

PROJECT: SF-490159 REFERENCE: 17BP.14.R.212

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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

Table with 4 columns: STATE (N.C.), STATE PROJECT REFERENCE NO. (17BP.14.R.212), SHEET NO. (1), TOTAL SHEETS (14)

CONTENTS

Table with 4 columns: LINE, STATION, PLAN, CROSS SECTIONS. Rows for -L- and -YI-.

ROADWAY SUBSURFACE INVESTIGATION

COUNTY JACKSON PROJECT DESCRIPTION SR 1336 (MONTEITH GAP RD) FROM N OF SR 1002 TO N OF SR 1337

INVENTORY

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.

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 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.

- NOTES: 1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT. 2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

C.D. JOHNSON

D.O. CHEEK

C.J. COFFEY

INVESTIGATED BY D.M. MULLEN

DRAWN BY DMM

CHECKED BY JCK

SUBMITTED BY JCK

DATE 7/11/2019



DocuSigned by:

Signature of Jody C. Kuhne

7/29/2019

4F9C088A18C400 SIGNATURE

DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

**SOIL DESCRIPTION**

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 209, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, *VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

**GRADATION**

**WELL GRADED** - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  
**UNIFORMLY GRADED** - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.  
**GAP-GRADED** - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

**ANGULARITY OF GRAINS**

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:  
**ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.**

**ROCK DESCRIPTION**

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

**WEATHERED ROCK (WR)**

**CRYSTALLINE ROCK (CR)**

**NON-CRYSTALLINE ROCK (NCR)**

**COASTAL PLAIN SEDIMENTARY ROCK (CP)**

**TERMS AND DEFINITIONS**

**ALLUVIUM (ALLUV.)** - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.  
**AQUIFER** - A WATER BEARING FORMATION OR STRATA.  
**ARENACEOUS** - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  
**ARGILLACEOUS** - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.  
**ARTESIAN** - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.  
**CALCAREOUS (CALC.)** - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  
**COLLUVIUM** - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.  
**CORE RECOVERY (REC.)** - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.  
**DIKE** - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.  
**DIP** - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.  
**DIP DIRECTION (DIP AZIMUTH)** - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  
**FAULT** - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  
**FISSILE** - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  
**FLOAT** - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED 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 (ROQ)** - 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 (SROQ)** - 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**

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)						SILT-CLAY MATERIALS (> 35% PASSING #200)						ORGANIC MATERIALS			
	A-1	A-3	A-2	A-4	A-5	A-7	A-1, A-2	A-4, A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7		
GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7		
SYMBOL	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]	[Symbol]
% PASSING #10 #40 #200	50 Mx 30 Mx 15 Mx	50 Mx 25 Mx 10 Mx	51 MN 35 Mx 35 Mx	40 Mx 35 Mx 35 Mx	41 MN 40 Mx 35 Mx	41 MN 40 Mx 35 Mx	36 MN 36 Mx 36 Mx	40 Mx 41 MN 40 Mx	41 MN 40 Mx 41 MN	40 Mx 41 MN 41 MN	41 MN 40 Mx 41 MN	40 Mx 41 MN 41 MN	41 MN 40 Mx 41 MN	41 MN 41 MN 41 MN		
MATERIAL PASSING #40 LL PI	-	-	40 Mx NP	41 MN 40 Mx 41 MN	40 Mx 41 MN 41 MN	40 Mx 41 MN 41 MN	40 Mx 41 MN 41 MN	40 Mx 41 MN 41 MN	40 Mx 41 MN 41 MN	40 Mx 41 MN 41 MN	40 Mx 41 MN 41 MN	40 Mx 41 MN 41 MN	40 Mx 41 MN 41 MN	40 Mx 41 MN 41 MN		
GROUP INDEX	0	0	0	4 Mx	8 Mx	12 Mx	16 Mx	NO Mx								
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS	CLAYEY SOILS											
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD			FAIR TO POOR			FAIR TO POOR			POOR			UNSATURABLE			

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

**MINERALOGICAL COMPOSITION**

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

**COMPRESSIBILITY**

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

**PERCENTAGE OF MATERIAL**

	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE 1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE 10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME 20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY 35% AND ABOVE

**WEATHERING**

**FRESH** - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.

**VERY SLIGHT (IV SL.)** - ROCK GENERALLY FRESH, JOINTS STAINED. SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.

**SLIGHT (SL.)** - ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.

**MODERATE (MOD.)** - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.

**MODERATELY SEVERE (MOD. SEV.)** - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*

**SEVERE (SEV.)** - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*

**VERY SEVERE (IV SEV.)** - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*

**COMPLETE** - ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

**MISCELLANEOUS SYMBOLS**

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- DIP & DIP DIRECTION OF ROCK STRUCTURES
- TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

**CONSISTENCY OR DENSENESS**

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )
GENERALLY GRANULAR MATERIAL (NON-COHEISIVE)	VERY LOOSE	< 4	N/A
	LOOSE	4 TO 10	N/A
	MEDIUM DENSE DENSE VERY DENSE	10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	< 2	< 0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF HARD	15 TO 30 > 30	2 TO 4 > 4

**GROUND WATER**

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

**RECOMMENDATION SYMBOLS**

UNDERCUT	UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE	UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL
SHALLOW UNDERCUT	UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK	

**TEXTURE OR GRAIN SIZE**

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
BOULDER (BLDR.)						
COBBLE (COB.)	4.76	2.00	0.42	0.25	0.075	0.053
GRAVEL (GR.)			2.0			
COARSE SAND (CS, SD.)				0.25		
FINE SAND (F SD.)					0.05	0.005
SILT (SL.)						0.005
CLAY (CL.)						

**ABBREVIATIONS**

AR - AUGER REFUSAL	MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC	VST - VANE SHEAR TEST
BT - BORING TERMINATED	CL. - CLAY	WEA. - WEATHERED
CPT - COARSE PENETRATION TEST	CSE - COARSE	W - UNIT WEIGHT
DMT - DILATOMETER TEST	DPT - DYNAMIC PENETRATION TEST	g - DRY UNIT WEIGHT
e - VOID RATIO	F - FINE	
FOSS. - FOSSILIFEROUS	FRAC. - FRACTURED, FRACTURES	
FRAGS. - FRAGMENTS	HI. - HIGHLY	

**SOIL MOISTURE - CORRELATION OF TERMS**

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

**EQUIPMENT USED ON SUBJECT PROJECT**

DRILL UNITS:  
 CME-45C  
 CME-55  
 CME-550  
 VANE SHEAR TEST  
 PORTABLE HOIST  
 \_\_\_\_\_

ADVANCING TOOLS:  
 CLAY BITS  
 6" CONTINUOUS FLIGHT AUGER  
 8" HOLLOW AUGERS  
 HARD FACED FINGER BITS  
 TUNG-CARBIDE INSERTS  
 CASING  w/ ADVANCER  
 TRICONE \_\_\_\_\_ \* STEEL TEETH  
 TRICONE \_\_\_\_\_ \* TUNG-CARB.  
 CORE BIT  
 \_\_\_\_\_

HAMMER TYPE:  
 AUTOMATIC  MANUAL  
  
CORE SIZE:  
 -B \_\_\_\_\_  -H \_\_\_\_\_  
 -N \_\_\_\_\_  
  
HAND TOOLS:  
 POST HOLE DIGGER  
 HAND AUGER  
 SOUNDING ROD  
 VANE SHEAR TEST  
 \_\_\_\_\_

**ROCK HARDNESS**

	VERY HARD	HARD	MODERATELY HARD	MEDIUM HARD	SOFT	VERY SOFT
	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	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.	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.	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.	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 FINGER NAIL.

