GEOTECHNICAL REPORT
DUAL BRIDGES ON U.S. 401
OVER NEUSE RIVER
WAKE COUNTY, NORTH CAROLINA
N.C.DOT NO. 8.1402103 (R-2425C)
LAW JOB NO. 30720-6-1415

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES

June 21, 1996

North Carolina Department of Transportation
P.O. Box 25201
Geotechnical Unit
Raleigh, North Carolina 27611

Attention: Mr. W.L. Moore, III, State Engineering Geologist

DESCRIPTION: DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER

AUG 5 1996

SUBJECT: GEOTECHNICAL REPORT
BRIDGE FOUNDATION INVESTIGATION FOR
DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
WAKE COUNTY, NORTH CAROLINA
N.C.DOT NO. 8.1402103 (R-2425C)
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Dear Mr. Moore:

Law Engineering and Environmental Services, Inc. (Law) is pleased to submit the attached geotechnical report for the above-referenced project. A Geotechnical Report Review Checklist for Site Investigations and other supportive documents are also attached.

Our services were provided in accordance with Law Engineering and Environmental Services, Inc. Proposal No. 30720-6-03550 dated May 6, 1996. We performed our services under the terms and conditions of the Engineering Agreement made and entered into on November 13, 1995 by and between the N.C.DOT and Law Engineering and Environmental Services.

We are available to discuss our recommendations with you and to provide additional studies or services necessary to complete the project. We have enjoyed assisting you on this project and look forward to serving as your geotechnical consultant on future projects.

Very truly yours,
LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Brian K. Banks, G.I.T.
Staff Geologist

J. Allan Tice, P.E.
Corporate Geotechnical Consultant
Registered, North Carolina 6428

NORTH CAROLINA PROFESSIONAL SEAL 6428 ENGINEER J. ALLAN TICE

BKB/JAT/bkb/pap/tag

Attachments

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1.0 PROJECT DESCRIPTION

Project information has been provided by the Geotechnical Unit of N.C.DOT. We have received the following information:

1. County map of site
2. Bridge Survey and Hydraulic Design Reports dated January 31, 1996 with attached preliminary roadway plan and profiles.
3. Location and surveys unit property contact report dated April 25, 1994.
4. Preliminary roadway plan dated December 11, 1995.

The bridges are to be 91 meters long with each bridge having 2 span lengths of 28 meters and 2 span lengths of 17.5 meters. The bridges are skewed at 90 degrees to the Neuse River. Interior bents 1 and 2 fall within the channel of the Neuse River. A future 3.6 meter greenway is proposed between Interior Bent 3 and End Bent 2.

The purpose of this geotechnical investigation was to provide the general subsurface investigation data for the design and construction of the new structures. In addition, this investigation was to provide soil properties and geologic data for the 100 year scour determination. This report, including the profile and cross sections, is based on all data obtained from our investigation performed during May, 1996.

2.0 SITE DESCRIPTION & GEOLOGY

2.1 Site Description

The bridge site is located on U.S. 401 where it crosses the Neuse River, approximately 5.5 kilometers northeast of the Raleigh, North Carolina city limits. A Site Location map is provided as Drawing No. 1 in the Appendix.

The land immediately surrounding the site is undeveloped and wooded, covered by large pines and hardwoods with a thin understory. The area around End Bent 2 of the existing bridge is clear and open, providing easy access for most vehicles via a dirt access road that runs from Mitchell Mill Road southwestward along U.S. 401 to the Neuse River. The bridge site lies within the flood plain of the Neuse River with the end bents on an embankment approximately 3.0 meters above the flood plain. Natural ground surface elevations within the flood plain in the immediate vicinity of the bridge are between 56 and 58 meters above MSL.

Photographs of the site are provided in the Appendix. These photographs show site conditions at each boring location prior to the start of the field exploration.

2.2 Geology

The bridge site is located in the Raleigh Belt of the eastern Piedmont Physiographic Province, an area underlain by ancient igneous and metamorphic rock. The Piedmont rocks of the Carolinas are marked by strongly directional zones or belts trending to the northeast. The belts contain rocks with similar properties but contrast sharply with one another in terms of petrology, grade of metamorphism and age.

The hard rock encountered at the bridge site is from the group of granitic rocks known as the Rolesville Suite. The hard rock cored during our investigation is classified as massive equigranular granitic rock, which is consistent with the Geologic Map of North Carolina compiled by The North Carolina Geologic Survey in 1985.

Neuse River has a well defined channel that, under normal rainfall conditions, is confined by moderately steep to near vertical river banks. The river depth is normally approximately 1.5 to 2.0 meters at its deepest point in the channel. During periods of

flooding, the Neuse River flows over its banks to deposit sediments on its roughly 200 meter-wide flood plain. Deposition of principally silt is occurring in the flood plain during these periodic episodes of flooding. The alluvial soil deposited by flood waters of the Neuse River is composed of weathered and transported Piedmont material previously existing upstream from the site.

The soils at the bridge site can be characterized into two classes. First, alluvial soils, mentioned above, make up a substantial part of the soils encountered at the site. The alluvial soils exist at the ground surface in the flood plain and in the channel of the Neuse River, extending to depths of 4.5 meters to 7.0 meters in the flood plain and between 2.0 and 2.7 meters in the channel. The alluvial soils existing in the flood plain consist of mostly silt (A-4) with interbeds of clay (A-6/A-7) and often exhibit a basal gravel zone marking the boundary between alluvial soils and the more resistant residual soils below. There are thin erratic interbeds of organic material consisting of leaves and wood fragments existing in the alluvial soil horizon in the flood plain.

In the channel of the Neuse River the alluvial soil is much coarser, existing chiefly of coarse sand (A-3) and gravel (A-1) with little or no fines. The velocity of the water in the channel is sufficient to carry away most smaller grain sizes. Also included in the sand and gravel channel material are zones of wood fragments ranging in size from sticks to logs.

Residual soils lie unconformably below the alluvial material across the site. Residual soils are derived from the in-situ weathering of the underlying parent rock type, in this case, granite. As a hard rock weathers in place, it leaves behind a distinctive stratigraphic profile characterized by residual soil overlying soft weathered rock and hard weathered rock overlying hard rock. Soft Weathered Rock and Hard Weathered Rock represent the transition between residual soil and hard rock. The residual soil in this sequence exhibits the same structure as its parent rock but lacks the strength of rock as a result of the weathering process.

Weathering along fractures and joints has produced seams of weathered rock within the granitic rock. It is not unusual to core through competent rock, re-enter weathered rock and return to competent rock. Core losses noted on the coring records are most likely due to the presence of these weathered zones. Weathering along discontinuities can also create boulders of hard rock within the residual soil or weathered rock zone. This is common in association with granitic bodies although it was not readily apparent in the borings performed at this bridge site.

The cross section and profile drawings of subsurface conditions and the test boring records included in the Appendix provide descriptions of the residual soil, weathered rock, and hard rock encountered at the site.

3.0 FIELD TESTING

A total of 18 borings was performed at the bridge site. The boring locations are shown on Drawing No. 2 in the Appendix. Six of the borings were performed at the proposed end bent locations and included only soil testing with a split spoon sampler. The remaining 12 borings were performed at each end of the 3 interior bents of each structure and involved soil testing and rock coring. Eight of the interior bent borings fell in the water and thus were drilled from a barge using a CME 450 drill rig. The land borings were advanced using a Mobile B-56 and a CME 550, both mounted on all-terrain vehicles.

The borings were advanced using wash drilling techniques to the depth of rock. Rock coring was performed at each of the interior bent borings with diamond tip core barrels. Water used during coring was taken directly from the Neuse River. Casing was advanced when necessary.

Baseline -L- surveyed along the center of the existing bridge was used to lay out boring locations by measuring distances and offsets. Ground surface and water surface elevations at each land boring were determined by Law personnel by direct measurement relative to a known benchmark. Collar elevations of the water borings were calculated by subtracting the water depth at the borings from the water surface elevation. Water surface elevations were measured daily and monitored throughout the day for fluctuation.

4.0 LABORATORY TESTING

Laboratory testing was conducted on selected soil samples to aid in classification of the on-site soils. AASHTO classification tests were conducted on 16 split-spoon samples which were considered representative of the soil stratigraphy encountered across the site. Sample numbers are shown on the boring logs beside the appropriate split spoon interval. Grain size distribution curves were generated for samples numbers SS-4, SS-5 and SS-6, which are representative of the Neuse River channel bed material for use in determining the critical scour depth. Three rock samples, representative of the rock

type found at the site, were tested for unconfined compression strength with Young's Modulus and Possion's Ratio.

All testing was performed in general accordance with applicable ASTM/AASHTO/N.C.DOT specifications. The results of these tests are included in the Appendix of this report.

5.0 SUBSURFACE CONDITIONS

5.1 General

Included in the Appendix are two generalized profiles parallel to the proposed bridge. The first profile represents the subsurface conditions encountered at the southbound lane and the second profile depicts the conditions at the northbound lane. The cross sections represent the conditions along the line of each bent, which are skewed at 90° to the -L- alignment. Also included in the Appendix are boring logs describing soil conditions at each of the boring locations, and core boring reports describing rock core in terms of color, weathering, continuity and hardness. Joint orientations are given relative to the axis of the core with 90° being parallel to the axis and 0° being perpendicular to the axis. Joint spacing, ADS, is given when it is determinable.

5.2 Subsurface Conditions - Southbound Lane - End Bent 1

Two borings were drilled to characterize the subsurface conditions at End Bent 1 on the Southbound Lane bridge. These borings encountered 1.23 to 2.10 meters of loose to medium dense (N values from 4 to 11) silty fine sandy alluvial material (A-2-4). A 2.87 to 3.40 meter-thick zone of medium stiff (N values from 6 to 8) alluvial silty sandy clay (A-6, A-7-6) and sandy silt (A-4) exists below the upper sand layer. Very dense (N value of 100+) alluvial silty sandy gravel marks the base of the alluvium, extending below the silt and clay to an approximate elevation of 51.0 meters. Weathered granite classified as Soft Weathered Rock (SWR) and Hard Weathered Rock (HWR) sampled as silty fine to coarse sand lies below the alluvium to the termination of the borings. This rock is characterized by N values greater than 100. The borings were terminated on hard rock at depths ranging from 7.91 to 9.93 meters.

5.3 Subsurface Conditions - Southbound Lane - Bent 1

At the location of Bent 1 on the Southbound Lane bridge, our borings encountered 1.70 to 2.20 meters of alluvial channel material existing as very loose to loose (N values of 1 to 5) silty fine sand (A-2-4) with a thin interbed of clay and fine to coarse sand (A-3) with wood fragments. Below the alluvial material exists 0.4 to 1.5 meters of residual soil classified as very dense (N value of 63) silty fine to coarse sand (A-2-4), weathered granite. Soft Weathered Rock (SWR) sampled as silty fine to coarse sand exists below the residual soil to depths of 5.80 to 6.70 meters. Hard Weathered Rock (HWR) exists below the Soft Weathered Rock, extending to elevations 45.76 and 45.01 meters in the two borings. Hard Rock (HR), was cored below the Hard Weathered Rock and is described as orange, tan, pink and gray medium to coarse grained, severely weathered to fresh, extremely fractured to sound, soft to very hard granite.

5.4 Subsurface Conditions - Southbound Lane - Bent 2

The two borings at this location encountered 1.71 to 2.16 meters of alluvial channel material consisting of very loose to dense (N values of 2 to 34) silty sand and gravel (A-2-4, A-3, A-1-b) with wood fragments. In Boring SBLB2-A, a 0.30 meter-thick granite boulder lies on top of residual soil. The boulder could be in place or it could have been transported by waters of the Neuse River. A 1.39 meter-thick zone of residual soil in this boring overlies Soft Weathered Rock (SWR) which begins at elevation 49.46 meters. The Soft Weathered Rock changes to Hard Rock (HR) at elevation 40.84 meters. Boring SBLB2-A was terminated in Hard Rock (HR) at elevation 35.67 meters.

In Boring SBLB2-B residual soil underlies the alluvial soil and exists from elevation 51.63 meters to 50.99 meters where it changes to Soft Weathered Rock (SWR). Another zone of residual soil exists from elevation 49.49 meters to 48.29 meters where it again changes to Soft Weathered Rock. Hard Rock (HR) exists from elevation 45.35 meters to the termination of the boring at 39.42 meters.

The residual soils, Soft Weathered Rock, and Hard Rock at this bent location are similar to those described above.

5.5 Subsurface Conditions - Southbound Lane - Bent 3

The two borings at this bent encountered 5.30 meters to 6.25 meters of alluvial material consisting of very soft to medium stiff (N values of 2 to 6) fine sandy clayey silt (A-4), very soft (N value of 1) silty sandy clay (A-6) and medium dense to dense (N values of 13 to 37) fine to coarse sand and gravel (A-2-4, A-1-b). The alluvial material overlies 2.8 to 3.25 meters of residual soils consisting of dense to very dense (N values of 31 to 67) silty gravely fine to coarse sand (A-2-4). The residual soil changes to Soft Weathered Rock (SWR) at elevations 46.86 meters and 48.22 meters. In Boring SBLB3-B there exists a 1.4 meter-thick zone of residual soil within the Soft Weathered Rock zone. A thin 0.6 to 0.7 meter-thick zone of Hard Weathered Rock (HWR) separates the Soft Weathered Rock from Hard Rock (HR). The borings were terminated in Hard Rock. The Soft Weathered Rock, Hard Weathered Rock and Hard Rock at this bent location are similar to that described above.

5.6 Subsurface Conditions - Southbound Lane - End Bent 2

At this end bent location alluvial material exists to elevations 50.61 meters and 48.18 meters. The alluvium consists of loose to medium dense (N values of 4 to 24) and medium stiff to stiff (N values of 5 to 12) silty fine to coarse sand (A-2-4), silty fine sandy clay (A-7), and fine sandy clayey silt (A-4). Residual material extends below the alluvium to elevations of 45.94 meters to 45.18 meters. Soft Weathered Rock (SWR) and Hard Weathered Rock (HWR) exist below the residual soil to the termination of the borings on the top of Hard Rock (HR) at elevations 44.08 and 41.54 meters. Residual soils and weathered rock at this location are similar to those described above.

5.7 Subsurface Conditions - Northbound Lane - End Bent 1

The two borings drilled at End Bent 1 on the Northbound Lane bridge encountered 4.5 to 5.8 meters of alluvial material consisting of sand, silt, clay and gravel. The upper 0.95 to 1.23 meters of soil is characterized as loose to medium dense (N values of 6 to 11) silty fine sand (A-2-4). Medium stiff to very stiff (N values of 6 to 24) fine sandy silt (A-4) and silty sandy clay (A-6) exist below the upper sand layer to elevations of 52.23 and 53.02 meters respectively. A 0.7 to 1.0 meter layer of basal gravel marks the lower limits of the alluvial material and overlies residual soil and weathered rock.

In Boring EB1-C, the basal gravel lies directly on top of Soft Weathered Rock (SWR) sampled as silty fine to coarse sand. The boring encountered 2.11 meters of (SWR) and was terminated on Hard Rock (HR) at a depth of 7.91 meters. Boring NBLEB1-B encountered 5.0 meters of residual soil below the basal gravel layer. This soil is characterized as very dense (N values of 67 to 96) silty sand (A-2-4) and gravel (A-1-b) and is the result of in-situ weathering of granite. Weathered rock sampled as silty fine to coarse sand (SWR, HWR) exists below the residual soil in boring NBLEB1-B to the termination of the boring on Hard Rock (HR) at a depth of 13.19 meters.

5.8 Subsurface Conditions - Northbound Lane - Bent 1

At this location 0.70 to 2.10 meters of alluvial channel material exists above the residual soils. The alluvial soil is very loose to loose (N values of 0 to 7) fine to coarse sand and gravel (A-3, A-1-b) with wood fragments. Below the alluvial material is 1.4 to 2.9 meters of residual soil classified as dense to very dense (N values of 30 to 53) silty fine to coarse sand and gravel (A-2-4, A-1-b) extending to the top of Soft Weathered Rock.

In Boring NBLB1-A Soft Weathered Rock (SWR) begins at elevation 48.11 meters and changes over to Hard Weathered Rock (HWR) at elevation 47.41 meters. Hard Rock (HR) begins at elevation 47.50 meters and extends to the termination of the bore hole at elevation 40.73 meters. In boring NBLB1-B Soft Weathered Rock (SWR) begins at elevation 50.63 and changes over to Hard Weathered Rock (HWR) at elevation 45.64 meters. Hard Rock (HR) is encountered at elevation 45.57 meters in NBLB1-B and extends to the termination of the boring at elevation 38.65 meters. The Soft Weathered Rock, Hard Weathered Rock and Hard Rock at this location is similar to that described above.

5.9 Subsurface Conditions - Northbound Lane - Bent 2

Alluvial channel material in the two borings at this location extends to depths of 2.50 to 2.70 meters below the river bottom. The alluvial channel material consists of very loose to medium dense (N values of 2 to 13) fine to coarse sand and gravel (A-3, A-1-b) with wood fragments. Below the alluvial soils lies 0.75 to 1.60 meters of residual soil. Soft Weathered Rock extends from elevation 50.08 meters to 44.83 meters in NBLB2-A and from elevation 49.46 meters to 46.96 meters in NBLB2-B. A thin 0.25 to 0.93 meter-thick zone of Hard Weathered Rock (HWR) exists below the Soft Weathered

Rock in these borings below which extends Hard Rock (HR) to the termination of the borings. The residual soils, Soft Weathered Rock, Hard Weathered Rock and Hard Rock at this bent location are similar to that described above.

5.10 Subsurface Conditions - Northbound Lane - Bent 3

The upper 4.70 meters to 5.40 meters of these two borings consists of alluvial material existing as very soft to soft and loose (N values of 1 to 6) silty fine sandy clay (A-6, A-7), silty sand (A-2-4), fine sandy clayey silt (A-4) and gravel (A-1-b). Below the alluvium exists 3.3 to 4.2 meters of residual soils consisting of dense to very dense (N values of 32 to 99) silty fine to coarse sand. Residual soils change to Soft Weathered Rock (SWR) at elevations 48.49 and 47.10 meters. Soft Weathered Rock changes to Hard Weathered Rock (HWR) at elevations 40.99 and 43.80 meters. In boring NBLB3-B there exists a 1.5 meter-thick zone of residual soil within the Soft Weathered Rock zone. Hard Rock (HR) begins below the Hard Weathered Rock at elevations 40.17 meters and 43.47 meters and continues to the termination of the borings. The Soft Weathered Rock, Hard Weathered Rock and Hard Rock at this bent location are similar to that described above.

5.11 Subsurface Conditions - Northbound Lane - End Bent 2

These borings encountered 5.73 to 8.50 meters of alluvium consisting of loose to medium dense and medium stiff to stiff (N values of 4 to 24) silty fine sand (A-2-4), clayey fine sandy silt (A-4) and silty fine sandy clay (A-7). Residual soils extend below the alluvium to boring depths of 8.00 to 11.50 meters. Residual soils change to Weathered Rock at elevations 45.18 meters and 48.93 meters. Borings were terminated on Hard Rock (HR) at elevations of 41.54 to 42.60 meters. Residual soils and weathered rock at this location are similar to those described above.

6.0 GROUNDWATER

Groundwater level observations were generally obtained immediately after drilling and 24 hours after completion at each land boring location. Groundwater readings are shown on the boring logs. On the south side of the river, 24 hour groundwater was observed at depths of 2.44 meters, 0.90 meters and 0.90 meters. On the north side of the river, 24 hour groundwater was observed at depths of 2.42 meters, 2.13 meters,

2.50 meters, 3.08 meters, 2.59 meters, 1.98 meters and 3.35 meters. These measured groundwater depths are somewhat inconsistent with the water elevation in the Neuse River. This could be due to the existence of a dam approximately 10 miles upstream of the bridge site. When water is released at the dam above and beyond the normal levels, it takes time for groundwater levels to reflect water levels in the river, especially when the majority of the flood plain soils are fine grained silts and clays. Therefore, measured groundwater levels in the flood plain can sometimes be lower than the elevation of the water surface in the Neuse River.

7.0 SCOUR

Detail scour analysis for the proposed structure was not part of the scope of services for the bridge foundation investigation, but limited scour information concerning the bridge site was obtained from site observations as required by the N.C. Department of Transportation for all water crossings. A Field Scour Report form describing the observed site conditions related to bridge scour is included in the Appendix.

8.0 FOUNDATION RECOMMENDATIONS

The soft and loose alluvial soils will not provide suitable support for spread foundations. We recommend HP 310mm x 79 kg/m steel piles terminating in the soft to hard weathered rock be used for the two end bents. At End Bent 1, piles driven to tip elevations ranging from about 45 meters to about 49 meters are expected to develop a vertical load capacity of 400 to 450 kilonewtons. The deeper pile tip elevations are expected on the eastern side of the NBL. At End Bent 2, piles driven to an average tip elevation of 45 meters are expected to develop a vertical load capacity of 400 to 450 kilonewtons.

For the interior bents, we recommend drilled piers bearing on the hard rock. Lateral resistance can be developed by the residual soil and soft weathered rock that is present above the hard rock if the scour analysis determines these materials will remain. Otherwise, the drilled piers can be socketed 2 to 3 meters into competent rock to develop lateral resistance. The required pier size is expected to depend on the lateral capacity analysis. Driven piles are not considered due to the potential reduction in lateral resistance if the alluvial soils are scoured and the difficulty of driving into the rock.

9.0 EMBANKMENTS

Based on the standard penetration resistances and soil types in the end bent borings, we recommend side and end slopes of 1.5(H):1(V) for the approach fills. Similar slopes are present on the approach fills for the existing bridge and do not show indications of excessive settlement or lack of stability. The medium stiff silts (A-4) in some end bent borings, are expected to experience some initial settlement under the weight of the fill. We recommend a one month delay period after placing the fill before pile driving.

10.0 CONSTRUCTION CONSIDERATIONS

Drilled pier construction should use temporary casing installed through the alluvium. The residual soils and soft weathered rock are sandy textured and water inflows into an unprotected hole may cause side softening or collapse. Either temporary casing or slurry drilling should be used to advance the drilled pier through the residual soil and into the soft weathered rock.

While it is possible to have lenses of hard rock present within the residual soil or the soft weathered rock, none of the end bent borings encounter such conditions. Therefore pile tip reinforcement is not recommended.

LAW
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APPENDIX

N.C.DOT GEOTECHNICAL UNIT SOIL
AND ROCK CLASSIFICATION SHEET
AND LEGEND SUPPLEMENT

SITE LOCATION MAP (DRAWING NO. 1)

BORING LOCATION PLAN (DRAWING NO. 2)

SOUTHBOUND LANE CROSS SECTIONS THROUGH BENTS
(DRAWINGS NO. 3 THROUGH 7)

NORTHBOUND LANE CROSS SECTIONS THROUGH BENTS
(DRAWINGS NO. 9 THROUGH 13)

SOUTHBOUND LANE BORING LOGS AND CORE REPORTS WITH CORE PHOTOS

NORTHBOUND LANE BORING LOGS AND CORE REPORTS WITH CORE PHOTOS

SCOUR REPORT

SITE PHOTOGRAPHS

AASHTO/ASTM LABORATORY TEST RESULTS

PROFILE ALONG SOUTHBOUND LANE,
APPROXIMATELY 18 METERS LEFT OF -L- (DRAWING NO. 8)

PROFILE ALONG NORTHBOUND LANE,
APPROXIMATELY 21 METERS RIGHT OF -L- (DRAWING NO. 14)

NORTH CAROLINA DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SOIL AND ROCK CLASSIFICATION, LEGEND, AND ABBREVIATIONS

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	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
(PASSING #40) LL				40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PI	6 MX		N.P.	10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL & SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				

• PI OF A-7-5 ≤ (LL-30); PI OF A-7-6 > (LL-30)

TEXTURE OR GRAIN SIZE

	BOULDER	COBBLE	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	SILT	CLAY
GRAIN SIZE (mm)	305	75	2	0.6	0.425	0.2	0.075	0.005
GRAIN SIZE (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	-MOIST- (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL SHRINKAGE LIMIT		
	-DRY- (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

ROCK DESCRIPTION

IN THE BROADEST MEANING, HARD ROCK IS CONSIDERED TO BE THAT INDURATED EARTH MATERIAL WHICH CANNOT BE SAMPLED BY CONVENTIONAL SOIL SAMPLING TOOLS OR TECHNIQUES. THE BOUNDARY BETWEEN SOIL AND ROCK IS ARBITRARY. TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF "WEATHERED ROCK". FOR THE PURPOSE OF THIS INVESTIGATION, THESE MATERIALS ARE DIVIDED AS FOLLOWS:

TERM	SYMBOLS		DESCRIPTION
HARD ROCK (HR)	CORED ROCK	INFERRED ROCK LINE [2]	MATERIAL THAT CANNOT BE PENETRATED BY POWER AUGERS, EXCEPT IN THIN LEDGES, AND REQUIRES ROCK CORING TOOLS FOR OBTAINING A SAMPLE
WEATHERED ROCK (WR)		HARD WEATHERED ROCK (HWR)	MATERIAL THAT CAN BE PENETRATED WITH GREAT DIFFICULTY USING POWER AUGERS AND YIELDS SPT REFUSAL [1]
		SOFT WEATHERED ROCK (SWR)	MATERIAL THAT CAN BE PENETRATED WITH SOME DIFFICULTY USING POWER AUGERS AND YIELDS SPT VALUES > 100 BLOWS BUT < SPT REFUSAL

[1] SPT REFUSAL ≤ 2.5 cm OF PENETRATION PER 50 BLOWS IN SPT.

[2] AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH AUGERS COULD NO LONGER PENETRATE. THE HARD ROCK SYMBOL IS SHOWN WHEN ROCK IS CORED AND ONLY TO THAT DEPTH CORED. A DESCRIPTION OF ROCK IS GIVEN, INCLUDING:

CORE RECOVERY (REC.) - TOTAL LENGTH OF ROCK RECOVERED IN THE CORE BARREL DIVIDED BY THE TOTAL LENGTH OF THE CORE RUN TIMES 100%.

ROCK QUALITY DESIGNATION (RQD) - TOTAL LENGTH OF SOUND ROCK SEGMENTS RECOVERED THAT ARE LONGER THAN OR EQUAL TO 10 cm DIVIDED BY THE TOTAL LENGTH OF THE CORE RUN TIMES 100%.

