

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

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PROJ. REFERENCE NO. 35022.1.1 U-4412 F.A. PROJ. STP-1184(I)
COUNTY HAYWOOD
PROJECT DESCRIPTION SR 1184 (HOWELL MILL ROAD) FROM US 276
(RUSS AVENUE) TO US 23 (ASHEVILLE HIGHWAY)
WAYNESVILLE
SITE DESCRIPTION RETAINING WALL FROM STA 24+25 - 26+40
36' RT ALONG ALIGNMENT -L-

CAUTION NOTICE

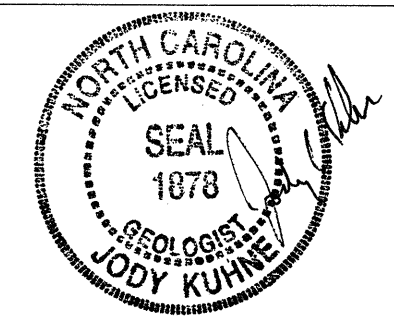
THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING 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 (ON-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
JC KUHNE
MM HAGER
C COFFEY
R CHILDERS

INVESTIGATED BY JC KUHNE
CHECKED BY WD FRYE
SUBMITTED BY WD FRYE
DATE 2/05/09



PROJECT: 35022.1.1 ID: U-4412

DRAWN BY: JC KUHNE

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.

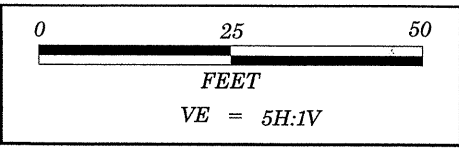
NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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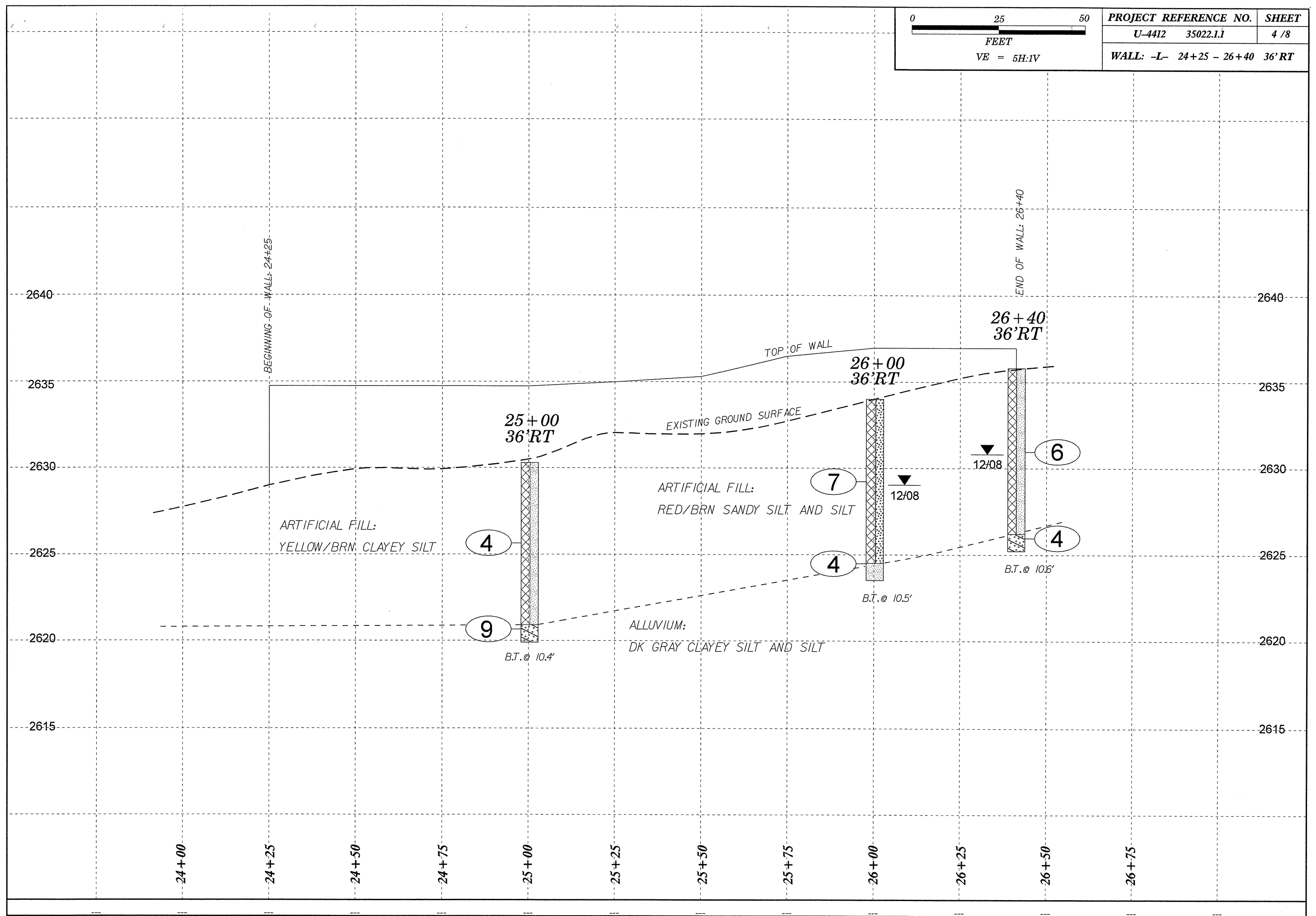
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																																																																																																																																																																									
<p>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 (AASHTO T206, 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, GRN. SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>	<p>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.</p> <p style="text-align: center;">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>	<p>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 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:</p> <p>WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p>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, 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 DISLOGGED 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 (RQD) - 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 (N 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 (SRQD) - 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.</p>																																																																																																																																																																																																									
<p style="text-align: center;">SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="4">ORGANIC MATERIALS</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1</td><td>A-1-b</td><td>A-3</td><td>A-2</td> <td>A-4</td><td>A-5</td><td>A-6</td><td>A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>SYMBOL</td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>% PASSING</td> <td>10</td><td>10</td><td>10</td><td>10</td> <td>10</td><td>10</td><td>10</td><td>10</td> <td>10</td><td>10</td><td>10</td><td>10</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>LIQUID LIMIT</td> <td>6</td><td>6</td><td>6</td><td>6</td> <td>6</td><td>6</td><td>6</td><td>6</td> <td>6</td><td>6</td><td>6</td><td>6</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>PLASTIC INDEX</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS. GRAVEL AND SAND</td><td>FINE SAND</td><td>SILTY OR CLAYEY GRAVEL AND SAND</td><td>SILTY CLAYEY SAND</td> <td>SILTY SOILS</td><td>CLAYEY SOILS</td><td></td><td></td> <td>GRANULAR SOILS</td><td>SILT-CLAY SOILS</td><td>MUCK, PEAT</td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>GEN. RATING AS A SUBGRADE</td> <td colspan="4">EXCELLENT TO GOOD</td> <td colspan="4">FAIR TO POOR</td> <td>FAIR TO POOR</td><td>POOR</td><td>UNSATURABLE</td><td></td> <td></td><td></td><td></td><td></td> </tr> </table> <p>PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</p>	GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)				SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS				GROUP CLASS.	A-1	A-1-b	A-3	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7					SYMBOL																	% PASSING	10	10	10	10	10	10	10	10	10	10	10	10					LIQUID LIMIT	6	6	6	6	6	6	6	6	6	6	6	6					PLASTIC INDEX	0	0	0	0	0	0	0	0	0	0	0	0					GROUP INDEX	0	0	0	0	0	0	0	0	0	0	0	0					USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY CLAYEY SAND	SILTY SOILS	CLAYEY SOILS			GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT						GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR	POOR	UNSATURABLE						<p style="text-align: center;">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE</p> <p>LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50</p> <p style="text-align: center;">PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th></th> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>3 - 5%</td> <td>1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>5 - 12%</td> <td>10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>12 - 20%</td> <td>20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>>10%</td> <td>>20%</td> <td>>20%</td> <td>35% AND ABOVE</td> </tr> </table> <p style="text-align: center;">GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p> <p style="text-align: center;">MISCELLANEOUS SYMBOLS</p> <p> ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</p> <p> SOIL SYMBOL</p> <p> ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</p> <p> INFERRED SOIL BOUNDARY</p> <p> INFERRED ROCK LINE</p> <p> ALLUVIAL SOIL BOUNDARY</p> <p> DIP & DIP DIRECTION OF ROCK STRUCTURES</p> <p> SOUNDING ROD</p> <p> SPT TEST BORING</p> <p> AUGER BORING</p> <p> CORE BORING</p> <p> MONITORING WELL</p> <p> PIEZOMETER INSTALLATION</p> <p> SLOPE INDICATOR INSTALLATION</p> <p> SPT N-VALUE</p> <p> SPT REFUSAL</p> <p style="text-align: center;">ABBREVIATIONS</p> <p>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</p> <p>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</p> <p>w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED ? - UNIT WEIGHT ? - DRY UNIT WEIGHT</p>		ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	3 - 5%	1 - 10%	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	5 - 12%	10 - 20%	MODERATELY ORGANIC	5 - 10%	12 - 20%	12 - 20%	20 - 35%	HIGHLY ORGANIC	>10%	>20%	>20%	35% AND ABOVE	<p style="text-align: center;">WEATHERING</p> <p>FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (V 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.</p> <p>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.</p> <p>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.</p> <p>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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>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. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i></p> <p>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. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i></p> <p>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.</p> <p style="text-align: center;">ROCK HARDNESS</p> <p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>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.</p> <p>MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT CAN BE GROOVED 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.</p> <p>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.</p> <p style="text-align: center;">FRACTURE SPACING</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>SPACING</th> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>> 4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FEET</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table> <p style="text-align: center;">BEDDING</p> <p style="text-align: center;">INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>	TERM	SPACING	TERM	THICKNESS	VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET	WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET	MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET	CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET	VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET			THINLY LAMINATED	< 0.008 FEET
GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)				SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS																																																																																																																																																																																																			
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PROJECT REFERENCE NO.	SHEET
U-4412 35022.1.1	4 / 8
WALL: -L- 24+25 - 26+40 36' RT	



BEGINNING OF WALL: 24+25

END OF WALL: 26+40

2640

2640

2635

2635

2630

2630

2625

2625

2620

2620

2615

2615

24+00

24+25

24+50

24+75

25+00

25+25

25+50

25+75

26+00

26+25

26+50

26+75

25+00
36' RT

26+00
36' RT

26+40
36' RT

TOP OF WALL

EXISTING GROUND SURFACE

ARTIFICIAL FILL:
YELLOW/BRN. CLAYEY SILT

ARTIFICIAL FILL:
RED/BRN SANDY SILT AND SILT

ALLUVIUM:
DK GRAY CLAYEY SILT AND SILT

4

7

6

9

4

4

B.T. @ 10.4'

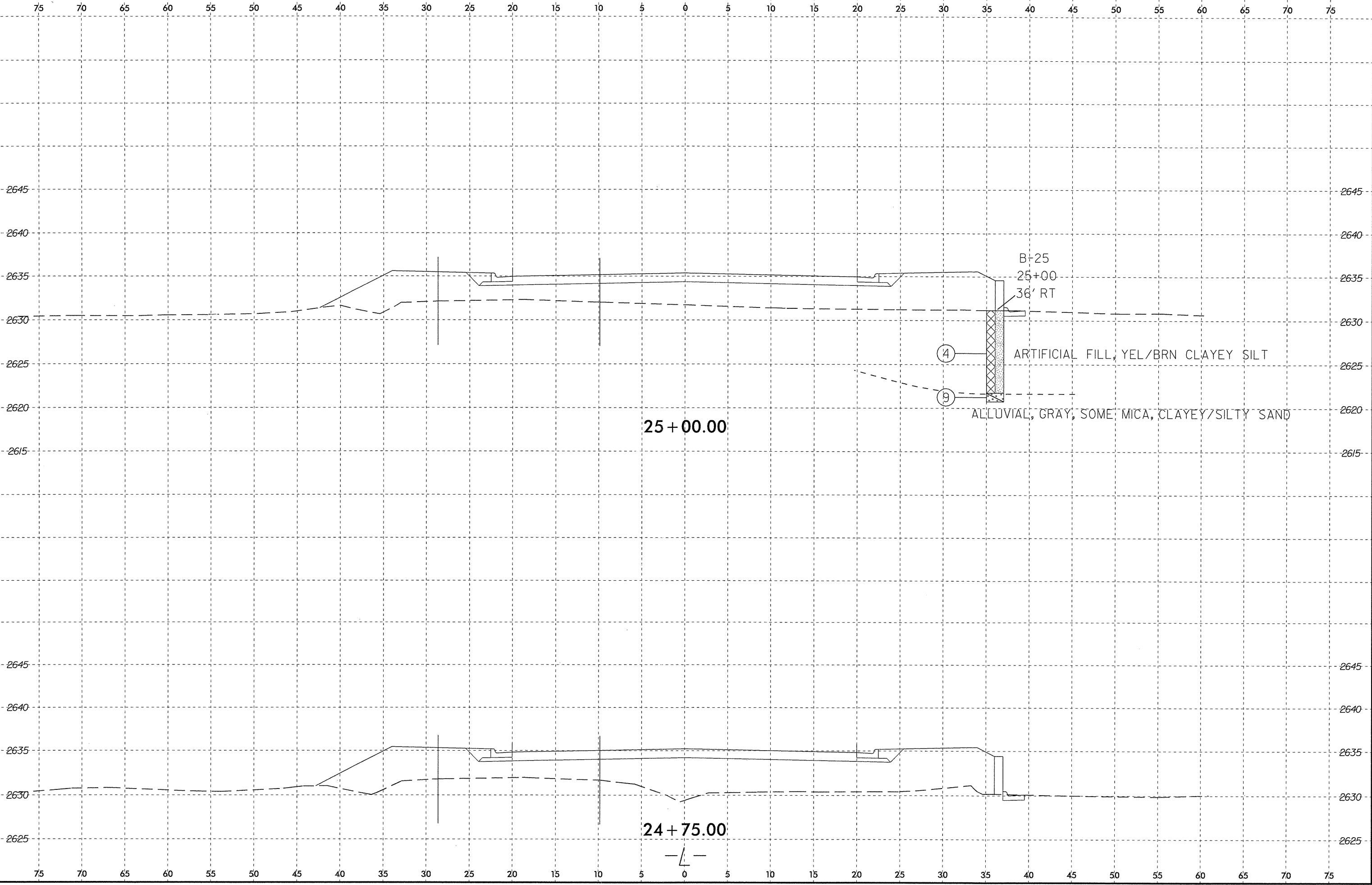
B.T. @ 10.5'

B.T. @ 10.6'

12/08

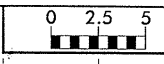
12/08

8/23/91

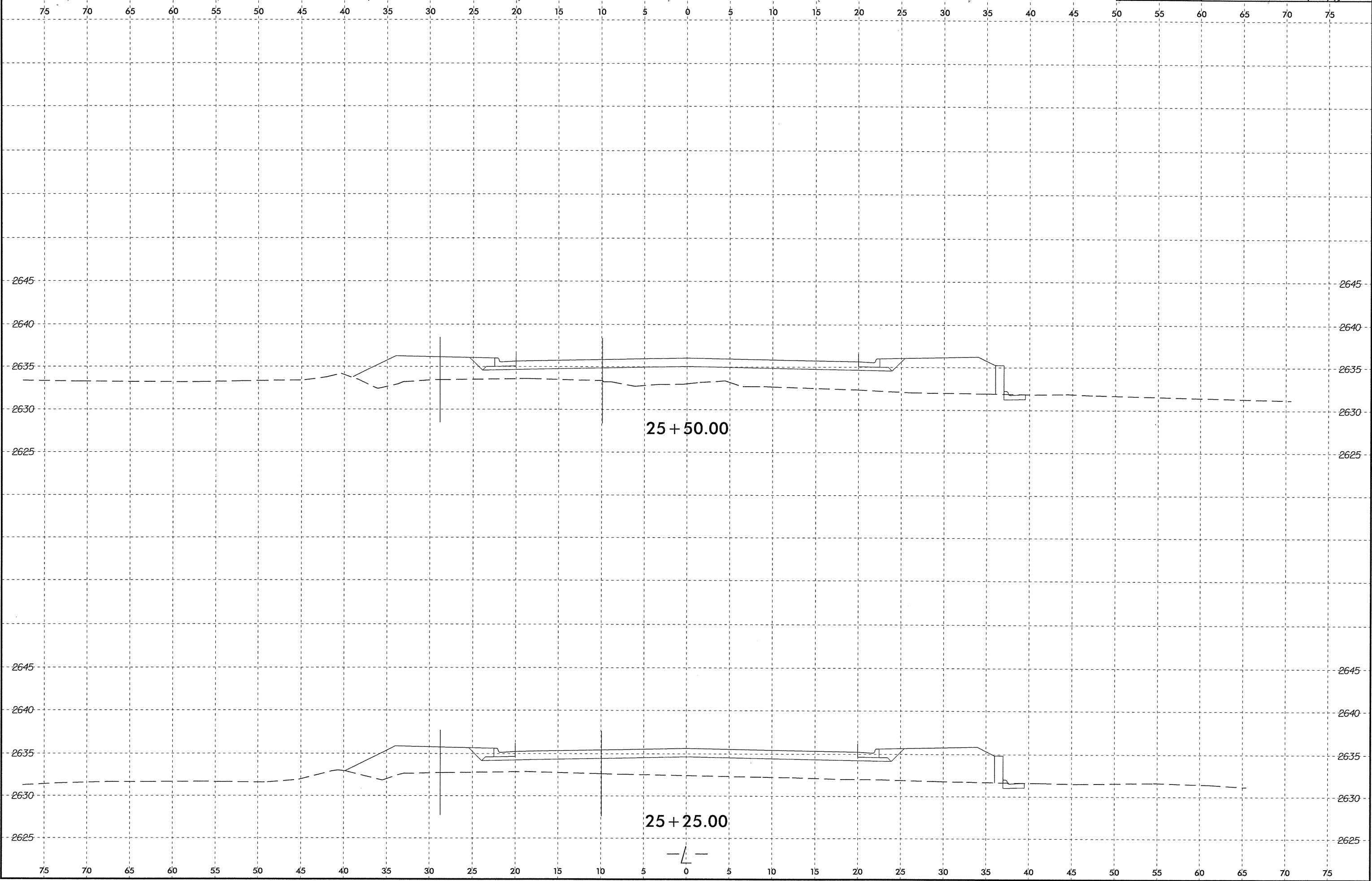


SYSTEMS DOWN USE NAME

8/23/00

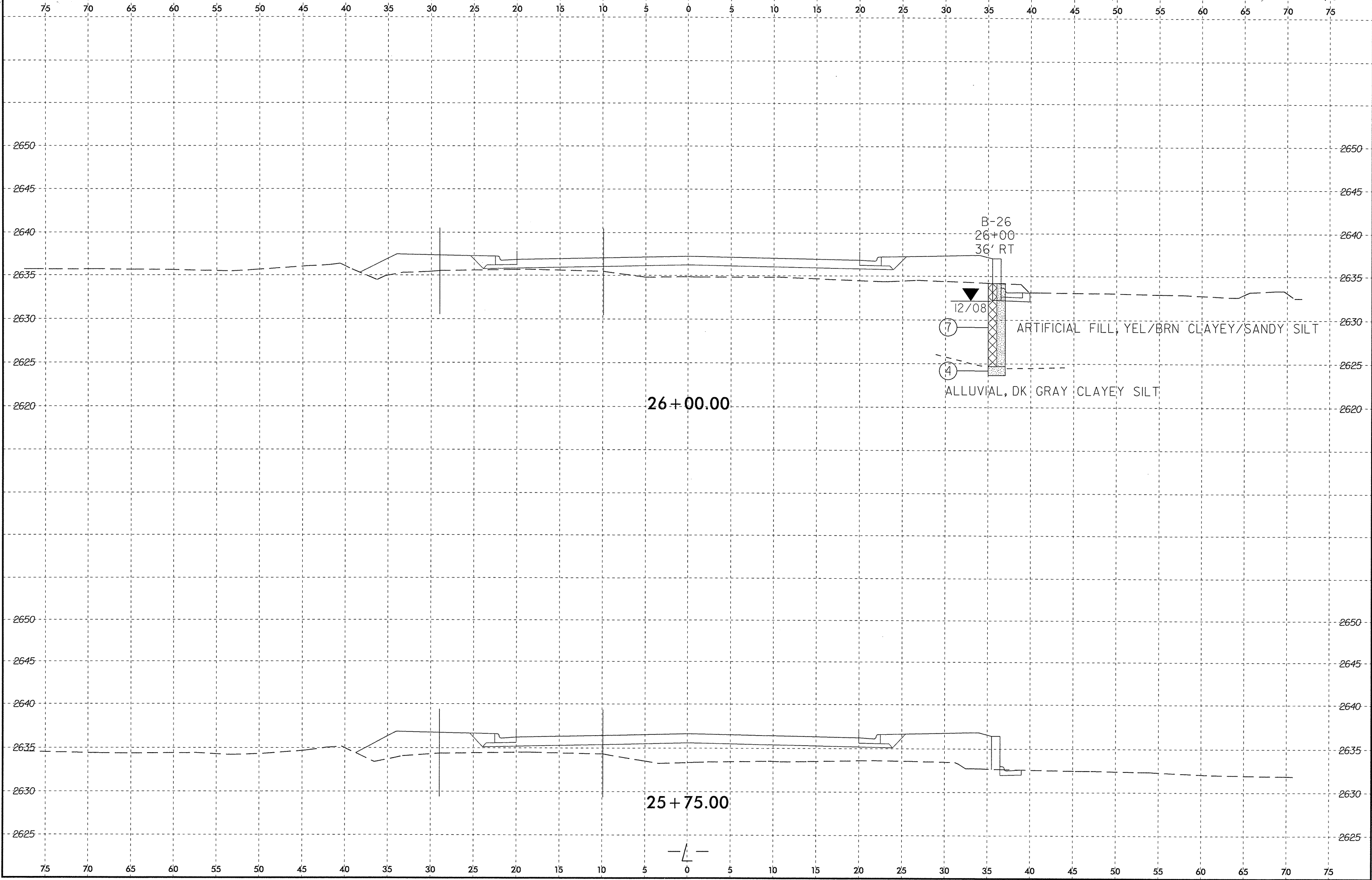


PROJ. REFERENCE NO. U-4412	SHEET NO. 6/8
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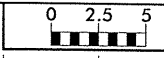
SYSTEMS SECTION
SURFACE

8/23/08

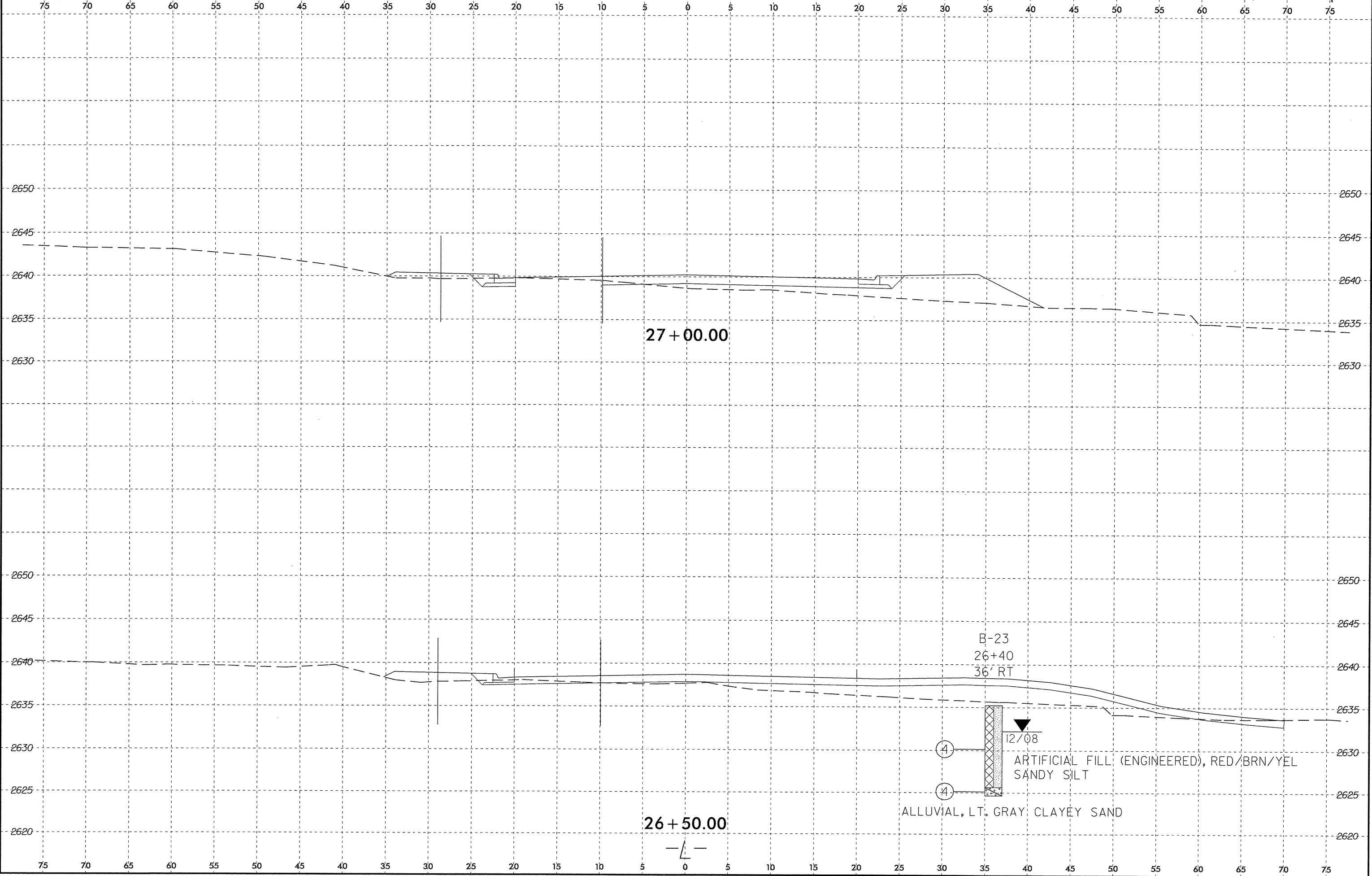


SYSTEM TIME
DOWN
USER NAME

8/23/14



PROJ. REFERENCE NO. U-4412	SHEET NO. 8/8
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27 + 00.00

26 + 50.00

B-23
26+40
36' RT

12/08

(4)

(4)

ARTIFICIAL FILL (ENGINEERED), RED/BRN/YEL SANDY SILT

ALLUVIAL, LT. GRAY CLAYEY SAND

SYSTEMS DIVISION
DESIGN SECTION

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. U-4412 35022.1.1 F.A. PROJ. _____
 COUNTY HAYWOOD
 PROJECT DESCRIPTION 6-SPAN BRIDGE ON SR 1184 (HOWELL MILL RD)
OVER RICHLAND CREEK

SITE DESCRIPTION _____

CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4, 5	PROFILE
6 - 12	CROSS SECTIONS
13 - 27	BORE LOG & CORE REPORTS
28	SCOUR REPORT
29 - 45	CORE PHOTOGRAPHS

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) 250-4086. 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.