**FRACTURE SPACING**

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

**BEDDING**

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

**INDURATION**

	FRIBLE	MODERATELY INDURATED	INDURATED	EXTREMELY INDURATED
	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

**PLASTICITY**

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

**COLOR**

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

**INDURATION**

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIBLE

MODERATELY INDURATED

INDURATED

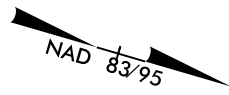
EXTREMELY INDURATED

**NOTES:**

BENCH MARK: N/A ELEVATIONS DERIVED FROM DTM

ELEVATION: N/A FEET

DATE: 8-15-14



BEGIN CONSTRUCTION  
-Y1- POC Sta. 10+60.00

BEGIN CONSTRUCTION  
-DR2- PC Sta. 10+19.75

3600 SQ YDS OF FILL  
THIS SIDE OF BRIDGE TO THE Y LINE  
INCLUDES 1158 SQ YDS OVER WETLANDS

-Y1- PT Sta. 12+60.90

1158 SQ YDS FILL OVER WETLAND AREA

BEGIN CONSTRUCTION  
-DRI- POT Sta. 10+52.00

END CONSTRUCTION  
-Y2- POC Sta. 12+00.00

END STATE PROJECT 17BP.14.R.212  
-L- POC Sta. 28+00.00

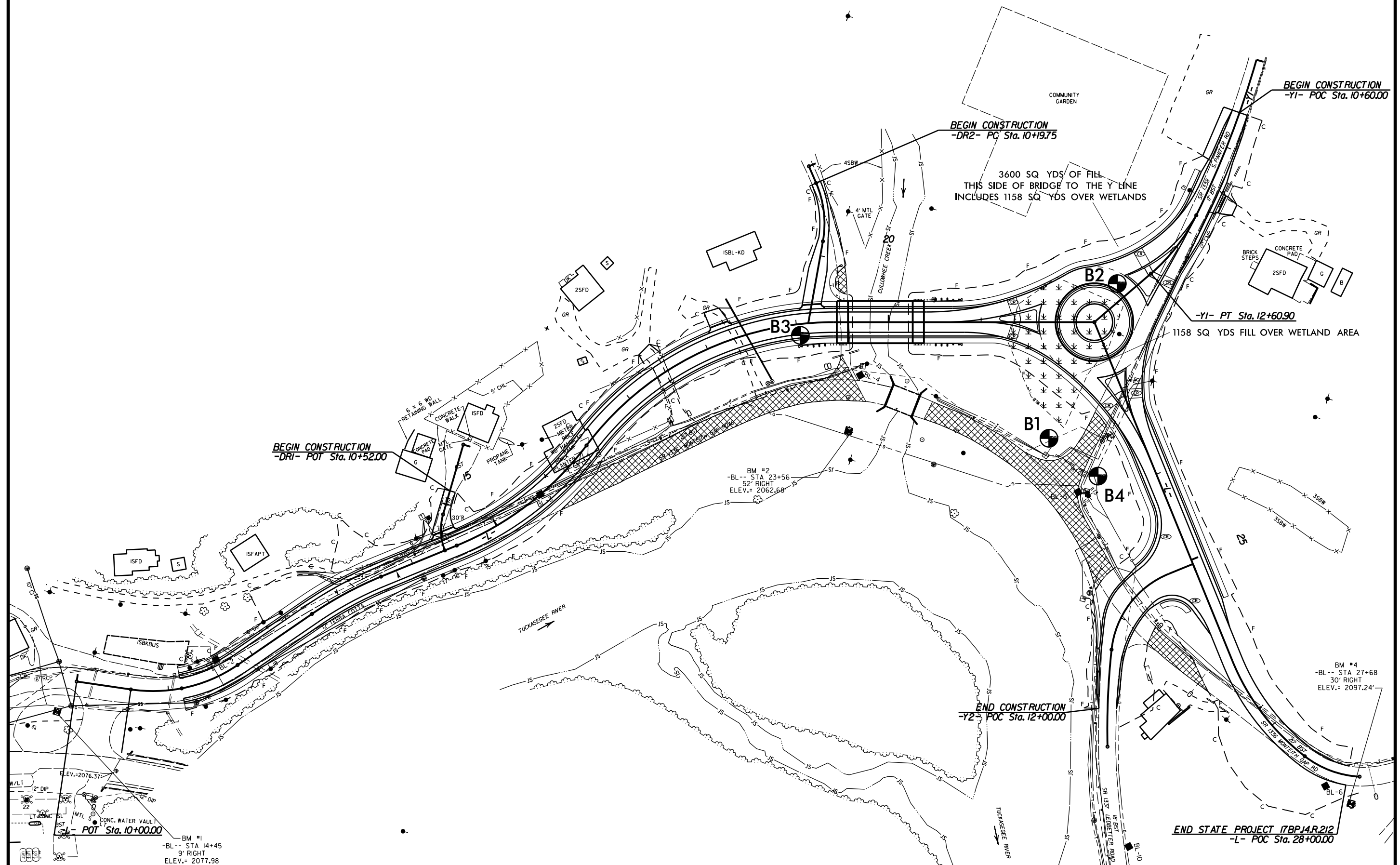
BM #2  
-BL-- STA 23+56  
52' RIGHT  
ELEV.= 2062.68

BM #4  
-BL-- STA 27+68  
30' RIGHT  
ELEV.= 2097.24'

BM #1  
-BL-- STA 14+45  
9' RIGHT  
ELEV.= 2077.98

POT Sta. 10+00.00

REVISIONS



**DATUM DESCRIPTION**

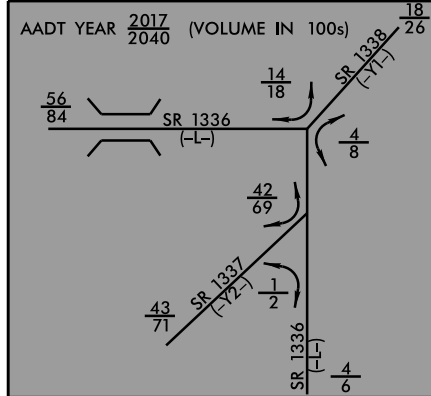
THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCGS FOR MONUMENT "B-4159 GPS-101" WITH NAD 83/95 STATE PLANE GRID COORDINATES OF NORTHING: 595248.141 (ft) EASTING: 754526.411(ft) ELEVATION: ELEV 2127.671(ft) THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.999772 THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM " " TO -L- STATION IS

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES VERTICAL DATUM USED IS NAVD 88

Description	North	East	Elevation
BCL1	596617.38	753453.65	2062.89
BCL2	596648.08	753454.07	2062.90
S1	596617.03	753465.26	2059.88
E1	596646.50	753467.94	2059.77
N1	596648.71	753441.93	2059.85
W1	596619.48	753439.36	2059.86

**-L-**  
 PI Sta 10+87.11 Δ = 19°09'54.6" (LT) D = 34'43'29.0" L = 55.9' T = 27.86' R = 165.00'  
 PI Sta 11+47.95 Δ = 23°38'58.2" (LT) D = 35'48'35.5" L = 66.04' T = 33.50' R = 150.00' e = NC (LOW SPEED)

**-Y2-**  
 PI Sta 10+88.11 Δ = 6'39'45.8" (LT) D = 57'1'44.8" L = 107.62' T = 59.69' R = 100.00' e = -0.05 (LOW SPEED)  
 PI Sta 11+88.65 Δ = 7'31'27.0" (LT) D = 7'09'43.1" L = 105.06' T = 52.60' R = 800.00' e = -0.02 (LOW SPEED)



POWER WESTERN CAROLINA UNIVERSITY FACILITIES MANAGEMENT 3476 OLD CULLOWHEE RD. CULLOWHEE, N.C. 28723 (828) 227-7226

TELEPHONE FRONTIER COMMUNICATIONS 84 ALLEN STREET SYLVIA, N.C. 28779

WATER/SEWER TUCKASEE WATER & SEWER AUTHORITY 1246 W. MAIN ST. SYLVIA, N.C. 28779 (828) 586-5189

GAS PUBLIC SERVICE CO. OF NORTH CAROLINA 2451 SCHEFFLIN RD. APEX, N.C. 27502

CATV MEDIACOM 106E MAIN ST. SYLVIA, N.C. 28779 1-800-946-5388

**-L-**  
 PI Sta 13+20.70 Δ = 12°10'28.7" (RT) D = 14°19'26.2" L = 84.99' T = 42.66' R = 400.00' V = 30 MPH e = NC (LOW SPEED)  
 PI Sta 15+43.44 Δ = 30°40'51.0" (LT) D = 17°06'11.6" L = 179.39' T = 91.90' R = 335.00' V = 30 MPH e = NC (LOW SPEED)  
 PI Sta 17+97.87 Δ = 52°58'42.5" (RT) D = 17°06'11.6" L = 309.76' T = 166.95' R = 335.00' V = 30 MPH e = NC (LOW SPEED)

**-L-**  
 PI Sta 26+84.87 Δ = 30°02'16.6" (LT) D = 22°55'05.9" L = 131.07' T = 67.08' R = 250.00' V = 30 MPH Lr = 144'  
 PI Sta 27+81.99 Δ = 34°43'05.8" (LT) D = 54°03'09.4" L = 64.23' T = 33.14' R = 106.00' V = 20 MPH e = 0.08 (EXISTING)

