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December 10, 2021

MEMORANDUM TO: Wright Archer, III, PE

Division Engineer

ATTENTION: Brian Ketner, PE

Division Project Engineer

FROM: Don Brown, P.E.

Practice Leader, Geotechnical & Construction Services

67070.1.1 (BR-0070) STATE PROJECT:

COUNTY: Caswell

DESCRIPTION: Replacement of Bridge 61 Over Hogan's Creek on NC 86 between SR 1300 and SR 1500

SUBJECT: **Roadway Subsurface Inventory**

Project Description

The proposed project consists of improvements to NC 86, located in Providence, North Carolina. The total length of the project is approximately 0.7± miles, with one alignment as noted below:

Alignment	Road Name	Stations
-L-	NC 86	12+85 to 48+00

Plans call for a new three span bridge over Hogan's Creek on new location, just east of the existing bridge. The project will include the realignment of NC 86, as a two-lane facility, to accommodate the new bridge location.

The project corridor is undeveloped land consisting of open fields and woodlands. Portions of the alignment appear to have been clear cut in the past 5-10 years.

The geotechnical field investigation for the project was conducted in September 2021 with a total of eight standard penetration test (SPT) borings for the roadway and seven hand auger borings. Eight SPT borings were also performed for the bridge, which are reported under separate cover.

Physiography & Geology

The project site is located in the town of Princeville in Caswell County, North Carolina. According to available literature, the site is situated within the Milton Belt of the Piedmont Geologic Province of North Carolina and underlain by mica gneiss and mica schist (mgs). The same literature also illustrates an inferred diabase dike crossing Hogan's Creek just west of NC 86.

The project corridor slopes downward from the higher elevations on the north (435± feet) and south (475± feet) ends of the project, toward Hogan's Creek.



Soil Properties

Soils encountered at the site included alluvial and residual soils. The alluvial soils consisted very loose to medium dense Silty SAND (A-2-4) and fine SAND (A-3) and medium stiff Sandy SILT (A-4). Medium dense coarse SAND with Gravel (A-1-b) was also encountered deeper in the alluvial profile. Boring L_3500 was terminated in alluvial soil.

The native residual soils, which are the weathered remains of the parent rock, were encountered below the alluvium or directly under the surficial topsoil. The residual soil primarily consists of very loose to very dense Silty SAND (A-2-4) and Clayey SAND (A-2-6) and medium stiff to hard Sandy SILT (A-4). Lesser amounts of Sandy CLAY (A-6) were also encountered.

Although not encountered in the borings, roadway embankment exists within the current footprint of NC 86, with the greater amounts being in the lower elevations of the project approaching the bridge over Hogan's Creek.

Rock Properties

Weathered rock was encountered in borings L_1600, L_1900, L_2200, and L_3800 at elevations ranging from 375.1 feet to 463.2 feet. The weathered rock was classified as mica schist.

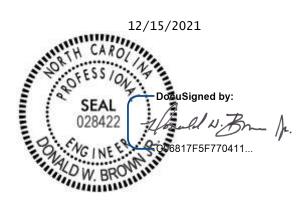
Rock was encountered in one boring (L_2200) an elevation of 410.4 feet. The rock was classified as mica schist.