PERSONNEL

DC ELLIOTT

C COFFEY

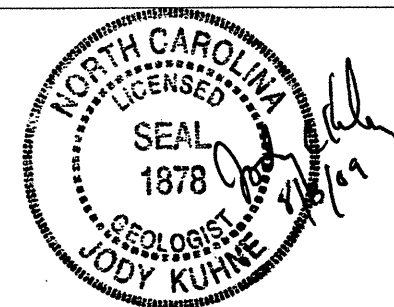
L RIDDLE

INVESTIGATED BY JC KUHNE

CHECKED BY WD FRYE

SUBMITTED BY JC KUHNE

DATE 8/13/2009



PROJECT: 35022.1.1 ID: U-4412

DRAWN BY: JC KUHNE





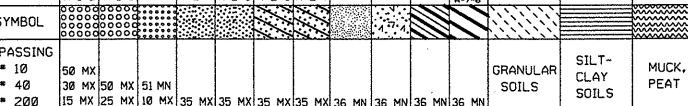
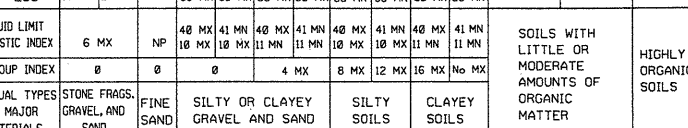
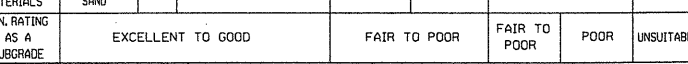
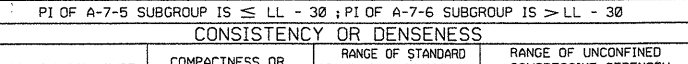
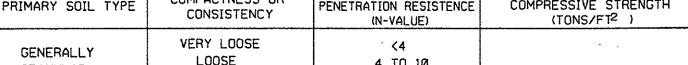
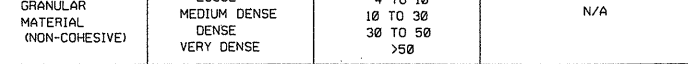
NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

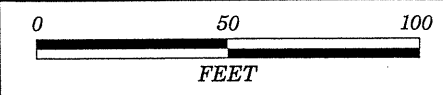
NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

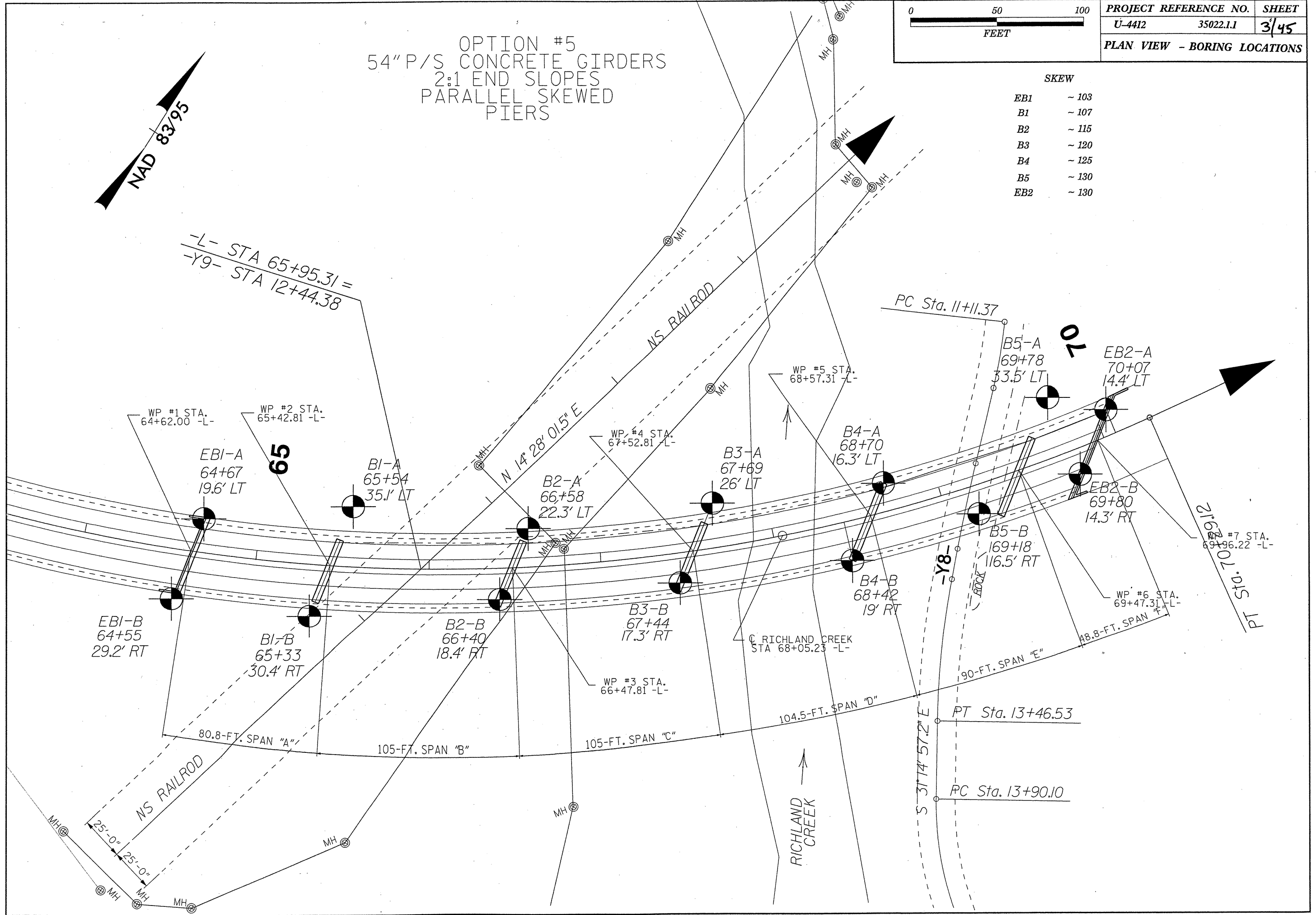
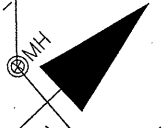
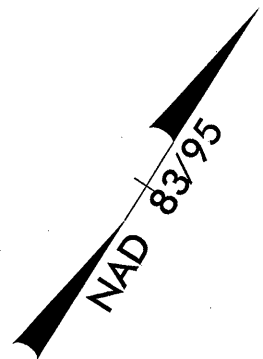
SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS	
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, 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, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY 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: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.		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 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, 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 DISLOGGED 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 (RQD) - 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 (N 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 (SRQD) - 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		MINERALOGICAL COMPOSITION		WEATHERING		ROCK HARDNESS	
GENERAL CLASS.	GRANULAR MATERIALS (<= 35% PASSING #200)	SILT-CLAY MATERIALS (> 35% PASSING #200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	VERY HARD
GROUP CLASS.	A-1, A-1-b, A-2, A-2-1, A-2-5, A-2-6, A-2-7	A-4, A-5, A-6, A-7	SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE		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.	HARD
SYMBOL			LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50		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.	MODERATELY HARD
% PASSING			PERCENTAGE OF MATERIAL		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.	VERY HARD
LIQUID LIMIT PLASTIC INDEX			ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL		SEVERE (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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>	HARD
GROUP INDEX			TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC >10%		VERY SEVERE (V 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. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i>	MODERATELY HARD
USUAL TYPES OF MAJOR MATERIALS			GROUND WATER		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.	VERY HARD
GEN. RATING AS A SUBGRADE			ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION		ROCK HARDNESS		VERY HARD
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOIL SYMBOL		VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT		HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		INFERRED SOIL BOUNDARY		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		INFERRED ROCK LINE		MEDIUM HARD	CAN BE GROUVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		ALLUVIAL SOIL BOUNDARY		SOFT	CAN BE GROUVED 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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		DIP & DIP DIRECTION OF ROCK STRUCTURES		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		ROCK HARDNESS	
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		MEDIUM HARD	CAN BE GROUVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		SOFT	CAN BE GROUVED 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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		ROCK HARDNESS	
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		MEDIUM HARD	CAN BE GROUVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		SOFT	CAN BE GROUVED 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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		ROCK HARDNESS	
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		MEDIUM HARD	CAN BE GROUVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		SOFT	CAN BE GROUVED 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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		ROCK HARDNESS	
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		MEDIUM HARD	CAN BE GROUVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		SOFT	CAN BE GROUVED 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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		ROCK HARDNESS	
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		MEDIUM HARD	CAN BE GROUVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		SOFT	CAN BE GROUVED 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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		SOUNDING ROD		ROCK HARDNESS	
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR		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.
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		FAIR TO POOR					

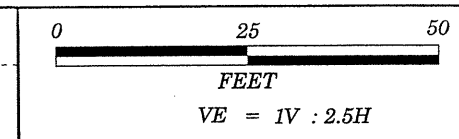


OPTION #5
 54" P/S CONCRETE GIRDERS
 2:1 END SLOPES
 PARALLEL SKEWED
 PIERS

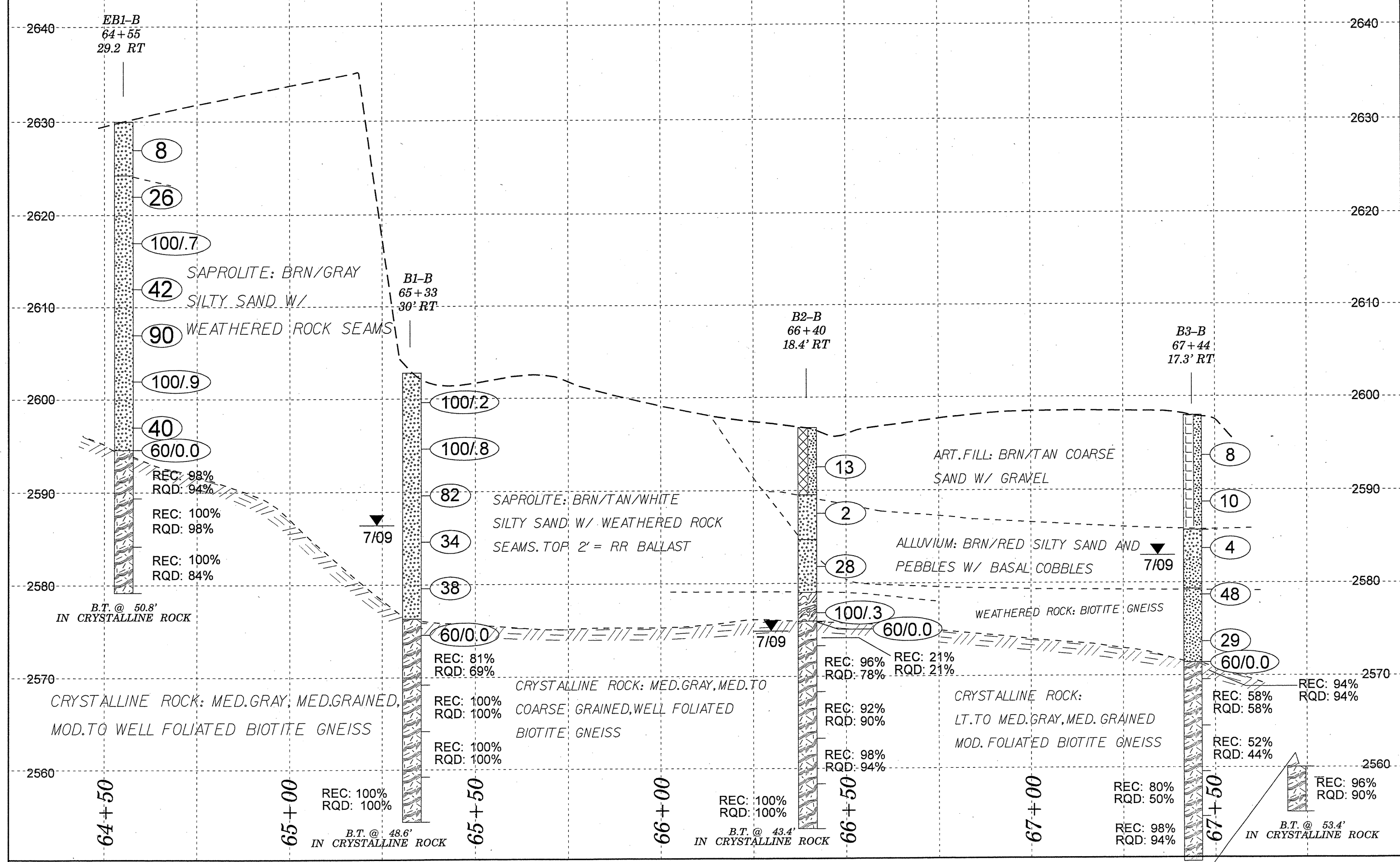
SKEW

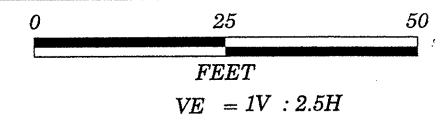
EB1	~ 103
B1	~ 107
B2	~ 115
B3	~ 120
B4	~ 125
B5	~ 130
EB2	~ 130