NORTH CAROLINA PROFESSIONAL SEAL 6428 ENGINEER ALLAN TICE

SEAL

Signature

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N - VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (qu) (kN / m²)
GENERALLY GRANULAR MATERIAL	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	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 > 400

GROUND WATER

- ▽ WATER LEVEL IN BORE HOLE { IMMEDIATELY AFTER DRILLING (I.A.D.) / SOON AFTER DRILLING (▽ ____ HRS.)
- ▼ STATIC WATER LEVEL (AFTER ____ HRS.)
- ▽ PERCHED WATER (PW), SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEPAGE

MISCELLANEOUS SYMBOLS AND ABBREVIATIONS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- 25° STRIKE AND DIP
- APPARENT DIP (NORMAL TO ____)
- ROD SOUNDING
- SPT / DPT / VST TEST BORING
- AUGER BORING
- CORE BORING
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- MONITORING WELL

SAMPLE DESIGNATIONS
- S-BULK SAMPLE
- SS-SPLIT SPOON SAMPLE
- ST-SHELBY TUBE SAMPLE
- UC-UNCONFINED COMPRESSION SAMPLE

ABBREVIATIONS

ALLUV.	ALLUVIUM	MIC.	MICACEOUS
AR	AUGER REFUSAL	MOT.	MOTTLED
BLDR.	BOULDER	N	BLOWS / 30 CM
CALC.	CALCAREOUS	NS	NO SAMPLE TAKEN
CL.	CLAY	ORG.	ORGANIC
CLY.	CLAYEY	REF.	REFER TO
COB.	COBBLE	RES.	RESIDUAL
CSE.	COARSE	S.	SOFT
DPT	DYNAMIC PENETRATION TEST	SAT.	SATURATED
EST.	ESTIMATED	SD.	SAND
F.	FINE	SDY.	SANDY
FOSS.	FOSSILIFEROUS	SED(S).	SEDIMENT(S)
FRAC.	FRACTURED	SL.	SILT, SILTY
FRAG(S).	FRAGMENT(S)	SLI.	SLIGHTLY
GR.	GRAVEL	SPT	STANDARD PENETRATION TEST
GS	SPECIFIC GRAVITY	TS.	TOPSOIL
GW	GROUND WATER	VST	VANE SHEAR TEST
MED.	MEDIUM	V.	VERY
		W/	WITH

BENCH MARK: Railroad Spike in Power Pole 17.41m LT -L- 77+85.34

STATE PROJECT NO. 8.1402103

T.I.P. NO. R-2425C F.A. NO.

COUNTY Wake ROUTE U.S. 401

SITE DESCRIPTION Dual Bridges on U.S. 401 over Neuse River

PROJECT GEOLOGIST BK Banks SUBMITTED BY Law

PERSONNEL Al Tice, K. Trimble, J. Ballsieper, F. Cox, S. Hancock, W. Whichard

DATE SUBMITTED 6/21/96

N.C.DOT LEGEND SUPPLEMENT

..i addition to the terms and abbreviations listed on the N.C.DOT Legend Sheet, the following is used to further describe rock quality on this project.

WEATHERING

Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer is 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 or a crystalline nature.
Slight (SLI.)	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in.). 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 show significant loss or 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 sever loss of strength and can be excavated with geologist's pick. Rock gives "clunk" sound when struck. **Comparable to hard weathered rock**
Severe (SEV.)	All rocks 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. **Comparable to soft weathered rock**
'ery Severe .√.SEV.)	All rock except quartz discolored or stained. Rock fabric elements are discernible but the mass is effectively reduced to soil status, with only fragments of strong rock remaining. Saprolite is an example of rock weathered to a degree such that only minor vestiges of the original rock fabric remain. **Comparable to soil**
Complete	Rock reduced to soil. Rock fabric not discernible only in small and scattered concentrations. Quartz may be present as dikes or stringers. Saprolite is also an example. **Comparable to soil**

ROCK CONTINUITY

Sound-	Core pieces larger than 15 cms.
Slightly Fractured (SLI.FRACT.)-	Core pieces between 10 and20 cms.
Moderately Fractured (MOD.FRACT.)-	Core pieces between 2.5 and 10 cms.
Extremely Fractured (EXT.FRACT.)-	Core pieces less than 2.5 cms.

JOINT SPACING

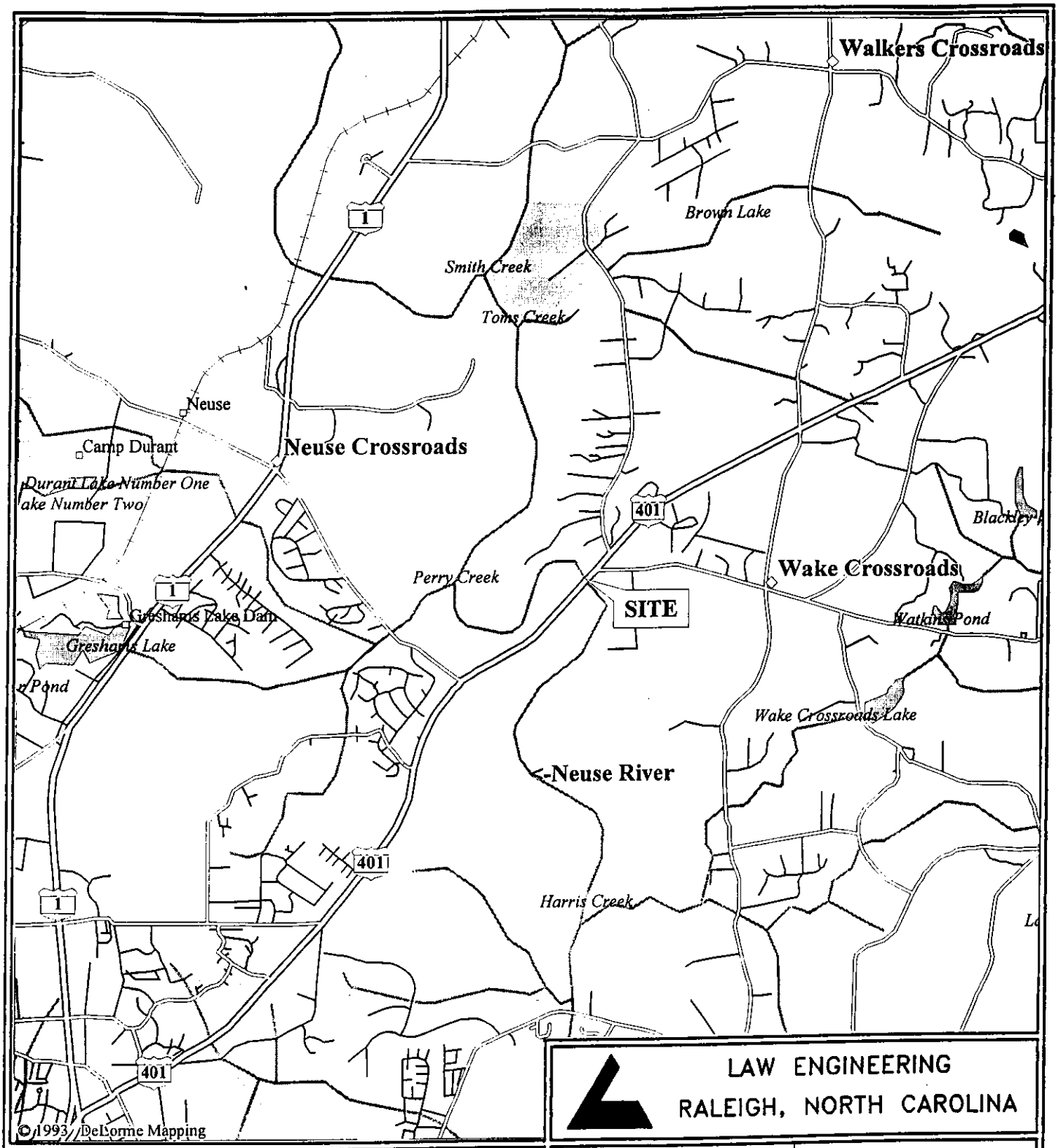
Average Discontinuity Spacing (ADS)

The average measured distance (in centimeters) between joints in the same set. Will not apply to individual joints.

JOINT THICKNESS

Average Discontinuity Thickness (ADT)

The average thickness or width of gap in the joint.



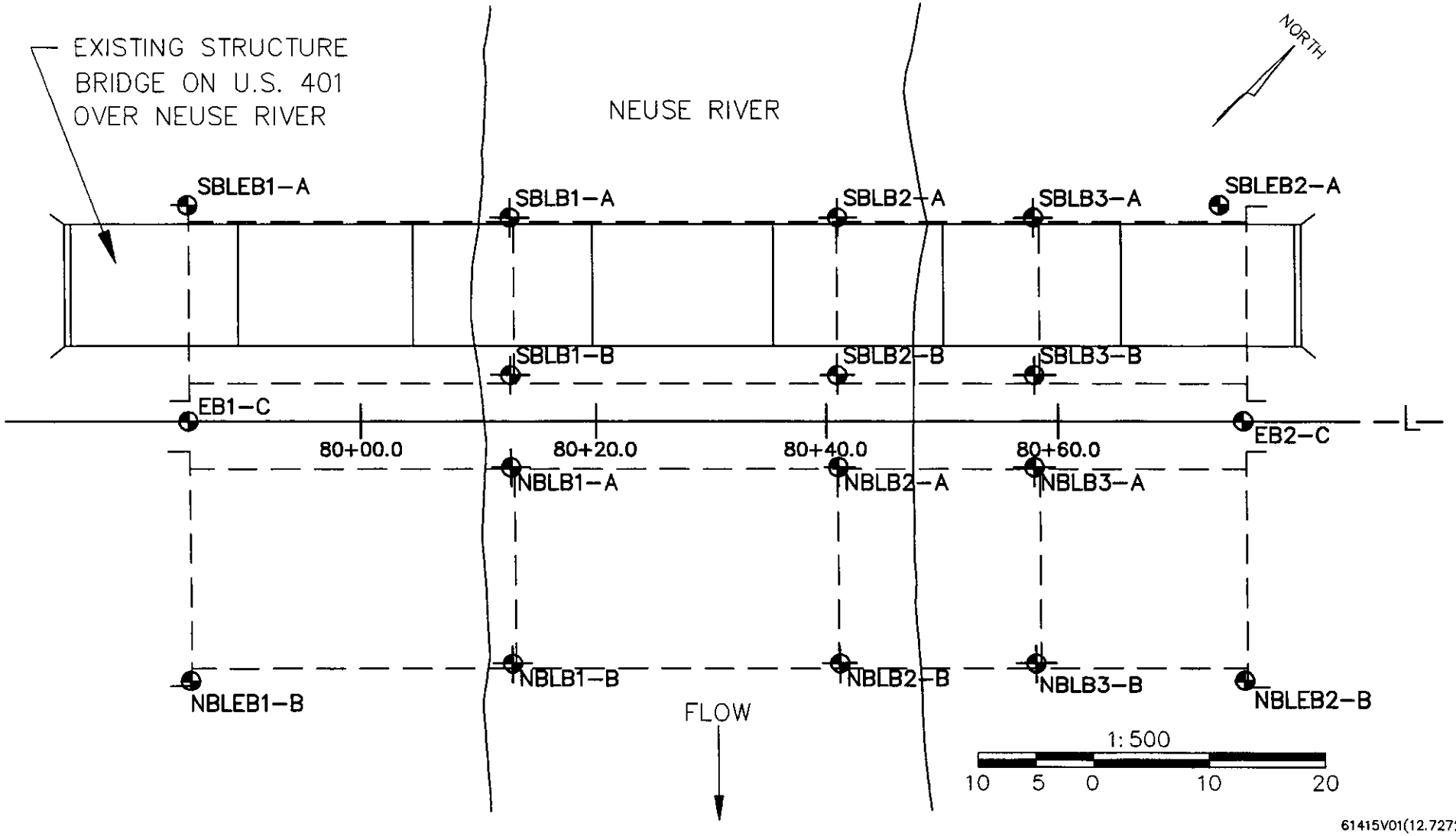
LAW ENGINEERING
RALEIGH, NORTH CAROLINA

SITE LOCATION MAP

DUAL BRIDGES ON US401 OVER
NEUSE RIVER
NCDOT PROJ NO. 8.1402103 (B-2425C)
WAKE COUNTY, NORTH CAROLINA

DRAWN: BKB	DATE: 5/96
DFT CHECK: —	SCALE: **1:50,000**
ENG CHECK: —	JOB: 30720-6-1415
APPROVAL:	DWG: 1

REFERENCE: DeLorme Mapping, 1993

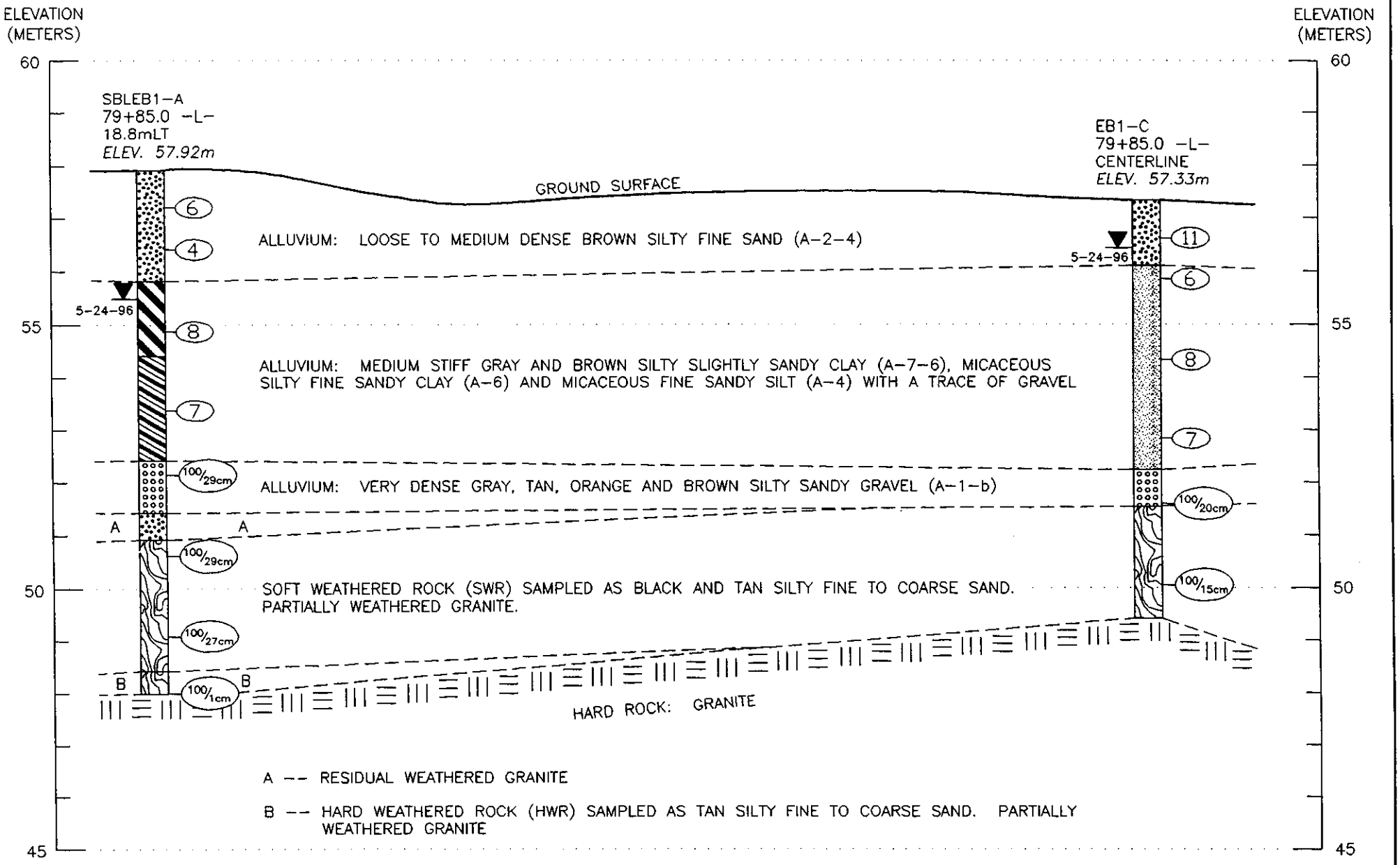


BORING LOCATION PLAN
DUAL BRIDGES ON US 401 OVER NEUSE RIVER
N.C. DOT PROJ. NO. 8.1402103 (R–2425C)

LAW ENGINEERING AND
ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

DRAWN: RWS	ENG CHECK: BKB	DATE: JUNE 1996	JOB: 30720–6–1415
DFT CHECK: RRB	APPROVAL: BKB	SCALE: 1: 500	DWG: 2

REFERENCE: NCDOT BRIDGE SURVEY & HYDRAULIC DESIGN



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HORIZONTAL AND VERTICAL SCALE IN METERS

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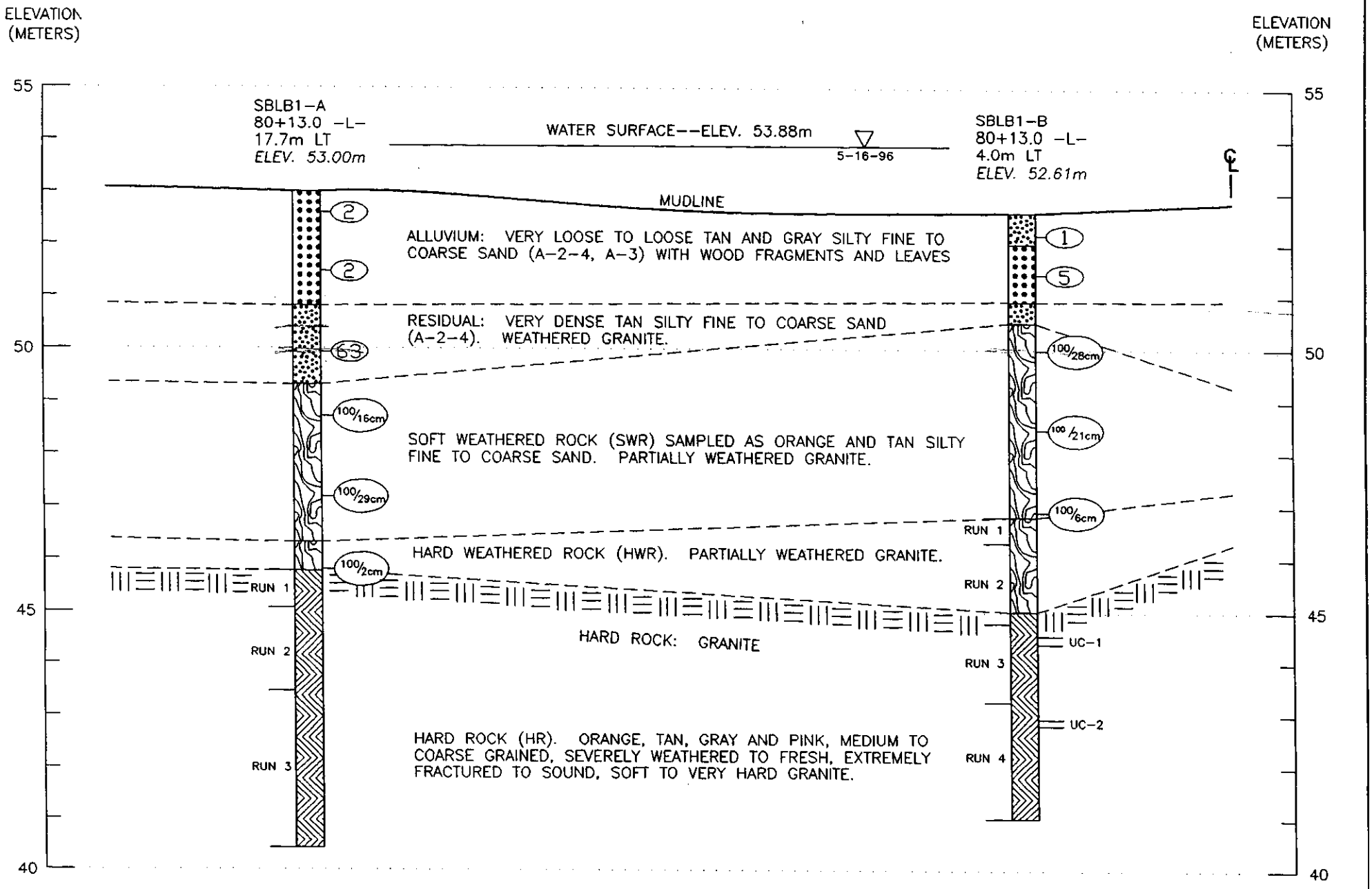
CROSS SECTION THROUGH END BENT ONE––SBL
DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
NCDOT PROJECT NO. 8.1402103 (R–2425C)
WAKE COUNTY, NORTH CAROLINA

LAW ENGINEERING – RALEIGH, NC	
DRAWN: BKB	DATE: 5/96
DFT CHECK: TLM	JOB: 30720–6–1415
ENG CHECK: JDR	DWG: 3



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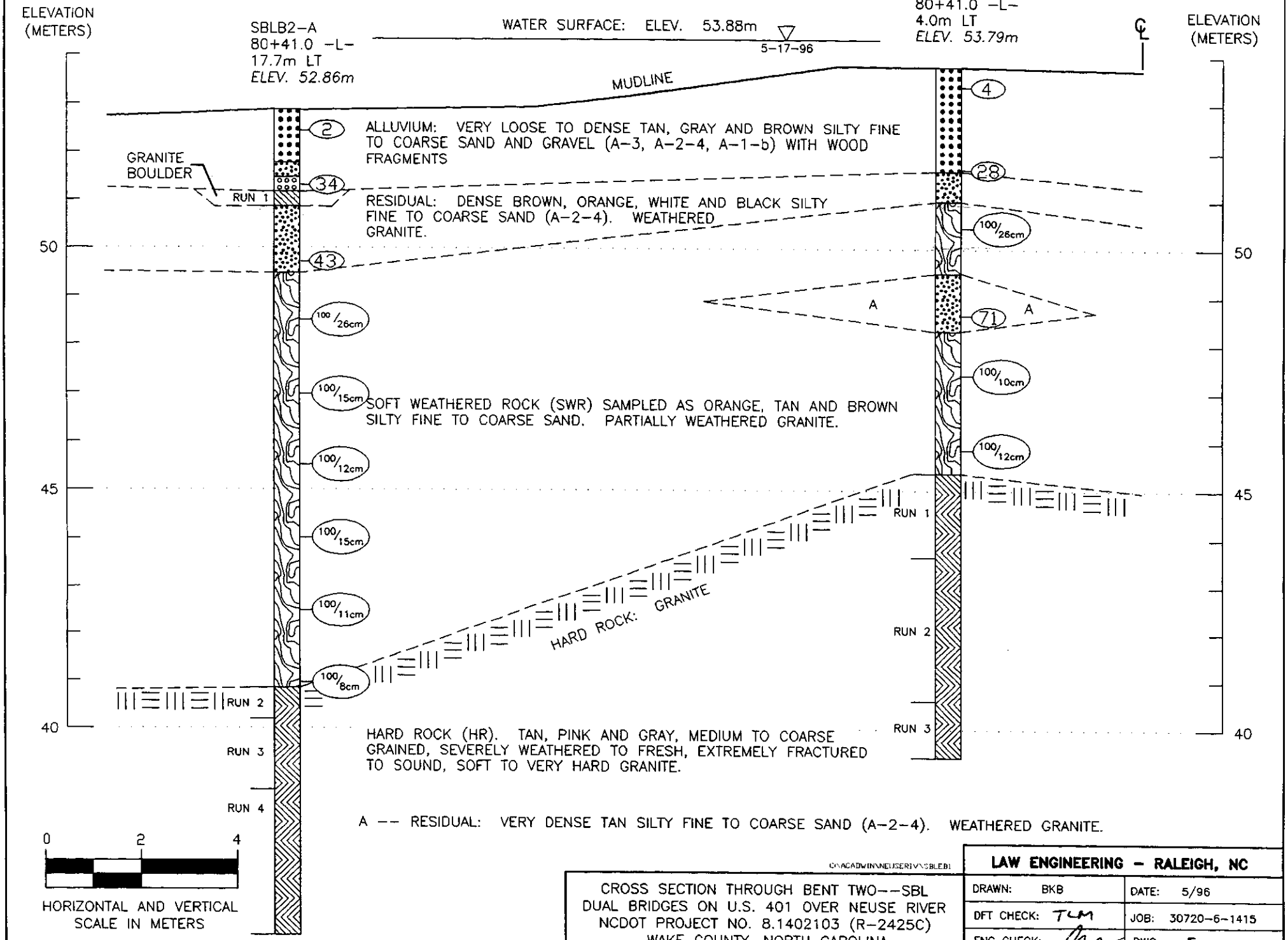
CROSS SECTION THROUGH BENT ONE--SBL
DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
NCDOT PROJECT NO. 8.1402103 (R-2425C)
WAKE COUNTY, NORTH CAROLINA

LAW ENGINEERING - RALEIGH, NC	
DRAWN: BKB	DATE: 5/96
DFT CHECK: TLM	JOB: 30720-6-1415
ENG CHECK:	DWG: 4



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CROSS SECTION THROUGH BENT TWO--SBL
DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
NCDOT PROJECT NO. 8.1402103 (R-2425C)
WAKE COUNTY, NORTH CAROLINA

LAW ENGINEERING - RALEIGH, NC

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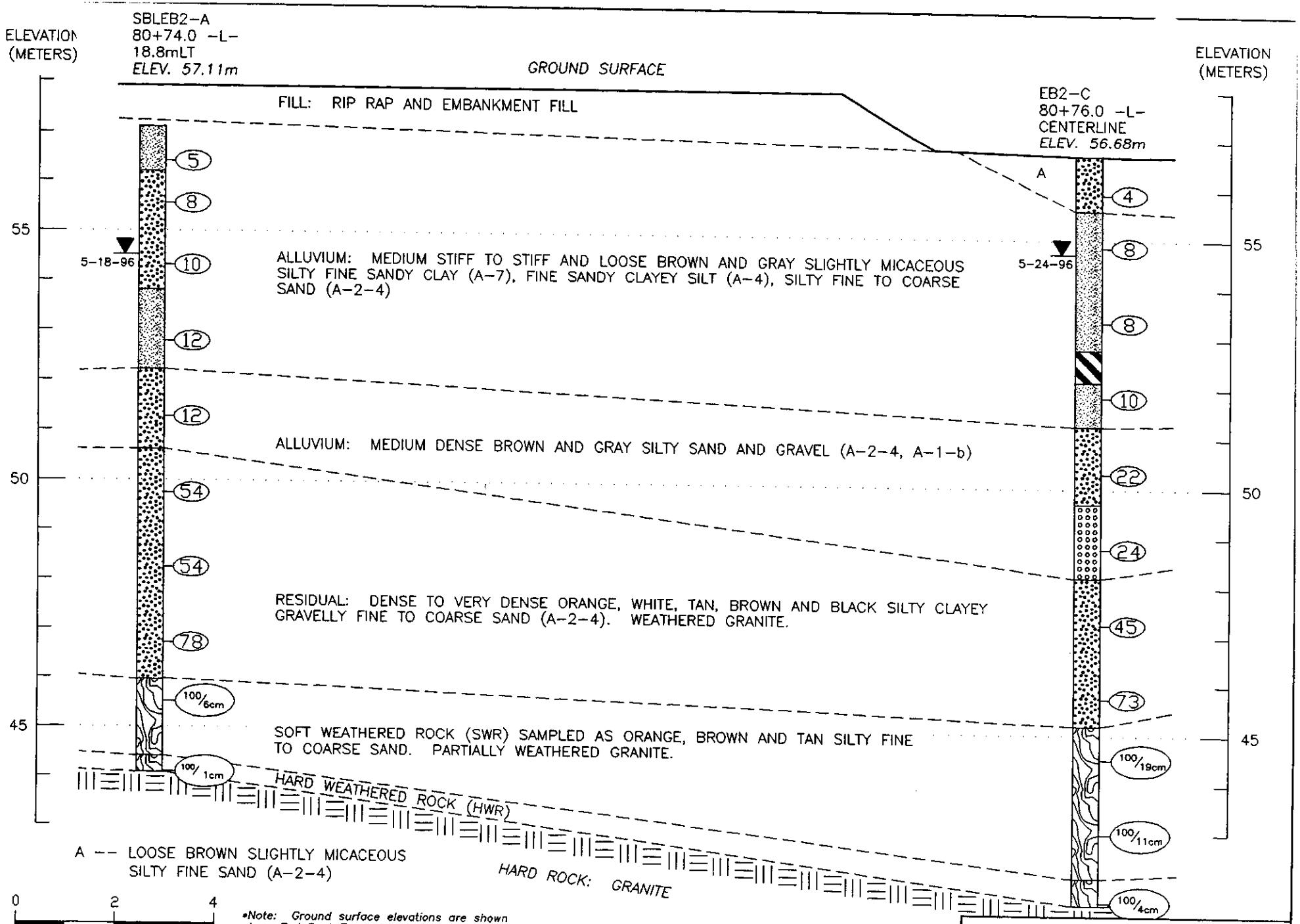

*Note: Ground surface elevations are shown along End Bent Two. Boring elevations are shown at their true elevations. Difference in collar elevation and ground surface elevation at the boring location is a result of the boring being offset from its original location. See the site photograph for SBLEB2-A, in the Appendix.

