

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34542.1.1 R-3421A	1	14

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 34542.1.1 R-3421A F.A. PROJ. NHF-220(4)  
COUNTY RICHMOND  
PROJECT DESCRIPTION US-220 BYPASS FROM US-74 BYPASS WEST OF ROCKINGHAM AT SR 1109 INTERCHANGE TO 0.3 MILES SOUTH OF SR 1140  
SITE DESCRIPTION LEFT & RIGHT LANE BRIDGES OVER US-74 BUS. WEST COLLECTOR ON I-73/US-220 BYPASS BETWEEN SR 1244 AND US-74 BUS. (STA. 88+35.81 -I73- /27+16.54 -FLY-)

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**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. 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 1909 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU UN-PLACED 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 THIS 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.

PERSONNEL  
C.C. MURRAY

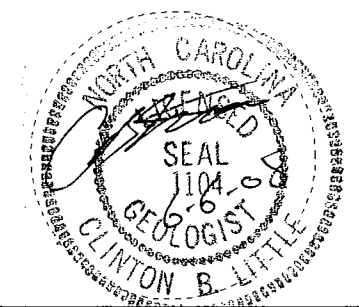
J.E. ESTEP

INVESTIGATED BY C.C. MURRAY

CHECKED BY C.B. LITTLE

SUBMITTED BY C.B. LITTLE

DATE MAY 2008



**PROJECT: 34542.1.1 ID: R-3421A**

DRAWN BY: J.K. McClURE /R.Q. CALLAWAY

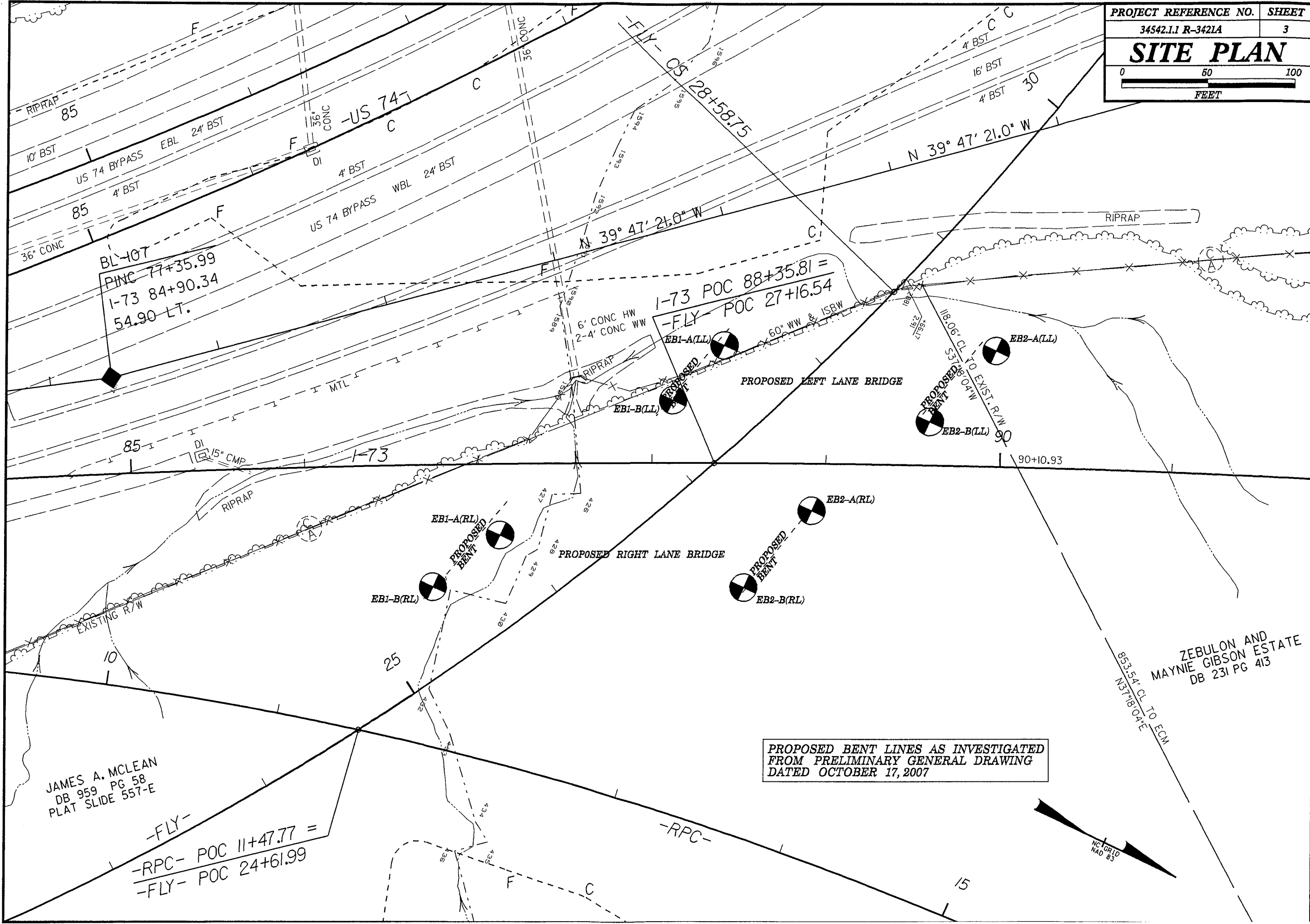
NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table with multiple columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSIBILITY, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, CONSISTENCY OR DENSITY, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, EQUIPMENT USED ON SUBJECT PROJECT, FRACTURE SPACING, BEDDING, INDURATION.

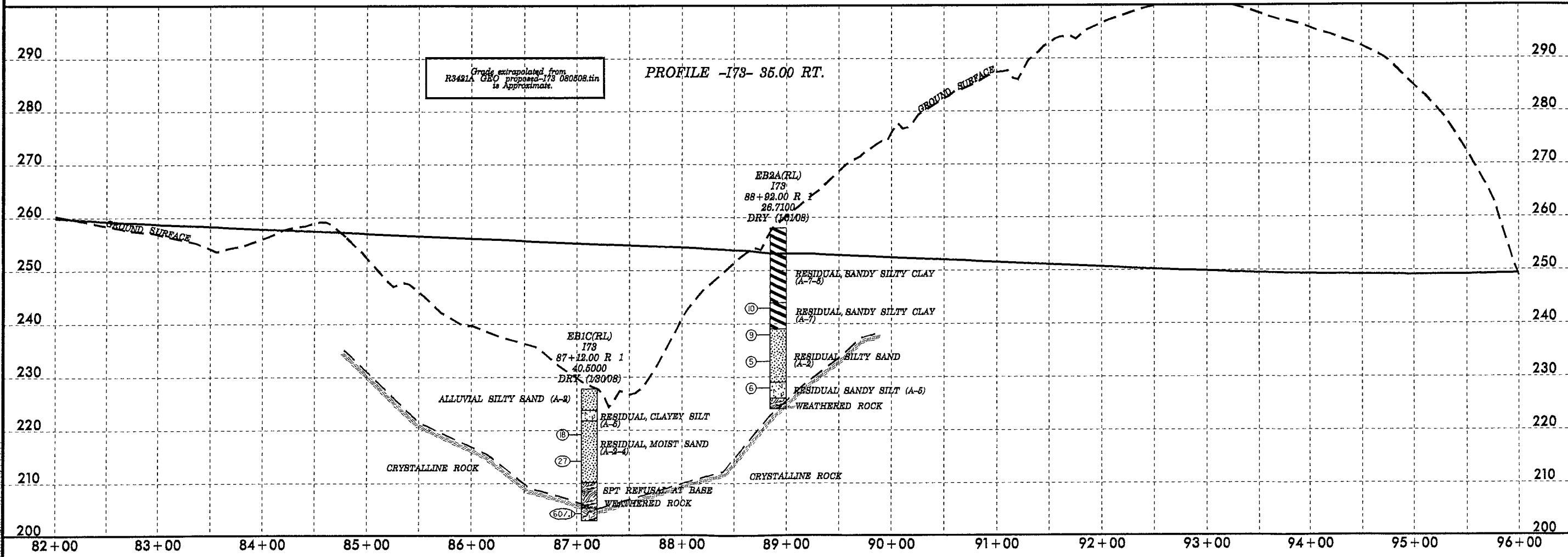
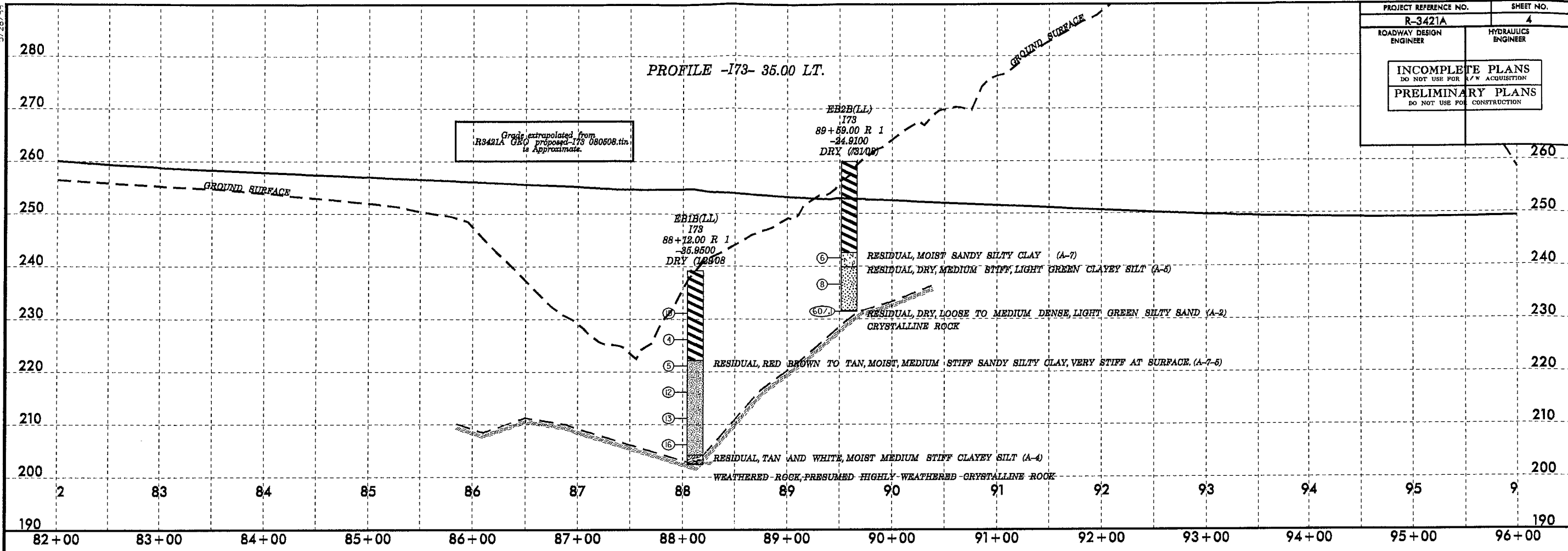


JAMES A. MCLEAN  
DB 959 PG 58  
PLAT SLIDE 557-E

ZEBULON AND  
MAYNIE GIBSON ESTATE  
DB 231 PG 413

PROPOSED BENT LINES AS INVESTIGATED  
FROM PRELIMINARY GENERAL DRAWING  
DATED OCTOBER 17, 2007

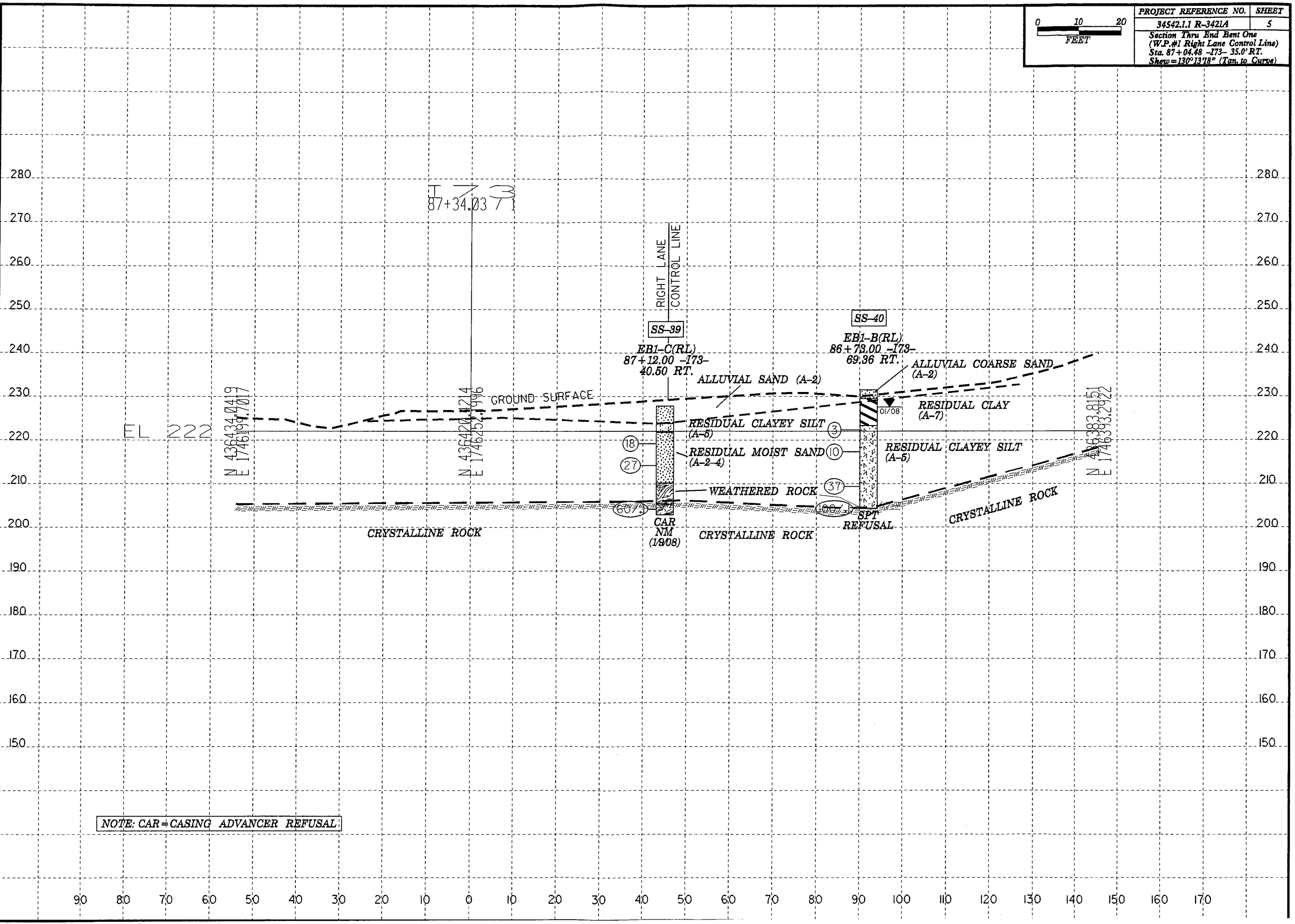
PROJECT REFERENCE NO.	SHEET NO.
R-3421A	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR A/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



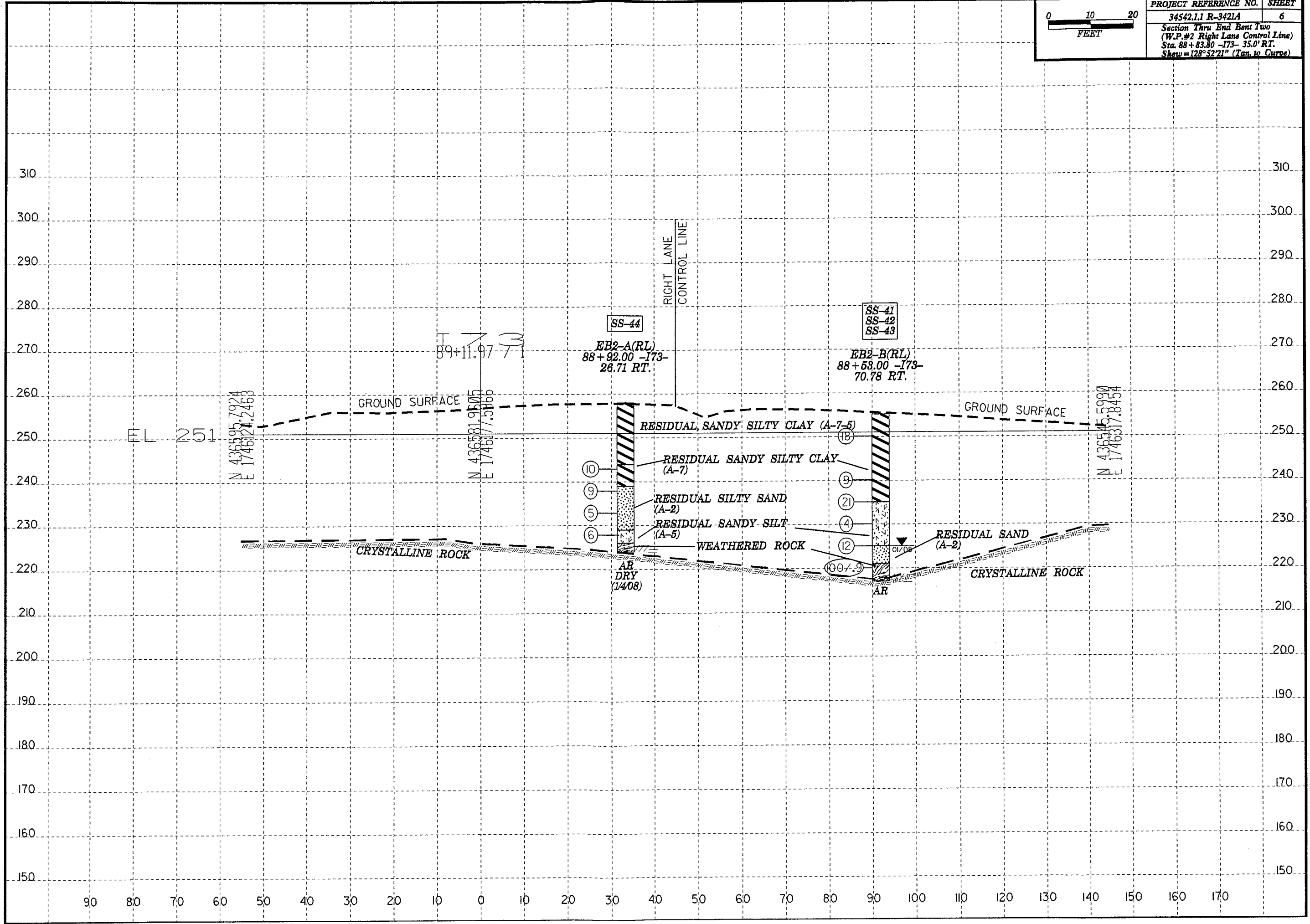
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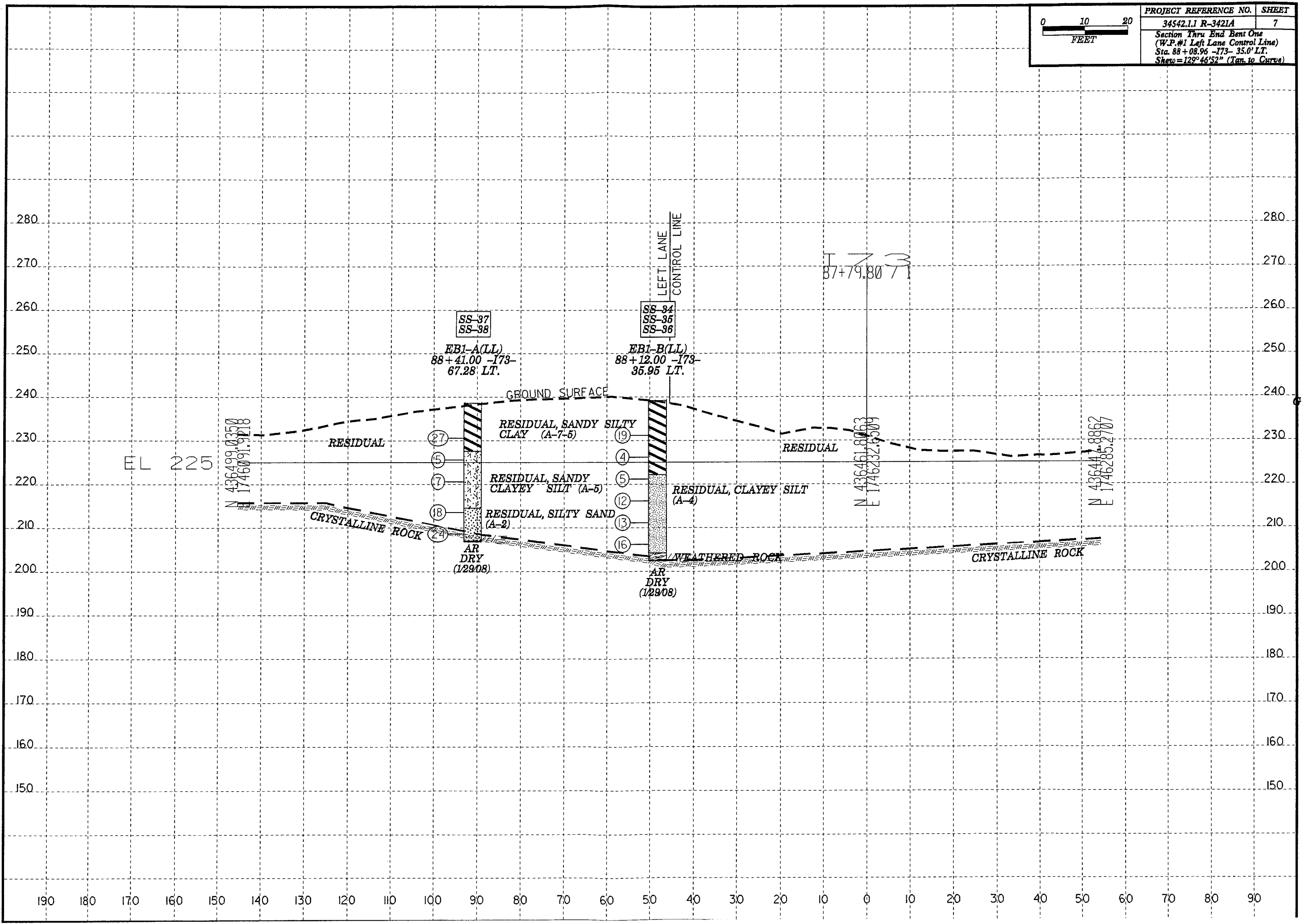


