



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

April 17, 2015

MEMORANDUM TO: Lisa Gilchrist, EI
Division Bridge Program Manager

FROM: K. J. Kim, Ph.D., P.E. *KJK*
Eastern Regional Geotechnical Manager

STATE PROJECT: 17BP.5.R.52 (380093)
COUNTY: Granville

DESCRIPTION: Bridge No. 93 on -L- (SR 1156) over Owen Creek

SUBJECT: Bridge Foundation Recommendations

The Geotechnical Engineering Unit has completed the subsurface investigation and prepared the foundation design recommendations for the above structure and presents the following project data.

- Bridge Inventory (8) pages
- Foundation Design Recommendation (3) pages
- Design Calculations () pages
- Special Provisions () pages

Please call Shihai Zhang, P.E. or Chris Kreider, P.E. at (919) 662-4710 if there are any questions concerning this memorandum.

KJK/CAK/SZ
Attachment

MAILING ADDRESS:
NCDOT EASTERN REGIONAL
GEOTECHNICAL OFFICE
1570 MAIL SERVICE CENTER
RALEIGH NC 27699-1570

TELEPHONE: 919-662-4710
FAX: 919-662-3095

www.ncdot.gov/doh/preconstruct/highway/geotech

LOCATION:
EASTERN REGIONAL GEOTECHNICAL
OFFICE
3301 JONES SAUSAGE RD., SUITE 100
GARNER, NC 27529-9489

FOUNDATION RECOMMENDATIONS

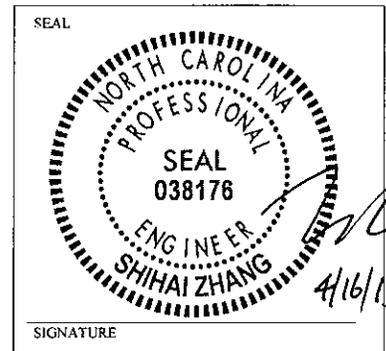
WBS: 17BP.5.R.52

DESCRIPTION : Bridge No. 93 on SR 1156 over Owen Creek

T.I.P. NO.: BMU-380093

COUNTY: Granville

STATION: 16+00.00 -L-



	INITIALS	DATE
DESIGN	SZ	4/16/15
CHECK	<i>CAK</i>	4/21/15
APPROVAL	<i>CAK</i>	4/21/15

BENT	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS DETAILS
END BENT 1	15+53.84 -L-	Cap on HP 12x53 Steel Piles	130 tons/pile	Bottom of Cap El. = 377.6 ft ± Estimated Length of Pile = 20 ft Number of Piles = 5
END BENT 2	16+46.16 -L-	Cap on HP 12x53 Steel Piles	130 tons/pile	Bottom of Cap El. = 377.2 ft ± Estimated Length of Pile = 15 ft Number of Piles = 5

NOTES ON PLANS & COMMENTS (See Following Pages)

FOUNDATION RECOMMENDATION NOTES ON PLANS

- 1) FOR PILES, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
- 2) PILES AT END BENT NO. 1 AND END BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 130 TONS PER PILE.
- 3) DRIVE PILES AT END BENT NO. 1 AND END BENT NO. 2 TO A REQUIRED DRIVING RESISTANCE OF 220 TONS PER PILE.
- 4) STEEL H-PILE POINTS ARE REQUIRED FOR STEEL H-PILES AT END BENT NO. 1 AND END BENT NO. 2. FOR STEEL PILE POINTS, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.

FOUNDATION RECOMMENDATION COMMENTS

- 1) NO WAITING PERIOD IS REQUIRED BEFORE BEGINNING ANY WORK FOR END BENT CONSTRUCTION AFTER COMPLETION OF THE EMBANKMENT AT EACH BENT.
- 2) 1½:1 (H:V) SLOPE AT THE END BENTS IS OK WITH SLOPE PROTECTIONS.
- 3) SUB-REGIONAL TIER BRIDGE APPROACH FILL DETAIL IS RECOMMENDED AT EACH END BENT.
- 4) PILE RESTRIKES ARE NOT NECESSARY FOR PILES AT END BENT NO. 1 AND END BENT NO. 2.
- 5) 2 BATTERED PILES ARE UTILIZED AT EACH END BENT.

