REFERENCE: HE-0001B

PROJECT: 49742

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN
-Y-	19+50 TO 48+60	4 - 6

CROSS SECTIONS

LINE	STATION	SHEETS
-Y-	19+50 TO 48+60	7 - 21

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *BUNCOMBE*

PROJECT DESCRIPTION *ACCESS ROAD CONNECTING FROM I-26 TO NC 191 (BREVARD RD)*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HE-0001B	1	22

CAUTION NOTICE

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

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

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

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

PERSONNEL

J. MANNING

M. SERZEGA

INVESTIGATED BY *M. SNYDER*

DRAWN BY *M. SNYDER*

CHECKED BY *J. GARDNER*

SUBMITTED BY *M. SNYDER*

DATE *MAY 2023*

Prepared in the Office of:

GANNETT FLEMING
One Glenwood Avenue
Suite 900
Raleigh, NC 27603
919-420-7660
NC Lic. No. F-0270

NORTH CAROLINA PROFESSIONAL SEAL 044566 ENGINEER MATTHEW R. SNYDER

DocuSigned by:

9618E6A666EF453...

SIGNATURE

5/25/2023

DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
HE-0001B	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
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- 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
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] 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: BORING COLLAR ELEVATIONS FROM HE0001_LS_TIN.TIN DATED 6/15/2022.

ELEVATION: N/A FEET

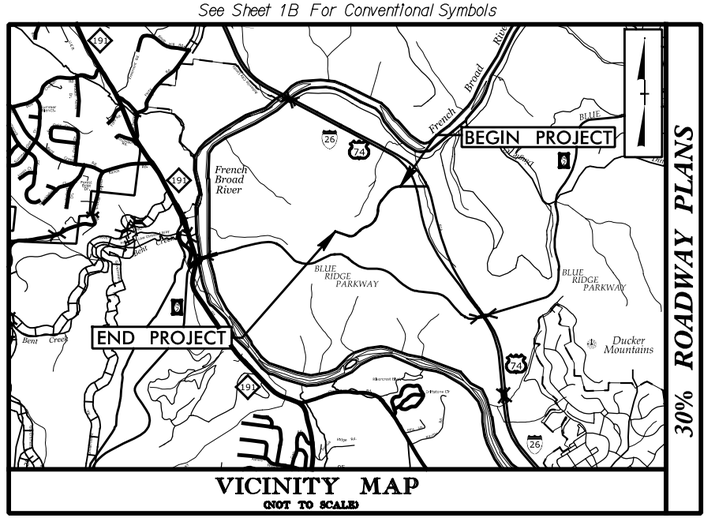
NOTES:

DATE: 8-15-14

TIP PROJECT: HE–0001B

CONTRACT:

See Sheet 1B For Conventional Symbols



VICINITY MAP
(NOT TO SCALE)

30% ROADWAY PLANS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

BUNCOMBE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HE–0001B	3	22

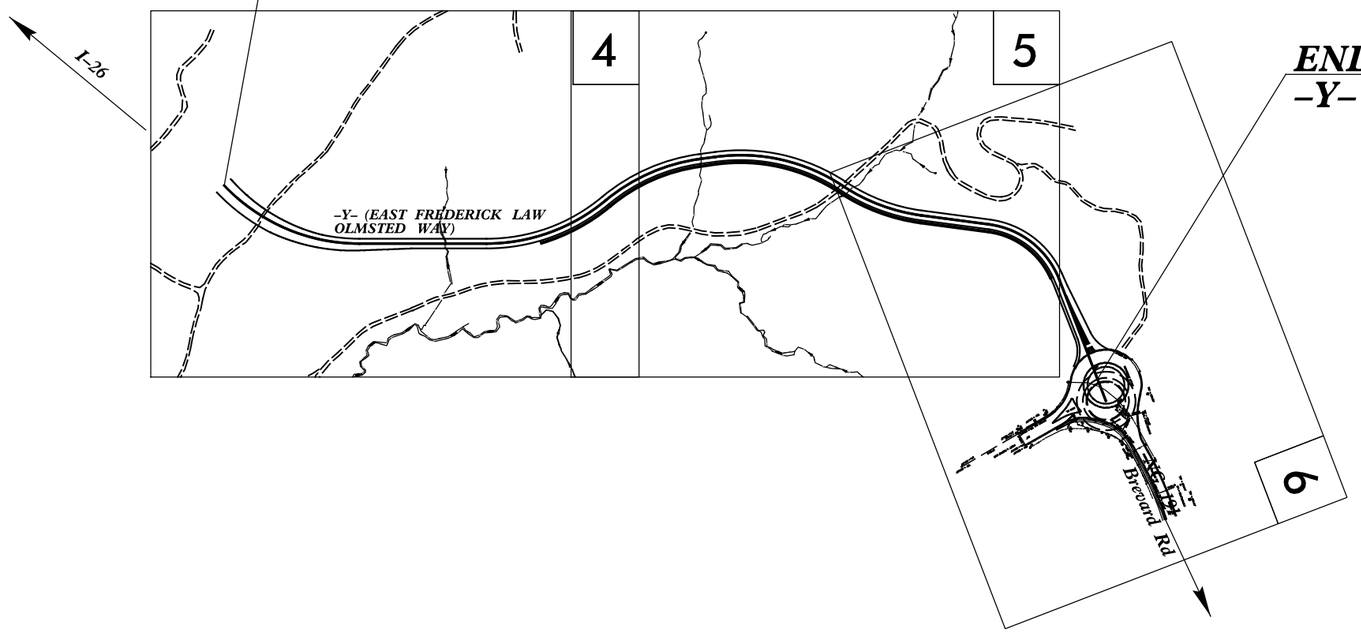
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
49742.3		PE

LOCATION: ACCESS ROAD CONNECTING FROM I–26 TO NC 191 (BREVARD RD)

TYPE OF WORK: GRADING, PAVING, AND DRAINAGE

NAD 83 /2011

BEGIN TIP PROJECT HE–0001B
–Y– STA. 19+50.00



END TIP PROJECT HE–0001B
–Y– STA. 48+57.94

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NOTES:
CLEARING ON THIS PROJECT WILL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD ___.