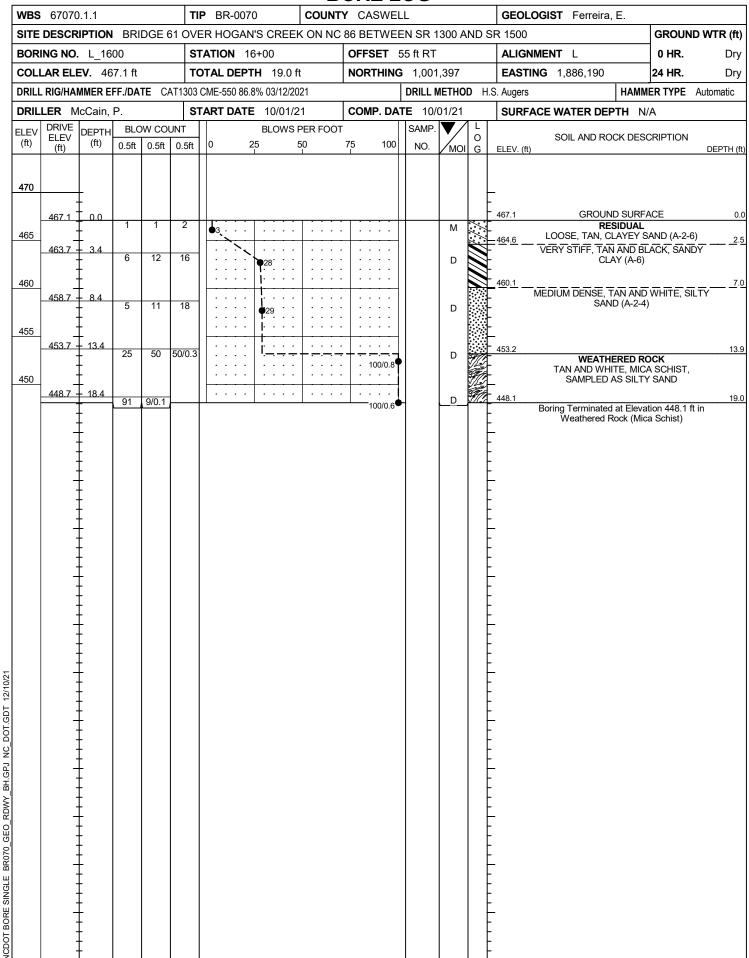
Groundwater

Groundwater was encountered in one boring (L_3800) after a 24± hour stabilization period, at a depth of 5.3 feet below the existing grade (el. 391.8 feet). Based on the split-spoon samples collected, we expect groundwater at a similar depth in the area of boring L_3500 .

Areas of Special Geotechnical Interest

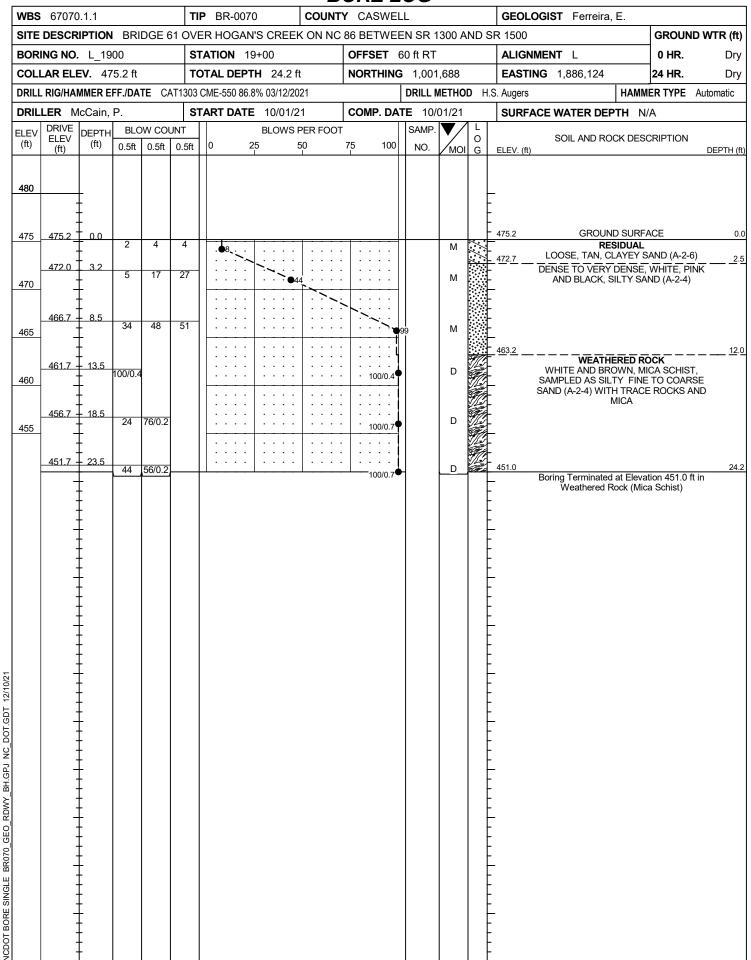
• Plank Road – According to a conversation with the current landowner, the proposed alignment reportedly once contained a plank road through the lower elevations of the corridor (i.e., flood plain). Remnants of what may have been the old timber road was encounter during sampling for End Bent No. 1 (boring EB1-B), at a depth of 2.8 feet below the current ground surface.





