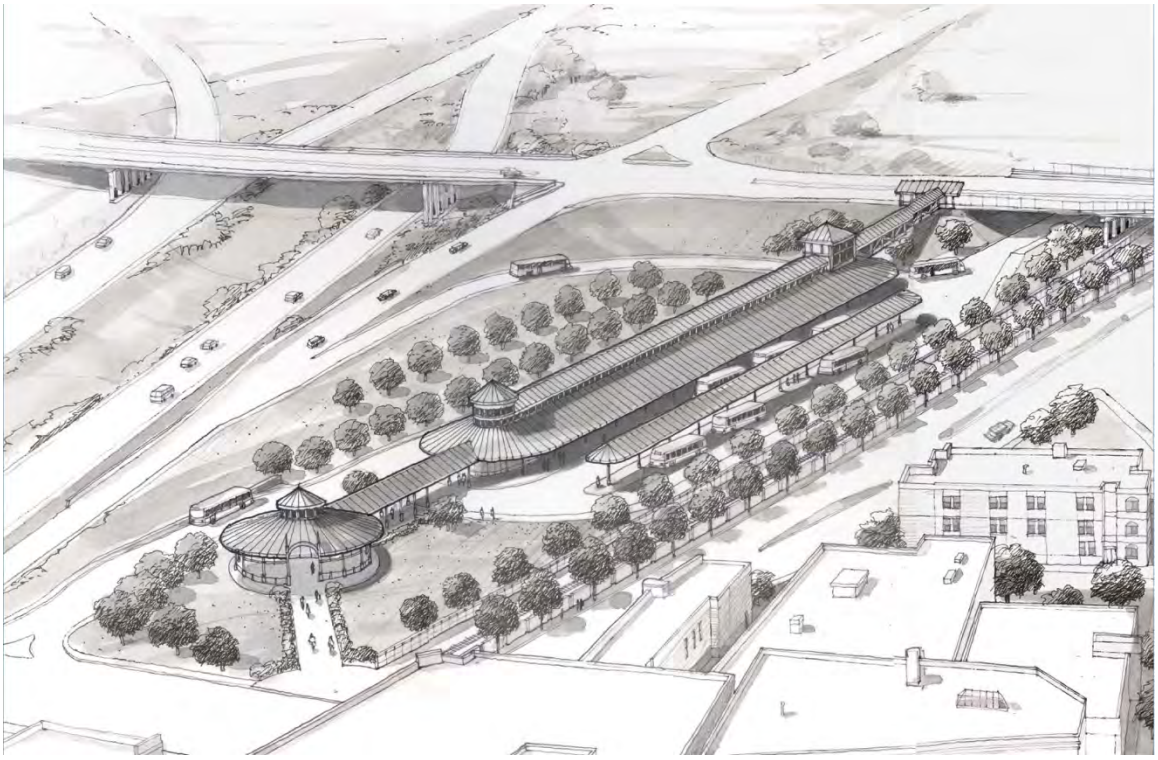
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

NEW BRITAIN – HARTFORD BUSWAY
STATE PROJECT NO. 88-H035

BUSWAY STATION 18+80 TO STATION 118+00

NEW BRITAIN, CONNECTICUT

BUSWAY BRIDGE OVER ALLEN STREET AND EAST STREET
GEOTECHNICAL REPORT



MAY 2011

URS
500 ENTERPRISE DRIVE
ROCKY HILL, CT 06067
860-529-8882

VN ENGINEERS, INC.
116 WASHINGTON AVENUE
NORTH HAVEN, CT 06473
203-234-7862

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

NEW BRITAIN – HARTFORD BUSWAY
STATE PROJECT NO. 88-H035

BUSWAY STATION 18+80 TO STATION 118+00

NEW BRITAIN, CONNECTICUT

BUSWAY BRIDGE OVER ALLEN STREET AND EAST STREET
GEOTECHNICAL REPORT

MAY 2011

CONNECTICUT DEPARTMENT OF TRANSPORTATION

Prepared By:
VN Engineers, Inc.
116 Washington Avenue
North Haven, CT 06473
(203) 234-7862
VN PIN: 27-107

Prepared for:
URS Corporation
500 Enterprise Drive
Rocky Hill, CT 06067
(860) 529-8882

STATE OF CONNECTICUT
RAYMOND VOLPE, JR.
No.23694
LICENSED
PROFESSIONAL ENGINEER

Approved By: Raymond Volpe
Raymond Volpe Jr., P.E.

Busway Bridge over Allen Street and East Street

Geotechnical Report

Table of Contents

1.0 INTRODUCTION…….. 2
1.1 General Information…….…….. 2

2.0 PROPOSED CONSTRUCTION……... 2

3.0 EXISTING SITE CONDITIONS ……. 2

4.0 SUBSURFACE DATA……3

5.0 SUBSURFACE CONDITIONS……. 4
5.1 Geology…… 4
5.2 Soil and Rock Profile…….. 5

6.0 LABORATORY TESTING RESULTS…… 5
6.1 Soil Gradation Analysis…….. 5
6.2 Unconfined Compression Tests……. 5

7.0 RECOMMENDATIONS……6
7.1 Geotechnical Issues……..6
7.2 Foundation Types……6
7.3 Bearing Strata and Bearing Pressure……9
7.4 Sub grade Preparation and Frost Protection……9
7.5 Static Design Parameters……10

8.0 CONSTRUCTIBILITY……..……10
8.1 Abutment at Allen Street……10
8.2 Pier 1……10
8.3 Pier 2……11
8.4 Abutment at St. Clair Avenue……11

9.0 LIMITATIONS……... 11

APPENDICES

Appendix 1 – Boring Location Plan and Subsurface Profile
Appendix 2 – Boring Logs
Appendix 3 – Laboratory Testing Results
Appendix 4 – Existing Geology and Soils Information from Published Sources
Appendix 5 – Limitations

1.0 INTRODUCTION

1.1 General Information

This Structure Geotechnical Report is for the proposed Bridge over Allen Street and East Street, New Britain to support the Busway. Foundation designs are in accordance with the Connecticut Department of Transportation Geotechnical Manual, using AASHTO Load and Resistance Factor Design (LRFD), 2004 with updates, design methodology.

2.0 PROPOSED CONSTRUCTION

A structure Type Study has been completed by the Program Manager. The proposed structure will consist of four, three-span continuous variable depth steel plate girders spaced at approximately 9'-9" on center. The superstructure would be slightly curved over the southern half of the bridge to follow the horizontal alignment of the Busway. The steel plate girders will support a composite reinforced concrete deck slab protected by membrane waterproofing and a 3" thick two-course bituminous concrete wearing surface.

Bolted field splices would be provided at points of dead load contraflexture in each span and at approximately 3rd points in the end spans (six splices per girder). During erection of structural steel, temporary supports may be required for the beam cantilevers at each pier.

High load multi-rotational bearings will be provided at all support locations. A neoprene strip seal expansion joint system with electrometric concrete headers will be provided at both abutments. The substructure will consist of full-height reinforced concrete abutments and solid stem piers on deep pile foundations. The abutments and piers would be skewed approximately 0 degrees relative to the Busway. The location and bridge plan is shown in Appendix 1 of this report. Also the location of the subsurface borings relative to the profile grade is shown in Appendix 1.

3.0 EXISTING SITE CONDITIONS

Overhead utilities exist along the south side of Allen Street. The utilities cross the roadway at the East Street intersection and continue along the west side of East Street. The utilities then cross East Street at the St. Clair Avenue intersection and run down the south side of St. Clair Avenue. In addition, there is a three way overhead traffic signal at the intersection of Allen and East Street.

An 18" Reinforced Concrete Pipe and a 8" sanitary sewer line intersect the proposed Busway alignment at approximately Busway station 107+60. The 8" sanitary pipe would likely be impacted by construction of pier 2 of the Allen/East Street Bridge structure.

A pilot subsurface exploration program was undertaken during the preliminary design phase of the Busway project. These preliminary borings established the preliminary design parameters of the structure and roadway design. In order to augment the preliminary boring information and to address specifically the critical locations of bearing structures, five (5) supervised test borings were performed at the following locations:

Proposed Bridge – At new abutment, Sta. 103+88 (B-134)
Proposed Bridge – At new pier, Sta. 105+69 (B-135)
Proposed Bridge – At new pier, Sta. 107+75 (B-136)
Proposed Bridge – At new abutment, Sta. 110+37 (B-137)
Proposed Bridge – At new abutment, Sta. 111+15 (B-138)

The test borings along the abandoned railroad were advanced utilizing truck mounted drilling equipment and extended to depths of 8' to 60' feet below the existing surface grades. The borings were performed using 4" outside diameter (3.25" I.D.) hollow stem augers, unless otherwise noted on the boring logs. In some cases 4" outside diameter solid stem augers and roller bits were used. To obtain the rock cores the drillers rotated a 2" inside diameter diamond encrusted NQ core barrel at the top of suspected bedrock. All field work was performed under the direct technical observation of a representative from VN Engineers, Inc. Our representative located the explorations in the field, maintained a continuous log of the explorations as the work proceeded, and supervised the soil sampling operations so as to develop the required subsurface information.

Select soil samples were subjected to laboratory testing. The laboratory program included moisture content determinations, and grain size, including hydrometer analyses. The results of the laboratory tests are attached in Appendix 3.

The results of the subsurface exploration program and laboratory analyses have provided the basis for our engineering analysis and design recommendations.

4.0 SUBSURFACE DATA

There are logs of existing borings taken near the proposed location of the bridge bearing structures during the pilot boring program conducted in 2003. The complete logs of these pilot borings are included in Appendix 2. The subsurface investigations taken in 2007 for this report are designated as B-134 at abutment 1, B-135 at pier 1, B-136 at pier 2, B-137 and B-138 at abutment 2. The complete logs of these holes are also shown in Appendix 2. Ten feet of rock core was taken at these locations where rock was encountered. The soil in these holes consisted of varying layers of Red brown silt or Red brown sand and gravel. Blow counts on the stiffer bottom layers were from 20 to over 100 blows per foot in the sampler. Boring B-134 hit rock at 30 feet, boring SB-24 hit rock at 43 feet, boring SB-25 hit rock at 32 feet, boring SB-26 hit rock at 44 feet, boring SB-27 hit rock

at 57, and boring SB-28A hit rock at 50 feet. Ground water was observed to be between three (3) and fifteen (15) feet below the surface.

5.0 SUBSURFACE CONDITIONS

Based on our boring logs, as well as others, the following is a general description of the subsurface conditions in order of increasing depth:

Pavement – approximately 1' thick asphalt and gravel base was encountered at borings B-135 and B-136.
Sand / Silt – Sandy silt /or fine sand mixed with gravel was encountered in borings B-134 thru B-137 to depths of 10' to 15' below grade.
Silt / Clay – Red Brown clayey silt was encountered in borings B-136, B-137, and B-138 at depths ranging from 15' to 23' and 2' to 27' below surface grade.
Sand / Gravel – Red Brown medium dense sand with silt and gravel was encountered in borings B-134 thru B-138 at depths ranging from 10' below ground surface to 35' below grade.
Silt / Gravel – Very stiff red brown silt with sand, gravel, and cobbles was encountered in boring B-137 at depth ranging from 35' to 48' below the ground surface.
Bedrock – The borings performed for this study reached bedrock at depths of 30' and 48' below grade at holes B-134 and B-137, respectively. Bedrock was also encountered in Pilot Borings SB-24 thru SB-28 at depths ranging from 27' to 57' below the surface grades. The type of rock found was reddish brown Portland Arkose siltstone.
Groundwater – Groundwater was observed in all holes between three (3) and fifteen (15) feet below surface grade.

5.1 Geology

Published geologic data and the subsurface explorations supervised by VN Engineers, Inc. shows the proposed structure will be primarily founded on fine-grained non-cyclic sediment (Qfs) which consists of reddish brown clayey silt. This deposit generally extends from the surface to depths of about 10 to 15 feet. This deposit is underlain by very dense silty gravel and coarse grained sand layer with common occurrences of cobbles and boulders. In the vicinity of abutment 2, the fine grained noncyclic sediment was found to extend about 37 feet below grade. The glacial till encountered at depths ranging from 20 to 37 feet below surface grade consists of silty gravel and sand with shale fragments. The glacial till is underlain with red brown Portland Arkose siltstone (Jp). The generalized geology and existing subsurface information from published sources through the area of the Busway is shown in Appendix 4.

5.2 Soil and Rock Profile

The boring location plan and subsurface soil and rock profile is shown in Appendix 1 of this report.

6.0 LABORATORY TESTING RESULTS

6.1 Soil Gradation Analysis

The borings performed for this study indicate that the site is underlain by slightly different conditions which can be simplified as loose to medium dense sand to a maximum depth of 10 feet, followed by either dense sand or stiff silt to depths between 10 to 25 feet, underlain by very dense glacial till which begins as high as 10 feet below grade and extends to as much as 52 feet below grade. Bedrock was encountered at a depth of 30 feet at boring B-134, however, not encountered to the maximum depth explored of 52.5 at boring B-137.

The loose sand soil was only encountered at borings B-135 and B-136, at depths of 10 and 8 feet below grade, respectively. B-135 consisted of very dense fine to coarse sand, some fine to coarse gravel, little silt, occasional cobbles (till) to the maximum depth of 32 feet. At boring B-136 the loose sand was underlain by stiff to very stiff silt to a depth of 23 feet, where the glacial till was initially encountered.

In contrast, no loose material was encountered at borings B-134 or 137, however medium dense sand or stiff silt was encountered from the ground surface to the top of the till layer, which was initially encountered at 15 and 25 feet below grade, respectively. Portland Arkose siltstone bedrock was encountered at boring B-134 at a depth of 30 feet below grade.

The soil gradation analysis and unconfined compression tests on the rock samples are shown in Appendix 3.

6.2 Unconfined Compression Tests

The borings performed for this study indicate that the site is underlain by Portland Arkose siltstone. Our laboratory tests on the samples of Portland Arkose siltstone indicate an average unconfined compressive strength of 3389 psi.

7.0 RECOMMENDATIONS

7.1 Geotechnical Issues

The following geotechnical issues are discussed in detail in separate sections included in this report:

- Foundation types
- Bearing Strata and Bearing Pressure
- Subgrade Preparation and Frost Protection
- Static Design Parameters

7.2 Foundation Types

The proposed abutments and piers will include spans of up to 250 feet, which will impose significant loads on the foundations. Although portions of the site soils may be sufficient for spread type foundations, the borings performed for this study indicate that the middle portions of the spans show loose sand to depths of 8 to 10 feet below grade, as well as silt soils to depths of 15 feet. While these soils could be over excavated and recompacted, there may be some degree of differential movement between the piers and the abutments due to the differing soil conditions and/or following the installation of fill soil at the abutments. Therefore, we recommend supporting the proposed new abutments and piers upon deep foundations.

For the loads required to support the elevated roadway, typical pile types may consist of concrete filled steel pipe piles, steel H-piles, or caissons. Installation of caissons would require disposal of soils, therefore it may be more economical to consider a driven steel pile. Given the choice of a concrete filled steel pipe or a steel H-pile, we understand that the ConnDOT would typically prefer to use H-piles for deep foundations.

Based upon the borings performed for this study, the site is underlain by several feet of glacial till prior to encountering bedrock. The till layer was generally encountered at depths ranging from 15 to 30 feet below the surface grades and ranges in thickness from approximately 15 feet to greater than 25 feet. Abutment 1 will have a footing elevation at elev. 101.0 within the dense silty sand soils. Therefore, a driven pile tip will bear within the glacial till layer at the approximate elev. 82.0. Bedrock was encountered at this location 30 feet below grade at elev. 77.0. Pier 1 will have a footing elevation at elev. 99.75 within the loose silty sand soils. The pile tip will bear within the glacial till layer at the approximate elev. 86.0. Pier 2 footing will be established at elev. 99.5 within the loose silty sand soils. The pile tip will bear within the glacial till layer at a depth greater than 32 feet below existing grade at an approximate elev. 65.0. Abutment 2 will have a footing elevation established at elev. 101.0 within the stiff clayey silt soils. The pile tip will bear within the glacial till layer

at the approximate elev. 67.0. Bedrock was encountered at this location 48 feet below grade at elev. 64.0. The actual depth of penetration into the till layer must be determined in the field via Pile Driving Analyzer (PDA), and later verified via full scale load testing.

Allowable load capacities for driven piles must be determined based upon Section 10 of the Interim 2006 LRFD Design Specifications. The driving stresses will be limited to 0.9 (0.65) Fy (LRFD 10.7.8) and the allowable pile resistance will be governed by the smaller of either the geotechnical design limitations or the structural design limitations. The structural design limitation will be governed by 0.34 Fy, with phi equal to 0.5, for difficult driving conditions. The geotechnical limitations may not be apparent until the piles are driven. Limitations in the actual allowable geotechnical capacity may be due to obstructions, such as boulders, which limit the required depth of penetration. Additionally, the actual geotechnical design capacity may be governed by the required uplift capacity of the pile. Although a pile which encounters a boulder may pass the required axial load test, the limited penetration may result in an insufficient factor of safety for the uplift capacity. Therefore, the required uplift capacity should be recalculated following the actual pile driving results.

Prior to installation of a driven pile the anticipated driving stresses must be determined by computer program and the actual driving stresses must be monitored during driving with a Piling Driving Analyzer (PDA).

For the purpose of this report it is assumed that the field conditions will allow the actual geotechnical resistance for the piles to equal or exceed the allowable design capacities provided below. However, the allowable geotechnical capacity will be determined by the site conditions. Therefore, the actual allowable geotechnical capacity of the pile must be verified in the field by a static load test. In accordance with the LRFD design method, and assuming an average load factor of 1.45, if the factored axial resistance capacities provided below are to govern the allowable design, the results of the load test would have to yield a value of at least 1.25 times the values provided below.

At least one static load test shall be performed, in accordance with section 10.7.3.8, for each different pile size and soil subsurface condition. The test pile should be driven with a Pile Driving Analyzer (PDA) and the combination of the pile load and dynamic test results should be used to calibrate a wave equation analysis. At least 5% (or no less than 4 of the remaining production piles) should be driven with the same hammer and driving criteria, utilizing the PDA, and the remaining piles shall be driven via the results of the wave equation analysis derived from the initial results.

We have provided four different steel H-pile sections for allowable geotechnical resistance capacities from 189 to 332 kips. Since the borings indicate boulders are likely to be encountered, we do not anticipate that a driven H-pile will reach competent bedrock. Therefore, we recommend anticipating 10 to 15 feet of pile embedment into the till layer, at best. A lighter capacity pile, which encounters a boulder will likely still pass the load test, while a higher capacity pile may not achieve enough resistance to support a sustained load. It should also be noted that a higher capacity hammer may damage the pile. Therefore, we recommend utilizing the 189 through 282 kips capacity piles, driven with a relatively light hammer, driven to the depth as determined by the PDA and load test, and deriving support within the till layer.

We have estimated the allowable geotechnical pile capacities in accordance with the LRFD method of design, assuming a depth of penetration into the glacial till layer of 10 to 15 feet. In our experience these capacities should be achieved with less penetration. The contractor should use these estimated penetrations to determine the pile length for the preconstruction test pile program, in accordance with section 10.7.3.3, and use the actual lengths to determine the production pile lengths. Therefore, the actual depth of penetration into the till layer must be determined in the field via a Pile Driving Analyzer (PDA), Piles which either encounter refusal at shallower depths than anticipated or do not achieve penetration into the till layer must be targeted for PDA testing.

Allowable Geotechnical Capacity

Pile Size	Tip Resistance	Total Skin Friction		Geotechnical Capacity
		Sand	Till	
HP 10 x 57	98 kips	35	56	189 kips
HP 12 x 74	127 kips	43	68	238 kips
HP 14 x 89	152 kips	50	80	282 kips
HP 14 x 117	200 kips	51	81	332 kips

Based upon the boring logs we occasionally encountered refusal blow counts above the till layer, therefore severe driving should be anticipated. The contractor may consider predrilling or spudding where obstructions are encountered. It should be noted that the group effect of the pile cap must be considered in accordance with 10.7.3.9.

It should be noted that the pile spacing should be limited to no less than 30”, or 2.5 pile diameters, whichever is greater. Additionally, we recommend performing laboratory analyses upon the different soil layers

encountered at the site to determine if the soil is corrosive to steel. Corrosion protection should be applied as required by the soil conditions.

7.3 Bearing Strata and Bearing Pressure

Based upon our review of the boring data at the proposed design subgrade elevations for the proposed new abutments and piers, the soils range in consistency from either loose to dense natural sand soils, to medium stiff natural silt. Additionally, the sand soils at B-137 are underlain by a layer of silt with 20 to 30% clay. Although these soils could be improved to provide support for spread type foundations, the allowable bearing pressure would likely be limited to 2 tsf in order to limit the settlement.

7.4 Subgrade Preparation and Frost Protection

As previously stated, the majority of the natural soils encountered at the depth of the proposed abutment/pier subgrade elevations consisted of either loose to dense natural sand soils or medium stiff natural silt soils, which could be susceptible to disturbance. Therefore, there will be some degree of site preparation required in order to protect the subgrade from disturbance due to heavy construction equipment, as well as adverse weather conditions, and provide sufficient support for the proposed pile caps.

Site preparation would naturally commence with clearing and stripping of asphalt and/or topsoil. Prior to commencement of clearing and stripping operations, any subsurface utilities and/or abandoned subsurface structures should be located within five (5) feet of the proposed construction area. Following excavation to the proposed subgrade elevation we recommend having the subgrade inspected by a qualified geotechnical engineer. Any areas which are determined to be insufficient for support of the proposed concrete should be over excavated and replaced with controlled compacted fill. The subgrade soils at boring B-135 and B-136 consist primarily of loose sand and are more susceptible to disturbance due to exposure to adverse weather and/or heavy construction equipment; therefore care should be taken not to disturb the soil during excavation. Therefore, where loose silty sands are encountered at the subgrade elevation we recommend that the contractor should; 1) not work during adverse weather, 2) maintain positive drainage during construction, and 3) not leave the subbase soil exposed for extended periods. Additionally, if the existing soils below the subgrade elevations are found to be over saturated, we would recommend over excavating to a more suitable layer.

Portions of the soil to be removed may consist of sandy soil which is suitable for reuse as controlled compacted fill. Therefore, the State may consider separating these soils from the unsuitable materials and stockpiling them for future reuse, if at all practical. Any materials which are too silty, wet or compressible will not be suitable for reuse as controlled compacted fill or

backfill, and should be disposed of in a suitable manner, or stockpiled on-site for future use as general fill within any landscaped areas.

All fill material on-site or imported should consist of predominantly sandy soil which conforms to the ConnDOT, "Standard Specifications for Roads, Bridges and Incidental Construction, 1995" (Form 815). Let it be noted that all fill shall be at suitable moisture content for compaction. Additionally, the bottom of the foundation elevations shall have a minimum of four (4) feet of soil cover at all locations for frost protection.

7.5 Static Design Parameters

If backfilling is performed in accordance with our recommendations, the pressures exerted by the soil on the below grade foundation walls may be estimated by assuming the soils act as a fluid with a unit weight of 62 pounds per cubic foot. This assumes an at-rest pressure condition.

8.0 CONSTRUCTIBILITY

8.1 Abutment at Allen Street

The pile supported footing for the proposed abutment will be established at elevation 101.0 within the dense sand soils encountered between 1.5 and 15 feet below the existing surface grades. These soils are considered suitable for support of the proposed pile cap and are likely to require little to no preparation work. We understand that following the installation of the proposed abutment, approximately 18 feet of fill soil will be required to raise the roadway over Allen Street.