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 2021 = 9,100
ADT 2045 = 18,600
K = 9 %
D = 55 %
T = 10%
V = 40 MPH
* TTST = 1% DUAL 4%

FUNC CLASS = MINOR ARTERIAL

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT HE–0001B = 0.550 Miles

TOTAL LENGTH TIP PROJECT HE–0001B = 0.550 Miles

NCDOT CONTACT: MCCRAY COATES, PE
DIVISION 13 PROJECT MANAGER

Prepared for the North Carolina Department of Transportation In the Office of:

GANNETT FLEMING
One Glenwood Avenue
Suite 900
Raleigh, NC 27603
919-420-7660
NC Lic. No. F-0270

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: N/A

LETTING DATE: N/A

RICKY A. TIPTON, PE
PROJECT ENGINEER

ANGELA B. PRIDGEN, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

GANNETT FLEMING

One Glenwood Avenue
Suite 900
Raleigh, NC 27603
P 919.420.7660 | **F** 919.999.3632

gannettfleming.com

May 12, 2023

State Project: 49742.3
TIP No.: HE-0001B
County: Buncombe
Description: Access Road Connecting I-26 to NC 191 (Brevard Rd)

Subject: Roadway Subsurface Inventory Report

PROJECT DESCRIPTION

The proposed project (HE-0001B) consists of approximately 0.55-miles of new alignment roadway (-Y-) to connect a future diverging diamond interchange (DDI) to Frederick Law Olmstead Way East and NC 191 (Brevard Rd). The new alignment roadway will be a two-lane typical section with embankments up to 25 feet and cut sections as deep as 85 feet.

The geotechnical investigation for HE-0001B was performed from August to September of 2022. Seventeen (17) Standard Penetration test (SPT) borings were performed with CME 550X ATV-mounted drill rigs equipped with automatic hammers. Representative soil samples were collected from split spoon samples and soil cuttings for field visual classification and laboratory analysis and classification.

The following alignments, totaling 0.6 miles, were investigated. Selected cross sections of these alignments are included in this report.

Line	Stations (+/-)
-Y-	19+50 – 48+60

PHYSIOGRAPHY AND GEOLOGY

The proposed project is located within the Blue Ridge Physiographic Province. The terrain within the project corridor consists of rolling hills and mountainsides.

The proposed project is underlain by Late Proterozoic Mica Schist and Biotite Gneiss. The occurrence of these rock types is indicated by the weathered and crystalline rock samples recovered during the geotechnical investigation, as well as the composition of the local residual soils. The overlying residual soils are a result of physical and chemical weathering of the underlying parent bedrock.

SOIL PROPERTIES

The soils encountered during the geotechnical investigation consisted of alluvial and residual soils.

Alluvial Soils: Alluvial soils are assumed to be present within existing streams crossing the proposed alignment.

Residual Soils: Soils classified as residual soils generally consisted of silty and clayey sand (A-2-4, A-2-5, A-2-6), sandy and clayey silt (A-4, A-5), and sandy and silty clay (A-6, A-7-5, A-7-6). Varying amounts of mica, manganese, and rock fragments were noted within soils interpreted as residual soils.

ROCK PROPERTIES

Weathered Rock: Weathered Rock is defined by penetration by split spoon of less than 1.0 foot per 100 blows. Weathered Rock was encountered in ten (10) borings. Four (4) of these borings encountered intermediate lenses of Weathered Rock that transitioned back to residual soils at greater depths. These lenses ranged in thickness from 0.8 to 7.5 feet. Weathered Rock was encountered at elevations ranging from 2,064 to 2,128 feet, excluding the intermediate lenses.

Crystalline Rock: Crystalline Rock is defined by auger refusal and/or SPT refusal with penetration by split spoon of less than or equal to 0.1 feet per 60 blows. Crystalline Rock was encountered in eight (8) borings at elevations ranging from 2,050 to 2,125 feet. Crystalline Rock encountered at the site is visually identified as Mica Schist and Biotite Gneiss.

GROUNDWATER

Groundwater measurements were attempted in most of the borings immediately upon completion of drilling and/or a minimum of 24-hr after completion of drilling. Groundwater was encountered during drilling operations (0-hr) in one (1) boring at a depth of 56.9 feet and elevation of 2,096 feet. Stabilized groundwater table (24-hr) measurements were recorded in two (2) borings at depths ranging from 4.0 to 51.5 feet and elevations ranging from 2,087 to 2,102 feet. Groundwater was not encountered in the remaining borings.

AREAS OF SPECIAL GEOTECHNICAL INTEREST

Alluvial Soils: The following areas are assumed to contain alluvial soils associated with existing streams crossing the proposed alignment:

Line	Stations (+/-)	Offset
-Y-	26+10 – 26+45	LT & RT
-Y-	34+10 – 34+30	LT & RT
-Y-	38+40 – 38+90	LT & RT

Cohesive Soils: The following areas contain cohesive soils at existing subgrade in fill areas or near proposed subgrade in cut areas and have the potential to cause subgrade problems during construction:

Line	Stations (+/-)	Offset
-Y-	25+75 – 30+50	LT & RT
-Y-	38+25 – 42+00	LT & RT
-Y-	44+00 – 46+00	LT & RT

Highly Plastic Soils: Highly plastic soils with plasticity indices (PI) greater than 25 within proposed cut sections or greater than 35 within 3-ft of subgrade were not encountered.

Weathered Rock: The following areas contain weathered rock above or within six (6) feet of proposed grade and have the potential to require ripping or blasting for removal:

Line	Stations (+/-)	Offset
-Y-	19+50 – 25+00	LT & RT
-Y-	35+00 – 37+50	LT & RT

Crystalline Rock: The following areas contain crystalline rock above or within six (6) feet of proposed grade and will likely require ripping or blasting for removal:

Line	Stations (+/-)	Offset
-Y-	19+50 – 21+50	LT & CT
-Y-	36+50 – 37+50	CT

Groundwater: Groundwater was not encountered within proposed cut sections.