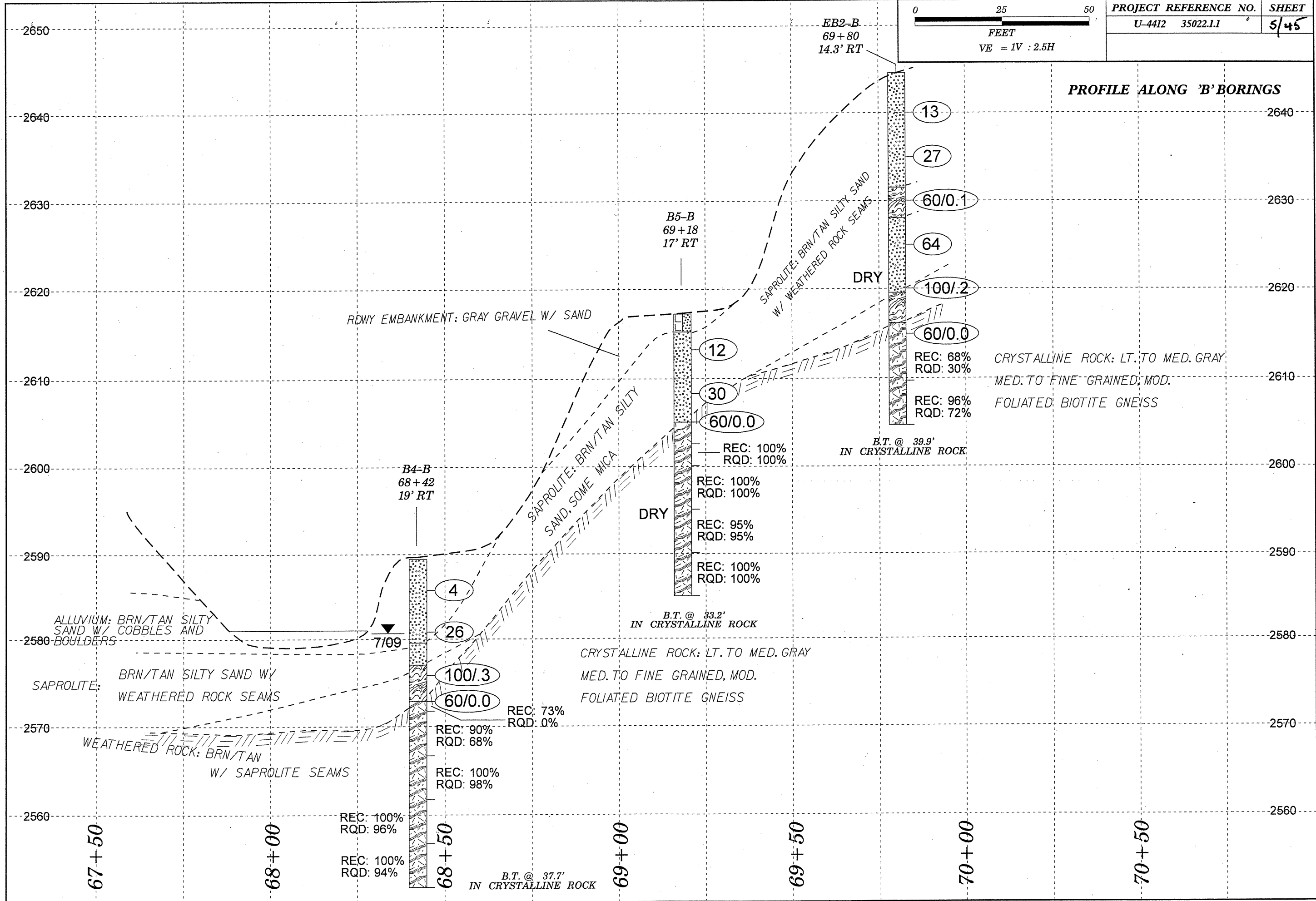


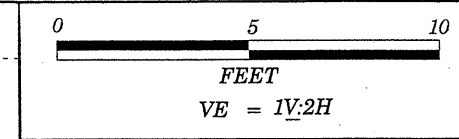
PROFILE ALONG 'B' BORINGS



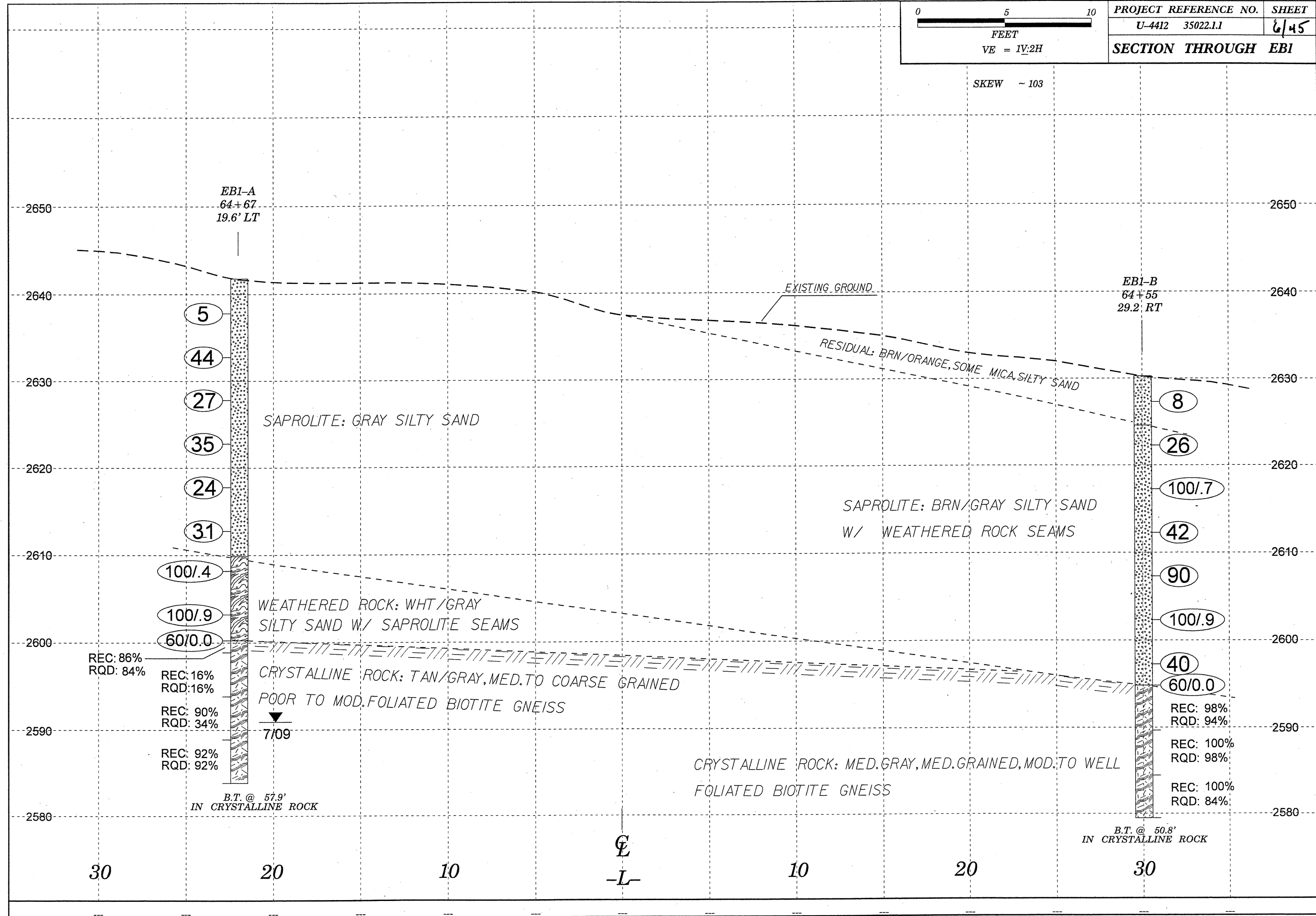


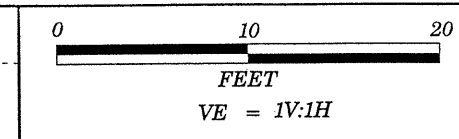
PROFILE ALONG 'B' BORINGS





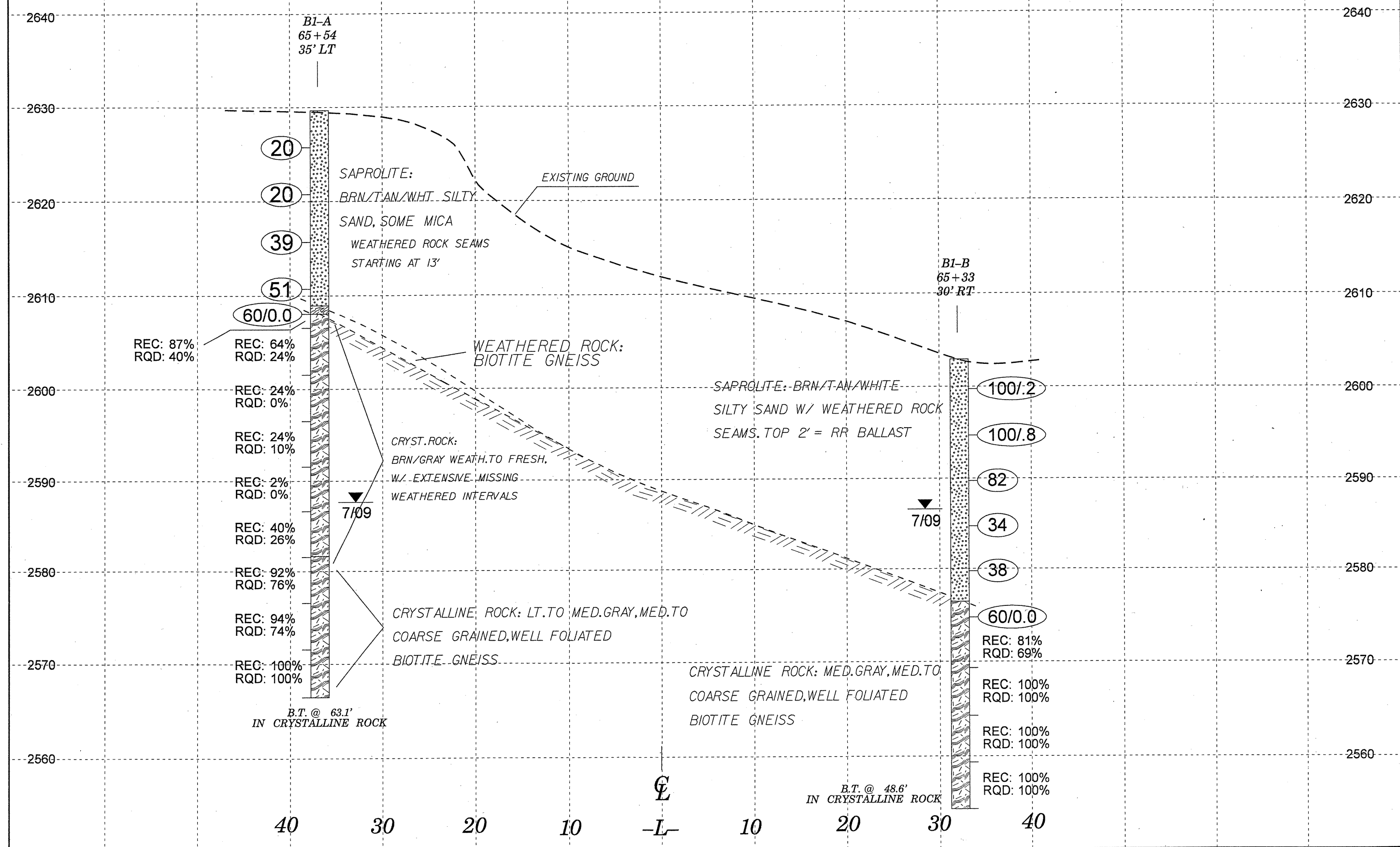
SKEW ~ 103

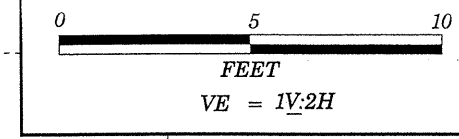




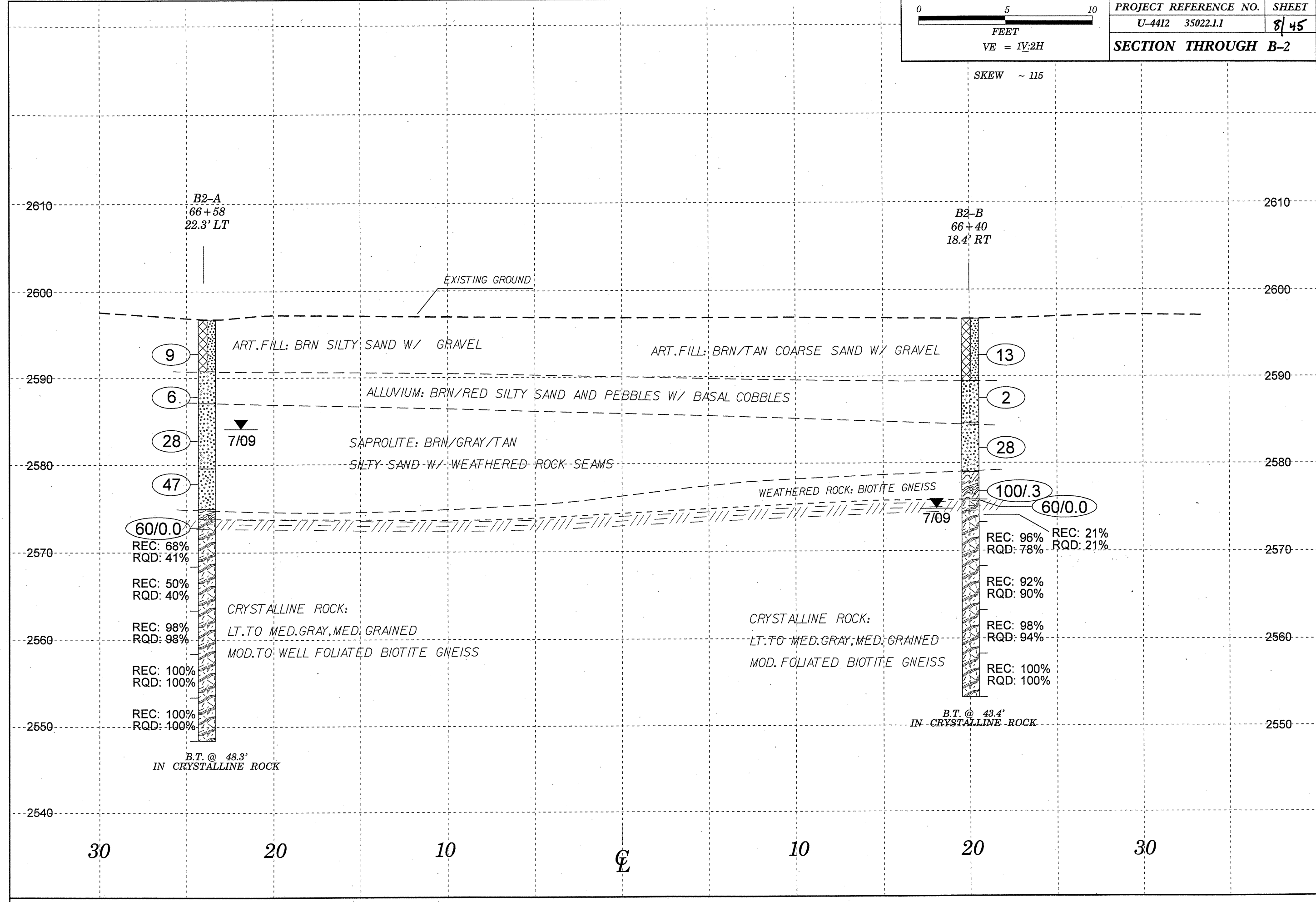
PROJECT REFERENCE NO.	SHEET
U-4412 35022.1.1	7/45
SECTION THROUGH B-1	

SKREW ~107





SKEW ~ 115



B2-A
66+58
22.3' LT

B2-B
66+40
18.4' RT

EXISTING GROUND

9

ART. FILL: BRN SILTY SAND W/ GRAVEL

ART. FILL: BRN/TAN COARSE SAND W/ GRAVEL

13

6

ALLUVIUM: BRN/RED SILTY SAND AND PEBBLES W/ BASAL COBBLES

2

28

7/09

SAPROLITE: BRN/GRAY/TAN
SILTY SAND W/ WEATHERED ROCK SEAMS

28

47

WEATHERED ROCK: BIOTITE GNEISS

100/3

60/0.0

60/0.0

REC: 68%
RQD: 41%

REC: 96% REC: 21%
RQD: 78% RQD: 21%

REC: 50%
RQD: 40%

REC: 92%
RQD: 90%

CRYSTALLINE ROCK:
LT. TO MED. GRAY, MED. GRAINED
MOD. TO WELL FOLIATED BIOTITE GNEISS

CRYSTALLINE ROCK:
LT. TO MED. GRAY, MED. GRAINED
MOD. FOLIATED BIOTITE GNEISS

REC: 98%
RQD: 98%

REC: 98%
RQD: 94%

REC: 100%
RQD: 100%

REC: 100%
RQD: 100%

REC: 100%
RQD: 100%

B.T. @ 43.4'
IN CRYSTALLINE ROCK

B.T. @ 48.3'
IN CRYSTALLINE ROCK

30

20

10

CL

10

20

30

2610

2610

2600

2600

2590

2590

2580

2580

2570

2570

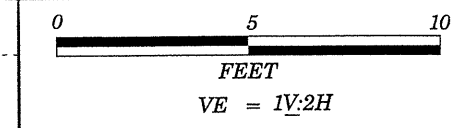
2560

2560

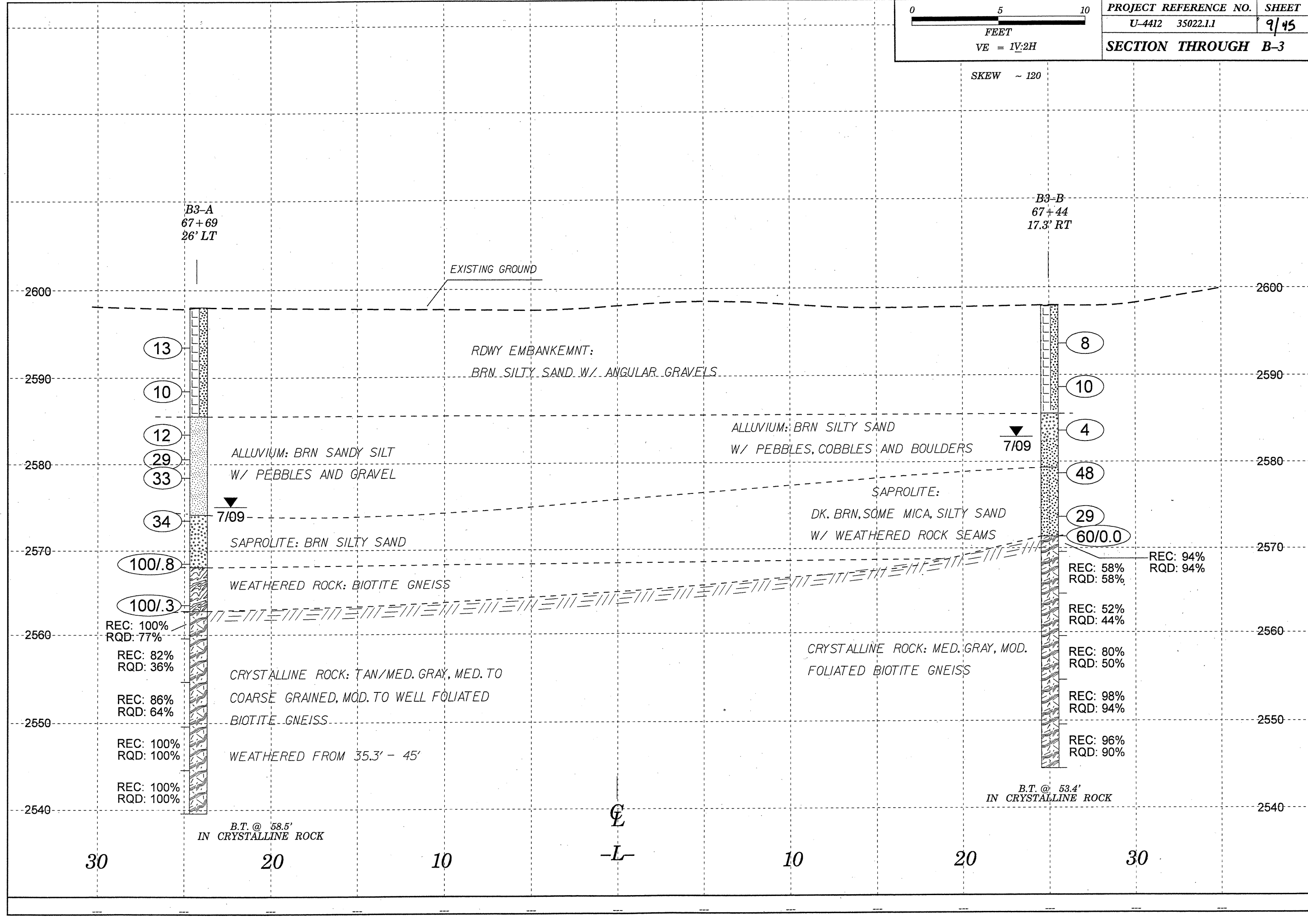
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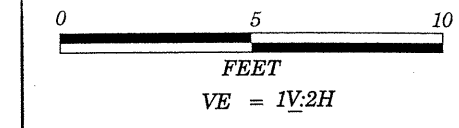
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2540



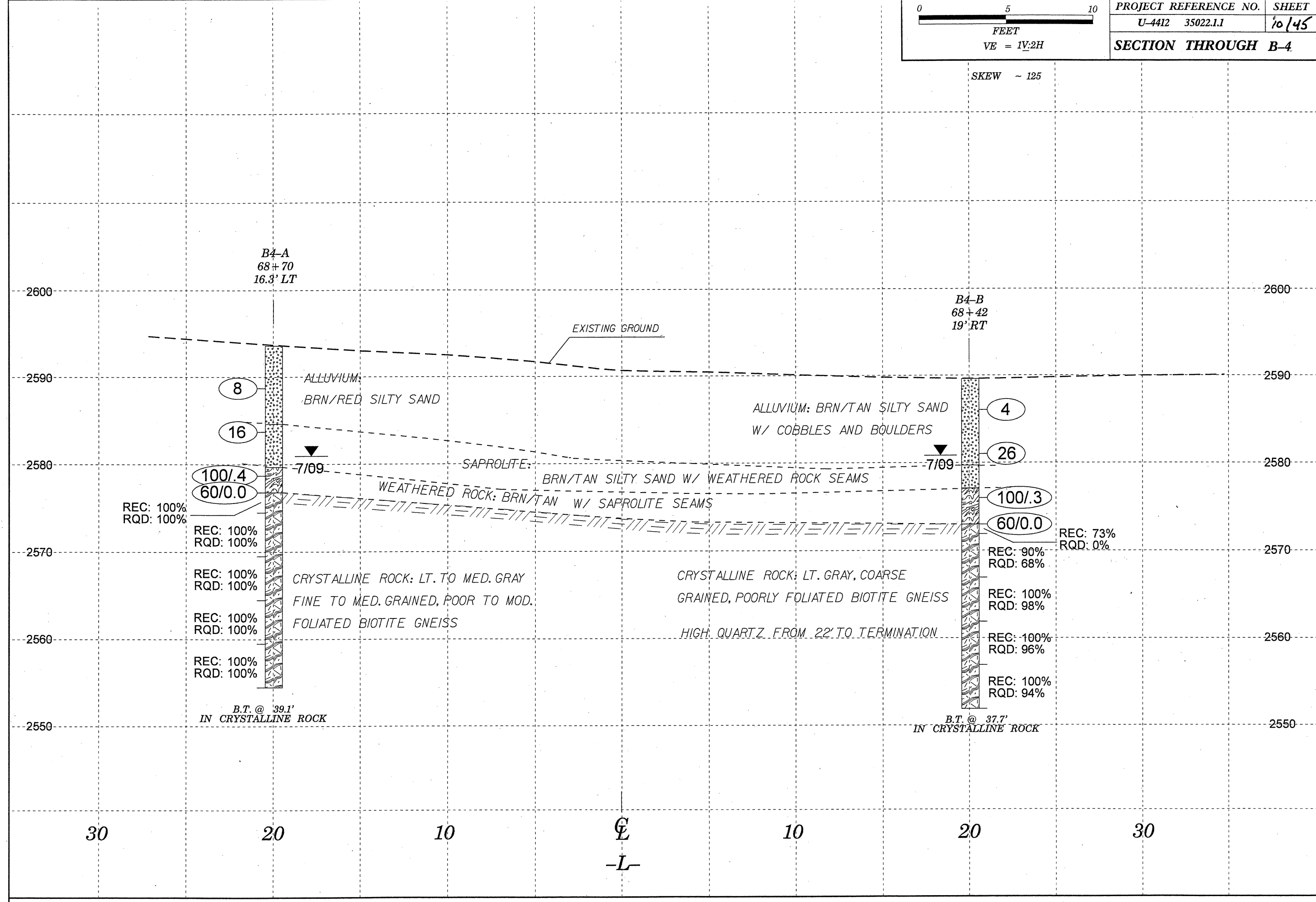
SKEW ~ 120





PROJECT REFERENCE NO.	SHEET
U-4412 35022.1.1	10/45
SECTION THROUGH B-4	

SKEW ~ 125



B4-A
68+70
16.3' LT

B4-B
68+42
19' RT

EXISTING GROUND

8

16

100/4
60/0.0

REC: 100%
RQD: 100%

REC: 100%
RQD: 100%

REC: 100%
RQD: 100%

REC: 100%
RQD: 100%

REC: 100%
RQD: 100%

B.T. @ 39.1'
IN CRYSTALLINE ROCK

4

26

100/3
60/0.0

REC: 73%
RQD: 0%

REC: 90%
RQD: 68%

REC: 100%
RQD: 98%

REC: 100%
RQD: 96%

REC: 100%
RQD: 94%

B.T. @ 37.7'
IN CRYSTALLINE ROCK

ALLUVIUM:
BRN/RED SILTY SAND

ALLUVIUM: BRN/TAN SILTY SAND
W/ COBBLES AND BOULDERS

SAPROLITE:
BRN/TAN SILTY SAND W/ WEATHERED ROCK SEAMS

WEATHERED ROCK: BRN/TAN W/ SAPROLITE SEAMS

CRYSTALLINE ROCK: LT. TO MED. GRAY
FINE TO MED. GRAINED, POOR TO MOD.
FOLIATED BIOTITE GNEISS

CRYSTALLINE ROCK: LT. GRAY, COARSE
GRAINED, POORLY FOLIATED BIOTITE GNEISS

HIGH QUARTZ FROM 22' TO TERMINATION

30

20

10

CL
-L-

10

20

30

2550

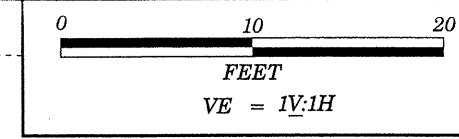
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2570

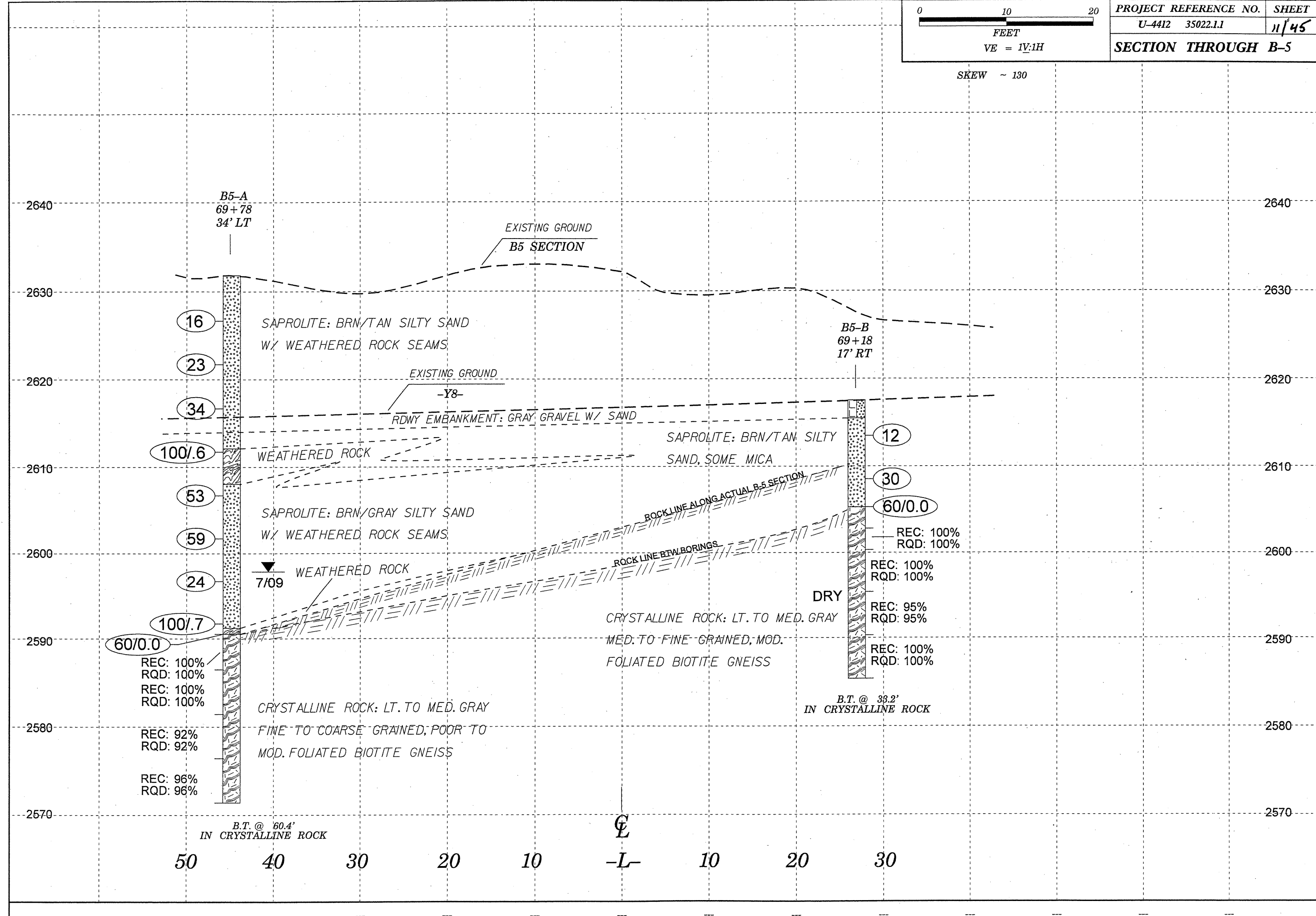
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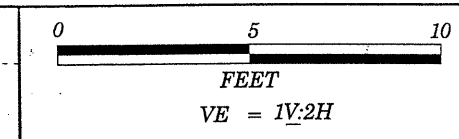
2590

2600



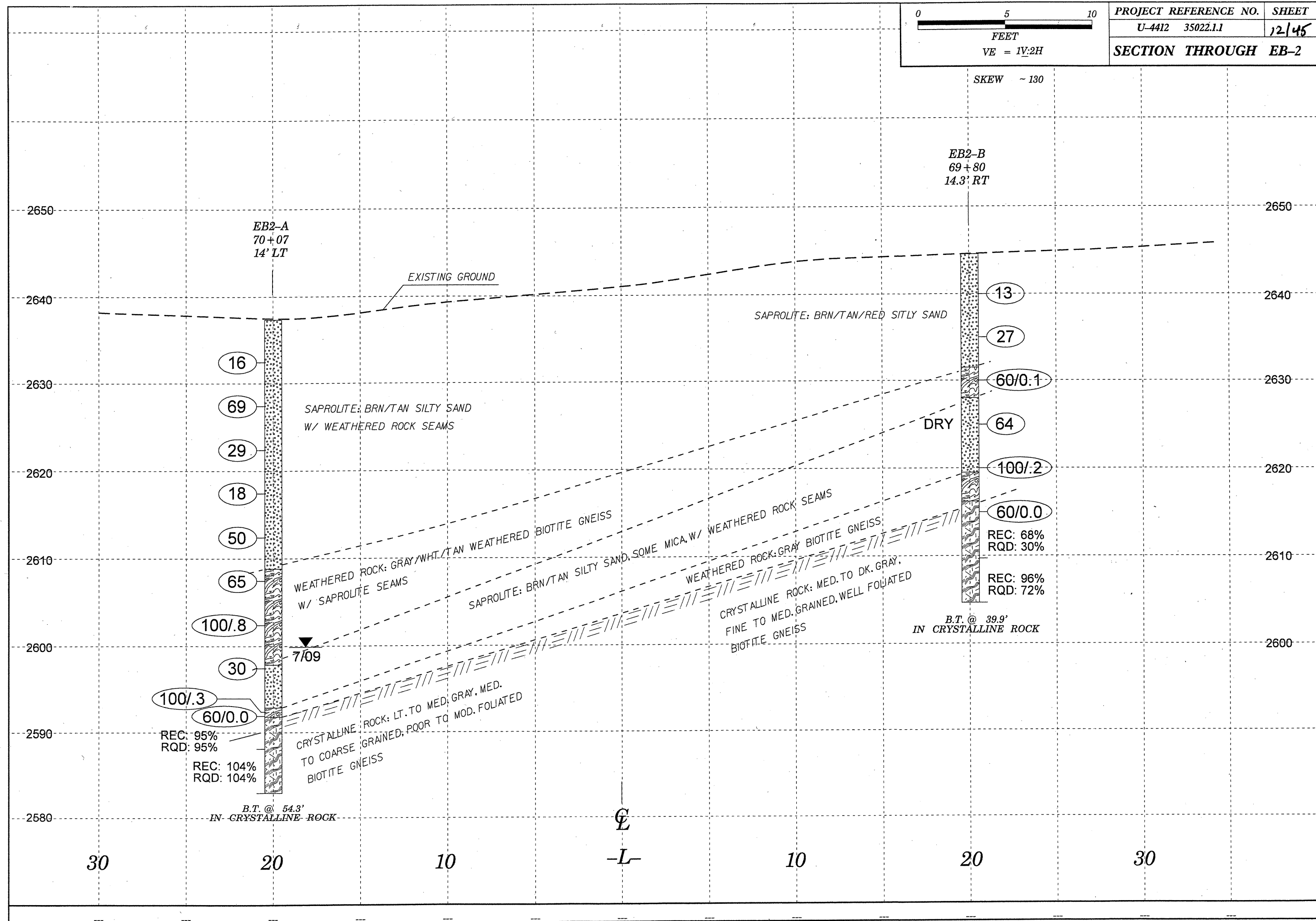
SKREW ~ 130





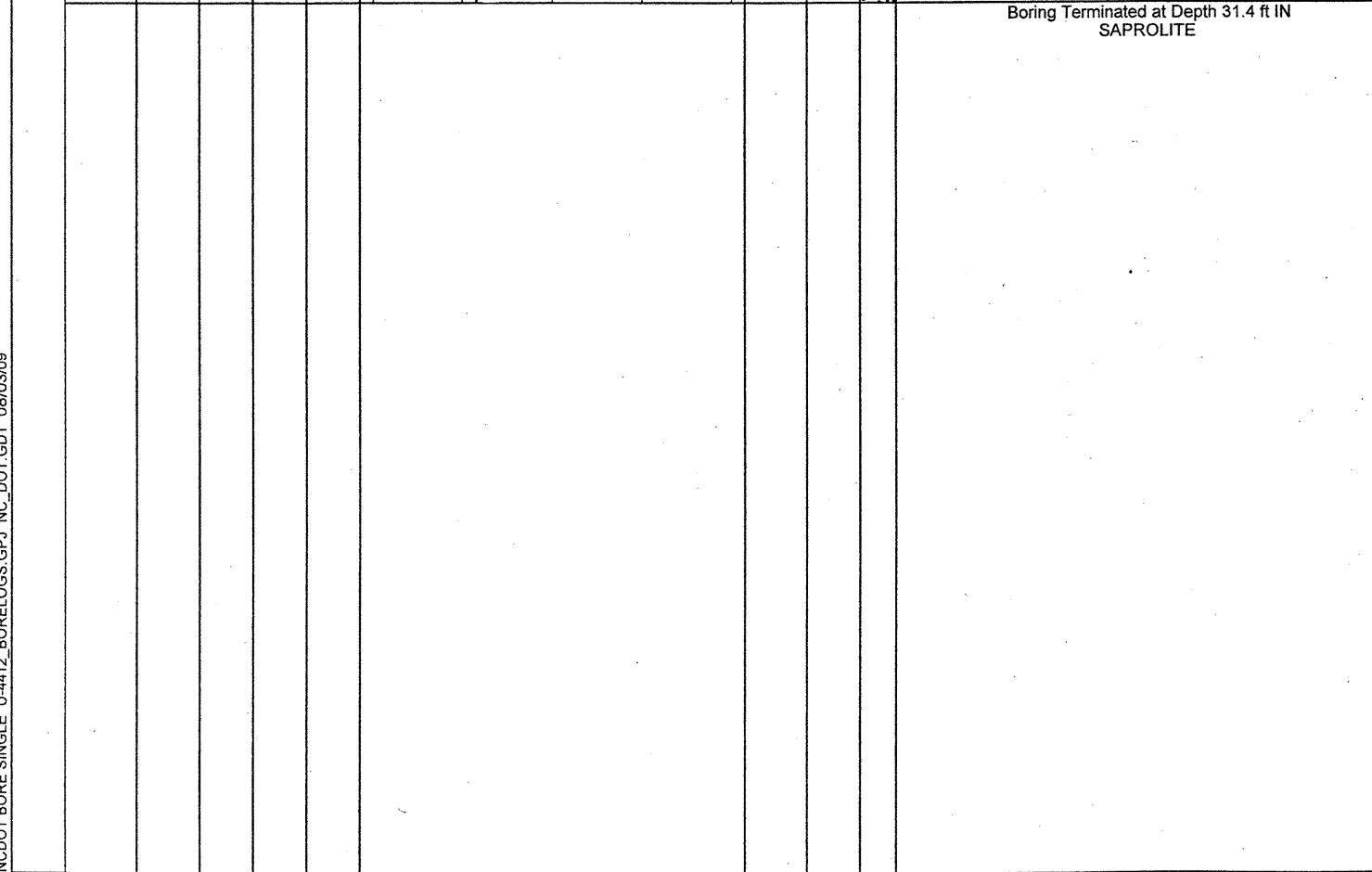
PROJECT REFERENCE NO.	SHEET
U-4412 35022.1.1	12/45
SECTION THROUGH EB-2	

SKEW ~ 130



PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Hager, M. M.
SITE DESCRIPTION SR 1184 (HOWELL MILL RD) FROM US 276 TO US 23 (ASHEVILLE HWY)			GROUND WTR (ft)
BORING NO. B-27	STATION 64+67	OFFSET 26ft LT	ALIGNMENT -L-
COLLAR ELEV. N/A	TOTAL DEPTH 31.4 ft	NORTHING N/A	EASTING N/A
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 12/18/08	COMP. DATE 12/18/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 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					
		4.9		2	2	3									
		9.9		6	18	26									
		14.9		6	12	15									
		19.9		7	16	19									
		24.9		9	12	12									
		29.9		9	15	14									



PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Kuhne, J. C.
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK			GROUND WTR (ft)
BORING NO. EB1-A	STATION 64+67	OFFSET 20ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,641.9 ft	TOTAL DEPTH 57.9 ft	NORTHING 661,865	EASTING 806,664
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 07/09/09	COMP. DATE 07/09/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 41.5 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					
2645															
2640															
2635															
2630															
2625															
2620															
2615															
2610	2,613.3	28.6	10	11	20										
2605	2,608.3	33.6	100/0.4												
2600	2,603.3	38.6	22	100/0.4											
2595	2,600.4	41.5	60/0.0												
2590															
2585															
2580															
2575															
2570															
2565															



NCDOT BORE SINGLE U-4412_BORELOGS.GPJ NC_DOT_GDT 08/03/09

NCDOT BORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT 08/03/09

PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Kuhne, J. C.
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK			GROUND WTR (ft)
BORING NO. EB1-B	STATION 64+55	OFFSET 29ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,630.5 ft		TOTAL DEPTH 50.8 ft	NORTHING 661,818
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic
START DATE 07/07/09	COMP. DATE 07/07/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 35.4 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2635																
2630														2,630.5		0.0
2625	2,627.5	3.0	4	4	4									2,624.8		5.7
2620	2,622.5	8.0	4	11	15											
2615	2,617.5	13.0	4	37	63/2											
2610	2,612.5	18.0	12	18	24											
2605	2,607.5	23.0	9	20	70											
2600	2,602.5	28.0	20	38	62/4											
2595	2,597.5	33.0	9	17	23									2,595.1		35.4
2590	2,595.1	35.4	60/0.0													
2585																
2580														2,579.7		50.8
2575																
2570																
2565																
2560																
2555																