Following our site preparation procedures regarding proof rolling of the subgrade (if required), these soils will provide adequate support for the proposed fill soils, with little to no settlement. Minor settlement will occur during the load application. Preparation of the subgrade for the adjacent retaining walls, as well as a discussion regarding the recommended type of retaining walls is provided in a separate report.

It should be noted that ground water was not encountered in the borings performed in the vicinity of this abutment.

8.2 Pier 1

The subgrade elevation for the proposed pile supported footing will be established at elevation 99.75 within the loose sand soils encountered at 1.5 to 10 feet below the existing surface grades. These soils are considered marginally suitable for support of the proposed pile cap and are likely to require some degree of preparation, as described in Section 7.4. It should be noted that since the pier will be pile supported, the subgrade for the pile cap need only be nominally compacted, sufficiently to recompact any soils

loosened during construction and temporarily support the weight of the concrete cap.

It should be noted that ground water was encountered at a depth of 15.5 feet below the ground surface in the boring performed for this study.

8.3 Pier 2

The subgrade elevation for the proposed pile supported footing will be established at elevation 99.5 within the loose sand soils encountered at one (1) to eight (8) feet below the existing surface grades. These soils are considered marginally suitable for support of the proposed pile cap and are likely to require some degree of preparation, as described in Section 7.4.

It should be noted that ground water was encountered at a depth of 15 feet below the ground surface in the boring performed for this study.

8.4 Abutment at St. Clair Avenue

The subgrade elevation for the proposed pile supported footing will be established at elevation 101.0 within the medium dense sand soils encountered between the ground surface and 10 feet below the existing surface grades. These soils are considered suitable for support of the proposed pile cap and are likely to require little to no preparation work.

We understand that following the installation of the proposed abutment, approximately 27 feet of fill soil will be required to transition the roadway from the bridge portion to the existing ground surface elevation. Following our site preparation procedures regarding proof rolling of the subgrade, these soils will provide adequate support for the proposed fill soils, with little to no settlement. The anticipated minor settlement will occur during the load application. Preparation of the subgrade for the adjacent retaining walls, as well as a discussion regarding the recommended type of retaining walls is provided in a separate report.

It should be noted that ground water was not encountered in the borings performed in the vicinity of this abutment.

9.0 LIMITATIONS

This report is subject to the limitations attached as Appendix 5.

APPENDIX 1

BORING LOCATION PLAN

AND SUBSURFACE PROFILE

ST. MARY'S CEMETERY

APPROX. FILL SLOPE LIMIT (TYP.)

BUSWAY ℄

CLF

MBR

RETAINING WALL NO. 110

END BCPC BEGIN RETAINING WALL No. 110 STA 100+00

RIGHT-OF-WAY REVIEW

NON-ACCESS/ HIGHWAY LINE (TYP.)

WINGWALL

ALLEN STREET

MATCH LINE STA 95+00 - SEE DRAWING NO. BOR-09

MATCH LINE STA 106+00 - SEE DRAWING NO. BOR-11

96+00 97+00 98+00 99+00 100+00 101+00 102+00 103+00 104+00 105+00

16' 16'

BUSWAY

B-133 RB-6 SB-22 SB-23 SB-24 SB-25

MBR CLF

END BCPC BEGIN RETAINING WALL NO. 109 STA 98+25

1.5:1 SLOPE WITH CRUSHED STONE FOR SLOPE PROTECTION

DETENTION POND

B-144 B-145

PIPER BROOK

NON-ACCESS/ HIGHWAY LINE (TYP.)

CLF

REMOVE EXISTING RAILROAD TRACK

WINGWALL

BUSWAY OVER ALLEN STREEET AND EAST STREET

EXISTING CONC. CHANNEL

ROUTE 9 S.B.

598+00 599+00 600+00 601+00 602+00 603+00 604+00 605+00 606+00 607+00

EAST STREET (ROUTE 175)

MULTI-USE TRAIL

10' 10' 8' 8' 10' 10'

RIGHT-OF-WAY REVIEW

CUT BIT. CONC. PAVEMENT

GRANITE CURBING

EXISTING CONCRETE ENDWALL TO REMAIN

PIPER BROOK

RIGHT-OF-WAY REVIEW

BIT. CONC. DRIVEWAY (COMMERCIAL)

CUT BIT. CONC. PAVEMENT

LEGEND

BORING LOCATION

B-1XX BORING NUMBER

2005 PILOT BORING LOCATION

RB-X AND SB-X 2005 PILOT BORING NUMBER

REV.	DATE	DESCRIPTION	SHEET NO.
		REVISIONS	

SCALE IN FEET 40 0 40

SCALE 1"=80'

DESIGNER: R. VOLPE JR.

DRAFTER: M. BAUER

CHECKED BY: R. GOMEZ

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

ENGINEER: URS CORPORATION

APPROVED BY: DATE:

URS

URS CORP. 500 ENTERPRISE DRIVE, SUITE 3B ROCKY HILL, CT 06067 (860) 529-8882

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

CADD FILE: $DGNNAME$ PLOTTED DATE: 5/11/2010

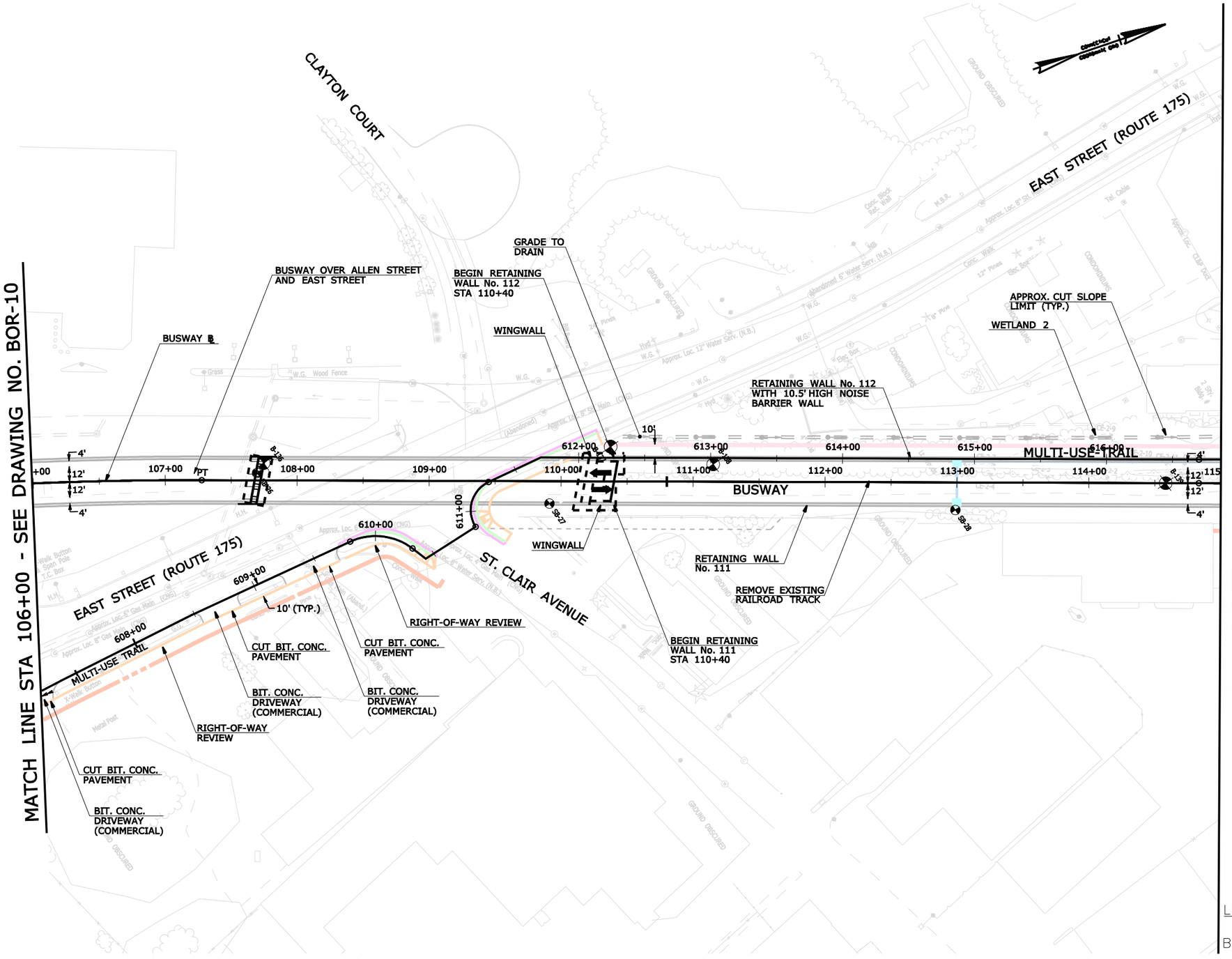
TOWN: NEW BRITAIN

DRAWING TITLE: BORING LOCATION PLAN

PROJECT NO.: 88-H035

DRAWING NO.: BOR-10

SHEET NO.: S



LEGEND

- BORING LOCATION
- B-1XX BORING NUMBER
- 2005 PILOT BORING LOCATION
- RB-X AND SB-X 2005 PILOT BORING NUMBER

REV.	DATE	DESCRIPTION	SHEET. NO.
		REVISIONS	

SCALE IN FEET
40 0 40
SCALE 1"=80'

DESIGNER: R. VOLPE JR.
DRAFTER: M. BAUER
CHECKED BY: R. GOMEZ

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

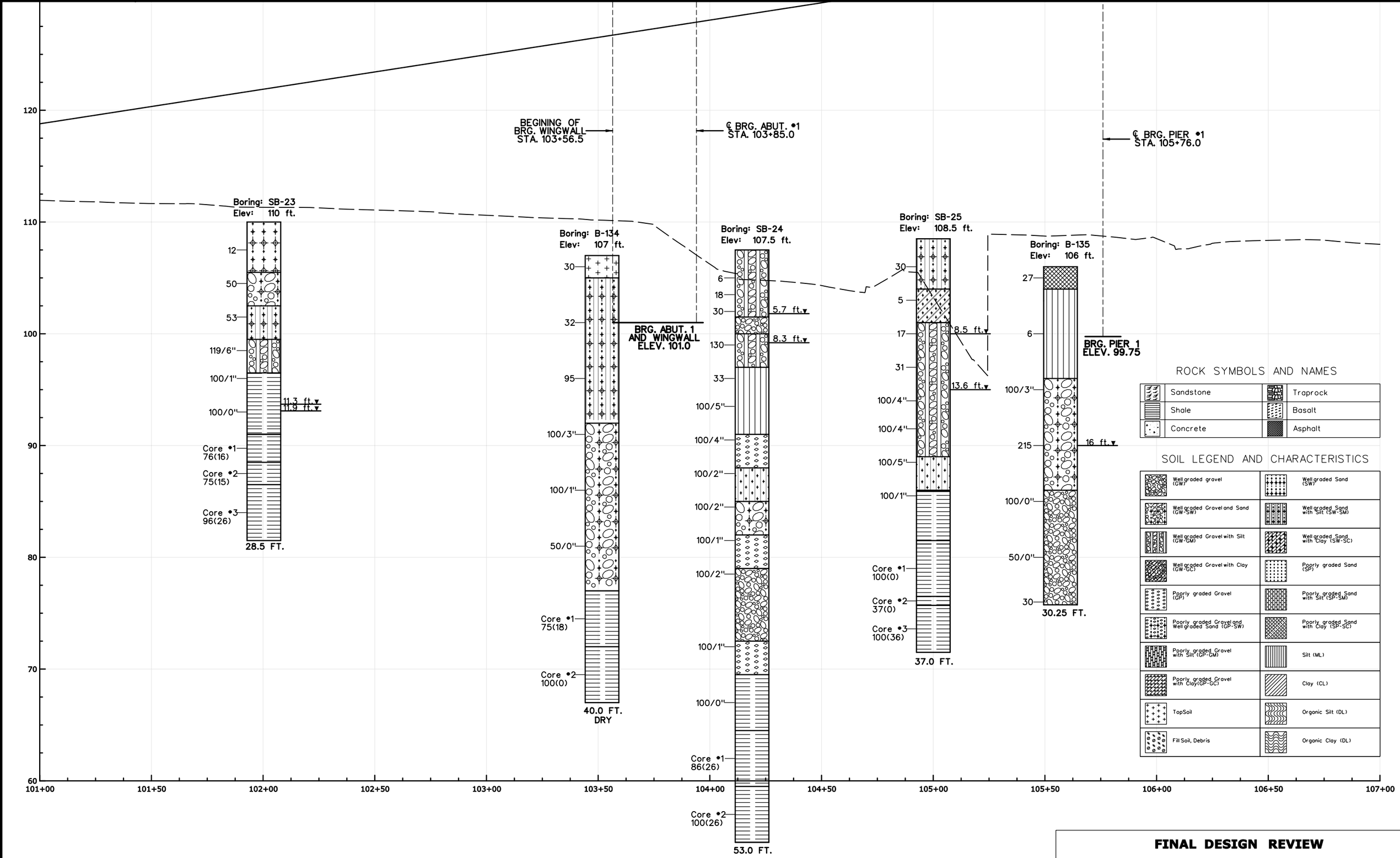
ENGINEER: URS CORPORATION
APPROVED BY: DATE:

URS
URS CORP.
500 ENTERPRISE DRIVE, SUITE 3B
ROCKY HILL, CT 06067
(860) 529-8882

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY
CADD FILE: $DGNNAME$ PLOTTED DATE: 5/11/2010

TOWN: NEW BRITAIN
DRAWING TITLE: BORING LOCATION PLAN

PROJECT NO.: 88-H035
DRAWING NO.: BOR-11
SHEET NO.: S



FINAL DESIGN REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted: $DATE$

DESIGNER/DRAFTER: M. BAUER
CHECKED BY: R. GOMEZ
HORIZ. SCALE IN FEET 0 10 20
VERT. SCALE IN FEET 0 4 8

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILEA$

SIGNATURE/BLOCK: VN ENGINEERS, INC.
116 WASHINGTON AVE.
NORTH HAVEN, CT 06473
(203) 234-7862

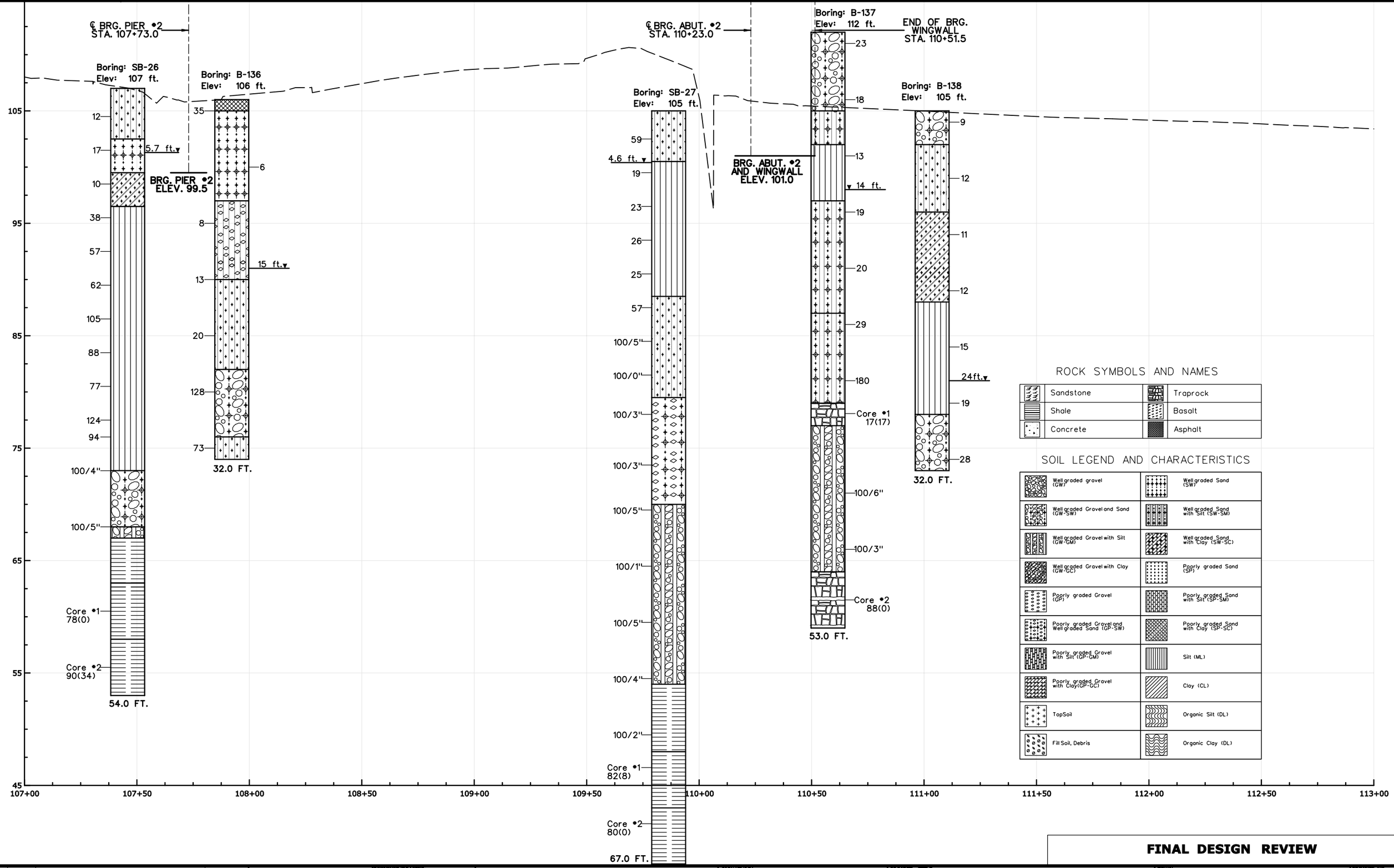
APPROVED BY: DATE:

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEW BRITAIN

DRAWING TITLE: SOIL PROFILE BRIDGE NO. XXXXX

PROJECT NO. 88-H035
DRAWING NO. PRO-1
SHEET NO. S



ROCK SYMBOLS AND NAMES

Sandstone	Traprock
Shale	Basalt
Concrete	Asphalt

SOIL LEGEND AND CHARACTERISTICS

Well graded gravel (GW)	Well graded Sand (SW)
Well graded Gravel and Sand (GW-SW)	Well graded Sand with Silt (SW-SM)
Well graded Gravel with Silt (GW-GM)	Well graded Sand with Clay (SW-SC)
Well graded Gravel with Clay (GW-GC)	Poorly graded Sand (SP)
Poorly graded Gravel (GP)	Poorly graded Sand with Silt (SP-SM)
Poorly graded Gravel and Well graded Sand (GP-SW)	Poorly graded Sand with Clay (SP-SC)
Poorly graded Gravel with Silt (GP-GM)	Silt (ML)
Poorly graded Gravel with Clay(GP-GC)	Clay (CL)
TopSoil	Organic Silt (DL)
Fill Soil, Debris	Organic Clay (DL)

FINAL DESIGN REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted: $DATE$

DESIGNER/DRAFTER: M. BAUER
CHECKED BY: R. GOMEZ
HORIZ. SCALE IN FEET 0 10 20
VERT. SCALE IN FEET 0 4 8

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILEA$

SIGNATURE/BLOCK: VN ENGINEERS, INC.
116 WASHINGTON AVE.
NORTH HAVEN, CT 06473
(203) 234-7862
APPROVED BY: DATE:

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEW BRITAIN

DRAWING TITLE: SOIL PROFILE BRIDGE NO. XXXXX

PROJECT NO. 88-H035
DRAWING NO. PRO-2
SHEET NO. S

APPENDIX 2

BORING LOGS

Driller: New England Boring / Mike	**Connecticut DOT Boring Report**	Hole No.: B-133	
Inspector: VN Engineers / Necip	TOWN: New Britain	Stat./Offset: 98+79 / 7' Right	
Engineer: Ray Volpe Jr.	Project No.: 88-H035	Northing: 809494	
Start Date: 7/5/2007	Route No.:	Easting: 996531	
Finish Date: 7/5/2007	Bridge No.:	Surface Elevation: 113	
Project Description:	**New Britain - Hartford Busway**		
Casing Size/Type: 3.25" I.D. HSA	Sampler Type/Size: Split Spoon / 1 3/8"	Core Barrel Type: 2" NQ	
Hammer Wt.: Fall:	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations: Dry	@ 16 after 0 hours		

Depth (ft)	SAMPLES: Sample Type/ No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0								113
	SS-1	7, 14, 22, 27	24"	13"			Brown F-C SAND, some F gravel, little silt	
5						5'		108
	SS-2	25, 100/2"	8"	4"			Red Brown F-C GRAVEL, some F sand, little silt	
10						9'		103
	-	27, 33, 40, 35	24"	0"			Red Brown F-C GRAVEL, some F sand, little silt, cobbles. Till	
15						15'		98
	C-1	4 Min					Rock Core Run #1	
	C-1	2 Min					15'-20' Rec. 45"	
	C-1	3 Min					RQD = 21/60 = 35%	
	C-1	4 Min					Red Brown Silt Stone	
	C-1	4 Min						
20							EOB @ 20'	93
25								88
30								83
35								78
40								73

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50 %

Total Penetration in Earth: 15' Rock: 5' No. of Samples: 2	NOTES: Auger refusal at 15' Began rock core run at 15'	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Mike	**Connecticut DOT Boring Report**		Hole No.: B-134
Inspector: VN Engineers / Necip	TOWN: New Britain		Stat./Offset: 103+88 / 10' Left
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 809964
Start Date: 7/3/2007	Route No.:		Easting: 996723
Finish Date: 7/3/2007	Bridge No.:		Surface Elevation: 107
Project Description:	**New Britain - Hartford Busway**		
Casing Size/Type: 3.25" I.D. HSA	Sampler Type/Size: Split Spoon / 1 3/8"		Core Barrel Type: 2" NQ
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations:			@ 13 after 0 hours

Depth (ft)	SAMPLES: Sample Type/ No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0								107
	SS-1	10, 15, 15, 19	24"	18"		2'	Top soil Black F-C sand	
5	SS-2	13, 15, 17, 18,	24"	16"			Red Brown F-C SAND, some silt, little F gravel MC = 12.80%	102
10	SS-3	46, 47, 48, 36	24"	17"				97
15	SS-4	35, 100/3"	9"	7"		15'		92
20	SS-5	100/1"	1"	1"			Red Brown F-C GRAVEL, some F-C sand, little silt, cobbles. Till	87
25	SS-6	50/0"	0"	0"				82
30						30'	Top of rock @ 30'	77
	C-1	7 Min					Rock core run # 1 30'-35' Rec. 45" RQD = 11"/60" = 18%	
	C-1	5 Min						
	C-1	5 Min						
	C-1	7 Min						
	C-1	5 Min						
35	C-2	5 Min					Rock core run # 2 35'-40' Rec. 50" RQD = 0"/60" = 0%	72
	C-2	8 Min						
	C-2	8 Min						
	C-2	10 Min						
	C-2	7 Min						
40							EOB @ 40'	67

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50 %

Total Penetration in Earth: 30' Rock: 10' No. of Samples: 6	NOTES: Spoon refusal at 15'-17' and 20'-22'. Cobbles and boulders Used 4" casing and 4" Rollerbit from 15'-30' to bore through till Began coring rock at 30'	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Orrin	**Connecticut DOT Boring Report**		Hole No.: B-135
Inspector: VN Engineers / M. Bauer	TOWN: New Britain		Stat./Offset: 105+69 / 3' L
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 810116
Start Date: 7/2/2007	Route No.:		Easting: 996822
Finish Date: 7/2/2007	Bridge No.:		Surface Elevation: 106
Project Description:	**New Britain - Hartford Busway**		
Casing Size/Type: 3.25" / HSA	Sampler Type/Size: Split Spoon / 1 3/8"		Core Barrel Type:
Hammer Wt.: Fall:	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations:			@ 16' after 0 hours