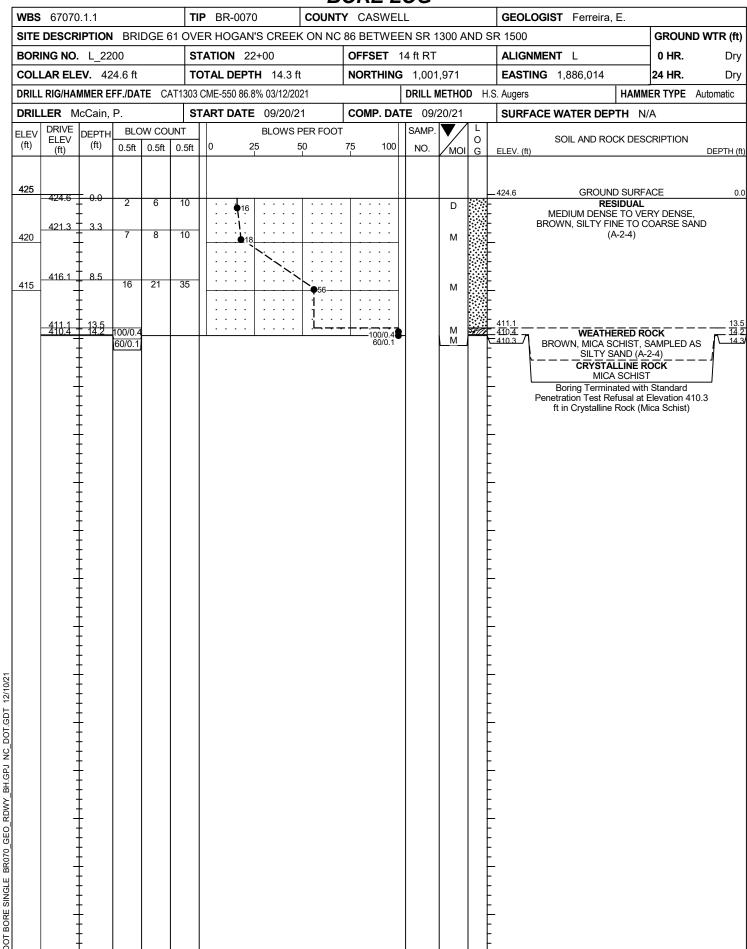
	B(ORE LOG		
WBS 67070.1.1	TIP BR-0070 COUNTY	CASWELL	GEOLOGIST Ferreira, E.	
SITE DESCRIPTION BRIDGE 61 C	OVER HOGAN'S CREEK ON NC	86 BETWEEN SR 1300 AND SF	R 1500	GROUND WTR (f
	STATION 16+00	OFFSET 25 ft RT	ALIGNMENT L	0 HR. Dr
COLLAR ELEV. 458.3 ft	TOTAL DEPTH 1.0 ft	NORTHING 1,001,390	L	24 HR . FIA
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Har	nd Auger HAMME	ER TYPE N/A
	START DATE 10/04/21	COMP. DATE 10/04/21	SURFACE WATER DEPTH N/A	A
ELEV (ft) DEPTH BLOW COUNT (ft) 0.5ft 0.5ft 0.5		75 100 NO. MOI G	SOIL AND ROCK DESC ELEV. (ft)	CRIPTION DEPTH
460			458.3 GROUND SURFA RESIDUAL BROWN, SANDY, MOIST COARSE, SILT (A WHITE AND TAN, MOIST, SI AND FINE, SAND (A-2-4) V ROCK FRAGMEN Boring Terminated with hand a Elevation 457.3 ft in dense	T, FINE TO A-4) LTY, COARSE VITH TRACE ITS auger refusal at

WISS 6770-1.1 TIP PR-0070 COUNTY CASWELL GEOLOGIST Femerin, E- STET DESCRIPTION BRIDGE 61 OVER HOGAN'S CREEK ON NO. 68 BETWEEN SR 1300 AND SR 1500 GROUND WTR (BORING NO. 1_600_HA_2 STATION 16+00 OFFSET 30 ft RT ALIGNMENT L 0 HR. D. COLLAR ELEV. 458.5 ft TOTAL DEPTH 1.0 ft NORTHING 1.001.391 EASTING 1.886.165 24 HR. FIA DRILLER NA START DATE 1.004/21 COMP-DATE 1.004/22 SUBFACE WATER DEPTH NA ELEV FIA D.		<u>B</u>	ORE LOG		
BORING NO. L_1600_HA_2	WBS 67070.1.1	TIP BR-0070 COUNT	Y CASWELL	GEOLOGIST Ferreira, E.	
