REFERENCE: B-5527

PROJECT: 55027

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5527	1	88

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *SURRY*

PROJECT DESCRIPTION *BRIDGES 122 AND 126 OVER TOMS CREEK ON US 52 NB AND SB*

INVENTORY

CONTENTS

CAUTION NOTICE

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

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

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

NOTES:

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

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DATE *MAY, 2022*

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SIGNATURE 06/13/2022 DATE

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PROJECT REFERENCE NO.	SHEET NO.
B-5527	2

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 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		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	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	 50 MX 25 MX	 51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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	UNSUITABLE

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE							
MM	305	75	2.0	0.25	0.05	0.005
IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

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

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.

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.

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

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

GROUND WATER

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

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
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST
BT - BORING TERMINATED	MICA. - MICACEOUS	WEA. - WEATHERED
CL. - CLAY	MOD. - MODERATELY	γ - UNIT WEIGHT
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	γ_d - DRY UNIT WEIGHT
CSE. - COARSE	ORG. - ORGANIC	
DMT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	SAMPLE ABBREVIATIONS
DPT - DYNAMIC PENETRATION TEST	SAP. - SAPROLITIC	S - BULK
e - VOID RATIO	SD. - SAND, SANDY	SS - SPLIT SPOON
F - FINE	SL. - SILT, SILTY	ST - SHELBY TUBE
FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RS - ROCK
FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	RT - RECOMPACTED TRIAXIAL
FRAGS. - FRAGMENTS	w - MOISTURE CONTENT	CBR - CALIFORNIA BEARING RATIO
HI. - HIGHLY	V - VERY	

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [X] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] ________
- [ ] ________

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 3.25" HOLLOW STEM AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE ______" STEEL TEETH
- [ ] TRICONE ______" TUNG.-CARB.
- [X] CORE BIT
- [ ] ________

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B ______
- [ ] -H ______
- [X] -N Q2

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [X] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] ________

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)	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 YEILD 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.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
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.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V 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.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

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

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

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

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 DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (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.

BENCH MARK: N/A
ELEVATIONS OBTAINED USING THE .TIN FILE (B5527_Ls_tin.tin)
ELEVATION: FEET

NOTES:
FIAD = Filled Immediately After Drilling
RSR = Rod Sounding Refusal
MnO = Manganese Oxide

DATE: 8-15-14

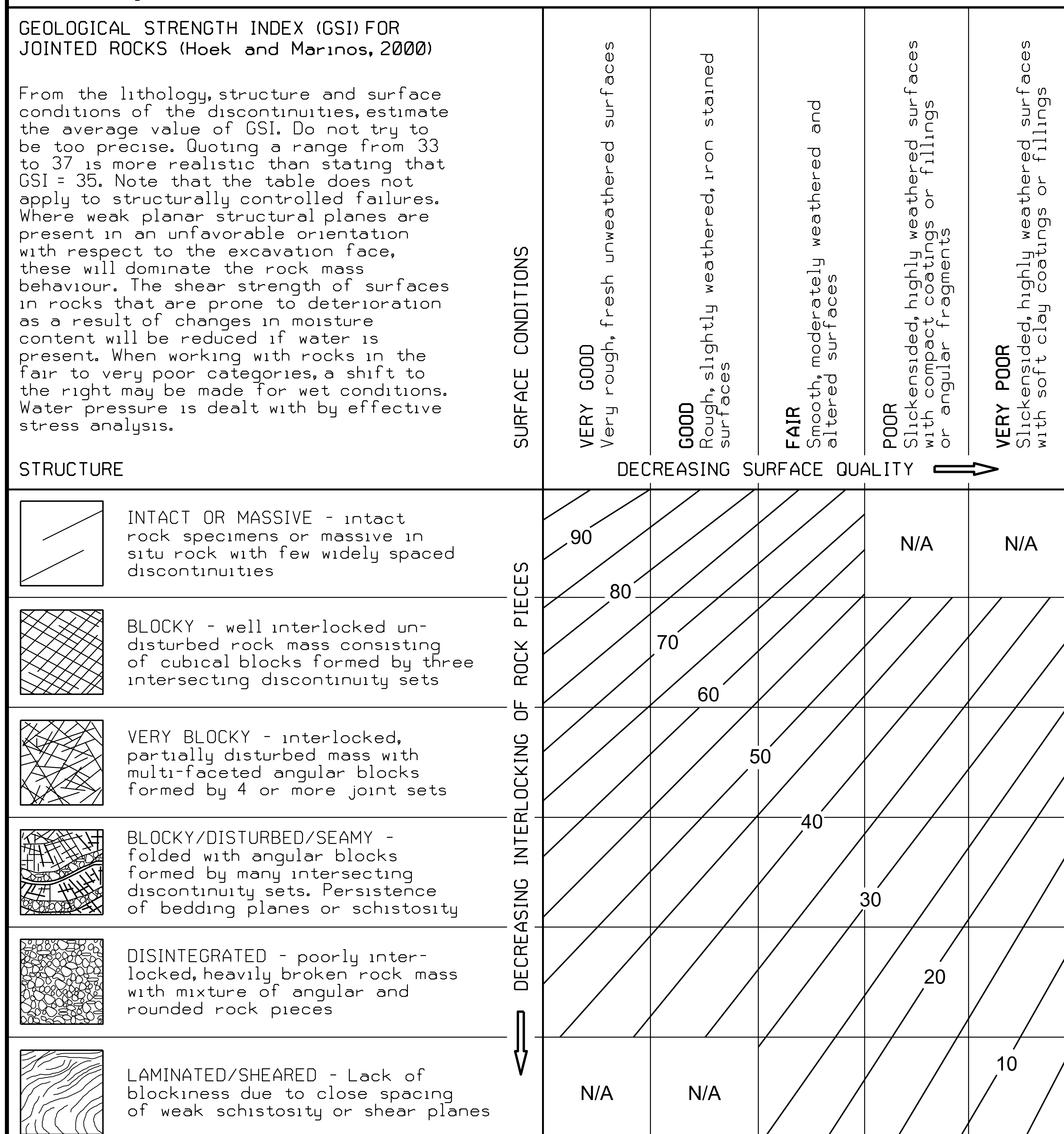
PROJECT REFERENCE NO.	SHEET NO.
B-5527	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

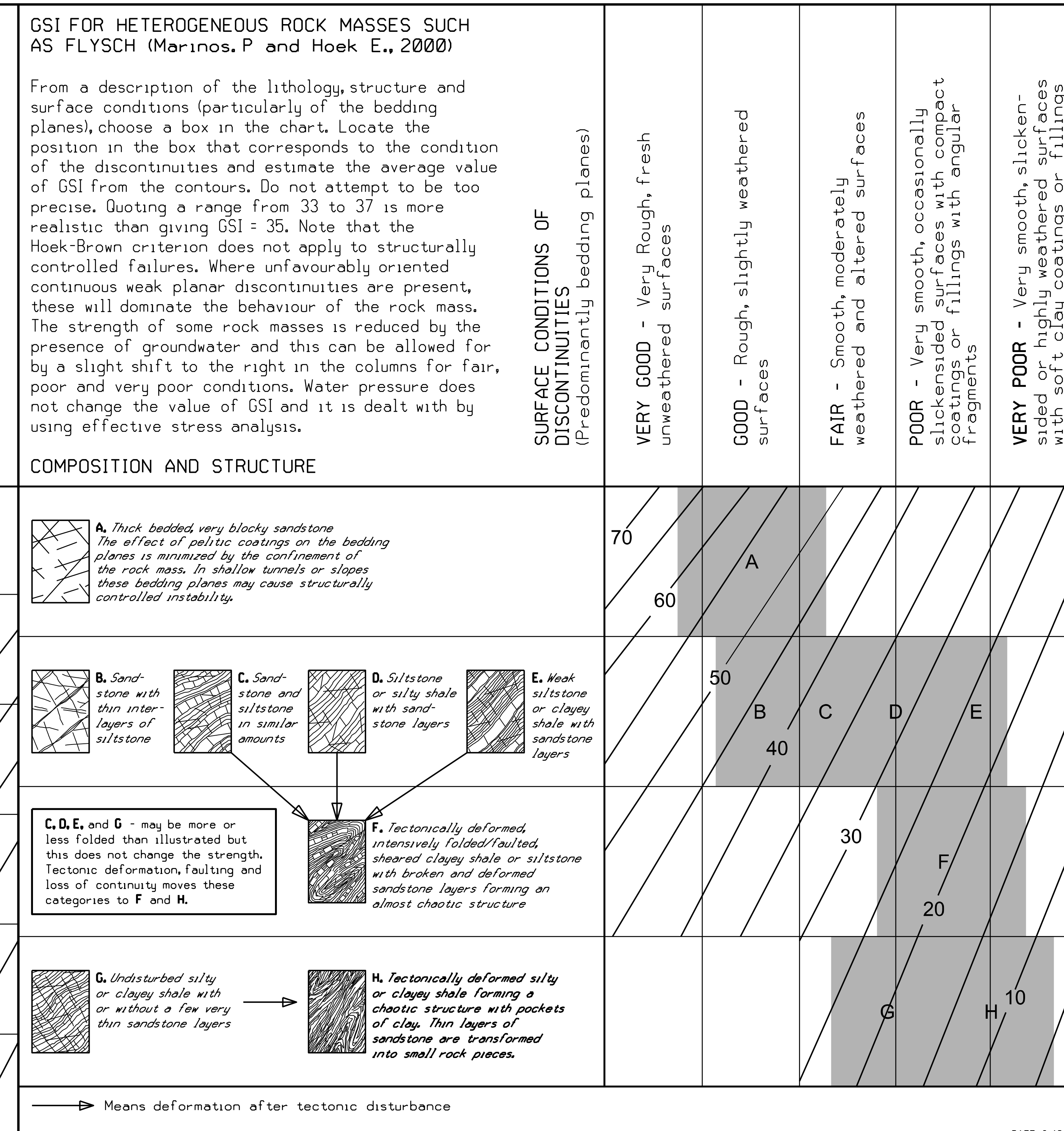
SUBSURFACE INVESTIGATION

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

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



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



DATE: 8-19-16

TIP PROJECT: B-5527

CONTRACT:

26-APR-2022 22:41
C:\Users\brett.smith\OneDrive - Summit Design and Engineering Services\Desktop\B5527_GEO_RDWY_DRAFT\CADD_GEOTECH\PlanProf\B5527_GEO_Inv_03.dgn
$$$$USERNAME$$$$

09/08/99

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5527	3	88
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
55027.1.FS1	BRSTP-0052(49)	PE	

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols

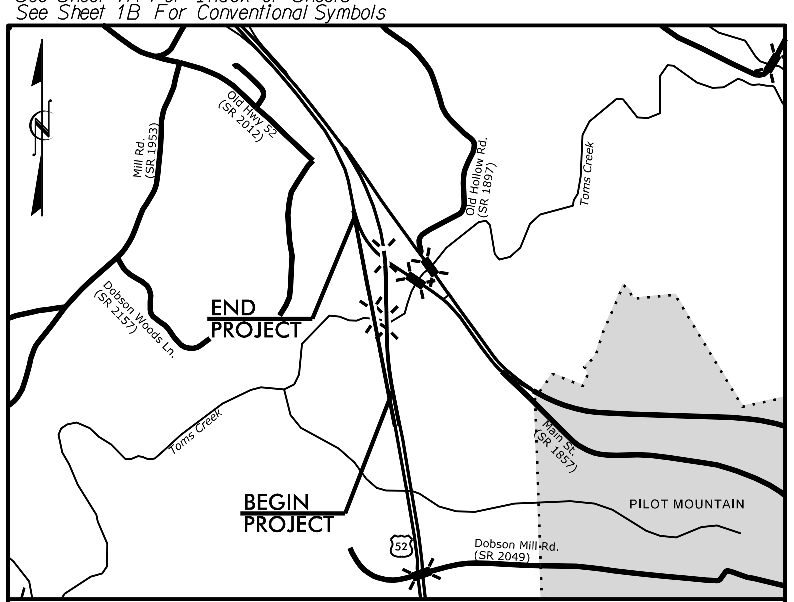
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

SURRY COUNTY

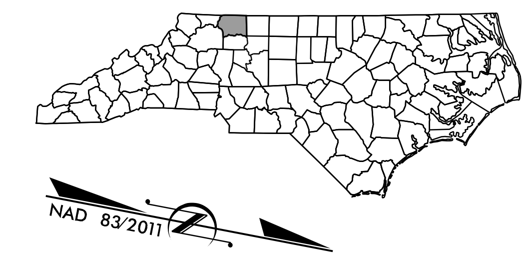
LOCATION: BRIDGES 122 AND 126 OVER TOMS CREEK ON US 52 NB AND SB

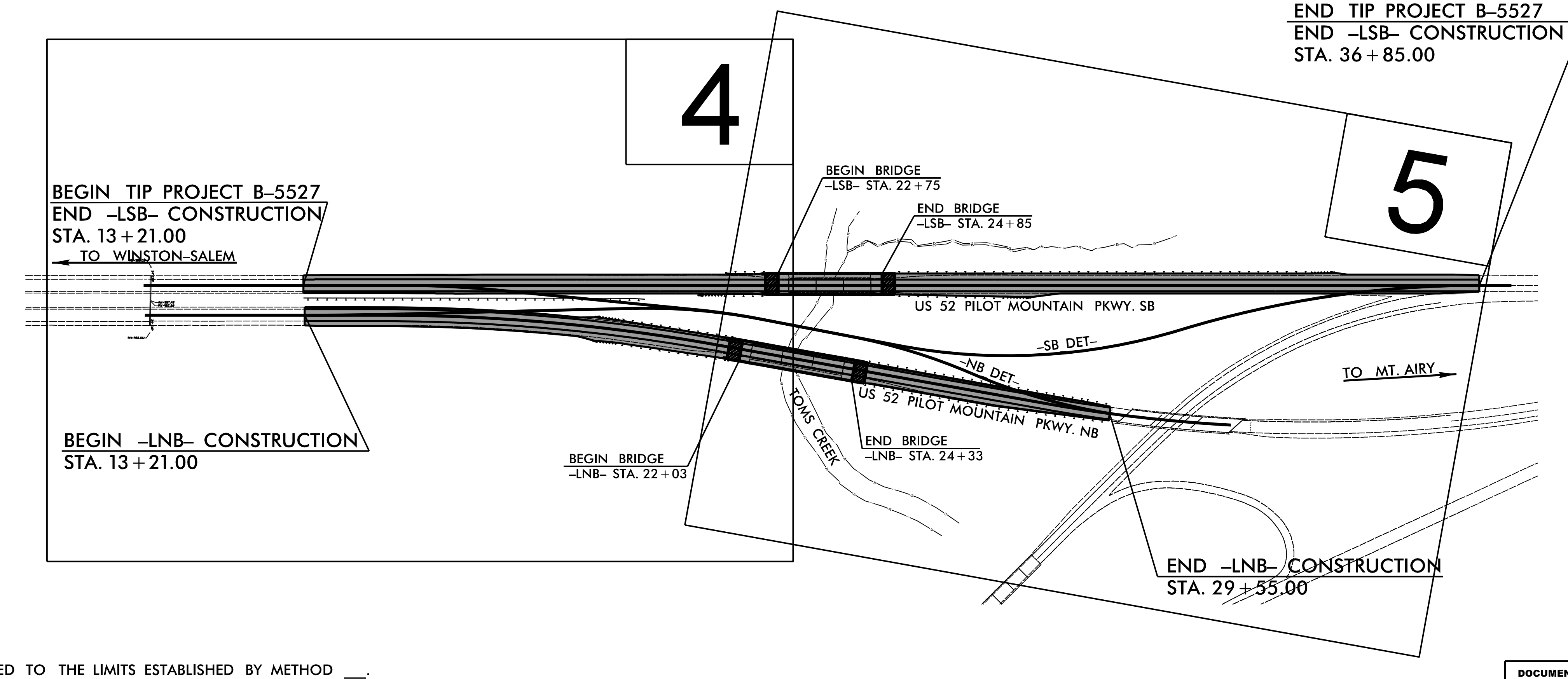
TYPE OF WORK: GRADING, DRAINAGE, PAVING, & STRUCTURES

REDLINE DRAINAGE PLANS
12 /22 /2021



VICINITY MAP (NTS)





NOTES:
1. CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD ___.
2. THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.
3. THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2020 = 30,670
ADT 2045 = 39,000
K = 9 %
D = 50 %
T = 19 % *
V = 70 MPH
* TTST =13% DUAL=6%
TIER = STATEWIDE
FUNC CLASS = INTERSTATE

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-5527 = 0.408 MI.
LENGTH STRUCTURE TIP PROJECT B-5527 = 0.040 MI.
TOTAL LENGTH TIP PROJECT B-5527 = 0.448 MI.

NOTE: -LSB- ALIGNMENT USED TO DETERMINE LENGTH OF PROJECT.

AMT

Prepared for the North Carolina Department of Transportation in the Office of:
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(919) 855-9989 • NC LICENSE NO. F-1049
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2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
APRIL 15, 2022

LETTING DATE:
MARCH 21, 2023

DAVID A. SHINBARA, PE
PROJECT ENGINEER

JOCELYN ADORNO, EI
PROJECT DESIGN ENGINEER

DAVID STUTTS, PE
NCDOT CONTACT

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

SUMMIT
DESIGN AND ENGINEERING SERVICES

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April 28, 2022

WBS Number: 55027.1.FS1
TIP Number: B-5527
Project ID: 38979
County: Surry
Description: Bridges 122 and 126 over Toms Creek on US 52 NB and SB

SUBJECT: Geotechnical Report - Roadway Subsurface Inventory

Project Description

The proposed 0.448 mile-long project is located northwest of the town of Pilot Mountain in Surry County. The core of the project involves the replacement of two (2) three-span bridges crossing over Toms Creek that are located on US 52 northbound and southbound. The bridges will be replaced in place, which will require two stages of construction in order to maintain traffic flow. The northbound bridge will be replaced first. Once completed and opened to traffic, the replacement of the southbound bridge will begin. Northbound and southbound detour roadways and a detour bridge over Toms Creek will be constructed to accommodate traffic during each phase of the project.

The northbound detour route and bridge will be constructed in the first phase of the project prior to the replacement of the northbound bridge. The northbound detour route will accommodate northbound traffic on US 52 while the northbound bridge is being replaced. The southbound detour route will be constructed during the second phase of construction and will accommodate southbound US 52 traffic during the southbound bridge replacement. The southbound detour route will share the detour bridge and associated approach fills that were constructed during the first phase of the project. Lastly, minor roadway widening and grade changes will be required for both the northbound and southbound lanes of US 52 in order to accommodate the width and height of the replacement bridges.

The proposed permanent earthworks, or earthworks directly associated with US 52, are mostly minor throughout much of the project corridor. Mostly consisting of sliver fills that are associated with the widening of the northbound and southbound lanes of US 52. The largest areas of proposed embankment fill are associated with grade changes for the bridge approach fills that will be constructed for the replacement structures. These proposed embankments exceed ten feet in height in these areas. A few small areas of cut are also proposed, mostly associated with ditches and their associated slopes. The proposed cuts generally do not exceed ten feet in depth.

The temporary earthworks, or earthworks associated with the detour alignments, are more significant, especially with respect to the proposed embankment fills. The detour bridge approach fill on the north side of Toms Creek exceeds twenty-five feet in height in some areas. Some minor cuts are also proposed with the detour alignments, mainly associated with grade changes proposed for the southbound detour route. The proposed cuts generally do not exceed ten feet in depth. It is unknown whether the earthworks for the detour alignments will remain in place after the project is finished and the temporary bridge is dismantled. Either way, the detour routes will be closed to traffic once both bridges have been opened to the traveling public.

The geotechnical investigation for B-5527 was primarily conducted from February 21st, 2022, to March 4th, 2022. Some additional field work utilizing hand tools (rod soundings) was conducted on April 6th, 2022. Twenty-eight (28) borings were advanced using a CME-550X drill rig equipped with an automatic hammer. Standard Penetration Tests (SPT) were performed at these locations to provide subsurface information for roadway foundation, slope design/construction, and preliminary bridge foundations.

Drill tooling was typically advanced using 3.25-inch hollow-stem augers. Due to the presence of shallow Crystalline Rock, four (4) of the twenty-eight total drilled borings were cored to confirm in situ bedrock. NQ2 Wireline coring equipment was utilized, mostly through the hollow stem augers, but in some cases, NW casing was used. The coring work was added to the original scope of work and done at a later time after discussions with NCDOT personnel. Select existing borings were cleaned out and then cored, beginning the coring runs where the borings had previously been terminated on or in Crystalline Rock. Due to some design changes that involved a newly proposed cut where shallow Crystalline Rock had previously been encountered during the investigation, five (5) rod soundings were also added to the original scope of work in order to try to get a handle on potential rock lines within the newly proposed cut.

All borings were advanced by North Carolina Licensed Drillers (Certified Well Contractors - CWC). All borings were logged by a North Carolina Licensed Geologist (LG/PG), Geologist in Training (GIT), Engineer Intern (EI), or other professional geotechnical field staff deemed qualified by NCDOT. To further supplement subsurface information, outcrop mapping was performed by a North Carolina Licensed Geologist throughout the project corridor.

Except for borings drilled within the roadway and in other high traffic areas, all borings were left open for a minimum of twenty-four (24) hours to collect groundwater data. In some instances, the 0-hour measurements were used in lieu of the 24-hour measurements due to boring cave-in issues and recent heavy rain events. Representative soil samples were collected, and twenty (20) were submitted to Summit's soils laboratory for classification and moisture content testing. Due to a miscommunication in the laboratory, no natural moisture content testing was conducted. Due to the lack of significant cut sections on the project, no bulk samples were collected for California Bearing Ratio (CBR) testing. Based on the subsurface conditions encountered within the project corridor, no undisturbed samples were deemed necessary to obtain or submit to the laboratory.

All investigations and reporting were performed in accordance with the NCDOT Geotechnical Engineering Unit's 2021 "Geotechnical Investigation and Recommendations Manual." It should be noted that the foundation investigation, subsurface inventory reporting, and foundation design for the northbound and southbound bridges over Toms Creek will be done at a later time and turned in under separate covers.

The following alignments were investigated for this project:

Alignment	Station(±)
-LNB-	13+21.00 – 29+55.00
-LSB-	13+21.00 – 36+85.00
-NB_DET-	10+00.00 – 26+47.18
-SB_DET-	10+00.00 – 31+92.46

Physiography, Geography, and Geology

The project area is located in the far northwestern corner of the Piedmont Physiographic Province. The topography within this province is best characterized as gently rolling, well-rounded hills and long low ridges with a few hundred feet of elevation difference between the hills and valleys. The project area is located within the foothills of the Blue Ridge Mountains, which can be seen in the distance from certain locations. Pilot Mountain, a quartzite monadnock and a remnant of the ancient Sauratown Mountains, is also nearby the project area.

The topography within the project corridor is generally flat to gently rolling, with the exception of the banks leading down to Toms Creek, which are quite steep, especially on the south side. A topographic high of approximately 990 feet above sea level occurs near the very end of the project corridor. A secondary topographic high of approximately 983 feet above sea level occurs near the very beginning of the project corridor. In between these two points, the project gradually descends in elevation in both directions to the topographic low of approximately 920 feet, which occurs at the bottom of the channel of Toms Creek.

The project area is located within the Yadkin-Peedee River Basin. Toms Creek bisects the project corridor and flows to the west-southwest, where it eventually merges with the Ararat River. The Ararat River eventually merges with the Yadkin River, which ultimately flows into High Rock Lake and Badin Lake. Surface drainage within the project corridor would mostly be expected to follow the u-shaped terrain and flow from the high points at each end of the project into the low floodplain of Toms Creek.

The project area is located along the northern edge of the Sauratown Mountains Anticlinorium, in close proximity to the Tugaloo Terrane. A Geological Terrane is a fault-bounded fragment of Earth's crust that shares a common geologic history distinguishing it from surrounding terranes or areas. The Sauratown Mountain Anticlinorium is composed of rocks similar in age and origin to the Western Blue Ridge. The rocks include a complex mixture of metamorphic rock that has repeatedly been squeezed, fractured, faulted, and folded. The Tugaloo Terrane is composed of metamorphosed sedimentary and volcanic rocks deposited on rifted continental and newly created oceanic crust off the coast of the ancient North American continent from about 480 to 570 million years ago. It is intensely deformed and metamorphosed.

The project corridor is primarily underlain by a Middle Proterozoic-aged (1.0 - 1.6 billion-year-old) Granitic Gneiss. This unit is megacrystic in places and contains amphibolite. The project corridor may also be underlain by a Late Proterozoic-Cambrian (520 – 750 million year old) Biotite Gneiss interlayered with Muscovite-Biotite Schist. This unit may also contain minor areas of Marble and Granitic Rock. Based on the best available geologic mapping data, the contact between these two primary geologic units may occur somewhere between Toms Creek and the beginning of the project corridor. Quaternary-aged alluvium is also present within the project corridor in the flat-lying floodplain areas of Toms Creek.

Soil Properties

During the geotechnical investigation, Residual/Saprolite, Alluvial, Roadway Embankment, and Artificial Fill soils were encountered within the project corridor. The following sections break down the unique properties, characteristics, prevalence, and potential challenges associated with each of the soil origins encountered within the project corridor. This section also presents a summary of the laboratory data associated with each of the soil origins.

Residual/Saprolite

Residual soils, soils derived from the weathering of rock, are one of two dominant soil origins found within the project corridor. In general, the Residual soils underlying the project follow the typical weathering profile observed throughout the piedmont and mountains. The clays, when present, are usually found closer to the ground surface. The silts and sands are typically found deeper and closer to the parent rock source. However, much like the parent rocks they weather from, Residual soils can vary significantly in some areas in both composition and vertical/horizontal distribution. The compositional boundaries (also known as contacts) within or between Residual soils are shown in the graphical section of this report as dashed lines. However, in reality, these contacts are much more likely gradational, which means that the compositional changes between clay, silt, and sand occur gradually and over some vertical/horizontal distance.

Saprolite is a type of Residual soil that retains the relic structure or fabric of the parent rock source. In areas where the relic structure or fabric of the parent rock was evident, Residual soils were classified in this report as Saprolite. Summit felt it was prudent to break out the areas of Saprolite within the project corridor as they can often be assigned a different set of engineering parameters than standard Residual soils. The relic structure or rock fabric present within Saprolites can positively influence factors such as the shear strength of the soil. However, it should also be noted that Saprolites can also retain relic discontinuities or joints that may have been present in the parent bedrock. These discontinuities can negatively influence factors such as the shear strength of the soil.

Gravel-sized fragments of Weathered and Crystalline Rock were encountered within the Residual soils present within the project corridor. Mostly in trace amounts, but higher amounts were observed in some areas, especially within the Saprolite. These rock fragments represent seams, lenses, ledges, or float material that remain consolidated within the surrounding unconsolidated Residual and Saprolitic soils. This occurs primarily thanks to complex differential weathering processes. It should be noted that these fragments often appear gravel-sized during the geotechnical investigation due to drilling and sampling procedures. In reality, these seams, lenses, or ledges may be up to a few feet thick, and some float materials may be cobble or boulder-sized.

The Residual soils present within the project corridor are predominantly composed of sands and silts. The majority of the samples were field classified, and laboratory testing was only conducted on a very limited basis as these types of soils are typically not considered problematic during construction and are easier to field classify during the investigation. Laboratory testing was conducted on zero (0) samples of the Residual silts and one (1) sample of the Residual sands. Analysis of the results showed it was AASHTO classified as a silty sand (A-2-4) with a Liquid Limit of 19 and a Plasticity Index (PI) value of 2. Sieve analysis of the Residual sand sample showed the percentage passing the #200 sieve (silt-clay material) at 34%.

SPT results within the Residual silts showed soil densities that typically ranged from soft to stiff. SPT results within the Residual sands showed soil densities that typically ranged from loose to dense, with some very dense areas. Very soft or very loose areas typically corresponded with areas of higher moisture content. Hard or very dense areas were usually found close to the Weathered Rock or Crystalline Rock interface. While no laboratory moisture content testing was performed, the field moisture descriptions of the Residual sands and silts typically ranged from dry to moist, with very few wet areas reported.

Residual clays are much less prevalent within the project corridor than the sands and silts and were rarely encountered during the geotechnical investigation. Laboratory testing was conducted on only one (1) sample of the Residual clays. Analysis of the results showed it was AASHTO classified as a sandy clay (A-6) with a Liquid Limit of 35 and a Plasticity Index (PI) value of 13. Sieve analysis of the Residual clay sample showed the percentage passing the #200 sieve (silt-clay material) at 54%. Natural moisture content testing was not performed, but field moisture descriptions suggest the Residual clays encountered were mostly moist. SPT results within the

Residual clays showed soil densities were typically medium stiff. Due mostly to their high sand content, the Residual clays are primarily slightly to moderately plastic.

Residual soils can present problems during construction, primarily when highly plastic soils (Plasticity Index value of 26 or more) are encountered. Highly plastic Residual soils can negatively affect embankment stability, embankment settlement, and subgrade stability. They also may not be suitable for use as embankment, subgrade, or backfill material on the project. In addition, Manganese Oxide (MnO) is commonly present in deeply weathered Residual soils located within the piedmont and mountains. Manganese Oxide will generate nearly frictionless surfaces of indeterminate orientation throughout the Residual soil profile, which can lead to slope stability issues.

Residual soils will be impacted during the roadway construction, primarily as a subgrade material, embankment foundation material, and in a few of the cut sections. From looking at the field and lab data, some general assumptions can be made about these soils. The Residual soils throughout the project corridor should generally be suitable as a subgrade material, embankment foundation material, and acceptable for use as embankment fill or other types of borrow material. While not encountered during the geotechnical investigation, small areas of highly plastic Residual soils may still be encountered during construction and will need to be dealt with appropriately.

Residual soils that are wetter than optimum can also present challenges during roadway construction. While no natural moisture content testing was conducted, field observations suggest that Residual soils wetter than optimum will not be a significant issue during construction. However, again, small areas may still be encountered during construction and will need to be dealt with appropriately. Manganese Oxide was observed within the split spoon sampler during SPT testing; however, only in little to trace amounts. No significant quantities of Manganese Oxide were observed during the geotechnical investigation, and this is not expected to impact slope stability on the project.

Roadway Embankment

Roadway Embankment soils from the construction of US 52 are the second dominant soil origin and are present throughout the project corridor. Roadway Embankment soils are often quite similar to the local soils from which they are typically sourced. However, they often have a "reworked" appearance, with a large variation in grain size. They can contain little to trace amounts of organic material, gravel, cobbles, boulders and/or other types of debris. If properly constructed, Roadway Embankment soils typically do not present significant issues during future construction projects.

However, some older Roadway Embankment fills across the state can be poorly compacted, contain highly plastic clays, perched water, and even miscellaneous debris such as tree trunks. In areas where the construction of the existing roadway required rock excavation or blasting, the Roadway Embankment is often laden with significant quantities of gravel, cobbles, and boulders that were removed from cut areas and used within the embankment. Based on historical aerial photography obtained for the project corridor, the existing roadway embankment for US 52 was likely constructed during the late 1950s or early 1960s.

Roadway Embankment soils within the project corridor are composed of a fairly equal mixture of sands, silts, and clays. Laboratory testing was conducted on six (6) samples of the Roadway Embankment silts. The table below provides a summary of the results of the laboratory testing:

	Liquid Limit (L.L)	Plasticity Index (P.I.)	Natural Moisture	Passing # 200 Sieve
LOW	27	4	N/A	38%
HIGH	42	10	N/A	51%
AVERAGE	**36**	**7**	**N/A**	**45%**

The Roadway Embankment silts tested were primarily AASHTO classified as sandy silts (A-4) with some clayey silts (A-5) mixed in. Natural moisture content testing was not performed, but field moisture descriptions suggest the Roadway Embankment silts encountered were mostly dry to moist. SPT results within the Roadway Embankment silts showed soil densities that typically ranged from medium stiff to stiff, with some soft and very stiff areas. Softer areas typically corresponded with areas of higher moisture content. Harder areas typically had higher concentrations of gravel, cobbles, and boulders.

Laboratory testing was conducted on seven (7) samples of the Roadway Embankment clays. The table below provides a summary of the results of the laboratory testing:

	Liquid Limit (L.L)	Plasticity Index (P.I.)	Natural Moisture	Passing # 200 Sieve
LOW	42	11	N/A	49%
HIGH	63	31	N/A	77%
AVERAGE	**50**	**18**	**N/A**	**58%**

The Roadway Embankment clays were primarily AASHTO classified as silty clays (A-7-5). Natural moisture content testing was not performed, but field moisture descriptions suggest the Roadway Embankment clays encountered were mostly dry to moist. SPT results within the Roadway Embankment clays showed soil densities that typically ranged from medium stiff to stiff, with some soft and very stiff areas. Softer areas typically corresponded with areas of higher moisture content. Harder areas typically had higher concentrations of gravel, cobbles, and boulders.

Roadway Embankment sands were also encountered but were not laboratory tested. Field classification was deemed sufficient as these types of soil are typically not considered problematic during construction and are easier to field classify during the investigation. Field moisture descriptions of the Roadway Embankment sands typically varied from dry to moist. SPT results showed soil densities that typically ranged from loose to medium dense, with some very loose and dense areas. Very loose areas typically corresponded with areas of higher moisture content. Very dense areas typically had higher concentrations of gravel, cobbles, and boulders.

Roadway Embankment soils will be heavily impacted during roadway construction, primarily as a subgrade material, embankment foundation material, and in a few small cut sections. From looking at the field and lab data, some general assumptions can be made about these soils. The Roadway Embankment soils throughout the project corridor should generally be suitable as a subgrade material, embankment foundation material, and acceptable as embankment fill or other types of borrow material.

Due mostly to their high sand content, the Roadway Embankment clays are primarily slightly to moderately plastic. However, one area of highly plastic (Plasticity Index value of 26 or more) Roadway Embankment clay was encountered within the project corridor. The highly plastic clay was encountered in an area well away from the existing roadway and roadway foundation. Due to its distance from the roadway, this area was likely purposely chosen as a disposal area for wasted or unsuitable soils during the construction of US 52. In addition to the area identified, additional small areas of highly plastic clays located within the Roadway Embankment may still be encountered during construction and will need to be dealt with properly. The approximate location of the highly plastic clay encountered will be highlighted in the "Areas of Special Geotechnical Interest" section of this text report.

Alluvial

Alluvial soils, soils that have been transported and deposited by water, were encountered in areas near or within the floodplain of Toms Creek. Alluvial deposition typically occurs in topographically low areas. These soils are often very near or below the groundwater table and are generally wet to saturated. As a consequence of their high moisture content and nature of deposition, alluvial soils typically exhibit very soft to soft/very loose to loose soil densities. They also can contain highly plastic clays and sometimes significant amounts of organic matter. Alluvial soils can also be quite varied compositionally over short distances depending on the energy level of the depositional environment. Lower energy floodplain deposition often consists of silts and clays, while higher energy channel deposits typically consist of sand and gravel. Very high energy environments, typically restricted to the piedmont and mountains, often consist of deposits of gravel, cobbles, and boulders. Coarse-grained Alluvial materials are often rounded to sub-rounded due to the erosive forces of the flowing water.

During the geotechnical investigation, Alluvial soils were mainly encountered in the lower-lying areas near Toms Creek. An additional small area running perpendicular to Toms Creek was encountered below some Artificial Fill. This was interpreted as the remnants of an old tributary to Toms Creek that was later filled in during the construction of US 52. The alluvial soils present within the project corridor are primarily composed of sands with lesser amounts of silts, clays, and gravel. Laboratory testing was conducted on three (3) samples of Alluvial sands. The table below provides a summary of the results of the laboratory testing:

	Liquid Limit (L.L)	Plasticity Index (P.I.)	Natural Moisture	Passing # 200 Sieve
LOW	18	0	N/A	26%
HIGH	34	6	N/A	34%
AVERAGE	**26**	**4**	**N/A**	**31%**

The Alluvial sands were primarily AASHTO classified as silty sands (A-2-4). Natural moisture content testing was not performed, but field moisture descriptions suggest the Alluvial sands encountered were mostly moist to wet, with some saturated areas. SPT results within the Alluvial sands showed soil densities that typically ranged from loose to medium dense, with some very loose and dense areas. Softer areas typically corresponded with areas of higher moisture content and a greater percentage of fines. Harder areas typically had higher concentrations of gravel, cobbles, and boulders.

Laboratory testing was conducted on only one (1) sample of the Alluvial silts. Analysis of the results showed it was AASHTO classified as a sandy silt (A-4) with a Liquid Limit of 32 and a Plasticity Index (PI) value of 4. Sieve analysis of the Alluvial silt sample showed the percentage passing the #200 sieve (silt-clay material) at 43%. Natural moisture content testing was not performed, but field moisture descriptions suggest the Alluvial silts encountered were mostly moist. SPT results within the Alluvial silts showed soil densities were typically soft.

Laboratory testing was conducted on only one (1) sample of the Alluvial clays. Analysis of the results showed it was AASHTO classified as a sandy clay (A-6) with a Liquid Limit of 28 and a Plasticity Index (PI) value of 12. Sieve analysis of the Alluvial silt sample showed the percentage passing the #200 sieve (silt-clay material) at 38%. Natural moisture content testing was not performed, but field moisture descriptions suggest the Residual clays encountered were mostly moist. SPT results within the Residual clays showed soil densities were typically soft.

Alluvial soils will be primarily impacted during the construction of the bridge, and detour bridge approach fills. From looking at the lab data, some general assumptions can be made about the Alluvial soils present within the project corridor. Due mostly to their high sand content, the Alluvial clays are primarily slightly to moderately plastic. While not encountered during the geotechnical investigation, small areas of highly plastic Alluvial soils may still be encountered during construction and will need to be dealt with appropriately. Alluvial soils can, in general, be problematic during and after construction. Depending on their characteristics, they can negatively impact embankment stability, embankment settlement, and subgrade stability. Approximate locations where Alluvial soils are believed to be present within the project corridor will be highlighted in the "Areas of Special Geotechnical Interest" section of this text report.

Artificial Fill

Artificial Fill is also known as uncontrolled fill; These soils are often comprised of low-quality or wasted materials that are not compacted and are not properly drained. Artificial Fill soils can also contain a variety of other materials. These can be natural materials such as gravel, cobbles, boulders, and organic materials such as brush, trees, or other yard waste. Or in some cases, Artificial Fills can contain man-made debris such as household garbage, tires, scrap metal, plastic, etc.

Artificial Fill soils consisting of silts and sands were encountered in one small area of the project corridor during the geotechnical investigation. This area was believed to have been a former drainage swale or tributary to Toms Creek that was filled in during the construction of US 52. These soils were not laboratory tested, and field classification was deemed sufficient as these types of soil are easier to field classify during the investigation. The silts were field classified as sandy silts (A-4), while the sands were field classified as silty sands (A-2-4). Field moisture descriptions of the Artificial Fill silts and sands ranged from moist to saturated. SPT results showed soil densities that were soft/loose to medium dense. Trace boulders were reported within the fill during drilling operations.

Artificial Fill soils will be impacted during the construction of one of the bridge approach fills. Unlike Roadway Embankment or Engineered Artificial Fill, the engineering properties of these soils are generally quite poor. They also have a tendency to be poorly drained and create perched groundwater situations. From looking at the field data, some general assumptions can be made about the Artificial Fill soils present within the project corridor. The Artificial Fill soils should generally be suitable as an embankment foundation material. However, due to their characteristics and nature of deposition, approximate locations where Artificial Fill soils are believed to be present within the project corridor will be highlighted in the "Areas of Special Geotechnical Interest" section of this text report.

Rock Properties

Middle Proterozoic-aged (1.0 - 1.6 billion-year-old) Granitic Gneiss was encountered within many areas of the project corridor. Weathered Rock, typically ranging from a foot thick to several feet thick, was often found overlying the Crystalline Rock. Due to the presence of shallow Crystalline Rock at the proposed end bent locations, rock coring was deemed necessary to confirm in-situ bedrock. Fifty-nine (59) feet of rock coring was advanced at four different boring locations.

White, gray, black, and dark green colored Granitic Gneiss was encountered at each location. In general, the Granitic Gneiss was fresh to slightly weathered, hard to very hard, and closely fractured. Recovery (REC) percentages ranged from 77% to 100%. Rock Quality Designation (RQD) percentages ranged from 17% to 96%. Geologic Strength Index (GSI) values within the Granitic Gneiss ranged from 55 to 90.

Differential weathering is not only evident in the varying rock lines within the project corridor but is also evident within the rock mass itself. Moderate to moderately severe weathering and even severe to very severely weathered seams (interpreted as core loss/lack of recovery) were encountered during the geotechnical investigation. REC percentages, RQD percentages, and GSI values were significantly lower in these areas.

Due to some design changes involving a newly proposed cut where shallow Crystalline Rock had previously been encountered during the investigation, Summit returned to the site to conduct five (5) rod soundings to try to get a handle on potential rock lines that may be present within the cut. In this area, Crystalline Rock lines are inferred within this report based on rod-sounding refusal behavior. Abrupt and "ringing" types of refusals were interpreted as Crystalline Rock. While gradual and dull refusals were interpreted as Saprolite or Weathered Rock.

Outcrop mapping was also conducted along the length of the project corridor. Several outcrops of Crystalline Rock were noted, primarily down in the lower elevations of the main channel of Toms Creek. The approximate location and outline of these outcrops are shown in the plan sheets following this text report. Summit was unable to obtain more precise measurements due to the locations of the outcrops in the middle of the creek. Approximate locations where Crystalline Rock is present within six (6) feet of proposed grade will be highlighted in the following section, "Areas of Special Geotechnical Interest."

While not in-situ Crystalline Rock, it's worth noting that numerous large boulders of Crystalline Rock are present along the banks of Toms Creek. These were evidently placed to prevent erosion and migration of the channel from impacting the existing interior bents of the bridges.

Groundwater Properties

At shallow depths and under unconfined conditions, groundwater flow would be expected to be primarily driven by variations in the elevation of the water table surface. This driving mechanism is called topographically-driven flow because the elevation of the water table usually mimics the elevation of the ground surface. Therefore, surface topography may be used to infer the direction of shallow groundwater flow in an area.

Deeper water-bearing zones usually occur within the underlying bedrock, which in this case, is composed of Crystalline Rock (Granitic Gneiss). The movement of groundwater through Crystalline Rocks is one of the least predictable phenomena in all of groundwater science. This is because the porosity of these rocks is very low, and a network of fractures usually controls permeability. The direction of groundwater movement in deeper bedrock aquifers may not be consistent with shallow, unconfined, and topographically-driven groundwater flow.

The geotechnical investigation was conducted during a period of average rainfall. Groundwater was encountered in ten of the twenty-eight total drilled borings. Top of water table elevations varied from 921.9 feet to 955.8 feet, with an average elevation of 935.9 feet above sea level. Groundwater was encountered as shallow as five feet beneath the ground surface to as deep as thirty-five feet. Typically, groundwater was encountered between seven and eighteen feet below the ground surface.

It should be noted that shallow, unconfined groundwater can vary significantly based on seasonal variations in precipitation and climatic issues such as drought. It should also be noted that rod soundings cannot accurately detect the depth of groundwater. Therefore, no groundwater information was reported with any of the rod sounding locations performed on the project. During the geotechnical investigation, groundwater was not encountered within six feet of the proposed grade within the project corridor.