Depth (ft)	SAMPLES: Sample Type/ No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0								106
	SS-1	22, 17, 10, 5	24"	18"		2'	asphalt and gravel base	
5	SS-2	2, 2, 4, 5	24"	17"		10'	Red Brown F SAND and silt, little F-C gravel	101
10	SS-3	100/3"	3"	1"		20'	Red Brown F-C SAND, some F-C gravel, little silt, cobbles. Glacial till	96
15	SS-4	24, 65, 150	18"	14"				91
20	SS-5	25, 100/0"	6"	5"		31'	Gray Brown F-C SAND, some F-C gravel, little schist, little silt, cobbles. Glacial till	86
25	SS-6	100/3"	3"	3"				81
30	SS-7	100/3"	3"	3"			EOB @ 30' 3"	76
35								71
40								66

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50 %

Total Penetration in Earth: 31' Rock: No. of Samples: 7	NOTES: Auger grinding at 10'-30' glacial till and cobbles	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Mike	**Connecticut DOT Boring Report**		Hole No.: B-136
Inspector: VN Engineers / Necip	TOWN: New Britain		Stat./Offset: 107+75 / 13' L
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 810292
Start Date: 7/2/2007	Route No.:		Easting: 996930
Finish Date: 7/2/2007	Bridge No.:		Surface Elevation: 106
Project Description:	**New Britain - Hartford Busway**		
Casing Size/Type: 3.25" I.D. HSA	Sampler Type/Size: Split Spoon / 1 3/8"		Core Barrel Type: 2" NQ
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations:			@ 15' after 0 hours

Depth (ft)	SAMPLES: Sample Type/ No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	SS-1	14, 18, 17, 23	24"	8"		1'	Asphalt and gravel base	106
5	SS-2	4, 3, 3, 3	24"	12"		8'	Red Brown F-C SAND, trace silt	101
10	SS-3	2, 3, 5, 7	24"	20"		15'	Red Brown SILT and F gravel, some F-C sand, trace clay	96
15	SS-4	6, 6, 7, 8	24"	24"		23'	Red Brown SILT, little F sand	91
20	SS-5	8, 10, 10, 12	24"	24"		30'	Red Brown F-C SAND, some F-C gravel, little silt	86
25	SS-6	52, 63, 65, 81	24"	14"				81
30	SS-7	44, 35, 38, 50	24"	18"			Red brown F SAND, some silt, trace F gravel	76
35							EOB @ 32'	71
40								66

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50 %

Total Penetration in Earth: 32' Rock: No. of Samples: 7	NOTES:	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Mike	**Connecticut DOT Boring Report**		Hole No.: B-137
Inspector: VN Engineers / Necip	TOWN: New Britain		Stat./Offset: 110+37 / 26' Left
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 810512
Start Date: 7/2/2007	Route No.:		Easting: 997074
Finish Date: 7/3/2007	Bridge No.:		Surface Elevation: 112
Project Description:	**New Britain - Hartford Busway**		
Casing Size/Type: 3.25" I.D. HSA	Sampler Type/Size: Split Spoon / 1 3/8"		Core Barrel Type: 2" NQ
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations:			@ 14' after 0 hours

Depth (ft)	SAMPLES Sample Type/ No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	SS-1	5, 11, 12, 10	24"	10"				112
							Red Brown F-C SAND, some F-M gravel, little silt	
5	SS-2	5, 8, 10, 16	24"	15"		7'		107
						10'	Brown F-C SAND, some silt, trace F gravel	
10	SS-3	3, 7, 6, 6	24"	24"				102
						15'	Red Brown SILT, some clay, trace F-C sand MC=25.4%	
15	SS-4	9, 9, 10, 12	24"	0"				97
							Red Brown F-C SAND, some silt, little F-C gravel	
20	SS-4	5, 7, 13, 13	24"	24"				92
						25'		
25	SS-5	12, 15, 14, 19	24"	24"				87
							Brown F-C SAND, some silt, some C gravel	
30	SS-6	38, 80, 100/6"	18"	17"		33'		82
	C-1	2 Min					Rock core run #1 33'-35'	
	C-1	2 Min				35'	Rec. 4" RQD = 4"/24" Gray Boulder	
35								77
40	SS-7	100/6"	24"	6"			Red Brown SILT, some F-C gravel, cobbles, boulders (till)	72
45	SS-8	80, 100/3"	9"	8"				67
						48'	Top of Rock	
	C-2	4 Min					Rock core run # 2	
	C-2	5 Min					47.5'-52.5' Rec. 53"	
50	C-2	4 Min			0%		RQD = 0"/60"	62
	C-2	5 Min					cored Boulders, Till	
	C-2	7 Min					EOB @ 53'	
55								57
60								52

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50 %

Total Penetration in Earth: 48' Rock: 5' No. of Samples: 8	NOTES: No rec. at 15'-17' Glacial Till at 52.5' Began coring at 47.5'	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Orrin	**Connecticut DOT Boring Report**		Hole No.: B-138
Inspector: VN Engineers / M. Bauer	TOWN: New Britain		Stat./Offset: 111+15 / 13' Left
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 840568
Start Date: 7/2/2007	Route No.:		Easting: 997130
Finish Date: 7/2/2007	Bridge No.:		Surface Elevation: 105
Project Description:	**New Britain - Hartford Busway**		
Casing Size/Type: 3.25" / HSA	Sampler Type/Size: Split Spoon / 1 3/8"		Core Barrel Type:
Hammer Wt.: Fall:	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations:		@ 24' after 0 hours	

Depth (ft)	SAMPLES: Sample Type/ No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0								105
	SS-1	4, 5, 4, 5	24"	12"		3'	Red Brown F-C SAND, some F-C Gravel	
5	SS-2	3, 6, 6, 6	24"	22"		9'	Red Brown SILT, some F-M sand	100
10	SS-3	4, 5, 6, 7	24"	20"			Red Brown SILT, some clay, trace F-C sand MC=22.8%	95
15	SS-4	3, 5, 7, 8	24"	20"		17'		90
20	SS-5	3, 6, 9, 8	24"	3"			Red Brown SILT, some clay	85
25	SS-6	8, 9, 10, 12	24"	1"		27'		80
30	SS-7	2, 5, 23, 10	24"	23"		32'	Red Brown F-C SAND, and F-C gravel, trace silt, cobbles, till	75
35							EOB @ 32'	70
40								65

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50 %

Total Penetration in Earth: 32' Rock: No. of Samples: 7	NOTES:	Sheet 1 of 1 SM-001-M REV. 1/02

Driller:	New England Boring / Orrin	**Connecticut DOT Boring Report**		Hole No.:	B-139
Inspector:	VN Engineers / M. Bauer	TOWN:	New Britain	Stat./Offset:	114+58
Engineer:	Ray Volpe Jr.	Project No.:	88-H035	Northing:	810838
Start Date:	7/3/2007	Route No.:		Easting:	997342
Finish Date:	7/3/2007	Bridge No.:		Surface Elevation:	102
Project Description:		**New Britain - Hartford Busway**			
Casing Size/Type:	3.25" / HSA	Sampler Type/Size:	Split Spoon / 1 3/8"	Core Barrel Type:	
Hammer Wt.:	Fall:	Hammer Wt.:	140 lb Fall: 30"		
Groundwater Observations:		@ 27' after 0 hours			

Depth (ft)	SAMPLES: Sample Type/ No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0								102
	SS-1	11, 17, 25, 20	24"	3"			Black F-C SAND and M-C gravel, little silt	
						3.5'		
5	SS-2	6, 8, 11, 10	24"	1"			Red Brown SILT, little F sand. MC=7.1%	97
10	SS-3	8, 10, 11, 12	24"	23"		12'		92
						15'	Red Brown SILT, some clay, trace F-M gravel	
15	SS-4	6, 7, 8, 12	24"	18"			Red Brown SILT, some clay, little M-C gravel, trace schist	87
20	SS-5	6, 5, 8, 9	24"	18"		22'	Red Brown SILT, some clay, little M-C gravel, trace schist	82
25	SS-6	10, 11, 11, 13	24"	23"			Red Brown SILT, some clay, little F sand	77
30	SS-7	9, 10, 10, 14	24"	24"		32'		72
							EOB @ 32'	
35								67
40								62

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50 %

Total Penetration in Earth: 32' Rock: No. of Samples: 7	NOTES:	Sheet 1 of 1 SM-001-M REV. 1/02

Driller:	New England Boring / Tim C.	**Connecticut DOT Boring Report**		Hole No.:	B-144
Inspector:	VN Engineers / M. Bauer	TOWN:	New Britain	Stat./Offset:	97+20 / 105' RT
Engineer:	Ray Volpe Jr.	Project No.:	88-H035	Northing:	809312.59
Start Date:	1/4/2010	Route No.:		Easting:	996579.26
Finish Date:	1/4/2010	Bridge No.:		Surface Elevation:	100
Project Description:		**New Britain - Hartford Busway Extra Work**			
Casing Size/Type:	3.25" / HSA	Sampler Type/Size:	Split Spoon / 1 3/8"	Core Barrel Type:	
Hammer Wt.:	Fall:	Hammer Wt.:	140 lb Fall: 30"		
Groundwater Observations:				@ 5' after 0 hours	

Depth (ft)	SAMPLES Sample Type/ No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	SS-1	2, 5, 6, 5	24"	18"		Silt & Sand	Red Brown SILT and f sand, little c-f gravel	100
						4'		
5	SS-2	29, 26, 46, 100/3"	21"	17"		Till	Red Brown SILT and c-f sand, some c-f gravel, Bedrock fragments, Till	95
						7.5'		
10							EOB @ 7.5'	90
15								85
20								80
25								75
30								70
35								65
40								60

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50 %

Total Penetration in Earth: 7.5' Rock: 0' No. of Samples: 2	NOTES: Auger refusal at 7.5'	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Tim C.	**Connecticut DOT Boring Report**	Hole No.: B-145	
Inspector: VN Engineers / M. Bauer	TOWN: New Britain	Stat./Offset: 98+30 / 145' RT	
Engineer: Ray Volpe Jr.	Project No.: 88-H035	Northing: 809405.46	
Start Date: 1/4/2010	Route No.:	Easting: 996645.77	
Finish Date: 1/4/2010	Bridge No.:	Surface Elevation: 100	
Project Description:	**New Britain - Hartford Busway Extra Work**		
Casing Size/Type: 3.25" / HSA	Sampler Type/Size: Split Spoon / 1 3/8"	Core Barrel Type:	
Hammer Wt.: Fall:	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations:	@ 5' after 0 hours		

Depth (ft)	SAMPLES Sample Type/ No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	SS-1	1, 6, 10, 13	24"	16"		Silt & Sand	Red Brown SILT and f sand, little c-f gravel	100
						4'		
5	SS-2	23, 100/3"	9"	7"		Till	Red Brown SILT and c-f sand, some c-f gravel, Bedrock fragments, Till	95
10	SS-3	100/6"	6"	5"			Red Brown c-f gravel, some silt, fractured siltstone	90
	C-1	5 Min					Rock core #1 10.5'-13.5'	
	C-1	3 Min	36"	30"	0%		Rec.= 30"/36" = 83% red brown silty shale	
	C-1	3 Min					highly fractured, slightly weathered	
							East Berlin Formation	
15	SS-4	50/0"	0"	0"			EOB @ 15'	85
20								80
25								75
30								70
35								65
40								60

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50 %

Total Penetration in Earth: 15' Rock: 0' No. of Samples: 3	NOTES: Auger refusal at 15'. Spoon refusal at 15'.	Sheet 1 of 1 SM-001-M REV. 1/02

The following boring logs have been transcribed or copied from the below source:

New Britain-Hartford Busway
Final Pilot Substructure and Rock Report

Driller: J. Galvin/GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-22**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 100+06 / 1' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 809615.3
Start Date: 02/25/03	Route No.:	Easting: 996569.1
Finish Date: 02/25/03	Bridge No.:	Surface Elevation: 112.8
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 11.7' after: 0 hours, @10.6' after: 24 hours, @10.9' after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0–1	W-N		1.5					112
2–3	S-1	36 28 24	1.5	1.2			POORLY GRADED SAND WITH GRAVEL (SP) - dark brown to black fine to coarse sand, some fine to medium gravel, little silt; moist, very dense, NP; (FILL).	111, 110
4	W-N		1.5					109
4.5'							ELEV. 108.3	
5	S-2	48 137/0.5	1.0	0.5			POORLY GRADED GRAVEL WITH SILT (GP-GM) - red fine to medium gravel, some silt, little fine to coarse sand; moist, very dense, NP; (FILL).	108
6–7	W-N		2.0					107, 106
8–9	S-3	22 23 21	1.5	1.2			POORLY GRADED GRAVEL WITH SILT (GP-GM) - red fine to medium gravel, some silt, little fine to coarse sand; moist, dense, NP; (FILL).	105, 104
10	W-N		1.5					103
10.5'							ELEV. 102.3	
11	S-4	140/0.5	0.5	0.3			GRAVELLY SILT (ML) - reddish brown silt, and fine to coarse gravel; moist, very dense, NP.	102
12	W-N		2.5					101
13								100
13.5'							ELEV. 99.3	
14	S-5	150/0.5	0.5	0.5				99
14.0'							POORLY GRADED GRAVEL WITH SILT (GP-GM) - red fine to medium gravel, little silt; moist, very dense, NP; (DECOMPOSED ROCK).	
							ELEV. 98.8	
15								98
16–17	W-N		5.0					97, 96
18								95
19				1.7	0.0		SANDY SILTSTONE; red, medium hard, moderately weathered; vugs and micaceous throughout.	94, 93

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 19.0' Rock: 10.0' No. of Samples: 5	NOTES:	Sheet **1** of **2** SM-001-M REV. 1/02

Driller: J. Galvin/GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-22**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 100+06 / 1' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 809615.3
Start Date: 02/25/03	Route No.:	Easting: 996569.1
Finish Date: 02/25/03	Bridge No.:	Surface Elevation: 112.8
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 11.7' after: 0 hours, @10.6' after: 24 hours, @10.9' after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20	C-1		1.8	94%	0%			
21	C-2		3.2	3.2 / 100%	1.1 / 34%		SANDY SILTSTONE; red, medium hard, moderately weathered; vugs and micaceous throughout.	92
22								91
23								90
24	C-3		1.0	0.7 / 70%	0.0 / 0%		SANDY SILTSTONE; red, medium hard, moderately weathered; vugs and micaceous throughout.	89
25	C-4		4.0	4.0 / 100%	1.3 / 32%		SANDY SILTSTONE; red, medium hard, moderately weathered; vugs and micaceous throughout.	88
26								87
27								86
28								85
29							ELEV. 83.8	84
30							End of boring at 29.0'.	83
31								82
32								81
33								80
34								79
35								78
36								77
37								76
38								75
39								74
								73

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 19.0' Rock: 10.0' No. of Samples: 5	NOTES:	Sheet **2** of **2** SM-001-M REV. 1/02

Driller: Galvin/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-23**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 102+00 /14' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 809786.5
Start Date: 02/24/03	Route No.:	Easting: 996658.3
Finish Date: 02/25/03	Bridge No.:	Surface Elevation: 110.1
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 15.1' after: 0 hours, @11.9' after: 24 hours, @11.3' after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0	W-N		1.5					110
1								109
2	S-1	6 12 15	1.5	1.0			WELL GRADED SAND WITH GRAVEL (SW) - reddish brown and black fine to coarse sand, little fine to medium gravel; dry, medium dense, NP; (FILL).	108
3	W-N		1.5					107
4								106
4.5'							ELEV. 105.6	
5	S-2	22 50 40	1.5	1.0			POORLY GRADED GRAVEL WITH SAND (GP-SP) - reddish brown fine to coarse gravel, little fine to coarse sand, trace silt; moist, very dense, NP; (FILL).	105
6	W-N		1.5					104
7								103
7.5'							ELEV. 102.6	
8	S-3	81 53 50	1.5	1.5			WELL GRADED SAND WITH SILT (SW-SM) - reddish brown fine to coarse sand, some silt, little fine to medium gravel; wet, very dense, NP.	102
9	W-N		1.5					101
10								100
10.5'							ELEV. 99.6	
11	S-4	73 119/0.5	1.0	0.8			GRAVELLY SILT (ML) - reddish brown silt, some fine to medium gravel, trace fine sand; wet, very dense, NP.	99
12	W-N		2.0					98
13								97
13.5'							ELEV. 96.6	
13.6'	S-5	100/0.1	0.1	0.1			WELL GRADED GRAVEL (GW) - red fine to coarse gravel; wet, very dense, NP (DECOMPOSED ROCK).	
14								96
							ELEV. 96.5	
15	W-N		2.9					95
16								94
17	S-6	100/0.0	0.0	0.0				93
18	W-N		3.0					92
19				1.9	0.4			91
19.4'							SANDSTONE; red, medium hard to hard, slightly to moderately weathered, micaceous, vugs, and calcite	

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger

Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 19.0' Rock: 9.5' No. of Samples: 6	NOTES:	Sheet **1** of **2** SM-001-M REV. 1/02

Driller: Galvin/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-23**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 102+00 /14' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 809786.5
Start Date: 02/24/03	Route No.:	Easting: 996658.3
Finish Date: 02/25/03	Bridge No.:	Surface Elevation: 110.1
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 15.1' after: 0 hours, @11.9' after: 24 hours, @11.3' after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20	C-1		2.5				inclusions throughout. ELEV. 90.7	90
21				76%	16%		SILTSTONE; red, medium hard to hard, slightly weathered, micaceous, vugs, and calcite inclusions throughout.	89
22	C-2		2.0	1.5	0.3			88
23				75%	15%			87
24	C-3		5.0	4.8	1.3		SILTSTONE; red, medium hard to hard, slightly weathered, micaceous, vugs, and calcite inclusions throughout.	86
25								85
26								84
27								83
28				96%	26%		ELEV. 81.6	82
29							End of boring at 28.5'.	81
30								80
31								79
32								78
33								77
34								76
35								75
36								74
37								73
38								72
39								71

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 19.0' Rock: 9.5' No. of Samples: 6	NOTES:	Sheet **2** of **2** SM-001-M REV. 1/02

Driller: Nitch/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-24**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 104+00 /16' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 809962.9
Start Date: 02/11/03	Route No.:	Easting: 996751.2
Finish Date: 02/25/03	Bridge No.:	Surface Elevation: 107.4
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 5.7' after: 24 hours, @8.3' after: 48 hours, @ after: hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0–1	W-N		1.5					107
2	S-1	5 6 5	1.5	0.0				106, 105
3–4	S-2	8 18 122	1.5	0.1			SILTY GRAVEL (GM) - yellow-brown fine to coarse gravel, little silt; dry, medium dense to very dense, NP; (FILL).	104
5	S-3	18 30 100/0.3	1.3	0.8			SILTY GRAVEL (GM) - yellow-brown fine to coarse gravel, little silt; moist, very dense, NP; (FILL).	103, 102
6						6.0'	ELEV. 101.4	
7	W-N		1.7				Boulder at 6.0'	101
7.5'							ELEV. 99.9	100
8	S-4	52 130	1.0	0.5			SILTY GRAVEL (GM) - yellow-brown fine to coarse gravel, little silt; dry, medium dense to very dense, NP; (FILL).	99
9–10	W-N		2.0					98
10.5'							ELEV. 96.9	97
11	S-5	24 33 33	1.5	1.0			SILT (ML) - reddish brown silt, trace fine gravel; moist, very dense, NP.	96
12–13	W-N		1.5					95
14	S-6	100/0.4	0.4	0.0				94
15–16	W-N		2.6					93, 92
16.5'							ELEV. 90.9	91
17	S-7	100/0.3	0.3	0.3			POORLY GRADED GRAVEL (GP) - reddish brown fine to coarse gravel, trace silt, trace fine sand; wet, very dense, NP.	
18–19	W-N		2.7					90, 89
19.5'							ELEV. 87.9	88
	S-8	100/0.2	0.2	0.2				

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger

Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 43.0' Rock: 10.0' No. of Samples: 13	NOTES:	Sheet **1** of **3** SM-001-M REV. 1/02

Driller: Nitch/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-24**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 104+00 /16' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 809962.9
Start Date: 02/11/03	Route No.:	Easting: 996751.2
Finish Date: 02/25/03	Bridge No.:	Surface Elevation: 107.4
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 5.7' after: 24 hours, @8.3' after: 48 hours, @ after: hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20							SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, little silt, little fine to medium gravel; wet, very dense, NP.	87
21	W-N		2.8					86
22						22.5'	ELEV. 84.9	85
23	S-9	100/0.2	0.2	0.2			WELL GRADED GRAVEL WITH SAND (GW-SW) - reddish brown fine to coarse gravel, some fine to coarse sand, trace silt; wet, very dense, NP.	84
24	W-N		2.8					83
25						25.5'	ELEV. 81.9	82
26	S-10	100/0.1	0.1	0.1			POORLY GRADED GRAVEL (GP) - red fine to coarse gravel; wet, very dense, NP.	81
27	W-N		2.9					80
28						28.5'	ELEV. 78.9	79
29	S-11	100/0.2	0.2	0.2			WELL GRADED GRAVEL (GW) - red fine to medium gravel; wet, very dense, NP.	78
30								77
31								76
32	W-N		6.3					75
33								74
34								73
35	S-12	100/0.1	0.1	0.1		35.0'	ELEV. 72.4	72
36							POORLY GRADED GRAVEL (GP) - red fine to coarse gravel; wet, very dense, NP.	71
37	W-N		4.9					70
38						38.0'	ELEV. 69.4	69
39								68

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 43.0' Rock: 10.0' No. of Samples: 13	NOTES:	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: Nitch/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-24**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 104+00 /16' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 809962.9
Start Date: 02/11/03	Route No.:	Easting: 996751.2
Finish Date: 02/25/03	Bridge No.:	Surface Elevation: 107.4
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 5.7' after: 24 hours, @8.3' after: 48 hours, @ after: hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
40	S-13	100/0.0	0.0	0.0				67
41	W-N		3.0					66
42								65
43	C-1		5.0	4.3	1.3		SANDY SILTSONE; red medium hard to hard, moderately weathered, micaceous, vugs, and calcite inclusions throughout.	64
44								63
45								62
46								61
47				86%	26%			60
48	C-2		5.0	5.0	1.3		SANDY SILTSONE; red medium hard to hard, moderately weathered, micaceous, vugs, and calcite inclusions throughout.	59
49								58
50								57
51								56
52								55
53				100%	26%		ELEV. 54.4	
54							End of Boring at 53.0'.	54
55								53
56								52
57								51
58								50
59								49
								48

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 43.0' Rock: 10.0' No. of Samples: 13	NOTES:	Sheet **3** of **3** SM-001-M REV. 1/02

