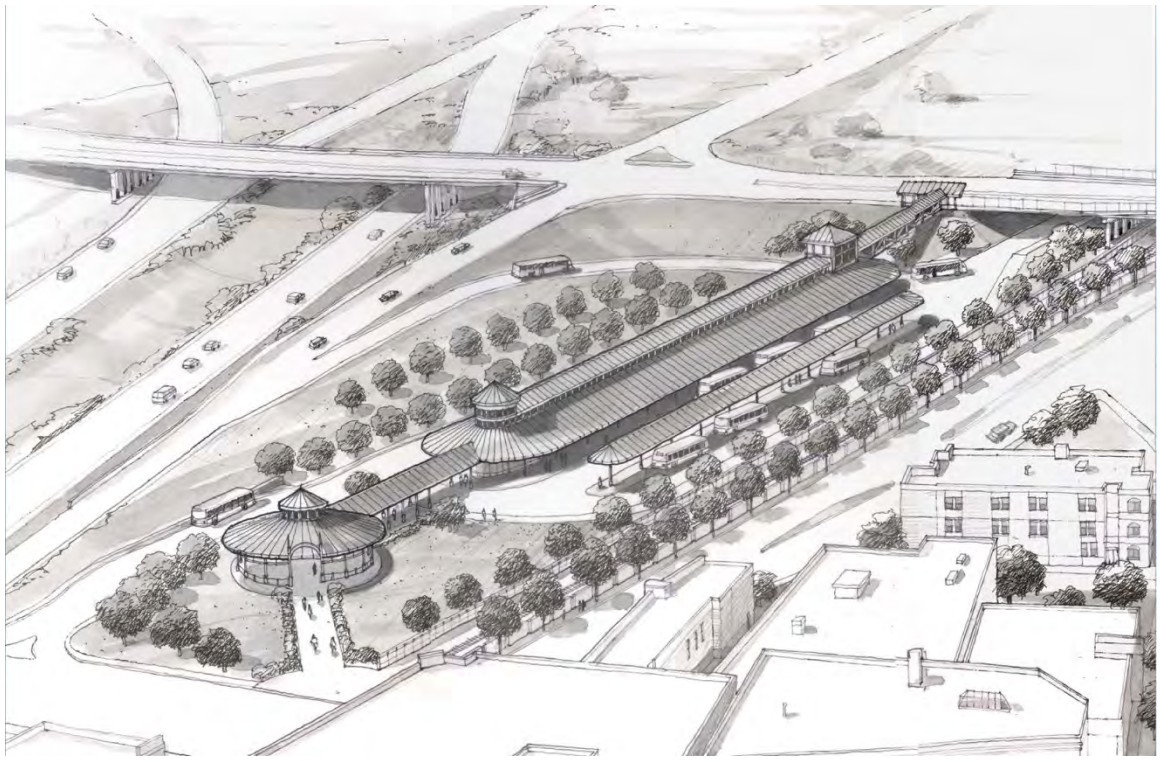
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

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

BUSWAY STATION 18+80 TO STATION 118+00

NEW BRITAIN, CONNECTICUT

BRIDGE NO. 03913 – TRUMAN OVERPASS WINGWALL
GEOTECHNICAL REPORT



FEBRUARY 2011

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CONNECTICUT DEPARTMENT OF TRANSPORTATION

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Bridge No. 03913 – Truman Overpass Wingwall

Geotechnical Report

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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 is a Structure Geotechnical Report for proposed Bridge No. 03913 Route 71 over Route 72. This structure is part of the design of an exclusive bus rapid transit (BRT) facility within an abandoned railroad corridor from New Britain Station to East Street Station in the City of New Britain, Connecticut. This roadway requires reconstruction of the exit ramp at the location of existing exit 9 off Rte. 72 Eastbound, as well as the reconstruction of the entrance ramp to Rte. 9 from Truman overpass (Rte. 71).

This report covers specific geotechnical data and instructions for the construction of a wingwall at the end of Route 72 exit ramp. 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 EXISTING BRIDGE

Existing Bridge No. 03913 – Route 71 (Truman Overpass) over Route 72 is a two (2) span curved continuous steel plate girder structure with a composite reinforced concrete deck. The abutments and wingwalls are full height of reinforced concrete. The south abutment and wingwalls are supported on steel H-Piles. The north abutment and reinforced concrete pier are founded on spread footings.

There are condition problems with the bridge due to its 35 years of service. It is understood the Program Manager will be addressing these condition problems during the rehabilitation study and making recommendations, if warranted. This design will be added as Extra Work if needed.

3.0 PROPOSED CONSTRUCTION

Existing Bridge Structure No. 03913 will be modified to accommodate the relocation of the Route 72 exit ramp. This will require the partial demolition of the top of the existing southwest and southeast wingwalls and the construction of a new flared concrete wingwall at the southwest corner of the bridge. The approach reinforced concrete barrier curb will also be removed to allow for this ramp. Also, the raised median on the deck will be partially removed and reconstructed to accommodate a left hand turn lane on the bridge. The proposed wingwall will be a reinforced concrete cantilever design with a pile supported footing. The location and bridge plan is shown in Appendix 1 of this report. Also the location of the subsurface boring relative to the profile grade is shown in Appendix 1.

4.0 SUBSURFACE DATA

In order to explore the subsurface soil and bedrock at the location of the proposed structure, a subsurface investigation program consisting of one (1) supervised test boring was performed at the following location:

Bridge No. 03913 - At wingwall, Sta. 211+14 (B-102)

The test boring at existing Bridge No. 03913 was advanced utilizing truck mounted drilling equipment and extended to depths of 38 feet below the existing surface grades. The boring was 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 included in Appendix 3.

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

Boring B-102 at Station 211+14 of the proposed Route 72 exit ramp represents the soil data for the construction of a wingwall to the Route 71 Bridge (Truman Overpass). The soil consisted of Brown and Red brown sand down to the 20 foot level following was a five (5) foot layer of Red brown silt, below the 25 feet level to 35 feet was reddish brown gravel. At 35 feet, rock coring commenced and was ended at about 38 feet. There was a 97 percent recovery of red brown Shale with 72 percent RQD. A complete log of this boring is presented in Appendix 2 of this report.

The blow counts at the 20 feet level was 39 blows per foot whereas the blow counts on the underlying silt was 5 blows per foot.

Groundwater was encountered 16' below grade at this boring location.

5.0 SUBSURFACE CONDITIONS

Based on our boring log, the following is a general description of the subsurface conditions in order of increasing depth:

Pavement – No pavement was encountered at boring B-102.
Soil / Gravel fill – 15 feet of sand fill and/or fill soil mixed with gravel was encountered in boring B-102.
Sand – Red Brown loose to dense sand with some silt and gravel was found in boring B-102 at depths ranging from 15 to 20 feet below grade.
Silt – Stiff to very stiff red brown silt with some sand and gravel was encountered in boring B-102 at depths ranges from 20' to 25' below the ground surface.

Gravel – Loose to very dense gravel was encountered in boring B-102 at depths ranging from 25' to 35' below the surface grades and generally terminated atop bedrock.
Bedrock – Bedrock was encountered in borings B-102 at a depth of 35' below the surface grades. The type of rock recovered was reddish brown Shale of the East Berlin Formation.
Groundwater – Groundwater was encountered 16 feet below grade in boring B-102.

5.1 Geology

Published geologic data and the subsurface explorations supervised by VN Engineers, Inc. shows the proposed wingwall will be primarily founded on sandy fill soils comprised of local ground-moraine and valley train deposits. The ground-moraine (Qgm) is made up of reddish-brown silty sand and gravel. It should be noted that published data reported that this layer is composed of clay size particles to large boulders, although boulders were not encountered in the boring performed for this study. The ground-moraine is inter-bedded with micaceous, medium grained sand and gravel consistent with Valley-Train deposits (Qvt). It should be noted that construction debris was observed within the fill soil layer.

5.2 Soil and Rock Profile

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

6.0 LABORATORY TESTING RESULTS

6.1 Soil Gradation Analysis

VN Engineers performed laboratory tests on a soil sample to verify the field classifications at critical locations and depths. The boring for this study shows that the site is underlain by loose to medium dense sandy fill soil to a maximum depth of 15 feet, followed by loose to very dense natural sand to a depth of 35 feet below existing grade. The results of the laboratory analyses are presented in Appendix 3 of this report.

6.2 Unconfined Compression Tests

The proposed wingwall foundation will utilize deep foundations bearing at the depth of the bedrock. The site is underlain by reddish brown Shale of the East Berlin Formation at a depth of 35 feet below grade which had an average unconfined compressive strength of 3389 psi for the samples tested at other locations. See Appendix 3.

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
- Subsurface drainage
- Settlement
- Existing fill
- Sub grade preparation
- Re-use of on-site materials
- Static Design Parameters

7.2 Foundation Types

The wingwall designed for this structure will consist of pile supported poured concrete footings. Based upon the grade changes at the site, this wall may be on the order of 14 feet high. The base of the wall may vary from elevation 166.5 to 171.5, and will bear within the sandy fill soil encountered from 0 to 15 feet below surface grade. The boring logs indicate varying layers of loose to dense sand and gravel from 15 to 32 feet below existing grade. The boring performed at this location shows that bedrock was encountered at 35 feet below grade and is overlain by several feet of very dense gravel. Therefore, we recommend supporting the proposed new wingwall upon deep foundations.

For the loads required to support the wingwall, 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 very dense gravel prior to encountering bedrock. This gravel layer was generally encountered at depth of approximately 30 feet below the surface grade and could range in thickness from 5 feet to greater than 10 feet.

Allowable load capacities for driven piles must be determined based upon Section 10 of the 2006 Interim 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 0.34Fy. 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 160 to 271 kips. However, the higher capacity piles may penetrate through the till layer when driven with a higher capacity hammer. Additionally, piles may not reach the bedrock due to a dense gravel layer. Therefore, we recommend utilizing the lighter capacity piles, driven with a relatively light hammer (Vulcan 08 or 10), driven to the depth as determined by the PDA and load test, and deriving support within the very dense gavel 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 feet. 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. In our experience these capacities should be achieved with less penetration using a lighter hammer. It should also be noted that a higher capacity hammer may damage the pile or drive the pile through the till layer to the underlying bedrock. Therefore, the actual depth of penetration into the till layer must be determined in the field via a Pile Driving Analyzer (PDA), and later verified via full scale load testing.

The load test should be performed no less than 5 days after the pile is driven, in accordance with section 10.7.3.8.

Allowable Geotechnical Capacity

Pile Size	Tip Resistance	Skin Friction		Downdrag	Total Geotechnical Capacity
		Sand	Till		
HP 10 x 57	63 kips	50	80	- 33	160 kips
HP 12 x 74	81 kips	61	97	- 40	200 kips
HP 14 x 89	98 kips	71	114	- 46	237 kips
HP 14 x 117	129 kips	73	116	-47	271

In the event that it is decided to penetrate the very dense gravel layer and provide end bearing piles into bedrock, the end bearing capacity will increase therefore VN Engineers should be contacted for revised allowable capacities.

Based upon the boring logs we occasionally encountered high blow counts above the till layer, therefore severe driving should be anticipated. The contractor may consider predrilling or spudding where obstructions are encountered. Additionally, 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 Conditions and Bearing Pressure

Based upon the boring performed for this study, the proposed wingwall subgrade elevation consists of loose to medium dense sandy fill soil at the elevations stated above. 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. Consequently, we recommend utilizing deep foundations which derive support from the very dense gravel or bedrock.

7.4 Subsurface Drainage

The preliminary design of the proposed wingwall indicates that it will include weepholes and bagged stone. In accordance with the ConnDOT Bridge Design Manual the drainage should consist of four-inch diameter weepholes which extended through the wall stem.

7.5 Settlement

As previously stated, the soil beneath the wingwall consists of loose to medium dense sandy fill soils. At boring location B-102 the loose sandy fill was encountered to depths of 12 to 15 feet below the surface grade. It may

be impractical to remove and replace the loose soil beneath the proposed footings. Therefore, we recommend utilizing a pile supported deep foundation which derives support from the dense gravel/bedrock. Settlement of a pile supported poured concrete wall would be limited to 3/8 of an inch or less.

7.6 Existing Fill

Fill soils encountered during the subsurface excavation program extended to depths greater than the bottom of the proposed wingwall foundation, as shown below.

Wingwall at Route 71 overpass - Boring B-102 indicates loose fill to 15'.

7.7 Subgrade Preparation

As previously stated, the majority of the natural soils encountered at the depth of the proposed wingwall subgrade elevations consisted of loose to medium dense sandy fill soil 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.

Site preparation would naturally commence with, stripping of topsoil. Prior to commencement of earthwork construction operations, any subsurface utilities and/or abandoned subsurface structures should be located within five (5) feet of the proposed construction area. Required tree removal should follow the location of utilities and structures. 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 backfill. Generally, the subgrade soils consisted of medium dense to dense sand. However, due to the uncertainty of fill soils and/or moisture found along portions of the proposed Busway, care should be taken not to disturb the soil during excavation. Therefore, where silts and/or 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 determined to be either organic or over saturated, we would recommend over excavating to a more suitable layer.

It should be noted that actual field conditions may vary from those encountered in the boring logs. Therefore, the borings logs can be utilized to target areas of unsuitable subgrade soils; however actual depth of excavation required should be determined in the field at the time of construction.

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 be placed in layers on the order of 10 to 12 inches in loose thickness and be uniformly compacted with a 10 ton vibratory roller, or greater, to at least 95 percent of its maximum dry density as determined by ASTM D-1557 Test Procedures.

7.8 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 Wingwall

The proposed wingwall footings will be established at elevation 166.5 and elevation 171.5 within the medium dense to dense fill soils initially encountered at five (5) feet below the existing surface grades. These soils are considered suitable for support of the proposed pile supported footing, however they are likely to require some degree of preparation work. The foundation sub grade must be prepared in accordance with the recommendations described in section 7.7 of this report.

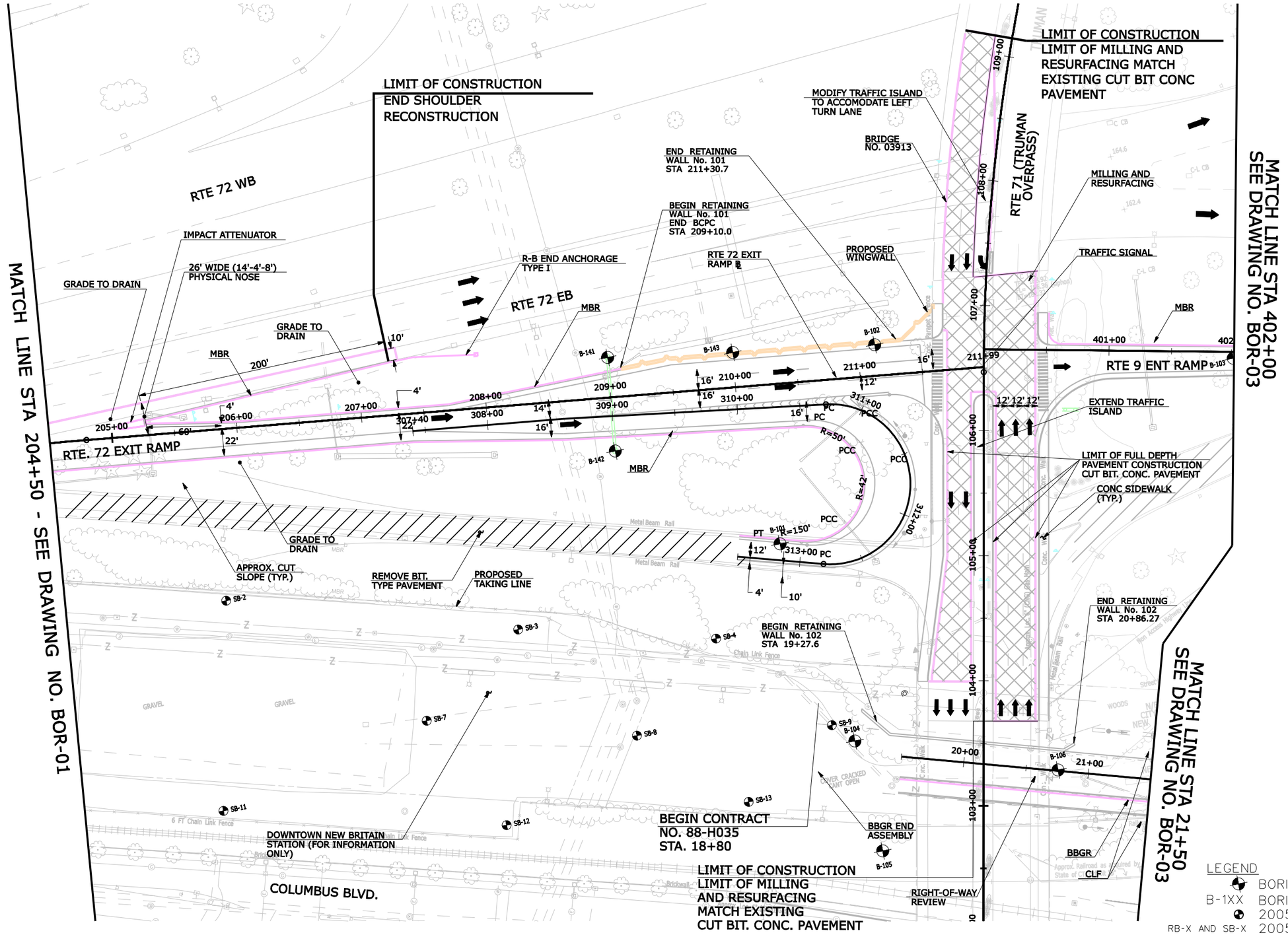
9.0 LIMITATIONS

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

APPENDIX 1

BORING LOCATION PLAN

AND SUBSURFACE PROFILE



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
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PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY
CADD FILE: $DGNNAME$ PLOTTED DATE: 4/28/2010

TOWN: NEW BRITAIN
DRAWING TITLE: BORING LOCATION PLAN

PROJECT NO.: 88-H035
DRAWING NO.: BOR-2
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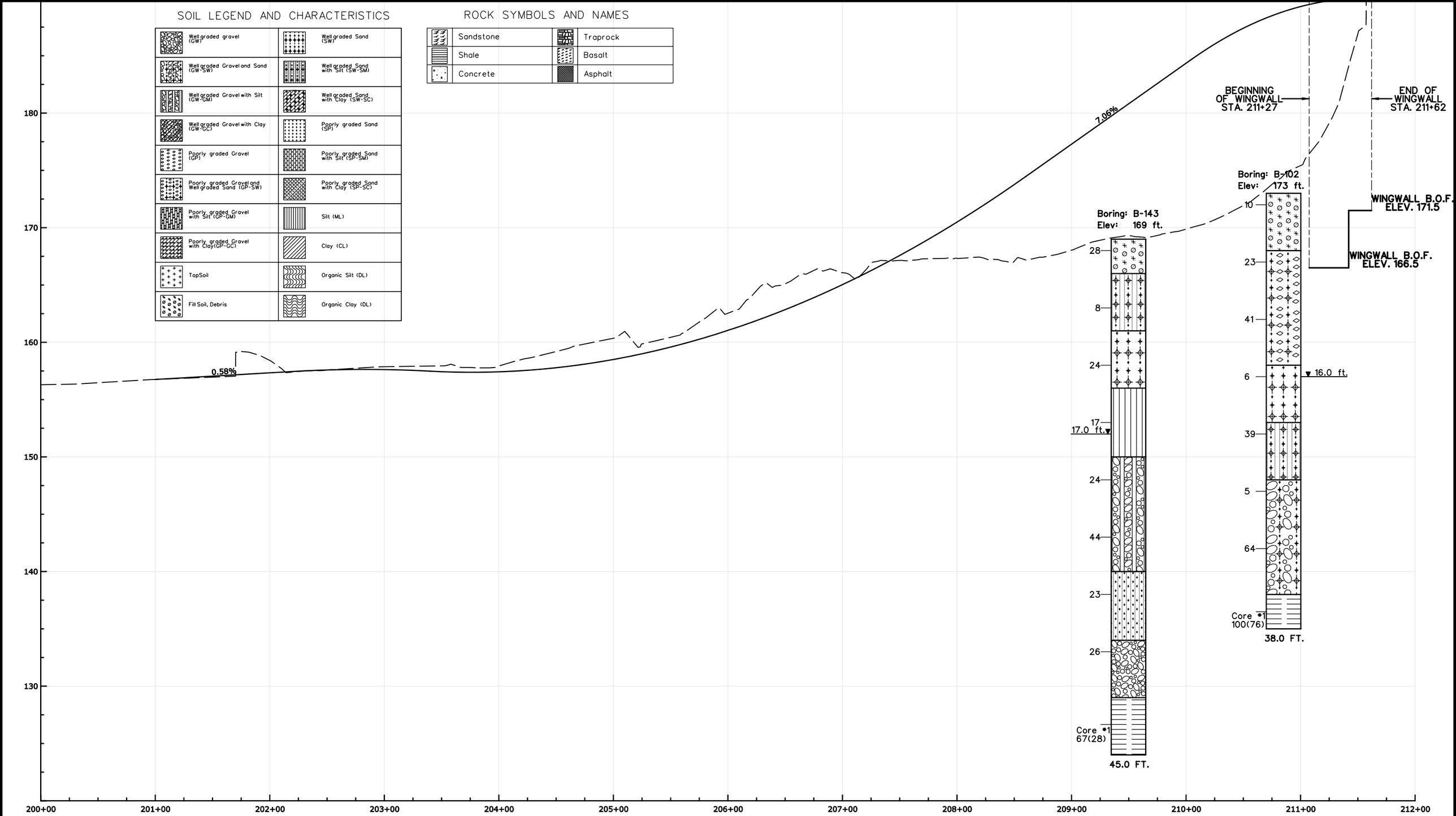

FINAL DESIGN REVIEW

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.