A visual reconnaissance for water wells was conducted throughout the project corridor. This was used in conjunction with the final survey file to attempt to identify water wells within or immediately adjacent to the proposed right of way of the project. Some water well locations are well hidden, and it is possible that some wells were missed or misidentified by the final survey and/or visual reconnaissance. No water wells were observed or encountered during the geotechnical investigation of this project.

Areas of Special Geotechnical Interest

Crystalline Rock - During the geotechnical investigation, Crystalline Rock was encountered in several areas. The excavation of Crystalline Rock can be problematic during construction and may require specialized equipment and/or blasting. More detailed information on the rocks underlying the project corridor can be found in the "Rock Properties" section of this text report. The following approximate locations listed below show areas where Crystalline Rock is believed to be present within six feet of proposed grade.

Alignment	Station(±)	Offset
-LNB-	14+25.00 – 19+75.00	Right
-LNB-	21+25.00 – 22+03.00	Left
-LSB-	21+37.00 – 22+40.00	Right
-NB_DET-	14+55.67 – 15+05.67	Left & Right
-SB_DET-	12+67.41 – 13+17.41	Left & Right

Alluvial Soils - During the geotechnical investigation, areas of Alluvial soils were observed and encountered. Alluvial soils can be problematic during and after construction. They can negatively impact embankment stability, embankment settlement, and subgrade stability. More detailed information on these soils can be found in the "Soil Properties" section of this text report. The following approximate locations listed below show areas where Alluvial soils are believed to be present within the project corridor:

Alignment	Station(±)	Offset
-LNB-	21+75.00 – 25+25.00	Left & Right
-LSB-	22+50.00 – 25+25.00	Left & Right
-NB_DET-	19+20.77 – 22+12.63	Left & Right
-SB_DET-	17+32.00 – 20+23.75	Left & Right

Plastic Soils - During the geotechnical investigation, highly plastic clays were encountered in one area within the project corridor. Highly plastic soils can be problematic during and after construction. They can negatively affect embankment stability, embankment settlement, subgrade stability and may not be suitable for use as borrow material. More detailed information on these soils can be found in the "Soil Properties" section of this text report. The following approximate location listed below shows the area where highly plastic clays are believed to be present within the project corridor:

Alignment	Station(±)	Offset
-SB_DET-	24+35.00 – 26+88.00	Left & Right

Artificial Fill - During the geotechnical investigation, areas of Artificial Fill were encountered at a few locations within the project corridor. Artificial fill often contains poor or wasted soils (unusable) from other projects. In some cases, they can contain buried organic material, household garbage, or other man-made debris. They also are typically poorly drained and can contain perched groundwater. More information on these soils can be found in the "Soils Properties" section of this text report. The following locations listed below show areas where Artificial Fill is believed to be present within the project corridor:

Alignment	Station(±)	Offset
-LNB-	21+25.00 – 22+03	Right

References

North Carolina Geological Survey, 1985, Geologic map of North Carolina: North Carolina Geological Survey, General Geologic Map, scale 1:500000.

The Geology of the Carolinas, J. Wright Horton, Jr., and Victor A. Zullo

Groundwater Science, Charles R. Fitts

Respectfully Submitted,

Brett Smith, PG
Project Geologist
Summit Design and Engineering Services, PLLC
NC License # 2390

PROJECT REFERENCE NO.	SHEET NO.
B-5527	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
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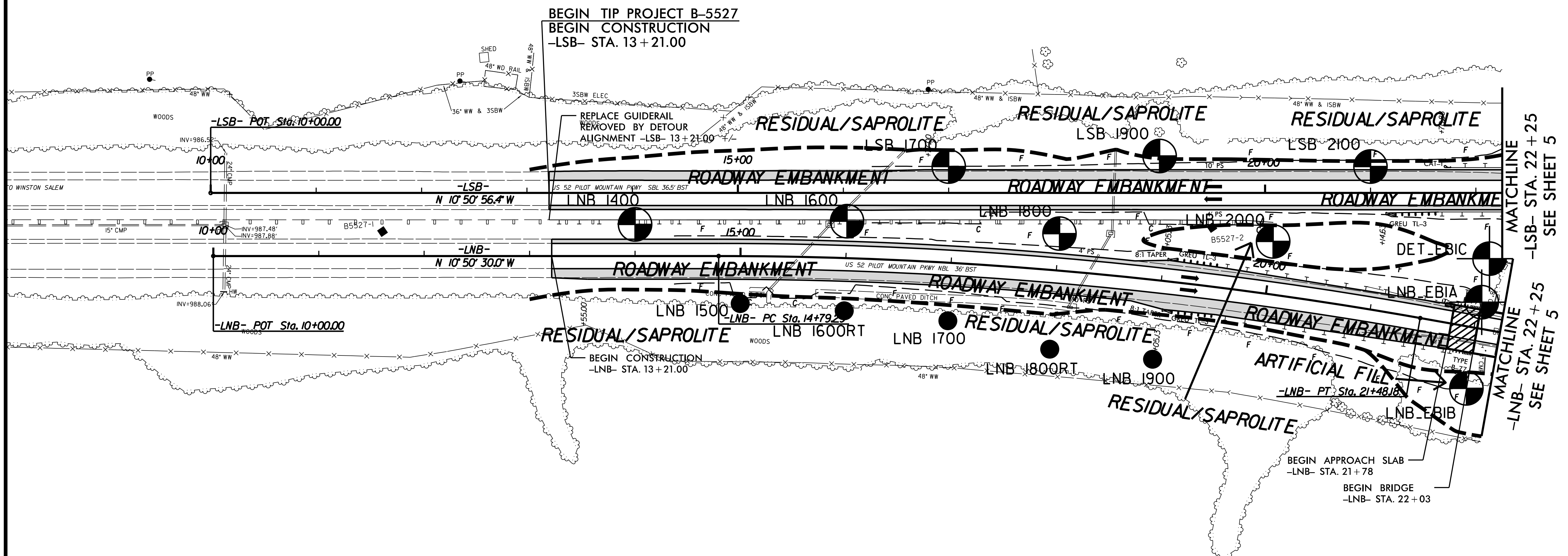
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

-LNB-
PI Sta 18+14.60
Δ = 10° 05' 07.9" (RT)
D = 1° 30' 28.0"
L = 668.90'
T = 335.31'
R = 3,800.00'
e = 5.0%
Ro = 180'

NAD 83/2011



FOR -LNB- PROFILE SEE SHT. 6
FOR -LSB- PROFILE SEE SHT. 7

FOR TEMPORARY ALIGNMENTS SEE SHEETS 2B-1 THRU 2B-4.
FOR DITCH DETAILS SEE SHEET 2D-1.

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PROJECT REFERENCE NO.	SHEET NO.
B-5527	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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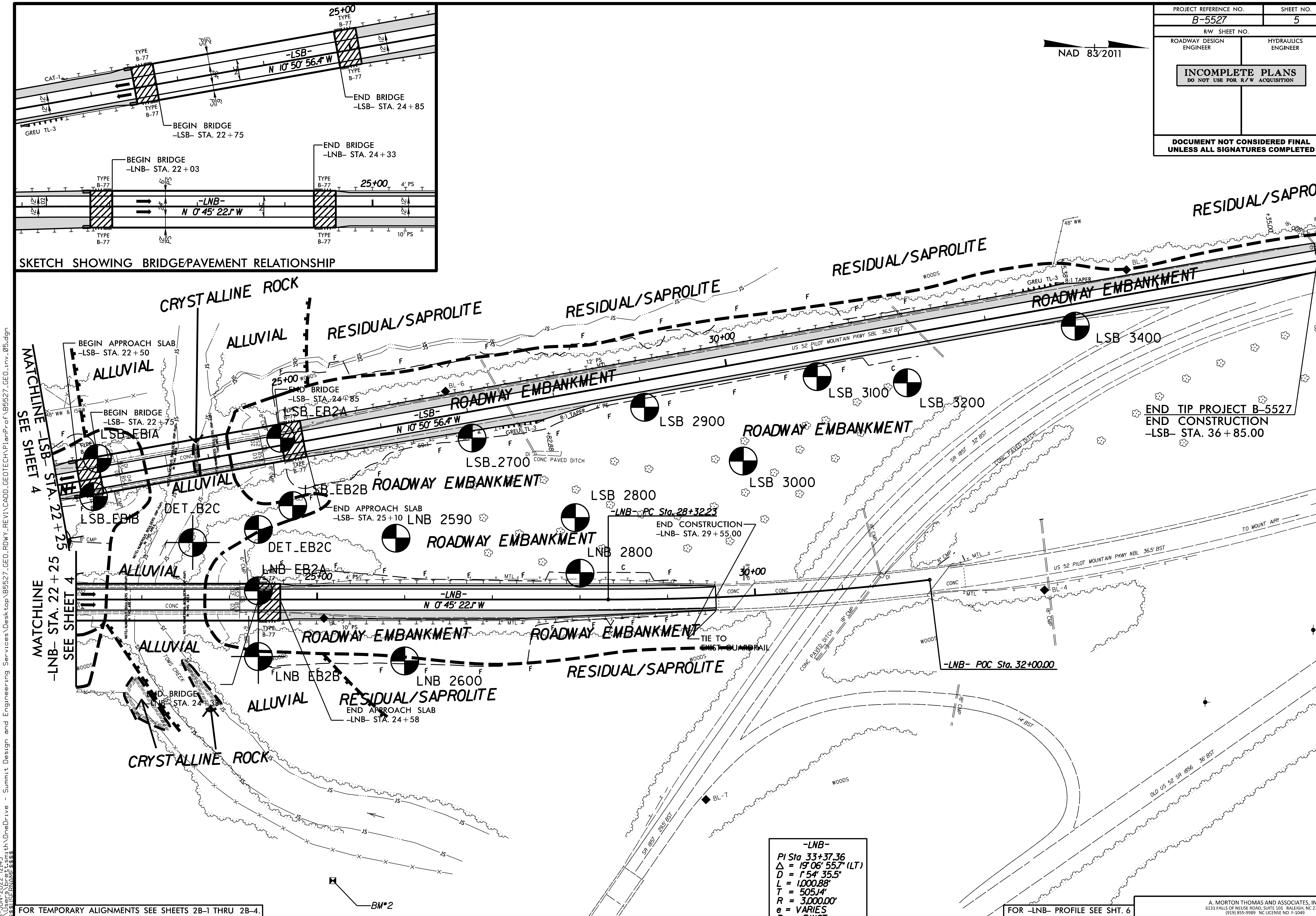
NAD 83/2011



-LNB-
PI Sta 33+37.36
Δ = 19°06' 55.7" (LT)
D = 1°54' 35.5"
L = 1,000.88'
T = 505.14'
R = 3,000.00'
e = VARIES
Ro = EXIST.

FOR TEMPORARY ALIGNMENTS SEE SHEETS 2B-1 THRU 2B-4.
FOR DITCH DETAILS SEE SHEET 2D-1.

FOR -LNB- PROFILE SEE SHT. 6
FOR -LSB- PROFILE SEE SHT. 7

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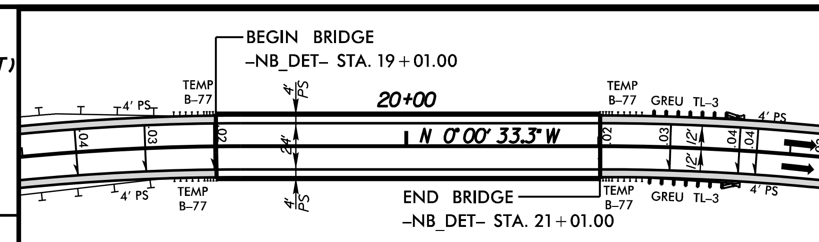
-NB_DET-

PI Sta 10+99.80	PI Sta 17+87.14	PI Sta 22+30.03
Δ = 1° 25' 07.5" (LT)	Δ = 12° 15' 04.2" (RT)	Δ = 12° 19' 54.4" (RT)
D = 0° 42' 39.1"	D = 4° 48' 53.2"	D = 4° 48' 53.2"
L = 199.58'	L = 254.45'	L = 256.12'
T = 99.80'	T = 127.71'	T = 128.56'
R = 8,060.00'	R = 1,190.00'	R = 1,190.00'
DS = 60 MPH	e = 4%	e = 4%
e = RC	RO = 144'	RO = 144'
RO = 72'		

-NB_DET- DS = 55 MPH



SKETCH SHOWING BRIDGE/PAVEMENT RELATIONSHIP

PROJECT REFERENCE NO.	SHEET NO.
B-5527	6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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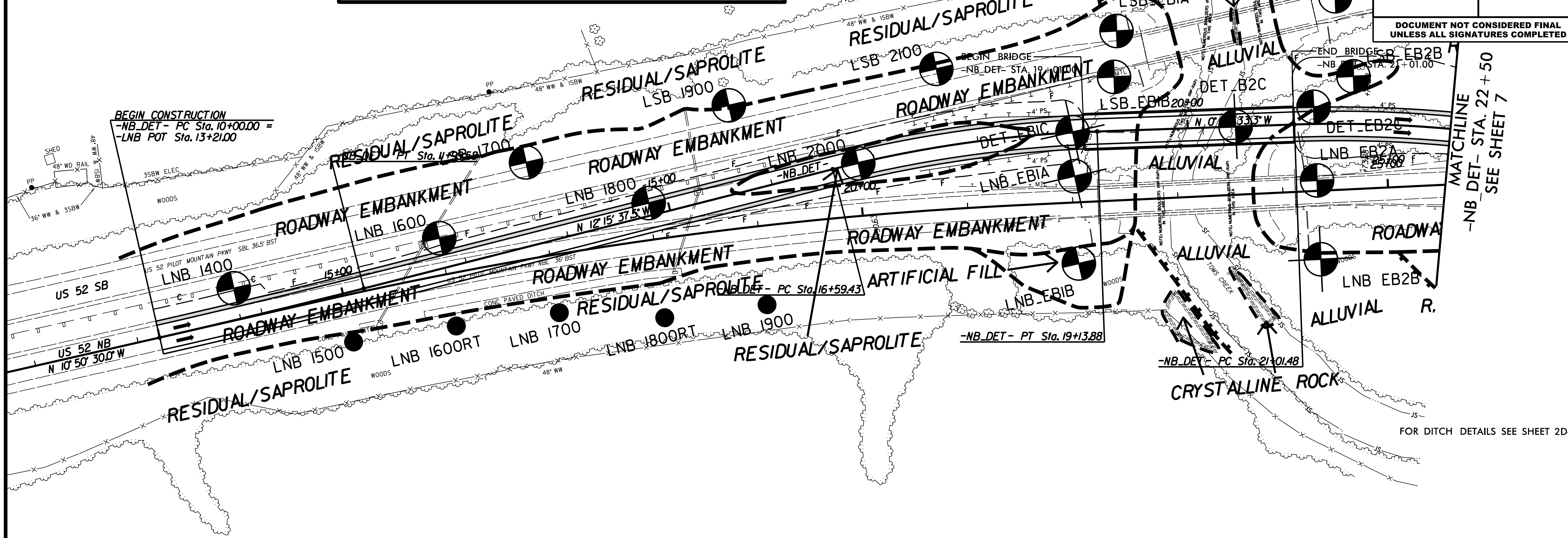

FOR DITCH DETAILS SEE SHEET 2D-1.

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PROJECT REFERENCE NO.	SHEET NO.
B-5527	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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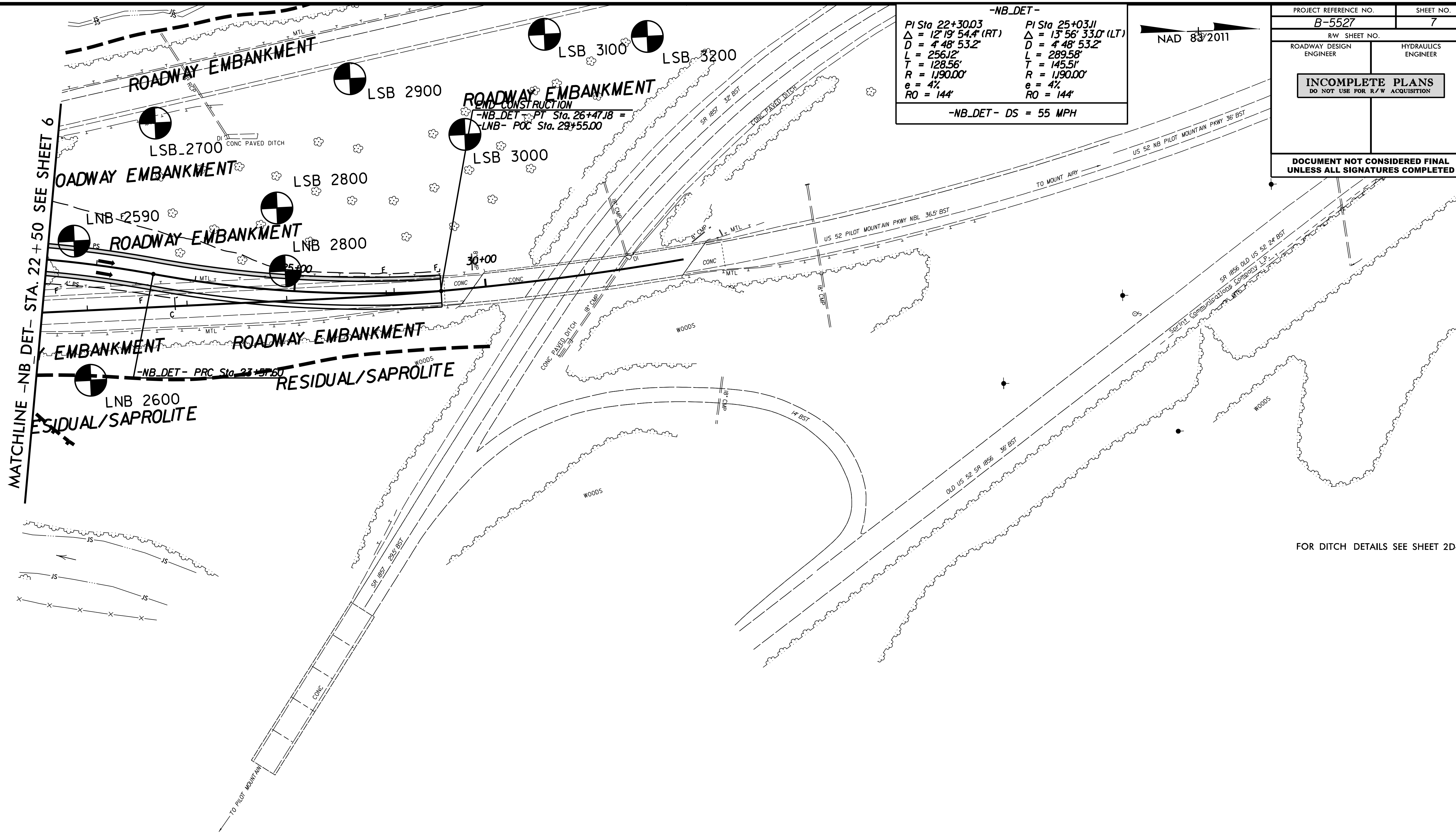
-NB_DET-	
PI Sta 22+30.03	PI Sta 25+03.11
Δ = 12°19' 54.4" (RT)	Δ = 13°56' 33.0" (LT)
D = 4°48' 53.2"	D = 4°48' 53.2"
L = 256.12'	L = 289.58'
T = 128.56'	T = 145.51'
R = 1,190.00'	R = 1,190.00'
e = 4%	e = 4%
RO = 144'	RO = 144'
-NB_DET- DS = 55 MPH	



FOR DITCH DETAILS SEE SHEET 2D-1.

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PROJECT REFERENCE NO.	SHEET NO.
B-5527	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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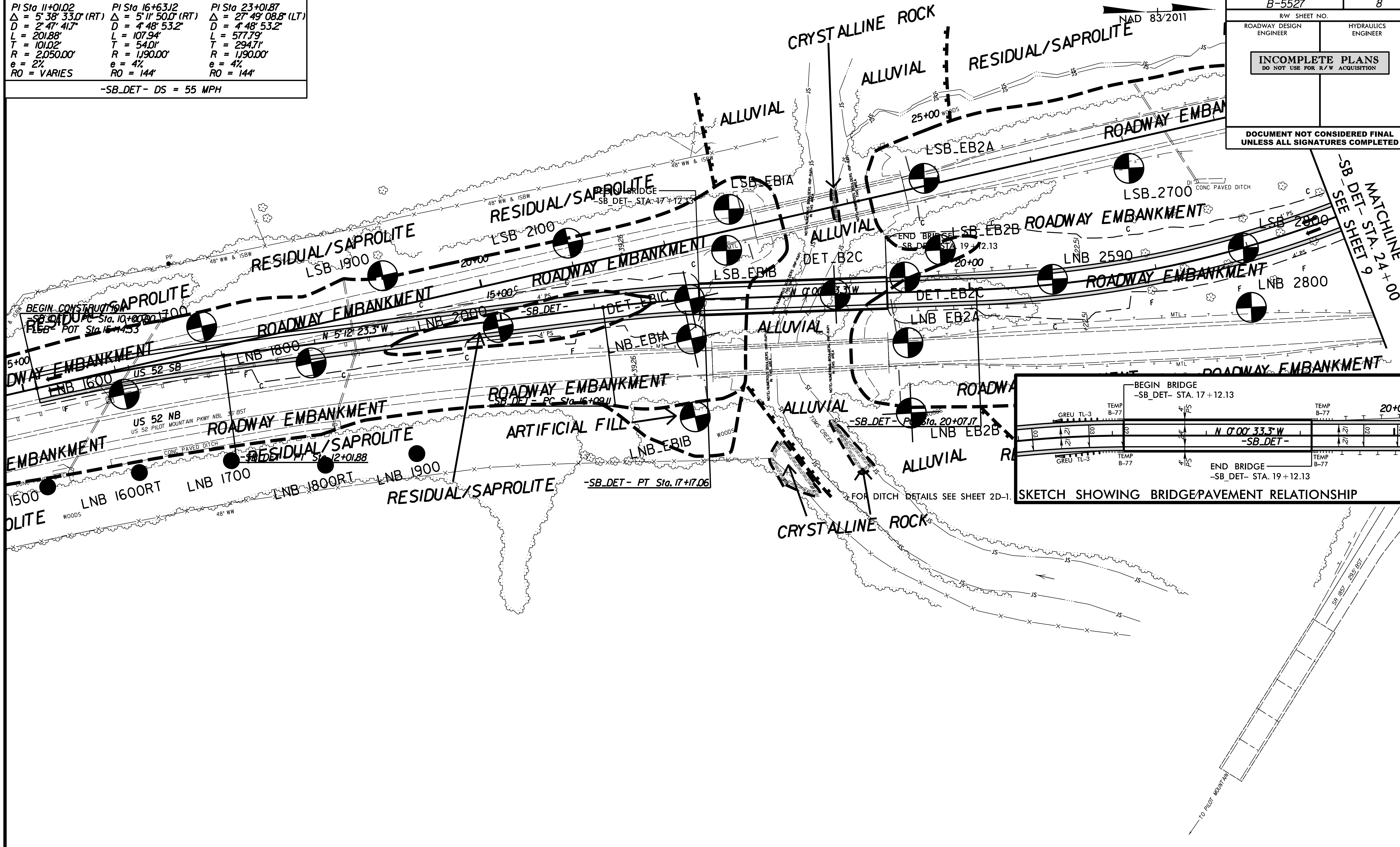
-SB_DET-

PI Sta 11+01.02	PI Sta 16+63.12	PI Sta 23+01.87
Δ = 5° 38' 33.0" (RT)	Δ = 5° 11' 50.0" (RT)	Δ = 27° 49' 08.8" (LT)
D = 2° 47' 41.7"	D = 4° 48' 53.2"	D = 4° 48' 53.2"
L = 201.88'	L = 107.94'	L = 577.79'
T = 101.02'	T = 54.01'	T = 294.71'
R = 2,050.00'	R = 1,190.00'	R = 1,190.00'
e = 2%	e = 4%	e = 4%
RO = VARIES	RO = 144'	RO = 144'

-SB_DET- DS = 55 MPH



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PROJECT REFERENCE NO.	SHEET NO.
B-5527	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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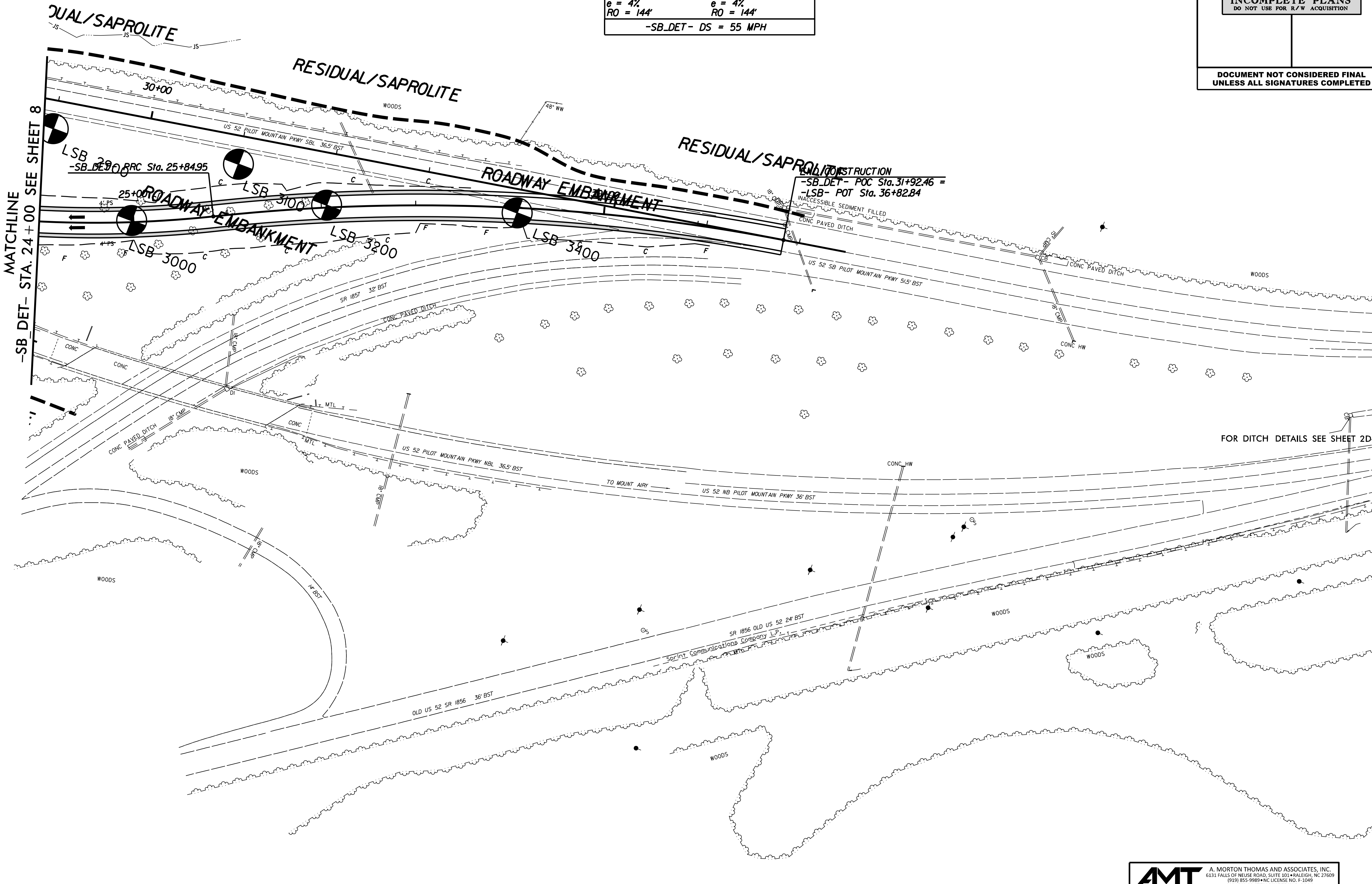
-SB_DET-

PI Sta 23+01.87	PI Sta 28+90.95
Δ = 27° 49' 08.8" (LT)	Δ = 16° 58' 45.7" (RT)
D = 4° 48' 53.2"	D = 2° 47' 41.7"
L = 577.79'	L = 607.51'
T = 294.71'	T = 306.00'
R = 1,190.00'	R = 2,050.00'
e = 4%	e = 4%
RO = 144'	RO = 144'

-SB_DET- DS = 55 MPH



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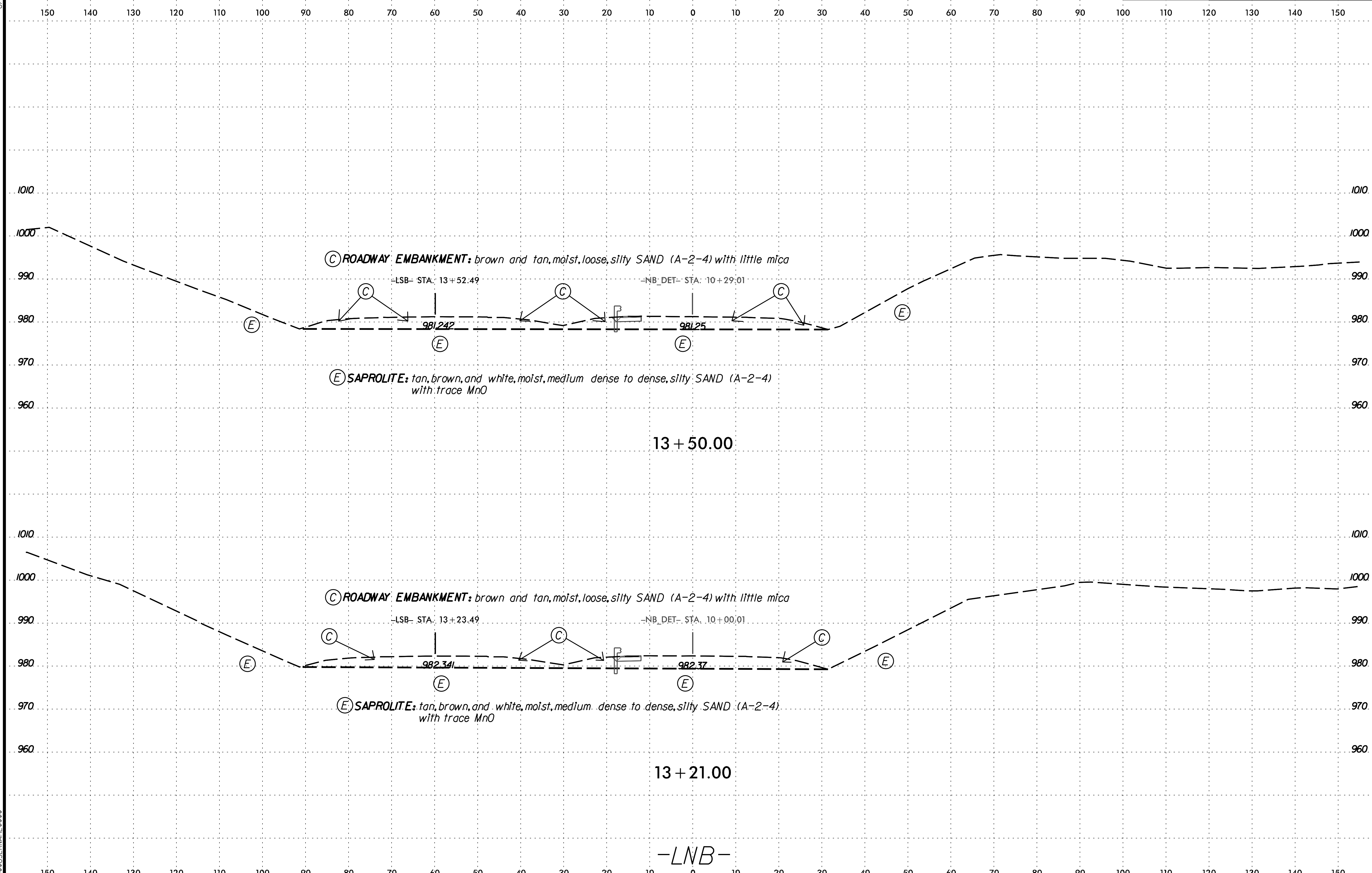

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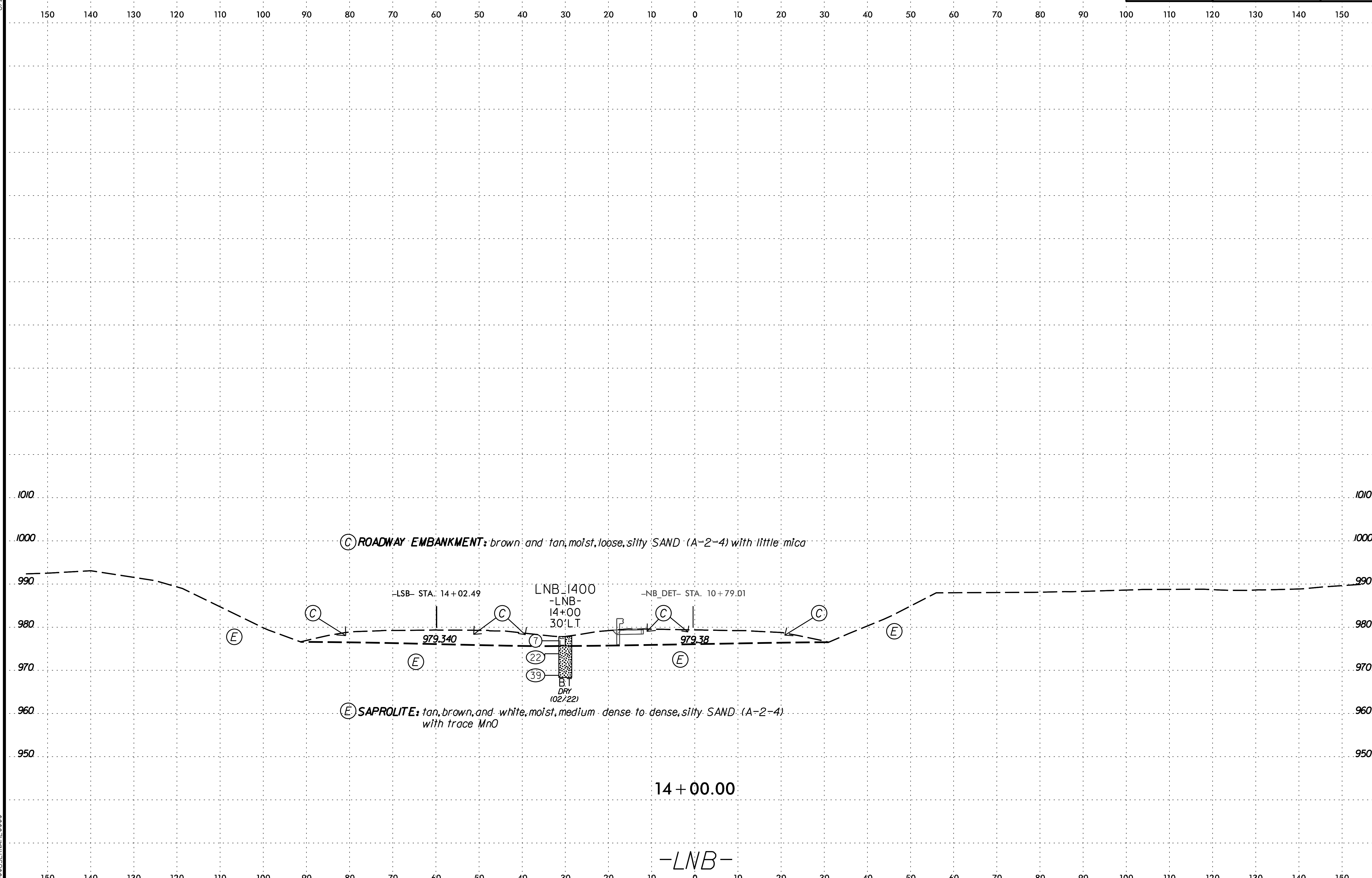

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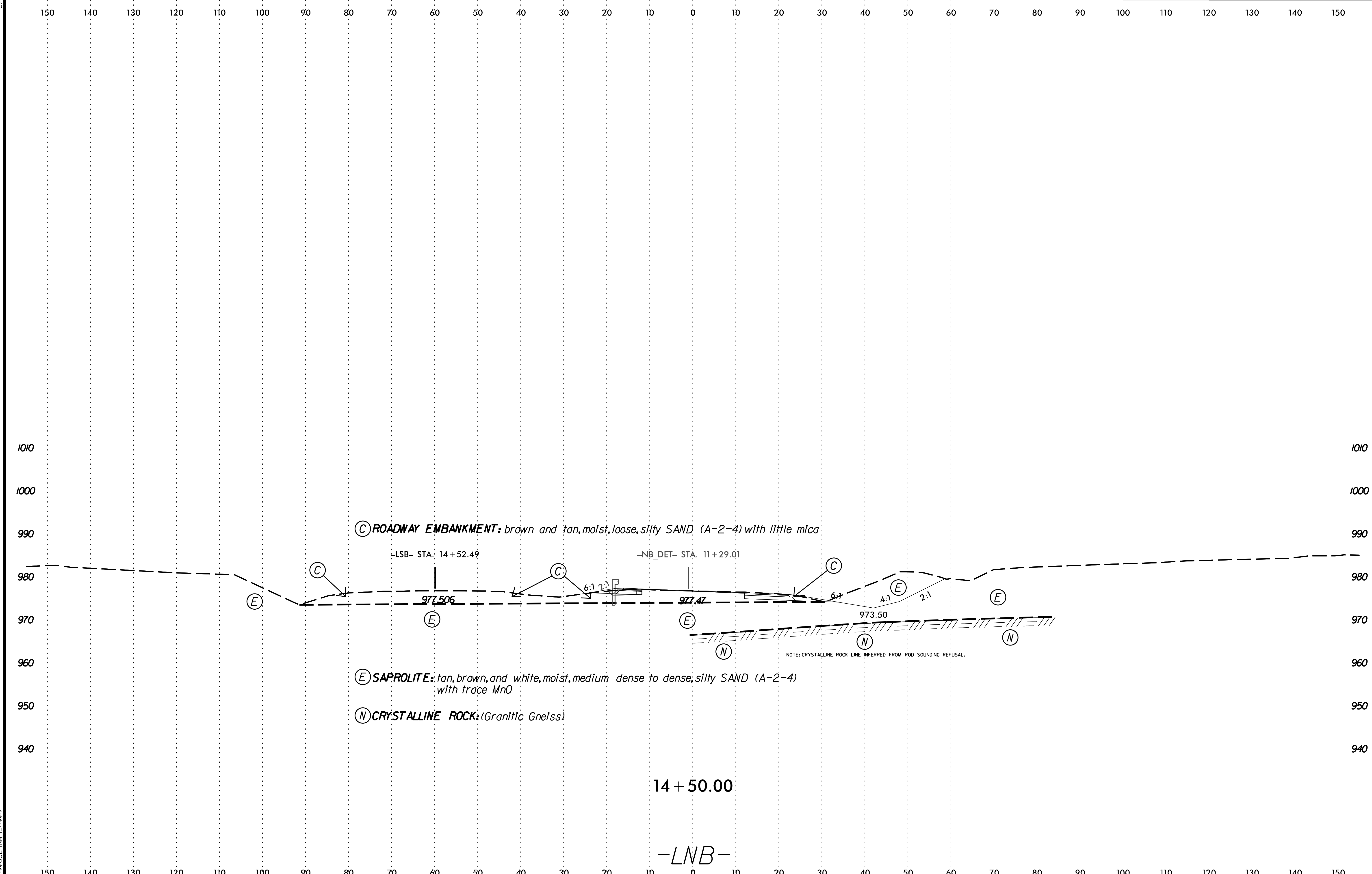

