

REFERENCE: BR-0126

PROJECT: 67126

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

**STRUCTURE
SUBSURFACE INVESTIGATION**

COUNTY WILKES
PROJECT DESCRIPTION REPLACE BRIDGE #0667
ON SR 1749 (AUSTIN TRAPHILL RD.)
OVER SPARKS CREEK

CONTENTS

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2A	SUPPLEMENTAL LEGEND (GSI)
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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0126	1	14

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE. INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

C.D. JOHNSON

D.O. CHEEK

C.J. COFFEY

INVESTIGATED BY D.M. MULLEN

DRAWN BY DMM

CHECKED BY JCK

SUBMITTED BY JCK

DATE _____



DocuSigned by: D Matt Mullen 12/31/2019

18909BD3CDB940C... SIGNATURE DATE

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

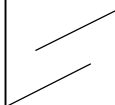

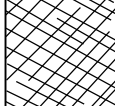
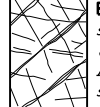



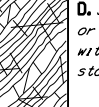

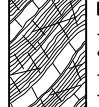


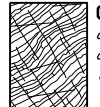

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

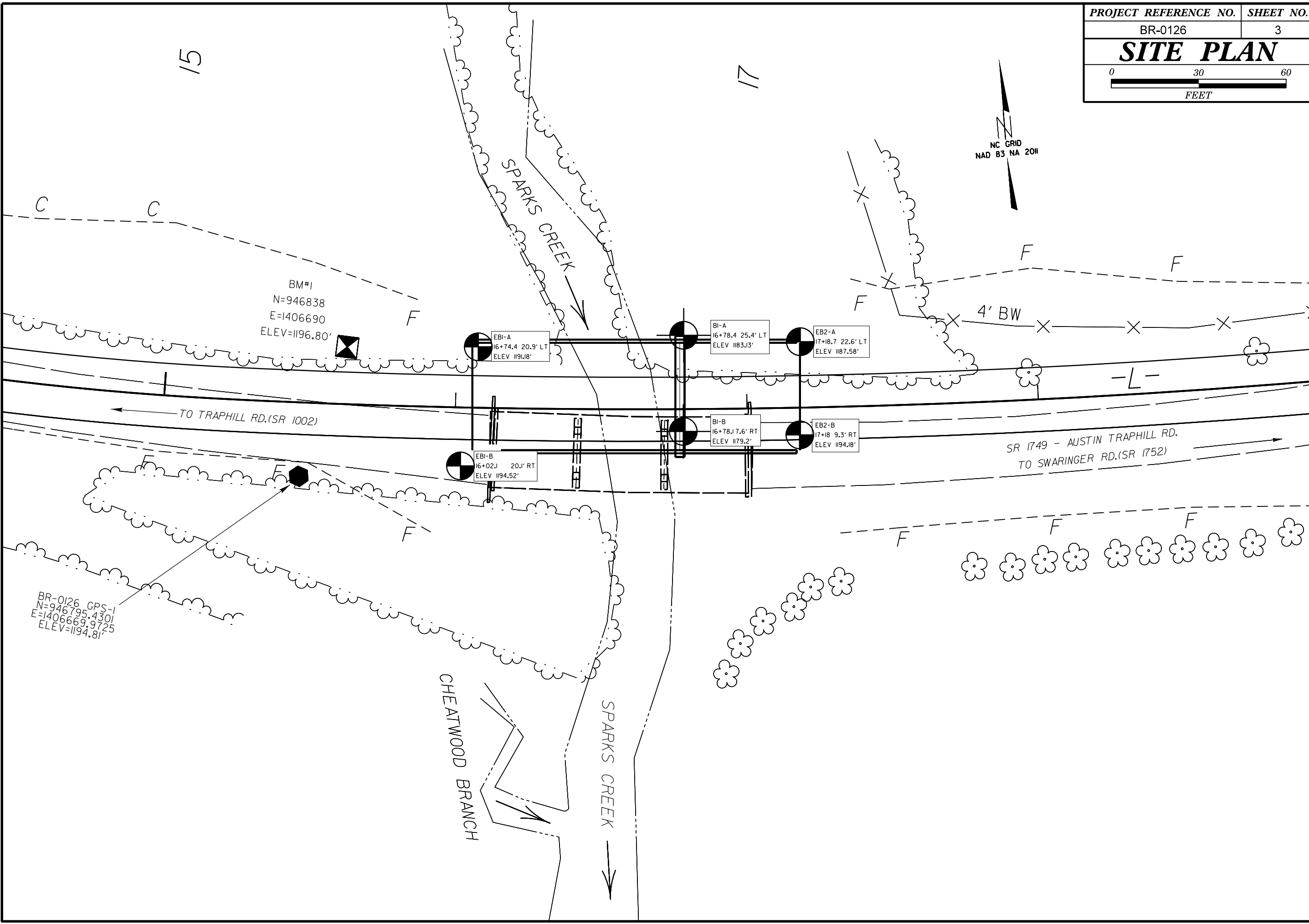
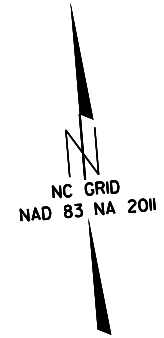
SUBSURFACE INVESTIGATION