COLLAR ELEV. 458.5 ft TOTAL DEPTH 1.0 ft NORTHING 1.001,391 EASTING 1.886.165 24 HR. FIA DRILL RIGHAMMER EFF,DATE N/A DRILL METHOD Hand Auger HAMMER TYPE N/A START DATE 10/04/21 COMP. DATE 10/04/21 SOIL AND ROCK DESCRIPTION DEPTH (t) 0.5t 0.5t 0.5t 0.5t 0.5t 0.5t 0.5t 0.5t	SITE DESCRIPTION BRIDGE 61	OVER HOGAN'S CREEK ON NC	86 BETWEEN SR 1300 AND SI	R 1500	GROUND WTR (
DRILLER N/A START DATE 10/04/21 COMP. DATE 10/04/21 SURFACE WATER DEPTH N/A	BORING NO. L_1600_HA_2	STATION 16+00	OFFSET 30 ft RT	ALIGNMENT L	0 HR . D
DRILLER N/A START DATE 10/04/21 COMP. DATE 10/04/21 SURFACE WATER DEPTH N/A	COLLAR ELEV. 458.5 ft	TOTAL DEPTH 1.0 ft	NORTHING 1,001,391	EASTING 1,886,165	24 HR . FIA
ELEV CROWN DEPTH BLOW COUNT CROWN CROWN	DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Har	nd Auger HAMM	IER TYPE N/A
(ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft)	DRILLER N/A	START DATE 10/04/21	COMP. DATE 10/04/21	SURFACE WATER DEPTH N	/A
	COLLAR ELEV. 458.5 ft DRILL RIG/HAMMER EFF./DATE N/A DRILLER N/A ELEV C(ft) DEPTH BLOW COUNTY (ft) 0.5ft 0.5ft 0 460	START DATE 10/04/21	NORTHING 1,001,391 DRILL METHOD Har COMP. DATE 10/04/21 SAMP. V L O G NO. MOI G Fig. 100 NO. MOI G Fig. 100 NO. MOI C O O Fig. 100 NO. MOI C Fig. 100 NO. MOI C O Fig. 100 NO. MOI C O Fig. 100 NO. MOI C O Fig. 100 NO. MOI C Fig. 100 NO. MOI C O Fig. 100 NO. MOI C O	EASTING 1,886,165 Ind Auger HAMM SURFACE WATER DEPTH N SOIL AND ROCK DESCRIPTION 458.5 GROUND SURFACE 457.5 RESIDUAL TAN AND WHITE, MOIST, SAND (A-2-4 Boring Terminated with hand Elevation 457.5 ft in dense	24 HR. FIA IER TYPE N/A //A CRIPTION DEPTH ACE , SILTY, FINE, auger refusal at se Silty Sand