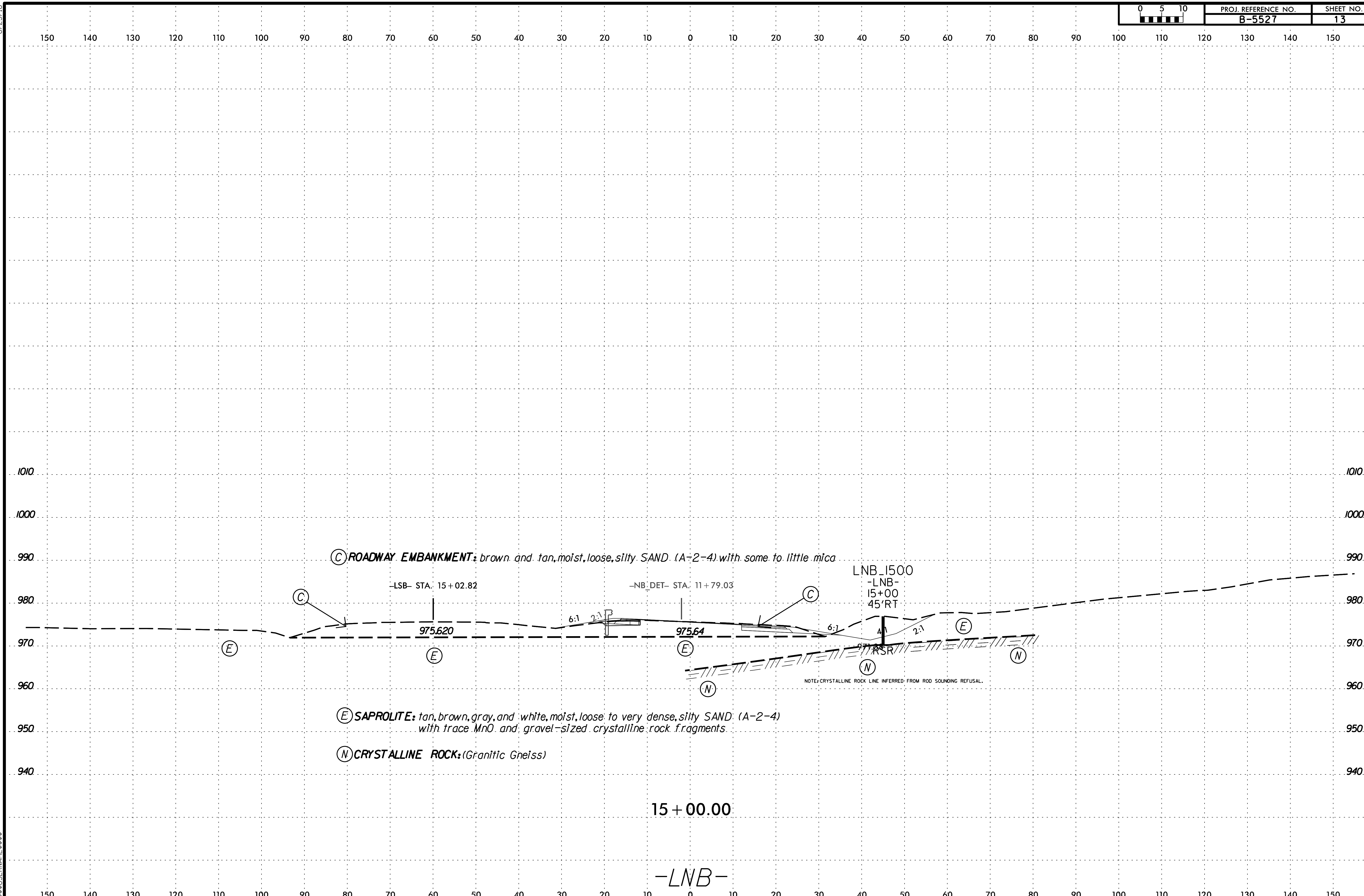

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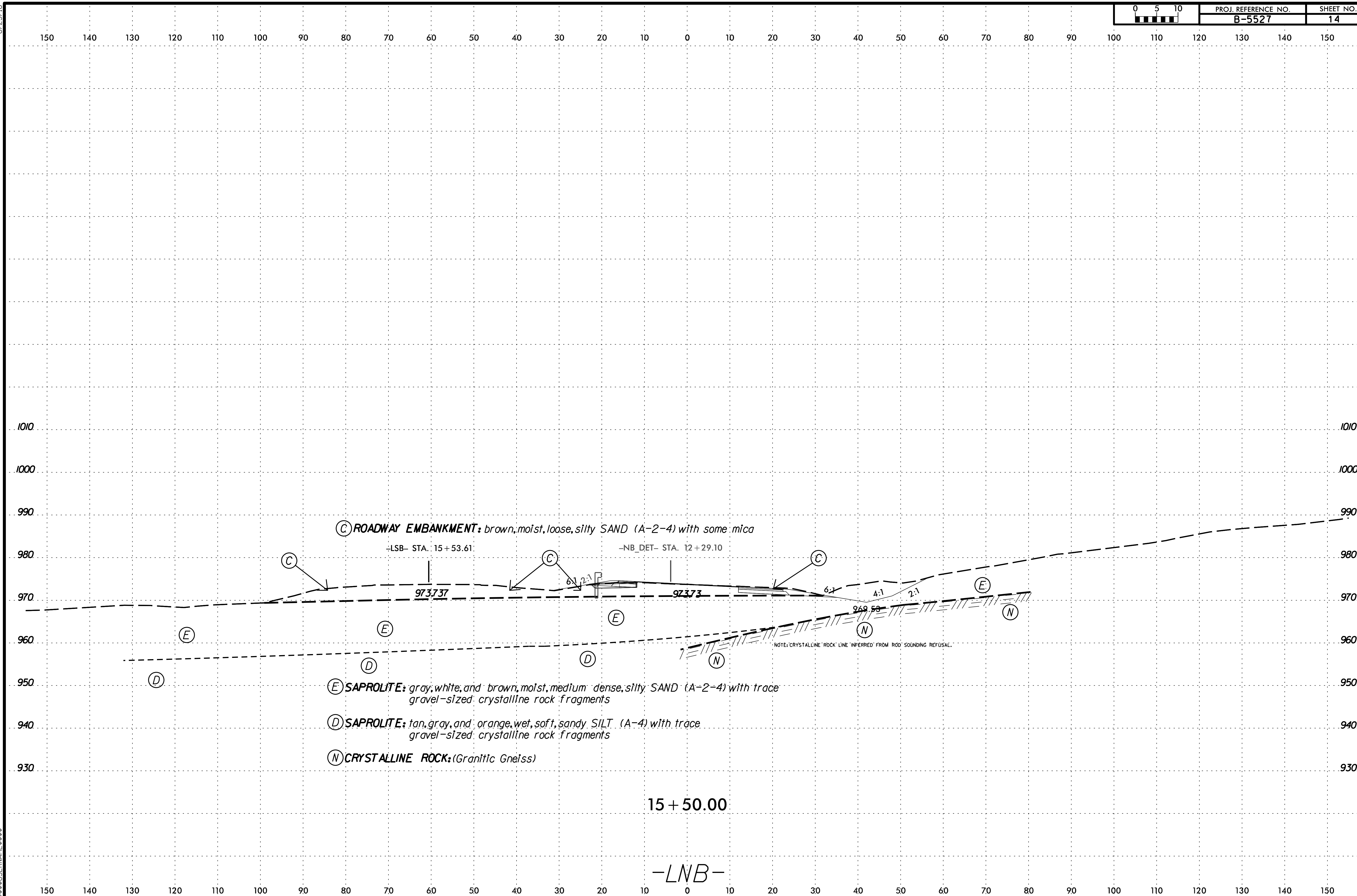

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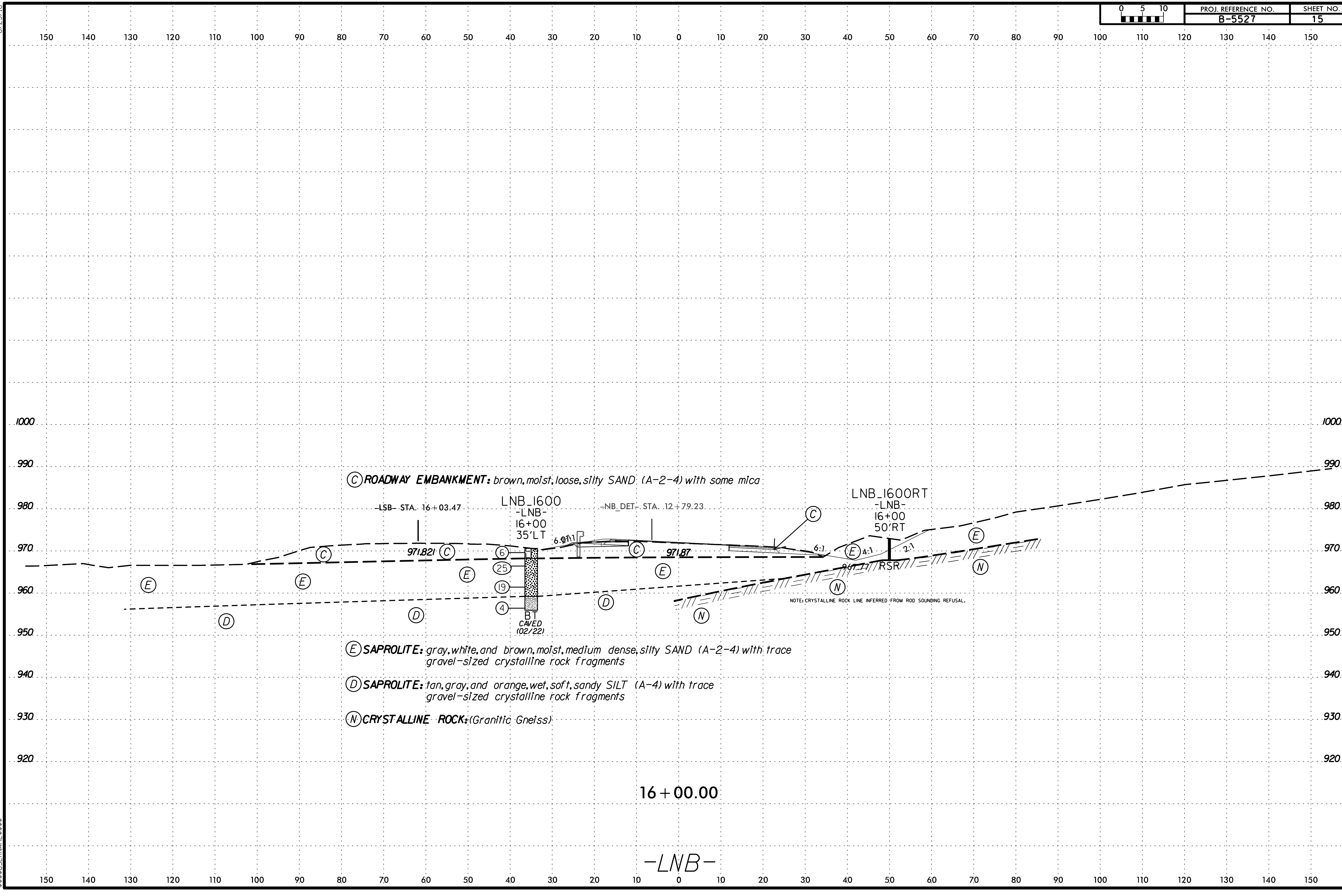

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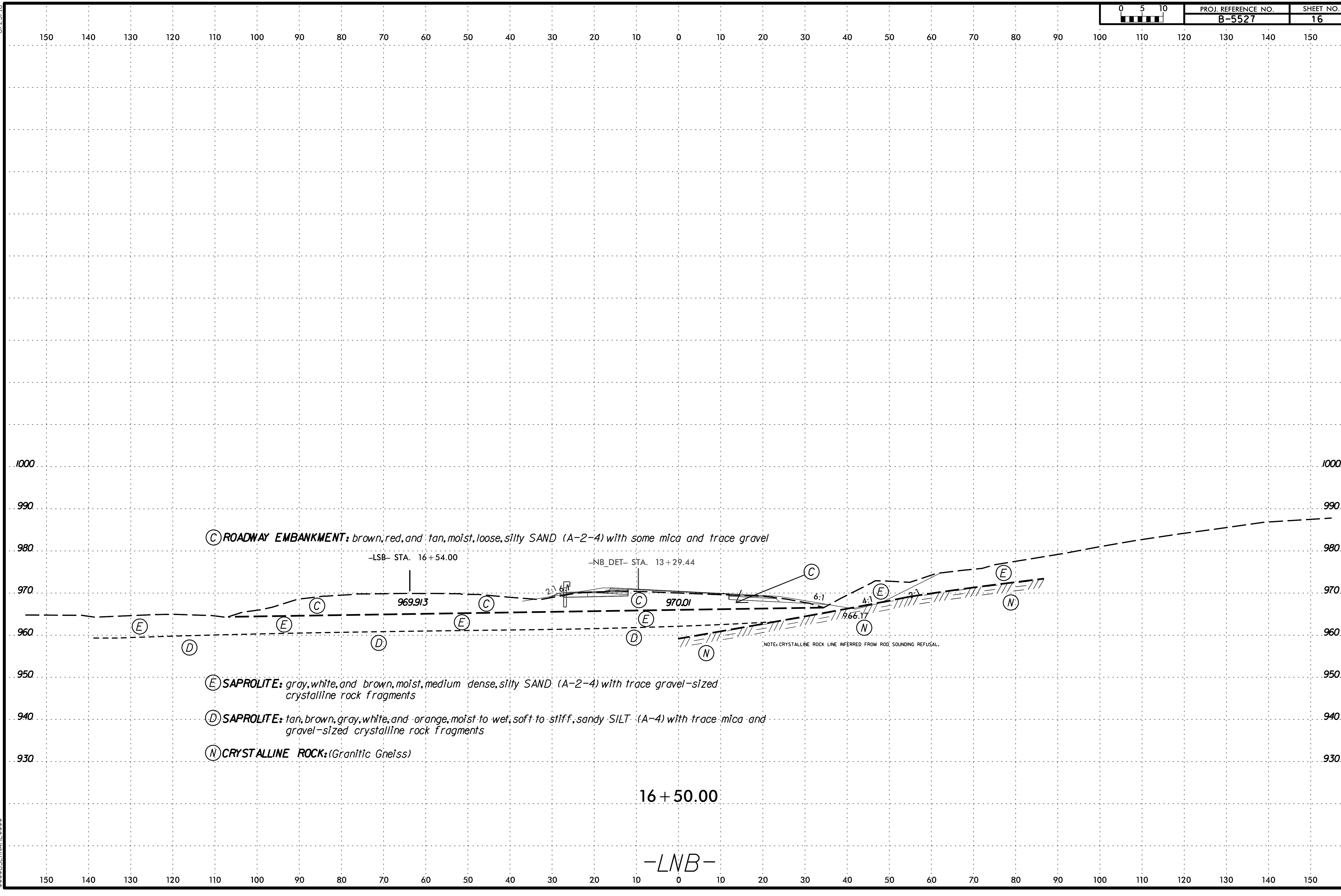

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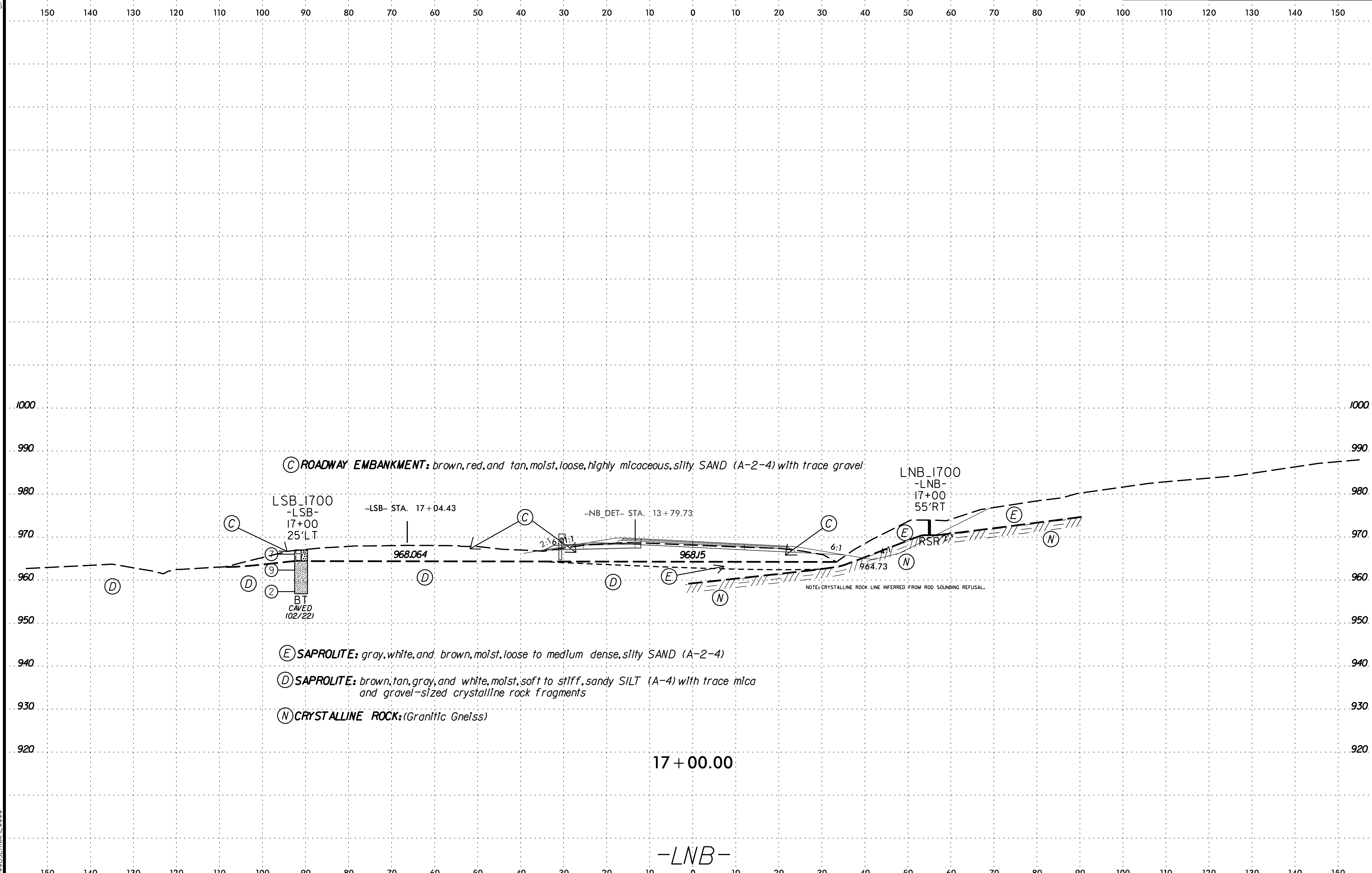

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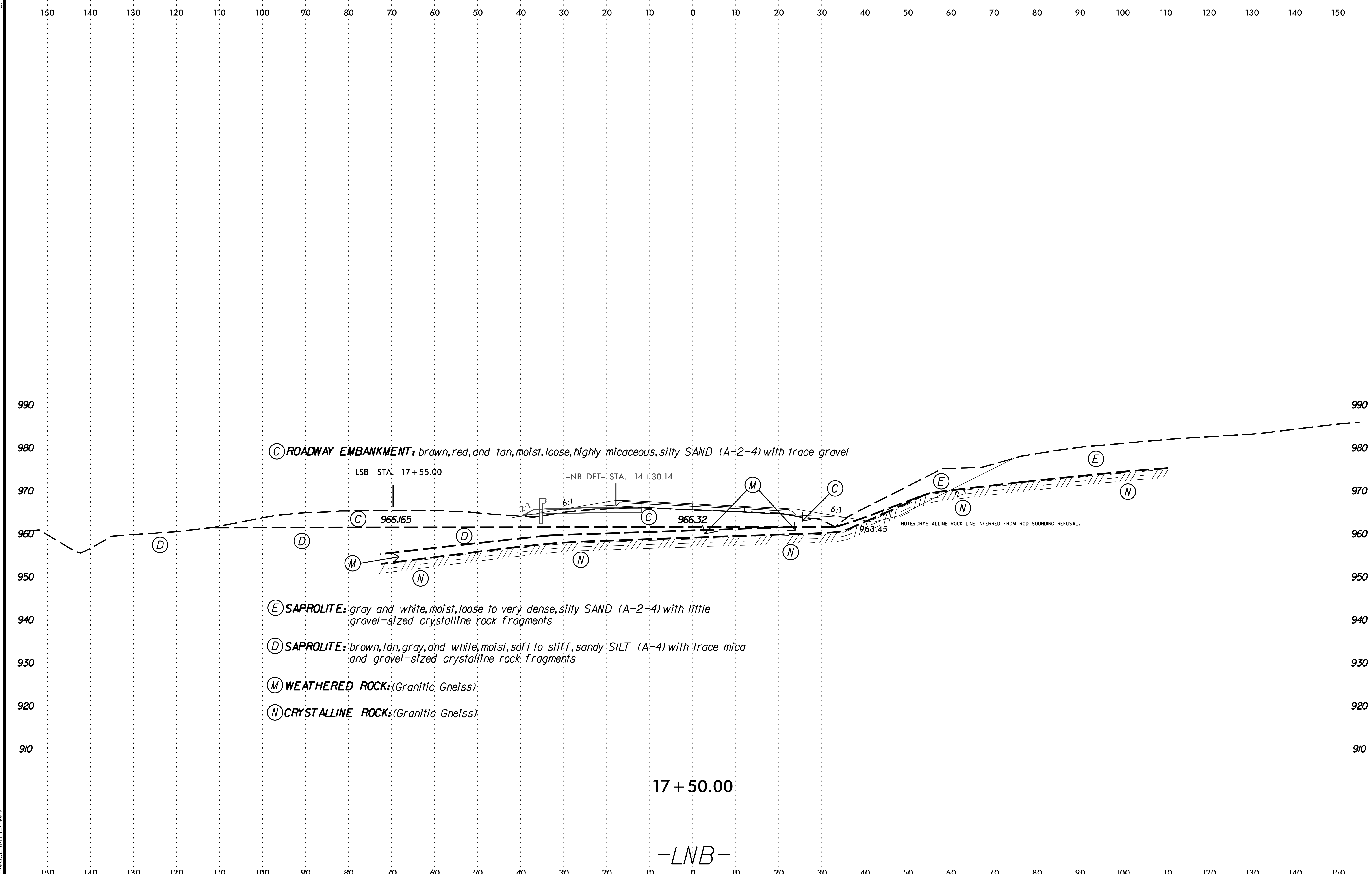

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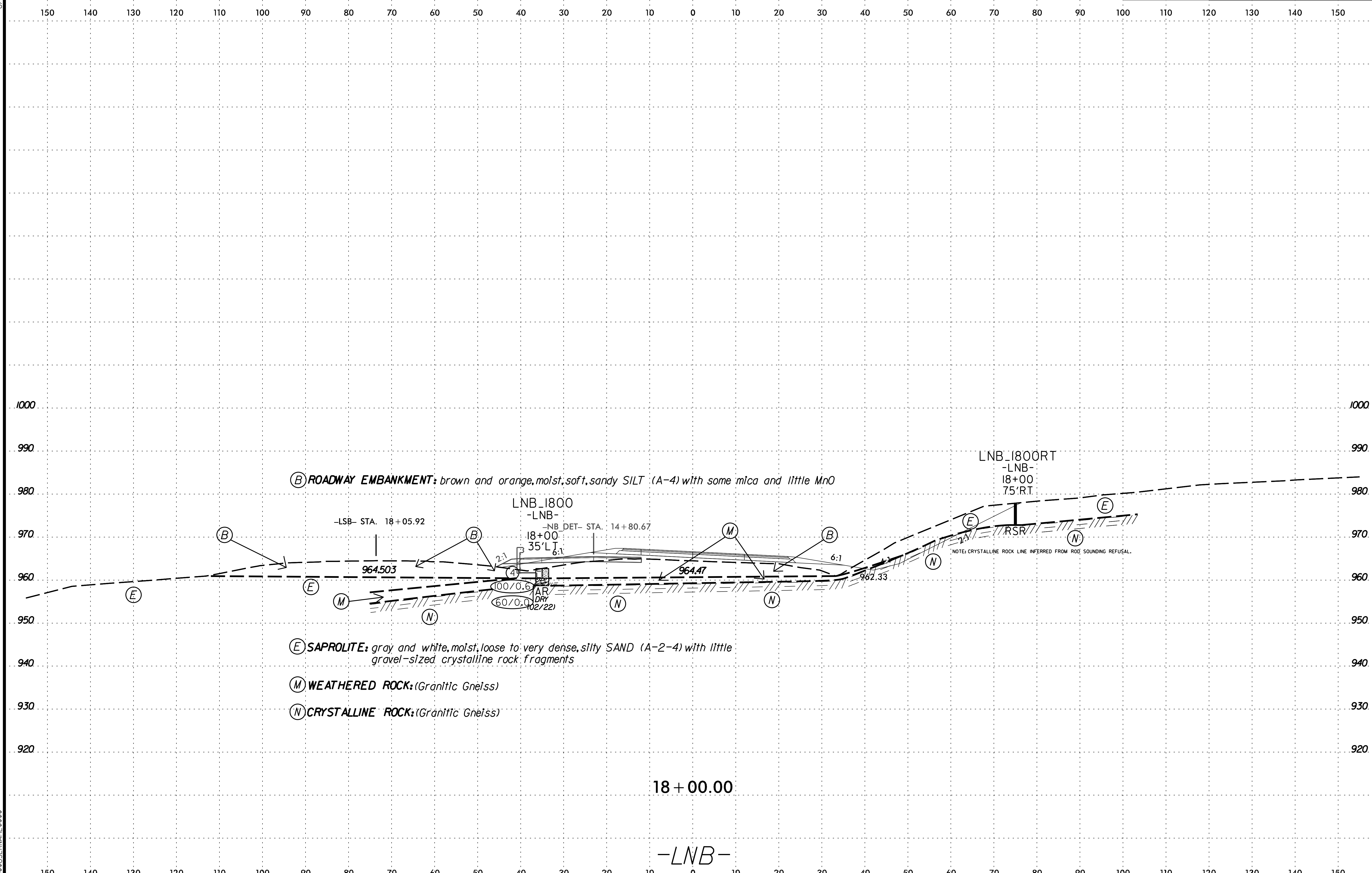

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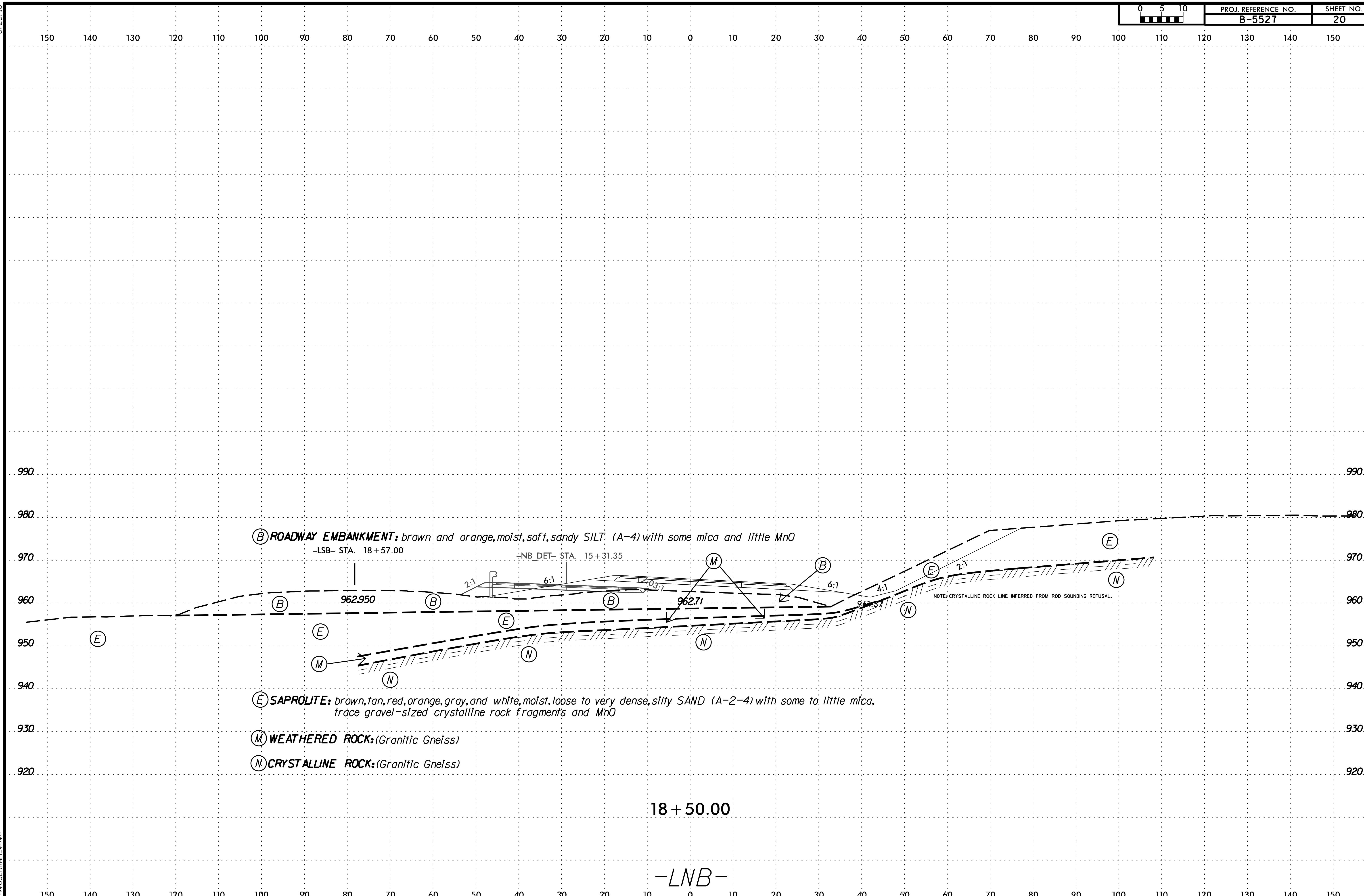

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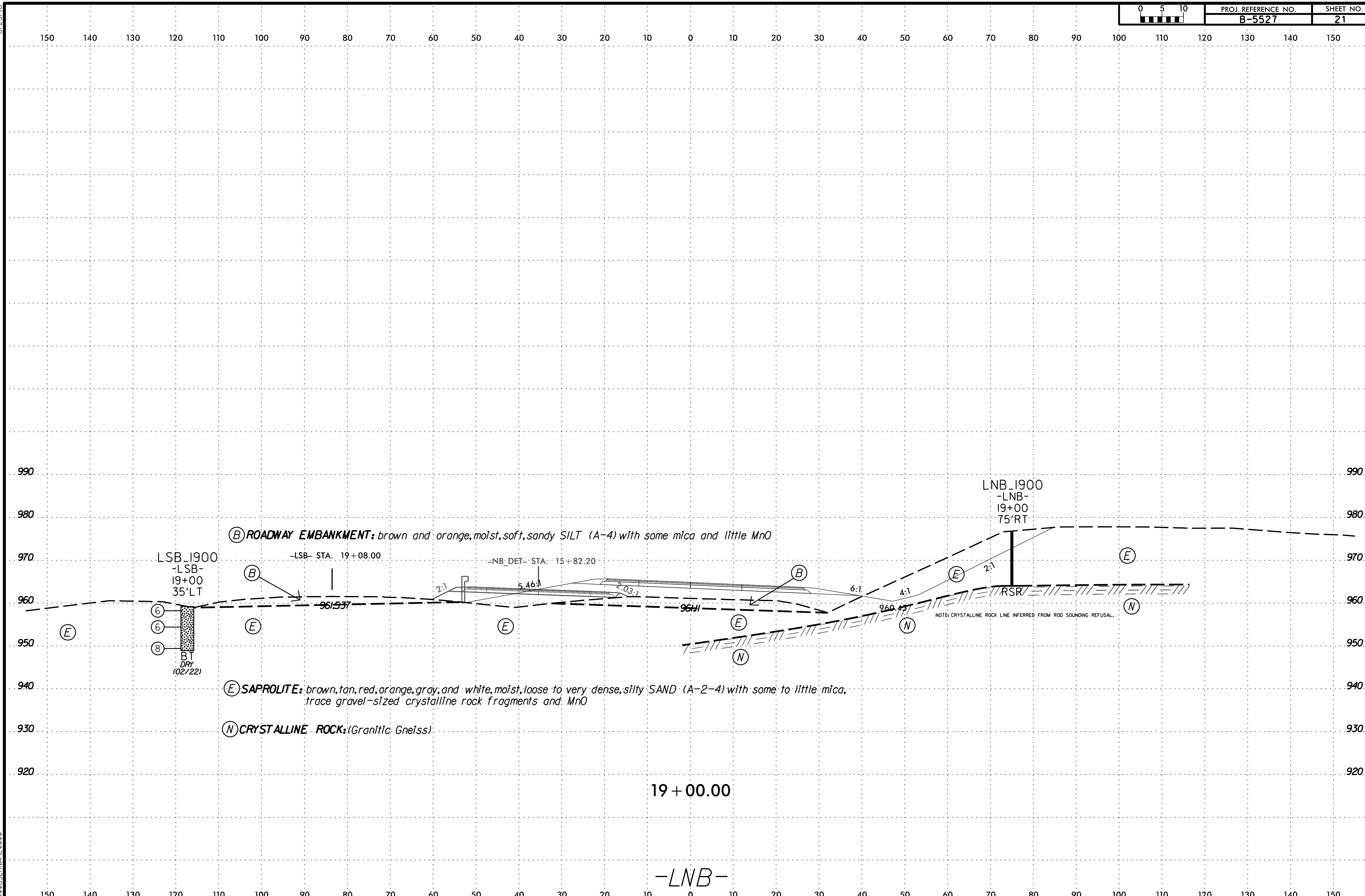
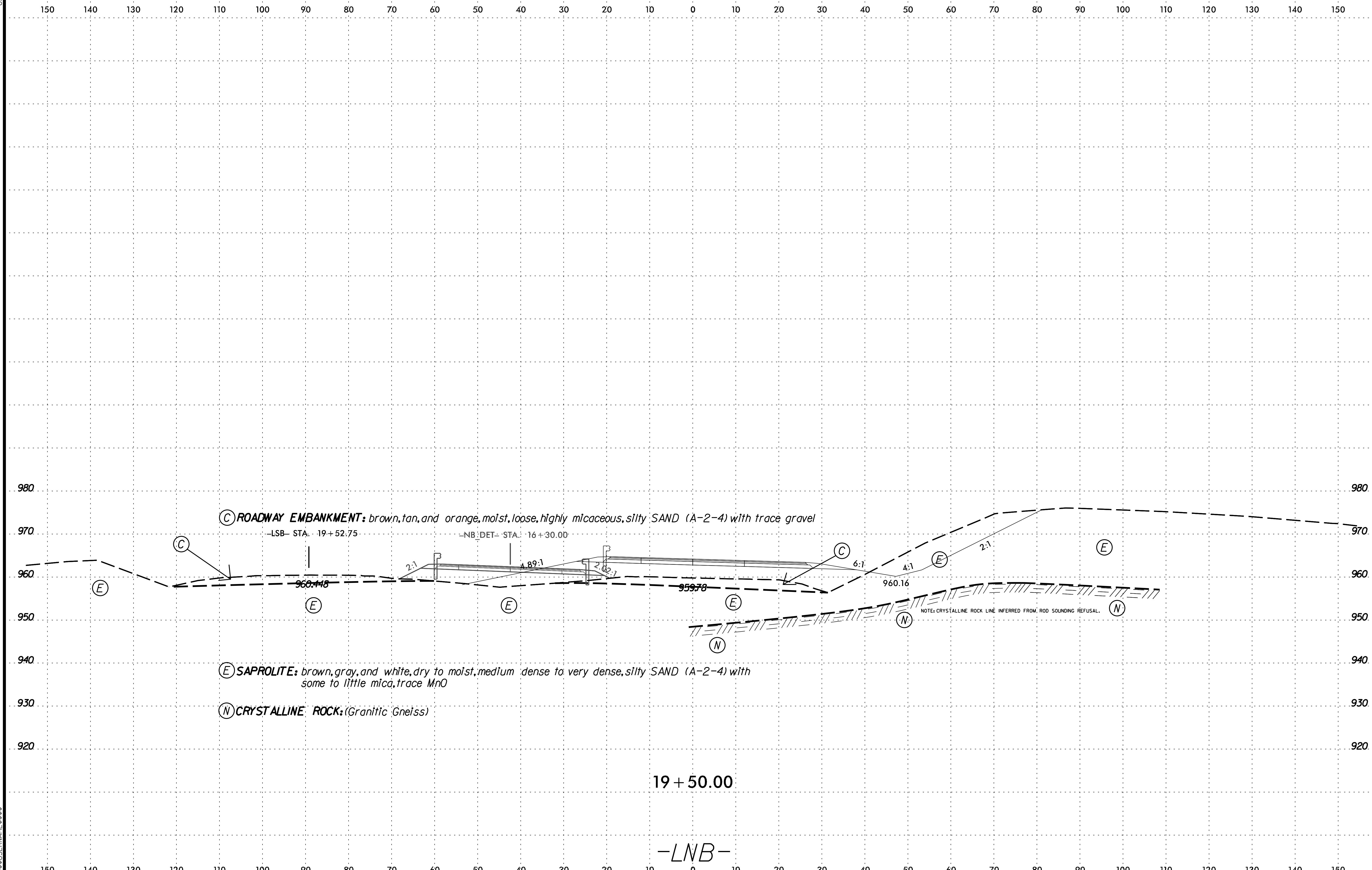

PROJ. REFERENCE NO.
B-5527
SHEET NO.
21
0 5 10
LNB_1900
-LNB-
19+00
75'RT
RSR
LSB_1900
-LSB-
19+00
35'LT
BT
DRY
(02/22)
-LSB- STA. 19+08.00
-NB_DET- STA. 15+82.20
961.537
961.11
960.45
NOTE: CRYSTALLINE ROCK LINE INFERRED FROM ROD SOUNDING REFUSAL.
(B) ROADWAY EMBANKMENT: brown and orange, moist, soft, sandy SILT (A-4) with some mica and little MnO
(E) SAPROLITE: brown, tan, red, orange, gray, and white, moist, loose to very dense, silty SAND (A-2-4) with some to little mica, trace gravel-sized crystalline rock fragments and MnO
(N) CRYSTALLINE ROCK: (Granitic Gneiss)
19+00.00
-LNB-

PROJ. REFERENCE NO.	SHEET NO.
B-5527	22



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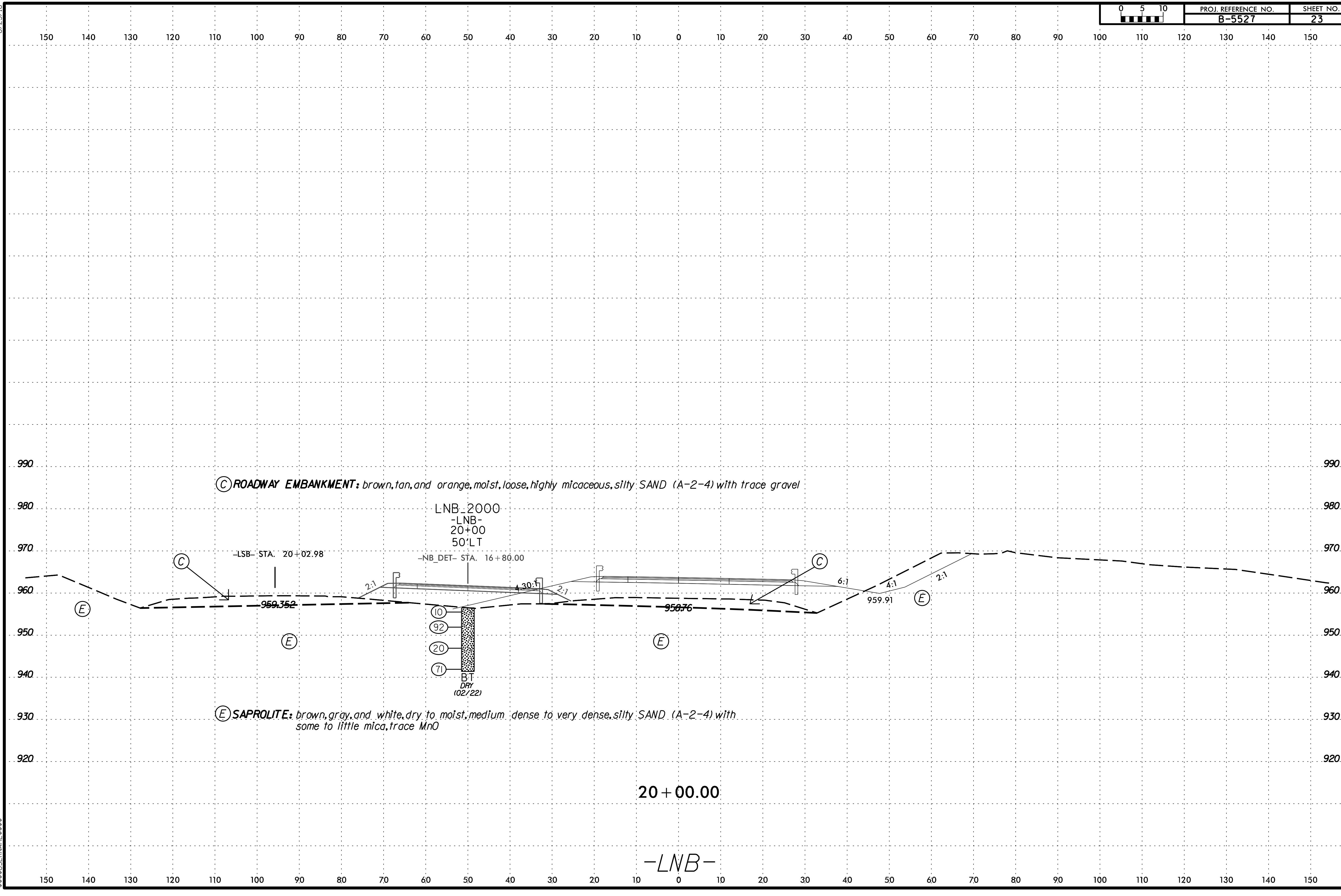
PROJ. REFERENCE NO.
B-5527
SHEET NO.
23
C ROADWAY EMBANKMENT: brown, tan, and orange, moist, loose, highly micaceous, silty SAND (A-2-4) with trace gravel
LNB_2000
-LNB-
20+00
50'LT
-LSB- STA. 20+02.98
-NB_DET- STA. 16+80.00
959.352
95876
959.91
BT
DRY
(02/22)
E SAPROLITE: brown, gray, and white, dry to moist, medium dense to very dense, silty SAND (A-2-4) with some to little mica, trace MnO
20+00.00
-LNB-
6/23/16
19-MAY-2022 13:15
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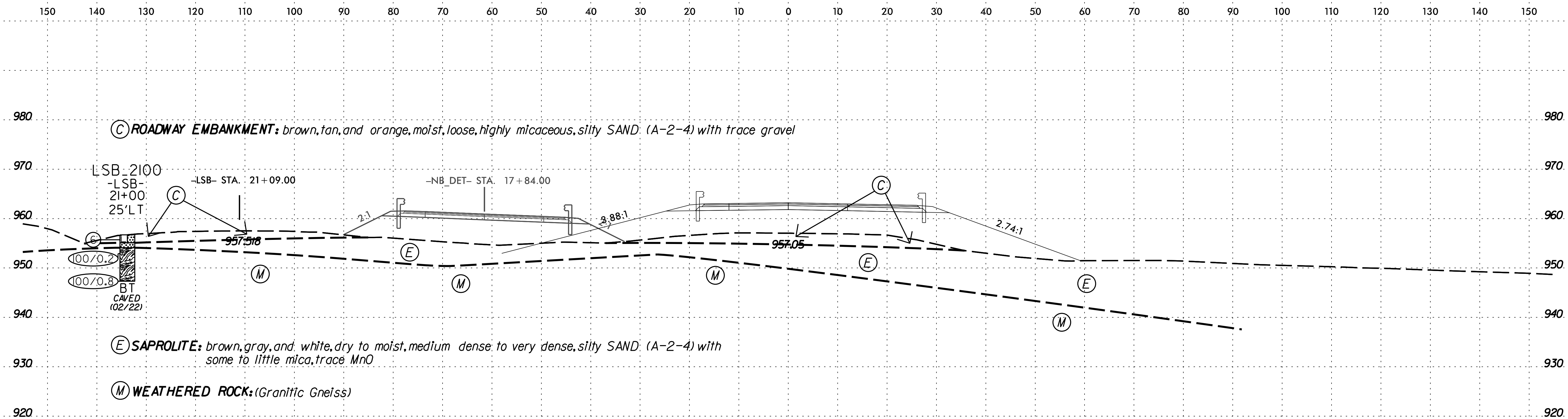
PROJ. REFERENCE NO.	SHEET NO.
B-5527	24



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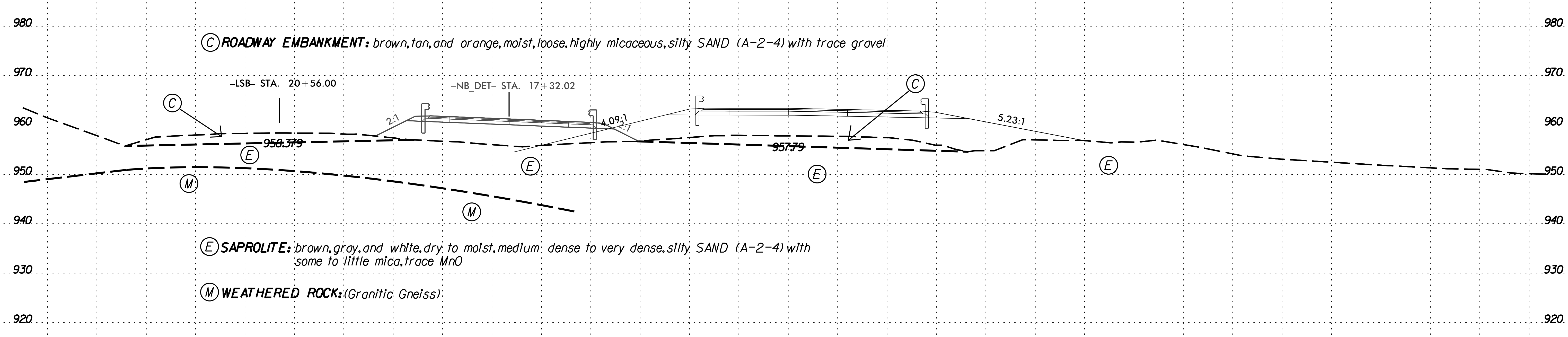

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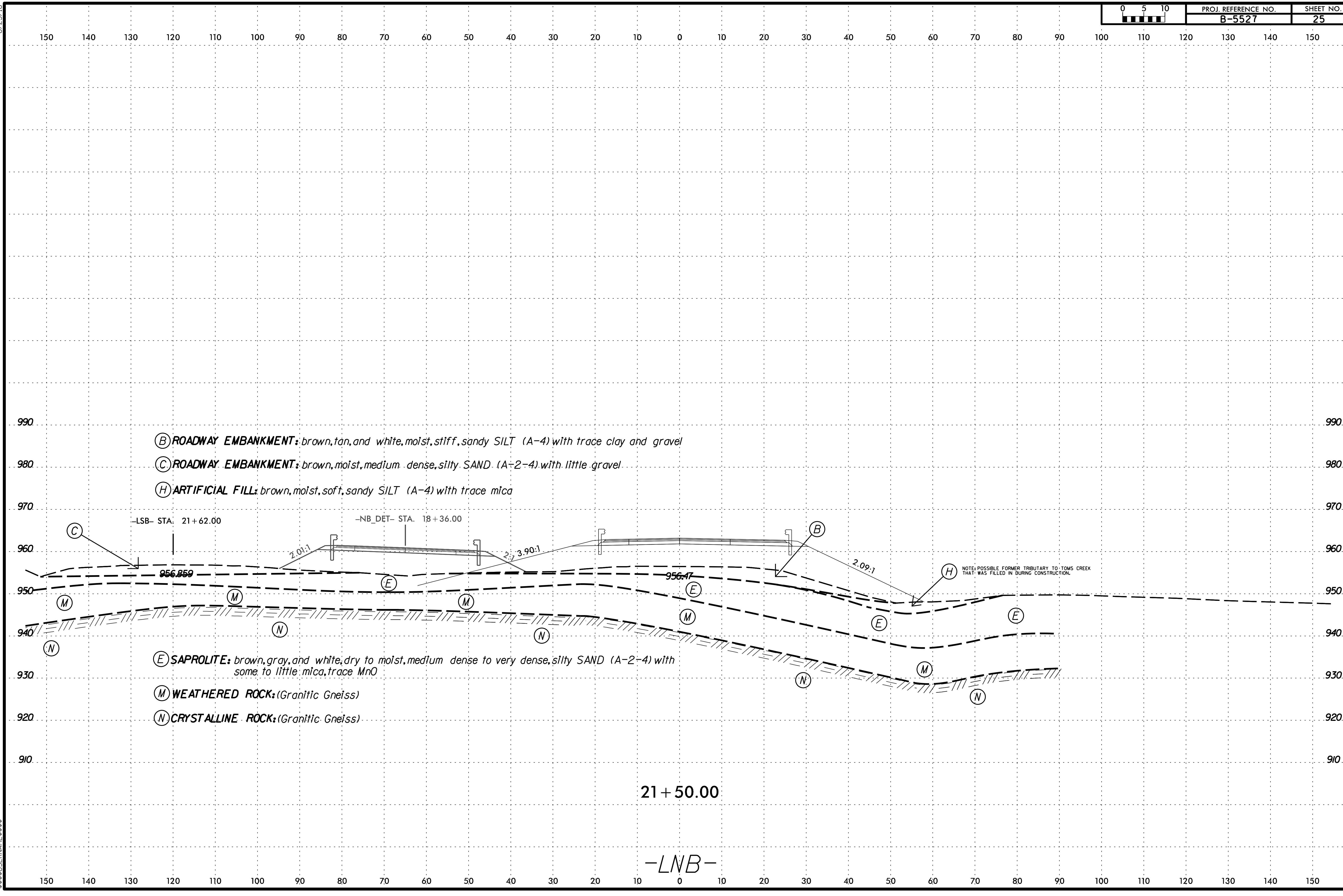
PROJ. REFERENCE NO.	SHEET NO.
B-5527	25



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SOIL TEST RESULTS

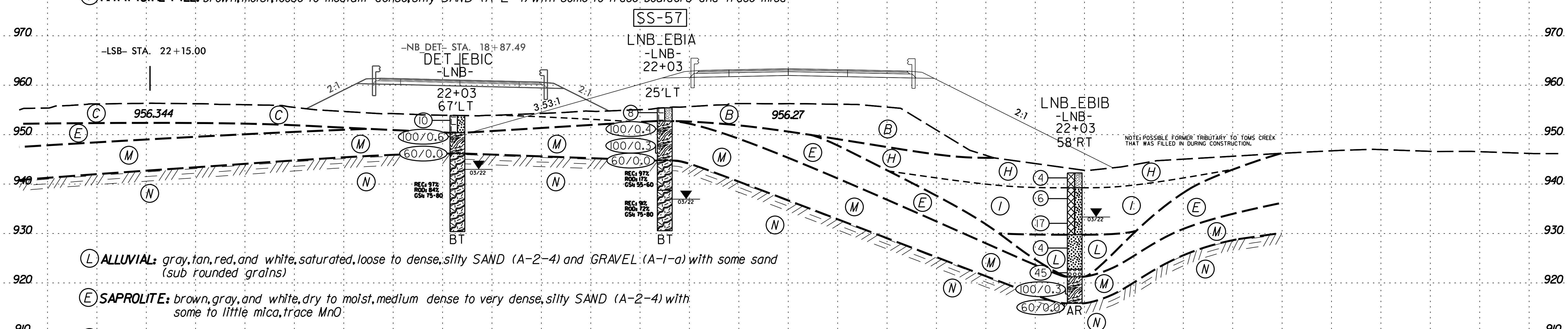
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-57	25'LT	22+03	0.0' - 1.5'	A-4(0)	28	4	22.0	33.1	36.3	8.6	78	66	44	N/A	N/A

(B) **ROADWAY EMBANKMENT:** brown, tan, and white, moist, stiff, sandy SILT (A-4) with trace clay and gravel

(C) **ROADWAY EMBANKMENT:** brown, moist, medium dense, silty SAND (A-2-4) with little gravel

(H) **ARTIFICIAL FILL:** brown, moist, soft, sandy SILT (A-4) with trace mica

(I) **ARTIFICIAL FILL:** brown, moist, loose to medium dense, silty SAND (A-2-4) with some to trace boulders and trace mica



(L) **ALLUVIAL:** gray, tan, red, and white, saturated, loose to dense, silty SAND (A-2-4) and GRAVEL (A-1-a) with some sand (sub rounded grains)

(E) **SAPROLITE:** brown, gray, and white, dry to moist, medium dense to very dense, silty SAND (A-2-4) with some to little mica, trace MnO

(M) **WEATHERED ROCK:** (Granitic Gneiss)

(N) **CRYSTALLINE ROCK:** (Granitic Gneiss)

NOTE: STRATIGRAPHY DRAWN THROUGH OFFSET BORING WITH BOTH PROJECTED ONTO THE NEAREST CROSS SECTION.