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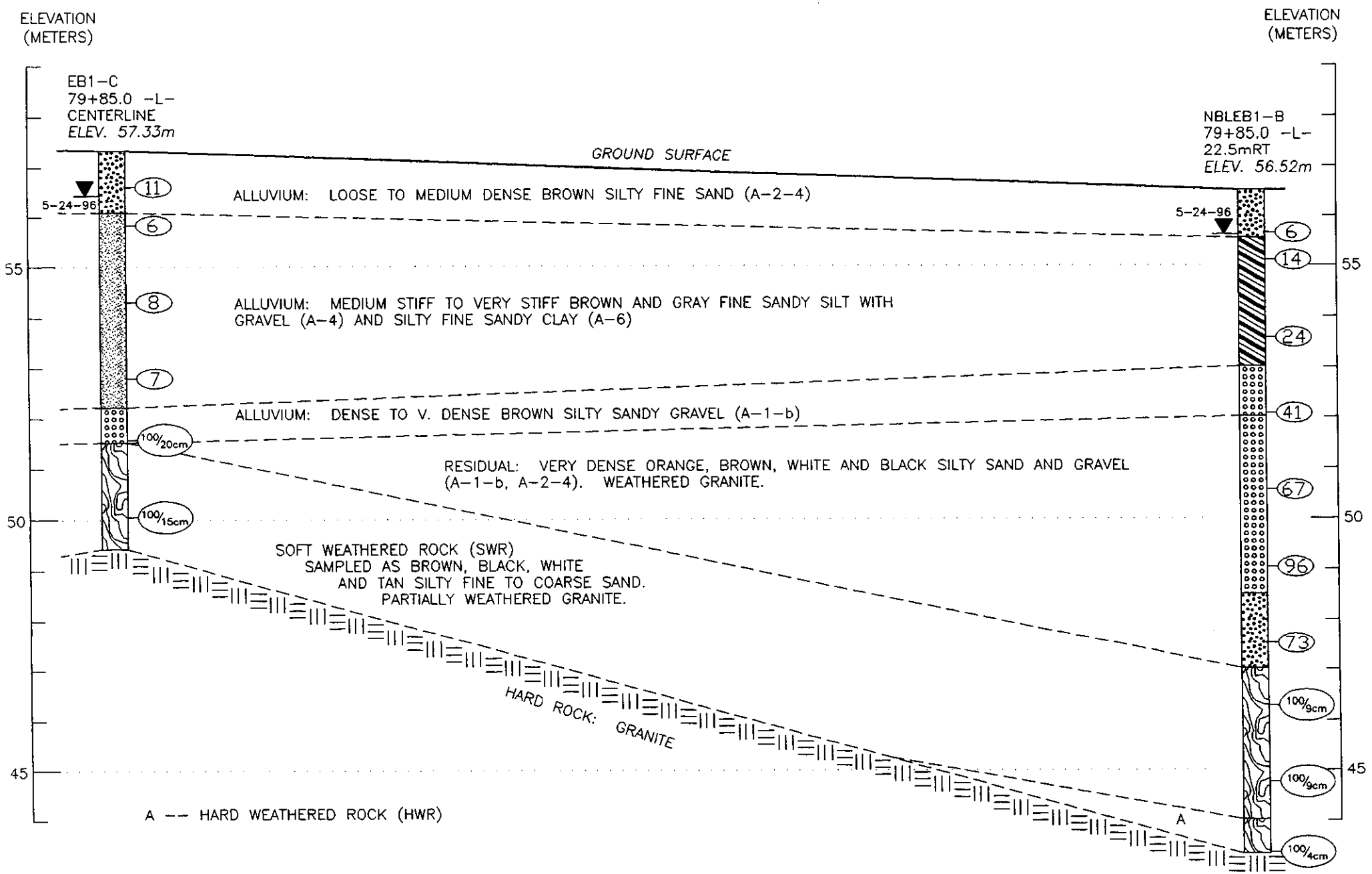
CROSS SECTION THROUGH END BENT TWO--SBL
DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
NCDOT PROJECT NO. 8.1402103 (R-2425C)
WAKE COUNTY, NORTH CAROLINA

LAW ENGINEERING - RALEIGH, NC

DRAWN: BKB	DATE: 5/96
DFT CHECK: TCM	JOB: 30720-6-1415
ENG CHECK:	DWG: 6



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HORIZONTAL AND VERTICAL SCALE IN METERS

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CROSS SECTION THROUGH END BENT ONE--NBL
DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
NCDOT PROJECT NO. 8.1402103 (R-2425C)
WAKE COUNTY, NORTH CAROLINA

LAW ENGINEERING – RALEIGH, NC	
DRAWN: BKB	DATE: 5/96
DFT CHECK: TLM	JOB: 30720-6-1415
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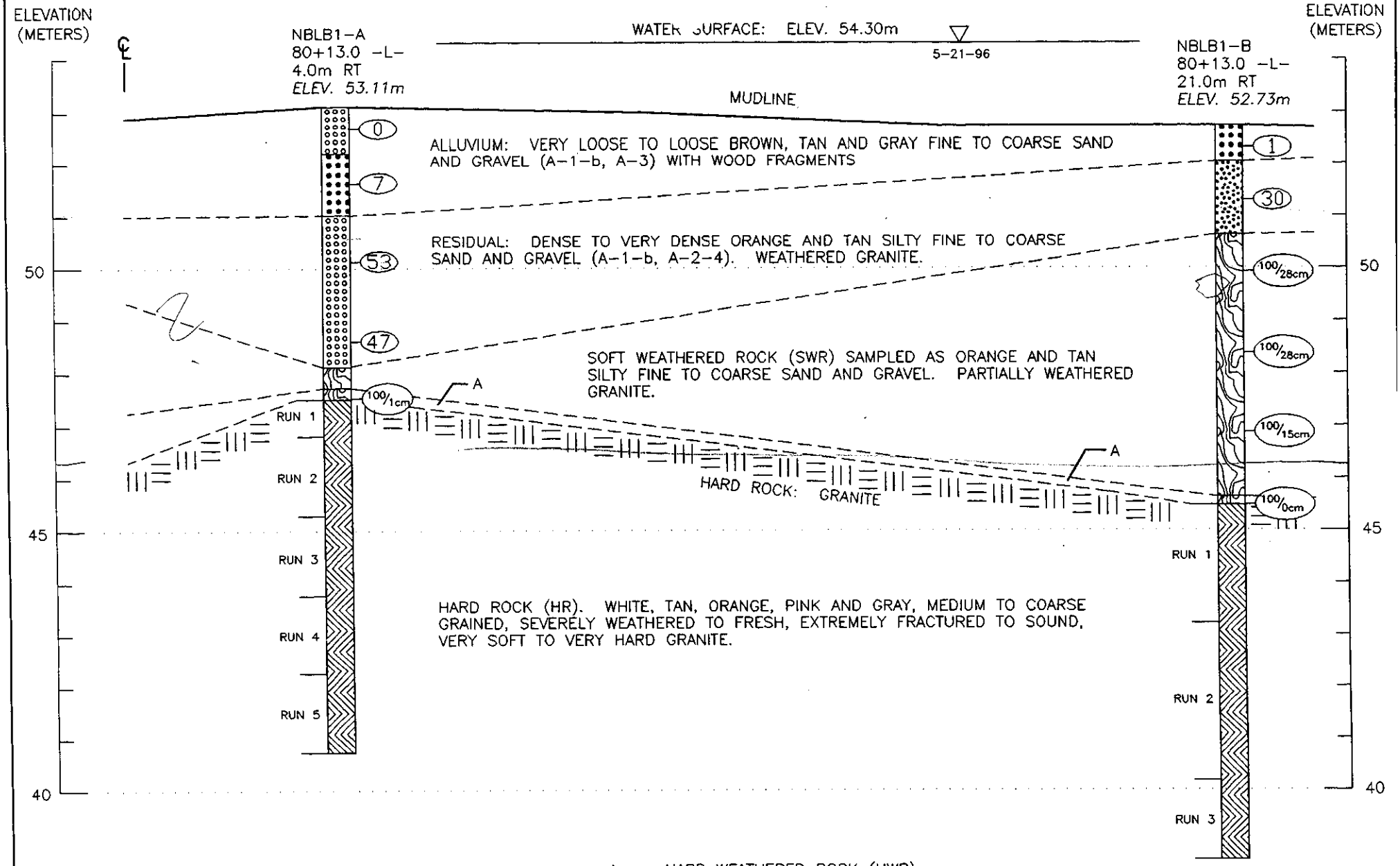

A -- HARD WEATHERED ROCK (HWR)

0 2 4

HORIZONTAL AND VERTICAL SCALE IN METERS

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CROSS SECTION THROUGH BENT ONE---NBL
DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
NCDOT PROJECT NO. 8.1402103 (R-2425C)
WAKE COUNTY, NORTH CAROLINA

LAW ENGINEERING - RALEIGH, NC

DRAWN: BKB	DATE: 5/96
DFT CHECK: TCM	JOB: 30720-6-1415
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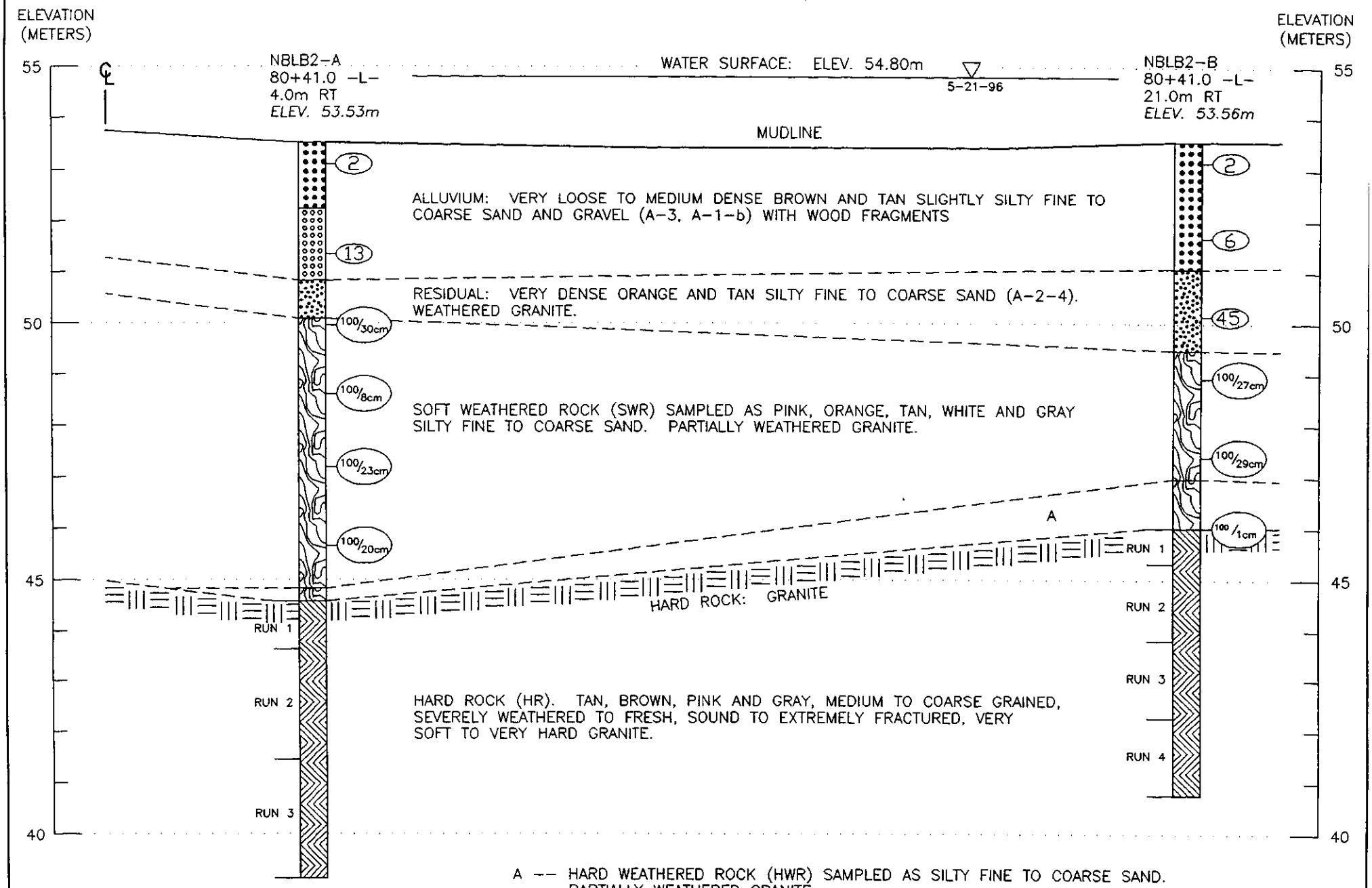

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CROSS SECTION THROUGH BENT TWO--NBL
DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
NCDOT PROJECT NO. 8.1402103 (R-2425C)
WAKE COUNTY, NORTH CAROLINA

LAW ENGINEERING - RALEIGH, NC

DRAWN: BKB	DATE: 5/96
DFT CHECK: TLM	JOB: 30720-6-1415
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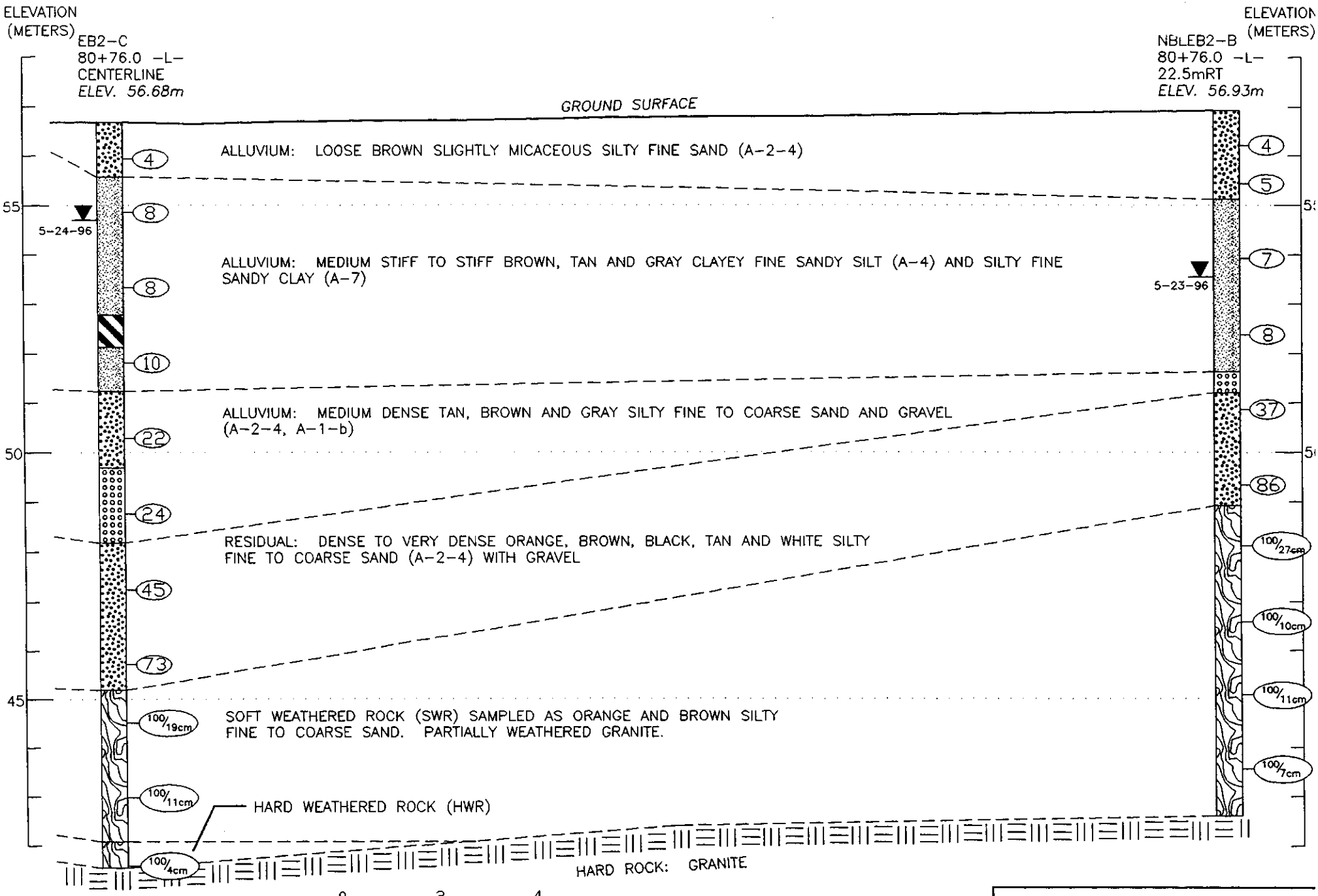

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HORIZONTAL AND VERTICAL SCALE IN METERS

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CROSS SECTION THROUGH END BENT TWO--NBL
DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
NCDOT PROJECT NO. 8.1402103 (R-2425C)
WAKE COUNTY, NORTH CAROLINA

LAW ENGINEERING - RALEIGH, NC	
DRAWN: BKB	DATE: 5/96
DFT CHECK: TLM	JOB: 30720-6-1415
ENG CHECK: JR2	DWG: 12

LAW ENGINEERING, INC.
3301 Atlantic Avenue
Raleigh, North Carolina 27619
Phone (919) 876-0416

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. SBLEB1-A	**BORING LOCATION** 79+85.0	**OFFSET** 18.8 m LT	**ALIGNMENT** -L-	**0 HR.** 0.49
COLLAR ELEV. 57.92 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** 2.44
TOTAL DEPTH 9.93 m	**DRILL MACHINE** CME 550	**DRILL METHOD** Mud Rotary	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/23/96	**COMPLETED** 5/23/96	**SURFACE WATER DEPTH** N/A		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
57.92					Ground Surface				57.92 0.00
	0.30	4	3	3	6		M		ALLUVIUM: BROWN SILTY FINE SAND (A-2-4)
	1.10	2	2	2	4		M		55.82 2.10
56	2.62	3	3	5	8	SS-1	M		ALLUVIUM: GRAY AND BROWN MOTTLED SILTY SLIGHTLY SANDY CLAY (A-7-6)
									54.42 3.50
54	4.14	3	3	4	7	SS-2	M-W		ALLUVIUM: GRAY AND BROWN MOTTLED MICACEOUS SILTY FINE SANDY CLAY (A-6)
	5.66	18	60	40	100/29cm		Sat		52.42 5.50
52									ALLUVIUM: GRAY, TAN AND ORANGE SILTY SANDY GRAVEL (A-1-b)
	7.18	24	45	55	100/29cm		W		51.42 6.50
50									RESIDUAL WEATHERED GRANITE (A-2-4)
	8.70	42	58		100/27cm		W		50.92 7.00
	9.92	100			100/1 cm				SOFT WEATHERED ROCK (SWR) SAMPLED AS TAN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
48									48.42 9.50
									47.99 9.93
46									HARD WEATHERED ROCK (HWR) SAMPLED AS TAN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
44									BORING TERMINATED AT 9.93 METERS ON GRANITE.
42									
40									

NCBMM3 1415 .6

LAW ENGINEERING, INC.
3301 Atlantic Avenue
Raleigh, North Carolina 27619
Phone (919) 876-0416

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. EB1-C	**BORING LOCATION** 79+85.0	**OFFSET** CL	**ALIGNMENT** -L-	**0 HR.** 0.27
COLLAR ELEV. 57.33 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** 0.90
TOTAL DEPTH 7.91 m	**DRILL MACHINE** CME 550	**DRILL METHOD** Mud Rotary	**HAMMER TYPE** 140#Safety
DATE STARTED 5/23/96	**COMPLETED** 5/23/96	**SURFACE WATER DEPTH**	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
57.33					Ground Surface				57.33 0.00
	0.30	5	6	5	11		M		ALLUVIUM: BROWN SILTY FINE SAND (A-2-4)
	1.07	2	2	4	6		M		56.10 1.23 ALLUVIUM: BROWN AND GRAY MICACEOUS FINE SANDY SILT (A-4) WITH TRACE OF GRAVEL
56	2.59	3	4	4	8		M		
54	4.11	2	3	4	7		W		
	5.63	21	72	28	100/20cm		M		52.23 5.10 ALLUVIUM: BROWN SILTY SANDY GRAVEL (A-1-b)
52	7.15	100			100/15cm		M		51.53 5.80 SOFT WEATHERED ROCK (SWR) SAMPLED AS WHITE, BLACK AND TAN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
50									49.42 7.91 BORING TERMINATED AT 7.91 METERS ON GRANITE.
48									
46									
44									
42									
40									

NCBMM3 1415 96

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3301 Atlantic Avenue
Raleigh, North Carolina 27619
Phone (919) 876-0416

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. SBLB1-A	**BORING LOCATION** 80+13.0	**OFFSET** 17.7m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 53.00 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** N/A
TOTAL DEPTH 12.59 m	**DRILL MACHINE** CME 45 on Barge	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/22/96	**COMPLETED** 5/22/96	**SURFACE WATER DEPTH** 1.17 m		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
53.00					Mudline				53.00 0.00
	0.00	1	1	1	2		Sat		ALLUVIAL: TAN FINE TO COARSE SAND (A-3) WITH WOOD FRAGMENTS AND LEAVES
52	1.13	1	1	1	2		Sat		
	2.66	24	36	27	63		W		50.80 2.20 RESIDUAL: TAN SILTY FINE TO COARSE SAND (A-2-4) WITH RELICT ROCK STRUCTURE. WEATHERED GRANITE.
50	4.18	91	9		100/16cm		W		49.30 3.70 SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND TAN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
48	5.70	38	62		100/29cm		W		
	7.22	100			100/2cm				46.30 6.70 HARD WEATHERED ROCK (HWR) - NO RECOVERY 45.76 7.24
46									HARD ROCK (HR). ORANGE, TAN, GRAY AND PINK, MEDIUM TO COARSE GRAINED, SEVERELY WEATHERED TO FRESH, EXTREMELY FRACTURED TO SOUND, SOFT TO VERY HARD GRANITE. (SEE CORE BORING REPORT)
44									
42									40.41 12.59 BORING TERMINATED AT 12.59 METERS IN GRANITE.
40									
38									
36									

NCBMM3 1415 .6

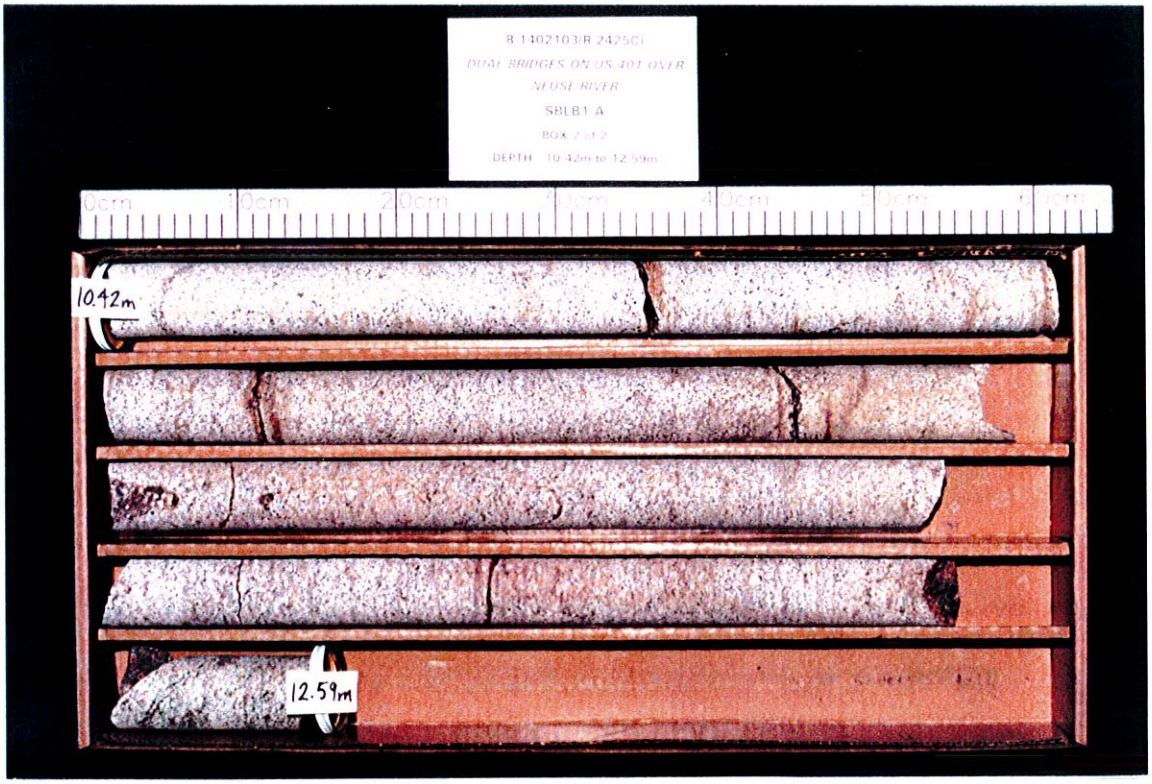
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO: SBLB1-A	BORING LOCATION (STA): 80+13.0 -L-		OFFSET: 17.7m LT
COLLAR ELEV: 53.00m	DATE STARTED: 05-22-96		DRILL MACHINE: CME 45 on Barge
TOTAL DEPTH: 12.59m	DATE COMPLETED: 05-22-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 5.35m		DRILLER: F.Cox/K.Pendley