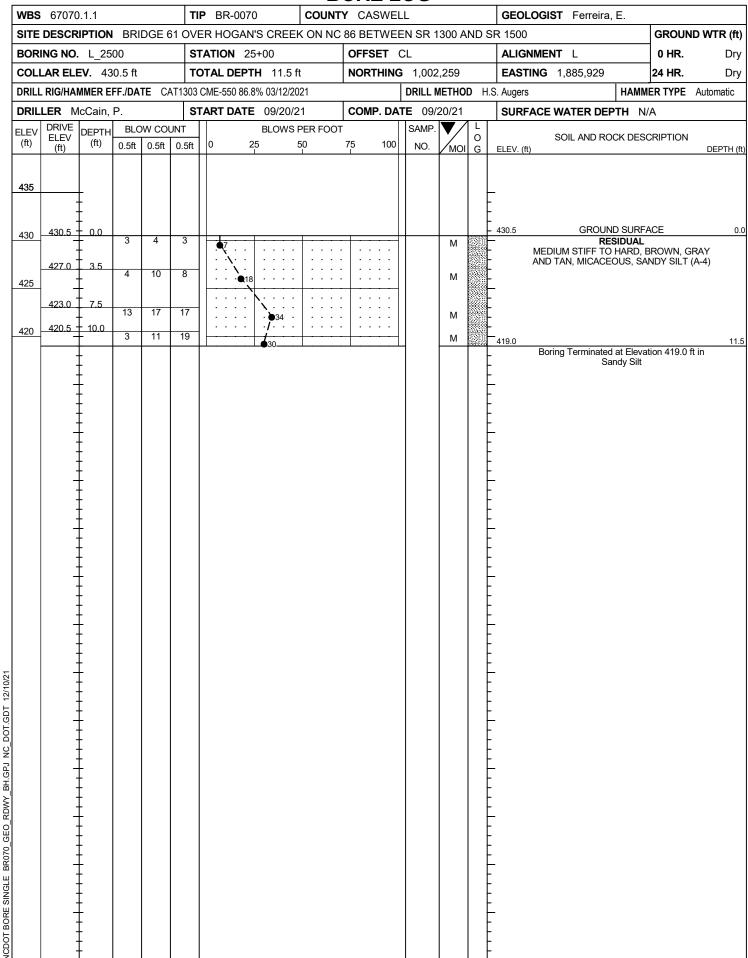


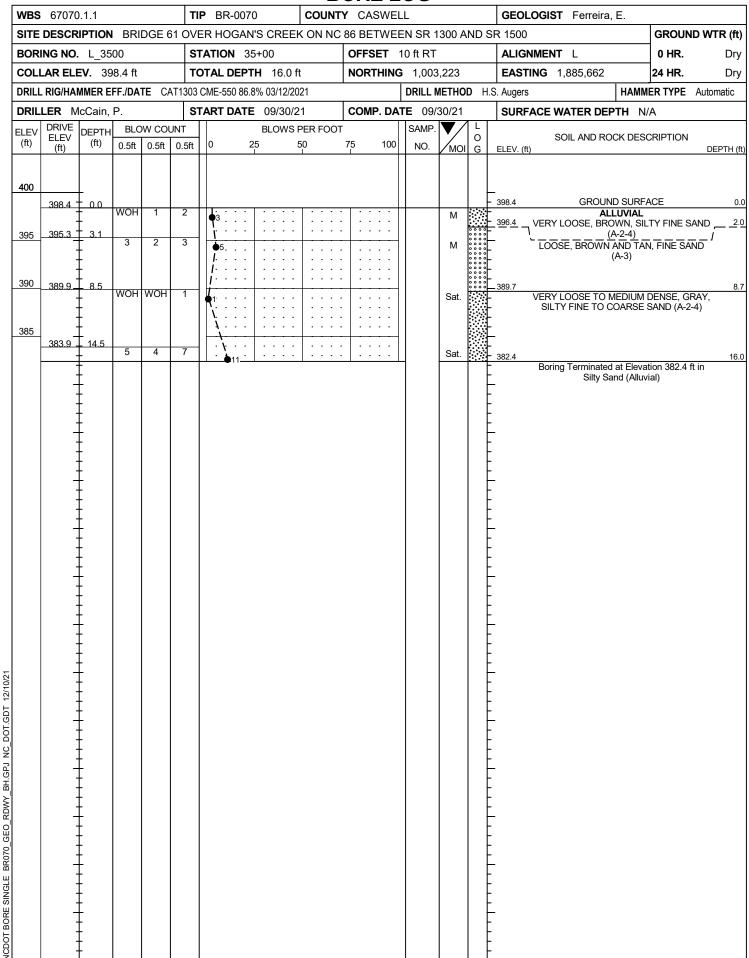
_		ORE LOG		
WBS 67070.1.1	TIP BR-0070 COUNTY	CASWELL	GEOLOGIST Ferreira, E.	
SITE DESCRIPTION BRIDGE 61 O	OVER HOGAN'S CREEK ON NC	36 BETWEEN SR 1300 AND SF	R 1500	GROUND WTR (f
BORING NO. L_1900_HA	STATION 19+00	OFFSET 14 ft RT	ALIGNMENT L	0 HR. Di
COLLAR ELEV. 449.2 ft	TOTAL DEPTH 0.6 ft	NORTHING 1,001,678	EASTING 1,886,079	24 HR . FIA
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Har	nd Auger HAMME	ER TYPE N/A
DRILLER N/A	START DATE 10/04/21	COMP. DATE 10/04/21	SURFACE WATER DEPTH N/A	A
DRIVE DEPTH BLOW COUNT		75 100 NO. MOI G	SOIL AND ROCK DESC ELEV. (ft)	CRIPTION DEPTH
450			ARSIDUAL BROWN, MOIST, SILTY, S Boring Terminated with hand a Elevation 448.6 ft in dense	SAND (A-2-4) Jauger refusal at