22+00.00

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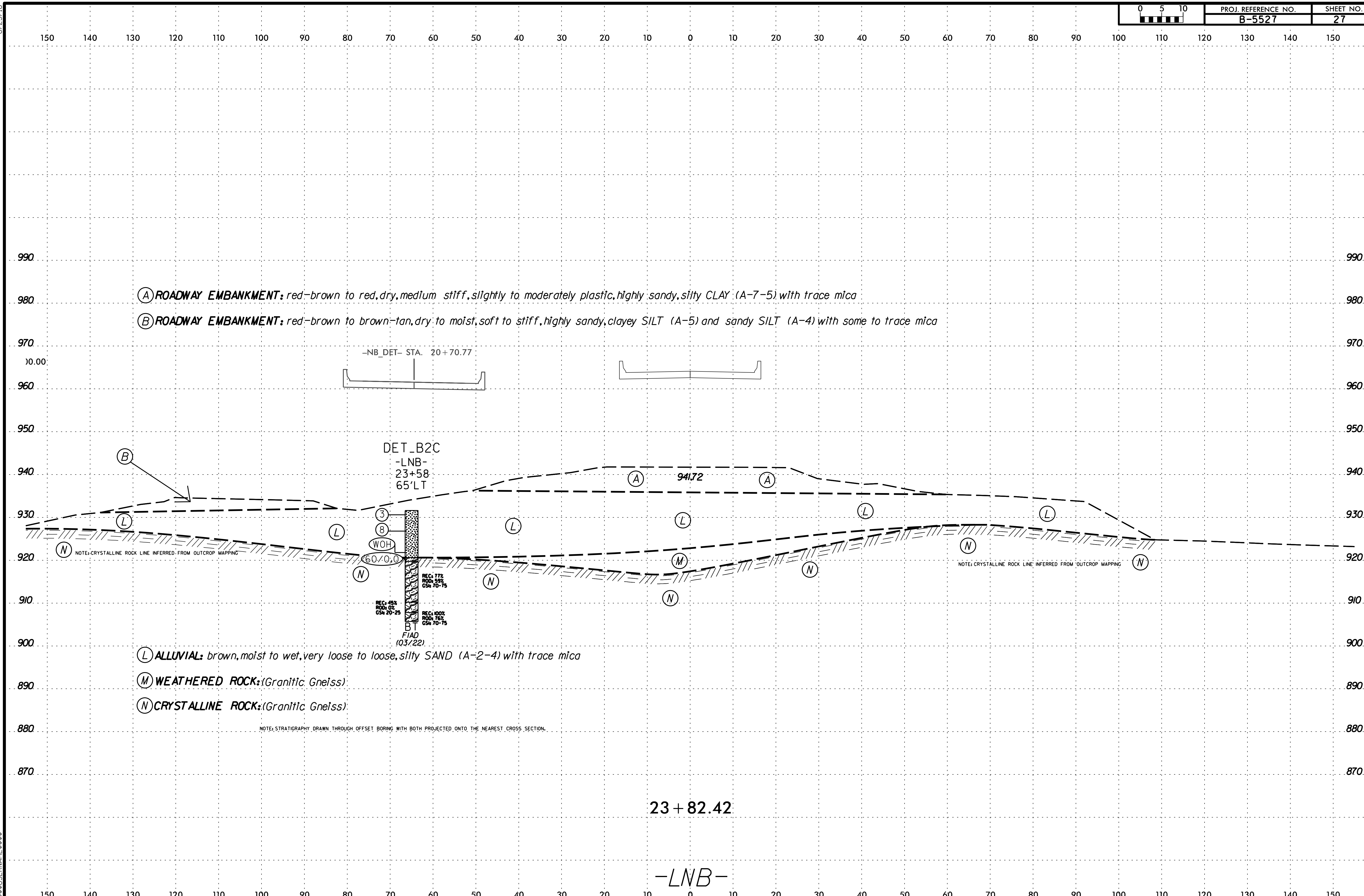
6/23/16



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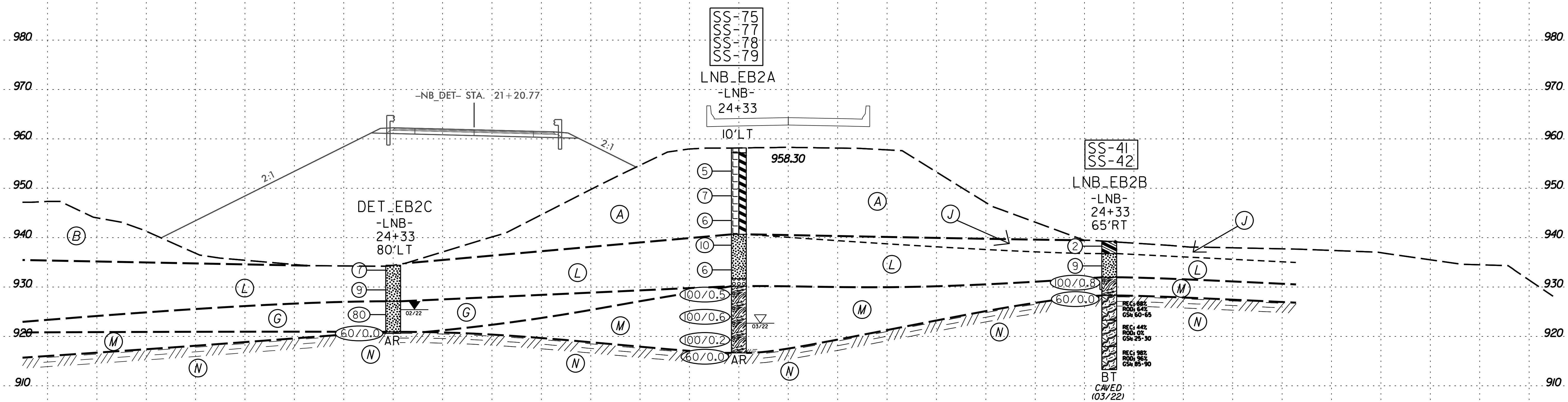
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-75	10'LT	24+33	3.7' - 5.2'	A-7-5(4)	42	12	15.4	45.1	15.2	24.3	98	90	49	N/A	N/A
SS-77	10'LT	24+33	13.7' - 15.2'	A-7-5(9)	54	19	12.2	33.8	15.1	38.9	92	87	56	N/A	N/A
SS-78	10'LT	24+33	18.7' - 20.2'	A-2-4(0)	18	0	24.4	54.7	10.8	10.1	99	91	26	N/A	N/A
SS-79	10'LT	24+33	23.7' - 25.2'	A-2-4(0)	27	6	21.2	47.6	12.9	18.3	93	86	33	N/A	N/A
SS-41	65'RT	24+33	0.0' - 1.5'	A-6(1)	28	12	18.1	47.2	6.6	28.1	95	91	38	N/A	N/A
SS-42	65'RT	24+33	4.0' - 5.5'	A-2-4(0)	34	6	29.3	43.6	7.3	19.8	89	74	34	N/A	N/A

(A) **ROADWAY EMBANKMENT:** red-brown to red, dry, medium stiff, slightly to moderately plastic, highly sandy, silty CLAY (A-7-5) with trace mica

(B) **ROADWAY EMBANKMENT:** red-brown to brown-tan, dry to moist, soft to stiff, highly sandy, clayey SILT (A-5) and sandy SILT (A-4) with some to trace mica



(J) **ALLUVIAL:** tan, moist, soft, slightly plastic, sandy CLAY (A-6)

(L) **ALLUVIAL:** brown, orange-brown, red-brown, and red-tan, moist to wet, loose to medium dense, silty SAND (A-2-4) with little clay, trace boulders and mica, and GRAVEL (A-1-a) with some sand (rounded grains)

(G) **RESIDUAL:** tan, brown, and white, dry, very dense, silty SAND (A-2-4) with some gravel-sized crystalline and weathered rock fragments

(M) **WEATHERED ROCK:** (Granitic Gneiss)

(N) **CRYSTALLINE ROCK:** (Granitic Gneiss)

24+32.43

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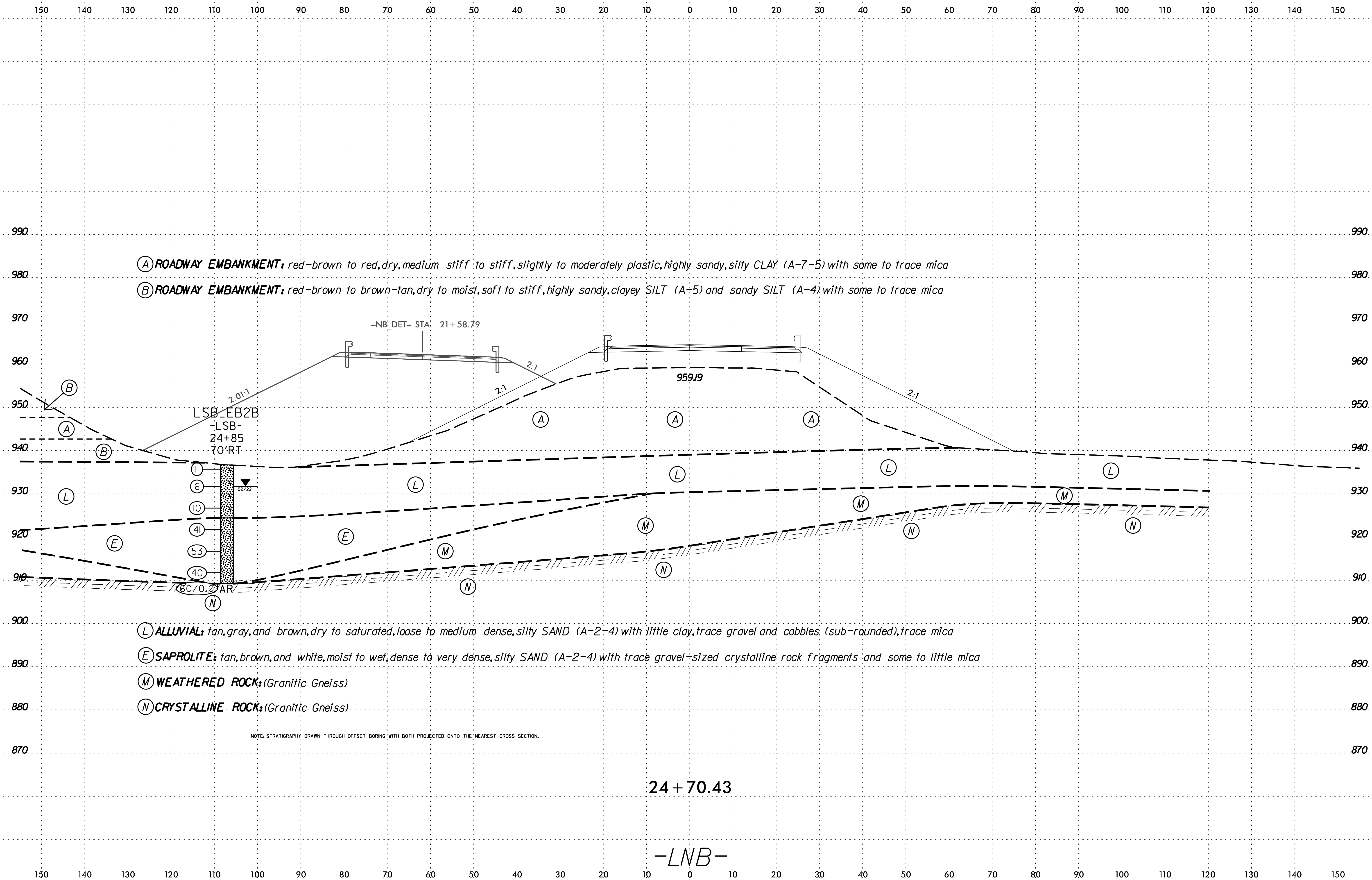
PROJ. REFERENCE NO.	SHEET NO.
B-5527	29



Ⓐ **ROADWAY EMBANKMENT:** *red-brown to red, dry, medium stiff to stiff, slightly to moderately plastic, highly sandy, silty CLAY (A-7-5) with some to trace mica*

Ⓑ **ROADWAY EMBANKMENT:** *red-brown to brown-tan, dry to moist, soft to stiff, highly sandy, clayey SILT (A-5) and sandy SILT (A-4) with some to trace mica*

Ⓛ **ALLUVIAL:** *tan, gray, and brown, dry to saturated, loose to medium dense, silty SAND (A-2-4) with little clay, trace gravel and cobbles (sub-rounded), trace mica*

Ⓔ **SAPROLITE:** *tan, brown, and white, moist to wet, dense to very dense, silty SAND (A-2-4) with trace gravel-sized crystalline rock fragments and some to little mica*

Ⓜ **WEATHERED ROCK:** *(Granitic Gneiss)*

Ⓝ **CRYSTALLINE ROCK:** *(Granitic Gneiss)*

NOTE: STRATIGRAPHY DRAWN THROUGH OFFSET BORING WITH BOTH PROJECTED ONTO THE NEAREST CROSS SECTION.

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PROJ. REFERENCE NO.	SHEET NO.
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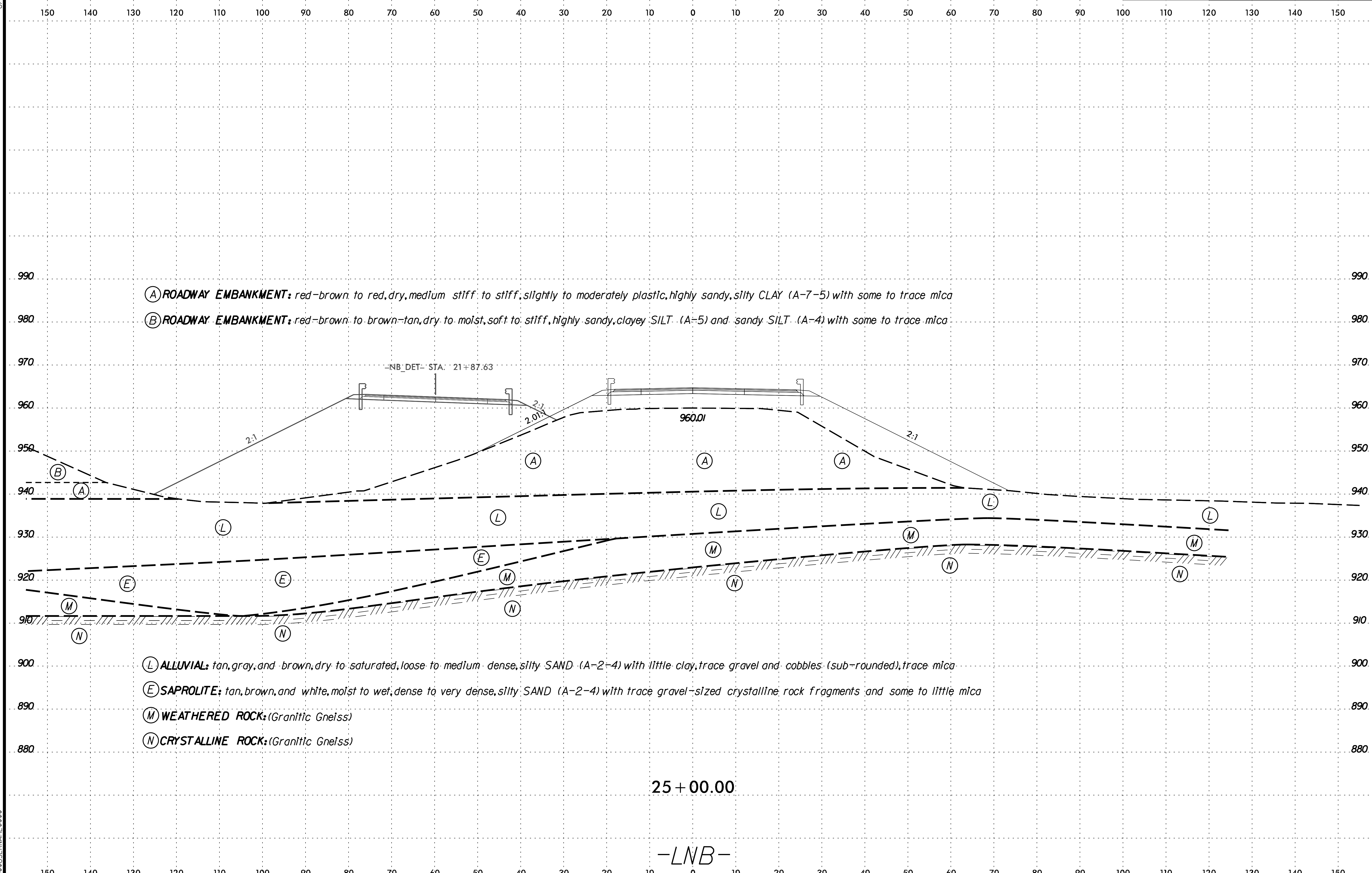

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PROJ. REFERENCE NO.	SHEET NO.
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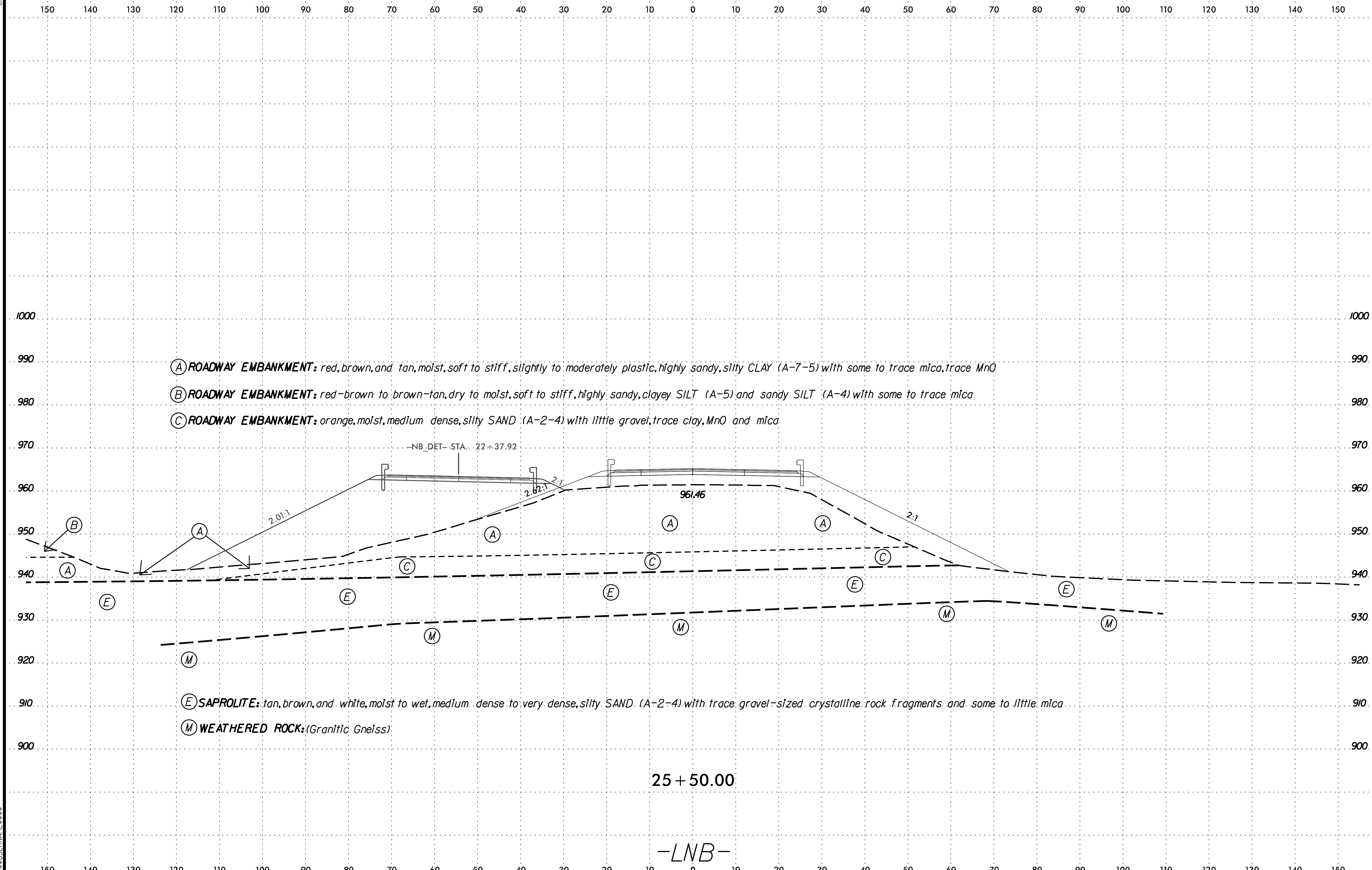

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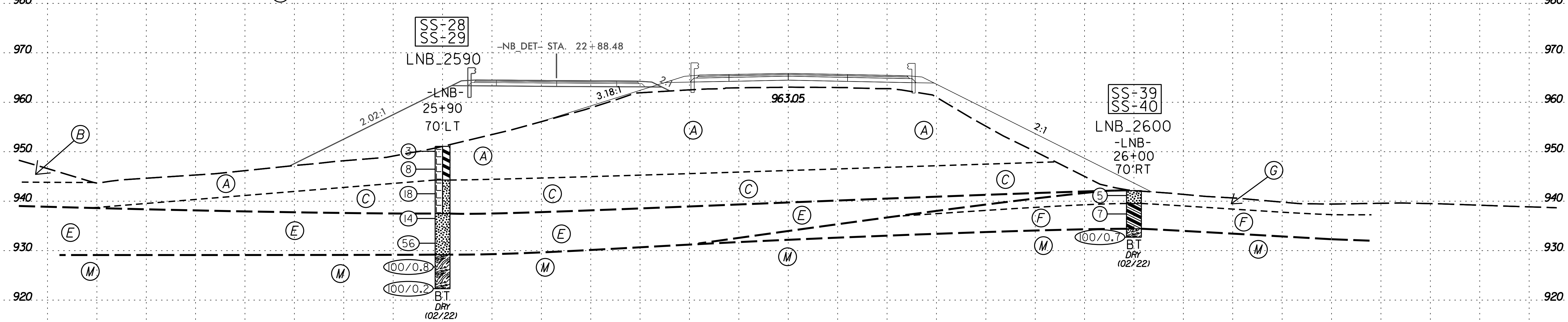
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-28	70'LT	25+90	0.0' - 1.5'	A-7-5(6)	43	13	13.1	37.4	21.8	27.7	98	92	56	N/A	N/A
SS-29	70'LT	25+90	3.6' - 5.1'	A-7-5(7)	51	20	21.0	31.4	2.4	45.2	97	88	50	N/A	N/A
SS-39	70'RT	26+00	0.0' - 1.5'	A-2-4(0)	19	2	14.2	59.3	8.4	18.1	100	96	34	N/A	N/A
SS-40	70'RT	26+00	3.7' - 5.2'	A-6(5)	35	13	7.7	44.6	12.3	35.4	100	98	54	N/A	N/A

(A) **ROADWAY EMBANKMENT:** red, brown, and tan, moist, soft to stiff, slightly to moderately plastic, highly sandy, silty CLAY (A-7-5) with some to trace mica, trace MnO

(B) **ROADWAY EMBANKMENT:** red-brown to brown-tan, dry to moist, soft to stiff, highly sandy, clayey SILT (A-5) and sandy SILT (A-4) with some to trace mica

(C) **ROADWAY EMBANKMENT:** orange, moist, medium dense, silty SAND (A-2-4) with little gravel, trace clay, MnO and mica



(G) **RESIDUAL:** tan, moist, loose, silty SAND (A-2-4) with little clay

(F) **RESIDUAL:** tan, moist, medium stiff, slightly plastic, sandy CLAY (A-6) with trace mica and MnO

(E) **SAPROLITE:** tan, brown, and white, moist, medium dense to very dense, silty SAND (A-2-4) with trace gravel-sized crystalline rock fragments

(M) **WEATHERED ROCK:** (Granitic Gneiss)

NOTE: STRATIGRAPHY DRAWN THROUGH OFFSET BORING WITH BOTH PROJECTED ONTO THE NEAREST CROSS SECTION.

26+00.00

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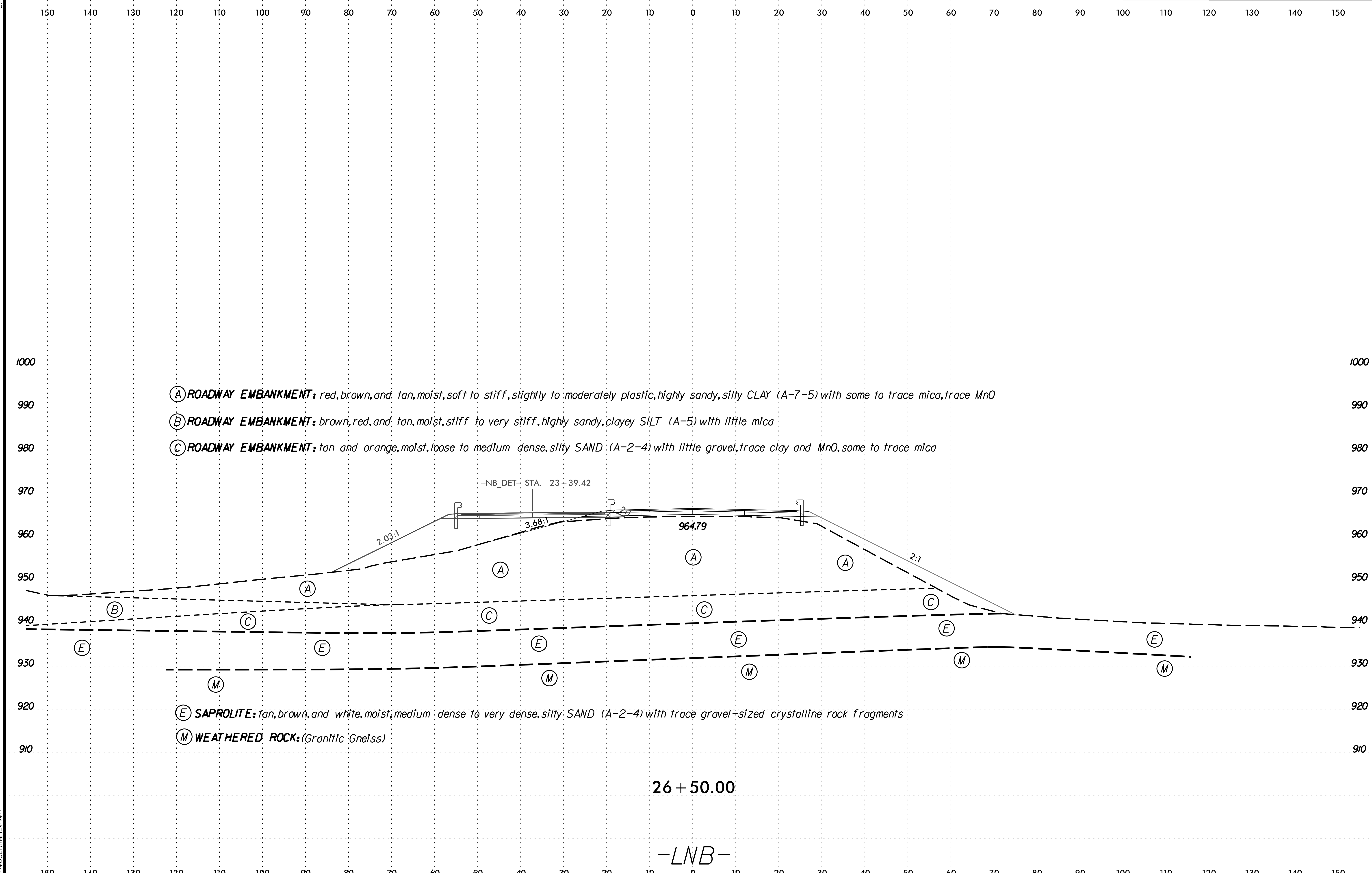
PROJ. REFERENCE NO.	SHEET NO.
B-5527	33



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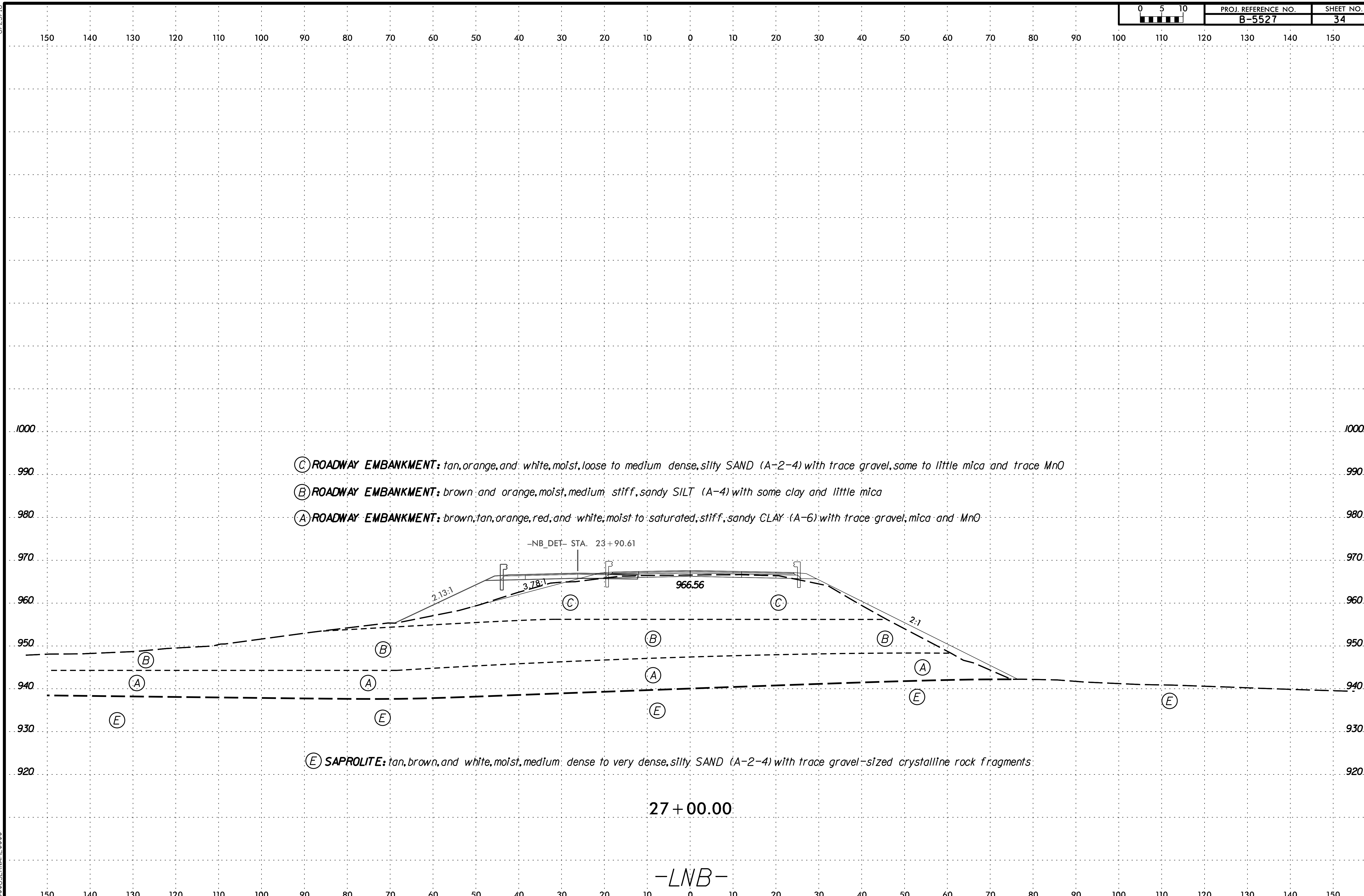
0 5 10
6/23/16
1000
990
980
970
960
950
940
930
920
(C) ROADWAY EMBANKMENT: tan, orange, and white, moist, loose to medium dense, silty SAND (A-2-4) with trace gravel, some to little mica and trace MnO
(B) ROADWAY EMBANKMENT: brown and orange, moist, medium stiff, sandy SILT (A-4) with some clay and little mica
(A) ROADWAY EMBANKMENT: brown, tan, orange, red, and white, moist to saturated, stiff, sandy CLAY (A-6) with trace gravel, mica and MnO
-NB_DET- STA. 23+90.61
2.13:1
3.78:1
966.56
2:1
(E) SAPROLITE: tan, brown, and white, moist, medium dense to very dense, silty SAND (A-2-4) with trace gravel-sized crystalline rock fragments
27+00.00
-LNB-
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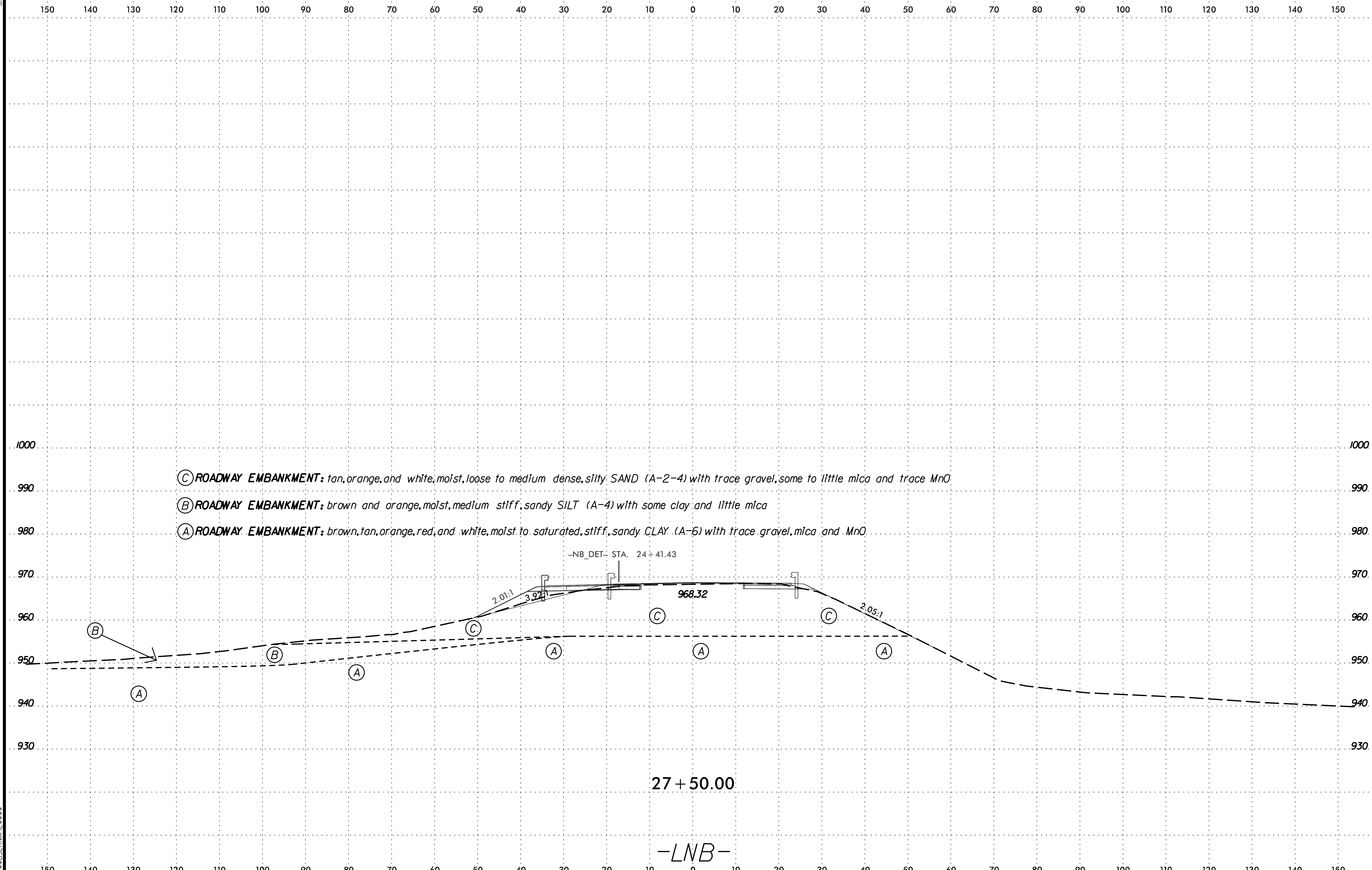

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PROJ. REFERENCE NO.	SHEET NO.
B-5527	36