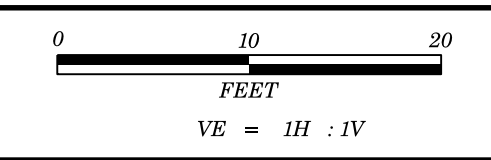
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

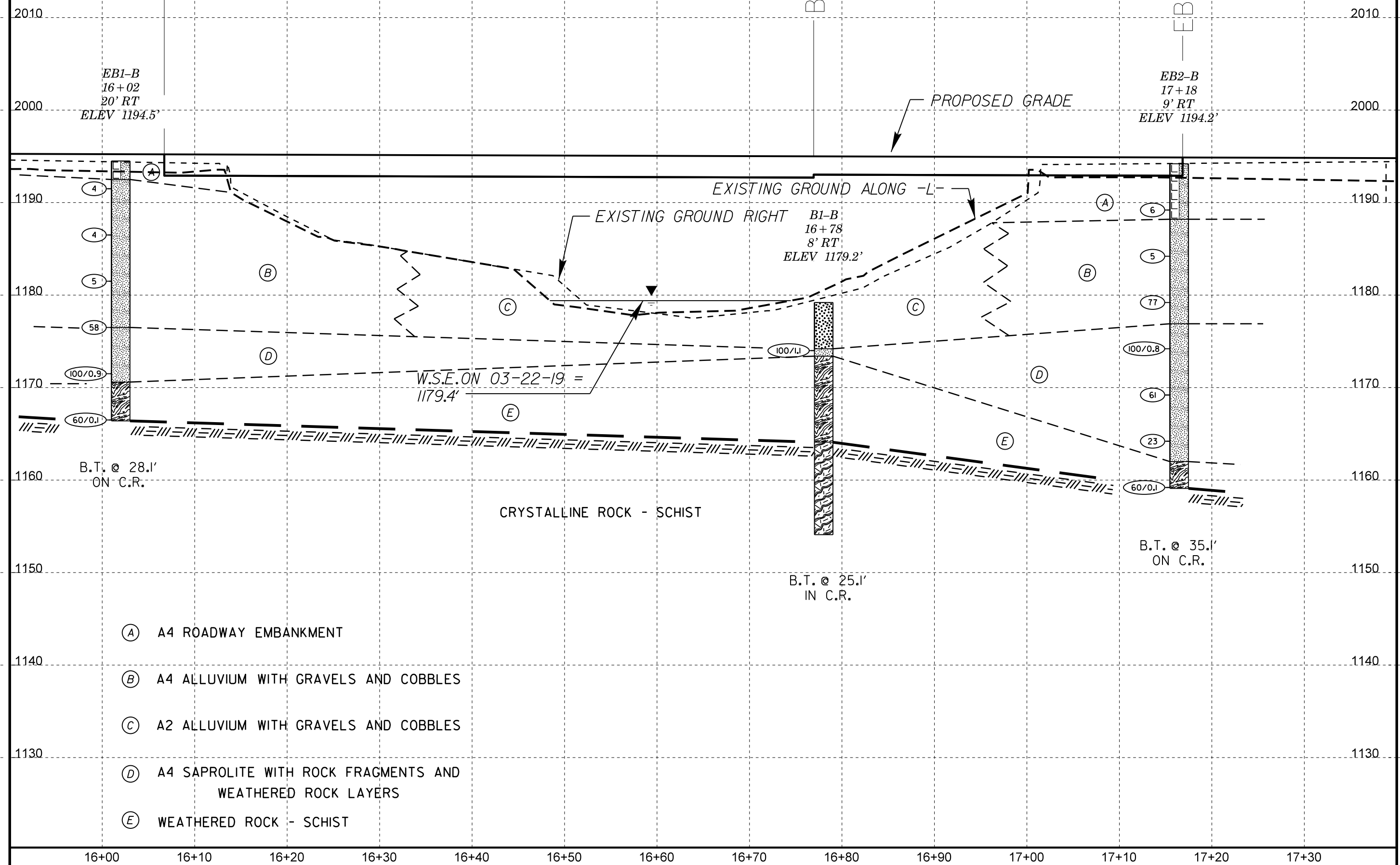
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE							
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70					
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80	70					B. Sandstone with thin inter-layers of siltstone	60					
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		60	50				C. Sandstone and siltstone in similar amounts		50				
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40				D. Siltstone or silty shale with sandstone layers			40			
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces				30			E. Weak siltstone or clayey shale with sandstone layers				30		
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			20		F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure					20	
						10		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers						10
								H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.						
							→ Means deformation after tectonic disturbance							