The following areas exhibited groundwater within six (6) feet of the proposed grade:

Line	Stations (+/-)	Offset
-Y-	36+50 – 37+50	LT

Sincerely,
Gannett Fleming, Inc.

Matthew Snyder, P.E.
Senior Project Geotechnical Engineer

GANNETT FLEMING

PROJECT REFERENCE NO.	SHEET NO.
HE-0001B	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

8/17/99

BEGIN TIP PROJECT HE-0001B
BEGIN CONSTRUCTION
-Y- POC STA. 19+50.00

NAD_83\2011

BILTMORE FARMS, INC.
DB 1222 PG 645

BILTMORE FARMS INC.
DB 1222 PG 645

YL_1900L

YL_2000L

YL_1930

RPA_1000L

YL_2200

YL_2400L

YL_2600

YL_2800R

YL_3000L

RESIDUAL

ALLUVIAL

RESIDUAL

20+00

25+00

30+00

-Y-

MATCHLINE SHEET 05
-Y- STA 31+00.00

SOIL

ROCK

C

F

UNDISTURBED STREAM BANK

UNDISTURBED STREAM BANK

12:04:13 PM
c:\pwworking\gfpw01\masnyder@gfnet.com\d1551497\HE-0001B_GEO_inv_004.dgn
masnyder

PROJECT REFERENCE NO.	SHEET NO.
HE-0001B	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83/2011

BILTMORE FARMS, INC.
DB 1222 PG 645

OLD TIMBER RR ROCK CROSSING

YI_3600L
YI_3700L
YI_3600
YI_3700
YI_3200L
YI_3400
YI_3900
YI_4100L
YI_4300

35+00
40+00

ALLUVIAL
RESIDUAL
ALLUVIAL
RESIDUAL

U/G STREAM
U/G STREAM
U/G STREAM
SPRING

SOIL
SOIL
SOIL
SOIL
SOIL
SOIL

MATCHLINE SHEET 04
-Y- STA 31+00.00

MATCHLINE SHEET 06
-Y- STA 44+00.00

8/17/99

12:04:16 PM
c:\pwworking\gfpw01\masnyder\gfnet.com\d1551497\HE-0001B_GEO_inv_005.dgn
masnyder

PROJECT REFERENCE NO.	SHEET NO.
HE-0001B	6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NOTE: ROUNDABOUT DESIGN TO BE COMPLETED BY OTHERS