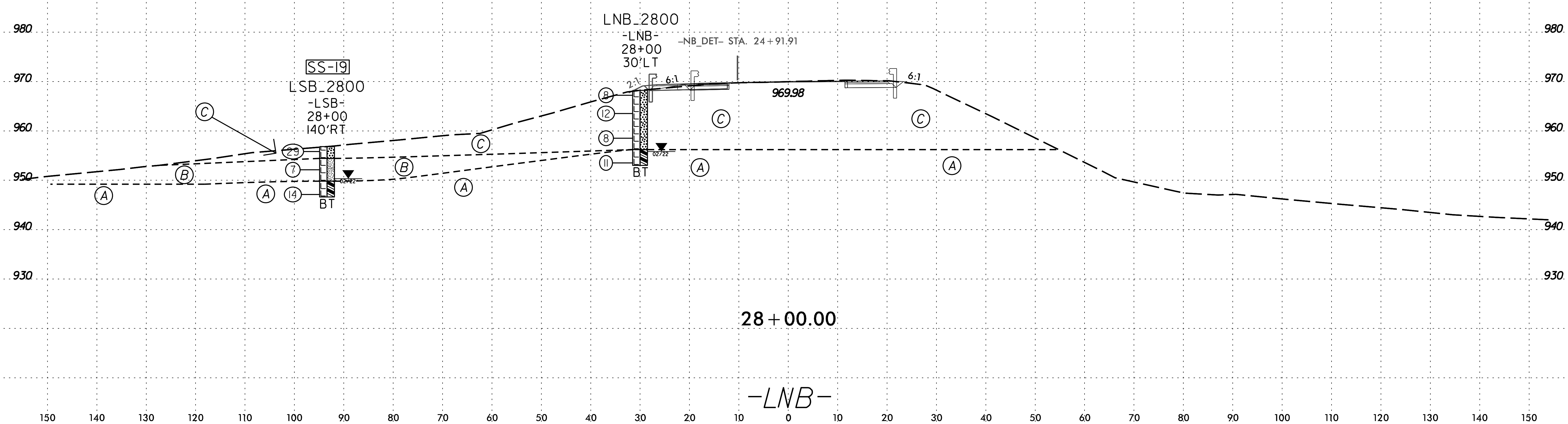
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-19	140'RT	28+00	3.7' - 5.2'	A-4(0)	27	6	17.5	49.6	8.7	24.2	94	88	38	N/A	N/A

(C) **ROADWAY EMBANKMENT:** tan, orange, and white, moist, loose to medium dense, silty SAND (A-2-4) with trace gravel, some to little mica and trace MnO

(B) **ROADWAY EMBANKMENT:** brown and orange, moist, medium stiff, sandy SILT (A-4) with some clay and little mica

(A) **ROADWAY EMBANKMENT:** brown, tan, orange, red, and white, moist to saturated, stiff, sandy CLAY (A-6) with trace gravel, mica and MnO



28+00.00

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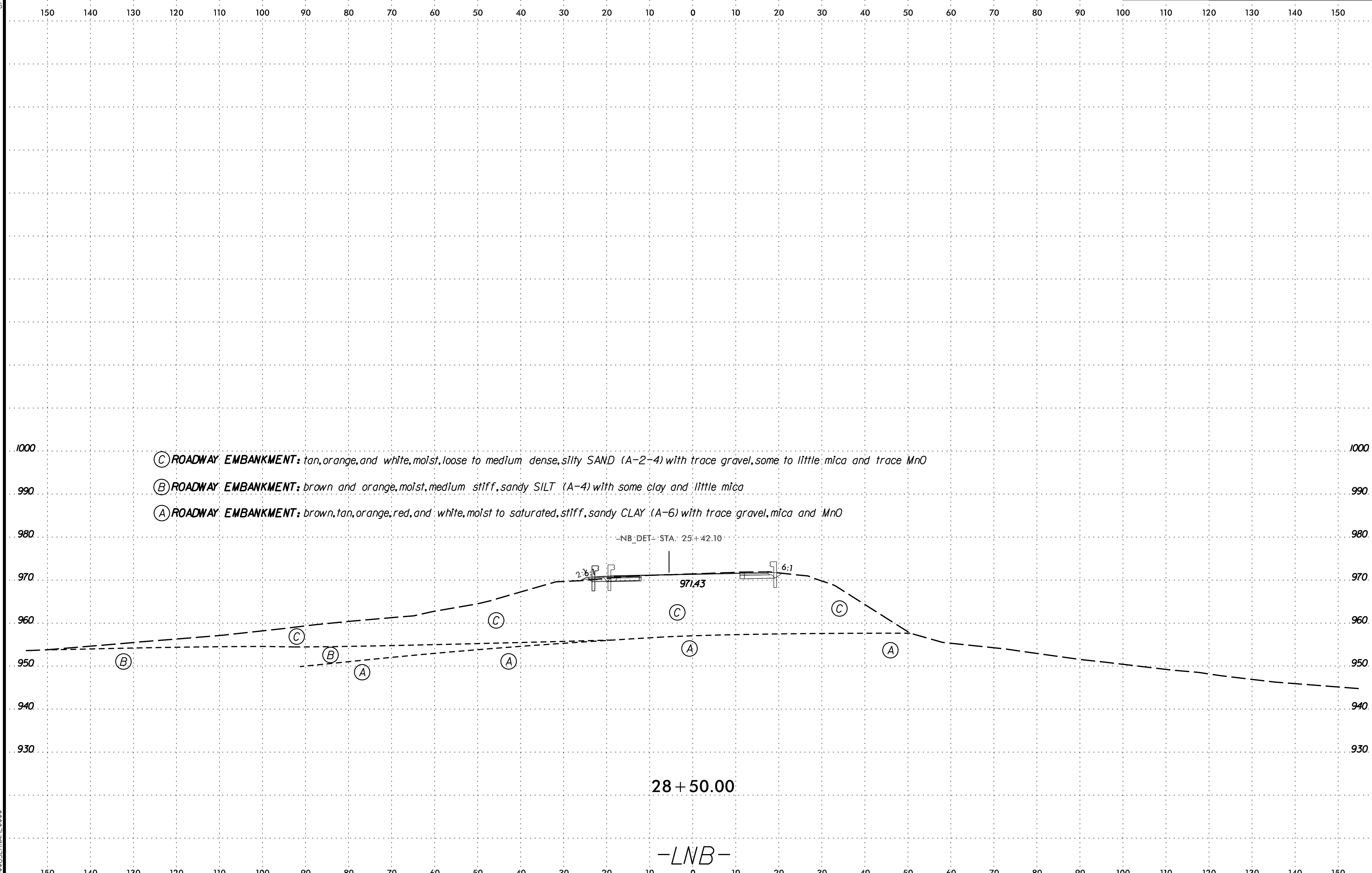
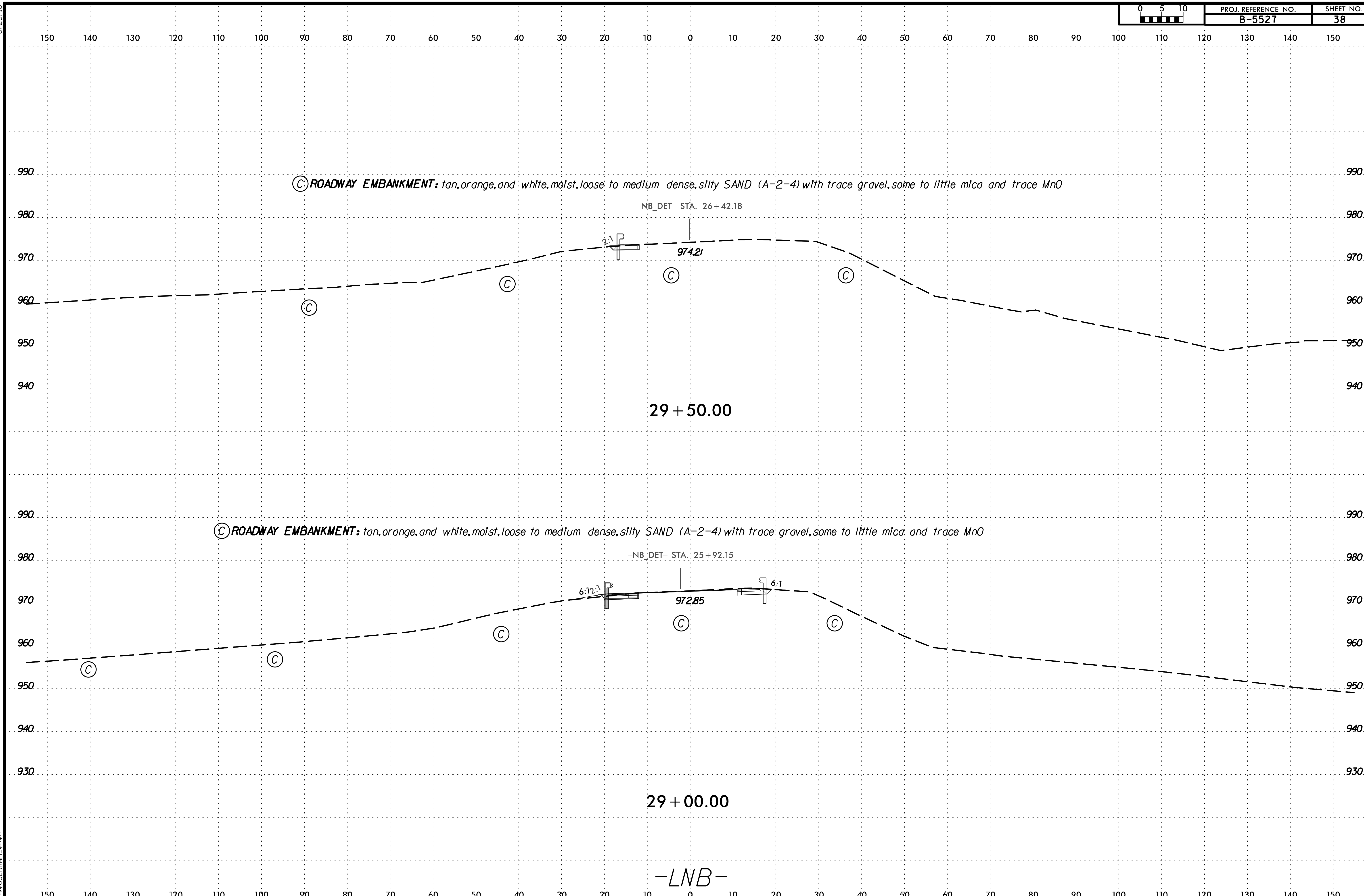
PROJ. REFERENCE NO.	SHEET NO.
B-5527	37





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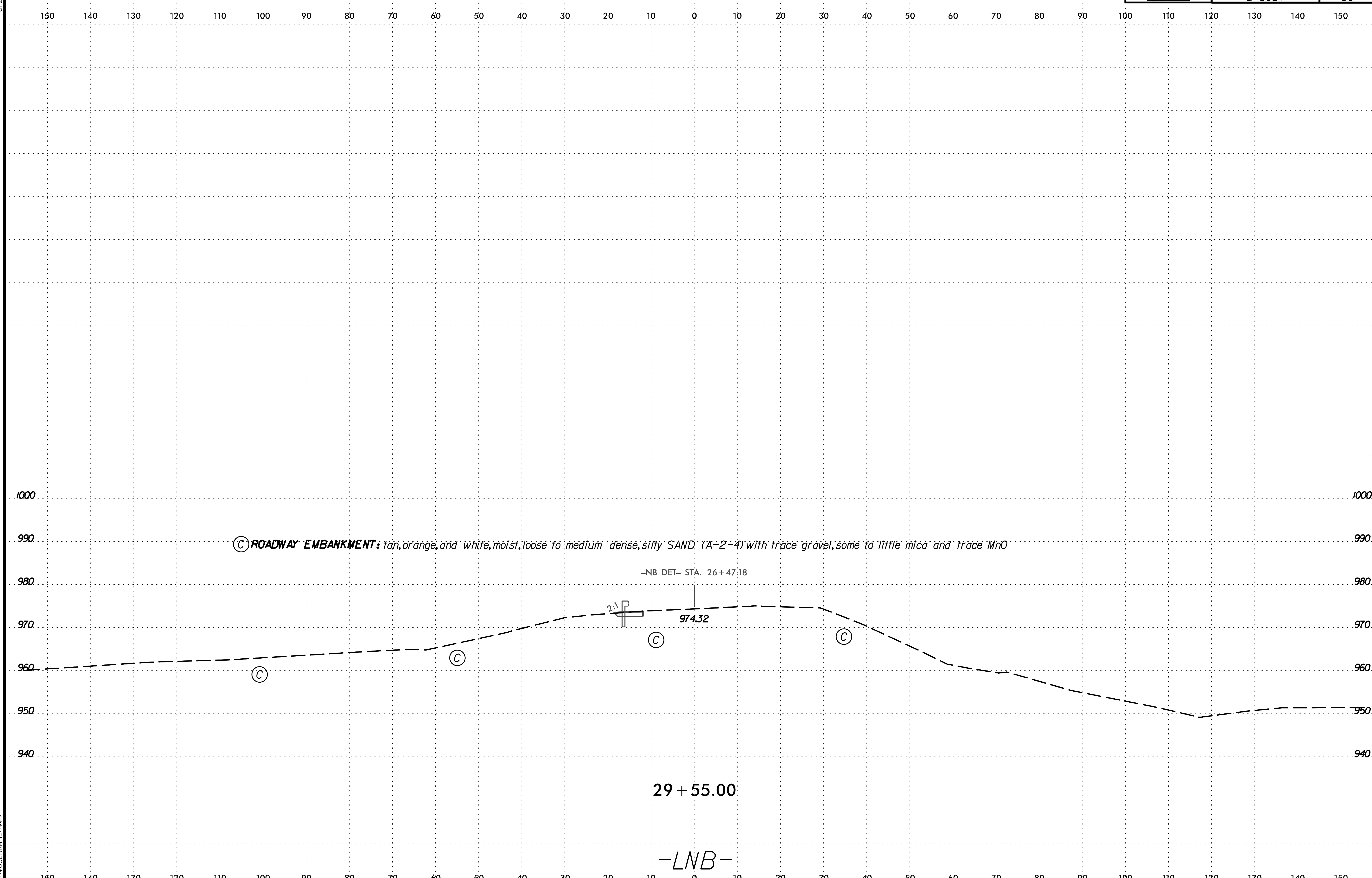
PROJ. REFERENCE NO.	SHEET NO.
B-5527	39



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PROJ. REFERENCE NO.	SHEET NO.
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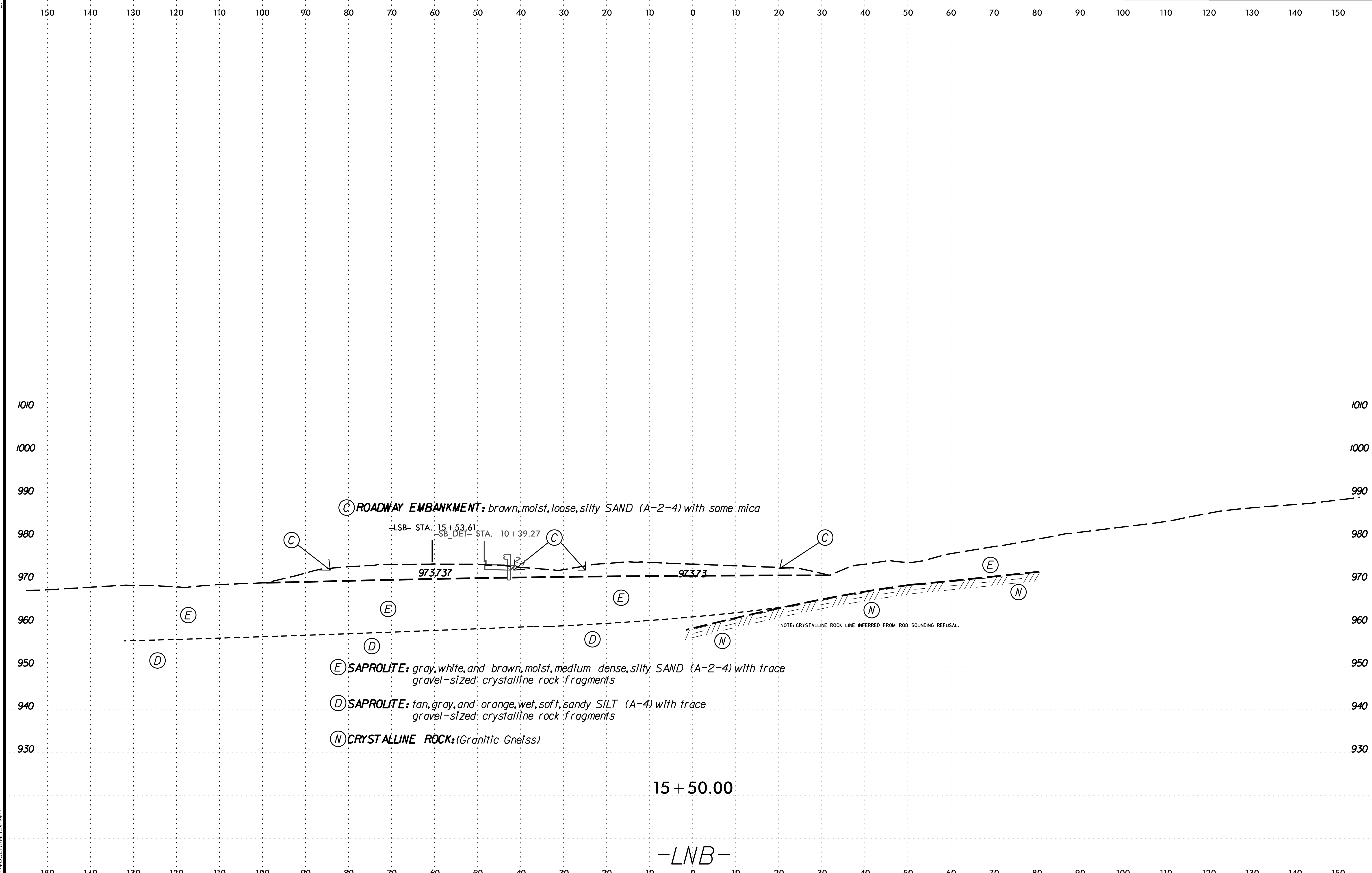

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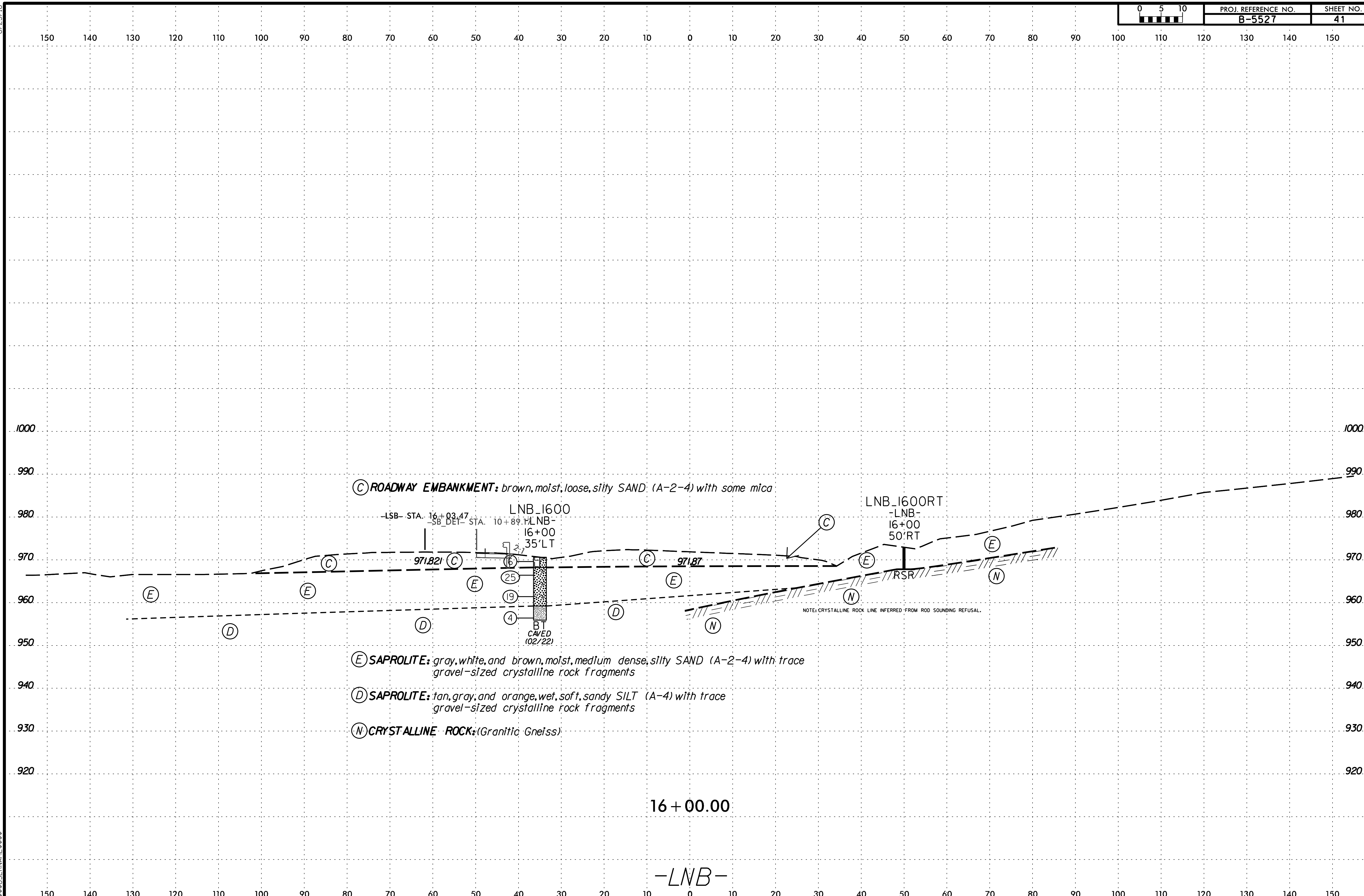

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PROJ. REFERENCE NO.	SHEET NO.
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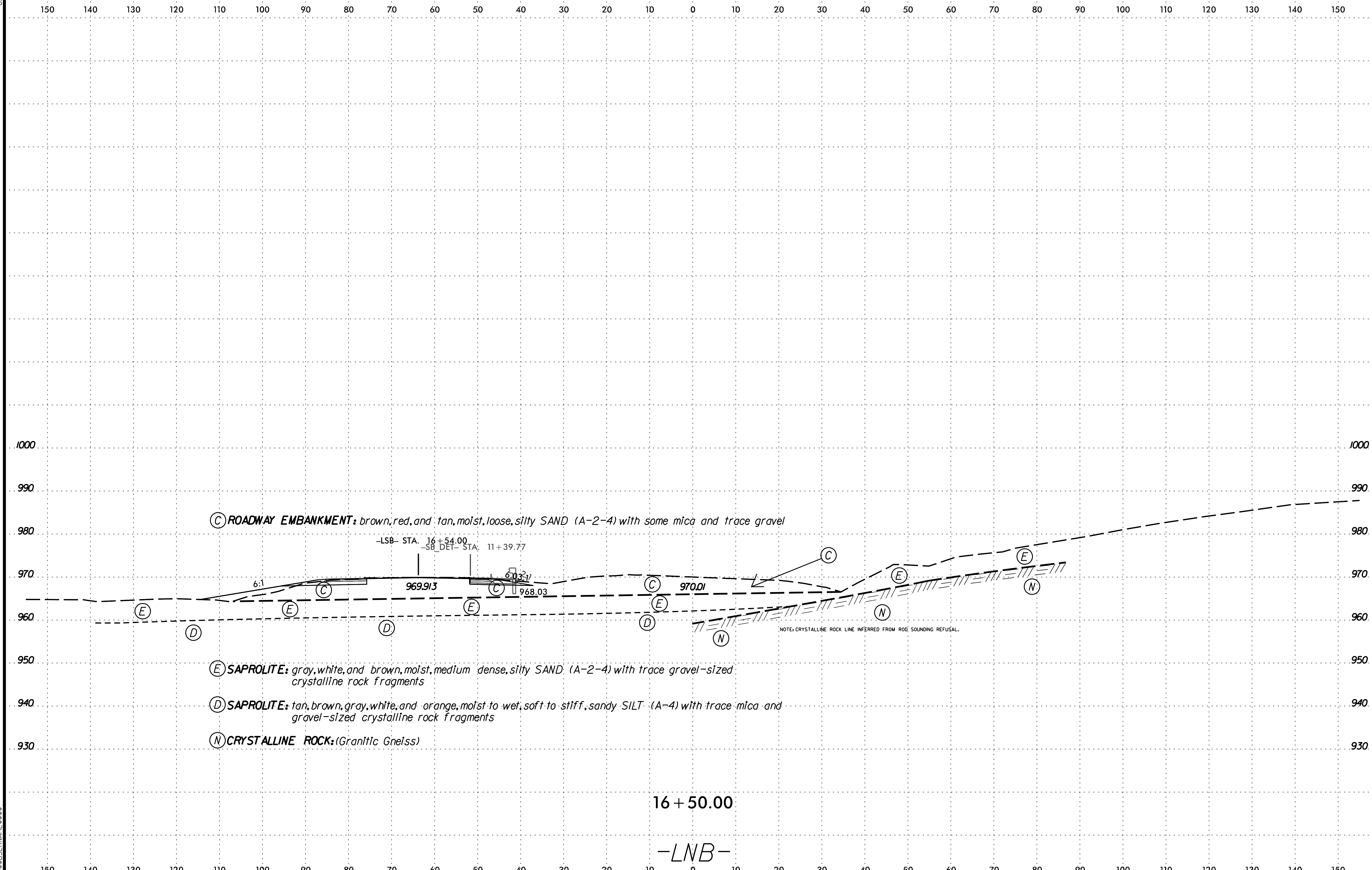

16+50.00

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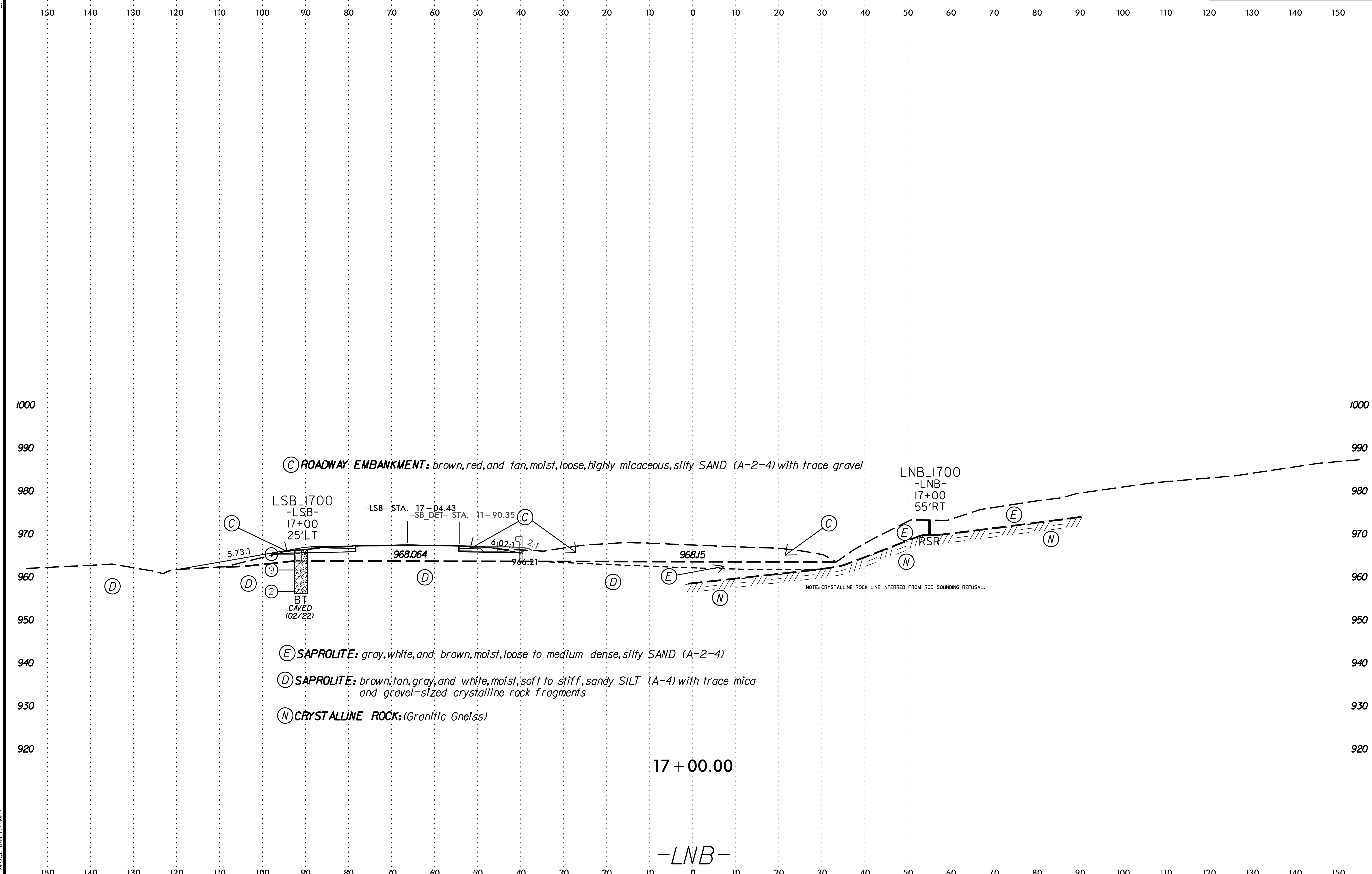
PROJ. REFERENCE NO.	SHEET NO.
B-5527	43



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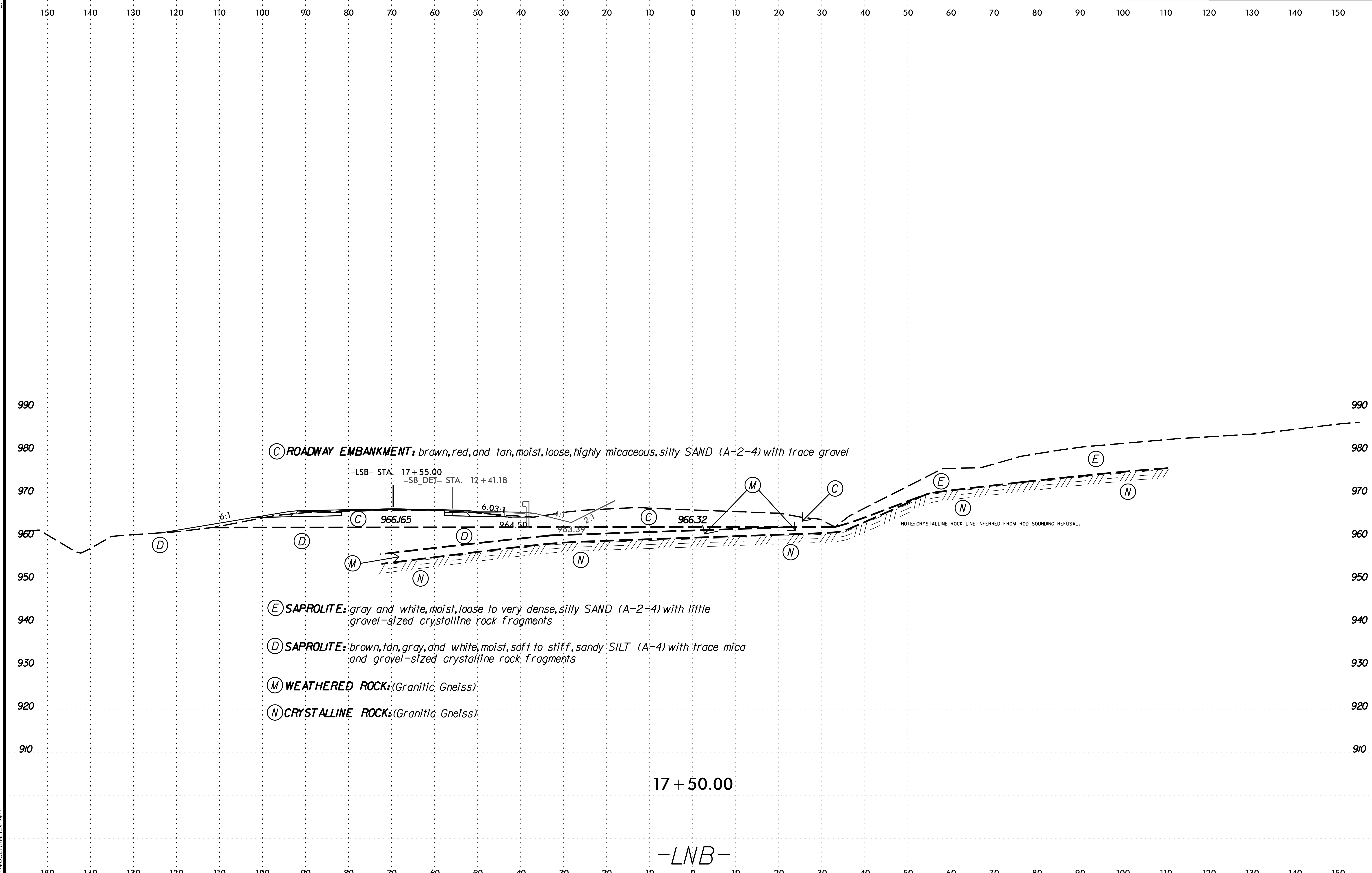
PROJ. REFERENCE NO.	SHEET NO.
B-5527	44



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PROJ. REFERENCE NO.	SHEET NO.
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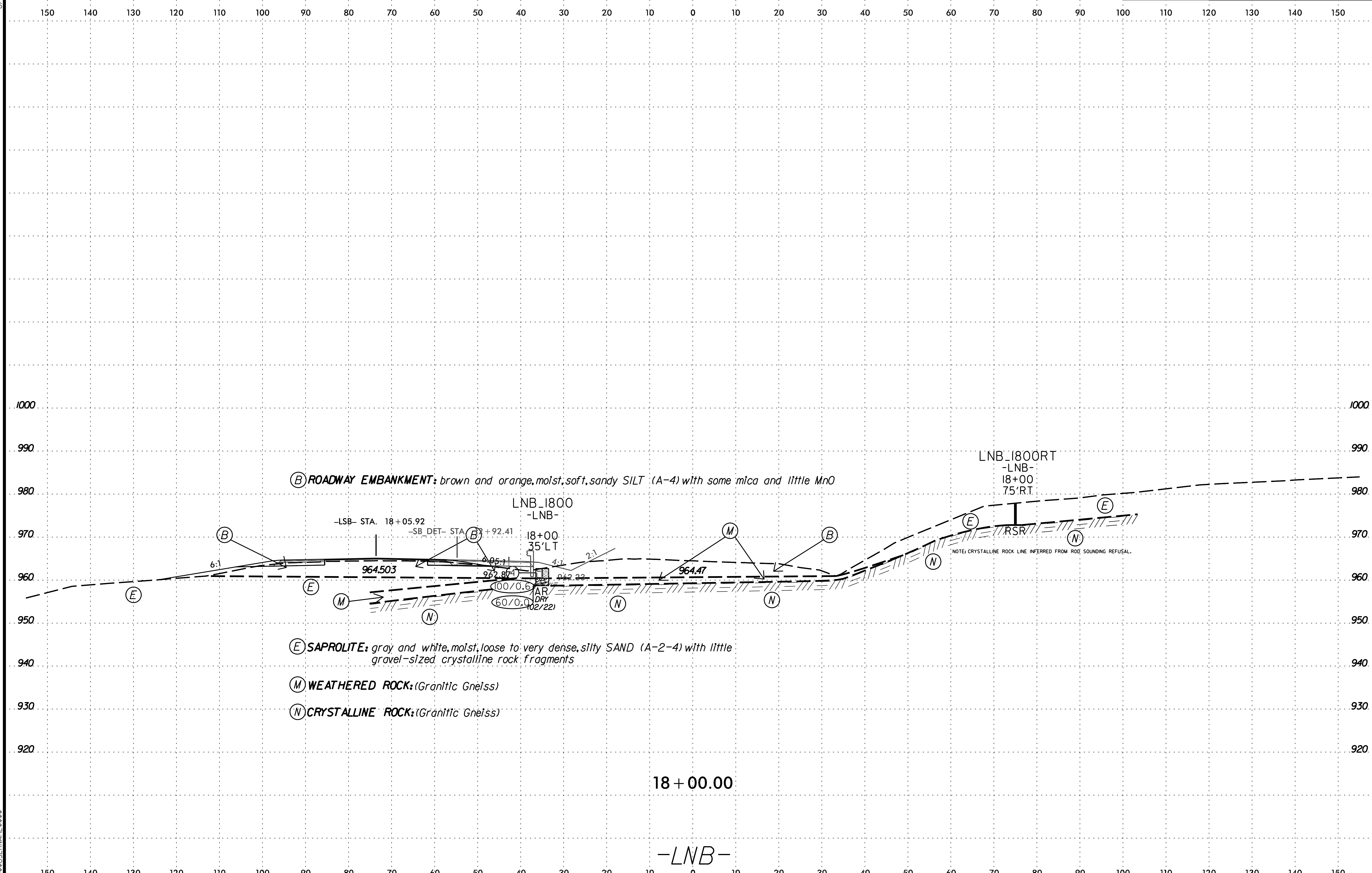

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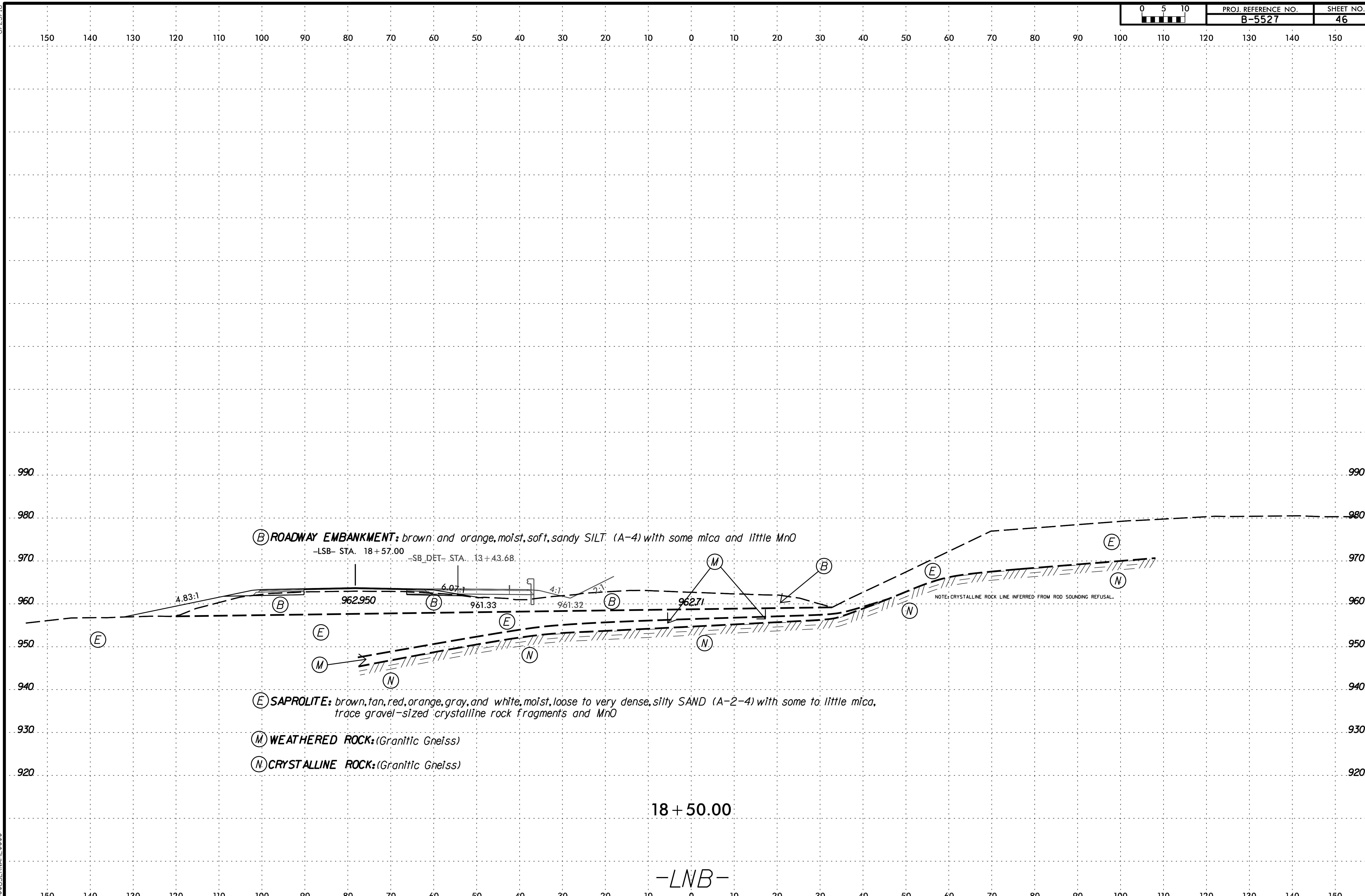

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PROJ. REFERENCE NO.	SHEET NO.
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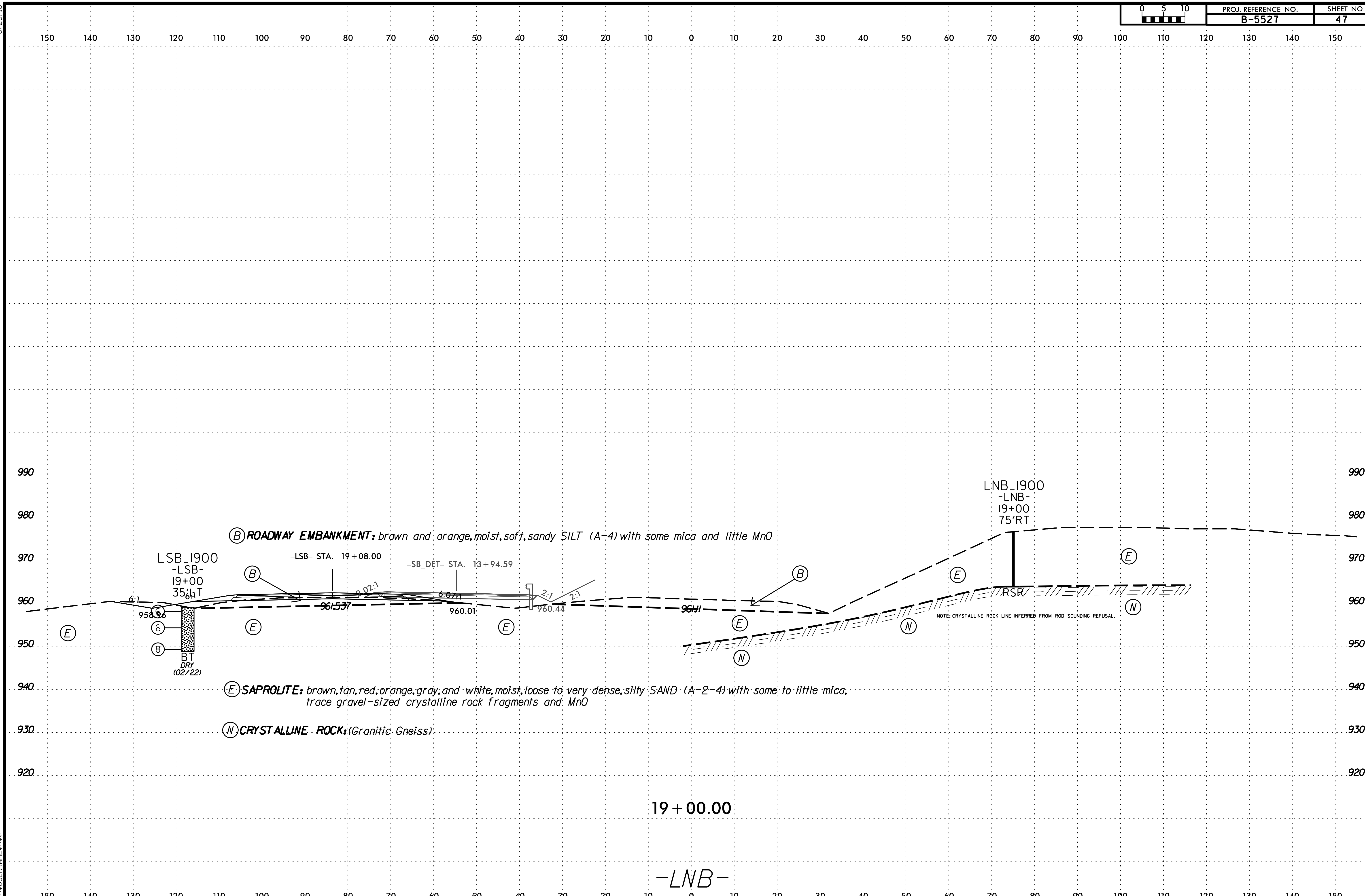