Driller: T. Galvin/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-25**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 105+00 / 6' L
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810060.2
Start Date: 02/25/03	Route No.:	Easting: 996782.3
Finish Date: 02/26/03	Bridge No.:	Surface Elevation: 108.6
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/ 1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 8.5' after: 0 hours, @13.6' after: 24 hours, @13.9' after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0–1	W-N		1.5					108
2–3	S-1	42 30 25	1.5	0.7			SILTY SAND WITH GRAVEL (SM) - reddish brown to black fine to coarse sand, some silt, some fine to coarse gravel; dry, very dense, NP; (FILL).	107, 106
3–4	W-N		1.5					105
4.5'							ELEV. 104.1	104
5–6	S-2	16 5 2	1.5	0.9			SILTY CLAY (CL-ML) - reddish brown clay, some silt, trace fine to medium sand; moist, medium stiff, +PL; organics present (FILL).	103
6–7	W-N		1.5					102
7.5'							ELEV. 101.1	101
8–9	S-3	20 17 24	1.5	1.0			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to coarse gravel, little fine to medium sand; moist, medium dense, NP.	100
9–10	W-N		1.5					99
11–12	S-4	29 31 30	1.5	1.2			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to coarse gravel, trace fine to medium sand; moist, very dense, NP.	98, 97
12–13	W-N		1.5					96
14	S-5	48 100/0.3	0.8	0.7			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to coarse gravel, little fine to medium sand; moist, very dense, NP.	95
15–16	W-N		2.2					94, 93
17	S-6	100/0.3	0.8	0.3			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to coarse gravel, trace fine to medium sand; moist, very dense, NP.	92
18–19	W-N		2.2					91, 90
19.5'		70					ELEV. 89.1	89

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 27.0' Rock: 10.0' No. of Samples: 8	NOTES:	Sheet **1** of **2** SM-001-M REV. 1/02

Driller: T. Galvin/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-25**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 105+00 / 6' L
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810060.2
Start Date: 02/25/03	Route No.:	Easting: 996782.3
Finish Date: 02/26/03	Bridge No.:	Surface Elevation: 108.6
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/ 1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 8.5' after: 0 hours, @13.6' after: 24 hours, @13.9' after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT E (LD4 1/03)

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20	S-7	100/0.4	0.9	0.8			SILTY SAND WITH GRAVEL (SM) - dark brown fine to medium sand, some silt, some fine to medium gravel; moist, very dense, NP	88
21	W-N		2.1					87
22						22.5'	ELEV. 86.1	86
23	S-8	100/0.1	0.1	0.1		22.6'	POORLY GRADED GRAVEL (GP) - red fine to coarse gravel, trace silt, trace fine to coarse sand; wet, very dense, NP (DECOMPOSED ROCK).	85
24							ELEV. 86.0	
25	W-N		4.4					84
26								83
27								82
28				5.0	0.0		SILTY SANDSTONE; red, medium hard to hard, moderately to highly weathered, very fine to medium-grained, calcite inclusions throughout.	81
29	C-1		5.0					80
30								79
31								78
32				100%	0%			77
33	C-2		0.8	0.3 / 37%	0.0 / 0%	32.8'	SILTY SANDSTONE; red, medium hard to hard, moderately to highly weathered, very fine to fine-grained, calcite inclusions throughout.	76
34				4.2	1.5		ELEV. 75.8	75
35	C-3		4.2				SANDY SILTSTONE; red, medium hard to hard, moderately weathered, micaceous, vugs and calcite inclusions throughout.	74
36								73
37				100%	36%		ELEV. 71.6	72
38							End of Boring at 37.0'.	71
39								70
								69

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger

Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 27.0' Rock: 10.0' No. of Samples: 8	NOTES:	Sheet **2** of **2** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-26**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 107+69 / 5' L
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810283.6
Start Date: 02/21/03	Route No.:	Easting: 996934.1
Finish Date: 02/24/03	Bridge No.:	Surface Elevation: 107.1
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/ 1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	
Groundwater Obs. @ 15.0' after: 0 hours, @15.0' after: 24 hours, @15.0' after: 48 hours		

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0								107
1	W-N		1.5					106
2	S-1	14 7 5	1.5	1.5			SANDY SILT WITH GRAVEL (ML) - reddish brown to black silt, some fine to coarse sand, little fine to medium gravel; moist, medium dense, NP; (FILL).	105
3								104
4	W-N		1.5					103
						4.5'	ELEV. 102.6	
5	S-2	9 9 8	1.5	0.3			SILTY SAND (SM) - reddish brown fine to coarse sand, little silt, trace fine gravel; wet, medium dense, NP; (FILL).	102
6								101
7	W-N		1.5					100
						7.5'	ELEV. 99.6	
8	S-3	5 6 4	1.5	1.0			SILTY CLAY (ML-CL) - reddish brown silt, some clay, trace fine gravel; moist, stiff, +PL; (FILL).	99
9								98
10	W-N		1.5					97
						10.5'	ELEV. 96.6	
11	S-4	6 9 29	1.5	0.7			GRAVELLY SILT WITH SAND (ML) - reddish brown to black silt, some fine to coarse gravel, trace fine sand; moist, hard, -PL; (FILL).	96
12								95
13	W-N		1.5					94
14	S-5	22 26 31	1.5	1.5			GRAVELLY SILT WITH SAND (ML) - reddish brown to black silt, some fine to coarse gravel, little fine to coarse sand; moist, hard, -PL; (FILL).	93
15								92
16	W-N		1.5					91
17	S-6	35 31 31	1.5	1.5			GRAVELLY SILT WITH SAND (ML) - reddish brown to black silt, some fine to coarse gravel, little fine to coarse sand; moist, hard, NPL; (FILL).	90
18								89
19	W-N		1.5					88
		26						

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 44.0' Rock: 10.0' No. of Samples: 13	NOTES:	Sheet **1** of **3** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-26**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 107+69 / 5' L
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810283.6
Start Date: 02/21/03	Route No.:	Easting: 996934.1
Finish Date: 02/24/03	Bridge No.:	Surface Elevation: 107.1
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/ 1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 15.0' after: 0 hours, @15.0' after: 24 hours, @15.0' after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20	S-7	32 73	1.5	0.0				87
21								86
22	W-N		1.5					85
23	S-8	58 48 40	1.5	1.5			SILT WITH SAND (ML) - reddish brown to black silt, little fine to coarse sand, trace fine gravel; moist, very dense, NP.	84
24								83
25	W-N		1.5					82
26	S-9	35 35 42	1.5	1.3			SILT WITH SAND (ML) - reddish brown to black silt, little fine to coarse sand, trace fine gravel; moist, very dense, NP.	81
27								80
28	W-N		1.5					79
29	S-10	51 60 64	1.5	0.5			SILT WITH SAND (ML) - reddish brown to black silt, little fine to coarse sand, trace fine gravel; wet, very dense, NP.	78
30	S-11	65 48 46	1.5	0.7			SANDY SILT WITH GRAVEL (ML) - reddish brown silt, some fine to coarse sand, little fine to medium gravel; wet, very dense, NP.	77
31								76
32	W-N		2.5					75
33								74
34						34.0'	ELEV. 73.1	73
35	S-12	73 100/0.3	0.8	0.7			WELL GRADED SAND WITH GRAVEL (SW) - reddish brown fine to coarse sand, some fine to medium gravel, trace silt; moist, very dense, NP.	72
36								71
37	W-N		4.2					70
38								69
39	S-13	100/0.4	0.4	0.4		39.0'	ELEV. 68.1 GRAVELLY SILT (ML) - reddish brown to black silt,	68

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger

Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 44.0' Rock: 10.0' No. of Samples: 13	NOTES:	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-26**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 107+69 / 5' L
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810283.6
Start Date: 02/21/03	Route No.:	Easting: 996934.1
Finish Date: 02/24/03	Bridge No.:	Surface Elevation: 107.1
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/ 1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 15.0' after: 0 hours, @15.0' after: 24 hours, @15.0' after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
40						40.0'	some fine to coarse gravel; moist, very dense, NP. ELEV. 67.1	67
41								66
42	W-N		4.6					65
43								64
44				3.9	0.0		SANDSTONE; red, medium hard to hard, moderately weathered; vugs, calcite inclusions, and cross bedding throughout, micaceous, very fine-grained.	63
45								62
46	C-1		5.0					61
47								60
48				78%	0%			59
49				4.5	1.7		SANDSTONE; red, medium hard to hard, moderately weathered; vugs, calcite inclusions, and cross bedding throughout, micaceous, very fine-grained.	58
50								57
51	C-2		5.0					56
52								55
53								54
54				90%	34%		ELEV. 53.1	53
							End of boring at 54.0'.	
55								52
56								51
57								50
58								49
59								48

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 44.0' Rock: 10.0' No. of Samples: 13	NOTES:	Sheet **3** of **3** SM-001-M REV. 1/02

Driller: J. Nitch/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-27**
Inspector: Mark Martin	Town: New Britain / Newington, CT	Stat./Offset: 109+91 /17' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810450.0
Start Date: 02/20/03	Route No.:	Easting: 997082.3
Finish Date: 02/21/03	Bridge No.:	Surface Elevation: 105.3
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 2.5 after: 0 hours, @4.6 after: 24 hours, @ after: hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0								105
1	A-N		1.5					104
2	S-1	21 35 24	1.5	0.4			SILTY SAND WITH GRAVEL (SM) - gray, reddish brown and black fine to medium sand, some silt, little to some medium to coarse gravel; moist, very dense, NP (FILL).	103
3								102
4	A-N		1.5			4.5'	ELEV. 100.8	101
5	S-2	8 9 10	1.5	1.5			SILT (ML) - reddish brown silt; moist, very stiff, +PL.	100
6								99
7	A-N		1.5					98
8	S-3	6 9 14	1.5	1.5			SILT (ML) - reddish brown silt; moist, very stiff, +PL.	97
9								96
10	A-N		1.5					95
11	S-4	7 11 15	1.5	1.2			SILT (ML) - reddish brown silt; moist, very stiff, +PL.	94
12								93
13	A-N		1.5					92
14	S-5	5 10 15	1.5	1.2			SILT (ML) - reddish brown silt; moist, very stiff, +PL.	91
15								90
16	A-N		1.5			16.5'	ELEV. 88.8	89
17	S-6	45 42 15	1.5	1.0			SILTY SAND WITH GRAVEL (SM) - reddish brown fine sand, some silt, little to some medium to coarse gravel; moist, very dense, NP.	88
18								87
19	A-N		1.5					86
		51					SILTY SAND WITH GRAVEL (SM) - reddish brown	

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 57.0' Rock: 10.0' No. of Samples: 15	NOTES:	Sheet 1 of 4 SM-001-M REV. 1/02

Driller: J. Nitch/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-27**
Inspector: Mark Martin	Town: New Britain / Newington, CT	Stat./Offset: 109+91 /17' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810450.0
Start Date: 02/20/03	Route No.:	Easting: 997082.3
Finish Date: 02/21/03	Bridge No.:	Surface Elevation: 105.3
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 2.5 after: 0 hours, @4.6 after: 24 hours, @ after: hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20	S-7	100/0.4	0.9	0.5			fine sand, some silt, little to some medium to coarse gravel; moist, very dense, NP.	85
	A-N		0.6					
21							Auger refusal at 21.0', switched to casing and wash	84
22	W-N		1.5					83
23	S-8	100/0.0	0.0	0.0			cobble from 22.5'-23.3'	82
24	W-N		3.0					81
25								80
						25.5'	ELEV. 79.8	
26	S-9	60 100/0.3	0.8	0.7			POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM) - reddish brown and gray coarse gravel, little silt, little very fine sand; moist, very dense, NP; cobbles throughout.	79
27								78
28	W-N		3.7				cobbles from 28.0-30.0, no sample possible	77
29								76
30	S-10	73 100/0.3	0.8	0.8			POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM) - reddish brown and gray coarse gravel, little silt, little very fine sand; moist, very dense, NP; cobbles throughout.	75
31								74
32							boulder from 30.8'-33.0'	73
33	W-N		4.2					72
34								71
35	S-11	100/0.4	0.4	0.2		35.0'	ELEV. 70.3	70
36							GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine coarse gravel, little to some very fine to coarse sand; moist, hard, +PL.	69
37								68
38	W-N		4.6					67
39								66

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 57.0' Rock: 10.0' No. of Samples: 15	NOTES:	Sheet **2** of **4** SM-001-M REV. 1/02

Driller: J. Nitch/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-27**
Inspector: Mark Martin	Town: New Britain / Newington, CT	Stat./Offset: 109+91 /17' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810450.0
Start Date: 02/20/03	Route No.:	Easting: 997082.3
Finish Date: 02/21/03	Bridge No.:	Surface Elevation: 105.3
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 2.5 after: 0 hours, @4.6 after: 24 hours, @ after: hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
40	S-12	100/0.1	0.1	0.1			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine coarse gravel, little to some very fine to coarse sand; moist, hard, +PL.	65
41								64
42	W-N		4.9					63
43								62
44								61
45	S-13	100/0.4	0.4	0.4			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine coarse gravel, little to some very fine to coarse sand; moist, hard, +PL.	60
46								59
47	W-N		4.6					58
48								57
49								56
50	S-14	100/0.3	0.3	0.3			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine coarse gravel, little to some very fine to coarse sand; moist, hard, +PL.	55
51						51.0'	ELEV. 54.3	54
52	W-N		4.7					53
53								52
54								51
55	S-15	100/0.2	0.2	0.0				50
56	W-N		1.8					49
57				4.1	0.4		SANDY SILTSTONE; reddish brown, medium hard to hard, moderately to slightly weathered, calcareous, vugs throughout	48
58								47
59	C-1		5.0					46

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 57.0' Rock: 10.0' No. of Samples: 15	NOTES:	Sheet **3** of **4** SM-001-M REV. 1/02

Driller: J. Nitch/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-27**
Inspector: Mark Martin	Town: New Britain / Newington, CT	Stat./Offset: 109+91 /17' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810450.0
Start Date: 02/20/03	Route No.:	Easting: 997082.3
Finish Date: 02/21/03	Bridge No.:	Surface Elevation: 105.3
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 2.5 after: 0 hours, @4.6 after: 24 hours, @ after: hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
60								45
61								44
62				82%	8%			
				4.0	0.0		SANDY SILTSTONE; reddish brown, medium hard to hard, moderately to slightly weathered, calcareous, vugs throughout	43
63								42
64	C-2		5.0					41
65								40
66								39
67				80%	0%		ELEV. 38.3	
							End of boring at 67.0	38
68								37
69								36
70								35
71								34
72								33
73								32
74								31
75								30
76								29
77								28
78								27
79								26

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 57.0' Rock: 10.0' No. of Samples: 15	NOTES:	Sheet **4** of **4** SM-001-M REV. 1/02

Driller: J. Galvin/GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-28**
Inspector: E. Glisan	Town: New Britain / Newington, CT	Stat./Offset: 112+99 /21' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810696.8
Start Date: 02/12/03	Route No.:	Easting: 997265.9
Finish Date: 02/13/03	Bridge No.:	Surface Elevation: 103.3
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 11.5 after: 0 hours, @11.5 after: 24 hours, @11.5 after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0	W-N		1.5					103
1								102
2	S-1	6 9 6	1.5	0.5			SILTY SAND (SM)- black fine to medium sand, little silt, trace fine gravel; dry, medium dense, NP; (FILL).	101
3								100
4	W-N		1.5					99
						4.5'	ELEV. 98.8	
5	S-2	7 5 4	1.5	1.0			SILT (ML)- yellow-brown silt, little fine sand, trace fine gravel; moist, loose, NP.	98
6								97
7	W-N		1.5					96
8	S-3	1 2 3	1.5	1.4			SILT (ML)- gray-brown silt, trace fine sand, trace clay; wet, loose, +PL.	95
9								94
10	W-N		1.5					93
11	S-4	5 9 10	1.5	0.2			SILT (ML)- gray-brown silt, trace fine sand, trace clay; wet, medium dense, +PL.	92
12						12.0'	ELEV. 91.3	
13	S-5	8 9 12	1.5	0.7			LEAN CLAY (CL)- gray clay, trace silt; moist, very stiff, +PL.	91
14	S-6	6 6 9	1.5	1.5			LEAN CLAY (CL)- gray clay, trace silt; moist, stiff, +PL.	90
15								89
16	W-N		1.5					88
17	S-7	6 8 11	1.5	1.5			LEAN CLAY (CL)- gray clay, trace silt; moist, very stiff, +PL.	87
18								86
19	W-N		1.5					85
		6					LEAN CLAY (CL)- gray clay, trace silt; moist, very stiff,	84

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 26.0' Rock: 0.0' No. of Samples: 9	NOTES: Driller lost Shelby Tube in hole at 26.0'. Boring abandoned and relocated 3' south.	Sheet **1** of **2** SM-001-M REV. 1/02

Driller: J. Galvin/GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-28**
Inspector: E. Glisan	Town: New Britain / Newington, CT	Stat./Offset: 112+99 /21' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 810696.8
Start Date: 02/12/03	Route No.:	Easting: 997265.9
Finish Date: 02/13/03	Bridge No.:	Surface Elevation: 103.3
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/ 2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 11.5 after: 0 hours, @11.5 after: 24 hours, @11.5 after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20	S-8	8 13	1.5	1.0			+PL.	83
21								82
22	W-N		1.5					81
23	S-9	5 10 10	1.5	1.5			LEAN CLAY (CL)- gray clay, trace silt; moist, very stiff, +PL.	80
24								79
25	ST-1		2.0	0.0				78
26							ELEV. 77.3 Boring Terminated at 26.0'	77
27								76
28								75
29								74
30								73
31								72
32								71
33								70
34								69
35								68
36								67
37								66
38								65
39								64

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 26.0' Rock: 0.0' No. of Samples: 9	NOTES: Driller lost Shelby Tube in hole at 26.0'. Boring abandoned and relocated 3' south.	Sheet **2** of **2** SM-001-M REV. 1/02

Driller: J. Galvin/GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-28A**
Inspector: E. Glisan	Town: New Britain / Newington, CT	Stat./Offset: 112+99 /21' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing:
Start Date: 02/13/03	Route No.:	Easting:
Finish Date: 02/13/03	Bridge No.:	Surface Elevation: 103.3
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	
Groundwater Obs. @ after: hours, @ after: hours, @ after: hours		

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0								103
1								102
2								101
3								100
4								99
5								98
6								97
7								96
8								95
9								94
10	W-N		21.0					93
11								92
12								91
13								90
14								89
15								88
16								87
17								86
18								85
19								84

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 50.0' Rock: 6.0' No. of Samples: 5	NOTES: Boring located 3' south of SB-28.	Sheet **1** of **3** SM-001-M REV. 1/02

Driller: J. Galvin/GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-28A**
Inspector: E. Glisan	Town: New Britain / Newington, CT	Stat./Offset: 112+99 /21' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing:
Start Date: 02/13/03	Route No.:	Easting:
Finish Date: 02/13/03	Bridge No.:	Surface Elevation: 103.3
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	
Groundwater Obs. @ after: hours, @ after: hours, @ after: hours		

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20								83
21						21.0'	ELEV. 82.3	82
22	ST-1A		2.0	1.3			LEAN CLAY (CL)- gray clay, trace silt; moist, +PL.	81
23								80
24	W-N		2.5					79
25								78
26	S-10	7 11 14	1.5	1.3			LEAN CLAY (CL)- gray clay, trace silt; moist, very stiff, +PL.	77
27								76
28	W-N		1.5					75
29	S-11	6 10 9	1.5	1.4			LEAN CLAY (CL)- gray clay, trace silt; moist, very stiff, +PL.	74
30								73
31								72
32	W-N		3.5					71
33								70
34	S-12	24 13 24	1.5	0.0				69
35								68
36	S-13	13 12 12	1.5	0.8			LEAN CLAY (CL)- gray clay, trace medium to coarse gravel, trace silt; moist, very stiff, +PL.	67
37						37.0'	ELEV. 66.3	66
38	W-N		3.5				Weathered shale fragments in wash water at approximately 37.0'.	65
39								64

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 50.0' Rock: 6.0' No. of Samples: 5	NOTES: Boring located 3' south of SB-28.	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: J. Galvin/GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-28A**
Inspector: E. Glisan	Town: New Britain / Newington, CT	Stat./Offset: 112+99 /21' R
Engineer: Baker Engineering	Project No.: 171-0305	Northing:
Start Date: 02/13/03	Route No.:	Easting:
Finish Date: 02/13/03	Bridge No.:	Surface Elevation: 103.3
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/4" I.D.	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NX/2-1/8" I.D.
Hammer Wt.: 300 Fall: 24"	Hammer Wt.: 140 Fall: 30"	
Groundwater Obs. @ after: hours, @ after: hours, @ after: hours		

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT_E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
40	S-14	120/0.2	0.2	0.1			POORLY GRADED GRAVEL (GP)- gray to black medium to coarse gravel; wet, very dense, NP; gravel is weathered shale fragments.	63
41								62
42								61
43								60
44								59
45	W-N		9.8					58
46								57
47								56
48								55
49								54
50	C-1		1.0	0.6 / 60%	0.0 / 0%	50.0'	ELEV. 53.3 SANDSTONE; reddish brown, hard, fresh to slightly weathered.	53
51				4.1	2.5		SANDSTONE; reddish brown, hard, fresh to slightly weathered.	52
52								51
53	C-2		5.0					50
54								49
55								48
56				82%	50%		ELEV. 47.3 End of Boring at 56.0'	47
57								46
58								45
59								44

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
Proportions Used: Trace = 1 - 10%, Little = 10 -20%, Some = 20 - 35%, And = 35 - 50%

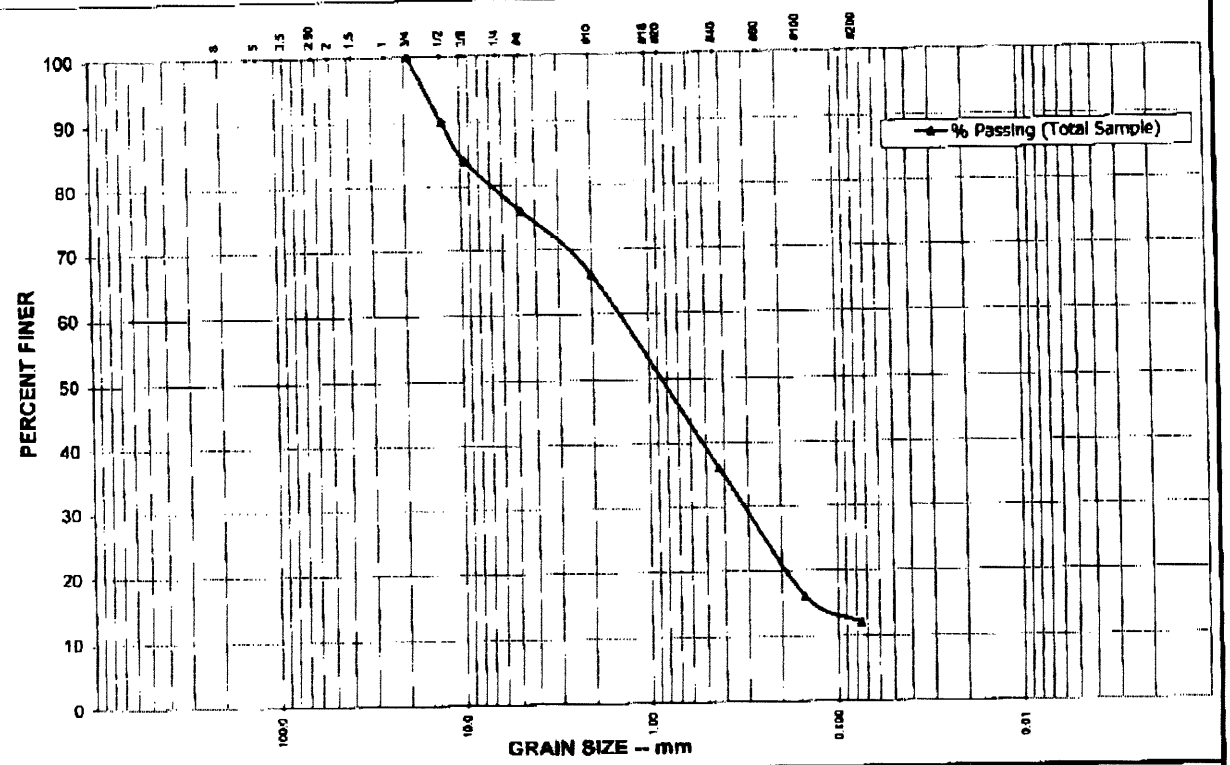
Total Penetration in Earth: 50.0' Rock: 6.0' No. of Samples: 5	NOTES: Boring located 3' south of SB-28.	Sheet **3** of **3** SM-001-M REV. 1/02