NCDOT BORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/03/09

PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Kuhne, J. C.
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK			GROUND WTR (ft)
BORING NO. EB1-B	STATION 64+55	OFFSET 29ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,630.5 ft		TOTAL DEPTH 50.8 ft	NORTHING 661,818
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic
START DATE 07/07/09	COMP. DATE 07/07/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 35.4 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) %			
2595.08												
2590	2,595.1	35.4	5.2	1:40/1.0 N=60/0.0 1:27/1.0 1:50/1.0 1:38/1.0 1:42/1.0	(5.1) 98%	(4.9) 94%					2,595.1	35.4
2585	2,589.9	40.6	5.2	0:19/0.2 1:56/1.0 1:50/1.0 1:48/1.0 1:53/1.0 1:51/1.0	(5.2) 100%	(5.1) 98%						
2580	2,584.7	45.8	5.0	1:50/0.2 1:38/1.0 1:49/1.0 1:50/1.0 1:41/1.0 1:37/1.0	(5.0) 100%	(4.2) 84%						
2575	2,579.7	50.8									2,579.7	50.8
2570												
2565												
2560												
2555												
2550												
2545												
2540												
2535												
2530												
2525												
2520												

NCDOT CORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.										
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)									
BORING NO. B1-A		STATION 65+54		OFFSET 35ft LT		ALIGNMENT -L-										
COLLAR ELEV. 2,629.9 ft		TOTAL DEPTH 63.1 ft		NORTHING 661,872		EASTING 806,750										
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core			HAMMER TYPE Automatic											
START DATE 07/10/09		COMP. DATE 07/10/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 21.6 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						
2630														2,629.9	GROUND SURFACE	0.0
2625	2,626.0	3.9	2	9	11										SAPROLITE BRN/TAN/WHT, SOME MICA, SILTY SAND W/ WEATHERED ROCK SEAMS STARTING AT 13'	
2620	2,621.0	8.9	11	9	11											
2615	2,616.0	13.9	7	14	25											
2610	2,611.0	18.9	14	24	27											
2605	2,608.3	21.6	60/0.0											2,609.2	WEATHERED ROCK WEATHERED BIOTITE GNEISS	20.7
2600														2,608.3	CRYSTALLINE ROCK BRN/GRAY, WEATHERED TO FRESH, MED. TO COARSE GRAINED, MOD. TO WELL FOLIATED BIOTITE GNEISS. EXTENSIVE MISSING WEATHERED INTERVALS.	21.6
2595																
2590																
2585																
2580																
2575																
2570																
2565																
2560																
2555																
2550																

NCDOT BORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT.GDT 08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.						
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)					
BORING NO. B1-A		STATION 65+54		OFFSET 35ft LT		ALIGNMENT -L-						
COLLAR ELEV. 2,629.9 ft		TOTAL DEPTH 63.1 ft		NORTHING 661,872		EASTING 806,750						
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core			HAMMER TYPE Automatic							
START DATE 07/10/09		COMP. DATE 07/10/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 21.6 ft						
CORE SIZE NXWL		TOTAL RUN 41.5 ft		DRILLER Cheek, D. O.								
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. (%)	RQD (%)		REC. (%)	RQD (%)			
2608.27	2,608.3	21.6	1.5	1:35/1.0	(1.3)	(0.6)					Begin Coring @ 21.6 ft	21.6
2605	2,608.8	23.1	5.0	N=60/0.0 0:39/0.5	87%	40%					CRYSTALLINE ROCK	
2600	2,601.8	28.1	5.0	1:25/1.0 1:12/1.0 1:17/1.0 0:57/1.0 1:09/1.0	(3.2)	(1.2)						
2595	2,596.8	33.1	5.0	0:48/1.0 0:58/1.0 0:49/1.0 0:38/1.0 0:41/1.0	(1.2)	(0.0)						
2590	2,591.8	38.1	5.0	0:31/1.0 0:39/1.0 0:40/1.0 0:48/1.0 0:52/1.0	(1.2)	(0.5)						
2585	2,586.8	43.1	5.0	0:32/1.0 0:31/1.0 0:33/1.0 0:29/1.0 0:37/1.0	(0.1)	(0.0)						
2580	2,581.8	48.1	5.0	0:51/1.0 0:38/1.0 1:17/1.0 1:42/1.0 1:39/1.0	(2.0)	(1.3)						
2575	2,576.8	53.1	5.0	1:22/1.0 1:00/1.0 1:21/1.0 1:17/1.0 1:35/1.0	(4.6)	(3.8)					CRYSTALLINE ROCK	48.0
2570	2,571.8	58.1	5.0	1:29/1.0 1:14/1.0 1:42/1.0 1:50/1.0 1:57/1.0	(4.7)	(3.7)						
2565	2,566.8	63.1	5.0	1:51/1.0 1:55/1.0 2:11/1.0 2:07/1.0 2:05/1.0	(5.0)	(5.0)						
2560											Boring Terminated at Elevation 2,566.8 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	63.1
2555												
2550												
2545												
2540												
2535												
2530												

NCDOT CORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT.GDT 08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.										
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)									
BORING NO. B1-B		STATION 65+33		OFFSET 30ft RT		ALIGNMENT -L-										
COLLAR ELEV. 2,603.1 ft		TOTAL DEPTH 48.6 ft		NORTHING 661,808		EASTING 806,724										
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core			HAMMER TYPE Automatic											
START DATE 07/06/09		COMP. DATE 07/06/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 26.5 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						
2605														2,603.1	GROUND SURFACE	0.0
2600	2,599.9	3.2											M		SAPROLITE BRN/TAN/WHITE SILTY SAND W/ WEATHERED ROCK SEAMS. TOP 2' RAILROAD BALLAST/FILL	
2595	2,594.9	8.2											M			
2590	2,589.9	13.2	4	25	75/3								D			
2585	2,584.9	18.2	18	50	32								D			
2580	2,579.9	23.2	13	14	20								D			
2575	2,574.9	28.2	10	16	22								D			
2570																
2565																
2560																
2555																
2550																
2545																
2540																
2535																
2530																
2525																

NCDOT BORE SINGLE U4412 BRIDGE BORELOGS.GPJ NC_DOT.GDT 08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.						
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)					
BORING NO. B1-B		STATION 65+33		OFFSET 30ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,603.1 ft		TOTAL DEPTH 48.6 ft		NORTHING 661,808		EASTING 806,724						
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core			HAMMER TYPE Automatic							
START DATE 07/06/09		COMP. DATE 07/06/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 26.5 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. (%)	RQD (%)		REC. (%)	RQD (%)			
2573.68	2,573.7	29.4	4.2	1:35/1.0 1:22/1.0 1:24/1.0 1:40/1.0	(3.4) 81%	(2.9) 69%					Begin Coring @ 29.4 ft CRYSTALLINE ROCK (continued)	
2570	2,569.5	33.6	5.0	0:22/0.2 1:48/1.0 1:55/1.0 1:50/1.0 1:49/1.0 1:56/1.0	(5.0) 100%	(5.0) 100%						
2565	2,564.5	38.6	5.0	1:46/1.0 1:51/1.0 1:49/1.0 1:40/1.0 1:41/1.0	(5.0) 100%	(5.0) 100%						
2560	2,559.5	43.6	5.0		(5.0) 100%	(5.0) 100%						
2555	2,554.5	48.6									Boring Terminated at Elevation 2,554.5 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	48.6
2550												
2545												
2540												
2535												
2530												
2525												
2520												
2515												
2510												
2505												
2500												
2495												

NCDOT CORE SINGLE U4412 BRIDGE BORELOGS.GPJ NC_DOT.GDT 08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.										
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK						GROUND WTR (ft)										
BORING NO. B2-A		STATION 66+58		OFFSET 22ft LT		ALIGNMENT -L-										
COLLAR ELEV. 2,596.7 ft		TOTAL DEPTH 48.3 ft		NORTHING 661,859		EASTING 806,650										
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic												
START DATE 06/30/09		COMP. DATE 06/30/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 22.9 ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2600																
2595	2,592.8	3.9	1	3	6										2,596.7	0.0
2590	2,587.8	8.9	2	3	3										2,590.8	5.9
2585	2,582.8	13.9	10	10	18										2,587.1	9.6
2580	2,577.8	18.9	5	14	33										2,575.0	21.7
2575	2,572.8	23.9	60/0.0												2,573.8	22.9
2570																
2565																
2560																
2555																
2550																
2545																
2540																
2535																
2530																
2525																
2520																

NCDOT BORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT_GDT 08/06/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.					
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK						GROUND WTR (ft)					
BORING NO. B2-A		STATION 66+58		OFFSET 22ft LT		ALIGNMENT -L-					
COLLAR ELEV. 2,596.7 ft		TOTAL DEPTH 48.3 ft		NORTHING 661,859		EASTING 806,650					
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic							
START DATE 06/30/09		COMP. DATE 06/30/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 22.9 ft					
CORE SIZE NXWL		TOTAL RUN 24.4 ft		DRILLER Coffey, Jr., C.							
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) %	ROD (ft) %	REC. (ft) %	ROD (ft) %			
2572.83											
2570	2,572.8	23.9	4.4	1:15/1.0 N=60/0.0 1:21/1.0 0:50/1.0 0:51/1.0 0:21/0.4	(3.0)	(1.8)				Begin Coring @ 23.9 ft CRYSTALLINE ROCK (continued)	
	2,568.4	28.3	5.0	1:21/1.0 1:10/1.0 1:36/1.0 1:50/1.0 1:52/1.0	(2.5)	(2.0)					
2565											
	2,563.4	33.3	5.0	1:41/1.0 1:45/1.0 1:30/1.0 1:40/1.0 1:52/1.0	(4.9)	(4.9)					
2560											
	2,558.4	38.3	5.0	1:54/1.0 2:01/1.0 2:07/1.0 1:48/1.0 1:59/1.0	(5.0)	(5.0)					
2555											
	2,553.4	43.3	5.0	1:57/1.0 2:04/1.0 1:51/1.0 2:01/1.0 2:10/1.0	(5.0)	(5.0)					
2550											
	2,548.4	48.3								Boring Terminated at Elevation 2,548.4 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	48.3
2545											
2540											
2535											
2530											
2525											
2520											
2515											
2510											
2505											
2500											
2495											

NCDOT CORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT_GDT 08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.									
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)								
BORING NO. B2-B		STATION 66+40		OFFSET 18ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,596.7 ft		TOTAL DEPTH 43.4 ft		NORTHING 661,817		EASTING 806,834									
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic											
START DATE 06/29/09		COMP. DATE 06/29/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 20.8 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					
2600															
2595	2,592.5	4.2	4	5	8									2,596.7	0.0
2590															
2585	2,587.5	9.2	1	1	1										
2580	2,582.5	14.2	10	13	15										
2575	2,577.5	19.2	100/3											2,575.9	20.8
2570															
2565															
2560															
2555															
2550															
2545															
2540															
2535															
2530															
2525															
2520															

NCDOT BORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT 08/06/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.						
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)					
BORING NO. B2-B		STATION 66+40		OFFSET 18ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,596.7 ft		TOTAL DEPTH 43.4 ft		NORTHING 661,817		EASTING 806,834						
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic								
START DATE 06/29/09		COMP. DATE 06/29/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 20.8 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. (%)	RQD (%)		REC. (%)	RQD (%)			
2575.94												
2575	2,575.9	20.8	2.6	0:58/1.0 N=60/0.0 0:54/1.0	(0.6) 21%	(0.6) 21%					Begin Coring @ 20.8 ft CRYSTALLINE ROCK	20.8
2570	2,573.3	23.4	5.0	0:41/0.6 1:37/1.0 1:28/1.0 1:37/1.0 1:34/1.0 1:44/1.0	(4.8) 96%	(3.9) 78%						
2565	2,568.3	28.4	5.0	1:30/1.0 1:20/1.0 1:28/1.0 1:31/1.0 1:25/1.0	(4.6) 92%	(4.5) 90%						
2560	2,563.3	33.4	5.0	1:50/1.0 1:44/1.0 1:39/1.0 1:38/1.0 1:45/1.0	(4.9) 98%	(4.7) 94%						
2555	2,558.3	38.4	5.0	1:45/1.0 1:48/1.0 1:50/1.0 1:39/1.0 1:49/1.0	(5.0) 100%	(5.0) 100%						
2550	2,553.3	43.4									Boring Terminated at Elevation 2,553.3 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	43.4
2550												
2545												
2540												
2535												
2530												
2525												
2520												

NCDOT BORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT 08/03/09

PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Kuhne, J. C.
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK			GROUND WTR (ft)
BORING NO. B3-A	STATION 67+69	OFFSET 26ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,598.0 ft	TOTAL DEPTH 58.8 ft	NORTHING 661,873	EASTING 806,957
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 07/14/09	COMP. DATE 07/14/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 35.3 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				
2600													GROUND SURFACE	0.0
2595	2,593.4	4.6	2	4	9							M	ROADWAY EMBANKMENT BRN SILTY SAND W/ ANGULAR GRAVELS	
2590	2,588.4	9.6	1	3	7							M		
2585	2,583.4	14.6	3	3	9							M	ALLUVIAL BRN SANDY SILT W/ PEBBLES AND GRAVEL	12.5
2580	2,580.5	17.5	8	12	17							M		
2575	2,578.4	19.6	17	19	14							M		
2570	2,573.4	24.6	20	22	12							M	SAPROLITE BRN SILTY SAND	23.9
2565	2,568.4	29.6	17	65	35/3							M	WEATHERED ROCK WEATHERED BIOTITE GNEISS	30.0
2560	2,563.4	34.6	100/3										CRYSTALLINE ROCK TAN/MED. GRAY, MED. TO COARSE GRAINED, MOD. TO WEL FOLIATED BIOTITE GNEISS. WEATHERED FROM 35.3' - 45'	35.3
2555														
2550														
2545														
2540														
2535														
2530														
2525														
2520														
2515														
2510														
2505														
2500														
2495														
2490														
2485														

NCDOT BORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT_GDT 08/03/09

PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Kuhne, J. C.
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK			GROUND WTR (ft)
BORING NO. B3-A	STATION 67+69	OFFSET 26ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,598.0 ft	TOTAL DEPTH 58.8 ft	NORTHING 661,873	EASTING 806,957
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 07/14/09	COMP. DATE 07/14/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 35.3 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) %			
2562.73											Begin Coring @ 35.3 ft	
2560	2,562.7	35.3	3.5	1:20/1.0 1:32/1.0 1:14/1.0	(3.5) 100%	(2.7) 77%					CRYSTALLINE ROCK	35.3
2555	2,559.2	38.8	5.0	0:31/0.5 1:10/1.0 1:05/1.0 1:35/1.0 1:28/1.0	(4.1) 82%	(1.8) 36%						
2550	2,554.2	43.8	5.0	1:25/1.0 1:29/1.0 1:55/1.0 2:09/1.0 2:15/1.0	(4.3) 86%	(3.2) 64%						
2545	2,549.2	48.8	5.0	2:03/1.0 1:58/1.0 2:16/1.0 2:08/1.0 1:57/1.0	(5.0) 100%	(5.0) 100%						
2540	2,544.2	53.8	5.0	2:10/1.0 1:57/1.0 2:08/1.0 2:14/1.0 2:11/1.0	(5.0) 100%	(5.0) 100%						
2535	2,539.2	58.8									Boring Terminated at Elevation 2,539.2 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	58.5
2530												
2525												
2520												
2515												
2510												
2505												
2500												
2495												
2490												
2485												

NCDOT CORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT_GDT 08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.									
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)								
BORING NO. B3-B		STATION 67+44		OFFSET 17ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,598.0 ft		TOTAL DEPTH 53.4 ft		NORTHING 661,827		EASTING 806,938									
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core			HAMMER TYPE Automatic										
START DATE 07/15/09		COMP. DATE 07/15/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 26.6 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					
2600															
														2,598.0	0.0
2595															
	2,593.7	4.3													
2590															
	2,588.7	9.3													
2585															
	2,583.7	14.3													
2580															
	2,578.7	19.3													
2575															
	2,573.7	24.3													
2570															
	2,571.4	26.6													
2565															
2560															
2555															
2550															
2545															
2540															
2535															
2530															
2525															
2520															

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.						
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)					
BORING NO. B3-B		STATION 67+44		OFFSET 17ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,598.0 ft		TOTAL DEPTH 53.4 ft		NORTHING 661,827		EASTING 806,938						
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core			HAMMER TYPE Automatic							
START DATE 07/15/09		COMP. DATE 07/15/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 26.6 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 (%)			
2571.38												
2570	2,571.4	26.6	1.8	2:21/1.0 N=60/0.0	(1.7) 94%	(1.7) 94%					Begin Coring @ 26.6 ft CRYSTALLINE ROCK	26.6
	2,569.6	28.4	5.0	1:50/0.8	(2.9) 58%	(2.9) 58%						
2565	2,564.6	33.4	5.0	2:17/1.0 2:04/1.0 1:42/1.0 1:14/1.0 0:57/1.0	(2.6) 52%	(2.2) 44%						
2560	2,559.6	38.4	5.0	0:48/1.0 0:59/1.0 1:42/1.0 1:57/1.0 2:03/1.0	(4.0) 80%	(2.5) 50%						
2555	2,554.6	43.4	5.0	1:35/1.0 1:42/1.0 NONE/1.0 NONE/1.0 NONE/1.0	(4.9) 98%	(4.7) 94%						
2550	2,549.6	48.4	5.0	1:23/1.0 1:52/1.0 2:05/1.0 2:17/1.0 2:02/1.0	(4.8) 96%	(4.5) 90%						
2545	2,544.6	53.4	5.0	1:45/1.0 1:48/1.0 1:42/1.0 1:55/1.0 1:50/1.0	(4.8) 96%	(4.5) 90%					Boring Terminated at Elevation 2,544.6 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	53.4
2540												
2535												
2530												
2525												
2520												

NCDOT BORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT.GDT 08/06/09

NCDOT BORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT.GDT 08/03/09

PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Kuhne, J. C.
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK			GROUND WTR (ft)
BORING NO. B4-A	STATION 68+70	OFFSET 16ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,593.6 ft	TOTAL DEPTH 39.1 ft	NORTHING 661,884	EASTING 807,056
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 07/16/09	COMP. DATE 07/16/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 16.8 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						
2595														2,593.6	GROUND SURFACE	0.0
2590	2,588.7	4.9	2	5	3							M	ALLUVIAL BRN/RED SILTY SAND			
2585	2,583.7	9.9	4	6	10							M	SAPROLITE BRN/TAN SILTY SAND W/ WEATERED ROCK SEAMS	9.0		
2580	2,578.7	14.9											WEATHERED ROCK WEATHERED BIOTITE GNEISS	13.9		
2575	2,576.8	16.8	100/4										CRYSTALLINE ROCK LT. TO MED. GRAY, FINE TO MED. GRAINED, POOR TO MOD. FOLIATED BIOTITE GNEISS	16.8		
2570																
2565																
2560																
2555														2,554.5	Boring Terminated at Elevation 2,554.5 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	39.1
2550																
2545																
2540																
2535																
2530																
2525																
2520																
2515																

NCDOT BORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC DOT GDT 08/03/09

PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Kuhne, J. C.
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK			GROUND WTR (ft)
BORING NO. B4-A	STATION 68+70	OFFSET 16ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,593.6 ft	TOTAL DEPTH 39.1 ft	NORTHING 661,884	EASTING 807,056
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 07/16/09	COMP. DATE 07/16/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 16.8 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. (%)	RQD (%)		REC. (%)	RQD (%)			
2576.8											Begin Coring @ 16.8 ft	
2575	2,576.8	16.8	2.3	2:47/1.0	(2.3)	(2.3)					CRYSTALLINE ROCK	16.8
	2,574.5	19.1	5.0	N=60/0.0 2:53/1.0 0:52/0.3	100%	100%						
2570												
	2,569.5	24.1	5.0	2:39/1.0 2:51/1.0 2:33/1.0 2:42/1.0 2:40/1.0	(5.0)	(5.0)						
2565												
	2,564.5	29.1	5.0	2:37/1.0 2:44/1.0 2:45/1.0 2:30/1.0 2:42/1.0	100%	100%						
2560												
	2,559.5	34.1	5.0	2:56/1.0 2:50/1.0 2:44/1.0 2:39/1.0 2:31/1.0	(5.0)	(5.0)						
2555												
	2,554.5	39.1	5.0	2:38/1.0 2:41/1.0 2:52/1.0 2:47/1.0 2:41/1.0	100%	100%						
2550												
2545												
2540												
2535												
2530												
2525												
2520												
2515												

NCDOT CORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC DOT GDT 08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.									
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)								
BORING NO. B4-B		STATION 68+42		OFFSET 19ft RT		ALIGNMENT -L-									
COLLAR ELEV. 2,589.6 ft		TOTAL DEPTH 37.7 ft		NORTHING 661,839		EASTING 807,038									
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core			HAMMER TYPE Automatic										
START DATE 07/17/09		COMP. DATE 07/17/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 16.6 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					
2590														GROUND SURFACE	0.0
2585	2,586.0	3.6	1	2	2							M	ALLUVIAL BRN/TAN SILTY SAND W/ COBBLES AND BOULDERS		
2580	2,581.0	8.6	8	4	22							M	SAPROLITE BRN/TAN SILTY SAND W/ WEATHERED ROCK SEAMS	9.9	
2575	2,576.0	13.6	100/3										WEATHERED ROCK BRN/TAN WEATHERED ROCK W/ SAPROLITE SEAMS	12.5	
2570	2,573.0	16.6	60/0.0										CRYSTALLINE ROCK LT. GRAY, COARSE GRAINED, POORLY FOLIATED BIOTITE GNEISS W/ HIGH QUARTZ CONTENT FROM 22' TO TERMINATION	16.6	
2550													Boring Terminated at Elevation 2,551.9 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	37.7	

NCDOT BORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.						
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)					
BORING NO. B4-B		STATION 68+42		OFFSET 19ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,589.6 ft		TOTAL DEPTH 37.7 ft		NORTHING 661,839		EASTING 807,038						
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core			HAMMER TYPE Automatic							
START DATE 07/17/09		COMP. DATE 07/17/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 16.6 ft						
CORE SIZE NXWL		TOTAL RUN 21.1 ft		DRILLER Cheek, D. O.								
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. (%)	RQD (%)		REC. (%)	RQD (%)			
2573.0	2,573.0	16.6	1.1	1:10/1.1	(0.8)	(0.0)					Begin Coring @ 16.6 ft CRYSTALLINE ROCK	16.6
2570	2,571.9	17.7	5.0	2:40/1.0 2:51/1.0 2:47/1.0 2:55/1.0 3:15/1.0	73%	0%						
2565	2,566.9	22.7	5.0	3:37/1.0 4:50/1.0 4:45/1.0 5:37/1.0 6:41/1.0	100%	98%						
2560	2,561.9	27.7	5.0	3:35/1.0 3:17/1.0 3:51/1.0 3:05/1.0 3:32/1.0	100%	96%						
2555	2,556.9	32.7	5.0	NONE/1.0 NONE/1.0 NONE/1.0 NONE/1.0	100%	94%						
2550	2,551.9	37.7									Boring Terminated at Elevation 2,551.9 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	37.7

NCDOT CORE SINGLE U4412 BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/03/09

PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Kuhne, J. C.
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK			GROUND WTR (ft)
BORING NO. B5-A	STATION 69+78	OFFSET 34ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,631.9 ft	TOTAL DEPTH 60.4 ft	NORTHING 661,933	EASTING 807,151
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 07/21/09	COMP. DATE 07/21/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 41.3 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2635													GROUND SURFACE	0.0
2630													SAPROLITE BRN/TAN SILTY SAND W/ WEATHERED ROCK SEAMS	
2625	2,626.8	5.1	4	10	6									
2620	2,621.8	10.1	11	12	11									
2615	2,616.8	15.1	14	22	12									
2610	2,611.8	20.1	30	70	30/1								WEATHERED ROCK BRN/TAN WEATHERED ROCK	19.7
2605	2,606.8	25.1	12	25	28								SAPROLITE BRN/GRAY SILTY SAND W/ WEATHERED ROCK SEAMS	23.8
2600	2,601.8	30.1	11	25	34									
2595	2,596.8	35.1	5	10	14									
2590	2,591.8 2,590.6	40.1 41.3	10	100/2	60/0.0								WEATHERED ROCK BRN GRAY WEATHERED ROCK CRYSTALLINE ROCK LT. TO MED GRAY, FINE TO COARSE GRAINED, POOR TO MOD. FOLIATED BIOTITE GNEISS	40.6 41.3
2585														
2580														
2575														
2570													Boring Terminated at Elevation 2,571.5 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	60.4
2565														
2560														
2555														

NCDOT BORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/03/09

PROJECT NO. 35022.1.1	ID. U-4412	COUNTY Haywood	GEOLOGIST Kuhne, J. C.
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK			GROUND WTR (ft)
BORING NO. B5-A	STATION 69+78	OFFSET 34ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,631.9 ft	TOTAL DEPTH 60.4 ft	NORTHING 661,933	EASTING 807,151
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 07/21/09	COMP. DATE 07/21/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 41.3 ft

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG MOI	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)		REC. (%)	RQD (%)			
2590.56											Begin Coring @ 41.3 ft CRYSTALLINE ROCK	41.3
2590.6	2,590.6	41.3	4.1	2:21/1.0 N=60/0.0 2:33/1.0 2:41/1.0 2:42/1.1	(4.1)	(4.1)						
2585	2,586.5	45.4	5.0	2:51/1.0 2:47/1.0 2:55/1.0 2:52/1.0 2:44/1.0	(5.0)	(5.0)						
2580	2,581.5	50.4	5.0	2:47/1.0 2:44/1.0 2:37/1.0 2:48/1.0 2:33/1.0	(4.6)	(4.6)						
2575	2,576.5	55.4	5.0	NO DATA/1.0 NO DATA/1.0 NO DATA/1.0 NO DATA/1.0	(4.8)	(4.8)						
2570	2,571.5	60.4									Boring Terminated at Elevation 2,571.5 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	60.4
2565												
2560												
2555												
2550												
2545												
2540												
2535												
2530												
2525												
2520												
2515												

NCDOT BORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.											
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)										
BORING NO. EB2-A		STATION 70+07		OFFSET 14ft LT		ALIGNMENT -L-											
COLLAR ELEV. 2,637.5 ft		TOTAL DEPTH 54.3 ft		NORTHING 661,926		EASTING 807,185											
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core				HAMMER TYPE Automatic											
START DATE 07/24/09		COMP. DATE 07/27/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 45.5 ft											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2640															2,637.5	GROUND SURFACE	0.0
2635																SAPROLITE BRN/TAN SILTY SAND W/ WEATHERED ROCK SEAMS	
2630	2,632.6	4.9	2	8	8												
2625	2,627.6	9.9															
2620	2,622.6	14.9	10	16	13												
2615	2,617.6	19.9	3	8	10												
2610	2,612.6	24.9	11	26	24												
2605	2,607.6	29.9	24	32	33												
2600	2,602.6	34.9	27	100/3													
2595	2,597.6	39.9	11	16	14												
2590	2,592.6	44.9															
2590	2,592.0	45.5	60/0.0														
2585																	
2580																	
2575																	
2570																	
2565																	
2560																	
2555																	
2550																	
2545																	
2540																	
2535																	
2530																	
2525																	
2520																	
2515																	
2510																	