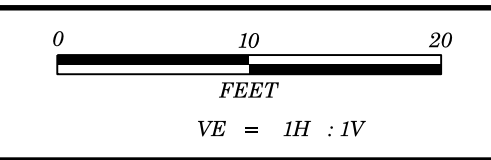


PROJECT REFERENCE NO.	SHEET NO.
BR-0126	4
PROFILE ALONG -L-	

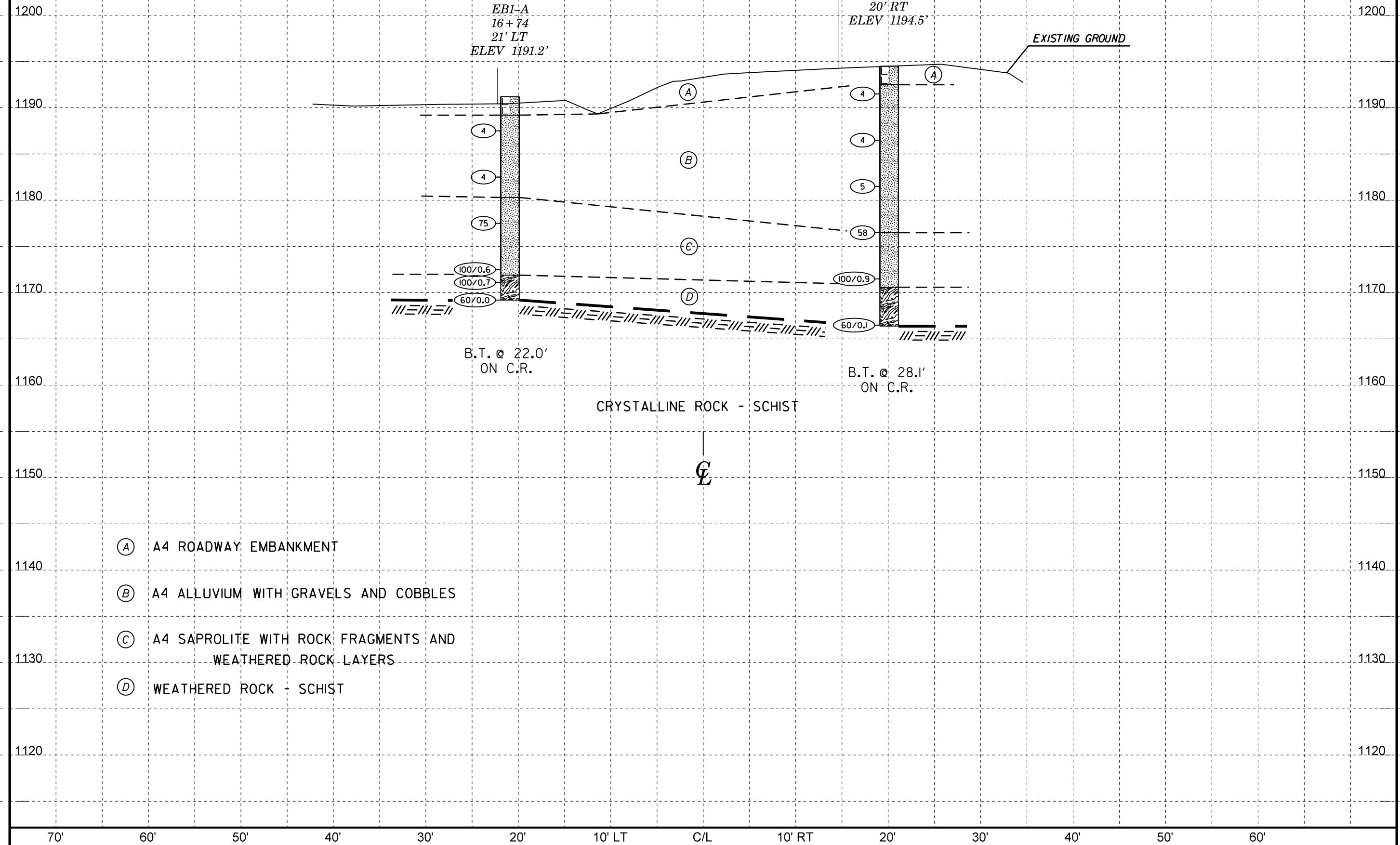
SKEW = 90 DEG.