**-DR2-**  
 PI Sta 10+52.86 Δ = 33°30'07.2" (RT) D = 52°05'13.5" L = 64.32' T = 33.14' R = 110.00'

**-Y1-**  
 PI Sta 10+90.48 Δ = 10°20'22.6" (RT) D = 5°43'46.5" L = 180.46' T = 90.48' R = 1,000.00' V = 40 MPH e = NC (LOW SPEED)  
 PI Sta 12+21.23 Δ = 23°02'42.2" (RT) D = 28°38'52.4" L = 80.44' T = 40.77' R = 200.00' V = 25 MPH e = NC (LOW SPEED)

**HDR** HDR Engineering, Inc. of the Carolinas  
 555 Fayetteville St, Suite 900 Raleigh, N.C. 27601  
 N.C.B.E.L.S. License Number: F-0116

PROJECT REFERENCE NO. 17BP.14.R.212	SHEET NO. 3
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	

SEE SHEET NO. 2B-1 FOR ROUNDABOUT DETAIL.  
 SEE SHEET NO. 2B-2 FOR BRIDGE SKETCH.  
 SEE SHEET NO. 5 FOR -L- PROFILE.  
 SEE SHEET NO. 6 FOR -Y1- AND -Y2- PROFILES.  
 SEE SHEET NO. 6 -DRI- AND -DR2- PROFILES.

**BEGIN STATE PROJECT**  
 17BP.14.R.212  
 -L- PCC Sta. 11+14.45  
 TIE TO TIP PROJECT B-4159  
 -Y1- POC Sta. 11+20.00

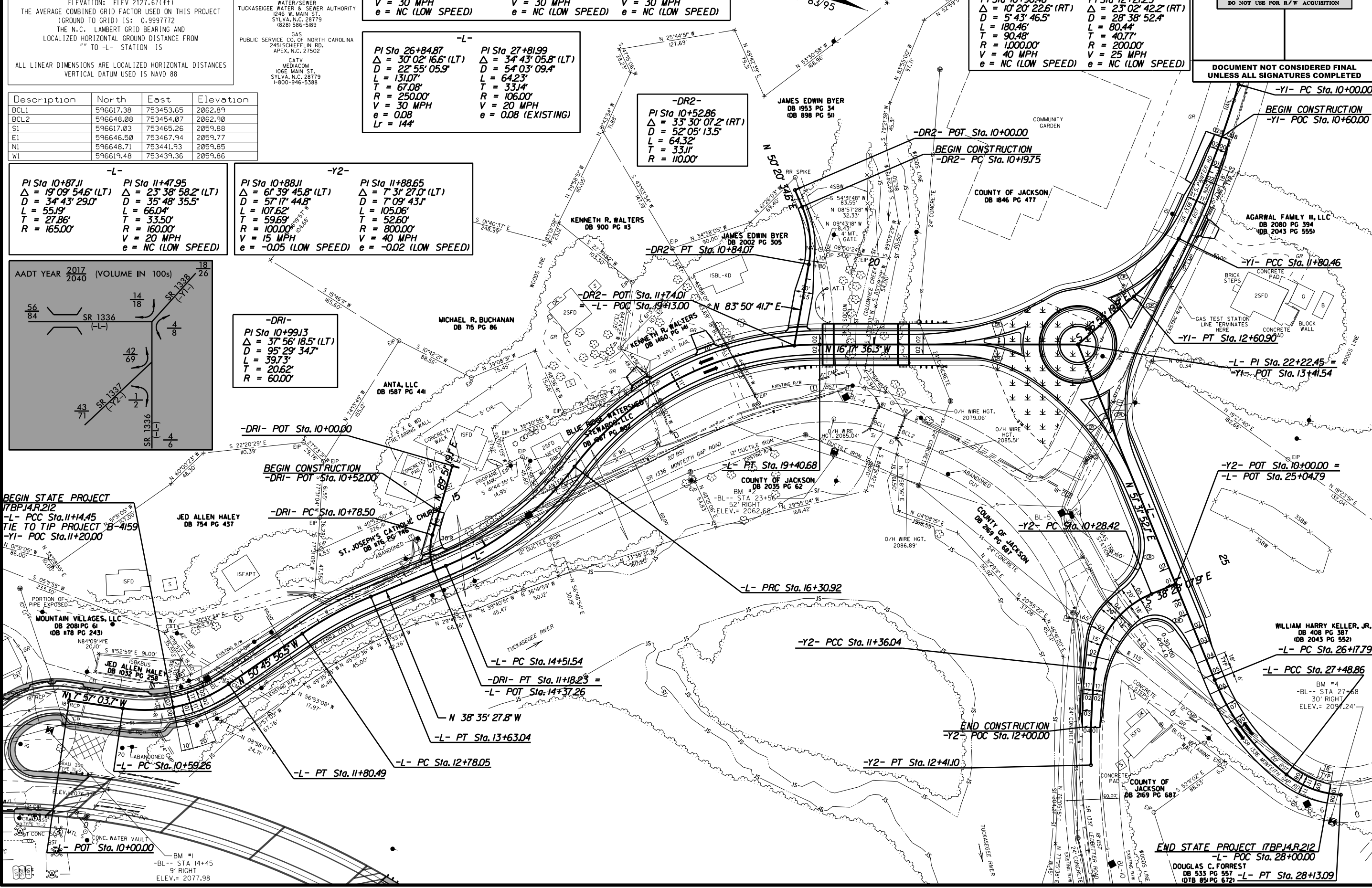
**END STATE PROJECT 17BP.14.R.212**  
 -L- POC Sta. 28+00.00  
 DOUGLAS C. FORREST  
 DB 533 PG 557 -L- PT Sta. 28+13.09  
 (DB 85 PG 672)