NCDOT BORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/06/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.							
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)						
BORING NO. EB2-A		STATION 70+07		OFFSET 14ft LT		ALIGNMENT -L-							
COLLAR ELEV. 2,637.5 ft		TOTAL DEPTH 54.3 ft		NORTHING 661,926		EASTING 807,185							
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core				HAMMER TYPE Automatic							
START DATE 07/24/09		COMP. DATE 07/27/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 44.4 ft							
CORE SIZE NXWL			TOTAL RUN 8.8 ft			DRILLER Coffey, Jr., C.							
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG MOI	LOG G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)		REC. (%)	ROD (%)				
2591.98													
2590	2,592.0	45.5	3.8	3:25/1.0 N=60/0.0	(3.6)	(3.6)						Begin Coring @ 45.5 ft CRYSTALLINE ROCK (continued)	
	2,588.2	49.3	5.0	3:55/1.0 5:00/1.0 5:41/0.8	(5.2)	(5.2)							
2585				6:26/1.0 3:44/1.0 5:55/1.0 7:20/1.0 6:14/1.0	104%	104%							
	2,583.2	54.3										Boring Terminated at Elevation 2,583.2 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS	54.3
2580													
2575													
2570													
2565													
2560													
2555													
2550													
2545													
2540													
2535													
2530													
2525													
2520													
2515													

NCDOT CORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.										
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 69+80		OFFSET 14ft RT		ALIGNMENT -L-										
COLLAR ELEV. 2,644.7 ft		TOTAL DEPTH 39.9 ft		NORTHING 661,889		EASTING 807,170										
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core				HAMMER TYPE Automatic										
START DATE 07/28/09		COMP. DATE 07/28/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 28.4 ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
2645														2,644.7	0.0	GROUND SURFACE
2640	2,640.1	4.6														SAPROLITE BRN/TAN/RED SILTY SAND
2635	2,635.1	9.6	4	4	9											
2630	2,630.1	14.6	9	13	14											
2625	2,625.1	19.6	7	12	52											
2620	2,620.1	24.6	19	100/2												
2615	2,615.1	29.6	60/0.0													
2610																
2605																
2600																
2595																
2590																
2585																
2580																
2575																
2570																
2565																

NCDOT BORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/03/09

PROJECT NO. 35022.1.1		ID. U-4412		COUNTY Haywood		GEOLOGIST Kuhne, J. C.						
SITE DESCRIPTION BR. NO. 55 ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK							GROUND WTR (ft)					
BORING NO. EB2-B		STATION 69+80		OFFSET 14ft RT		ALIGNMENT -L-						
COLLAR ELEV. 2,644.7 ft		TOTAL DEPTH 39.9 ft		NORTHING 661,889		EASTING 807,170						
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT Core				HAMMER TYPE Automatic						
START DATE 07/28/09		COMP. DATE 07/28/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 28.4 ft						
CORE SIZE NXWL		TOTAL RUN 10.3 ft		DRILLER Coffey, Jr., C.								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS	
					REC. (%)	ROD (%)		REC. (%)	ROD (%)		ELEV. (ft)	DEPTH (ft)
2615.07												Begin Coring @ 29.6 ft
2610	2,615.1	29.6	5.3	3:03/1.0 N=60/0.0 3:10/1.0 2:58/1.0 3:11/1.0 3:05/1.3	(3.6) 68%	(1.6) 30%						CRYSTALLINE ROCK (continued)
2605	2,609.8	34.9	5.0	3:35/1.0 3:41/1.0 3:32/1.0 3:45/1.0 3:51/1.0	(4.8) 96%	(3.6) 72%						
2600	2,604.8	39.9										Boring Terminated at Elevation 2,604.8 ft IN CRYSTALLINE ROCK, BIOTITE GNEISS
2595												
2590												
2585												
2580												
2575												
2570												
2565												

NCDOT CORE SINGLE U4412_BRIDGE_BORELOGS.GPJ NC_DOT_GDT_08/03/09



**FIELD
 SCOUR REPORT**

WBS: 35022.1.1 TIP: U-4412 COUNTY: HAYWOOD

DESCRIPTION(1): BRIDGE NO. 55 ON SR 1184 (HOWELL MILL ROAD) OVER RICHLAND CREEK

EXISTING BRIDGE

Information from: Field Inspection XX Microfilm _____ (reel _____ pos: _____)
 Other (explain) _____

Bridge No.: 55 Length: 160 Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2
 Foundation Type: Est. pile and/or spread footings

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: NONE

Interior Bents: NONE

Channel Bed: DEEP AND FAST CENTER CHANNEL, NO UNUSUAL SCOUR

Channel Bank: NONE

EXISTING SCOUR PROTECTION

Type(3): CONCRETE APRON ALONG SOUTH EB

Extent(4): ENTIRE WIDTH

Effectiveness(5): EFFECTIVE

Obstructions(6): NONE

INSTRUCTIONS

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): BOULDERS, COBBLES, SANDY GRAVEL

Channel Bank Material(8): SAME AS ABOVE, SILTY SAND MATRIX

Channel Bank Cover(9): TREES, SHRUBS

Floodplain Width(10): 200'

Floodplain Cover(11): GRASS, TREES, SHRUBS

Stream is(12): Aggrading _____ Degrading _____ Static XX

Channel Migration Tendency(13): NONE, STREAM CONFINED BY HWY AND RR BRIDGES, EMBANKMENTS

Observations and Other Comments: _____

Reported by: [Signature] Date: 8/3/09

DESIGN SCOUR ELEVATIONS(14)

Feet XX Meters _____

BENTS

	B3	B4	B5								
LT	SAME	2577	2615								
RT	SAME	2573	2615								

Comparison of DSE to Hydraulics Unit theoretical scour:
B4 AND B5 RAISED TO REFLECT NON-SCOUR MATERIAL IN BORINGS

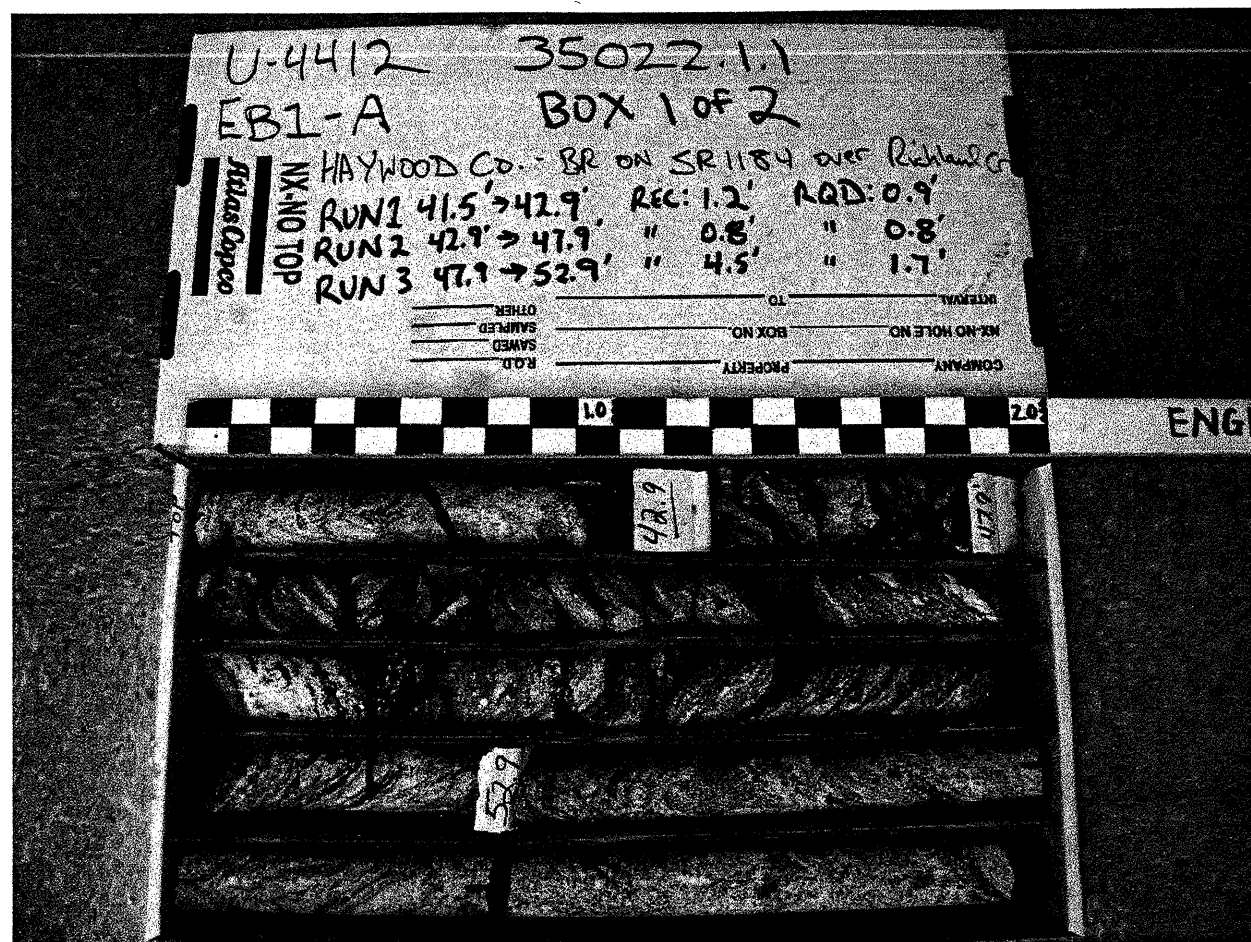
DSE determined by: JCKuhne Date: 8/13/2009

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank											
Sample No.											
Retained #4											
Passed #10											
Passed #40											
Passed #200											
Coarse Sand											
Fine Sand											
Silt											
Clay											
LL											
PI											
AASHTO											
Station											
Offset											
Depth											

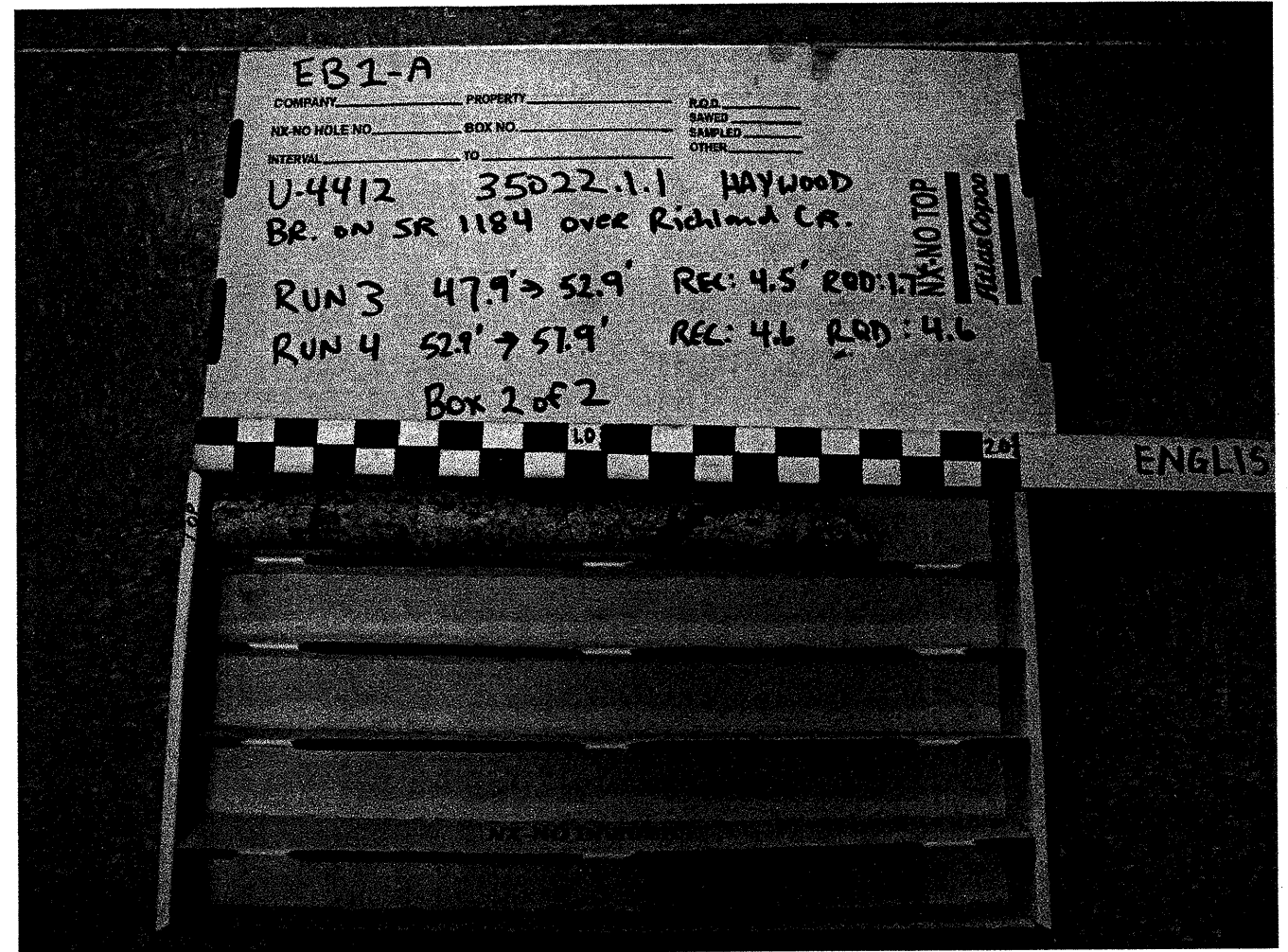
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING EB1-A

DEPTH: 41.5' - 55.9'



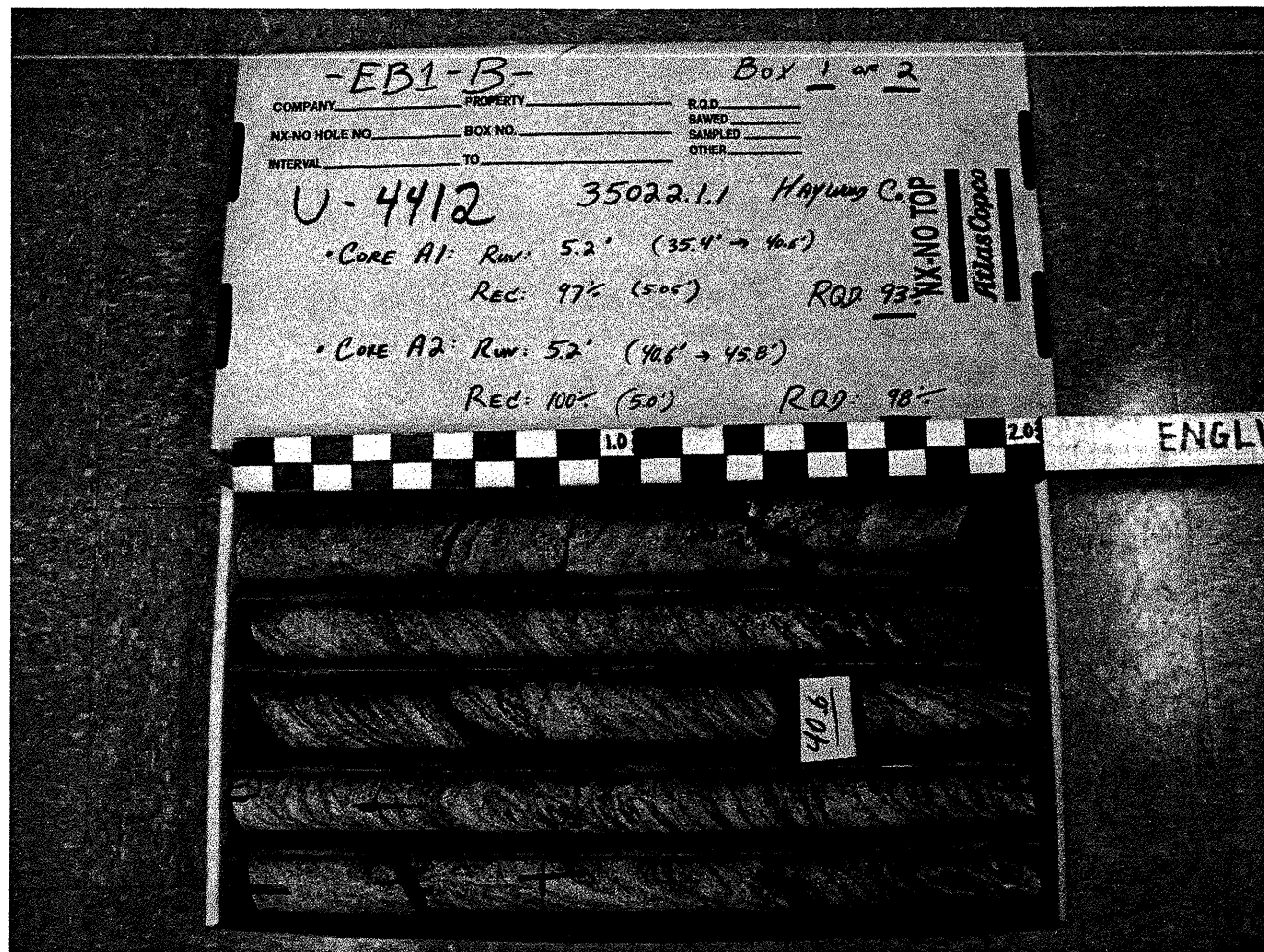
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING EB1-A

DEPTH: 55.9' - 57.9'



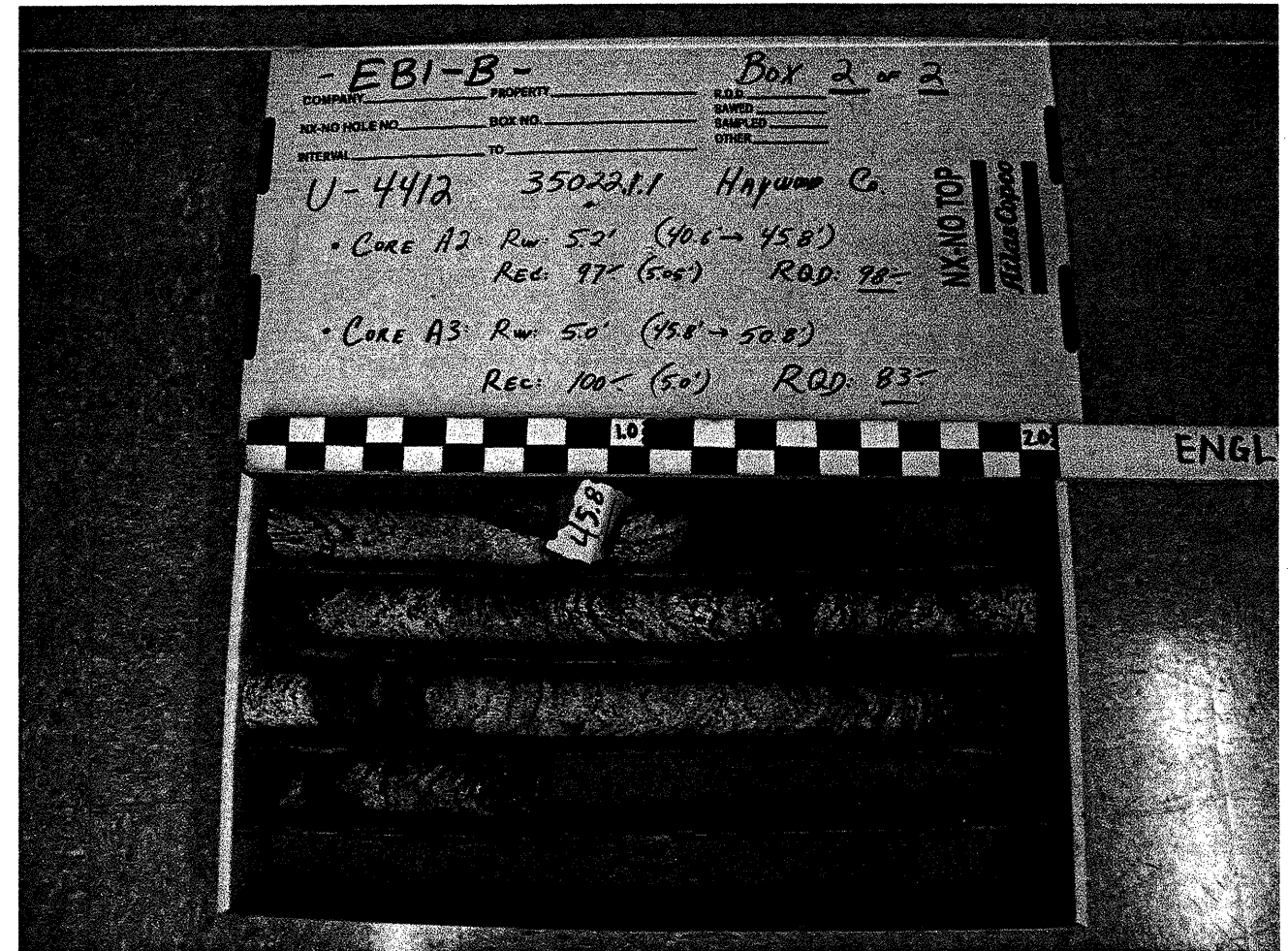
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING EB1-B

DEPTH: 35.4' - 44.1'



U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING EB1-B

DEPTH: 44.1' - 50.8'

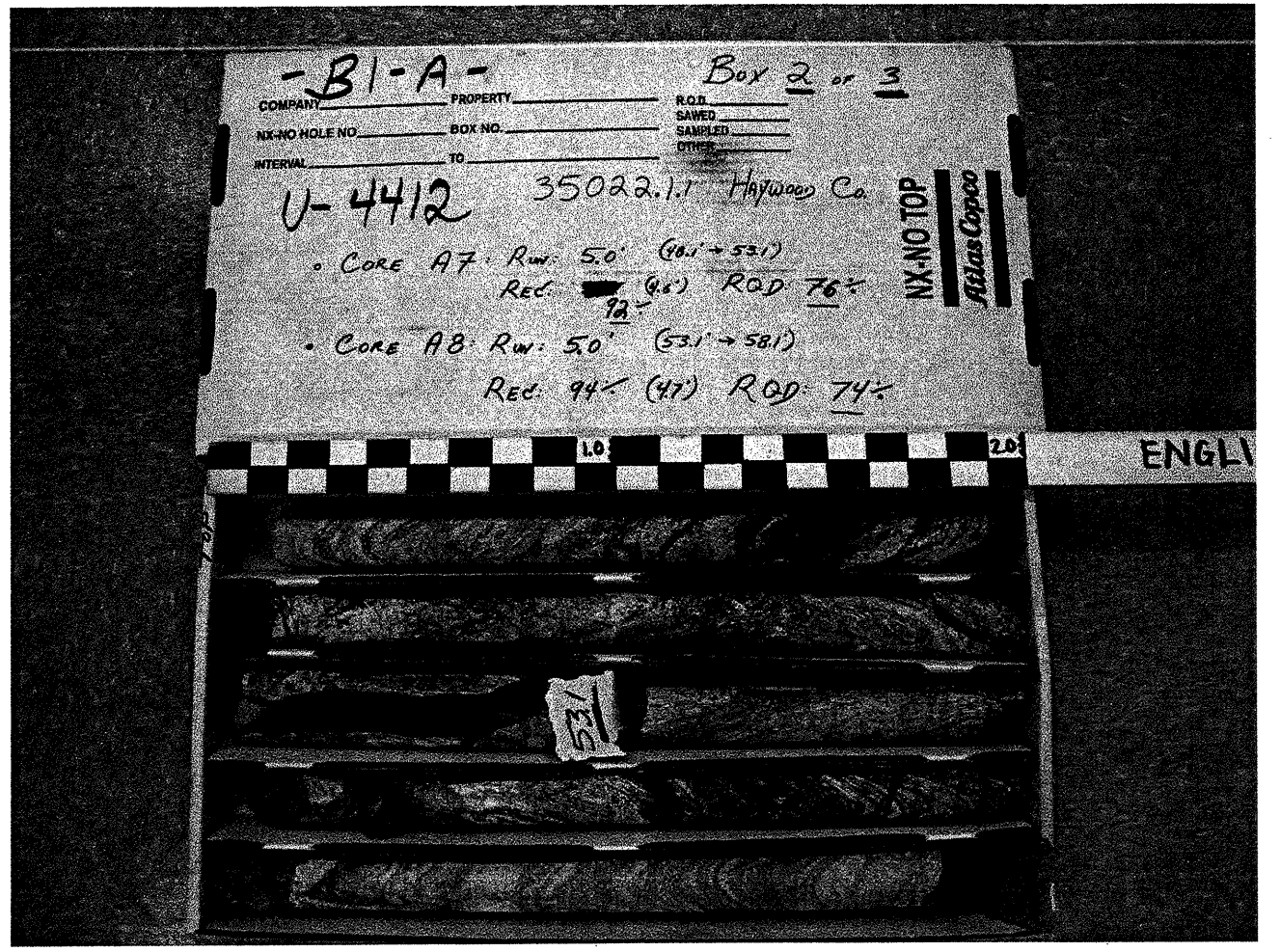


U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B1-A

DEPTH: 21.6' - 48.1'

U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B1-A

DEPTH: 48.1' - 58.1'

