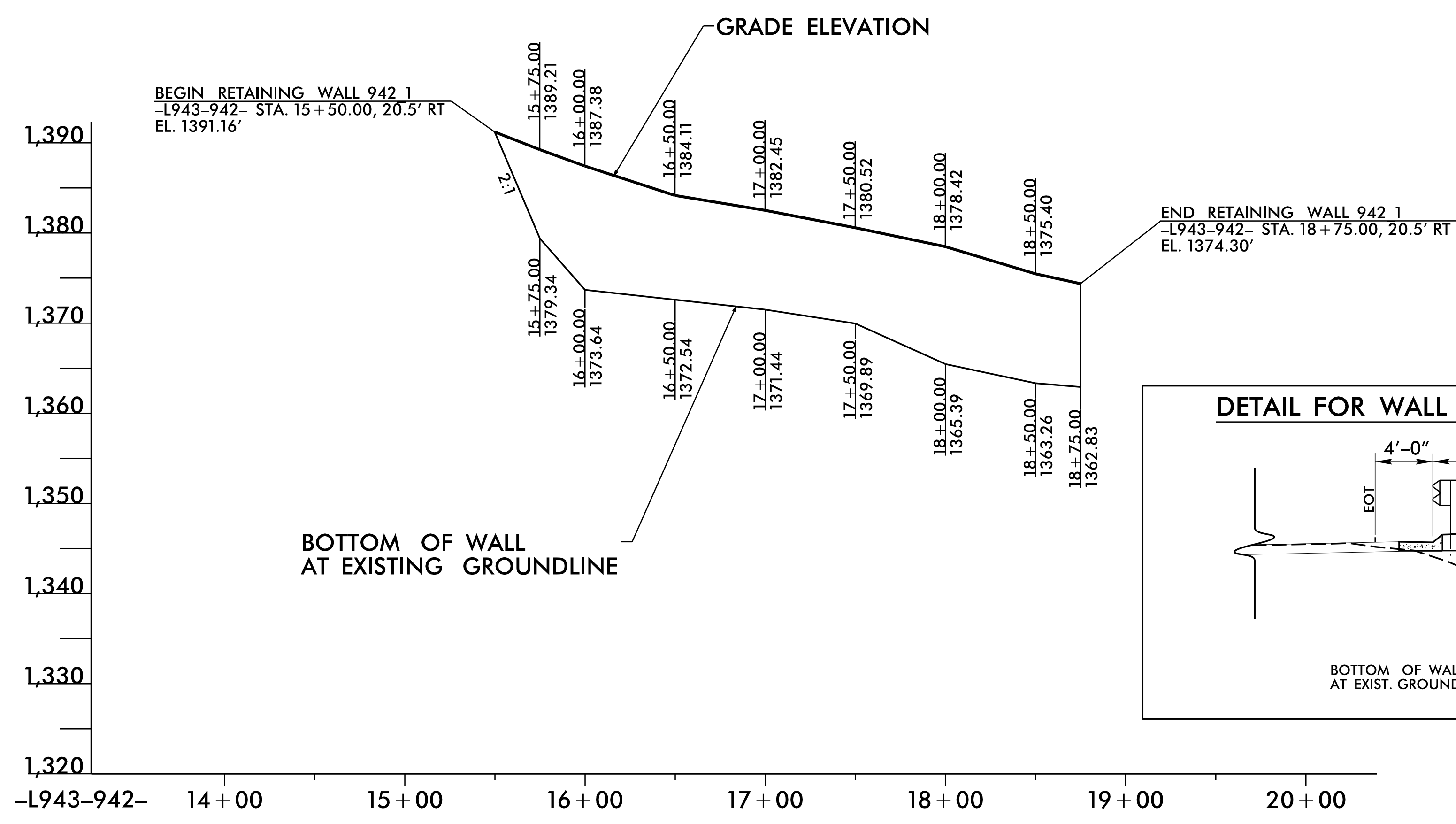
Seal: NORTH CAROLINA PROFESSIONAL SEAL 042642 ENGINEER ROBERT E. KRAL

Signed by: Robert E. Kral 05/19/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



SITE 942 - PLAN
NOT TO SCALE



THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL WALL FACE OF WALL #942_1 AT THE FOLLOWING LOCATIONS:
-L943-942- STA. 15+93.02 TO 16+79.71, RT
AND -L943-942- STA. 17+40.92 TO 18+64.72, RT

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

RETAINING WALL ENVELOPE AND DESIGN LAYOUT PROVIDED BY TGS JULY 30, 2025.

Prepared in the Office of:

CGE CAROLINAS GEOTECHNICAL GROUP

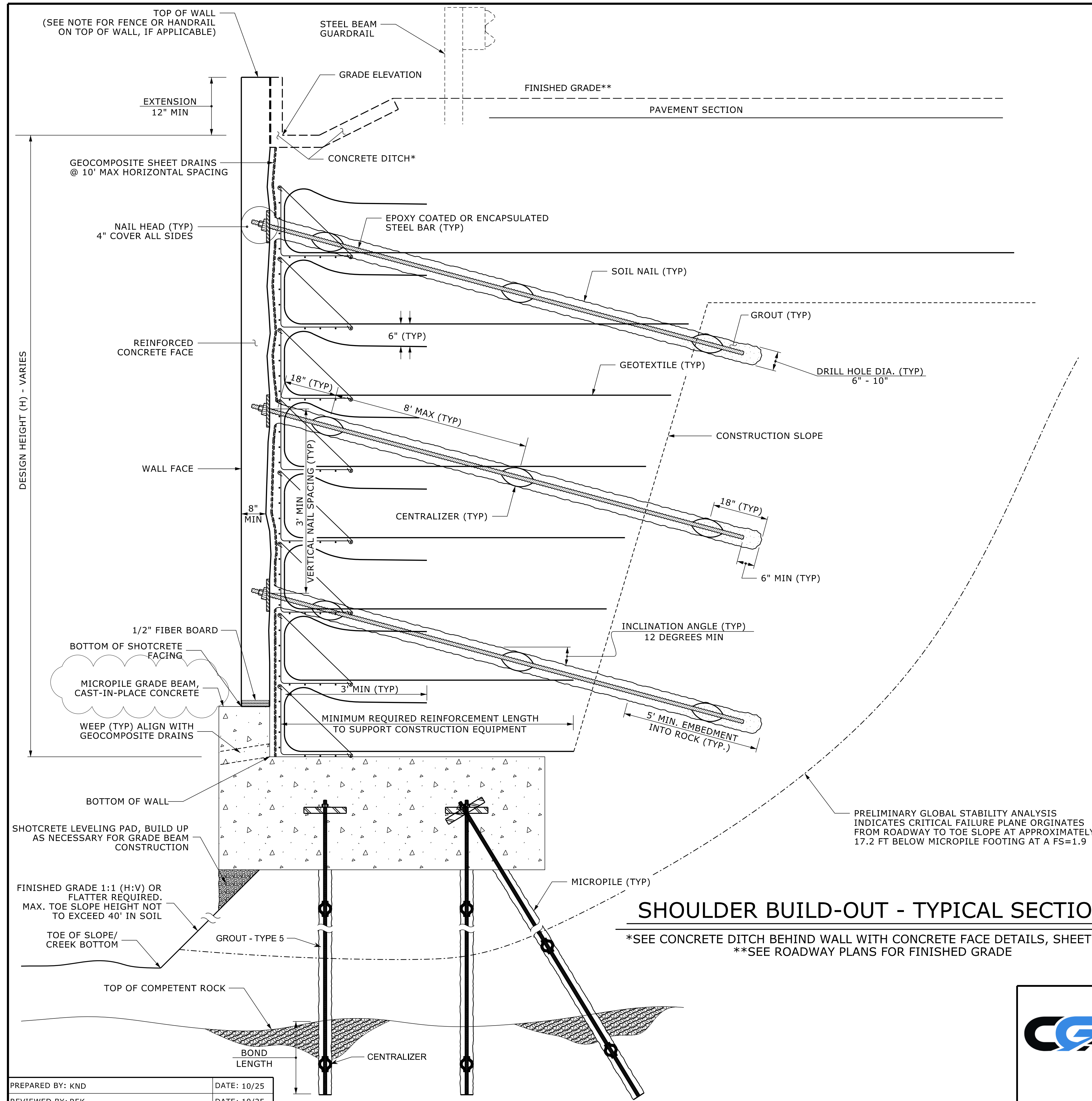
1805 SARDIS ROAD NORTH SUITE 100 CHARLOTTE, NC 28270 (980) 339-8684

SITE 942 RETAINING WALL SHOULDER BUILD-OUT & ROCK EMBANKMENT WITH MICROPILE KNEE WALL

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

SHEET NO. W-8

PROJECT NO.: W03293
POLK COUNTY
STATION: -L943-942- STA. 15+50.00 TO 23+62.00, RT
SHEET 1 OF 4



SHOULDER BUILD-OUT - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL WITH CONCRETE FACE DETAILS, SHEET W-6
 **SEE ROADWAY PLANS FOR FINISHED GRADE

GEOTECHNICAL ENGINEER Signed by: Robert E. Kral AAF88FF73CE4B1 05/19/2026 SIGNATURE DATE	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

- NOTES:**
- FOR SOIL NAIL SHOULDER BUILD-OUT, SEE RETAINING WALLS SPECIAL PROVISION.
 - FOR MICROPILE GRADE BEAM, SEE RETAINING WALLS SPECIAL PROVISION.
 - FOR MICROPILES, SEE RETAINING WALLS SPECIAL PROVISION.
 - DESIGN MICROPILE GRADE BEAM FOR A MINIMUM OF 5 FEET OF GROUND LOSS BELOW GRADE BEAM.
 - MICROPILE CASING MAY BE REQUIRED.
 - ESTABLISH THE BACK OF SOIL NAIL WALL FACE AT A 3.5' OR GREATER OFFSET FROM THE BACK OF THE EXISTING OR PROPOSED GUARDRAIL POST.
 - EXTEND THE TOP TWO LAYERS OF GEOTEXTILE TO CENTERLINE OF ROAD.
 - FOR SOIL NAIL RETAINING WALLS, SEE RETAINING WALLS SPECIAL PROVISION.
 - AT CONTRACTOR'S OPTION, ALTERNATIVE DESIGN MAY BE USED FOR SITE #942 RETAINING WALL. SEE RETAINING WALLS SPECIAL PROVISION.
 - DESIGN SITE #942 RETAINING WALL FOR INTERNAL, EXTERNAL, AND GLOBAL STABILITY.
 - FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
 - BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR SITE 942 RETAINING WALL, 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 SITE 942 RETAINING WALL FOR THE FOLLOWING:
 - 1) DESIGN HEIGHT (H) = WALL HEIGHT + WALL EMBEDMENT
 - 2) DESIGN LIFE = 75 YEARS
 - 3) MINIMUM WALL EMBEDMENT DEPTH = 1 FT
 - 4) ROCK EMBANKMENT PARAMETERS:
 - UNIT WEIGHT, $\gamma = 135$ PCF
 - FRICTION ANGLE, $\phi = 42$ DEGREES
 - COHESION, $c = 0$ PSF
 - 5) ASSUMED BORROW MATERIAL PARAMETERS, SEE SECTION 1018 OF THE STANDARD SPECIFICATIONS
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 6) IN-SITU ASSUMED MATERIAL PARAMETERS RESIDUAL SOIL:
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 7) IN-SITU ASSUMED MATERIAL PARAMETERS CRYSTALLINE ROCK:
 - UNIT WEIGHT, $\gamma = 170$ PCF
 - FRICTION ANGLE, $\phi = 34$ DEGREES
 - COHESION, $c = 1,000$ PSF
 - EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH SOIL NAILS FOR SITE 942 RETAINING WALL.
 - "TEMPORARY SHORING" MAY BE REQUIRED FOR SITE 942 RETAINING WALL IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY OR TRAFFIC CONTROL PLANS.


PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L943-942- STA. 15+50.00 TO 23+62.00, RT
 SHEET 2 OF 4

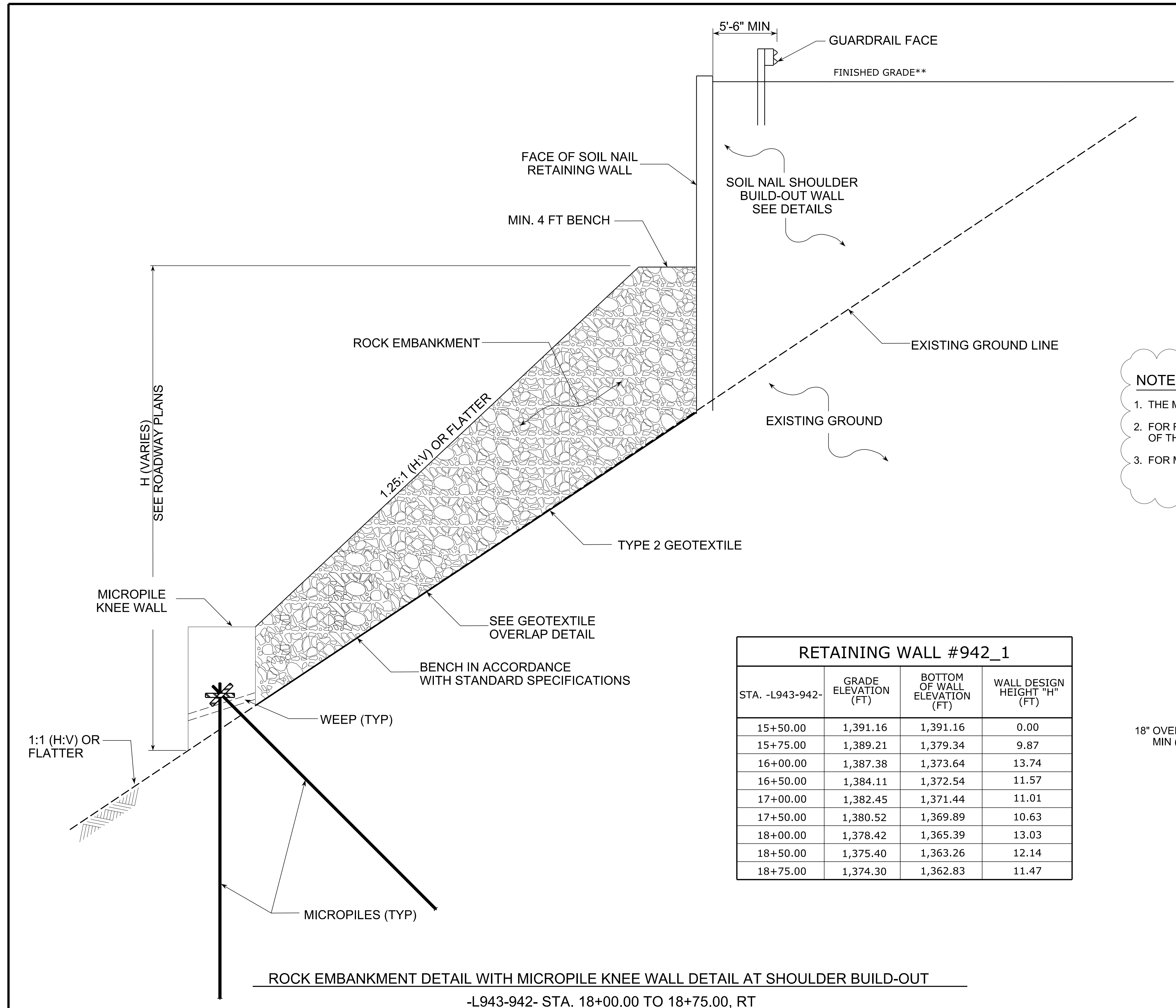
Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	KND	03/26	3			W-9
2	KND	05/26	4			

PREPARED BY: KND DATE: 10/25
 REVIEWED BY: REK DATE: 10/25

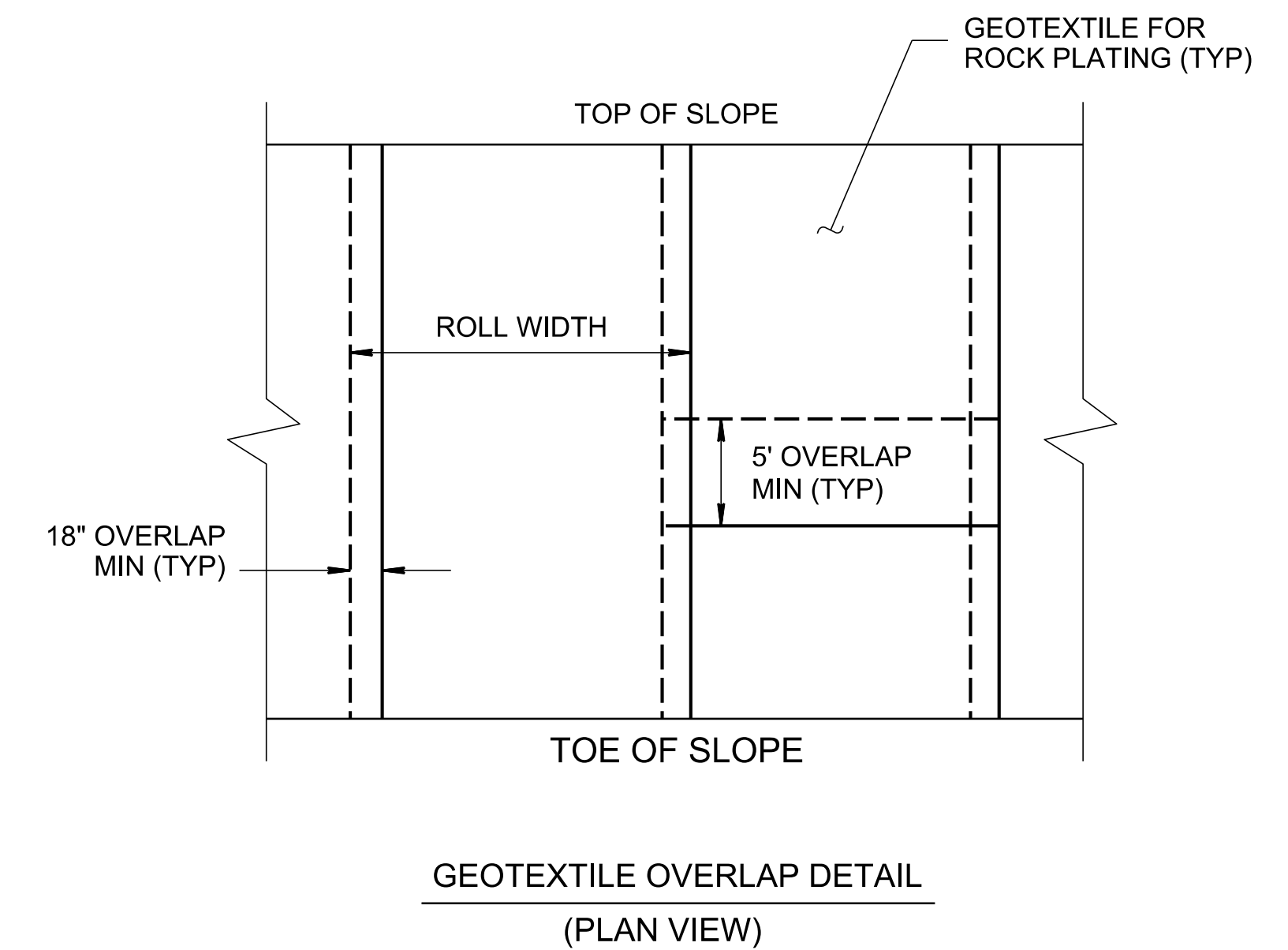
GEOTECHNICAL ENGINEER
 ENGINEER

 Signed by: Robert E. Kral
 AAF88FF73CE4B91 05/19/2026
 SIGNATURE DATE SIGNATURE DATE
 DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



- NOTES:**
1. THE MAXIMUM ALLOWABLE HEIGHT FOR THE ROCK EMBANKMENT DETAIL IS 80'.
 2. FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
 3. FOR MICROPILE KNEE WALL, SEE RETAINING WALLS SPECIAL PROVISION.