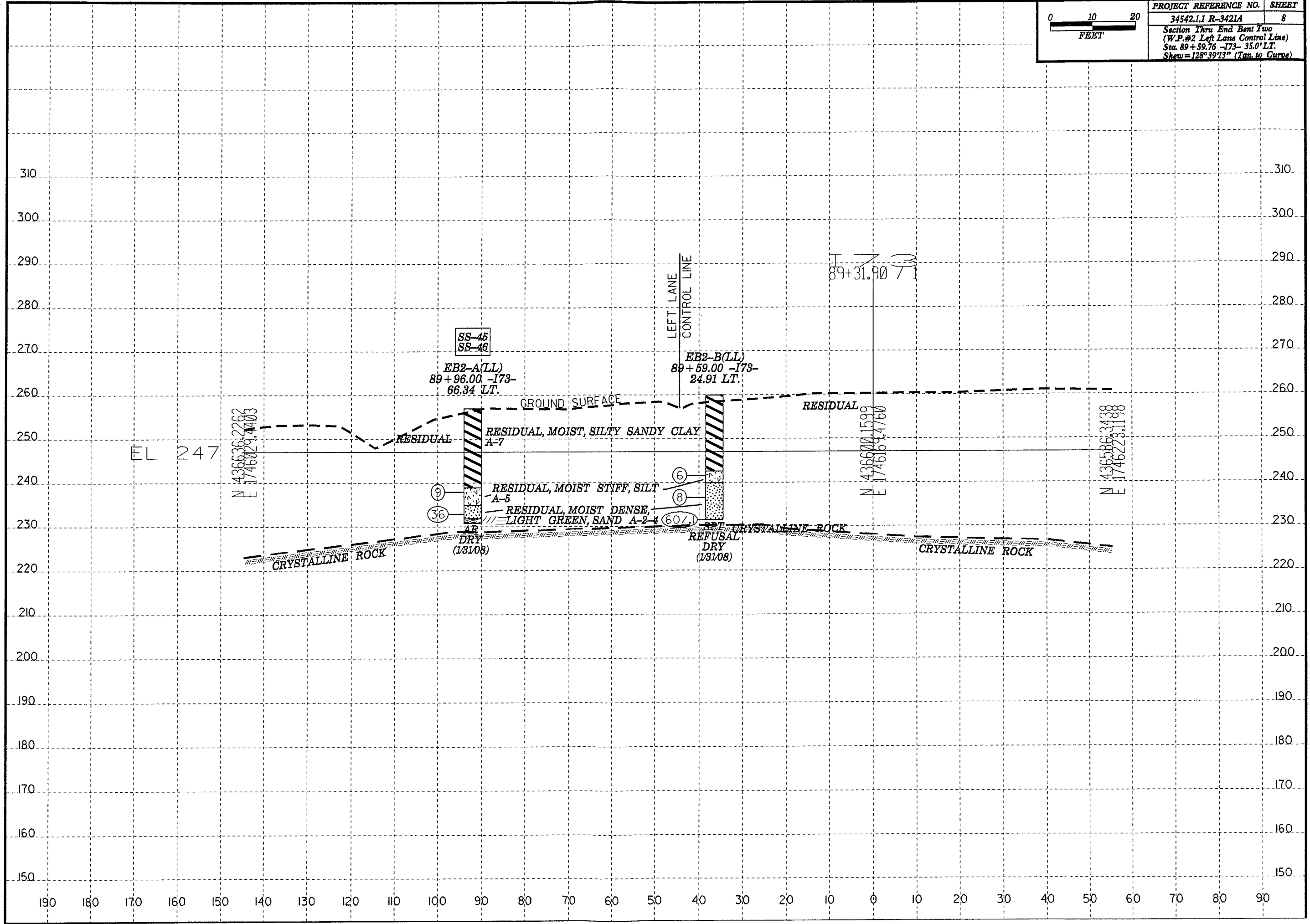
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NOTE: CAR = CASING ADVANCER REFUSAL

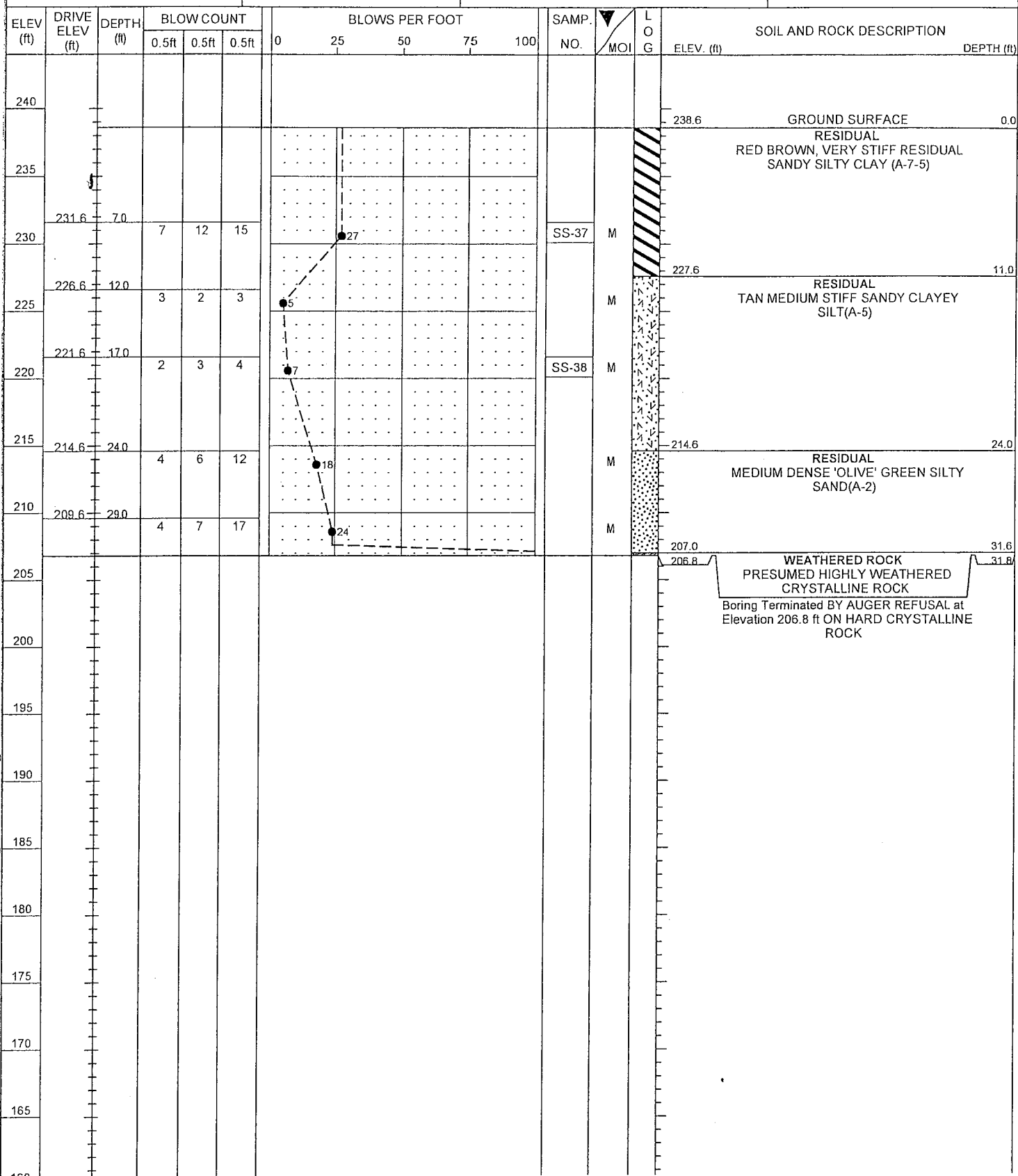




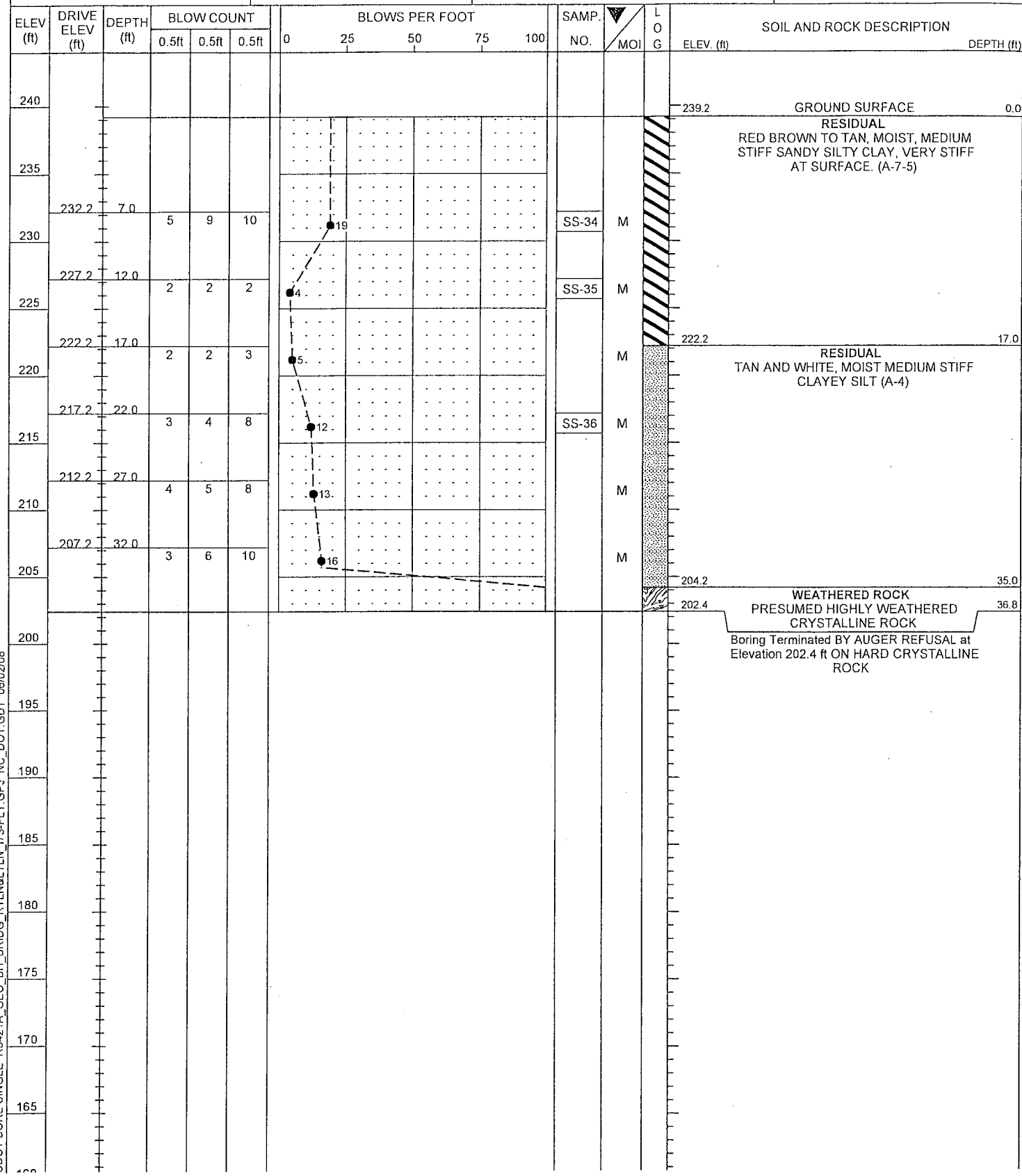




PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE I-73 OVER FLY			GROUND WTR (ft)
BORING NO. EB1A(LL)	STATION 88+41	OFFSET 67R LT	ALIGNMENT -I73-
COLLAR ELEV. 238.6 ft	TOTAL DEPTH 31.8 ft	NORTHING 436,489	EASTING 1,746,146
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 01/29/08	COMP. DATE 01/29/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 31.8 ft



PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE I-73 OVER FLY			GROUND WTR (ft)
BORING NO. EB1B(LL)	STATION 88+12	OFFSET 36ft LT	ALIGNMENT -I73-
COLLAR ELEV. 239.2 ft	TOTAL DEPTH 36.8 ft	NORTHING 436,476	EASTING 1,746,186
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 01/29/08	COMP. DATE 01/29/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 36.8 ft



CDOT BORE SINGLE R3421A\_GEO\_BH\_BRIDG\_RTLN&LTLN\_I73-FLY.GPJ\_NC\_DOT.GDT\_06/02/08

CDOT BORE SINGLE R3421A\_GEO\_BH\_BRIDG\_RTLN&LTLN\_I73-FLY.GPJ\_NC\_DOT.GDT\_06/02/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE I-73 OVER FLY			GROUND WTR (ft)
BORING NO. EB2A(LL)	STATION 89+96	OFFSET 66ft LT	ALIGNMENT -I73-
COLLAR ELEV. 256.9 ft	TOTAL DEPTH 26.1 ft	NORTHING 436,632	EASTING 1,746,083
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 01/31/08	COMP. DATE 01/31/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 26.1 ft

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				
260													GROUND SURFACE	0.0
255													RESIDUAL MOIST, SILTY SANDY CLAY A-7	
240	238.9	18.0											RESIDUAL MOIST STIFF, SILT A-5	18.0
235	233.9	23.0	5	5	4						SS-45	M	RESIDUAL MOIST DENSE, LIGHT GREEN, SAND A-2-4	22.0
230			7	6	30						SS-46	M	WEATHERED ROCK PRESUMED HIGHLY WEATHERED CRYSTALLINE ROCK	25.0
230													Boring Terminated BY AUGER REFUSAL at Elevation 230.8 ft ON HARD CRYSTALLINE ROCK	26.1

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRIDG\_RTLN&LTLN\_I73-FLY.GPJ\_NC\_DOT.GDT\_06/02/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE I-73 OVER FLY			GROUND WTR (ft)
BORING NO. EB2B(LL)	STATION 89+59	OFFSET 25ft LT	ALIGNMENT -I73-
COLLAR ELEV. 259.9 ft	TOTAL DEPTH 28.4 ft	NORTHING 436,615	EASTING 1,746,136
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 01/31/08	COMP. DATE 01/31/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 28.3 ft

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				
260													GROUND SURFACE	0.0
255													RESIDUAL MOIST SANDY SILTY CLAY (A-7)	
240	242.6	17.3	2	3	3							M	RESIDUAL DRY, MEDIUM STIFF, LIGHT GREEN CLAYEY SILT (A-5)	17.3
235	237.6	22.3	4	4	4							M	RESIDUAL DRY, LOOSE TO MEDIUM DENSE, LIGHT GREEN SILTY SAND (A-2)	20.0
230	232.6	27.3	2	33	60/1							M	CRYSTALLINE ROCK	28.3
230													Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 231.5 ft IN HARD CRYSTALLINE ROCK	28.4

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRIDG\_RTLN&LTLN\_I73-FLY.GPJ\_NC\_DOT.GDT\_06/02/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE I-73 OVER FLY			GROUND WTR (ft)
BORING NO. EB1B(RL)	STATION 86+73	OFFSET 69ft RT	ALIGNMENT -I-73-
COLLAR ELEV. 231.5 ft	TOTAL DEPTH 27.2 ft	NORTHING 436,396	EASTING 1,746,341
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic	
START DATE 01/30/08	COMP. DATE 01/30/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 27.2 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
235													GROUND SURFACE	0.0
230													ALLUVIAL GRAY LOOSE COARSE SAND (A-2)	2.0
225													RESIDUAL STIFF, MOIST, RED BROWN CLAY (A-7)	
220	223.3	8.2	0	1	2						SS-40	M	RESIDUAL STIFF MOIST RED BROWN CLAYEY SILT (A-5)	8.2
215	218.3	13.2	4	5	5							M		
210	210.4	21.1	6	15	22							M		
205	205.4	26.1	7	58	100/1							M		
200													WEATHERED ROCK PRESUMED SEVERELY WEATHERED CRYSTALLINE ROCK	27.1
195													Boring Terminated with Standard Penetration Test Refusal at Elevation 204.3 ft ON HARD CRYSTALLINE ROCK	27.2

CDDT BORE SINGLE R3421A\_GEO\_BH\_BRIDG\_RTIN&LTIN\_I73-FLY.GPJ\_NC\_DOT.GDT\_06/02/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE I-73 OVER FLY			GROUND WTR (ft)
BORING NO. EB1C(RL)	STATION 87+12	OFFSET 41ft RT	ALIGNMENT -I-73-
COLLAR ELEV. 227.8 ft	TOTAL DEPTH 24.9 ft	NORTHING 436,418	EASTING 1,746,298
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic	
START DATE 01/30/08	COMP. DATE 01/30/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 22.5 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
230													GROUND SURFACE	0.0
225													ALLUVIAL LOOSE MOIST CLAYEY SILTY SAND (A-2)	4.0
220	220.2	7.6	8	9	9						SS-39	M	RESIDUAL MEDIUM STIFF, MOIST, CLAYEY SILT (A-5)	6.0
215	215.2	12.6	6	12	15							M	RESIDUAL MEDIUM DENSE, MOIST SAND (A-2-4)	
210														
205	205.2	22.6	80	60/1								M	WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK, SPT REFUSAL AT BASE	17.6
200													CRYSTALLINE ROCK	22.5
195													Boring Terminated WITH CASING ADVANCER REFUSAL at Elevation 202.9 ft IN HARD CRYSTALLINE ROCK	24.9

CDDT BORE SINGLE R3421A\_GEO\_BH\_BRIDG\_RTIN&LTIN\_I73-FLY.GPJ\_NC\_DOT.GDT\_06/02/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE I-73 OVER FLY			GROUND WTR (ft)
BORING NO. EB2B(RL)	STATION 88+53	OFFSET 71ft RT	ALIGNMENT -I-73-
COLLAR ELEV. 255.1 ft	TOTAL DEPTH 38.0 ft	NORTHING 436,558	EASTING 1,746,266
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 01/30/08	COMP. DATE 01/30/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 38.0 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
260																
255															255.1	GROUND SURFACE
250	251.1	4.0	4	7	11								M			RESIDUAL VERY STIFF MOIST RED BROWN SILTY CLAY (A-7-5)
245																
240	241.1	14.0	7	4	5								SS-41	M		
235	236.1	19.0	4	7	14									W	235.1	RESIDUAL SOFT WET TAN CLAYEY SILT (A-5)
230	231.1	24.0	1	2	2									W		
225	226.1	29.0	3	3	9								SS-43		225.1	RESIDUAL LOOSE WET TAN SAND (A-2)
220	221.1	34.0	5	29	71/4										221.1	WEATHERED ROCK
215															217.1	Boring Terminated BY AUGER REFUSAL at Elevation 217.1 ft ON HARD CRYSTALLINE ROCK

CDDT BORE SINGLE R3421A\_GEO\_BH\_BRIDG\_RTLN&LTN\_I73-FLY.GPJ NC\_DOT.GDT 06/02/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE I-73 OVER FLY			GROUND WTR (ft)
BORING NO. EB2A(RL)	STATION 88+92	OFFSET 27ft RT	ALIGNMENT -I-73-
COLLAR ELEV. 258.0 ft	TOTAL DEPTH 34.0 ft	NORTHING 436,575	EASTING 1,746,210
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 01/31/08	COMP. DATE 01/31/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 34.0 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
260																
255															258.0	GROUND SURFACE
250																
245																
240	243.9	14.1	4	4	6								M		243.9	RESIDUAL STIFF, MOIST, SANDY SILTY CLAY (A-7)
235	238.9	19.1	3	4	5								M		239.0	RESIDUAL MEDIUM STIFF, MOIST SILTY SAND (A-2)
230	233.9	24.1	1	2	3								M			
225	228.9	29.1	1	2	4								SS-44	M	229.0	RESIDUAL MEDIUM STIFF MOIST SANDY SILT (A-5)
220															226.0	WEATHERED ROCK
215															224.0	Boring Terminated BY AUGER REFUSAL at Elevation 224.0 ft ON HARD CRYSTALLINE ROCK

CDDT BORE SINGLE R3421A\_GEO\_BH\_BRIDG\_RTLN&LTN\_I73-FLY.GPJ NC\_DOT.GDT 06/02/08

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAY  
 MATERIALS & TESTS UNIT  
 SOILS LABORATORY

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAY  
 MATERIALS & TESTS UNIT  
 SOILS LABORATORY

T. I. P. No. R-3421A

T. I. P. No. R-3421A

REPORT ON SAMPLES OF SOILS FOR QUALITY

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 3454211 County RICHMOND Owner \_\_\_\_\_  
 Date: Sampled 1/28/08 Received 2/8/08 Reported 2/13/08  
 Sampled from \_\_\_\_\_ By C C MURRAY  
 Submitted by N WAINAINA 1995 Standard Specifications

Project 3454211 County RICHMOND Owner \_\_\_\_\_  
 Date: Sampled 1/28/08 Received 2/8/08 Reported 2/13/08  
 Sampled from \_\_\_\_\_ By C C MURRAY  
 Submitted by N WAINAINA 1995 Standard Specifications

743680 TO 743697  
 6/3/08

743680 TO 743697  
 6/3/08

TEST RESULTS

Proj. Sample No.	SS-30	SS-31	SS-32	SS-33	SS-34	SS-35
Lab. Sample No.	743680	743681	743682	743683	743684	743685
Retained #4 Sieve	%	-	-	-	-	-
Passing #10 Sieve	%	100	99	100	100	100
Passing #40 Sieve	%	81	84	83	96	96
Passing #200 Sieve	%	27	28	33	60	65

TEST RESULTS

Proj. Sample No.	SS-36	SS-37	SS-38	SS-39	SS-40	SS-41
Lab. Sample No.	743686	743687	743688	743689	743690	743691
Retained #4 Sieve	%	-	-	-	-	5
Passing #10 Sieve	%	100	100	100	100	93
Passing #40 Sieve	%	95	98	91	82	89
Passing #200 Sieve	%	59	73	45	27	76

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60	%	35.5	33.4	32.6	12.5	10.6
Fine Sand Ret - #270	%	43.6	46.5	41.8	33.9	17.1
Silt 0.05 - 0.005 mm	%	16.8	18.0	17.4	27.3	27.4
Clay < 0.005 mm	%	4.1	2.0	8.2	26.2	44.9
Passing #40 Sieve	%	-	-	-	-	-
Passing #200 Sieve	%	-	-	-	-	-

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60	%	12.6	7.3	21.8	33.6	32.2
Fine Sand Ret - #270	%	38.3	24.9	40.8	46.3	37.7
Silt 0.05 - 0.005 mm	%	36.8	29.1	29.3	16.0	21.9
Clay < 0.005 mm	%	12.2	38.7	8.2	4.1	8.2
Passing #40 Sieve	%	-	-	-	-	-
Passing #200 Sieve	%	-	-	-	-	-

L. L.	37	30	38	43	57	47
P. I.	NP	NP	5	15	22	13
AASHTO Classification	A-2-4(0)	A-2-4(0)	A-2-4(0)	A-7-6(8)	A-7-5(19)	A-7-5(9)
Station	88+50	88+50	88+80	86+20	89+40	89+40
OFFSET	75 LT	75 LT	29 RT	69 RT	19 LT	19 LT
ALIGNMENT	L REV	L REV	L REV	L REV	L REV	L REV
Depth (Ft)	7.20	22.20	11.50	7.90	7.00	12.00
to	8.70	23.70	13.00	9.40	8.50	13.50

L. L.	39	53	42	36	44	56
P. I.	10	21	4	NP	6	19
AASHTO Classification	A-4(5)	A-7-5(16)	A-5(0)	A-2-4(0)	A-5(0)	A-7-5(17)
Station	89+40	87+55	87+55	86+74	86+74	88+50
OFFSET	19 LT	25 LT	25 LT	20 RT	70 RT	75 RT
ALIGNMENT	L REV	L REV	L REV	L REV	L REV	L REV
Depth (Ft)	22.00	7.00	17.00	7.60	8.20	14.00
to	23.50	8.50	18.50	9.10	9.70	15.50

cc: C C MURRAY  
 Soils File

Soils Engineer

Soils Engineer

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAY  
 MATERIALS & TESTS UNIT  
 SOILS LABORATORY

T. I. P. No. R-3421A

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 3454211 County RICHMOND Owner \_\_\_\_\_  
 Date: Sampled 1/28/08 Received 2/8/08 Reported 2/13/08  
 Sampled from \_\_\_\_\_ By C C MURRAY  
 Submitted by N WAINAINA \_\_\_\_\_ 1995 Standard Specifications

743680 TO 743697  
 6/3/08

TEST RESULTS

Proj. Sample No.	SS-42	SS-43	SS-44	SS-45	SS-46	SS-47
Lab. Sample No.	743692	743693	743694	743695	743696	743697
Retained #4 Sieve %	4	14	-	-	-	1
Passing #10 Sieve %	93	83	100	100	97	92
Passing #40 Sieve %	88	73	79	95	60	65
Passing #200 Sieve %	52	47	38	61	20	20

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	15.5	21.8	32.8	13.7	52.6	46.3
Fine Sand Ret - #270 %	33.4	34.9	37.5	35.3	32.6	38.6
Silt 0.05 - 0.005 mm %	30.7	20.9	21.5	38.8	10.7	12.0
Clay < 0.005 mm %	20.4	22.4	8.2	12.2	4.1	3.1
Passing #40 Sieve %	-	-	-	-	-	-
Passing #200 Sieve %	-	-	-	-	-	-

L. L.	43	47	44	47	33	22
P. I.	9	9	3	8	NP	NP
AASHTO Classification	A-5(3)	A-5(3)	A-5(0)	A-5(5)	A-2-4(0)	A-2-4(0)
Station	88+50	88+50	88+74	89+87	89+87	10+80
OFFSET	75 RT	75 RT	70 RT	70 LT	70 LT	10 LT
ALIGNMENT	L REV	L REV	L REV	L REV	L REV	RPC
Depth (Ft)	24.00	29.00	29.10	18.00	23.00	13.50
to	25.50	30.50	30.60	19.50	24.50	15.00

\_\_\_\_\_  
 Soils Engineer

*J. Fargher*

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

**CONTENTS**

<u>SHEET</u>	<u>DESCRIPTION</u>
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4	PROFILE(S)
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11-18	BORE LOG & CORE REPORT(S)
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21-23	CORE PHOTOGRAPHS)

PROJ. REFERENCE NO. 34542.1.1 R-3421A F.A. PROJ. NHF-220(4)  
 COUNTY RICHMOND  
 PROJECT DESCRIPTION US-220 BYPASS FROM US-74 BYPASS WEST  
OF ROCKINGHAM AT SR 1109 INTERCHANGE TO 0.3 MILES  
SOUTH OF SR 1140  
 SITE DESCRIPTION LEFT & RIGHT LANE BRIDGES OVER US-74 BUS.  
ON I-73/US-220 BYPASS BETWEEN SR 1244 AND SR 1140  
(STA. 101+31.22 -I73- / 20+99.74 -L2-)

**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. 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 1991 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. 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 THIS 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.