NAD 83/2011

BILTMORE FARMS, INC.
DB 1222 PG 645

END TIP PROJECT HE-0001B
END CONSTRUCTION
-Y- POT Sta. 48+59.99

SOIL

SILT

C

YL_4700

45+00

-Y-

YL_4500

MATCHLINE SHEET 5
-Y- STA 44+00.00

RESIDUAL

BILTMORE FARMS, INC.
DB 1222 PG 645

GR

RIP-RAP

18" CMP

30" CMP

RIP-RAP

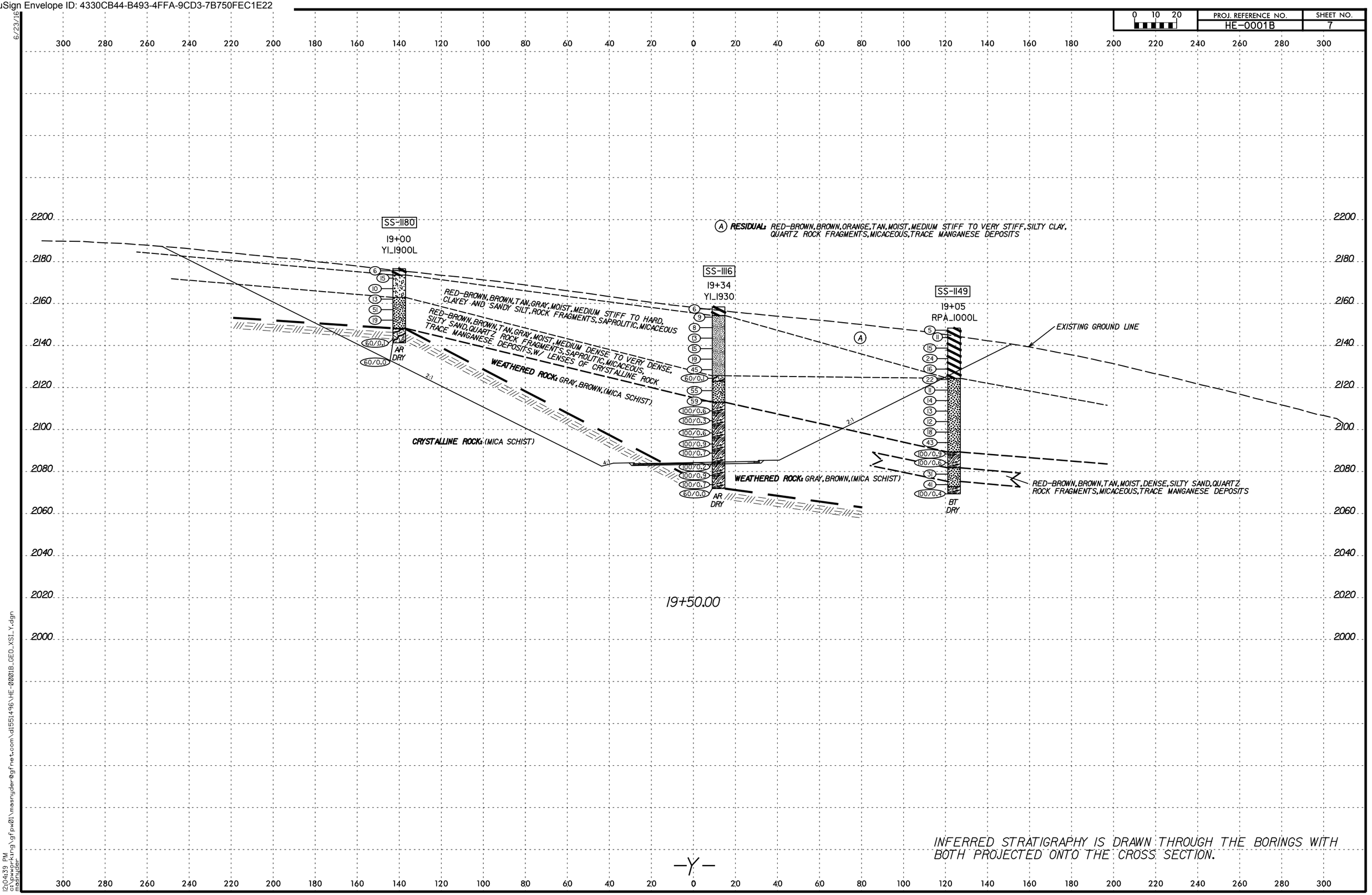
RIP-RAP

RAYTHEON TE
CORPOR.
DB 6057 F

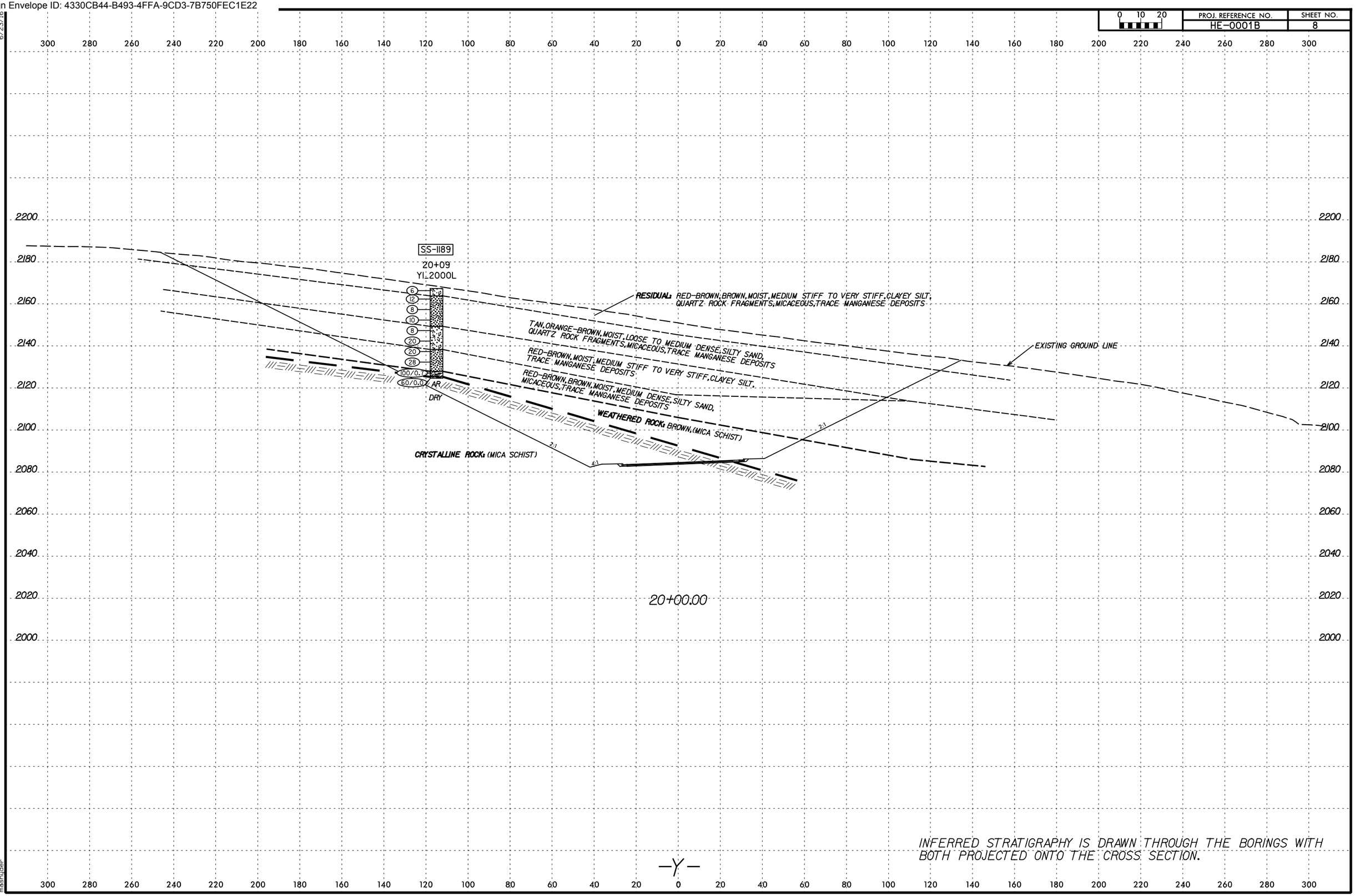
8/17/99

12:04:19 PM
c:\pwworking\gfpw01\masnyder@gfnet.com\d1551497\HE-0001B_GEO_inv_006.dgn
masnyder

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	7



0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	8



0 10 20

PROJ. REFERENCE NO.	SHEET NO.
HE-0001B	9

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2200
2180
2160
2140
2120
2100
2080
2060
2040
2020

RESIDUAL: RED-BROWN,BROWN,MOIST,MEDIUM STIFF TO VERY STIFF,CLAYEY SILT, QUARTZ ROCK FRAGMENTS,MICACEOUS,TRACE MANGANESE DEPOSITS