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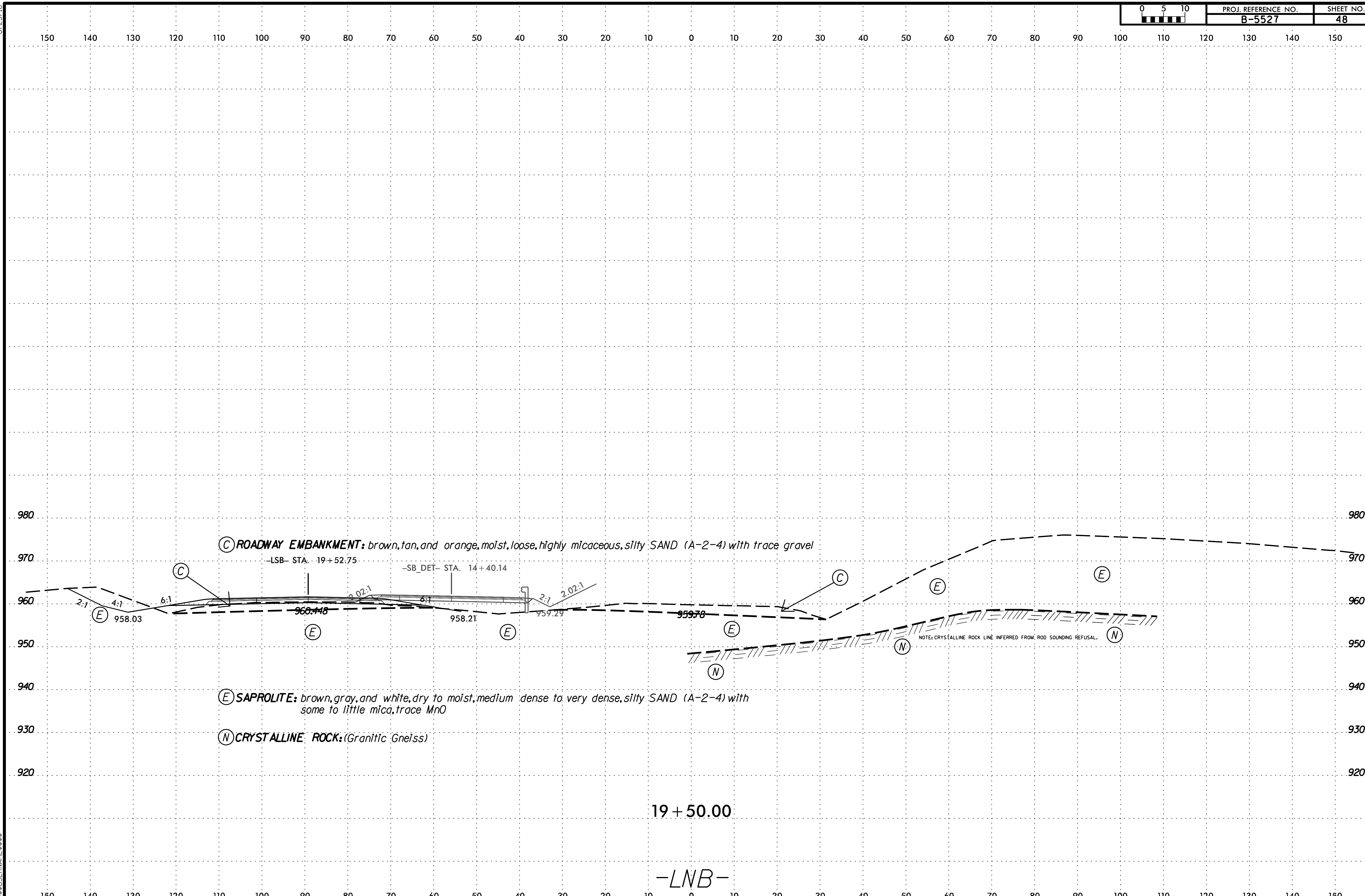
PROJ. REFERENCE NO.	SHEET NO.
B-5527	48



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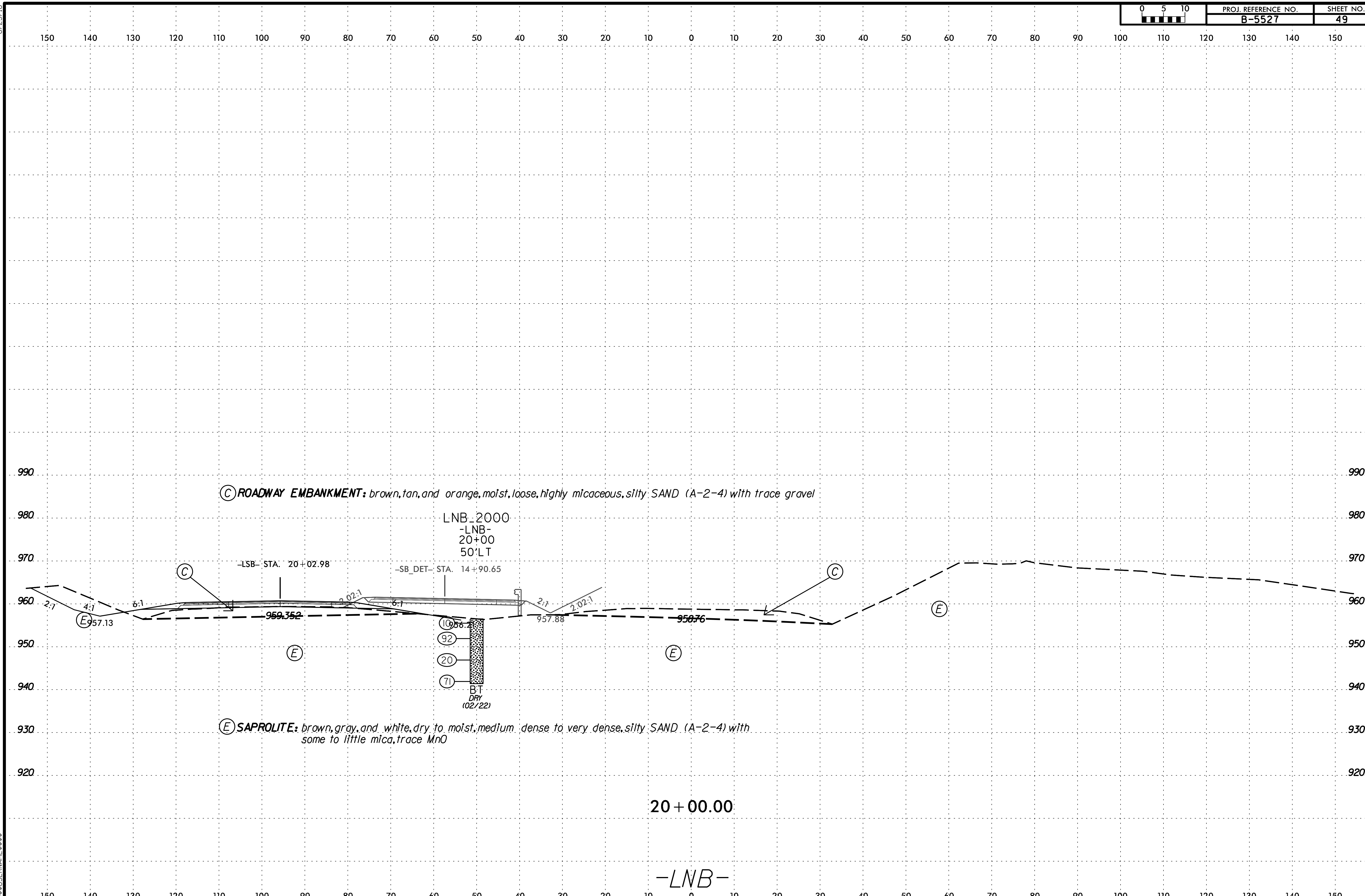
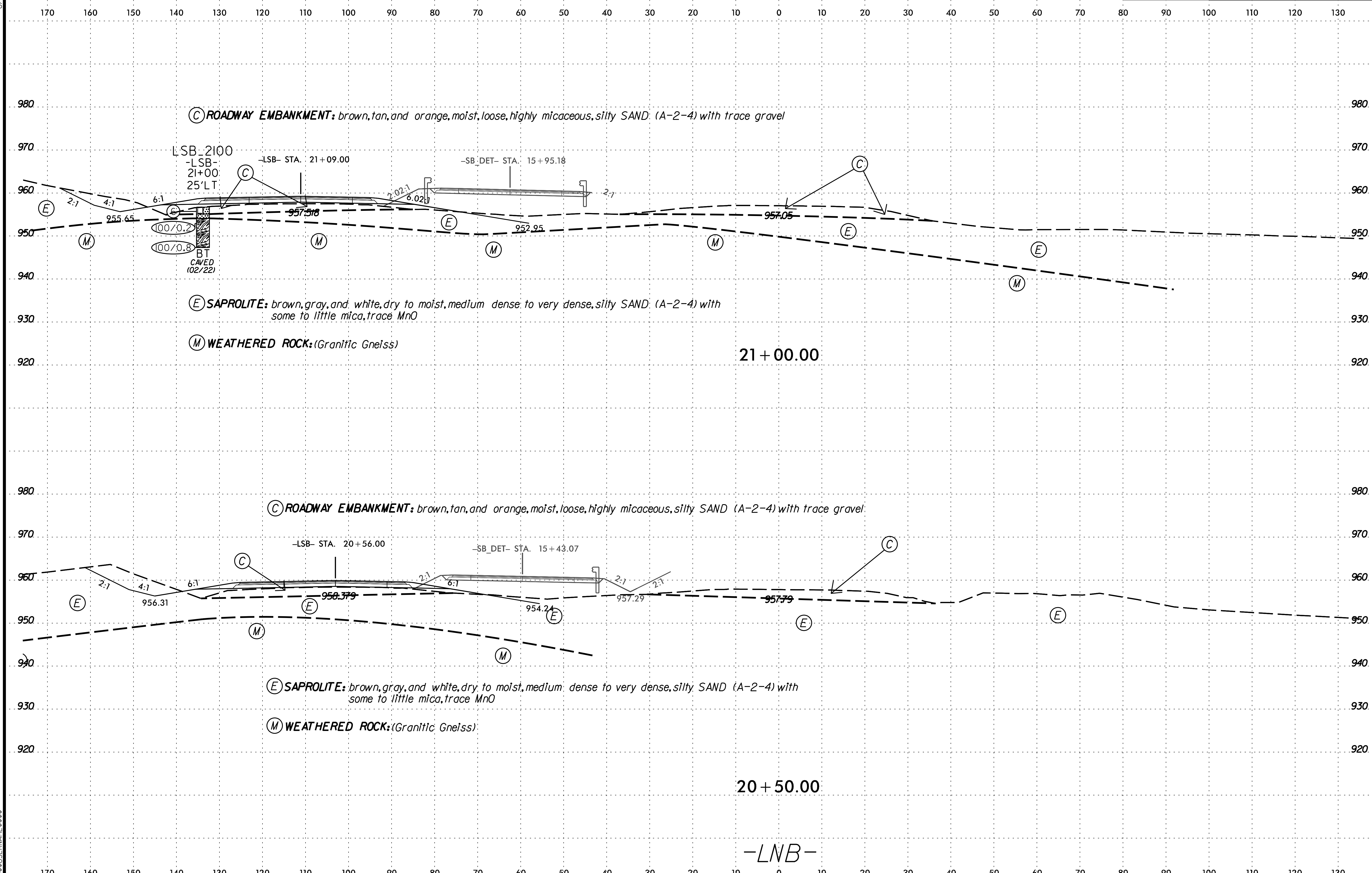


0 5 10
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
990
980
970
960
950
940
930
920
Ⓒ ROADWAY EMBANKMENT: brown, tan, and orange, moist, loose, highly micaceous, silty SAND (A-2-4) with trace gravel
LNB_2000
-LNB-
20+00
50'LT
-LSB- STA. 20+02.98
-SB_DET- STA. 14+90.65
2:1
4:1
6:1
2.02:1
957.13
959.352
956.2
957.88
958.76
10
92
20
71
BT
DRY
(02/22)
Ⓔ SAPROLITE: brown, gray, and white, dry to moist, medium dense to very dense, silty SAND (A-2-4) with some to little mica, trace MnO
20+00.00
-LNB-

6/23/16



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0 5 10	PROJ. REFERENCE NO.	SHEET NO.
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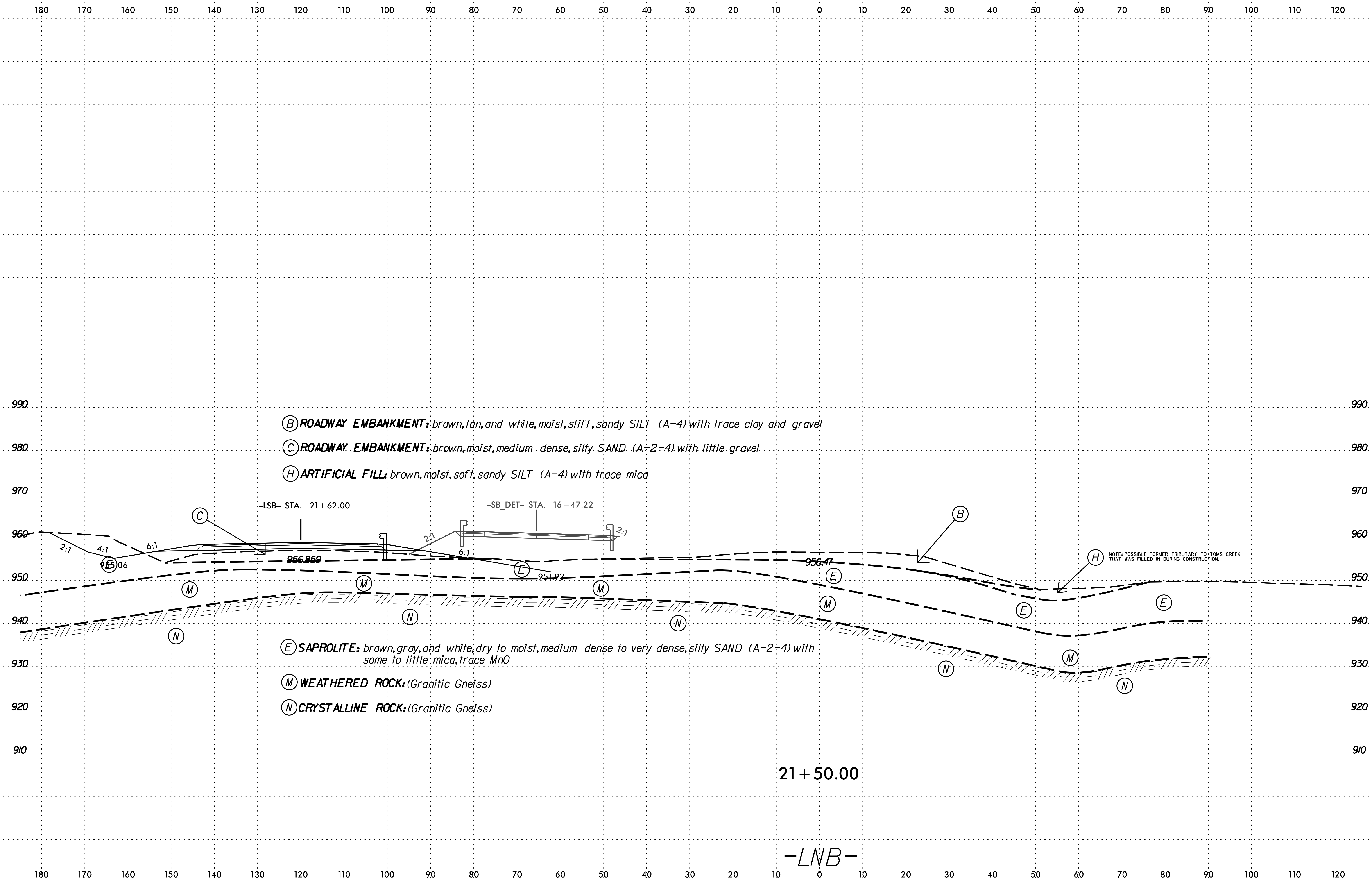

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SOIL TEST RESULTS

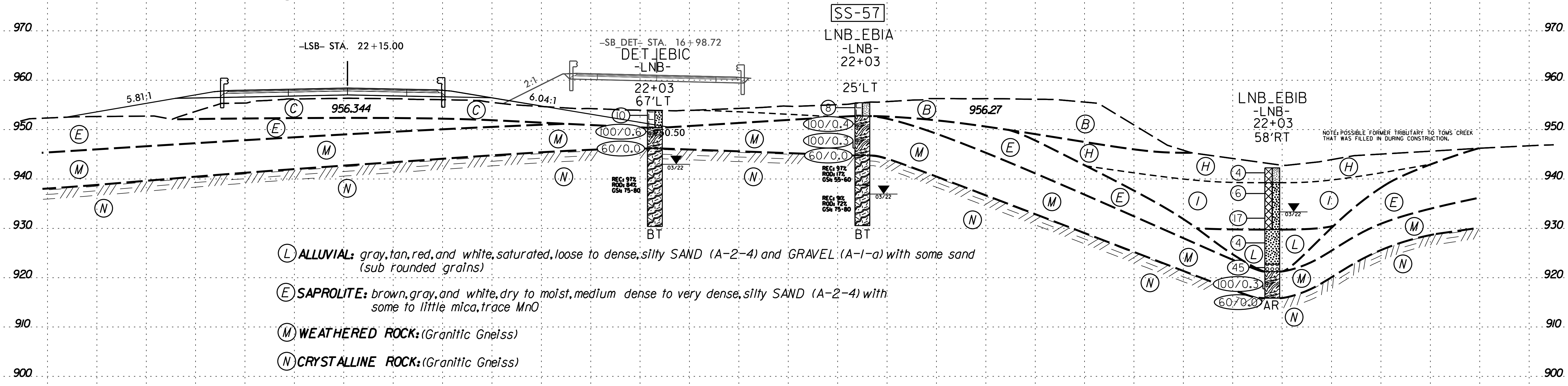
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-57	25'LT	22+03	0.0' - 1.5'	A-4(0)	28	4	22.0	33.1	36.3	8.6	78	66	44	N/A	N/A

(B) **ROADWAY EMBANKMENT:** brown, tan, and white, moist, stiff, sandy SILT (A-4) with trace clay and gravel

(C) **ROADWAY EMBANKMENT:** brown, moist, medium dense, silty SAND (A-2-4) with little gravel

(H) **ARTIFICIAL FILL:** brown, moist, soft, sandy SILT (A-4) with trace mica

(I) **ARTIFICIAL FILL:** brown, moist, loose to medium dense, silty SAND (A-2-4) with some to trace boulders and trace mica



(L) **ALLUVIAL:** gray, tan, red, and white, saturated, loose to dense, silty SAND (A-2-4) and GRAVEL (A-1-a) with some sand (sub rounded grains)

(E) **SAPROLITE:** brown, gray, and white, dry to moist, medium dense to very dense, silty SAND (A-2-4) with some to little mica, trace MnO

(M) **WEATHERED ROCK:** (Granitic Gneiss)

(N) **CRYSTALLINE ROCK:** (Granitic Gneiss)

NOTE: STRATIGRAPHY DRAWN THROUGH OFFSET BORING WITH BOTH PROJECTED ONTO THE NEAREST CROSS SECTION.

22+00.00

-LNB-

SOIL TEST RESULTS

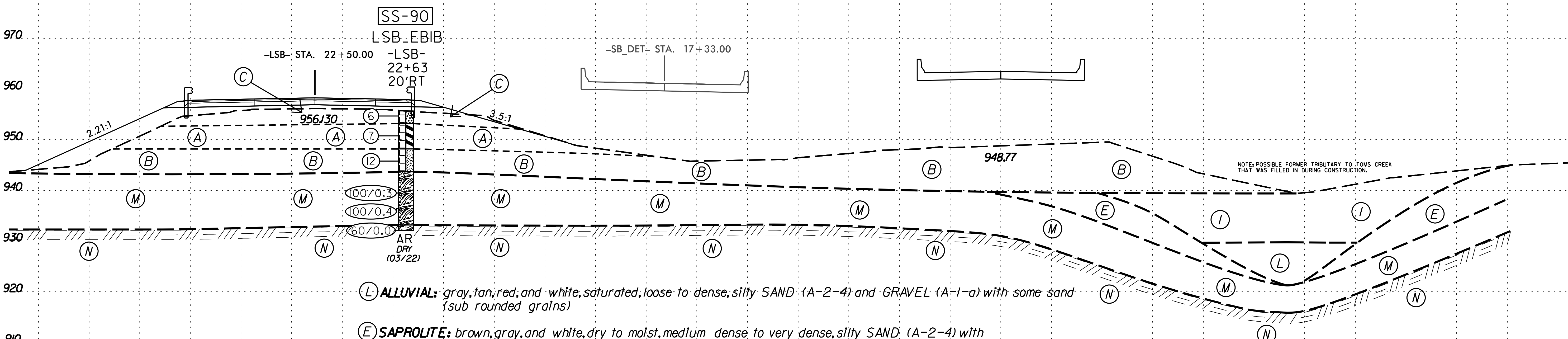
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-90	20'RT	22+63	3.9' - 5.4'	A-7-5(11)	51	18	17.7	22.6	10.9	48.8	95	84	62	N/A	N/A

(C) **ROADWAY EMBANKMENT:** red-tan, dry, loose, silty SAND (A-2-4) with trace mica

(A) **ROADWAY EMBANKMENT:** red, dry, medium stiff, moderately plastic, highly sandy, silty CLAY (A-7-5) with trace mica

(B) **ROADWAY EMBANKMENT:** gray and white, dry, stiff, sandy SILT (A-4)

(I) **ARTIFICIAL FILL:** brown, moist, loose to medium dense, silty SAND (A-2-4) with some to trace boulders and trace mica



(L) **ALLUVIAL:** gray, tan, red, and white, saturated, loose to dense, silty SAND (A-2-4) and GRAVEL (A-1-a) with some sand (sub rounded grains)

(E) **SAPROLITE:** brown, gray, and white, dry to moist, medium dense to very dense, silty SAND (A-2-4) with some to little mica, trace MnO

(M) **WEATHERED ROCK:** (Granitic Gneiss)

(N) **CRYSTALLINE ROCK:** (Granitic Gneiss)

NOTE: STRATIGRAPHY DRAWN THROUGH OFFSET BORING WITH BOTH PROJECTED ONTO THE NEAREST CROSS SECTION.

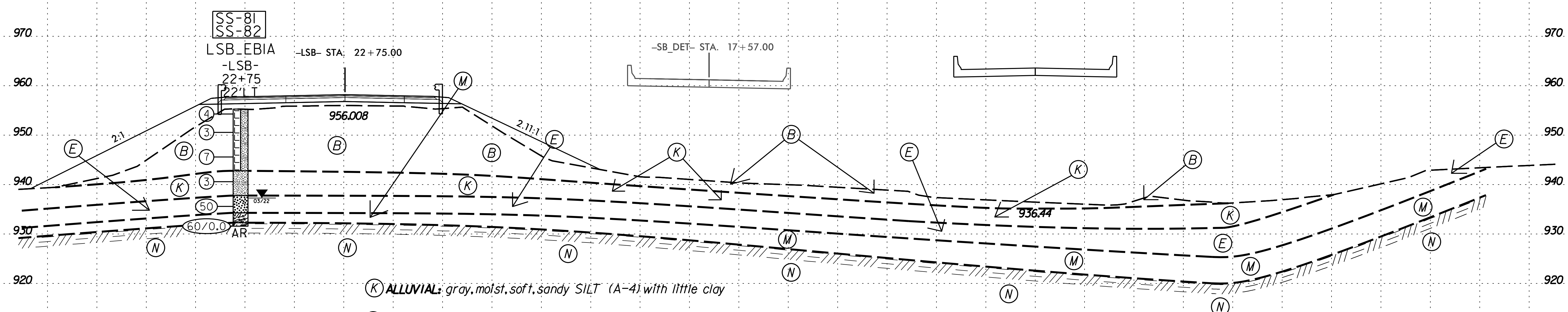
22+33.41

-LNB-

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-81	22'LT	22+75	3.7' - 5.2'	A-4(0)	39	5	15.4	47.9	26.1	10.6	90	88	45	N/A	N/A
SS-82	22'LT	22+75	13.7' - 15.2'	A-4(0)	32	4	32.1	31.9	19.8	16.2	96	73	43	N/A	N/A

(B) **ROADWAY EMBANKMENT:** red-brown, dry to moist, soft to medium stiff, sandy SILT (A-4) with little clay and trace mica



(K) **ALLUVIAL:** gray, moist, soft, sandy SILT (A-4) with little clay

(E) **SAPROLITE:** gray and white, dry, dense, highly micaceous, silty SAND (A-2-4)

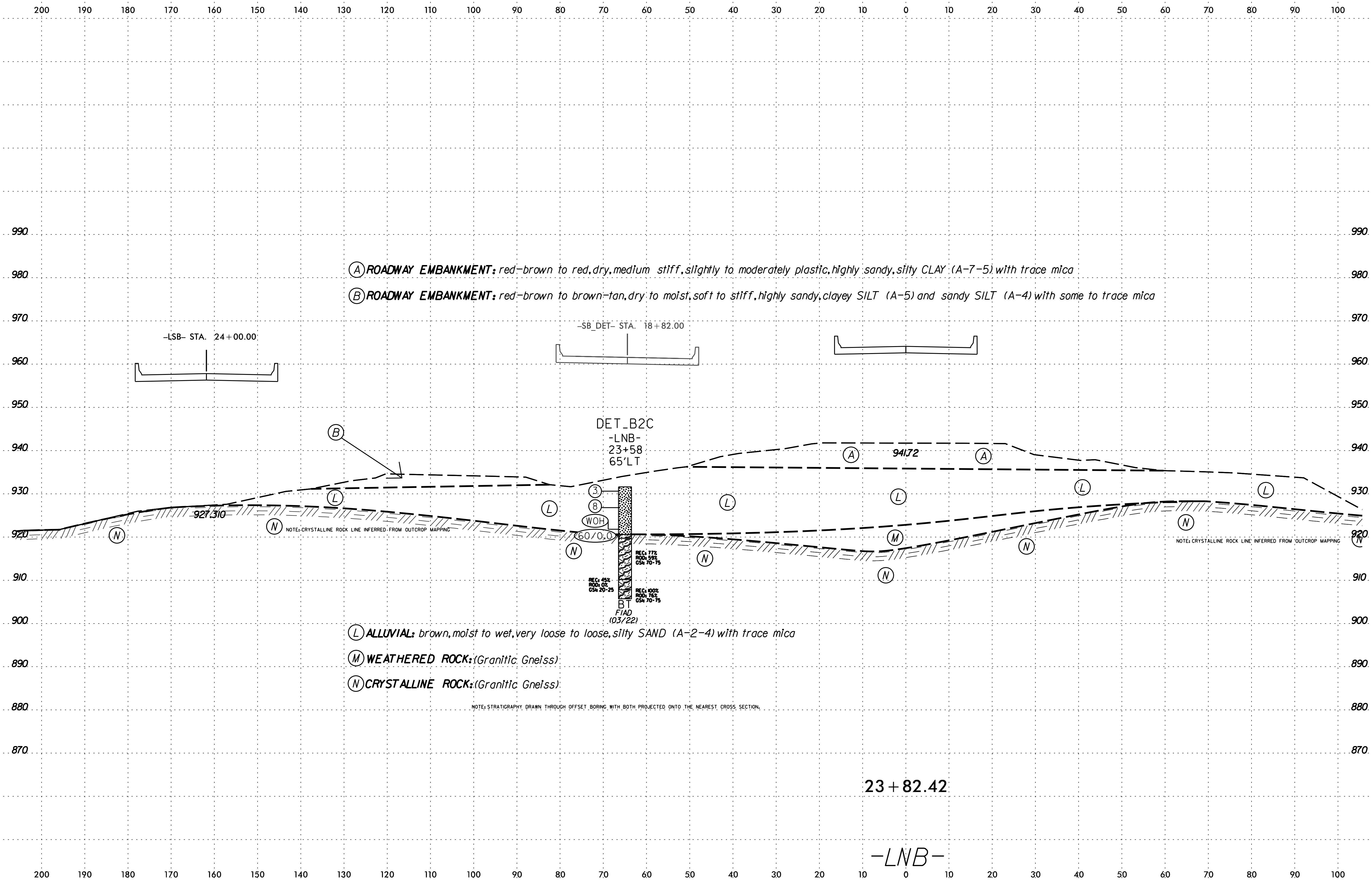
(M) **WEATHERED ROCK:** (Granitic Gneiss)

(N) **CRYSTALLINE ROCK:** (Granitic Gneiss)

22+57.41

-LNB-

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	B-5527	55



(A) **ROADWAY EMBANKMENT:** *red-brown to red, dry, medium stiff, slightly to moderately plastic, highly sandy, silty CLAY (A-7-5) with trace mica*

(B) **ROADWAY EMBANKMENT:** *red-brown to brown-tan, dry to moist, soft to stiff, highly sandy, clayey SILT (A-5) and sandy SILT (A-4) with some to trace mica*

(L) **ALLUVIAL:** *brown, moist to wet, very loose to loose, silty SAND (A-2-4) with trace mica*

(M) **WEATHERED ROCK:** *(Granitic Gneiss)*

(N) **CRYSTALLINE ROCK:** *(Granitic Gneiss)*

NOTE: STRATIGRAPHY DRAWN THROUGH OFFSET BORING WITH BOTH PROJECTED ONTO THE NEAREST CROSS SECTION.

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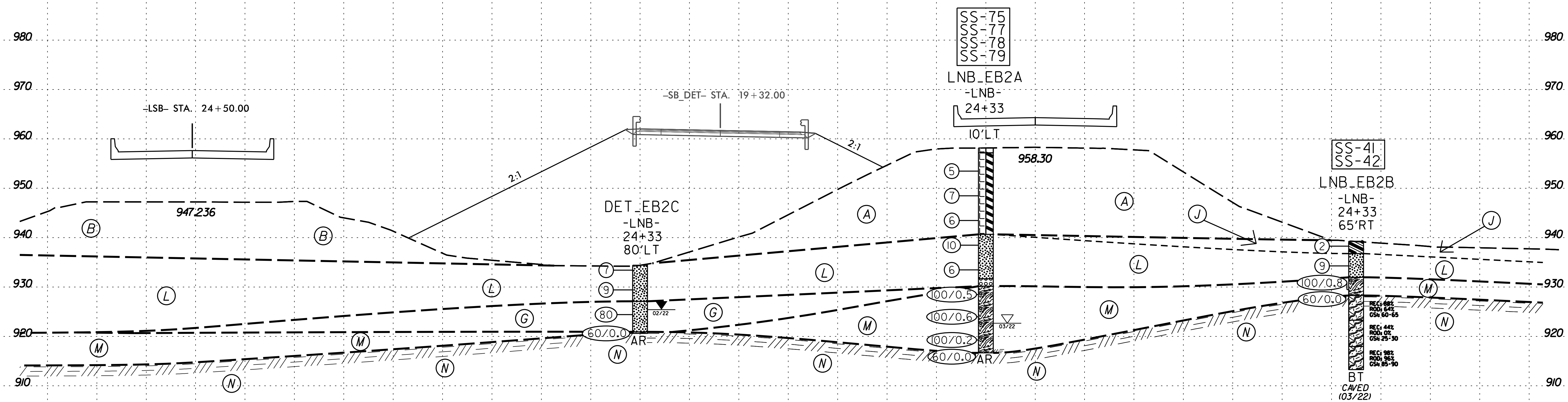
PROJ. REFERENCE NO.	SHEET NO.
B-5527	56

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-75	10'LT	24+33	3.7' - 5.2'	A-7-5(4)	42	12	15.4	45.1	15.2	24.3	98	90	49	N/A	N/A
SS-77	10'LT	24+33	13.7' - 15.2'	A-7-5(9)	54	19	12.2	33.8	15.1	38.9	92	87	56	N/A	N/A
SS-78	10'LT	24+33	18.7' - 20.2'	A-2-4(0)	18	0	24.4	54.7	10.8	10.1	99	91	26	N/A	N/A
SS-79	10'LT	24+33	23.7' - 25.2'	A-2-4(0)	27	6	21.2	47.6	12.9	18.3	93	86	33	N/A	N/A
SS-41	65'RT	24+33	0.0' - 1.5'	A-6(1)	28	12	18.1	47.2	6.6	28.1	95	91	38	N/A	N/A
SS-42	65'RT	24+33	4.0' - 5.5'	A-2-4(0)	34	6	29.3	43.6	7.3	19.8	89	74	34	N/A	N/A

(A) **ROADWAY EMBANKMENT:** red-brown to red, dry, medium stiff, slightly to moderately plastic, highly sandy, silty CLAY (A-7-5) with trace mica

(B) **ROADWAY EMBANKMENT:** red-brown to brown-tan, dry to moist, soft to stiff, highly sandy, clayey SILT (A-5) and sandy SILT (A-4) with some to trace mica



(J) **ALLUVIAL:** tan, moist, soft, slightly plastic, sandy CLAY (A-6)

(L) **ALLUVIAL:** brown, orange-brown, red-brown, and red-tan, moist to wet, loose to medium dense, silty SAND (A-2-4) with little clay, trace boulders and mica, and GRAVEL (A-1-a) with some sand (rounded grains)

(G) **RESIDUAL:** tan, brown, and white, dry, very dense, silty SAND (A-2-4) with some gravel-sized crystalline and weathered rock fragments

(M) **WEATHERED ROCK:** (Granitic Gneiss)

(N) **CRYSTALLINE ROCK:** (Granitic Gneiss)

24+32.43

-LNB-

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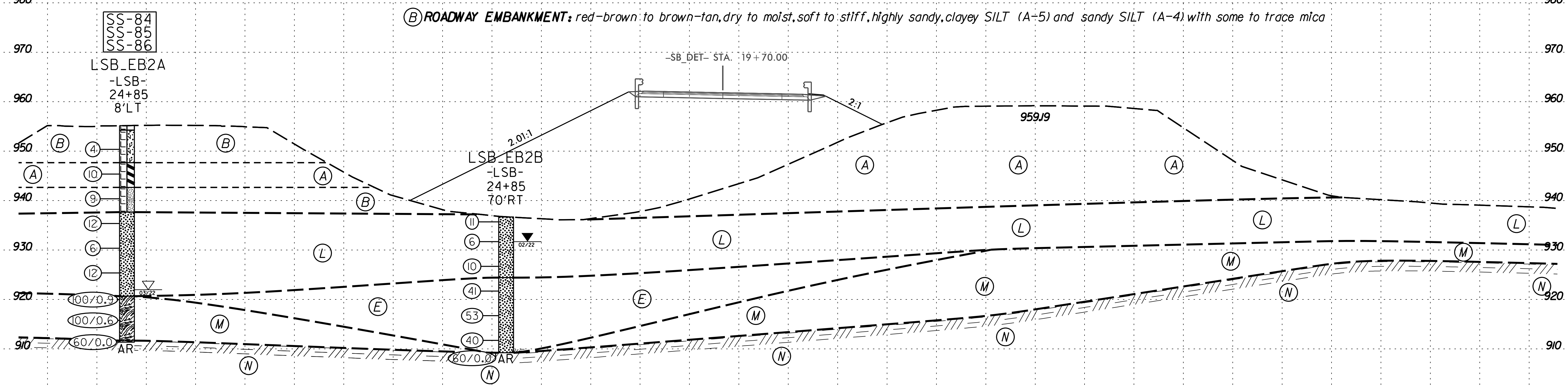
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-84	8'LT	24+85	3.8' - 5.3'	A-5(2)	41	8	20.0	35.6	14.1	30.3	96	84	51	N/A	N/A
SS-85	8'LT	24+85	8.8' - 10.3'	A-7-5(5)	46	11	15.3	36.6	4.0	44.1	99	92	55	N/A	N/A
SS-86	8'LT	24+85	13.8' - 15.3'	A-4(0)	38	6	15.8	53.8	19.8	10.6	98	92	41	N/A	N/A

(A) **ROADWAY EMBANKMENT:** red-brown to red, dry, medium stiff to stiff, slightly to moderately plastic, highly sandy, silty CLAY (A-7-5) with some to trace mica

(B) **ROADWAY EMBANKMENT:** red-brown to brown-tan, dry to moist, soft to stiff, highly sandy, clayey SILT (A-5) and sandy SILT (A-4) with some to trace mica



(L) **ALLUVIAL:** tan, gray, and brown, dry to saturated, loose to medium dense, silty SAND (A-2-4) with little clay, trace gravel and cobbles (sub-rounded), trace mica

(E) **SAPROLITE:** tan, brown, and white, moist to wet, dense to very dense, silty SAND (A-2-4) with trace gravel-sized crystalline rock fragments and some to little mica

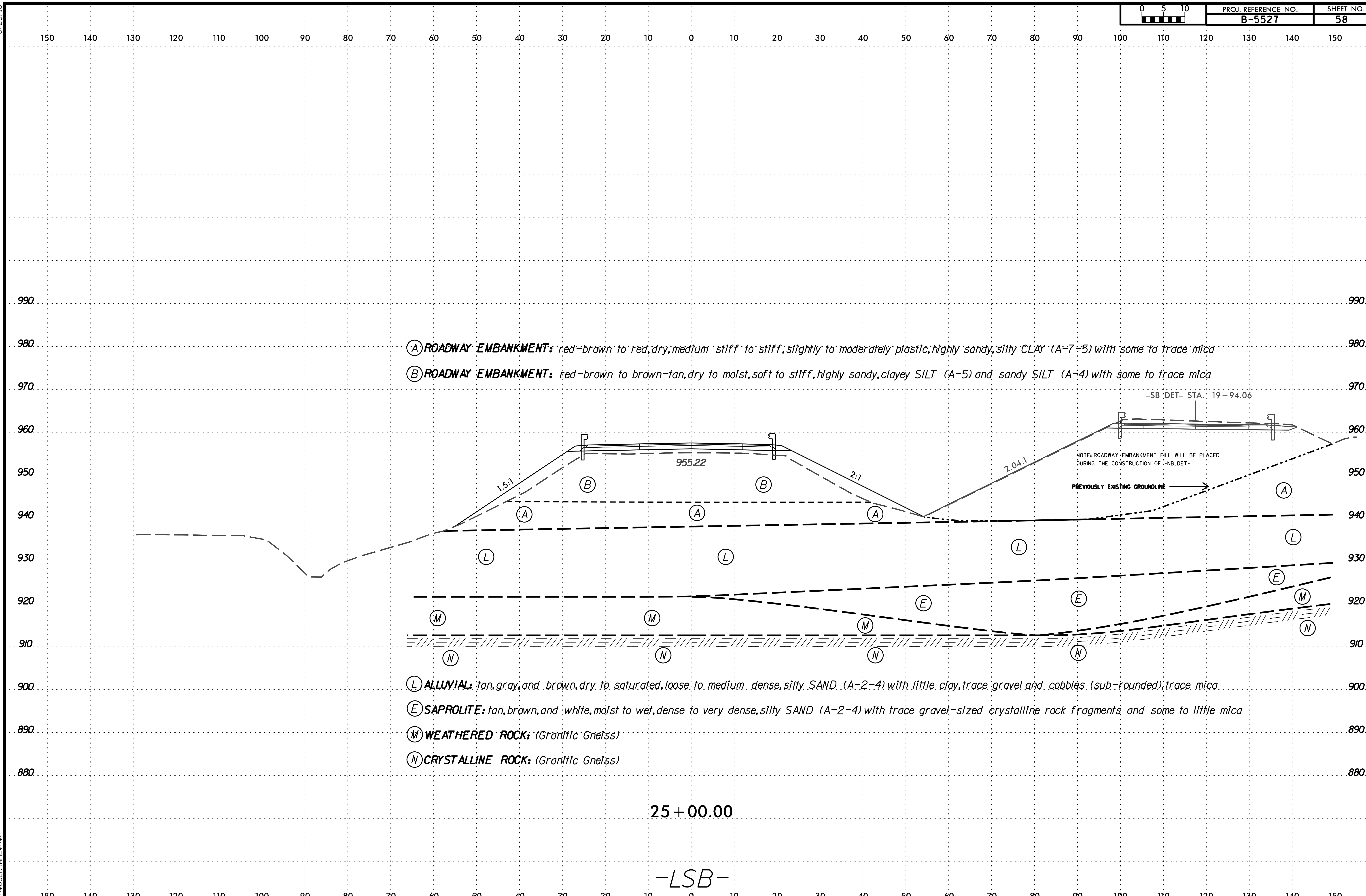
(M) **WEATHERED ROCK:** (Granitic Gneiss)

(N) **CRYSTALLINE ROCK:** (Granitic Gneiss)

NOTE: STRATIGRAPHY DRAWN THROUGH OFFSET BORING WITH BOTH PROJECTED ONTO THE NEAREST CROSS SECTION.