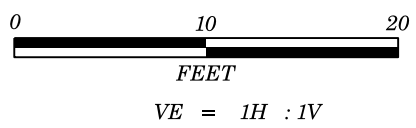


- (A) A4 ROADWAY EMBANKMENT
- (B) A4 ALLUVIUM WITH GRAVELS AND COBBLES
- (C) A2 ALLUVIUM WITH GRAVELS AND COBBLES
- (D) A4 SAPROLITE WITH ROCK FRAGMENTS AND WEATHERED ROCK LAYERS
- (E) WEATHERED ROCK - SCHIST

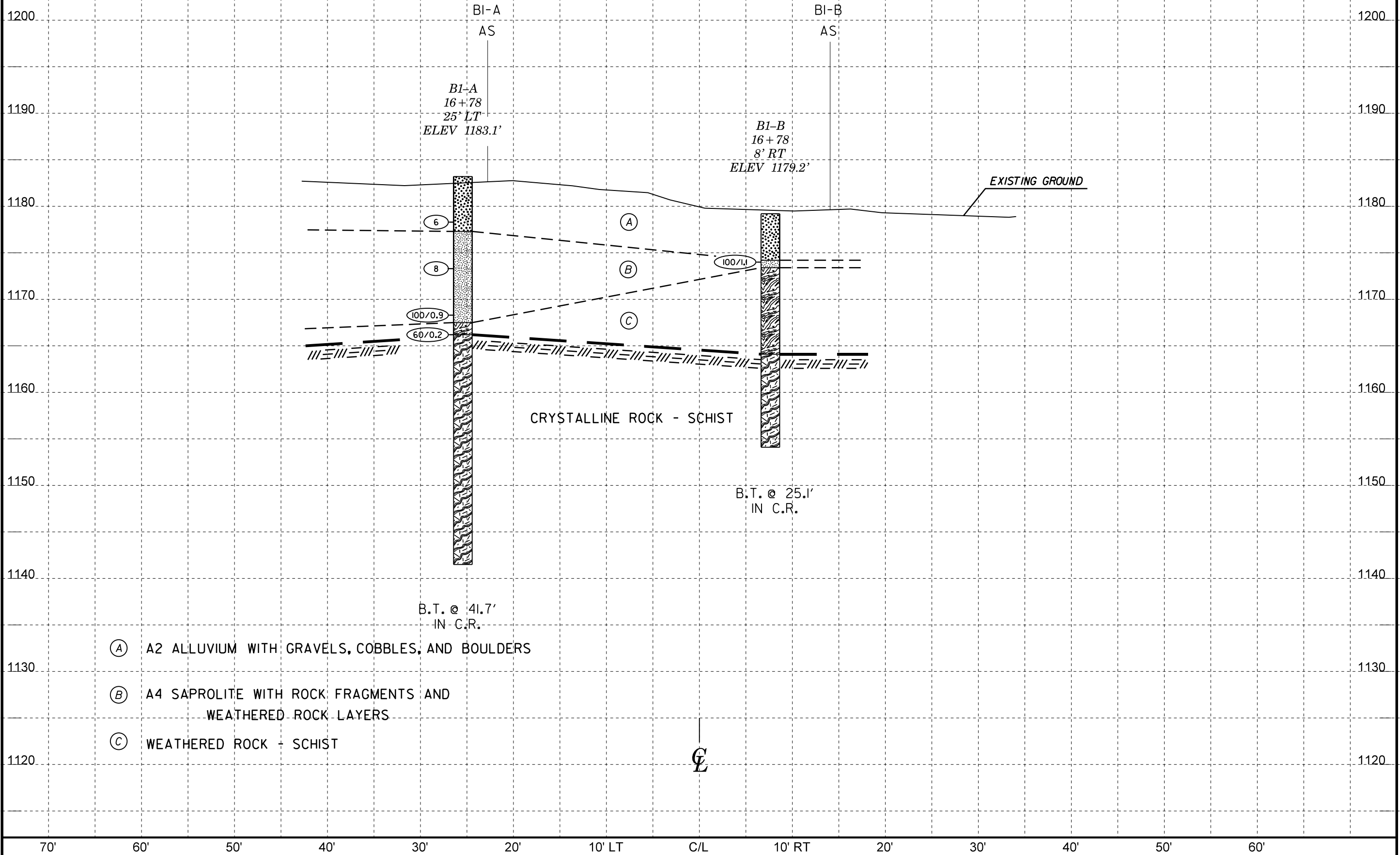


PROJECT REFERENCE NO.	SHEET NO.
BR-0126	5
CROSS SECTION ALONG END BENT 1	
SKEW = 90 DEG.	