TAN,ORANGE-BROWN,MOIST,LOOSE TO MEDIUM DENSE,SILTY SAND, QUARTZ ROCK FRAGMENTS,MICACEOUS,TRACE MANGANESE DEPOSITS

RED-BROWN,MOIST,MEDIUM STIFF TO VERY STIFF,CLAYEY SILT, TRACE MANGANESE DEPOSITS

RED-BROWN,BROWN,MOIST,MEDIUM DENSE,SILTY SAND, MICACEOUS,TRACE MANGANESE DEPOSITS

WEATHERED ROCK: BROWN,(MICA SCHIST)

CRYSTALLINE ROCK: (MICA SCHIST)

EXISTING GROUND LINE

2:1

20+50.00

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

-Y-

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	10

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2200
2180
2160
2140
2120
2100
2080
2060
2040
2020

RESIDUAL: ORANGE-BROWN, TAN, MOIST, MEDIUM STIFF, SANDY CLAY, ROCK FRAGMENTS

TAN, WHITE, MOIST, STIFF, SANDY SILT, QUARTZ ROCK FRAGMENTS, MICACEOUS, SAPROLITIC

RED-BROWN, GRAY-BROWN, WHITE, MOIST, MEDIUM DENSE TO VERY DENSE, SILTY SAND, QUARTZ ROCK FRAGMENTS, TRACE MANGANESE DEPOSITS, MICACEOUS, SAPROLITIC, LENSES OF WEATHERED ROCK

EXISTING GROUND LINE

2:1

4:1

2:1

CRYSTALLINE ROCK: (MICA SCHIST)

WEATHERED ROCK: GRAY, BROWN, (MICA SCHIST)

21+00.00

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

-Y-

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	11

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2200
2180
2160
2140
2120
2100
2080
2060
2040
2020
2000

RESIDUAL: ORANGE-BROWN,TAN,MOIST,MEDIUM STIFF,SANDY CLAY,ROCK FRAGMENTS

TAN,WHITE,MOIST,STIFF,SANDY SILT,QUARTZ ROCK FRAGMENTS,MICACEOUS,SAPROLITIC

RED-BROWN,GRAY-BROWN,WHITE,MOIST,MEDIUM DENSE TO VERY DENSE, SILTY SAND,QUARTZ ROCK FRAGMENTS,TRACE MANGANESE DEPOSITS, MICACEOUS,SAPROLITIC,LENSES OF WEATHERED ROCK

EXISTING GROUND LINE

2:1

4:1

CRYSTALLINE ROCK: (MICA SCHIST)

WEATHERED ROCK: GRAY-BROWN,WHITE,(MICA SCHIST)

21+50.00

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

-Y-

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

6/23/16

0 5 10

PROJ. REFERENCE NO.	SHEET NO.
HE-0001B	12

210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90

2170
2160
2150
2140
2130
2120
2110
2100
2090
2080
2070
2060
2050

RESIDUAL: ORANGE-BROWN,TAN,MOIST,MEDIUM STIFF,SANDY CLAY,ROCK FRAGMENTS

TAN,WHITE,MOIST,STIFF,SANDY SILT,QUARTZ ROCK FRAGMENTS,MICACEOUS,SAPROLITIC

RED-BROWN,GRAY-BROWN,WHITE,MOIST,MEDIUM DENSE TO VERY DENSE, SILTY SAND,QUARTZ ROCK FRAGMENTS,TRACE MANGANESE DEPOSITS, MICACEOUS,SAPROLITIC

SS-1095
21+97
Y1_2200

7
11
13
25
14
25
25
100/0.3
44
68
100/0.4

BT
DRY

EXISTING GROUND LINE

2:1

4:1

2:1

WEATHERED ROCK: GRAY-BROWN,WHITE,(MICA SCHIST)

WEATHERED ROCK: GRAY-BROWN,WHITE,(MICA SCHIST)

22+00.00
-Y-

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

12:04:41 PM
c:\pwworking\gfpw01\masnyder@gfnet.com\d1551496\HE-0001B_GEO_XS1_Y.dgn
masnyder

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	13

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

2100 2090 2080 2070 2060 2050

SS-1112

25+95

Y1_2600

2:1

2:1

4

12

11

BT
DRY

RESIDUAL: ORANGE-BROWN, MOIST, SOFT, SANDY CLAY

ORANGE-BROWN, TAN, MOIST, STIFF, CLAYEY SILT, ROCK FRAGMENTS, MICACEOUS

EXISTING GROUND LINE

26+00.00

2120 2110 2100 2090 2080 2070 2060 2050

SS-1103

23+95

Y1_2400L

2:1

7

9

10

18

100/0.1

23

27

43

84

BT
DRY

RESIDUAL: ORANGE-BROWN, MOIST, MEDIUM STIFF, SANDY CLAY, ROCK FRAGMENTS

ORANGE-BROWN, TAN, GRAY, WHITE, MOIST, LOOSE TO VERY DENSE, SILTY SAND, SAPROLITIC, MICACEOUS

WEATHERED ROCK: GRAY, (MICA SCHIST)

3:1

EXISTING GROUND LINE

24+00.00

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

—Y—

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

6/23/16

0 5 10

PROJ. REFERENCE NO.	SHEET NO.
HE-0001B	14

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

2110
2100
2090
2080
2070
2060
2050
2040
2030

2:1

RESIDUAL: ORANGE-BROWN, RED-BROWN, MOIST, MEDIUM STIFF, SILTY CLAY, ROCK FRAGMENTS, SAPROLITIC, MICACEOUS

GRAY-BROWN, TAN, MOIST, VERY STIFF, SANDY SILT, ROCK FRAGMENTS, MICACEOUS, SAPROLITIC

GRAY-BROWN, TAN, MOIST, DENSE, SILTY SAND, ROCK FRAGMENTS, MICACEOUS, SAPROLITIC

SS-1073
27+92
YI_2800R

2:1

6
7
16
44
60/0.0

AR
DRY

CRYSTALLINE ROCK: (MICA SCHIST)

EXISTING GROUND LINE

28+00.00
-Y-

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

12:04:42 PM
c:\pwworking\gfpw01\masnyder@gfnet.com\d1551496\HE-0001B_GEO_XS1_Y.dgn
masnyder