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DESIGNER/DRAFTER: M. BAUER

CHECKED BY: R. GOMEZ

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VERT. SCALE IN FEET 0 4 8

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

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APPROVED BY: DATE:

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY

TOWN: NEW BRITAIN

DRAWING TITLE: SOIL PROFILE BRIDGE NO. 03913 WINGWALL

PROJECT NO. 88-H035

DRAWING NO. PRO-1

SHEET NO. S

APPENDIX 2

BORING LOGS

Driller: New England Boring / Trent	**Connecticut DOT Boring Report**		Hole No.: B-101
Inspector: VN Engineers / M. Bauer	TOWN: New Britain		Stat./Offset: 313+18 / 12' Right
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 804411
Start Date: 7/27/2007	Route No.:		Easting: 992176
Finish Date: 7/27/2007	Bridge No.:		Surface Elevation: 187
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:		@ 30' 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								187
						10" Asphalt	Asphalt / Road Base	
	SS-1	47, 35, 23, 26	24"	12"			Red Brown F-C SAND, some F-C gravel, trace silt	
						4'		
5	SS-2	14, 11, 12, 22	24"	15"				182
10	SS-3	18, 23, 18, 15	24"	11"			Red Brown F-C SAND, little silt, trace F gravel MC = 9.7%	177
15	SS-4	3, 3, 3, 4	24"	12"				172
						19'		
20	SS-5	29, 23, 16, 20	24"	10"				167
25	SS-6	3, 2, 3, 6	24"	11"			Brown Reclaimed F-C SAND, some F-C gravel, little silt, debris. MC=25.8%	162
						29'		
30	SS-7	4, 8, 9, 4	24"	12"			Red Brown SILT, some F sand, little F gravel	157
							EOB @ 32'	
35								152
40								147

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: 6" of asphalt and 4" of road base at surface Recovered some construction debris at 23'. (wood, brick, glass)	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Trent	**Connecticut DOT Boring Report**		Hole No.: B-102
Inspector: VN Engineers / Necip	TOWN: New Britain		Stat./Offset: 211+14 / 23' Left
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 804552
Start Date: 7/27/2007	Route No.:		Easting: 992282
Finish Date: 7/27/2007	Bridge No.:		Surface Elevation: 173
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: 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								173
	SS-1	3, 4, 6, 11	24"	22"			Brown F-C SAND, little F-C, gravel, little silt, Fill	
5						5'		168
	SS-2	14, 11, 12, 22	24"	18"			Black F-C SAND, some F-M gravel, Debris, Fill	
10	SS-3	18, 23, 18, 15	24"	6"				163
15						15'		158
	SS-4	3, 3, 3, 4	24"	15"			Red Brown F-C SAND, little F-M gravel, trace silt MC = 6.5%	
20						20'		153
	SS-5	29, 23, 16, 20	24"	9"			Red Brown SILT, some F-C sand, some F-C gravel	
25						25'		148
	SS-6	3, 2, 3, 6	24"	9"			Red Brown F-C GRAVEL, some F-C sand, little silt	
30	SS-7	30, 32, 32, 36	24"	0"				143
35						35'		138
	C-1	4 Min					Rock Core Run	
	C-1	6.5 Min	36	36	72%		Rec =36"	
	C-1	5 Min				38'	RQD = 26/36 = 72%	
							Red Brown Sedimentary Shale	
40							EOB @ 38'	133

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: 35' Rock: 3' No. of Samples: 7	NOTES: Recovered some construction debris at 10'. (wood, brick, glass)	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Mike	**Connecticut DOT Boring Report**		Hole No.: B-103
Inspector: VN Engineers / Necip	TOWN: New Britain		Stat./Offset: 402+00 / 5' Right
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 804486
Start Date: 7/27/2007	Route No.:		Easting: 992561
Finish Date: 7/27/2007	Bridge No.:		Surface Elevation: 175
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: Dry	@ after 0 hours		

Depth (ft)	SAMPLES: Sample Type/ No.	SAMPLES: Blows on Sampler per 6 inches	SAMPLES: Pen. (in.)	SAMPLES: Rec. (in.)	SAMPLES: RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	SS-1	3, 6, 16, 25	24"	15"			Red Brown F-C SAND, some F-C gravel, little silt, cobbles	175
5	SS-2	10, 19, 31, 26	24"	8"		8'		170
							EOB @ 8'	
10								165
15								160
20								155
25								150
30								145
35								140
40								135

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: 8' Rock: No. of Samples: 2	NOTES: Auger refusal at 8'	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: ABC Boring / Jaime Lloret	**Connecticut DOT Boring Report**		Hole No.: B-104
Inspector: VN Engineers / M. Bauer	TOWN: New Britain		Stat./Offset: 19+12 / 9' Left
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 804245
Start Date: 7/27/2007	Route No.:		Easting: 992204
Finish Date: 7/27/2007	Bridge No.:		Surface Elevation: 171
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:		@ 20' 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	3, 12, 43, 45	24"	10"		3'	Black topsoil F-C SAND, some F gravel	171
5	SS-2	4, 5, 3, 3	24"	8"			Red Brown F-C SAND, some silt, little F gravel MC = 11.6%	166
10	SS-3	2, 3, 3, 3	24"	9"				161
15	SS-4	3, 5, 10, 6	24"	6"		16'		156
						20'	Red Brown F-C SAND, little Silt	
20	SS-5	9, 14, 22, 32	24"	15"				151
25	SS-6	3, 9, 21, 30	24"	22"			Red Brown F-C SAND, some silt	146
30	SS-7	4, 9, 24, 26	24"	16"		32'		141
							EOB @ 32'	
35								136
40								131

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: Soil contaminated with gasoline or some kind of fuel at 20'	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: ABC Boring / Jamie Lloret	**Connecticut DOT Boring Report**		Hole No.: B-105
Inspector: VN Engineers / M. Bauer	TOWN: New Britain		Stat./Offset: 19+42 / 76' Left
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 804154
Start Date: 7/18/2007	Route No.:		Easting: 992209
Finish Date: 7/18/2007	Bridge No.:		Surface Elevation: 171
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:			@ 20' 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								171
	SS-1	2, 8, 10, 10	24"	9"		2'	Black F-C SAND, some F-M gravel, little ash	
5	SS-2	6, 8, 10, 15	24"	8"			Red Brown F-C SAND, some F-M gravel, trace silt	166
10	SS-3	6, 9, 10, 12	24"	12"				161
15	SS-4	16, 22, 19, 21	24"	12"		15'	Red Brown SILT, some F-C sand, little F-C gravel, trace schist	156
20	SS-5	8, 13, 17, 15	24"	14"			Red Brown SILT, some F-C sand, little F-C gravel, trace schist	151
25	SS-6	5, 10, 10, 11	24"	18"		25'	Red Brown SILT, some F-C gravel, Little F-C sand, trace schist	146
30	SS-7	11, 20, 30, 30	24"	24"				141
35							EOB @ 32'	136
40								131

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: Samples are very consistent, Sand and gravel become more coarse at 25'. More like glacial till with higher schist content	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: ABC Boring / Jamie Lloret	**Connecticut DOT Boring Report**		Hole No.: B-106
Inspector: VN Engineers / M. Bauer	TOWN: New Britain		Stat./Offset: 20+76 / 1' Left
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 804190
Start Date: 7/18/2007	Route No.:		Easting: 992359
Finish Date: 7/18/2007	Bridge No.:		Surface Elevation: 170
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								170
							4" Asphalt	
	SS-1	18, 14, 11, 10	24"	9"			Brown F-C SAND. Some silt, little gravel, MC = 11.1%	
						5'		
5	SS-2	4, 5, 5, 5	24"	6"				165
10	SS-3	5, 5, 5, 6	24"	10"			Brown F-C SAND, some silt, little F-M gravel	160
						15'		
15		3, 3, 3, 3	24"	0"				155
	SS-4	3, 4, 4, 4	24"	18"			Black Grey Silt, some F sand, trace F gravel	
20	SS-5	2, 2, 3, 5	24"	12"				150
25	SS-6	4, 1, 2, 2	24"	14"			Black Grey Silt, some F sand, trace F gravel	145
						30'		
30	SS-7	6, 7, 8, 10	24"	9"				140
35	SS-8	8, 24, 23, 20	24"	11"			Red Brown SILT, some F-C sand, little F-M gravel, Glacial Till	135
						37'		
							EOB @ 37'	
40								130

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: 37' Rock: No. of Samples: 8	NOTES: Rock caught in spoon at 15' - 17' No rec. Glacial Till at 30'	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Tim C.	**Connecticut DOT Boring Report**		Hole No.: B-141
Inspector: VN Engineers / M. Bauer	TOWN: New Britain		Stat./Offset: 209+00 / 32' LT
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 804584.81
Start Date: 1/6/2010	Route No.:		Easting: 992070.99
Finish Date: 1/6/2010	Bridge No.:		Surface Elevation: 167
Project Description:	**New Britain - Hartford Busway**		
Casing Size/Type: 4" casing	Sampler Type/Size: Split Spoon / 1 3/8"		Core Barrel Type: 2" NQ
Hammer Wt.:300 Fall: 30"	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations:		@ 16' after 0 hours	

Depth (ft)	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, 7, 15, 14	24"	9"		Fill 3'	Brown c-f SAND, some c-f gravel, little silt, Debris, Fill	167
5	SS-2	2, 8, 5, 4	24"	3"				162
10	SS-3	9, 7, 6, 8	24"	16"		Sand 19'	Brown c-f SAND, little c-f gravel, trace silt	157
15	SS-4	9, 10, 7, 9	24"	10"				152
20	SS-5	3, 2, 1, 1	24"	20"		Sand & Silt 28'	Red Brown SILT, some f sand, trace f gravel	147
25	SS-6	6, 8, 10, 8	24"	19"				142
30	SS-7	35, 29, 35, 41	24"	5"		Gravel & Sand 40.5'	Red Brown c-f GRAVEL and sand, trace silt, Till	137
35	SS-8	20, 13, 14, 27	24"	18"				132
40	SS-9	100/4"	4"	2"			Top of Rock	127
45	C-1 C-1 C-1 C-1 C-1	5 Min 2 Min 2 Min 4 Min 6 Min	60"	31"		Bedrock	Rock core run #1 40.5'-45.5' Rec.= 31"/60" = 52% RQD= 5"/60" = 8% red brown silty shale highly fractured, slightly weathered East Berlin Formation	122
50	C-2 C-2 C-2 C-2 C-2	8 Min 8 Min 10 Min 7 Min 6 Min	60"	60"		50.5'	Rock core run #2 45.5'-50.5' Rec.= 60"/60" = 100% RQD= 20"/60" = 33% red brown silty shale Moderately fractured, slightly weathered East Berlin Formation	117
55							EOB @ 50.5'	112
60								107

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

Total Penetration in Earth: 40' Rock: 10' No. of Samples: 9	NOTES:	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Tim C.	**Connecticut DOT Boring Report**		Hole No.: B-142
Inspector: VN Engineers / M. Bauer	TOWN: New Britain		Stat./Offset: 209+00 / 43' RT
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 804510.27
Start Date: 1/7/2010	Route No.:		Easting: 992062.29
Finish Date: 1/7/2010	Bridge No.:		Surface Elevation: 170
Project Description:	**New Britain - Hartford Busway**		
Casing Size/Type: 4" casing	Sampler Type/Size: Split Spoon / 1 3/8"		Core Barrel Type: 2" NQ
Hammer Wt.:300 Fall: 30"	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations:			@ 14' after 0 hours

Depth (ft)	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	3, 4, 6, 7	24"	11"		Fill 3'	Brown c-f SAND, little silt, trace f gravel, debris, fill	170
5	SS-2	4, 4, 4, 4	24"	15"				165
10	SS-3	11, 8, 8, 13	24"	20"		Sand 20'	Red Brown c-f SAND, little c-f gravel, trace silt	160
15	SS-4	16, 13, 11, 11	24"	11"				155
20	SS-5	9, 10, 10, 8	24"	9"				150
25	SS-6	12, 9, 6, 8	24"	0"		Gravel & Silt 33'	Red Brown c-f GRAVEL, some silt, little f sand	145
30	SS-7	10, 6, 7, 9	24"	9"				140
35	SS-8	24, 58, 44, 14	24"	8"		Till 42'	Red Brown c-f GRAVEL, some c-f sand, little silt, bedrock fragments, till	135
40	SS-9	22, 53, 100/3"	15"	1"			Top of Rock	130
45	C-1 C-1 C-1 C-1 C-1	3 Min 3 Min 3 Min 4 Min 4 Min	60"	58"		Bedrock	Rock core run #1 42'-47' Rec.= 58"/60" = 97% RQD= 12"/60" = 20% red brown silty shale Moderately fractured, slightly weathered East Berlin Formation	125
50	C-2 C-2 C-2 C-2 C-2	3 Min 4 Min 3 Min 3 Min 3 Min	60"	54"		52'	Rock core run #2 47'-52' Rec.= 54"/60" = 90% RQD= 11"/60" = 18% red brown silty shale Moderately fractured, slightly weathered East Berlin Formation	120
55							EOB @ 52'	115
60								110

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

Total Penetration in Earth: 42' Rock: 10' No. of Samples: 9	NOTES: Spoon refusal at 41' 3". Began coring rock at 42'.	Sheet 1 of 1 SM-001-M REV. 1/02

Driller: New England Boring / Tim C.	**Connecticut DOT Boring Report**		Hole No.: B-143
Inspector: VN Engineers / M. Bauer	TOWN: New Britain		Stat./Offset: 210+00 / 30' LT
Engineer: Ray Volpe Jr.	Project No.: 88-H035		Northing: 804569.13
Start Date: 1/8/2010	Route No.:		Easting: 992169.84
Finish Date: 1/8/2010	Bridge No.:		Surface Elevation: 169
Project Description:	**New Britain - Hartford Busway**		
Casing Size/Type: 4" casing	Sampler Type/Size: Split Spoon / 1 3/8"		Core Barrel Type: 2" NQ
Hammer Wt.:300 Fall: 30"	Hammer Wt.: 140 lb Fall: 30"		
Groundwater Observations:		@ 17 after 0 hours	

Depth (ft)	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	7, 8, 20, 29	24"	23"		Fill 3'	Brown c-f SAND, little f gravel, little silt, glass, brick, fill.	169
5	SS-2	4, 4, 4, 3	24"	19"		Silt & Sand 8'	Tan SILTY SAND, MC = 17.4%, Non-Plastic	164
10	SS-3	12, 11, 13, 14	24"	22"		Sand 13'	Brown WELL GRADED SAND, with silt, MC = 8.3%	159
15	SS-4	14, 13, 4, 2	24"	8"		Silt 19'	Red Brown SILT, with sand, MC = 17.7%	154
20	SS-5	12, 13, 11, 16	24"	7"		Gravel & Silt 29'	Red Brown c-f GRAVEL, some silt, little c-f sand, soil contaminated with gasoline	149
25	SS-6	12, 19, 25, 16	24"	6"				144
30	SS-7	11, 12, 11, 4	24"	20"		Silt 35'	Red Brown SILT, some f sand, little c-f gravel	139
35	SS-8	15, 15, 11, 9	24"	10"		Gravel & Silt 40'	Red Brown c-f GRAVEL, little silt, weathered bedrock,Till Top of Rock	134
40	C-1 C-1 C-1 C-1 C-1	6 Min 3 Min 4 Min 3 Min 3 Min	60"	40"	28%	Bedrock 45'	Rock core run #1 40'-45' Rec.= 40"/60" = 67% RQD= 16.5"/60" = 28% red brown silty shale Moderately fractured, slightly weathered East Berlin Formation	129
45	C-2 C-2 C-2 C-2 C-2		60"	0"	0%	EOB	The core barrel became stuck after the first attempt at C-2. The driller was eventually able to recover the core barrel but it was empty. We attempted to roller bit the hole to try to clear out any rock debris that caused the jam. We were not getting a wash and the roller bit got stuck as well. We concluded that there is a fissure in the bedrock at about 42' down which prevented the wash from coming up and out of the casing. No core was recovered at this depth however, we learned that seams and fissures exist in the bedrock in this area.	124
50								119
55								114
60								109

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

Total Penetration in Earth: 40' Rock: 10' No. of Samples: 8	NOTES: Top of rock at 40'	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: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-2**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804453.9
Start Date: 02/07/03	Route No.:	Easting: 991733.8
Finish Date: 02/10/03	Bridge No.:	Surface Elevation: 170.4
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. @ 21.7' after: 0 hours, @21.8' after: 24 hours, @21.8' after: 42 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						0.3'	ASPHALT	
1	W-N		1.5				ELEV. 170.1	170
							CONCRETE	
	S-1	100/0.3	0.3	0.3		1.5'	ELEV. 168.9	169
2							SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, some silt, trace fine to coarse gravel; wet, very dense, NP; (FILL).	
3	W-N		2.7					168
4								167
5	S-2	20 21 24	1.5	0.7			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, some silt, trace fine to coarse gravel; wet, very dense, NP; (FILL).	166 165
6								164
7	W-N		1.5					
						7.5'	ELEV. 162.9	163
8	S-3	113 52 48	1.5	0.8			POORLY GRADED SAND WITH GRAVEL (SP-SM) - reddish brown fine to coarse sand, some fine to medium gravel, little silt; wet, very dense, NP; (TILL).	162
9								161
10	W-N		1.5					160
11	S-4	50 45 46	1.5	0.8			POORLY GRADED SAND WITH GRAVEL (SP-SM) - reddish brown fine to coarse sand, and fine to medium gravel, little silt; wet, very dense, NP; (TILL).	159
12								158
13	W-N		1.5					
						13.5'	ELEV. 156.9	157
14	S-5	95 53 57	1.5	0.7			SILTY SAND (SM) - reddish brown fine to coarse sand, some silt, trace fine gravel; moist, very dense, NP; (TILL).	156
15								155
16	W-N		1.5					154
17	S-6	39 31 40	1.5	1.0			SILTY SAND (SM) - reddish brown fine to coarse sand, some silt, trace fine gravel; moist, very dense, NP; (TILL).	153
18								152
19	W-N		1.5					
		24				19.5'	ELEV. 150.9	151

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: 40.0' Rock: 10.0' No. of Samples: 11	NOTES:	Sheet 1 of 3 SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-2**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804453.9
Start Date: 02/07/03	Route No.:	Easting: 991733.8
Finish Date: 02/10/03	Bridge No.:	Surface Elevation: 170.4
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. @ 21.7' after: 0 hours, @21.8' after: 24 hours, @21.8' after: 42 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	25 23	1.5	0.7			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown fine to medium gravel, some fine to coarse sand, trace silt; wet, very dense, NP; (TILL).	150
21								149
22	W-N		1.5					148
23	S-8	24 19 14	1.5	0.3			POORLY GRADED GRAVEL (GP) - reddish brown fine to medium gravel, trace fine to coarse sand; wet, dense, NP; (TILL).	147
24								146
25	W-N		1.5			25.5'	ELEV. 144.9	145
26	S-9	16 14 15	1.5	0.5			POORLY GRADED SAND WITH GRAVEL (SP) - brown to black fine to coarse sand, some fine to medium gravel, trace silt; wet, dense, NP; (TILL).	144
27								143
28	W-N		1.5			28.5'	ELEV. 141.9	142
29	S-10	100/0.5	0.5	0.5			POORLY GRADED GRAVEL WITH SAND (GP) - brown to black fine to coarse gravel, little coarse sand; wet, very dense, NP; (TILL).	141
30								140
31	W-N		5.0					139
32								138
33								137
34	S-11	68 100/0.5	1.0	0.5			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown fine to medium gravel, some fine to coarse sand, trace silt; wet, very dense, NP; (TILL).	136
35								135
36								134
37	W-N		5.0					133
38						38.0'	ELEV. 132.4	132
39								131

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: 40.0' Rock: 10.0' No. of Samples: 11	NOTES:	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-2**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804453.9
Start Date: 02/07/03	Route No.:	Easting: 991733.8
Finish Date: 02/10/03	Bridge No.:	Surface Elevation: 170.4
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. @ 21.7' after: 0 hours, @21.8' after: 24 hours, @21.8' after: 42 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				2.3	0.0		SANDSTONE; red to gray; medium hard; slightly weathered; cross-bedded throughout.	130
41								129
42	C-1		5.0					128
43								127
44								126
45				46%	0%			
				5.0	1.6		SANDSTONE; red to gray; medium hard; slightly weathered; fine to medium-grained; cross-bedded throughout.	125
46								124
47	C-2		5.0					123
48							SANDSTONE; red; hard; fresh to slightly weathered; very fine to fine-grained.	122
49								121
50				100%	32%		ELEV. 120.4	
							End of boring at 50.0'	120
51								119
52								118
53								117
54								116
55								115
56								114
57								113
58								112
59								111

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: 40.0' Rock: 10.0' No. of Samples: 11	NOTES:	Sheet **3** of **3** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-3**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804385.5
Start Date: 02/05/03	Route No.:	Easting: 991958.2
Finish Date: 02/06/03	Bridge No.:	Surface Elevation: 167.2
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/ 4"	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. @ 19.8' after: 0 hours, @6.5' after: 24 hours, @7.9' 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						0.3'	ASPHALT	167
1							ELEV. 166.9 CONCRETE	166
2	W-N		4.5			2.0'	ELEV. 165.2	165
3								164
4								163
5	S-1	3 8 11	1.5	0.0			SILTY SAND WITH GRAVEL (SM) - red to brown fine to coarse sand, some silt, trace fine gravel: wet, medium dense, NP; (FILL).	162
6								161
7	W-N		1.5					160
8	S-2	8 120/0.0	0.5	0.2		7.5'	ELEV. 159.7	159
9	W-N		2.5				SANDY GRAVEL (GP) - red to brown fine to medium gravel, little fine to coarse sand; wet, very dense; (FILL).	158
10						10.5'	ELEV. 156.7	157
11	S-3	16 15 15	1.5	0.7			SILTY SAND WITH GRAVEL (SM) - red to brown fine to coarse sand, some silt, trace fine to medium gravel: wet, dense, NP; (FILL).	156
12								155
13	W-N		1.5					154
14	S-4	18 15 18	1.5	0.8			SILTY SAND WITH GRAVEL (SM) - red to brown fine to coarse sand, some silt, trace fine to medium gravel: wet, dense, NP; (FILL).	153
15								152
16	W-N		1.5					151
17	S-5	16 17 23	1.5	0.8			SILTY SAND WITH GRAVEL (SM) - red to brown fine to coarse sand, some silt, trace fine to medium gravel: wet, dense, NP; (FILL).	150
18								149
19	W-N		1.5					148
		9					SILTY SAND WITH GRAVEL (SM) - red to brown fine	