**ID: R-3421A**

**PROJECT: 34542.1.1**

PERSONNEL  
**C.C. MURRAY**

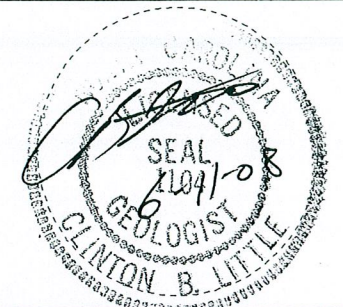
**J.E. ESTEP**

INVESTIGATED BY **C.C. MURRAY**

CHECKED BY **C.B. LITTLE**

SUBMITTED BY **C.B. LITTLE**

DATE **MAY 2008**



DRAWN BY: **J.K. McCLURE /R.Q. CALLAWAY**

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

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

PROJECT REFERENCE NO. 34542.1.I R-3421A	SHEET NO. 2
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## SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

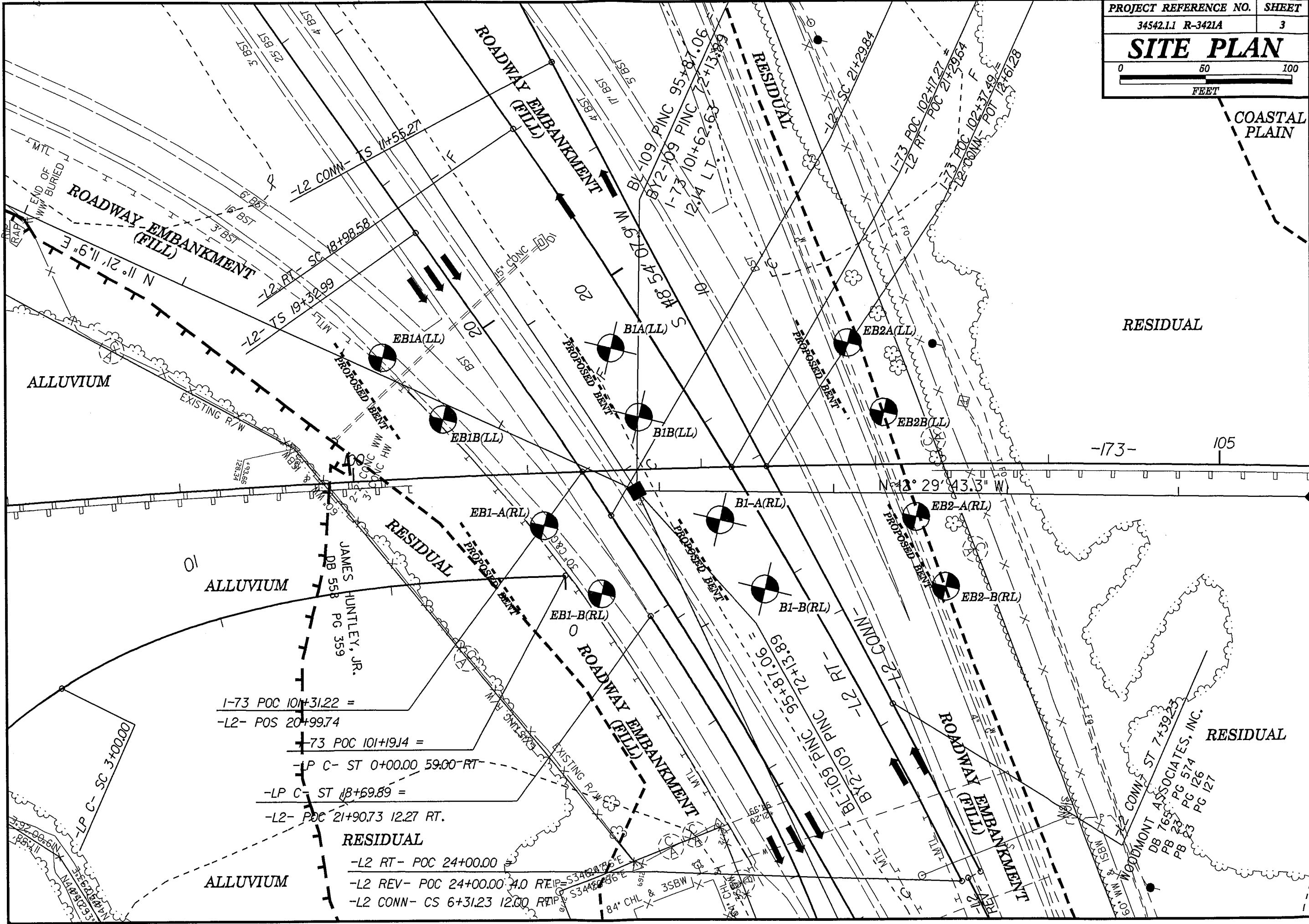
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRA. SATY CLM. MOST WITH INTERBEDDED FINE SAND LAYERS, HARD PLASTIC, A-7-6</i>	<b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORM</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) <b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. <b>ANGULARITY OF GRAINS</b> THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <b>ANGULAR</b> , <b>SUBANGULAR</b> , <b>SUBROUNDED</b> , OR <b>ROUNDED</b> .	<b>HARD ROCK</b> IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: <b>WEATHERED ROCK (WR)</b> <b>CRYSTALLINE ROCK (CR)</b> <b>NON-CRYSTALLINE ROCK (NCR)</b> <b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b>	<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (ROQ)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SCREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SROQ)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>	<b>MINERALOGICAL COMPOSITION</b>	<b>WEATHERING</b>	
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	FRESH ROCK FRESH, CRYSTALLINE BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SL.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SL.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH, OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS ALL FELDSPARS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS, IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL. SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, YIELDS SPT N VALUES > 100 BPF. VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF. COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.	
<b>COMPRESSIBILITY</b>	<b>PERCENTAGE OF MATERIAL</b>		
SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE		
	<b>GROUND WATER</b>		
	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP		
	<b>MISCELLANEOUS SYMBOLS</b>		
	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD	SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL	SAMPLE DESIGNATIONS S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CALIFORNIA BEARING RATIO SAMPLE
	<b>ABBREVIATIONS</b>		
	AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS - FOSSILIFEROUS FRAC - FRACTURED, FRACTURES FRAGS - FRAGMENTS HL - HIGHLY MED - MEDIUM MICA - MICACEOUS MOD - MODERATELY NP - NON PLASTIC ORG - ORGANIC PMT - PRESSUREMETER TEST SAP - SAPROLITIC SD - SAND, SANDY SL - SILT, SILTY SLJ - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST WEA - WEATHERED γ - UNIT WEIGHT γ <sub>d</sub> - DRY UNIT WEIGHT		
	<b>EQUIPMENT USED ON SUBJECT PROJECT</b>	<b>FRACTURE SPACING</b>	<b>BEDDING</b>
SOIL MOISTURE - CORRELATION OF TERMS	DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST	TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FEET VERY CLOSE LESS THAN 0.16 FEET	TERM THICKNESS VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET
	ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE 2 1/8" TUNG-CARB. CORE BIT	HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.
	<b>PLASTICITY</b>		
NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY	PLASTICITY INDEX (PI) DRY STRENGTH 0-5 VERY LOW 6-15 SLIGHT 16-25 MEDIUM 26 OR MORE HIGH		
	<b>COLOR</b>		
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.			
			<b>NOTES:</b>
			ELEVATION: _____ FT.



# SITE PLAN



COASTAL PLAIN



ALLUVIUM

RESIDUAL

-173- 105

RESIDUAL

ALLUVIUM

RESIDUAL

-L2 RT- POC 24+00.00

-L2 REV- POC 24+00.00 4.0 RTIP

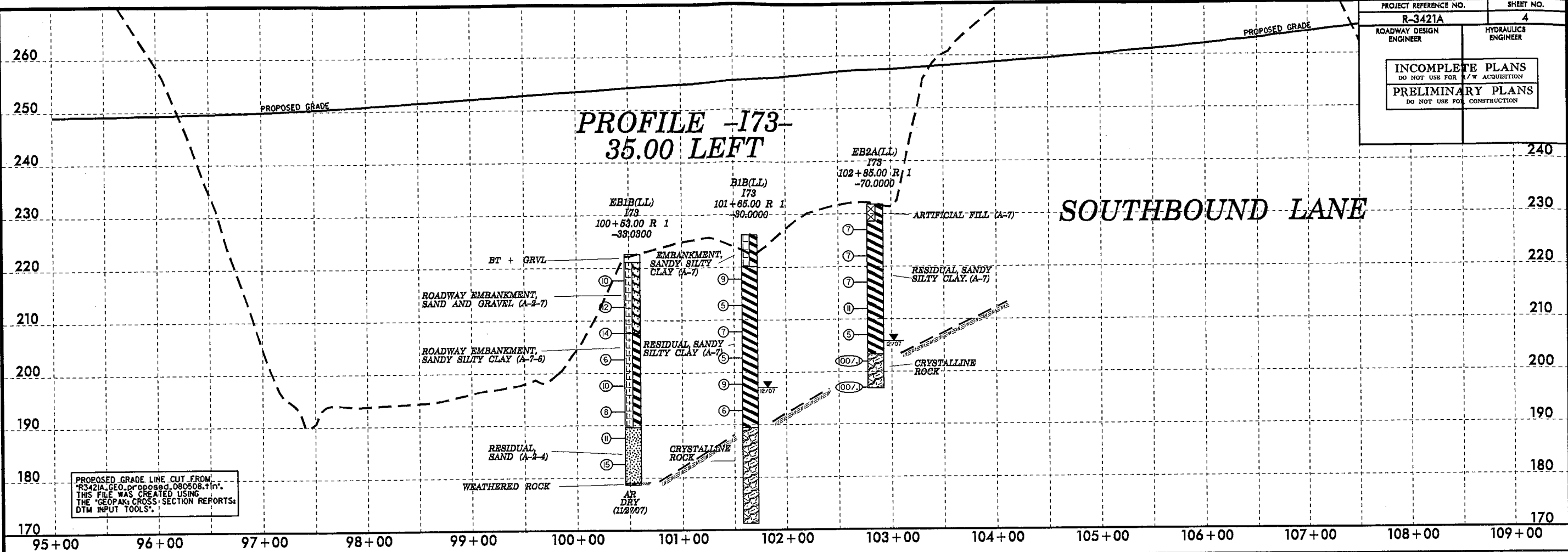
-L2 CONN- CS 6+31.23 12.00 RTIP

- 1-73 POC 101+31.22 =
- L2- POS 20+99.74
- 73 POC 101+19.14 =
- LP C- ST 0+00.00 59.00 RT
- LP C- ST 18+69.89 =
- L2- POC 21+90.73 12.27 RT.

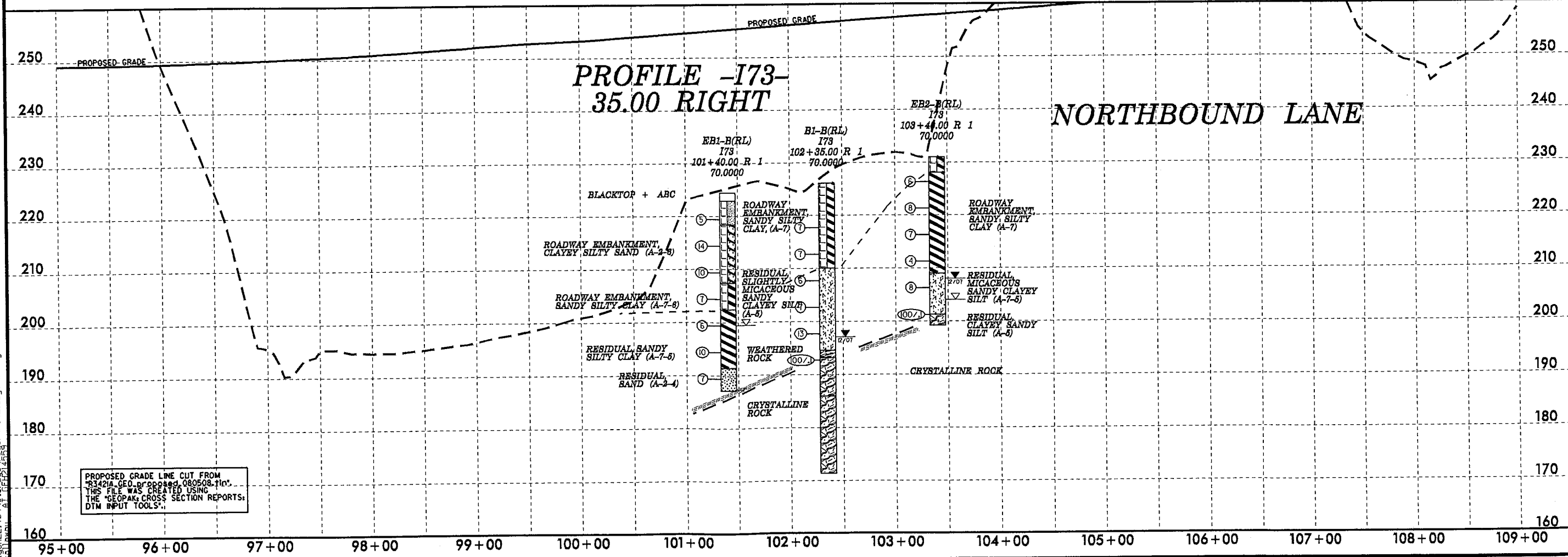
WOODMONT ASSOCIATES, INC.  
 DB 765 PG 574  
 PB 23 PG 126  
 PB 23 PG 127

5/28/99

PROJECT REFERENCE NO.		SHEET NO.
R-3421A		4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
<p><b>INCOMPLETE PLANS</b>            DO NOT USE FOR ACQUISITION</p> <p><b>PRELIMINARY PLANS</b>            DO NOT USE FOR CONSTRUCTION</p>		



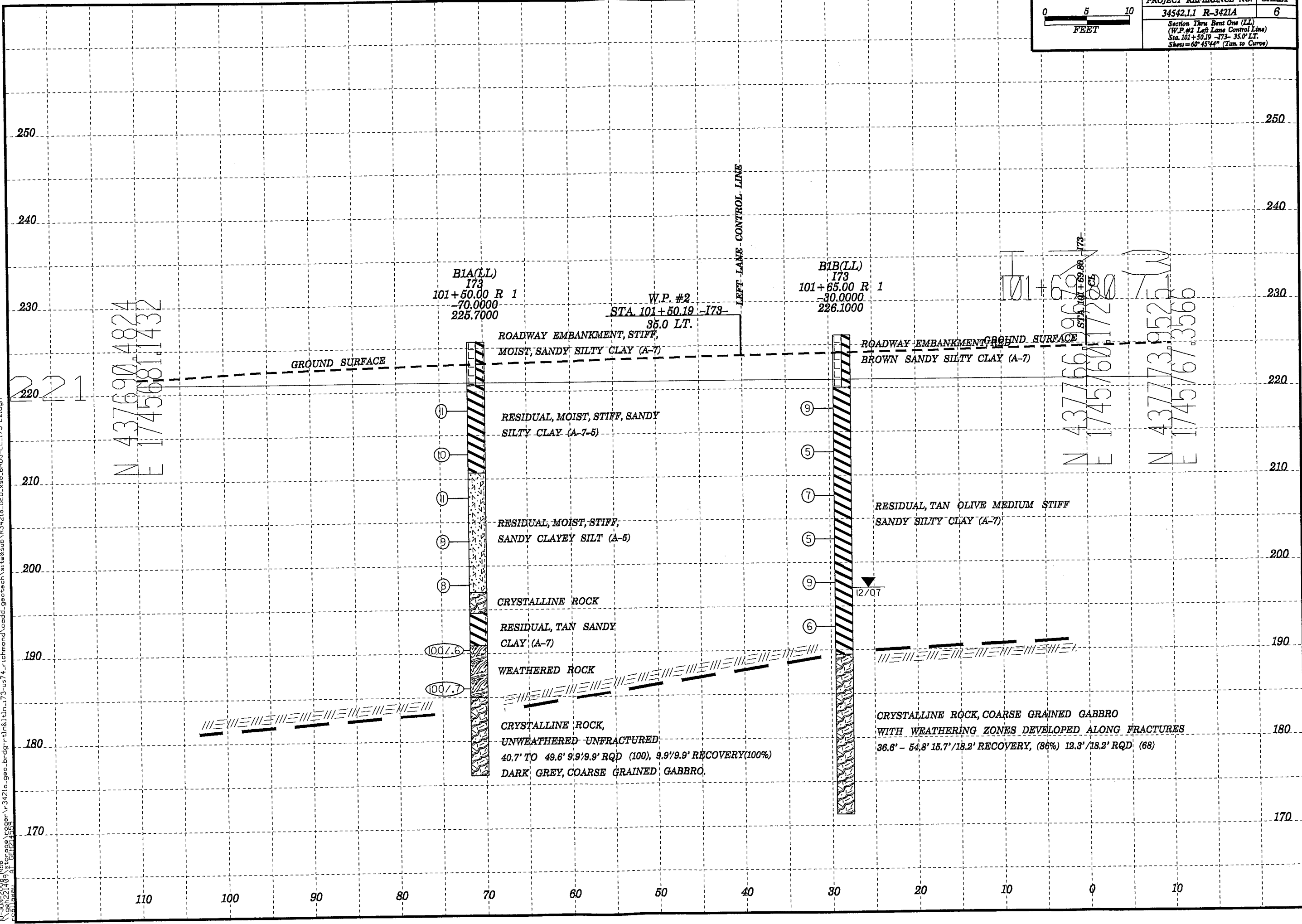
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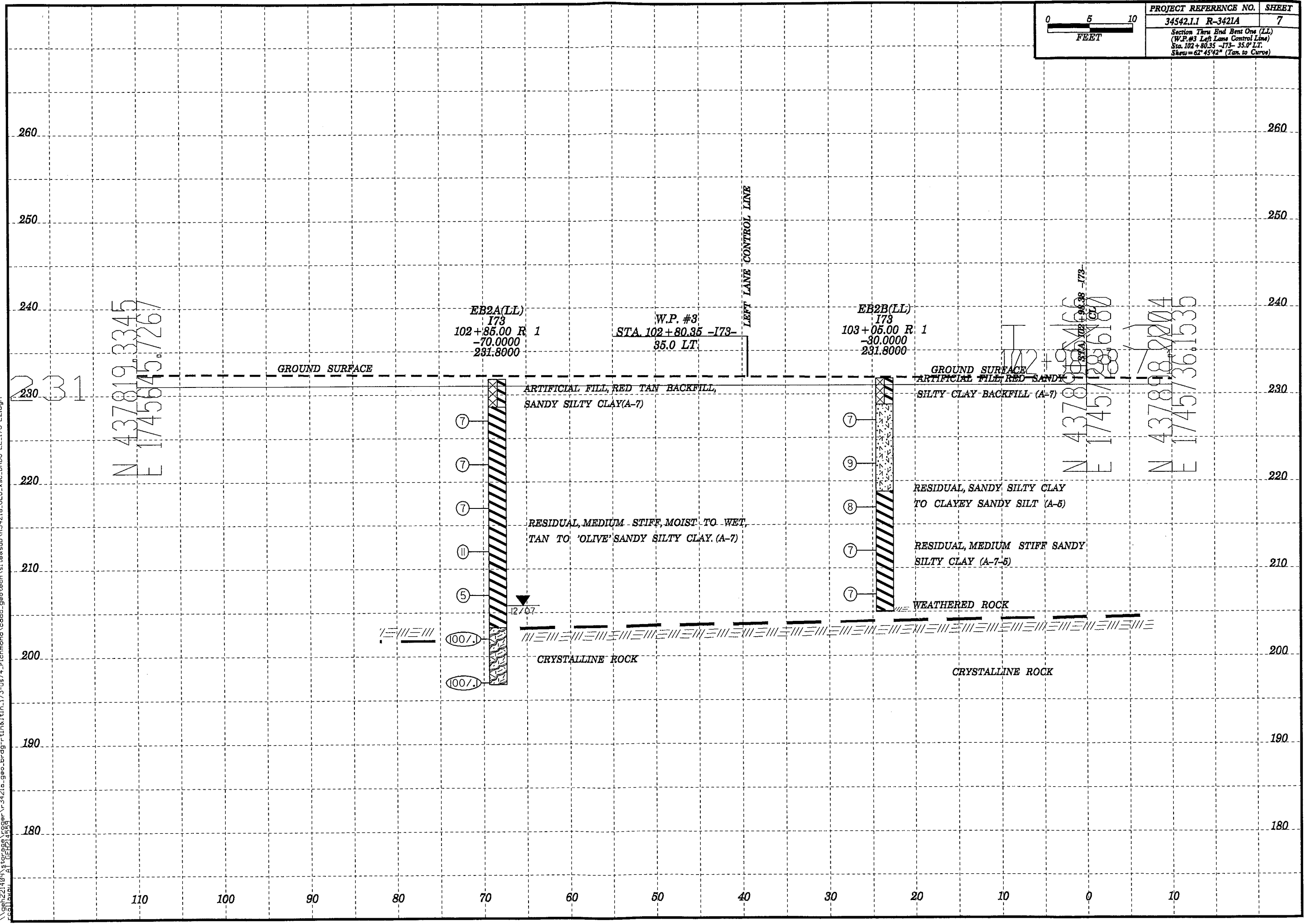
PROPOSED GRADE LINE CUT FROM "R3421A\_GEO\_proposed\_080508.dgn". THIS FILE WAS CREATED USING THE "GEOPAK CROSS SECTION REPORTS" DTM INPUT TOOLS.