RETAINING WALL #942_1

STA. -L943-942-	GRADE ELEVATION (FT)	BOTTOM OF WALL ELEVATION (FT)	WALL DESIGN HEIGHT "H" (FT)
15+50.00	1,391.16	1,391.16	0.00
15+75.00	1,389.21	1,379.34	9.87
16+00.00	1,387.38	1,373.64	13.74
16+50.00	1,384.11	1,372.54	11.57
17+00.00	1,382.45	1,371.44	11.01
17+50.00	1,380.52	1,369.89	10.63
18+00.00	1,378.42	1,365.39	13.03
18+50.00	1,375.40	1,363.26	12.14
18+75.00	1,374.30	1,362.83	11.47



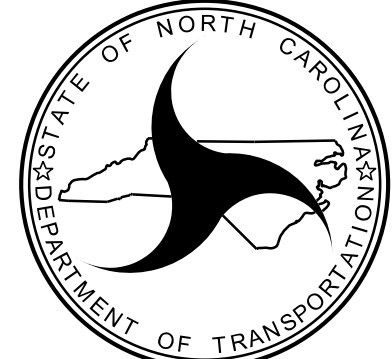
ROCK EMBANKMENT DETAIL WITH MICROPILE KNEE WALL DETAIL AT SHOULDER BUILD-OUT
 -L943-942- STA. 18+00.00 TO 18+75.00, RT

PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L943-942- STA. 15+50.00 TO 23+62.00, RT
 SHEET 3 OF 4

PREPARED BY: KND DATE: 10/25
 REVIEWED BY: REK DATE: 10/25


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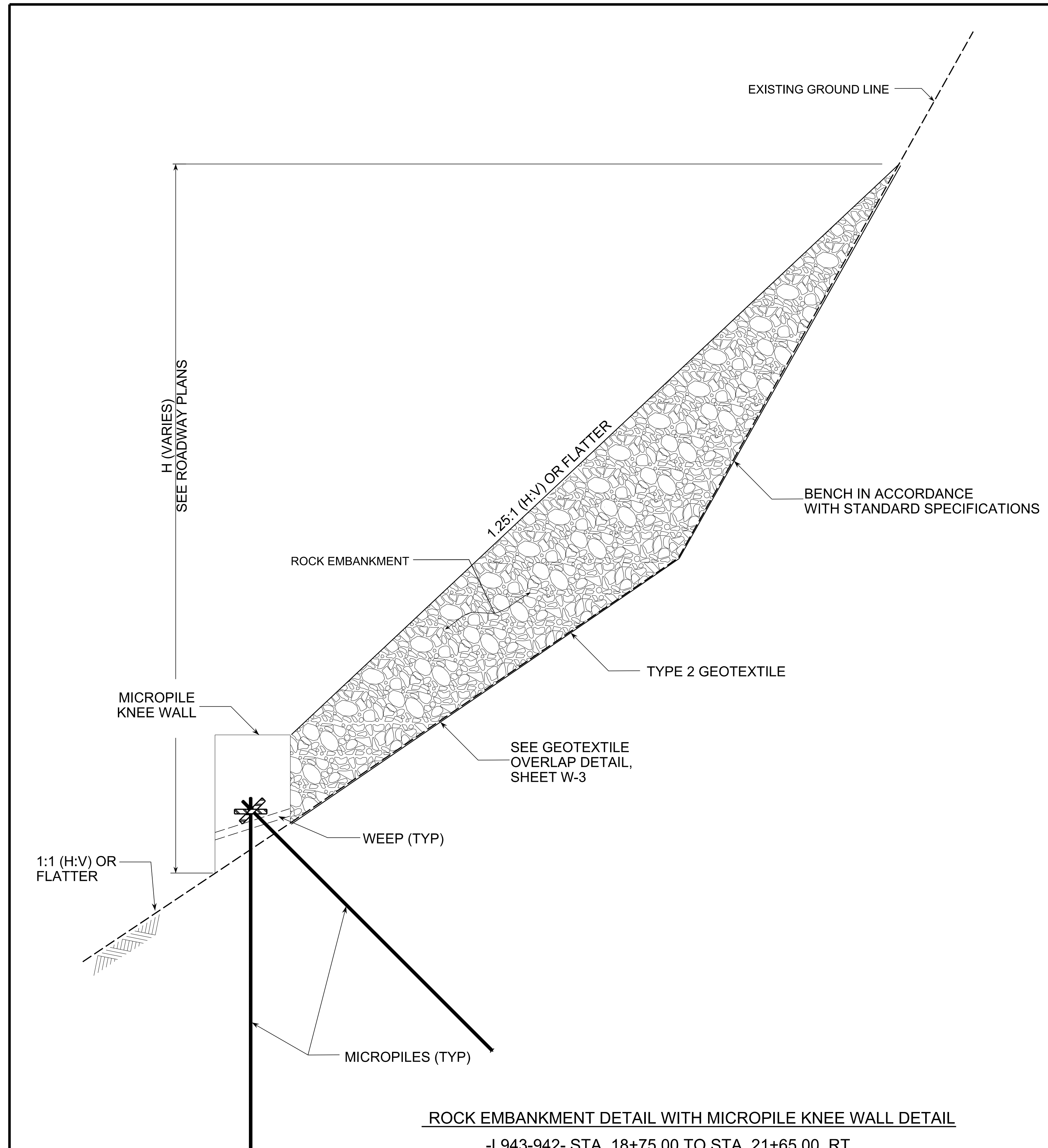
CAROLINAS GEOTECHNICAL GROUP
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684


 NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SITE 942 RETAINING WALL SHOULDER BUILD-OUT & ROCK EMBANKMENT WITH MICROPILE KNEE WALL

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-10
2			4			

GEOTECHNICAL ENGINEER  Signed by: <i>Robert E. Kral</i> AAF88FF73CE4B1 SIGNATURE DATE	ENGINEER DATE
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ROCK EMBANKMENT DETAIL WITH MICROPILE KNEE WALL DETAIL
 -L943-942- STA. 18+75.00 TO STA. 21+65.00, RT

ESTIMATED QUANTITIES - SITE #942*	
SOIL NAIL RETAINING WALL	3,680 SF
MICROPILE GRADE BEAM	325 LF
ROCK EMBANKMENTS	16,800 TON
GEOTEXTILE FOR ROCK EMBANKMENTS	3,850 SY
MICROPILE GRADE BEAM	365 LF
GROUT FOR ROCK FILL	750 CY

*ESTIMATED QUANTITIES FOR SITE #942 RETAINING WALL ARE FOR BID PURPOSES ONLY.

PAY ITEMS	
RETAINING WALLS, SITE #942	LS

ROCK EMBANKMENT WITH MICROPILE KNEE WALL						
STA. -L943-942-	TOP OF SLOPE OFFSET (FT)	TOP OF KNEE WALL OFFSET (FT)	TOP OF WALL ELEVATION (FT)	BOTTOM OF KNEE WALL ELEVATION (FT)	500-YR FLOOD ELEVATION (FT)	MIN. ROCK FILL ELEVATION (FT)
18+00.00	20.5' RT	55.0' RT	1342.1	1338.1	1364.3	1366.3
18+50.00	20.5' RT	55.0' RT	1341.6	1337.6	1361.4	1363.4
19+00.00	19.5' RT	65.0' RT	1341.0	1337.0	1360.3	1362.3
19+50.00	19.5' RT	75.0' RT	1340.3	1336.3	1354.3	1356.3
20+00.00	19.5' RT	75.0' RT	1338.6	1334.6	1343.5	1345.5
20+50.00	19.5' RT	75.0' RT	1341.1	1337.1	1348.6	1350.6
21+00.00	19.5' RT	65.0' RT	1329.8	1325.8	1342.0	1344.0
21+50.00	19.5' RT	65.0' RT	1325.4	1321.4	1344.0	1346.0

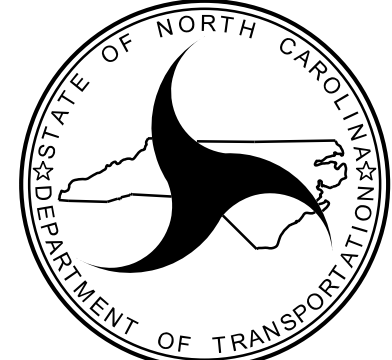
PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L943-942- STA. 15+50.00 TO 23+62.00, RT
 SHEET 4 OF 4

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

Prepared in the Office of:



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 GEOTECHNICAL
 GROUP**
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684



NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
**GEOTECHNICAL
 ENGINEERING UNIT**

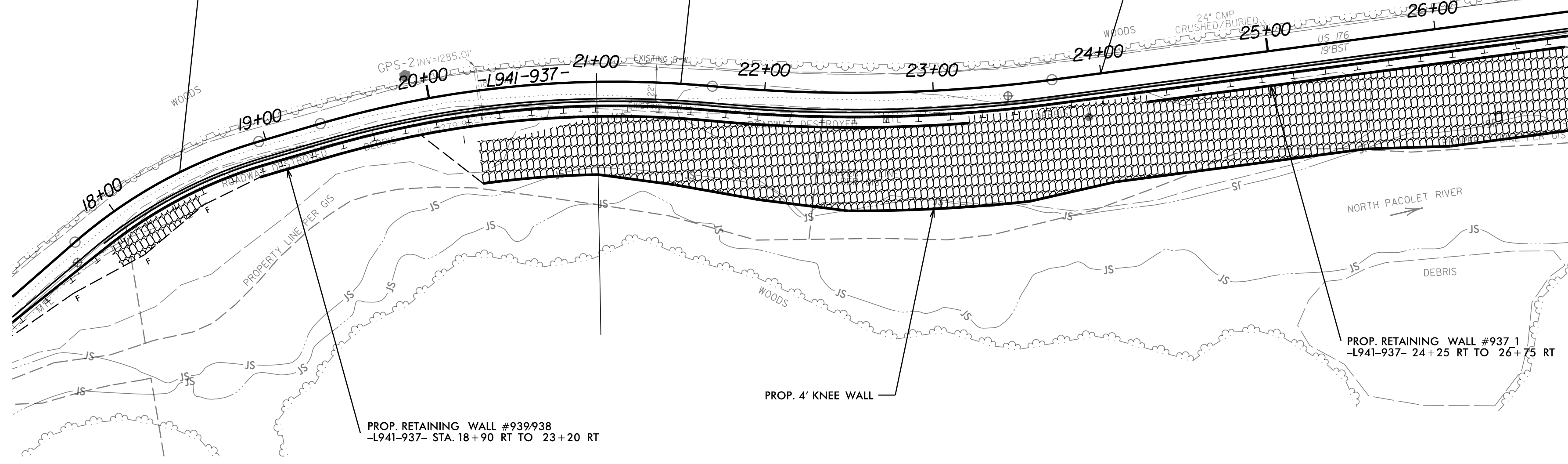
REVISIONS					SHEET NO. W-11
NO.	BY	DATE	NO.	BY	
1	KND	05/26	3		
2			4		

SITE 938 /939 RETAINING WALL:

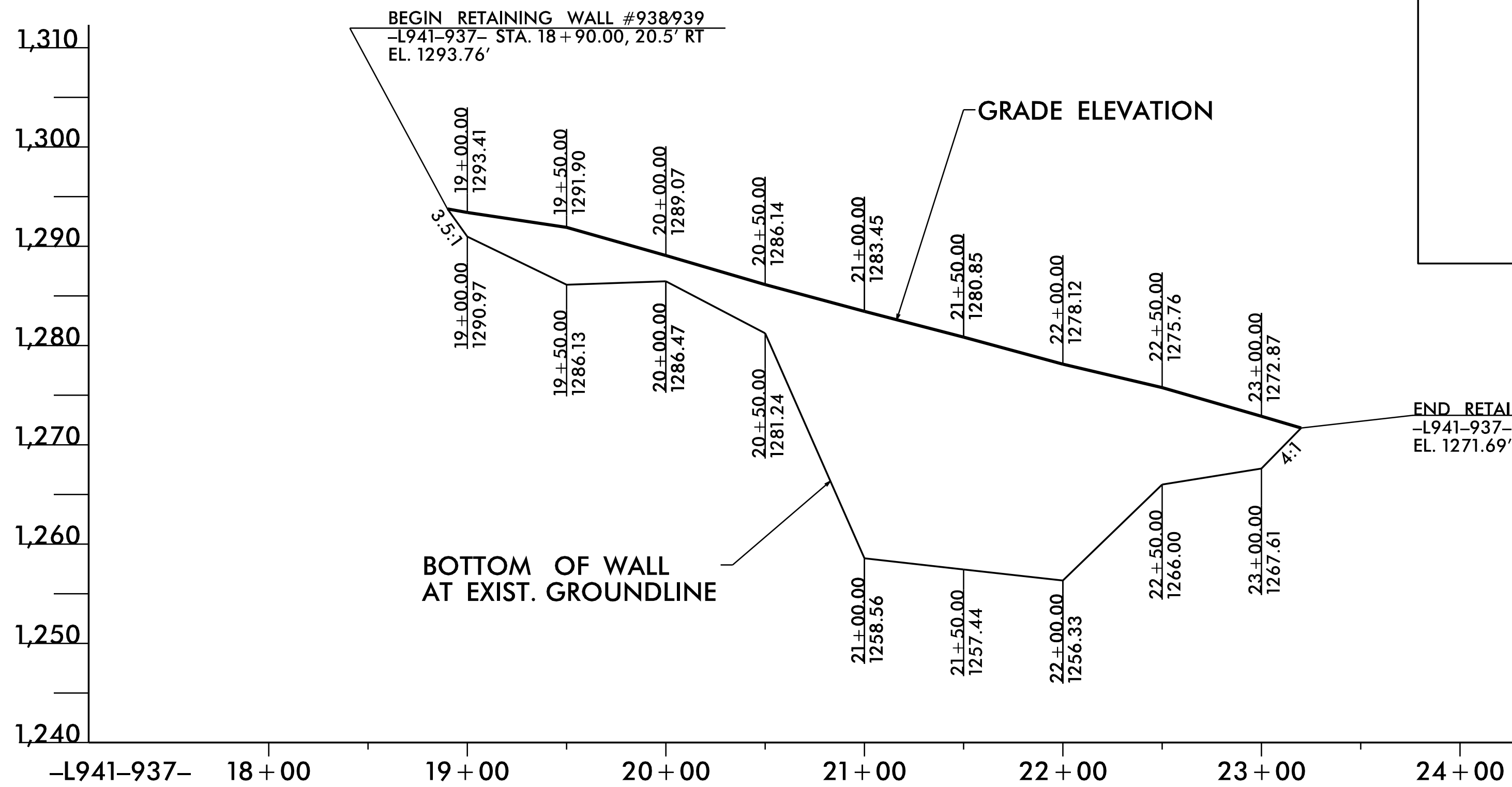
END SITE 940/BEGIN SITE 939
-L941-937- STA 18+70.00

END SITE 939/BEGIN SITE 938
-L941-937- STA 21+50.00

END SITE 938/BEGIN SITE 937
-L941-937- STA 24+00.00

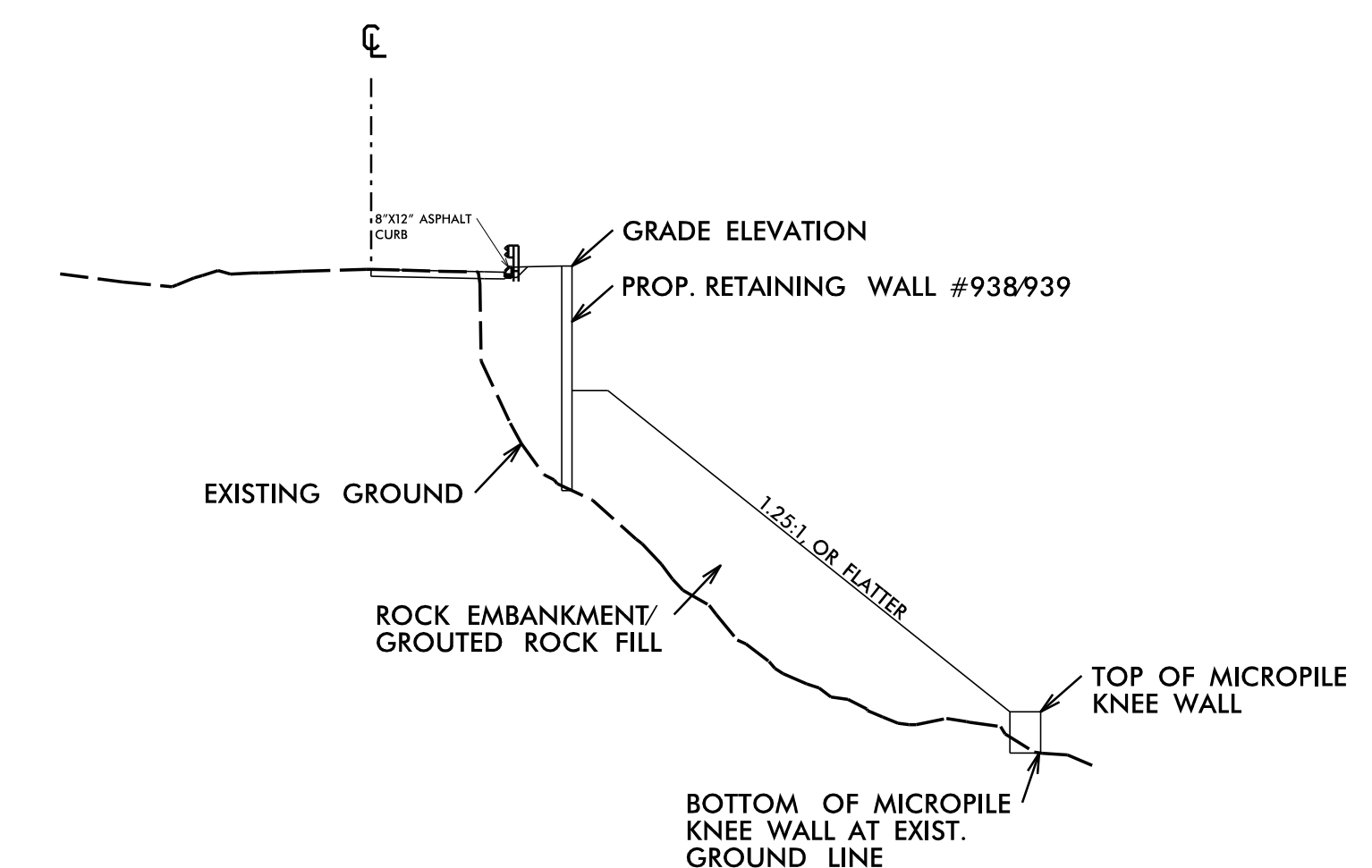
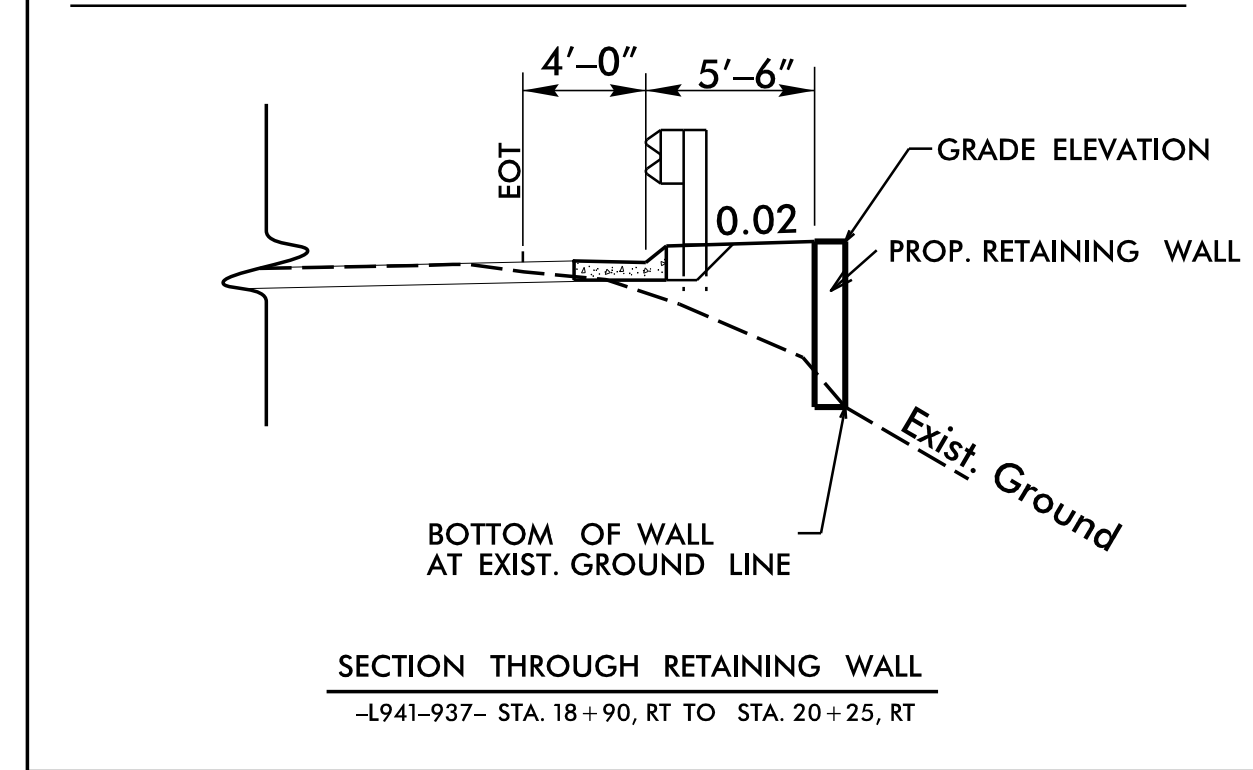


SITE 938 /939 - PLAN
NOT TO SCALE

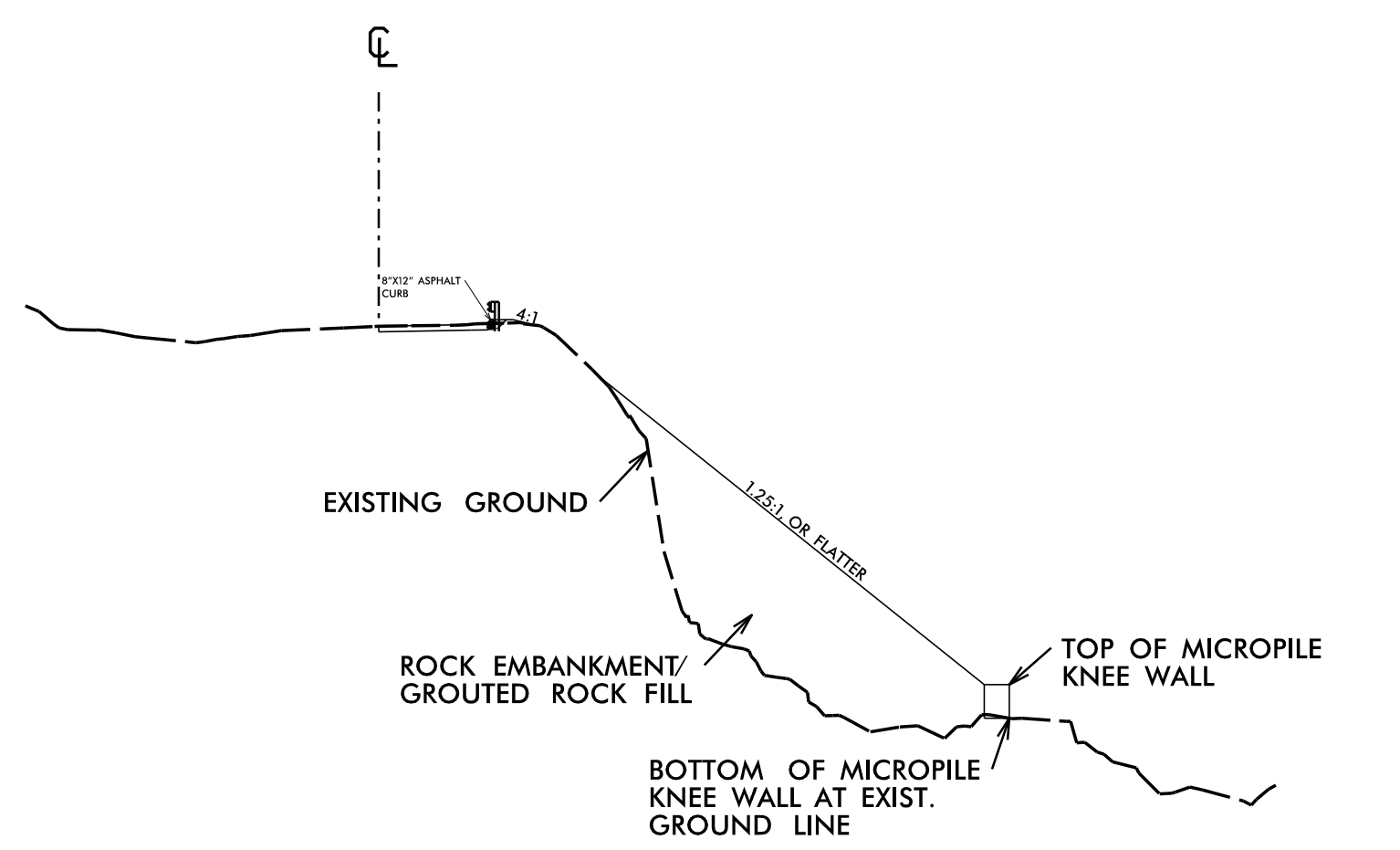


RETAINING WALL #938 /939 - ENVELOPE
NOT TO SCALE
(LOOKING AT FACE OF WALL)