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: 39.0' Rock: 10.0' No. of Samples: 11	NOTES:	Sheet **1** of **3** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-3**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804385.5
Start Date: 02/05/03	Route No.:	Easting: 991958.2
Finish Date: 02/06/03	Bridge No.:	Surface Elevation: 167.2
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/ 4"	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. @ 19.8' after: 0 hours, @6.5' after: 24 hours, @7.9' 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-6	10 11	1.5	1.0			to coarse sand, some silt, trace fine to medium gravel: wet, dense, -PL; (FILL).	147
21								146
22	W-N		1.5					145
						22.5'	ELEV. 144.7	
23	S-7	WOH 2 4	1.5	1.5			SILTY CLAY WITH SAND (CL-ML) - light to dark brown clay, some silt, trace fine sand; wet, very stiff, +PL; (FILL).	144
24								143
25	W-N		1.5					142
26	S-8	8 9 12	1.5	1.0			SILTY CLAY WITH SAND (CL-ML) - light to dark brown clay, some silt, trace fine sand; wet, medium stiff, +PL; (FILL).	141
27								140
28	W-N		1.5					139
						28.0'	ELEV. 139.2	
29	S-9	23 28 24	1.5	0.0			POORLY GRADED GRAVEL WITH SILT (GP-GM) - light to dark brown, fine to coarse gravel, some fine to coarse sand, little silt; wet, very dense, -PL; (TILL).	138
30	S-10	22 24 23	1.5	1.5			POORLY GRADED GRAVEL WITH SILT (GP-GM) - light to dark brown, fine to coarse gravel, some fine to coarse sand, little silt; wet, very dense, -PL; (TILL).	137
31								136
32	W-N		2.5					135
33								134
34	S-11	62 100/0.4	0.9	0.5			POORLY GRADED GRAVEL WITH SILT (GP-GM) - light to dark brown, fine to coarse gravel, some fine to coarse sand, little silt; wet, very dense, -PL; (TILL).	133
35	W-N		4.1					132
36								131
37								130
38								129
39				2.7	0.9	39.0'	ELEV. 128.2	128
							SANDSTONE; red to gray, very fine to coarse;	

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: 39.0' Rock: 10.0' No. of Samples: 11	NOTES:	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-3**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804385.5
Start Date: 02/05/03	Route No.:	Easting: 991958.2
Finish Date: 02/06/03	Bridge No.:	Surface Elevation: 167.2
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/ 4"	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. @ 19.8' after: 0 hours, @6.5' after: 24 hours, @7.9' 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.)
40							medium hard; moderate to highly weathered; calcite inclusions present throughout.	127
41	C-1		5.0					126
42								125
43								124
44				54%	18%			
	C-2		3.5	3.3 / 94%	1.8 / 51%		SANDSTONE; red to gray, very fine to coarse; medium hard; moderate to highly weathered; calcite inclusions present throughout.	123
45								122
46								121
47								120
48	C-3		1.5	0.3 / 20%	0 / 0%		SANDSTONE; red to gray, very fine to coarse; medium hard; moderate to highly weathered; calcite inclusions present throughout.	119
49							ELEV. 118.2 End of Boring at 49.0'	118
50								117
51								116
52								115
53								114
54								113
55								112
56								111
57								110
58								109
59								108

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: 39.0' Rock: 10.0' No. of Samples: 11	NOTES:	Sheet 3 of 3 SM-001-M REV. 1/02

Driller: R. Ingram/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-4**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804347.4
Start Date: 02/14/03	Route No.:	Easting: 992111.9
Finish Date: 02/19/03	Bridge No.:	Surface Elevation: 167.3
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. @ 18.0' after: 0 hours, @17.5' after: 24 hours, @16.9' 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	A-N		1.5					167
1–2	S-1	21 15 21	1.5	1.0			SILTY SAND WITH GRAVEL (SM) - brown and black fine to coarse sand, some silt, trace fine to medium gravel; dry, dense, NP; (FILL).	166
2–3	A-N		1.5					165
3–4	S-2	20 31 50/0.1	1.1	0.7			SILTY SAND WITH GRAVEL (SM) - reddish brown and black fine to coarse sand, some silt, little fine to medium gravel; dry, very dense, NP; (FILL).	164
4–5	A-N		1.9					163
5–6	S-3	11 15 16	1.5	0.3			SILTY CLAY (CL) - tan, gray, black clay, some silt, trace fine sand; moist, hard, -PL; (FILL).	162
6–7	A-N		1.5					161
7.5'							ELEV. 159.8	160
7–8	S-4	15 32 38	1.5	1.0			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, some silt, trace fine to medium gravel; dry, very dense, NP; (FILL).	159
8–9	A-N		1.5					158
10.5'							ELEV. 156.8	157
9–10	S-5	3 3 12	1.5	1.4			SILTY CLAY (CL) - reddish brown clay, some silt, trace fine sand; wet, stiff, +PL; (FILL).	156
10–11	A-N		1.5					155
13.5'							ELEV. 153.8	154
11–12	S-6	35 50/0.4	0.9	0.0				153
12–13	A-N		2.6					152
19.5'		36					ELEV. 147.8	151
								150
								149
								148

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: 30.5' Rock: 10.0' No. of Samples: 10	NOTES:	Sheet **1** of **3** SM-001-M REV. 1/02

Driller: R. Ingram/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-4**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804347.4
Start Date: 02/14/03	Route No.:	Easting: 992111.9
Finish Date: 02/19/03	Bridge No.:	Surface Elevation: 167.3
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. @ 18.0' after: 0 hours, @17.5' after: 24 hours, @16.9' 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	46 40	1.5	1.0			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, some silt, some fine to coarse gravel; moist, very dense, NP; (TILL).	147
21								146
22	A-N		1.5					145
23	S-8	22 32 25	1.5	0.6			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, some silt, some fine to coarse gravel; moist, very dense, NP; (TILL).	144
24								143
25	A-N		1.5					142
						25.5'	ELEV. 141.8	
26	S-9	39 45 40	1.5	0.7			WELL GRADED GRAVEL WITH SAND (GW) - reddish brown fine to medium gravel, some fine to coarse sand; wet, very dense, NP; (TILL).	141
27								140
28	A-N		1.5					139
29	S-10	50/0.0	0.0	0.0				138
30	A-N		2.0					137
						30.5'	ELEV. 136.8	
31				4.6	4.3		SANDSTONE; red, hard, fresh to slightly weathered, fine-grained, micaceous, cross-bedded throughout.	136
32								135
33	C-1		5.0					134
34								133
35				92%	86%			132
36				5.0	4.7		SANDSTONE; red, hard, fresh to slightly weathered, fine-grained, micaceous, cross-bedded throughout.	131
37								130
38	C-2		5.0					129
39								128

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: 30.5' Rock: 10.0' No. of Samples: 10	NOTES:	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: R. Ingram/Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-4**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804347.4
Start Date: 02/14/03	Route No.:	Easting: 992111.9
Finish Date: 02/19/03	Bridge No.:	Surface Elevation: 167.3
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. @ 18.0' after: 0 hours, @17.5' after: 24 hours, @16.9' 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.)
40				100%	94%		ELEV. 126.8	127
41							End of boring at 40.5'.	126
42								125
43								124
44								123
45								122
46								121
47								120
48								119
49								118
50								117
51								116
52								115
53								114
54								113
55								112
56								111
57								110
58								109
59								108

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: 30.5' Rock: 10.0' No. of Samples: 10	NOTES:	Sheet **3** of **3** SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-7**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804328.3
Start Date: 02/06/03	Route No.:	Easting: 991872.2
Finish Date: 02/10/03	Bridge No.:	Surface Elevation: 169.3
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. @ 20.0' after: 0 hours, @20.1' after: 24 hours, @20.1' 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						0.3'	ASPHALT	169
1	A-N		1.5				ELEV. 169.0	
2	S-1	8 11 22	1.5	0.4			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, some silt, trace fine to medium gravel; dry, dense, NP; (FILL).	168 167
3								
4	A-N		1.5					166
5	S-2	3 5 7	1.5	0.4			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, some silt, trace fine to medium gravel; dry, medium dense, NP; (FILL).	165 164
6								
7	A-N		1.5					163
						7.5'	ELEV. 161.8	162
8	S-3	6 47 50/0.3	1.3	0.5			SANDY SILT (ML) - reddish brown silt, some fine to coarse sand, trace fine gravel; moist, hard, -PL; (FILL).	161
9								
10	A-N		1.7					160
						10.5'	ELEV. 158.8	159
11	S-4	40 50/0.5	0.9	0.7			SILTY GRAVEL WITH SAND (GM) - reddish brown fine to coarse gravel, some silt, little fine to coarse sand; moist, very dense, NP; (FILL).	158
12	A-N		2.1					157
13								
						13.5'	ELEV. 155.8	156
14	S-5	29 30 23	1.5	0.5			POORLY GRADED GRAVEL WITH SAND (GP-GM) - reddish brown fine to coarse gravel, some fine to coarse sand, little silt; moist, very dense; (FILL).	155
15								
16	A-N		1.5					154
						16.5'	ELEV. 152.8	153
17	S-6	21 16 16	1.5	0.6			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, some silt, little fine to medium gravel; dry, dense, NP; (FILL).	152
18								
19	A-N		1.5					151
								150
		8					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: 45.0' Rock: 10.0' No. of Samples: 11	NOTES:	Sheet 1 of 3 SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-7**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804328.3
Start Date: 02/06/03	Route No.:	Easting: 991872.2
Finish Date: 02/10/03	Bridge No.:	Surface Elevation: 169.3
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. @ 20.0' after: 0 hours, @20.1' after: 24 hours, @20.1' 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	10 11	1.5	0.9			fine to coarse sand, some silt, little fine to medium gravel; wet, dense, NP; (FILL).	149
21								148
22	A-N		1.5					147
						22.5'	ELEV. 146.8	
23	S-8	12 7 5	1.5	1.0			CLAYEY SILT WITH SAND (CL-ML) - reddish brown silt, some clay, little fine sand; wet, stiff, -PL; (FILL).	146
24								145
25	A-N		1.5					144
26	ST-1		2.0	0.0				143
27								142
28	A-N		1.0					141
						28.5'	ELEV. 140.8	
29	S-9	11 33 48	1.5	0.7			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to coarse sand, some silt, little fine to medium gravel; dry, very dense, NP; (TILL).	140
30						30.0'	ELEV. 139.3	139
31	S-10	24 23 17	1.5	0.4			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown fine to medium gravel, some fine to coarse sand, little silt; wet, dense, NP; (TILL).	138
32								137
33	W-N		3.5					136
34								135
35						35.0'	ELEV. 134.3	
36	S-11	17 22 29	1.5	0.5			SILTY SAND (SM) - reddish brown fine to coarse sand, some silt, trace fine to coarse gravel; dry, dense, NP; (TILL).	134
37								133
38								132
						38.5'	ELEV. 130.8	
39								131
								130

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: 45.0' Rock: 10.0' No. of Samples: 11	NOTES:	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-7**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804328.3
Start Date: 02/06/03	Route No.:	Easting: 991872.2
Finish Date: 02/10/03	Bridge No.:	Surface Elevation: 169.3
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. @ 20.0' after: 0 hours, @20.1' after: 24 hours, @20.1' 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								129
41	W-N		8.5					128
42								127
43								126
44								125
45				3.8	0		SANDSTONE WITH INTERBEDDED SHALE; red to black, medium hard to hard, moderately to highly weathered, calcite inclusions present throughout.	124
46								123
47	C-1		5.0					122
48								121
49								120
50				76%	0%			119
51				4.8	3.2	51.1'	ELEV. 118.2 SILTSTONE; reddish gray to dark gray, hard, slightly weathered, calcite inclusions present throughout.	118
52	C-2		5.0					117
53								116
54								115
55				96%	64%		ELEV. 114.3 End of boring at 55.0'	114
56								113
57								112
58								111
59								110

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: 45.0' Rock: 10.0' No. of Samples: 11	NOTES:	Sheet 3 of 3 SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-8**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804283.7
Start Date: 02/5/03	Route No.:	Easting: 992034.7
Finish Date: 02/6/03	Bridge No.:	Surface Elevation: 168.7
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/ 4"	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. @ 19.6' after: 0 hours, @19.5' after: 24 hours, @19.5' 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						0.4'	ASPHALT	
1	A-N		1.5				ELEV. 168.3	168
							SILTY SAND WITH GRAVEL (SM) - dark brown to brown fine to coarse sand, some silt, trace fine gravel; moist, very dense, -PL; (FILL).	167
2	S-1	18 50/0.2	0.7	0.5		2.5'	ELEV. 166.2	166
3	A-N		2.3					165
4								
5	S-2	26 18 10	1.5	0.66			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to coarse gravel, little fine to coarse sand; moist, very stiff, -PL; (FILL).	164
6								163
7	A-N		1.5					162
8	S-3	9 8 12	1.5	1.0			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to coarse gravel, little fine to coarse sand; moist, very stiff, -PL; (FILL).	161
9								160
10	A-N		1.5					159
11	S-4	19 14 15	1.5	1.4			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to coarse gravel, little fine to coarse sand; moist, very stiff, -PL; (FILL).	158
12								157
13	A-N		1.5					156
						13.5'	ELEV. 155.2	
14	S-5	16 20 47	1.5	1.0			SILTY GRAVEL WITH SAND (GM) - reddish brown, fine gravel, and silt, little fine sand; moist, very dense, -PL; (FILL).	155
15								154
16	A-N		1.5					153
17	S-6	50/0.3	0.3	0.3			SILTY GRAVEL WITH SAND (GM) - reddish brown, fine gravel, and silt, little fine sand; moist, very dense, -PL; (FILL).	152
18	A-N		2.7					151
19								150
		37					SILTY GRAVEL WITH SAND (GM) - reddish brown,	149

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: 40.0' Rock: 10.0' No. of Samples: 12	NOTES:	Sheet **1** of **3** SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-8**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804283.7
Start Date: 02/5/03	Route No.:	Easting: 992034.7
Finish Date: 02/6/03	Bridge No.:	Surface Elevation: 168.7
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/ 4"	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. @ 19.6' after: 0 hours, @19.5' after: 24 hours, @19.5' 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.)
20	S-7	41 55	1.5	0.5			fine gravel, and silt, little fine sand; moist, very dense, -PL; (FILL).	148
21								
22	A-N		1.5					147
23	S-8	31 18 17	1.5	0.5			SILTY GRAVEL WITH SAND (GM) - reddish brown, fine gravel, and silt, little fine sand; moist, very dense, -PL; (FILL).	146
24								145
25	A-N		1.5					144
						25.5'	ELEV. 143.2	
26	S-9	20 11 13	1.5	0.66			POORLY GRADED SAND WITH SILT (SP-SM) - reddish brown, fine to coarse sand, little fine gravel, little silt; wet, dense, -PL; (FILL).	143
27								142
28	A-N		1.5					141
						28.5'	ELEV. 140.2	
29	S-10	20 13 13	1.5	0.66			WELL GRADED GRAVEL WITH SAND (GW) - reddish brown to black fine to medium gravel, little fine to coarse sand; wet, dense; (FILL).	140
30								139
31	S-11	13 11 12	1.5	0.5			WELL GRADED GRAVEL WITH SAND (GW) - reddish brown to black fine to medium gravel, little fine to coarse sand; wet, dense; (FILL).	138
32								137
33	W-N		3.5					136
34								135
35								134
36	S-12	16 17 26	1.5	0.66			WELL GRADED GRAVEL WITH SAND (GW) - reddish brown to black fine to medium gravel, little fine to coarse sand; wet, dense; (FILL).	133
37								132
							ELEV. 131.2	
38	W-N		3.5				SANDSTONE, red to gray, very fine to medium grained, medium hard, fresh to slightly weathered; cross-bedded throughout.	131
39								130
								129

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: 40.0' Rock: 10.0' No. of Samples: 12	NOTES:	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-8**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804283.7
Start Date: 02/5/03	Route No.:	Easting: 992034.7
Finish Date: 02/6/03	Bridge No.:	Surface Elevation: 168.7
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/ 4"	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. @ 19.6' after: 0 hours, @19.5' after: 24 hours, @19.5' 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.)
40				4.9	4.7			
41								128
42	C-1		5.0					127
43								126
44								125
45				98%	94%			124
46				5.0	3.8		SANDSTONE, red to gray, very fine to medium grained, medium hard, fresh to slightly weathered; cross-bedded throughout.	123
47	C-2		5.0					122
48								121
49								120
50				100%	76%			119
							ELEV. 118.7	
51							End of Boring at 50.0'	118
52								117
53								116
54								115
55								114
56								113
57								112
58								111
59								110
								109

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: 40.0' Rock: 10.0' No. of Samples: 12	NOTES:	Sheet **3** of **3** SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-9**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 18+92 / 20' L
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804261.3
Start Date: 02/05/03	Route No.:	Easting: 992189.1
Finish Date: 02/05/03	Bridge No.:	Surface Elevation: 168.1
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/ 4"	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.)	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						0.3'	ASPHALT	168
1	A-N		1.5				ELEV. 167.8	167
2	S-1	27 21 25	1.5	0.75			SANDY SILT WITH GRAVEL (ML) - reddish brown silt, some fine to medium sand, little fine gravel; dry, hard, -PL; (FILL).	166
3								165
4	A-N		1.5					164
5	S-2	8 6 11	1.5	1.1			CLAYEY SILT WITH GRAVEL (ML) - reddish brown silt, some clay , little fine gravel, trace sand; dry, very stiff, -PL; (FILL).	163
6								162
7	A-N		1.5					161
						7.5'	ELEV. 160.6	
8	S-3	31 11 10	1.5	0.66			SILTY GRAVEL WITH SAND (GM) - reddish brown fine to coarse gravel, some silt, trace fine sand; dry, medium dense, -PL; (FILL).	160
9								159
10	A-N		1.5					158
11	S-4	13 16 21	1.5	1.3			SILTY GRAVEL WITH SAND (GM) - reddish brown fine to coarse gravel, some silt, trace fine sand; dry, medium dense, -PL; wood fragments present (FILL).	157
12								156
13	A-N		1.5					155
						13.5'	ELEV. 154.6	
14	S-5	20 24 29	1.5	1.4			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to medium sand, some silt, little fine to medium gravel; moist, very dense; (FILL).	154
15								153
16	A-N		1.5					152
17	S-6	24 26 16	1.5	1.2			SILTY SAND WITH GRAVEL (SM) - reddish brown fine to medium sand, some silt, little fine to medium gravel; moist, dense; organic odor present (FILL).	151
18								150
19	A-N		1.5					149
		14				19.5'	ELEV. 148.6	

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: 24.0' Rock: 0.0 No. of Samples: 8	NOTES: Boring terminated at 24.0' due to contaminated soil.	Sheet **1** of **2** SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-9**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset: 18+92 / 20' L
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804261.3
Start Date: 02/05/03	Route No.:	Easting: 992189.1
Finish Date: 02/05/03	Bridge No.:	Surface Elevation: 168.1
Project Description: New Britain - Hartford Busway		
Casing Type/Size: HW/ 4"	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	S-7	28 21	1.5	0.4			POORLY GRADED GRAVEL WITH SAND (GP-GM) - reddish brown to black fine to medium gravel, some fine sand, trace silt; wet, very dense, -PL; petroleum odor present (FILL).	148
21								147
22	A-N		1.5					146
						22.5'	ELEV. 145.6	
23	S-8	21 18 19	1.5	1.5			SILTY SAND WITH GRAVEL (SM) - reddish brown to black fine sand, some silt, little fine gravel; wet, dense, -PL; petroleum odor present (FILL).	145
24							ELEV. 144.1	144
							Boring Terminated at 24.0'	
25								143
26								142
27								141
28								140
29								139
30								138
31								137
32								136
33								135
34								134
35								133
36								132
37								131
38								130
39								129

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: 24.0' Rock: 0.0 No. of Samples: 8	NOTES: Boring terminated at 24.0' due to contaminated soil.	Sheet **2** of **2** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-11**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineers	Project No.: 171-0305	Northing: 804289.5
Start Date: 02/12/03	Route No.:	Easting: 991698.7
Finish Date: 02/13/03	Bridge No.:	Surface Elevation: 171.7
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. @ 22.8' after: 0 hours, @22.8' after: 23.5hours, @22.8' after: 44.0hours

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						0.3'	ASPHALT	
1	W-N		1.5				ELEV. 171.4	171
2	S-1	14 16 12	1.5	0.8			SILTY SAND (SM) - reddish brown to black fine to coarse sand, some silt, trace gravel; dry, dense, NP; organics present (FILL).	170
3								169
4	W-N		1.5					168
5	S-2	15 19 24	1.5	1.0		4.5'	ELEV. 167.2 SANDY SILT WITH GRAVEL (ML) - reddish brown silt, some fine to coarse sand, little fine gravel; dry, very dense, NP; (FILL).	167
6								166
7	W-N		1.5					165
8	S-3	22 39 60	1.5	0.3		7.5'	ELEV. 164.2 POORLY GRADED GRAVEL (GP) - reddish brown fine to coarse gravel; moist, very dense, NP; (TILL).	164
9								163
10	W-N		1.5					162
11	S-4	60 66 55	1.5	0.8			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown fine to coarse gravel, some fine to coarse sand, some silt; moist, very dense, NP; (TILL).	161
12								160
13	W-N		1.5					159
14	S-5	52 95 38	1.5	1.0			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown fine to coarse gravel, some fine to coarse sand, some silt; moist, very dense, NP; (TILL).	158
15								157
16	W-N		1.5					156
17	S-6	28 38 18	1.5	0.5			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown fine to coarse gravel, some fine to coarse sand, trace silt; moist, very dense, NP; (TILL).	155
18								154
19	W-N		1.5					153
		13					POORLY GRADED GRAVEL WITH SAND (GP) -	152

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: 47.0' Rock: 3.0' No. of Samples: 13	NOTES: Boring terminated at 50.0' due to shearing of core bit.	Sheet **1** of **3** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-11**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineers	Project No.: 171-0305	Northing: 804289.5
Start Date: 02/12/03	Route No.:	Easting: 991698.7
Finish Date: 02/13/03	Bridge No.:	Surface Elevation: 171.7
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. @ 22.8' after: 0 hours, @22.8' after: 23.5hours, @22.8' after: 44.0hours		

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	15 19	1.5	0.0			reddish brown fine to coarse gravel, some fine to coarse sand, trace silt; moist, very dense, NP; (TILL).	151
21								
22	W-N		1.5					150
23	S-8	10 14 14	1.5	0.3			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown to black fine to medium gravel, some fine to coarse sand, little silt; wet, medium dense, NP; (TILL).	149
24								148
25	W-N		1.5					147
26	S-9	14 19 16	1.5	0.5			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown to black fine to medium gravel, some fine to coarse sand, little silt; wet, dense, NP; (TILL).	146
27								145
28	W-N		1.5					144
29	S-10	20 19 20	1.5	0.1			POORLY GRADED GRAVEL (GP) - reddish brown to black fine to medium gravel, trace fine to medium sand, little silt; wet, dense, NP; (TILL).	143
30						30.0'	ELEV. 141.7	142
31	S-11	24 15 14	1.5	0.3			WELL GRADED GRAVEL WITH SAND (GP) - reddish brown to black fine to medium gravel, little fine to coarse sand; wet, medium dense, NP; (TILL).	141
32								140
33	W-N		2.5					139
34						34.0'	ELEV. 137.7	138
35	S-12	66 59 40	1.5	0.1			POORLY GRADED GRAVEL (GP) - reddish brown to black fine to medium gravel; wet, very dense, NP; (TILL).	137
36								136
37	W-N		3.5					135
38								134
39								133
	S-13	44 29	1.5	0.5			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown to black fine to medium gravel, some	132