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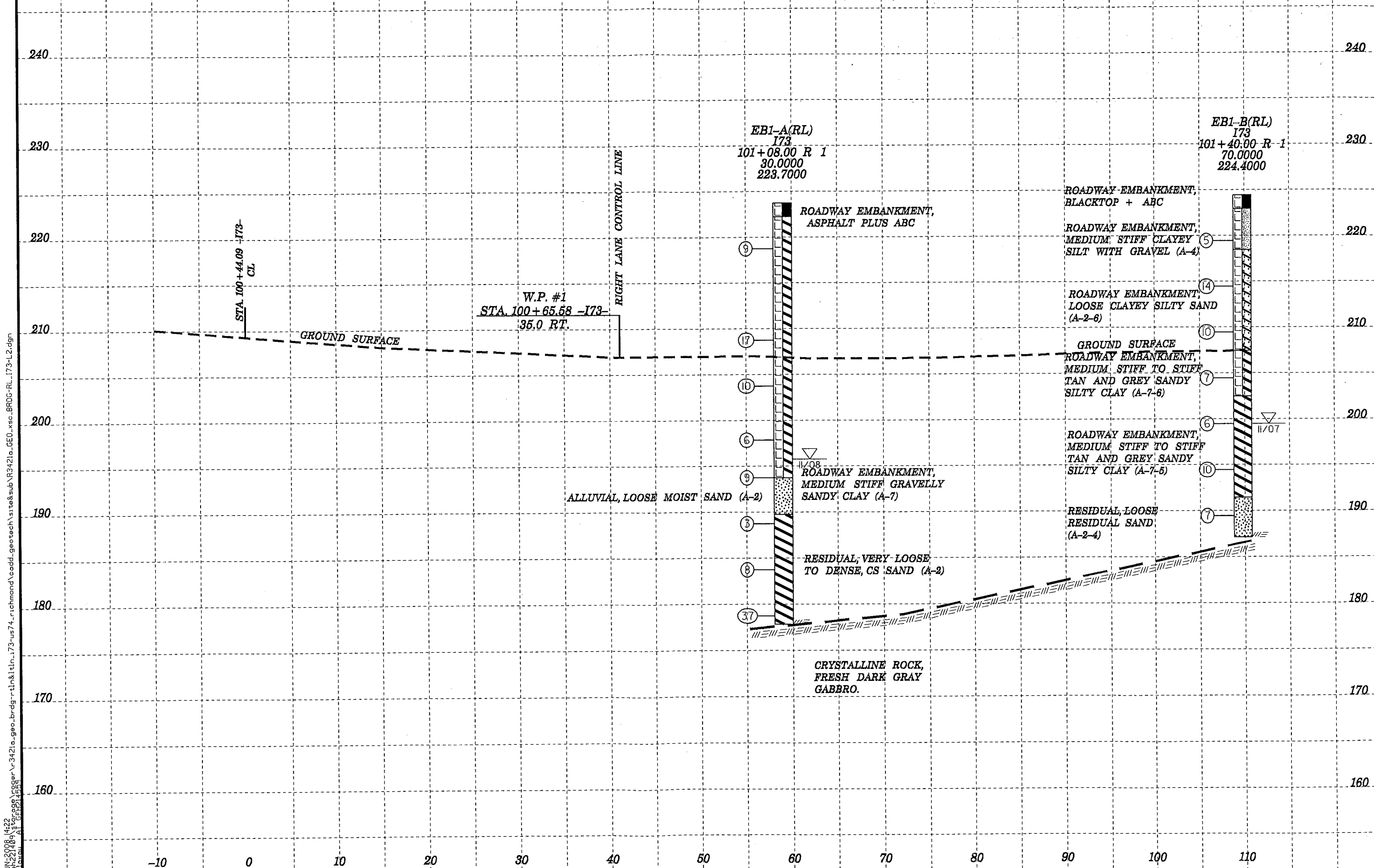


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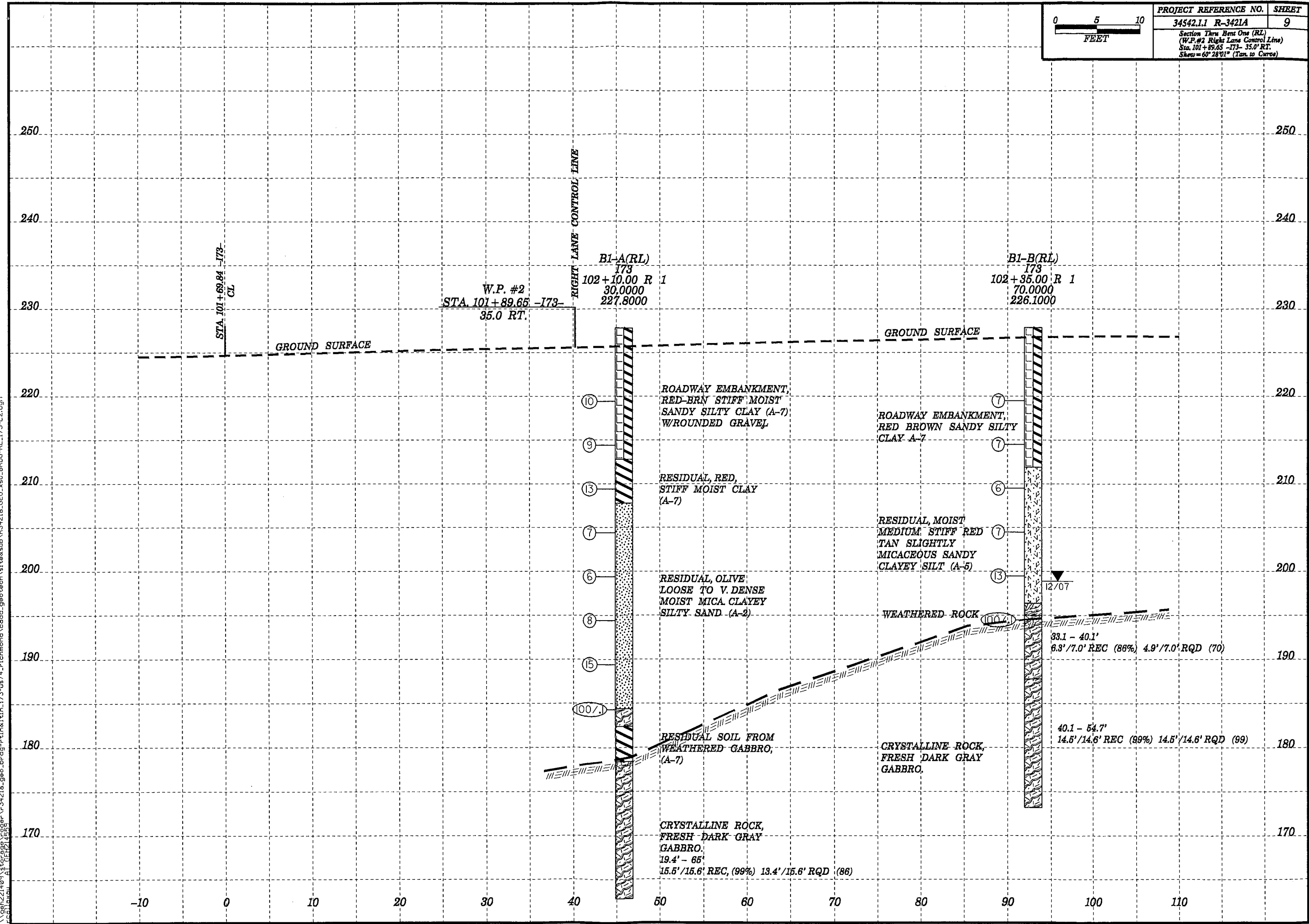
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PROJECT REFERENCE NO.	SHEET
34542.11 R-342LA	8

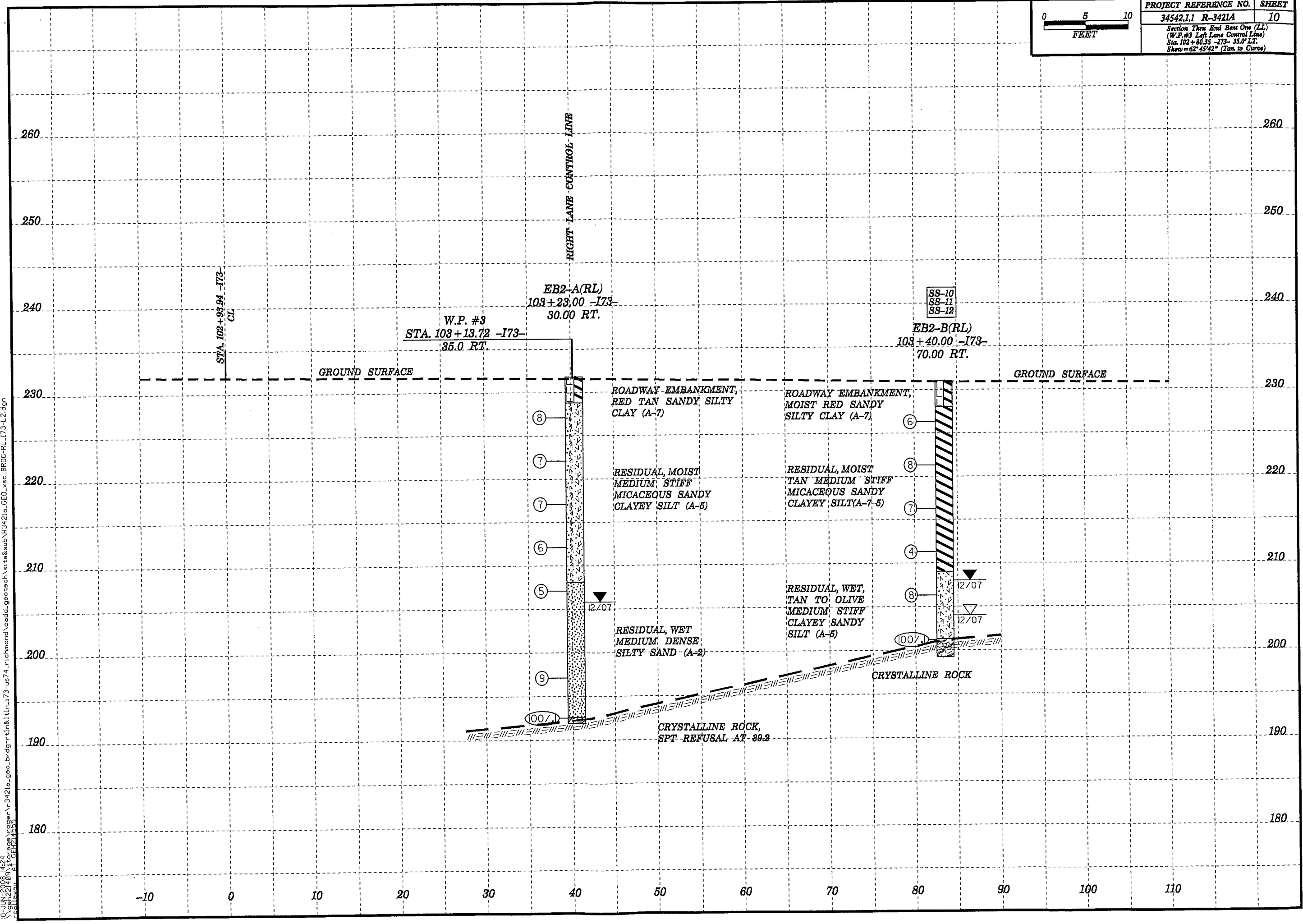
*Section Thru End Bench One (RL)*  
 (W.P.#1 Right Lane Control Line)  
 Sta. 100+65.58 -173- 35.0' RT.  
 Skew = 58° 25' 21" (Tan. to Curve)



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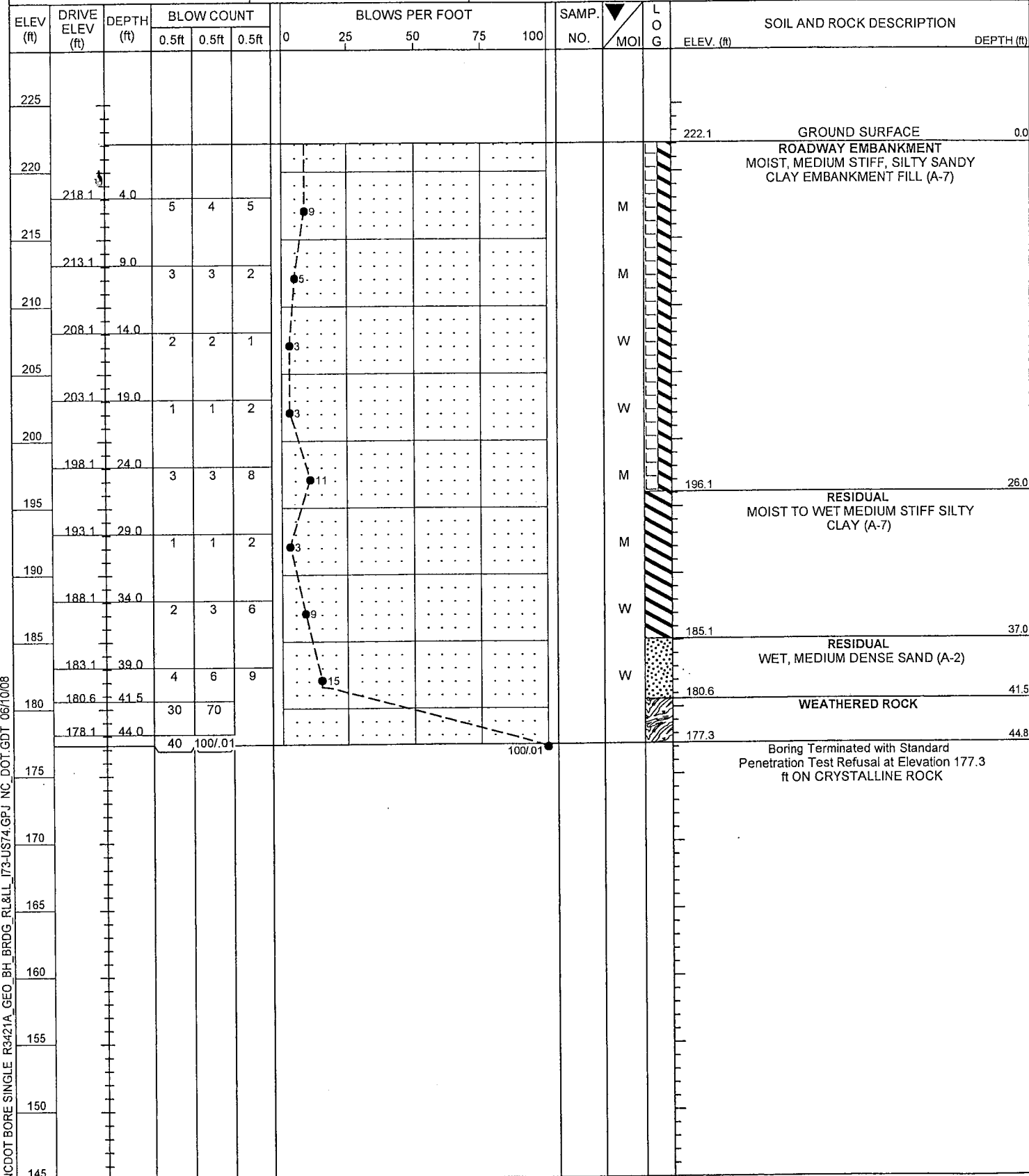
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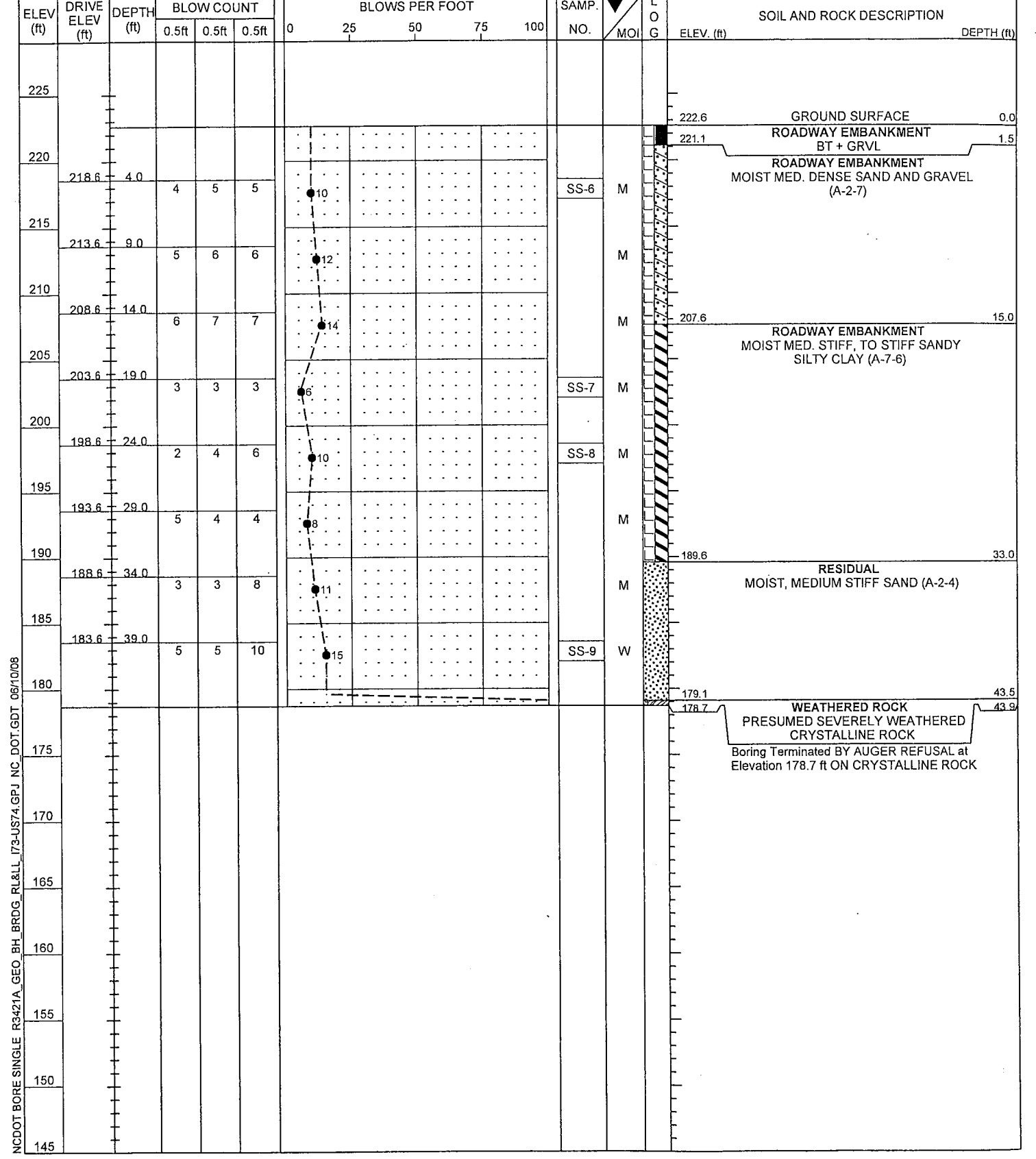


PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE OVER US 74 BUS. ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR 1140			GROUND WTR (ft)
BORING NO. EB1A(LL)	STATION 100+20	OFFSET 70ft LT	ALIGNMENT -I73-
COLLAR ELEV. 222.1 ft	TOTAL DEPTH 44.8 ft	NORTHING 437,603	EASTING 1,745,732
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 11/29/07	COMP. DATE 11/29/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 44.8 ft



NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ\_NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE OVER US 74 BUS. ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR 1140			GROUND WTR (ft)
BORING NO. EB1B(LL)	STATION 100+53	OFFSET 33ft LT	ALIGNMENT -I73-
COLLAR ELEV. 222.6 ft	TOTAL DEPTH 43.9 ft	NORTHING 437,645	EASTING 1,745,759
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 11/29/07	COMP. DATE 11/29/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 43.9 ft



NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ\_NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE OVER US 74 BUS. ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR 1140			GROUND WTR (ft)
BORING NO. B1A(LL)	STATION 101+50	OFFSET 70ft LT	ALIGNMENT -I73-
COLLAR ELEV. 225.7 ft	TOTAL DEPTH 49.6 ft	NORTHING 437,730	EASTING 1,745,698
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ Core	HAMMER TYPE Automatic	
START DATE 12/06/07	COMP. DATE 12/06/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 28.7 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
230															
225														225.7	0.0
220														220.7	5.0
	218.8	6.9	4	5	6						SS-18	M			
215															
	213.8	11.9	2	3	7							M			
210														210.7	15.0
	208.8	16.9	4	5	6						SS-19	M			
205															
	203.8	21.9	2	4	5							M			
200															
	198.8	26.9	2	2	6									197.0	28.7
195														194.6	31.1
	197.2	28.5	2	2	6										
190														190.9	34.8
	190.9	34.8	63	371.1											
185														186.7	39.0
	186.7	39.0	42	587.2											
180															
175														176.1	49.6
170															
165															
160															
155															
150															

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE OVER US 74 BUS. ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR 1140			GROUND WTR (ft)
BORING NO. B1A(LL)	STATION 101+50	OFFSET 70ft LT	ALIGNMENT -I73-
COLLAR ELEV. 225.7 ft	TOTAL DEPTH 49.6 ft	NORTHING 437,730	EASTING 1,745,698
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ Core	HAMMER TYPE Automatic	
START DATE 12/06/07	COMP. DATE 12/06/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 28.7 ft

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)		REC. (%)	ROD (%)			
197												
	197.0	28.7	1.1		(1.0)	(1.0)		(2.3)	(2.1)		197.0	28.7
195					91%	91%		96%	88%		194.6	31.1
	194.6	31.1	1.3		(1.3)	(1.1)		100%	85%			
190											190.9	34.8
185											185.0	40.7
180											181.0	44.7
175											176.1	49.6
170												
165												
160												
155												
150												

NCDOT CORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE OVER US 74 BUS. ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR 1140			GROUND WTR (ft)
BORING NO. B1B(LL)	STATION 101+65	OFFSET 30ft LT	ALIGNMENT -I73-
COLLAR ELEV. 226.1 ft	TOTAL DEPTH 54.8 ft	NORTHING 437,755	EASTING 1,745,732
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ Core	
START DATE 12/11/07		COMP. DATE 12/11/07	
SURFACE WATER DEPTH N/A		DEPTH TO ROCK 36.6 ft	

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				
230														
225													226.1 GROUND SURFACE	0.0
220													220.1 ROADWAY EMBANKMENT RED BROWN SANDY SILTY CLAY (A-7)	6.0
215	218.7	7.4	3	4	5							M	RESIDUAL TAN OLIVE MEDIUM STIFF SANDY SILTY CLAY (A-7)	
210	213.7	12.4	2	2	3							M		
205	208.7	17.4	2	3	4							M		
200	203.7	22.4	3	2	3							M		
195	198.7	27.4	2	4	5							M		
190	193.7	32.4	2	2	4							M		
185													189.5	36.6
180														
175														
170													171.3	54.8
165														
160														
155														
150														

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION LEFT LANE BRIDGE OVER US 74 BUS. ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR 1140			GROUND WTR (ft)
BORING NO. B1B(LL)	STATION 101+65	OFFSET 30ft LT	ALIGNMENT -I73-
COLLAR ELEV. 226.1 ft	TOTAL DEPTH 54.8 ft	NORTHING 437,755	EASTING 1,745,732
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ Core	
START DATE 12/11/07		COMP. DATE 12/11/07	
SURFACE WATER DEPTH N/A		DEPTH TO ROCK 36.6 ft	

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
189.5											Begin Coring @ 36.6 ft	
	189.5	36.6	3.7		(2.1) 57%	(1.9) 51%		(15.7) 86%	(12.3) 68%		CRYSTALLINE ROCK	36.6
185	185.8	40.3	5.0		(4.6) 92%	(4.0) 80%					NEARLY UNWEATHERED BLOCKS OF GABBRO SEPARATED BY WASHED OUT INTERVALS UP TO 1.6' THICK	
180	180.8	45.3	4.8		(4.5) 94%	(3.4) 71%						
175	176.0	50.1	4.7		(4.5) 96%	(3.0) 64%						
170	171.3	54.8									Boring Terminated at Elevation 171.3 ft IN CRYSTALLINE ROCK	54.8
165												
160												
155												
150												
145												
140												
135												
130												
125												
120												
115												
110												