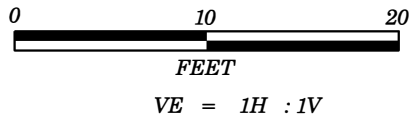
PLOT DRIVER: \$PLTDVRS\$  
 USER: \$USER\$  
 FILE: \$PWYVAULTPATHDES\$

PENTABLE: \$PENTBL\$  
 TIME: \$TIME\$

DATE: \$DATE\$

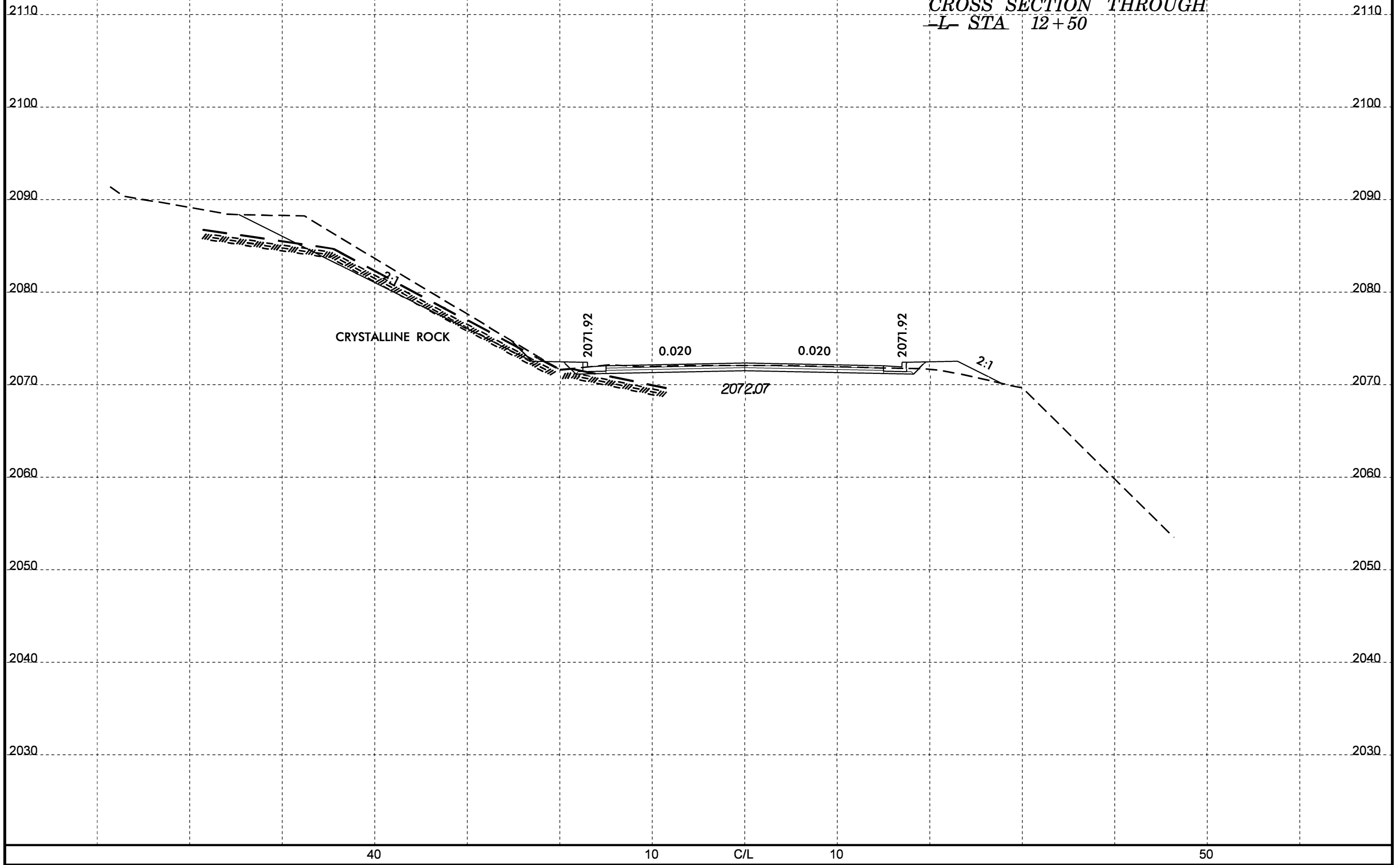
REVISIONS

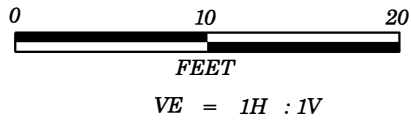




PROJECT REFERENCE NO.	SHEET NO.
17BP.14.R.212	5
SR 1336 FROM NORTH OF SR 1002 TO NORTH OF SR 1337	

SF-550079  
 CROSS SECTION THROUGH  
 -L- STA 12+50



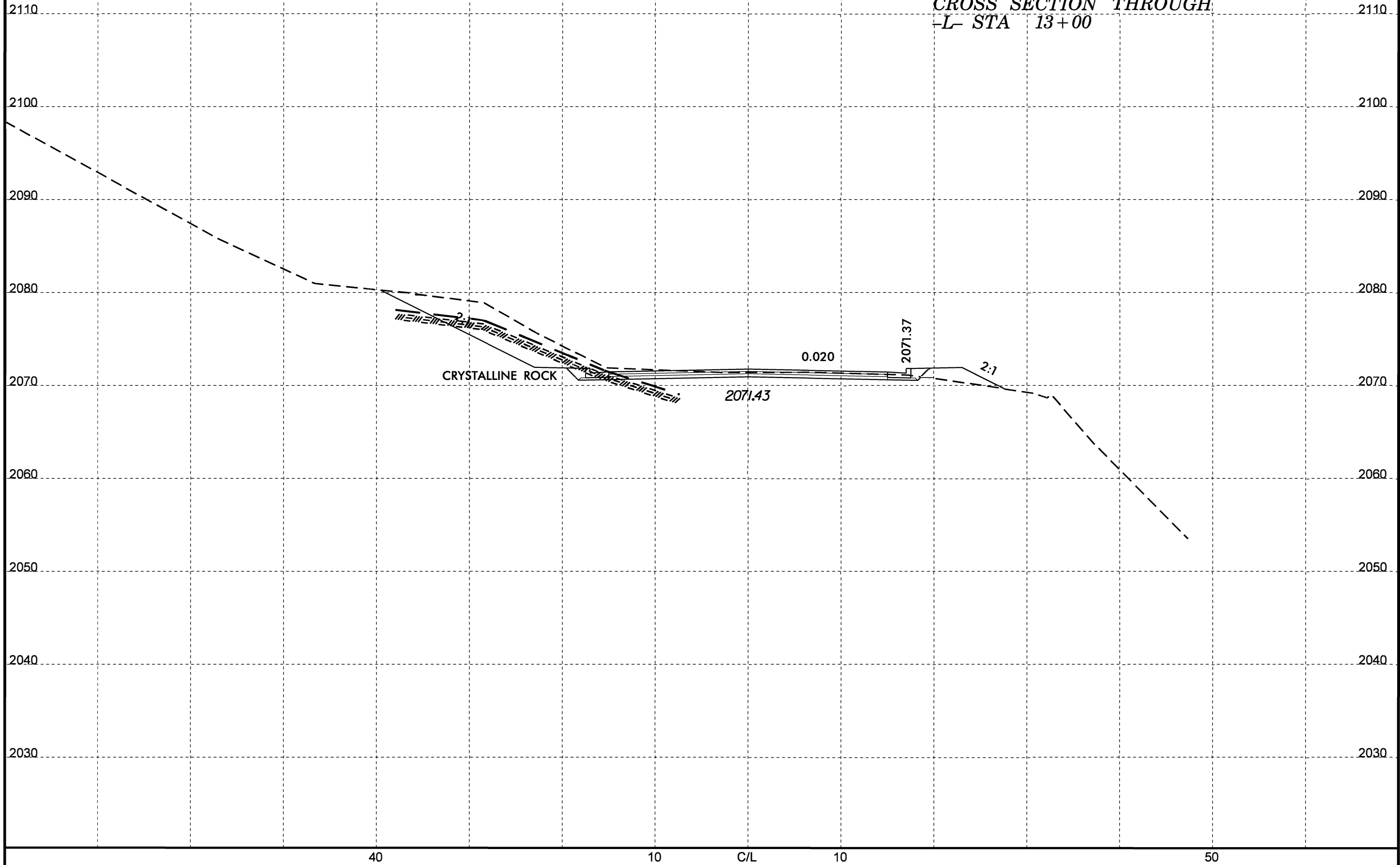


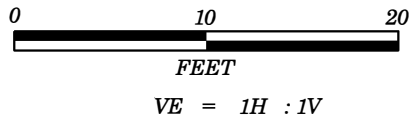
PROJECT REFERENCE NO. SHEET NO.

17BP.14.R.212 6

SR 1336 FROM NORTH OF SR 1002  
TO NORTH OF SR 1337

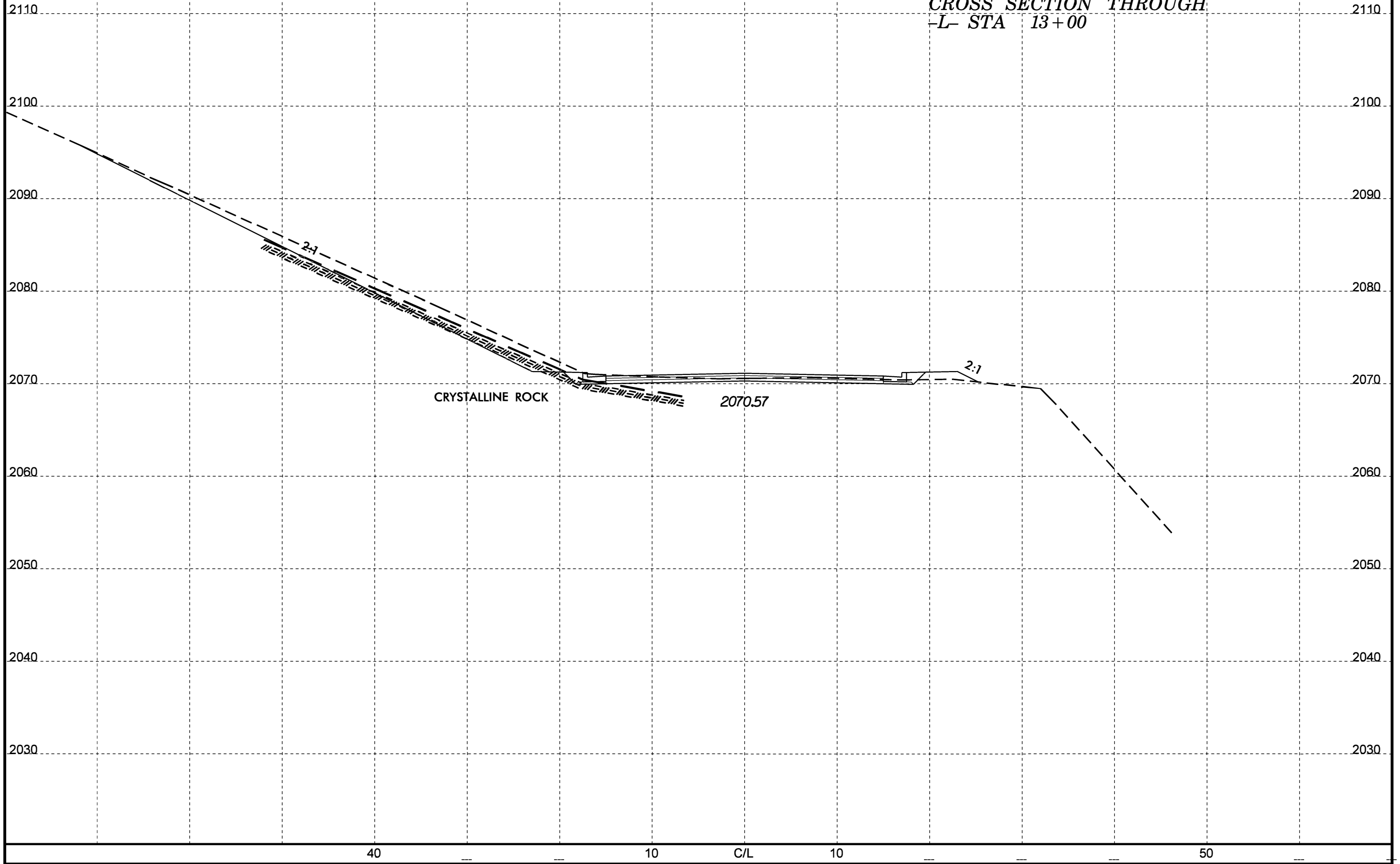
SF-550079  
CROSS SECTION THROUGH  
L- STA 13+00