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: 47.0' Rock: 3.0' No. of Samples: 13	NOTES: Boring terminated at 50.0' due to shearing of core bit.	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: Makudera/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-11**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineers	Project No.: 171-0305	Northing: 804289.5
Start Date: 02/12/03	Route No.:	Easting: 991698.7
Finish Date: 02/13/03	Bridge No.:	Surface Elevation: 171.7
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. @ 22.8' after: 0 hours, @22.8' after: 23.5hours, @22.8' after: 44.0hours		

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		28					fine to coarse sand, little silt; wet, very dense, NP; (TILL).	
41								131
42								130
43						43.0'	Lost drill water at 42.5'. ELEV. 128.7	129
44	W-N		6.5					128
45								127
46								126
47								125
48	C-1		3.0	1.7 / 57%	0.0 / 0%		SANDSTONE; red and gray, medium hard to hard, moderately weathered, fine to medium-grained; calcite inclusions and tensile fractures present throughout.	124
49								123
50						49.5'	ELEV. 122.2 BASALT; dark gray to black, very hard, slightly to moderately weathered.	122
51							ELEV. 121.7 Boring terminated at 50.0'	121
52								120
53								119
54								118
55								117
56								116
57								115
58								114
59								113
								112

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: 47.0' Rock: 3.0' No. of Samples: 13	NOTES: Boring terminated at 50.0' due to shearing of core bit.	Sheet **3** of **3** SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-12**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804233.9
Start Date: 02/13/03	Route No.:	Easting: 991918.4
Finish Date: 02/14/03	Bridge No.:	Surface Elevation: 170.4
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. @ 23.7' after: 0 hours, @21.5' after: 23 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						0.3'	ASPHALT	
1	A-N		1.5				ELEV. 170.1	170
2	S-1	7 7 5	1.5	0.4			SANDY SILT WITH GRAVEL (ML) - red and brown silt, some fine to coarse sand, little fine to coarse gravel; dry, medium dense, NP; (FILL).	169 168
3								
4	A-N		1.5					167
5	S-2	19 15 18	1.5	1.3			GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to coarse gravel, little fine to coarse sand; dry, dense, NP; (FILL).	166 165
6								
7	A-N		1.5					164
						7.5'	ELEV. 162.9	163
8	S-3	8 9 7	1.5	0.2			POORLY GRADED GRAVEL (GP) - reddish brown fine to coarse gravel, little silt, little fine to coarse sand; moist, medium dense, NP; (FILL).	162
9								
10	A-N		1.5					161
						10.5'	ELEV. 159.9	160
11	S-4	5 16 47	1.5	1.3			SANDY SILT (ML) - red and light to dark brown silt, some fine to coarse sand, trace coarse gravel; dry, hard, -PL; (FILL).	159
12								
13	A-N		1.5					158
						13.5'	ELEV. 156.9	157
14	S-5	44 50/0.3	0.8	0.5			POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown fine to coarse gravel, little silt, little fine to coarse sand; dry, very dense, NP; (TILL).	156
15	A-N		2.2					155
16								
						16.5'	ELEV. 153.9	154
17	S-6	46 52 30	1.5	1.1			SILTY SAND WITH GRAVEL (SM) - red and light to dark brown fine to coarse sand, some silt, little fine gravel; dry, very dense, NP; (TILL).	153
18								
19	A-N		1.5					152
		17				19.5'	ELEV. 150.9	151

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: 42.0' Rock: 10.0' No. of Samples: 10	NOTES:	Sheet **1** of **3** SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-12**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804233.9
Start Date: 02/13/03	Route No.:	Easting: 991918.4
Finish Date: 02/14/03	Bridge No.:	Surface Elevation: 170.4
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. @ 23.7' after: 0 hours, @21.5' after: 23 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.)
20	S-7	17 18	1.5	1.5			WELL GRADED SAND WITH SILT (SW) - reddish brown fine to coarse sand, some silt, trace fine gravel; dry, dense, NP; (TILL).	150
21								149
22	A-N		1.5					148
						22.5'	ELEV. 147.9	
23	S-8	17 28 22	1.5	1.5			GRAVELLY SILT (ML) - reddish brown silt, some fine to coarse gravel; moist, very dense, NP; (TILL).	147
24								146
25	A-N		1.5					145
						25.5'	ELEV. 144.9	
26	S-9	7 9 9	1.5	0.8			WELL GRADED SAND WITH GRAVEL (SW) - reddish brown fine to coarse sand, little fine gravel, trace silt; wet, medium dense, NP; (TILL).	144
27								143
28	A-N		1.5					142
						28.5'	ELEV. 141.9	
29	S-10	40 50/0.3	0.8	0.3			POORLY GRADED GRAVEL (GP) - reddish brown to black fine to coarse gravel, trace fine to coarse sand ; wet, very dense, NP; (DECOMPOSED ROCK).	141
						29.5'	ELEV. 140.9	
30							Lost drill water at 30.0'.	140
31								139
32								138
33								137
34							Lost drill water at 34.0'.	136
35	A-N		12.9					135
36								134
37								133
38								132
39								131

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: 42.0' Rock: 10.0' No. of Samples: 10	NOTES:	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: R. Ingrams/ Seaboard	**Connecticut DOT Boring Report**	Hole No.: **SB-12**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804233.9
Start Date: 02/13/03	Route No.:	Easting: 991918.4
Finish Date: 02/14/03	Bridge No.:	Surface Elevation: 170.4
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. @ 23.7' after: 0 hours, @21.5' after: 23 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								130
41								129
42								128
43	C-1		5.0	4.0	1.6		SANDSTONE; red and gray, hard, slightly weathered, very fine to medium-grained.	127
44								126
45								125
46				80%	32%			124
47	C-2		5.0	5.0	3.6		SANDSTONE; red and gray, hard, slightly weathered, very fine to medium-grained.	123
48								122
49								121
50								120
51				100%	72%			119
52							ELEV. 118.4 End of boring at 52.0'	118
53								117
54								116
55								115
56								114
57								113
58								112
59								111

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: 42.0' Rock: 10.0' No. of Samples: 10	NOTES:	Sheet 3 of 3 SM-001-M REV. 1/02

Driller: Makedura/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-13**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804214.2
Start Date: 02/14/03	Route No.:	Easting: 992111.9
Finish Date: 02/20/03	Bridge No.:	Surface Elevation: 169.0
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. @ 19.8' after: 16 hours, @19.8' after: 44 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						0.3'	ASPHALT	
1	W-N		1.5				ELEV. 168.7	168
2	S-1	56 42 30	1.5	1.5			GRAVELLY SILT (ML) - reddish brown silt, some fine to medium gravel; dry, very dense, NP; (FILL).	167
3								166
4	W-N		1.5					165
5	S-2	17 11 13	1.5	1.0			GRAVELLY SILT (ML) - reddish brown silt, some fine to coarse gravel; dry, medium dense, NP; (FILL).	164
6								163
7	W-N		1.5					162
8	S-3	19 12 15	1.5	1.2			GRAVELLY SILT (ML) - reddish brown silt, some fine to coarse gravel, trace fine to medium sand; dry, medium dense, NP; (FILL).	161
9								160
10	W-N		1.5					159
11	S-4	9 9 7	1.5	1.0		10.5'	ELEV. 158.5 POORLY GRADED GRAVEL WITH SAND (GP) - reddish brown fine to coarse gravel, little fine to coarse sand, trace silt; moist, medium dense, NP; (FILL).	158
12								157
13	W-N		1.5					156
14	S-5	41 25 26	1.5	1.0		13.5'	ELEV. 155.5 GRAVELLY SILT (ML) - reddish brown silt, some fine to medium gravel, little clay, trace fine sand; moist, very dense, NP; (FILL).	155
15								154
16	W-N		1.5					153
17	S-6	27 29 26	1.5	0.5			GRAVELLY SILT (ML) - reddish brown silt, some fine to medium gravel, little clay, trace fine sand; moist, very dense, NP; (FILL).	152
18								151
19	W-N		1.5					150
		19				19.5'	ELEV. 149.5	

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: 38.1' Rock: 10.0' No. of Samples: 10	NOTES:	Sheet **1** of **3** SM-001-M REV. 1/02

Driller: Makedura/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-13**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804214.2
Start Date: 02/14/03	Route No.:	Easting: 992111.9
Finish Date: 02/20/03	Bridge No.:	Surface Elevation: 169.0
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. @ 19.8' after: 16 hours, @19.8' after: 44 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.)
20	S-7	21 20	1.5	1.0			WELL GRADED GRAVEL WITH SAND (GW) - reddish brown fine to coarse gravel, little fine to coarse sand, trace silt; wet, dense, NP; (TILL).	
21	W-N		1.5					148
22								147
23	S-8	15 14 16	1.5	0.7			WELL GRADED GRAVEL WITH SAND (GW) - reddish brown fine to coarse gravel, little fine to coarse sand, trace silt; wet, dense, NP; (TILL).	146
24	W-N		1.5					145
25								144
26	S-9	19 15 11	1.5	0.5			WELL GRADED GRAVEL WITH SAND (GW) - reddish brown fine to coarse gravel, little fine to coarse sand, trace silt; wet, medium dense, NP; (TILL).	143
27	W-N		1.5					142
28								141
						28.5'	ELEV. 140.5	
29	S-10	65 100/0.1	0.6	0.3			POORLY GRADED GRAVEL (GP) - reddish brown fine to coarse gravel; wet, very dense, NP; (DECOMPOSED ROCK).	140
30	W-N		7.9					139
31								138
32								137
33						33.0'	ELEV. 136.0	136
34								135
35								134
36							Lost drill water at 36.0'.	133
37	C-1		0.9	0.7 / 78%	0.0 / 0%		SANDSTONE; gray, hard, fresh to slightly weathered, fine grained (Meta-sedimentary).	132
						37.8'	ELEV. 131.2	
38	W-N		1.1				BASALT; black, very hard, slightly weathered, broken throughout.	131
39				3.2	3.1	39.0'	ELEV. 130.0	130
							SANDSTONE; red, hard to very hard, fresh,	

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: 38.1' Rock: 10.0' No. of Samples: 10	NOTES:	Sheet **2** of **3** SM-001-M REV. 1/02

Driller: Makedura/ GeoLogic	**Connecticut DOT Boring Report**	Hole No.: **SB-13**
Inspector: Ryan Tinsley	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 804214.2
Start Date: 02/14/03	Route No.:	Easting: 992111.9
Finish Date: 02/20/03	Bridge No.:	Surface Elevation: 169.0
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. @ 19.8' after: 16 hours, @19.8' after: 44 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							micaceous, cross-bedded throughout, very fine to fine-grained (Meta-sedimentary).	129
41	C-2		5.0					128
42								127
43								126
44				64%	62%			125
45	C-3		2.0	1.6 / 80%	1.3 / 65%		SANDSTONE; red, hard to very hard, fresh, micaceous, cross-bedded throughout, very fine to fine-grained.	124
46								123
47	C-4		3.0	1.5 / 50%	1.3 / 43%		SANDSTONE; red, hard to very hard, fresh, micaceous, cross-bedded throughout, very fine to fine-grained.	122
48								121
49							ELEV. 120.0	120
50							End of Boring at 49.0'.	119
51								118
52								117
53								116
54								115
55								114
56								113
57								112
58								111
59								110

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%

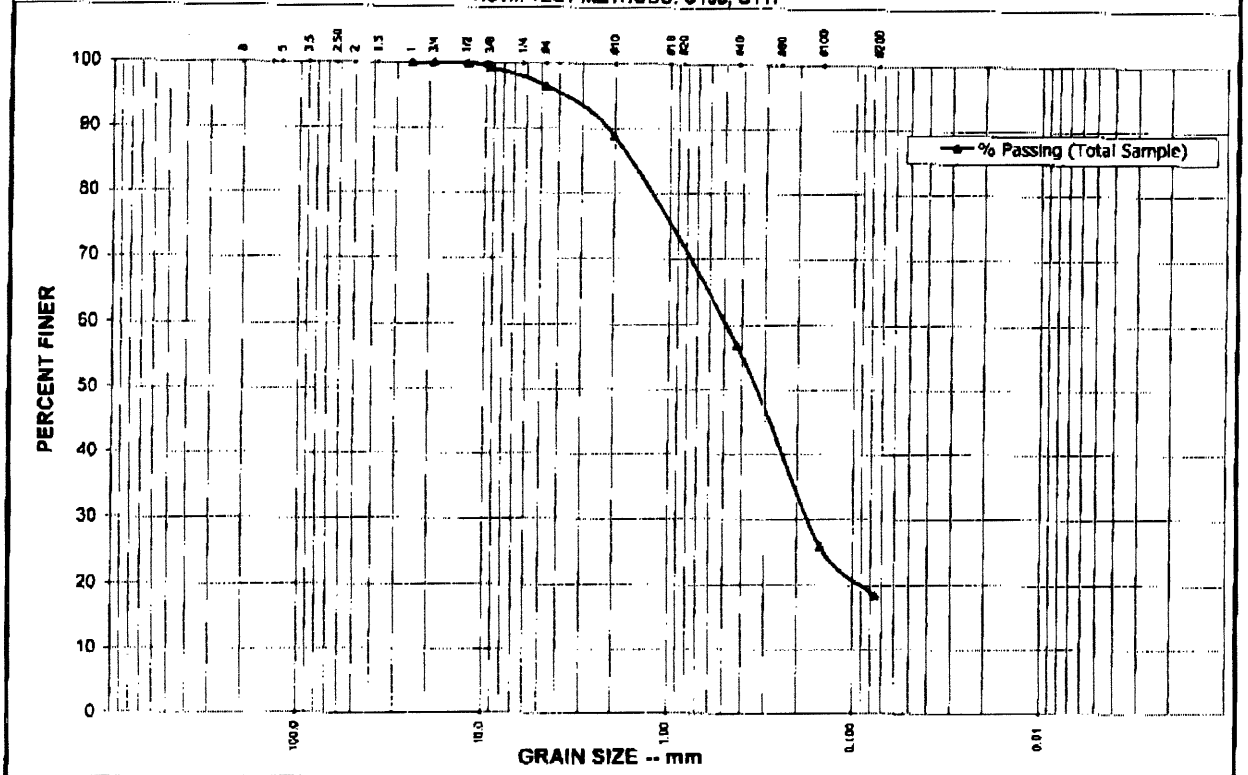
Total Penetration in Earth: 38.1' Rock: 10.0' No. of Samples: 10	NOTES:	Sheet **3** of **3** SM-001-M REV. 1/02

APPENDIX 3

LABORATORY TESTING RESULTS

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		10.0	41.0	49.0	Silt (>0.002mm)	Clay (<0.002mm)
0.0	3.4	% Sand		78.2	18.4	

Classification: BROWN C-F SAND, little Silt, trace 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"	0.00	100.0			
19.0	3/4"	0.00	100.0			
12.5	1/2"	0.00	100.0			
9.5	3/8"	2.00	99.4			
6.3	1/4"					
4.75	#4	11.00	96.6			
2.00	#10	36.00	88.8			
1.00	#18					
0.425	#40	139.00	56.7			
0.250	#60					
0.150	#100	236.00	25.9			
0.075	#200	262.00	18.4			
	Total Dry Wt.	321				
	Split Wt.					

Project: VN Engineers,Inc.	Project No.: J2031487C	Date: 8/10/2007	
City: North Haven,CT	Specification: Not Provided	Lab No: C1863-07	
Source: B101 S-4, 15'-17'	Sampled from: Provided by client		

JGI EASTERN, Inc.
114 Woodlawn Road
Berlin, CT 06037
(860) 829-1725 fax: (860) 829-1746
www.jgieastern.com

Remarks: Natural moisture content = 9.7%

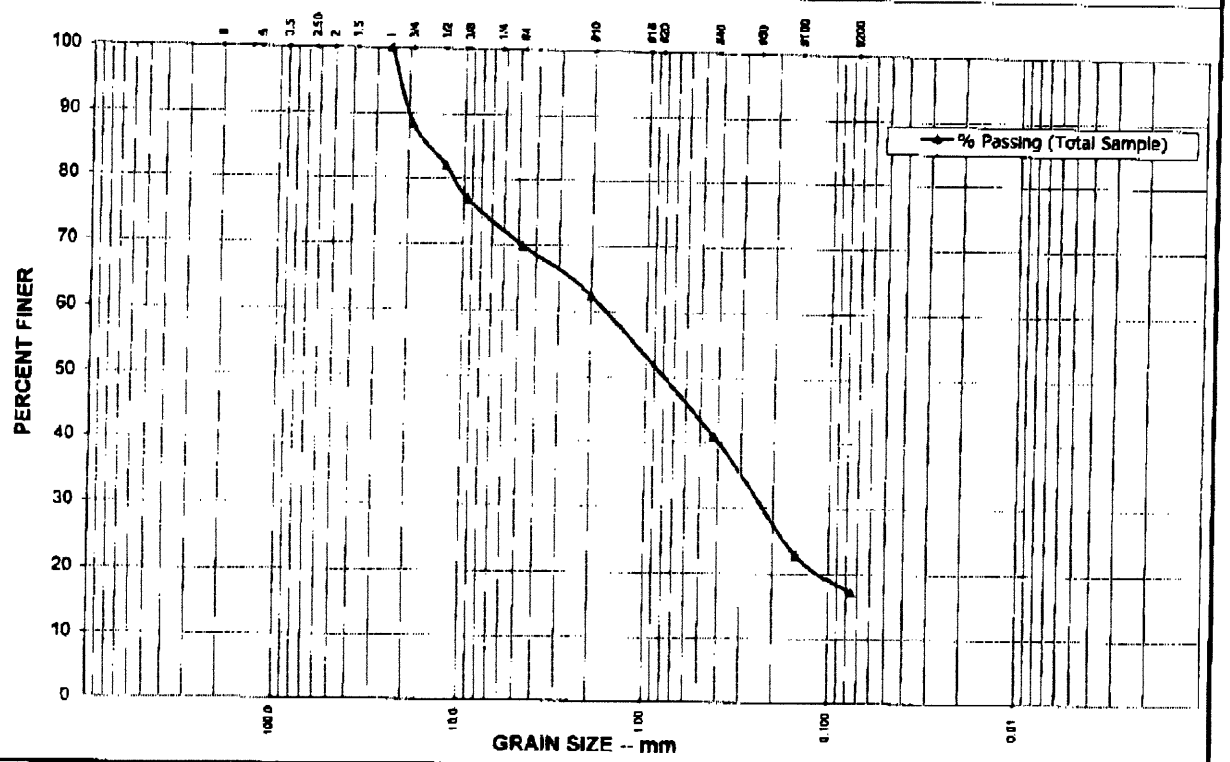
Tested By: M.F. Date: 8/11/2007

Reviewed By: [illegible] Date: 8/13/07

ASTM C136GSP1, Rev. 5

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		14.2	40.7	45.1	Silt (>0.002mm)	Clay (<0.002mm)
0.0	30.2	% Sand		52.8	17.2	

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

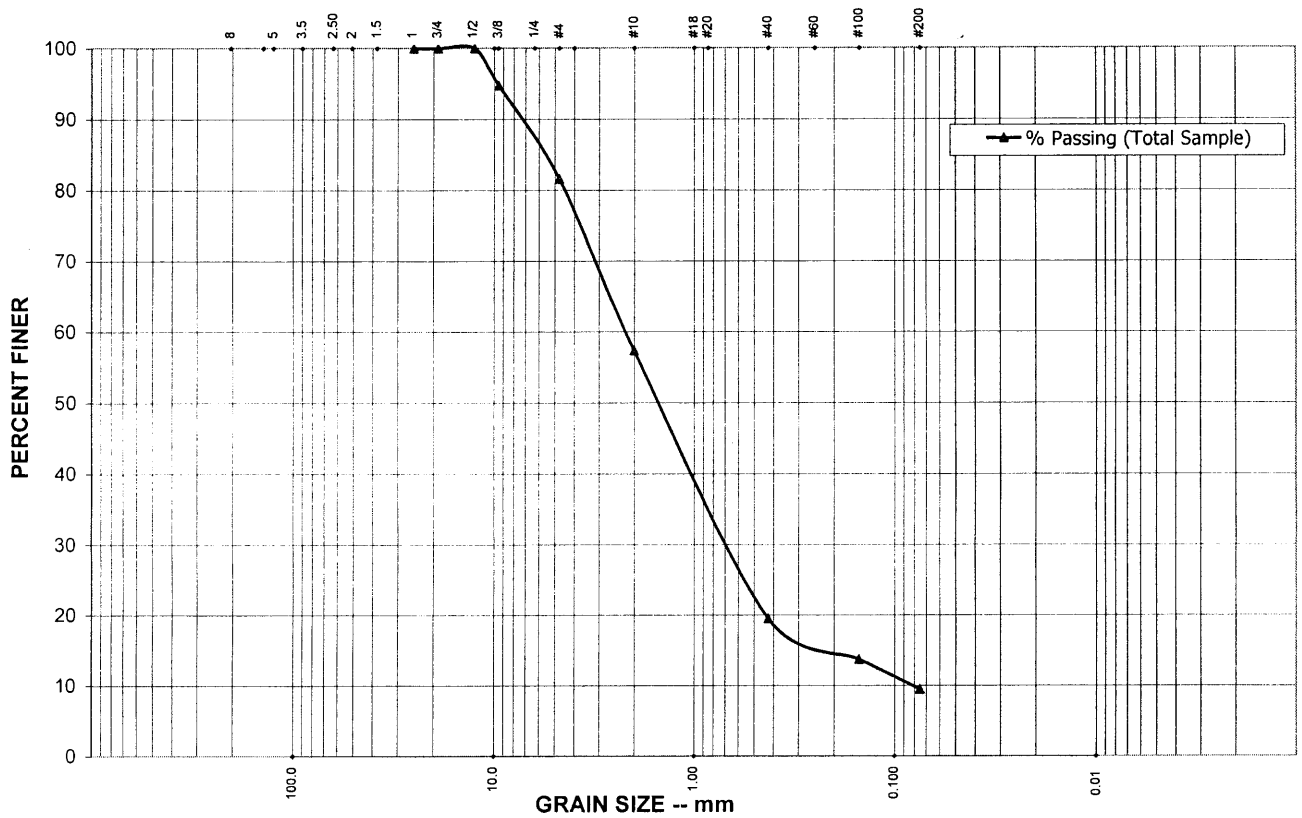
Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Retained	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
90.0	3.5"					
57.0	2.25"					
50.0	2"					
37.5	1.5"					
25.0	1"	0.00	100.0			
19.0	3/4"	25.00	88.4			
12.5	1/2"	39.00	81.9			
9.5	3/8"	50.00	76.7			
6.3	1/4"					
4.75	#4	65.00	69.8			
2.00	#10	81.00	62.3			
1.00	#18					
0.425	#40	127.00	40.9			
0.250	#60					
0.150	#100	166.00	22.8			
0.075	#200	178.00	17.2			
	Total Dry Wt.	215				
	Split Wt.					