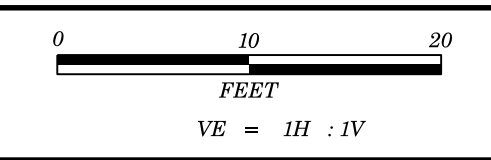


PROJECT REFERENCE NO.	SHEET NO.
BR-0126	6
CROSS SECTION ALONG INTERIOR BENT 1	
SKEW = 90 DEG.	

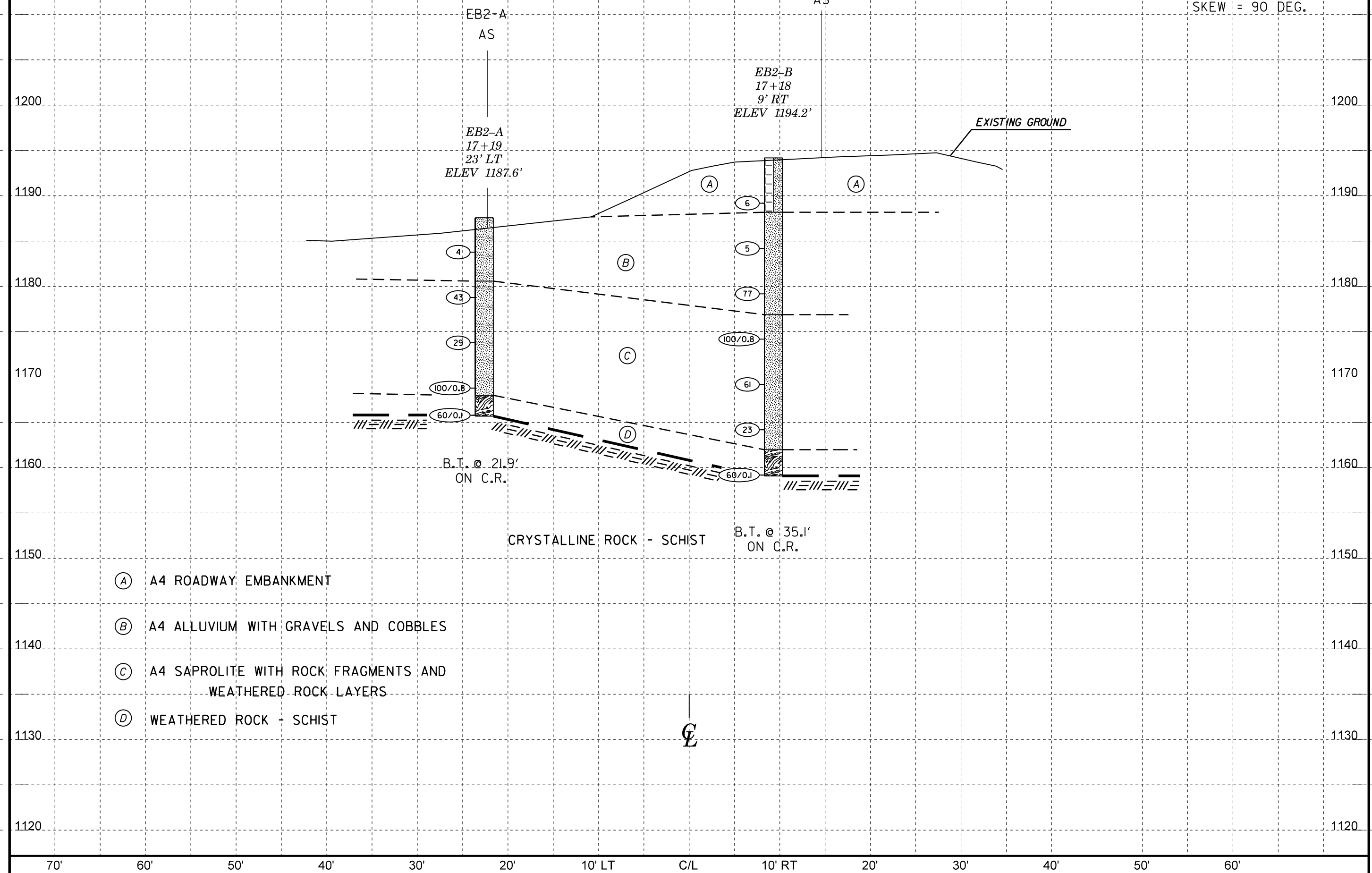


- (A) A2 ALLUVIUM WITH GRAVELS, COBBLES, AND BOULDERS
- (B) A4 SAPROLITE WITH ROCK FRAGMENTS AND WEATHERED ROCK LAYERS
- (C) WEATHERED ROCK - SCHIST





PROJECT REFERENCE NO.	SHEET NO.
BR-0126	7
CROSS SECTION ALONG END BENT 2	
SKEW = 90 DEG.	



- (A) A4 ROADWAY EMBANKMENT
- (B) A4 ALLUVIUM WITH GRAVELS AND COBBLES
- (C) A4 SAPROLITE WITH ROCK FRAGMENTS AND WEATHERED ROCK LAYERS
- (D) WEATHERED ROCK - SCHIST

CRYSTALLINE ROCK - SCHIST

B.T. @ 21.9'
ON C.R.

B.T. @ 35.1'
ON C.R.

70' 60' 50' 40' 30' 20' 10' LT C/L 10' RT 20' 30' 40' 50' 60'

GEOTECHNICAL BORING REPORT

BORE LOG

WBS BR-0126		TIP 67126.1.1		COUNTY WILKES		GEOLOGIST Johnson, C. D.										
SITE DESCRIPTION Replace Wilkes bridge #0667 on SR - 1749 (Austin Traphill Rd.) over Sparks Creek							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 16+74		OFFSET 21 ft LT		ALIGNMENT L										
COLLAR ELEV. 1,191.2 ft		TOTAL DEPTH 22.0 ft		NORTHING 946,835		EASTING 1,406,735										
DRILL RIG/HAMMER EFF./DATE AFC6744 CME - 45C 96%/04/08/2019			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER Cheek, D. O.		START DATE 12/12/19		COMP. DATE 12/12/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
1195																
															1,191.2	GROUND SURFACE 0.0
															1,189.2	ROADWAY EMBANKMENT 2.0 Brown, slightly micaceous, sandy silt with roots, leaves, sticks and a trace of clay
1190																
	1,187.5	3.7	2	2	2											
1185																
	1,182.5	8.7	1	2	2											
1180																
	1,177.5	13.7	15	39	36											
1175																
	1,172.5	18.7														
	1,171.1	20.1	53	47/0.1												
1170																