PILE PAY ITEMS

(Revised 8/15/12)

WBS ELEMENT 17BP.5.R.52

TIP NO. BMU-380093

COUNTY Granville

STATION 16+00.00 -L-

DATE 4/16/2015

DESIGNED BY SZ

CHECKED BY AK

DESCRIPTION Bridge No. 93 on SR 1156 over Owen Creek

NUMBER OF BENTS WITH PILES _____	}	Only required for "Predrilling for Piles" & "Pile Excavation" pay items
NUMBER OF PILES PER BENT _____		
NUMBER OF END BENTS WITH PILES _____		
NUMBER OF PILES PER END BENT _____		

Bent # or End Bent #	PILE PAY ITEM QUANTITIES						PDA Testing (per each)
	Steel Pile Points (yes/no)	Pipe Pile Plates (yes/no/maybe)	Predrilling For Piles (per linear ft)	Pile Redrives (per each)	Pile Excavation (per linear ft)		
					In Soil	Not In Soil	
End Bent 1	yes						X
End Bent 2	yes						
TOTALS			0	0	0	0	

Notes:
 Blanks or "no" represent quantity of zero.
 If steel pile points are required, calculate quantity of "Steel Pile Points" as equal to the number of steel piles.
 If pipe pile plates are or may be required, calculate the quantity of "Pipe Pile Plates" as equal to the number of pipe piles.
 Show quantity of "PDA Testing" on the plans as total only.
 If quantity of "PDA Testing" is 3 or less, reference "Pile Driving Criteria" provision in PDA notes on plans and include "Pile Driving Criteria" provision in the contract.



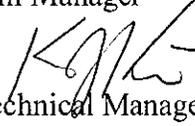
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

April 21, 2015

MEMORANDUM TO: Lisa Gilchrist, EI
Division Bridge Program Manager

FROM: K. J. Kim, Ph.D., P.E. 
Eastern Regional Geotechnical Manager

STATE PROJECT: 17BP.5.R.52 (380093)
COUNTY: Granville

DESCRIPTION: Bridge No. 93 on -L- (SR 1156) over Owen Creek

SUBJECT: Geotechnical Report - Design and Construction Recommendations

I. Slope/Embankment Stability

A. Slope Design

Recommend that all slopes be constructed at a ratio of 2:1 (H:V) or flatter.

B. Undercut

A quantity of 100 cubic yards of undercut for embankment stability should be included in the project contract as a contingency item to be used at the discretion of the Engineer.

C. Geotextile for Soil Stabilization

A quantity of 100 square yards of geotextile for soil stabilization should be included in the project contract as a contingency item to be used at the discretion of the Engineer.

II. Subgrade Stability

A. Subgrade Undercut

Recommend a quantity of 100 cubic yards of subgrade undercut be included in the project contract as a contingency item for areas of unsuitable subgrade soil to be used at the discretion of the Engineer.

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LOCATION:
EASTERN REGIONAL GEOTECHNICAL
OFFICE
3301 JONES SAUSAGE RD., SUITE 100
GARNER, NC 27529-9489

B. Geotextile for Soil Stabilization

Recommend a quantity of 100 square yards of geotextile for soil stabilization be included in the project contract as a contingency item to be used at the discretion of the Engineer.

III. Borrow Specifications

A. Select Granular Material

Select Granular Material for embankment construction on geotextile for soil stabilization shall meet the criteria outlined in Standard Specification, Article 1016-3 Class II or Class III. Include 200 cubic yards of this material in the project contract as a contingency item. The backfill material should be placed on geotextile for soil stabilization to a height not less than three (3) feet above geotextile for soil stabilization.

B. Shrinkage Factor

A shrinkage factor of 20 percent is recommended in the calculation of all earthwork quantities. This is to compensate for loss of soils due to erosion, clearing and grubbing of fill areas, and an increase in embankment quantities required due to consolidation of underlying soils and other factors.

IV. Miscellaneous

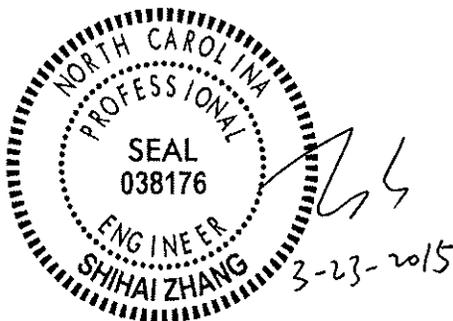
A. Reduction of Unclassified Excavation – Clearing and Grubbing

No significant loss of unclassified excavation is anticipated due to clearing and grubbing.

B. Reduction of Unclassified Excavation – Unsuitable Unclassified

Unclassified excavation will be derived from cut slope, ditch, and abutment embankment excavation. It is anticipated that 100 percent of unclassified excavation is suitable for embankment construction.