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
45.76	7.24	2:09 2:36 	0.69	0 (0%)	0.44 (64%)	Run 1	Orange and tan medium to coarse grained moderately to severely weathered, moderately to extremely fractured, moderately hard to soft granite. 2 Joints at 0-20 degrees 3 Joints at 40 degrees 4 Joints at 50-70 degrees
45.07	7.93						
		0:55 1:26 1:42 1:12 1:06	1.62	0.39 (24%)	1.62 (100%)	Run2	Gray pink and tan medium to coarse grained, fresh to moderately severely weathered, sound to extremely fractured, very hard to medium hard granite. 14 Joints at 0-10 degrees ADS = 3 to 18cm 6 Joints at 70-90 degrees
43.45	9.55						
		2:20 2:41 3:11 3:08 3:30 3:07 4:14 4:31 4:58 5:23	3.04	2.90 (95%)	3.04 (100%)	Run 3	Tan, gray and pink medium to coarse grained, moderately weathered to fresh, extremely fractured to sound, moderately hard to very hard granite. 8 Joints at 0-10 degrees ADS = 8 to 64cm 4 Joints at 35-50 degrees ADS > 13cm
40.41	12.59						
		     					Boring terminated at 12.59 in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
SBLB1-A

Box 1 of 2
7.24m to 10.42m



Box 2 of 2
10.42m to 12.59m

LAW ENGINEERING, INC.
3301 Atlantic Avenue
Raleigh, North Carolina 27619
Phone (919) 876-0416

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. SBLB1-B	**BORING LOCATION** 80+13.0	**OFFSET** 4.0m LT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 52.61 m	**NORTHING** Not Provided	**EASTING** Not Provided	**24 HR.** N/A
TOTAL DEPTH 11.60 m	**DRILL MACHINE** CME 45 on Barge	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety
DATE STARTED 5/16/96	**COMPLETED** 5/16/96	**SURFACE WATER DEPTH** 1.27 m	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
52.61					Mudline				
	0.00	1	1	0	1		Sat		ALLUVIUM: TAN MICACEOUS SILTY FINE SAND (A-2-4) WITH THIN INTERBED OF CLAY
52	0.78	4	3	2	5		Sat		52.01 — 0.60 — ALLUVIUM: GRAY MICACEOUS FINE TO MEDIUM SAND (A-3)
	2.50	25	43	57	100/28cm		M-W		50.91 — 1.70 — RESIDUAL: WEATHERED GRANITE — 50.51 — 2.10 — SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND TAN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
50	4.03	16	65	35	100/21cm		M		
48	5.55	100			100/6cm				46.81 — 5.80 — HARD WEATHERED ROCK (HWR) CORED AS ORANGE, MEDIUM TO COARSE GRAINED, MODERATELY SEVERE TO VERY SEVERELY WEATHERED GRANITE (SEE CORE BORING REPORT)
46									45.01 — 7.60 — HARD ROCK (HR). PINK AND GRAY, MEDIUM TO COARSE GRAINED, FRESH TO MODERATELY WEATHERED, SOUND TO MODERATELY FRACTURED, VERY HARD TO MODERATELY HARD GRANITE (SEE CORE BORING REPORT)
44						UC-1			
42						UC-2			
40									41.01 — 11.60 — BORING TERMINATED AT 11.60 METERS IN GRANITE.
38									
36									
34									

NCBMM3 1415 L .6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO: SBLB1-B	BORING LOCATION (STA): 80+13.0 -L-		OFFSET: 4.0m LT
COLLAR ELEV: 52.614m	DATE STARTED: 05-16-96		DRILL MACHINE: CME 45 on barge
TOTAL DEPTH: 11.60m	DATE COMPLETED: 05-16-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 5.80m		DRILLER: F.Cox/K.Pendley

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
46.81	5.80	2:05 0:56/.2m	0.50	0	0	Run 1	No Recovery. Cuttings indicate hard weathered granite (HWR)
46.31	6.30						
		0:58 2:08 1:28 1:32	1.52	0	0.17 (11%)	Run 2	Orange medium to coarse grained, moderately severe to severely weathered, soft to very soft granite.
44.79	7.82	1:56					
		2:10 3:30 4:23 5:01	1.52	0.96 (63%)	1.14 (75%)	Run 3	Pink and gray medium to coarse grained, fresh to moderately weathered, sound to moderately fractured, very hard to moderately hard granite. 4 Joints at 0 degrees ADS = 9 to 75cm 3 Joints at 45 degrees ADS = 38 to 73cm
43.27	9.34	5:06					
		6:31 6:52 7:11 8:27 10:15 19:33	2.26	2.13 (94%)	2.26 (100%)	Run 4	Pink and gray medium to coarse grained, fresh to very slightly weathered, sound to moderately fractured, very hard granite. 2 Joints at 70 degrees ADS = 156cm
41.01	11.60	43:09					
							Boring terminated at 11.60 meters in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
SBLB1-B

Box 1 of 2
5.80m to 10.77m

Box 2 of 2
10.77m to11.60m

LAW ENGINEERING, INC.
3301 Atlantic Avenue
Raleigh, North Carolina 27619
Phone (919) 876-0416

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** KD Trimble
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. SBLB2-A	**BORING LOCATION** 80+41.0	**OFFSET** 17.7m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 52.86 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** N/A
TOTAL DEPTH 17.19 m	**DRILL MACHINE** CME 45 on Barge	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/22/96	**COMPLETED** 5/22/96	**SURFACE WATER DEPTH** 1.02 m		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
52.86					Mudline				52.86 0.00
	0.00	1	1	1	2		Sat		ALLUVIUM: TAN FINE TO COARSE SAND (A-3) WITH WOOD FRAGMENTS
52	1.14								51.76 1.10
		1	1	33	34		Sat		51.46 ALLUVIUM: BROWN AND GRAY SILTY SAND (A-2-4) 1.40
									51.15 1.71
									50.85 ALLUVIUM: BROWN AND GRAY SILTY SANDY GRAVEL (A-1-b) 2.01
	2.74								GRANITE BOULDER
50		21	23	20	43	SS-7	Sat		RESIDUAL: BROWN, ORANGE, WHITE AND BLACK SILTY FINE TO COARSE SAND (A-2-4). WEATHERED GRANITE. 3.40
	4.26								49.46
		28	46	55	100/26cm		Sat		SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND BROWN MICACEOUS SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
48	5.78								
		100			100/15cm		Sat		
46	7.22								
		100			100/12cm		Sat		
	8.74								
44		100			100/15cm		Sat		
	10.26								
		100			100/11cm		Sat		
42	11.78								
		100			100/8cm		Sat		40.84 12.02
40									HARD ROCK (HR). TAN, PINK AND GRAY, MEDIUM TO COARSE GRAINED, SEVERELY WEATHERED TO FRESH, EXTREMELY FRACTURED TO SOUND, SOFT TO VERY HARD GRANITE. (SEE CORE BORING REPORT)
38									
36									35.67 17.19
									BORING TERMINATED AT 17.19 METERS IN GRANITE.

NCBMM3 1415 J6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO.: SBLB2-A	BORING LOCATION (STA): 80+41.0 -L-		OFFSET: 17.7m LT
COLLAR ELEV.: 52.86m	DATE STARTED: 05-22-96		DRILL MACHINE: CME 45 on barge
TOTAL DEPTH: 17.19m	DATE COMPLETED: 05-22-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 5.17m		DRILLER: F.Cox/K.Pendley

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
51.15	1.71	13:00	0.30	0.22 (73%)	0.22 (73%)	Run 1	Gray, medium grained, fresh, sound, very hard granite boulder
50.85	2.01						
40.84	12.02	2:30 2:30	0.61	0.14 (23%)	0.51 (84%)	Run 2	Tan, pink and gray, medium to coarse grained, moderately weathered, extremely fractured, hard granite. 6 Joints at 30-40 degrees ADS = 3 to 6 cm 1 Joint at 70 degrees
40.23	12.63						
38.71	14.15	2:00 1:30 1:30	1.52	1.33 (88%)	1.52 (100%)	Run 3	Tan, pink and gray medium to coarse grained, severely weathered to fresh, sound to extremely fractured, very hard to soft granite. 9 Joints at 0-20 degrees ADS = 2 to 40cm 4 Joints at 45 degrees ADS = 12 to 46cm
35.67	17.19	3:00 2:30 2:30 1:30 2:00 2:30	3.04	2.30 (76%)	2.95 (97%)	Run 4	Tan, pink and gray, medium to coarse grained, slightly weathered to fresh, sound to extremely fractured, very hard to moderately hard granite. 13 Joints at 10-20 degrees ADS = 3 to 43cm 9 Joints at 50-70 degrees ADS = 1 to 50cm Boring terminated at 17.19 meters in granite

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Rev. 4/96

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
SBLB2-A

Box 1 of 2
1.71m to 2.01m
12.02m to 14.15m

Box 2 of 2
14.15m to 17.19m

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. SBLB2-B	**BORING LOCATION** 80+41.0	**OFFSET** 4.0m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 53.79 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** N/A
TOTAL DEPTH 14.37 m	**DRILL MACHINE** CME 45 on Barge	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/17/96	**COMPLETED** 5/17/96	**SURFACE WATER DEPTH** 0.53 m		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
53.79					Mudline				53.79 0.00
	0.00	3	2	2	4		Sat		ALLUVIUM: GRAY AND TAN SLIGHTLY SILTY, GRAVELLY FINE TO COARSE SAND (A-3)
	1.72	10	10	18	28		Sat		51.63 2.16 RESIDUAL: WEATHERED GRANITE
	3.24	54	46		100/28cm		W		50.99 2.80 SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND TAN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
	4.76	19	25	46	71		W		49.49 4.30 RESIDUAL: TAN SILTY FINE TO COARSE SAND (A-2-4) WITH ROCK FRAGMENTS. WEATHERED GRANITE.
	6.28	100			100/10cm		M		48.29 5.50 SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND TAN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
	7.80	100			100/12cm				45.35 8.44 HARD ROCK (HR): TAN, PINK AND GRAY, MEDIUM TO COARSE GRAINED, SLIGHTLY WEATHERED TO FRESH, EXTREMELY FRACTURED TO SOUND, MODERATELY HARD TO VERY HARD GRANITE. (SEE CORE BORING REPORT)
									39.42 14.37 BORING TERMINATED AT 14.37 METERS IN GRANITE.

NCBMM3 1415 36

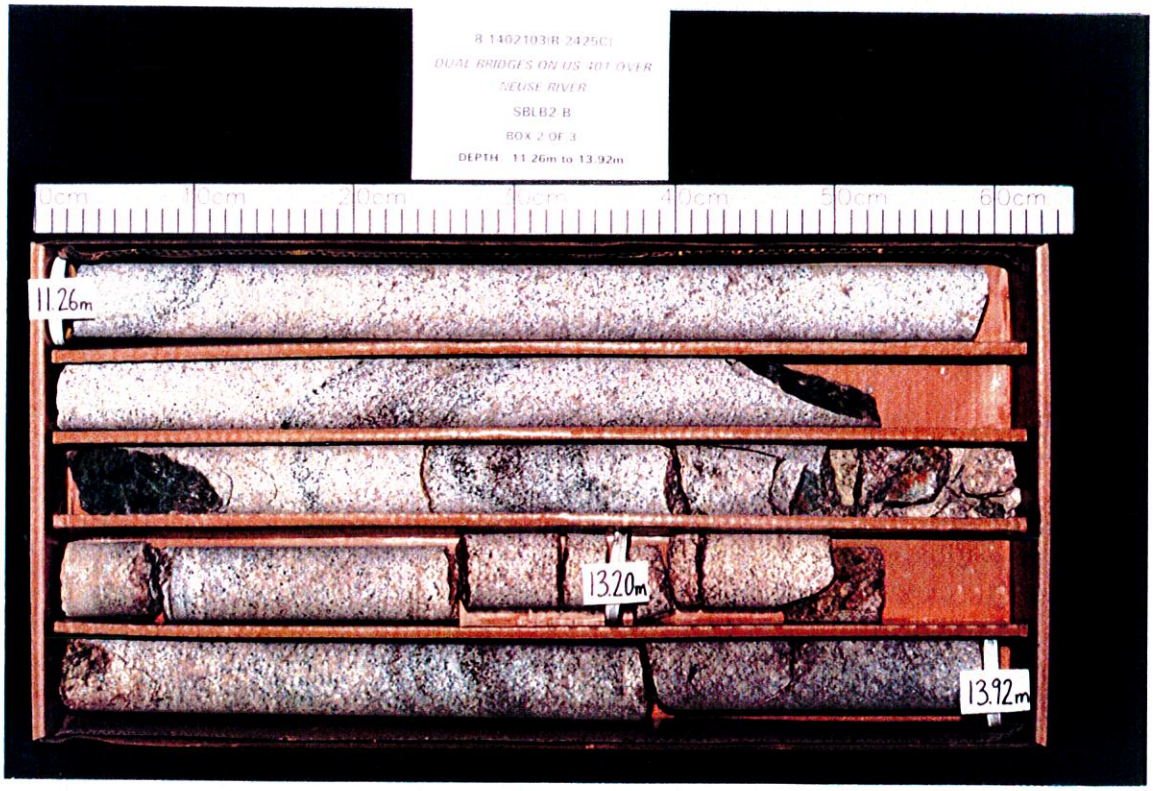
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO.: SBLB2-B	BORING LOCATION (STA): 80+41.0 -L-		OFFSET: 4.0m LT
COLLAR ELEV.: 53.79m	DATE STARTED: 05-17-96		DRILL MACHINE: CME 45 on barge
TOTAL DEPTH: 14.37m	DATE COMPLETED: 05-17-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 5.93m		DRILLER: F.Cox/K.Pendley

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
45.35	8.44	1:19 1:47 2:40 1:45 1:41 1:39	1.72	0.82 (48%)	1.60 (93%)	Run 1	Tan pink and gray, medium to coarse grained, slightly to moderately weathered, slightly to extremely fractured, hard to moderately hard granite. 8 Joints at 9-20 degrees ADS = 2 to 40cm 8 Joints at 45-60 degrees ADS = 2 to 35cm
43.63	10.16						
		1:37 3:10 4:00 4:12 4:15 4:04 4:36 7:20 6:19 5:58	3.04	2.05 (67%)	2.98 (98%)	Run 2	Pink and gray, medium to coarse grained, slightly weathered to fresh, sound to extremely fractured, very hard to hard granite. 6 Joints at 0 degrees ADS = 3 to 18 cm 9 Joints at 45 degrees ADS = 2 to 122cm 1 Joint at 90 degrees
40.59	13.20						
		5:31 8:46 29:10 43:22	1.17	0.94 (80%)	1.17 (100%)	Run 3	Pink and gray, medium to coarse grained, fresh to slightly weathered, sound to moderately fractured, very hard to hard granite. 9 Joints at 0-10 degrees ADS = 2 to 36cm 2 Joints at 45 degrees ADS = 44cm
39.42	14.37						
							Boring terminated at 14.37 meters in granite

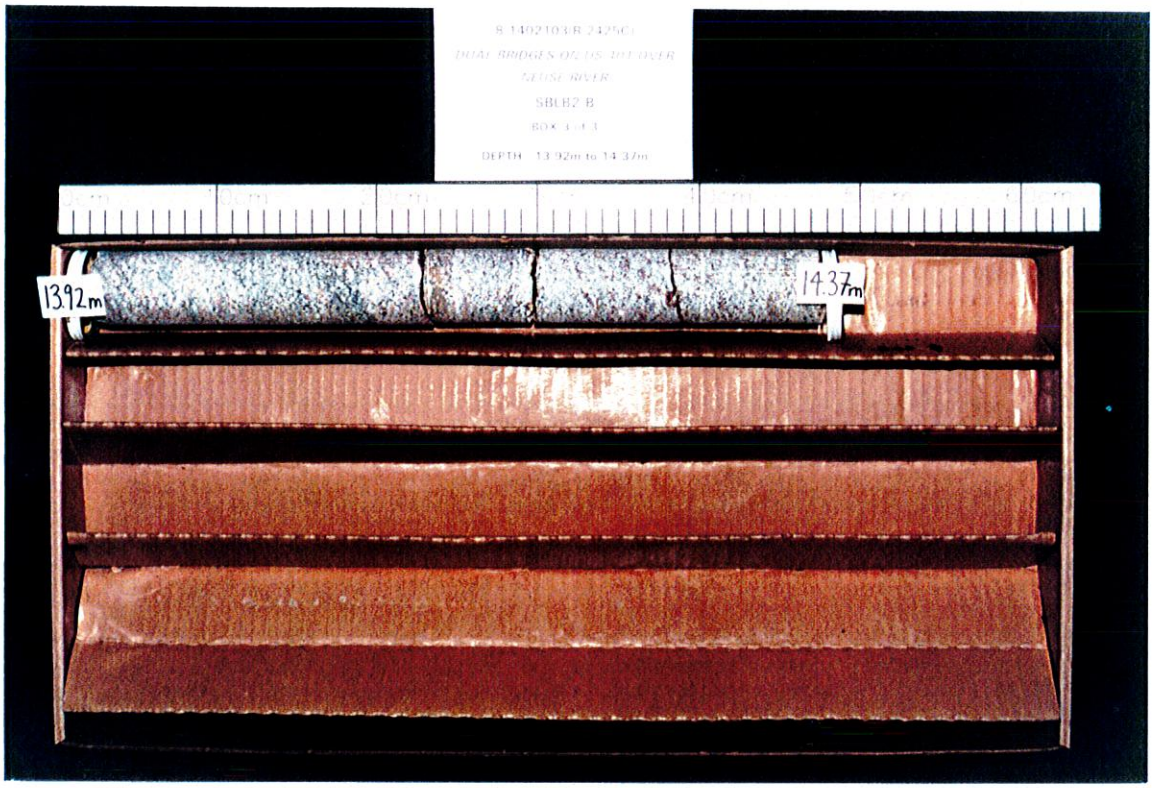
Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
SBLB2-B

Box 1 of 3
8.44m to 11.26m



Box 2 of 3
11.26m to 13.92m

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
SBLB2-B



Box 3 of 3
13.92m to 14.37m

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BKBanks/JBallsieper
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. SBLB3-A	**BORING LOCATION** 80+58.5	**OFFSET** 17.7m LT	**ALIGNMENT** -L- — **0 HR.** 2.05
COLLAR ELEV. 56.36 m	**NORTHING** Not Provided	**EASTING** Not Provided	**24 HR.** 2.42
TOTAL DEPTH 16.32 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety
DATE STARTED 5/15/96	**COMPLETED** 5/17/96	**SURFACE WATER DEPTH** N/A	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
56.36					Ground Surface				56.36 0.00
56	0.30	3	3	3	6		M		ALLUVIUM: BROWN MICACEOUS FINE SANDY CLAYEY SILT (A-4)
	1.09	2	1	3	4		M		
							▽		54.26 2.10
54	2.64	1	0	1	1	SS-9	W		ALLUVIUM: GRAY MICACEOUS SILTY FINE SANDY CLAY (A-6) WITH WOOD FRAGMENTS AND ROOTS
									52.76 3.60
	4.14								ALLUVIUM: GRAY MICACEOUS SILTY CLAYEY FINE SAND (A-2-4) WITH MANY THIN INTERBEDS OF SILTY ORGANIC MATERIAL
52		2	2	11	13		W		51.63 4.73
	5.66								ALLUVIUM: TAN FINE TO COARSE SANDY SILTY GRAVEL (A-1-b)
		17	17	20	37	SS-10	Sat		50.11 6.25
50	7.18	23	25	24	59		W		RESIDUAL: ORANGE AND TAN SILTY GRAVELLY FINE TO COARSE SAND (A-2-4)
	8.70	35	39	28	67		W		
									46.86 9.50
	10.23	44	66		100/26cm		W		SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE, TAN, WHITE AND BLACK MICACEOUS SILTY FINE TO COARSE SAND WITH TRACE OF GRAVEL. PARTIALLY WEATHERED GRANITE.
46	11.75	50	85	15	100/17cm		W		
44	13.27	43	78	22	100/17cm		W		
42	14.79	100			100/8cm		W		
									40.66 15.70
	16.31								HARD WEATHERED ROCK (HWR) - NO RECOVERY 40.04 16.32
40		100			100/1cm				BORING TERMINATED AT 16.32 METERS ON GRANITE. STEEL CASING SHEARED OFF. OFFSET TO SBLB3-A(b) TO ROCK CORE. (SEE CORE BORING REPORT FOR SBLB3-A(b).
38									

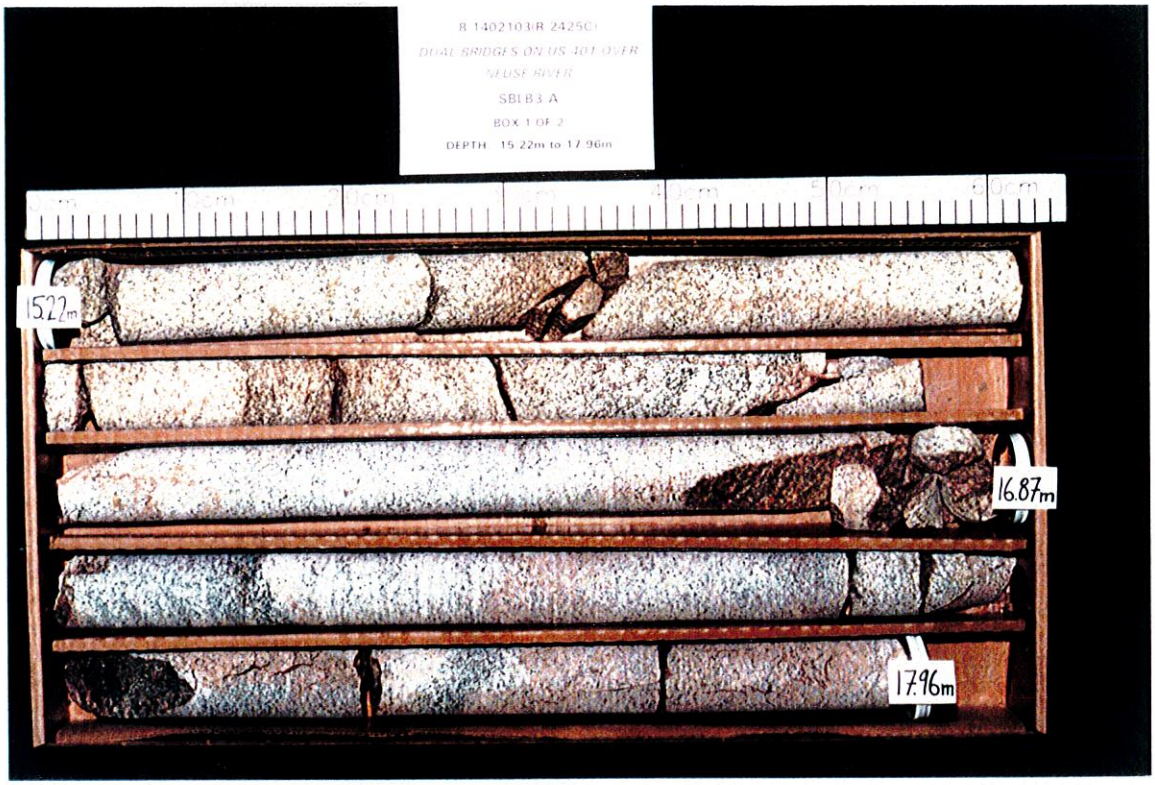
NCBMM3 1415 L .6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: J.Ballsieper
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO.: SBLB3-A(b)	BORING LOCATION (STA): 80+58.5 -L-		OFFSET: 17.7m LT
COLLAR ELEV.: 56.37m	DATE STARTED: 05-15-96		DRILL MACHINE: Mobile B-56
TOTAL DEPTH: 18.16m	DATE COMPLETED: 05-17-96		DRILL METHOD: Rock Core
CORE SIZE: NQ	TOTAL RUN: 2.94m		DRILLER: S.Hancock/J.Young

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
41.14	15.22	2:46 2:51 2:12 3:17 3:25	1.65	1.42 (86%)	1.61 (98%)	Run 1	Pink and gray, medium to coarse grained, fresh to moderately severely weathered, sound to extremely fractured, very hard to moderately hard granite. 4 Joints at 0 degrees ADS = 2 to 91cm 3 Joints at 20 degrees ADS = 10 to 52cm 10 Joints at 45 degrees 2 Joints at 80 degrees ADS = 10 to 52cm
39.49	16.87	3:47 4:07 4:22 4:13	1.29	1.21 (94%)	1.29 (100%)	Run 2	Pink and gray medium to coarse grained, fresh to slightly weathered, sound to moderately fractured, very hard to hard granite. 5 Joints at 0 degrees ADS=4 to 18cm 1 Joint at 45 degrees
38.20	18.16						
							Boring terminated at 18.16 meters in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
SBLB3-A