Project: VN Engineers,Inc.	Project No.: J2031487C	Date: 8/10/2007	
City: North Haven,CT	Specification: Not Provided	Lab No: C1862-07	
Source: B101 S-6, 25'-27'	Sampled from: Provided by client		
JGI EASTERN, Inc.	Remarks: Natural moisture content = 25.6%		
114 Woodlawn Road Berlin, CT 06037 (860) 829-1725 fax: (860) 829-1745 www.jgieastern.com	Tested By: M.F.	Date: 8/11/2007	
	Reviewed By:	Date: 8/13/07	

ASTM C136GSP1, Rev. 5

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		33.6	52.6	13.9	Silt (>0.002mm)	Clay (<0.002mm)
0.0	18.4	% Sand		72.1	9.5	

Classification: BROWN C-F SAND, little C-F Gravel, trace 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"	0.00	100.0			
19.0	3/4"	0.00	100.0			
12.5	1/2"	0.00	100.0			
9.5	3/8"	10.00	94.7			
6.3	1/4"					
4.75	#4	35.00	81.6			
2.00	#10	81.00	57.4			
1.00	#18					
0.425	#40	153.00	19.5			
0.250	#60					
0.150	#100	164.00	13.7			
0.075	#200	172.00	9.5			
	Total Dry Wt.	190				
	Split Wt.					

Project:	**VN Engineers,Inc.**	Project No.:	**J2031487C**	Date:	**8/9/2007**
City:	North Haven,CT	Specification:	Not Provided	Lab No:	**C1851-07**
Source:	B102 S-4, 15'-17'	Sampled from:	Provided by client		

JGI EASTERN, Inc. A Terracon COMPANY

114 Woodlawn Road
Berlin, CT 06037
(860) 829-1725 fax: (860) 829-1745
www.jgieastern.com

Remarks: Natural moisture content = 6.5%

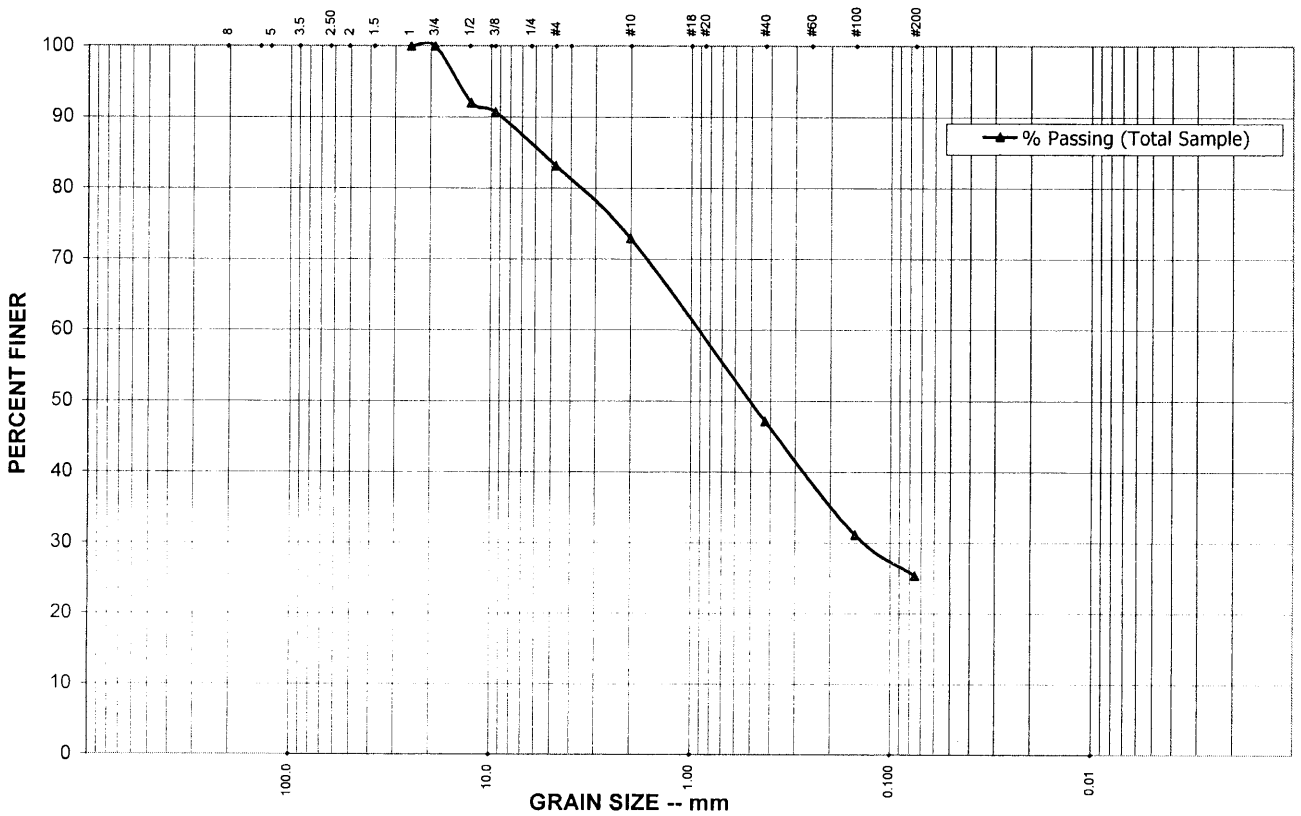
Tested By: M.F. Date: 8/10/2007

Reviewed By: KJTS Date: 8/11/07

ASTM C136GSP1, Rev. 5

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		17.7	44.6	37.7	Silt (>0.002mm)	Clay (<0.002mm)
0.0	16.9	% Sand		57.8	25.3	

Classification: BROWN C-F SAND, some Sand, 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"	0.00	100.0			
19.0	3/4"	0.00	100.0			
12.5	1/2"	18.00	92.0			
9.5	3/8"	21.00	90.7			
6.3	1/4"					
4.75	#4	38.00	83.1			
2.00	#10	61.00	72.9			
1.00	#18					
0.425	#40	119.00	47.1			
0.250	#60					
0.150	#100	155.00	31.1			
0.075	#200	168.00	25.3			
	Total Dry Wt.	225				
	Split Wt.					

Project:	**VN Engineers,Inc.**	Project No.:	**J2031487C**	Date:	**8/9/2007**
City:	North Haven,CT	Specification:	Not Provided	Lab No:	**C1854-07**
Source:	B104 S-3, 10'-12'	Sampled from:	Provided by client		

JGI EASTERN, Inc. A Terracon COMPANY

114 Woodlawn Road
Berlin, CT 06037
(860) 829-1725 fax: (860) 829-1745
www.jgieastern.com

Remarks: Natural moisture content = 11.6%

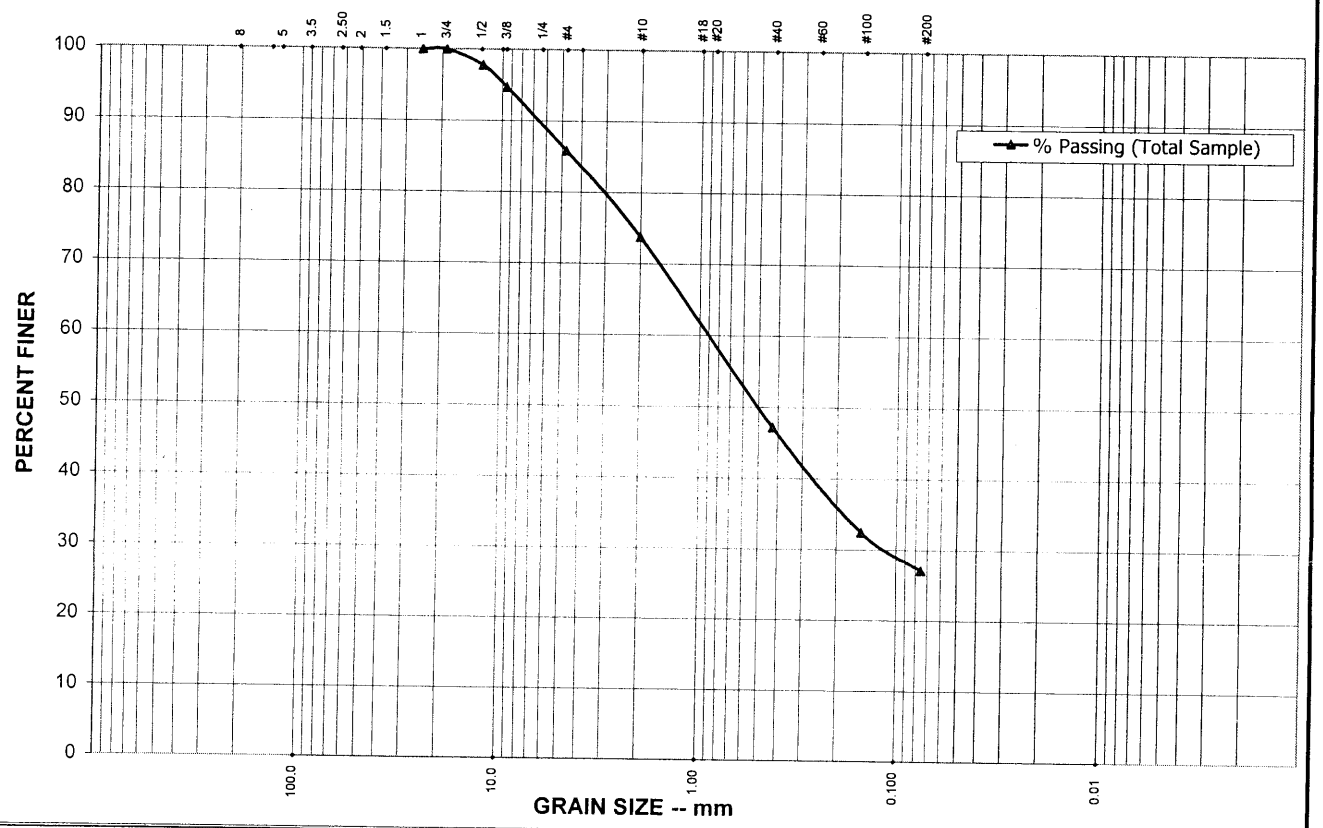
Tested By: M.F. Date: 8/10/2007

Reviewed By: KGM Date: 8/11/07

ASTM C136GSP1, Rev. 5

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		20.5	45.5	34.1	Silt (>0.002mm)	Clay (<0.002mm)
0.0	14.2	% Sand		58.7	27.1	

Classification: BROWN C-F SAND, some Silt, little 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"	0.00	100.0			
19.0	3/4"	0.00	100.0			
12.5	1/2"	5.00	97.8			
9.5	3/8"	12.00	94.7			
6.3	1/4"					
4.75	#4	32.00	85.8			
2.00	#10	59.00	73.8			
1.00	#18					
0.425	#40	119.00	47.1			
0.250	#60					
0.150	#100	152.00	32.4			
0.075	#200	164.00	27.1			
	Total Dry Wt.	225				
	Split Wt.					

Project: **VN Engineers,Inc.**	Project No.: **J2031487C**	Date: **8/9/2007**	
City: North Haven,CT	Specification: Not Provided	Lab No: **C1848-07**	
Source: B106 S-1, 1'-3'	Sampled from: Provided by client		

JGI EASTERN, Inc. A Terracon COMPANY

114 Woodlawn Road
Berlin, CT 06037
(860) 829-1725 fax: (860) 829-1745
www.jgieastern.com

Remarks: Natural moisture content = 11.1%

Tested By: M.F. Date: 8/10/2007

Reviewed By: KMS Date: 8/11/07

ASTM C136GSP1, Rev. 5

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117

% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		5.7	20.1	74.1	Silt (>0.002mm)	Clay (<0.002mm)
	4		% Sand	64	32	

USCS Classification: SILTY SAND: tan, (SM)

Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Ret. (g)	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
75.0	3"					
57.0	2.25"					
50.0	2"					
37.5	1.5"					
25.0	1"					
19.0	3/4"	0.00	100			
12.5	1/2"					
9.5	3/8"	7.00	97			
6.3	1/4"					
4.75	#4	12.00	96			
2.00	#10	22.00	92			
1.00	#18					
0.425	#40	57.00	79			
0.250	#60					
0.150	#100	154.00	44			
0.075	#200	186.00	32			
	Total Dry Wt.	274				
	Split Wt.					

Project:	**VN Engineering, Inc.**	Project No.:	**J2031487C**	Date:	**4/9/2010**
City:	North Haven, CT	Specification:	Not Provided	Report No:	**J2031487C.0046**
Source:	B143, S-2	Sampled from:	Provided by client		

Terracon

201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1900 (p) 860-721-1939 (f)
http://www.terracon.com/

Remarks: Job No. 27-107.01

Tested By: M.F. Date: 4/20/2010

Reviewed By: [signature] Date: 4/20/10

J2-C136CR, 1-1-09, Rev. 8

PLASTICITY TEST REPORT

Report Number: J2031487C.0046
Service Date: 04/09/10
Report Date: 04/19/10

Terracon
201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1900

Client

VN Engineers, Inc.
Attn: Sofia Nirshberg, P.E.
116 Washington Avenue
North Haven, CT 06473

Project

VN Engineering Testing Services
Laboratory Testing Services
Various Locations, CT

Project Number J2031487C

Material Information

Source of Material: B-143, S-2
Proposed Use: Not Provided
Soil Description: SILTY SAND: tan, (SM)

Classification: SILTY SAND: tan, (SM)

Sample Information

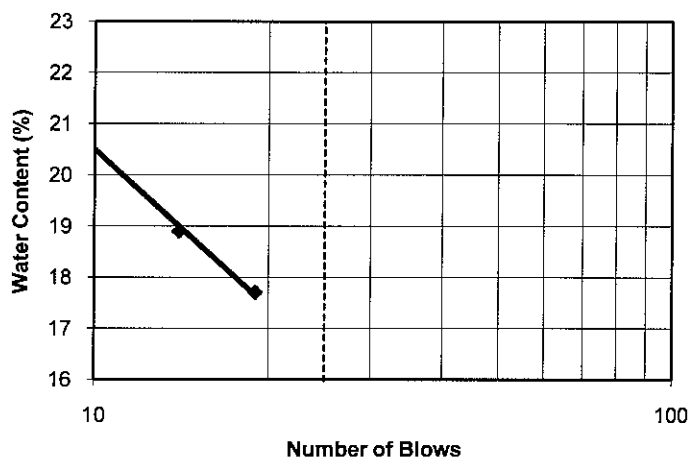
Sample Location: Provided by client
Sampled By: Made by Client
Sample Date: 04/09/10

Laboratory Test Data

	Result	Requirements
Liquid Limit:	16	
Plastic Limit:	Non-plastic	
Plasticity Index:	Non-plastic	
In-Place Moist. (%):		

Liquid Limit Method: Method A
Sample Preparation: Dry

Liquid Limit Determination



Comments:
Soil is Non-Plastic could not roll out for Plastic Limit

Services:

Terracon Rep: Made by Client
Reported To:
Contractor: VN Engineers
Report Distribution:

Reviewed By:
Kevin J. Brigandi
Principal, Department Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

Terracon

ASTM D 2216 Standard Test Method for Water (Moisture) Content of Soil and Aggregate

TEST DATA REPORT

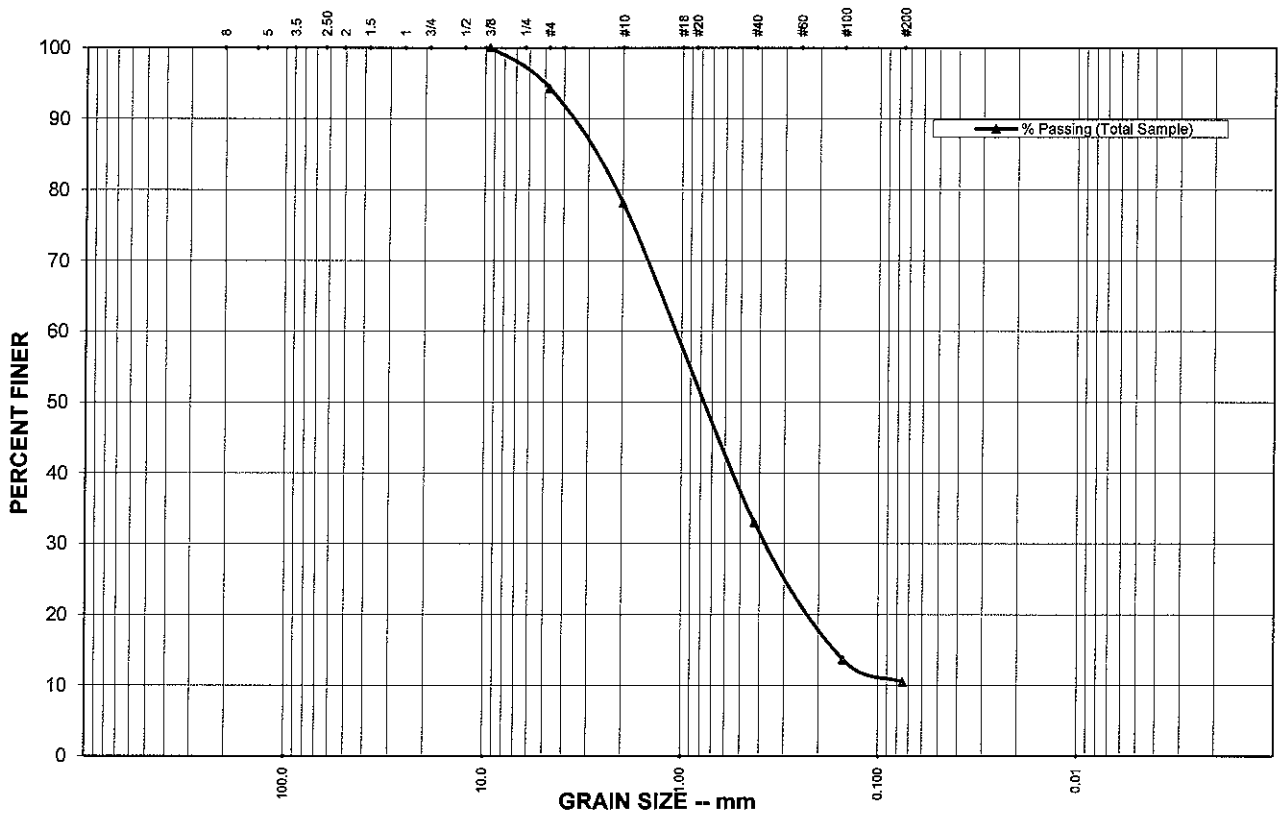
Project Name	VN Engineers, Inc.	Lab #	J2031487C.0046
Project #	J2031487C	Lab Technician:	M.Fongemie
Sampling Date	4/9/2010	Date of Test:	4/16/2010
Sampling Technician	Client		
Sample Source:	B-143, S-2		

Original Weight:	569	g	% Moisture	17.4%
Oven Dry Weight	520	g		
Tare Weight:	238	g		

Reviewed By: _____ Date: 4/20/10

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		19.3	53.8	26.9	Silt (>0.002mm)	Clay (<0.002mm)
	6		% Sand	84	10	

USCS Classification: WELL GRADED SAND: with silt, brown, (SW)

Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Ret. (g)	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
75.0	3"					
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"	0.00	100			
6.3	1/4"					
4.75	#4	18.00	94			
2.00	#10	69.00	78			
1.00	#18					
0.425	#40	211.00	33			
0.250	#60					
0.150	#100	272.00	14			
0.075	#200	282.00	10			
	Total Dry Wt.	315				
	Split Wt.					

Project:	**VN Engineers, Inc.**	Project No.:	**J2031487C**	Date:	**4/9/2010**
City:	North Haven, CT	Specification:	Not Provided	Report No:	**J2031487C.0049**
Source:	B143, S-3	Sampled from:	Provided by client		

Terracon

201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1900 (p) 860-721-1939 (f)
http://www.terracon.com/

Remarks: Job No. 27-107.1

Tested By: M.F. Date: 4/16/2010

Reviewed By: Date: 4/20/10

J2-C136CR, 1-1-09, Rev. 8

Terracon

ASTM D 2216 Standard Test Method for Water (Moisture) Content of Soil and Aggregate

TEST DATA REPORT

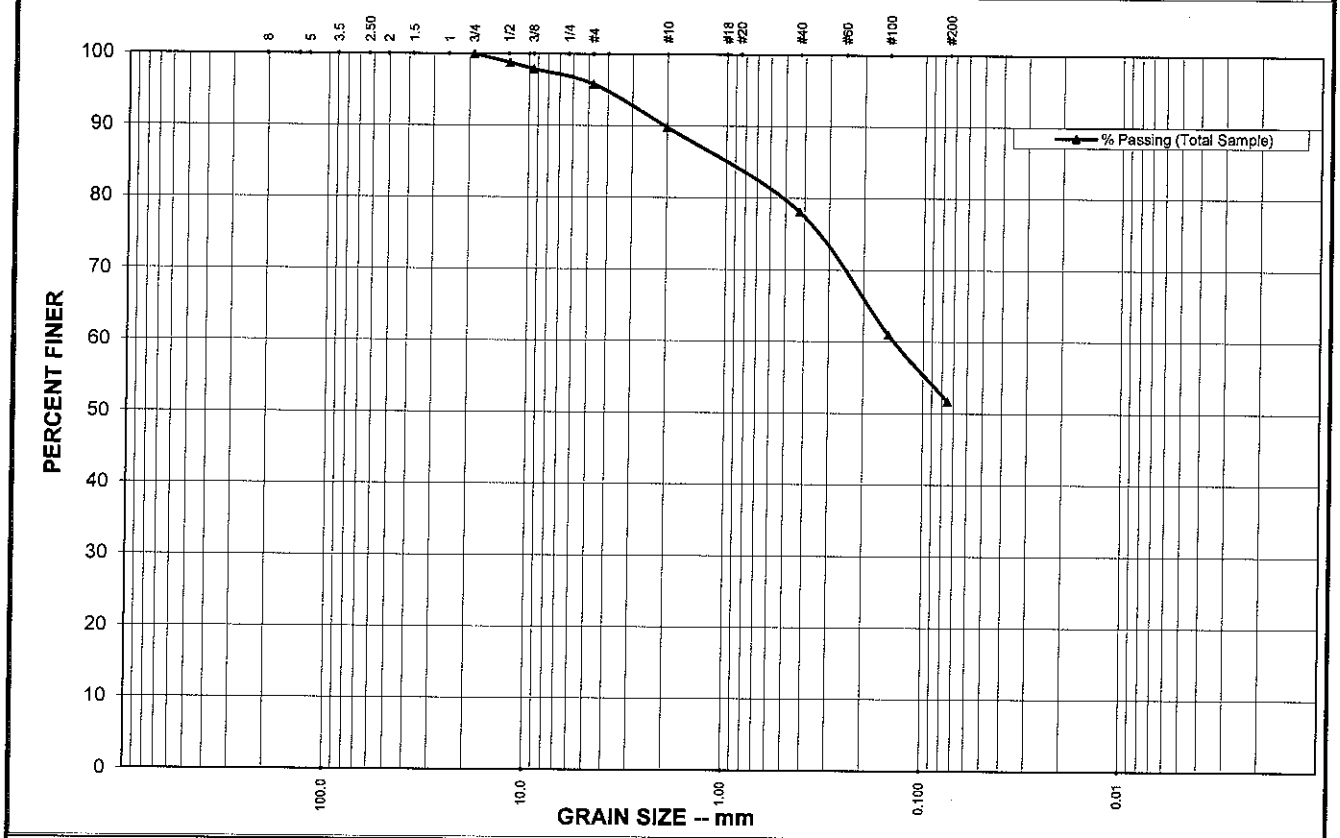
Project Name	VN Engineers, Inc.	Lab #	J2031487C.0049
Project #	J2031487C	Lab Technician:	M.Fongemie
Sampling Date	4/9/2010	Date of Test:	4/16/2010
Sampling Technician	Client		
Sample Source:	B-143, S-3		

Original Weight:	641	g	% Moisture	8.3%
Oven Dry Weight	615	g		
Tare Weight:	300	g		

Reviewed By: _____ Date: 4/20/10

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		13.6	26.5	59.9	Silt (>0.002mm)	Clay (<0.002mm)
	4		% Sand	44	52	

USCS Classification: SILT: with sand, red brown, (ML)

Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Ret. (g)	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
75.0	3"					
57.0	2.25"					
50.0	2"					
37.5	1.5"					
25.0	1"					
19.0	3/4"	0.00	100			
12.5	1/2"	4.00	99			
9.5	3/8"	7.00	98			
6.3	1/4"					
4.75	#4	14.00	96			
2.00	#10	34.00	90			
1.00	#18					
0.425	#40	73.00	78			
0.250	#60					
0.150	#100	130.00	61			
0.075	#200	161.00	52			
	Total Dry Wt.	333				
	Split Wt.					