Prepared by,



Shihai Zhang, PE
Geotechnical Operations Engineer

JLP/CAK/SZ/jlp

Prepared by,



Jaime Love Pedro, LG
Project Geological Engineer



**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT**

Summary of Quantities

WBS Number: 17BP.5.R.52 County: Granville Project Engineer: S. Zhang
 TIP Number: 380093 Field Office: Raleigh Project Geologist: J. L. Pedro
 Description: Bridge No. 93 on -L- (SR 1156) over Owen Creek

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
003600000-E	Undercut Excavation	225 - Roadway Excavation	I. B	Contingency	N/A	N/A	100	CY
003600000-E	Undercut Excavation	225 - Roadway Excavation	II. A	Contingency	N/A	N/A	100	CY
Total Quantity of Undercut Excavation =								
019500000-E	Select Granular Material	265 - Select Granular Material	III. A	Contingency	N/A	N/A	200	CY
Total Quantity of Select Granular Material =								
019600000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. C	Contingency	N/A	N/A	100	SY
019600000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	Contingency	N/A	N/A	100	SY
Total Quantity of Geotextile for Soil Stabilization =								
These Items Only Impact Earthwork Totals								
N/A	Shrinkage Factor	235 - Embankments	III. B	N/A	N/A	N/A	20	%



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
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March 18, 2015

STATE PROJECT: 17BP.5.R.52 (380093)
COUNTY: Granville
DESCRIPTION: Bridge No. 93 on -L- (SR 1156) over Owen Creek
SUBJECT: Geotechnical Report – Inventory

The Geotechnical Engineering Unit has completed a subsurface investigation for this project and presents the following inventory. No plans, profiles, or cross-sections will be submitted for this roadway project.

Project Description

The project consists of the replacement of Bridge No. 93 on SR 1156 (Harper Renn Rd.) over Owen Creek. The total length of the roadway portion of the project is 0.11 miles. The proposed grade will be raised just slightly. A geotechnical investigation was conducted for the bridge during March of 2015. Bore logs from the bridge subsurface investigation were referenced for this project. Representative soil samples were collected for visual classification in the field.

Physiography & Geology

The project is located 5.5 miles southwest of the town of Oxford in the rolling terrain of central Granville County. Geologically the site is characterized by sands, silts, and clays associated with the metamorphosed granite of the Carolina Slate Belt.

Soil Properties

Soils encountered at the site are roadway embankment, alluvial, and residual soils. The soils consist of granular and cohesive materials.

Roadway embankment soils consist of brown and orange, medium stiff to stiff, moist, sandy clay and silt (A-6, A-4). This material varies in depth from 3.0 to 12.0 feet. Alluvial soils deposited by Owen Creek consist primarily of gray and brown, very soft to medium stiff, moist to wet, sandy silt and silty clay (A-4, A-7-6) with some silty coarse sand (A-2-4) with weathered rock fragments. Residual soils consist of gray, white, and brown, medium dense to dense, moist, silty sand (A-2-4) and very stiff to hard, sandy silt (A-4). Residual soils are derived from weathering of the underlying weathered and crystalline rock.

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RALEIGH NC 27699-1589

TELEPHONE: 919-707-6850
Fax: 919-250-4237
connect.ncdot.gov/resources/Geological

LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

Rock Properties

Weathered rock is more prominent on the EB1 side, and is minimal at the EB2 side of the bridge. Crystalline rock is approximately 16.0 to 35.0 feet below the ground surface and consists of gray, and white, moderately weathered to fresh, hard, close to wide fracture spacing, metamorphosed diorite. At the right side of End Bent 1, crystalline rock consists of brown, tan, and white, severely weathered to fresh, moderately hard to hard, close fracture spacing, granite. Crystalline rock is not anticipated to cause problems during construction.

Groundwater

The groundwater level is anticipated to be at elevations similar to Owen Creek. Seasonal fluctuations in the water table can be expected. Groundwater is not anticipated to cause problems during construction.