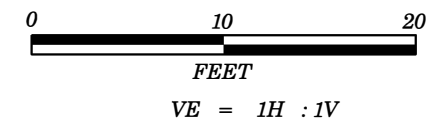




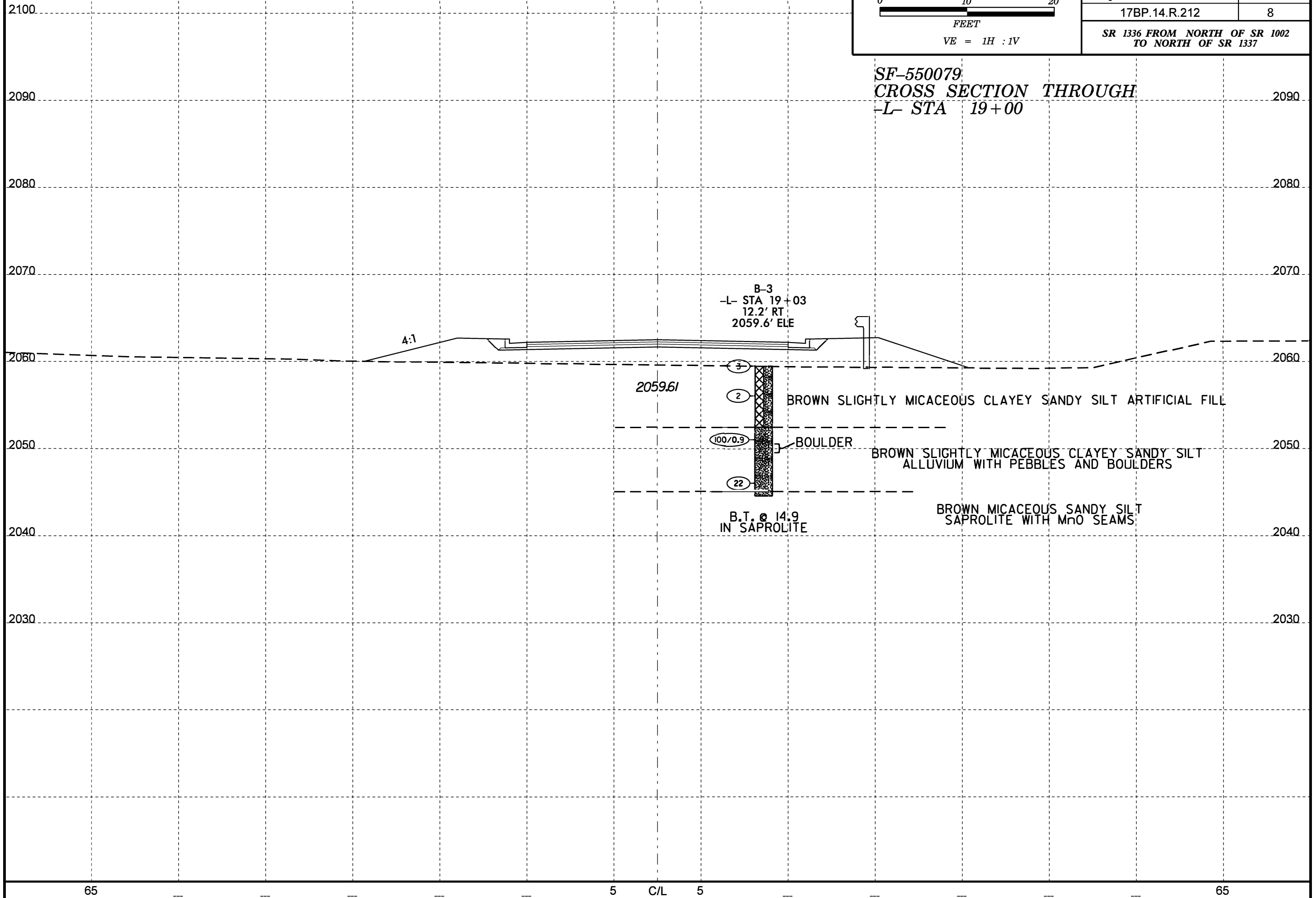
PROJECT REFERENCE NO.	SHEET NO.
17BP.14.R.212	7
SR 1336 FROM NORTH OF SR 1002 TO NORTH OF SR 1337	