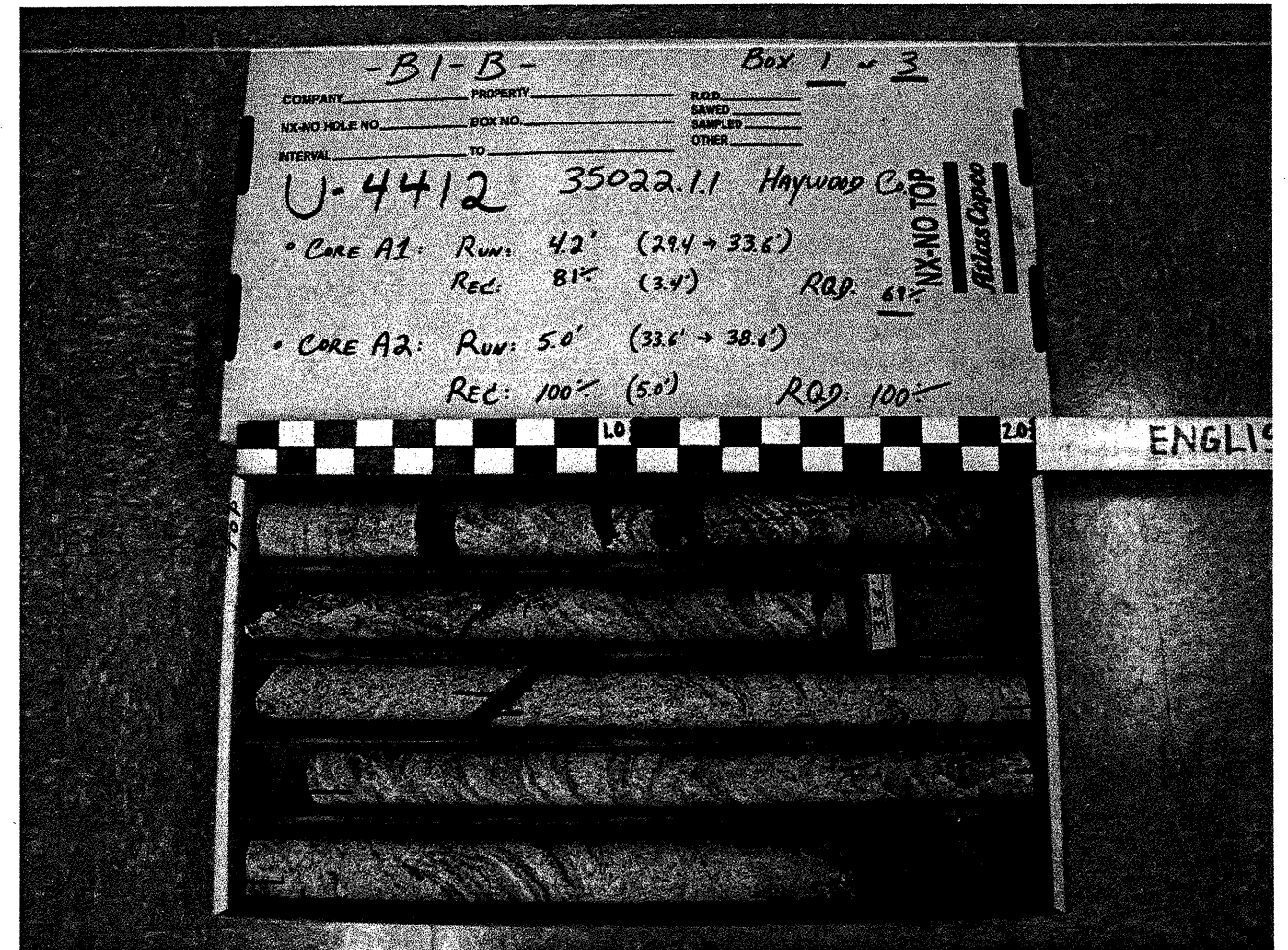
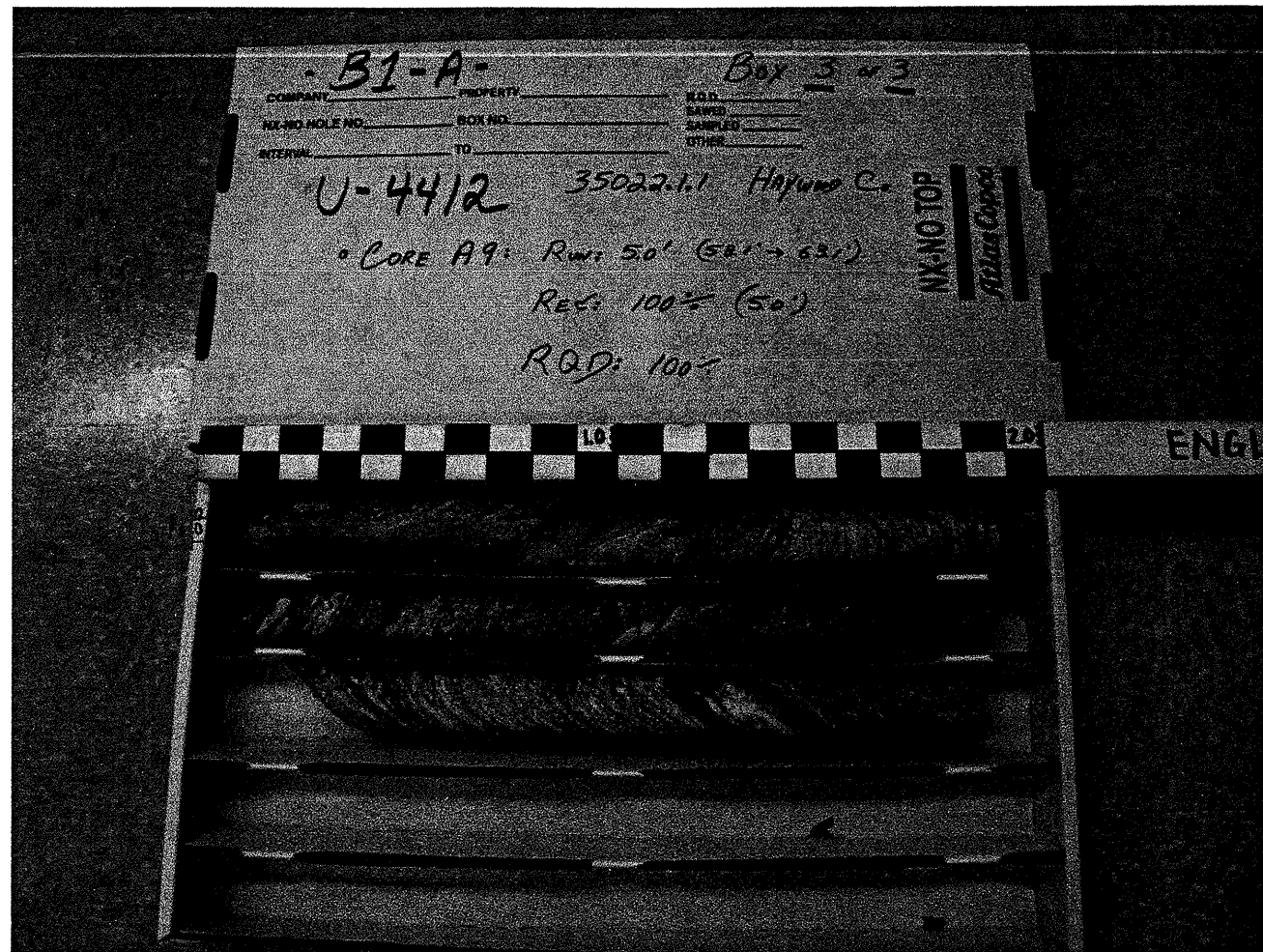


U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B1-A

DEPTH: 58.1' - 63.1'

U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B1-B

DEPTH: 29.4' - 38.6'



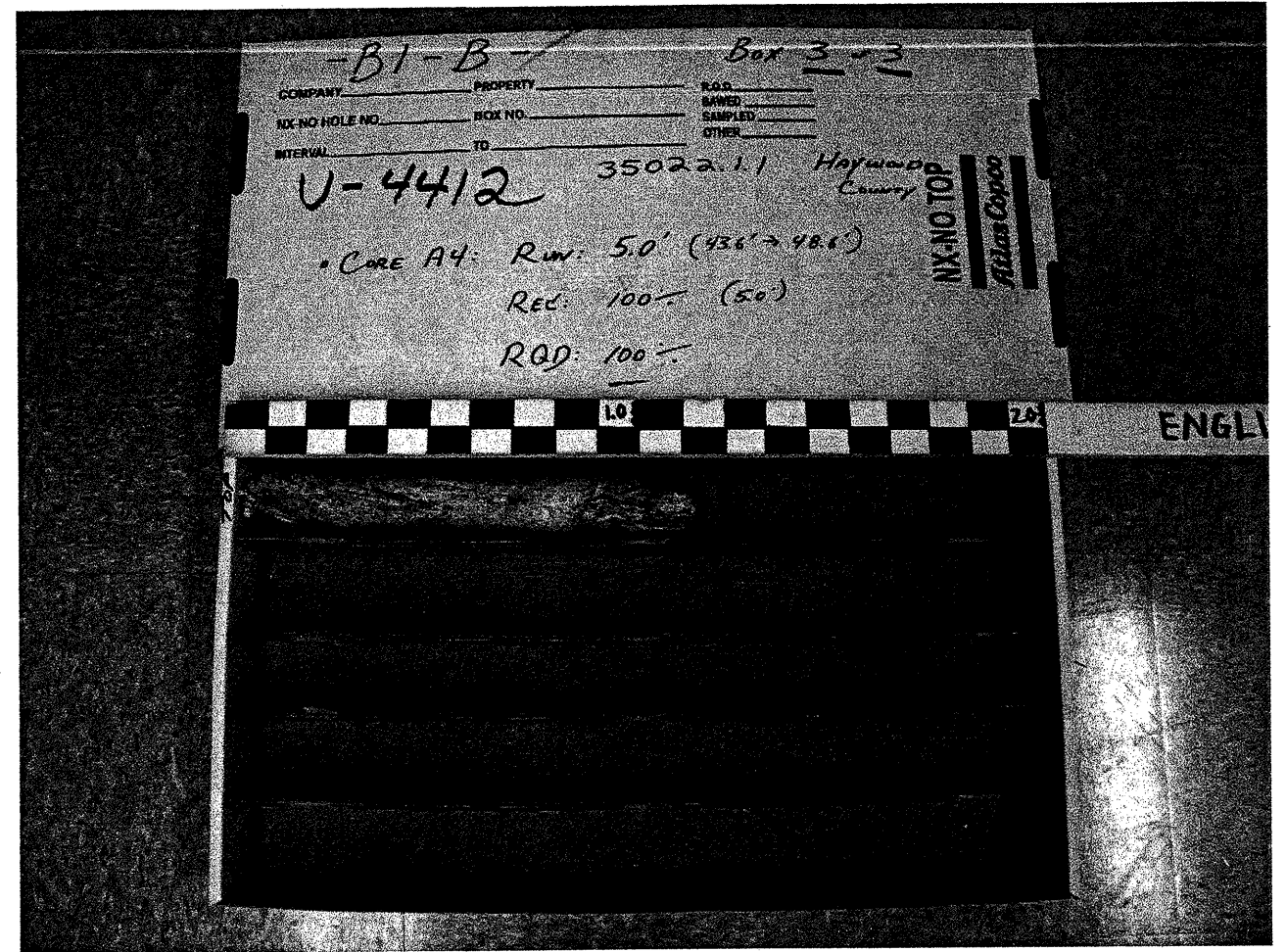
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B1-B

DEPTH: 38.6' - 47.6'



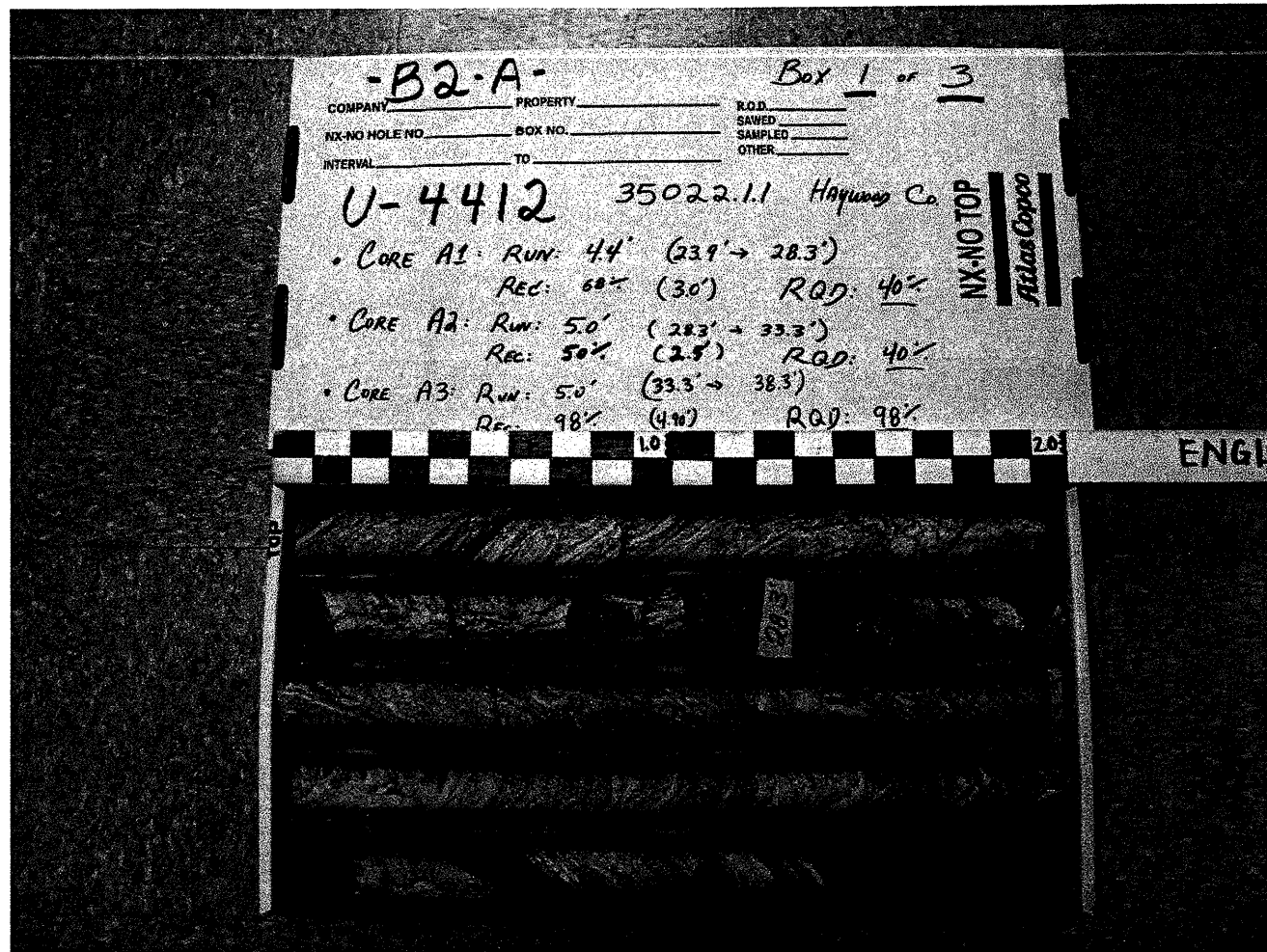
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B1-B

DEPTH: 47.6' - 48.6'



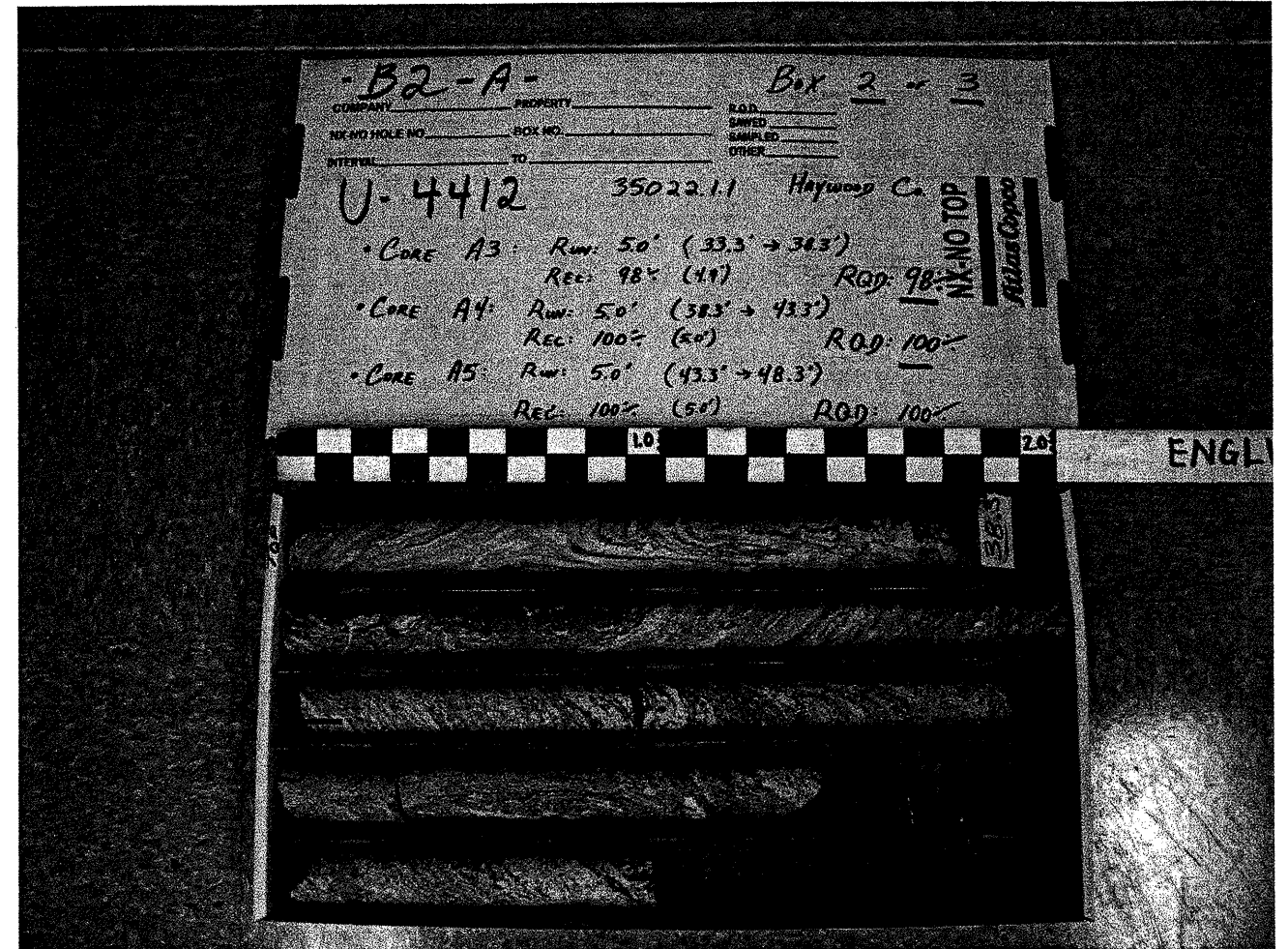
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B2-A

DEPTH: 23.9' - 36.0'



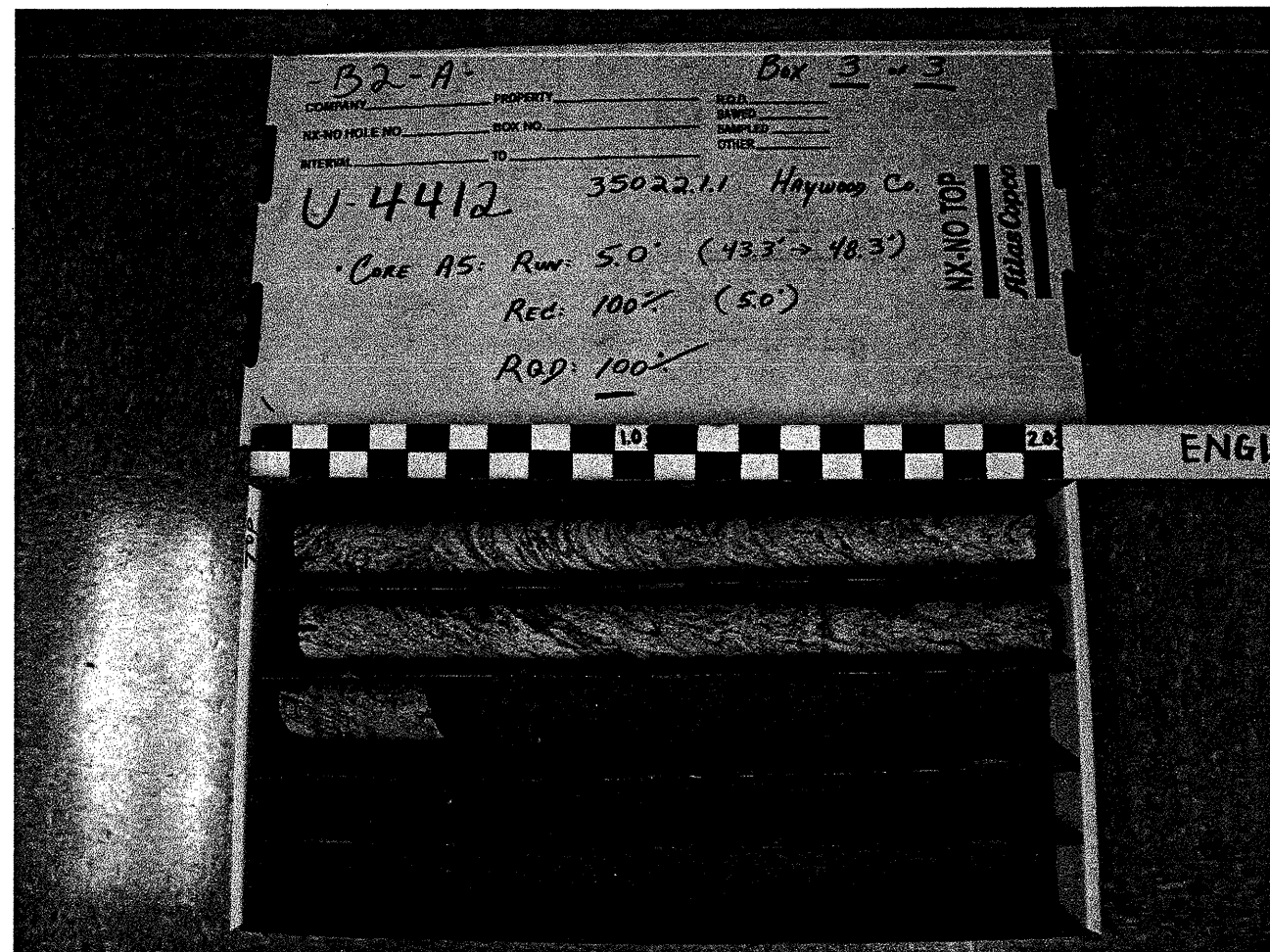
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B2-A

DEPTH: 36.0' - 44.3'



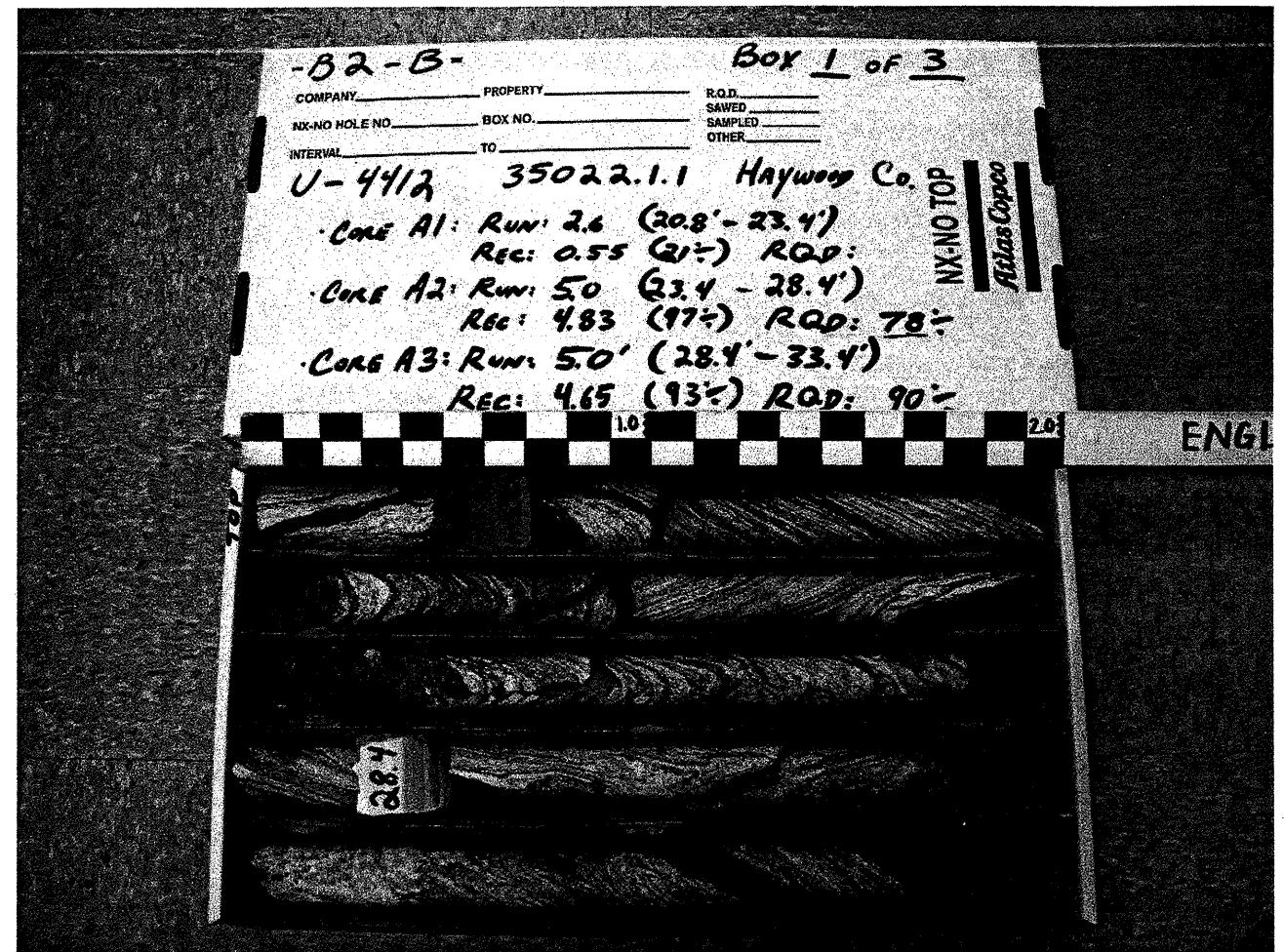
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B2-A

DEPTH: 44.3' - 48.3'



U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B2-B

DEPTH: 20.8' - 30.3'