DETAIL FOR RETAINING WALL #939/938



SECTION THROUGH RETAINING WALL
-L941-937- STA. 20+25, RT TO STA. 23+20, RT



TYPICAL SECTION
-L941-937- STA. 23+20, RT TO STA. 23+50, RT

GEOTECHNICAL ENGINEER Signed by: Robert E. Kral AA8887730E481 SIGNATURE DATE 05/19/2026	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

PROJECT NO.: W03293
POLK COUNTY
STATION: -L941-937- STA. 18+70.00 TO 23+50.00, RT
SHEET 1 OF 4

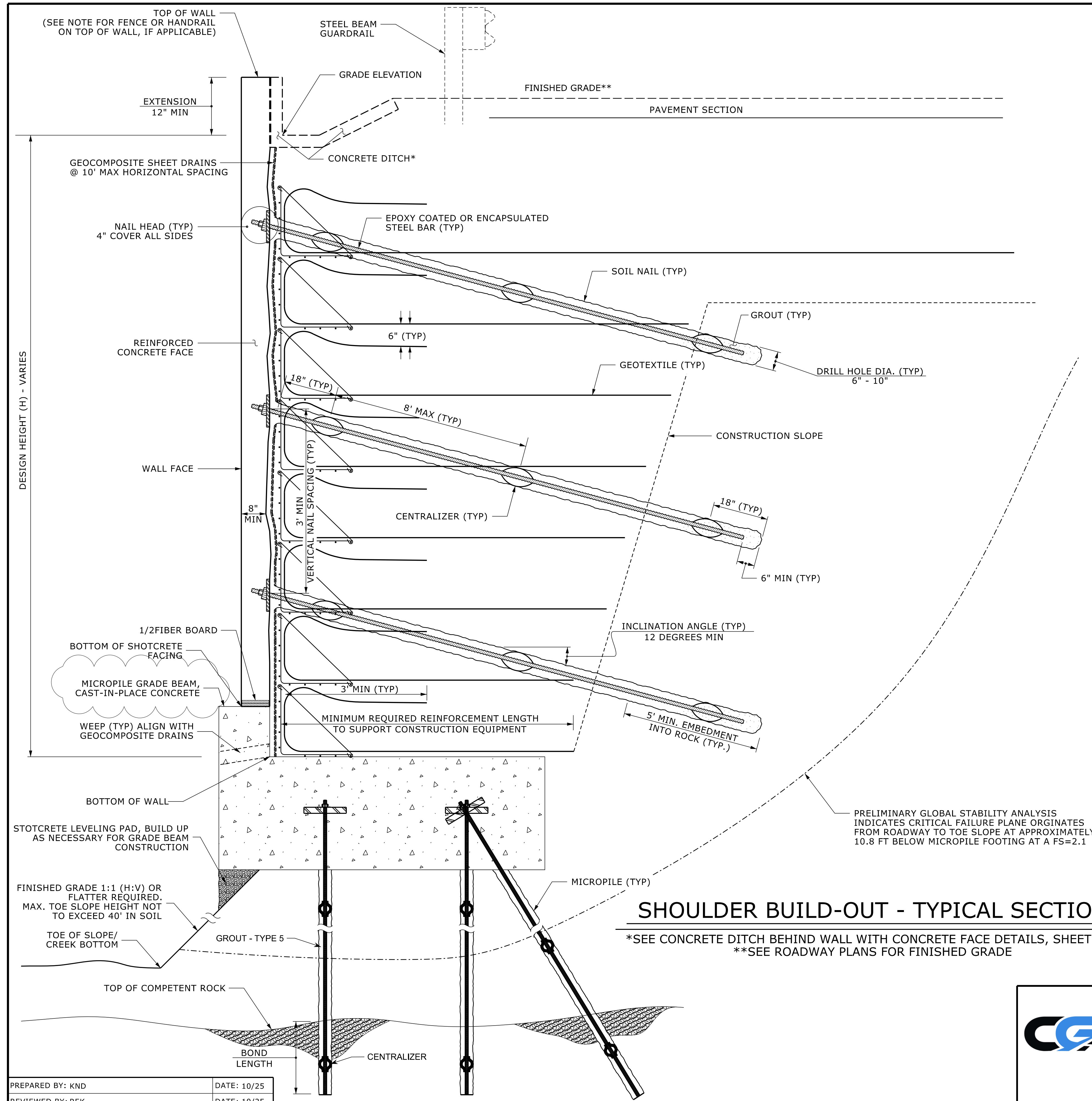
PREPARED BY: KND DATE: 10/25
REVIEWED BY: REK DATE: 10/25

RETAINING WALL ENVELOPES AND DESIGN LAYOUT PROVIDED BY TGS JULY 30, 2025.

Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP
1805 SARDIS ROAD NORTH
SUITE 100
CHARLOTTE, NC 28270
(980) 339-8684

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-12
2			4			



GEOTECHNICAL ENGINEER Signed by: Robert E. Kral AAF88FF73CE4B1 SIGNATURE	ENGINEER DATE: 05/19/2026 SIGNATURE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

NOTES:

- FOR SOIL NAIL SHOULDER BUILD-OUT, SEE RETAINING WALLS SPECIAL PROVISION.
- FOR MICROPILE GRADE BEAM, SEE RETAINING WALLS SPECIAL PROVISION.
- FOR MICROPILES, SEE RETAINING WALLS SPECIAL PROVISION.
- DESIGN MICROPILE GRADE BEAM FOR A MINIMUM OF 5 FEET OF GROUND LOSS BELOW GRADE BEAM.
- MICROPILE CASING MAY BE REQUIRED.
- ESTABLISH THE BACK OF SOIL NAIL WALL FACE AT A 3.5' OR GREATER OFFSET FROM THE BACK OF THE EXISTING OR PROPOSED GUARDRAIL POST.
- EXTEND THE TOP TWO LAYERS OF GEOTEXTILE TO CENTERLINE OF ROAD.
- FOR SOIL NAIL RETAINING WALLS, SEE RETAINING WALLS SPECIAL PROVISION.
- AT CONTRACTOR'S OPTION, ALTERNATIVE DESIGN MAY BE USED FOR SITE #938 AND SITE #939 RETAINING WALLS. SEE RETAINING WALLS SPECIAL PROVISION.
- DESIGN SITE #938 AND SITE #939 RETAINING WALLS FOR INTERNAL, EXTERNAL, AND GLOBAL STABILITY.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR RETAINING WALL #938/939, 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 #938/939 FOR THE FOLLOWING:
 - 1) DESIGN HEIGHT (H) = WALL HEIGHT + WALL EMBEDMENT
 - 2) DESIGN LIFE = 75 YEARS
 - 3) MINIMUM WALL EMBEDMENT DEPTH = 1 FT
 - 4) ROCK EMBANKMENT PARAMETERS:
 - UNIT WEIGHT, $\gamma = 135$ PCF
 - FRICTION ANGLE, $\phi = 42$ DEGREES
 - COHESION, $c = 0$ PSF
 - 5) ASSUMED BORROW MATERIAL PARAMETERS, SEE SECTION 1018 OF THE STANDARD SPECIFICATIONS
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 6) IN-SITU ASSUMED MATERIAL PARAMETERS RESIDUAL SOIL:
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 7) IN-SITU ASSUMED MATERIAL PARAMETERS CRYSTALLINE ROCK:
 - UNIT WEIGHT, $\gamma = 170$ PCF
 - FRICTION ANGLE, $\phi = 34$ DEGREES
 - COHESION, $c = 1,000$ PSF
- EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH SOIL NAILS FOR RETAINING WALL #938/939.
- "TEMPORARY SHORING" MAY BE REQUIRED FOR RETAINING WALL #938/939 IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY OR TRAFFIC CONTROL PLANS.

SHOULDER BUILD-OUT - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL WITH CONCRETE FACE DETAILS, SHEET W-6
 **SEE ROADWAY PLANS FOR FINISHED GRADE

PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L941-937- STA. 18+70.00 TO 23+50.00, RT
 SHEET 2 OF 4

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REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	KND	03/26	3			W-13
2	KND	05/26	4			

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

GEOTECHNICAL ENGINEER

ENGINEER

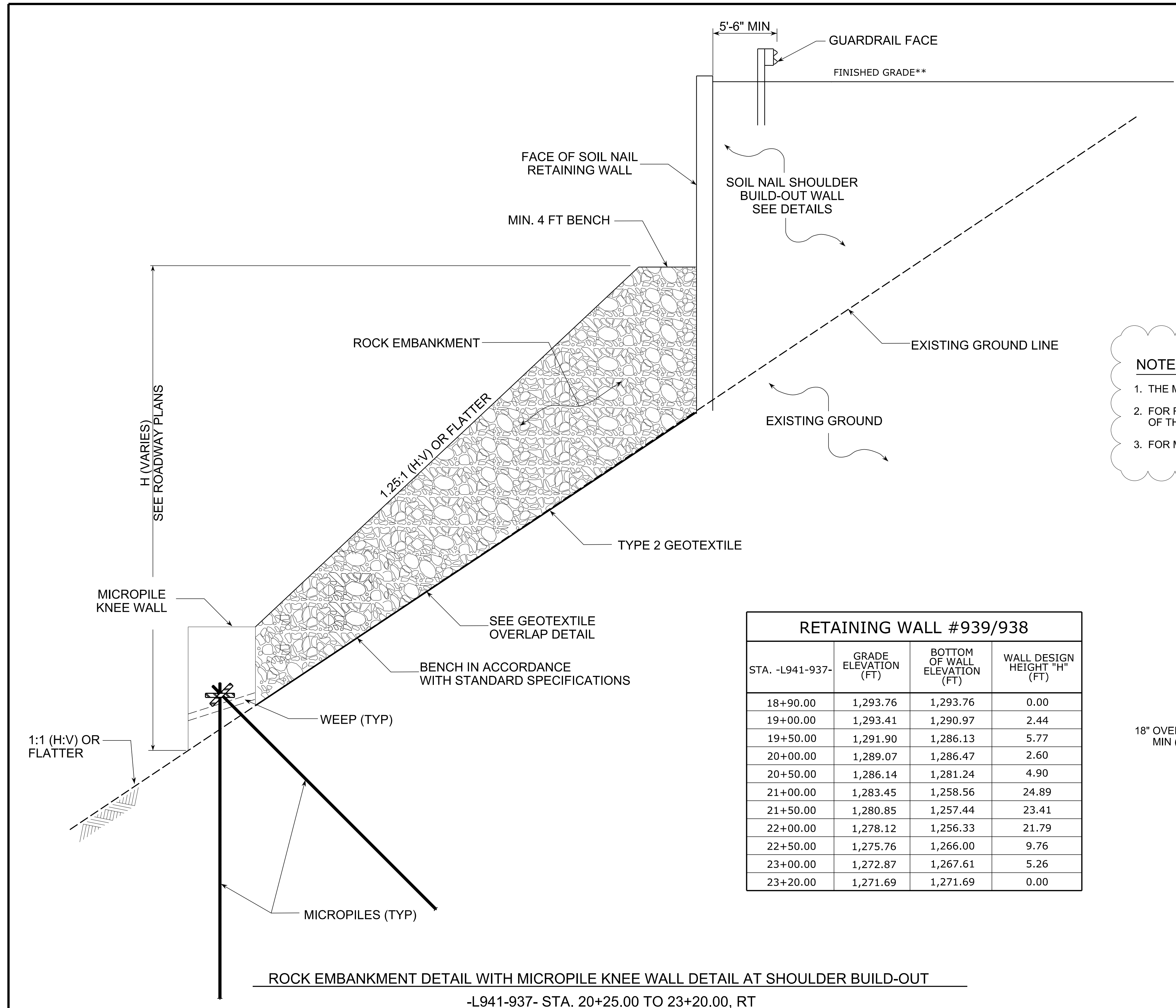


Signed by: *Robert E. Kral* 05/19/2026

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SIGNATURE DATE SIGNATURE DATE

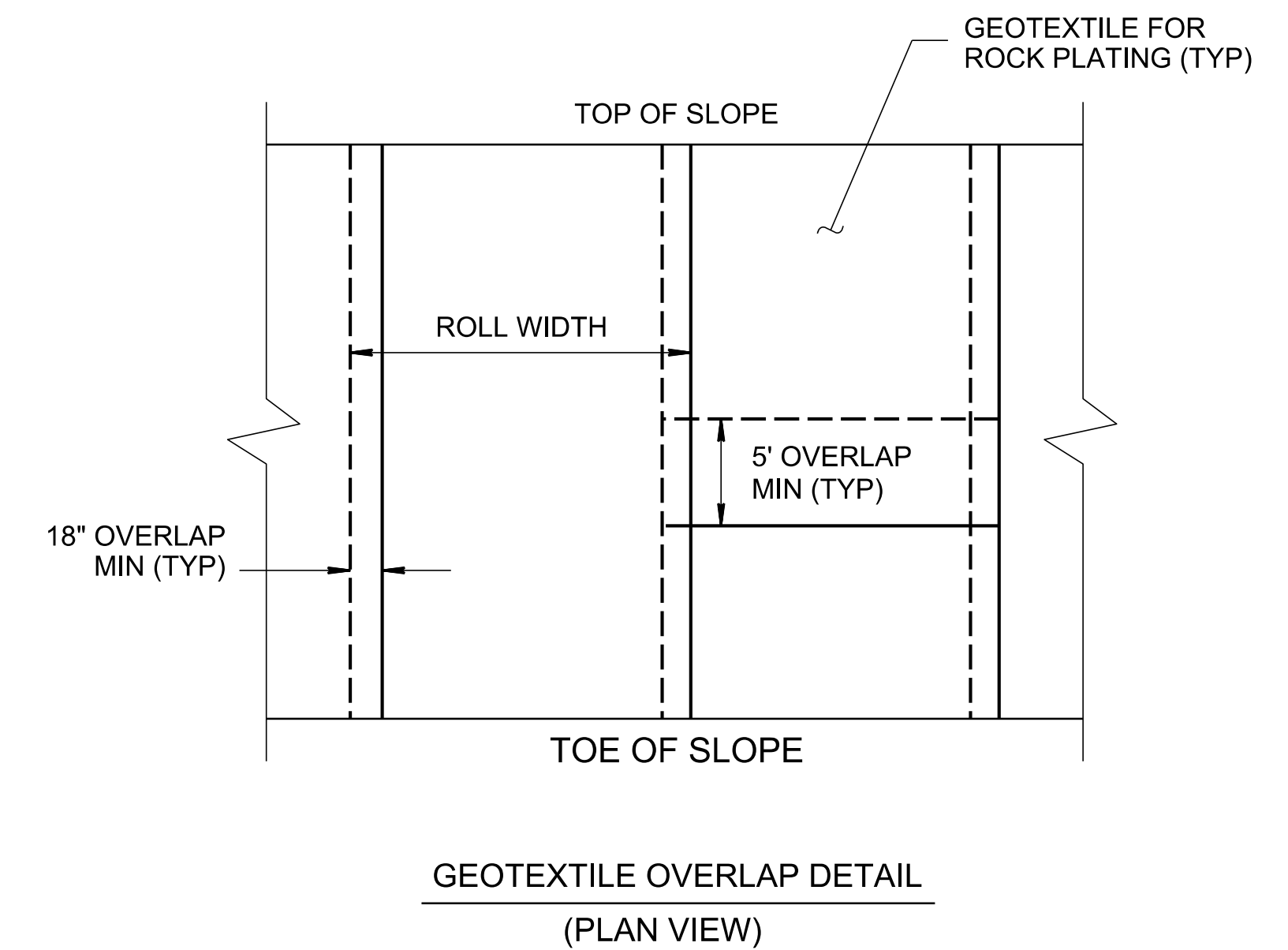
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



- NOTES:**
1. THE MAXIMUM ALLOWABLE HEIGHT FOR THE ROCK EMBANKMENT DETAIL IS 80'.
 2. FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
 3. FOR MICROPILE KNEE WALL, SEE RETAINING WALLS SPECIAL PROVISION.

RETAINING WALL #939/938

STA. -L941-937-	GRADE ELEVATION (FT)	BOTTOM OF WALL ELEVATION (FT)	WALL DESIGN HEIGHT "H" (FT)
18+90.00	1,293.76	1,293.76	0.00
19+00.00	1,293.41	1,290.97	2.44
19+50.00	1,291.90	1,286.13	5.77
20+00.00	1,289.07	1,286.47	2.60
20+50.00	1,286.14	1,281.24	4.90
21+00.00	1,283.45	1,258.56	24.89
21+50.00	1,280.85	1,257.44	23.41
22+00.00	1,278.12	1,256.33	21.79
22+50.00	1,275.76	1,266.00	9.76
23+00.00	1,272.87	1,267.61	5.26
23+20.00	1,271.69	1,271.69	0.00



ROCK EMBANKMENT DETAIL WITH MICROPILE KNEE WALL DETAIL AT SHOULDER BUILD-OUT
-L941-937- STA. 20+25.00 TO 23+20.00, RT

PROJECT NO. : W03293

POLK COUNTY

STATION: -L941-937- STA. 18+70.00 TO 23+50.00, RT

SHEET 3 OF 4

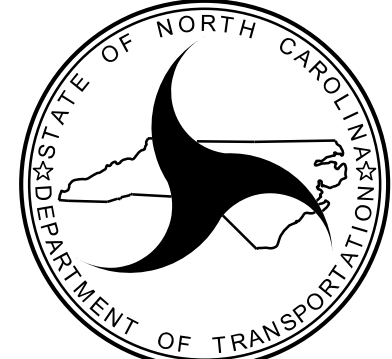
PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

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(980) 339-8684

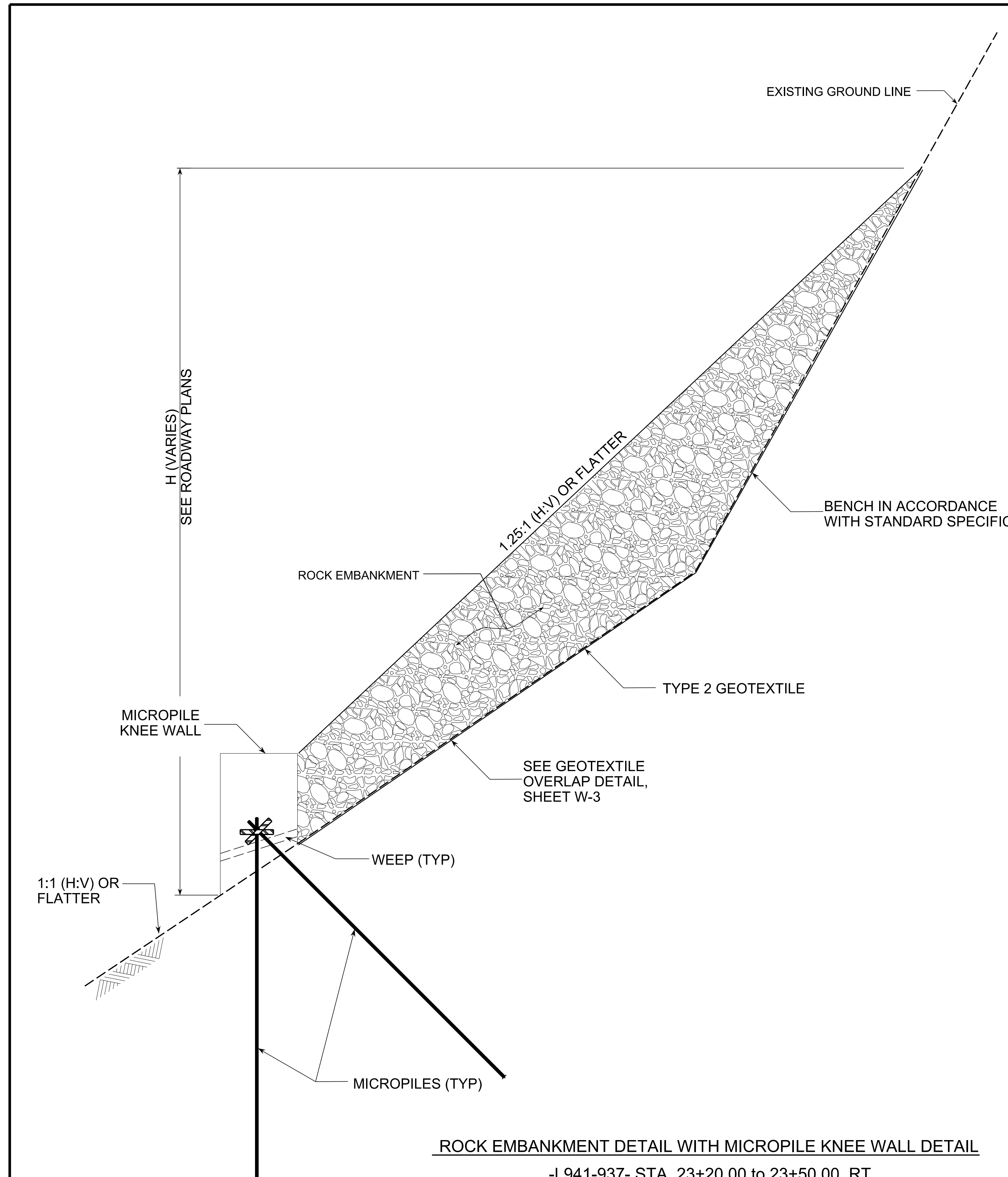


NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SITE 938/939 RETAINING WALL SHOULDER BUILD-OUT & ROCK EMBANKMENT WITH MICROPILE KNEE WALL

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	KND	05/26	3			W-14
2			4			



ROCK EMBANKMENT DETAIL WITH MICROPILE KNEE WALL DETAIL
-L941-937- STA. 23+20.00 to 23+50.00, RT

PAY ITEMS	
RETAINING WALLS, SITE #938	LS
RETAINING WALLS, SITE #939	LS

GEOTECHNICAL ENGINEER

 ENGINEER
 Robert E. Kral
 05/19/2026
 SIGNATURE DATE SIGNATURE DATE
 DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ESTIMATED QUANTITIES - SITE #939*	
SOIL NAIL RETAINING WALL #938/939	2,575 SF
MICROPILE GRADE BEAM	260 LF
ROCK EMBANKMENTS	4,250 TON
GEOTEXTILE FOR ROCK EMBANKMENTS	1,050 SY
MICROPILE GRADE BEAM	125 LF
GROUT FOR ROCK FILL	150 CY

*ESTIMATED QUANTITIES FOR SITE #939 RETAINING WALL ARE FOR BID PURPOSES ONLY.