SF-550079  
CROSS SECTION THROUGH  
L- STA 13+00





SF-550079  
 CROSS SECTION THROUGH  
 -L- STA 19+00



B-3  
 -L- STA 19+03  
 12.2' RT  
 2059.6' ELE

4:1

2059.61



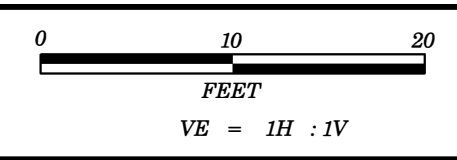
BROWN SLIGHTLY MICACEOUS CLAYEY SANDY SILT ARTIFICIAL FILL

BOULDER  
 BROWN SLIGHTLY MICACEOUS CLAYEY SANDY SILT ALLUVIUM WITH PEBBLES AND BOULDERS

B.T. @ 14.9  
 IN SAPROLITE

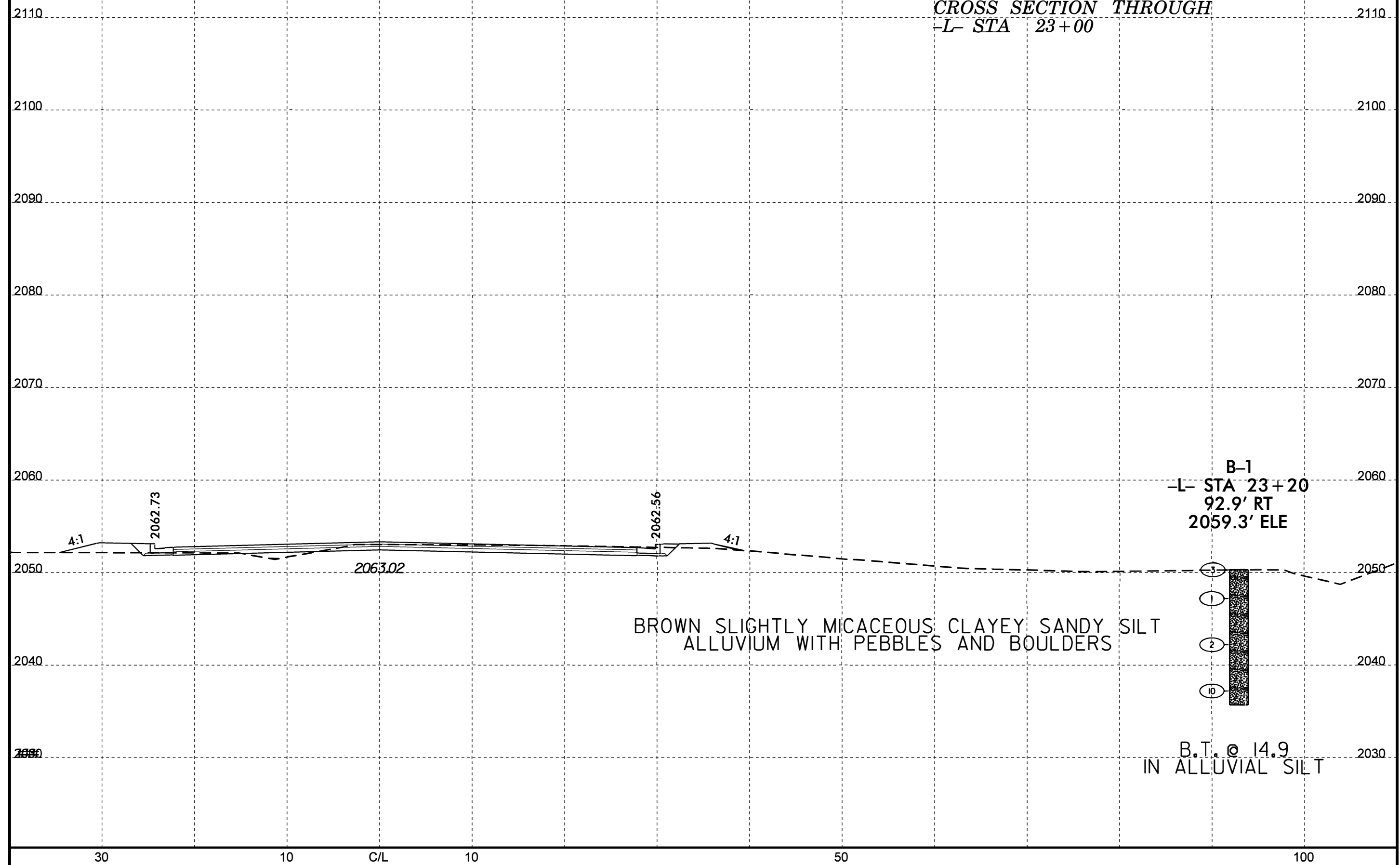
BROWN MICACEOUS SANDY SILT SAPROLITE WITH MnO SEAMS