Box 1 of 2
15.22m to 17.96m

Box 2 of 2
17.96m to18.16m

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Raleigh, North Carolina 27619
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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** KD Trimble
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. SBLB3-B	**BORING LOCATION** 80+58.5	**OFFSET** 4.0m LT	**ALIGNMENT** -L- — **0 HR.** 0.24
COLLAR ELEV. 56.32 m	**NORTHING** Not Provided	**EASTING** Not Provided	**24 HR.** 2.13
TOTAL DEPTH 20.15 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety
DATE STARTED 5/20/96	**COMPLETED** 5/20/96	**SURFACE WATER DEPTH** N/A	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
56.32					Mudline				0.00
	0.30	5	3	3	6	SS-11	M		ALLUVIUM: BROWN MICACEOUS, FINE SANDY CLAYEY SILT (A-4) WITH TRACE OF WOOD FRAGMENTS
	0.98	3	1	2	3		M		
	2.50	1	1	1	2		W-Sat		
									52.82 3.50
	4.02	1	1	2	3	SS-12	W-Sat		ALLUVIUM: BROWN FINE SANDY SILTY CLAY (A-6) WITH WOOD FRAGMENTS, ROOTS AND LEAVES
									51.88 4.44
									ALLUVIUM: GRAVEL (A-1)
									51.02 5.30
	5.59	14	15	16	31		M-W		RESIDUAL: ORANGE SILTY FINE TO COARSE SAND (A-2-4) WITH RELICT ROCK STRUCTURE. WEATHERED GRANITE.
	7.11	13	15	26	41	SS-13	M-W		
									48.22 8.10
	8.63	29	58	42	100/11cm		M-W		SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE SILTY CLAYEY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
									46.82 9.50
	10.20	23	38	46	84		M-W		RESIDUAL: BROWN AND ORANGE SILTY FINE TO COARSE SAND (A-2-4). WEATHERED GRANITE.
	11.50	18	35	55	90		M-W		
									43.82 12.50
	13.02	42	59	41	100/29cm		M-W		SOFT WEATHERED ROCK (SWR) SAMPLED AS BROWN AND ORANGE SLIGHTLY MICACEOUS SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
	14.54	100			100/5cm				
									40.82 15.50
	16.06	100			100/1cm				HARD WEATHERED ROCK (HWR) - NO RECOVERY
									40.12 16.20
									HARD ROCK (HR), ORANGE, TAN, PINK AND GRAY, MEDIUM TO COARSE GRAINED, MODERATELY WEATHERED TO FRESH, EXTREMELY FRACTURED TO SOUND, MODERATELY HARD TO VERY HARD GRANITE (SEE CORING BORING REPORT)

NCBMM3 1415 .16

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** KD Trimble
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. SBLB3-B	**BORING LOCATION** 80+58.5	**OFFSET** 4.0m LT	**ALIGNMENT** -L- — **0 HR.** 0.24
COLLAR ELEV. 56.32 m	**NORTHING** Not Provided	**EASTING** Not Provided	**24 HR.** 2.13
TOTAL DEPTH 20.15 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety
DATE STARTED 5/20/96	**COMPLETED** 5/20/96	**SURFACE WATER DEPTH** N/A	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
37.32					Continued from previous page				
									HARD ROCK (HR). ORANGE, TAN, PINK AND GRAY, MEDIUM TO COARSE GRAINED, MODERATELY WEATHERED TO FRESH, EXTREMELY FRACTURED TO SOUND, MODERATELY HARD TO VERY HARD GRANITE (SEE CORING BORING REPORT)
36.17									BORING TERMINATED AT 20.15 METERS IN GRANITE. 20.15

36 34 32 30 28 26 24 22 20

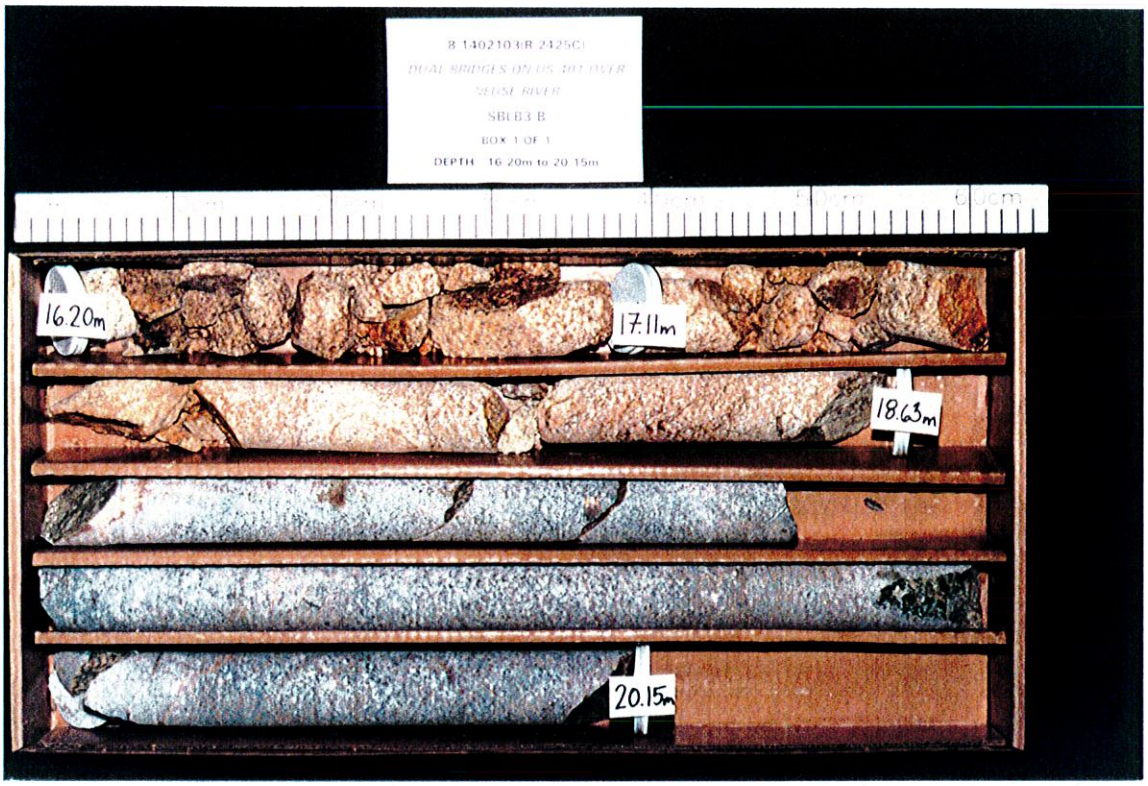
NCBMM3 1415 L J6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO.: SBLB3-B	BORING LOCATION (STA): 80+58.5 -L-		OFFSET: 4.0m LT
COLLAR ELEV.: 56.32m	DATE STARTED: 05-20-96		DRILL MACHINE: Mobile B-56
TOTAL DEPTH: 20.15m	DATE COMPLETED: 05-20-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 3.95m		DRILLER: S.Hancock/J.Young

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
40.12	16.20	3:00 2:30 2:30	0.91	0 (0%)	0.36 40%	Run 1	Orange and tan, medium to coarse grained, moderately weathered, moderately to extremely fractured, moderately hard granite. Joints show iron staining and clay infilling
39.21	17.11						
		2:35 1:45 2:00 2:35	1.52	0.40 (26%)	0.76 (50%)	Run 2	Orange tan and gray, medium to coarse grained, moderately to very slightly weathered, slightly to extremely fractured, hard to moderately hard granite. 4 Joints at 45 degrees ADS = 4 to 17cm Joints show iron staining
37.69	18.63	2:20					
		2:45 4:36 6:00 6:30	1.52	1.45 (95%)	1.52 (100%)	Run 3	Pink and gray, medium to coarse grained, fresh, moderately fractured to sound, very hard granite. 5 Joints at 50-60 degrees ADS = 9 to 70cm 1 Joint at 80 degrees Joints show iron staining and mineralization
36.17	20.15	11:30					
							Boring terminated at 20.15 meters in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
SBLB3-B



Box 1 of 1
16.20m to 20.15m

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** J.Ballsieper
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. SBLEB2-A	**BORING LOCATION** 80+74.0	**OFFSET** 18.8m LT	**ALIGNMENT** -L-
COLLAR ELEV. 57.11 m	**NORTHING** Not Provided	**EASTING** Not Provided	**0 HR.** 1.71
TOTAL DEPTH 13.03 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary	**24 HR.** 2.59
DATE STARTED 5/17/96	**COMPLETED** 5/17/96	**SURFACE WATER DEPTH** N/A	**HAMMER TYPE** 140#Safety

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
57.11					Ground Surface				57.11 0.00
	0.30	2	2	3	5		M		ALLUVIUM: BROWN SLIGHTLY MICACEOUS FINE SANDY CLAYEY SILT (A-4)
56	1.12	4	4	4	8		M		56.21 0.90 ALLUVIUM: BROWN SLIGHTLY MICACEOUS SILTY FINE SAND (A-2-4)
	2.38	4	4	6	10				
54	3.90	4	5	7	12		Sat		53.81 3.30 ALLUVIUM: BROWN AND GRAY SLIGHTLY MICACEOUS FINE SANDY CLAYEY SILT (A-4) WITH THIN SEAMS OF CLAY
52	5.42	4	5	7	12		Sat		52.21 4.90 ALLUVIUM: GRAY SILTY CLAYEY MEDIUM TO COARSE SAND (A-2-4) AND GRAVEL
	6.94	22	26	28	54		W		50.61 6.50 RESIDUAL: ORANGE WHITE AND TAN MICACEOUS SILTY CLAYEY GRAVELLY FINE TO COARSE SAND (A-2-4). WEATHERED GRANITE.
50	8.46	25	24	30	54		W		
48	9.98	33	34	44	78		W		
46	11.50	100			100/6cm		W		45.94 11.17 SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND TAN MICACEOUS SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
	13.02	100			100/1cm				44.41 12.70 44.08 HARD WEATHERED ROCK (HWR) - NO RECOVERY 13.03
44									BORING TERMINATED AT 13.03 METERS ON GRANITE.
42									
40									

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** KD Trimble
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. EB2-C	**BORING LOCATION** 80+76.0	**OFFSET** CL	**ALIGNMENT** -L-	**0 HR.** 1.73
COLLAR ELEV. 56.68 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** 1.98
TOTAL DEPTH 15.14 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary	**HAMMER TYPE** 140#Safety
DATE STARTED 5/23/96	**COMPLETED** 5/23/96	**SURFACE WATER DEPTH** N/A	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
56.68					Ground Surface				56.68 0.00
	0.34	3	2	2	4		M		ALLUVIUM: BROWN SILTY FINE SAND (A-2-4)
56	1.42	3	4	4	8	SS-16	M-W		55.58 1.10 ALLUVIUM: BROWN CLAYEY FINE SANDY SILT (A-4)
54	2.94	3	4	4	8		W-Sat		52.78 3.90 ALLUVIUM: BROWN AND GRAY SILTY FINE SANDY CLAY (A-7)
	4.46	4	5	5	10		W-Sat		52.12 4.56 ALLUVIUM: GRAY FINE SANDY SILT (A-4)
52	5.98	19	12	10	22		W-Sat		51.23 5.45 ALLUVIUM: BROWN SILTY FINE TO COARSE SAND (A-2-4)
50	7.50	1	8	16	24		W-Sat		49.68 7.00 ALLUVIUM: BROWN AND GRAY SILTY FINE SANDY CLAYEY GRAVEL (A-1-b)
48	9.02	22	23	22	45		M-W		48.18 8.50 RESIDUAL: ORANGE, BROWN, BLACK AND WHITE SILTY FINE TO COARSE SAND (A-2-4). WEATHERED GRANITE.
	10.54	23	33	40	73		M-W		
46	12.06	73	27		100/19cm		M-W		45.18 11.50 SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND BROWN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
44	13.58	100			100/11cm		M-W		
42	15.10	100			100/4cm				42.08 14.60 HARD WEATHERED ROCK (HWR) - NO RECOVERY 41.54 15.14
40									BORING TERMINATED AT 15.14 METERS ON GRANITE.
38									

NCBMM3 1415 6/20/96

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. EB1-C	**BORING LOCATION** 79+85.0	**OFFSET** CL	**ALIGNMENT** -L-	**0 HR.** 0.27
COLLAR ELEV. 57.33 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** 0.90
TOTAL DEPTH 7.91 m	**DRILL MACHINE** CME 550	**DRILL METHOD** Mud Rotary	**HAMMER TYPE** 140#Safety
DATE STARTED 5/23/96	**COMPLETED** 5/23/96	**SURFACE WATER DEPTH**	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
57.33					Ground Surface				57.33 0.00
	0.30	5	6	5	11		M		ALLUVIUM: BROWN SILTY FINE SAND (A-2-4)
	1.07								56.10 1.23
56		2	2	4	6		M		ALLUVIUM: BROWN AND GRAY MICACEOUS FINE SANDY SILT (A-4) WITH TRACE OF GRAVEL
	2.59								
		3	4	4	8		M		
54									
	4.11								
		2	3	4	7		W		
									52.23 5.10
52	5.63								ALLUVIUM: BROWN SILTY SANDY GRAVEL (A-1-b)
		21	72	28	100/20cm		M		51.53 5.80
	7.15								SOFT WEATHERED ROCK (SWR) SAMPLED AS WHITE, BLACK AND TAN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
50		100			100/15cm		M		
									49.42 7.91
									BORING TERMINATED AT 7.91 METERS ON GRANITE.
48									
46									
44									
42									
40									

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** KD Trimble
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. NBLEB1-B	**BORING LOCATION** 79+85.0	**OFFSET** 22.5m RT	**ALIGNMENT** -L- — **0 HR.** 2.97
COLLAR ELEV. 56.52 m	**NORTHING** Not Provided	**EASTING** Not Provided	**24 HR.** 0.90
TOTAL DEPTH 13.19 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary	**HAMMER TYPE** 140#Safety
DATE STARTED 5/23/96	**COMPLETED** 5/23/96	**SURFACE WATER DEPTH** N/A	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
56.52					Ground Surface				56.52 0.00
56	0.44	3	3	3	6		M		ALLUVIUM: BROWN SILTY FINE SAND (A-2-4)
	0.99	4	5	9	14		M-W		55.57 0.95 ALLUVIUM: BROWN AND GRAY SILTY FINE SANDY CLAY (A-6)
54	2.51	3	3	21	24		M-W		
	4.03	17	19	22	41		W-Sat		53.02 3.50 ALLUVIUM: BROWN FINE TO COARSE SANDY SILTY GRAVEL (A-1-b)
52	5.55	19	30	37	67	SS-3	M-W		52.02 4.50 RESIDUAL: ORANGE, BROWN, WHITE AND BLACK SILTY SANDY GRAVEL (A-1-b). WEATHERED GRANITE.
50	7.07	43	46	50	96		M-W		
48	8.59	24	18	55	73		M-W		48.52 8.00 RESIDUAL: BROWN AND BLACK SILTY SAND (A-2-4). WEATHERED GRANITE.
	10.11	100			100/9cm		M-W		47.02 9.50 SOFT WEATHERED ROCK (SWR) SAMPLED AS BROWN AND BLACK SILTY SAND. PARTIALLY WEATHERED GRANITE.
46	11.63	100			100/9cm		M-W		
44	13.15	100			100/4cm				44.02 12.50 HARD WEATHERED ROCK (HWR) - NO RECOVERY 43.33 13.19
42									BORING TERMINATED AT 13.19 METERS ON GRANITE.
40									
38									

NCBMM3 1415 L .6

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. NBLB1-A	**BORING LOCATION** 80+13.0	**OFFSET** 4.0m RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 53.11 m	**NORTHING** Not Provided	**EASTING** Not Provided	**24 HR.** N/A
TOTAL DEPTH 12.38 m	**DRILL MACHINE** CME 45 on Barge	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety
DATE STARTED 5/21/96	**COMPLETED** 5/21/96	**SURFACE WATER DEPTH** 1.19 m	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
53.11					Mudline				
	0.00	WOH			WOH 0	SS-4	Sat		ALLUVIUM: BROWN FINE TO COARSE SAND AND GRAVEL (A-1-b)
52	1.04	3	3	4	7		Sat		52.21 0.90 ALLUVIUM: TAN AND GRAY FINE SAND (A-3) WITH WOOD FRAGMENTS
	2.56	10	19	34	53	SS-5	W-Sat		51.01 2.10 RESIDUAL: ORANGE SILTY FINE TO COARSE SANDY GRAVEL (A-1-b) WITH RELICT ROCK STRUCTURE. WEATHERED GRANITE.
50	4.08	36	33	14	47	SS-6	M-W		
48	5.60	100			100/1cm				48.11 5.00 SOFT WEATHERED ROCK (SWR) 47.71 5.40 HARD WEATHERED ROCK (HWR) - NO RECOVERY 47.50 5.61 HARD ROCK (HR). WHITE, TAN, ORANGE, PINK AND GRAY, MEDIUM TO COARSE GRAINED, SEVERELY WEATHERED TO FRESH, EXTREMELY FRACTURED TO SOUND, VERY SOFT TO VERY HARD GRANITE (SEE CORE BORING REPORT)
46									
44									
42									40.73 12.38 BORING TERMINATED AT 12.38 METERS IN GRANITE.
40									
38									
36									

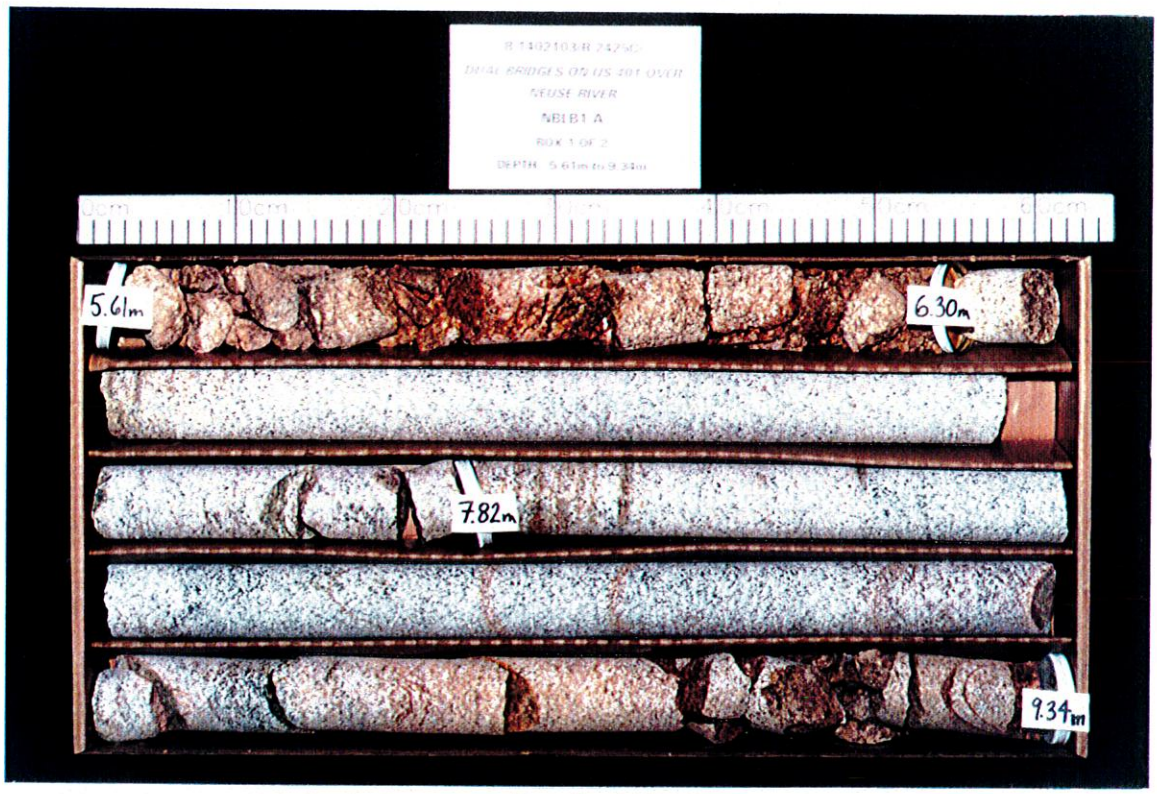
NCBMM3 1415 .J6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

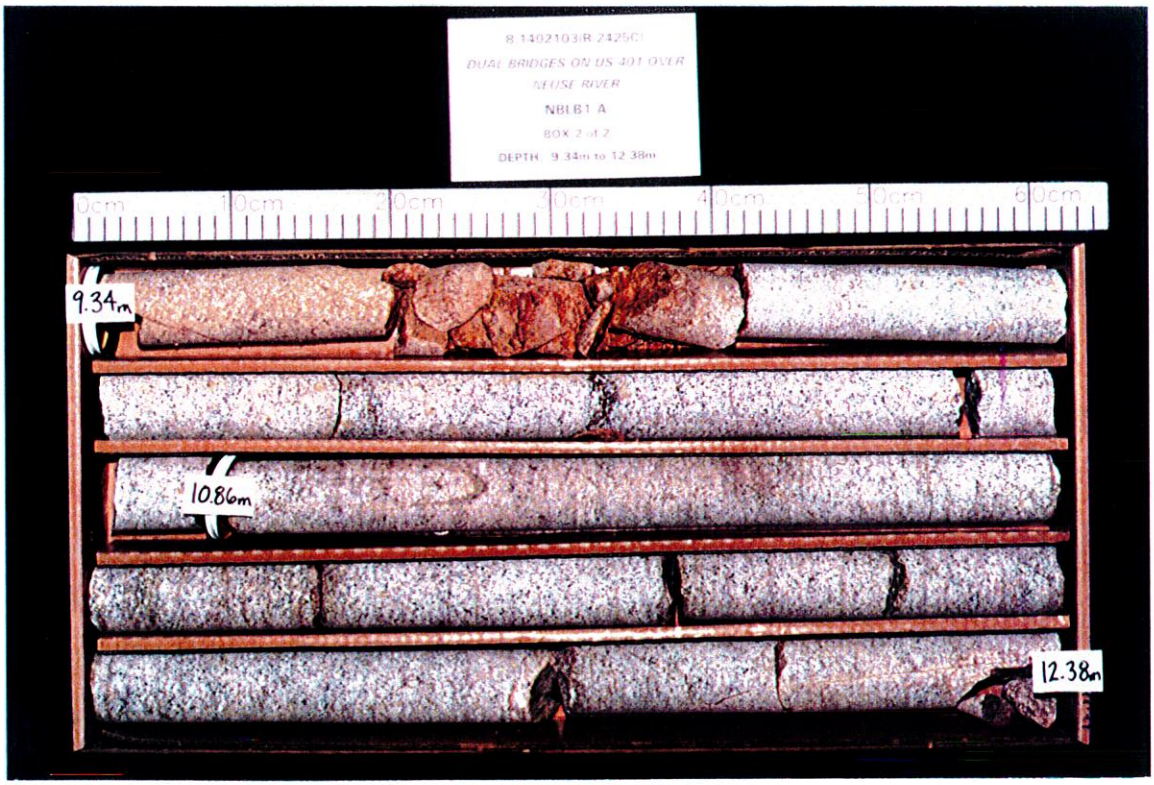
PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO: NBLB1-A	BORING LOCATION (STA): 80+13.0 -L-		OFFSET: 4.0m RT
COLLAR ELEV: 53.11m	DATE STARTED: 05-21-96		DRILL MACHINE: CME 45 on barge
TOTAL DEPTH: 12.38m	DATE COMPLETED: 05-21-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 6.77m		DRILLER: K.Pendley

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
47.50	5.61	2:56 1:54	0.69	0 (0%)	0.53 (77%)	Run 1	White, tan and orange medium to coarse grained, moderately to severely weathered, moderately to extremely fractured, moderately hard to very soft granite
46.81	6.30						
		0:28 1:03 2:38 3:18	1.52	0.68 (45%)	0.84 (55%)	Run 2	(Recovered material) Pink and gray medium to coarse grained fresh, slightly fractured to sound, very hard granite
45.29	7.82	3:22					
		3:19 2:56 2:38 2:42	1.52	1.19 (78%	1.52 (100%)	Run 3	Pink gray and orange, medium to coarse grained, fresh to moderately weathered, sound to extremely fractured, very hard to moderately hard granite. 5 Joints at 45 degrees ADS = 2cm
43.77	9.34	2:30					2 Joints at 0 degrees ADS = 2cm
		1:32 2:28 2:48 2:52	1.52	1.20 (79%)	1.45 (95%)	Run 4	Pink gray and orange, medium to coarse grained, fresh to moderately weathered, sound to extremely fractured, very hard to moderately hard granite. 2 Joints at 70 degrees ADS = 8cm
42.25	10.86	2:58					3 Joints at 0-10 degrees ADS < 36cm
		4:29 4:40 4:52	1.52	1.52 (100%)	1.52 (100%)	Run 5	Pink and gray, medium to coarse grained, fresh, sound to slightly fractured, very hard granite 4 Joints at 0-10 degrees ADS = 13 to 22cm
40.73	12.38	5:03 5:22					2 Joints at 35 degrees ADS = 14cm Boring terminated at 12.38 meters in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
NBLB1-A



Box 1 of 2
5.61m to 9.34m



Box 2 of 2
9.34m to 12.38m

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. NBLB1-B	**BORING LOCATION** 80+13.0	**OFFSET** 21.0m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 52.73 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** N/A
TOTAL DEPTH 14.08 m	**DRILL MACHINE** CME 45 on Barge	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety
DATE STARTED 5/15/96	**COMPLETED** 5/15/96	**SURFACE WATER DEPTH** 1.14 m	

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
52.73					Mudline				
	0.00	WOH	1	0	1		Sat		52.73 0.00 ALLUVIUM: BROWN FINE TO MEDIUM SAND (A-3) WITH WOOD FRAGMENTS
52	1.01	10	14	16	30		W		52.03 0.70 RESIDUAL: TAN SILTY FINE TO COARSE SAND (A-2-4). WEATHERED GRANITE.
	2.70	22	50	50	100/28cm		W		50.63 2.10 SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND TAN SILTY FINE TO COARSE SAND AND GRAVEL. PARTIALLY WEATHERED GRANITE.
50	4.22	19	41	59	100/28cm		W		
48	5.74	100			100/15cm		M		
46	7.26	100			100/0cm				45.64 7.09 45.47 7.26 HARD WEATHERED ROCK (HWR) - NO RECOVERY HARD ROCK (HR). PINK, GRAY AND TAN, MEDIUM TO COARSE GRAINED, SEVERELY WEATHERED TO FRESH, SOUND TO EXTREMELY FRACTURED, VERY SOFT TO VERY HARD GRANITE. (SEE CORE BORING REPORT)
44									
42									
40									38.65 14.08 BORING TERMINATED AT 14.08 METERS IN GRANITE.
38									
36									
34									