ESTIMATED QUANTITIES - SITE #938*	
SOIL NAIL RETAINING WALL #938/939	2,350 SF
MICROPILE GRADE BEAM	200 LF
ROCK EMBANKMENTS	6,800 TON
GEOTEXTILE FOR ROCK EMBANKMENTS	1,675 SY
MICROPILE GRADE BEAM	200 LF
GROUT FOR ROCK FILL	375 CY

*ESTIMATED QUANTITIES FOR SITE #938 RETAINING WALL ARE FOR BID PURPOSES ONLY.

ROCK EMBANKMENT WITH MICROPILE KNEE WALL						
STA. -L941-937-	TOP OF SLOPE OFFSET (FT)	TOP OF KNEE WALL OFFSET (FT)	TOP OF KNEE WALL ELEVATION (FT)	BOTTOM OF KNEE WALL ELEVATION (FT)	500-YR FLOOD ELEVATION (FT)	MIN. ROCK FILL ELEVATION (FT)
20+50.00	29.6' RT	55.0' RT	1245.8	1241.8	1281.7	1283.7
21+00.00	20.5' RT	55.0' RT	1241.2	1237.2	1274.0	1276.0
21+50.00	20.5' RT	60.0' RT	1239.8	1235.8	1270.0	1272.0
22+00.00	20.5' RT	65.0' RT	1237.5	1233.5	1262.7	1264.7
22+50.00	20.5' RT	70.0' RT	1234.0	1230.0	1256.2	1258.2
23+00.00	20.5' RT	70.0' RT	1233.0	1229.0	1255.8	1257.8
23+50.00	19.5' RT	70.0' RT	1233.3	1229.3	1247.7	1249.7

PROJECT NO. : W03293
 POLK COUNTY
 STATION: -L941-937- STA. 18+70.00 TO 23+50.00, RT
 SHEET 4 OF 4

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

Prepared in the Office of:


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 CHARLOTTE, NC 28270
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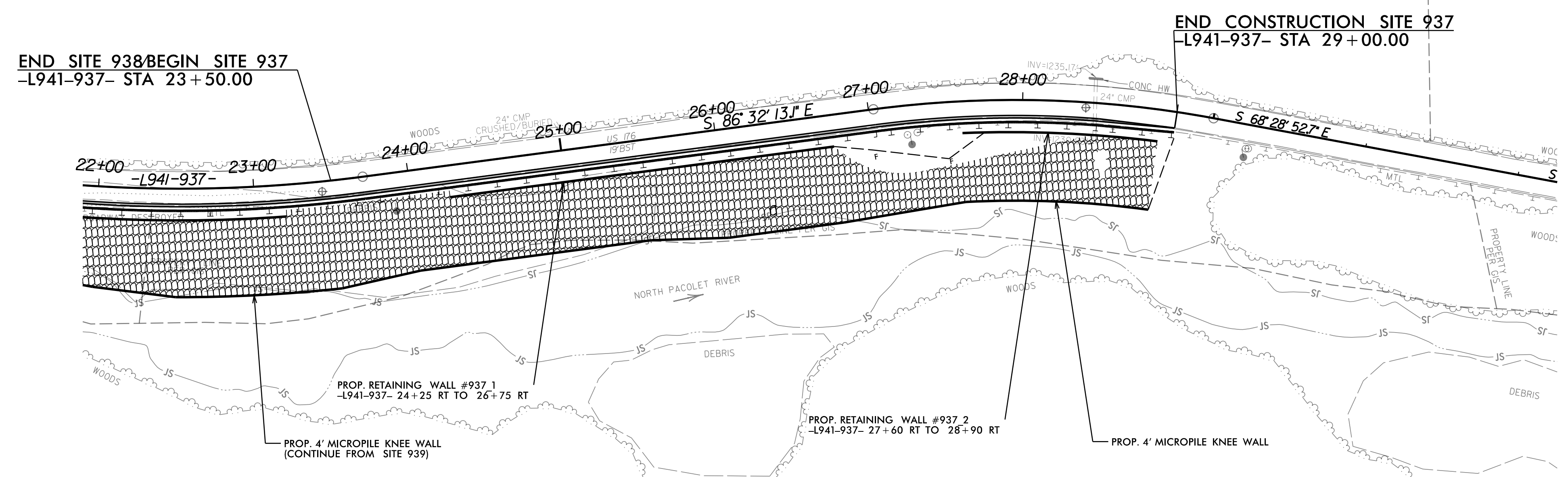
NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SITE 938/939 RETAINING WALL SHOULDER BUILD-OUT & ROCK EMBANKMENT WITH MICROPILE KNEE WALL				
REVISIONS				
NO.	BY	DATE	NO.	BY
1	KND	05/26	3	
2			4	

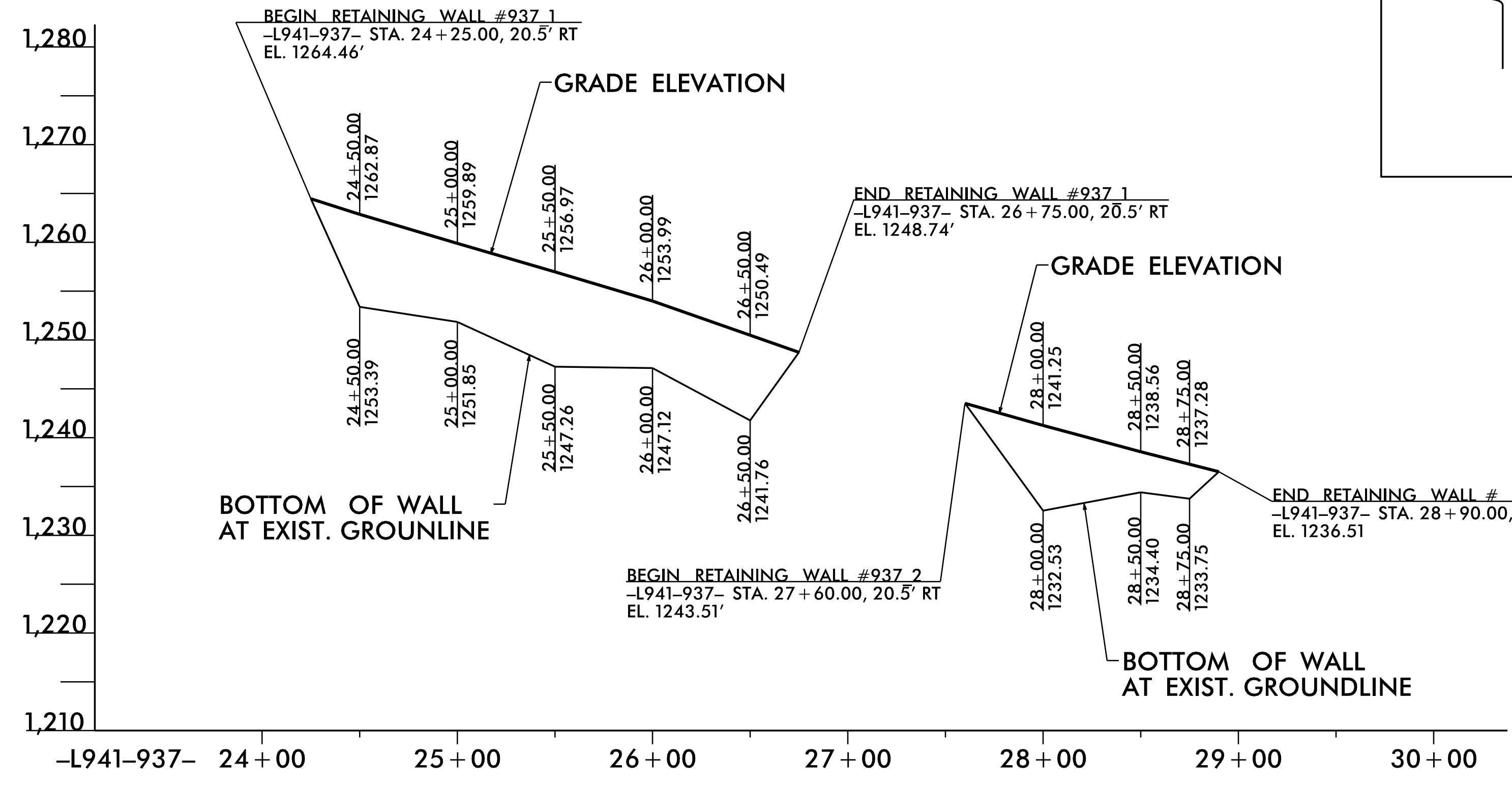
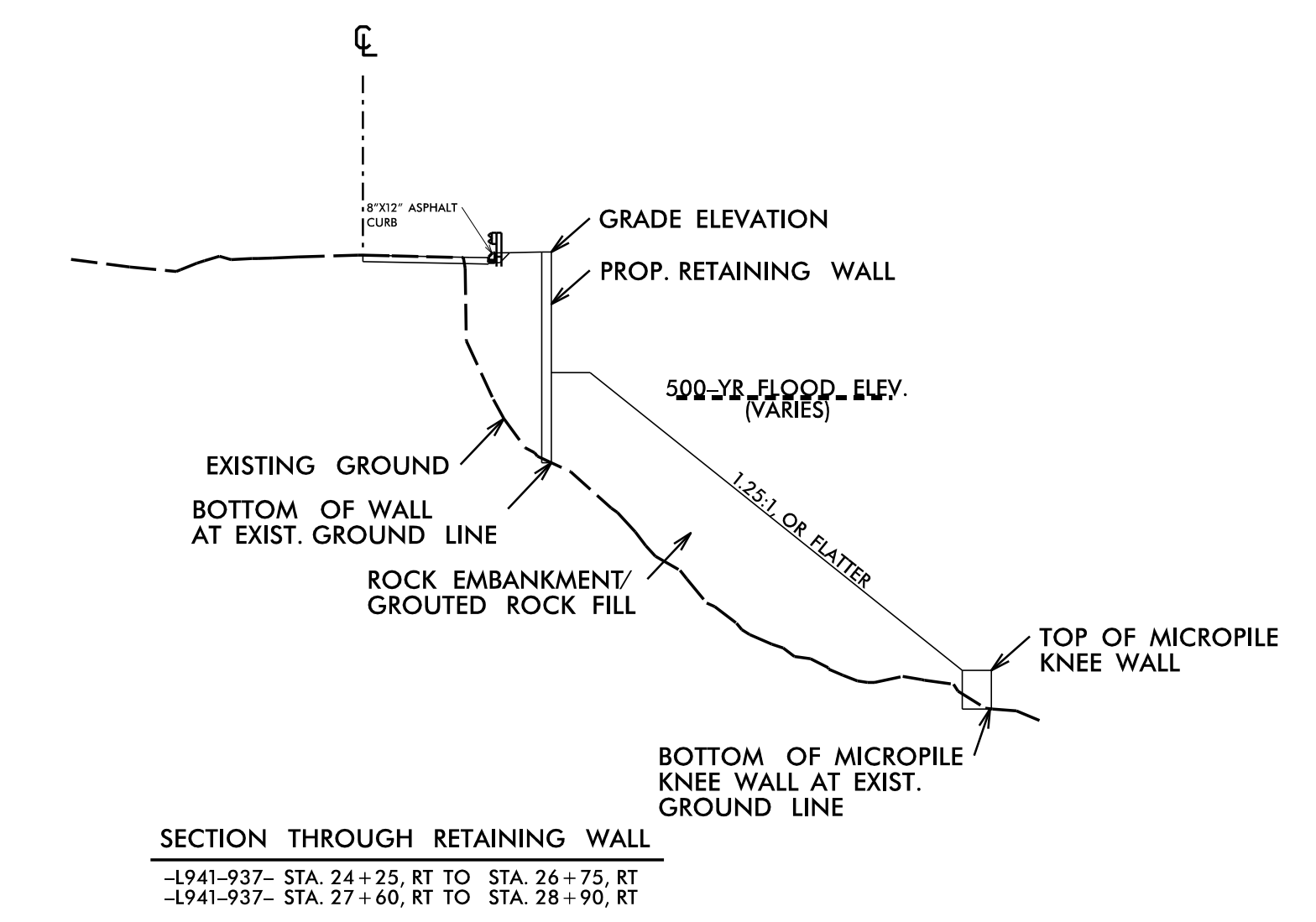
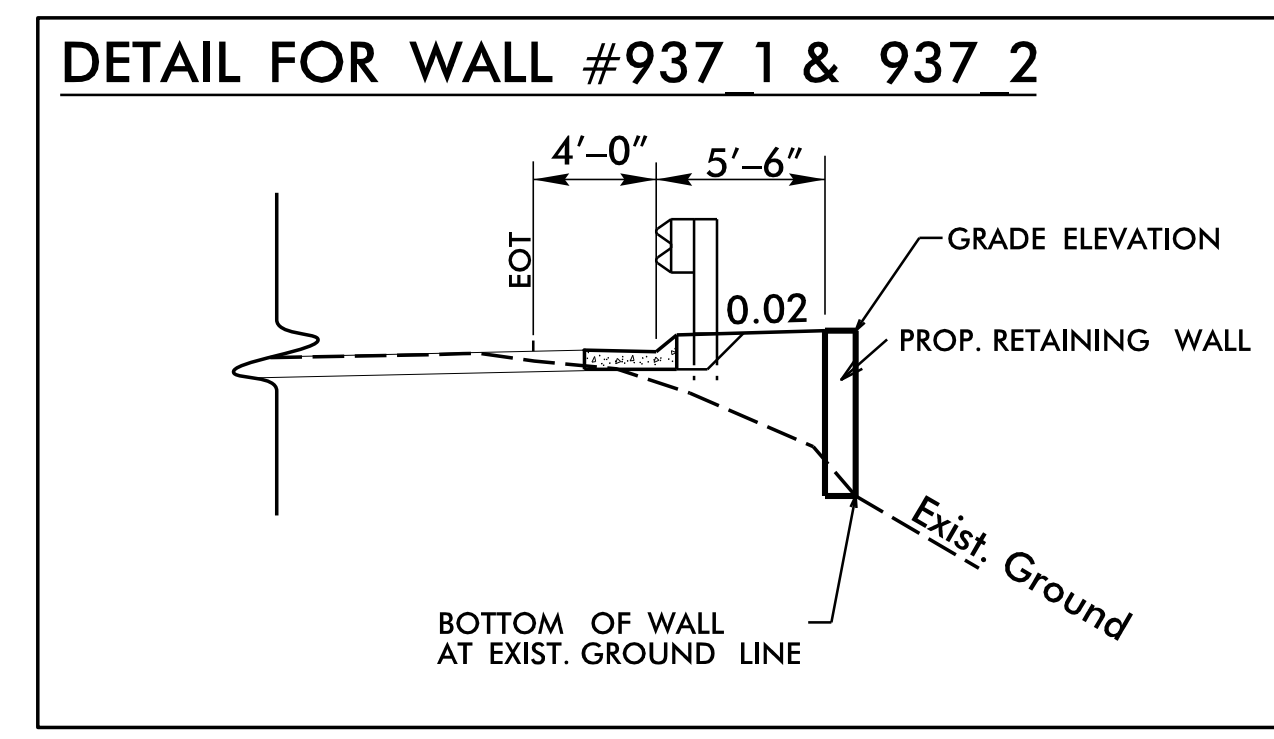
SHEET NO. W-15

SITE 937 RETAINING WALLS:

GEOTECHNICAL ENGINEER  Signed by: Robert E. Kral AAF88FF73CE4B1 DATE: 05/19/2026 SIGNATURE: _____ DATE: _____	ENGINEER SIGNATURE: _____ DATE: _____
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



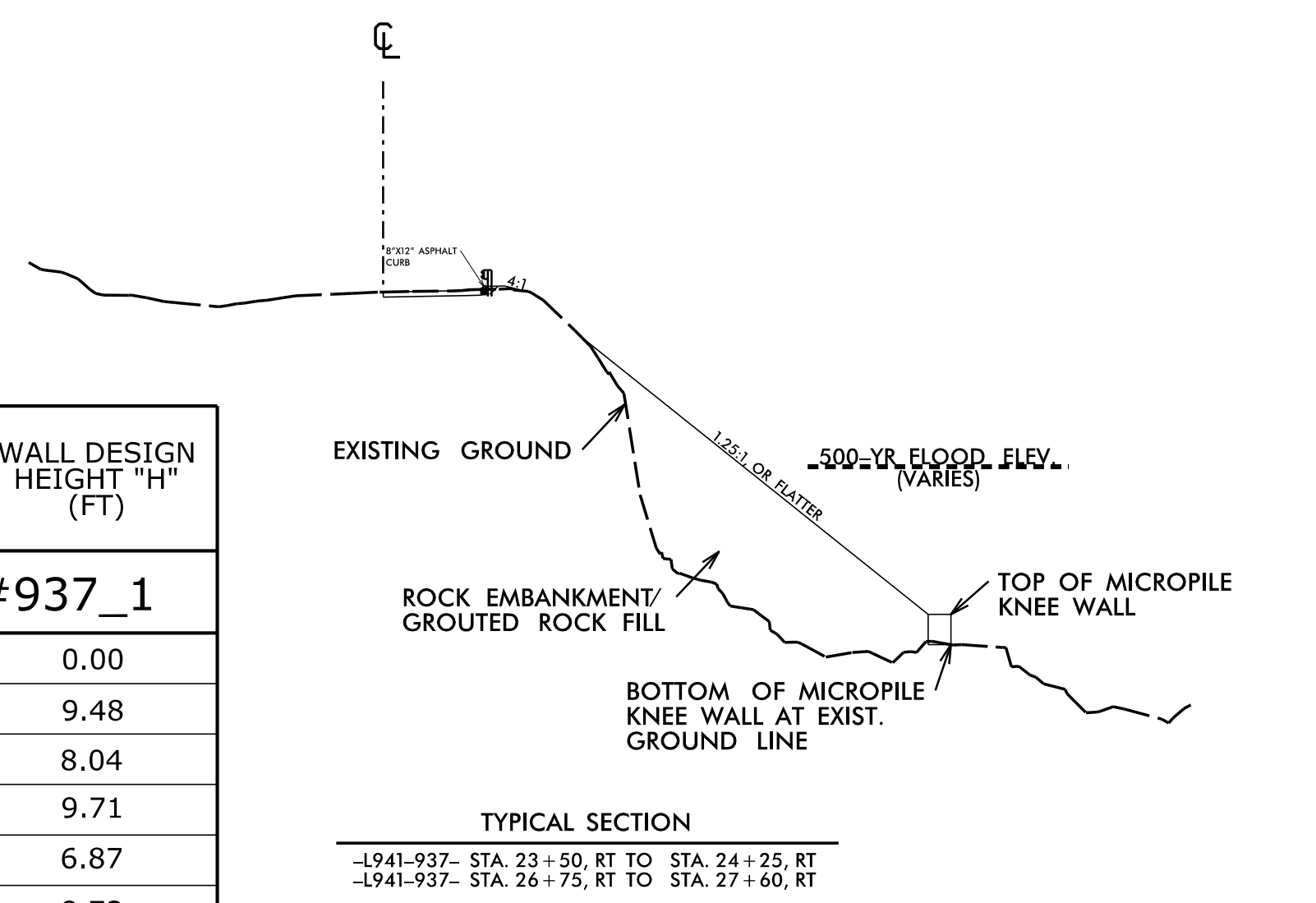
SITE 937 - PLAN
NOT TO SCALE



RETAINING WALL #937_1 & #937_2 - ENVELOPE
NOT TO SCALE
(LOOKING AT FACE OF WALL)

THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL WALL FACE OF WALL #937_2 AT THE FOLLOWING LOCATIONS:
-L941-937- STA. 27+60.00 TO 28+90.00, RT