APPENDIX 3

LABORATORY TESTING RESULTS

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		15.6	48.9	37.5	Silt (>0.002mm)	Clay (<0.002mm)
0.0	24.0	% Sand		64.0	12.0	

Classification: BROWN C-F SAND, some Fine Gravel, little Silt

Sieve Size (mm)	U.S. Sieve Size (In.)	Cumulative Wt. Retained	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
90.0	3.5"					
57.0	2.25"					
50.0	2"					
37.5	1.5"					
25.0	1"					
19.0	3/4"	0.00	100.0			
12.5	1/2"	0.05	90.0			
9.5	3/8"	0.08	84.0			
6.3	1/4"					
4.75	#4	0.12	76.0			
2.00	#10	0.17	66.0			
1.00	#18					
0.425	#40	0.32	36.0			
0.250	#60					
0.150	#100	0.42	16.0			
0.075	#200	0.44	12.0			

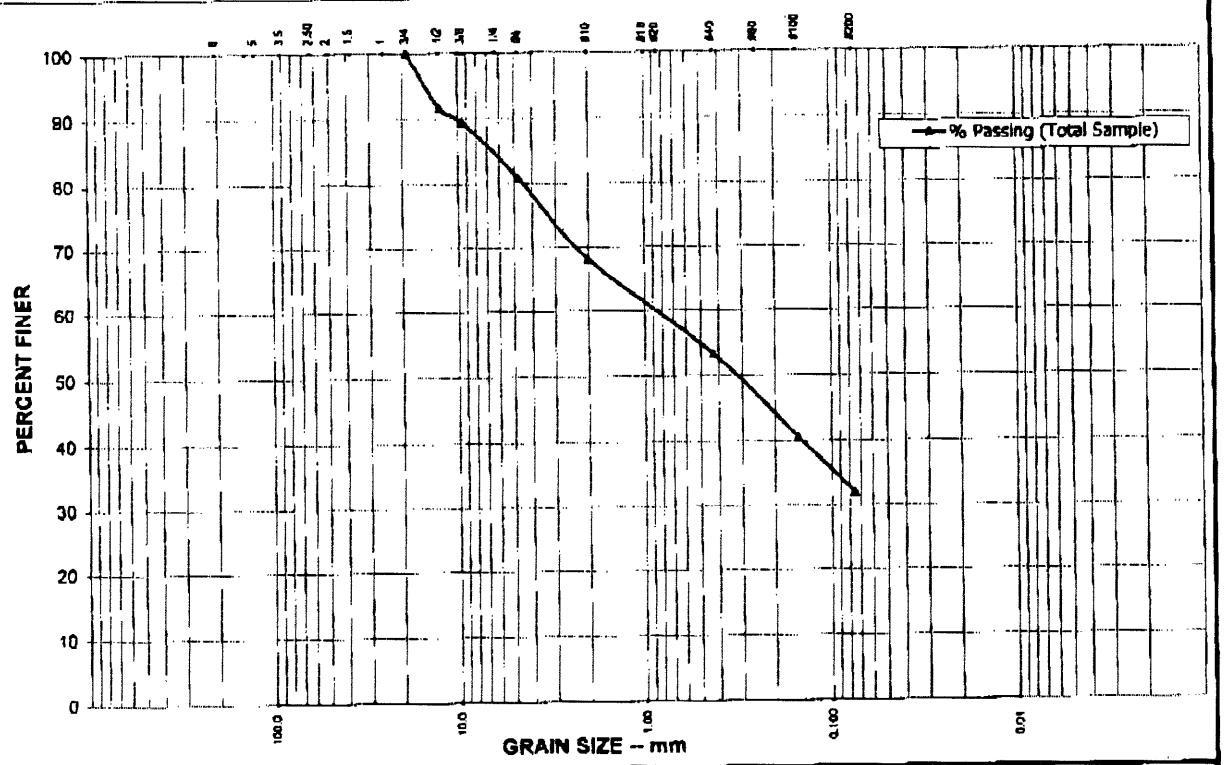
Total Dry Wt. 0.5
Split Wt.

Project: VN Engineers,Inc.	Project No.: J2031487C	Date: 7/10/2007	
City: North Haven,CT	Specification: Not Provided	Lab No: C1719-07	
Source: B133, S-1, 0'-2'	Sampled from: Provided by client , Job No. 27-107		
JGI EASTERN, Inc.	Remarks: Natural moisture content = 4.0%		
114 Woodlawn Road Berlin, CT 06037 (860) 829-1725 fax: (860) 829-1745 www.jgieastern.com	Tested By: M.F.	Date: 7/18/2007	
	Reviewed By:	Date:	

ASTM C136GSP1, Rev. 5

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		26.1	30.4	43.5	Silt (>0.002mm)	Clay (<0.002mm)
0.0	19.1		% Sand	48.9	31.9	

Classification: RED BROWN C-F Sand, some Silt, little Fine Gravel

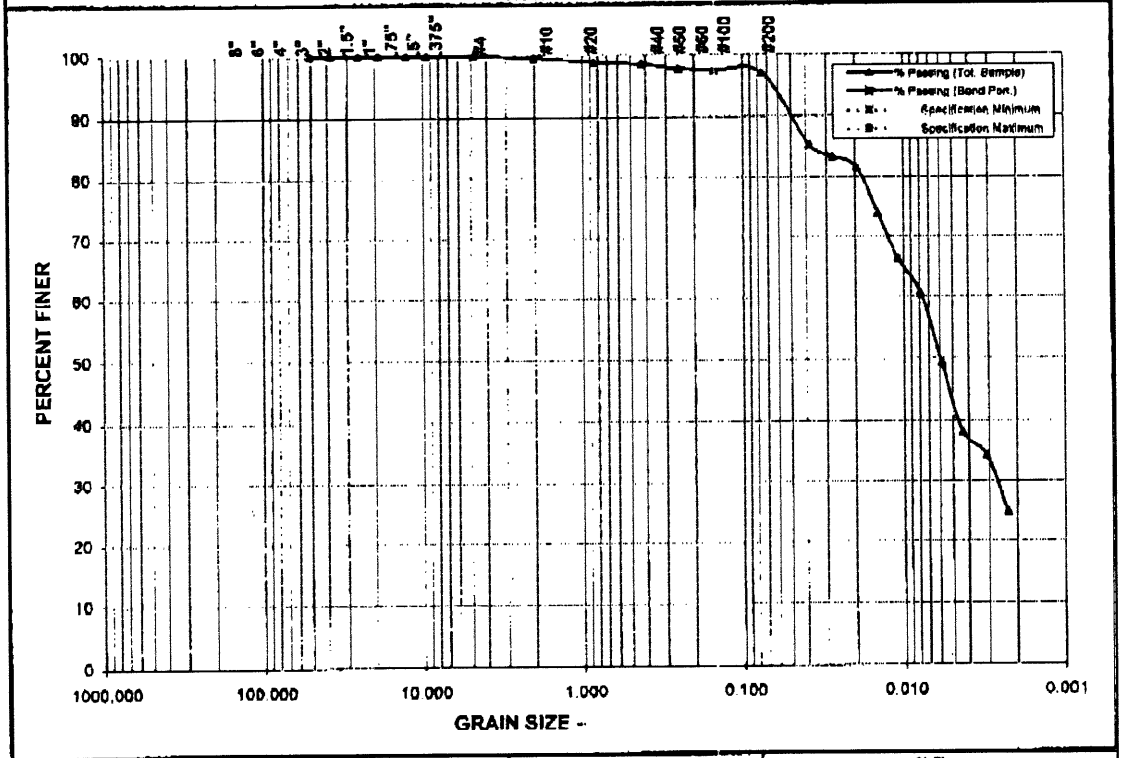
Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Retained	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
90.0	3.5"					
57.0	2.25"					
50.0	2"					
37.5	1.5"					
25.0	1"					
19.0	3/4"	0.00	100.0			
12.5	1/2"	0.04	91.5			
9.5	3/8"	0.05	89.4			
6.3	1/4"					
4.75	#4	0.09	80.9			
2.00	#10	0.15	68.1			
1.00	#18					
0.425	#40	0.22	53.2			
0.250	#60					
0.150	#100	0.28	40.4			
0.075	#200	0.32	31.9			
	Total Dry Wt.	0.47				
	Split Wt.					

Project: VN Engineers,Inc.	Project No.: J2031487C	Date: 7/10/2007	
City: North Haven,CT	Specification: Not Provided	Lab No: C1731-07	
Source: B134, S-3, 10'-12'	Sampled from: Provided by client , Job No. 27-107		
JGI EASTERN, Inc.	114 Woodlawn Road Berlin, CT 06037 (860) 829-1735 fax: (860) 829-1746 www.jgieastern.com	Remarks: Natural moisture content = 12.8%	
		Tested By: M.F.	Date: 7/19/2007
		Reviewed By:	Date:

ASTM C136GSP1, Rev. 5

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM D-422



% Cobbles	% Gravel	Crs	Med	Fine	% Fines	
		11.5	37.2	51.3	Silt	Clay
0.0	0.1	% Sand		2.9	72.13	24.83

Classification: RED BROWN SILT, some Clay, trace C-F Sand

Sieve Size (mm.)	Sieve Size (in./no.)	Cumulative Wt. Retnd	% Passing (Tot. Sample)	% Passing (Sand Port.)	Specification Minimum	Specification Maximum
50.800	2"	0.00	100.0			
38.100	1.5"	0.00	100.0			
25.400	1"	0.00	100.0			
19.050	3/4"	0.00	100.0			
12.700	1/2"	0.00	100.0			
9.525	3/8"	0.00	100.0			
4.750	#4	0.15	99.9			
2.000	#10	0.18	99.5			
0.850	#20	0.58	99.8			
0.425	#40	0.78	98.5			
0.300	#50	----				
0.250	#60	1.13	97.8			
0.150	#100	1.29	97.5			
0.075	#200	1.50	97.0			
0.038			85.2			
0.027			83.4			
0.019			81.5			
0.014			73.9			
0.011			66.4			
0.008			60.7			
0.006			49.4			
0.004			39.0			
0.003			34.3			
0.002			24.8			

Total Dry Wt. 133.18
Split Wt. 53.25

Project: VN Engineers,INC.	Project No.: J2031478C	Date: 7/10/07	
North Haven,CT	Specification: ASTM D-422	Lab No: C1830-07	
Source: B-137,S-3,10'-12'	Sampled from: Provided by client		

JGI EASTERN, Inc.
201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1980 (p) 860-721-1639 (f)
www.jgieastern.com

Remarks:
Natural moisture content = 25.4%

Reviewed By: [illegible] Date: 8/8/07

JGI EASTERN, Inc.

ASTM D 422 Hydrometer Analysis

Project Name	VN Enginners	Lab Technician	M.F.
Project #	J2031487C	Date:	8/6/2007
Lab #	C1830-07	Soil Description	RED BROWN

LABORATORY TEST DATA

Wet Sample Wt.: 166.98 Gms.
Dry Sample Wt. : 133.18 Gms

Hygroscopic Moisture
Wet Wt. + Tare: 37.19
Dry Wt. + Tare : 37.09
Tare #____Wt. : 20.05
Moisture Content (%): 0.59

Begin Soak: 8/6/2007 6:00
End Soak: 8/7/2007 6:00
Total Soak Time: 24.0 Hrs.

G_s 2.647
Dry Weight of Soil, W_s 53.25
Meniscus Correction, F_m 1
Temperature correction, F_T 0.15

Hydrometer Type: ASTM 152-H
Temperature of test, T 20 (°C)
Zero correction, F_z 7
152-H Hydrometer Correction $_e$: 1.01

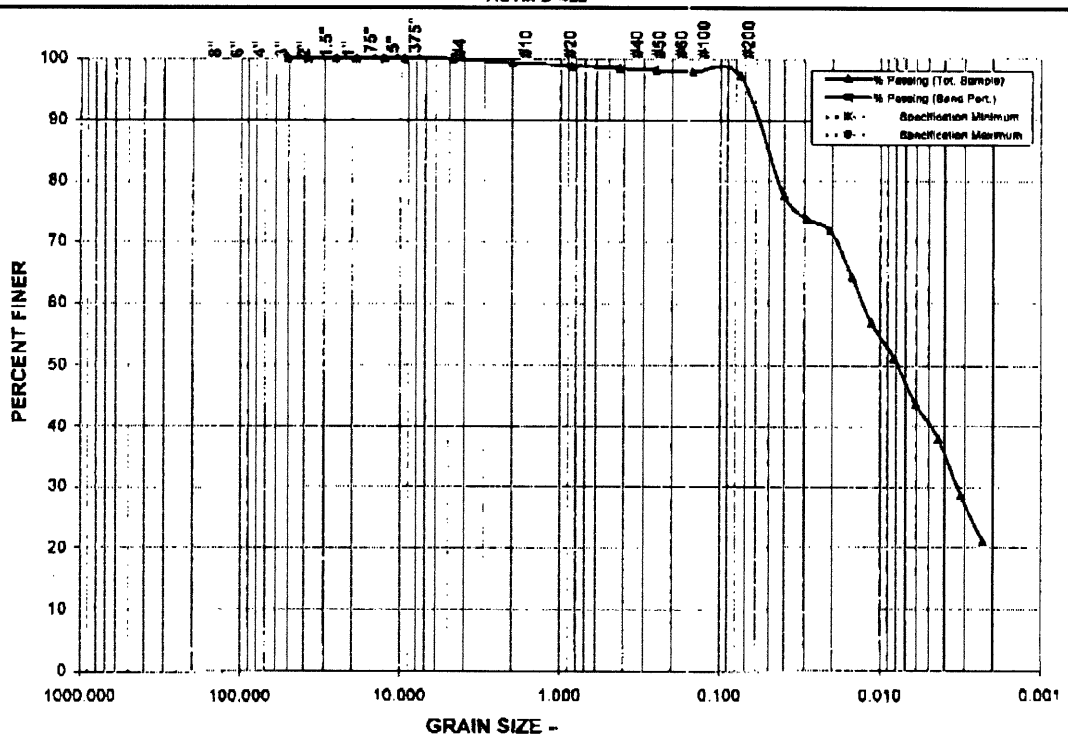
Actual Time 00:00	Elapsed Time, (min)	Acual Hydrometer Reading *R*	R_{cp}	Percent Finer, Split Sample 100	From Table 2, Use R to determine L		From Table 3	Particle Diameter D (mm)
					R_{cL}	L (cm)	A or K	
6:04	0	------	-------	------	------	------	------	-------
6:05	1	52	45.15	85.64	53	7.6	0.0139	0.0382
6:06	2	51	44.15	83.74	52	7.8	0.0139	0.0274
6:09	4	50	43.15	81.84	51	7.9	0.0139	0.0195
6:13	8	46	39.15	74.26	47	8.6	0.0139	0.0144
6:20	15	42	35.15	66.67	43	9.2	0.0139	0.0109
6:35	30	39	32.15	60.98	40	9.7	0.0139	0.0079
7:05	60	33	26.15	49.60	34	10.7	0.0139	0.0059
8:05	120	27	20.15	38.21877934	28	11.7	0.0139	0.0043
10:05	240	25	18.15	34.42535211	26	12	0.0139	0.0031
2:05	480	20	13.15	24.94178404	21	12.9	0.0139	0.0023
6:05	1440	15	8.15	15.45821596	16	13.7	0.0139	0.0014
6:05	2880	15	8.15	15.45821596	16	13.7	0.0139	0.0010

Reviewed By: KMS Date: 8/8/07

NVLAP # 100315-0

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM D-422



% Cobbles	% Gravel	Crs	Med	Fine	% Fines	
		20.7	32.6	48.7	Silt	Clay
0.0	0.1	% Sand		2.7	76.18	21.00

Classification; RED BROWN SILT , some Clay, trace C-F Sand

Sieve Size (mm.)	Sieve Size (in./no.)	Cumulative Wt. Retnd	% Passing (Tot. Sample)	% Passing (Sand Port.)	Specification Minimum	Maximum
50.800	2"	0.00	100.0			
38.100	1.5"	0.00	100.0			
25.400	1"	0.00	100.0			
19.050	3/4"	0.00	100.0			
12.700	1/2"	0.00	100.0			
9.525	3/8"	0.00	100.0			
4.750	#4	0.23	99.9			
2.000	#10	0.28	99.3			
0.850	#20	0.53	98.8			
0.425	#40	0.72	98.4			
0.300	#50	---				
0.250	#60	0.89	98.1			
0.150	#100	1.04	97.8			
0.075	#200	1.35	97.2			
0.040			77.5			
0.029			73.7			
0.021			71.9			
0.015			64.3			
0.011			56.8			
0.008			51.1			
0.006			43.6			
0.004			36.0			
0.003			28.5			
0.002			21.0			

Total Dry Wt. 155.28
Split Wt. 50.42

Project: VN Engineers,INC.	Project No.: J2031478C	Date: 7/10/07	
North Haven,CT	Specification: ASTM D-422	Lab No: C1831-07	
Source: B-138,S-3,10'-12'	Sampled from: Provided by client		

JGI EASTERN, Inc.
201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1900 (p) 860-721-1939 (f)
www.jgieastern.com

Remarks:
Natural moisture content = 22.8%

Reviewed By: KGB Date: 8/8/07

ASTM D422 - Rev. 3

JGI EASTERN, Inc.

ASTM D 422 Hydrometer Analysis

Project Name	VN Enginners	Lab Technician	M.F.
Project #	J2031487C	Date:	8/6/2007
Lab #	C1831-07	Soil Description	RED BROWN

LABORATORY TEST DATA

Wet Sample Wt.: 187.06 Gms.
Dry Sample Wt. : 152.28 Gms

Hygroscopic Moisture
Wet Wt. + Tare: 36.74
Dry Wt. + Tare : 36.64
Tare #____Wt. : 20.13
Moisture Content (%): 0.61

Begin Soak: 8/6/2007 5:45
End Soak: 8/7/2007 5:45
Total Soak Time: 24.0 Hrs.

G_s 2.647
Dry Weight of Soil, W_s 53.25
Meniscus Correction, F_m 1
Temperature correction, F_T 0.15

Hydrometer Type: ASTM 152-H
Temperature of test, T 20 (°C)
Zero correction, F_z 7
152-H Hydrometer Correction $_a$: 1.01

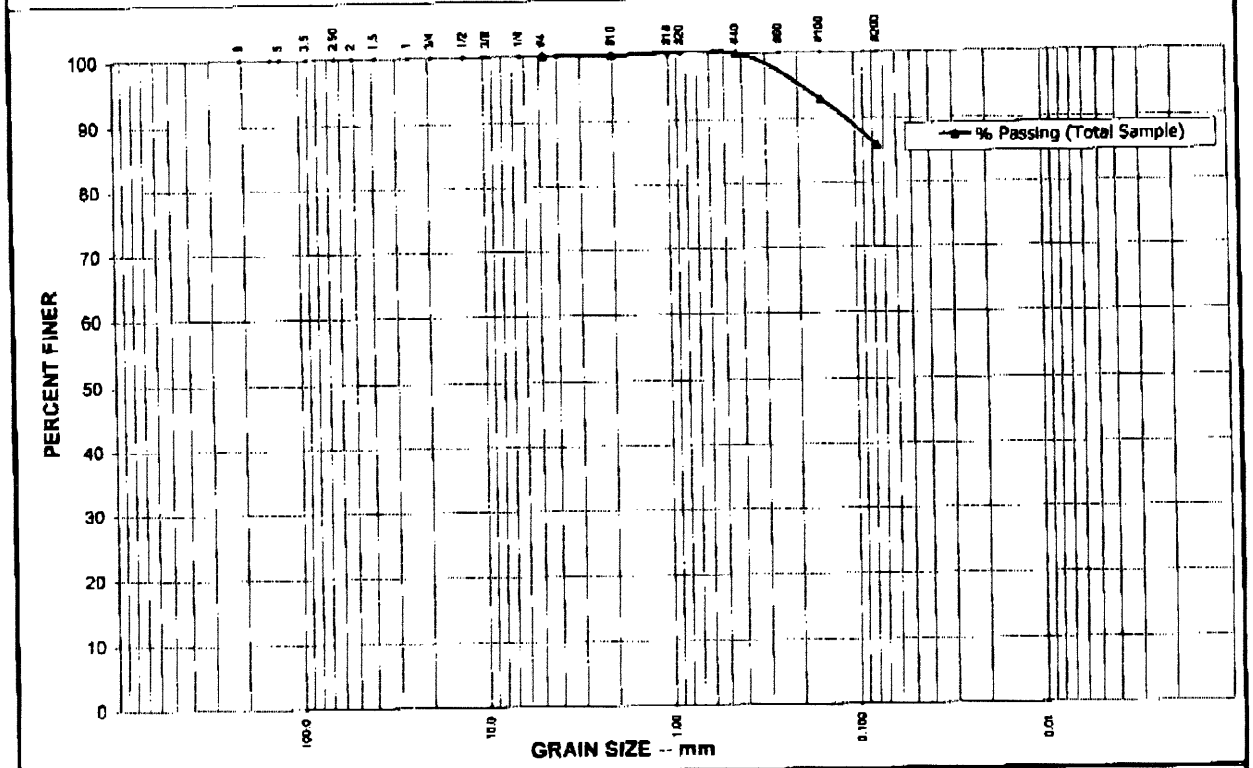
Actual Time 00:00	Elapsed Time, (min)	Acual Hydrometer Reading *R*	R_{cp}	Percent Finer, Split Sample 100	From Table 2, Use R to determine L		From Table 3	Particle Diameter D (mm)
					R_{cL}	L (cm)	A or K	
5:59	0	----	------	-------	------	------	------	-------
6:00	1	48	41.15	78.05	49	8.3	0.0139	0.0399
6:02	2	46	39.15	74.26	47	8.6	0.0139	0.0287
6:04	4	45	38.15	72.36	46	8.8	0.0139	0.0206
6:08	8	41	34.15	64.77	42	9.4	0.0139	0.0150
6:15	15	37	30.15	57.19	38	10.1	0.0139	0.0114
6:30	30	34	27.15	51.50	35	10.6	0.0139	0.0082
7:00	60	30	23.15	43.91	31	11.2	0.0139	0.0060
8:00	120	27	20.15	38.21877934	28	11.7	0.0139	0.0043
10:00	240	22	15.15	28.73521127	23	12.5	0.0139	0.0032
2:00	480	18	11.15	21.14835681	19	13.2	0.0139	0.0023
6:00	1440	18	11.15	21.14835681	19	13.2	0.0139	0.0013
6:00	2880	18	11.15	21.14835681	19	13.2	0.0139	0.0009

Reviewed By: KDS Date: 8/8/07

NVLAP # 100315-0

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		0.0	0.0	100.0	Silt (>0.002mm)	Clay (<0.002mm)
0.0	0.0	% Sand		14.3	85.7	

Classification: RED BROWN SILT, little Fine Sand

Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Retained	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
90.0	3.5"					
57.0	2.25"					
50.0	2"					
37.5	1.5"					
25.0	1"					
19.0	3/4"					
12.5	1/2"					
9.5	3/8"					
6.3	1/4"					
4.75	#4	0.00	100.0			
2.00	#10	0.00	100.0			
1.00	#18					
0.425	#40	0.00	100.0			
0.250	#60					
0.150	#100	0.01	92.9			
0.075	#200	0.02	85.7			
	Total Dry Wt.	0.14				
	Split Wt.					