	1,169.2	22.0	61	39/0.2												
			60/0.0													
															1,180.3	SAPROLITE 10.9 Brown, slightly micaceous, coarse sandy silt with cobbles at 10.8
															1,171.9	WEATHERED ROCK 19.3 Brown to white, micaceous, sandy silt with a few rock fragments and stiff layers
															1,171.9	WEATHERED ROCK 19.3 Weathered rock - brown schist
															1,169.2	CRYSTALLINE ROCK 22.0 Crystalline rock - brown schist Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,169.2 ft ON C.R.

WBS BR-0126		TIP 67126.1.1		COUNTY WILKES		GEOLOGIST Johnson, C. D.										
SITE DESCRIPTION Replace Wilkes bridge #0667 on SR - 1749 (Austin Traphill Rd.) over Sparks Creek							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 16+02		OFFSET 20 ft RT		ALIGNMENT L										
COLLAR ELEV. 1,194.5 ft		TOTAL DEPTH 28.1 ft		NORTHING 946,794		EASTING 1,406,726										
DRILL RIG/HAMMER EFF./DATE AFC6744 CME - 45C 96%/04/08/2019			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER Cheek, D. O.		START DATE 12/17/19		COMP. DATE 12/14/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
1195																
															1,194.5	GROUND SURFACE 0.0
															1,192.5	ROADWAY EMBANKMENT 2.0 Red, orange, slightly micaceous, clayey sandy silt with a few gravels
1190																
	1,191.5	3.0	2	2	2											
1185																
	1,186.5	8.0	2	2	2											
1180																
	1,181.5	13.0	1	2	3											
1175																
	1,176.5	18.0	59	36	22											
1170																
	1,171.5	23.0	21	79/04												
			60/0.1													
															1,170.6	WEATHERED ROCK 23.9 Weathered rock - schist
															1,170.6	WEATHERED ROCK 23.9 Weathered rock - schist
															1,166.4	CRYSTALLINE ROCK 28.1 Crystalline rock - schist Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,166.4 ft ON C.R.