STA. -L941-937-	GRADE ELEVATION (FT)	BOTTOM OF WALL ELEVATION (FT)	WALL DESIGN HEIGHT "H" (FT)
SITE 937 RETAINING WALL #937_1			
24+25.00	1,264.46	1,264.46	0.00
24+50.00	1,262.87	1,253.39	9.48
25+00.00	1,259.89	1,251.85	8.04
25+50.00	1,256.97	1,247.26	9.71
26+00.00	1,253.99	1,247.12	6.87
26+50.00	1,250.49	1,241.76	8.73
26+75.00	1,248.74	1,248.74	0.00
SITE 937 RETAINING WALL #937_2			
27+60.00	1,243.51	1,243.41	0.00
28+00.00	1,241.25	1,232.53	8.72
28+50.00	1,238.56	1,234.40	4.16
28+75.00	1,237.28	1,233.75	3.53
28+90.00	1,236.51	1,236.51	0.00



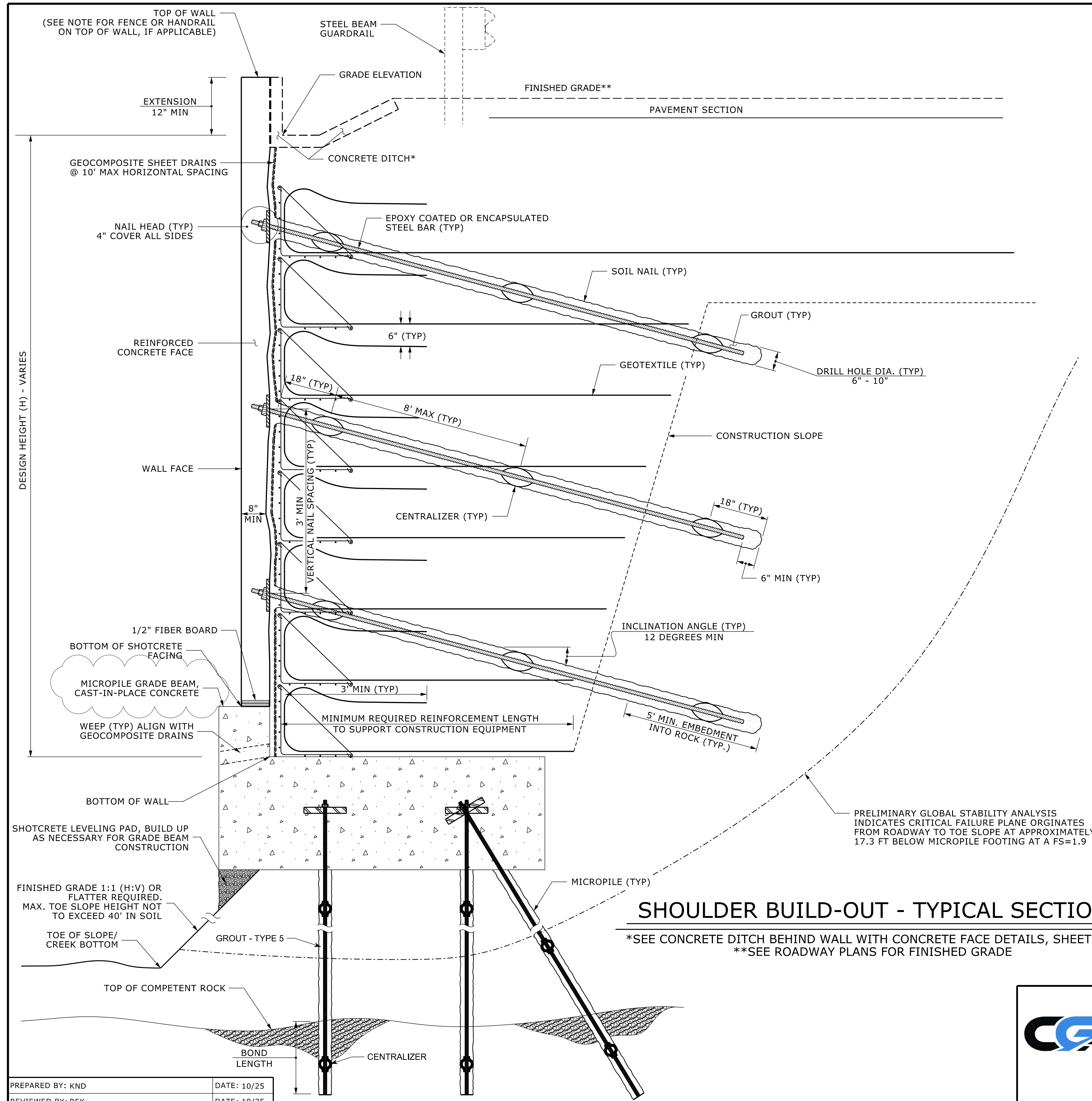
PROJECT NO.: W03293
POLK COUNTY
STATION: -L941-937- STA. 23+50.00 TO 29+00.00, RT
SHEET 1 OF 4

PREPARED BY: KND DATE: 10/25
REVIEWED BY: REK DATE: 10/25
RETAINING WALL ENVELOPES AND DESIGN LAYOUT PROVIDED BY TGS JULY 30, 2025.

Prepared in the Office of:

CAROLINUS GEOTECHNICAL GROUP
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-16
2			4			



SHOULDER BUILD-OUT - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL WITH CONCRETE FACE DETAILS, SHEET W-6
 **SEE ROADWAY PLANS FOR FINISHED GRADE

GEOTECHNICAL ENGINEER Signed by: Robert E. Kral AAF88FF73CE4B1 SIGNATURE	ENGINEER DATE: 05/19/2026 SIGNATURE: _____ DATE: _____
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

NOTES:

- FOR SOIL NAIL SHOULDER BUILD-OUT, SEE RETAINING WALLS SPECIAL PROVISION.
- FOR MICROPILE GRADE BEAM, SEE RETAINING WALLS SPECIAL PROVISION.
- FOR MICROPILES, SEE RETAINING WALLS SPECIAL PROVISION.
- DESIGN MICROPILE GRADE BEAM FOR A MINIMUM OF 5 FEET OF GROUND LOSS BELOW GRADE BEAM.
- MICROPILE CASING MAY BE REQUIRED.
- ESTABLISH THE BACK OF SOIL NAIL WALL FACE AT A 3.5' OR GREATER OFFSET FROM THE BACK OF THE EXISTING OR PROPOSED GUARDRAIL POST.
- EXTEND THE TOP TWO LAYERS OF GEOTEXTILE TO CENTERLINE OF ROAD.
- FOR SOIL NAIL RETAINING WALLS, SEE RETAINING WALLS SPECIAL PROVISION.
- AT CONTRACTOR'S OPTION, ALTERNATIVE DESIGN MAY BE USED FOR SITE 937 RETAINING WALL. SEE RETAINING WALLS SPECIAL PROVISION.
- DESIGN SITE 937 RETAINING WALL AND MICROPILE GRADE BEAM FOR INTERNAL, EXTERNAL, AND GLOBAL STABILITY.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR SITE 937 RETAINING WALL, 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 SITE 937 RETAINING WALL FOR THE FOLLOWING:
 - 1) DESIGN HEIGHT (H) = WALL HEIGHT + WALL EMBEDMENT
 - 2) DESIGN LIFE = 75 YEARS
 - 3) MINIMUM WALL EMBEDMENT DEPTH = 1 FT
 - 4) ROCK EMBANKMENT PARAMETERS:
 - UNIT WEIGHT, $\gamma = 135$ PCF
 - FRICTION ANGLE, $\phi = 42$ DEGREES
 - COHESION, $c = 0$ PSF
 - 5) ASSUMED BORROW MATERIAL PARAMETERS, SEE SECTION 1018 OF THE STANDARD SPECIFICATIONS
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 6) IN-SITU ASSUMED MATERIAL PARAMETERS RESIDUAL SOIL:
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 7) IN-SITU ASSUMED MATERIAL PARAMETERS CRYSTALLINE ROCK:
 - UNIT WEIGHT, $\gamma = 170$ PCF
 - FRICTION ANGLE, $\phi = 34$ DEGREES
 - COHESION, $c = 1,000$ PSF
- EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH SOIL NAILS FOR SITE 937 RETAINING WALL.
- "TEMPORARY SHORING" MAY BE REQUIRED FOR SITE 937 RETAINING WALL IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY OR TRAFFIC CONTROL PLANS.


PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L941-937- STA. 23+50.00 TO 29+00.00, RT
 SHEET 2 OF 4

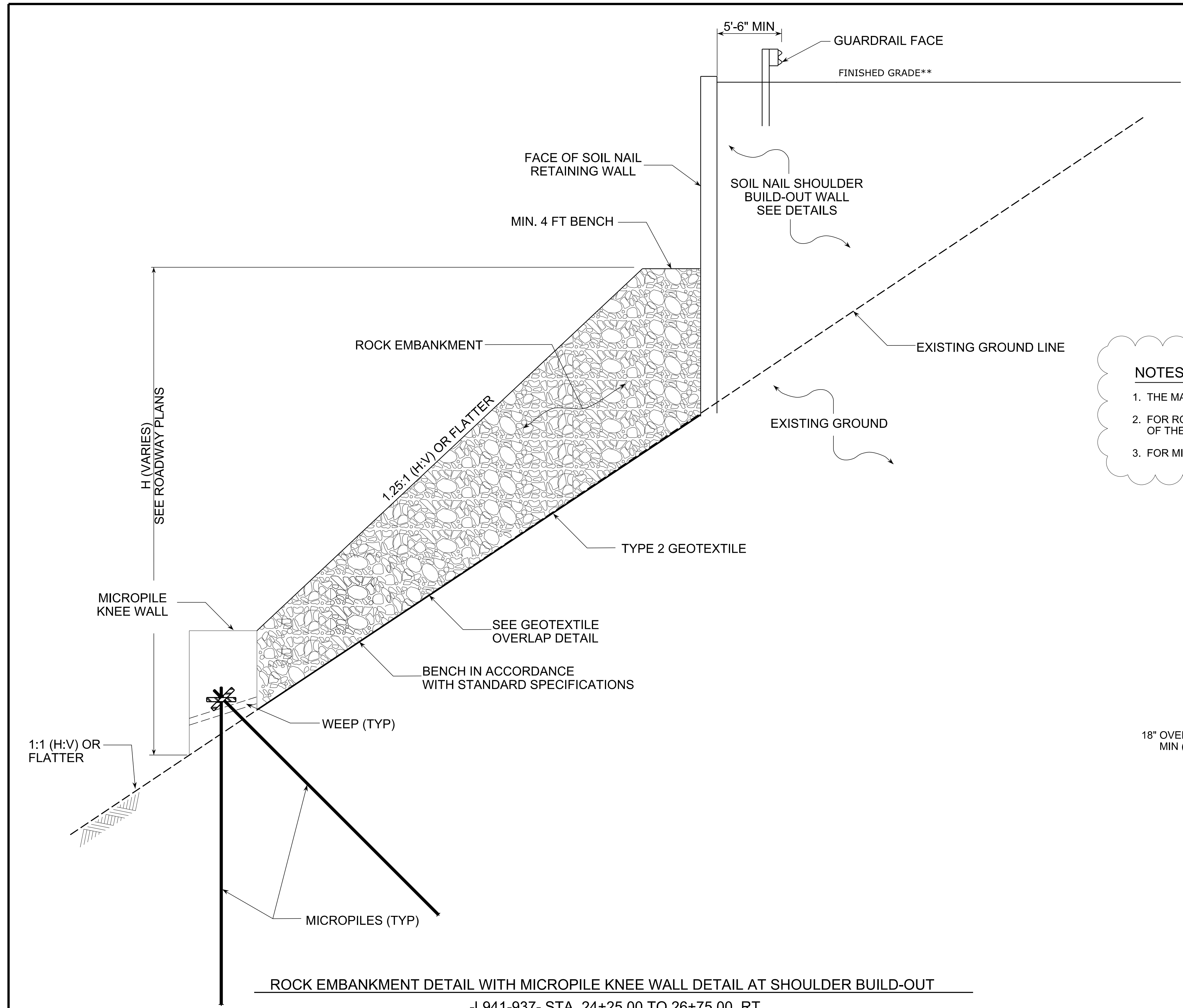
Prepared in the Office of:

**CAROLINAS
 GEOTECHNICAL
 GROUP**
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	KND	03/26	3			W-17
2	KND	05/26	4			

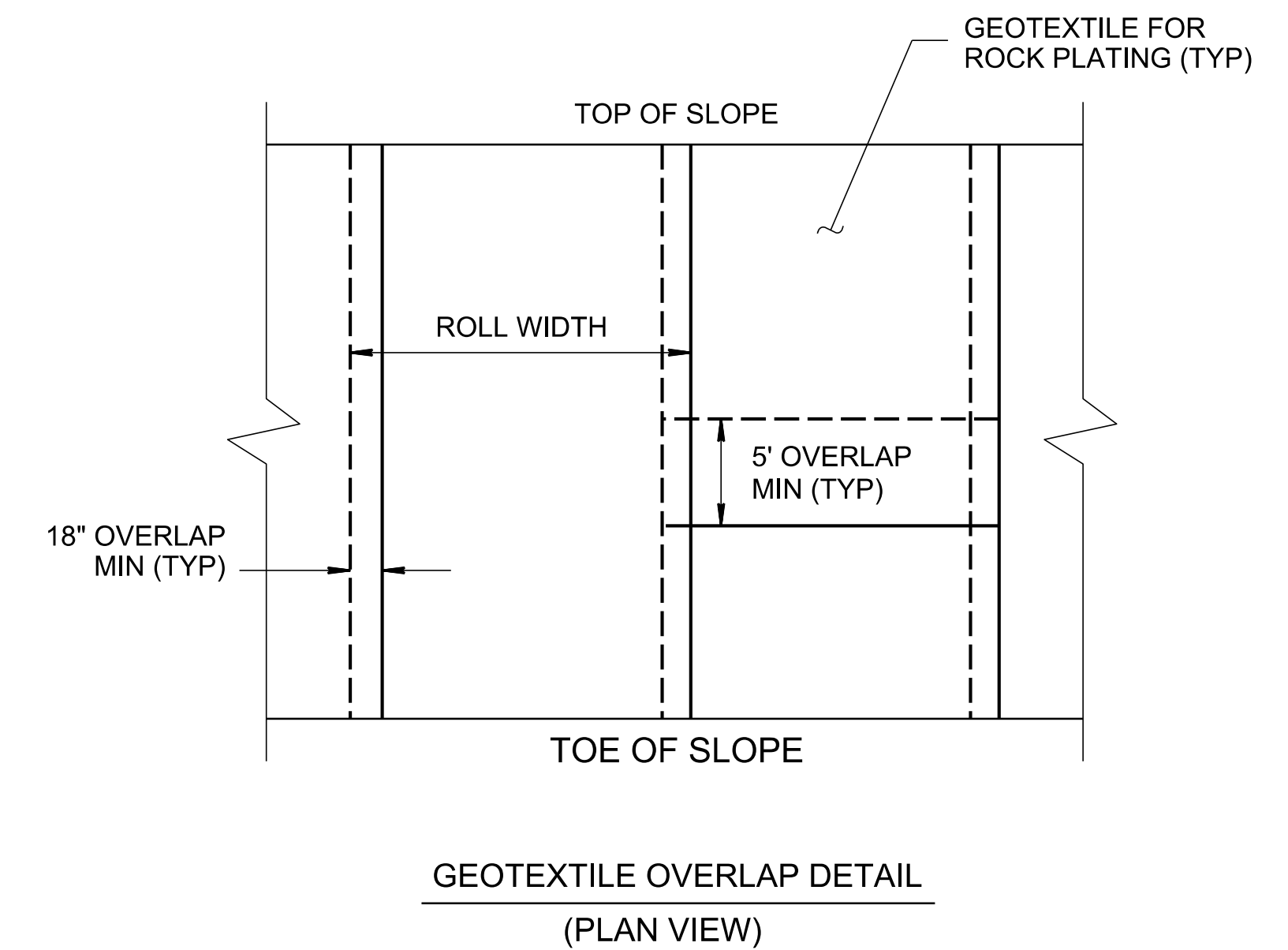
PREPARED BY: KND DATE: 10/25
 REVIEWED BY: REK DATE: 10/25

GEOTECHNICAL ENGINEER
 ENGINEER

 Signed by: Robert E. Kral
 AAF88FF73CE4B91 05/19/2026
 SIGNATURE DATE SIGNATURE DATE
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NOTES:

1. THE MAXIMUM ALLOWABLE HEIGHT FOR THE ROCK EMBANKMENT DETAIL IS 80'.
2. FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
3. FOR MICROPILE KNEE WALL, SEE RETAINING WALLS SPECIAL PROVISION.



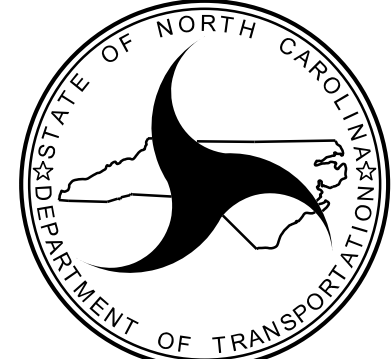
ROCK EMBANKMENT DETAIL WITH MICROPILE KNEE WALL DETAIL AT SHOULDER BUILD-OUT
 -L941-937- STA. 24+25.00 TO 26+75.00, RT
 -L941-937- STA. 27+60.00 TO 28+90.00, RT

PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L941-937- STA. 23+50.00 TO 29+00.00, RT
 SHEET 3 OF 4

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25


Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684


 NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SITE 937 RETAINING WALLS
 SHOULDER BUILD-OUT &
 ROCK EMBANKMENT WITH
 MICROPILE KNEE WALL

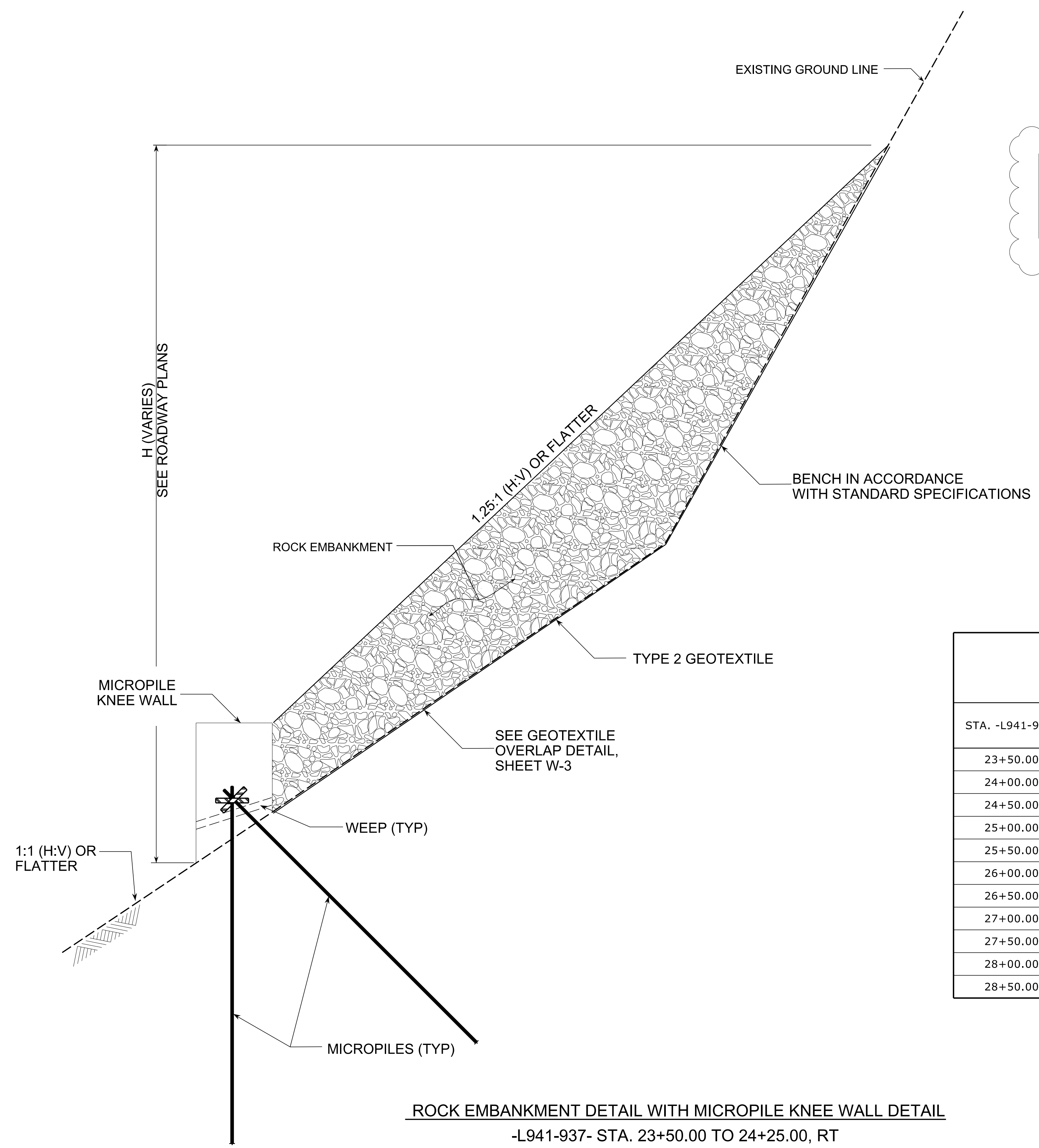
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NO.	BY	DATE	NO.	DATE	
1	KND	05/26	3		W-18
2			4		

GEOTECHNICAL ENGINEER  Signed by: <i>Robert E. Krahl</i> AAF88F73C5E4B1 SIGNATURE DATE 05/19/2026	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

PAY ITEMS	
RETAINING WALLS, SITE #937	LS

ESTIMATED QUANTITIES - SITE #937*	
SOIL NAIL RETAINING WALL #937_1	1,920 SF
SOIL NAIL RETAINING WALL #937_2	620 SF
MICROPILE GRADE BEAM	380 LF
ROCK EMBANKMENTS	17,100 TON
GEOTEXTILE FOR ROCK EMBANKMENTS	4,350 SY
MICROPILE GRADE BEAM	540 LF
GROUT FOR ROCK FILL	1,200 CY

*ESTIMATED QUANTITIES FOR SITE 937 RETAINING WALL ARE FOR BID PURPOSES ONLY.