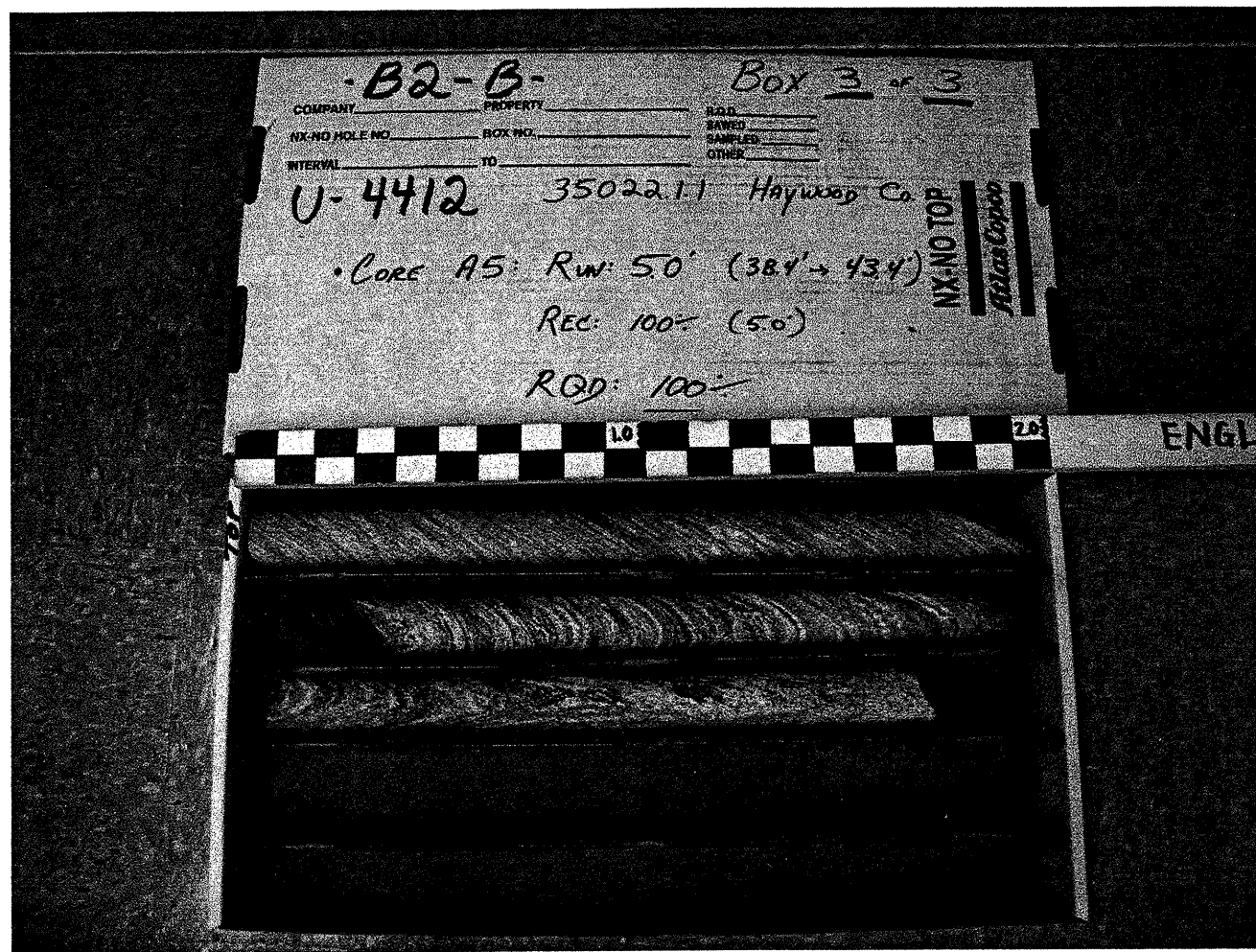
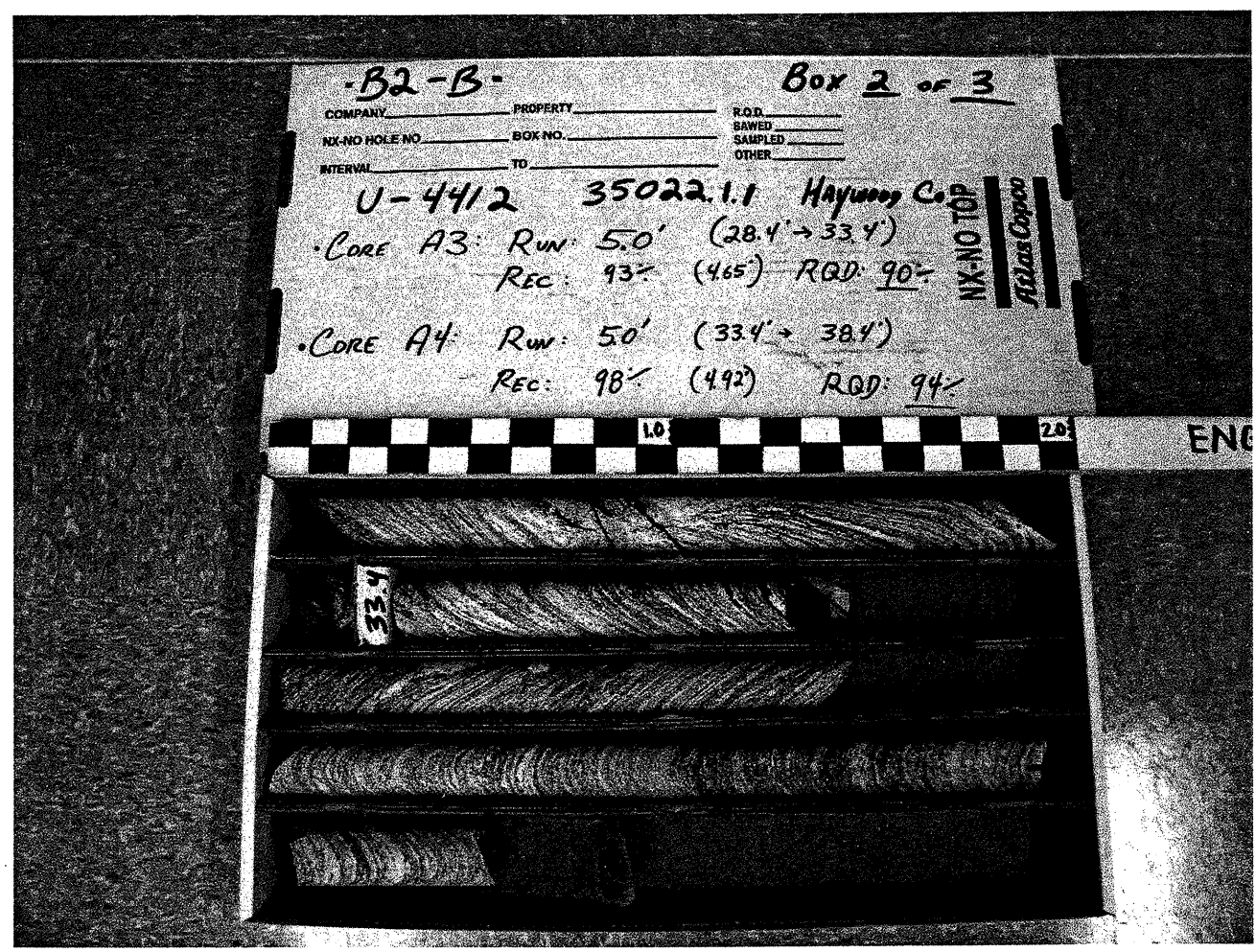


U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B2-B

DEPTH: 30.3' - 38.4'

U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B2-B

DEPTH: 38.4' - 43.4'

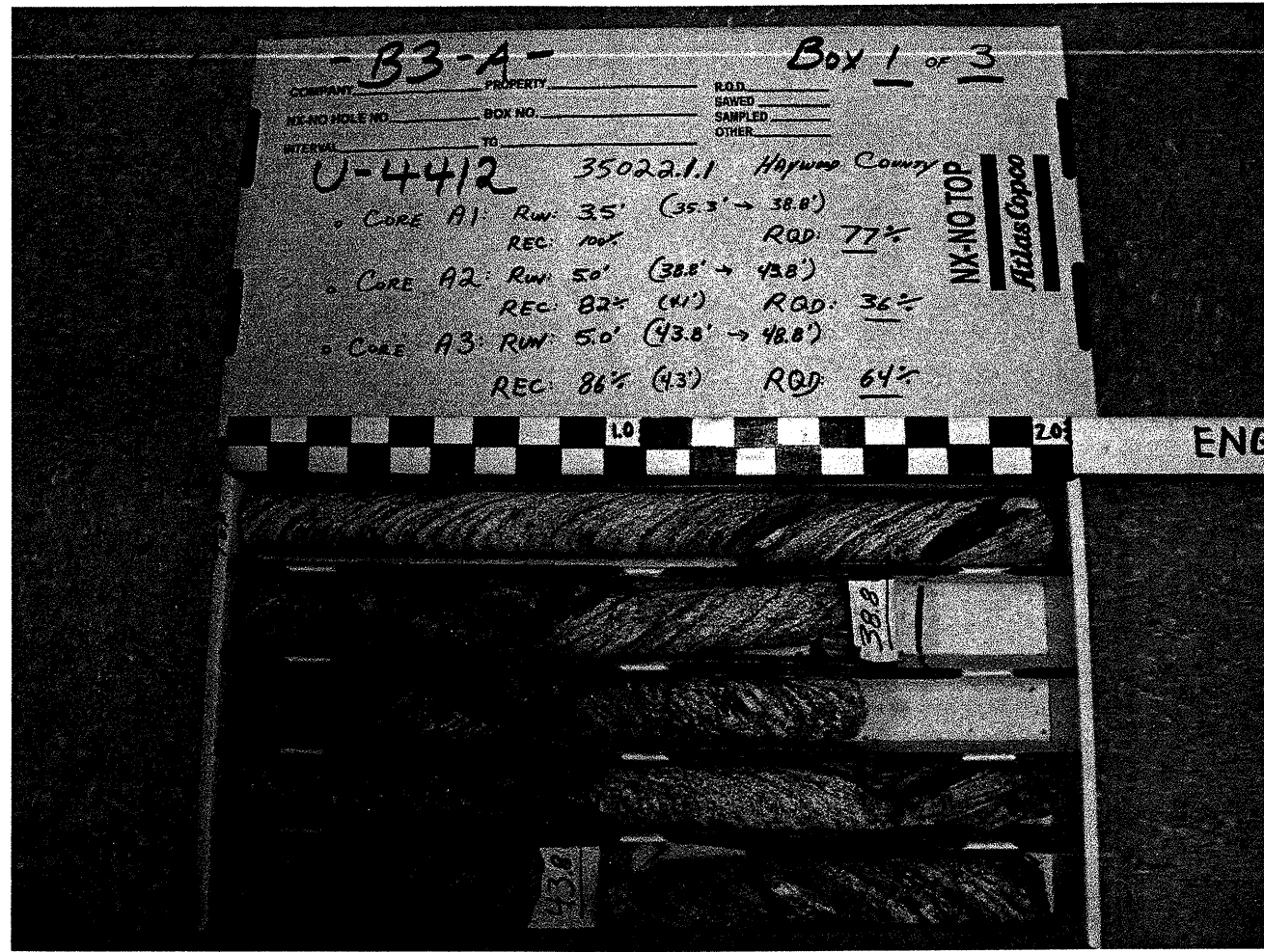


U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B3-A

DEPTH: 35.3' - 44.8'

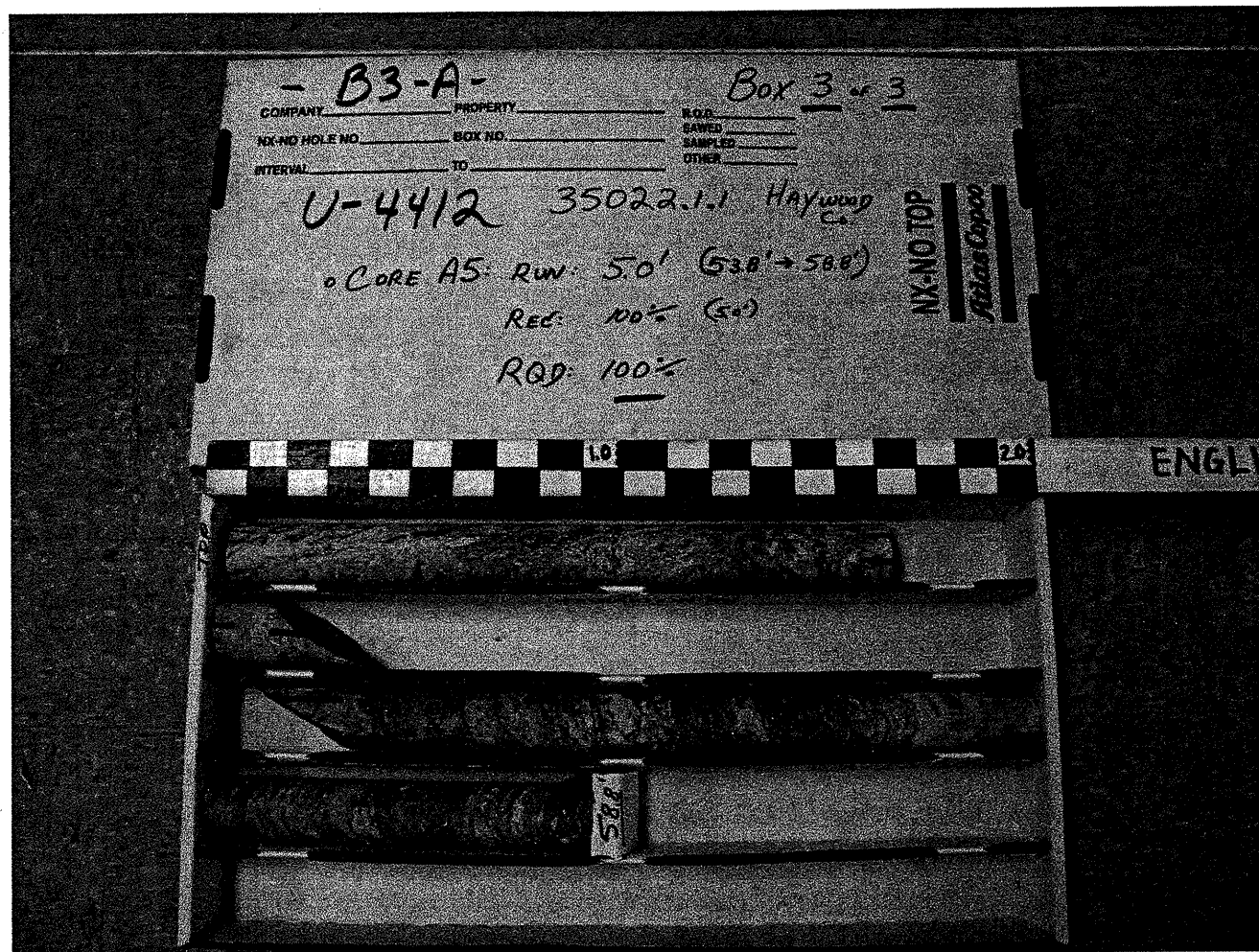
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B3-A

DEPTH: 44.8' - 54.3'



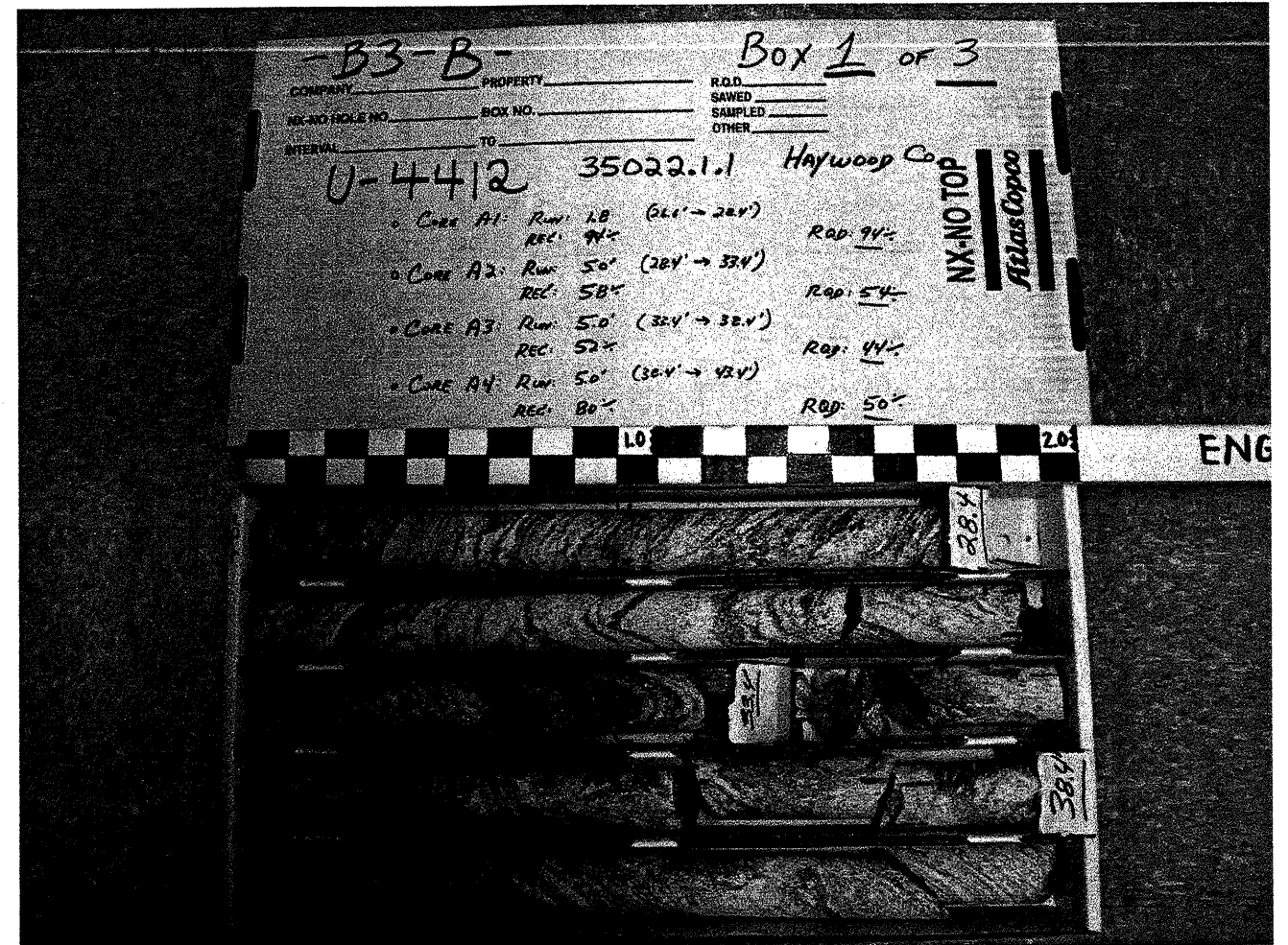
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B3-A

DEPTH: 54.3' - 58.8'



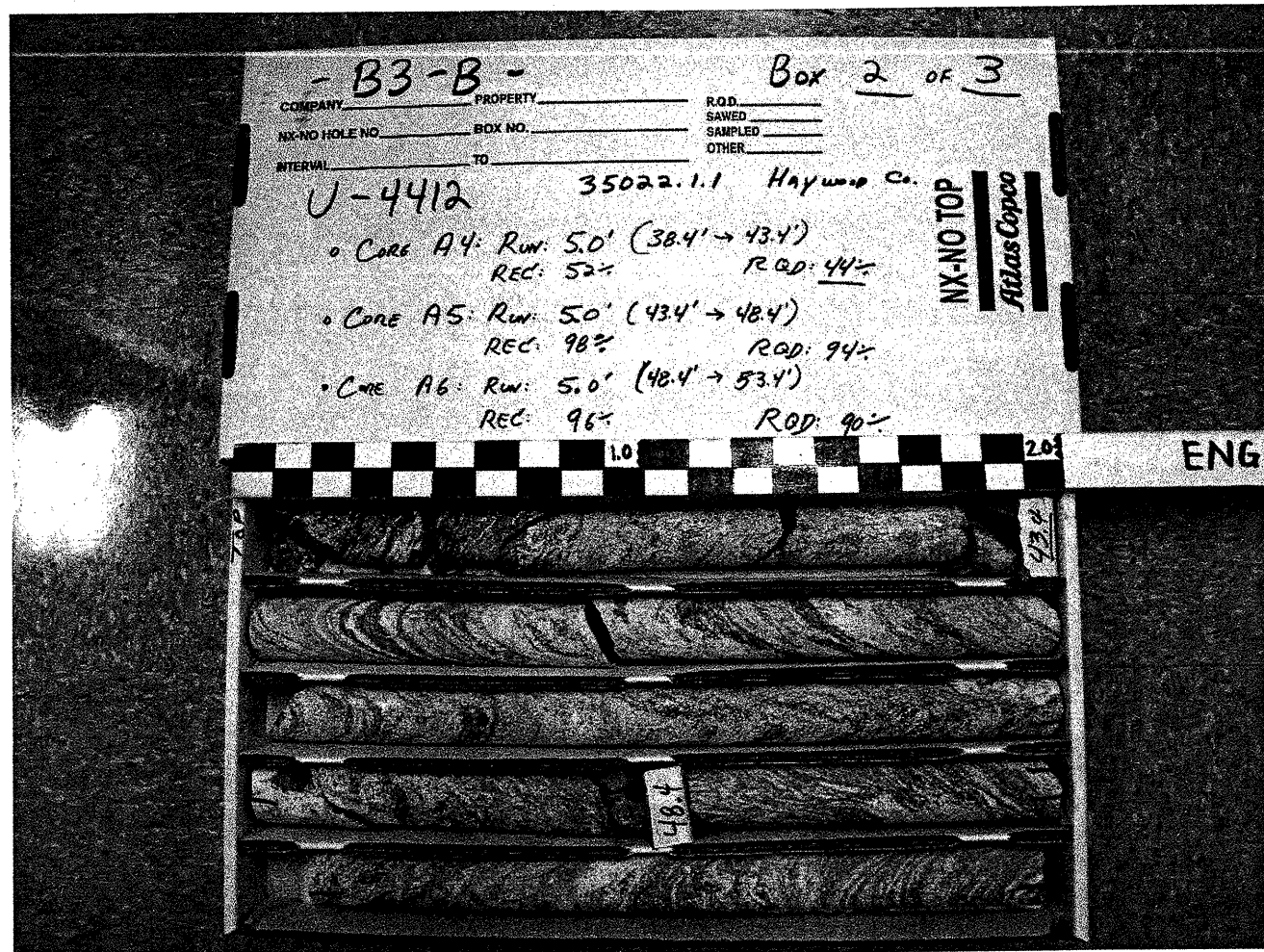
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B3-B

DEPTH: 26.6' - 40.4'



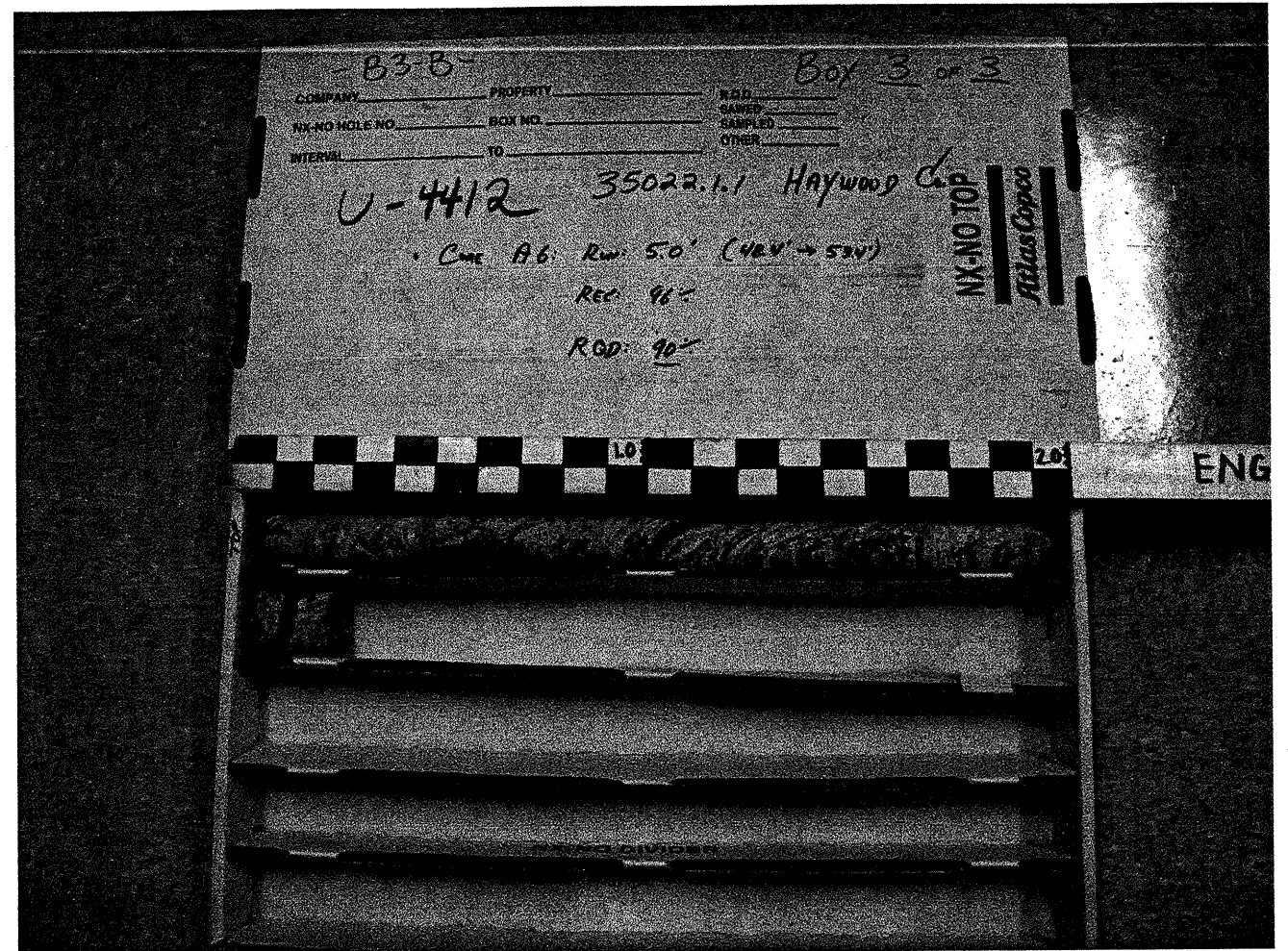
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B3-B

DEPTH: 40.4' - 51.2'



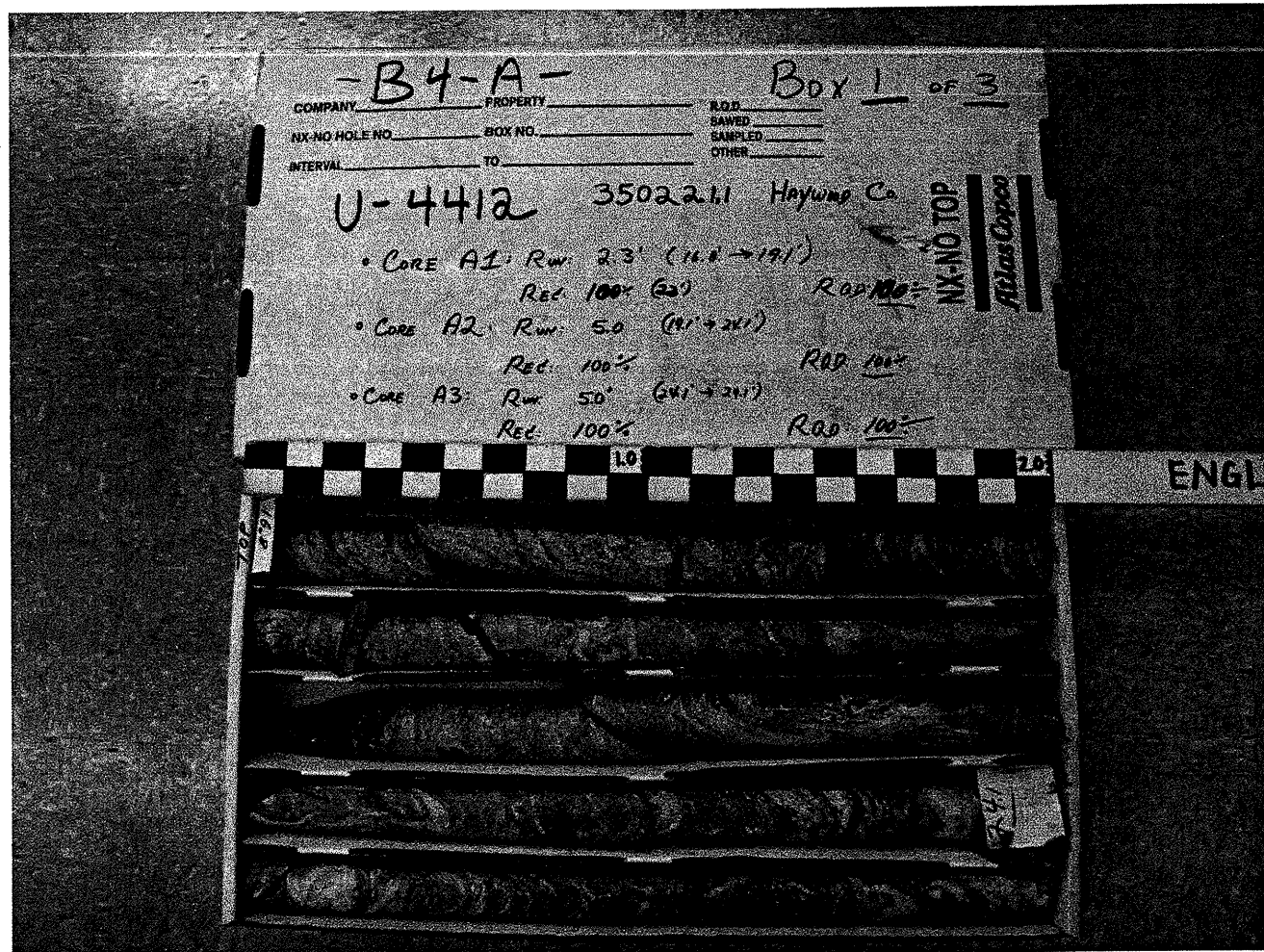
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B3-B