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	15

6/23/16

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

2140
2130
2120
2110
2100
2090
2080
2070
2060

SS-1078
29+93
YI_3000L

3
10
4
13
7
12

2:1
4:1
3:1

RESIDUAL: ORANGE-BROWN,BROWN,MOIST,SOFT,SANDY CLAY,ROCK FRAGMENTS

EXISTING GROUND LINE

ORANGE-BROWN,GRAY-BROWN,TAN,WHITE,MOIST,LOOSE TO MEDIUM DENSE,CLAYEY AND SILTY SAND,ROCK FRAGMENTS, MICACEOUS,SAPROLITIC

BT
DRY

30+00.00

-Y-

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	16

200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100

2120 2110 2100 2090 2080 2070

33+82
YI_3400

2:1 4:1 2:1

15 35 20

BT
DRY

RESIDUAL: TAN, BROWN, GRAY, MOIST, MEDIUM DENSE TO DENSE, CLAYEY AND SILTY SAND, QUARTZ ROCK FRAGMENTS, SAPROLITIC, MICACEOUS

EXISTING GROUND LINE

34+00.00

2170 2160 2150 2140 2130 2120 2110 2100 2090 2080 2070

SS-1082
SS-1088
31+90
YI_3200L

2:1

5 14 13 10 9 17 12 91 60/0.0

AR
DRY

RESIDUAL: ORANGE-BROWN, BROWN, MOIST, MEDIUM STIFF, SANDY CLAY

ORANGE-BROWN, GRAY-BROWN, TAN, MOIST, LOOSE TO MEDIUM DENSE, CLAYEY AND SILTY SAND, ROCK FRAGMENTS, MICACEOUS, SAPROLITIC

4:1 3:1

EXISTING GROUND LINE

CRYSTALLINE ROCK: (MICA SCHIST)

32+00.00

-Y-

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100

180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120

2160 2150 2140 2130 2120 2110 2100 2090 2080 2070

SS-1031
SS-1037
35+88
YI_3600L

SS-1043
SS-1048
35+89
YI_3600

10 23 13 12 14 100/0.8 17 50 50 15 28 100/0.6 100/0.9

9 15 14 28 21 85 65 79 28 100/0.3 60/0.0

RESIDUAL: ORANGE-BROWN,TAN,BROWN,MOIST,STIFF, SILTY AND SANDY CLAY,QUARTZ ROCK FRAGMENTS,MICACEOUS

WHITE,TAN,BROWN,MOIST,STIFF TO HARD,SANDY AND CLAYEY SILT, QUARTZ ROCK FRAGMENTS,SAPROLITIC,MICACEOUS

EXISTING GROUND LINE

2:1

WEATHERED ROCK: GRAY-BROWN,(BIOTITE GNEISS)

TAN,WHITE,BROWN,ORANGE-BROWN,MOIST,MEDIUM DENSE TO VERY DENSE,CLAYEY AND SILTY SAND, ROCK FRAGMENTS,SAPROLITIC,MICACEOUS

4:1

TAN,BROWN,MOIST,VERY STIFF TO HARD,SANDY SILT, ROCK FRAGMENTS,SAPROLITIC,MICACEOUS

WEATHERED ROCK: GRAY-BROWN,WHITE,(BIOTITE GNEISS)

BT DRY

BT DRY

CRYSTALLINE ROCK: (BIOTITE GNEISS)

36+00.00

-Y-

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	18

210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90

2180
2170
2160
2150
2140
2130
2120
2110
2100
2090
2080

SS-1064
SS-1069
36+89
Y1_3700L

11 9 10 6 7 9 11 20 41 46 29 100/0.7 100/0.7 60/0.0

09/22

BT

SS-1050
36+88
Y1_3700

9 10 13 11 12 17 100/0.6 100/0.6 100/0.4 60/0.0

AR
DRY

RESIDUAL: ORANGE-BROWN,BROWN,MOIST,MEDIUM STIFF TO VERY STIFF,SILTY CLAY, ROCK FRAGMENTS,SAPROLITIC,MICACEOUS

ORANGE-BROWN,GRAY,TAN,MOIST TO WET,STIFF TO HARD, SANDY AND CLAYEY SILT,ROCK FRAGMENTS,SAPROLITIC, MICACEOUS

ORANGE-BROWN,TAN,MOIST,DENSE,SILTY SAND, ROCK FRAGMENTS,SAPROLITIC,MICACEOUS

ORANGE-BROWN,TAN,MOIST,VERY STIFF,SANDY CLAY,SAPROLITIC

WEATHERED ROCK: GRAY-BROWN,WHITE,(BIOTITE GNEISS)

CRYSTALLINE ROCK: (BIOTITE GNEISS)

EXISTING GROUND LINE

2:1

37+00.00
-Y-

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

12:04:44 PM
c:\pwworking\gfpw01\masnyder@gfnet.com\d1551496\HE-0001B_GEO_XS1_Y.dgn
masnyder

6/23/16

0 5 10

PROJ. REFERENCE NO.	SHEET NO.
HE-0001B	19

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

2130
2120
2110
2100
2090
2080
2070
2060
2050

2:1

2:1

38+87
YI_3900

EXISTING GROUND LINE

RESIDUAL: TAN,MOIST,MEDIUM STIFF,SANDY CLAY

7
9
09/22

ORANGE-BROWN,TAN,WHITE,MOIST,STIFF TO VERY STIFF,
SANDY SILT,ROCK FRAGMENTS,SAPROLITIC,MICACEOUS

17
23

BROWN,WHITE,MOIST,MEDIUM DENSE TO VERY DENSE,SILTY SAND,
QUARTZ ROCK FRAGMENTS,SAPROLITIC,MICACEOUS

23
98
100/0.1

BT

WEATHERED ROCK: BROWN,WHITE,(BIOTITE GNEISS)