ROCK EMBANKMENT WITH MICROPILE KNEE WALL						
STA. -L941-937-	TOP OF SLOPE OFFSET (FT)	TOP OF KNEE WALL OFFSET (FT)	TOP OF KNEE WALL ELEVATION (FT)	BOTTOM OF KNEE WALL ELEVATION (FT)	500-YR FLOOD ELEVATION (FT)	MIN. ROCK FILL ELEVATION (FT)
23+50.00	19.5' RT	70.0' RT	1233.3	1229.3	1247.7	1249.7
24+00.00	19.5' RT	65.0' RT	1234.6	1230.6	1245.9	1247.9
24+50.00	20.5' RT	65.0' RT	1226.5	1222.5	1252.2	1254.2
25+00.00	20.5' RT	65.0' RT	1221.4	1217.4	1237.6	1239.6
25+50.00	20.5' RT	65.0' RT	1218.8	1214.8	1236.7	1238.7
26+00.00	20.5' RT	39.8' RT	1215.6	1211.6	1230.7	1232.7
26+50.00	20.5' RT	70.0' RT	1211.8	1207.8	1231.1	1233.1
27+00.00	19.5' RT	69.1' RT	1207.2	1203.2	1235.1	1237.1
27+50.00	19.5' RT	65.8' RT	1516.1	1212.1	1227.7	1229.7
28+00.00	32.2' RT	65.0' RT	1197.6	1193.63	1228.9	1230.9
28+50.00	20.5' RT	65.0' RT	1201.6	1197.6	1221.1	1223.1

ROCK EMBANKMENT DETAIL WITH MICROPILE KNEE WALL DETAIL
 -L941-937- STA. 23+50.00 TO 24+25.00, RT
 -L941-937- STA. 26+75.00 TO 27+60.00, RT

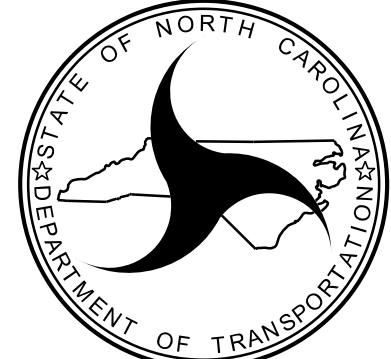
PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L941-937- STA. 23+50.00 TO 29+00.00, RT
 SHEET 4 OF 4

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

Prepared in the Office of:



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 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684



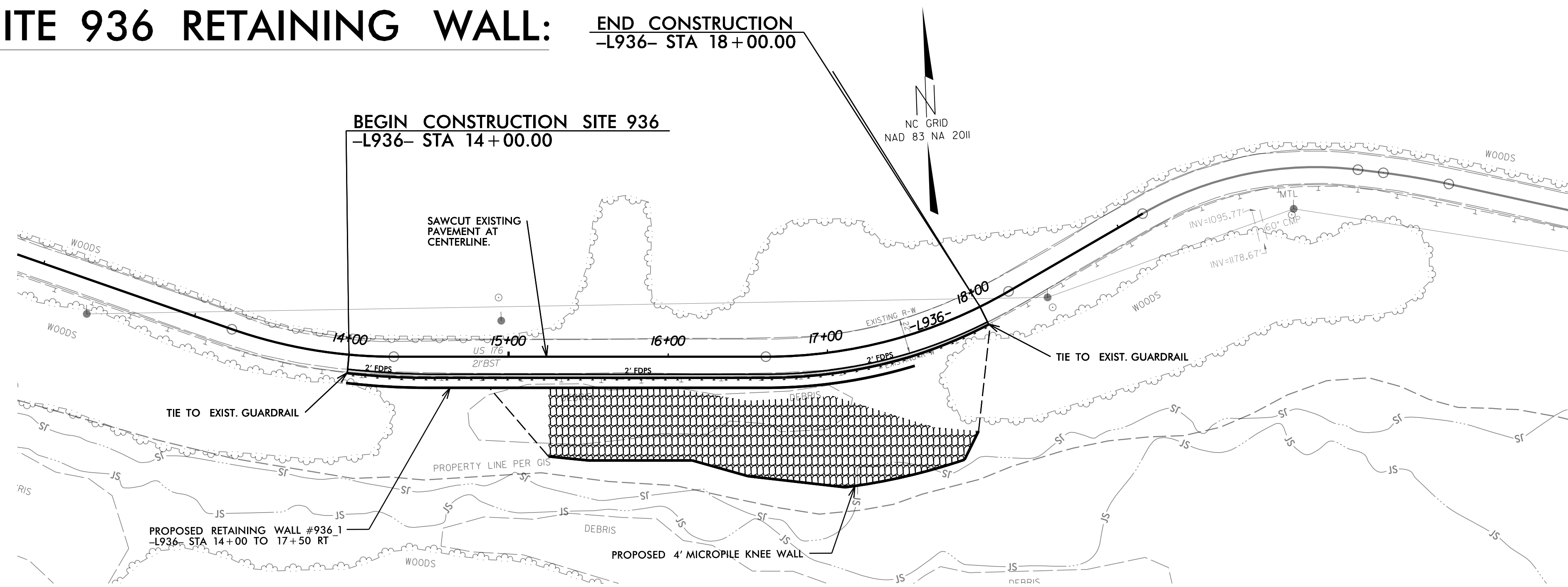
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

**GEOTECHNICAL
ENGINEERING UNIT**

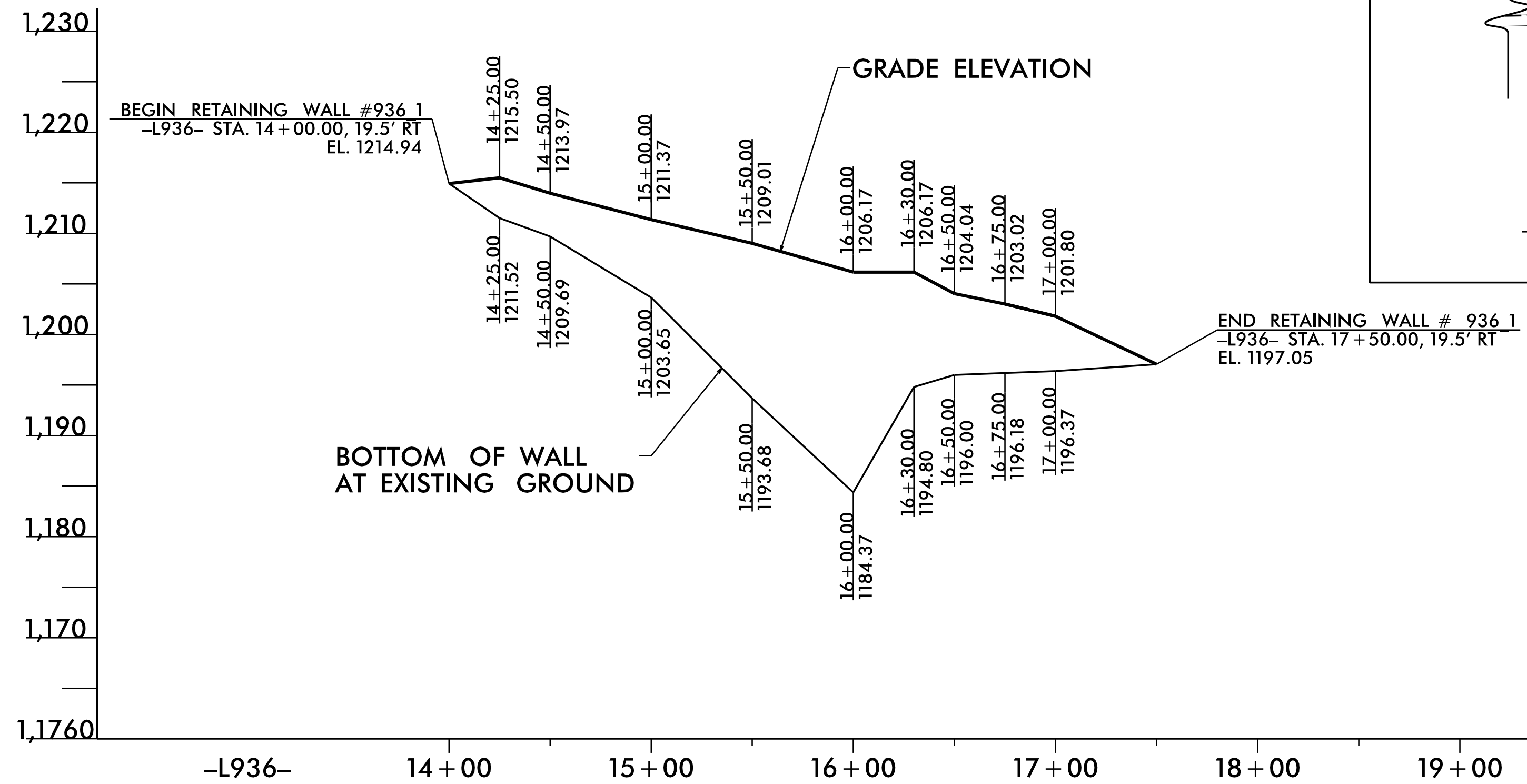
SITE 937 RETAINING WALLS SHOULDER BUILD-OUT & ROCK EMBANKMENT WITH MICROPILE KNEE WALL						
REVISIONS						
NO.	BY	DATE	NO.	BY	DATE	SHEET NO.
1	KND	05/26	3			W-19
2			4			

SITE 936 RETAINING WALL: END CONSTRUCTION

-L936- STA 18+00.00

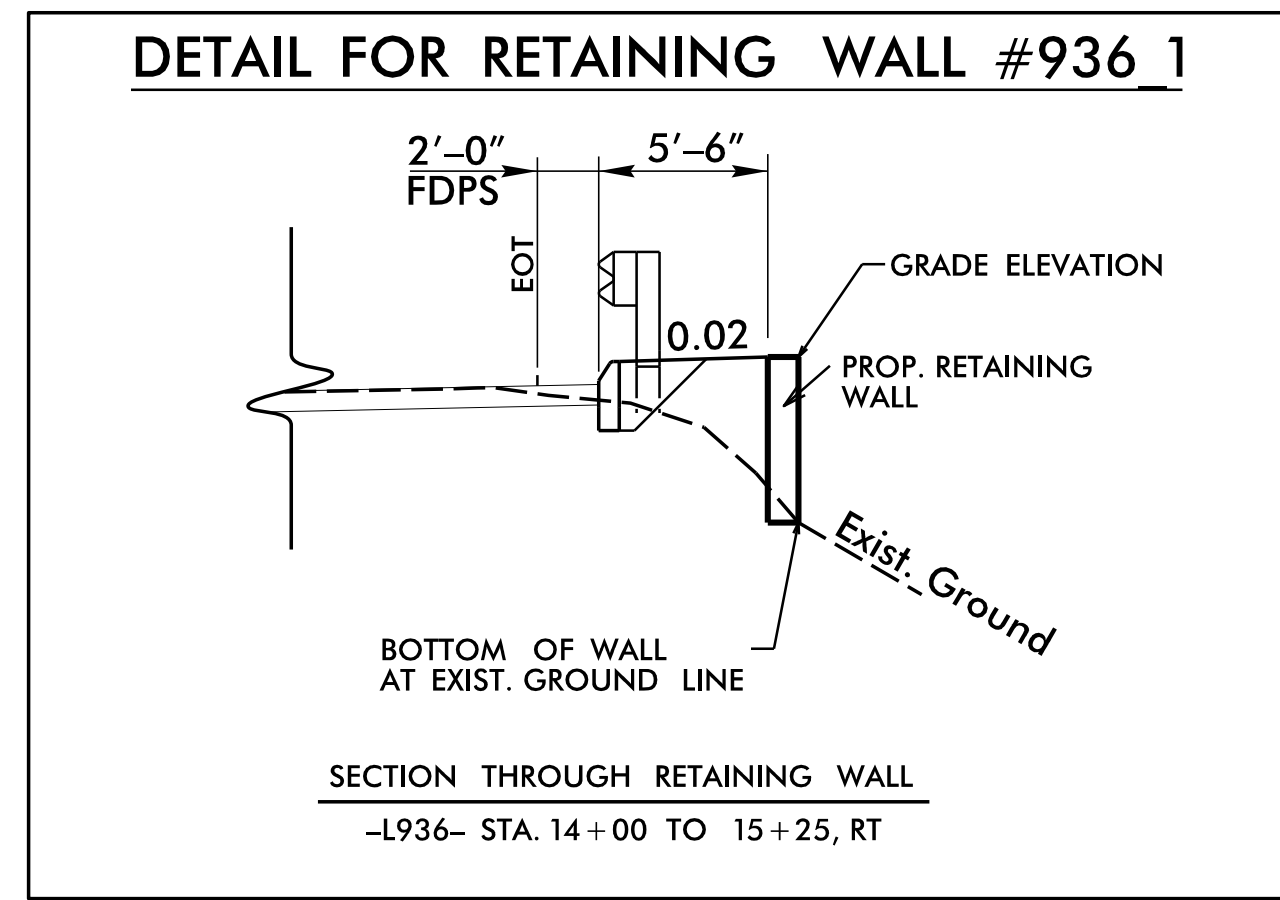


SITE 936 - PLAN
NOT TO SCALE

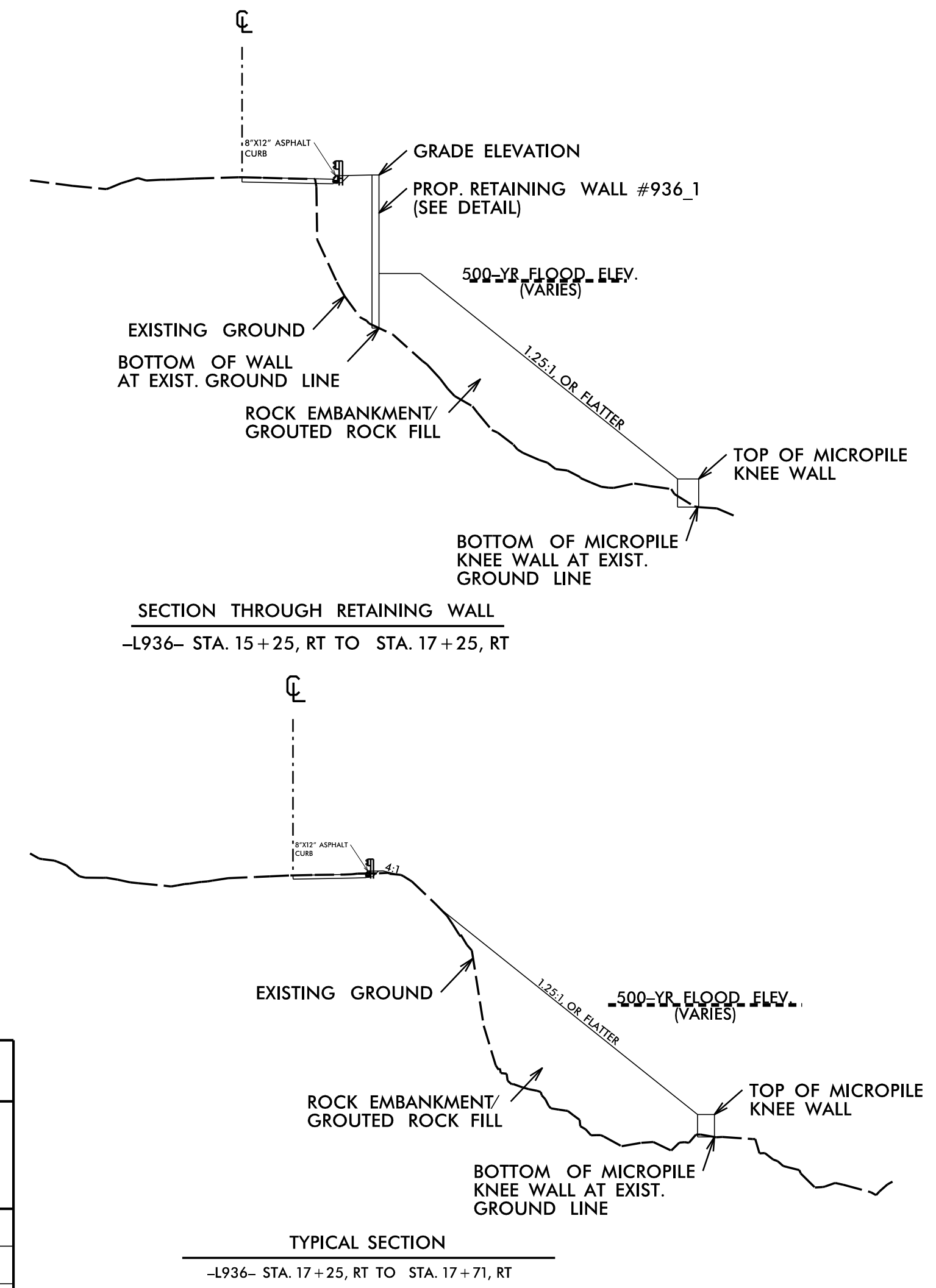


RETAINING WALL #936_1 - ENVELOPE
NOT TO SCALE (LOOKING AT FACE OF WALL)

THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL WALL FACE OF WALL #936_1 AT THE FOLLOWING LOCATIONS:
-L936- STA. 14+00.00 TO 14+50.00, RT
AND -L936- STA. 16+61.11 TO 17+50.00, RT



SITE 936 RETAINING WALL			
STA. -L936-	GRADE ELEVATION (FT)	BOTTOM OF WALL ELEVATION (FT)	WALL DESIGN HEIGHT "H" (FT)
14+00.00	1,214.94	1,214.94	0.00
12+25.00	1,215.50	1,211.52	3.98
14+50.00	1,213.97	1,209.69	4.28
15+00.00	1,211.37	1,203.65	7.72
15+50.00	1,209.01	1,193.68	15.33
16+00.00	1,206.17	1,184.37	21.80
16+30.00	1,206.17	1,194.80	11.37
16+50.00	1,204.04	1,196.00	8.04
16+75.00	1,203.02	1,196.18	6.84
17+00.00	1,201.80	1,196.37	5.43
17+50.00	1,197.05	1,197.05	0.00



PROJECT NO.: W03293
POLK COUNTY
STATION: -L936- STA. 14+00.00 TO 18+00.00, RT
SHEET 1 OF 6

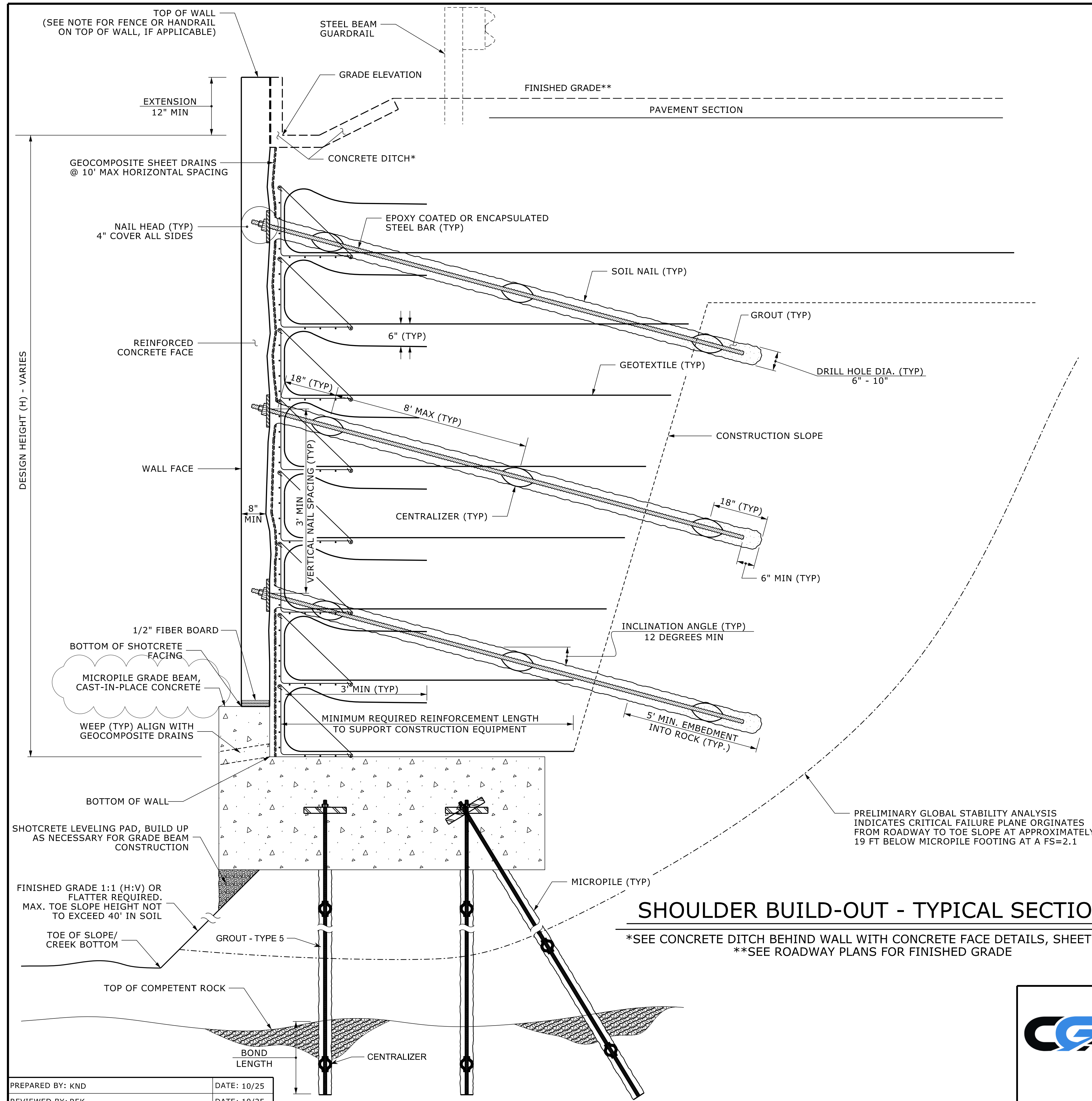
Professional Engineer Seal for Robert E. Kral, License No. 042642, dated 05/19/2026. Includes signature and date fields.