Project:	VN Engineers, Inc.	Project No.:	J2031487C	Date:	4/9/2010
City:	North Haven, CT	Specification:	Not Provided	Report No:	J2031487C.0050
Source:	B143, S-4	Sampled from:	Provided by client		

Terracon
201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1900 (p) 860-721-1939 (f)
http://www.terracon.com/

Remarks: Job No. 27-107.1

Tested By: M.F. Date: 4/16/2010

Reviewed By: [signature] Date: 4/20/10

J2-C136CR, 1-1-09, Rev. 8

Terracon

ASTM D 2216 Standard Test Method for Water (Moisture) Content of Soil and Aggregate

TEST DATA REPORT

Project Name	VN Engineers, Inc.	Lab #	J2031487C.0050
Project #	J2031487C	Lab Technician:	M.Fongemie
Sampling Date	4/9/2010	Date of Test:	4/16/2010
Sampling Technician	Client		
Sample Source:	B-143, S-4		

Original Weight:	593	g	% Moisture	17.7%
Oven Dry Weight	534	g		
Tare Weight:	201	g		

Reviewed By: _____ Date: 4/20/10

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

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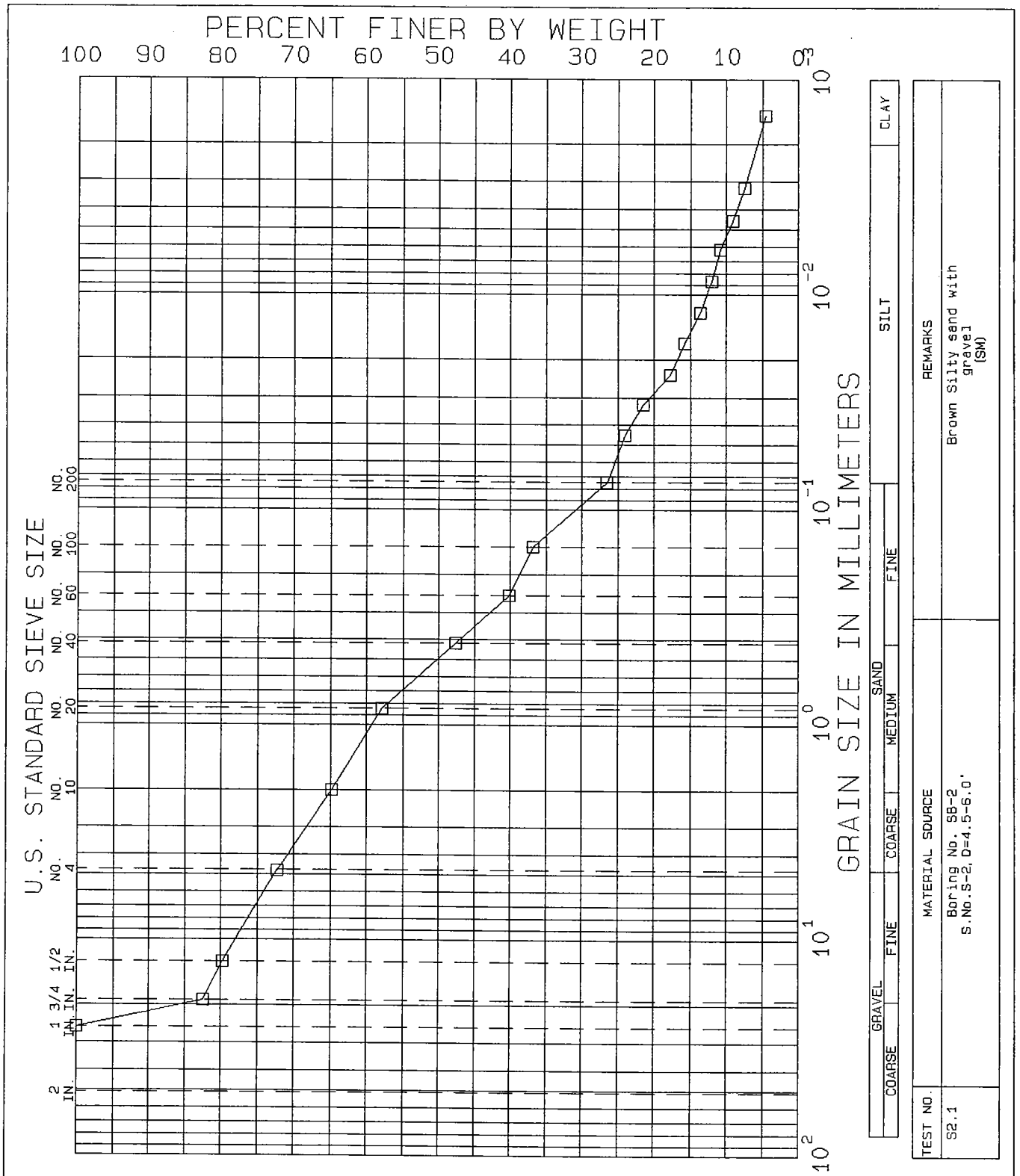
LABORATORY TESTING DATA SHEET

Project Name: NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
Project No.: L17828
Project Engineer: D. SCHULZE
Assigned By: D. GAFFNEY
Date: AUG.03
Reviewed By: [signature]
Date Reviewed: 9/3/03

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.: $C_c / (1 + e_0)$	Laboratory Log and Soil Description
SB-1	S-4	10.5-12.0	1	13.9	20	16	16	3												Brown Silty, clayey gravel with sand (GC-GM)
SB-2	S-2	4.5-6.0	2	20.3	21	21	26	6												Brown Silty sand with gravel (SM)
SB-2	S-4	10.5-12.0	3	10.3	NP	NP	14	3												Brown Silty sand with gravel (SM)
SB-4	S-5	13.5-15.0	4	24.4	21	20	84	9												Brown Silt (ML)
SB-5	S-2 S-3	4.5-9.0	5	6.3	24	23	23	4												Brown Silty sand with gravel (SM)
SB-5	S-9	25.5-27.0	6	2.8	16	14	44	9												Brown Silty sand with gravel (SM)
SB-6	S-7	19.5-21.0	7	7.9	NP	NP	10	2												Brown Well graded sand with silt and gravel (SW-SM)
SB-7	S-7	19.5 20.0	8	17.8																
SB-7	S-8	22.5-24.0	9	25.1	20	21	76	5												Brown Silt with sand (ML)
SB-8	S-5	13.5-15.0	10	9.5	16	16	11	2												Brown Well graded sand with silt and gravel (SW-SM)
SB-8	S-9	25.5-27.0	11	18.4																
SB-8	S-10 S-11	28.5-31.5	12	18.7	NP	NP	4	1												Brown Poorly graded sand with gravel (SP)
SB-10	S-8	22.5-24.0	13	16.4	NP	NP	15	1												Brown Silty sand (SM)
SB-11	S-5	13.5-15.0	14	14.1	20	17	18	3												Brown Silty sand with gravel (SM)

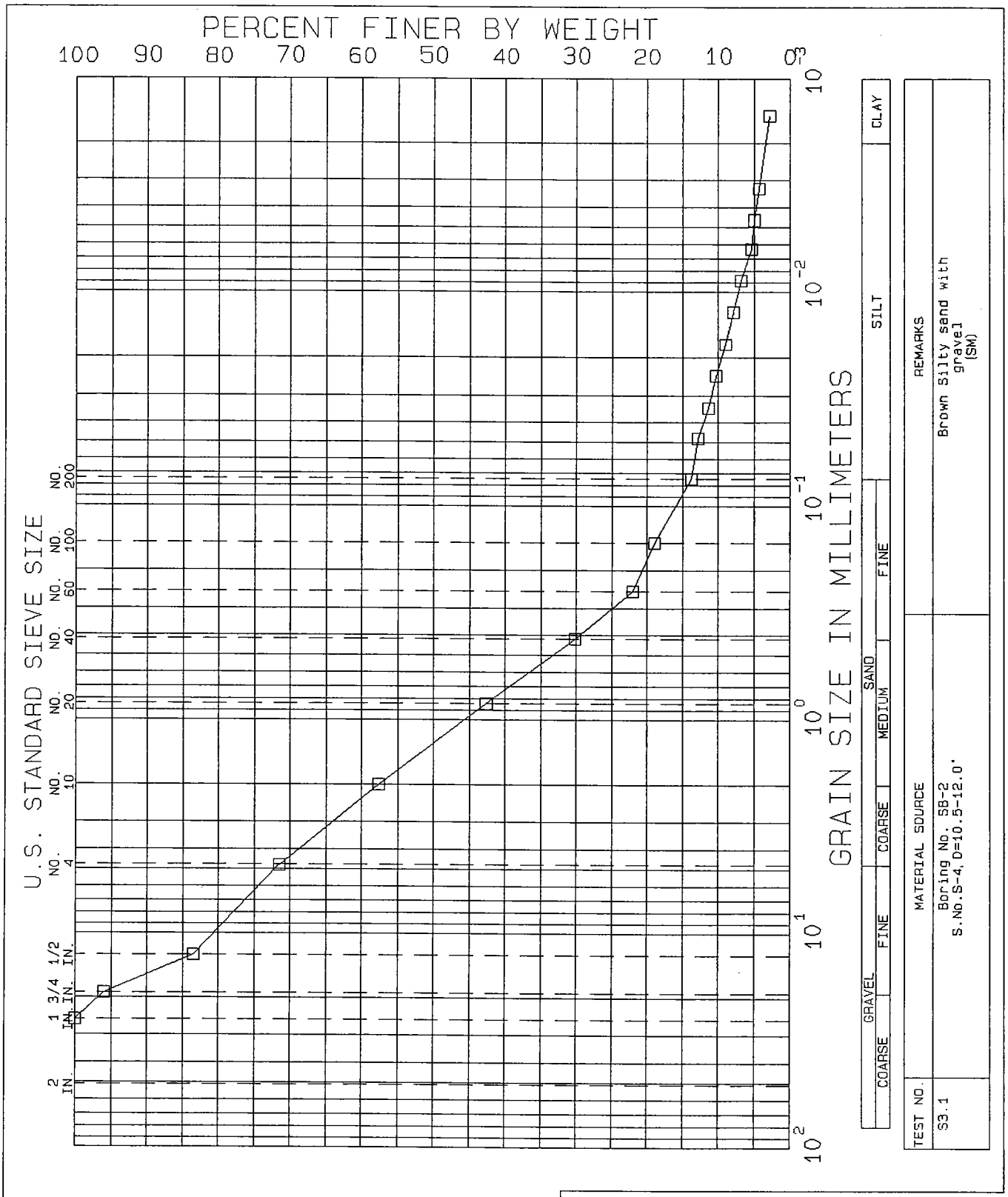


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-2	TEST SERIES	
SAMPLE	S-2	NO.	2
DEPTH	4.5-6.0'	DATE	Aug.03
TECH.	MST		
REVIEWER	DAS	FILE	L17828

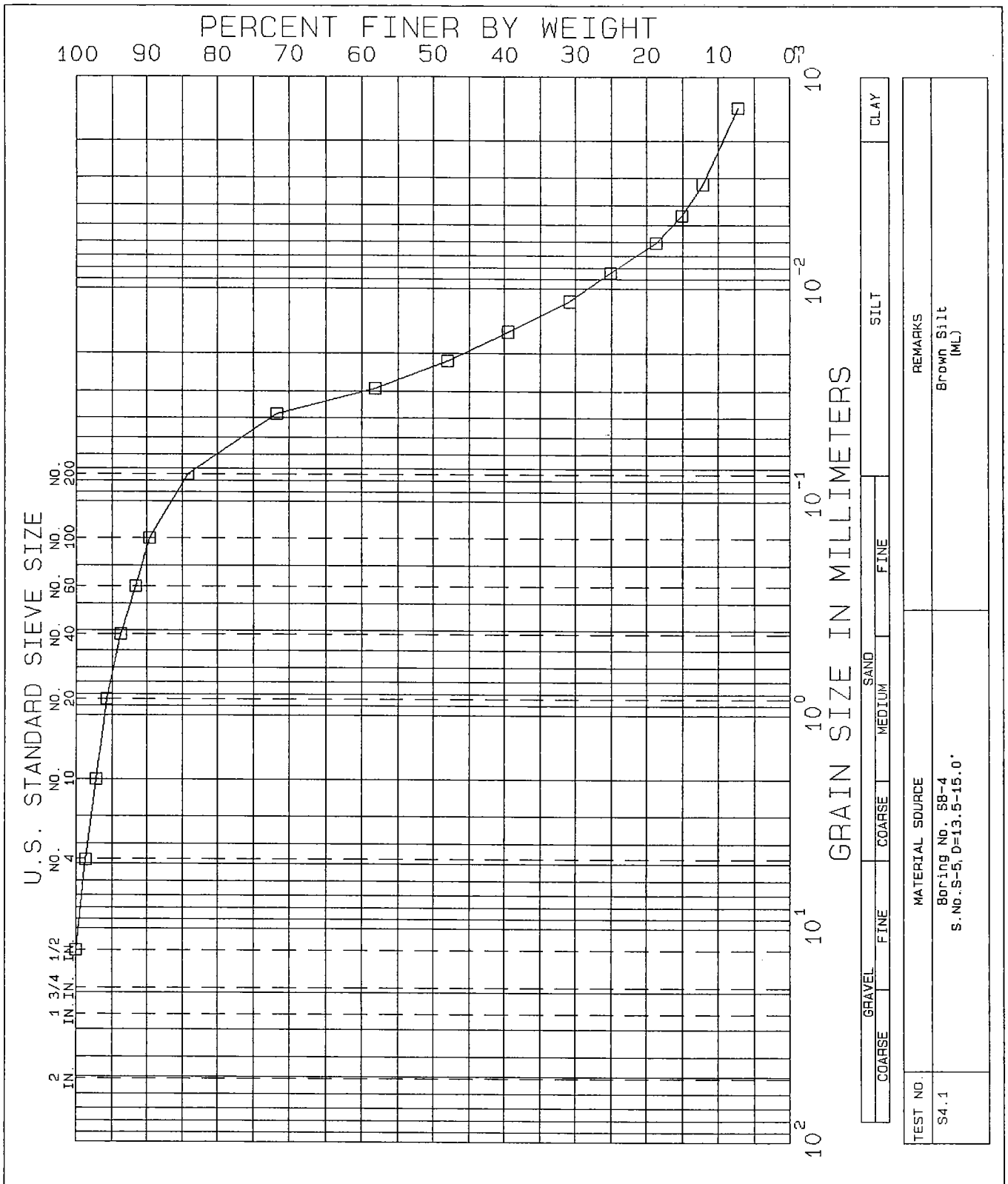


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-2	TEST SERIES	
SAMPLE	S-4	NO.	3
DEPTH	10.5-12.0'	DATE	Aug.03
TECH.	MST		
REVIEWER	DAS	FILE	L17828

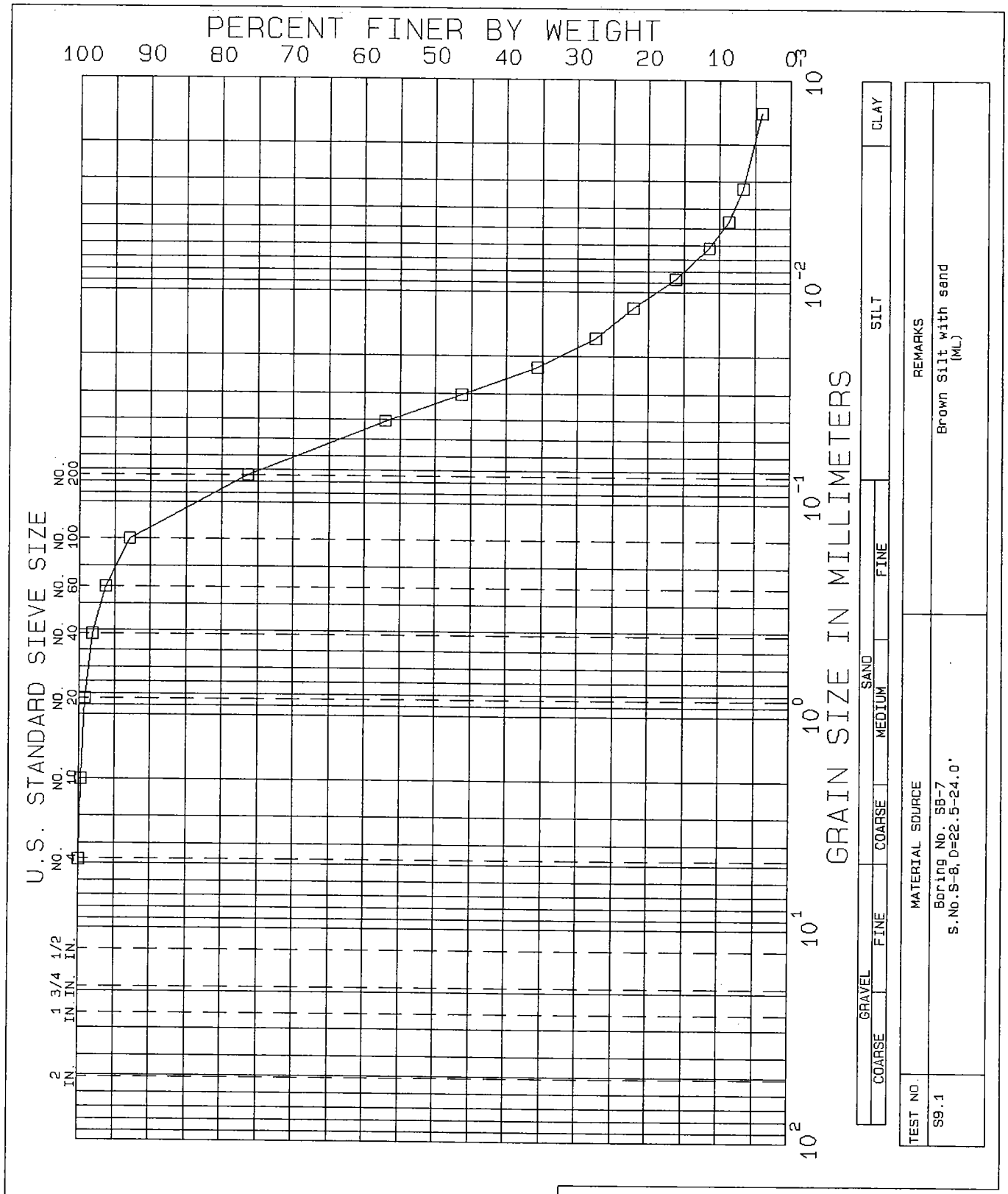


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-4	TEST SERIES	
SAMPLE	S-5	NO.	4
DEPTH	13.5-15.0'	DATE	Aug.03
TECH.	MST		
REVIEWER	DAS	FILE	L17628