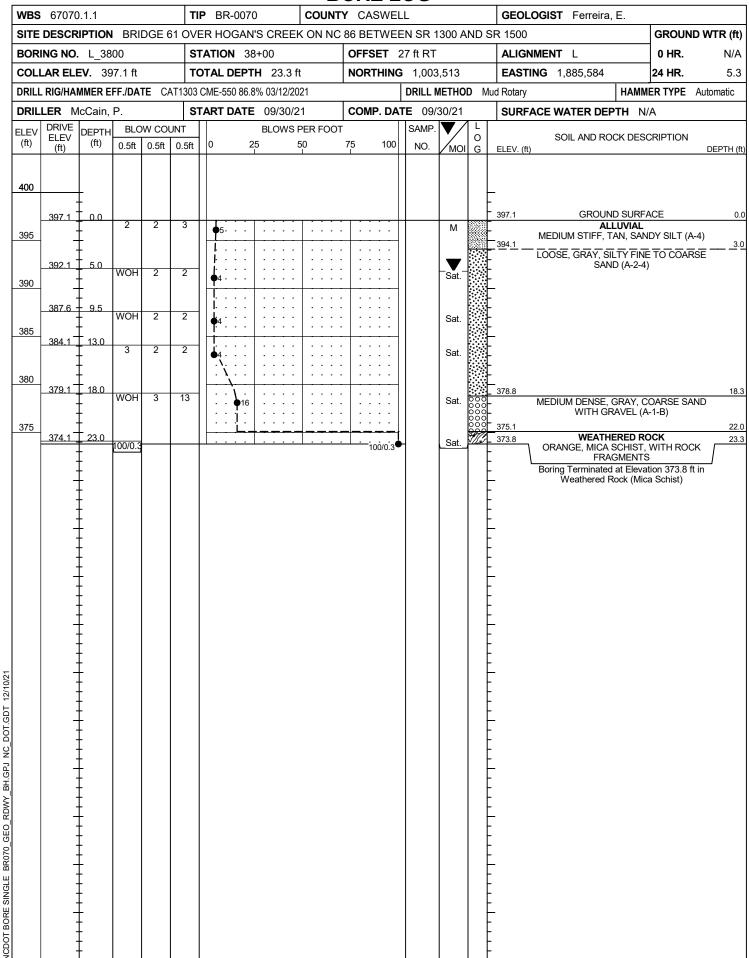
BORING NO. L_1950_HA STATION 19+50 OFFSET 7 ft RT ALIGNMENT L 0 HR. DECOLLAR ELEV. 447.3 ft TOTAL DEPTH 0.6 ft NORTHING 1,001,725 EASTING 1,886,061 24 HR. FIA DRILL RIG/HAMMER EFF./DATE N/A START DATE 10/04/21 COMP. DATE 10/04/21 SURFACE WATER DEPTH N/A BLOW COUNT (ft) BLOW SPER FOOT 0 25 50 75 100 NO. MOI G ELEV. (ft) SOIL AND ROCK DESCRIPTION DEPTH 450 A50 A50 NO. MOI G ELEV. (ft) SOIL AND ROCK DESCRIPTION DEPTH DEPTH			BORE LOG		
BORING NO. L_1950_HA	WBS 67070.1.1	TIP BR-0070 COI	JNTY CASWELL	GEOLOGIST Ferreira, E.	
COLLAR ELEV. 447.3 ft TOTAL DEPTH 0.6 ft NORTHING 1,001,725 EASTING 1,886,061 24 HR. FIA DRILL RIG/HAMMER EFF./DATE N/A START DATE 10/04/21 COMP. DATE 10/04/21 SURFACE WATER DEPTH N/A ELEV (ft) DEPTH (ft) BLOW COUNT (ft) BLOWS PER FOOT (ft) SAMP. NO. SOIL AND ROCK DESCRIPTION (Ft) DEPTH 450 450 AMP. (ft) AMP. (ft) AMP. (ft) BROWN, MOIST, MICACEOUS, SILTY (FT) BROWN, MOIST, MICACEOUS, SILTY (FT) BROWN, MOIST, MICACEOUS, SILTY (FT) 450 BROWN, MOIST, MICACEOUS, SILTY (FT)	SITE DESCRIPTION BRIDGE 6	1 OVER HOGAN'S CREEK ON	NC 86 BETWEEN SR 1300 AND	SR 1500	GROUND WTR (ff
DRILL RIG/HAMMER EFF./DATE N/A START DATE 10/04/21 COMP. DATE 10/04/21 SURFACE WATER DEPTH N/A BLOW COUNT (ft) (ft) 0.5ft 0.5ft 0.5ft 0 25 50 75 100 NO. MOI G ELEV. (ft) WASHINGTON OF THE COMP. DATE 10/04/21 BLOWS PER FOOT NO. MOI G ELEV. (ft) O.5ft 0.5ft 0.5ft 0 25 50 75 100 NO. MOI G ELEV. (ft) BROWN, MOIST, MICACEOUS, SILTY SAND (A-2-4) BROWN BROWN Hand auger refusal at	BORING NO. L_1950_HA	STATION 19+50	OFFSET 7 ft RT	ALIGNMENT L	0 HR. Dr
DRILLER N/A START DATE 10/04/21 COMP. DATE 10/04/21 SURFACE WATER DEPTH N/A	COLLAR ELEV. 447.3 ft	TOTAL DEPTH 0.6 ft	NORTHING 1,001,725	EASTING 1,886,061	24 HR. FIAI
DRIVE City DEPTH BLOW COUNT BLOWS PER FOOT SAMP. L O SOIL AND ROCK DESCRIPTION SOIL AND ROCK DESCRIPTION DEPTH SAMP. L O SOIL AND ROCK DESCRIPTION DEPTH DEPTH SAMP. L O SOIL AND ROCK DESCRIPTION DEPTH DEP	DRILL RIG/HAMMER EFF./DATE N/	1	DRILL METHOD H	land Auger HA	MMER TYPE N/A
(ft) (ft) (ft) (0.5ft 0.5ft 0.5ft 0.5ft 0 25 50 75 100 NO. MOI G ELEV. (ft) SOIL AND ROCK DESCRIPTION DEPTH 450 447.3 GROUND SURFACE RESIDUAL RESIDUAL SAND (A-2-4) Boring Terminated with hand auger refusal at	DRILLER N/A	START DATE 10/04/21	COMP. DATE 10/04/21	SURFACE WATER DEPTH	N/A
	DRILL RIG/HAMMER EFF./DATE N/ DRILLER N/A ELEV DRIVE (ft) DEPTH (ft) 0.5ft 0.5ft	START DATE 10/04/21 NT	DRILL METHOD H COMP. DATE 10/04/21 DOT SAMP. L O 75 100 NO. MOI G	SURFACE WATER DEPTH SOIL AND ROCK D ELEV. (ft) GROUND SU 447.3 GROUND SU A47.3 BROWN, MOIST, MICL SAND (A-Boring Terminated with he	MMER TYPE N/A N/A ESCRIPTION DEPTH RFACE AL ACEOUS, SILTY Jand auger refusal at