24+70.43

-LNB-



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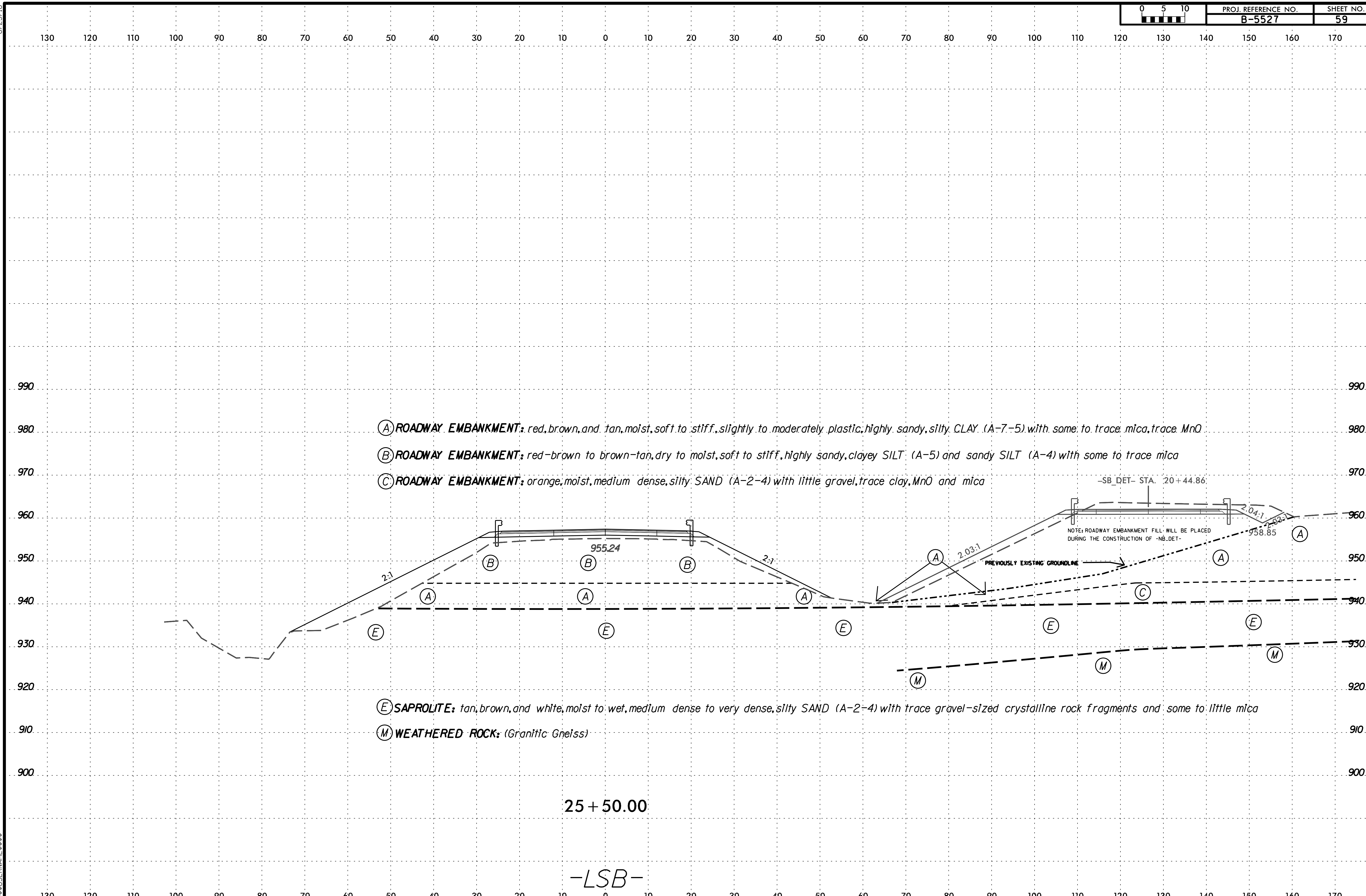

25+50.00

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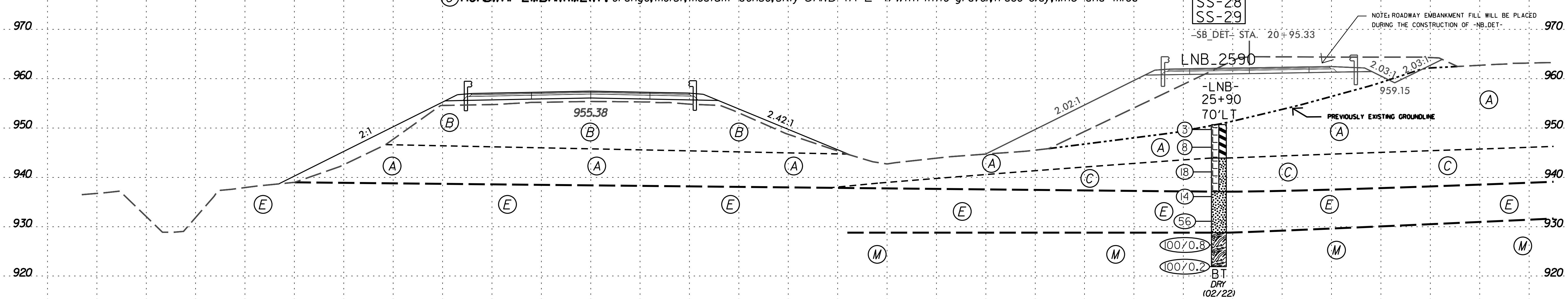
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-28	70'LT	25+90	0.0' - 1.5'	A-7-5(6)	43	13	13.1	37.4	21.8	27.7	98	92	56	N/A	N/A
SS-29	70'LT	25+90	3.6' - 5.1'	A-7-5(7)	51	20	21.0	31.4	2.4	45.2	97	88	50	N/A	N/A

(A) **ROADWAY EMBANKMENT:** red, brown, and tan, moist, soft to stiff, slightly to moderately plastic, highly sandy, silty CLAY (A-7-5) with some to trace mica, trace MnO

(B) **ROADWAY EMBANKMENT:** red-brown to brown-tan, dry to moist, soft to stiff, highly sandy, clayey SILT (A-5) and sandy SILT (A-4) with some to trace mica

(C) **ROADWAY EMBANKMENT:** orange, moist, medium dense, silty SAND (A-2-4) with little gravel, trace clay, MnO and mica



(E) **SAPROLITE:** tan, brown, and white, moist to wet, medium dense to very dense, silty SAND (A-2-4) with trace gravel-sized crystalline rock fragments and some to little mica

(M) **WEATHERED ROCK:** (Granitic Gneiss)

NOTE: STRATIGRAPHY DRAWN THROUGH OFFSET BORING WITH BOTH PROJECTED ONTO THE NEAREST CROSS SECTION.

26+00.00

-LSB-

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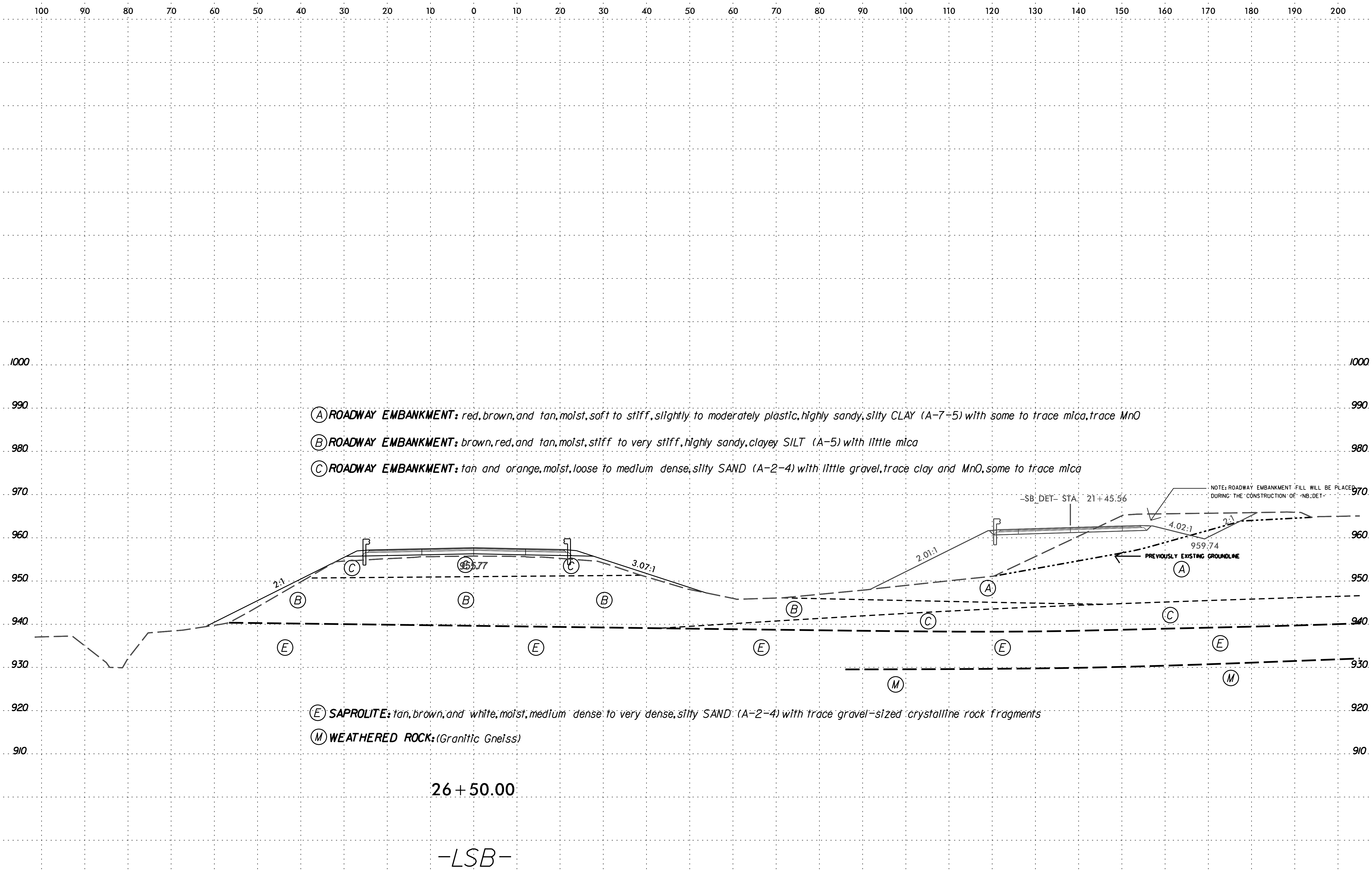
PROJ. REFERENCE NO.	SHEET NO.
B-5527	61



26+50.00

-LSB-

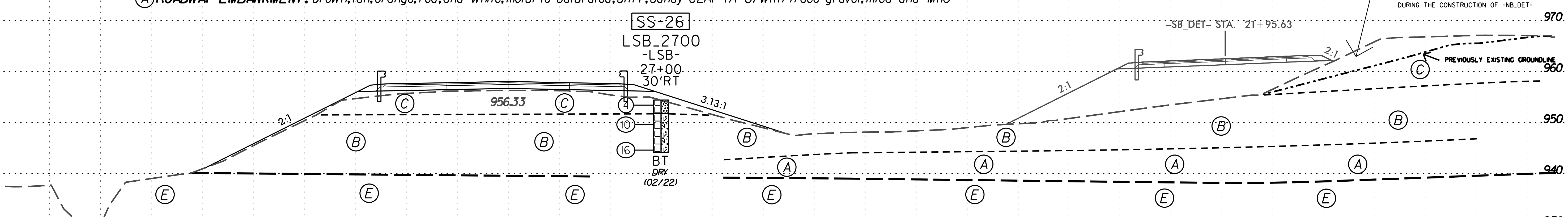
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-26	30'RT	27+00	3.8' - 5.3'	A-5(3)	42	10	13.3	39.8	18.2	28.7	93	86	50	N/A	N/A

(C) **ROADWAY EMBANKMENT:** tan, orange, and white, moist, loose to medium dense, silty SAND (A-2-4) with trace gravel, some to little mica and trace MnO

(B) **ROADWAY EMBANKMENT:** brown, red, orange, and tan, moist, stiff, highly sandy, clayey SILT (A-5) and sandy SILT (A-4) with little mica

(A) **ROADWAY EMBANKMENT:** brown, tan, orange, red, and white, moist to saturated, stiff, sandy CLAY (A-6) with trace gravel, mica and MnO

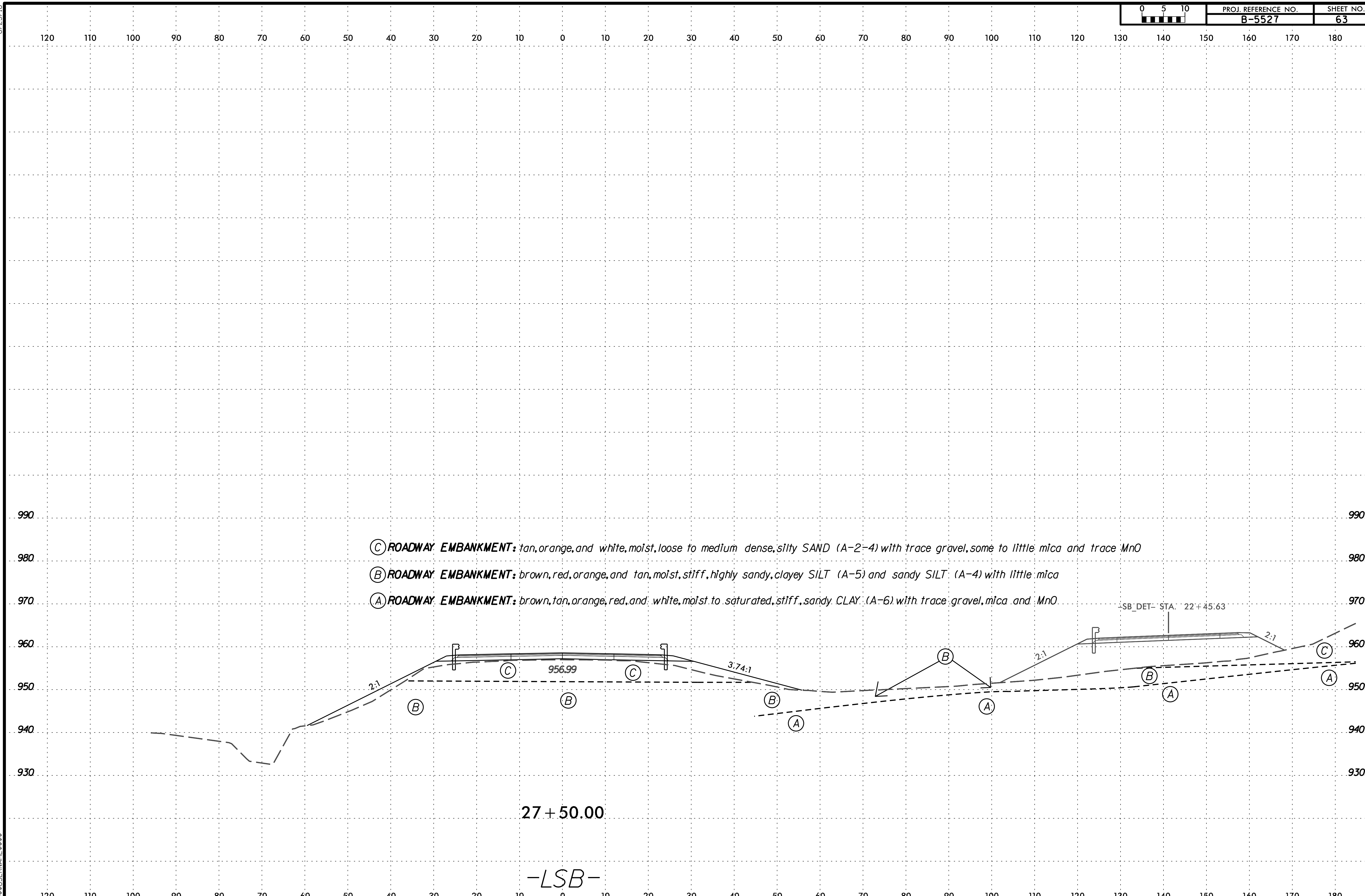


(E) **SAPROLITE:** tan, brown, and white, moist, medium dense to very dense, silty SAND (A-2-4) with trace gravel-sized crystalline rock fragments

27+00.00

-LSB-

PROJ. REFERENCE NO.	SHEET NO.
B-5527	63



27+50.00

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PROJ. REFERENCE NO.	SHEET NO.
B-5527	64

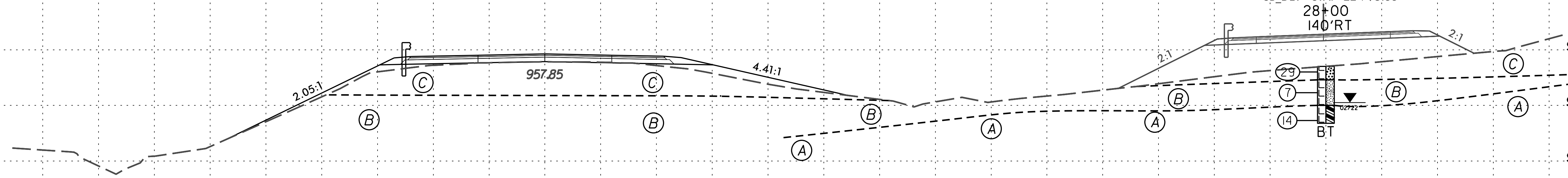
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-19	140'RT	28+00	3.7' - 5.2'	A-4(0)	27	6	17.5	49.6	8.7	24.2	94	88	38	N/A	N/A

(C) **ROADWAY EMBANKMENT:** tan, orange, and white, moist, loose to medium dense, silty SAND (A-2-4) with trace gravel, some to little mica and trace MnO

(B) **ROADWAY EMBANKMENT:** brown and orange, moist, medium stiff, sandy SILT (A-4) with some clay and little mica

(A) **ROADWAY EMBANKMENT:** brown, tan, orange, red, and white, moist to saturated, stiff, sandy CLAY (A-6) with trace gravel, mica and MnO



28+00.00

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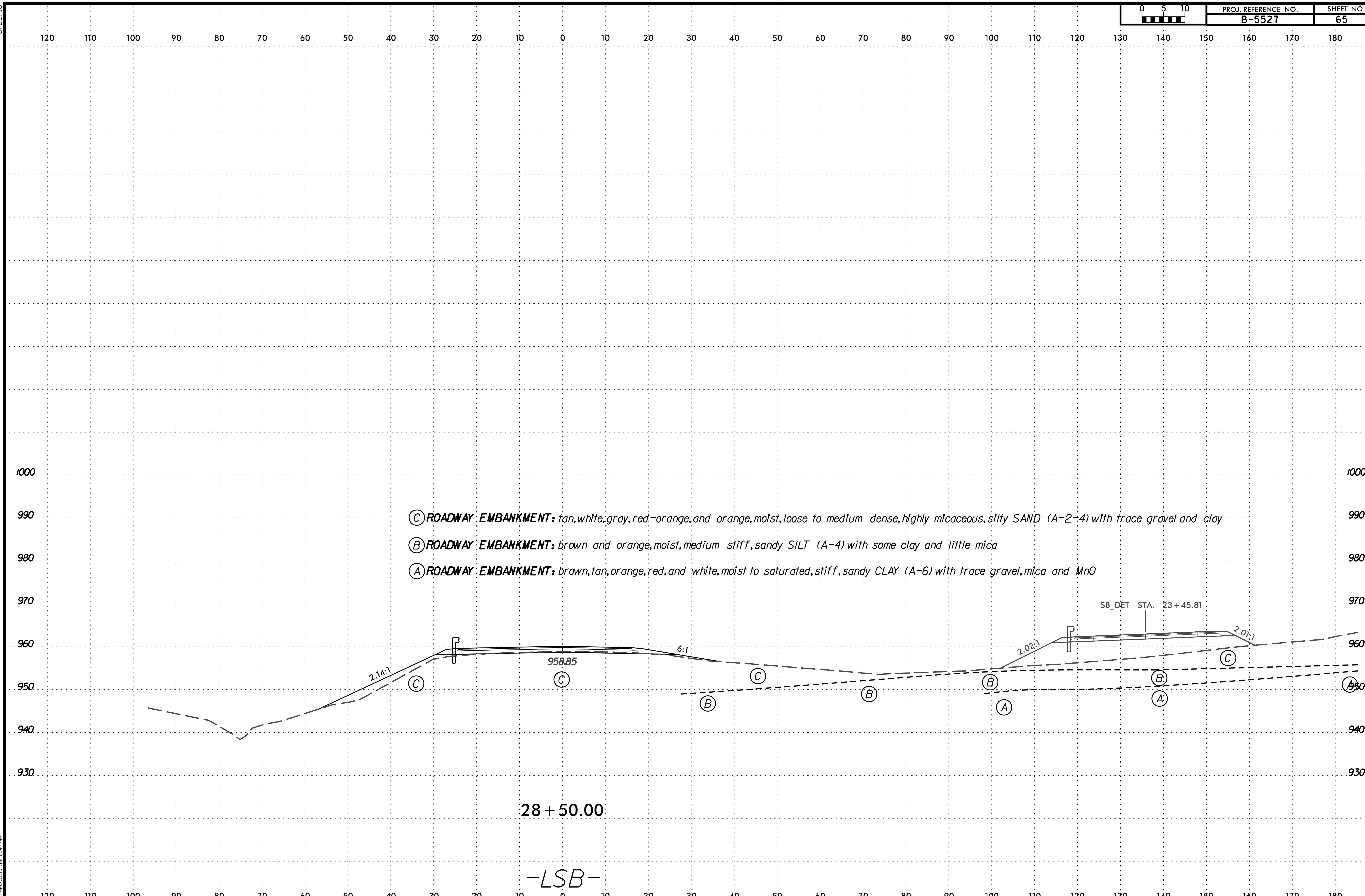
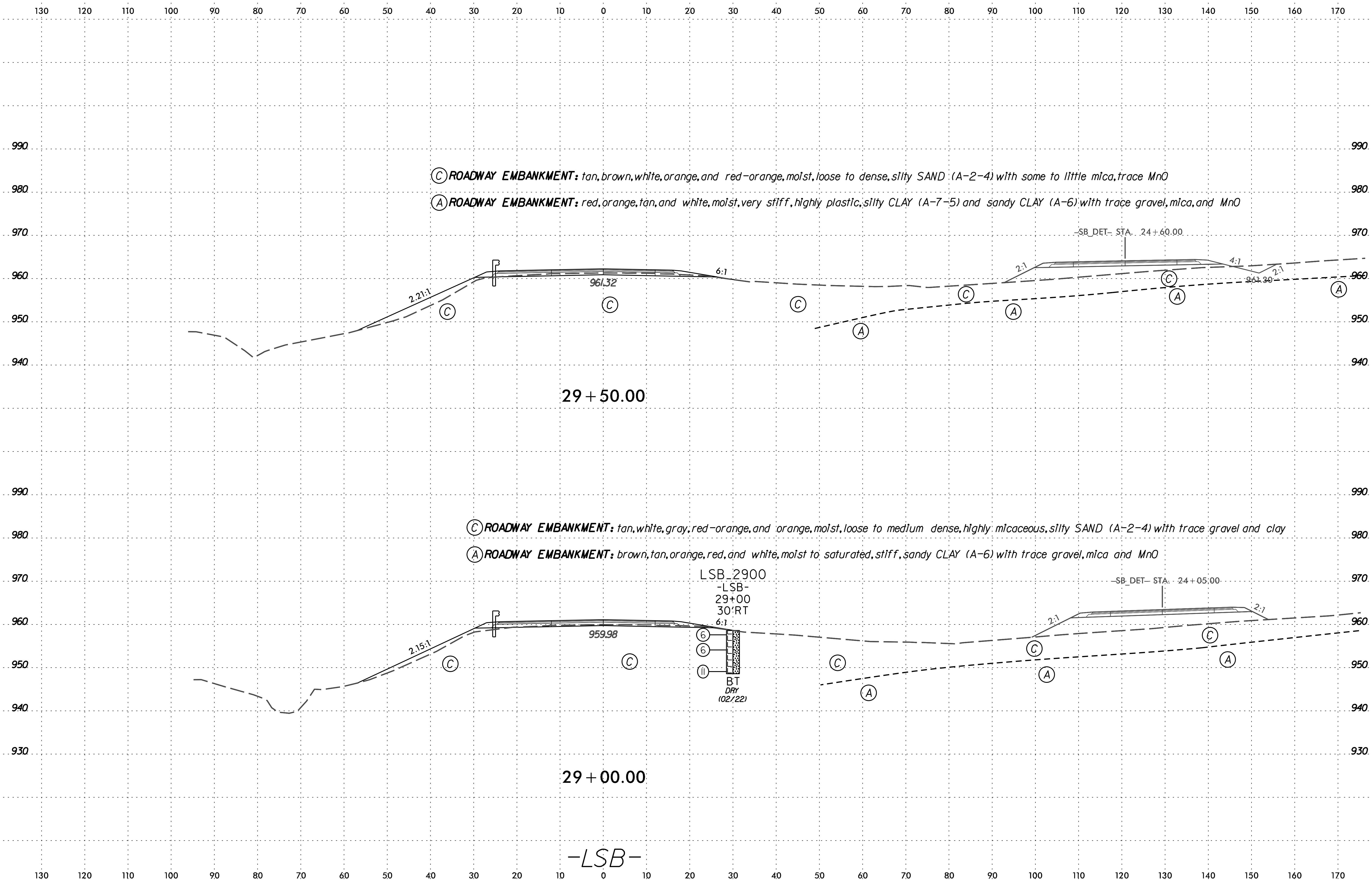


Ⓒ ROADWAY EMBANKMENT: tan,white,gray,red-orange,and orange,moist,loose to medium dense,highly micaceous,silty SAND (A-2-4) with trace gravel and clay
Ⓑ ROADWAY EMBANKMENT: brown and orange,moist,medium stiff,sandy SILT (A-4) with some clay and little mica
Ⓐ ROADWAY EMBANKMENT: brown,tan,orange,red,and white,moist to saturated,stiff,sandy CLAY (A-6) with trace gravel,mica and MnO
-SB_DET- STA. 23+45.81
2.14:1
6:1
958.85
2.02:1
2.01:1
28+50.00
-LSB-

PROJ. REFERENCE NO.	SHEET NO.
B-5527	66



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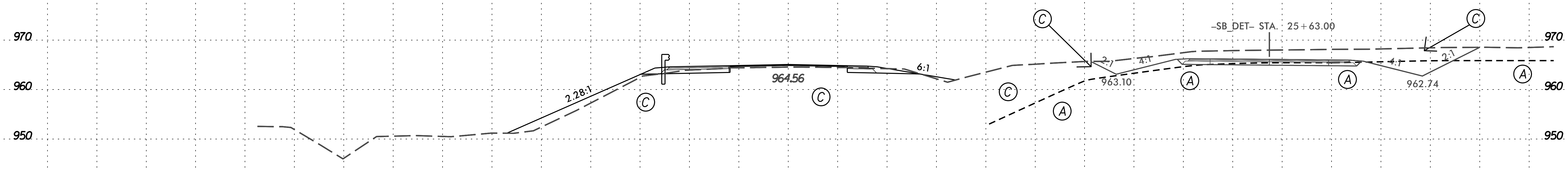
Ⓒ **ROADWAY EMBANKMENT:** tan, brown, white, orange, and red-orange, moist, loose to dense, silty SAND (A-2-4) with some to little mica, trace MnO

Ⓐ **ROADWAY EMBANKMENT:** red, orange, tan, and white, moist, very stiff, highly plastic, silty CLAY (A-7-5) and sandy CLAY (A-6) with trace gravel, mica, and MnO

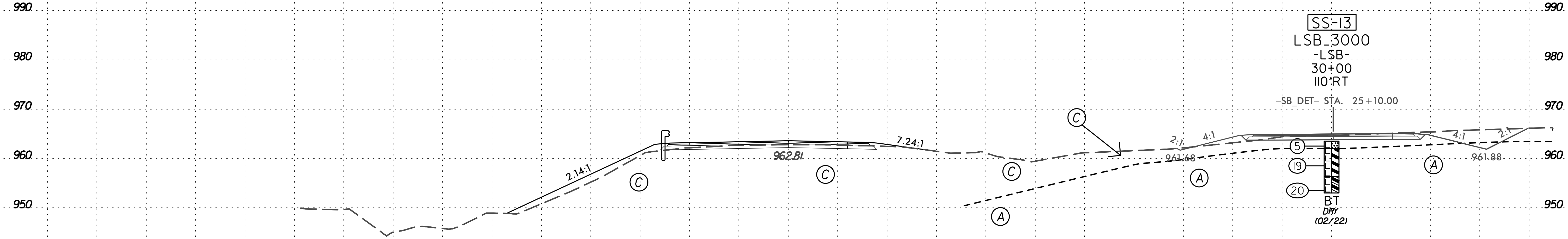


30+50.00

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-13	110'RT	30+00	4.0' - 5.5'	A-7-5(26)	63	31	6.0	22.1	14.2	57.7	100	97	77	N/A	N/A

Ⓒ **ROADWAY EMBANKMENT:** tan, brown, white, orange, and red-orange, moist, loose to dense, silty SAND (A-2-4) with some to little mica, trace MnO

Ⓐ **ROADWAY EMBANKMENT:** red, orange, tan, and white, moist, very stiff, highly plastic, silty CLAY (A-7-5) and sandy CLAY (A-6) with trace gravel, mica, and MnO



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6/23/16
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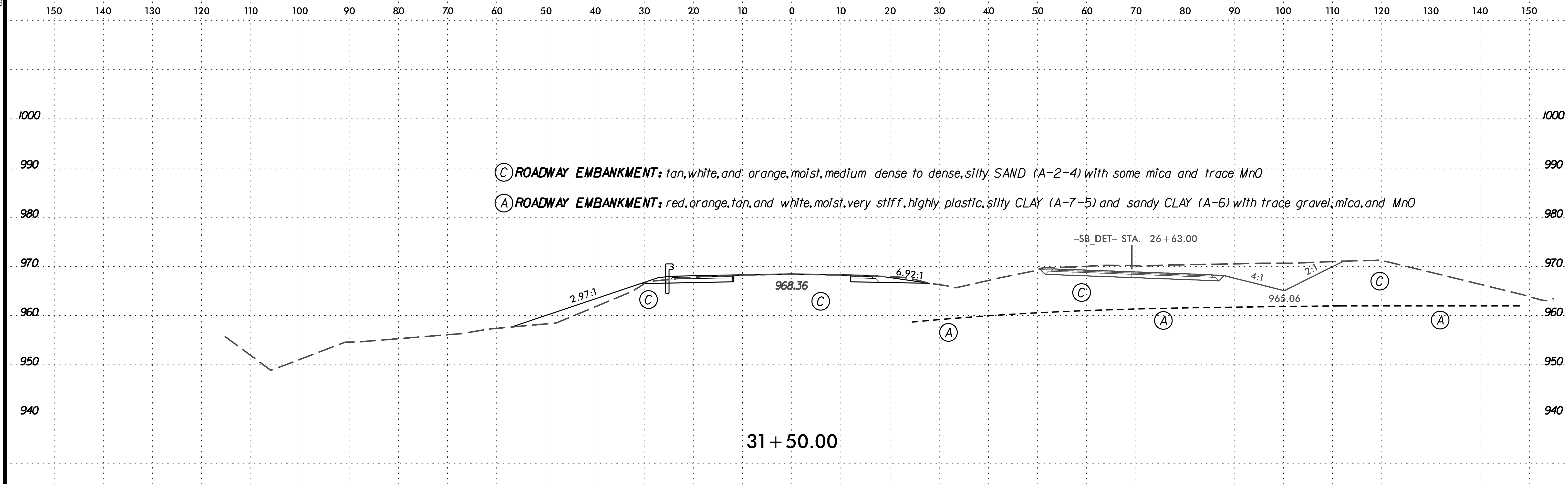
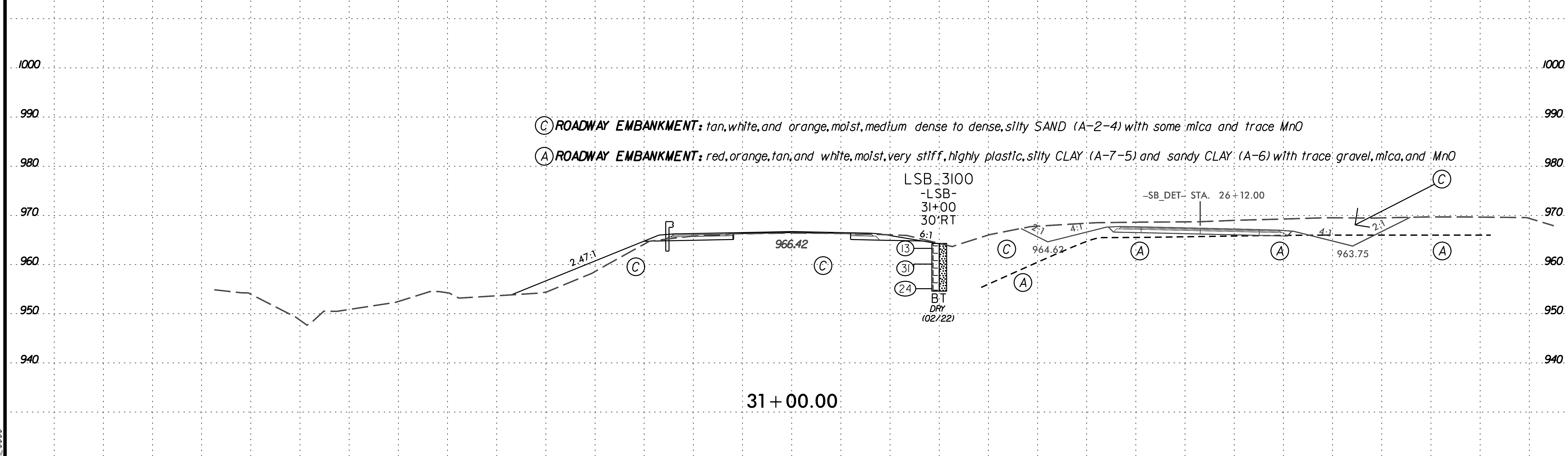
PROJ. REFERENCE NO.	SHEET NO.
B-5527	68





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6/23/16

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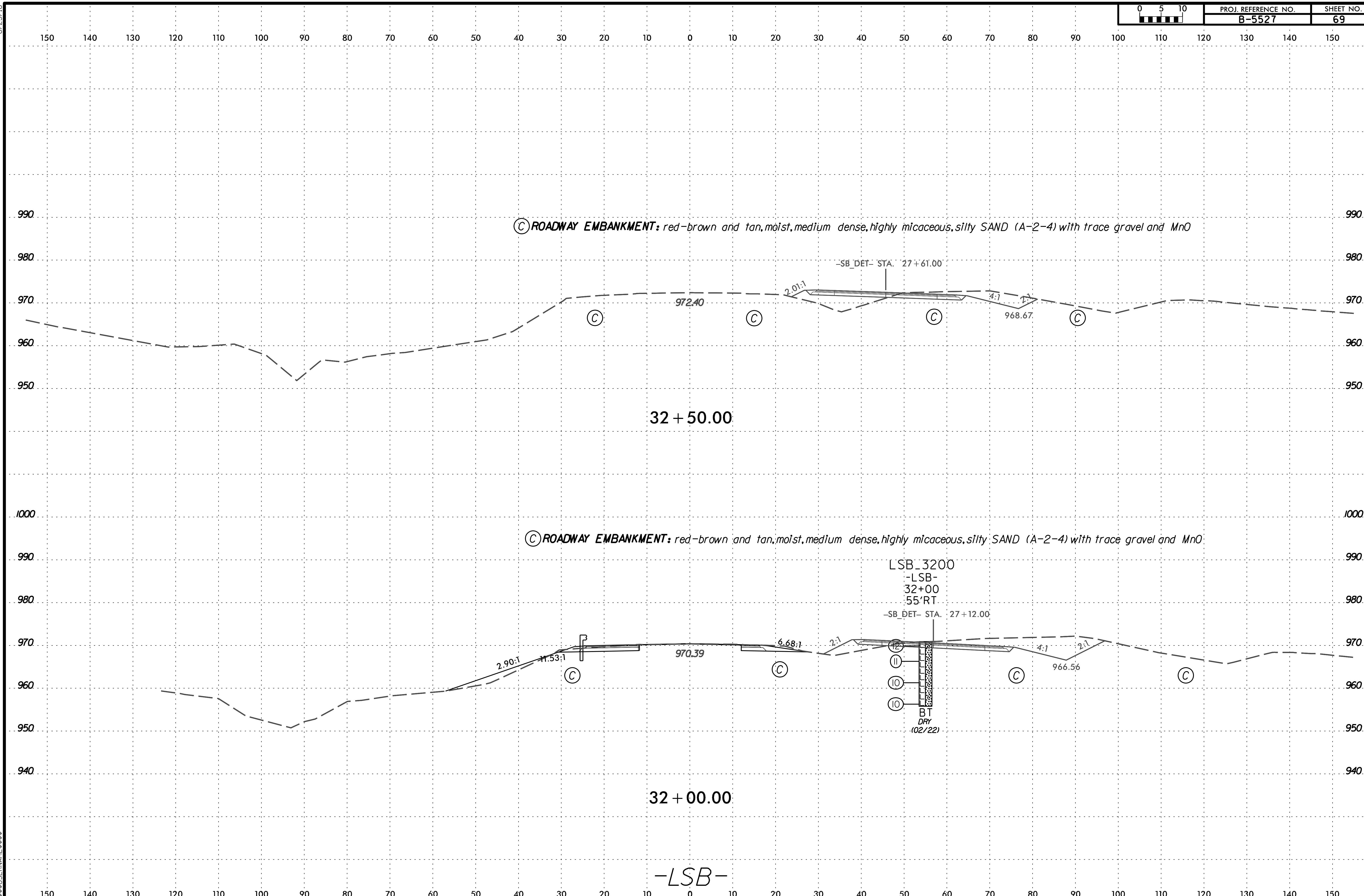
PROJ. REFERENCE NO. B-5527 | SHEET NO. 69



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6/23/16

PROJ. REFERENCE NO.	SHEET NO.
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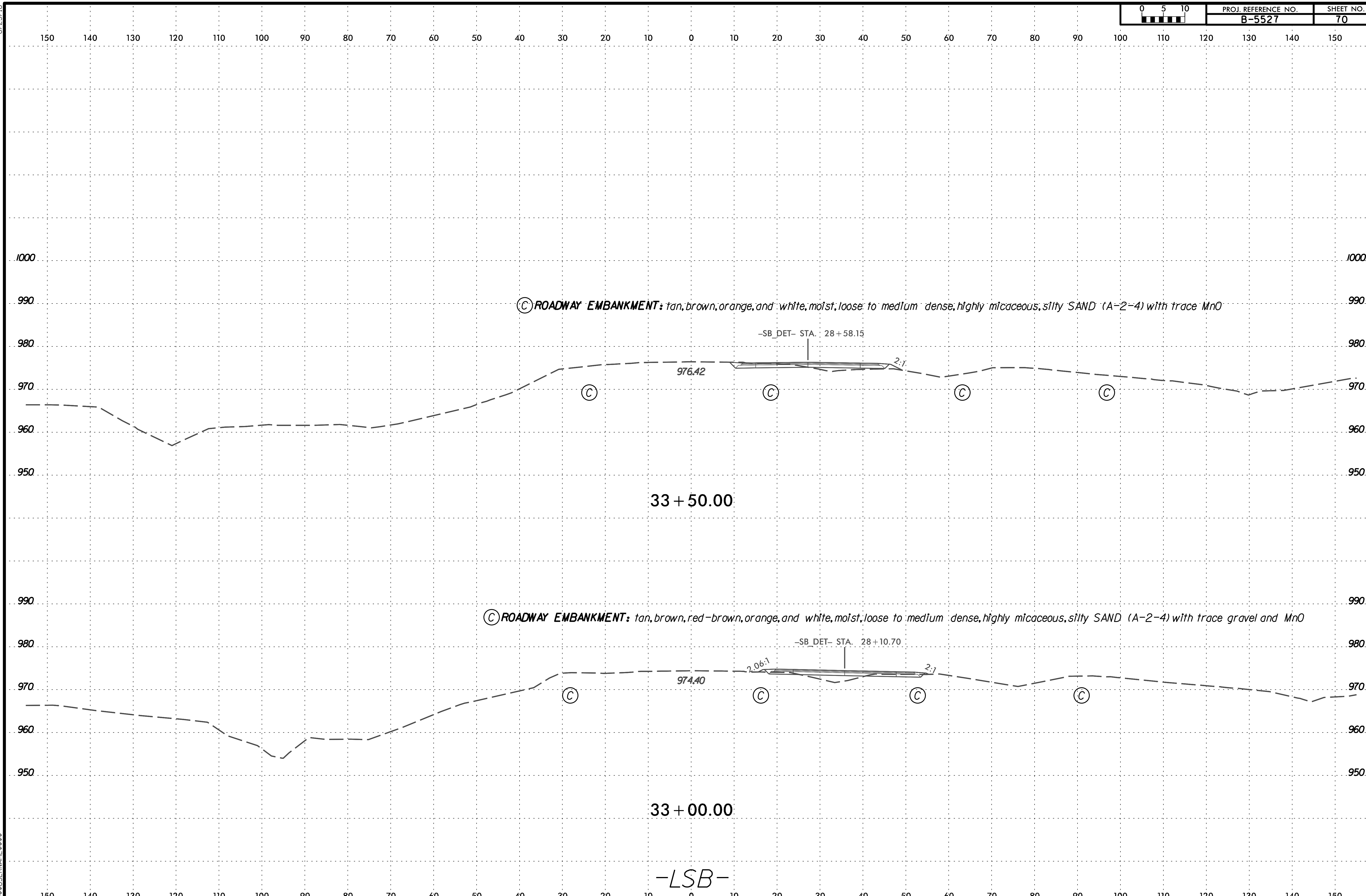

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PROJ. REFERENCE NO.	SHEET NO.
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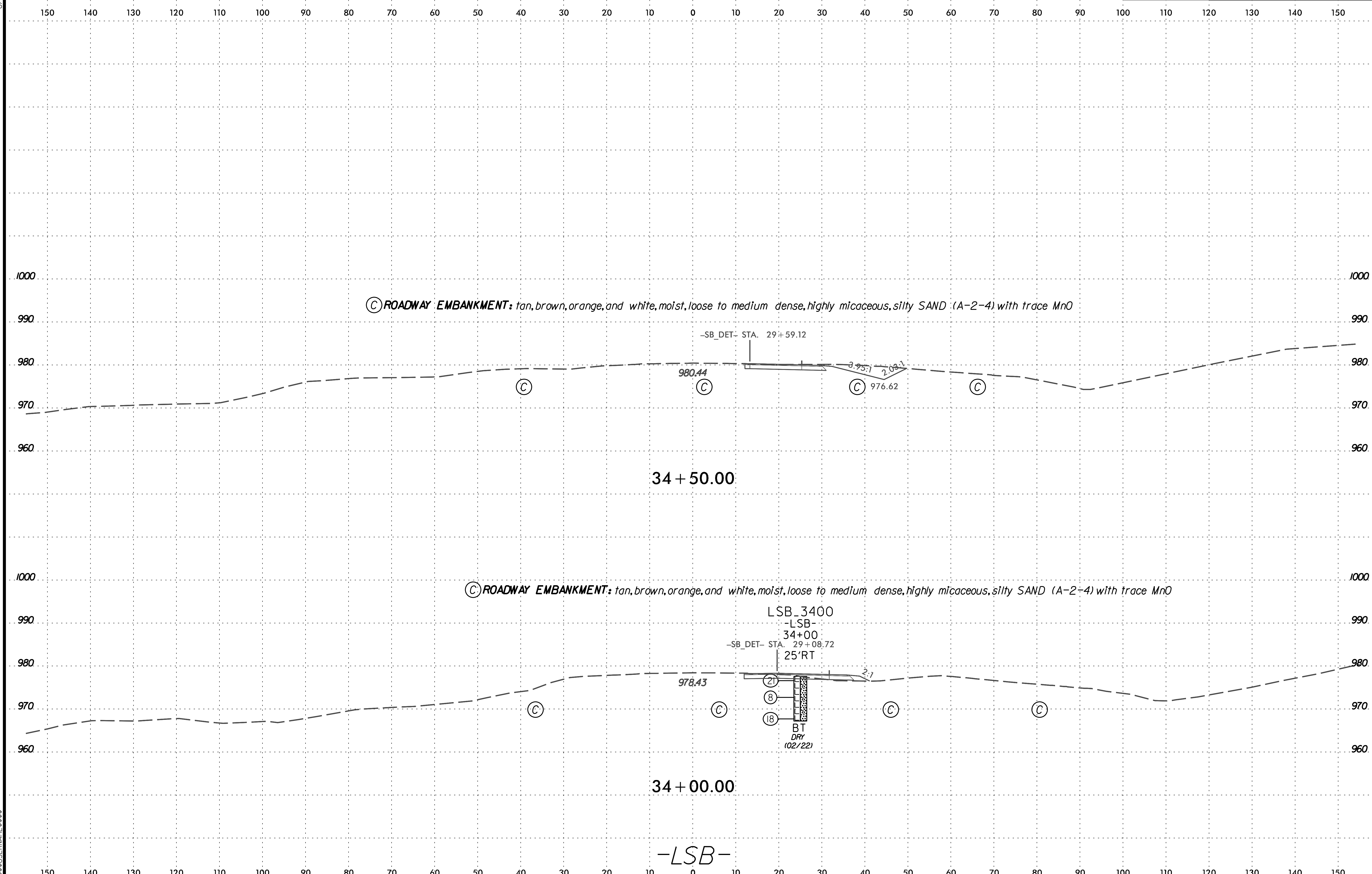