Project: VN Engineers,Inc.	Project No.: J2031487C	Date: 7/10/2007	
City: North Haven,CT	Specification: Not Provided	Lab No: C1718-07	
Source: B139, S-2, 5'-7'	Sampled from: Provided by client, Job No. 27-107		
JGI EASTERN, Inc.	114 Woodlawn Road Berlin, CT 06037 (860) 829-1725 fax: (860) 829-1745 www.jgieastern.com	Remarks: Natural moisture content = 7.1%	
		Tested By: M.F.	Date: 7/16/2007
		Reviewed By:	Date:

ASTM C136GSP1, Rev. 5

MT Group
New England Regional Office
21 North Plains Industrial Road, Wallingford, CT 06492
(203) 949-7733 FAX (203) 949-7735
www.materials-testing.com

Client: V.N. Engineers
116 Washington Ave
North Haven, CT 06473

Report #: 001
Date: 09/17/07
Lab Technician: Juan Zacharini

Project: New Britain Hartford Busway
Sample: Cores
Test: Compressive Strength
Method: ASTM C42
Sampled By: Client **On:** N/A **Delivered By:** Client

Core #	Client ID	Dia.	Original Height (inches)	Height Capped (inches)	L/D Ratio	Area (sq. in)	Max Load (Lbs.)	PSI	L/D Factor	Comp. Strength
1	27-107 B-112 24.5' – 25.0'	1.98	5.50	3.85	1.94	3.08	25420	8256	0.99	8198
2	27-107 B-115 36.5' – 36.8'	1.98	5.50	2.76	1.39	3.08	10220	3319	0.94	3130
3	27-107 B134 34.4' – 34.7'	1.98	4.50	3.51	1.77	3.08	10890	3537	0.98	3463
4	27-107 B-113 28.5' – 29.0'	1.98	4.00	3.05	1.54	3.08	11430	3713	0.96	3575
5 **	27-107 B-110 44.5' – 44.8'	1.98	5.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	27-107 B-111 28.5' – 29.0'	1.98	6.00	3.92	1.98	3.08	28960	9405	0.99	9340
**	Core #5 no compressive									
	strength - crack running									
	full length of core									

Reported To: V.N. Engineers

Submitted By: MT Group, LLC
Mohammad S. Keshawarz, P.E.

STATE OF CONNECTICUT
MOHAMMAD S. KESHAWARZ
No. 16793
LICENSED
PROFESSIONAL ENGINEER

The above reported data is the property of the client. No reproduction of the above data without the sole permission of MT Group, LLC. MT Group, LLC accepts no liability for work executed by others.

RECEIVED

SEP 19 2003

BAKER ENGINEERING NY INC.
ROCKY HILL, CT

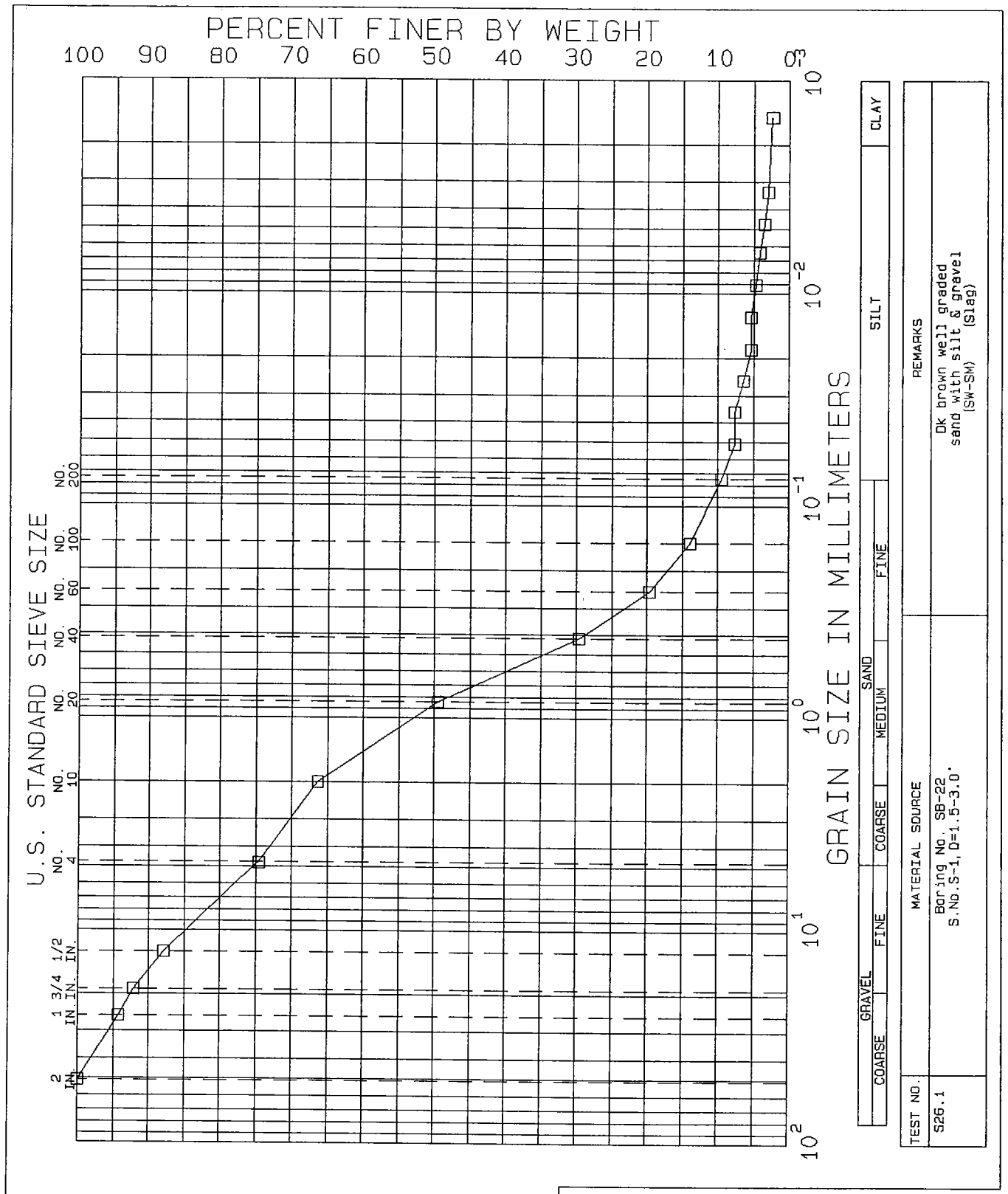
LABORATORY TESTING DATA SHEET

Project Name: NEW BRITAIN-HARTFORD BUSWAY
CONNECTICUT

Project No.: L17828 | Assigned By: D. GAFFNEY | Reviewed By: Don Schulze

Project Engineer: D. SCHULZE | Date: AUG.03 | Date Reviewed: 9/15/03

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Perme-ability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol.: $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
SB-12	S-8	22.5-24.0	15	12.4	16	14	29	5												Brown silty sand with gravel (SM)
SB-13	S-7	19.5-21.0	16	15.2	NP	NP	7	2												Red-brown, well graded sand w/ silt & gravel (SW-SM)
SB-14	S-4	10.5-12.0	17	10.4	16	13	20	5												Brown silty sand with gravel (SM)
SB-15	S-3	4.5-6.0	18	16.3	20	17	30	4												Brown silty gravel with sand (GM)
SB-16	S-5	12.0-13.5	19	20.8	NP	NP	64	4												Brown gravelly silt with sand (ML)
SB-16	S-9	24.0-25.2	20	10.2	14	12	44	12												Red-brown silty sand (SM)
SB-17	S-8	22.5-24.0	21	22.4	21	20	68	11												Red-brown gravelly silt with sand (ML)
SB-18	S-5	13.5-15.0	22	30.1	30	19	68	18												Red-brown sandy lean clay (CL)
SB-19	S-3	7.5-9.0	23	21.7	21	21	91	8												Red-brown silt (ML)
SB-21	S-2	4.5-6.0	24	15.4	NP	NP	18	4												Dark brown silty sand (SM)
SB-21	S-8	22.5-24.0	25	14.6	19	16	21	6												Red-brown silty sand with gravel (SM)
SB-22	S-1	1.5-3.0	26	9.8	NP	NP	10	3												Dk brown well graded sand with silt & gravel (SW-SM)
SB-22	S-3	7.5-9.0	27	18.0	24	16	16	5												Red-brown clayey gravel with sand (GC)
SB-23	S-4	10.5-11.5	28	14.7	18	14	27	6												Red-brown, silty, clayey sand with gravel (SC-SM)
SB-24	S-3	4.5-5.3	29	19.3	25	18	21	6												Red-brown, silty, clayey sand with gravel (SC-SM)
SB-25	S-2	4.5-6.0	30	33.2	27	19	44	6												Red-brown, clayey sand (SC)

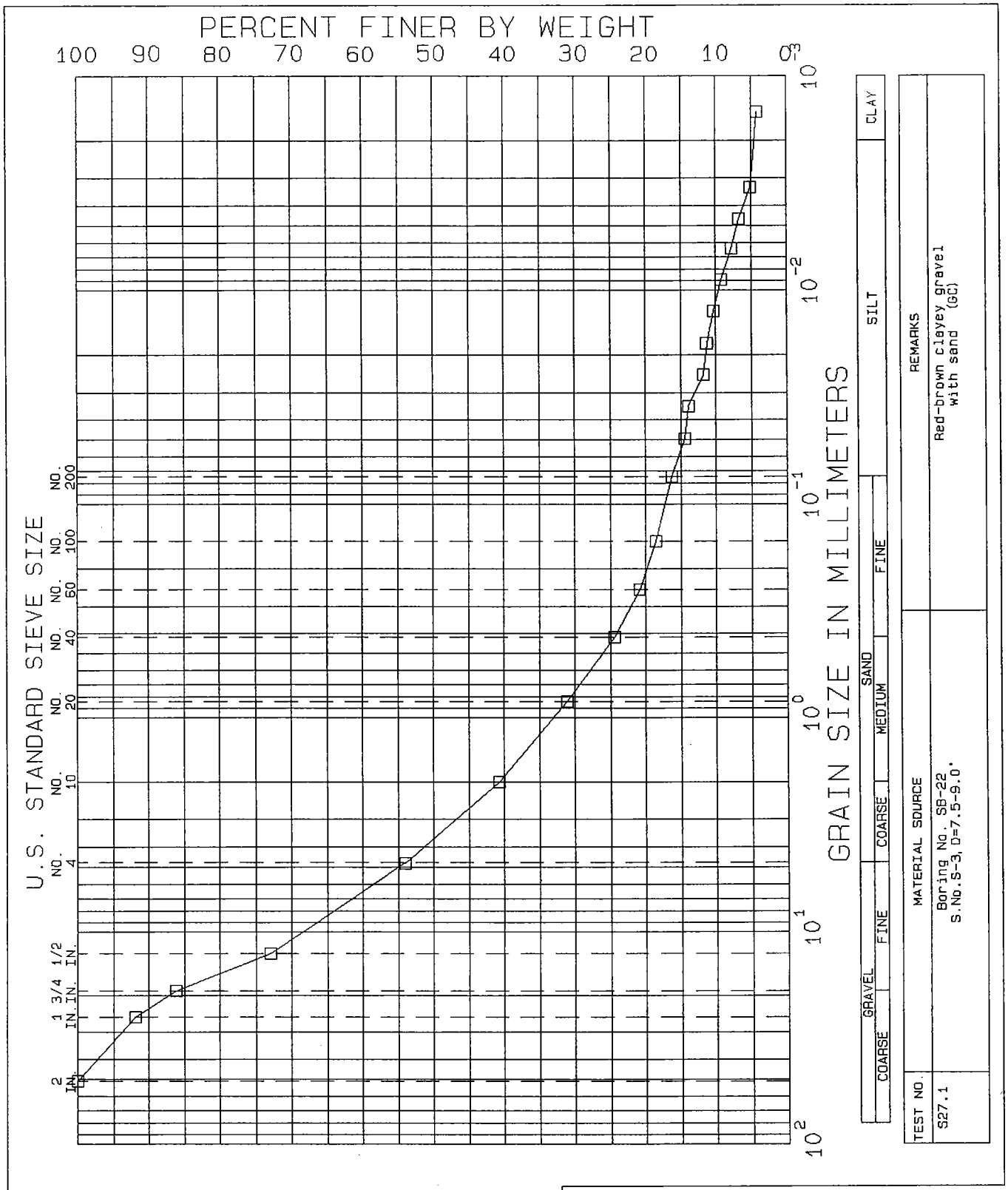


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-22	TEST SERIES	
SAMPLE	S-1	NO.	26
DEPTH	1.5-3.0'	DATE	Aug.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828

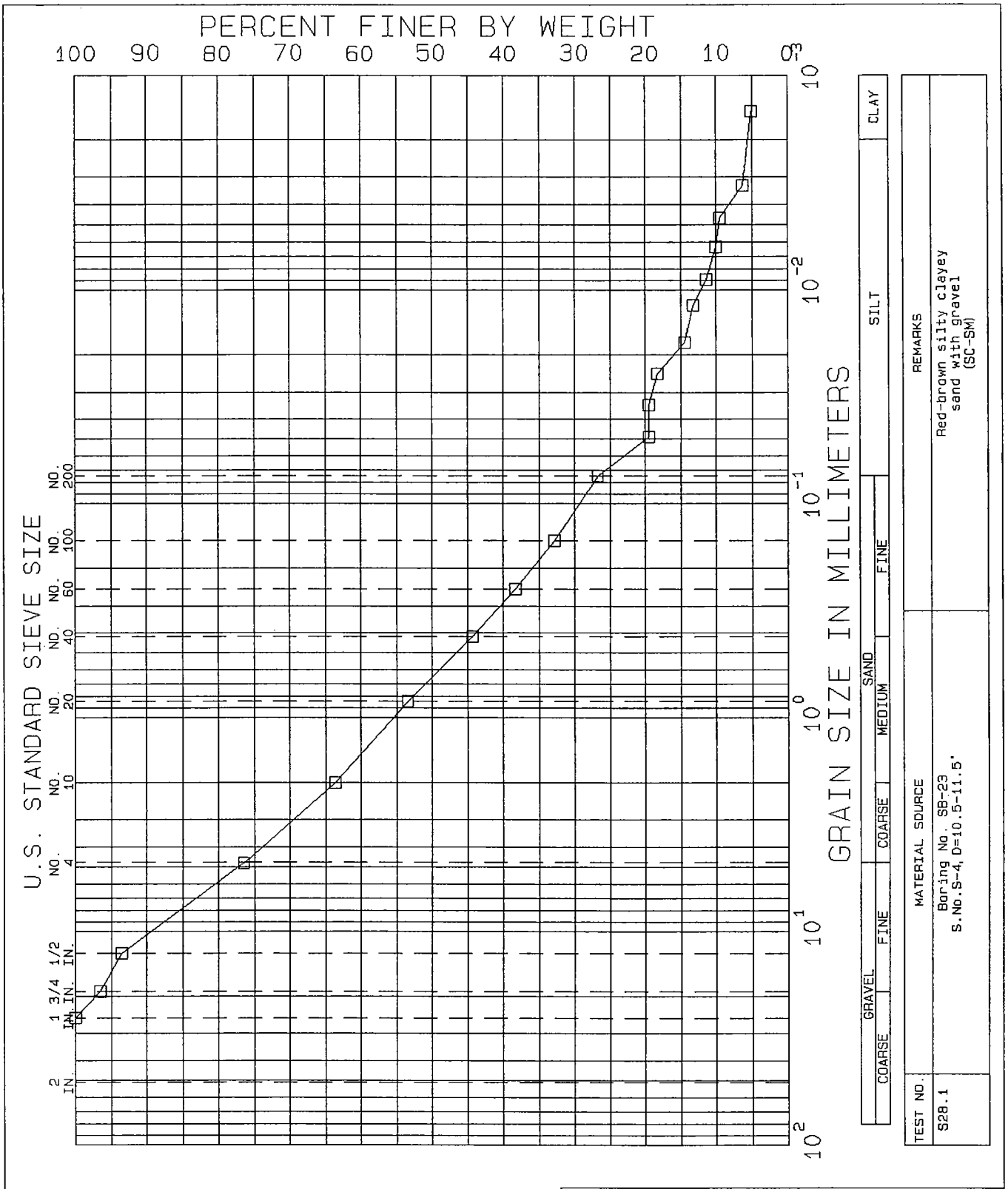


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-22	TEST SERIES	
SAMPLE	S-3	NO.	27
DEPTH	7.5-9.0'	DATE	Aug.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828

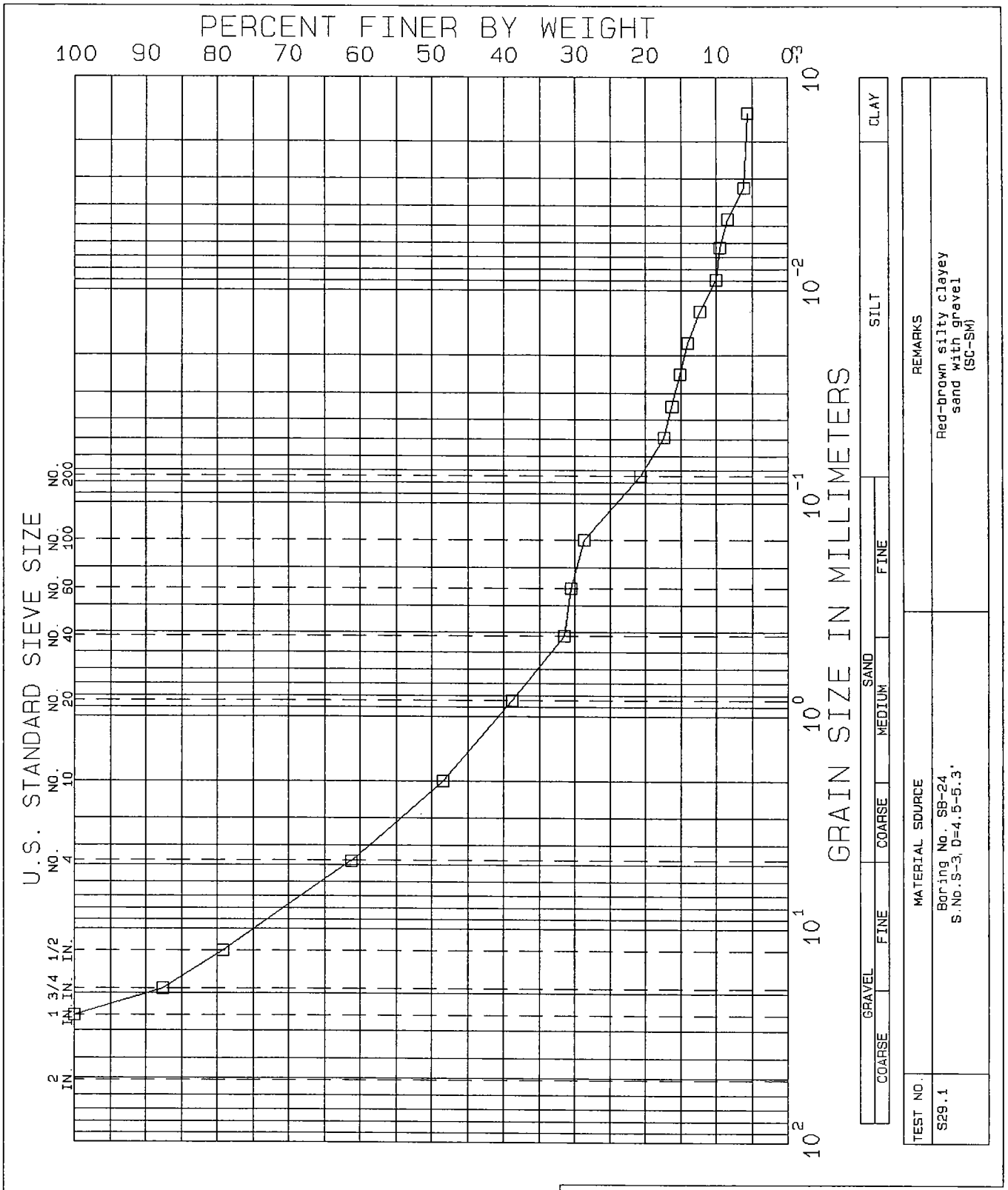


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-23	TEST SERIES	
SAMPLE	S-4	NO.	28
DEPTH	10.5-11.5'	DATE	Aug.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828

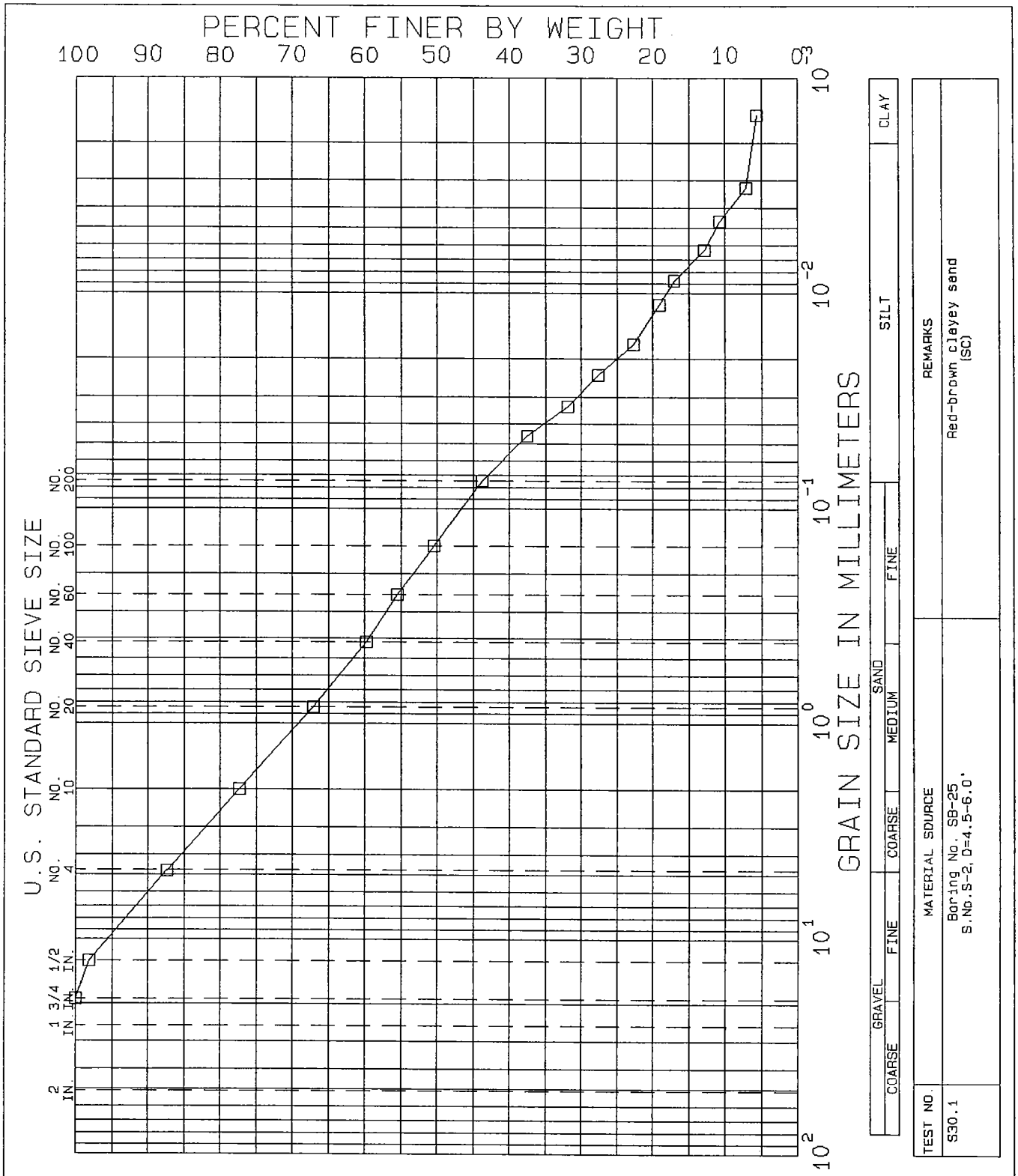


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-24	TEST SERIES	
SAMPLE	S-3	NO.	29
DEPTH	4.5-5.3'	DATE	Aug.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828



NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

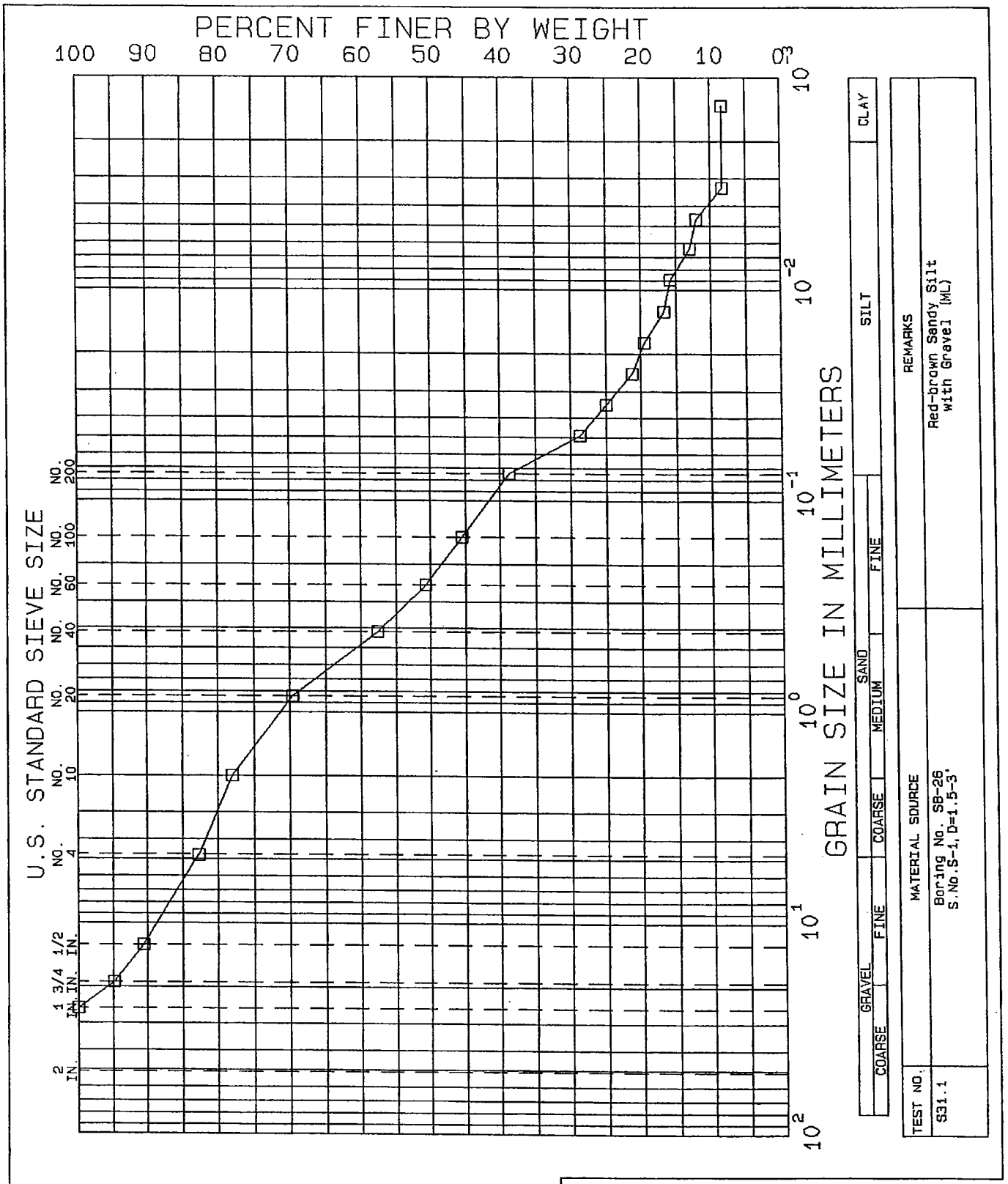
GRADATION TESTS

BORING NO.	SB-25	TEST SERIES	
SAMPLE	S-2	NO.	30
DEPTH	4.5-6.0'	DATE	Aug.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17B28

LABORATORY TESTING DATA SHEET

Project Name: NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
Project No.: L17823 | Assigned By: D. GAFFNEY | Reviewed By:
Project Engineer: D. SCHULZE | Date: SEP.03 | Date Reviewed:

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Perme-ability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol.: $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
SB-26	S-1	1.5-3.0	31	11.8	17	16	39	8												Red-brown Silty sand with gravel (SM)
SB-26	S-6	16.5-18.0	32	16.3	23	15	33	10												Red-brown Clayey sand with gravel (SC)
SB-27	S-10	30.0-30.8	33	9.8	15	12	33	10												Red-brown Silty sand with gravel (SM)
SB-28	S-3	7.5-9.0	34	38.2	34	24	60	9												Brown Sandy lean clay (CL)
SB-30	S-6	16.5-18.0	35	23.6	26	21	88	19												Red-brown Silty clay (CL-ML)
SB-31	S-9	25.5-27.0	36	19.0	20	18	81	9												Red-brown Silt with sand (ML)
SB-32	S-1	1.5-3.0	37	10.3	24	16	31	10												Red-brown clayey sand with gravel (SC)
SB-32	S-7	16.5-18.0	38	16.1	18	18	23	6												Red-brown Silty sand with gravel (SM)
SB-34	S-4	10.5-12.0	39	21.2	21	21	58	8												Red-brown Sandy silt (ML)
SB-35	S-6	16.5-18.0	40	24.2	22	19	90	15												Red-brown Silt (ML)
SB-35	S-8	22.5-24.0	41	29.2	21	20	95	15												Red-brown Silt (ML)
SB-36	S-2 S-3	4.5-9.0	42	18.5	27	18	30	8												Red-brown clayey gravel with sand (GC)
SB-36	S-7	19.5-21.0	43	28.0	24	20	92	22												Red-brown Silt (ML)
SB-37	S-4	10.5-12.0	44	17.1	27	17	30	9												Brown clayey gravel with sand (GC)
SB-38	S-8	22.5-24.0	45	23.4	23	15	23	7												Red-brown clayey gravel with sand (GC)

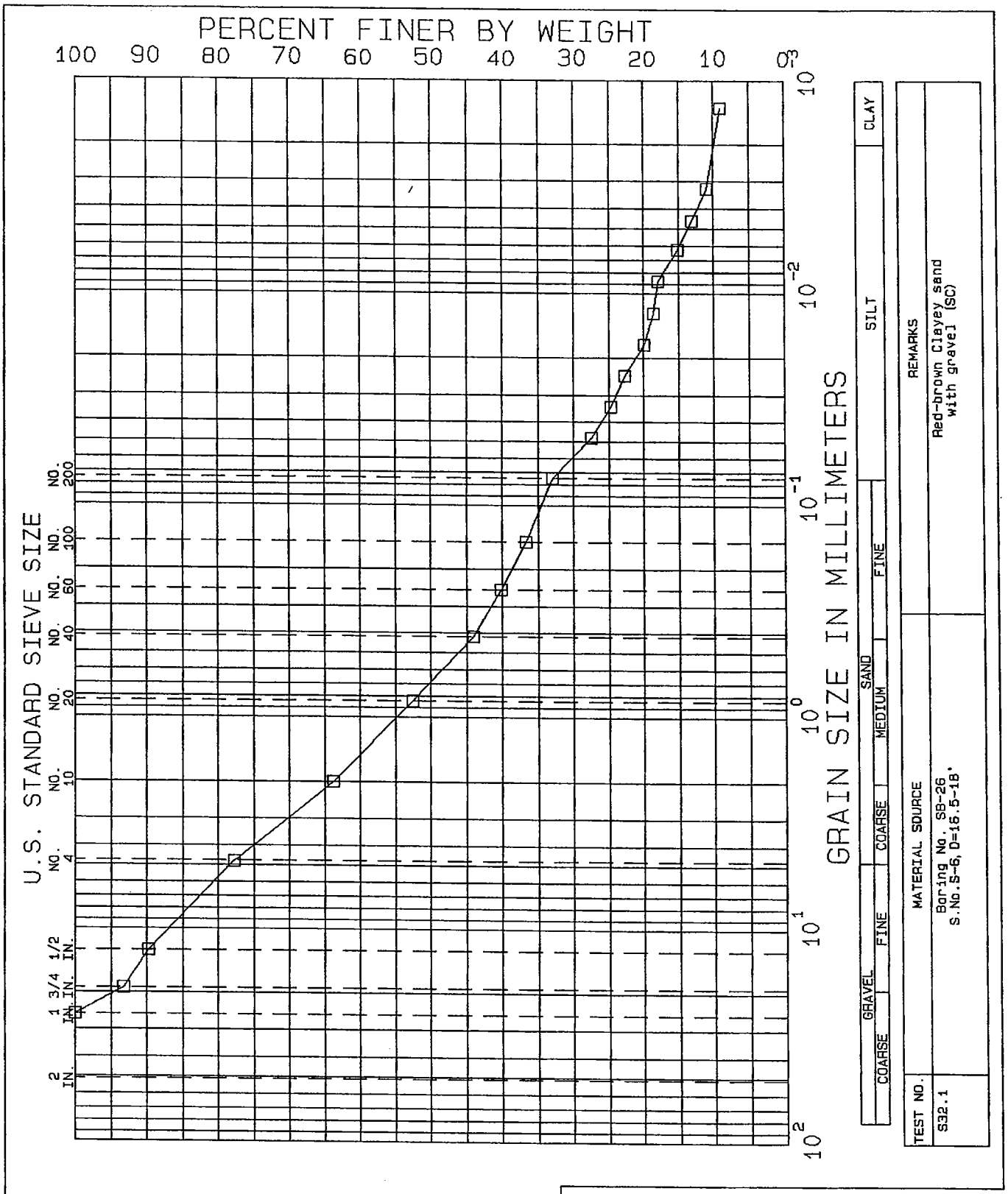


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-26	TEST SERIES	
SAMPLE	S-1	NO.	31
DEPTH	1.5-3'	DATE	Sep.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828



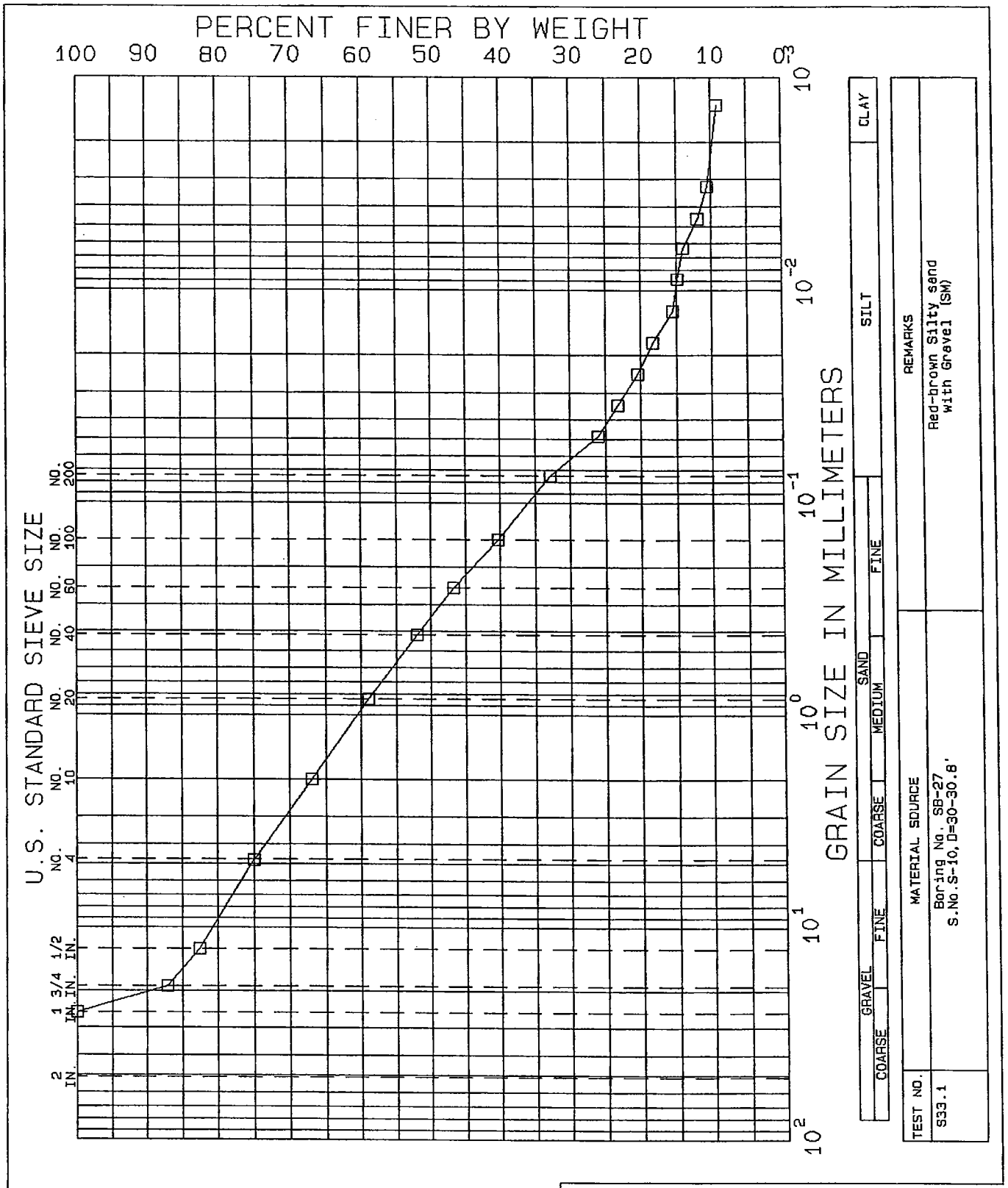
NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-26	TEST SERIES	
SAMPLE	S-6	NO.	32
DEPTH	16.5-18'	DATE	Sep.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS

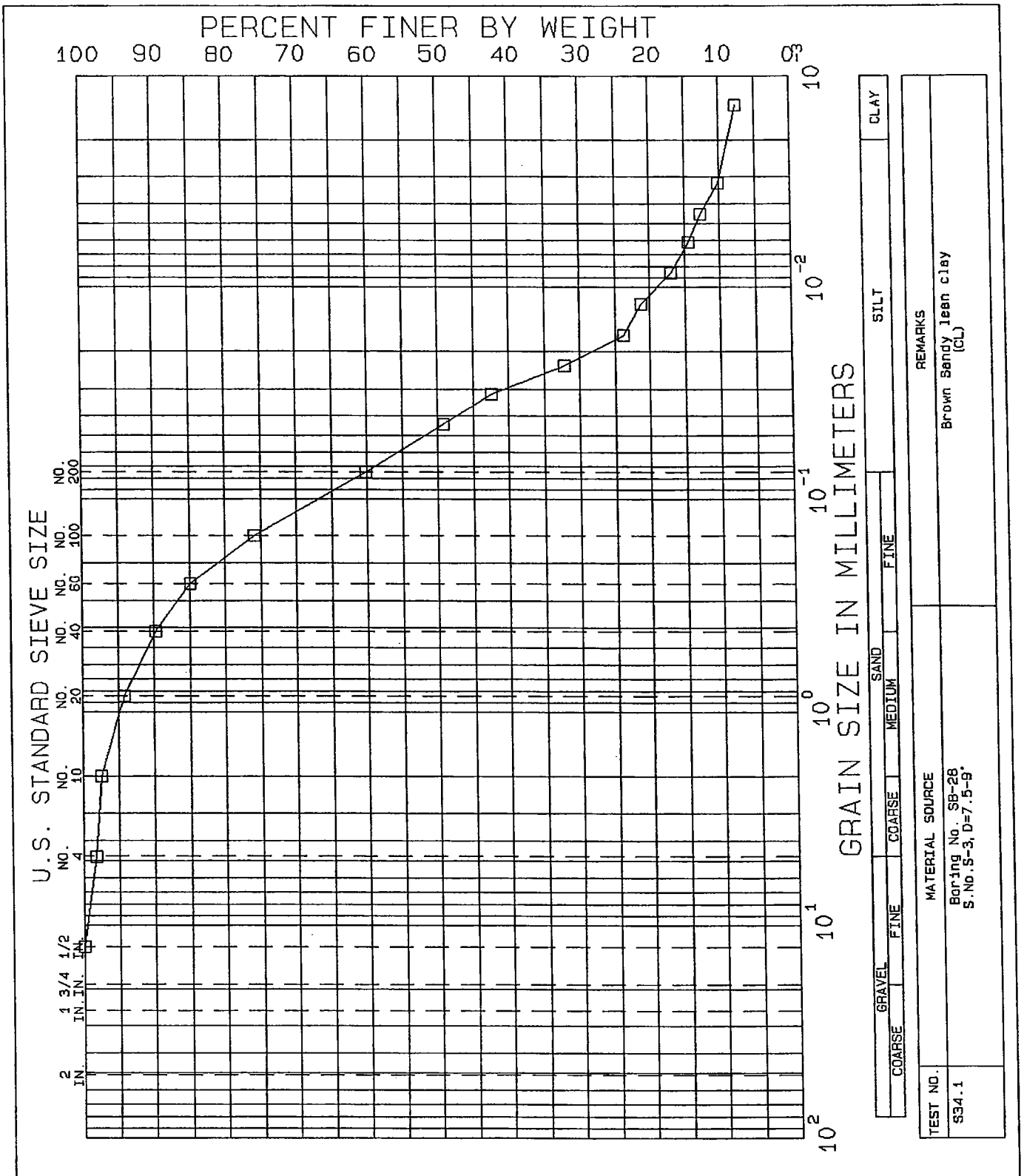


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-27	TEST SERIES	
SAMPLE	S-10	NO.	33
DEPTH	30-30.8'	DATE	Sep.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828



NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-28	TEST SERIES	
SAMPLE	S-3	NO.	34
DEPTH	7.5-9'	DATE	Sep.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828

APPENDIX 4

EXISTING GEOLOGY AND SOILS INFORMATION FROM PUBLISHED SOURCES

APPENDIX 4

EXISTING GEOLOGY AND SOILS
INFORMATION FROM PUBLISHED SOURCES

Geology and Existing Geotechnical Information: General Site Geology from Published Sources.

Soils

The project is located in the Central Lowlands of Connecticut, a north-south trending region between the Eastern and Western Highlands. The physiographic map (Figure 3) of the New Britain and South Hartford Quadrangles indicate the following soil types with the project limits: Artificial Fill (af), Ground-Moraine Deposits (Qgm), Valley Train Deposits (Qvt), Fine-grained Noncyclic Sediment (Qfs), Kame-delta Deposit (Qkd), Flood Plain Alluvium (Qfa), Alluvium (Qal), Swamp Deposits (Qs), and Terrace Alluvium (Qta).

The above surficial deposits are described below as the units occur along the proposed alignment of the Hartford Busway from southeast to northeast.

The Artificial Fills consist of railroad construction fills. The fill generally consists of sand, silt, and gravel obtained from deltaic, ground moraine, or flood plain deposits. Most of the fills were probably obtained from adjacent areas and share similar characteristics.

Ground-moraine deposits are a result of drifting and consist of mostly unstratified deposits with variable thicknesses and undulatory surfaces with low relief. The deposit is made up of till, which is a nonsorted, nonstratified, reddish-brown sediment composed of clay size particles to large boulders. The upper portion of the till is generally compact and firm. East of New Britain, the matrix of the till consists of a high percentage of clay. The average thickness of the till is approximately 20 feet.

A Valley-Train deposit is an outwash deposit by a melt water stream in a valley beyond a glacier. This deposit consists of a light colored, micaceous, medium-grained sand to medium gravel, which is often well sorted, well stratified, and cross-bedded. Typically, there is a 1 to 3 foot thick layer of gravel and gravelly sand, which is underlain by 2.5 foot thick eolian sand. However, the total thickness can be upwards of 20 feet.

Fine-grained noncyclic sediment consists of reddish-brown clayey silt that is characterized by convolute bedding. The deformed unit is distinguished by its silt content and thin bedding. The finer layers within the unit range from 0.5 to 1.5 inches thick and the coarser grained laminae are 2 to several times thicker. Random occurrences of pebbles and cobbles are common. The thickness of this sediment ranges from 5-12 feet thick.

The Kame-delta Deposit is composed of stratified drift. This delta deposit consists of reddish-brown, well sorted, well stratified sands with moderate amounts of silt, clay, and gravel. There are typically three distinct layers within this deposit, which are distinguished by grain size. The uppermost layer consists of cross bedded gravel and is generally 2 to 5 feet thick. The middle layer consists of coarse sands, which tend to be 10 to 20 feet thick. The bottom layer consists of finer sands that tend to be at least 18 feet thick.

The Flood Plain Alluvium refers to alluvium, which underlies the surface of a modern flood plain. This alluvium is a result of deposits ranging from silt to cobble sized gravel from various streams as well as the Farmington River. It consists of a well-sorted silt with interbedded find to very fine-grained sands or poorly to well sorted and well stratified gravels. The thickness of this alluvium ranges from 12 to 33 feet.

The Alluvium in the area is comprised of two facies, an upper and lower. The lower facies consists of reddish-brown, medium-grained sand to fine gravel. There are occurrences within this facies of a light colored material of same size that is both intermixed and separated. There are few pebbles present and the size of these pebbles can be up to 2 inches. This lower Alluvium facies is well to moderately well sorted, well stratified, and cross-bedded to the south. The upper Alluvium facies is characterized as a finer, massive, well sorted, poorly stratified, light gray to yellow clayey sandy silt.

The Swamp Deposits are characterized by muck and peat deposits. The muck consists of silt, clay, and very find sand intermixed with decomposed humus. The muck is generally 1.5 to 2.5 feet thick. The peat consists of only partially decomposed humus, which is generally greater than 5 feet thick. Many of the artificial fills in the New Britain area are believed to be underlain by swamp deposits. Depressions and ponds can occur in artificial fills where underlying swamp deposits are thick.

The Terrace Alluvium is present on the northeast section of the project limits. It consists of light colored reddish brown, coarse-grained sand and cobbles. These capping terraces are relatively thin (10 feet or less) and are a result of the Mattabesset and Connecticut rivers.

Rock

The following bedrock information was obtained from the Bedrock Geologic Map of the New Britain Quadrangle and the Bedrock Geologic Map of Connecticut (Figure 4).