PROJECT REFERENCE NO.	SHEET NO.
17BP.14.R.212	9
SR 1336 FROM NORTH OF SR 1002 TO NORTH OF SR 1337	

SF-550079  
 CROSS SECTION THROUGH  
 -L- STA 23+00

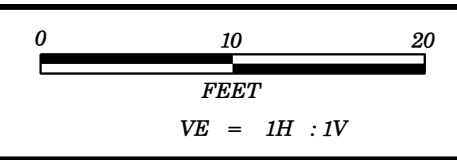


BROWN SLIGHTLY MICACEOUS CLAYEY SANDY SILT  
 ALLUVIUM WITH PEBBLES AND BOULDERS

B-1  
 -L- STA 23+20  
 92.9' RT  
 2059.3' ELE

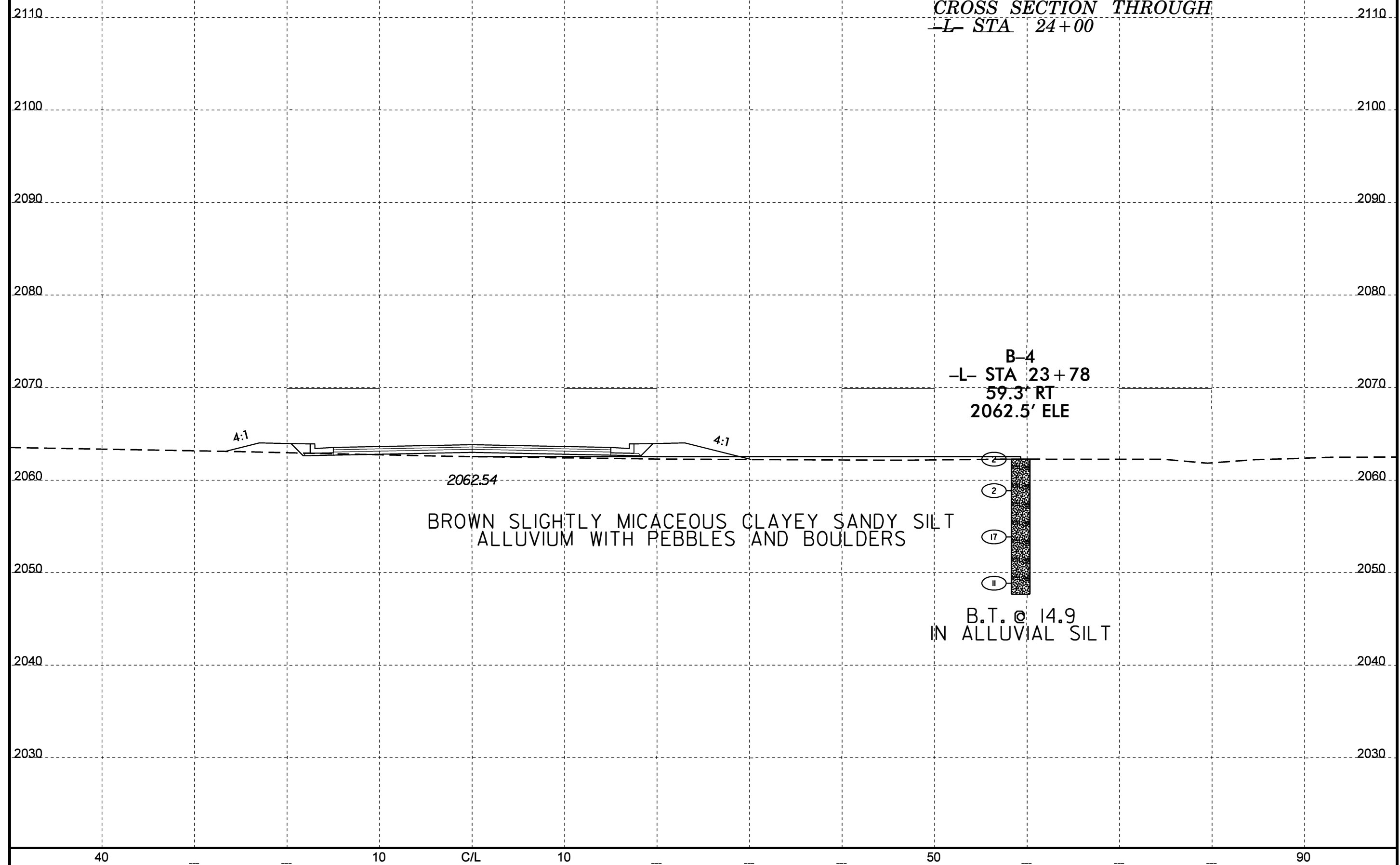
B.T. @ 14.9  
 IN ALLUVIAL SILT

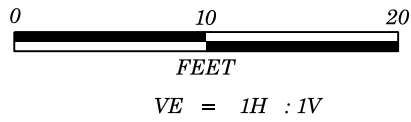
30 10 C/L 10 50 100



PROJECT REFERENCE NO.	SHEET NO.
17BP.14.R.212	10
SR 1336 FROM NORTH OF SR 1002 TO NORTH OF SR 1337	

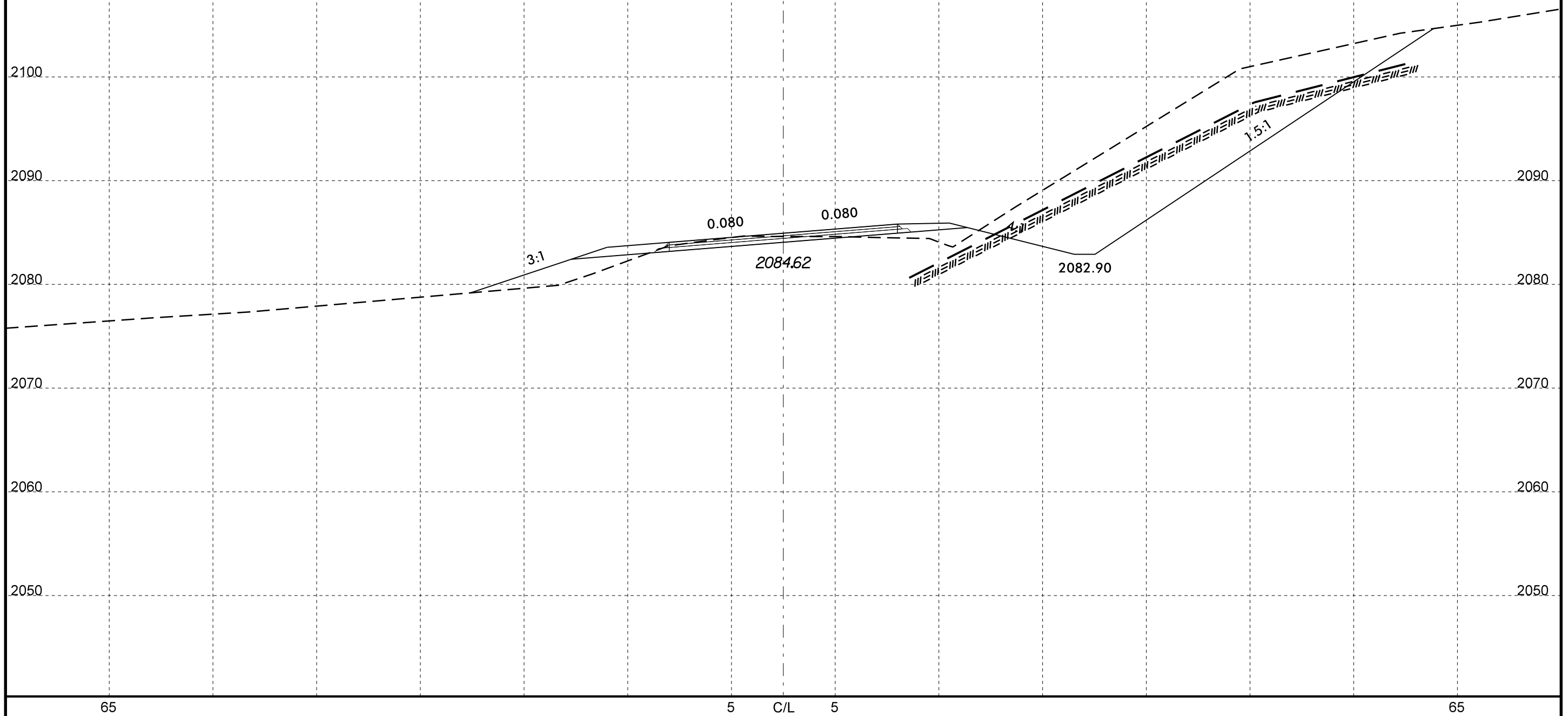
SF-550079  
 CROSS SECTION THROUGH  
 -L- STA 24+00

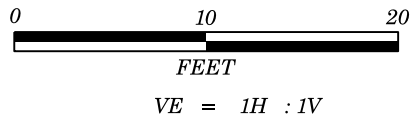




PROJECT REFERENCE NO.	SHEET NO.
17BP.14.R.212	11
SR 1336 FROM NORTH OF SR 1002 TO NORTH OF SR 1337	

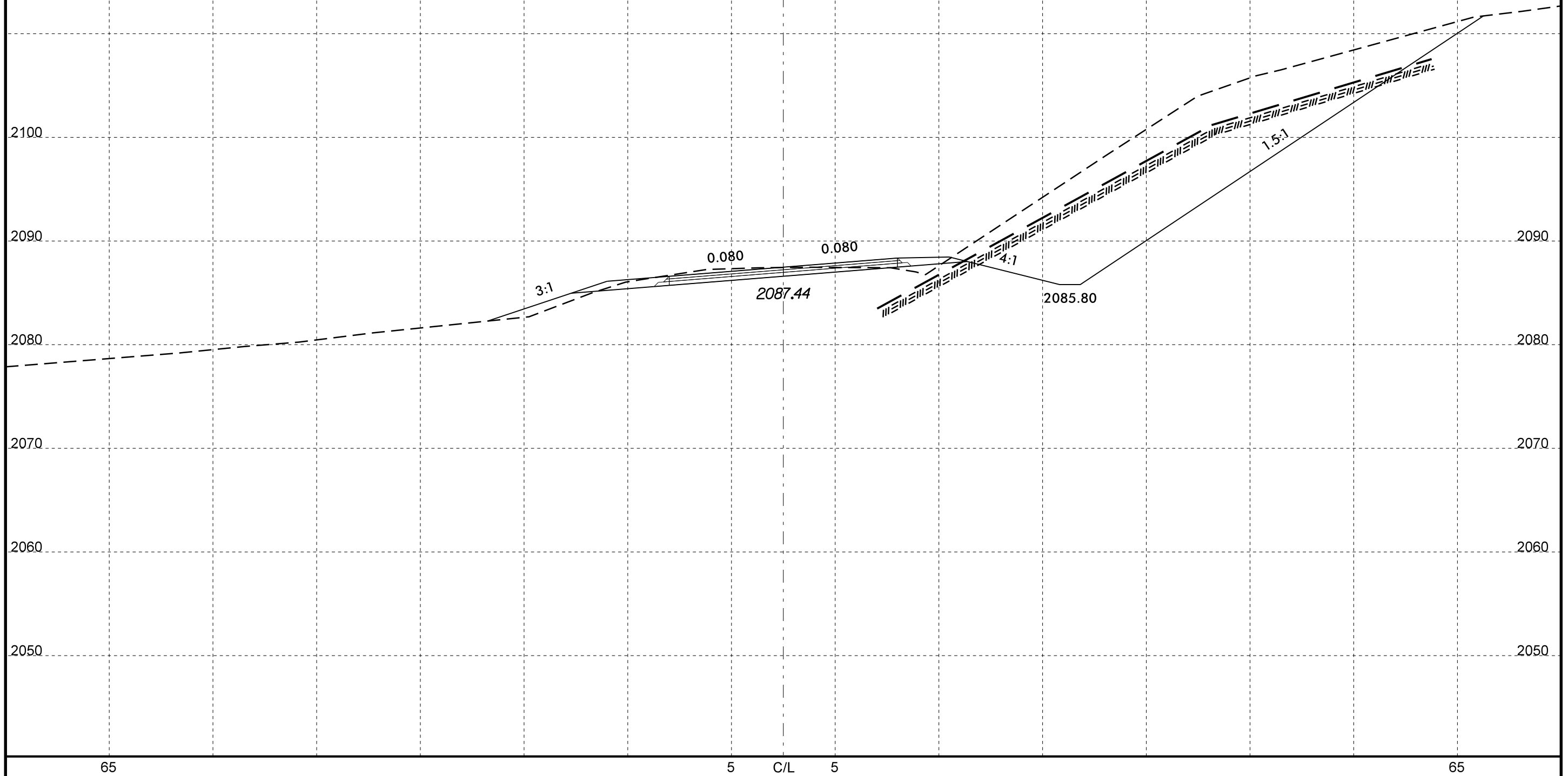
SF-550079  
CROSS SECTION THROUGH  
-L- STA 27+00