PREPARED BY: KND DATE: 10/25
REVIEWED BY: REK DATE: 10/25
RETAINING WALL ENVELOPE AND DESIGN LAYOUT PROVIDED BY TGS JULY 25, 2025.

Prepared in the Office of:
CGE CAROLINAS GEOTECHNICAL GROUP
1805 SARDIS ROAD NORTH SUITE 100 CHARLOTTE, NC 28270 (980) 339-8684

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

SHEET NO. W-20



SHOULDER BUILD-OUT - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL WITH CONCRETE FACE DETAILS, SHEET W-6
 **SEE ROADWAY PLANS FOR FINISHED GRADE

GEOTECHNICAL ENGINEER Robert E. Kral 05/19/2026 SIGNATURE DATE	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

- NOTES:**
- FOR SOIL NAIL SHOULDER BUILD-OUT, SEE RETAINING WALLS SPECIAL PROVISION.
 - FOR MICROPILE GRADE BEAM, SEE RETAINING WALLS SPECIAL PROVISION.
 - FOR MICROPILES, SEE RETAINING WALLS SPECIAL PROVISION.
 - DESIGN MICROPILE GRADE BEAM FOR A MINIMUM OF 5 FEET OF GROUND LOSS BELOW GRADE BEAM.
 - MICROPILE CASING MAY BE REQUIRED.
 - ESTABLISH THE BACK OF SOIL NAIL WALL FACE AT A 3.5' OR GREATER OFFSET FROM THE BACK OF THE EXISTING OR PROPOSED GUARDRAIL POST.
 - EXTEND THE TOP TWO LAYERS OF GEOTEXTILE TO CENTERLINE OF ROAD.
 - FOR SOIL NAIL RETAINING WALLS, SEE RETAINING WALLS SPECIAL PROVISION.
 - AT CONTRACTOR'S OPTION, ALTERNATIVE DESIGN MAY BE USED FOR SITE #936 RETAINING WALL. SEE RETAINING WALLS SPECIAL PROVISION.
 - DESIGN SITE #936 RETAINING WALL FOR INTERNAL, EXTERNAL, AND GLOBAL STABILITY.
 - FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
 - BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR SITE 936 RETAINING WALL, 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 SITE 936 RETAINING WALL FOR THE FOLLOWING:
 - 1) DESIGN HEIGHT (H) = WALL HEIGHT + WALL EMBEDMENT
 - 2) DESIGN LIFE = 75 YEARS
 - 3) MINIMUM WALL EMBEDMENT DEPTH = 1 FT
 - 4) ROCK EMBANKMENT PARAMETERS:
 - UNIT WEIGHT, $\gamma = 135$ PCF
 - FRICTION ANGLE, $\phi = 42$ DEGREES
 - COHESION, $c = 0$ PSF
 - 5) ASSUMED BORROW MATERIAL PARAMETERS, SEE SECTION 1018 OF THE STANDARD SPECIFICATIONS
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 6) IN-SITU ASSUMED MATERIAL PARAMETERS RESIDUAL SOIL:
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
 - 7) IN-SITU ASSUMED MATERIAL PARAMETERS CRYSTALLINE ROCK:
 - UNIT WEIGHT, $\gamma = 170$ PCF
 - FRICTION ANGLE, $\phi = 34$ DEGREES
 - COHESION, $c = 1,000$ PSF
 - EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH SOIL NAILS FOR SITE 936 RETAINING WALL.
 - "TEMPORARY SHORING" MAY BE REQUIRED FOR SITE 936 RETAINING WALL IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY OR TRAFFIC CONTROL PLANS.

PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L936- STA. 14+00.00 TO 18+00.00, RT
 SHEET 2 OF 6

PREPARED BY: KND DATE: 10/25
 REVIEWED BY: REK DATE: 10/25

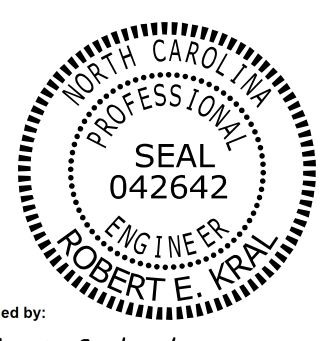
Prepared in the Office of:

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 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	KND	05/26	3			W-21
2			4			

GEOTECHNICAL ENGINEER

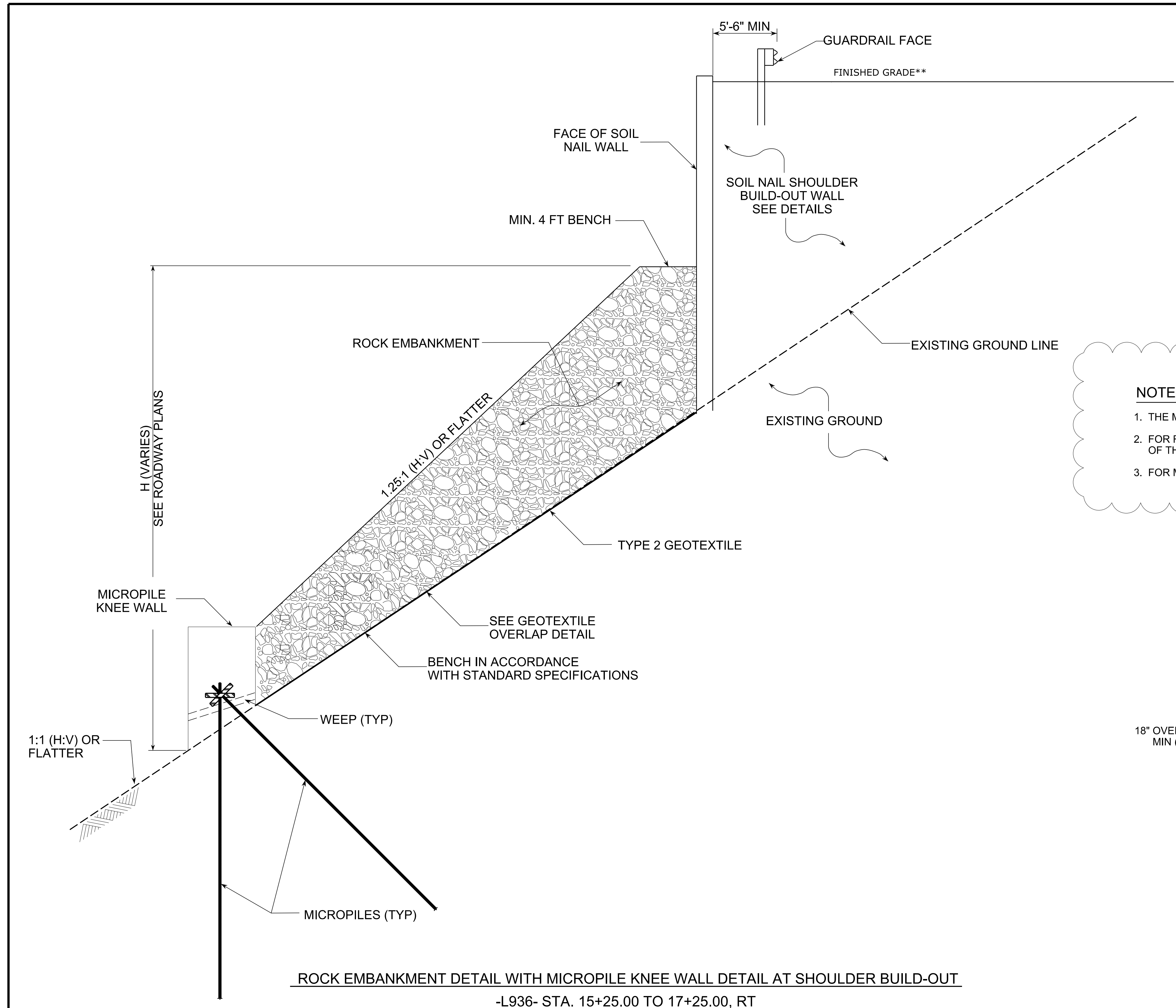
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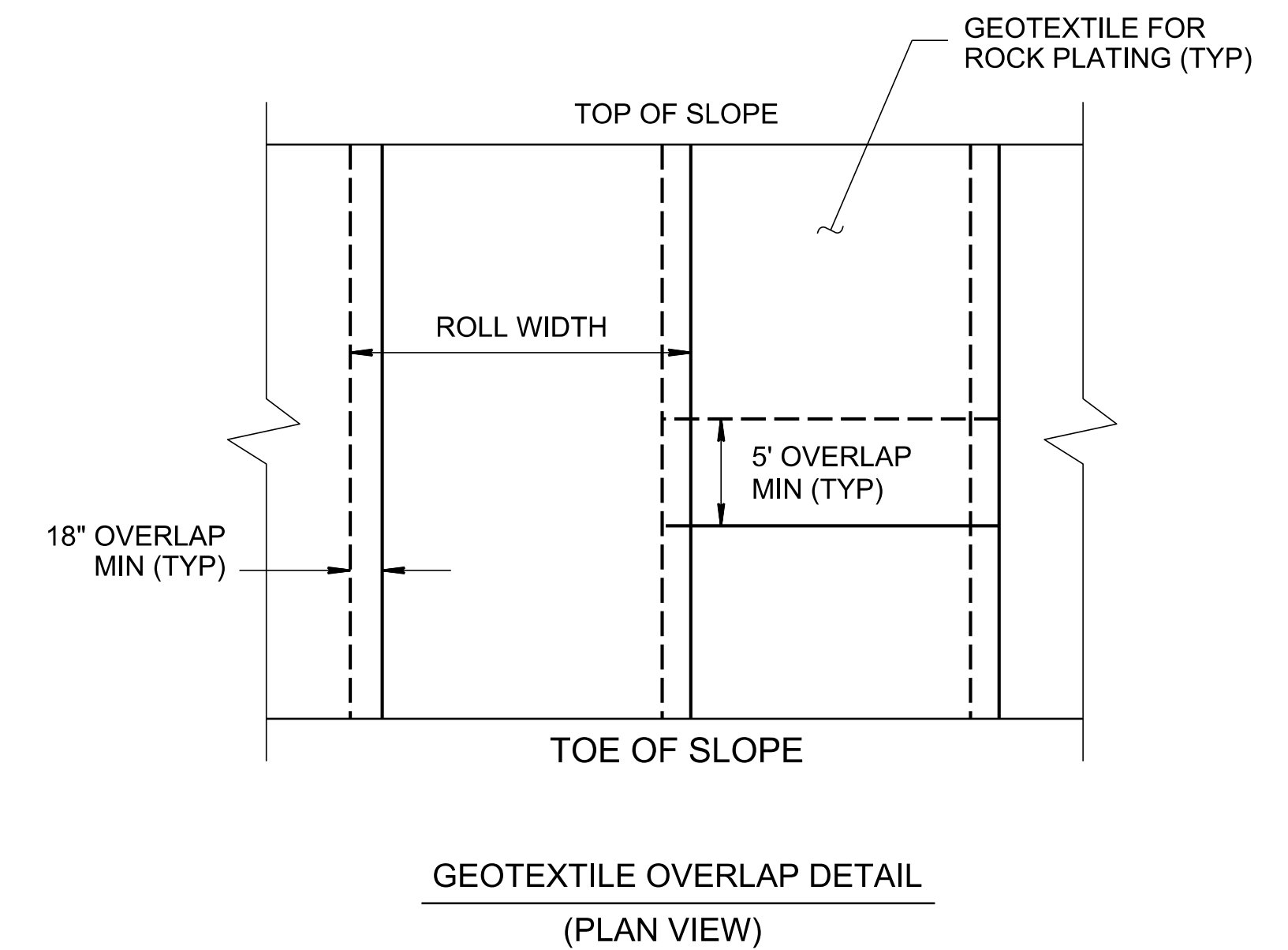
Signed by: *Robert E. Kral* 05/19/2026

AAFB8FF73CE4B1

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



- NOTES:**
1. THE MAXIMUM ALLOWABLE HEIGHT FOR THE ROCK EMBANKMENT DETAIL IS 80'.
 2. FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
 3. FOR MICROPILE KNEE WALL, SEE RETAINING WALLS SPECIAL PROVISION.



ROCK EMBANKMENT DETAIL WITH MICROPILE KNEE WALL DETAIL AT SHOULDER BUILD-OUT
 -L936- STA. 15+25.00 TO 17+25.00, RT

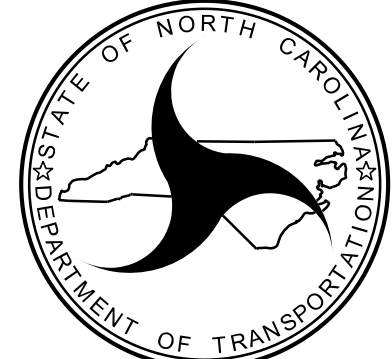
PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L936- STA. 14+00.00 TO 18+00.00, RT
 SHEET 3 OF 6

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

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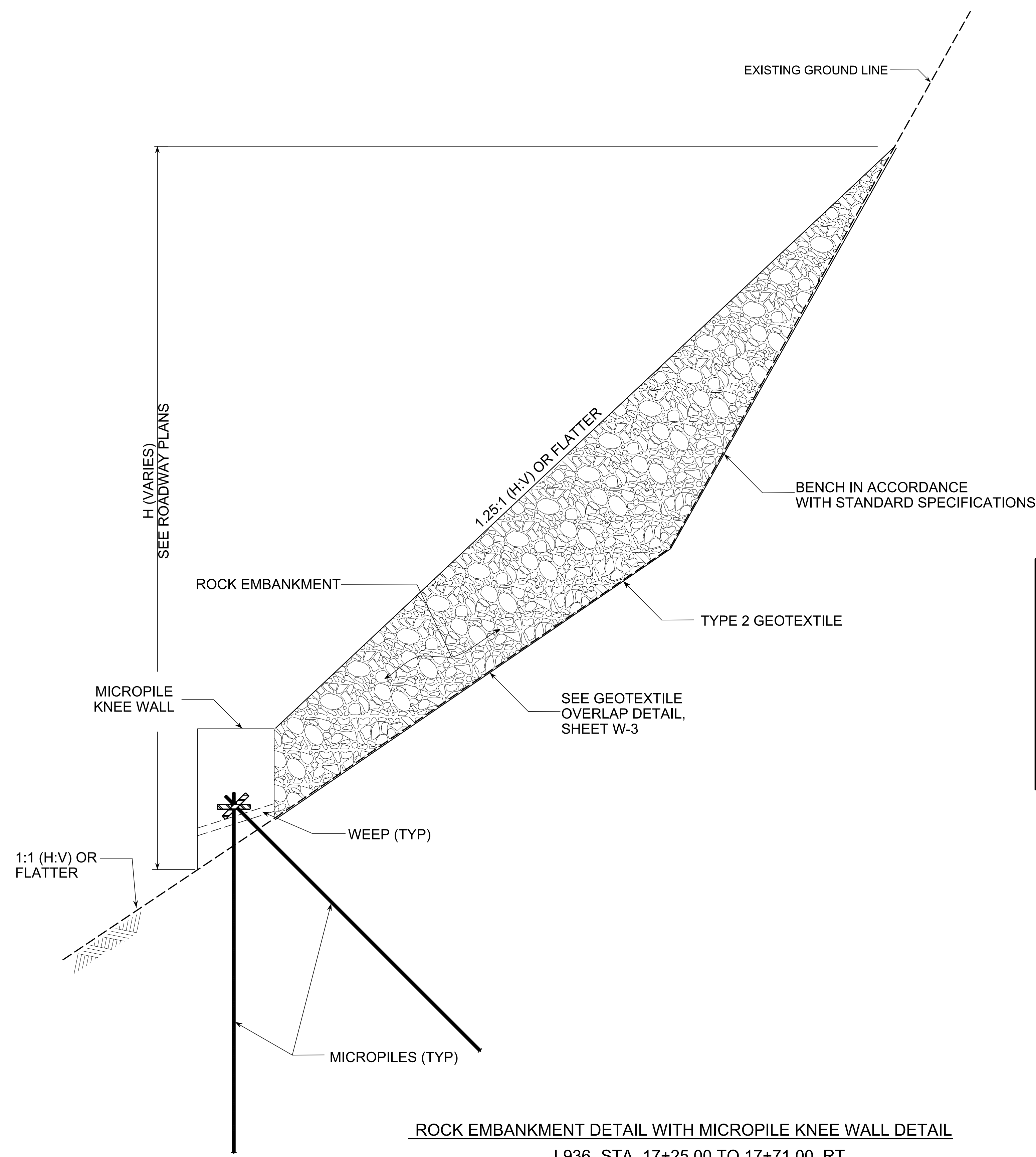
GEOTECHNICAL ENGINEERING UNIT

SITE 936 RETAINING WALL SHOULDER BUILD-OUT & ROCK EMBANKMENT WITH MICROPILE KNEE WALL

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	KND	05/26	3		
2			4		

SHEET NO. W-22

GEOTECHNICAL ENGINEER  Signed by: Robert E. Krahl AAF88FF73CE4B91 SIGNATURE DATE	ENGINEER DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



ESTIMATED QUANTITIES - SITE #936*

SOIL NAIL RETAINING WALL	3,200 SF
MICROPILE GRADE BEAM	280 LF
ROCK EMBANKMENTS	11,700 TON
GEOTEXTILE FOR ROCK EMBANKMENTS	2,800 SY
MICROPILE GRADE BEAM	250 LF
GROUT FOR ROCK FILL	650 CY

*ESTIMATED QUANTITIES FOR SITE #936 RETAINING WALL ARE FOR BID PURPOSES ONLY.

ROCK EMBANKMENT WITH MICROPILE KNEE WALL

STA. -L936-	TOP OF SLOPE OFFSET (FT)	TOP OF KNEE WALL OFFSET (FT)	TOP OF KNEE WALL ELEVATION (FT)	BOTTOM OF KNEE WALL ELEVATION (FT)	500-YR FLOOD ELEVATION (FT)	MIN. ROCK FILL ELEVATION (FT)
15+50.00	19.5' RT	65.0' RT	1167.6	1163.6	1193.8	1195.8
16+00.00	19.5' RT	65.0' RT	1162.9	1158.9	1191.1	1193.1
16+50.00	26.1' RT	75.0' RT	1160.7	1156.7	1180.2	1182.2
17+00.00	27.5' RT	85.0' RT	1144.6	1140.6	1173.9	1175.9
17+50.00	17.3' RT	85.0' RT	1139.2	1135.2	1168.5	1170.5

PAY ITEMS

RETAINING WALLS, SITE #936	LS
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ROCK EMBANKMENT DETAIL WITH MICROPILE KNEE WALL DETAIL
 -L936- STA. 17+25.00 TO 17+71.00, RT

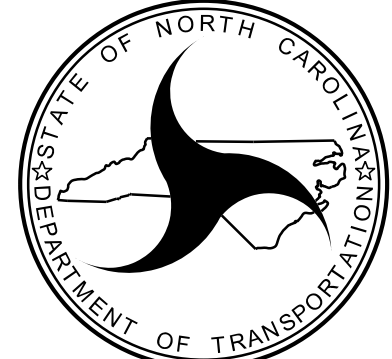
PROJECT NO.: W03293
 POLK COUNTY
 STATION: -L936- STA. 14+00.00 TO 18+00.00, RT
 SHEET 4 OF 6

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

Prepared in the Office of:



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GROUP**
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
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NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

**GEOTECHNICAL
ENGINEERING UNIT**

SITE 936 RETAINING WALL SHOULDER BUILD-OUT & ROCK EMBANKMENT WITH MICROPILE KNEE WALL

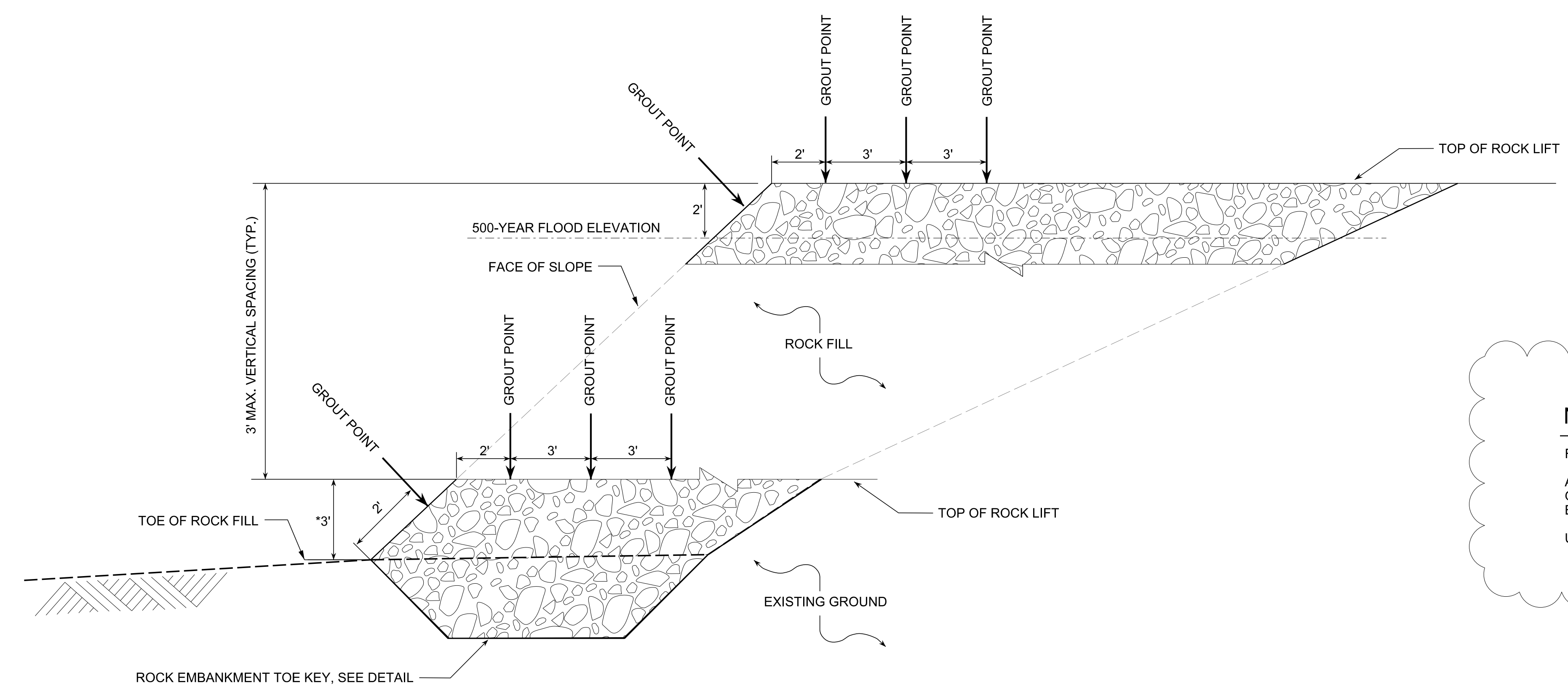
REVISIONS						SHEET NO. W-23
NO.	BY	DATE	NO.	BY	DATE	
1	KND	05/26	3			
2			4			

GEOTECHNICAL ENGINEER

ENGINEER

Signed by: Robert E. Kral
 AA88FF73CE4B1
 05/19/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