DEPTH: 51.2' - 53.4'



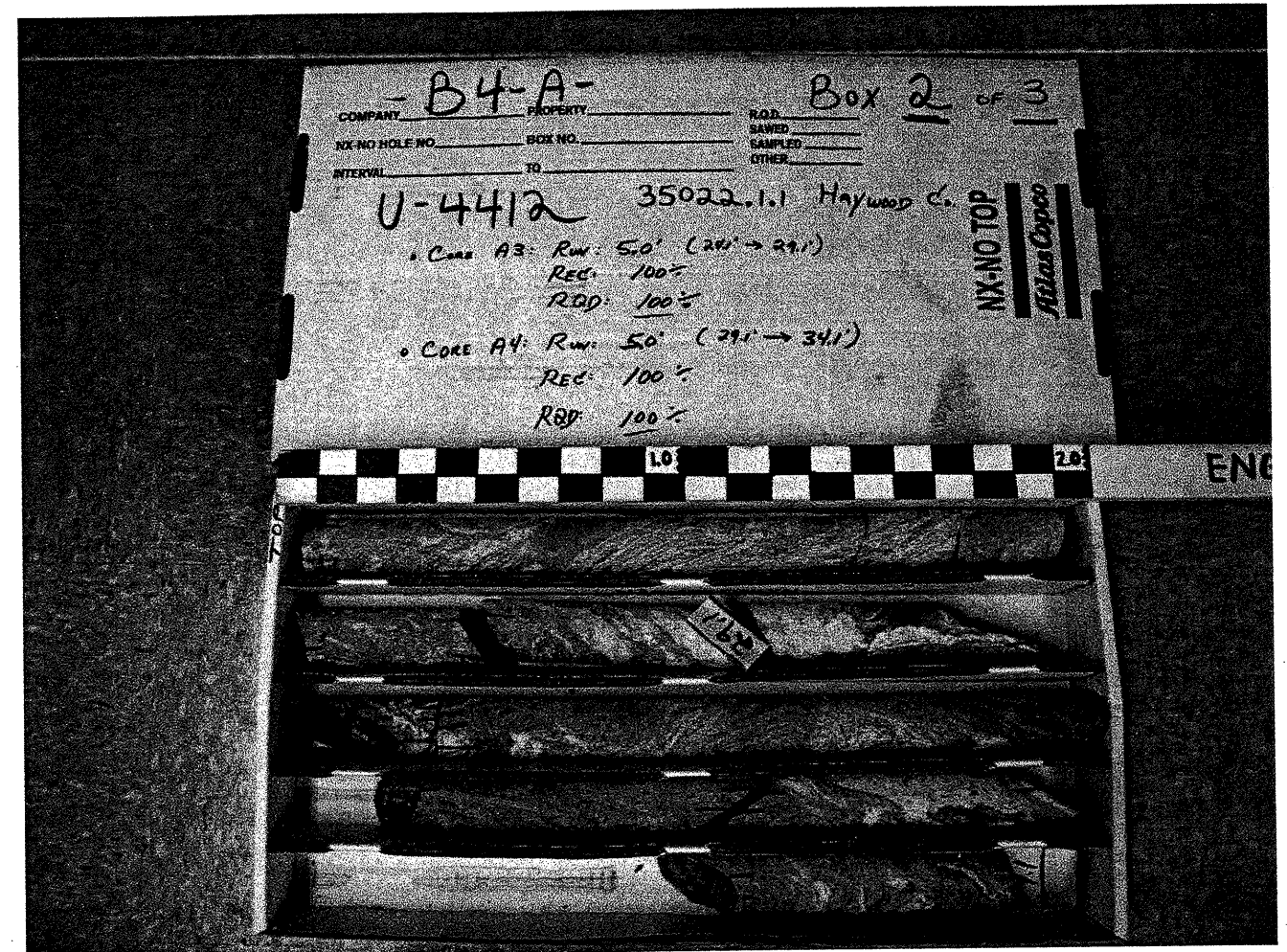
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B4-A

DEPTH: 16.8' - 26.1'



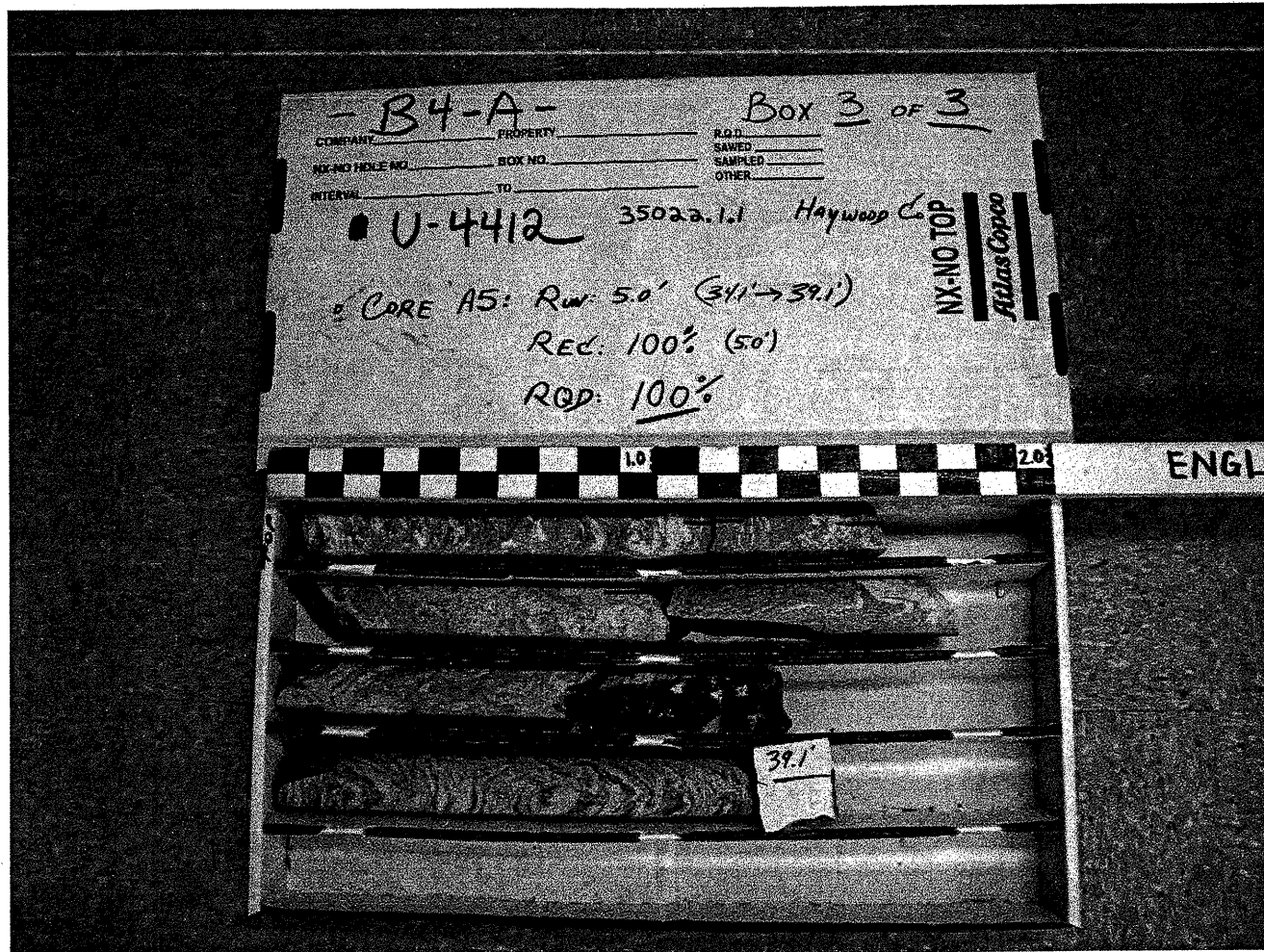
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B4-A

DEPTH: 26.1' - 34.1'



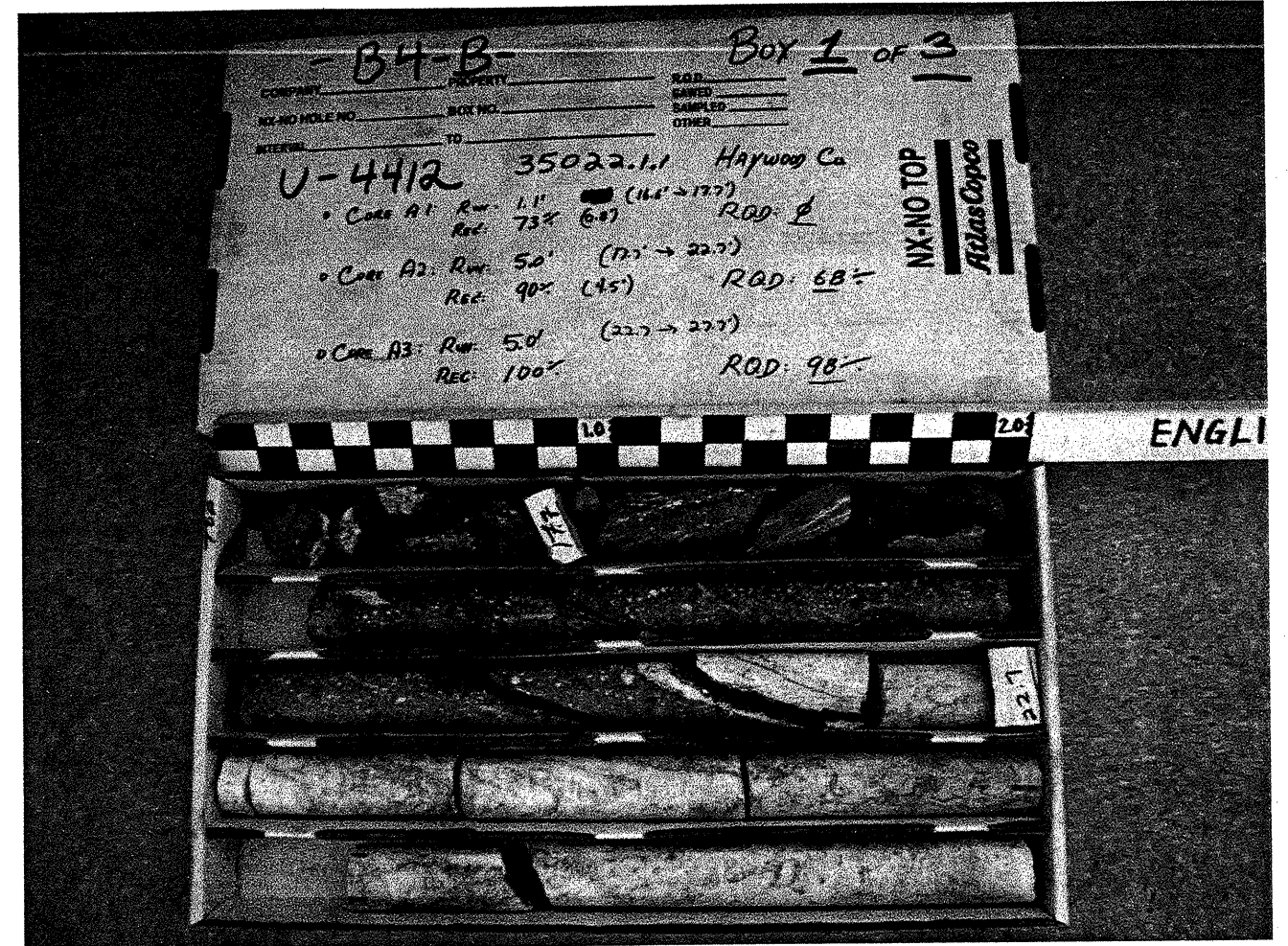
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B4-A

DEPTH: 34.1' - 39.1'



U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B4-B

DEPTH: 16.6' - 26.3'



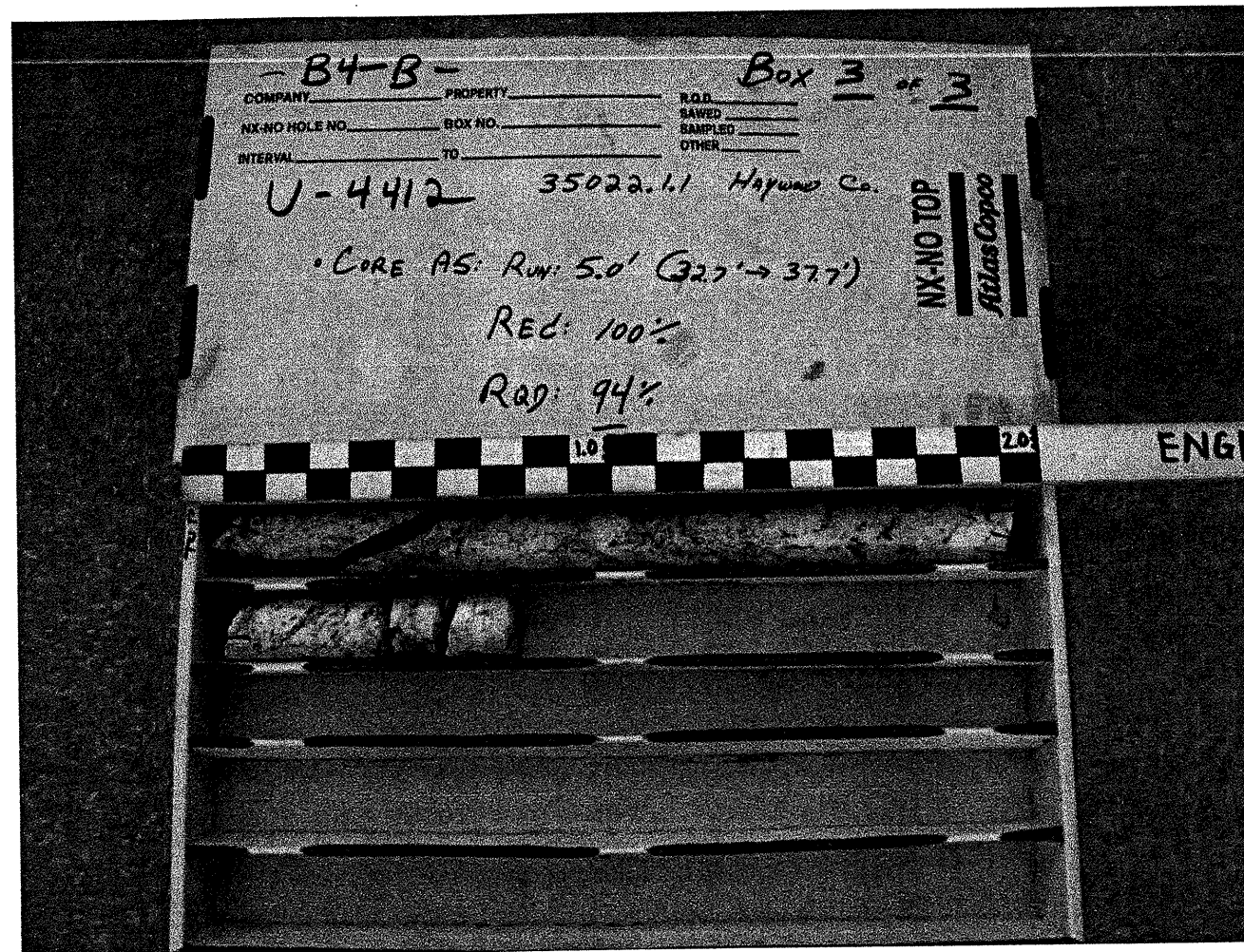
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B4-B

DEPTH: 26.3' - 35.7'



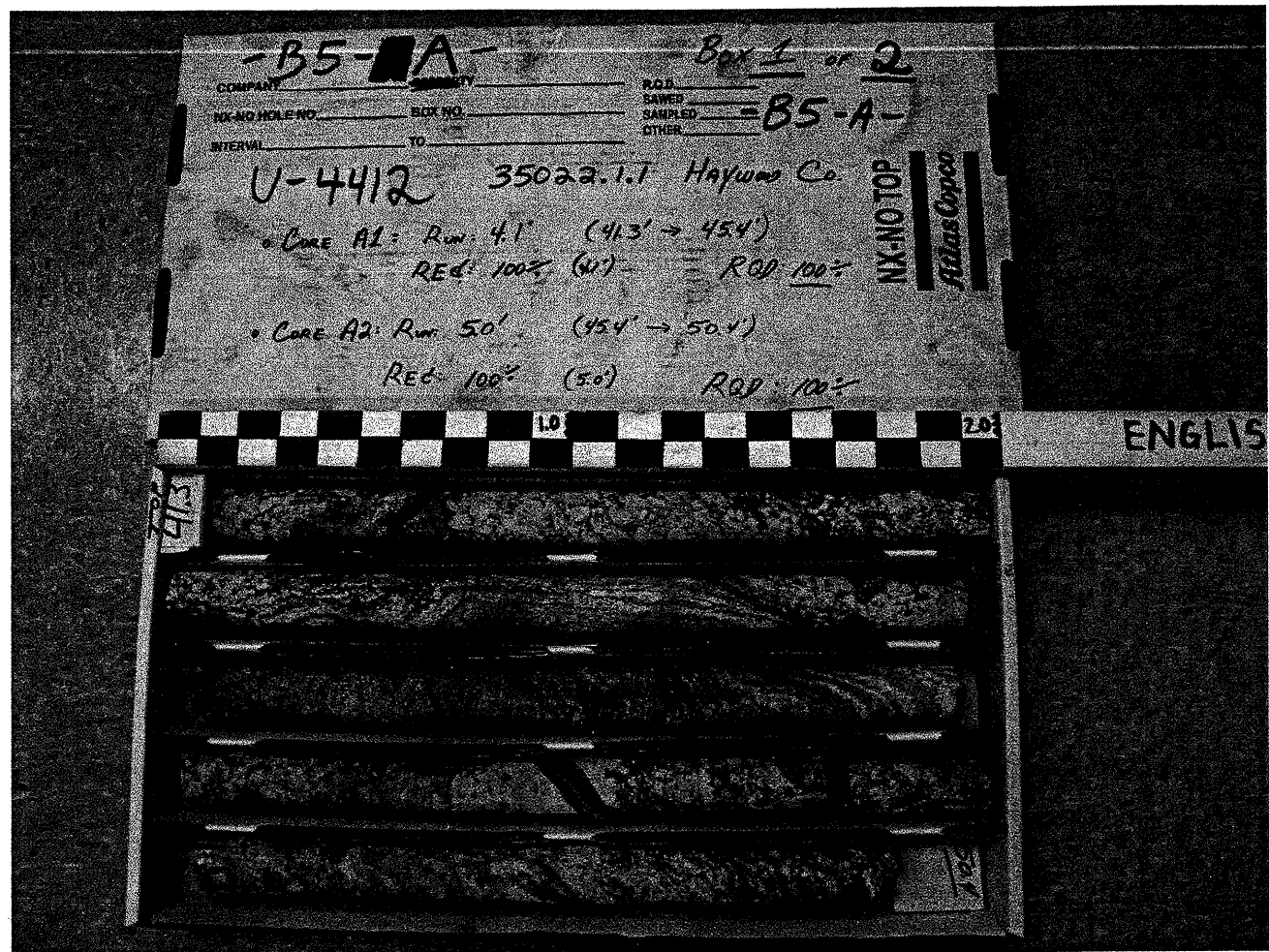
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B4-B

DEPTH: 35.7' - 37.7'



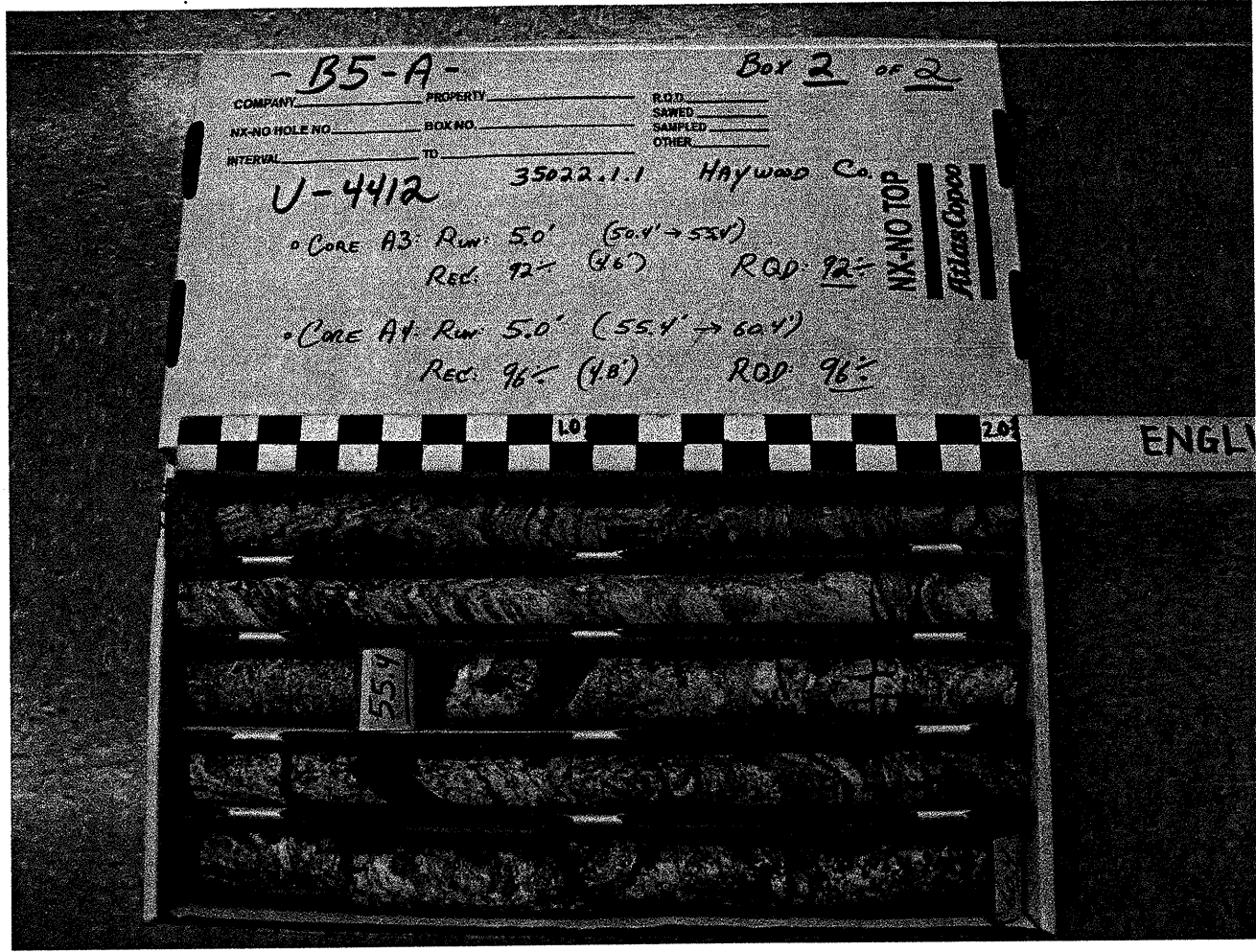
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B5-A

DEPTH: 41.3' - 50.4'



U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B5-A

DEPTH: 50.4' - 60.4'



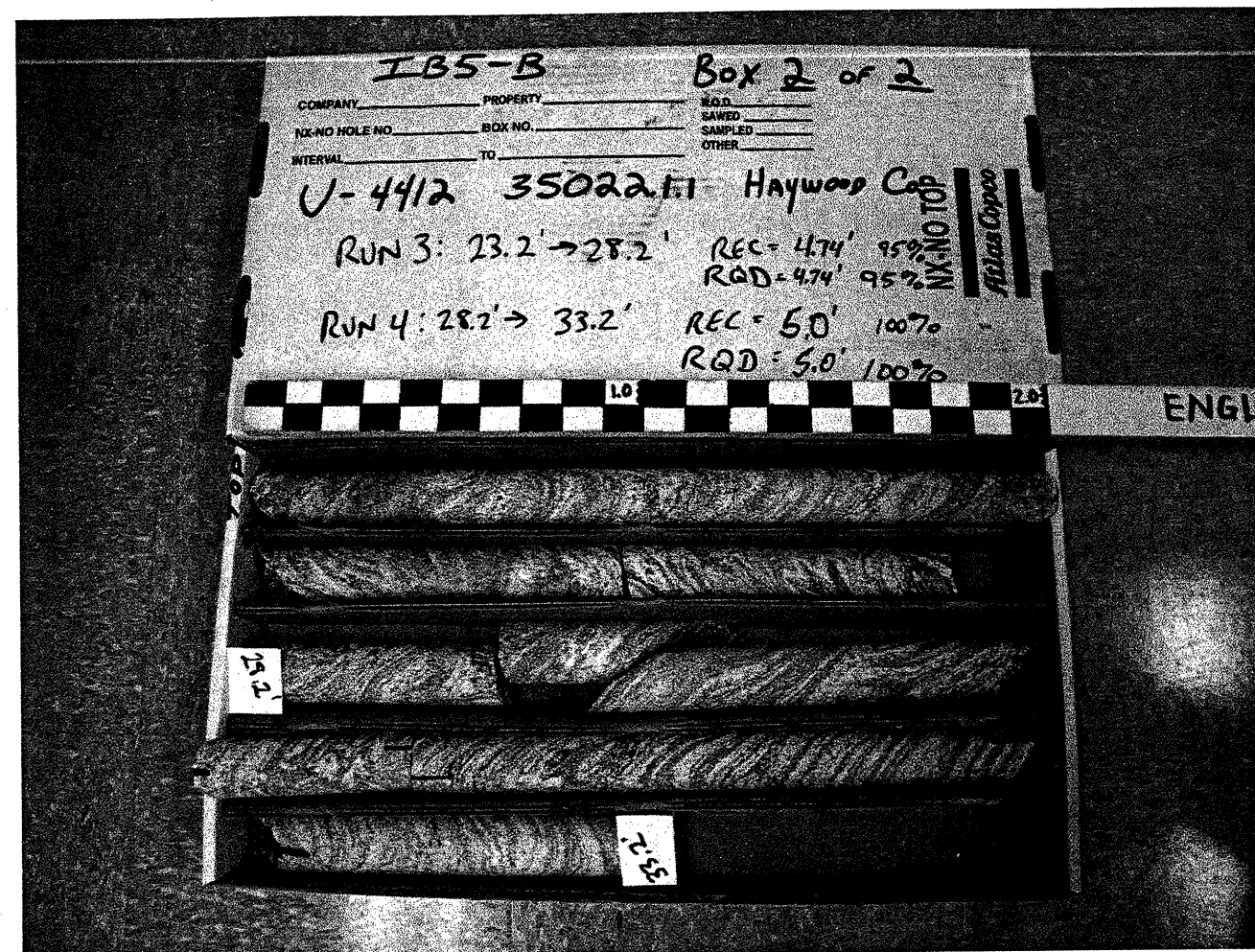
U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B5-B

DEPTH: 15.7' - 24.2'



U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING B5-B

DEPTH: 24.2' - 33.2'



U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING EB2-A

DEPTH: 45.5' - 54.3'



U-4412, 35022.1.1
BRIDGE ON SR 1184 (HOWELL MILL RD) OVER RICHLAND CREEK
BORING EB2-B

DEPTH: 29.6' - 39.9'