NCDOT CORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

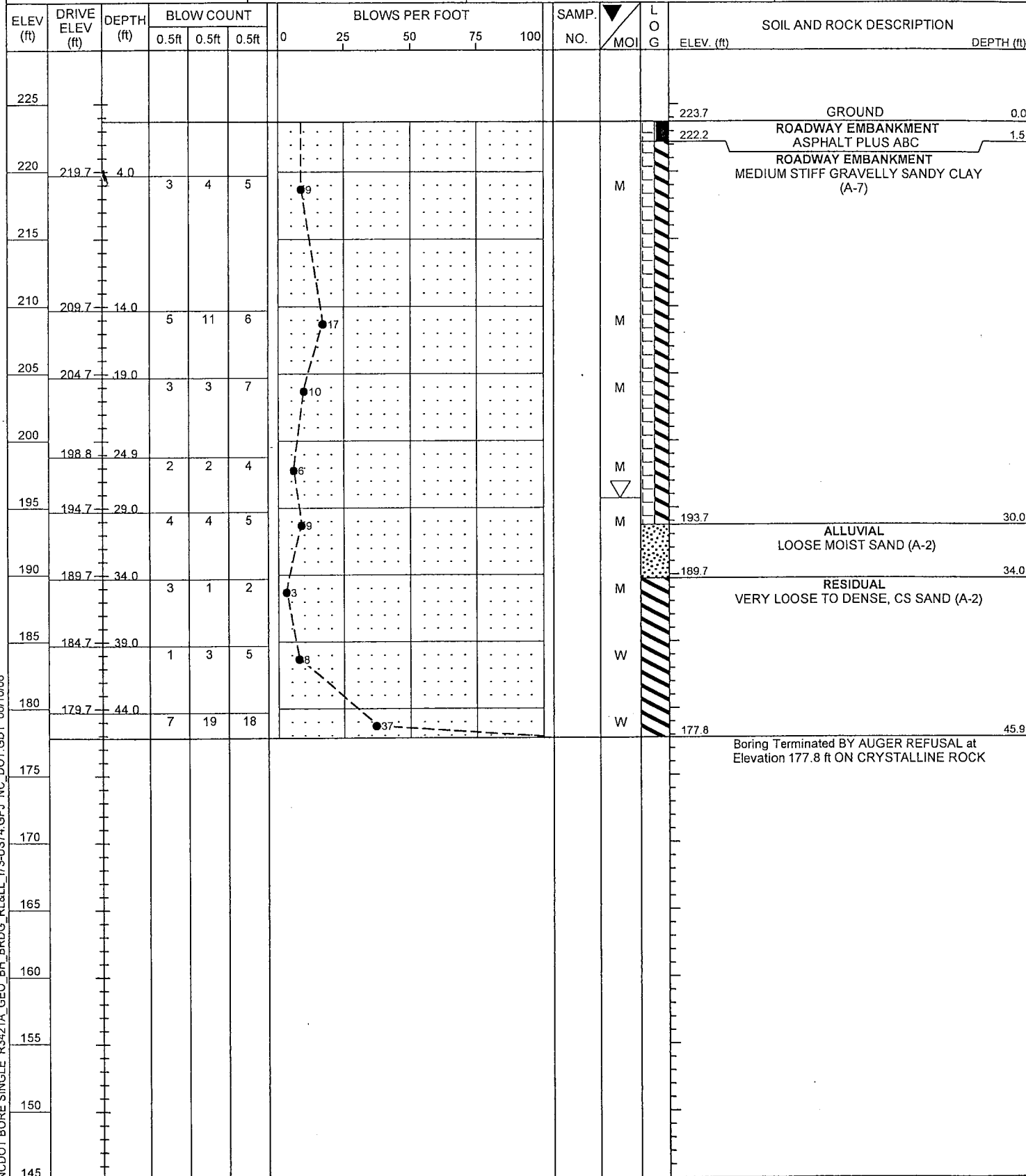
PROJECT NO. 34542.1.1		ID. R-3421A		COUNTY Richmond		GEOLOGIST Murray, C. C.										
SITE DESCRIPTION LEFT LANE BRIDGE OVER US 74 BUS. ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR 1140						GROUND WTR (ft)										
BORING NO. EB2A(LL)		STATION 102+85		OFFSET 70ft LT		ALIGNMENT -I73-										
COLLAR ELEV. 231.8 ft		TOTAL DEPTH 35.0 ft		NORTHING 437,862		EASTING 1,745,664										
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic												
START DATE 12/04/07		COMP. DATE 12/04/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 28.5 ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
235														231.8	GROUND SURFACE	0.0
230														228.6	ARTIFICIAL FILL RED TAN BACKFILL, SANDY SILTY CLAY(A-7)	3.2
225	228.0	3.8	2	3	4								M		RESIDUAL MEDIUM STIFF, MOIST TO WET, TAN TO 'OLIVE' SANDY SILTY CLAY. (A-7)	
220	223.0	8.8	3	3	4								M			
215	218.0	13.8	2	3	4								M			
210	213.0	18.8	5	4	7								W			
205	208.0	23.8	2	2	3								W			
200	203.0	28.8	30	100/1										203.3	CRYSTALLINE ROCK	28.5
195	198.0	33.8	39	100/1										196.8	Boring Terminated BY AUGER REFUSAL at Elevation 196.8 ft IN CRYSTALLINE ROCK	35.0

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1		ID. R-3421A		COUNTY Richmond		GEOLOGIST Murray, C. C.										
SITE DESCRIPTION LEFT LANE BRIDGE OVER US 74 BUS. ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR 1140						GROUND WTR (ft)										
BORING NO. EB2B(LL)		STATION 103+05		OFFSET 30ft LT		ALIGNMENT -I73-										
COLLAR ELEV. 231.8 ft		TOTAL DEPTH 26.8 ft		NORTHING 437,891		EASTING 1,745,698										
DRILL MACHINE CME-550X		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
START DATE 12/04/07		COMP. DATE 12/04/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 26.8 ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
235														231.8	GROUND SURFACE	0.0
230														228.8	ARTIFICIAL FILL RED SANDY SILTY CLAY BACKFILL (A-7)	3.0
225	228.0	3.8	3	3	4								SS-13	M	RESIDUAL MEDIUM STIFF TO STIFF SANDY SILTY CLAY TO CLAYEY SANDY SILT (A-5)	
220	223.0	8.8	2	3	6								M			
215	218.0	13.8	2	3	5								SS-14	M	RESIDUAL MEDIUM STIFF SANDY SILTY CLAY (A-7-5)	13.0
210	213.0	18.8	3	3	4								M			
205	208.0	23.8	1	4	3								W			
200														205.1	WEATHERED ROCK	26.7
195														205.0	Boring Terminated BY AUGER REFUSAL at Elevation 205.0 ft ON CRYSTALLINE ROCK	26.8

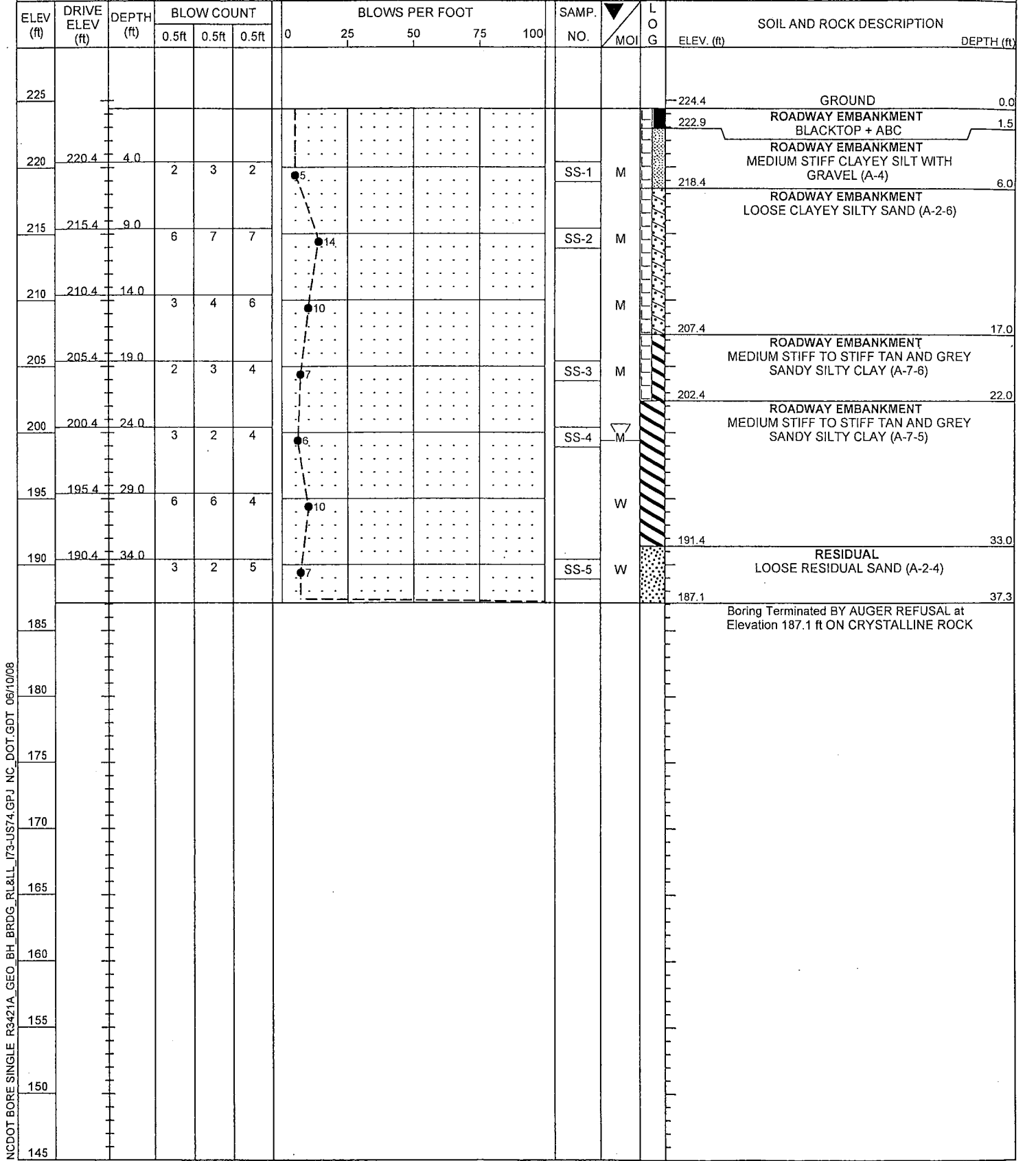
NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE OVER US 74 BUS. ON I-73 / US220 BYPASS BETWEEN SR 1244 AND SR II40			GROUND WTR (ft)
BORING NO. EB1-A(RL)	STATION 101+08	OFFSET 30ft RT	ALIGNMENT -I73-
COLLAR ELEV. 223.7 ft	TOTAL DEPTH 45.9 ft	NORTHING 437,715	EASTING 1,745,805
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 11/28/08	COMP. DATE 11/28/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 45.9 ft



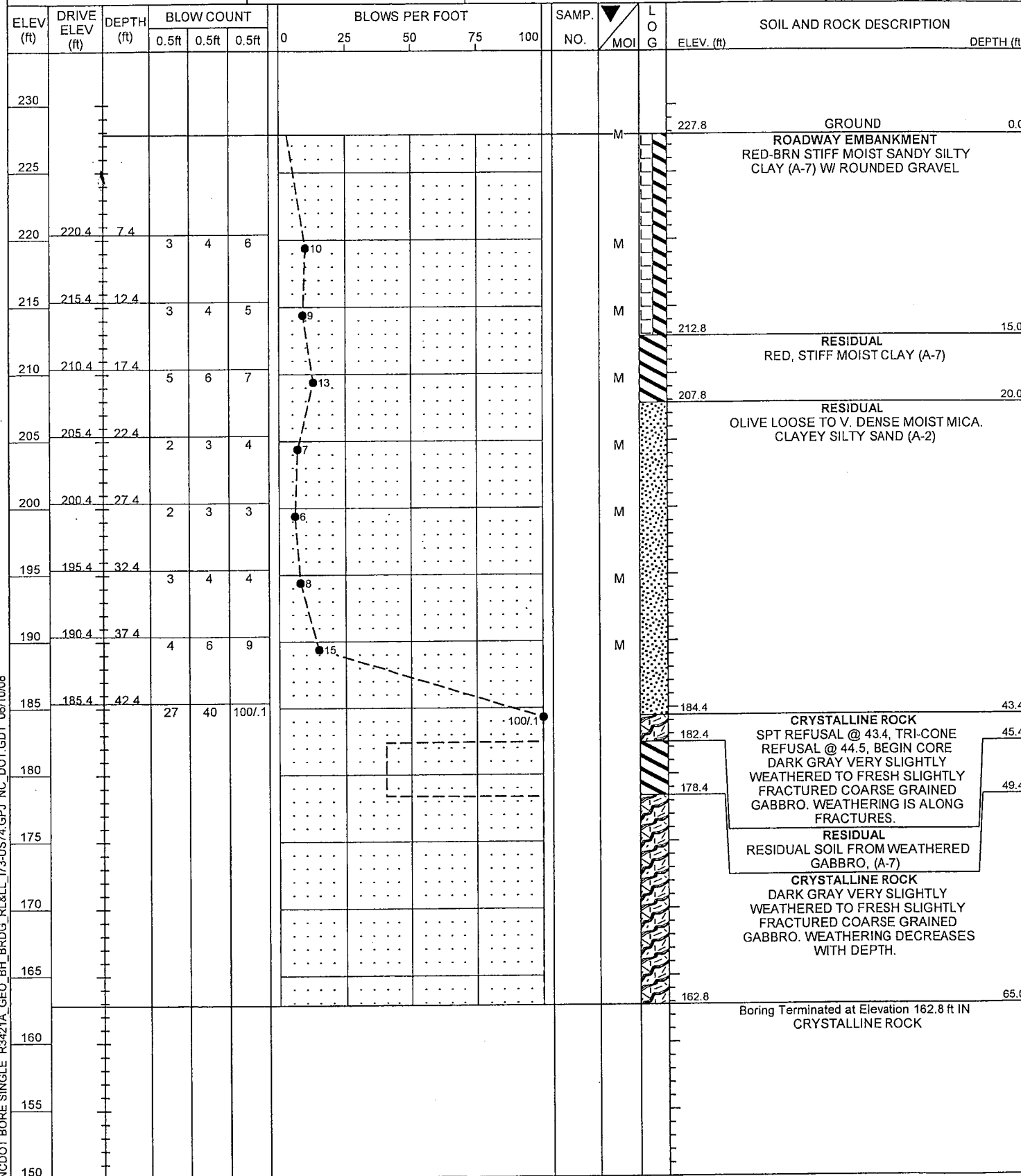
NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE OVER US 74 BUS. ON I-73 / US220 BYPASS BETWEEN SR 1244 AND SR II40			GROUND WTR (ft)
BORING NO. EB1-B(RL)	STATION 101+40	OFFSET 70ft RT	ALIGNMENT -I73-
COLLAR ELEV. 224.4 ft	TOTAL DEPTH 37.3 ft	NORTHING 437,756	EASTING 1,745,835
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 11/28/07	COMP. DATE 11/28/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 37.3 ft



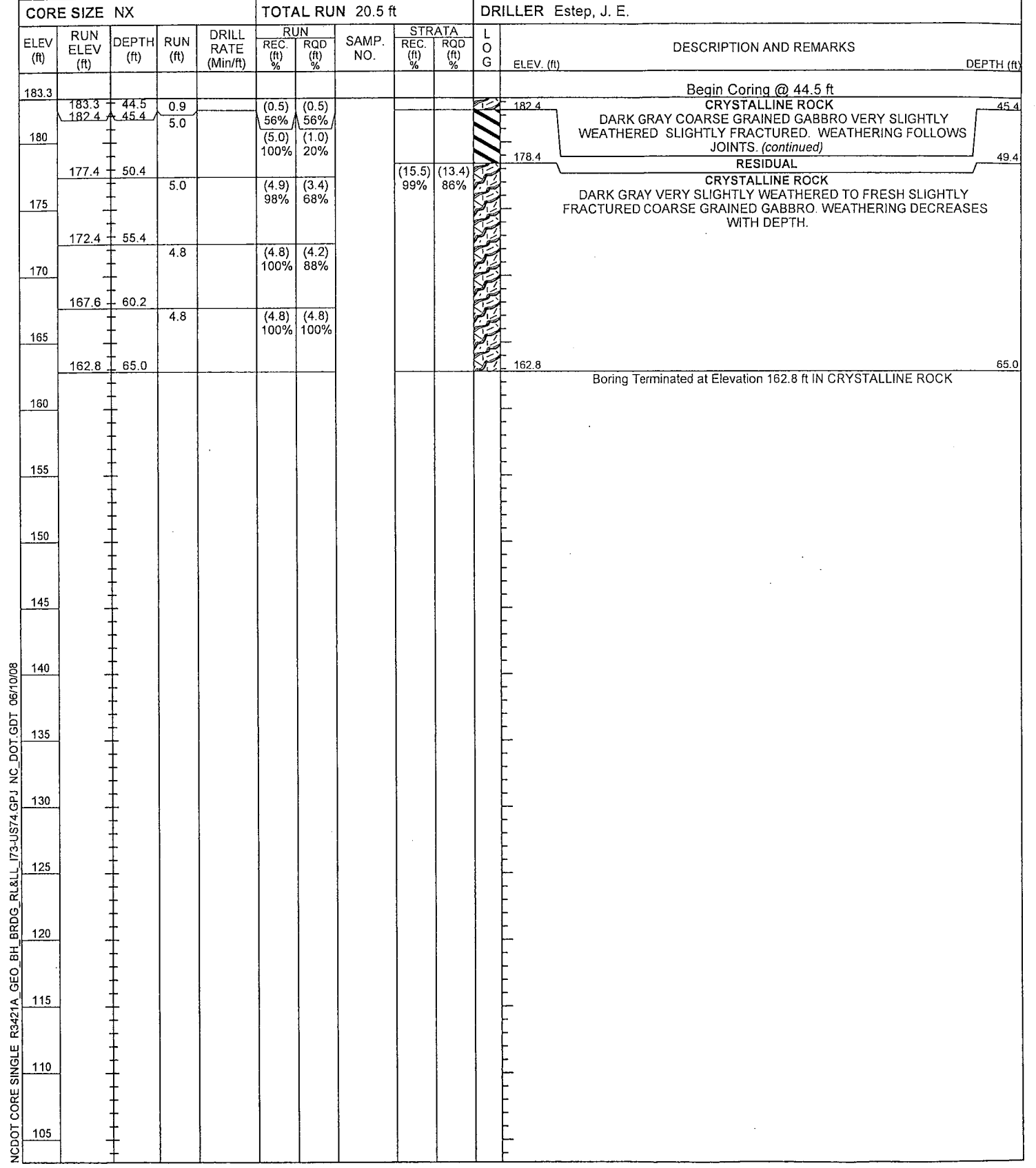
NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE OVER US 74 BUS. ON I-73 / US220 BYPASS BETWEEN SR 1244 AND SR 1140			GROUND WTR (ft)
BORING NO. B1-A(RL)	STATION 102+10	OFFSET 30ft RT	ALIGNMENT -I73-
COLLAR ELEV. 227.8 ft	TOTAL DEPTH 65.0 ft	NORTHING 437,813	EASTING 1,745,779
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 12/05/07	COMP. DATE 12/06/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 43.4 ft



NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ\_NC\_DOT.GDT\_06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE OVER US 74 BUS. ON I-73 / US220 BYPASS BETWEEN SR 1244 AND SR 1140			GROUND WTR (ft)
BORING NO. B1-A(RL)	STATION 102+10	OFFSET 30ft RT	ALIGNMENT -I73-
COLLAR ELEV. 227.8 ft	TOTAL DEPTH 65.0 ft	NORTHING 437,813	EASTING 1,745,779
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 12/05/07	COMP. DATE 12/06/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 43.4 ft



NCDOT CORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ\_NC\_DOT.GDT\_06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE OVER US 74 BUS. ON I-73 / US220 BYPASS BETWEEN SR 1244 AND SR II40			GROUND WTR (ft)
BORING NO. B1-B(RL)	STATION 102+35	OFFSET 70ft RT	ALIGNMENT -I73-
COLLAR ELEV. 226.1 ft	TOTAL DEPTH 55.0 ft	NORTHING 437,847	EASTING 1,745,812
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 12/05/07	COMP. DATE 12/05/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 32.9 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
230															226.1
225														ROADWAY EMBANKMENT RED BROWN SANDY SILTY CLAY	
220															
215	218.7	7.4	4	3	4						SS-15	M			
210	213.7	12.4	2	3	4							M			
205	208.7	17.4	2	3	3						SS-16	W		RESIDUAL MOIST MEDIUM STIFF RED TAN SLIGHTLY MICACEOUS SANDY CLAYEY SILT (A-5)	16.0
200	203.7	22.4	2	3	4						SS-17				
195	198.7	27.4	4	5	8										
190	193.7	32.4	33	100/1										WEATHERED ROCK	31.5
														CRYSTALLINE ROCK VERY SLIGHTLY WEATHERED UNFRACTURED TO SLIGHTLY FRACTURED DARK GRAY COARSE GRAINED GABBRO. ZONES WEATHERED TO CLAY ALONG JOINTS.	32.9
185														CRYSTALLINE ROCK FRESH DARK GRAY GABBRO.	40.1
180															
175															
170															171.4
														Boring Terminated at Elevation 171.1 ft IN CRYSTALLINE ROCK	54.7

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE OVER US 74 BUS. ON I-73 / US220 BYPASS BETWEEN SR 1244 AND SR II40			GROUND WTR (ft)
BORING NO. B1-B(RL)	STATION 102+35	OFFSET 70ft RT	ALIGNMENT -I73-
COLLAR ELEV. 226.1 ft	TOTAL DEPTH 55.0 ft	NORTHING 437,847	EASTING 1,745,812
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 12/05/07	COMP. DATE 12/05/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 32.9 ft

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
193											Begin Coring @ 33.1 ft	
	193.0	33.1	2.0		(2.0)	(1.5)					CRYSTALLINE ROCK	
190	191.0	35.1	5.0		(4.3)	(3.4)					VERY SLIGHTLY WEATHERED UNFRACTURED TO SLIGHTLY FRACTURED DARK GRAY COARSE GRAINED GABBRO. ZONES WEATHERED TO CLAY ALONG JOINTS. (continued)	
	186.0	40.1						(14.5)	(14.5)		CRYSTALLINE ROCK	40.1
185			4.9		(4.9)	(4.9)		99%	99%		UNWEATHERED UNFRACTURED GABBRO WITH RQD=100	
	181.1	45.0										
180			4.8		(4.8)	(4.8)		100%	100%			
	176.3	49.8										
175			4.9		(4.8)	(4.7)		98%	96%			
	171.4	54.7									Boring Terminated at Elevation 171.1 ft IN CRYSTALLINE ROCK	54.7
170												
165												
160												
155												
150												
145												
140												
135												
130												
125												
120												
115												

NCDOT CORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE OVER US 74 BUS. ON I-73 / US220 BYPASS BETWEEN SR 1244 AND SR 1140			GROUND WTR (ft)
BORING NO. EB2-A(RL)	STATION 103+23	OFFSET 30ft RT	ALIGNMENT -I73-
COLLAR ELEV. 231.8 ft	TOTAL DEPTH 39.9 ft	NORTHING 437,923	EASTING 1,745,752
DRILL MACHINE CME-550X		DRILL METHOD H.S. Augers	
START DATE 12/04/07		COMP. DATE 12/04/07	
SURFACE WATER DEPTH N/A		DEPTH TO ROCK 39.2 ft	

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				
235													GROUND	0.0
230													ROADWAY EMBANKMENT RED TAN SANDY SILTY CLAY (A-7)	3.0
225	228.1	3.7	3	3	5							M	RESIDUAL MOIST MEDIUM STIFF MICACEOUS SANDY CLAYEY SILT (A-5)	
220	223.1	8.7	3	3	4							M		
215	218.1	13.7	2	3	4							M		
210	213.1	18.7	1	3	3							W		
205	208.1	23.7	1	2	3							W	RESIDUAL WET MEDIUM DENSE SILTY SAND (A-2)	23.7
200														
195	198.1	33.7	2	3	6									
190	193.1	38.7	16	100/1									CRYSTALLINE ROCK SPT REFUSAL AT 39.2 Boring Terminated BY AUGER REFUSAL at Elevation 191.9 ft IN CRYSTALLINE ROCK	39.2

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY Richmond	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RIGHT LANE BRIDGE OVER US 74 BUS. ON I-73 / US220 BYPASS BETWEEN SR 1244 AND SR 1140			GROUND WTR (ft)
BORING NO. EB2-B(RL)	STATION 103+40	OFFSET 70ft RT	ALIGNMENT -I73-
COLLAR ELEV. 231.0 ft	TOTAL DEPTH 31.8 ft	NORTHING 437,948	EASTING 1,745,787
DRILL MACHINE CME-550X		DRILL METHOD H.S. Augers	
START DATE 11/30/07		COMP. DATE 12/04/07	
SURFACE WATER DEPTH N/A		DEPTH TO ROCK 29.7 ft	

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				
235													GROUND	0.0
230													ROADWAY EMBANKMENT MOIST RED SANDY SILTY CLAY	3.0
225	227.3	3.7	3	3	3							SS-10 M	RESIDUAL MOIST TAN MEDIUM STIFF MICACEOUS SANDY CLAYEY SILT(A-7-5)	
220	222.3	8.7	3	3	5							M		
215	217.3	13.7	2	3	4							SS-11 M		
210	212.3	18.7	2	2	2							W		
205	207.3	23.7	2	3	5							SS-12	RESIDUAL WET, TAN TO OLIVE MEDIUM STIFF CLAYEY SANDY SILT (A-5)	22.0
200	202.3	28.7	5	32	100/1								CRYSTALLINE ROCK	29.7
195													Boring Terminated BY AUGER REFUSAL at Elevation 199.2 ft IN CRYSTALLINE ROCK	31.8

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RL&LL\_I73-US74.GPJ NC\_DOT.GDT 06/10/08



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAY  
 MATERIALS & TESTS UNIT  
 SOILS LABORATORY