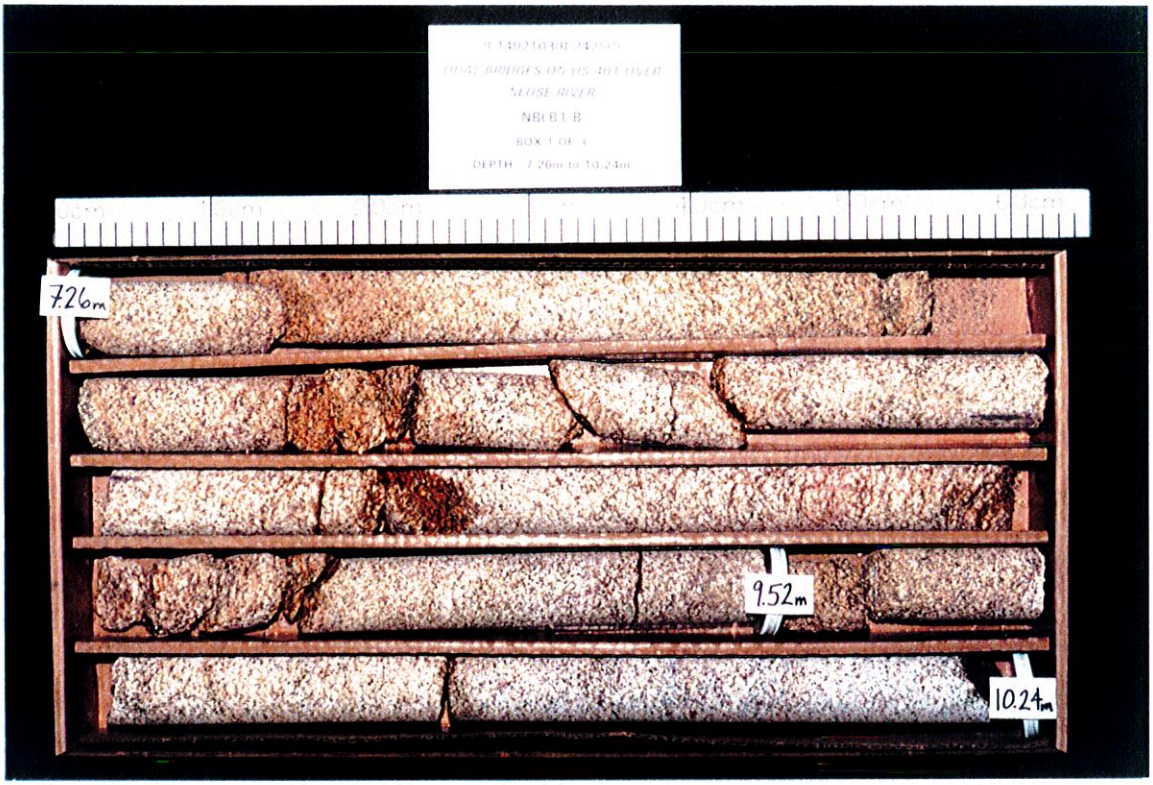
NCBMM3 1415 6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

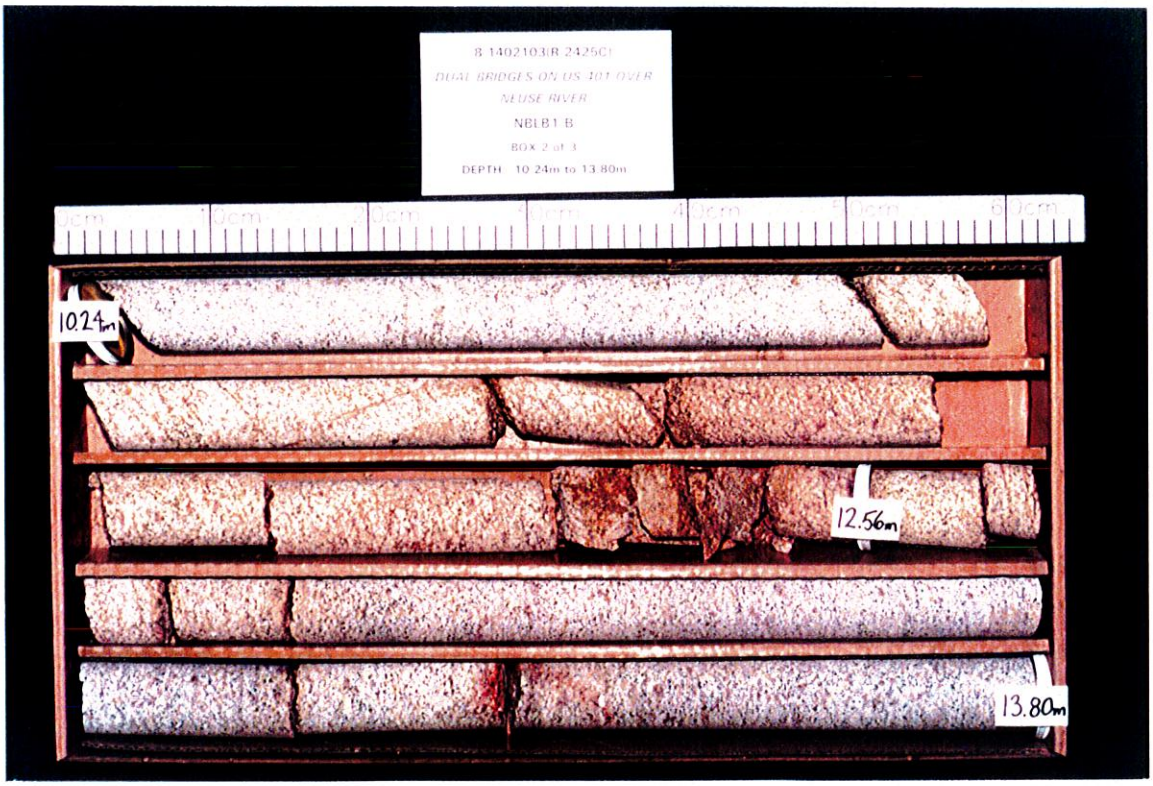
PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO: NBLB1-B	BORING LOCATION (STA): 80+13.0 -L-		OFFSET: 21.0m RT
COLLAR ELEV.: 52.73m	DATE STARTED: 05-15-96		DRILL MACHINE: CME 45 on barge
TOTAL DEPTH: 14.08m	DATE COMPLETED: 05-15-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 6.82m		DRILLER: F.Cox/K.Pendley

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
45.47	7.26		2.26	1.35 (60%)	2.14 (95%)	Run 1	Pink and tan medium to coarse grained, moderately severe to severely weathered, sound to extremely fractured, moderately hard to very soft granite. 6 Joints at 45 degrees ADS = 4 to 9cm 2 Joints at 70 degrees 4 Joints at 0 degrees ADS = 13 to 55cm
43.21	9.52						
			3.04	1.82 (60%)	2.24 (74%)	Run 2	Pink and tan medium to coarse grained, fresh to very severely weathered, sound to moderately fractured, very hard to very soft granite. 3 Joints at 0 degrees ADS = 6 to 32cm 1 Joint at 90 degrees 6 Joints at 45 degrees ADS = 6 to 46cm
40.17	12.56						
			1.52	1.35 (89%)	1.52 (100%)	Run 3	Pink, gray and tan medium to coarse grained, fresh to slightly weathered, sound to moderately fractured, very hard to hard granite. 2 Joints at 20 degrees ADS = 3cm 4 Joints at 0 degrees ADS = 7 to 59cm
38.65	14.08						
							Boring terminated at 14.08 meters in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
NBLB1-B

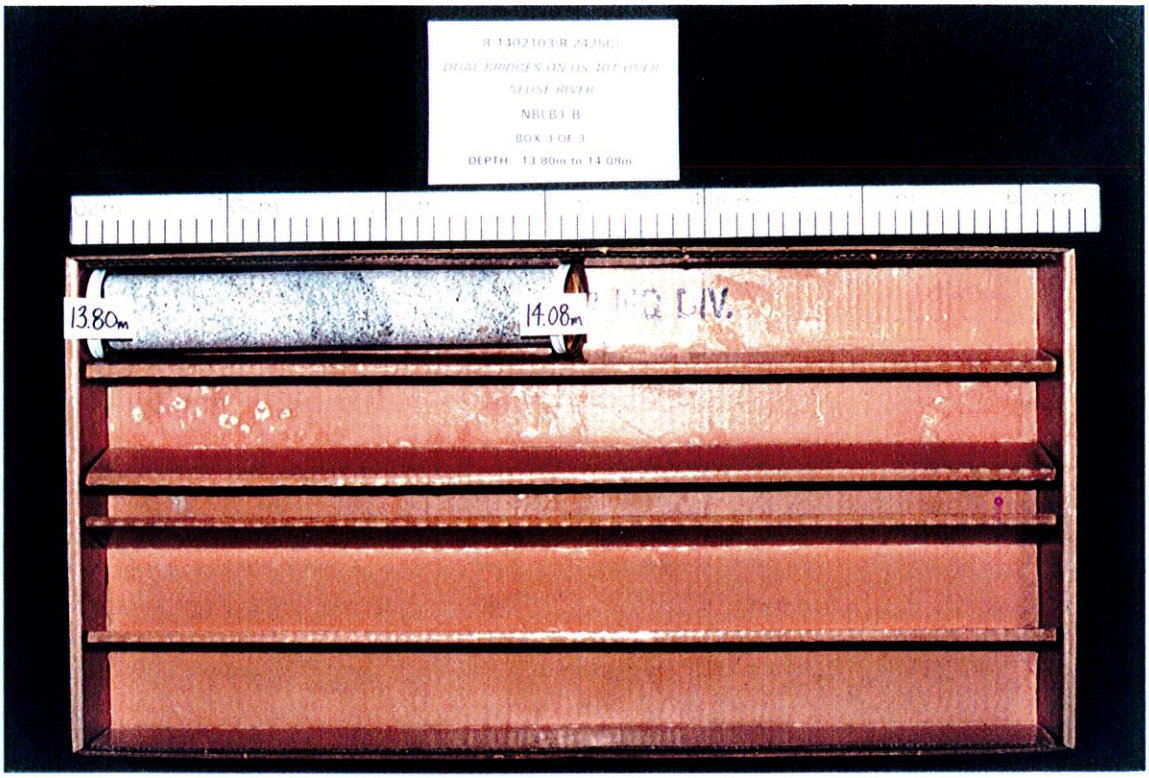


Box 1 of 3
7.26m to 10.24m



Box 2 of 3
10.24m to13.80m

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
NBLB1-B



Box 3 of 3
13.80m to 14.08m

LAW ENGINEERING, INC.
3301 Atlantic Avenue
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Phone (919) 876-0416

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. NBLB2-A	**BORING LOCATION** 80+41.0	**OFFSET** 4.0m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 53.53 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** N/A
TOTAL DEPTH 14.39 m	**DRILL MACHINE** CME 45 on Barge	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/20/96	**COMPLETED** 5/21/96	**SURFACE WATER DEPTH** 0.77 m		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
53.53					Mudline				
	0.00	WOH	1	1	2		Sat		ALLUVIUM: BROWN SLIGHTLY SILTY FINE TO COARSE SAND (A-3) WITH TRACE OF GRAVEL
52	1.77	2	6	7	13	SS-8	Sat		ALLUVIUM: TAN SLIGHTLY SILTY COARSE SAND AND GRAVEL (A-1-b)
	3.29	13	87		100/30cm		M-W		RESIDUAL: ORANGE SILTY FINE TO COARSE SAND (A-2-4)
50	4.81	100			100/8cm		M		SOFT WEATHERED ROCK (SWR) SAMPLED AS PINK, ORANGE, TAN AND WHITE SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
48	6.23	35	65		100/23cm		M		
46	7.75	71	29		100/20cm		M		
44									HARD WEATHERED ROCK (HWR). PARTIALLY WEATHERED GRANITE
									HARD ROCK (HR), PINK AND GRAY, MEDIUM TO COARSE GRAINED, FRESH TO SLIGHTLY WEATHERED, SOUND TO MODERATELY FRACTURED, HARD TO VERY HARD GRANITE (SEE CORE BORING REPORT)
42									
40									
38									BORING TERMINATED AT 14.39 METERS IN GRANITE.
36									

53.53 — 0.00
52.23 — 1.30
50.83 — 2.70
50.08 — 3.45
44.83 — 8.70
44.58 — 8.95
39.14 — 14.39

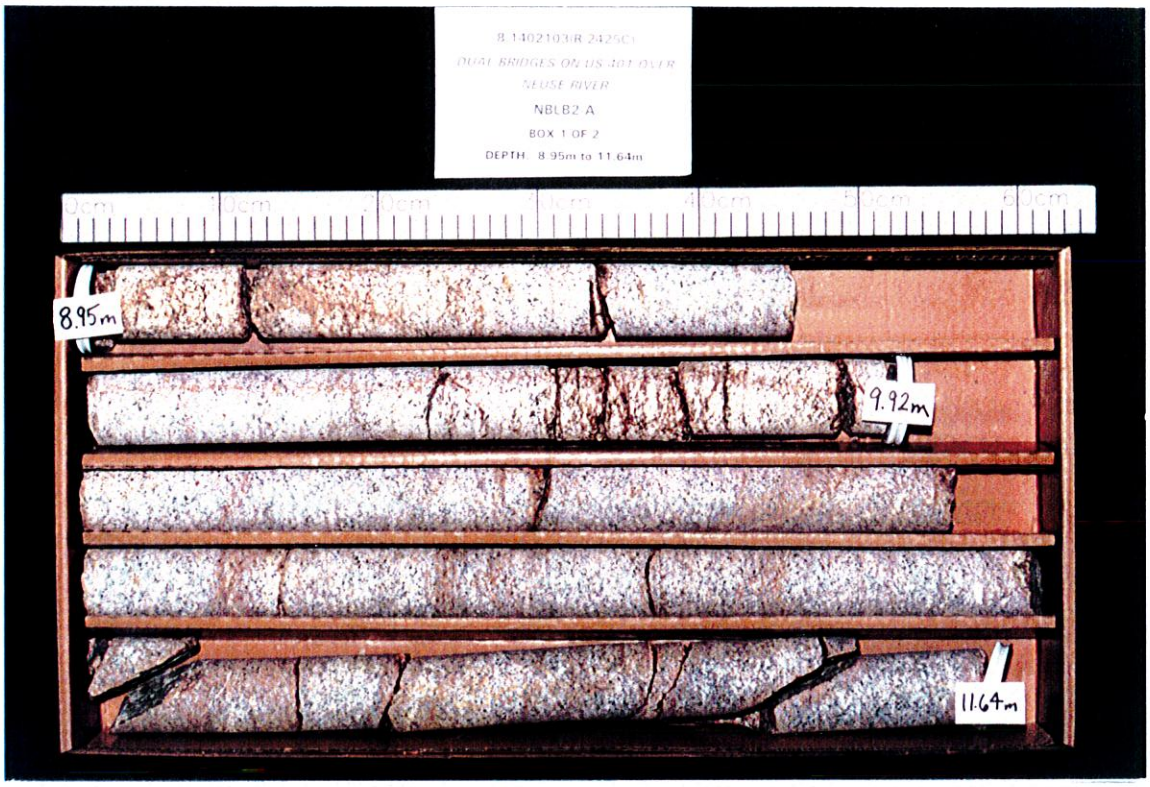
NCBMM3 1415 .6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

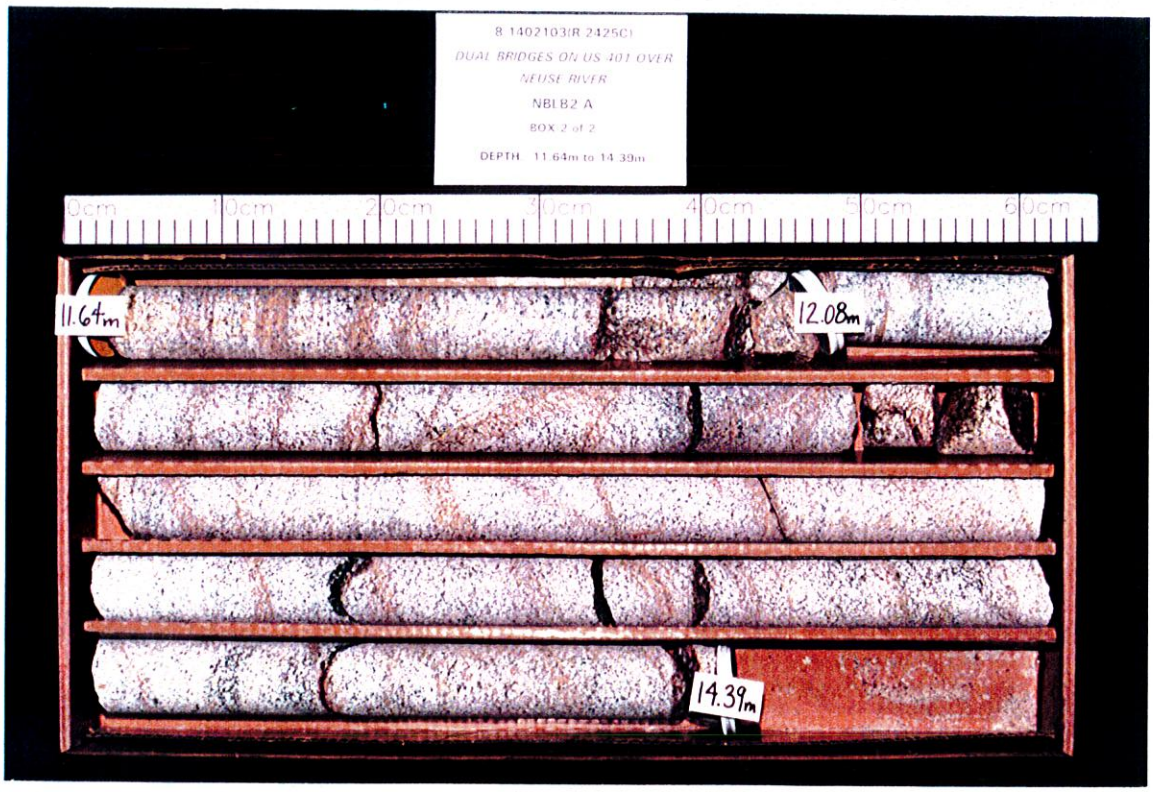
PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO.: NBLB2-A	BORING LOCATION (STA): 80+41.0 -L-		OFFSET: 4.0m RT
COLLAR ELEV.: 53.53m	DATE STARTED: 05-20-96		DRILL MACHINE: CME 45 on barge
TOTAL DEPTH: 14.39m	DATE COMPLETED: 05-21-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 5.44m		DRILLER: F.Cox/K.Pendley

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
44.58	8.95	2:30 5:03 3:09	0.97	0.63 (65%)	0.93 (96%)	Run 1	Pink and gray, medium to coarse grained, fresh to slightly weathered, sound to moderately fractured, hard to very hard granite. 9 Joints at 0-10 degrees ADS = 1 to 29cm
43.61	9.92						
		2:57 5:13 5:11 5:52 6:19 13:22	2.16	1.75 (81%)	2.16 (100%)	Run 2	Pink and gray, medium to coarse grained, fresh, sound to moderately fractured, very hard granite. 9 Joints at 0-20 degrees ADS = 12 to 30cm 3 Joints at 40 degrees ADS = 1 to 16cm 2 Joints at 60 degrees ADS = 40cm
41.45	12.08	27:43					
		1:40 2:28 2:28 3:20 5:16 4:59	2.31	2.09 (90%)	2.31 (100%)	Run 3	Pink and gray, medium to coarse grained, fresh, sound to moderately fractured, very hard granite. 8 Joints at 0-20 degrees ADS = 2 to 95cm 4 Joints at 45 degrees ADS = 32 to 58cm
39.14	14.39	5:09					Boring terminated at 14.39 meters in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
NBLB2-A



Box 1 of 2
8.95m to 11.64m



Box 2 of 2
11.64m to 14.39m

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. NBLB2-B	**BORING LOCATION** 80+41.0	**OFFSET** 21.0m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 53.56 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** N/A
TOTAL DEPTH 12.80 m	**DRILL MACHINE** CME 45 on Barge	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/21/96	**COMPLETED** 5/21/96	**SURFACE WATER DEPTH** 0.74 m		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
53.56					Mudline				
	0.00	WOH	1	1	2		Sat		ALLUVIUM: BROWN AND TAN FINE TO COARSE SAND (A-3) WITH TRACE OF GRAVEL AND WITH WOOD FRAGMENTS
	1.48	1	2	4	6		Sat		
52									53.56 — 0.00
	3.00	13	20	25	45		W		RESIDUAL: ORANGE AND TAN SILTY FINE TO COARSE SAND (A-2-4) WITH RELICT ROCK STRUCTURE. WEATHERED GRANITE.
50									51.06 — 2.50
	4.52	31	69		100/27cm		M		SOFT WEATHERED ROCK (SWR) SAMPLED AS PINK, WHITE AND GRAY SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
48	6.04	22	78		100/29cm		M		49.46 — 4.10
									46.96 — 6.60
	7.56	100			100/1cm				HARD WEATHERED ROCK (HWR) SAMPLED AS SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
46									45.99 — 7.57
									HARD ROCK (HR). TAN, BROWN, PINK AND GRAY, MEDIUM TO COARSE GRAINED, SEVERELY WEATHERED TO FRESH, SOUND TO EXTREMELY FRACTURED, VERY SOFT TO VERY HARD GRANITE (SEE CORE BORING REPORT)
44									
42									40.76 — 12.80
									BORING TERMINATED AT 12.80 METERS IN GRANITE.
40									
38									
36									

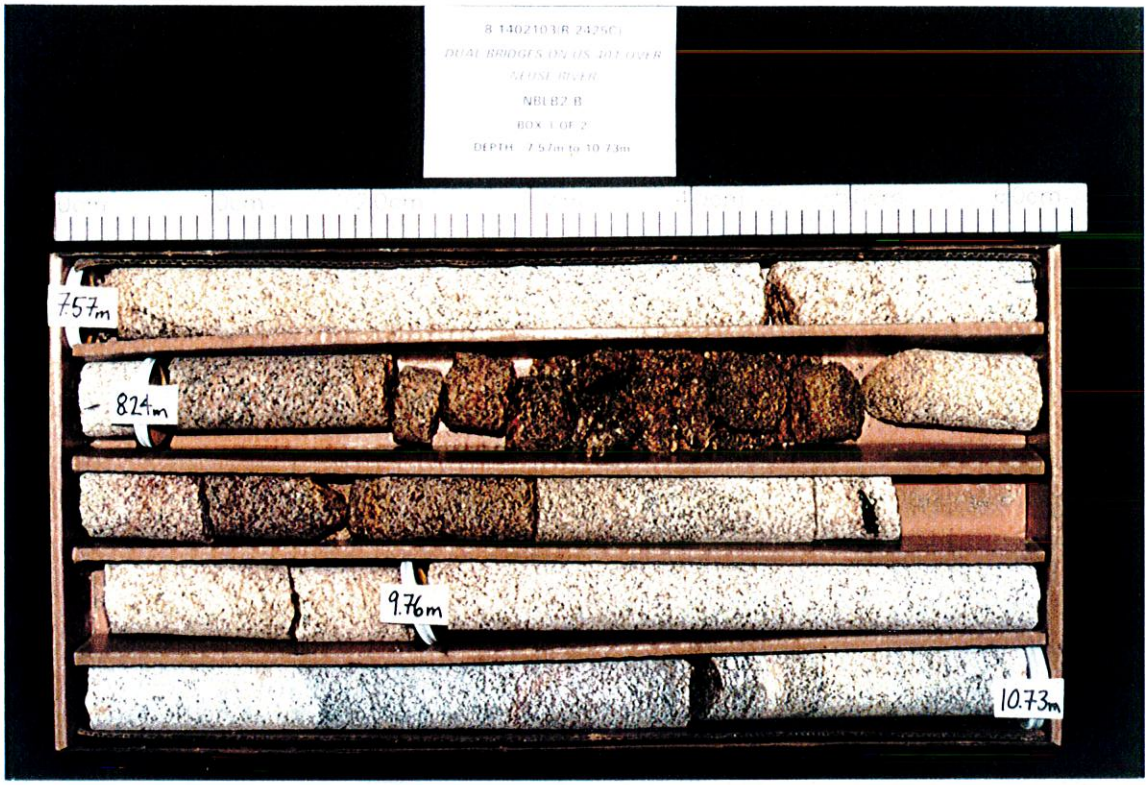
NCBMM3 1415 6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

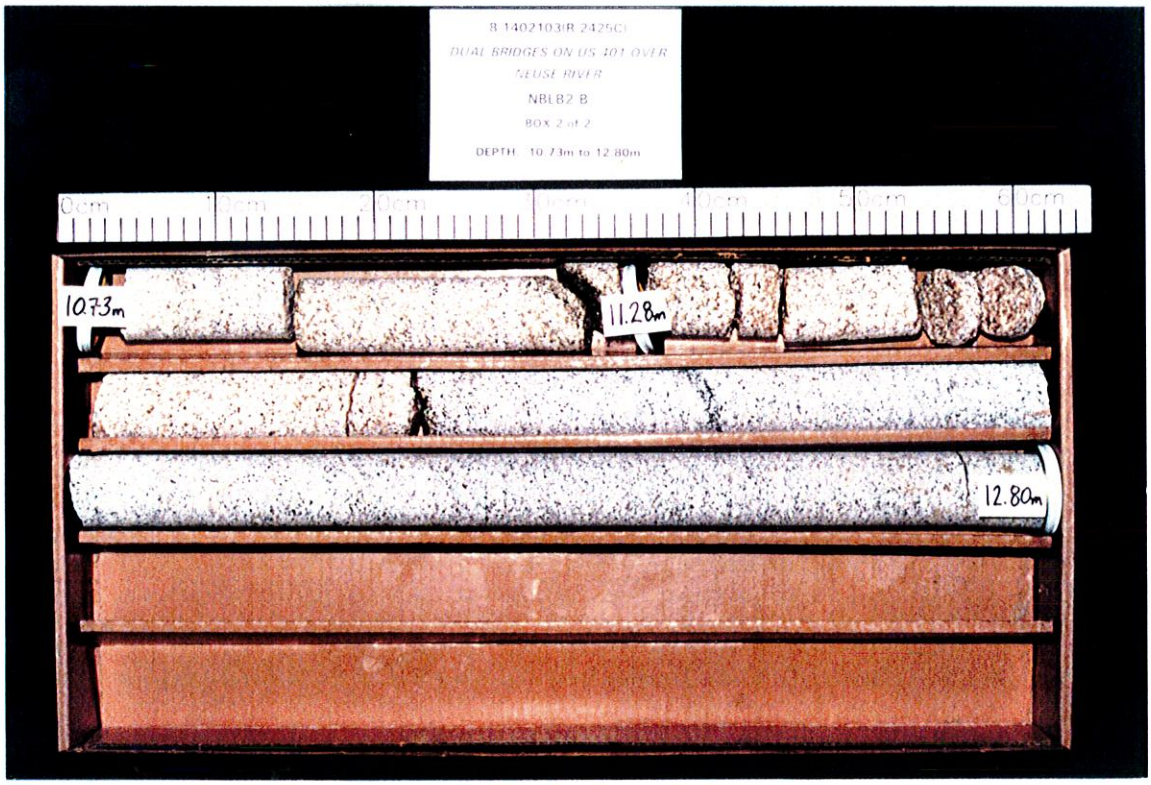
PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO.: NBLB2-B	BORING LOCATION (STA): 80+41.0 - L-		OFFSET: 21.0m RT
COLLAR ELEV.: 53.56m	DATE STARTED: 05-21-96		DRILL MACHINE: CME 45 on barge
TOTAL DEPTH: 12.80m	DATE COMPLETED: 05-21-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 5.23m		DRILLER: F.Cox/K.Pendley