39+00.00

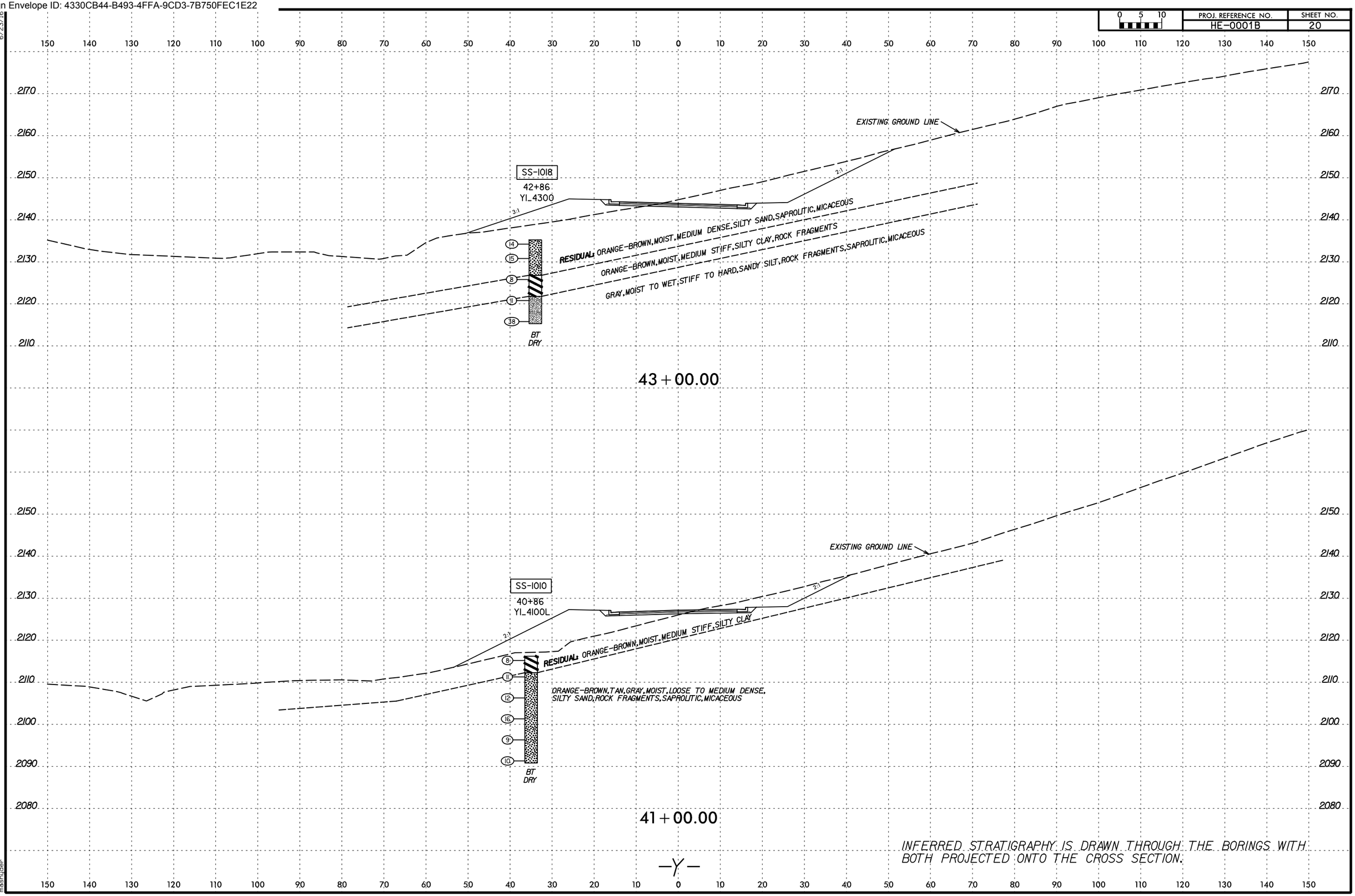
-Y-

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

12:04:44 PM
c:\pwworking\gfpw01\masnyder@gfnet.com\d1551496\HE-0001B_GEO_XS1_Y.dgn
masnyder