T. I. P. No. R-3421A

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 3454211 County RICHMOND Owner \_\_\_\_\_  
 Date: Sampled 12/12/07 Received 12/19/07 Reported 12/21/07  
 Sampled from \_\_\_\_\_ By C C MURRAY  
 Submitted by N WAINAINA \_\_\_\_\_ 1995 Standard Specifications

742744 TO 742762  
 6/10/08

TEST RESULTS

Proj. Sample No.	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Lab. Sample No.	742750	742751	742752	742753	742754	742755
Retained #4 Sieve %	-	1	-	-	-	-
Passing #10 Sieve %	95	95	100	100	100	100
Passing #40 Sieve %	82	80	87	93	90	86
Passing #200 Sieve %	67	59	27	65	65	50

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	19.6	24.6	30.5	12.3	18.8	23.8
Fine Sand Ret - #270 %	12.5	16.0	51.1	32.3	21.6	31.9
Silt 0.05 - 0.005 mm %	15.4	8.9	14.3	33.1	37.4	28.1
Clay < 0.005 mm %	52.5	50.5	4.0	22.2	22.2	16.2
Passing #40 Sieve %	-	-	-	-	-	-
LOCATION %	EB1B	EB1B	EB1B	-	-	-

L. L.	47	69	26	59	57	51
P. I.	21	39	NP	17	16	9
AASHTO Classification	A-7-6(13)	A-7-5(21)	A-2-4(0)	A-7-5(12)	A-7-5(12)	A-5(3)
Station	100+50	100+50	100+50	103+40	103+40	103+40
OFFSET	30 LT	30 LT	30 LT	70 RT	70 RT	70 RT
ALIGNMENT	SBL	SBL	SBL	I 73 NB	I 73 NB	I 73 NB
Depth (Ft)	19.00	24.00	39.00	3.70	13.70	23.70
to	20.50	25.50	40.50	5.20	15.20	25.20

Soils Engineer

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAY  
 MATERIALS & TESTS UNIT  
 SOILS LABORATORY

T. I. P. No. R-3421A

REPORT ON SAMPLES OF SOILS FOR QUALITY

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 Date: Sampled 12/12/07 Received 12/19/07 Reported 12/21/07  
 Sampled from \_\_\_\_\_ By C C MURRAY  
 Submitted by N WAINAINA \_\_\_\_\_ 1995 Standard Specifications

742744 TO 742762  
 6/10/08

TEST RESULTS

Proj. Sample No.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Lab. Sample No.	742744	742745	742746	742747	742748	742749
Retained #4 Sieve %	1	12	-	-	-	15
Passing #10 Sieve %	95	81	98	98	100	78
Passing #40 Sieve %	68	43	82	86	82	50
Passing #200 Sieve %	36	19	61	57	33	30

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	43.6	61.8	25.5	22.8	31.7	47.8
Fine Sand Ret - #270 %	21.2	16.7	14.9	23.0	43.6	15.6
Silt 0.05 - 0.005 mm %	8.9	4.3	15.2	19.8	20.6	3.3
Clay < 0.005 mm %	26.3	17.2	44.4	34.3	4.0	33.3
Passing #40 Sieve %	-	-	-	-	-	-
LOCATION %	EB1B	EB1B	EB1A	EB1A	EB1A	EB1B

L. L.	27	33	47	55	35	42
P. I.	9	14	19	24	6	17
AASHTO Classification	A-4(0)	A-2-6(0)	A-7-6(10)	A-7-5(12)	A-2-4(0)	A-2-7(1)
Station	101+40	101+40	101+40	101+40	101+40	100+50
OFFSET	70 RT	70 RT	70 RT	70 RT	70 RT	30 LT
ALIGNMENT	NBL	NBL	NBL	NBL	NBL	SBL
Depth (Ft)	4.00	9.00	19.00	24.00	34.00	4.00
to	5.50	10.50	20.50	25.50	35.50	5.50

cc: C C MURRAY  
 Soils File

Soils Engineer

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAY  
 MATERIALS & TESTS UNIT  
 SOILS LABORATORY

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
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Project 3454211 County RICHMOND Owner \_\_\_\_\_  
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 Submitted by N WAINAINA 1995 Standard Specifications

742744 TO 742762  
 6/10/08

742744 TO 742762  
 6/10/08

TEST RESULTS

Proj. Sample No.	SS-13	SS-14	SS-15	SS-16	SS-17	SS-18
Lab. Sample No.	742756	742757	742758	742759	742760	742761
Retained #4 Sieve %	-	-	-	-	-	-
Passing #10 Sieve %	100	100	100	100	100	100
Passing #40 Sieve %	93	93	92	94	88	100
Passing #200 Sieve %	61	60	79	61	46	81

TEST RESULTS

Proj. Sample No.	SS-19				
Lab. Sample No.	742762				
Retained #4 Sieve %	2				
Passing #10 Sieve %	97				
Passing #40 Sieve %	91				
Passing #200 Sieve %	53				

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	16.2	17.4	13.7	15.2	22.4	1.2
Fine Sand Ret - #270 %	29.3	27.5	8.7	30.9	39.4	23.2
Silt 0.05 - 0.005 mm %	34.3	34.9	10.9	39.8	28.1	33.1
Clay < 0.005 mm %	20.2	20.2	66.7	14.1	10.1	42.4
Passing #40 Sieve %	-	-	-	-	-	-
Passing #200 Sieve %	-	-	-	-	-	-

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%					
Coarse Sand Ret - #60 %	20.0				
Fine Sand Ret - #270 %	31.7				
Silt 0.05 - 0.005 mm %	34.1				
Clay < 0.005 mm %	14.1				
Passing #40 Sieve %	-				
Passing #200 Sieve %	-				

L. L.	56	53	69	59	52	69
P. I.	10	12	33	8	8	23
AASHTO Classification	A-5(7)	A-7-5(8)	A-7-5(30)	A-5(7)	A-5(2)	A-7-5(24)
Station	103+05	103+05	102+35	102+35	102+35	101+50
OFFSET	30 LT	30 LT	70 RT	70 RT	70 RT	70 LT
ALIGNMENT	I 73 NB	I 73 NB	I 73 NB	I 73 NB	I 73 NB	173-SB
Depth (Ft)	3.80	13.80	7.40	17.40	22.40	6.90
to	5.30	15.30	8.90	18.90	23.90	8.40

L. L.	59				
P. I.	4				
AASHTO Classification	A-5(3)				
Station	101+50				
OFFSET	70 LT				
ALIGNMENT	173-SB				
Depth (Ft)	16.90				
to	18.40				

Soils Engineer

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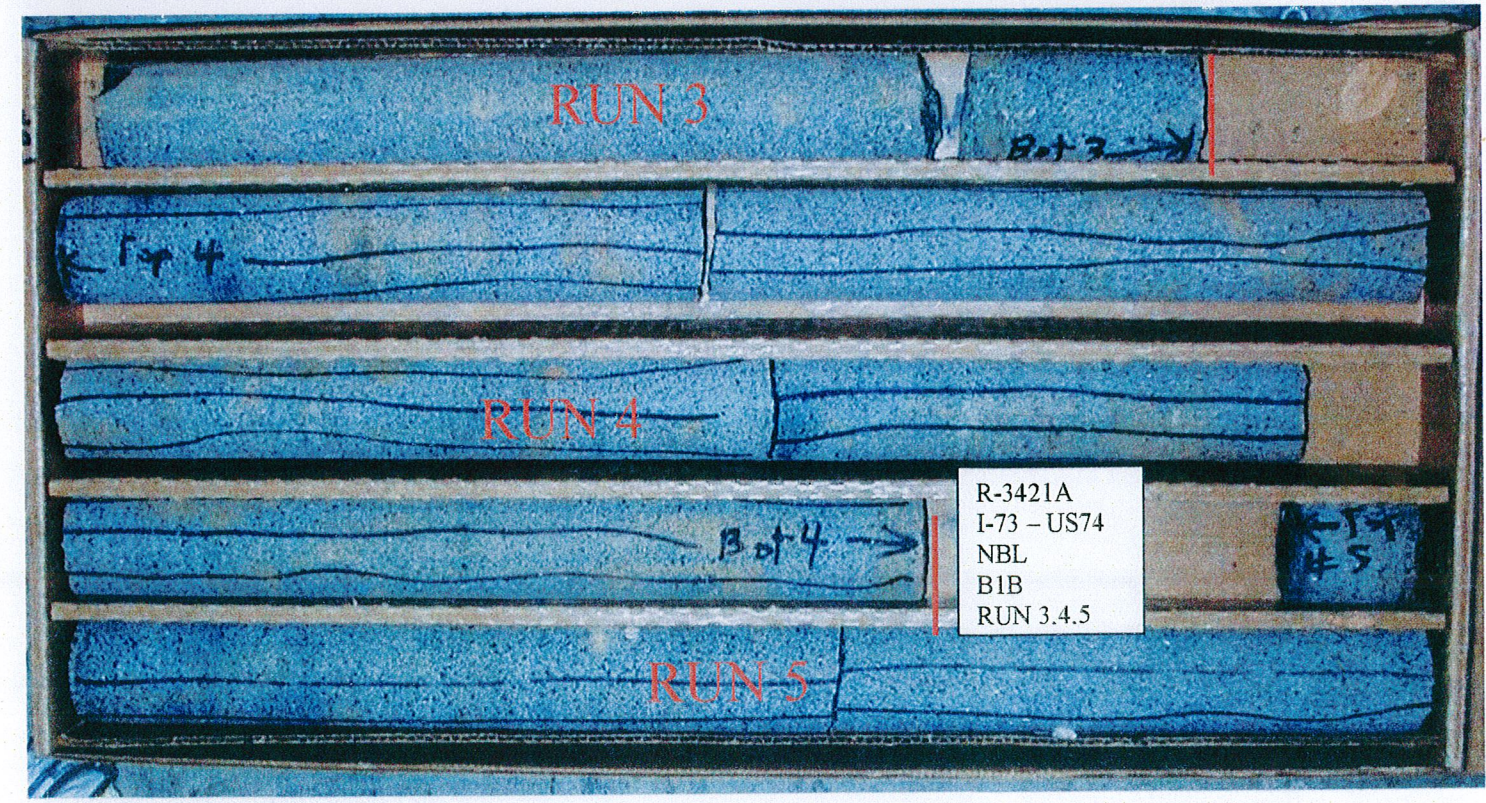
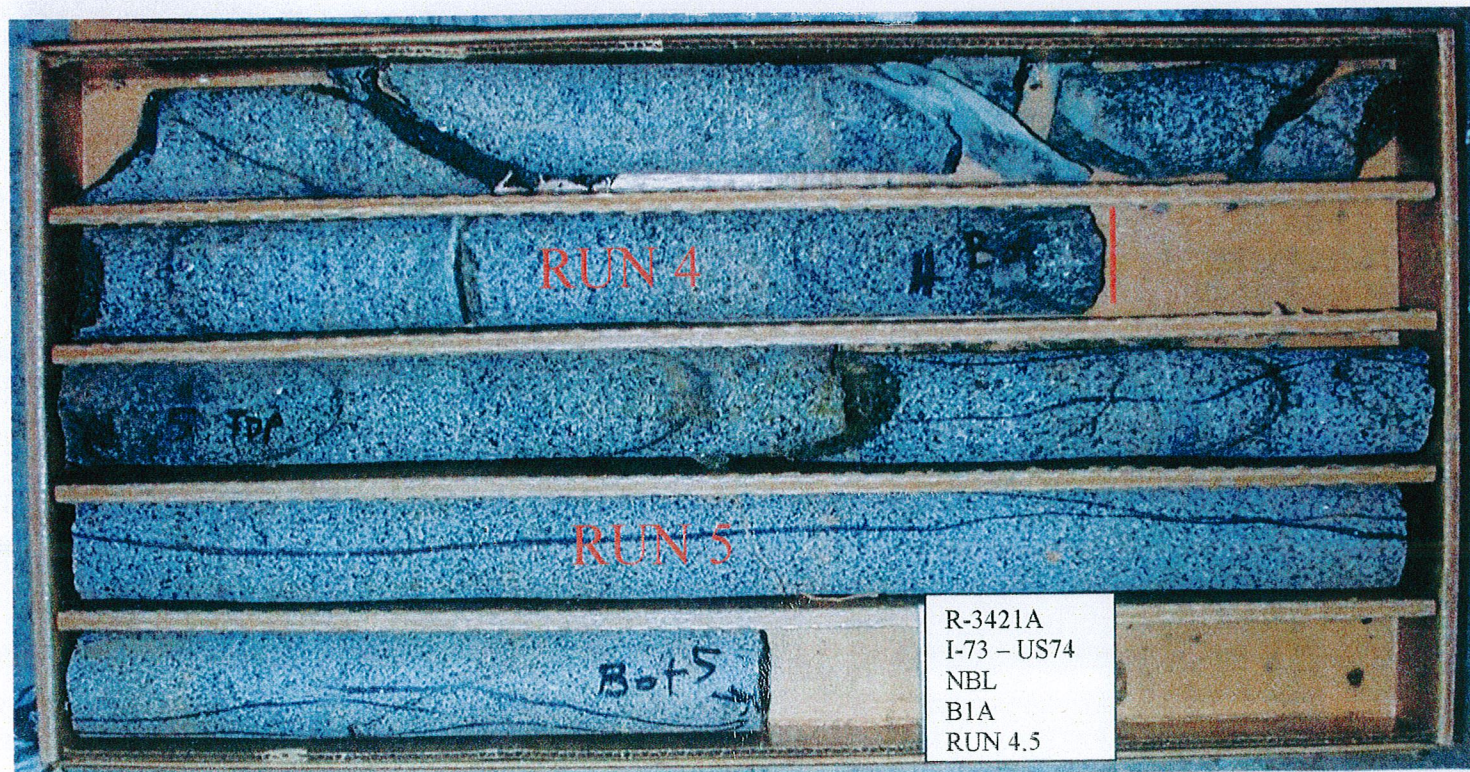
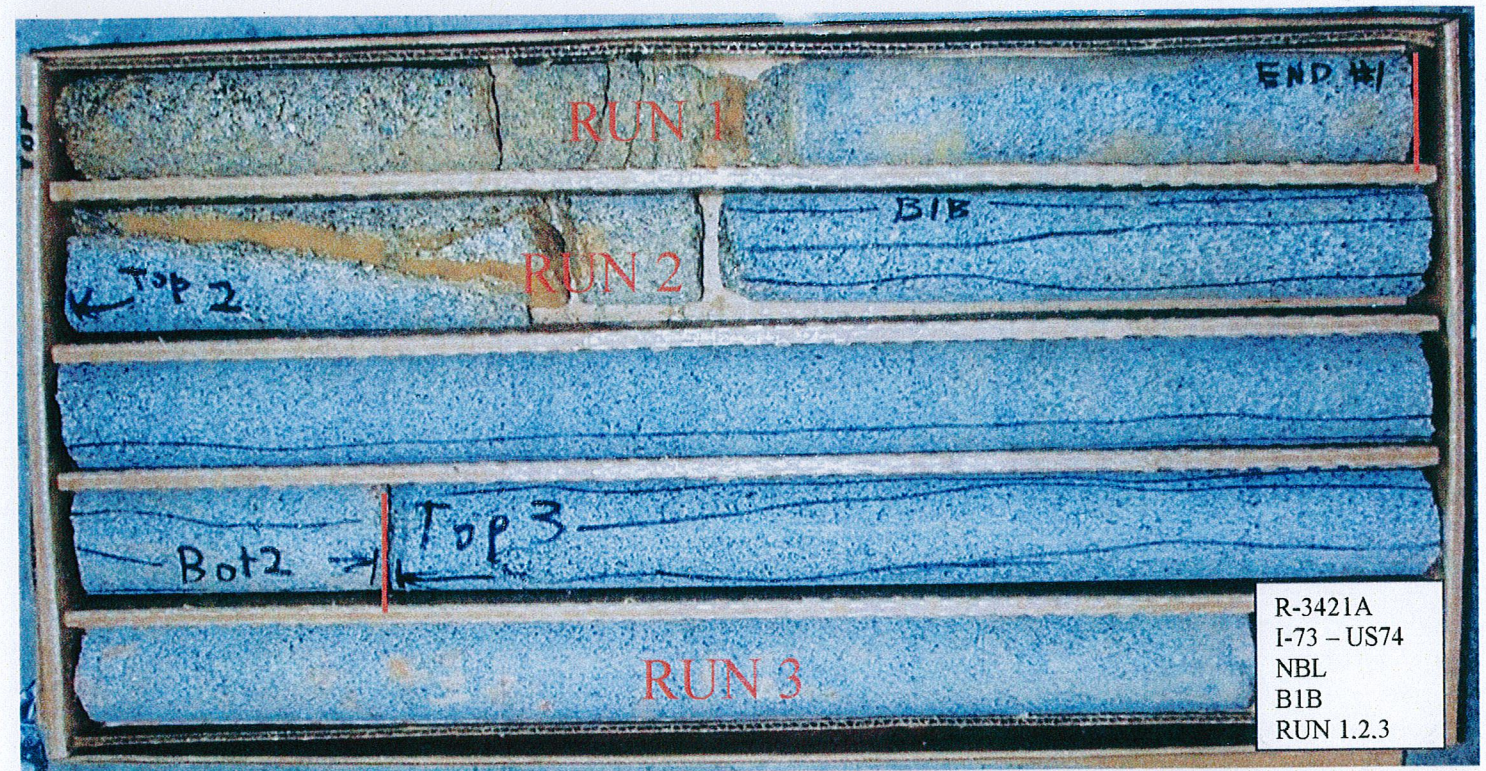
R-3421A 34542  
RICHMOND COUNTY  
SOUTH BOUND LANE BRIDGE OVER US 74 ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR1140

CORE PHOTOS



R-3421A 34542  
RICHMOND COUNTY  
NORTH BOUND LANE BRIDGE OVER US 74 ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR1140

CORE PHOTOS



R-3421A 34542  
RICHMOND COUNTY  
NORTH BOUND LANE BRIDGE OVER US 74 ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR1140

PHOTOS



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34542.1.1 R-3421A	1	

*J. Faragher*

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

**STRUCTURE  
SUBSURFACE INVESTIGATION**

**CONTENTS**

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE(S)
5-6	CROSS SECTION(S)
7-10	BORE LOG & CORE REPORT(S)
11	SOIL TEST RESULTS SCOUR REPORT
12	CORE PHOTOGRAPH(S) SITE PHOTOGRAPH(S)

PROJ. REFERENCE NO. 34542.1.1 R-3421A F.A. PROJ. NHF-220(4)  
 COUNTY RICHMOND  
 PROJECT DESCRIPTION US-220 BYPASS FROM US-74 BYPASS WEST  
OF ROCKINGHAM AT SR 1109 INTERCHANGE TO 0.3 MILES  
SOUTH OF SR 1140  
 SITE DESCRIPTION BRIDGE OVER US-74 BUS. WEST COLLECTOR  
ON RAMP C BETWEEN I-73 /US-220 BYPASS AND  
US-74 BUS. EAST (STA. 11+47.77 -RPC- /24+61.99 -FLY-)

**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. 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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. 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 THIS 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.

**PROJECT: 34542.1.1 ID: R-3421A**

PERSONNEL  
C.C. MURRAY

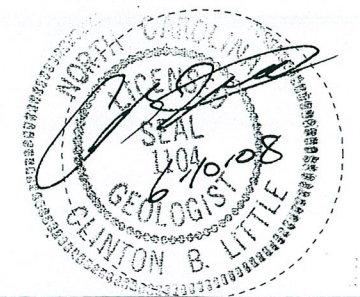
J.E. ESTEP

INVESTIGATED BY C.C. MURRAY

CHECKED BY C.B. LITTLE

SUBMITTED BY C.B. LITTLE

DATE MAY 2008



DRAWN BY: J.K. McClure /R.Q. Callaway





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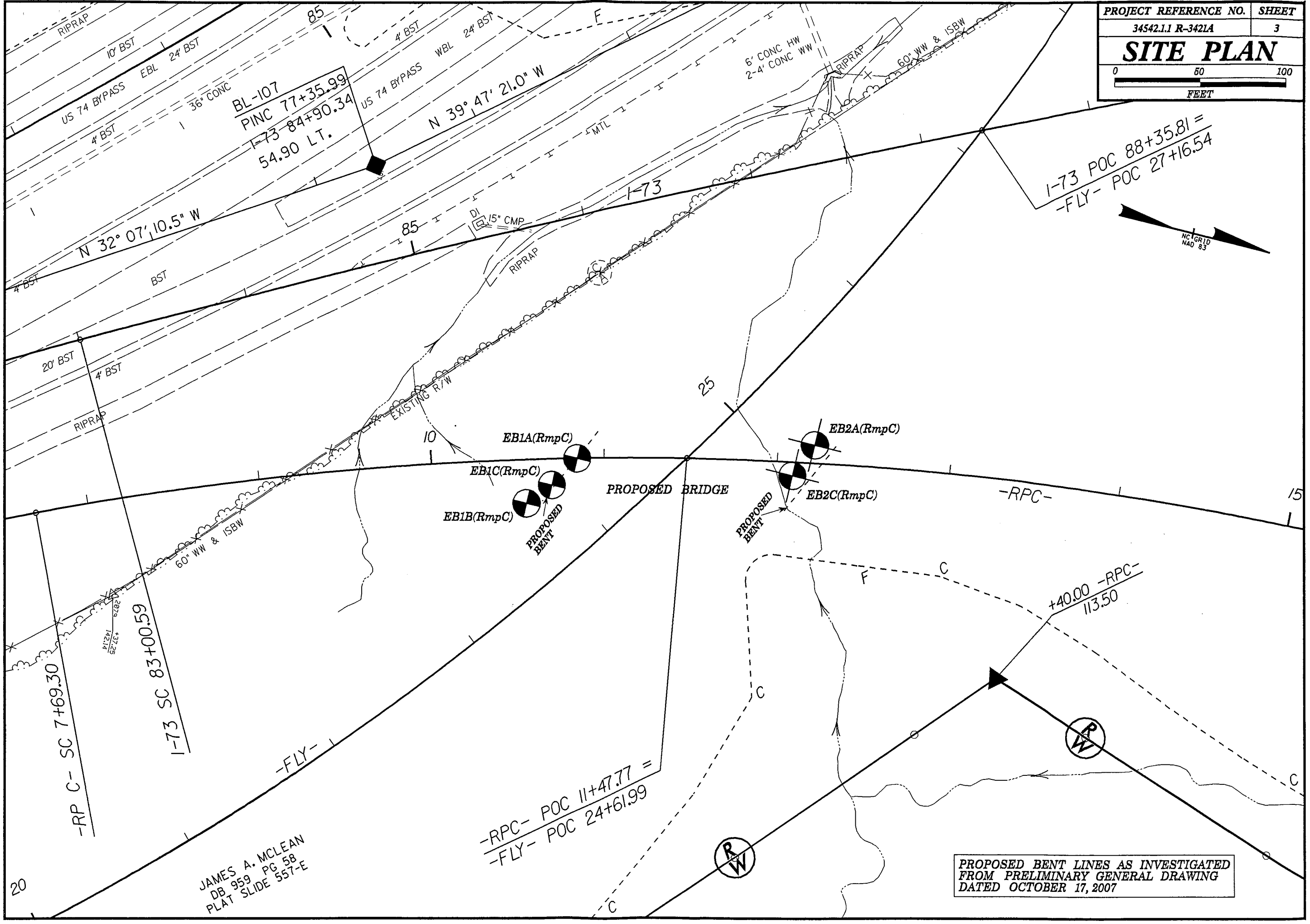
NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

## SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE ASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, ASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, DARK SILT CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HARD PLASTIC, A-7-6</i>	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.  THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <b>ANGULAR</b> , <b>SUBANGULAR</b> , <b>SUBROUNDED</b> , OR <b>ROUNDED</b> .	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 60 BLOWS PER FOOT IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:  WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.  CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL. IF TESTED, ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.  NON-CRYSTALLINE ROCK (NCR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN SEDIMENTARY ROCK (CP)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 60 BLOWS PER FOOT. <b>STRATA CORE RECOVERY (SREC)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>SOIL LEGEND AND ASHTO CLASSIFICATION</b>	<b>MINERALOGICAL COMPOSITION</b>	<b>WEATHERING</b>	
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	FRESH ROCK GENERALLY FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SL.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SL.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF. COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	<b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 60 BLOWS PER FOOT. <b>STRATA CORE RECOVERY (SREC)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>COMPRESSIBILITY</b>	<b>PERCENTAGE OF MATERIAL</b>	<b>GROUND WATER</b>	
SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP	
<b>CONSISTENCY OR DENSENESS</b>	<b>MISCELLANEOUS SYMBOLS</b>	<b>ROCK HARDNESS</b>	
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROUDED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROUDED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	
<b>TEXTURE OR GRAIN SIZE</b>	<b>ABBREVIATIONS</b>	<b>EQUIPMENT USED ON SUBJECT PROJECT</b>	
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053	AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST F - VOID RATIO FOSS - FOSSILIFEROUS FRAC - FRACTURED, FRACTURES FRAGS - FRAGMENTS HI - HIGHLY MED - MEDIUM MICA - MICACEOUS MOD - MODERATELY NP - NON PLASTIC ORG - ORGANIC PMT - PRESSUREMETER TEST SAP - SAPROLITIC SD - SAND, SANDY SL - SILT, SILTY SLI - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST WEA - WEATHERED γ - UNIT WEIGHT γ <sub>d</sub> - DRY UNIT WEIGHT	DRILL UNITS: <input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-55B <input type="checkbox"/> PORTABLE HOIST	
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>	<b>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</b>	<b>FRACURE SPACING</b>	<b>BEDDING</b>
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	- SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.6 TO 1 FEET VERY CLOSE LESS THAN 0.6 FEET	TERM THICKNESS VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET
<b>PLASTICITY</b>	<b>PLASTICITY INDEX (PI)</b>	<b>INDURATION</b>	
NONPLASTIC 0-5 VERY LOW LOW PLASTICITY 6-15 SLIGHT MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	
<b>COLOR</b>	<b>COLOR</b>	<b>NOTES:</b>	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		ELEVATION: _____ FT.	