The bedrock units within the project limits are members of the Newark Group, which is Jurassic in age (approximately 210 to 230 mya). This area is characterized by sedimentary rock (brownstone), which has been intruded by basaltic sills (trap rock), with a series of normal faults trending northeast and southwest. There is little to no exposure of bedrock throughout the project area. The geologic maps indicate the following rock types, which underlay the surficial deposits within the project location: East Berlin Formation (Jke), Hampton Basalt (Jrh). And Portland Arkose (Jrp). The above bedrock

units are described below as the units occur along the proposed alignment of the Hartford Busway from southwest to northeast.

The East Berlin Formation consists of a dark reddish brown to grayish-red, micaceous, feldspathic to arkosic interbedded medium to fine-grained sandstone, siltstone, and shale. The East Berlin Formation also may locally consist of medium gray, thin bedded, micaceous shale. The thickness of this unit is unknown, but may exceed 600 feet.

The intruding Hampden Basalt (traprock) underlies a small section of the alignment as it enters New Britain from the east. This basalt consists of a dark to very dark gray or greenish gray, hard, fine-grained basalt. The thickness is approximately 150 feet. There are local occurrences of two or more lava flows that constitute a single stratigraphic unit within the Hampden Basalt.

The Portland Arkose (brownstone) underlies a majority of the proposed alignment. This arkose consists of a reddish-brown to grayish-red, micaceous, feldspathic, interbedded, medium to fine-grained sandstone, siltstone, and shale. The thickness of this unit is highly variable and may exceed 1000 feet.

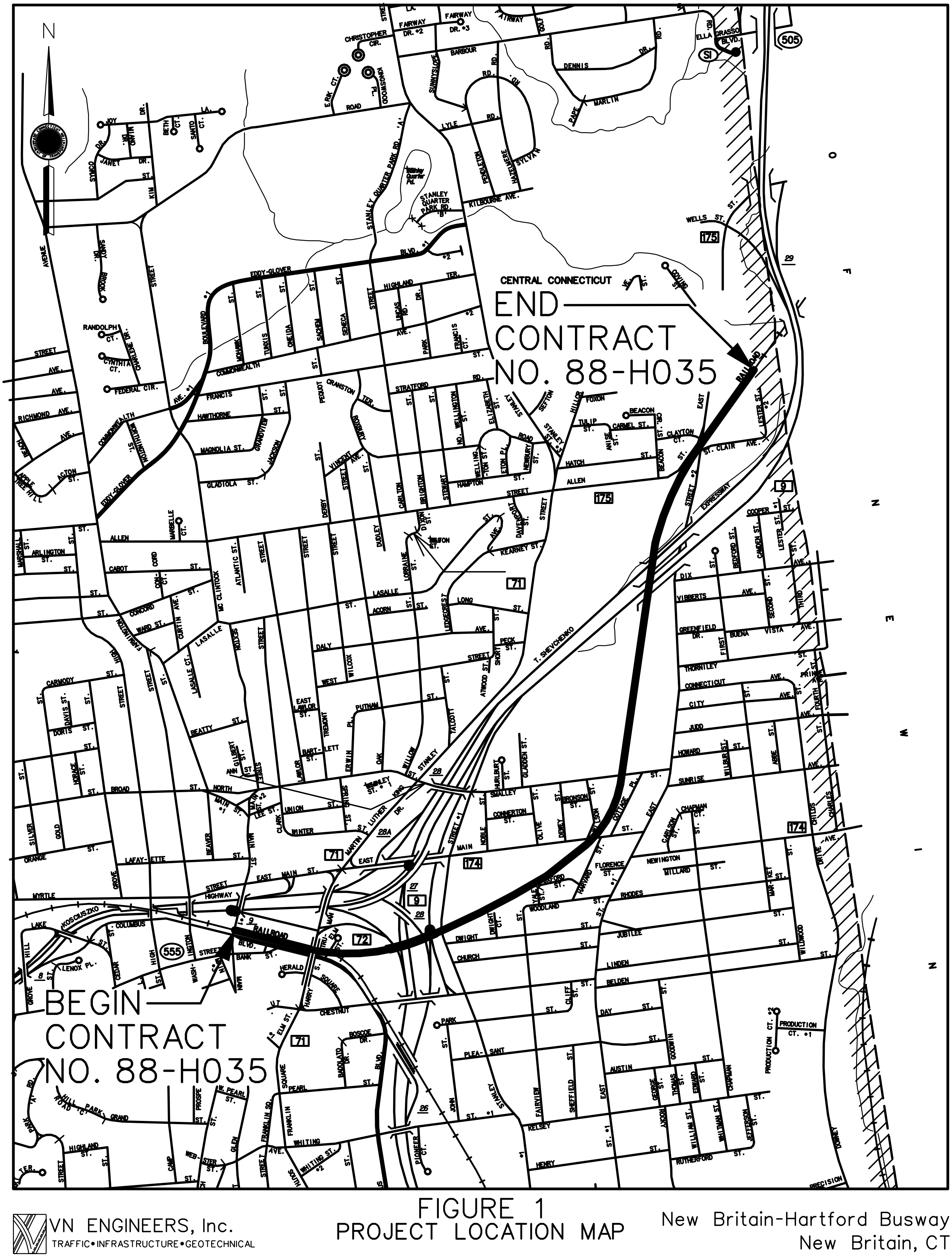
Groundwater and Drainage

The regional data on groundwater and drainage conditions are based on The Hartford South Quadrangle Report No. 20.

Most of the water bearing deposits within the proposed roadway are gravelly sand deposits surrounding streams and river flood plains. The aquifers in the area are relatively thin and generally do not exceed a thickness of 35 feet, but are relatively high yielding. The sands are generally underlain by less permeable clayey silts.

Groundwater is also typically found in depressions in the bedrock, which are filled with sand and gravel. Groundwater in bedrock is typically limited to areas of secondary porosity; however, discontinuities can be sufficient water bearing sources as long as recharge areas are not sealed by clays.

The regional drainage is controlled by the Connecticut River to the east and its main tributaries, the Mattabessett, South Branch of the Park, and Farmington Rivers. The local drainage flows toward the swamps, lakes/ponds, and small streams.



VN ENGINEERS, Inc.
TRAFFIC• INFRASTRUCTURE• GEOTECHNICAL

FIGURE 1
PROJECT LOCATION MAP
N.T.S.

New Britain-Hartford Busway
New Britain, CT

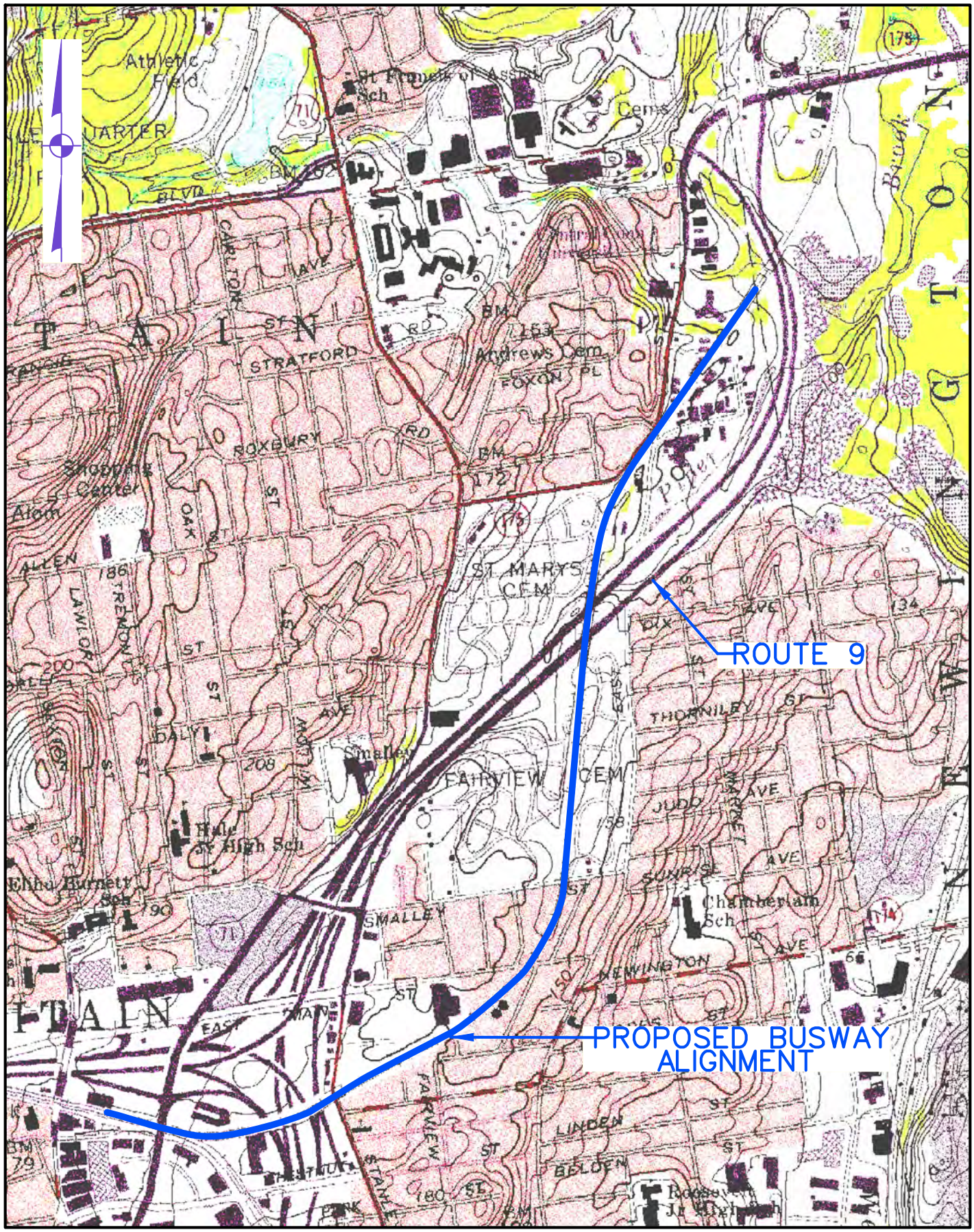


FIGURE 2
TOPOGRAPHIC LOCATION MAP
N.T.S.

VN ENGINEERS, Inc.
TRAFFIC•INFRASTRUCTURE•GEOTECHNICAL

New Britain-Hartford Busway
New Britain, CT

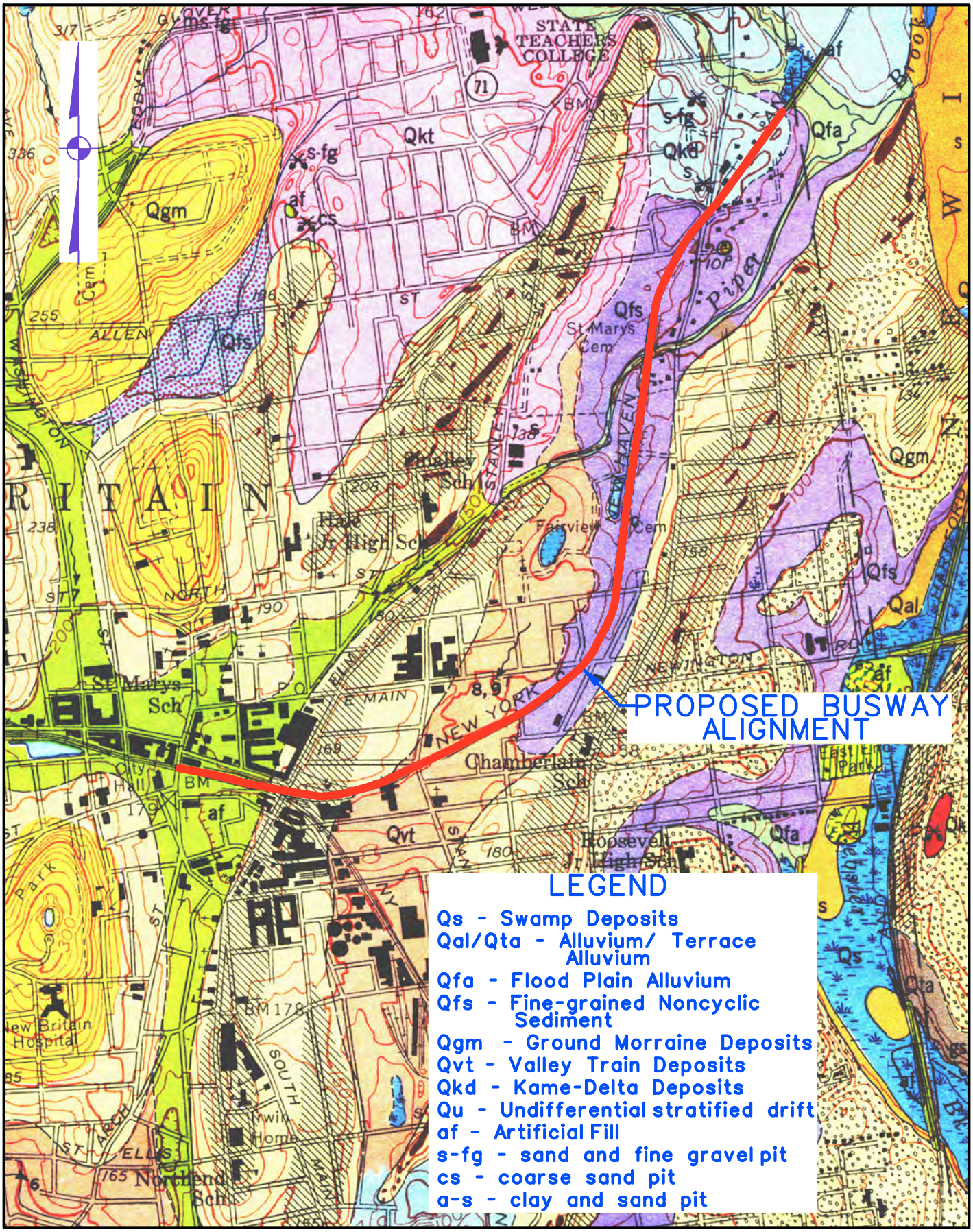
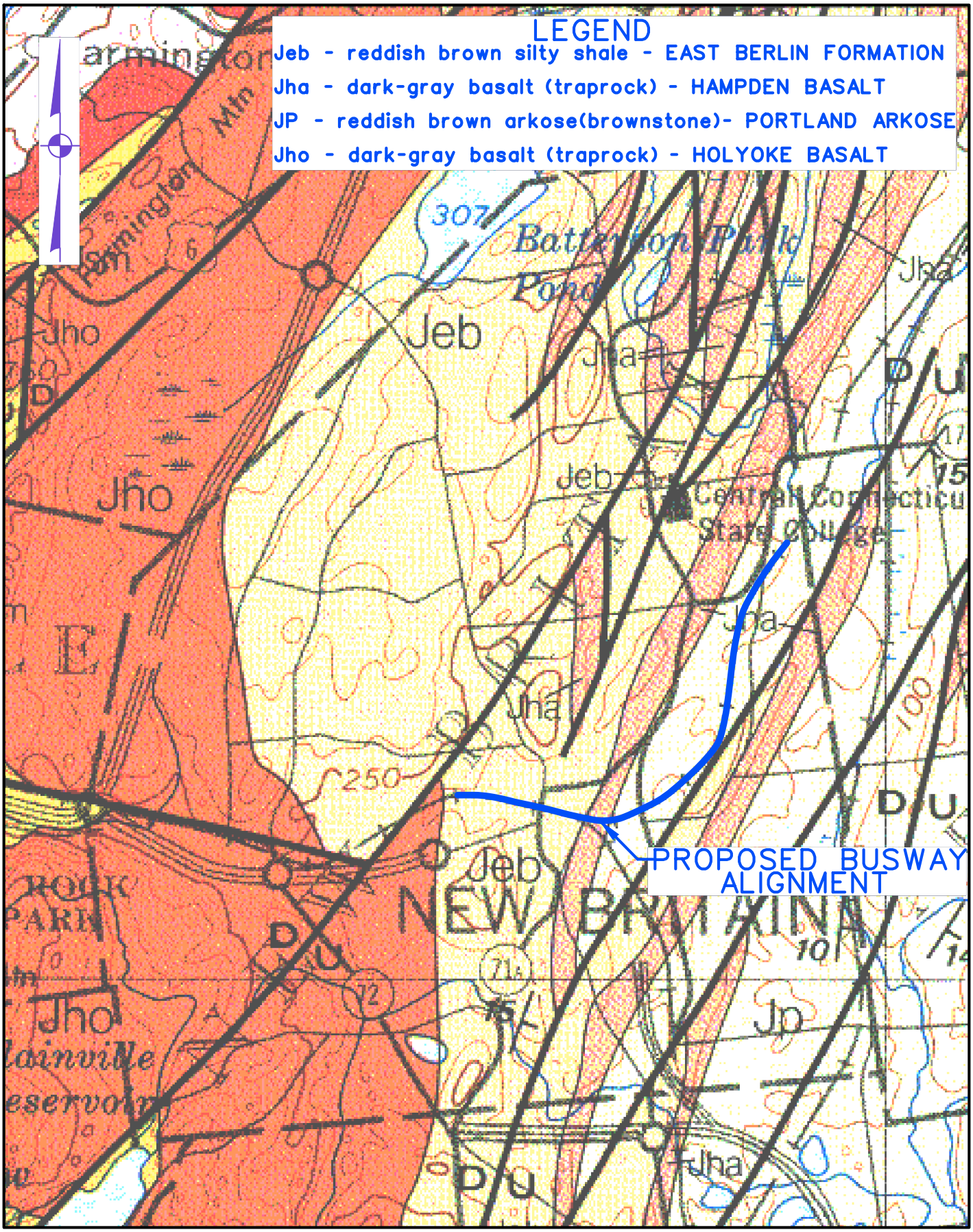


FIGURE 3
SURFICIAL GEOLOGY MAP
N.T.S.

VN ENGINEERS, Inc.
TRAFFIC•INFRASTRUCTURE•GEOTECHNICAL

New Britain-Hartford Busway
New Britain, CT



VN ENGINEERS, Inc.
TRAFFIC•INFRASTRUCTURE•GEOTECHNICAL

FIGURE 4
BEDROCK GEOLOGIC MAP
N.T.S.

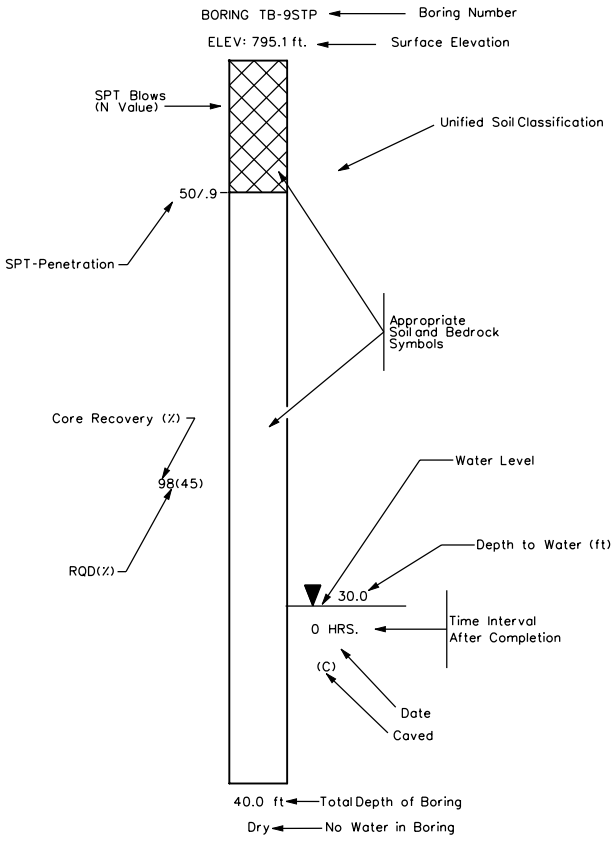
New Britain-Hartford Busway
New Britain, CT

SOIL LEGEND AND CHARACTERISTICS

Well graded gravel (GW)	Well graded Sand (SW)
Well graded Gravel and Sand (GW-SW)	Well graded Sand with Silt (SW-SM)
Well graded Gravel with Silt (GW-GM)	Well graded Sand with Clay (SW-SC)
Well graded Gravel with Clay (GW-GC)	Poorly graded Sand (SP)
Poorly graded Gravel (GP)	Poorly graded Sand with Silt (SP-SM)
Poorly graded Gravel and Well graded Sand (GP-SW)	Poorly graded Sand with Clay (SP-SC)
Poorly graded Gravel with Silt (GP-GM)	Silt (ML)
Poorly graded Gravel with Clay(GP-GC)	Clay (CL)
TopSoil	Organic Silt (DL)
Fill Soil, Debris	Organic Clay (DL)

ROCK SYMBOLS AND NAMES

Sandstone	Traprock
Shale	Basalt
Concrete	Asphalt



VN ENGINEERS, Inc.
TRAFFIC•INFRASTRUCTURE•GEOTECHNICAL

FIGURE 5: SOIL AND ROCK LEGEND
New Britain - Hartford Busway
New Britain, CT

APPENDIX 5

LIMITATIONS

APPENDIX
LIMITATIONS

A. SUBSURFACE INFORMATION

Locations: The locations of the explorations were in accordance with the plans provided by URS. The elevations of the explorations were later surveyed by the CDOT.

Interface of Strata: The stratification lines shown on the individual logs of the subsurface explorations represent the approximate boundary between soil types, and the transition may be gradual.

Field Logs/Final Logs: A field log was prepared for each exploration by a member of our staff. The field log contains factual information and interpretation of the soil conditions between samples.

We must emphasize that our recommendations are based on the final logs and the information contained therein, and not on the field logs.

The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and tests of the field samples. The final logs are included in the engineering report.

Water Levels: Water level readings have been made in the explorations at times and under conditions stated on the individual logs. This data has been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, regrading, temperature, and other factors at the time measurements were made.

Pollution/Contamination: Unless specifically indicated to the contrary in this report, the scope of our services was limited only to investigation and evaluation of the geotechnical engineering aspects of the site conditions, and did not include any consideration of potential site pollution or contamination resulting from the presence of chemicals, metals, radioactive elements, etc. This report offers no facts or opinions related to potential pollution/contamination of the site.

Environmental Considerations: Unless specifically indicated to the contrary in this report, this report does not address environmental considerations which may affect the site development, e.g., wetlands determinations, flora and fauna, wildlife, etc. The conclusions and recommendations of this report are not intended to supersede any environmental conditions which should be reflected in the site planning.

B. APPLICABILITY OF REPORT

This report has been prepared in accordance with generally accepted soils and foundation engineering practices for the exclusive use of URS for specific application to design of the proposed Busway Project. No other warranty, expressed or implied, is made.

C. REINTERPRETATION OF RECOMMENDATIONS

Change in Location or Nature of Facilities: In the event that any changes in the nature, design or location of the redesign are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

Changed Conditions During Construction: The analyses and recommendations submitted in this report are based in part upon the data obtained from forty (40) widely-spaced test borings performed for this study. The nature and extent of variations between the explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

Changes in State-of-the-Art: The conclusions and recommendations contained in this report are based upon the applicable standards of our profession at the time this report was prepared.

Use of Report by Prospective Bidders: This soil and foundation engineering report was prepared for the project by VN Engineers, Inc. for design purposes only, and may not be sufficient to prepare an accurate bid. Contractors utilizing the information in the report should do so with the expressed understanding that its scope is limited to design considerations. Prospective bidders should obtain the owner's permission to perform whatever additional explorations or data gathering they deem necessary to prepare their bid accurately.