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
45.99	7.57	1:23 1:37	0.67	0.63 (94%)	0.63 (94%)	Run 1	Tan and pink, medium to coarse grained, moderately weathered, sound to slightly fractured, hard to moderately hard granite. 3 Joints at 0-10 degrees ADS=4 to 42cm Joints show iron staining
45.32	8.24						
		1:01 1:09 1:08 1:03	1.52	0.80 (53%)	1.22 (80%)	Run 2	Pink, brown, tan, medium to coarse grained, moderately to severely weathered, slightly to extremely fractured, hard to very soft granite
43.80	9.76	1:16					
		1:19 1:26 1:32 1:22	1.52	1.27 (84%)	1.29 (85%)	Run 3	Tan and gray, medium to coarse grained, slightly weathered to fresh, sound to slightly fractured, hard to very hard granite. 4 4 Joints at 0-15 degrees ADS=20 to 76cm 1 Joint at 45 degrees
42.28	11.28	1:34					
		1:31 1:47 2:03 2:14	1.52	1.17 (77%)	1.45 (95%)	Run 4	Pink and gray, medium to coarse grained, very slightly weathered to fresh, sound to moderately fractured, very hard granite. 7 Joints at 0-10 degrees ADS=2 to 17cm
40.76	12.80	3:41					
							Boring terminated at 12.80 meters in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
NBLB2-B



Box 1 of 2
7.57m to 10.73m



Box 2 of 2
10.73m to 12.80m

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** KD Trimble
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. NBLB3-A	**BORING LOCATION** 80+58.5	**OFFSET** 4.0m RT	**ALIGNMENT** -L-	**0 HR.** 0.00
COLLAR ELEV. 56.49 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** 2.50
TOTAL DEPTH 18.75 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/21/96	**COMPLETED** 5/21/96	**SURFACE WATER DEPTH** N/A		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
56.49					Ground Surface				56.49 0.00
56	0.34	3	3	3	6		D-M		ALLUVIUM: BROWN MICACEOUS SILTY SAND (A-2-4) WITH WOOD FRAGMENTS AND LEAVES
	1.11	4	2	2	4		M		55.54 0.95 ALLUVIUM: BROWN MICACEOUS FINE SANDY CLAYEY SILT (A-4) WITH TRACE OF WOOD FRAGMENTS AND LEAVES
54	2.63	2	1	1	2		M-W		
	4.12	1	4	6	10		W-Sat		52.59 3.90 ALLUVIUM: BROWN SANDY SILTY CLAY (A-7) WITH TRACE OF WOOD FRAGMENTS
52	5.64	22	17	22	41		W-Sat		51.79 4.70 RESIDUAL: ORANGE AND BROWN SILTY FINE TO COARSE SAND (A-2-4). WEATHERED GRANITE.
50	7.16	34	34	46	80		W-Sat		
48	8.68	23	27	73	100/23cm		M-W		48.49 8.00 SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND BROWN SILTY CLAYEY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
46	10.20	100			100/4cm		M-W		
44	11.72	100			100/4cm				
	13.24	100			100/11cm		M-W		
42	14.76	100			100/8cm		M-W		40.99 15.50 HARD WEATHERED ROCK (HWR) SAMPLED AS BROWN MICACEOUS FINE SANDY SILT. PARTIALLY WEATHERED GRANITE. 40.17 16.32
40	16.28	100			100/4cm				HARD ROCK (HR). TAN, PINK AND GRAY, MEDIUM TO COARSE GRAINED, MODERATELY WEATHERED TO FRESH EXTREMELY FRACTURED TO SOUND, MODERATELY HARD TO VERY HARD GRANITE. (SEE CORE BORING REPORT)
38									BORING TERMINATED AT 18.75 METERS IN GRANITE. 37.74 18.75

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO.: NBLB3-A	BORING LOCATION (STA): 80+58.5 -L-		OFFSET: 4.0m RT
COLLAR ELEV.: 56.49m	DATE STARTED: 05-21-96		DRILL MACHINE: Mobile B-56
TOTAL DEPTH: 18.75m	DATE COMPLETED: 05-21-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 2.43m		DRILLER: S.Hancock/J.Young

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
40.17	16.32	2:22	0.91	0.51 (56%)	0.74 (81%)	Run 1	Tan, pink and gray, medium to coarse grained, moderately weathered to fresh, extremely to moderately fractured, very hard to moderately hard granite.
		2:45					
		5:15					4 Joints at 0 degrees ADS = 4 to 22cm
							2 Joints at 65 degrees ADS = 9cm
39.26	17.23						Joints show iron staining.
		7:48	1.52	1.12 (74%)	1.52 (100%)	Run 2	Pink and gray, medium to coarse grained, fresh, sound to moderately fractured, very hard granite.
		8:00					
		7:15					12 Joints at 0-10 degrees ADS = 3 to 48cm
		7:45					
37.74	18.75	8:30					Few joints show some iron staining
							Boring terminated at 18.74 meters in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
NBLB3-A

Box 1 of 1
16.32m to 18.75m

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** KD Trimble
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. NBLB3-B	**BORING LOCATION** 80+58.5	**OFFSET** 21.0m RT	**ALIGNMENT** -L-	**0 HR.** 2.71
COLLAR ELEV. 56.70 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** 3.08
TOTAL DEPTH 23.18 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/22/96	**COMPLETED** 5/22/96	**SURFACE WATER DEPTH** N/A		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
56.70					Ground Surface				56.70 0.00
56	0.30	3	1	2	3	SS-14	M		ALLUVIUM: BROWN MICACEOUS SILTY FINE SANDY CLAY (A-6) WITH WOOD FRAGMENTS, GRASS AND ROOTS
	1.06	1	1	1	2		M-W		54.70 2.00
54	2.58	1	1	0	1	SS-15	MW		ALLUVIUM: BROWN AND GRAY CLAYEY FINE SANDY SILT (A-4) WITH WOOD FRAGMENTS
	4.10	3	1	1	2		M-W		52.00 4.70
52	5.62	19	17	15	32		M-W		ALLUVIUM: GRAVEL 51.30 5.40 RESIDUAL: ORANGE AND BROWN SILTY FINE TO COARSE SAND (A-2-4). WEATHERED GRANITE.
50	7.14	18	32	53	85		M-W		
48	8.66	26	46	53	99		M-W		47.10 9.60 SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND BROWN SILTY FINE SAND. PARTIALLY WEATHERED GRANITE.
	10.18	55	45		100/25cm				45.50 11.20 RESIDUAL: ORANGE, BROWN, WHITE AND BLACK SILTY FINE SAND (A-2-4). WEATHERED GRANITE.
46	11.70	29	40	45	85				44.00 12.70
44	13.22	100			100/1cm				43.80 12.90 SOFT WEATHERED ROCK (SWR) 43.47 13.23 HARD WEATHERED ROCK (HWR) - NO RECOVERY HARD ROCK (HR), TAN, PINK AND GRAY, MEDIUM TO COARSE GRAINED, MODERATELY WEATHERED TO FRESH, EXTREMELY FRACTURED TO SOUND, MODERATELY HARD TO VERY HARD GRANITE. (SEE CORING BORING REPORT)
42									
40	17.63					UC-3			
38									

NCBMM3 1415 .6

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N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** KD Trimble
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. NBLB3-B	**BORING LOCATION** 80+58.5	**OFFSET** 21.0m RT	**ALIGNMENT** -L-	**0 HR.** 2.71
COLLAR ELEV. 56.70 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** 3.08
TOTAL DEPTH 23.18 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary/Rock Core	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/22/96	**COMPLETED** 5/22/96	**SURFACE WATER DEPTH** N/A		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
37.70					Continued from previous page				
									HARD ROCK (HR). TAN, PINK AND GRAY, MEDIUM TO COARSE GRAINED, MODERATELY WEATHERED TO FRESH, EXTREMELY FRACTURED TO SOUND, MODERATELY HARD TO VERY HARD GRANITE. (SEE CORING BORING REPORT)
36									
34									33.52 23.18
									BORING TERMINATED AT 23.18 METERS IN GRANITE.
32									
30									
28									
26									
24									
22									
20									

NCBMM3 1415 J6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO.: 8.1402103	ID: R-2425C	COUNTY: Wake	GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO.: NBLB3-B	BORING LOCATION (STA): 80+58.5 -L-		OFFSET: 21.0m RT
COLLAR ELEV.: 56.70m	DATE STARTED: 05-22-96		DRILL MACHINE: Mobile B-56
TOTAL DEPTH: 23.18m	DATE COMPLETED: 05-22-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 9.95m		DRILLER: S.Hancock

ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
43.47	13.23	1:30 1:45 42.63	14.06	0.84	0.33 (39%)	0.68 (81%)	Run 1	Tan and pink, medium to coarse grained, slightly to moderately weathered, sound to moderately fractured, hard to moderately hard granite 8 Joints at 0-10 degrees ADS = 2 to 33cm
		2:00 2:00 1:45 1:36 1:59 1:02 1:19 1:06 0.96 0.88 39.59	17.10	3.04	0.39 (13%)	0.80 (26%)	Run 2	Tan and pink, medium to coarse grained, slightly to moderately weathered, sound to moderately fractured, hard to moderately hard granite. 9 Joints at 0-10 degrees ADS = 2 to 38cm
		1:00 1:15 1:45 1:30 1:26 2:43 2:51 3:02 3:14 36.55	20.14	3.04	1.18 (39%)	2.45 (81%)	Run 3	Tan, pink and gray, medium to coarse grained, moderately to very slightly weathered, sound to moderately fractured, hard to very hard granite. 21 Joints at 0-10 degrees ADS = 3 to 50cm 9 Joints at 45 degrees ADS = 5 to 33cm 1 Joint at 70 degrees

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO.: 8.1402103 ID: R-2425C COUNTY: Wake			GEOLOGIST: BK Banks
SITE DESCRIPTION: Dual Bridges on U.S.401 over Neuse River			LAW JOB NO: 30720-6-1415
BORING NO.: NBLB3-B	BORING LOCATION (STA): 80+58.5 -L-		OFFSET: 21.0m RT
COLLAR ELEV.: 56.70m	DATE STARTED: 05-22-96		DRILL MACHINE: Mobile B-56
TOTAL DEPTH: 23.18m	DATE COMPLETED: 05-22-96		DRILL METHOD: Mud Rotary/Rock Core
CORE SIZE: NQ	TOTAL RUN: 9.95m		DRILLER: S.Hancock

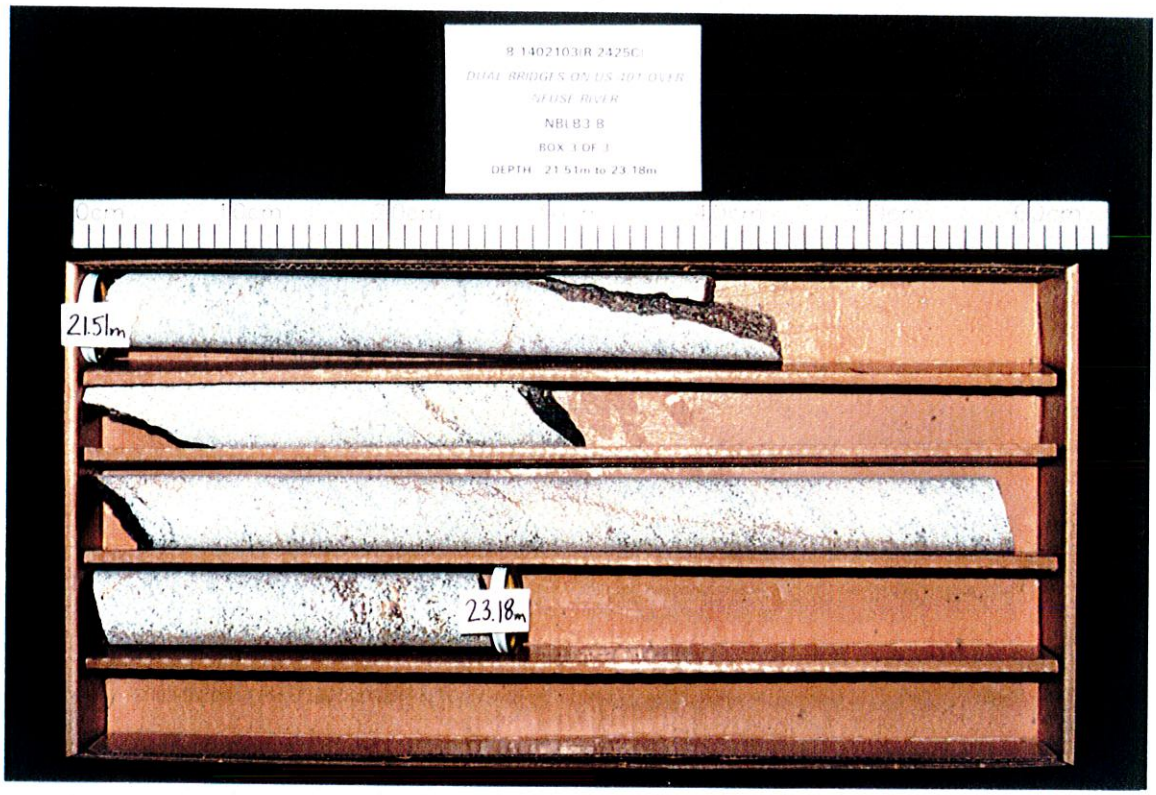
ELEV. (m)	DEPTH (m)	DRILL RATE (MN/30cm)	RUN (m)	RQD %	REC %	SAMP NO.	FIELD CLASSIFICATION AND REMARKS
36.55	20.14	3:10 3:19 3:18 3:31 3:32 3:22 3:14 3:51 3:49 3:42	3.04	2.01 (66%)	2.81 (92%)	Run 4	Tan, pink and gray, medium to coarse grained, very slightly weathered to fresh, extremely fractured to sound, very hard granite. 6 Joints at 0-10 degrees ADS = 5 to 21cm 10 Joints at 45 degrees ADS = 3 to 74cm 3 Joints at 70 degrees 1 Joint at 90 degrees Joints show clay infilling and mineralization
							Boring terminated at 23.18m in granite

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
NBLB3-B

Box 1 of 3
13.23m to 18.26m

Box 2 of 3
18.26m to 21.51m

Dual Bridges on U.S. 401 Over Neuse River
N.C.DOT Project No. 8.1402103 (R-2425C)
NBLB3-B



Box 3 of 3
21.51m to 23.18m

LAW ENGINEERING, INC.
3301 Atlantic Avenue
Raleigh, North Carolina 27619
Phone (919) 876-0416

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake	**GEOLOGIST** KD Trimble
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415			**GROUNDWATER (m)**
BORING NO. EB2-C	**BORING LOCATION** 80+76.0	**OFFSET** CL	**ALIGNMENT** -L-	**0 HR.** 1.73
COLLAR ELEV. 56.68 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** 1.98
TOTAL DEPTH 15.14 m	**DRILL MACHINE** Mobile B-56	**DRILL METHOD** Mud Rotary	**HAMMER TYPE** 140#Safety	
DATE STARTED 5/23/96	**COMPLETED** 5/23/96	**SURFACE WATER DEPTH** N/A		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
56.68					Ground Surface				56.68 0.00
	0.34	3	2	2	4		M		ALLUVIUM: BROWN SILTY FINE SAND (A-2-4)
56									55.58 1.10
	1.42	3	4	4	8	SS-16	M-W		ALLUVIUM: BROWN CLAYEY FINE SANDY SILT (A-4)
54	2.94	3	4	4	8		W-Sat		
	4.46	4	5	5	10		W-Sat		52.78 3.90
52									ALLUVIUM: BROWN AND GRAY SILTY FINE SANDY CLAY (A-7) 52.12 4.56
	5.98	19	12	10	22		W-Sat		ALLUVIUM: GRAY FINE SANDY SILT (A-4) 51.23 5.45
50	7.50	1	8	16	24		W-Sat		ALLUVIUM: BROWN SILTY FINE TO COARSE SAND (A-2-4) 49.68 7.00
48	9.02	22	23	22	45		M-W		ALLUVIUM: BROWN AND GRAY SILTY FINE SANDY CLAYEY GRAVEL (A-1-b) 48.18 8.50
	10.54	23	33	40	73		M-W		RESIDUAL: ORANGE, BROWN, BLACK AND WHITE SILTY FINE TO COARSE SAND (A-2-4). WEATHERED GRANITE.
46	12.06	73	27		100/19cm		M-W		45.18 11.50
44	13.58	100			100/11cm		M-W		SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND BROWN SILTY FINE TO COARSE SAND. PARTIALLY WEATHERED GRANITE.
42	15.10	100			100/4cm				42.08 14.60
									HARD WEATHERED ROCK (HWR) - NO RECOVERY 41.54 15.14
40									BORING TERMINATED AT 15.14 METERS ON GRANITE.
38									

NCBMM3 1415 6

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Raleigh, North Carolina 27619
Phone (919) 876-0416

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 8.1402103	**ID.** R-2425C	**COUNTY** Wake		**GEOLOGIST** BK Banks
SITE DESCRIPTION Dual Bridges on U.S.401 over Neuse River-Law Project No. 30720-6-1415				**GROUNDWATER (m)**
BORING NO. NBLEB2-B	**BORING LOCATION** 80+76.0	**OFFSET** 22.5m RT	**ALIGNMENT** -L-	**0 HR.** 0.30
COLLAR ELEV. 56.93 m	**NORTHING** Not Provided	**EASTING** Not Provided		**24 HR.** 3.38
TOTAL DEPTH 14.33 m	**DRILL MACHINE** CME 550	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** 140#Safety
DATE STARTED 5/22/96	**COMPLETED** 5/22/96	**SURFACE WATER DEPTH** N/A		

ELEV. (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
56.93					Ground Surface				56.93 0.00
	0.30	1	2	2	4		D-M		ALLUVIUM: BROWN SLIGHTLY MICACEOUS SILTY FINE SAND (A-2-4)
56	1.09	2	3	2	5		M		55.13 1.80
	2.61	2	3	4	7		M-W		ALLUVIUM: TAN SLIGHTLY MICACEOUS FINE SANDY SILT (A-4)
54	4.13	3	4	4	8		M-W		51.63 5.30
52	5.65	15	18	19	37		M-W		51.20 5.73 ALLUVIUM: TAN AND GRAY SANDY SILTY GRAVEL (A-1-b)
50	7.17	31	44	42	86		M		RESIDUAL: ORANGE AND TAN SILTY FINE TO COARSE SAND (A-2-4) WITH RELICT ROCK STRUCTURE. WEATHERED GRANITE.
	8.69	47	53		100/27cm		M		48.93 8.00
48	10.21	100			100/10cm		M		SOFT WEATHERED ROCK (SWR) SAMPLED AS ORANGE AND TAN SILTY FINE TO COARSE SAND WITH GRAVEL. PARTIALLY WEATHERED GRANITE.
46	11.73	100			100/11cm		M		
44	13.25	100			100/7cm				42.60 14.33
42									BORING TERMINATED AT 14.33 METERS ON GRANITE.
40									

NCBMM3 1415 ℄ 6

GEOTECHNICAL UNIT FIELD SCOUR REPORT

PROJECT: 8.1402103 **ID:** R-2425C **COUNTY:** Wake

DESCRIPTION (1): Dual Bridges on U.S. 401 over Neuse River

INFORMATION ON EXISTING BRIDGES **Information obtained from** X field inspection
___ microfilm (Reel:___ Position:___)
___ other ___

COUNTY BRIDGE NO. 131 **BRIDGE LENGTH** 107m **NO.BENTS** 8 **NO.BENTS IN: CHANNEL** 2, **FLOOD PLAIN** 6

FOUNDATION TYPE: Spread footing on all bents

EVIDENCE OF SCOUR (2):

ABUTMENTS OR END BENT SLOPES: OK

INTERIOR BENTS: Wash out holes around interior bent piers

CHANNEL BED: None

CHANNEL BANKS: Western bank is nearly vertical indicating scour

EXISTING SCOUR PROTECTION:

TYPE (3): Rip-Rap along end bents

EXTENT (4): Wraps around end bents

EFFECTIVENESS (5): OK

OBSTRUCTIONS (6) (DAMS, DEBRIS, ETC.): Old concrete bridge piles exist a few meters upstream of the bridge

DESIGN INFORMATION

CHANNEL BED MATERIAL (7) (SAMPLE RESULTS ATTACHED): Silty fine to coarse sand (A-2-4), fine to coarse sand (A-3) and fine to coarse sandy gravel (A-1-b)

CHANNEL BANK MATERIAL (8) (SAMPLE RESULTS ATTACHED): Silty fine sand (A-2-4), sandy clayey silt (A-4) and sandy silty clay (A-6, A-7)

FOUNDATION BEARING MATERIAL (9): Hard rock (HR). Granite

CHANNEL BANK COVER (10): Grass, weeds; lightly vegetated to clear

FLOOD PLAIN WIDTH (11): 200 meter in immediate vicinity of bridge

FLOOD PLAIN COVER (12): Shrubs and trees exist on the southern floodplain. On the northern side of the river, the bridge site is clear and open. Away, from the bridge on the northern floodplain, the area is lightly wooded.

DESIGN INFORMATION CONTINUED

STREAM IS X **DEGRADING** _____ **AGGRADING (13)**

OTHER OBSERVATIONS AND COMMENTS: There is a dam approximately 10 miles upstream that, under normal circumstances helps to control the flow of the river.

CHANNEL MIGRATION TENDENCY (14): The migration tendency is southward in the immediate vicinity of the bridge.

CRITICAL SCOUR ELEVATIONS (15): 50.50 meters above MSL

REPORTED BY: B.K. Banks **DATE:** May 23, 1996

INSTRUCTIONS

(1) GIVE THE DESCRIPTION OF THE SPECIFIC SITE GIVING ROUTE NUMBER AND BODY OF WATER CROSSED.
(2) NOTE ANY EVIDENCE OF SCOUR AT THE EXISTING END BENTS OR ABUTMENTS (UNDERMINING, SLOUGHING, SCOUR LOCATIONS, DEGRADATIONS, ETC.).
(3) NOTE ANY EXISTING SCOUR PROTECTION (RIPRAP, ETC.).
(4) DESCRIBE THE EXTENT OF ANY EXISTING SCOUR PROTECTION.
(5) DESCRIBE WHETHER OR NOT THE SCOUR PROTECTION APPEARS TO BE WORKING.
(6) NOTE ANY DAMS, FALLEN TREES, DEBRIS AT BENTS, ETC.
(7) DESCRIBE THE CHANNEL BED MATERIAL; A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
(8) DESCRIBE THE CHANNEL BANK MATERIAL; A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
(9) DESCRIBE THE FOUNDATION BEARING MATERIAL.
(10) DESCRIBE THE BANK COVERING (GRASS, TREES, RIPRAP, NONE, ETC.).
(11) GIVE THE APPROXIMATE FLOOD PLAIN WIDTH (ESTIMATE).
(12) DESCRIBE THE FLOOD PLAIN COVERING (GRASS, TREES, CROPS, ETC.).
(13) CHECK THE APPROPRIATE SPACE AS TO WHETHER THE STREAM IS DEGRADING OR AGGRADING.
(14) DESCRIBE THE POTENTIAL OF THE BODY OF WATER TO MIGRATE LATERALLY DURING THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS).
(15) GIVE THE CRITICAL SCOUR ELEVATION EXPECTED OVER THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS). THIS CAN BE GIVEN AS AN ELEVATION RANGE ACROSS THE SITE, OR ON A BENT BY BENT BASIS WHERE VARIATIONS EXIST. DISCUSS RELATIONSHIP BETWEEN THE HYDRAULICS THEORETICAL SCOUR AND THE CRITICAL SCOUR ELEVATION. IF THE CRITICAL SCOUR ELEVATION IS DEPENDENT ON SCOUR COUNTER MEASURES, EXPLAIN. (RIPRAP ARMORING ON SLOPES, ETC.). THE CRITICAL SCOUR ELEVATION IS BASED ON THE ERODABILITY OF MATERIALS WITH CONSIDERATION FOR JOINTING, FOLIATION, BEDDING ORIENTATION AND FREQUENCY; CORE RECOVERY PERCENTAGE; PERCENT RQD; DIFFERENTIAL WEATHERING; SHEAR STRENGTH; OBSERVATIONS AT EXISTING STRUCTURES; OTHER TESTS DEEMED APPROPRIATE; AND OVERALL GEOLOGIC CONDITIONS AT THE SITE.