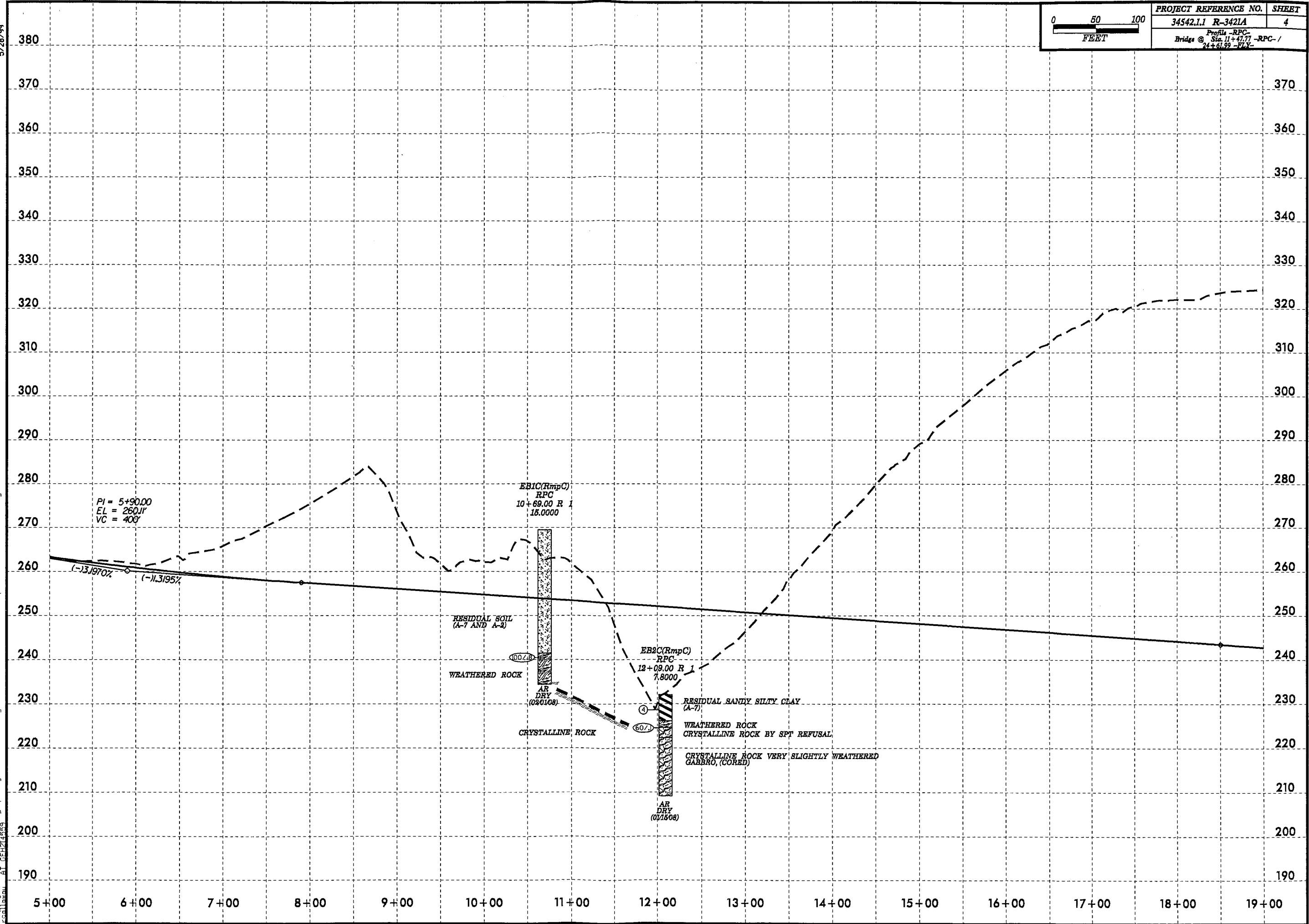


JAMES A. MCLEAN  
 DB 959 PG 58  
 PLAT SLIDE 557-E

PROPOSED BENT LINES AS INVESTIGATED  
 FROM PRELIMINARY GENERAL DRAWING  
 DATED OCTOBER 17, 2007

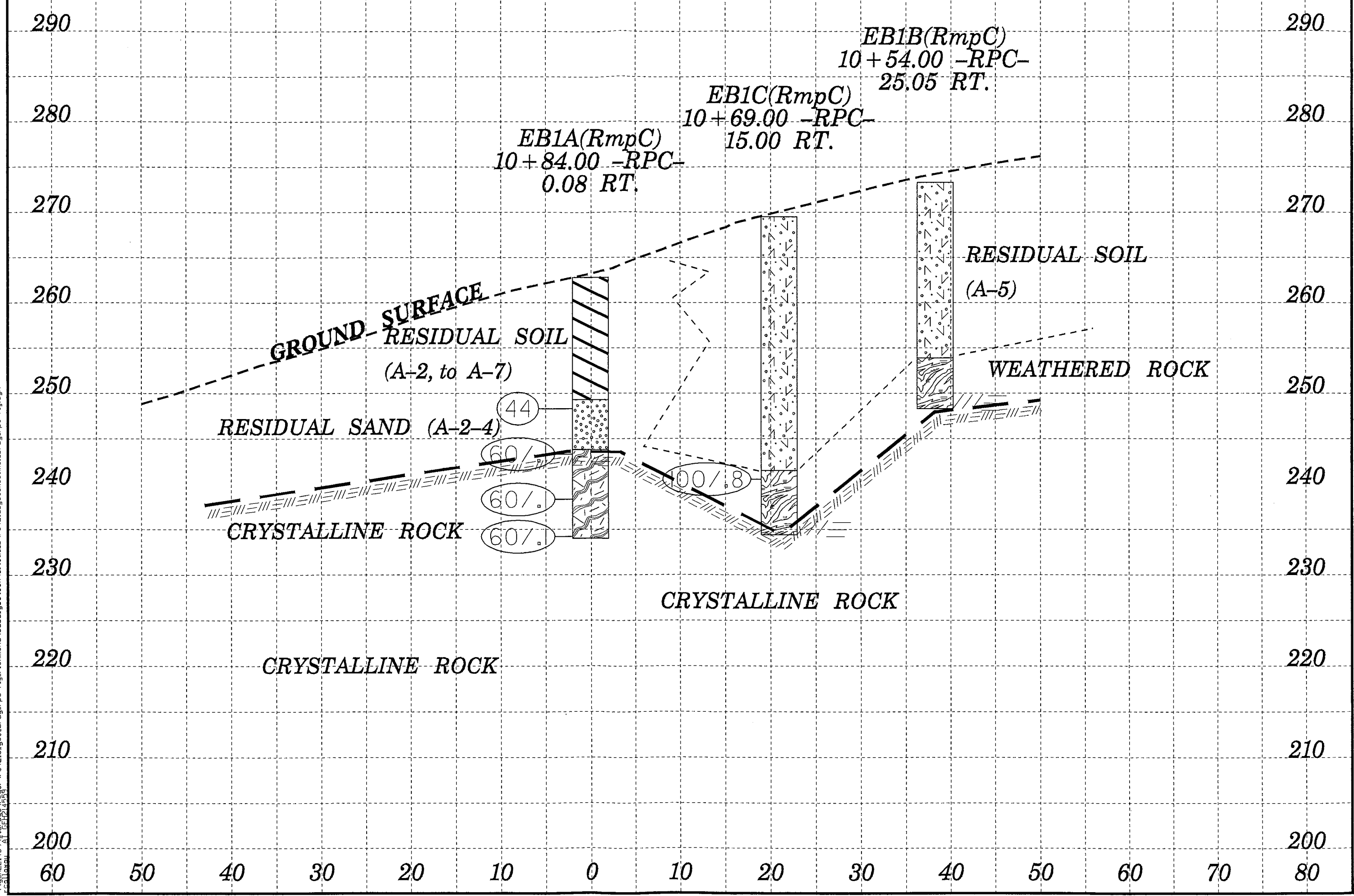


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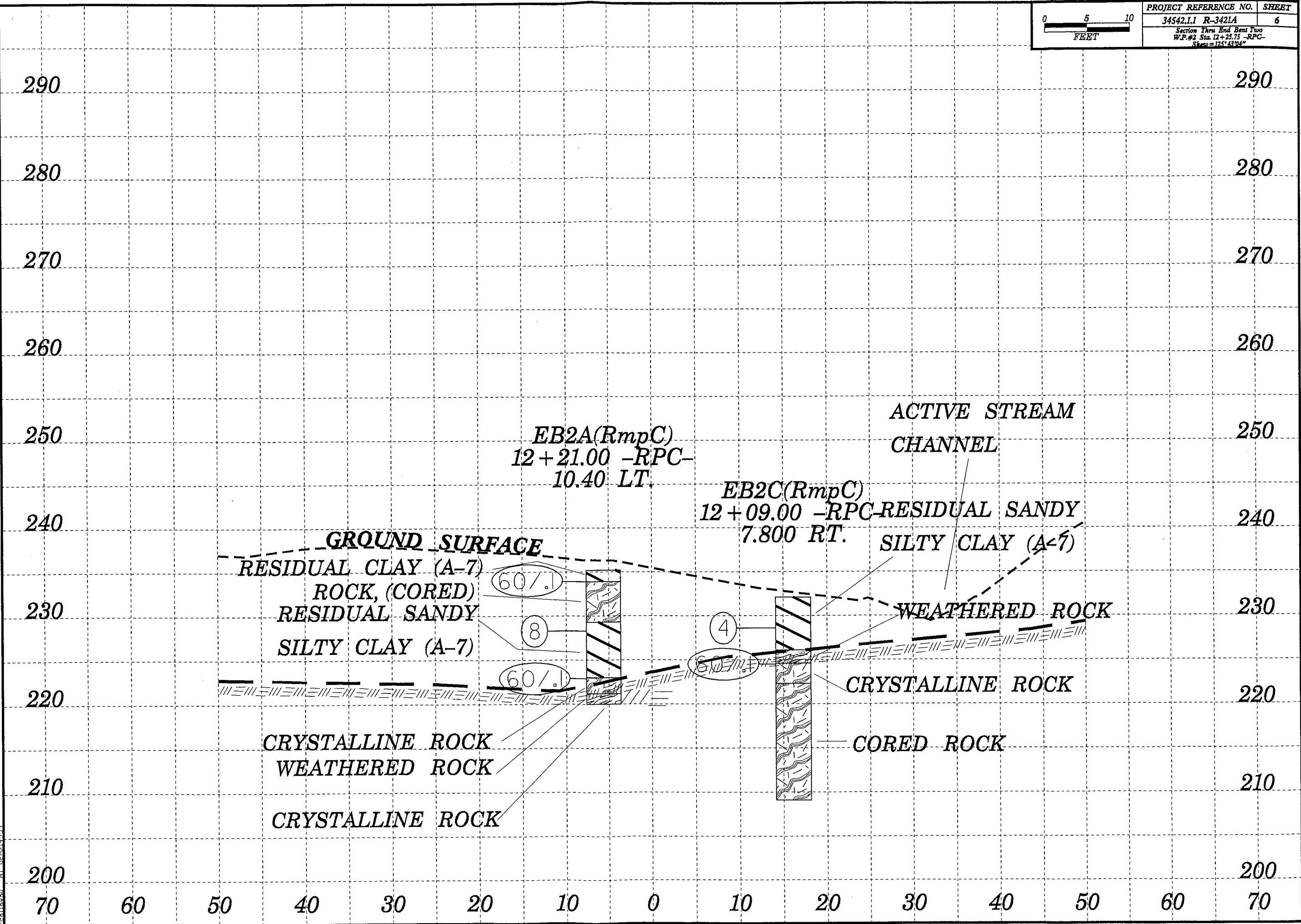
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290  
280  
270  
260  
250  
240  
230  
220  
210  
200

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

**GROUND SURFACE**

**ACTIVE STREAM CHANNEL**

**EB2A(RmpC)**  
12 + 21.00 -RPC-  
10.40 LT.

**EB2C(RmpC)**  
12 + 09.00 -RPC-  
7.800 RT.

**RESIDUAL CLAY (A-7)**

**ROCK, (CORED)**

**RESIDUAL SANDY**

**SILTY CLAY (A-7)**

**WEATHERED ROCK**

**CRYSTALLINE ROCK**

**CORED ROCK**

607.1

8

4

607.1

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY RICHMOND	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RAMP C BRIDGE OVER FLY			GROUND WTR (ft)
BORING NO. EB1A(RmpC)	STATION 10+84	OFFSET 0ft RT	ALIGNMENT -RPC-
COLLAR ELEV. 262.8 ft	TOTAL DEPTH 28.8 ft	NORTHING 436,330	EASTING 1,746,448
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 01/31/08	COMP. DATE 01/31/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 19.0 ft

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				
265													GROUND SURFACE	0.0
260													RESIDUAL CLAYEY TO SANDY RESIDUAL SOIL (A-2, A-7)	
250	249.3	13.5	8	14	30						SS-47		RESIDUAL DENSE, MOIST, TAN SAND (A-2-4)	13.5
245	244.3	18.5	38	60/1									CRYSTALLINE ROCK PRESUMED CRYSTALLINE ROCK, SPT REFUSAL	19.0
240	239.3	23.5	45	60/1										
235	234.3	28.5	60/1										Boring Terminated BY AUGER REFUSAL at Elevation 234.0 ft IN HARD CRYSTALLINE ROCK	28.8

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RMPC@FLY.GPJ :IC\_DOT.GDT 06/05/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY RICHMOND	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RAMP C BRIDGE OVER FLY			GROUND WTR (ft)
BORING NO. EB1B (RmpC)	STATION 10+54	OFFSET 25ft RT	ALIGNMENT -RPC-
COLLAR ELEV. 273.3 ft	TOTAL DEPTH 25.0 ft	NORTHING 436,307	EASTING 1,746,480
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 01/31/08	COMP. DATE 01/31/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 25.0 ft

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				
275													GROUND SURFACE	0.0
270											M		RESIDUAL RESIDUAL SOIL (A-5)	
260														
255													WEATHERED ROCK PRESUMED WEATHERED ROCK	19.4
250											M			
245													Boring Terminated BY AUGER REFUSAL at Elevation 248.3 ft ON HARD CRYSTALLINE ROCK	25.0

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RMPC@FLY.GPJ :IC\_DOT.GDT 06/05/08



PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY RICHMOND	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RAMP C BRIDGE OVER FLY			GROUND WTR (ft)
BORING NO. EB1C(RmpC)	STATION 10+69	OFFSET 15ft RT	ALIGNMENT -RPC-
COLLAR ELEV. 269.5 ft	TOTAL DEPTH 35.1 ft	NORTHING 436,319	EASTING 1,746,466
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 02/08/08	COMP. DATE 02/08/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 35.1 ft

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					
270														GROUND SURFACE	0.0
265														RESIDUAL RESIDUAL SOIL (A-7 AND A-2)	
260															
255															
250															
245															
240	241.3	28.2	35	65/3						100/8			WEATHERED ROCK PRESUMED SEVERELY WEATHERED CRYSTALLINE ROCK	28.0	
235															
230														Boring Terminated BY AUGER REFUSAL at Elevation 234.4 ft ON HARD CRYSTALLINE ROCK	35.1
225															
220															
215															
210															
205															
200															
195															
190															

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RMP\_C@FLY.GPJ NC\_DOT\_GDT\_06/05/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY RICHMOND	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RAMP C BRIDGE OVER FLY			GROUND WTR (ft)
BORING NO. EB2C(RmpC)	STATION 12+09	OFFSET 8ft RT	ALIGNMENT -RPC-
COLLAR ELEV. 232.1 ft	TOTAL DEPTH 23.0 ft	NORTHING 436,453	EASTING 1,746,428
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 01/05/08	COMP. DATE 01/05/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 7.5 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
235														232.1	0.0	GROUND SURFACE
230	229.6	2.5										M		226.1	6.0	RESIDUAL SOFT, MOIST RED BROWN SANDY SILTY CLAY (A-7)
225	224.6	7.5	4	2	2							M	224.6	7.5	WEATHERED ROCK	
														222.3	9.8	CRYSTALLINE ROCK HARD CRYSTALLINE ROCK BY SPT REFUSAL
220														209.1	23.0	CRYSTALLINE ROCK GABBRO VERY SLIGHTLY WEATHERED
215																
210																
205																
200																
195																
190																
185																
180																
175																
170																
165																
160																
155																

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RMPC@FLY.GPJ :NC\_DOT\_GCT\_06/05/08

PROJECT NO. 34542.1.1	ID. R-3421A	COUNTY RICHMOND	GEOLOGIST Murray, C. C.
SITE DESCRIPTION RAMP C BRIDGE OVER FLY			GROUND WTR (ft)
BORING NO. EB2C(RmpC)	STATION 12+09	OFFSET 8ft RT	ALIGNMENT -RPC-
COLLAR ELEV. 232.1 ft	TOTAL DEPTH 23.0 ft	NORTHING 436,453	EASTING 1,746,428
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 01/05/08	COMP. DATE 01/05/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 7.5 ft

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
					REC. (%)	RQD (%)		REC. (%)	RQD (%)		
222.3	222.3	9.8	3.2		(3.1)	(3.1)		(13.1)	(13.1)		Begin Coring @ 9.8 ft
220	219.1	13.0	5.0		(5.0)	(5.0)		99%	99%		CRYSTALLINE ROCK DARK GRAY GABBRO VERY SLIGHTLY WEATHERED TO FRESH AND SOUND
215	214.1	18.0	5.0		(5.0)	(5.0)					
210	209.1	23.0	5.0		(5.0)	(5.0)					Boring Terminated at Elevation 209.1 ft IN HARD CRYSTALLINE ROCK
205	204.1	28.0									
200											
195											
190											
185											
180											
175											
170											
165											
160											
155											
150											
145											

NCDOT CORE SINGLE R3421A\_GEO\_BH\_BRDG\_RMPC@FLY.GPJ :NC\_DOT\_GDT\_06/05/08

PROJECT NO. 34542.1.1		ID. R-3421A		COUNTY RICHMOND		GEOLOGIST Murray, C. C.										
SITE DESCRIPTION RAMP C BRIDGE OVER FLY							GROUND WTR (ft)									
BORING NO. EB2A(RmpC)		STATION 12+21		OFFSET 10ft LT		ALIGNMENT -RPC-										
COLLAR ELEV. 235.2 ft		TOTAL DEPTH 15.2 ft		NORTHING 436,461		EASTING 1,746,408										
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic											
START DATE 01/10/08		COMP. DATE 01/10/08		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 15.2 ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
240																
235														235.2	GROUND SURFACE	0.0
														233.9	RESIDUAL PRESUMED RESIDUAL CLAY (A-7)	1.3
														229.3	CRYSTALLINE ROCK ROCK, (CORED)	5.9
230	229.3	5.9												229.3	RESIDUAL BROWN SANDY SILTY CLAY (A-7)	5.9
			2	2	6									223.0	CRYSTALLINE ROCK	12.2
														221.2	SPT REFUSAL	14.0
225														220.0	WEATHERED ROCK	15.2
220														Boring Terminated BY AUGER REFUSAL at Elevation 220.0 ft ON HARD CRYSTALLINE ROCK		
215																
210																
205																
200																
195																
190																
185																
180																
175																
170																
165																
160																

NCDOT BORE SINGLE R3421A\_GEO\_BH\_BRDG\_RMPC@FLY.GPJ\_NC\_DOT.GJT\_06/05/08

PROJECT NO. 34542.1.1		ID. R-3421A		COUNTY RICHMOND		GEOLOGIST Murray, C. C.					
SITE DESCRIPTION RAMP C BRIDGE OVER FLY							GROUND WTR (ft)				
BORING NO. EB2A(RmpC)		STATION 12+21		OFFSET 10ft LT		ALIGNMENT -RPC-					
COLLAR ELEV. 235.2 ft		TOTAL DEPTH 15.2 ft		NORTHING 436,461		EASTING 1,746,408					
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic						
START DATE 01/10/08		COMP. DATE 01/10/08		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 15.2 ft					
CORE SIZE NX			TOTAL RUN 5.5 ft		DRILLER Estep, J. E.						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %	REC. (ft) %	RQD (ft) %			
233.9	233.9	1.3	5.5		(1.1) 20%	(0.0) 0%	(1.1) 24%	(0.0) 0%		Begin Coring @ 1.3 ft	1.3
										CRYSTALLINE ROCK	
										APPARENTLY AN UNWEATHERED VESTIGAL ROCK "FLOATING" IN RESIDUAL SOIL. FINE GRAINED GABBRO.	
230	228.4	6.8		N=8						RESIDUAL	5.9
225											
220				N=60/1						CRYSTALLINE ROCK	12.2
										WEATHERED ROCK	14.0
										Boring Terminated BY AUGER REFUSAL at Elevation 220.0 ft ON HARD CRYSTALLINE ROCK	15.2
215											
210											
205											
200											
195											
190											
185											
180											
175											
170											
165											
160											
155											

NCDOT CORE SINGLE R3421A\_GEO\_BH\_BRDG\_RMPC@FLY.GPJ\_NC\_DOT.GJT\_06/05/08

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAY  
MATERIALS & TESTS UNIT  
SOILS LABORATORY

T. I. P. No. R-3421A

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 34552.1.1 County RICHMOND Owner \_\_\_\_\_  
 Date: Sampled 11/15/04 Received 11/30/04 Reported 12/2/2004  
 Sampled from \_\_\_\_\_ By C C MURRAY  
 Submitted by N WAINAINA 1995 Standard Specifications

718367 TO 718403  
6/5/08

**TEST RESULTS**

Proj. Sample No.	SS-41	SS-42	SS-44	SS-45	SS-46	SS-47
Lab. Sample No.	718373	718374	718375	718376	718377	718378
Retained #4 Sieve %	8	-	-	-	-	7
Passing #10 Sieve %	88	100	99	98	98	78
Passing #40 Sieve %	39	59	63	51	51	41
Passing #200 Sieve %	10	29	29	27	14	20

**MINUS NO. 10 FRACTION**

SOIL MORTAR - 100%							
Coarse Sand Ret - #60 %	71.1	66.5	55.2	63.0	70.5	63.2	
Fine Sand Ret - #270 %	18.6	4.9	16.8	17.3	16.3	12.7	
Silt 0.05 - 0.005 mm %	2.2	0.3	2.2	2.3	2.1	5.5	
Clay < 0.005 mm %	8.1	28.3	25.9	17.4	11.1	18.6	
Passing #40 Sieve %	-	-	-	-	-	-	
Passing #200 Sieve %	-	-	-	-	-	-	

L. L.	21	64	47	40	28	38
P. I.	NP	38	25	20	4	23
AASHTO Classification	A-1-b(0)	A-2-7(4)	A-2-7(2)	A-2-6(1)	A-2-4(0)	A-2-6(1)
Station	12+00	12+00	12+00	12+00	12+00	12+00
	130 RT	130 RT	130 RT	130 RT	130 RT	130 RT
Hole No.	FLY	FLY	FLY	FLY	FLY	FLY
Depth (Ft)	38.30	43.30	53.30	58.30	63.30	68.30
to	39.80	44.80	54.80	59.80	64.80	69.80

\_\_\_\_\_  
Soils Engineer



R-3421A 34542  
RICHMOND COUNTY  
BRIDGE OVER US 74 BUSINESS WEST COLLECTOR ON RAMP C BETWEEN I-73 / US 220 BYPASS AND US 74

CORE PHOTOS



REFERENCE: R-3421A

PROJECT: 34542

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY RICHMOND  
PROJECT DESCRIPTION US 220 BYPASS FROM US 74 BYPASS  
WEST OF ROCKINGHAM AT SR 1109 INTERCHANGE  
TO 0.3 MILES SOUTH OF SR 1140  
SITE DESCRIPTION CULVERT AT -LOOP B- STA. 8+68.70  
ON US74/I73 INTERCHANGE OVER UNNAMED TRIBUTARY  
TO PEE DEE RIVER

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5-6	BORING LOGS
7	SITE PHOTOGRAPHS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3421A	1	7

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. 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.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. 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:
1. 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.
  2. 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. JONES
- B. KEANEY
- B. HOWEY
- C. WANG
- D. RACEY
- S. DAVIS

INVESTIGATED BY F & R, INC  
HDR ENGINEERING, INC

DRAWN BY C. MYERS

CHECKED BY B. KEANEY  
HDR

SUBMITTED BY ENGINEERING, INC.