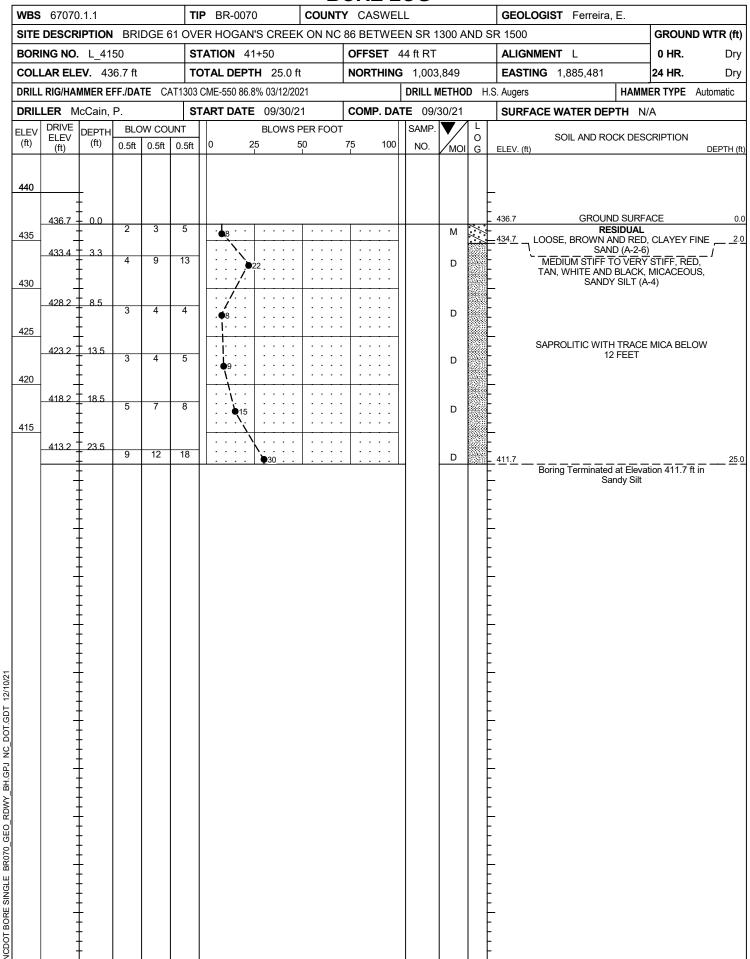


NCDOT BORE SINGLE



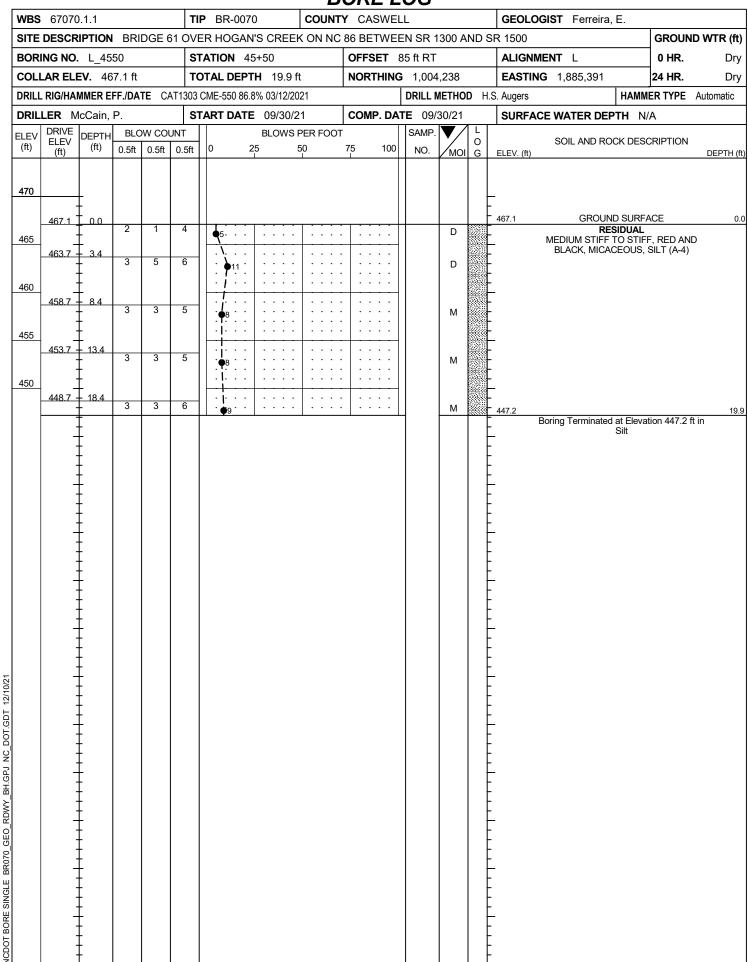






			DUK	RE LOG		
WBS 67070.1.1		TIP BR-0070	COUNTY CA	ASWELL	GEOLOGIST Ferreira, E.	
SITE DESCRIPTION	BRIDGE 61	OVER HOGAN'S CREEK		ETWEEN SR 1300 AND S	SR 1500	GROUND WTR (f
BORING NO. L_4150	O_HA	STATION 41+50	OFF	SET 12 ft RT	ALIGNMENT L	0 HR. Dr
COLLAR ELEV. 421.		TOTAL DEPTH 6.0 ft	NOR	RTHING 1,003,838	EASTING 1,885,451	24 HR. FIAI
DRILL RIG/HAMMER EFF	./DATE N/A			DRILL METHOD Ha	and Auger HAMMI	ER TYPE N/A
DRILLER N/A		START DATE 10/04/2	1 CON	MP. DATE 10/04/21	SURFACE WATER DEPTH N/	A
ELEV DRIVE ELEV (ft) (ft) (BLOW COUNT 0.5ft 0.5ft 0.8		PER FOOT 50 75	SAMP. L O NO. MOI G	SOIL AND ROCK DESC ELEV. (ft)	CRIPTION DEPTH
425						ı— -
415					BROWN, MOIST, SANDY SI TRACE MICA TAN, MOIST, SILTY SAND TRACE MICA WHITE AND BLACK, DRY, (A-4) WITH TRACE	(A-2-4) WITH SANDY SILT
					Boring Terminated at Elevat Silt Boring Terminated at Elevat Boring Terminated at E	ion 415.0 ft in

BORING NO. L_4490_HA			BORE LOG		
BORING NO. L_4490_HA	NBS 67070.1.1	TIP BR-0070	COUNTY CASWELL	GEOLOGIST Ferreira, E.	
COLLAR ELEV. 427.6 ft	SITE DESCRIPTION BR	DGE 61 OVER HOGAN'S CREEK	ON NC 86 BETWEEN SR 1300 AN	D SR 1500	GROUND WTR (f
DRILL RIG/HAMMER EFF./DATE N/A START DATE 10/04/21 COMP. DATE 10/04/21 SURFACE WATER DEPTH N/A BLOW COUNT BLOWS PER FOOT NO. MOI G ELEV. (ft) (ft) (ft) (ft) 0.5ft	30RING NO. L_4490_H	STATION 45+50	OFFSET 30 ft RT	ALIGNMENT L	0 HR. Dr