PHOTO NO. 1 - View of SBLEB1-A, looking south along U.S.401

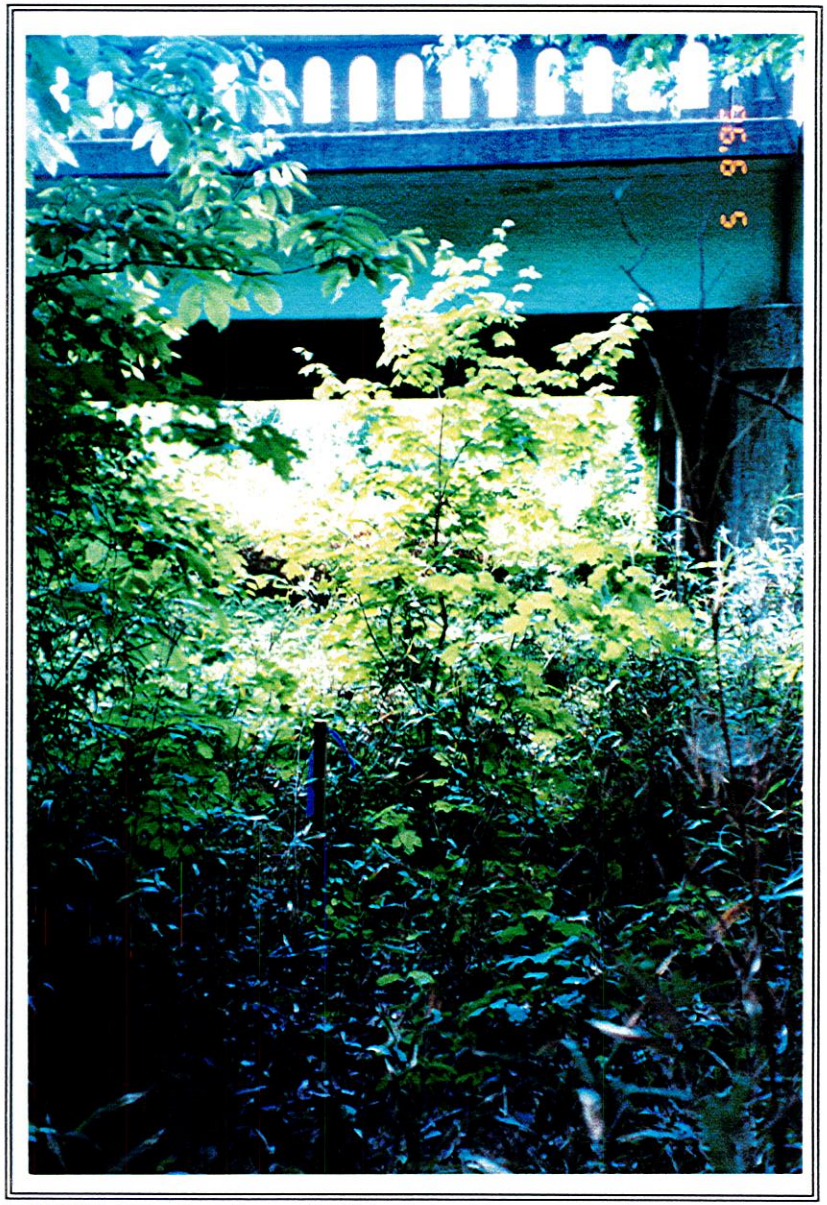


PHOTO NO. 2 - View of EB1-C, looking west along proposed End Bent One

PHOTO NO. 3 - View of NBLEB1-B, looking east away from U.S.401

PHOTO NO. 4 - View of NBLEB2-B, looking east away from U.S.401

PHOTO NO. 5 - View of east side of the bridge, looking south showing locations of the water borings SBLB1-B, SBLB2-B, NBLB1-A, NBLB2-A, NBLB1-B, and NBLB2-B

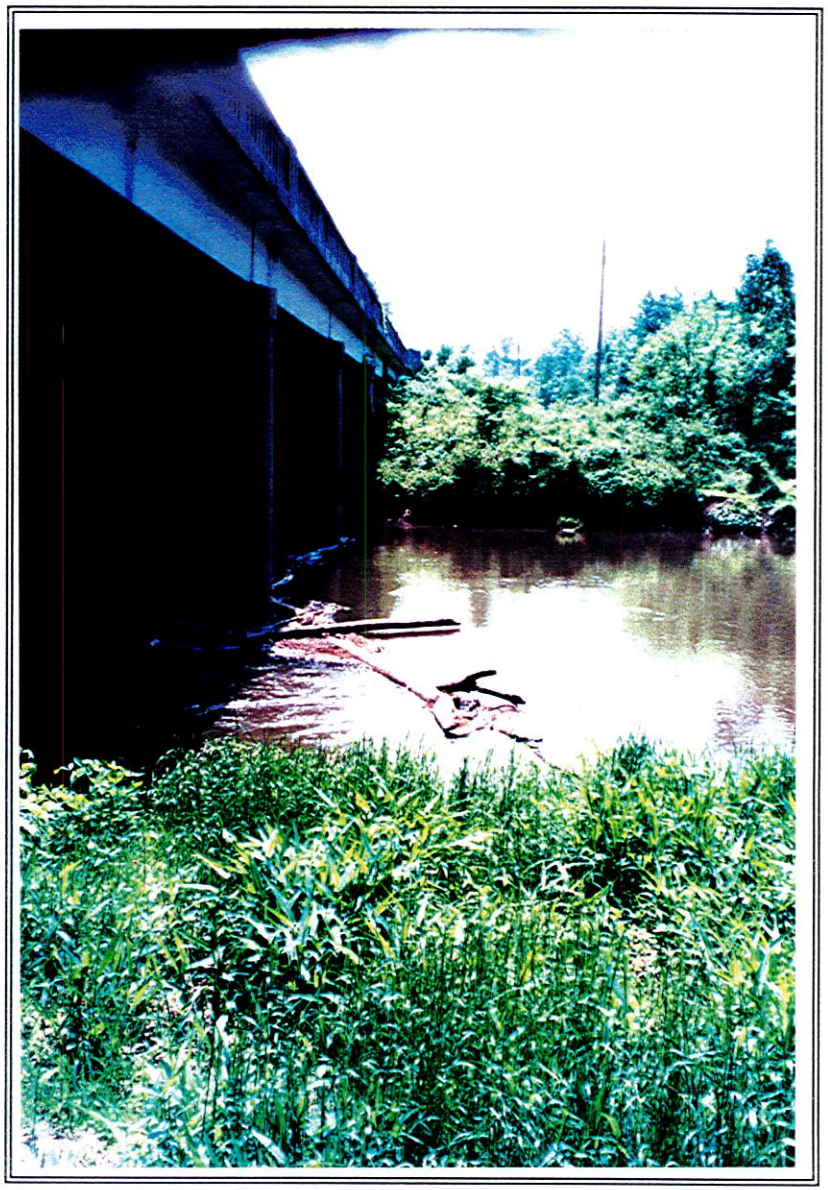


PHOTO NO. 6 - View of the west side of the bridge, looking south showing locations of the water borings SBLB1-A and SBLB2-A. The log jam shown in the picture has been removed to access Boring SBLB2-A

PHOTO NO. 7 - View of NBLB3-A (Foreground), SBLB3-B (Centerground) and SBLB3-A (Background), looking west toward U.S.401

PHOTO NO. 8 - View of NBLB3-B looking south toward the Neuse River

PHOTO NO. 9 - SBLEB2-A looking northeast toward End Bent Two. Stake at toe of slope indicates offset location of borehole

PHOTO NO. 10 - View of EB2-C looking north toward End Bent Two

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

3301 ATLANTIC AVENUE
RALEIGH, NC 27604

N.C.D.O.T./A.A.S.H.T.O. CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

Law Project Name and Number: Neuse River Bridges 30720-6-1415

Project: Dual Bridges on US 401 over Neuse River **County: Wake** **Owner: N.C.D.O.T.**

Date Sampled: 05-15-96 to 05-23-96 **Received: 05-28-96** **Reported: 06-10-96**

Sampled from: SBLEB1-A, NBLEB1-B, NBLB1-A **By: Banks, Trimble, Ballsieper**

Submitted by: Law Engineering and Environmental Services, Inc. **1992 Standard Specifications**

TEST RESULTS

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained 4.75 mm Sieve	%	0.0	0.0	40.1	1.5	14.2	0.0
Passing 2.00 mm Sieve	%	100.0	100.0	51.2	86.5	73.9	81.8
Passing 425 µm Sieve	%	99.7	99.5	25.1	26.5	38.3	34.4
Passing 75 µm Sieve	%	94.6	70.7	8.0	5.1	16.0	16.0

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	%	0.7	1.9	82.4	84.2	71.4	73.6
Fine Sand Ret - 53 µm	%	7.9	27.5	11.3	11.6	14.1	12.3
Silt 0.05 - 0.005 mm	%	43.7	36.0	3.0	1.3	7.5	4.9
Clay < 0.005 mm	%	47.7	34.6	3.3	2.9	7.0	9.2

Moisture Content	%	ND	ND	ND	ND	ND	ND
Liquid Limit, L.L.		55	35	21	25	28	28
Plasticity Index, P.I.		28	15	NP	NP	NP	NP
AASHTO Classification		A-7-6 (31)	A-6 (9)	A-1-b	A-1-b	A-1-b	A-1-b

Boring No.		SBLEB1-A	SBLEB1-A	NBLEB1-B	NBLB1-A	NBLB1-A	NBLB1-A
Station		79+85.0	79+85.0	79+85.0	80+13.0	80+13.0	80+13.0
Offset		18.8m LT	18.8m LT	22.5m RT	4.0m RT	4.0m RT	4.0m RT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (m)	From	2.62	4.14	5.55	0.00	2.56	4.08
	to	3.08	4.60	6.01	0.46	3.02	4.54

ND=Not Determined.

Reviewed by:

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

3301 ATLANTIC AVENUE
RALEIGH, NC 27604

N.C.D.O.T./A.A.S.H.T.O. CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

Law Project Name and Number: Neuse River Bridges 30720-6-1415

Project: Dual Bridges on US 401 over Neuse River **County: Wake** **Owner: N.C.D.O.T.**

Date Sampled: 05-15-96 to 05-23-96 **Received: 05-28-96** **Reported: 06-10-96**

Sampled from: SBLB2-A, NBLB2-A, SBLB3-A, SBLB3-B **By: Banks, Trimble, Ballsieper**

Submitted by: Law Engineering and Environmental Services, Inc. **1992 Standard Specifications**

TEST RESULTS

Lab Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Retained 4.75 mm Sieve	%	0.0	9.2	0.0	0.0	0.0	0.0
Passing 2.00 mm Sieve	%	92.5	65.9	99.7	85.0	99.4	99.8
Passing 425 µm Sieve	%	52.7	31.7	99.4	42.6	97.3	97.3
Passing 75 µm Sieve	%	18.8	6.8	75.3	17.3	45.9	66.3

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	%	60.8	85.9	1.1	67.3	8.2	6.3
Fine Sand Ret - 53 µm	%	23.1	7.8	30.7	17.5	51.6	33.1
Silt 0.05 - 0.005 mm	%	10.0	0.0	30.4	8.3	14.1	23.7
Clay < 0.005 mm	%	6.1	6.3	37.8	6.9	26.1	36.9

Moisture Content	%	ND	ND	ND	ND	ND	ND
Liquid Limit, L.L.		31	22	37	31	30	35
Plasticity Index, P.I.		NP	NP	12	NP	7	12
AASHTO Classification		A-2-4	A-1-b	A-6 (9)	A-1-b	A-4 (1)	A-6(6)

Boring No.		SBLB2-A	NBLB2-A	SBLB3-A	SBLB3-A	SBLB3-B	SBLB3-B
Station		80+41.0	80+41.0	80+58.5	80+58.5	80+58.5	80+58.5
Offset		17.7m LT	4.0m RT	17.7m LT	17.7m LT	4.0m LT	4.0m LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (m)	From	2.74	1.77	2.64	5.66	0.30	4.02
	to	3.20	2.23	3.09	6.12	0.76	4.48

ND=Not Determined.

B K Banks
Reviewed by:

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

3301 ATLANTIC AVENUE
RALEIGH, NC 27604

N.C.D.O.T./A.A.S.H.T.O. CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

Law Project Name and Number: Neuse River Bridges 30720-6-1415

Project: Dual Bridges on US 401 over Neuse River **County: Wake** **Owner: N.C.D.O.T.**

Date Sampled: 05-15-96 to 05-23-96 **Received: 05-28-96** **Reported: 06-10-96**

Sampled from: SBLB3-B, NBLB3-B, EB2-C **By: Banks, Trimble, Ballsieper**

Submitted by: Law Engineering and Environmental Services, Inc. **1992 Standard Specifications**

TEST RESULTS

Lab Sample No.		SS-13	SS-14	SS-15	SS-16		
Retained 4.75 mm Sieve	%	0.0	0.0	0.0	0.0		
Passing 2.00 mm Sieve	%	85.3	99.3	100.0	100.0		
Passing 425 µm Sieve	%	36.4	98.6	99.1	99.7		
Passing 75 µm Sieve	%	16.4	67.8	60.3	36.7		

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	%	72.4	3.0	4.8	4.5		
Fine Sand Ret - 53 µm	%	12.5	34.1	39.6	65.2		
Silt 0.05 - 0.005 mm	%	6.0	29.0	26.5	16.6		
Clay < 0.005 mm	%	9.1	33.9	29.1	13.7		

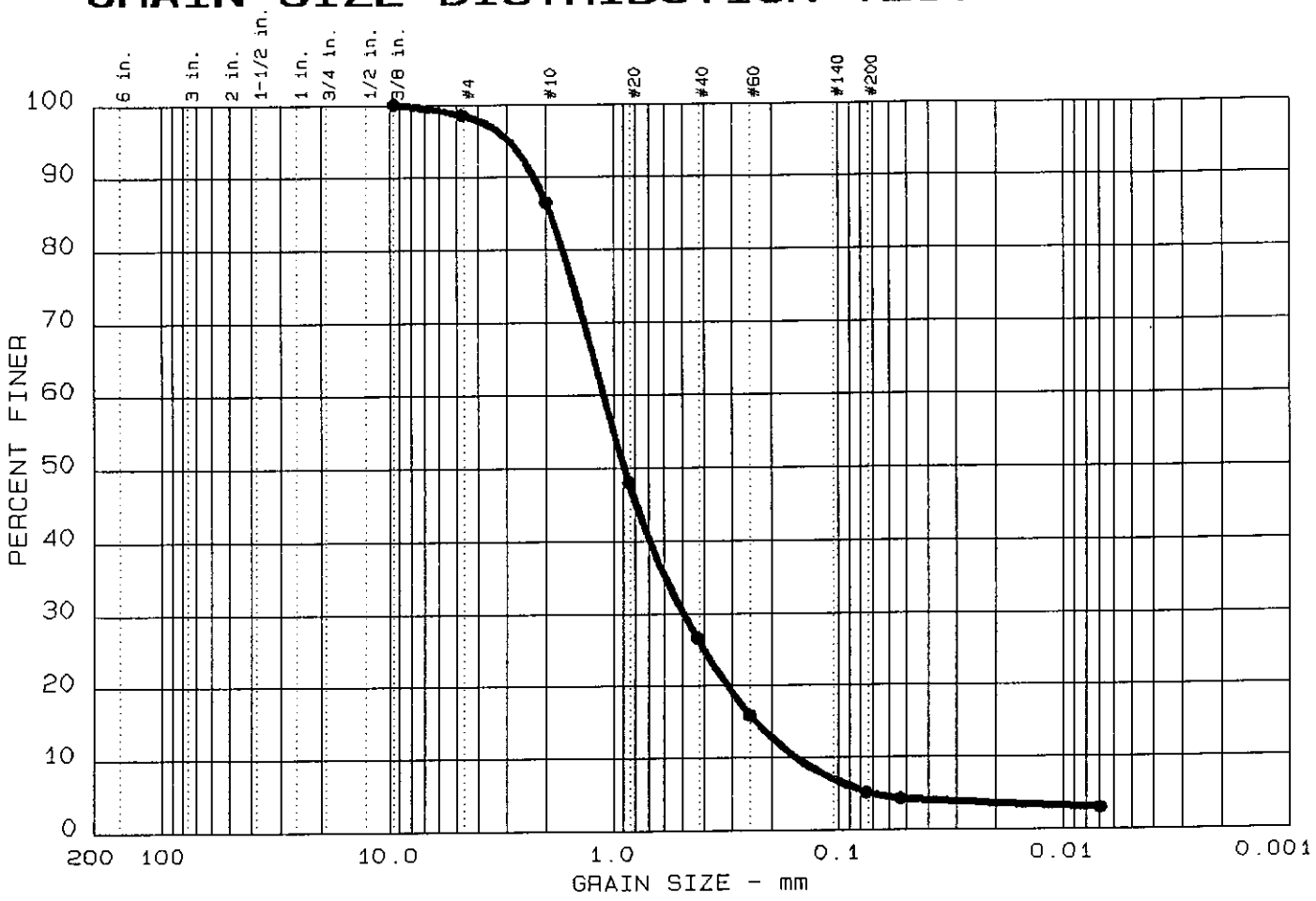
Moisture Content	%	ND	ND	ND	ND		
Liquid Limit, L.L.		32	38	32	23		
Plasticity Index, P.I.		9	14	8	NP		
AASHTO Classification		A-2-4	A-6 (8)	A-4 (3)	A-4		

Boring No.		SBLB3-B	NBLB3-B	NBLB3-B	EB2-C		
Station		80+58.5	80+58.5	80+58.5	80+76.0		
Offset		4.0m LT	17.7mRT	17.7mRT	Centerline		
Alignment		-L-	-L-	-L-	-L-		
Depth (m)	From	7.11	0.30	2.58	1.42		
	to	7.57	0.76	3.04	1.88		

ND=Not Determined.

BK Banks
Reviewed by:

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	1.5	93.4	5.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
●	25	NP	1.91	1.10	0.89	0.490	0.2344	0.1549	1.40	7.1

	MATERIAL DESCRIPTION	USCS	AASHTO
●	SS-4	ND	A-1-b

Project No.: 30720-6-1415
Project: DUAL BRIDGES ON U.S.401 OVER NEUSE RIVER
● Location: NBLB1-A 80+13.0 4.0mRT -L- 0.00-0.46

Date: 06-10-96

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

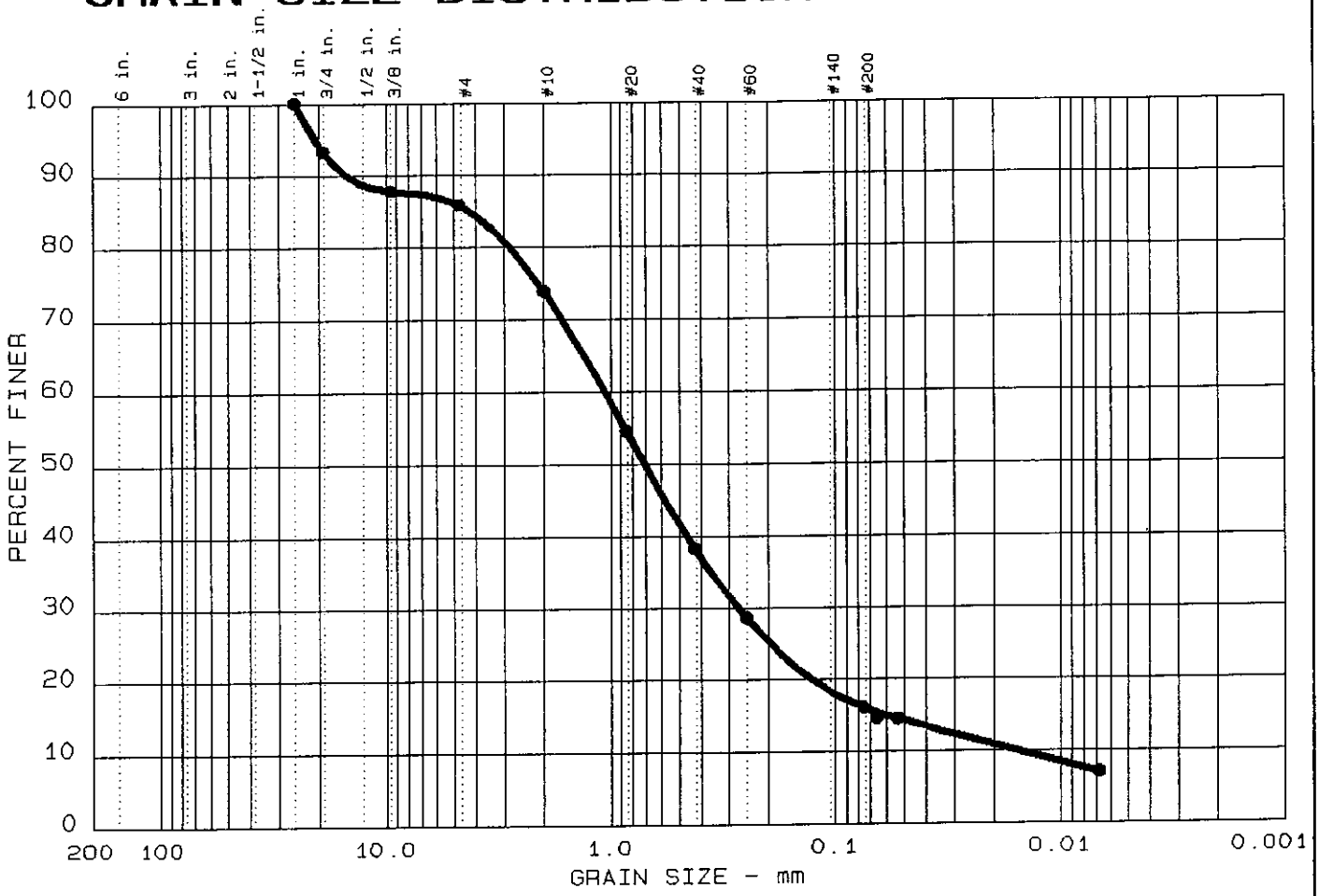
Remarks:

SPECIFIC GRAVITY IS ASSUMED.

ND=NOT DETERMINED.

Figure No. 04

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	5	0.0	14.2	69.8	16.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
●	28	NP	4.22	1.06	0.71	0.272	0.0594	0.0149	4.67	71.0

MATERIAL DESCRIPTION	USCS	AASHTO
● SS-5	ND	A-1-b

Project No.: 30720-6-1415
Project: DUAL BRIDGES ON U.S.401 OVER NEUSE RIVER
● Location: NBL81-A 80+13.0 4.0mRT -L- 2.56-3.02

Date: 06-10-96

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

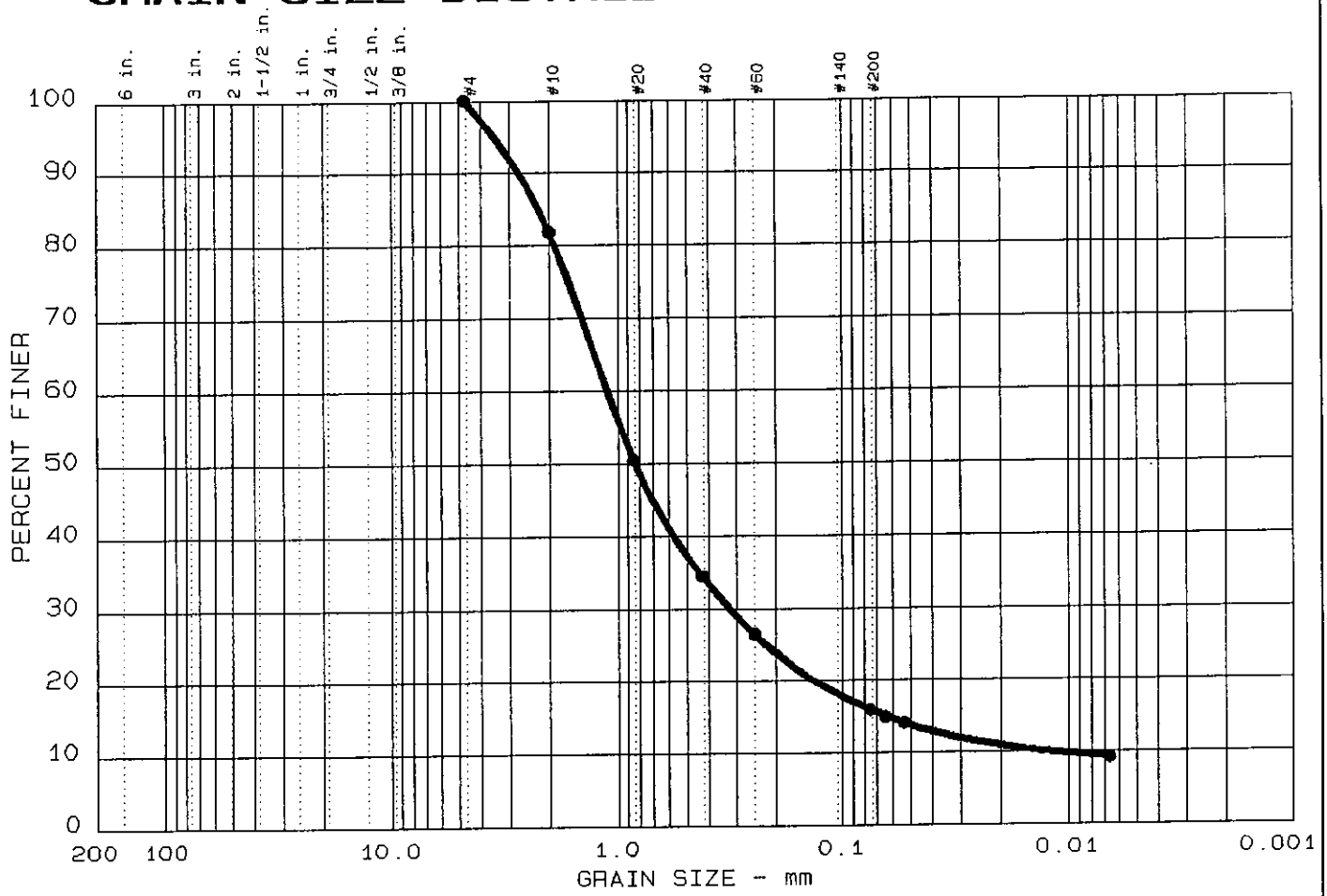
Remarks:

SPECIFIC GRAVITY IS ASSUMED.

ND=NOT DETERMINED.

Figure No. 05

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	12	0.0	0.0	84.0	16.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	28	NP	2.23	1.11	0.84	0.323	0.0630	0.0119	7.91	93.8

	MATERIAL DESCRIPTION	USCS	AASHTO
●	SS-6	ND	A-1-b

Project No.: 30720-6-1415
Project: NEUSE RIVER BRIDGES
● Location: NBLB1-A 80+13.0 4.0mRT -L- 4.08-4.54

Date: 06-11-96

Remarks:
ND=NOT DETERMINED.
SPECIFIC GRAVITY IS ASSUMED.

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Figure No. 12

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

SUMMARY OF LABORATORY TESTING

DUAL BRIDGES ON U.S. 401 OVER NEUSE RIVER
LAW PROJECT NO. 30720-6-1415

ROCK CORE SPECIMENS					
SAMPLE ID	DEPTH (m)	ULTIMATE COMPRESSIVE STRENGTH (kPa)	YOUNG'S MODULUS (kPa X 10^6)	CROSS SECTIONAL AREA (cm^2)	POISSON'S RATIO
UC-1 (SBLB1-B)	8.06-8.22	53,990	19.7	17.35	0.414
UC-2 (SBLB1-B)	10.37-10.51	144,870	35.4	17.35	0.321
UC-3 (NBLB3-B)	17.63-17.77	81,710	3.3	17.35	0.320