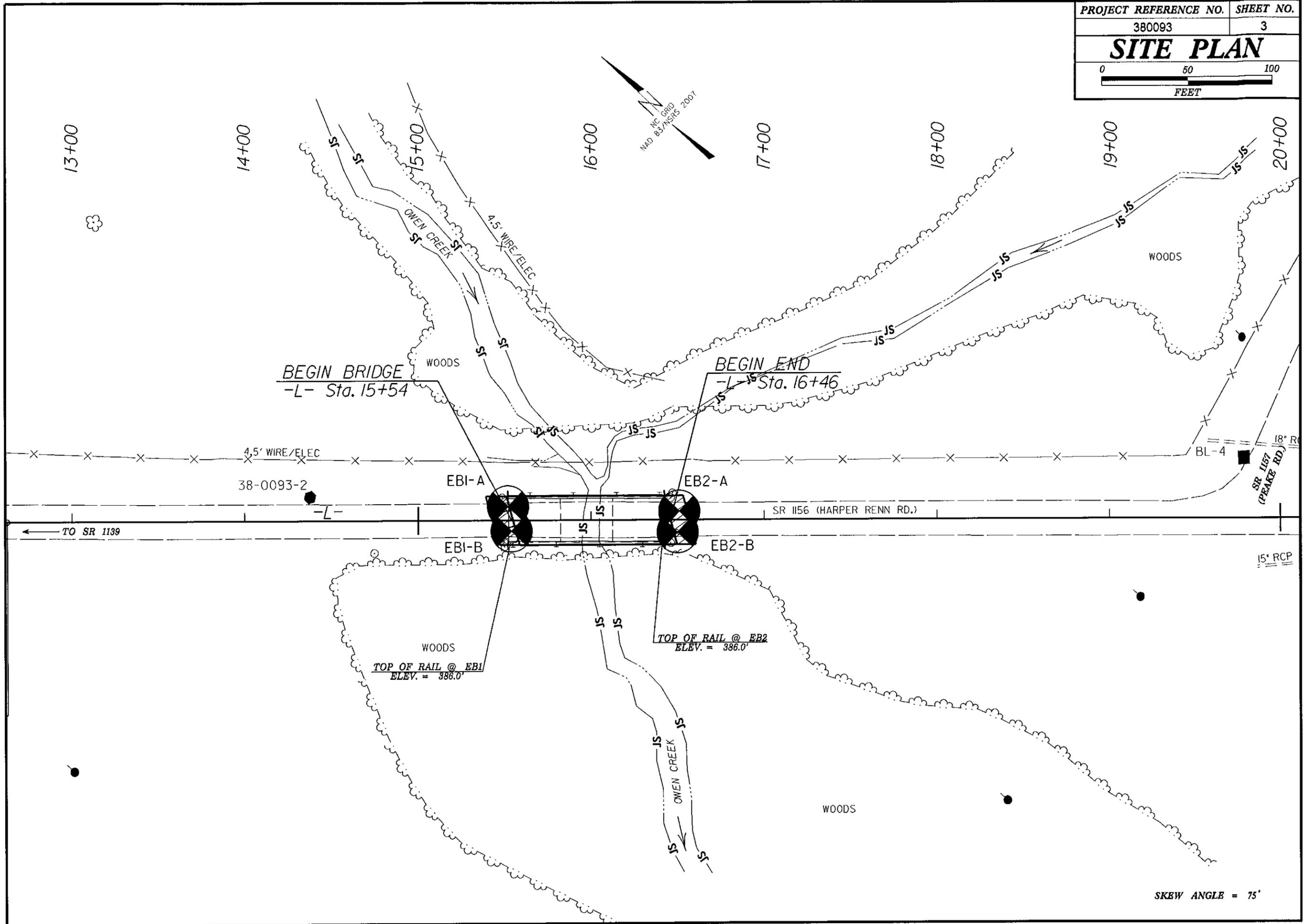
Respectfully submitted,



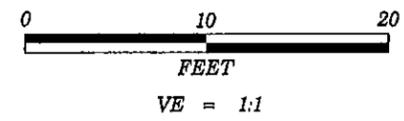
Jaime Love Pedro, LG
Project Geological Engineer