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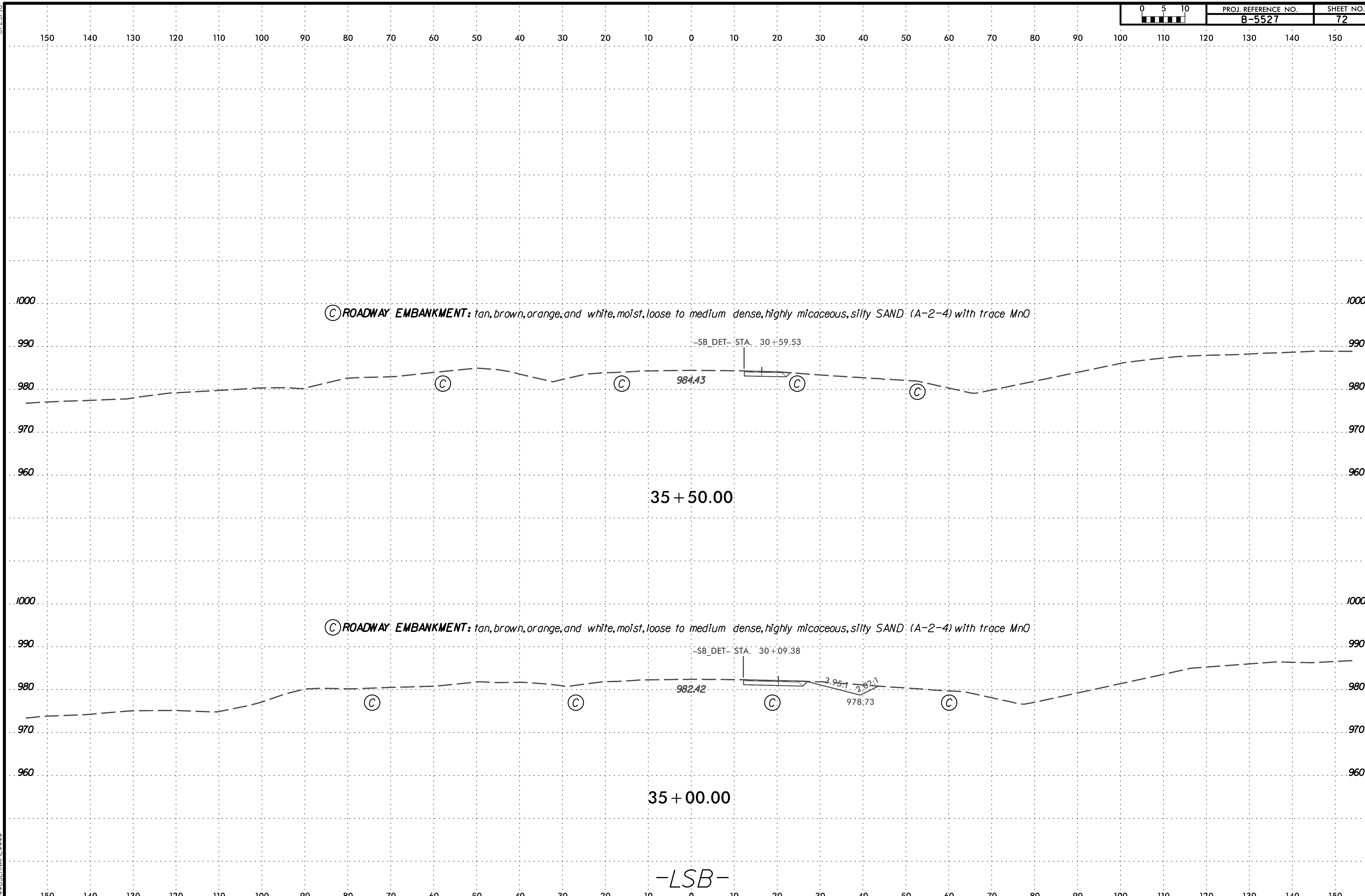
PROJ. REFERENCE NO.	SHEET NO.
B-5527	72



6/23/16

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6/23/16

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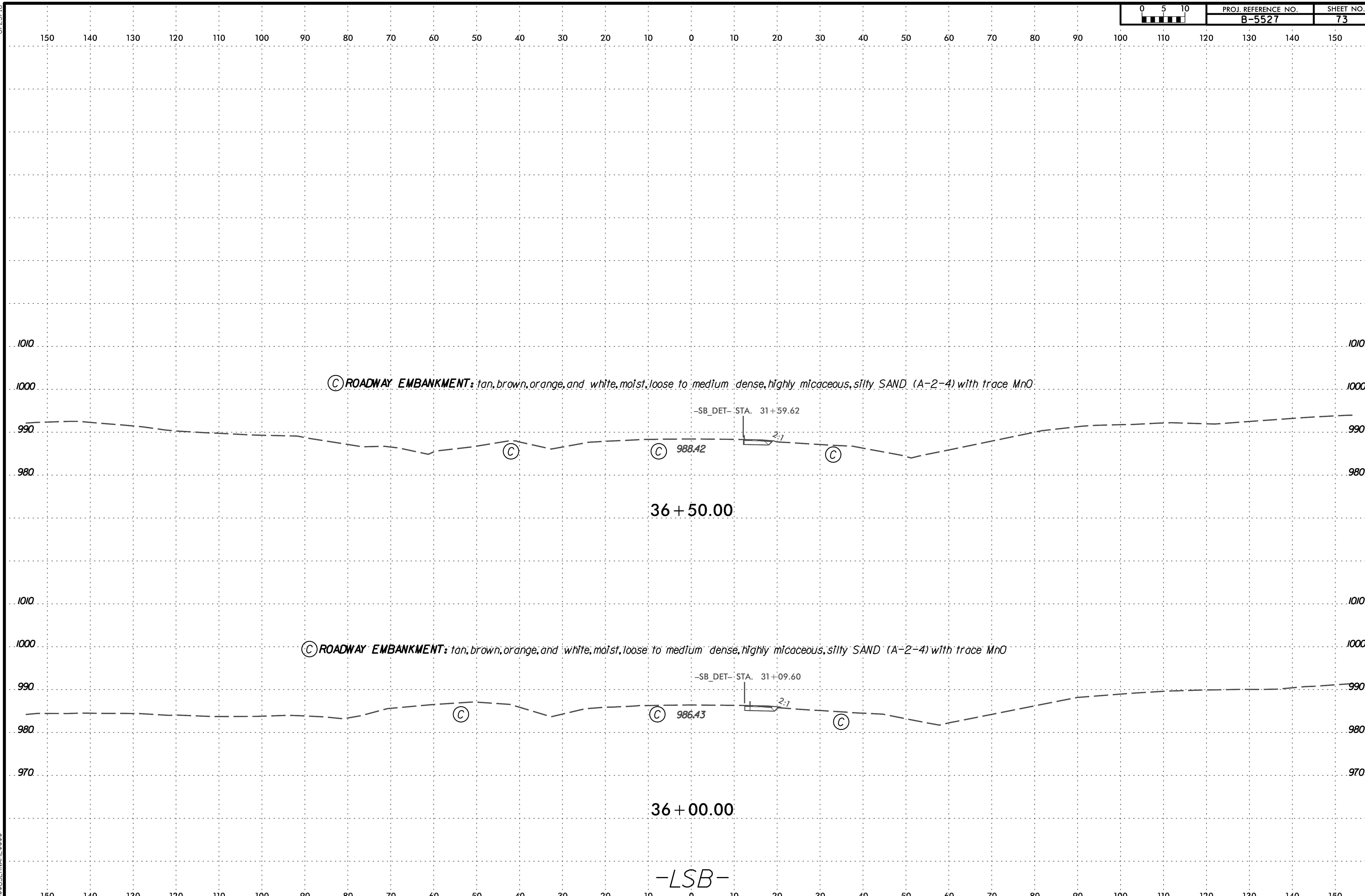


NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
CORE LOGS AND CORE PHOTOS

PROJECT: 55027 REFERENCE: B-5527

Prepared in the Office of:
SUMMIT
DESIGN AND ENGINEERING SERVICES
FIRM NO. P-0339 and C-487
2715 Ashton Drive, Ste 104
Wilmington, NC 28412
Phone: (910) 475-1208
www.summitde.com

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 55027.1.FS1	**TIP** B-5527	**COUNTY** SURRY	**GEOLOGIST** Fischer, H. & Gross, A.
SITE DESCRIPTION BRIDGES 122 AND 126 OVER TOMS CREEK ON US 52 NB AND SB			**GROUND WTR (ft)**
BORING NO. DET_EB1C	**STATION** 22+03	**OFFSET** 67 ft LT	**ALIGNMENT** -LNB- / **0 HR.** N/A
COLLAR ELEV. 953.7 ft	**TOTAL DEPTH** 23.5 ft	**NORTHING** 966,670	**EASTING** 1,560,932 / **24 HR.** 10.9
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/2/2021		**DRILL METHOD** Core Boring	**HAMMER TYPE** Automatic
DRILLER Moseley, M.B.	**START DATE** 02/24/22	**COMP. DATE** 03/03/22	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ2	**TOTAL RUN** 15.8 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %
946.04									
945	946.0	7.7	0.8	*N=60/0.0*	(0.6) 75%	(0.4) 50%		(15.3) 97%	(13.3) 84%
	945.2	8.5	5.0	0:52/0.8 2:09/1.0 1:40/1.0 1:16/1.0 1:20/1.0 2:24/1.0	(4.8) 96%	(4.5) 90%			
940	940.2	13.5	5.0	1:14/1.0 1:12/1.0 1:42/1.0 2:08/1.0 1:20/1.0	(4.9) 98%	(4.6) 92%			
935	935.2	18.5	5.0	1:20/1.0 1:20/1.0 1:24/1.0 1:29/1.0 1:08/1.0	(5.0) 100%	(3.8) 76%			
	930.2	23.5							

DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft))

Begin Coring @ 7.7 ft

946.0 — **CRYSTALLINE ROCK** — 7.7

gray, white, and black, very slight to fresh weathering, hard to very hard, close to moderately close fracture spacing, GRANITIC GNEISS

GSI: 75-80

930.2 — 23.5

Boring Terminated at Elevation 930.2 ft in Crystalline Rock (Granitic Gneiss)

- Topsoil Thickness = 0.0 Feet

- Boring deepened on 3/3/22 to confirm in-situ bedrock.

WBS 55027.1.FS1	**TIP** B-5527	**COUNTY** SURRY	**GEOLOGIST** Fischer, H. & Gross, A.
SITE DESCRIPTION BRIDGES 122 AND 126 OVER TOMS CREEK ON US 52 NB AND SB			**GROUND WTR (ft)**
BORING NO. LNB_EB1A	**STATION** 22+03	**OFFSET** 25 ft LT	**ALIGNMENT** -LNB- / **0 HR.** N/A
COLLAR ELEV. 955.4 ft	**TOTAL DEPTH** 24.9 ft	**NORTHING** 966,670	**EASTING** 1,560,974 / **24 HR.** 18.5
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/2/2021		**DRILL METHOD** Core Boring	**HAMMER TYPE** Automatic
DRILLER Moseley, M.B.	**START DATE** 02/24/22	**COMP. DATE** 03/03/22	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ2	**TOTAL RUN** 14.2 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %
944.74									
	944.7	10.7	4.2	*N=60/0.0* 0:51/1.2 0:47/1.0 1:03/1.0 1:18/1.0	(4.0) 95%	(0.6) 14%		(5.8) 97%	(1.0) 17%
940	940.5	14.9	5.0	0:51/1.0 0:51/1.0 1:03/1.0 1:04/1.0 1:08/1.0	(4.4) 88%	(2.7) 54%		(7.5) 91%	(5.9) 72%
935	935.5	19.9	5.0	0:56/1.0 0:52/1.0 0:55/1.0 0:47/1.0 1:06/1.0	(4.8) 96%	(3.6) 72%			
	930.5	24.9							

DESCRIPTION AND REMARKS

Begin Coring @ 10.7 ft

944.7 — **CRYSTALLINE ROCK** — 10.7

white, dark green, black, and brown, moderate to moderate severe weathering, medium hard to moderately hard, close fracture spacing, GRANITIC GNEISS

GSI: 55-60

938.7 — 16.7

white, gray, dark green, and black, slight to very slight weathering, hard to very hard, close fracture spacing, GRANITIC GNEISS

GSI: 75-80

930.5 — 24.9

Boring Terminated at Elevation 930.5 ft in Crystalline Rock (Granitic Gneiss)

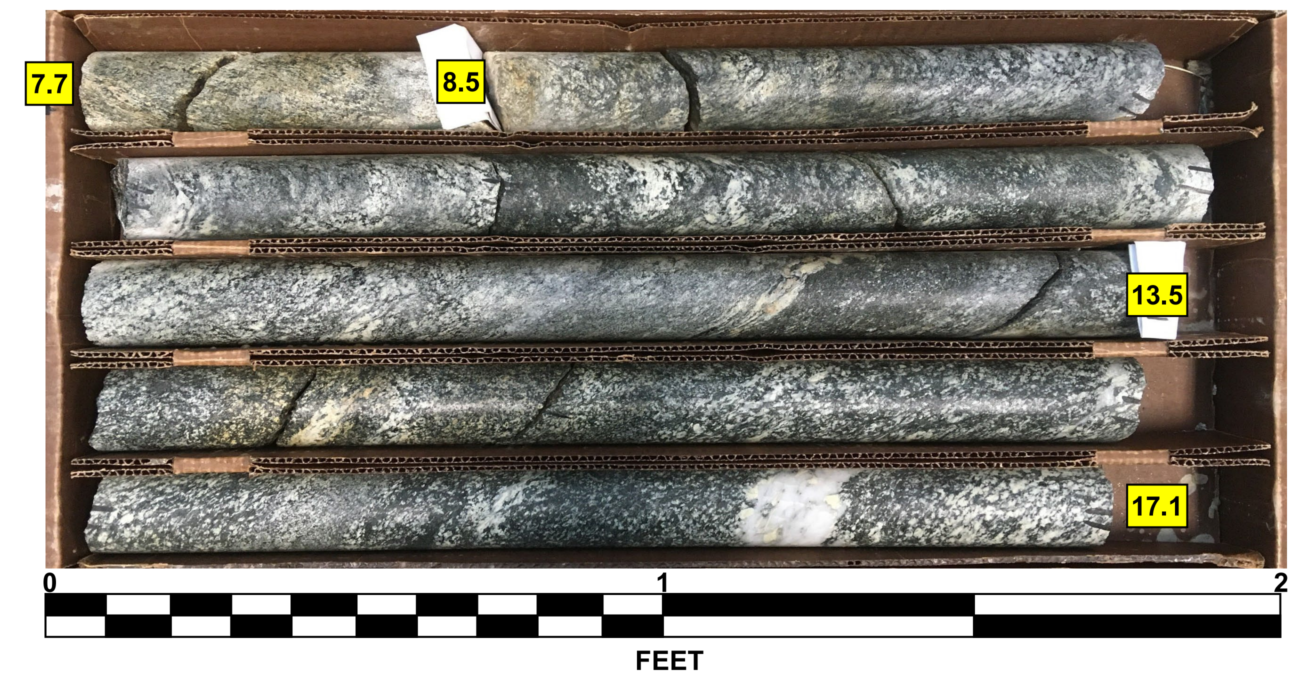
- Topsoil Thickness = 0.3 Feet

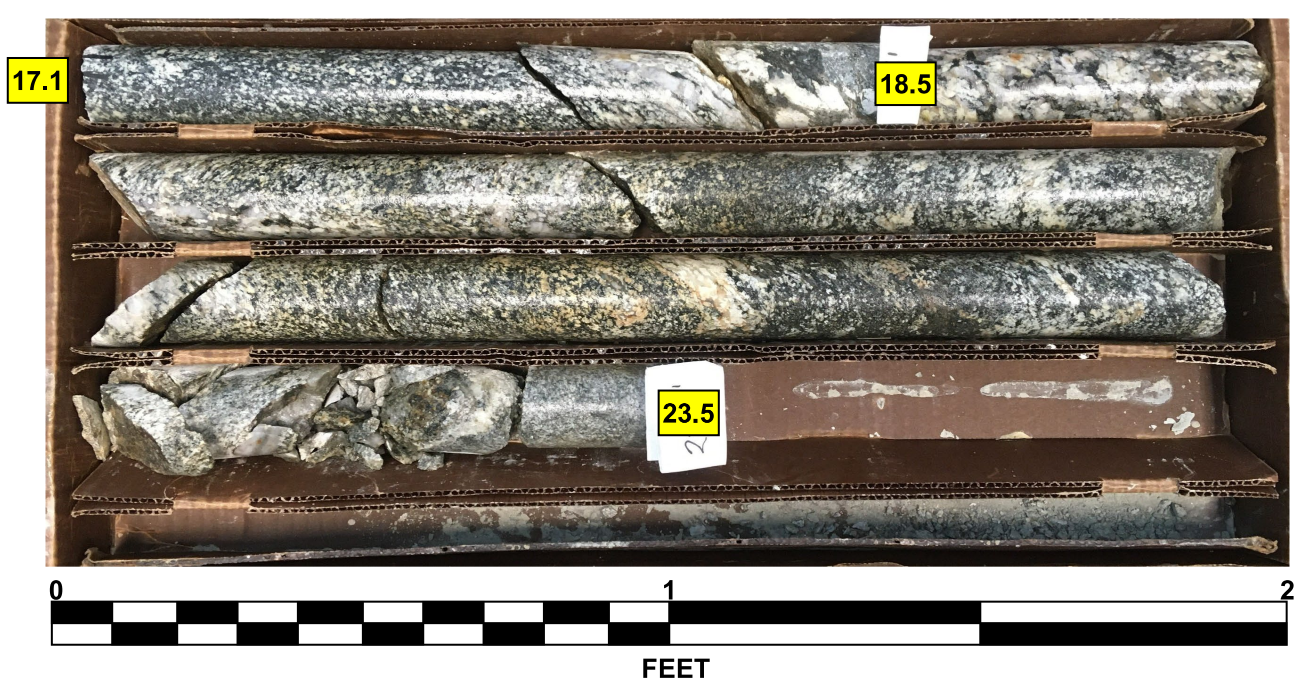
- Boring deepened on 3/3/22 to confirm in-situ bedrock.

CORE PHOTOGRAPHS

DET_EB1C

BOXES 1 & 2: 7.7 - 23.5 FEET





LNB_EB1A

BOXES 1 & 2: 10.7 - 24.9 FEET

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 55027.1.FS1 | **TIP** B-5527 | **COUNTY** SURRY | **GEOLOGIST** Fischer, H. & Gross, A.

SITE DESCRIPTION BRIDGES 122 AND 126 OVER TOMS CREEK ON US 52 NB AND SB

BORING NO. DET_B2C	**STATION** 23+58	**OFFSET** 65 ft LT	**ALIGNMENT** -LNB-	**GROUND WTR (ft)**
COLLAR ELEV. 931.6 ft	**TOTAL DEPTH** 25.9 ft	**NORTHING** 966,825	**EASTING** 1,560,932	**0 HR.** N/A **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/2/2021		**DRILL METHOD** Core Boring		**HAMMER TYPE** Automatic
DRILLER Moseley, M.B.	**START DATE** 02/23/22	**COMP. DATE** 03/04/22	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 14.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %
919.74									
	919.7	11.9	4.0	1:40/1.0 1:42/1.0 1:19/1.0 1:20/1.0	(2.8) 70%	(2.7) 68%		(7.3) 77%	(5.6) 59%
915	915.7	15.9	5.0	1:22/1.0 1:05/1.0 1:13/1.0 1:16/1.0 1:37/1.0	(4.0) 80%	(2.9) 58%			
910	910.7	20.9	5.0	1:39/1.0 2:01/1.0 1:49/1.0 1:49/1.0 1:57/1.0	(3.6) 72%	(1.6) 32%		(1.0) 42% (2.1) 100%	(0.0) 0% (1.6) 76%
	905.7	25.9							

DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft))

Begin Coring @ 11.9 ft

919.7 — **CRYSTALLINE ROCK** — 11.9
gray, dark green, white, and black, very slight to moderate weathering, hard to very hard, close fracture spacing, GRANITIC GNEISS

GSI: 70-75

910.2 — 21.4
brown and gray, moderate severe to severe weathering, medium hard to moderately hard, very close fracture spacing, GRANITIC GNEISS

907.8 — 23.8

GSI: 20-25

905.7 — 25.9
gray, dark green, white, and black, very slight to moderate weathering, hard to very hard, close fracture spacing, GRANITIC GNEISS

GSI: 70-75

Boring Terminated at Elevation 905.7 ft in Crystalline Rock (Granitic Gneiss)

- Topsoil Thickness = 0.0 Feet

- Boring deepened on 3/4/22 to confirm in-situ bedrock.

WBS 55027.1.FS1 | **TIP** B-5527 | **COUNTY** SURRY | **GEOLOGIST** Fischer, H. & Gross, A.

SITE DESCRIPTION BRIDGES 122 AND 126 OVER TOMS CREEK ON US 52 NB AND SB

BORING NO. LNB_EB2B	**STATION** 24+33	**OFFSET** 65 ft RT	**ALIGNMENT** -LNB-	**GROUND WTR (ft)**
COLLAR ELEV. 939.2 ft	**TOTAL DEPTH** 26.0 ft	**NORTHING** 966,902	**EASTING** 1,561,061	**0 HR.** N/A **24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/2/2021		**DRILL METHOD** Core Boring		**HAMMER TYPE** Automatic
DRILLER Moseley, M.B.	**START DATE** 02/23/22	**COMP. DATE** 03/02/22	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 15.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %
928.23									
925	928.2	11.0	5.0	*N=60/0.0* 0:46/1.0 2:02/1.0 3:27/1.0 2:15/1.0 2:05/1.0	(4.4) 88%	(3.2) 64%		(4.4) 88%	(3.2) 64%
920	923.2	16.0	5.0	0:40/1.0 0:43/1.0 0:54/1.0 0:52/1.0 0:57/1.0	(1.9) 38%	(0.0) 0%		(2.2) 42%	(0.0) 0%
915	918.2	21.0	5.0	1:22/1.0 2:47/1.0 1:56/1.0 1:21/1.0 1:30/1.0	(4.9) 98%	(4.5) 90%		(4.6) 98%	(4.5) 96%
	913.2	26.0							

DESCRIPTION AND REMARKS

Begin Coring @ 11.0 ft

928.2 — **CRYSTALLINE ROCK** — 11.0
white, gray, black, and brown, very slight to moderate severe weathering (very severe weathering 12.1' - 12.7'), medium hard to hard, close fracture spacing, GRANITIC GNEISS

923.2 — 16.0

GSI: 60-65

dark gray and brown, moderate to moderate severe weathering, medium hard to moderately hard, close to very close fracture spacing, GRANITIC GNEISS

917.9 — 21.3

GSI: 25-30

white, gray, and black, fresh to very slight weathering, hard to very hard, moderately close fracture spacing, GRANITIC GNEISS

913.2 — 26.0

GSI: 85-90

Boring Terminated at Elevation 913.2 ft in Crystalline Rock (Granitic Gneiss)

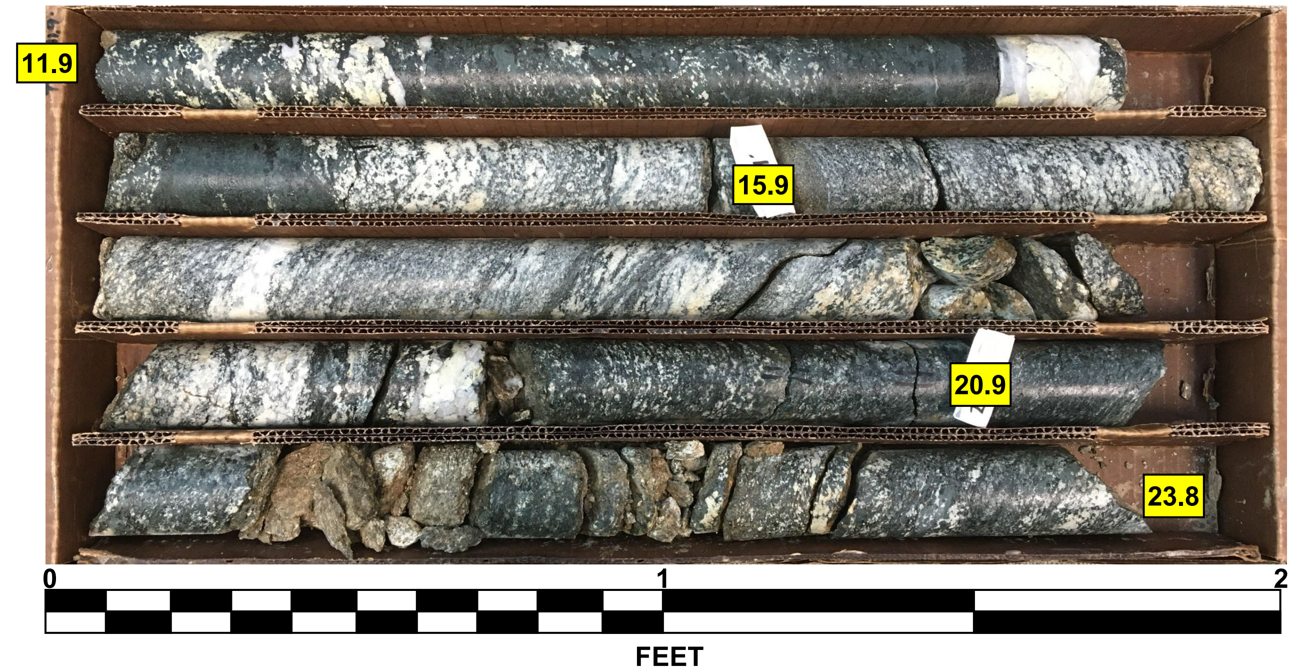
- Topsoil Thickness = 0.0 Feet

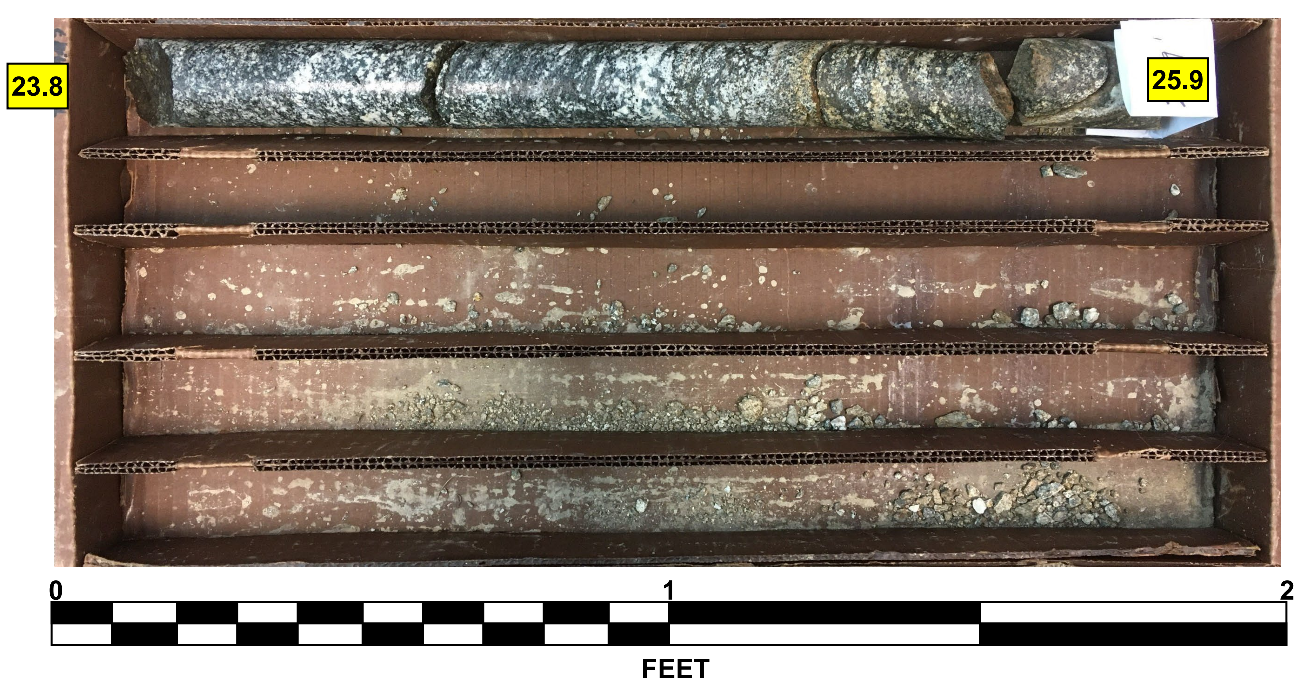
- Boring deepened on 3/2/22 to confirm in-situ bedrock.

CORE PHOTOGRAPHS

DET_B2C

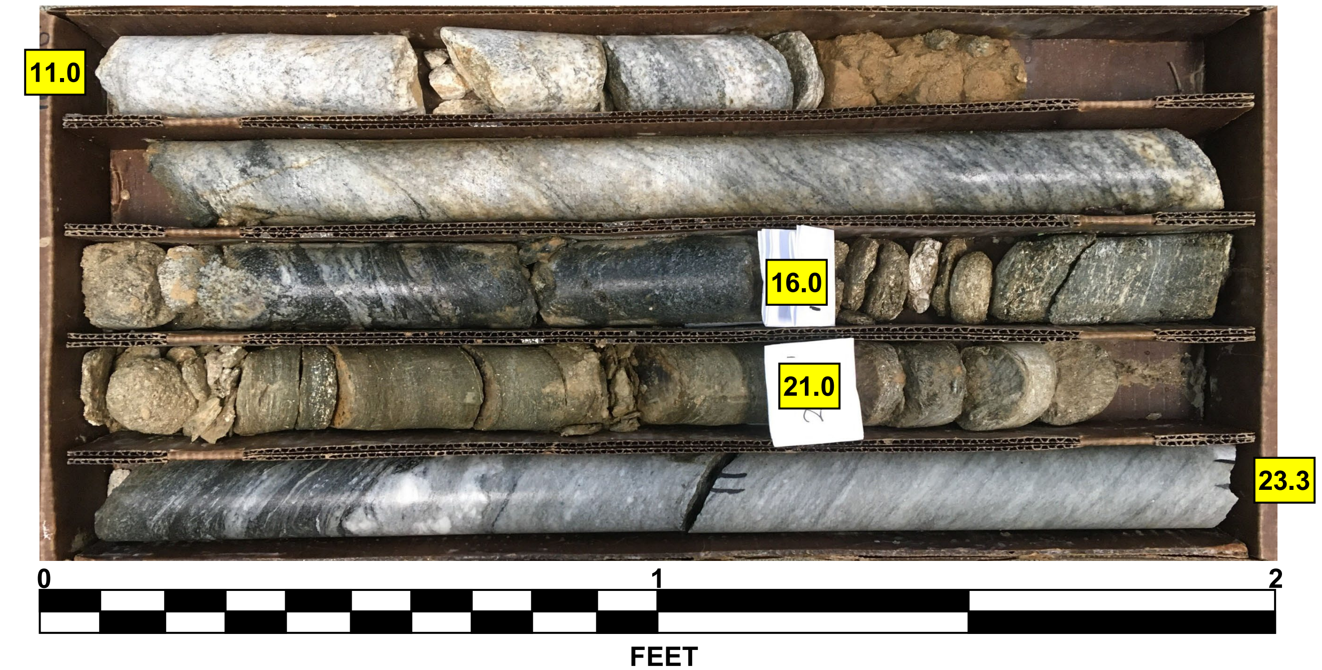
BOXES 1 & 2: 11.9 - 25.9 FEET

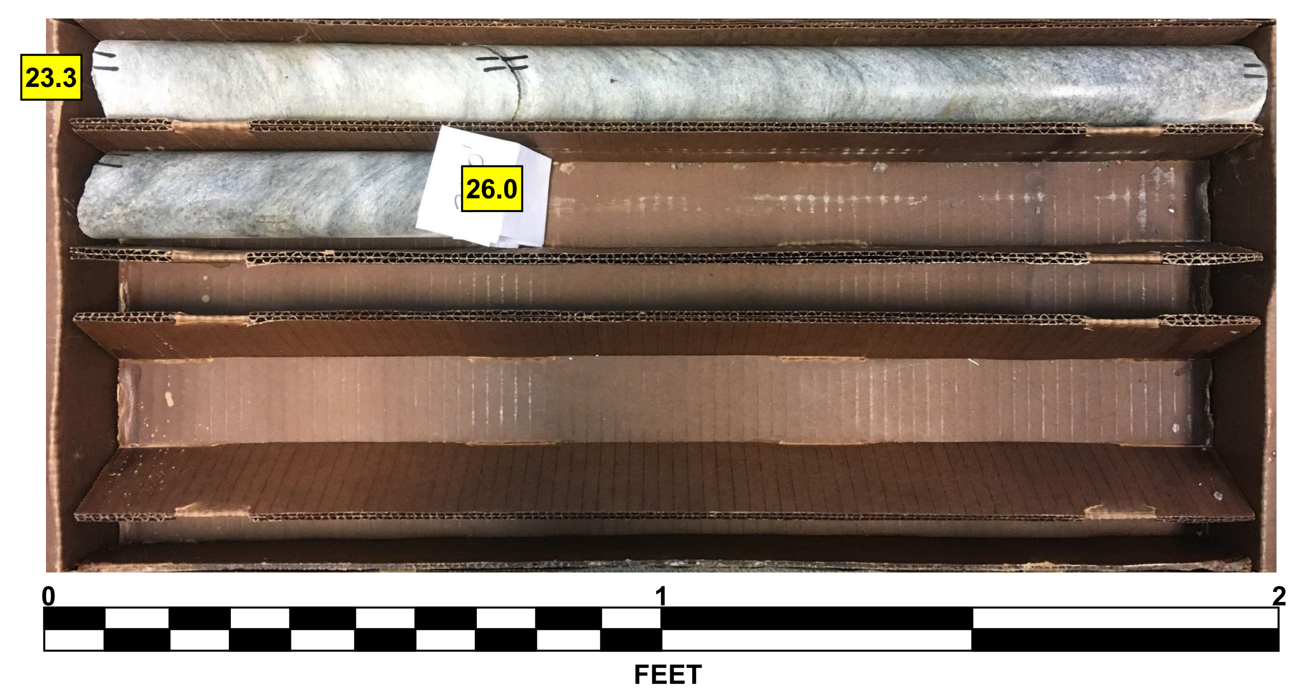




LNB_EB2B

BOXES 1 & 2: 11.0 - 26.0 FEET





NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX B
SOIL TEST RESULTS

Prepared in the Office of:
SUMMIT DESIGN AND ENGINEERING SERVICES
FIRM NO. P-0339 and C-487
2715 Ashton Drive, Ste 104
Wilmington, NC 28412
Phone: (910) 475-1208
www.summitde.com

M & T Form 503

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAY
MATERIALS & TESTS UNIT
SOILS LABORATORY

T. I. P. No. B-5527

REPORT ON SAMPLES OF Replace Bridges 122 and 126 on US 52 over Toms Cree

Project 55027.1.FS1 **County** Surry **Owner** NCDOT - Geotech
Date: Sampled 2/21/22 - 3/4/22 **Received** 3/10/22 **Reported** 3/31/22
Sampled from Roadway Investigation **By** Geotech
Submitted by B. Smith 2008 **Standard Specifications**

4/5/22

TEST RESULTS

Proj. Sample No.		SS-28	S-29	SS-39	SS-40	SS-26	SS-19
Boring No.		LNB_2590	LNB_2590	LNB_2600	LSB_2600	LSB_2700	LSB_2800
Retained #4 Sieve	%	1	3	0	0	5	4
Passing #10 Sieve	%	98	97	100	100	93	94
Passing #40 Sieve	%	92	88	96	98	86	88
Passing #200 Sieve	%	56	50	34	54	50	38

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - #60	%	13.1	21.0	14.2	7.7	13.3	17.5
Fine Sand Ret - #270	%	37.4	31.4	59.3	44.6	39.8	49.6
Silt 0.05 - 0.005 mm	%	21.8	2.4	8.4	12.3	18.2	8.7
Clay < 0.005 mm	%	27.7	45.2	18.1	35.4	28.7	24.2
Passing #40 Sieve	%	93.7	91.0	96.5	98.5	93.1	93.3
Passing #200 Sieve	%	57.5	52.0	34.0	54.3	54.3	40.1

L. L.		43	51	19	35	42	27
P. I.		13	20	2	13	10	6
AASHTO Classification		A-7-5	A-7-5	A-2-4	A-6	A-5	A-4
Group Index		6	7	0	5	3	0
pH							
Station		25+90	25+90	26+00	26+00	27+00	28+00
OFFSET		70'LT	70'LT	70'RT	70'RT	30'RT	140'RT
ALIGNMENT		LNB	LNB	LNB	LNB	LSB	LSB
Depth (Ft)		0.0	3.6	0.0	3.7	3.8	3.7
	to	1.5	5.1	1.5	5.2	5.3	5.2
Natural Moisture %							

Soils Engineer

M & T Form 503

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAY
MATERIALS & TESTS UNIT
SOILS LABORATORY

T. I. P. No. B-5527

k **REPORT ON SAMPLES OF** Replace Bridges 122 and 126 on US 52 over Toms Cr

Project 55027.1.FS1 **County** Surry **Owner** NCDOT - Geotech
Date: Sampled 2/21/22 - 3/4/22 **Received** 3/10/22 **Reported** 3/31/22
Sampled from Roadway Investigation **By** Geotech
Submitted by B. Smith 2008 **Standard Specifications**

4/5/22

TEST RESULTS

Proj. Sample No.		SS-13	SS-81	SS-82	SS-90	SS-84	SS-85
Boring No.		LSB_3000	LSB_EB1A	LSB_EB1A	LSB_EB1B	LSB_EB2A	LSB_EB2A
Retained #4 Sieve	%	0	4	1	4	2	1
Passing #10 Sieve	%	100	90	96	95	96	99
Passing #40 Sieve	%	97	88	73	84	84	92
Passing #200 Sieve	%	77	45	43	62	51	55

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - #60	%	6.0	15.4	32.1	17.7	20.0	15.3
Fine Sand Ret - #270	%	22.1	47.9	31.9	22.6	35.6	36.6
Silt 0.05 - 0.005 mm	%	14.2	26.1	19.8	10.9	14.1	4.0
Clay < 0.005 mm	%	57.7	10.6	16.2	48.8	30.3	44.1
Passing #40 Sieve	%	97.5	97.1	76.3	88.5	87.4	93.1
Passing #200 Sieve	%	77.6	50.0	45.3	65.6	52.5	55.4

L. L.		63	39	32	51	41	46
P. I.		31	5	4	18	8	11
AASHTO Classification		A-7-5	A-4	A-4	A-7-5	A-5	A-7-5
Group Index		26	0	0	11	2	5
pH							
Station		30+00	22+75	22+75	22+63	24+85	24+85
OFFSET		110'RT	22'LT	22'LT	14'RT	8'LT	8'LT
ALIGNMENT		LSB	LSB	LSB	LSB	LSB	LSB
Depth (Ft)		4.0	3.7	13.7	3.9	3.8	8.8
	to	5.5	5.2	15.2	5.4	5.3	10.3
Natural Moisture %							

Soils Engineer

M & T Form 503

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

T. I. P. No. B-5527

REPORT ON SAMPLES OF Replace Bridges 122 and 126 on US 52 over Toms Cr

Project 55027.1.FS1 **County** Surry **Owner** NCDOT - Geotech
Date: Sampled 2/21/22 - 3/4/22 **Received** 3/10/22 **Reported** 3/31/22
Sampled from Roadway Investigation **By** Geotech
Submitted by B. Smith 2008 **Standard Specifications**

4/5/22

TEST RESULTS

Proj. Sample No.		SS-86	SS-57	SS-75	SS-77	SS-78	SS-79
Boring No.		LSB_EB2A	LSB_EB1A	LNB_EB2A	LNB_EB2A	LNB_EB2A	LNB_EB2A
Retained #4 Sieve	%	1	14	1	6	0	6
Passing #10 Sieve	%	98	78	98	92	99	93
Passing #40 Sieve	%	92	66	90	87	91	86
Passing #200 Sieve	%	41	44	49	56	26	33

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - #60	%	15.8	22.0	15.4	12.2	24.4	21.2
Fine Sand Ret - #270	%	53.8	33.1	45.1	33.8	54.7	47.6
Silt 0.05 - 0.005 mm	%	19.8	36.3	15.2	15.1	10.8	12.9
Clay < 0.005 mm	%	10.6	8.6	24.3	38.9	10.1	18.3
Passing #40 Sieve	%	94.5	84.9	92.2	94.3	91.8	93.2
Passing #200 Sieve	%	42.1	55.7	50.0	60.9	26.1	36.1

L. L.		38	28	42	54	18	27
P. I.		6	4	12	19	0	6
AASHTO Classification		A-4	A-4	A-7-5	A-7-5	A-2-4	A-2-4
Group Index		0	0	4	9	0	0
pH							
Station		24+85	22+03	24+33	24+33	24+33	24+33
OFFSET		8'LT	25'LT	10'LT	10'LT	10'LT	10'LT
ALIGNMENT		LSB	LNB	LNB	LNB	LNB	LNB
Depth (Ft)		13.8	0.0	3.7	13.7	18.7	23.7
	to	15.3	1.5	5.2	15.2	20.2	25.2
Natural Moisture %							

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4/5/22

TEST RESULTS

Proj. Sample No.		SS-41	SS-42				
Boring No.		LNB_EB2B	LNB_EB2B				
Retained #4 Sieve	%	5	9				
Passing #10 Sieve	%	95	89				
Passing #40 Sieve	%	91	74				
Passing #200 Sieve	%	38	34				

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - #60	%	18.1	29.3				
Fine Sand Ret - #270	%	47.2	43.6				
Silt 0.05 - 0.005 mm	%	6.6	7.3				
Clay < 0.005 mm	%	28.1	19.8				
Passing #40 Sieve	%	95.4	82.7				
Passing #200 Sieve	%	39.7	37.7				

L. L.		28	34				
P. I.		12	6				
AASHTO Classification		A-6	A-2-4				
Group Index		1	0				
pH							
Station		24+33	24+33				
OFFSET		65'RT	65'RT				
ALIGNMENT		LNB	LNB				
Depth (Ft)		0.0	4.0				
	to	1.5	5.5				
Natural Moisture %							

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