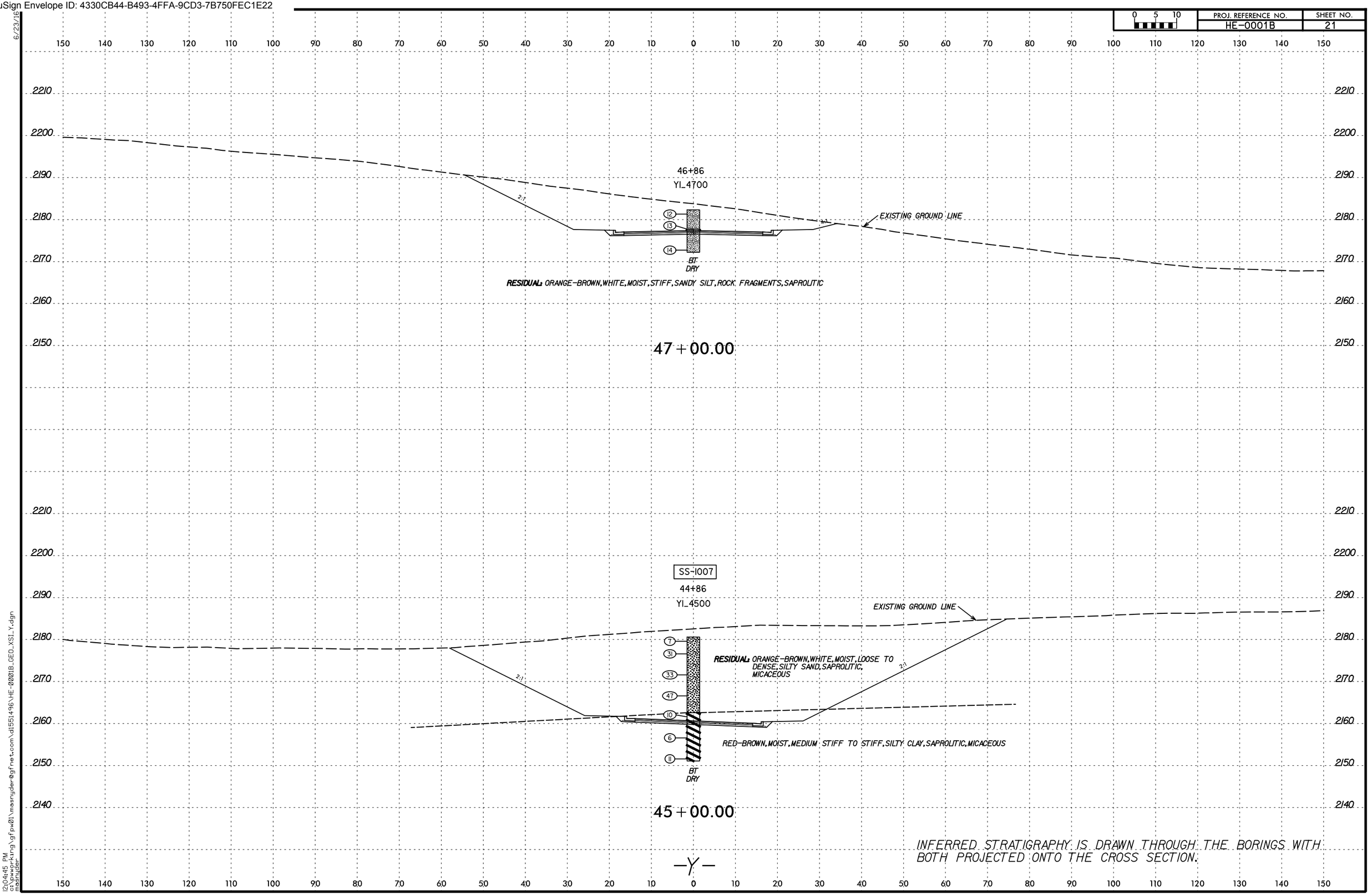
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	20



12:04:45 PM
c:\pwworking\gfpw01\masnyder@gfnet.com\d1551496\HE-0001B_GEO_XS1_Y.dgn
masnyder

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	HE-0001B	21



SOIL TEST RESULTS

SAMPLE NO.	ALIGNMENT	STATION	OFFSET	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING SIEVE			% MOISTURE	% ORGANIC
								C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1180	-Y-	19+00	140' LT	8.5-10.0	A-5(0)	41	1	5.6	66.2	26.1	2.1	99	98	41	13.7	-
SS-1149	-Y-	19+05	124' RT	18.5-20.0	A-7-5(6)	61	12	7.9	29.0	25.8	37.3	79	75	54	20.6	-
SS-1116	-Y-	19+34	12' RT	13.9-15.4	A-4(0)	35	0	12.1	54.7	26.3	6.9	100	95	45	30.5	-
SS-1189	-Y-	20+09	115' LT	19.0-20.5	A-5(10)	74	6	7.2	28.2	53.2	11.4	100	98	69	53.5	-
SS-1095	-Y-	21+97	9' RT	23.3-24.8	A-2-5(0)	41	6	21.2	62.7	11.6	4.5	100	91	30	10.4	-
SS-1103	-Y-	23+95	30' LT	8.7-10.2	A-2-4(0)	37	0	14.8	65.1	17.2	2.9	99	94	31	13.2	-
SS-1112	-Y-	25+95	CL	9.5-11.0	A-5(0)	55	4	27.0	33.5	29.9	9.6	91	76	42	31.7	-
SS-1073	-Y-	27+92	52' RT	2.5-4.0	A-7-5(5)	52	12	10.1	49.4	11.8	28.7	97	93	52	20.6	-
SS-1078	-Y-	29+93	24' LT	8.9-10.4	A-2-5(0)	47	0	15.4	62.9	17.5	4.2	98	91	35	14.5	-
SS-1082	-Y-	31+90	33' LT	0.0-1.5	A-6(5)	39	14	8.1	38.7	14.1	39.1	88	85	55	18.7	-
SS-1088	-Y-	31+90	33' LT	27.7-29.2	A-2-5(0)	54	1	24.4	51.9	14.9	8.8	86	79	29	23.6	-
SS-1043	-Y-	35+89	6' LT	14.4-15.9	A-4(1)	30	4	7.6	50.8	31.7	9.9	100	98	57	12.8	-
SS-1048	-Y-	35+89	6' LT	39.4-40.9	A-4(0)	37	2	9.3	55.6	31.3	3.8	100	98	52	19.9	-
SS-1031	-Y-	35+88	86' LT	9.2-10.7	A-4(0)	38	2	11.4	62.6	22.2	3.8	100	97	45	12.4	-
SS-1037	-Y-	35+88	86' LT	44.2-45.7	A-5(1)	48	5	16.8	51.3	24.0	7.9	99	92	45	27.0	-
SS-1050	-Y-	36+88	7' LT	0.0-1.5	A-7-5(13)	53	19	10.9	27.3	19.1	42.7	99	94	68	20.2	-
SS-1064	-Y-	36+89	108' LT	23.8-25.3	A-7-5(3)	53	12	21.6	37.9	24.2	16.3	88	80	44	31.7	-
SS-1069	-Y-	36+89	108' LT	48.8-50.3	A-4(1)	30	4	14.6	40.8	32.7	11.9	99	94	55	20.1	-
SS-1010	-Y-	40+86	35' LT	0.0-1.5	A-7-6(12)	47	21	9.9	29.6	20.3	40.2	96	93	63	22.6	-
SS-1018	-Y-	42+86	34' LT	8.4-9.9	A-7-5(15)	65	26	11.0	33.3	15.2	40.5	92	86	60	32.6	-
SS-1007	-Y-	44+86	CL	18.0-19.5	A-7-5(21)	66	16	1.1	22.8	47.2	28.9	100	100	87	47.2	-