JLP/NTR/jlp

PROJECT REFERENCE NO.	SHEET NO.
380093	3
SITE PLAN	

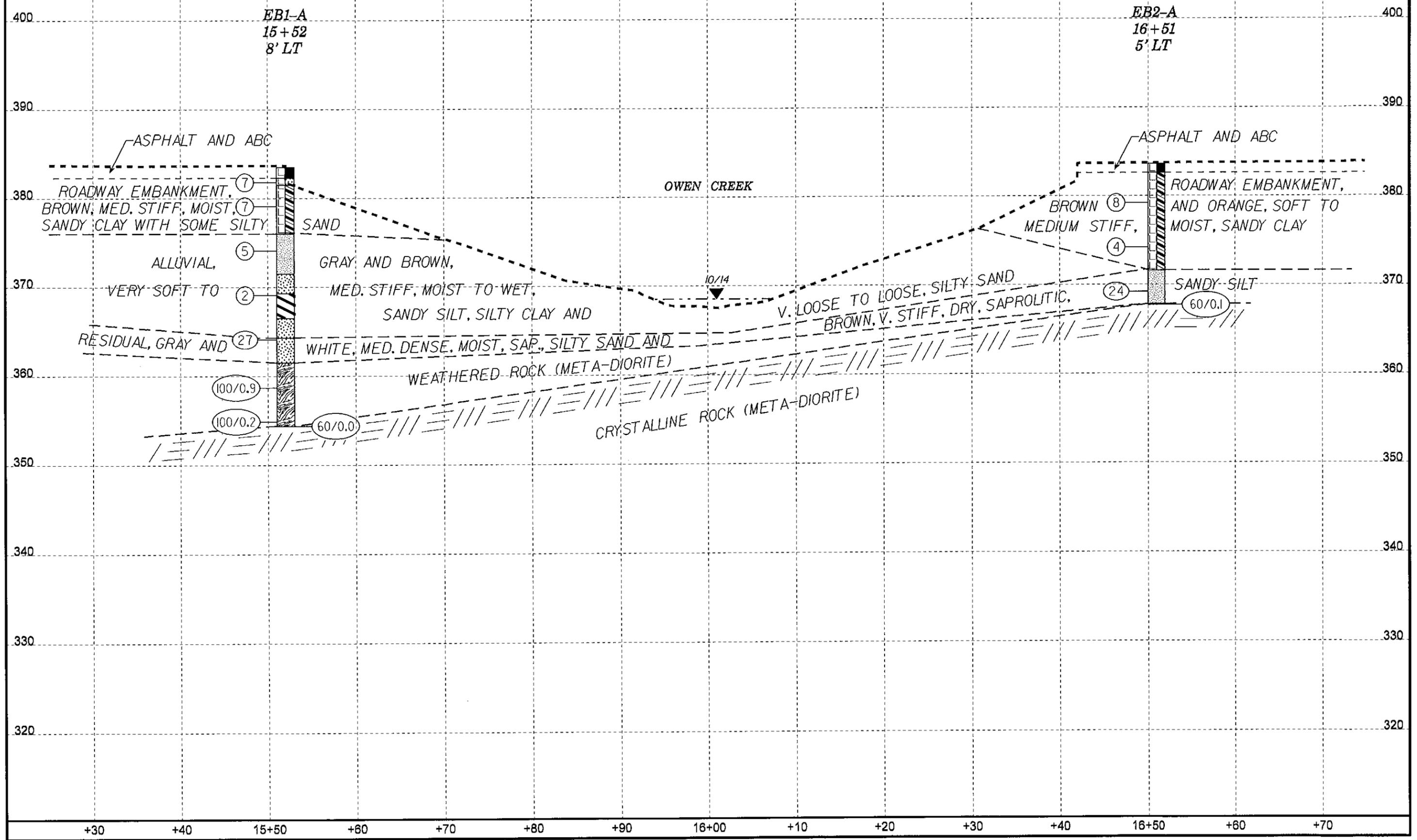


SKEW ANGLE = 75'



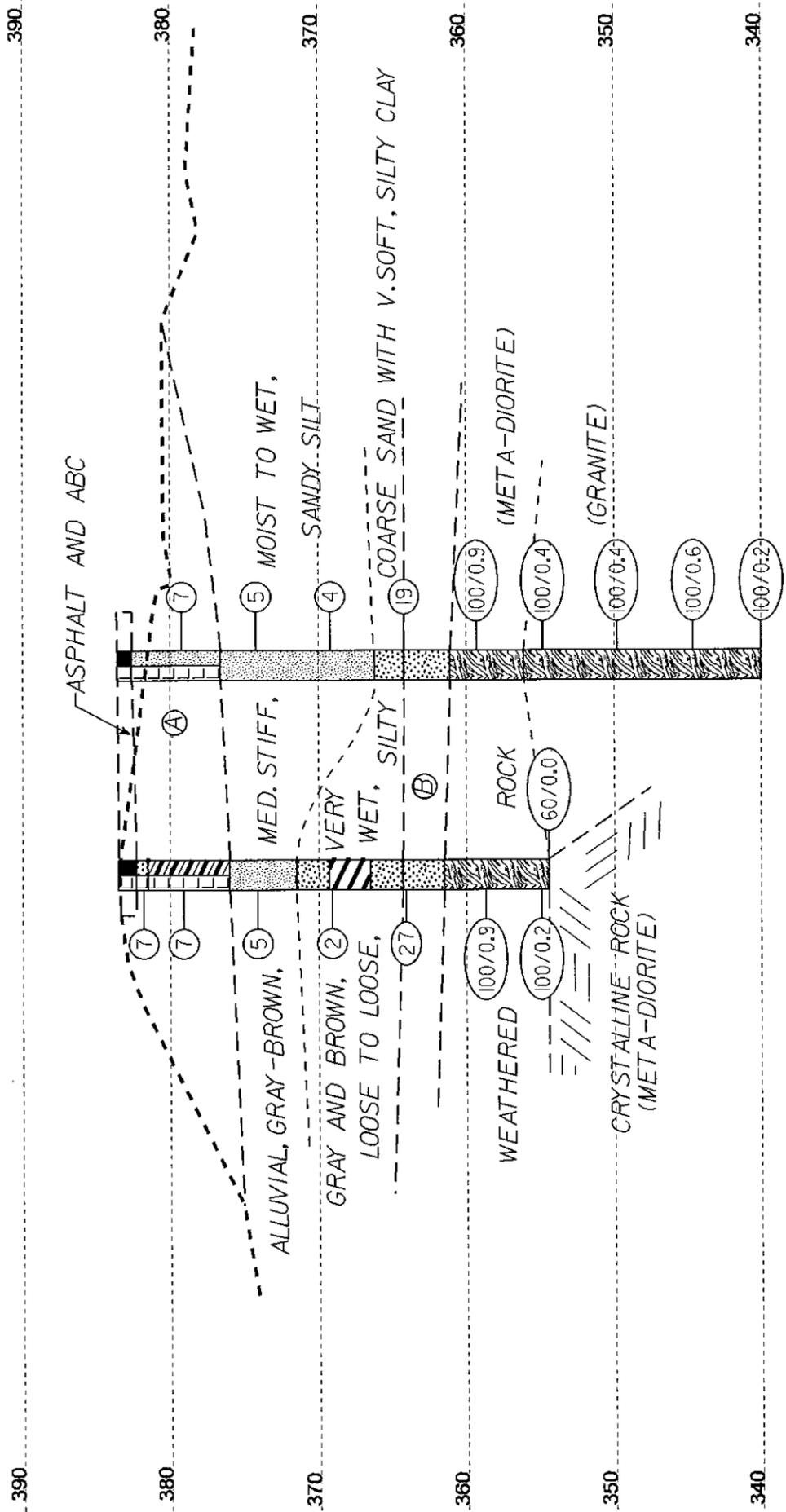
PROJECT REFERENCE NO.	SHEET NO.
380093	4