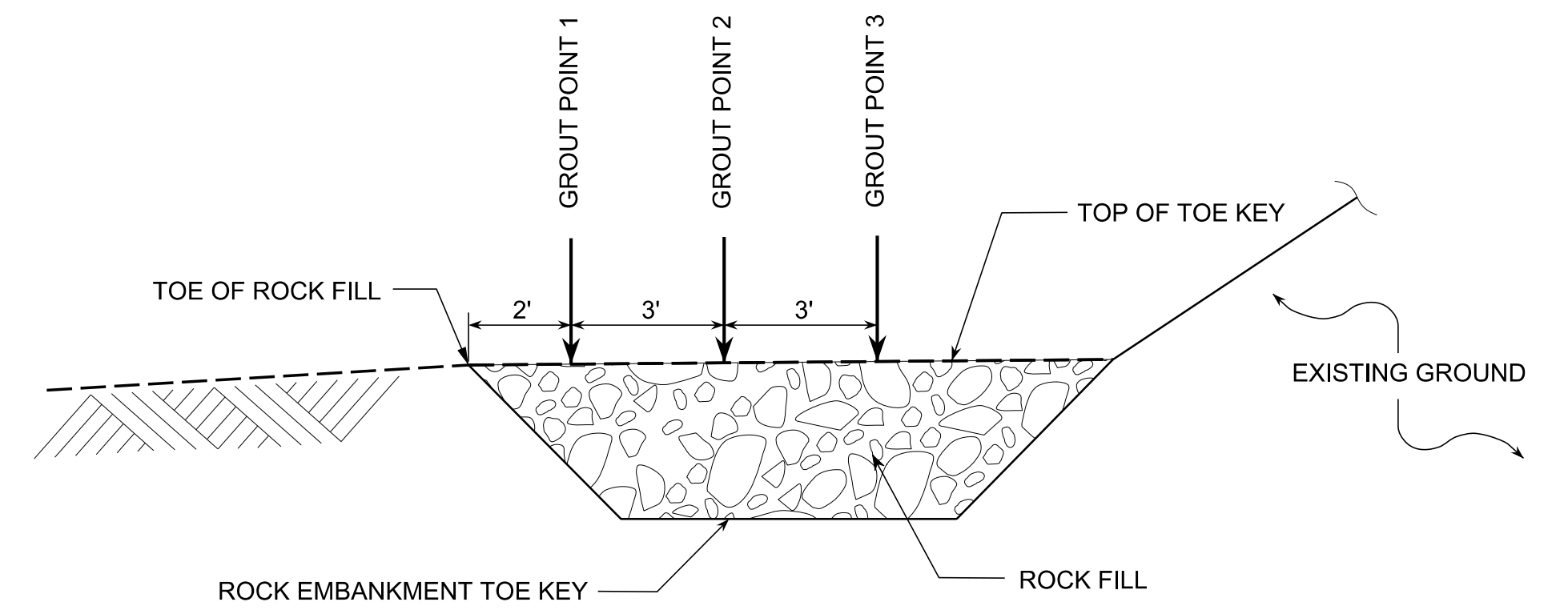
PARTIALLY GROUTED ROCK FILL - ROCK FILL SECTION
 * IF NO TOE KEY, START GROUTING AT THE TOP OF THE FIRST 3-FT LIFT

NOTES:

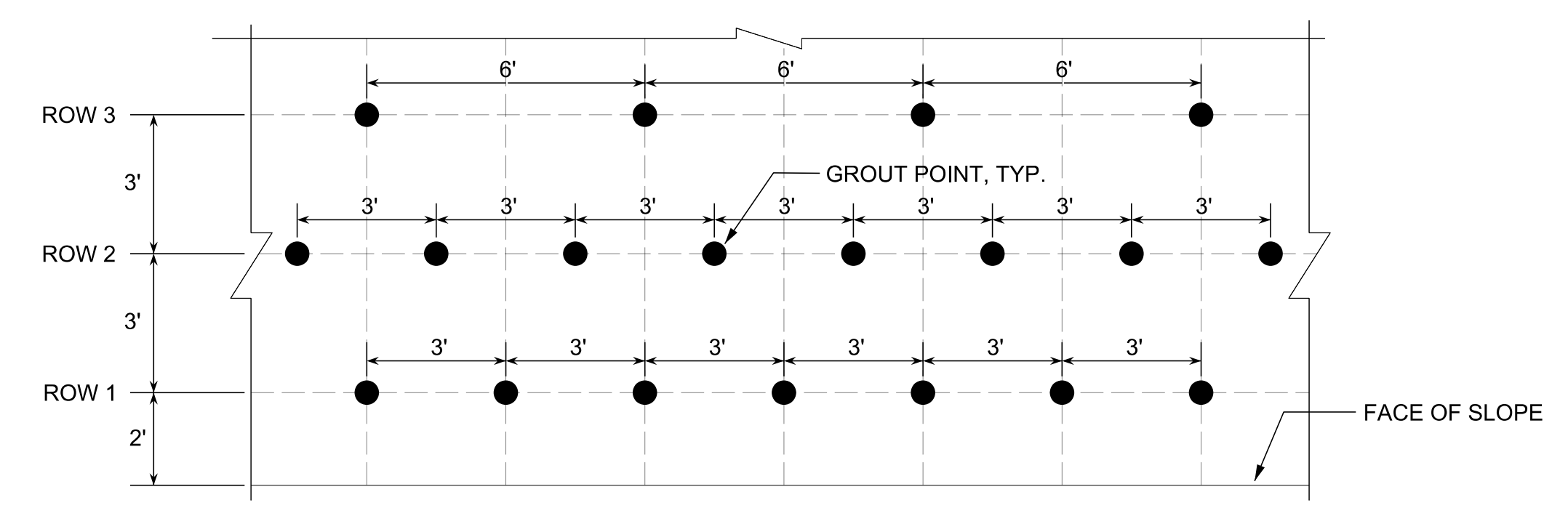
FOR PARTIALLY GROUTED ROCK FILL, SEE RETAINING WALLS SPECIAL PROVISION.

APPLY GROUT ON THE SLOPE FACE AND AT THE TOP OF EACH 3 FT LIFT OF ROCK FILL. APPLY 3 CUBIC FEET OF GROUT AT EACH GROUT POINT IN THE PATTERNS SHOWN ON PAGE 2. THE HIGHEST GROUT POINT WILL BE THE TOP OF THE ROCK EMBANKMENT.

USE PARTIALLY GROUTED ROCK FILL FROM TOE TO AT LEAST 2FT ABOVE THE 500-YR FLOOD ELEVATION.



PARTIALLY GROUTED ROCK FILL - TOE KEY DETAIL



PARTIALLY GROUTED ROCK FILL - PLAN VIEW GROUT POINTS
 VIEW FROM FRONT TOP

PARTIALLY GROUTED ROCK FILL DETAILS

PROJECT NO.: W03293

POLK COUNTY

SITE 942 STATION: -L943-942- STA. 15+50.00 TO 23+62.00, RT

SITE 939/938 STATION: -L941-937- STA. 18+70.00 TO 23+50.00, RT

SITE 937 STATION: -L941-937- STA. 23+50.00 TO 29+00.00, RT

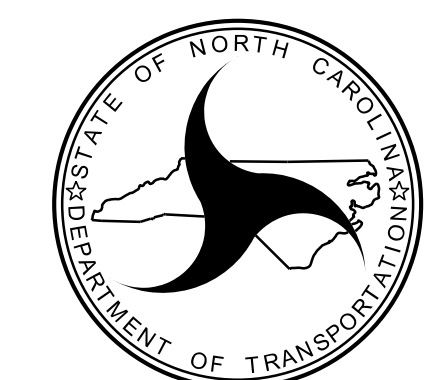
SITE 936 STATION: -L936- STA. 14+00.00 TO 18+00.00, RT

SHEET 5 OF 6

PREPARED BY: KND	DATE: 10/25
REVIEWED BY: REK	DATE: 10/25

Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP
 1805 SARDIS ROAD NORTH
 SUITE 100
 CHARLOTTE, NC 28270
 (980) 339-8684



NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS


GEOTECHNICAL ENGINEERING UNIT

PARTIALLY GROUTED ROCK FILL NOTES & DETAILS					
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	KND	05/26	3		
2			4		

SHEET NO. W-24

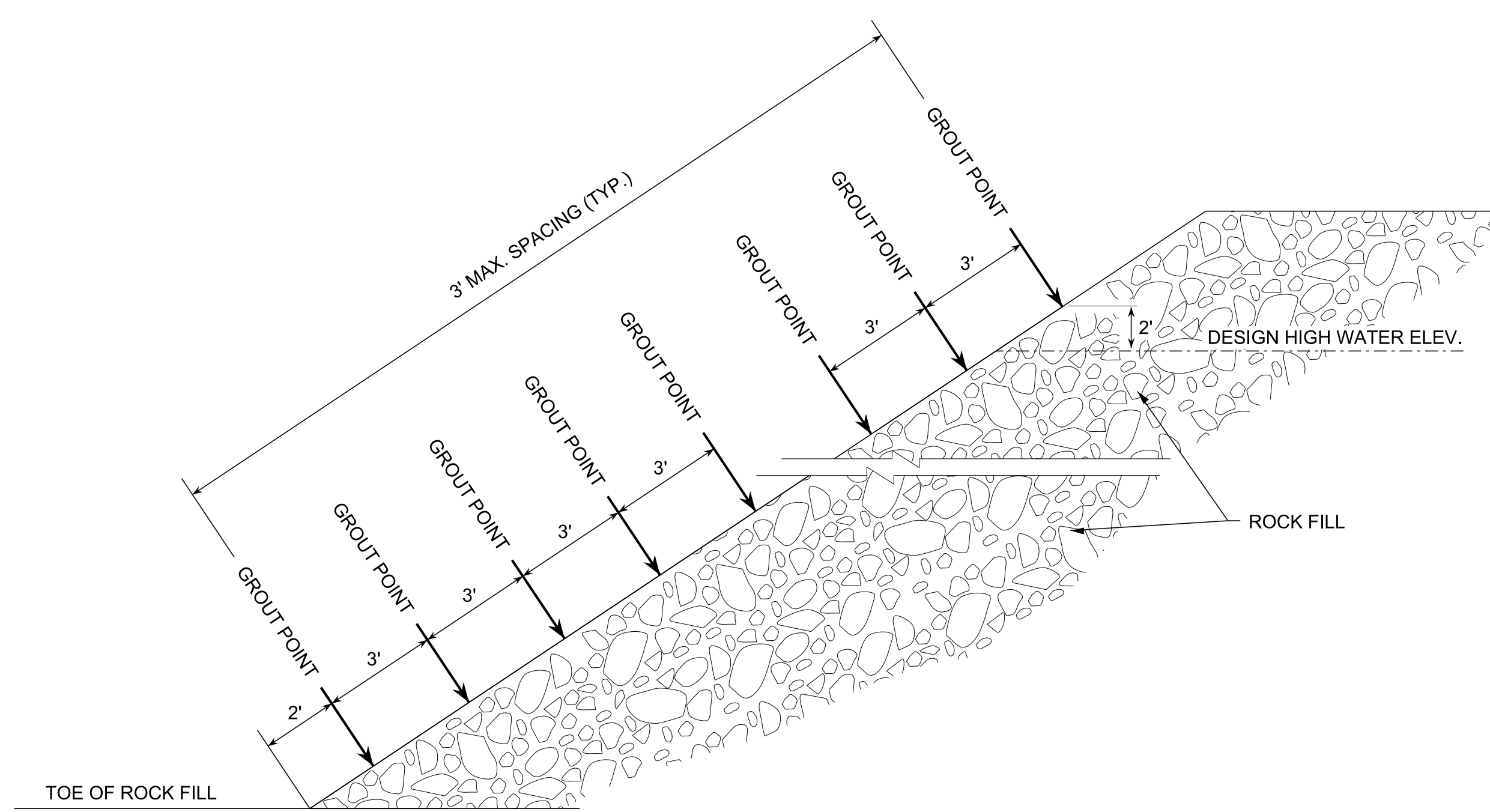
GEOTECHNICAL ENGINEER

ENGINEER

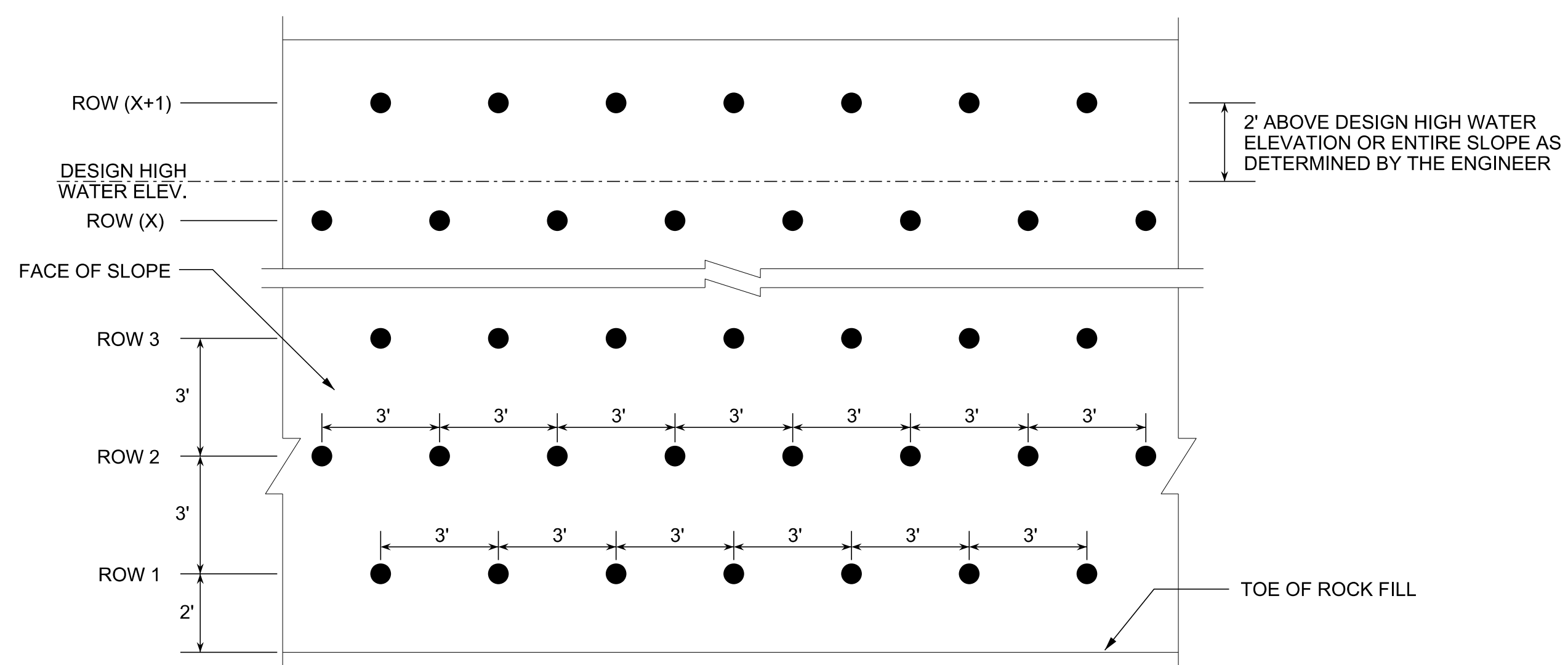


Signed by: Robert E. Kral
 AAF88FF73CE4B1
 05/19/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

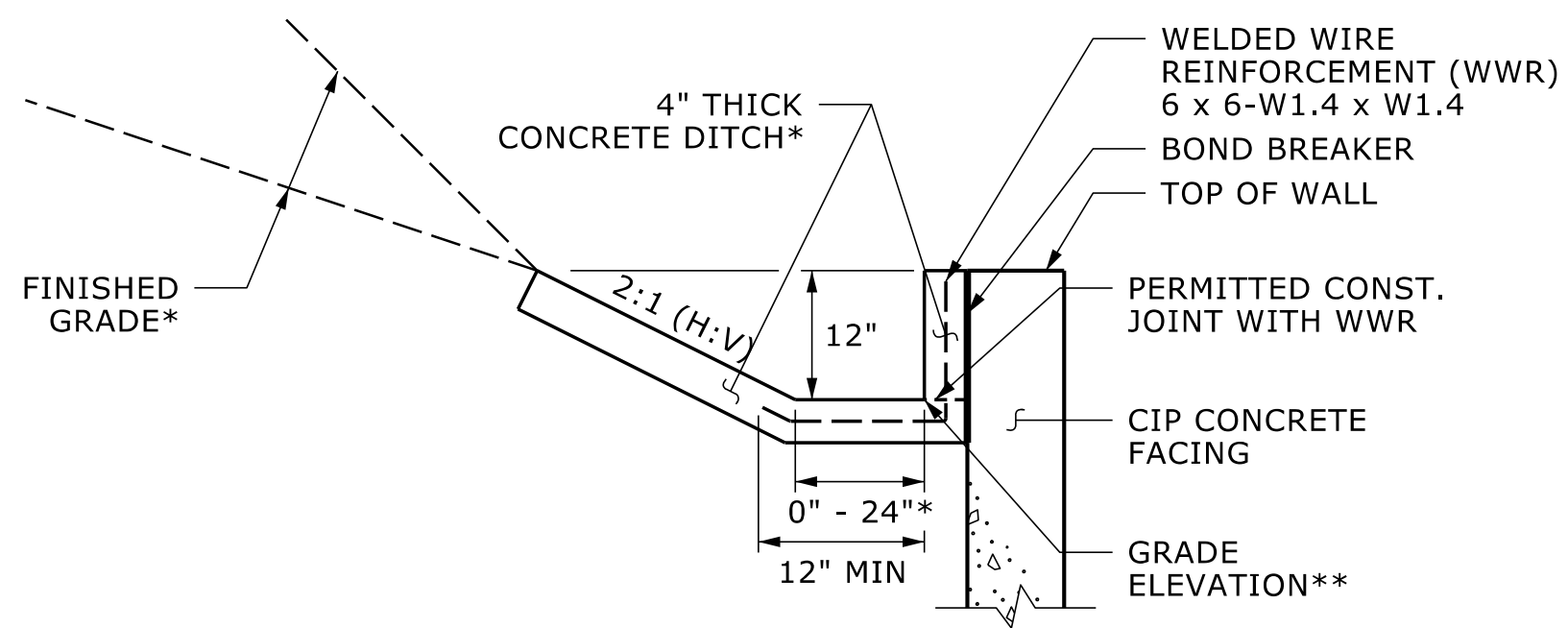


PARTIALLY GROUTED ROCK FILL - SLOPE FACE DETAIL



PARTIALLY GROUTED ROCK FILL - SLOPE FACE GROUT POINTS
 VIEW FROM FRONT SLOPE FACE

PARTIALLY GROUTED ROCK FILL DETAILS



CONCRETE DITCH BEHIND WALL WITH CONCRETE FACING

*SEE ROADWAY PLANS FOR CONCRETE DITCH AND FINISHED GRADE DETAILS.
 **SEE WALL ENVELOPE SHEET AND TABLE ON SHEET W-1 FOR GRADE ELEVATIONS.

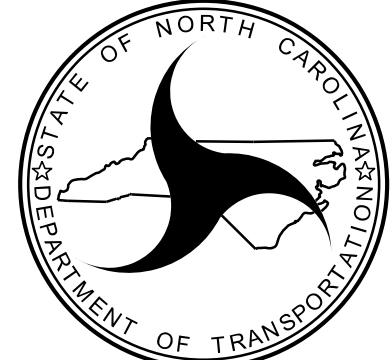
PROJECT NO.: W03293
 POLK COUNTY
 SITE 942 STATION: -L943-942- STA. 15+50.00 TO 23+62.00, RT
 SITE 939/938 STATION: -L941-937- STA. 18+70.00 TO 23+50.00, RT
 SITE 937 STATION: -L941-937- STA. 23+50.00 TO 29+00.00, RT
 SITE 936 STATION: -L936- STA. 14+00.00 TO 18+00.00, RT
 SHEET 6 OF 6

PREPARED BY: KND	DATE: 10/25
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REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-25
2			4			