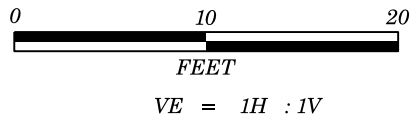




PROJECT REFERENCE NO.	SHEET NO.
17BP.14.R.212	12
SR 1336 FROM NORTH OF SR 1002 TO NORTH OF SR 1337	

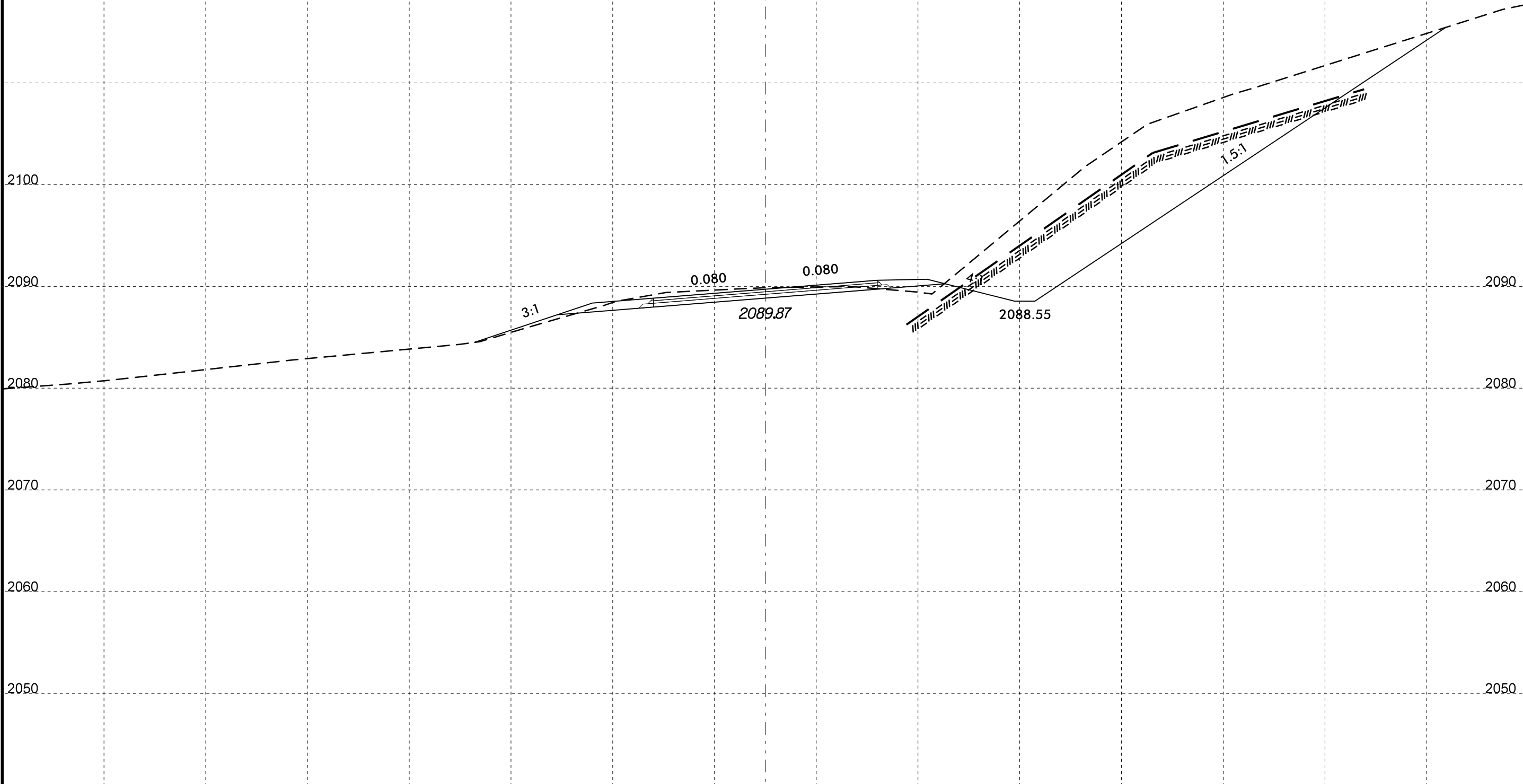
SF-550079  
CROSS SECTION THROUGH  
-L- STA 27+25





PROJECT REFERENCE NO.	SHEET NO.
17BP.14.R.212	13
SR 1336 FROM NORTH OF SR 1002 TO NORTH OF SR 1337	

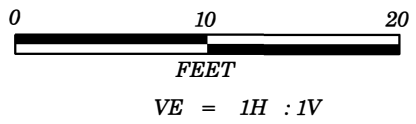
SF-550079  
 CROSS SECTION THROUGH  
 -L- STA 27+48.86



2100  
 2090  
 2080  
 2070  
 2060  
 2050

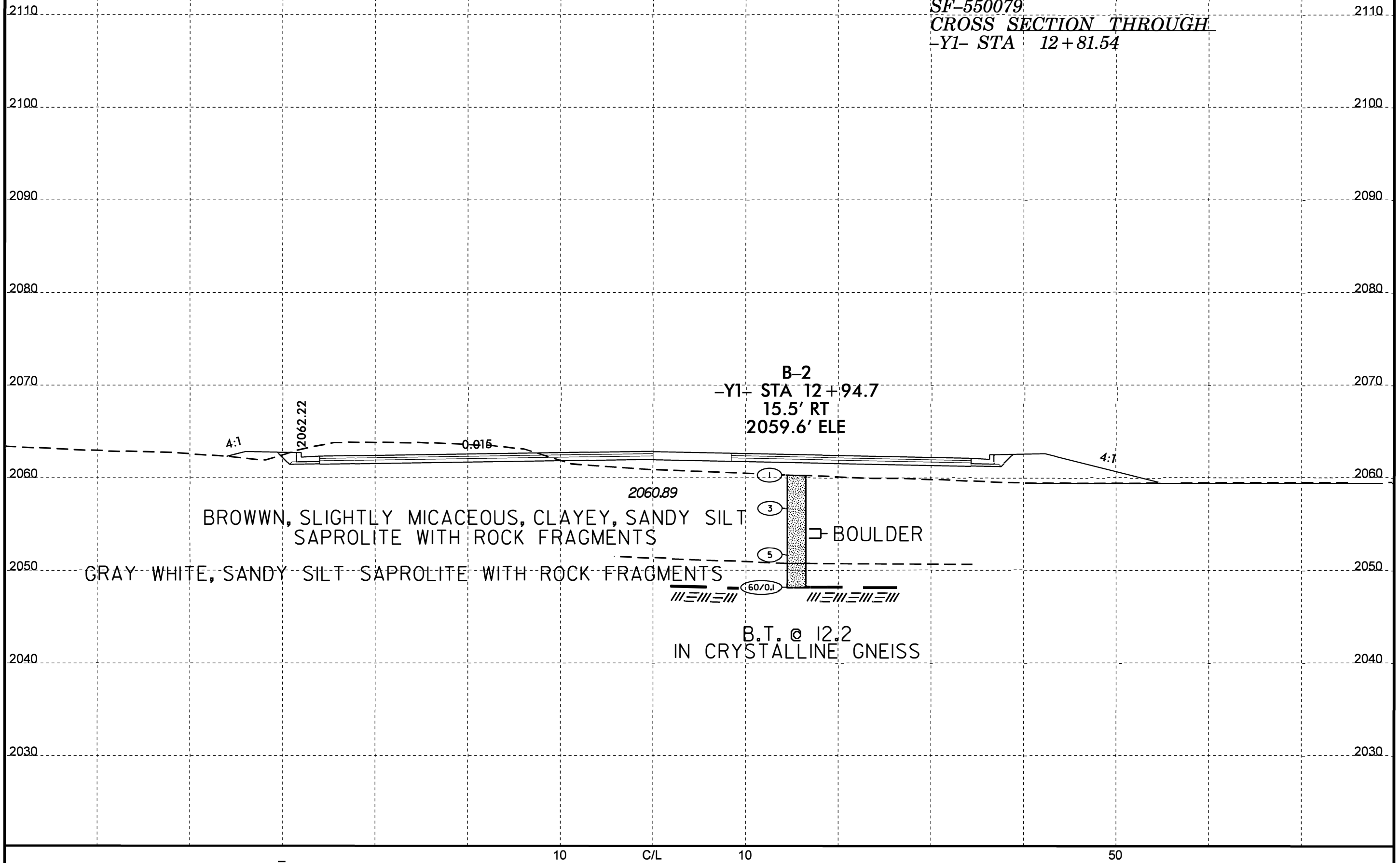
2090  
 2080  
 2070  
 2060  
 2050

65 5 C/L 5 65



PROJECT REFERENCE NO.	SHEET NO.
17BP.14.R.212	14
SR 1336 FROM NORTH OF SR 1002 TO NORTH OF SR 1337	

SF-550079  
 CROSS SECTION THROUGH  
 -Y1- STA 12+81.54



BROWN, SLIGHTLY MICACEOUS, CLAYEY, SANDY SILT  
 SAPROLITE WITH ROCK FRAGMENTS

GRAY WHITE, SANDY SILT SAPROLITE WITH ROCK FRAGMENTS

B-2  
 -Y1- STA 12+94.7  
 15.5' RT  
 2059.6' ELE

B.T. @ 12.2  
 IN CRYSTALLINE GNEISS

BOULDER

2060.89

2062.22

0.015

4:1

4:1

10

C/L

10

50

2110

2110

2100

2100

2090

2090

2080

2080

2070

2070

2060

2060

2050

2050

2040

2040

2030

2030