FENCE DIAGRAM OF BORINGS
PROJECTED ALONG -L- PROFILE



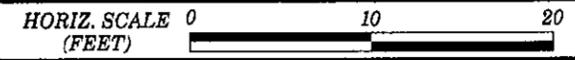
E1-A
15+52
8' LT

E1-B
15+54
6' RT



Ⓐ ROADWAY EMBANKMENT, BROWN, MED. STIFF, MOIST, SANDY CLAY AND SILT WITH SOME SILTY SAND

Ⓑ RESIDUAL, GREEN-GRAY AND WHITE, MEDIUM DENSE, MOIST, SAPROLITIC, SILTY SAND

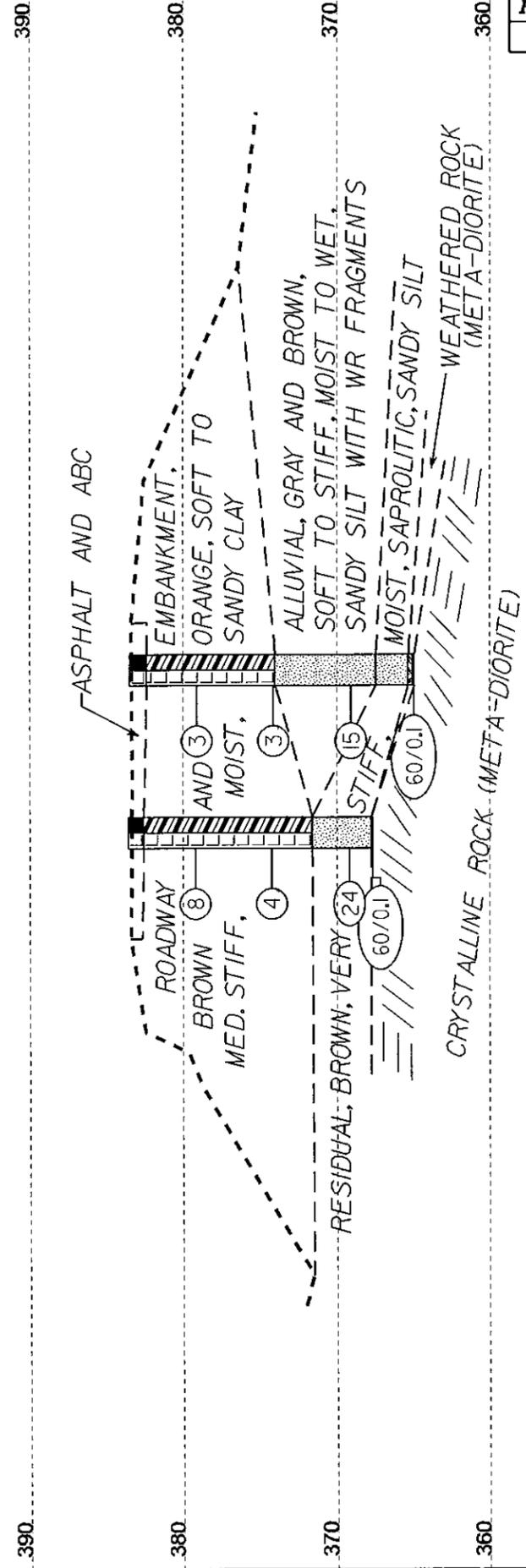


VE = 1:1

CROSS SECTION THROUGH END BENT 1

E2-A
16+51
5' LT

E2-B
16+50
7' RT



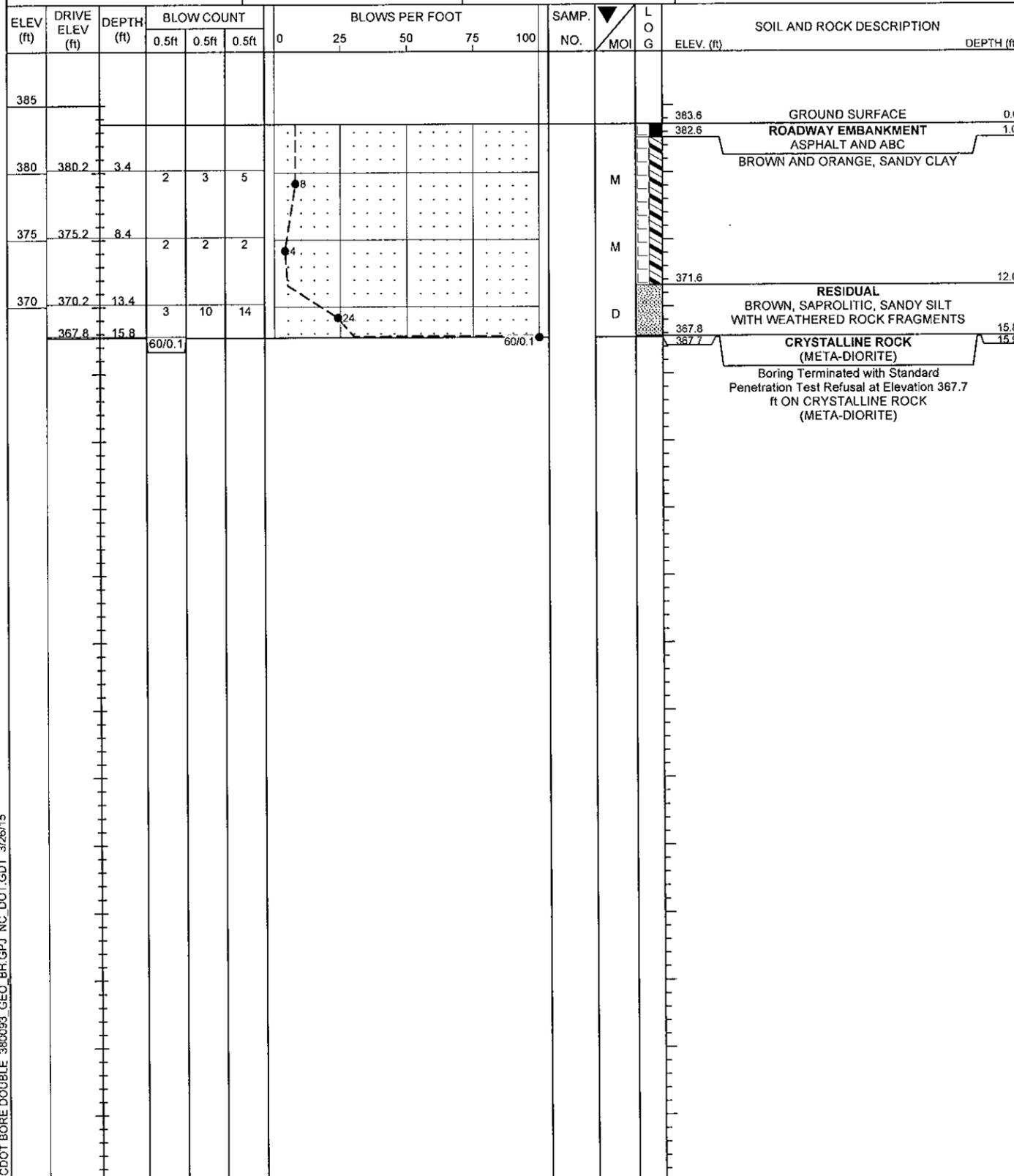
VE = 1:1

CROSS SECTION THROUGH END BENT 2

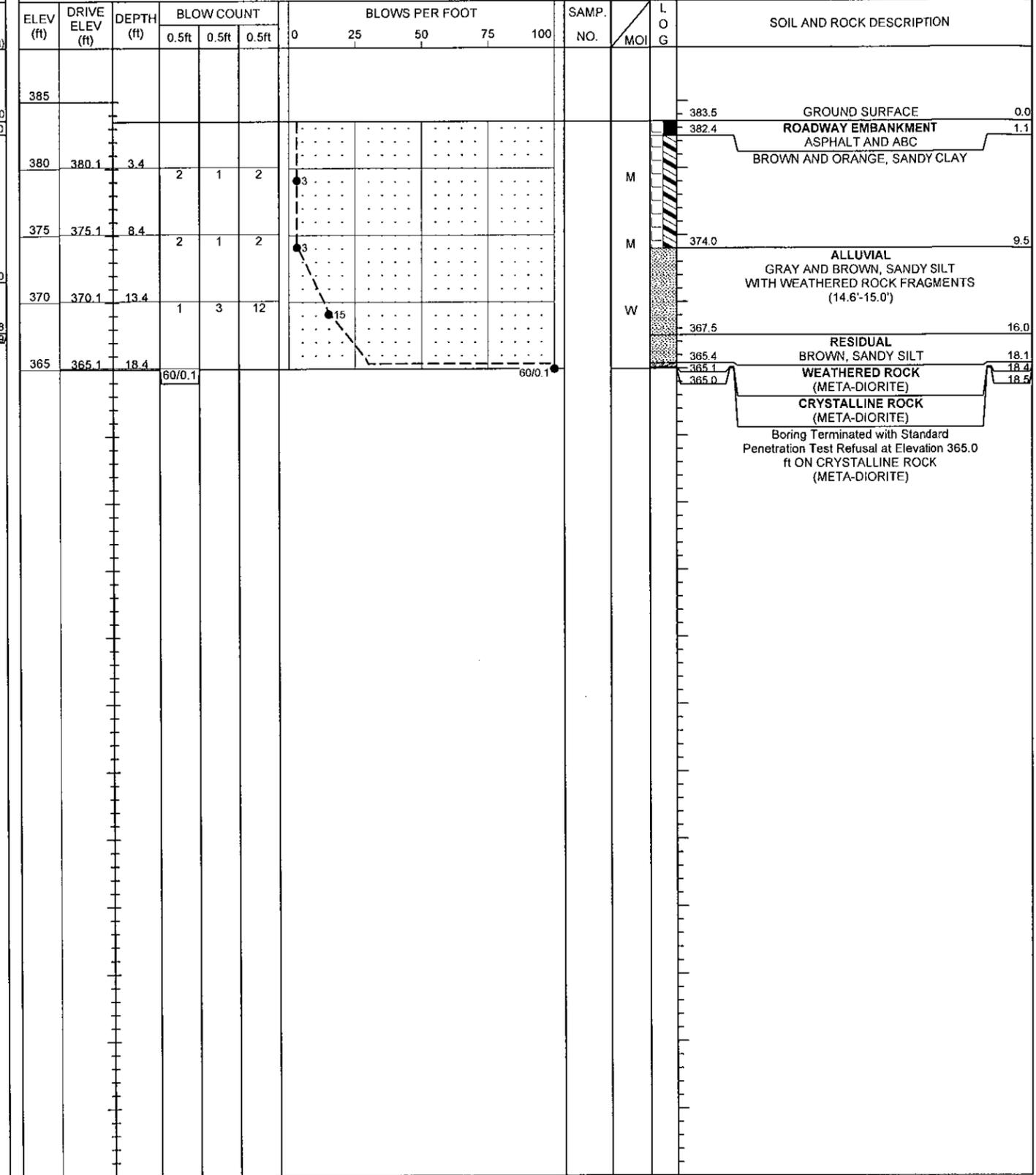
390 380 370 360 350 340 330 400 390 380 370 360 350 340