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS BR-0126		TIP 67126.1.1		COUNTY WILKES		GEOLOGIST Johnson, C. D.										
SITE DESCRIPTION Replace Wilkes bridge #0667 on SR - 1749 (Austin Traphill Rd.) over Sparks Creek							GROUND WTR (ft)									
BORING NO. B1-A		STATION 16+78		OFFSET 25 ft LT		ALIGNMENT L										
COLLAR ELEV. 1,183.1 ft		TOTAL DEPTH 41.7 ft		NORTHING 946,833		EASTING 1,406,806										
DRILL RIGHAMMER EFF./DATE AFC6744 CME - 45C 96% 04/08/2019			DRILL METHOD NW Casing WSPT & Core			HAMMER TYPE Automatic										
DRILLER Cheek, D. O.		START DATE 12/15/19		COMP. DATE 12/15/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
1185														1,183.1	GROUND SURFACE	0.0
1180	1,178.2	4.9	4	3	3									1,177.2	ALLUVIAL Fine to coarse sand	5.9
1175	1,173.2	9.9	2	3	5									1,167.4	SAPROLITE Brown, tan, micaceous, fine, sandy silt harder drilling at 12.7	15.7
1170	1,168.2	14.9	48	52/3										1,166.1	WEATHERED ROCK Weathered rock - Schist	17.0
1165	1,166.1	17.0	60/02												CRYSTALLINE ROCK Crystalline rock - Schist	
1160																
1155																
1150																
1145																
														1,141.4	Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,141.4 ft IN C.R.	41.7

WBS BR-0126		TIP 67126.1.1		COUNTY WILKES		GEOLOGIST Johnson, C. D.					
SITE DESCRIPTION Replace Wilkes bridge #0667 on SR - 1749 (Austin Traphill Rd.) over Sparks Creek							GROUND WTR (ft)				
BORING NO. B1-A		STATION 16+78		OFFSET 25 ft LT		ALIGNMENT L					
COLLAR ELEV. 1,183.1 ft		TOTAL DEPTH 41.7 ft		NORTHING 946,833		EASTING 1,406,806					
DRILL RIGHAMMER EFF./DATE AFC6744 CME - 45C 96% 04/08/2019			DRILL METHOD NW Casing WSPT & Core			HAMMER TYPE Automatic					
DRILLER Cheek, D. O.		START DATE 12/15/19		COMP. DATE 12/15/19		SURFACE WATER DEPTH N/A					
CORE SIZE		TOTAL RUN		RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (%)		RQD (%)	REC. (%)			
1166.1	1,166.1	17.0	4.7		(4.2) 89%	(2.0) 43%				Begin Coring @ 17.0 ft	17.0
1165	1,161.4	21.7				(2.0) 42%				CRYSTALLINE ROCK	
1160			5.0		(3.7) 74%	(1.7) 34%					
1155	1,156.4	26.7			(3.5) 70%	(1.6) 32%				17.02 - 18 GSI: 85 - 90 18 - 27.9 GSI: 40 - 50 27.9 - 39.02 GSI: 70 - 75	
1150	1,151.4	31.7			(5.0) 100%	(4.9) 98%					
1145	1,146.4	36.7			(4.2) 84%	(2.8) 56%					
	1,141.4	41.7								Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,141.4 ft IN C.R.	41.7

GEOTECHNICAL BORING REPORT

BORE LOG

WBS BR-0126		TIP 67126.1.1		COUNTY WILKES		GEOLOGIST Johnson, C. D.										
SITE DESCRIPTION Replace Wilkes bridge #0667 on SR - 1749 (Austin Traphill Rd.) over Sparks Creek							GROUND WTR (ft)									
BORING NO. EB2-A		STATION 17+19		OFFSET 23 ft LT		ALIGNMENT L										
COLLAR ELEV. 1,187.6 ft		TOTAL DEPTH 21.9 ft		NORTHING 946,827		EASTING 1,406,845										
DRILL RIGHAMMER EFF./DATE AFC6744 CME - 45C 96% 04/08/2019			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER Cheek, D. O.		START DATE 12/12/19		COMP. DATE 12/12/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
1190															1,187.6	0.0
1185	1,183.8	3.8	1	2	2										1,180.6	7.0
1180	1,178.8	8.8	9	22	21										1,168.0	19.6
1175	1,173.8	13.8	7	11	18										1,165.7	21.9
1170	1,168.8	18.8	26	74/0.3												
	1,165.8	21.8	60/0.1													