DATE 7/2015



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



8/18/2015

SIGNATURE DATE

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

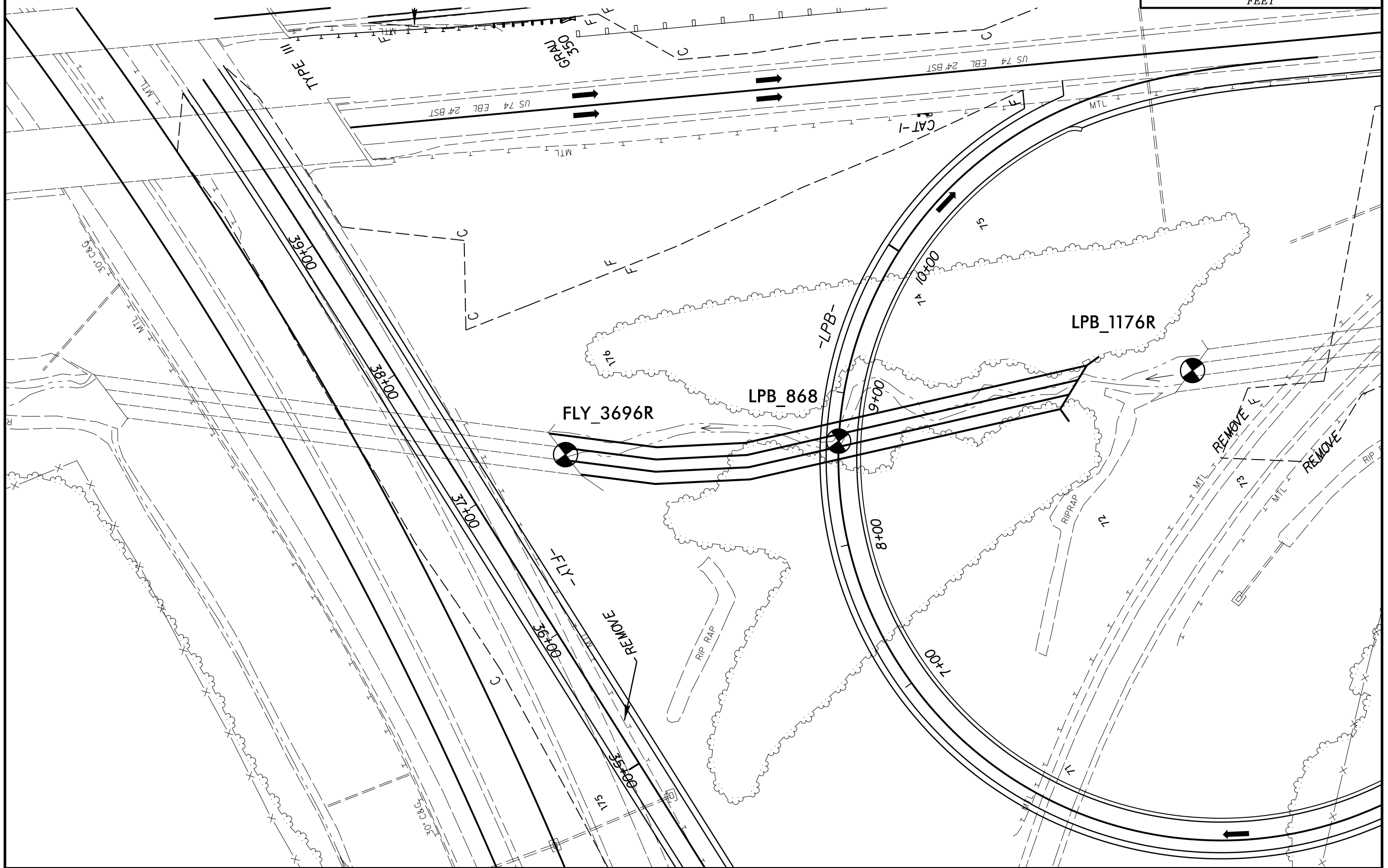
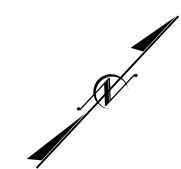
## SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

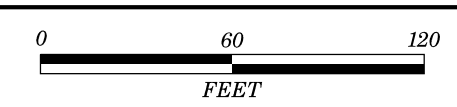
SOIL DESCRIPTION												GRADATION						ROCK DESCRIPTION						TERMS AND DEFINITIONS																							
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>												WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.						HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:  WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.  CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.  NON-CRYSTALLINE ROCK (NCR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN SEDIMENTARY ROCK (CP)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.						ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.																							
SOIL LEGEND AND AASHTO CLASSIFICATION												ANGULARITY OF GRAINS						WEATHERING						MISCELLANEOUS SYMBOLS																							
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS												THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.						FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (IV SLI.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SLI.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL. SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF. VERY SEVERE (IV SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF. COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.						MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.						ROCK FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL. ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF. ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF. ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.						ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY						DIP & DIP DIRECTION OF ROCK STRUCTURES SPT DMT VST PMT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE					
MINERALOGICAL COMPOSITION												COMPRESSION						GROUND WATER						RECOMMENDATION SYMBOLS																							
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS												SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50						WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP						UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK																							
COMPRESSION												PERCENTAGE OF MATERIAL						ABBREVIATIONS						EQUIPMENT USED ON SUBJECT PROJECT																							
SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER												ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE						AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - COARSE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED UNIT WEIGHT DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO						DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE *STEEL TEETH TRICONE *TUNG-CARB. CORE BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: -B -H -N HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST																							
TEXTURE OR GRAIN SIZE												TEXTURE OR GRAIN SIZE						SOIL MOISTURE - CORRELATION OF TERMS						PLASTICITY																							
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053												BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)						GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3						SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE						NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC PLASTICITY INDEX (PI) 0-5 6-15 16-25 26 OR MORE DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH																	
COLOR												COLOR						FRACTURE SPACING						BEDDING																							
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.												FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY						TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FOOT VERY CLOSE LESS THAN 0.16 FEET						TERM THICKNESS VERY THICKLY BEDDED 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET																							
ELEVATION												ELEVATION						INDURATION						NOTES																							
ELEVATION: _____ FEET												FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.						BORING AND GROUND SURFACE ELEVATIONS OBTAINED FROM NCDOT- PROVIDED DTM FILE FIAD - FILLED IMMEDIATELY AFTER DRILLING UCS - UNCONFINED COMPRESSIVE STRENGTH																													

# CULVERT AT -LOOP B- STA. 8+68.70

PROJECT REFERENCE NO.	SHEET NO.
R-3421A	3
<b>SITE PLAN</b>	
0                      60                      120 FEET	



# PROFILE ALONG LOOP B CULVERT CENTERLINE



<b>PROJECT REFERENCE NO.</b>	<b>SHEET NO.</b>
R-3421A	4
<b>PROFILE ALONG LOOP B CULVERT CENTERLINE</b>	

240

**NOTES:**  
 BORING LOCATION AND OFFSET ARE RELATIVE TO CENTERLINE -LPB- OR -FLY-  
  
 GROUND LINE PROFILE OF CULVERT TAKEN FROM  
 CULVERT SURVEY & HYDRAULIC DESIGN REPORT RECEIVED 6-1-2015  
  
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH  
 PROJECTED ONTO THE PROFILE.

-LPB- 8+68.7  
3@8'x7' RCBC with Sills

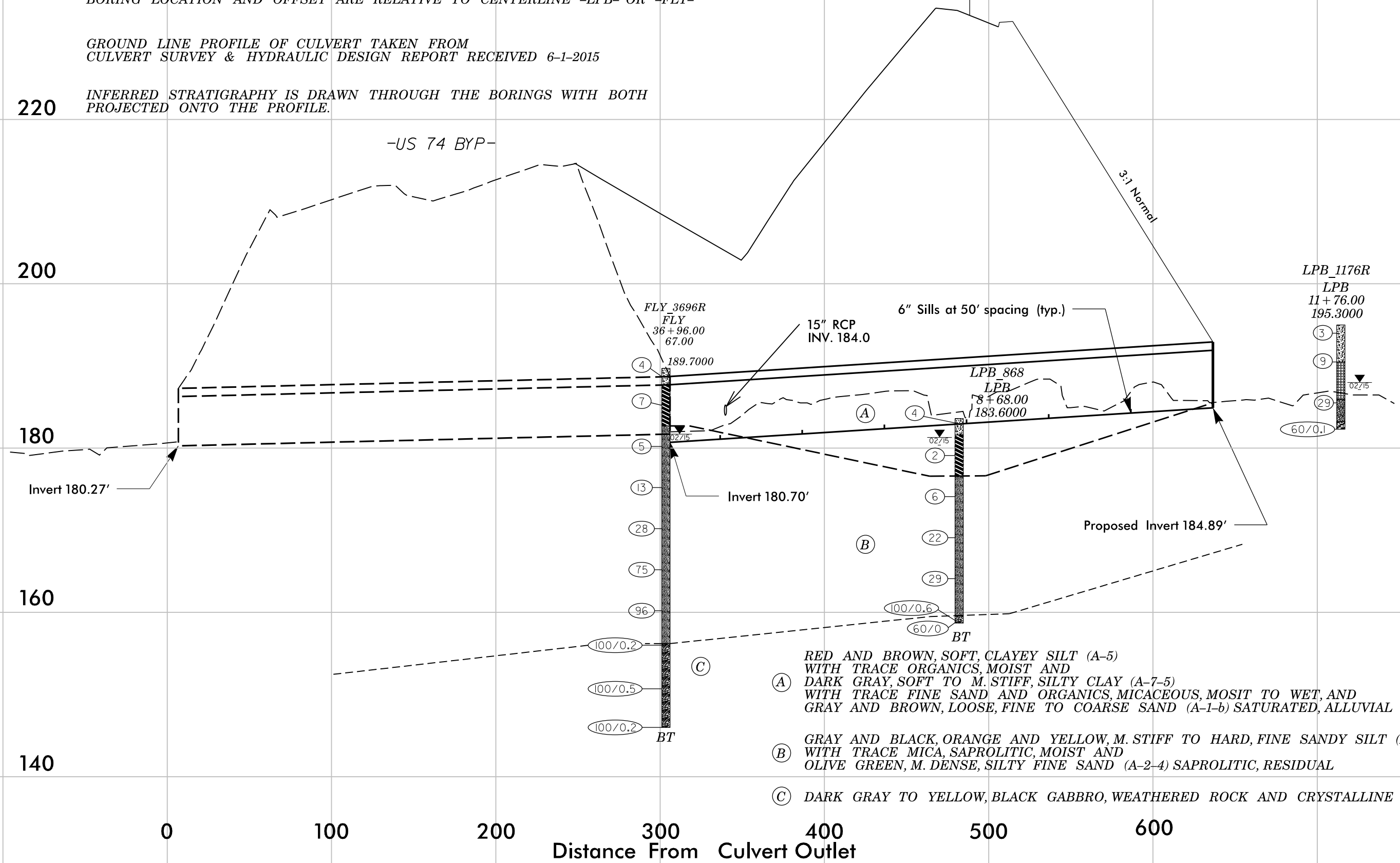
220

200

180

160

140



- (A) RED AND BROWN, SOFT, CLAYEY SILT (A-5) WITH TRACE ORGANICS, MOIST AND DARK GRAY, SOFT TO M. STIFF, SILTY CLAY (A-7-5) WITH TRACE FINE SAND AND ORGANICS, MICACEOUS, MOIST TO WET, AND GRAY AND BROWN, LOOSE, FINE TO COARSE SAND (A-1-b) SATURATED, ALLUVIAL
- (B) GRAY AND BLACK, ORANGE AND YELLOW, M. STIFF TO HARD, FINE SANDY SILT (A-4), WITH TRACE MICA, SAPROLITIC, MOIST AND OLIVE GREEN, M. DENSE, SILTY FINE SAND (A-2-4) SAPROLITIC, RESIDUAL
- (C) DARK GRAY TO YELLOW, BLACK GABBRO, WEATHERED ROCK AND CRYSTALLINE ROCK

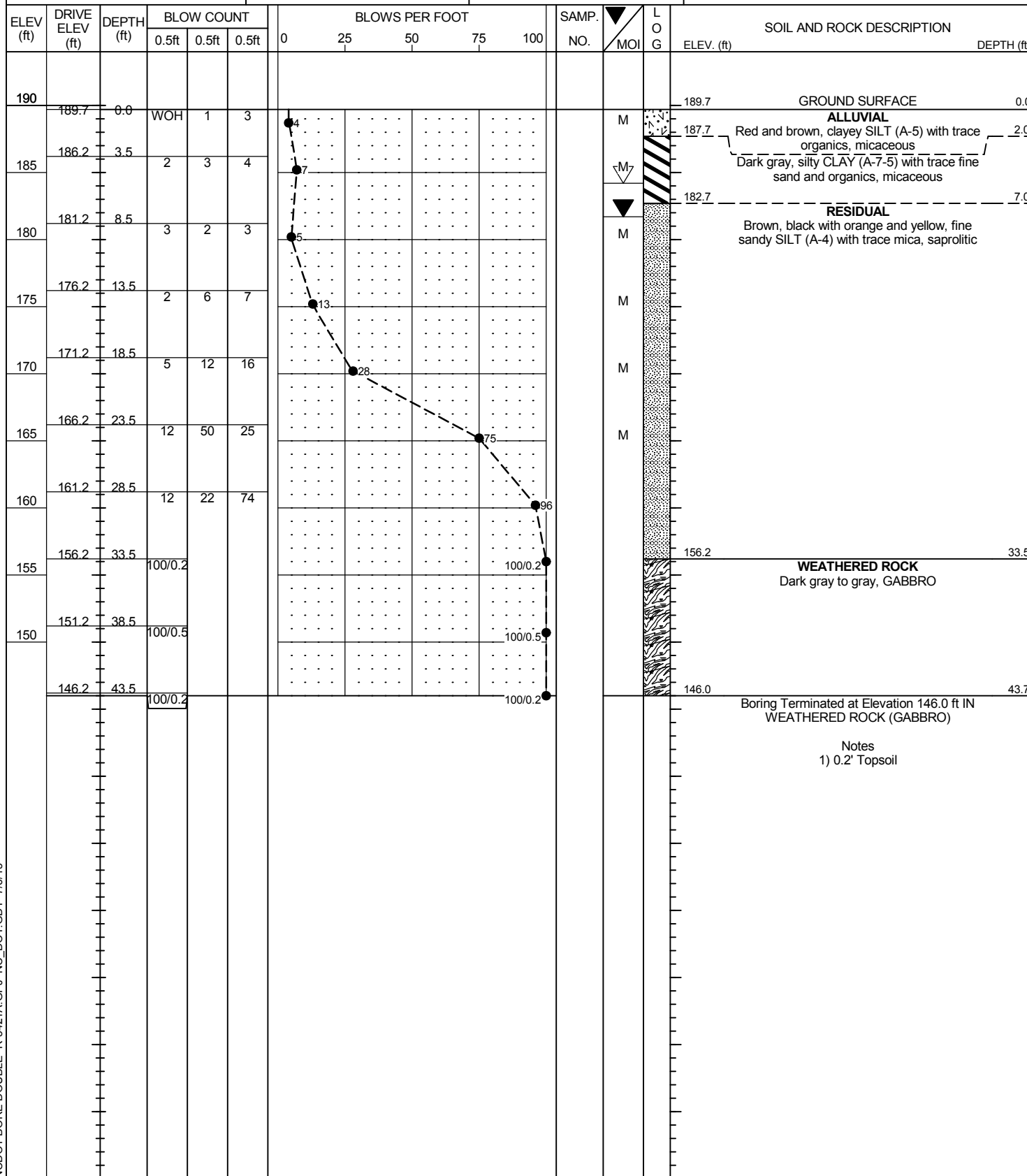
0                      100                      200                      300                      400                      500                      600  
 Distance From Culvert Outlet



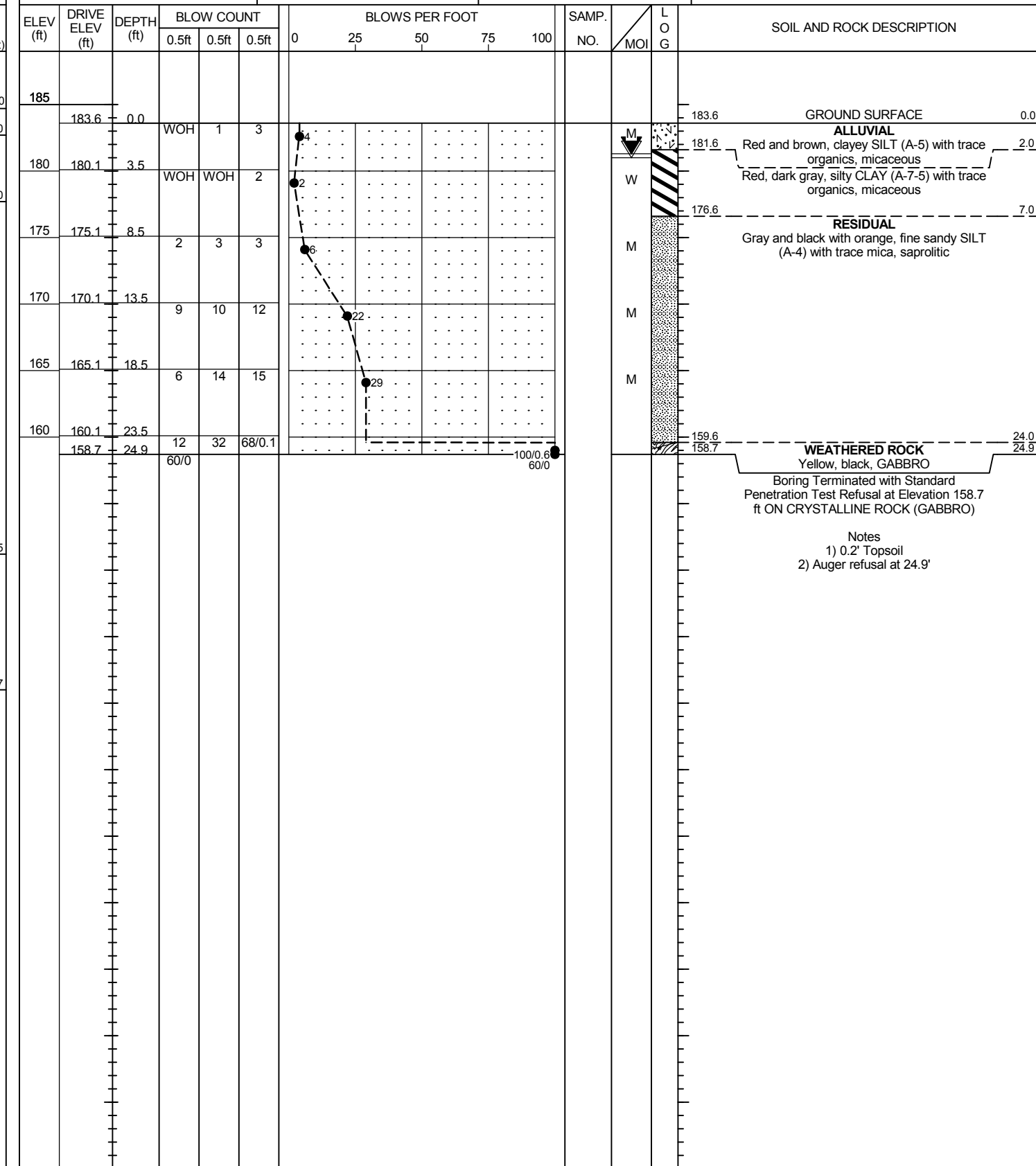
# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 34542.1.FR4	TIP R-3421A	COUNTY RICHMOND	GEOLOGIST C. Wang
SITE DESCRIPTION US 220 Bypass from US 74 Bypass West of Rockingham at SR1109 to 0.3 miles south of SR1140			GROUND WTR (ft)
BORING NO. FLY_3696R	STATION 36+96	OFFSET 67 ft RT	ALIGNMENT -FLY-
COLLAR ELEV. 189.7 ft	TOTAL DEPTH 43.7 ft	NORTHING 436,849	EASTING 1,745,286
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 76% 02/05/2015		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 02/18/15	COMP. DATE 02/19/15	SURFACE WATER DEPTH N/A



WBS 34542.1.FR4	TIP R-3421A	COUNTY RICHMOND	GEOLOGIST C. Wang
SITE DESCRIPTION US 220 Bypass from US 74 Bypass West of Rockingham at SR1109 to 0.3 miles south of SR1140			GROUND WTR (ft)
BORING NO. LPB_868	STATION 8+68	OFFSET CL	ALIGNMENT -LPB-
COLLAR ELEV. 183.6 ft	TOTAL DEPTH 24.9 ft	NORTHING 436,978	EASTING 1,745,410
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 76% 02/05/2015		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 02/18/15	COMP. DATE 02/18/15	SURFACE WATER DEPTH N/A





# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 34542.1.FR4	TIP R-3421A	COUNTY RICHMOND	GEOLOGIST C. Wang
SITE DESCRIPTION US 220 Bypass from US 74 Bypass West of Rockingham at SR1109 to 0.3 miles south of SR1140			GROUND WTR (ft)
BORING NO. LPB_1176R	STATION 11+76	OFFSET 151 ft RT	ALIGNMENT -LPB-
COLLAR ELEV. 195.3 ft	TOTAL DEPTH 12.7 ft	NORTHING 437,169	EASTING 1,745,548
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 76% 02/05/2015		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 02/16/15	COMP. DATE 02/17/15	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						
200																
195	195.3	0.0												195.3	GROUND SURFACE	0.0
			WOH	1	2											
190	191.8	3.5	4	2	7									190.8	<b>ALLUVIAL</b> Red and brown, clayey SILT (A-5) with trace fine sand and organics, micaceous	4.5
185	186.8	8.5	12	14	15									186.2	Gray and brown, fine to coarse SAND (A-1-b) and gravel	9.1
	182.7	12.6	60/0.1											183.5	<b>RESIDUAL</b> Olive green, silty fine SAND (A-2-4), saprolitic	11.8
														182.6	<b>CRYSTALLINE ROCK</b> GABBRO	12.7

Boring Terminated with Standard Penetration Test Refusal at Elevation 182.6 ft IN CRYSTALLINE ROCK (GABBRO)

Notes  
 1) Strata break in split spoon at 4.5' and 9.1'  
 2) Hard drilling at 11.8'  
 3) Auger refusal at 12.6'

NCDOT BORE DOUBLE R-3421A.GPJ NC\_DOT\_GDT 7/6/15



**Photo 1: Looking South Along Loop B Culvert**