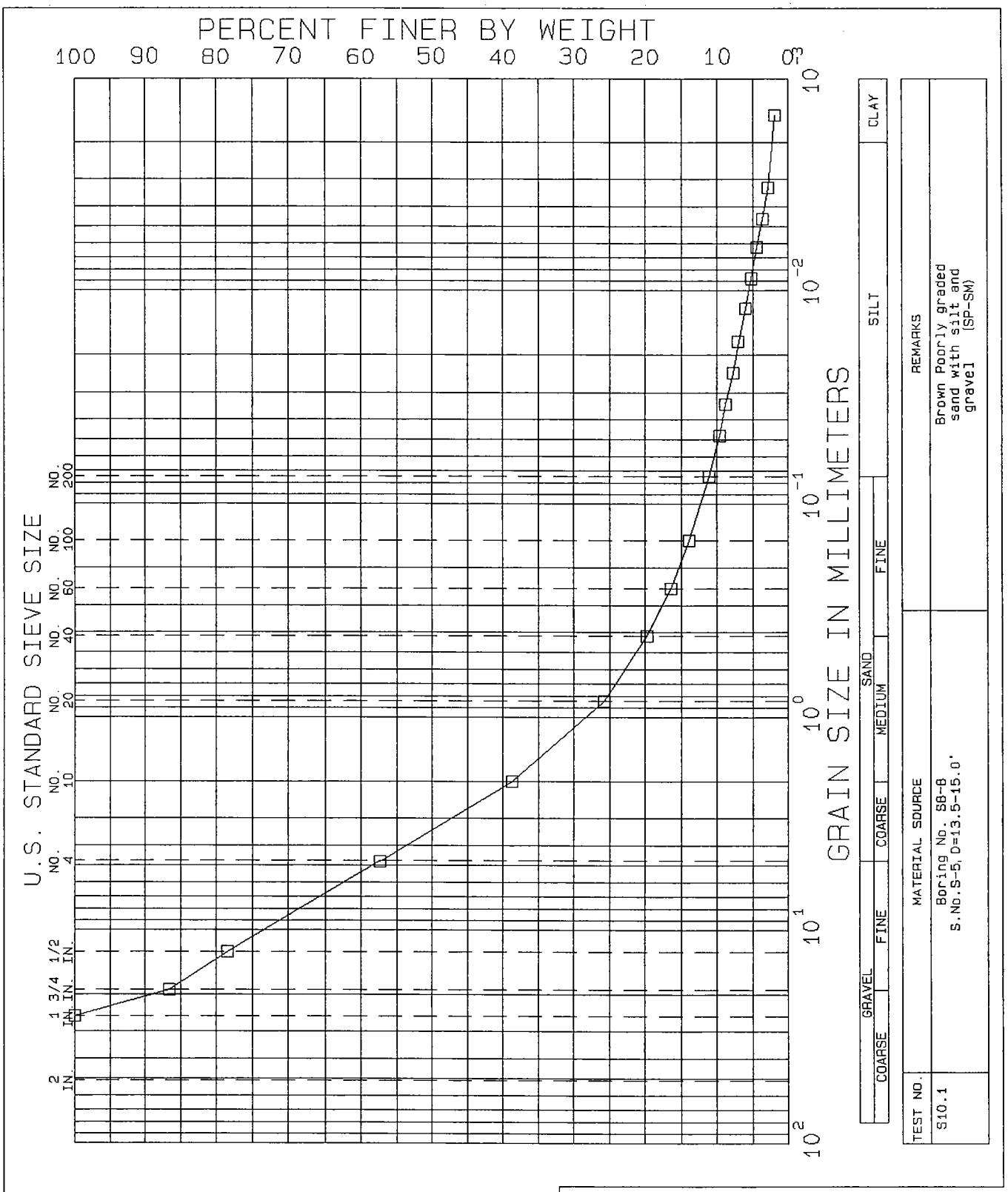
NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-7	TEST SERIES	
SAMPLE	S-B	NO.	9
DEPTH	22.5-24.0'	DATE	Aug.03
TECH.	MST		
REVIEWER	DAS	FILE	L17828

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS

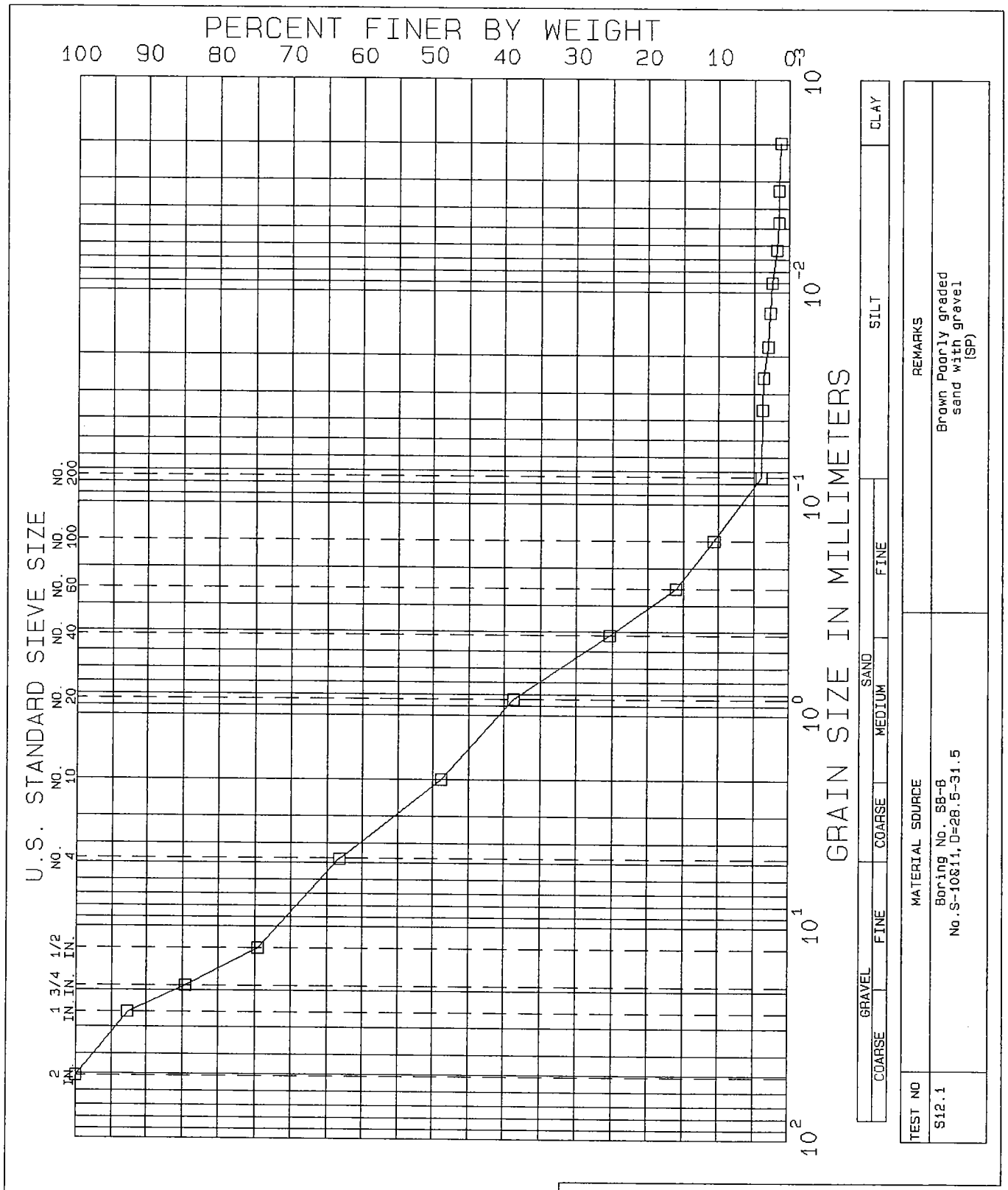


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-8	TEST SERIES	
SAMPLE	S-5	NO.	10
DEPTH	13.5-15.0'	DATE	Aug.03
TECH.	MST		
REVIEWER	DAS	FILE	L17828

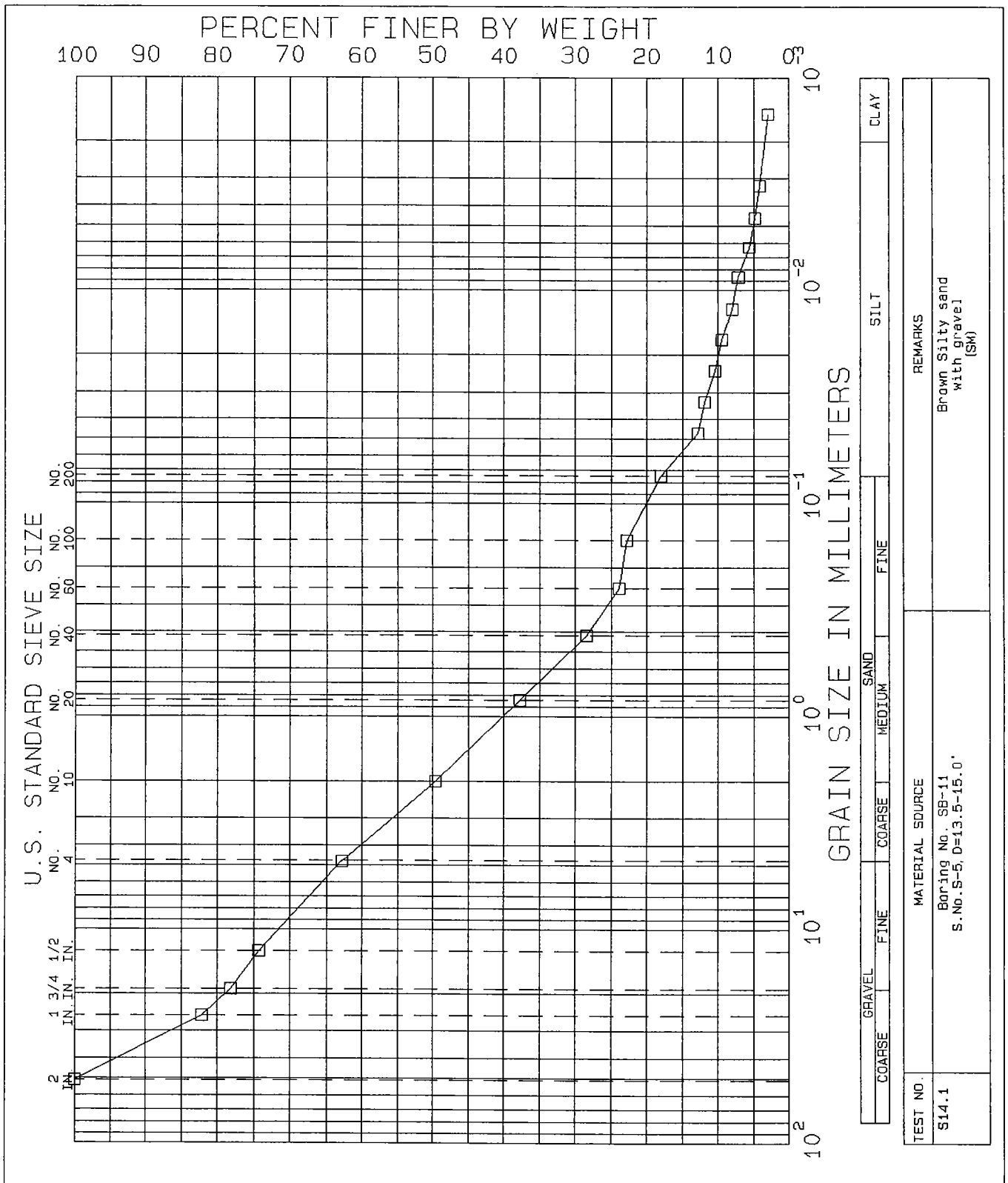


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-8	TEST SERIES	
SAMPLE	S10&11	NO.	12
DEPTH	28.5-31.5'	DATE	Aug.03
TECH.	MST		
REVIEWER	DAS	FILE	L17828



NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-11	TEST SERIES	
SAMPLE	S-5	NO.	14
DEPTH	13.5-15.0'	DATE	Aug.03
TECH.	MST		
REVIEWER	DAS	FILE	L17828

RECEIVED

SEP 19 2003

BAKER ENGINEERING NY INC.
ROCKY HILL, CT

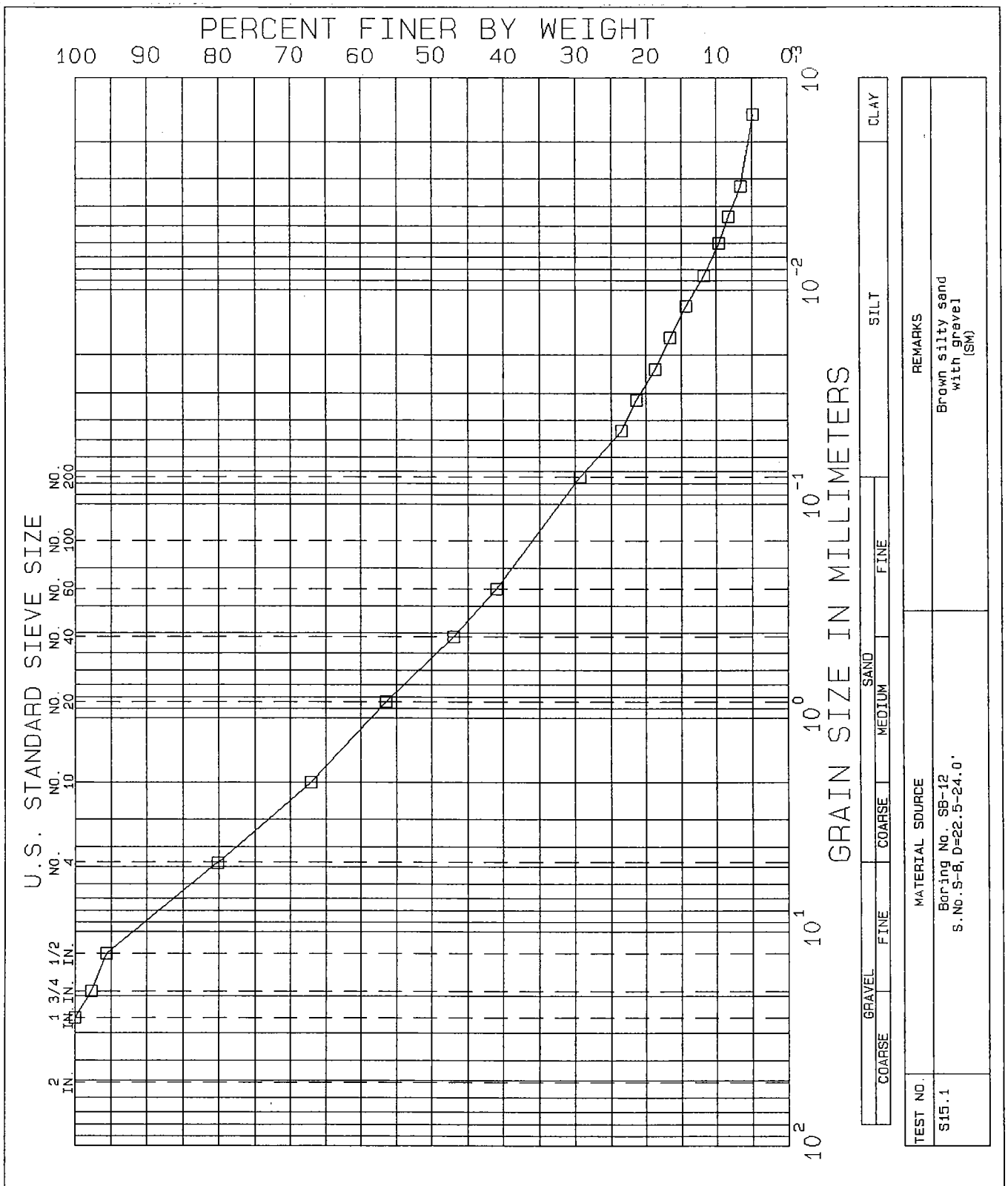
LABORATORY TESTING DATA SHEET

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)

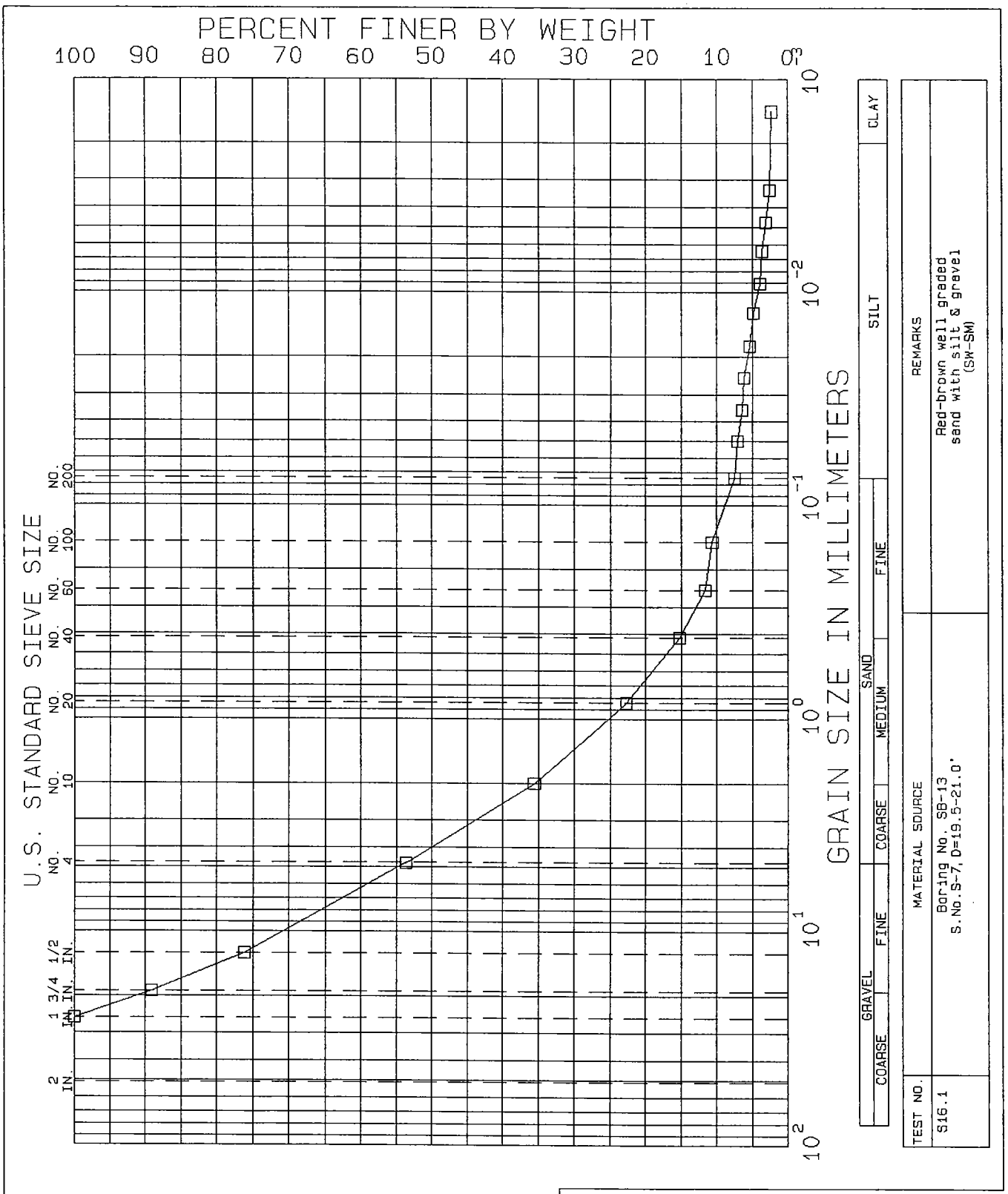


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-12	TEST SERIES	
SAMPLE	S-8	NO.	15
DEPTH	22.5-24.0'	DATE	Aug.03
TECH.	MST		
REVIEWER	DAS	FILE	L17828



NEW BRITAIN-HARTFORD BUSWAY

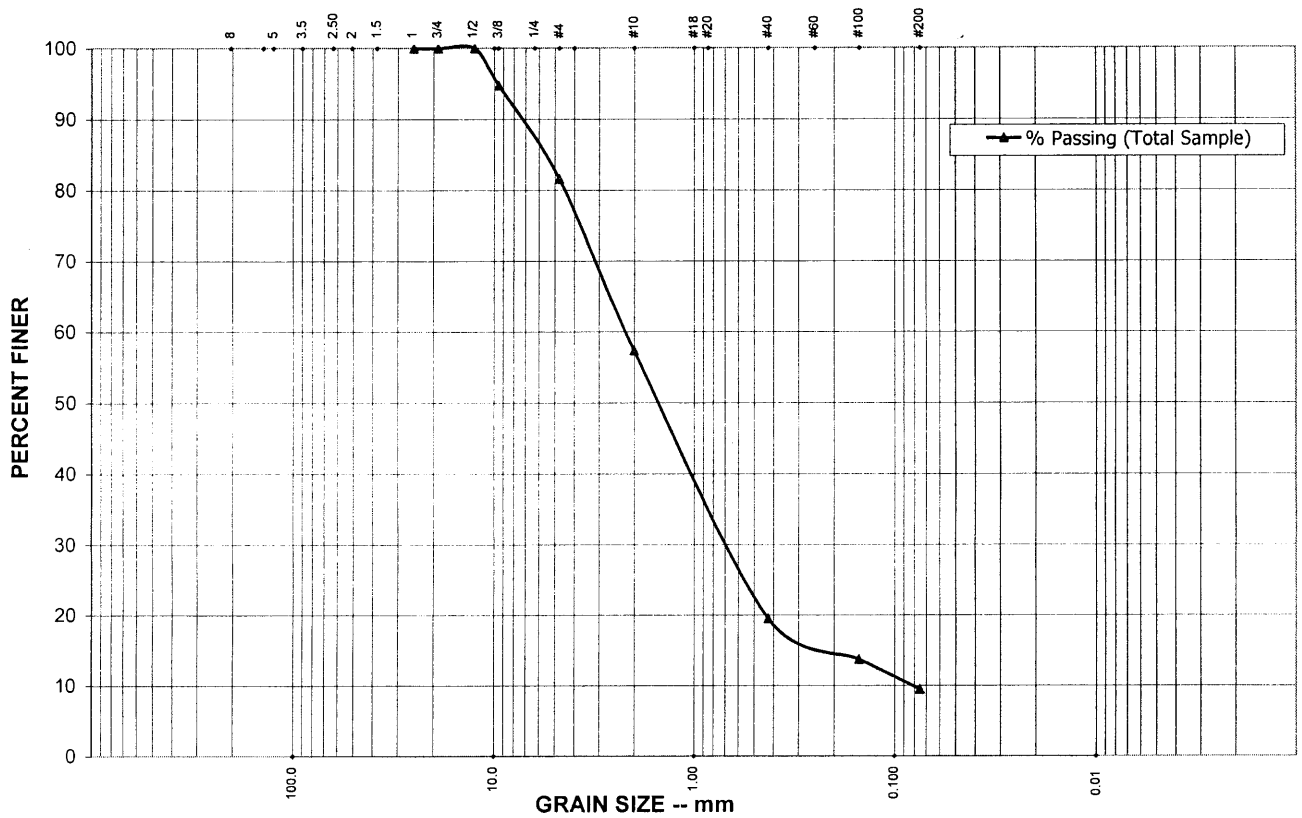
CONNECTICUT

GRADATION TESTS

BORING NO.	SB-13	TEST SERIES	
SAMPLE	S-7	NO.	16
DEPTH	19.5-21.0'	DATE	Aug.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		33.6	52.6	13.9	Silt (>0.002mm)	Clay (<0.002mm)
0.0	18.4	% Sand		72.1	9.5	

Classification: BROWN C-F SAND, little C-F Gravel, trace 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"	0.00	100.0			
19.0	3/4"	0.00	100.0			
12.5	1/2"	0.00	100.0			
9.5	3/8"	10.00	94.7			
6.3	1/4"					
4.75	#4	35.00	81.6			
2.00	#10	81.00	57.4			
1.00	#18					
0.425	#40	153.00	19.5			
0.250	#60					
0.150	#100	164.00	13.7			
0.075	#200	172.00	9.5			
	Total Dry Wt.	190				
	Split Wt.					