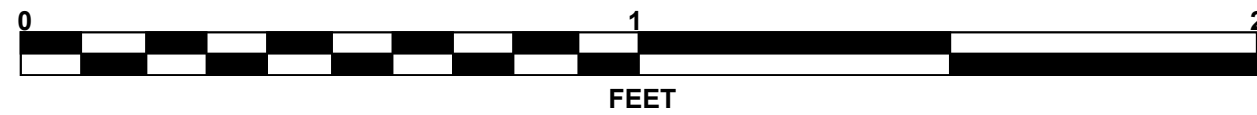
WBS BR-0126		TIP 67126.1.1		COUNTY WILKES		GEOLOGIST Johnson, C. D.										
SITE DESCRIPTION Replace Wilkes bridge #0667 on SR - 1749 (Austin Traphill Rd.) over Sparks Creek							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 17+18		OFFSET 9 ft RT		ALIGNMENT L										
COLLAR ELEV. 1,194.2 ft		TOTAL DEPTH 35.1 ft		NORTHING 946,795		EASTING 1,406,842										
DRILL RIGHAMMER EFF./DATE AFC6744 CME - 45C 96% 04/08/2019			DRILL METHOD NW Casing w/ SPT			HAMMER TYPE Automatic										
DRILLER Cheek, D. O.		START DATE 12/16/19		COMP. DATE 12/16/19		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
1195															1,194.2	0.0
1190	1,189.2	5.0	2	2	4										1,188.2	6.0
1185	1,184.2	10.0	1	2	3										1,176.9	17.3
1180	1,179.2	15.0	11	50	27										1,162.0	32.2
1175	1,174.2	20.0	57	43/0.3											1,159.1	35.1
1170	1,169.2	25.0	26	36	25											
1165	1,164.2	30.0	10	12	11											
1160	1,159.2	35.0	60/0.1													

NCDOT BORE DOUBLE BR-0126_GEO_BRDG_BORELOGS.GPJ NC_DOT_GDT 12/18/19

CORE PHOTOGRAPHS

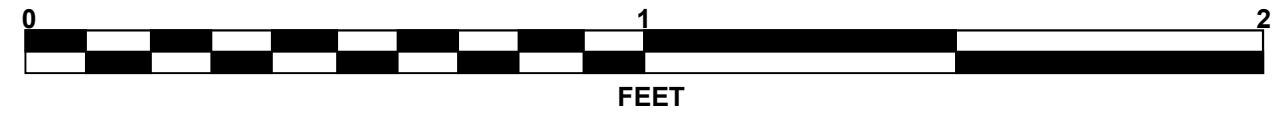
B1-A

BOX 1 OF 3: 17.02 - 27.9
17.02 - 18 GSI: 85 - 90
18 - 27.9 GSI: 40 - 50



B1-A

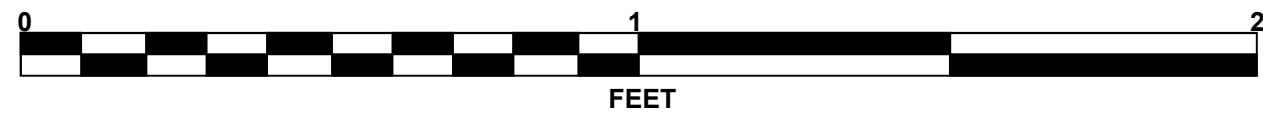
BOX 2 OF 3: 27.9 - 39.02 FEET
GSI: 70 - 75



CORE PHOTOGRAPHS

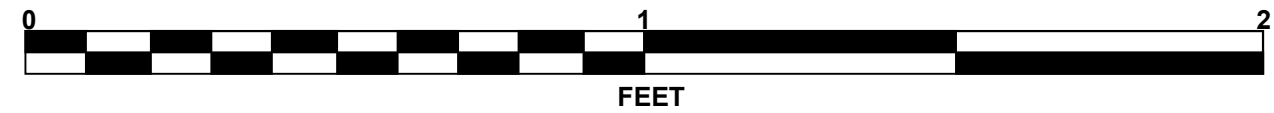
B1-A

BOX 3 OF 3: 39.02 - 41.72 FEET
GSI: 75 - 80



B1-B

BOX 1 OF 2: 5.8 - 22.8 FEET
GSI 40 - 45



CORE PHOTOGRAPHS

B1-B
BOX 2 OF 2: 22.8 - 35.1 FEET
GSI: 50 - 60