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.5.R.52	TIP 380093	COUNTY GRANVILLE	GEOLOGIST Pedro, J. L.
SITE DESCRIPTION BRIDGE NO. 93 ON -L- (SR 1156) OVER OWEN CREEK			GROUND WTR (ft)
BORING NO. EB2-A	STATION 16+51	OFFSET 5 ft LT	ALIGNMENT -L-
COLLAR ELEV. 383.6 ft	TOTAL DEPTH 15.9 ft	NORTHING 917,127	EASTING 2,098,380
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 86% 02/09/2015		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Pinter, D. G.	START DATE 03/11/15	COMP. DATE 03/11/15	SURFACE WATER DEPTH N/A



WBS 17BP.5.R.52	TIP 380093	COUNTY GRANVILLE	GEOLOGIST Pedro, J. L.
SITE DESCRIPTION BRIDGE NO. 93 ON -L- (SR 1156) OVER OWEN CREEK			GROUND WTR (ft)
BORING NO. EB2-B	STATION 16+50	OFFSET 7 ft RT	ALIGNMENT -L-
COLLAR ELEV. 383.5 ft	TOTAL DEPTH 18.5 ft	NORTHING 917,119	EASTING 2,098,371
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 86% 02/09/2015		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Pinter, D. G.	START DATE 03/11/15	COMP. DATE 03/11/15	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE 380093_GEO_BH.GPJ_NC_DOT.GDT_3/26/15

SITE PHOTOGRAPH

Bridge No. 93 on -L- (SR 1156) over Owen Creek



Looking North towards End Bent 1