DRILLER N/A START DATE 10/04/21 COMP. DATE 10/04/21 SURFACE WATER DEPTH N/A	COLLAR ELEV. 427.6 ft	TOTAL DEPTH 1.2 ft	NORTHING 1,004,221	EASTING 1,885,339	24 HR. FIA
DRIVE City DEPTH BLOW COUNT DEPTH BLOW COUNT O.5ft O.5	ORILL RIG/HAMMER EFF./DA	TE N/A	DRILL METHOD	Hand Auger HAMME	R TYPE N/A
Company Comp		START DATE 10/04/2	1 COMP. DATE 10/04/21	SURFACE WATER DEPTH N/A	4
427.6 GROUND SURFACE	(f) ELEV (f)		75 400	SOIL AND ROCK DESC	RIPTION DEPTH
	(ft) ELEV (ft) 0.5ft	0.5ft 0.5ft 0 25 5	50 75 100 NO. MOI	G ELEV. (ft) 427.6 GROUND SURFA 426.4 RESIDUAL BROWN, MOIST, SILTY, F (A-2-4)	DEPTH



		ORE LOG		
WBS 67070.1.1	TIP BR-0070 COUNTY	CASWELL	GEOLOGIST Ferreira, E.	
SITE DESCRIPTION BRIDGE 61 O	OVER HOGAN'S CREEK ON NC		R 1500	GROUND WTR (f
	STATION 44+90	OFFSET 30 ft RT	ALIGNMENT L	0 HR. Dr
COLLAR ELEV. 427.7 ft	TOTAL DEPTH 0.5 ft	NORTHING 1,004,164	EASTING 1,885,357	24 HR. FIA
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Har	nd Auger HAMME	ER TYPE N/A
	START DATE 10/04/21	COMP. DATE 10/04/21	SURFACE WATER DEPTH N//	A
ELEV (ft) $\begin{array}{c} DRIVE \\ ELEV \\ (ft) \end{array}$ $\begin{array}{c} DEPTH \\ (ft) \end{array}$ $\begin{array}{c} BLOW COUNT \\ 0.5ft \end{array}$ $\begin{array}{c} 0.5ft \end{array}$		75 100 NO. MOI G	SOIL AND ROCK DESC	CRIPTION DEPTH
430			GROUND SURFA RESIDUAL BROWN, MOIST, SILTY, F (A-2-4) Boring Terminated with hand a Elevation 427.2 ft in dense	FINE, SAND