Project:	**VN Engineers,Inc.**	Project No.:	**J2031487C**	Date:	**8/9/2007**
City:	North Haven,CT	Specification:	Not Provided	Lab No:	**C1851-07**
Source:	B102 S-4, 15'-17'	Sampled from:	Provided by client		

JGI EASTERN, Inc. A Terracon COMPANY

114 Woodlawn Road
Berlin, CT 06037
(860) 829-1725 fax: (860) 829-1745
www.jgieastern.com

Remarks: Natural moisture content = 6.5%

Tested By: M.F. Date: 8/10/2007

Reviewed By: KJTS Date: 8/11/07

ASTM C136GSP1, Rev. 5

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117

% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		5.7	20.1	74.1	Silt (>0.002mm)	Clay (<0.002mm)
	4		% Sand	64	32	

USCS Classification: SILTY SAND: tan, (SM)

Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Ret. (g)	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
75.0	3"					
57.0	2.25"					
50.0	2"					
37.5	1.5"					
25.0	1"					
19.0	3/4"	0.00	100			
12.5	1/2"					
9.5	3/8"	7.00	97			
6.3	1/4"					
4.75	#4	12.00	96			
2.00	#10	22.00	92			
1.00	#18					
0.425	#40	57.00	79			
0.250	#60					
0.150	#100	154.00	44			
0.075	#200	186.00	32			
	Total Dry Wt.	274				
	Split Wt.					

Project:	**VN Engineering, Inc.**	Project No.:	**J2031487C**	Date:	**4/9/2010**
City:	North Haven, CT	Specification:	Not Provided	Report No:	**J2031487C.0046**
Source:	B143, S-2	Sampled from:	Provided by client		

Terracon

201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1900 (p) 860-721-1939 (f)
http://www.terracon.com/

Remarks: Job No. 27-107.01

Tested By: M.F. Date: 4/20/2010

Reviewed By: [signature] Date: 4/20/10

J2-C136CR, 1-1-09, Rev. 8

PLASTICITY TEST REPORT

Report Number: J2031487C.0046
Service Date: 04/09/10
Report Date: 04/19/10

Terracon
201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1900

Client

VN Engineers, Inc.
Attn: Sofia Nirshberg, P.E.
116 Washington Avenue
North Haven, CT 06473

Project

VN Engineering Testing Services
Laboratory Testing Services
Various Locations, CT

Project Number J2031487C

Material Information

Source of Material: B-143, S-2
Proposed Use: Not Provided
Soil Description: SILTY SAND: tan, (SM)

Classification: SILTY SAND: tan, (SM)

Sample Information

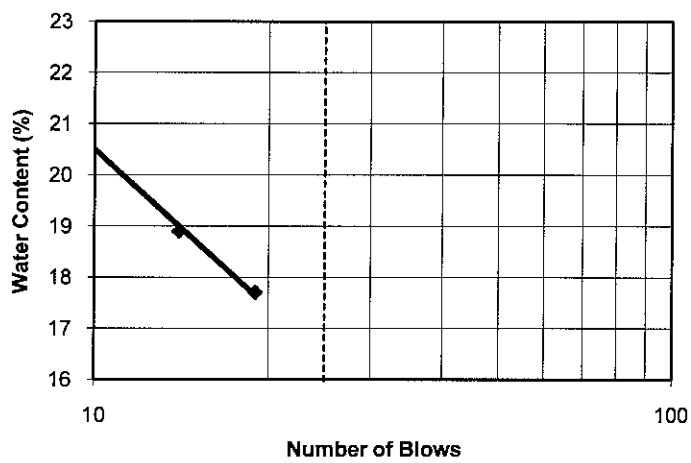
Sample Location: Provided by client
Sampled By: Made by Client
Sample Date: 04/09/10

Laboratory Test Data

	Result	Requirements
Liquid Limit:	16	
Plastic Limit:	Non-plastic	
Plasticity Index:	Non-plastic	
In-Place Moist. (%):		

Liquid Limit Method: Method A
Sample Preparation: Dry

Liquid Limit Determination



Comments:
Soil is Non-Plastic could not roll out for Plastic Limit

Services:

Terracon Rep: Made by Client
Reported To:
Contractor: VN Engineers
Report Distribution:

Reviewed By:
Kevin J. Brigandi
Principal, Department Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

Terracon

ASTM D 2216 Standard Test Method for Water (Moisture) Content of Soil and Aggregate

TEST DATA REPORT

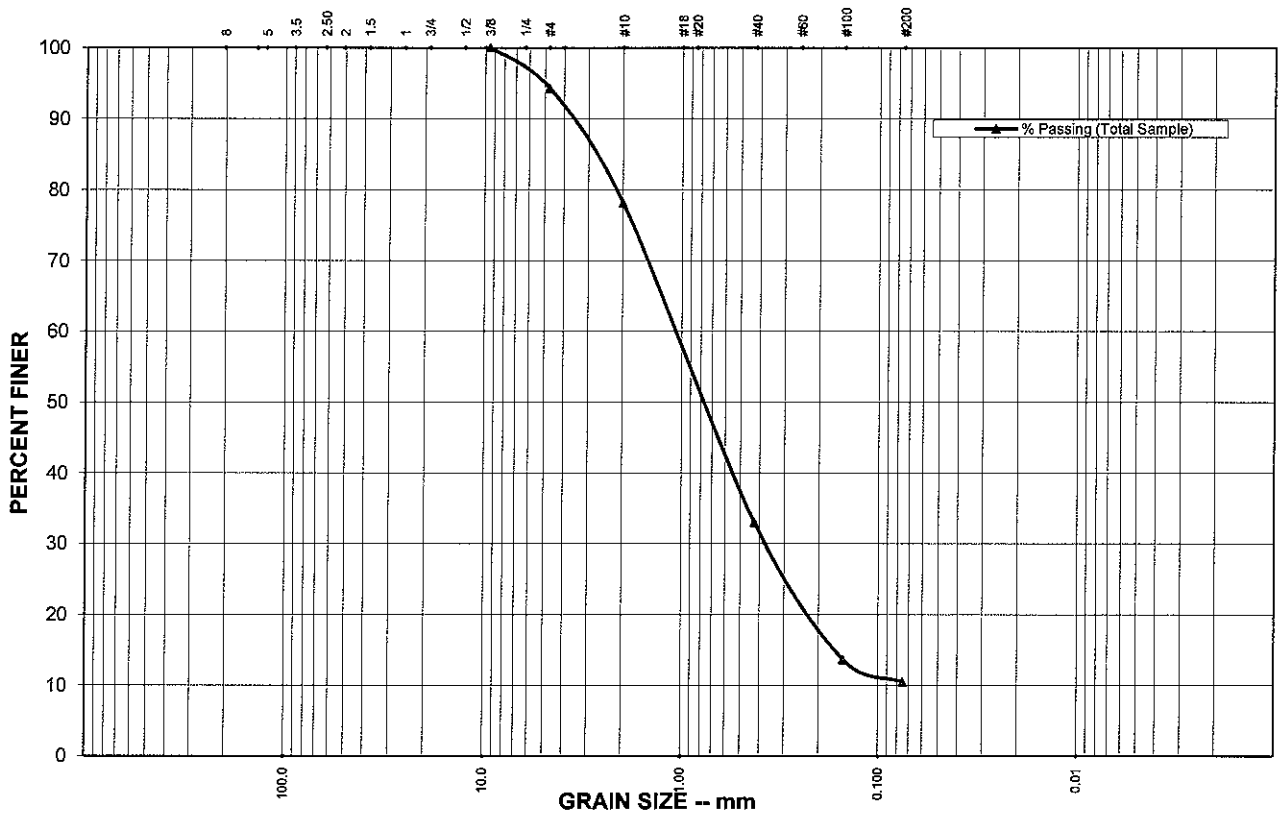
Project Name	VN Engineers, Inc.	Lab #	J2031487C.0046
Project #	J2031487C	Lab Technician:	M.Fongemie
Sampling Date	4/9/2010	Date of Test:	4/16/2010
Sampling Technician	Client		
Sample Source:	B-143, S-2		

Original Weight:	569	g	% Moisture	17.4%
Oven Dry Weight	520	g		
Tare Weight:	238	g		

Reviewed By: _____ Date: 4/20/10

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		19.3	53.8	26.9	Silt (>0.002mm)	Clay (<0.002mm)
	6		% Sand	84	10	

USCS Classification: WELL GRADED SAND: with silt, brown, (SW)

Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Ret. (g)	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
75.0	3"					
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"	0.00	100			
6.3	1/4"					
4.75	#4	18.00	94			
2.00	#10	69.00	78			
1.00	#18					
0.425	#40	211.00	33			
0.250	#60					
0.150	#100	272.00	14			
0.075	#200	282.00	10			
	Total Dry Wt.	315				
	Split Wt.					

Project:	**VN Engineers, Inc.**	Project No.:	**J2031487C**	Date:	**4/9/2010**
City:	North Haven, CT	Specification:	Not Provided	Report No:	**J2031487C.0049**
Source:	B143, S-3	Sampled from:	Provided by client		

Terracon

201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1900 (p) 860-721-1939 (f)
http://www.terracon.com/

Remarks: Job No. 27-107.1

Tested By: M.F. Date: 4/16/2010

Reviewed By: Date: 4/20/10

J2-C136CR, 1-1-09, Rev. 8

Terracon

ASTM D 2216 Standard Test Method for Water (Moisture) Content of Soil and Aggregate

TEST DATA REPORT

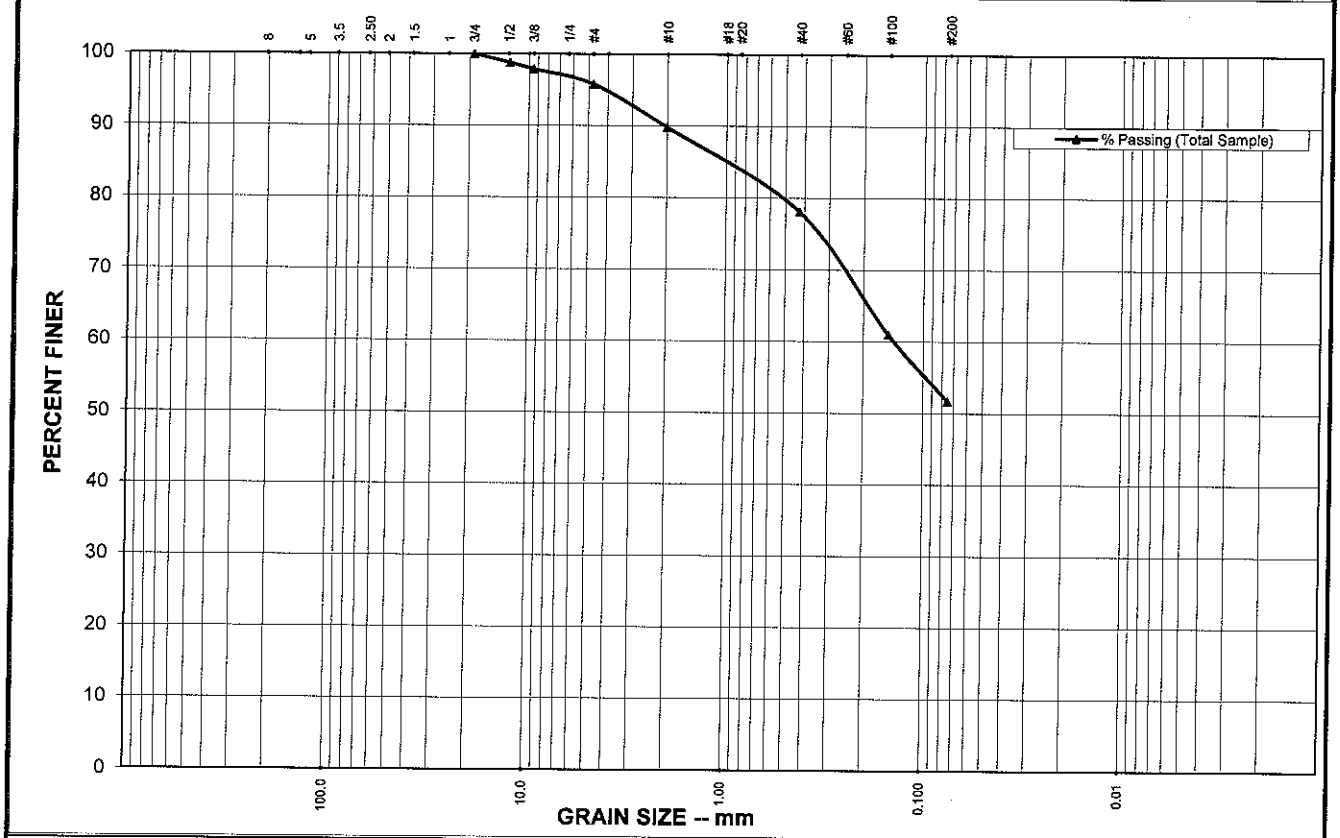
Project Name	VN Engineers, Inc.	Lab #	J2031487C.0049
Project #	J2031487C	Lab Technician:	M.Fongemie
Sampling Date	4/9/2010	Date of Test:	4/16/2010
Sampling Technician	Client		
Sample Source:	B-143, S-3		

Original Weight:	641	g	% Moisture	8.3%
Oven Dry Weight	615	g		
Tare Weight:	300	g		

Reviewed By: _____ Date: 4/20/10

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHODS: C136, C117



% Cobbles	% Gravel	Coarse	Medium	Fine	% Fines	
		13.6	26.5	59.9	Silt (>0.002mm)	Clay (<0.002mm)
	4		% Sand	44	52	

USCS Classification: SILT: with sand, red brown, (ML)

Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Ret. (g)	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
200.0	8"					
125.0	5"					
75.0	3"					
57.0	2.25"					
50.0	2"					
37.5	1.5"					
25.0	1"					
19.0	3/4"	0.00	100			
12.5	1/2"	4.00	99			
9.5	3/8"	7.00	98			
6.3	1/4"					
4.75	#4	14.00	96			
2.00	#10	34.00	90			
1.00	#18					
0.425	#40	73.00	78			
0.250	#60					
0.150	#100	130.00	61			
0.075	#200	161.00	52			
	Total Dry Wt.	333				
	Split Wt.					

Project:	VN Engineers, Inc.	Project No.:	J2031487C	Date:	4/9/2010
City:	North Haven, CT	Specification:	Not Provided	Report No:	J2031487C.0050
Source:	B143, S-4	Sampled from:	Provided by client		

Terracon
201 Hammer Mill Road
Rocky Hill, CT 06067
860-721-1900 (p) 860-721-1939 (f)
http://www.terracon.com/

Remarks: Job No. 27-107.1

Tested By: M.F. Date: 4/16/2010

Reviewed By: [signature] Date: 4/20/10

J2-C136CR, 1-1-09, Rev. 8

Terracon

ASTM D 2216 Standard Test Method for Water (Moisture) Content of Soil and Aggregate

TEST DATA REPORT

Project Name	VN Engineers, Inc.	Lab #	J2031487C.0050
Project #	J2031487C	Lab Technician:	M.Fongemie
Sampling Date	4/9/2010	Date of Test:	4/16/2010
Sampling Technician	Client		
Sample Source:	B-143, S-4		

Original Weight:	593	g	% Moisture	17.7%
Oven Dry Weight	534	g		
Tare Weight:	201	g		

Reviewed By: _____ Date: 4/20/10

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

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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.

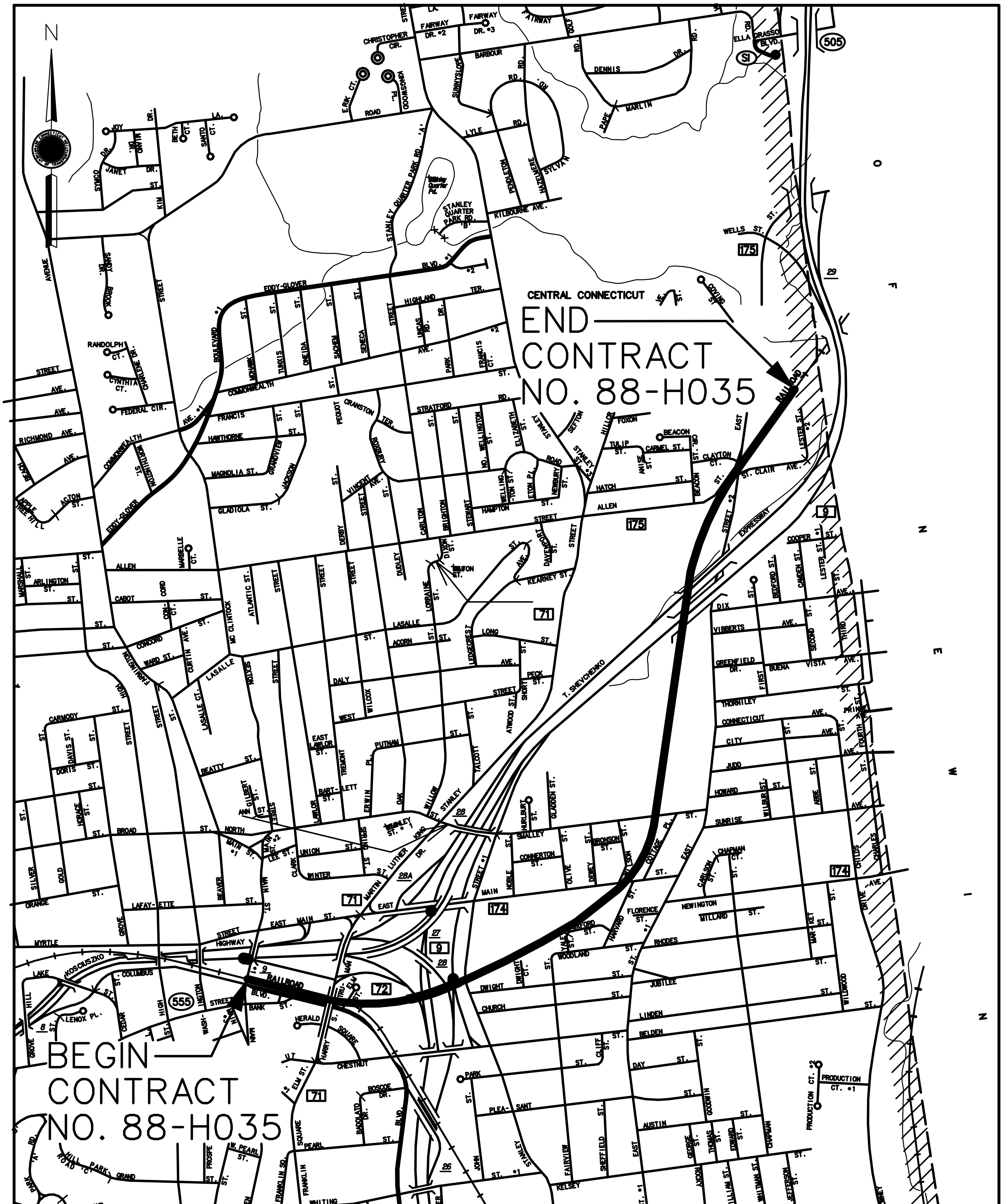
Groundwater and Drainage

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

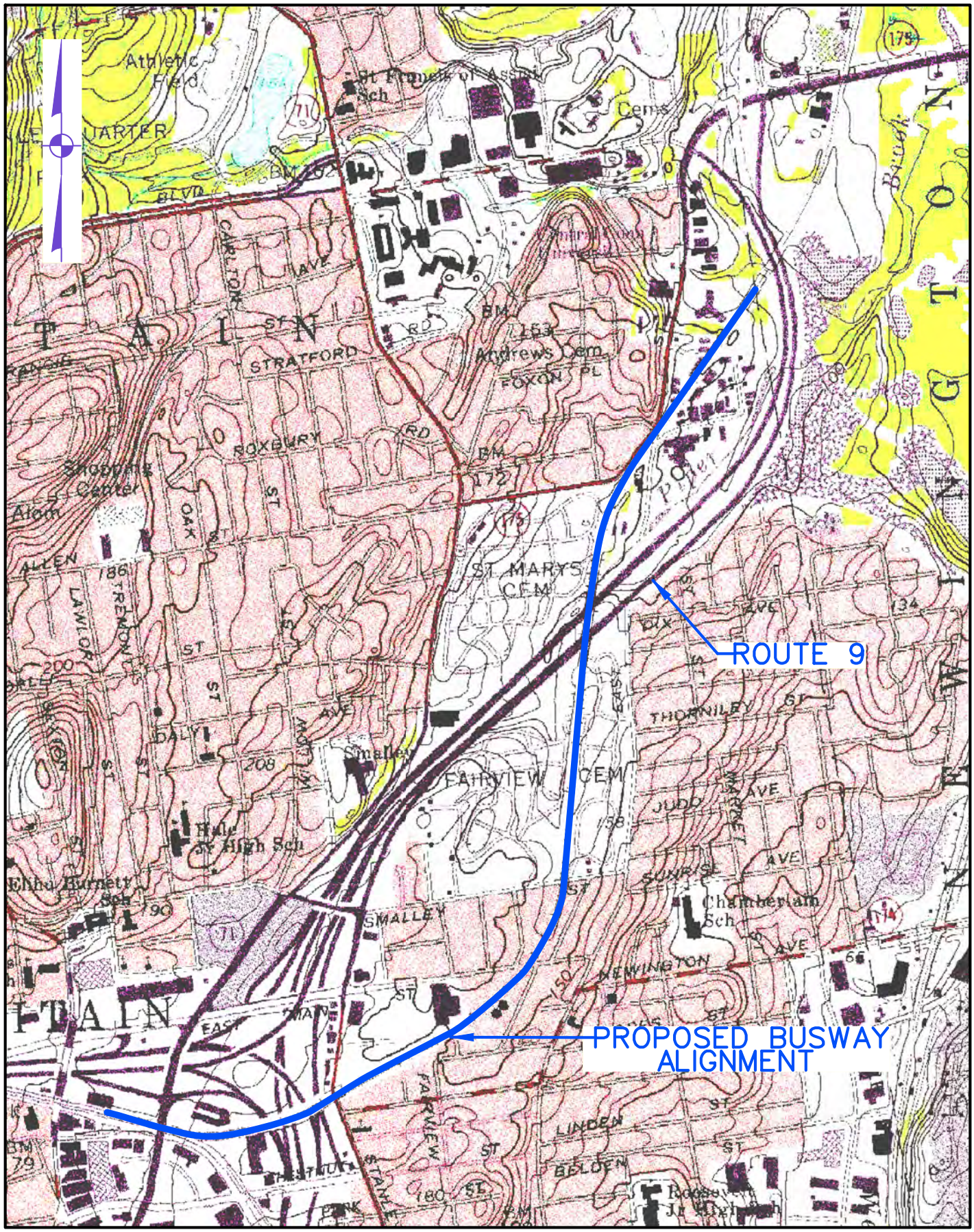


FIGURE 2
TOPOGRAPHIC LOCATION MAP
N.T.S.

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TRAFFIC•INFRASTRUCTURE•GEOTECHNICAL

New Britain-Hartford Busway
New Britain, CT

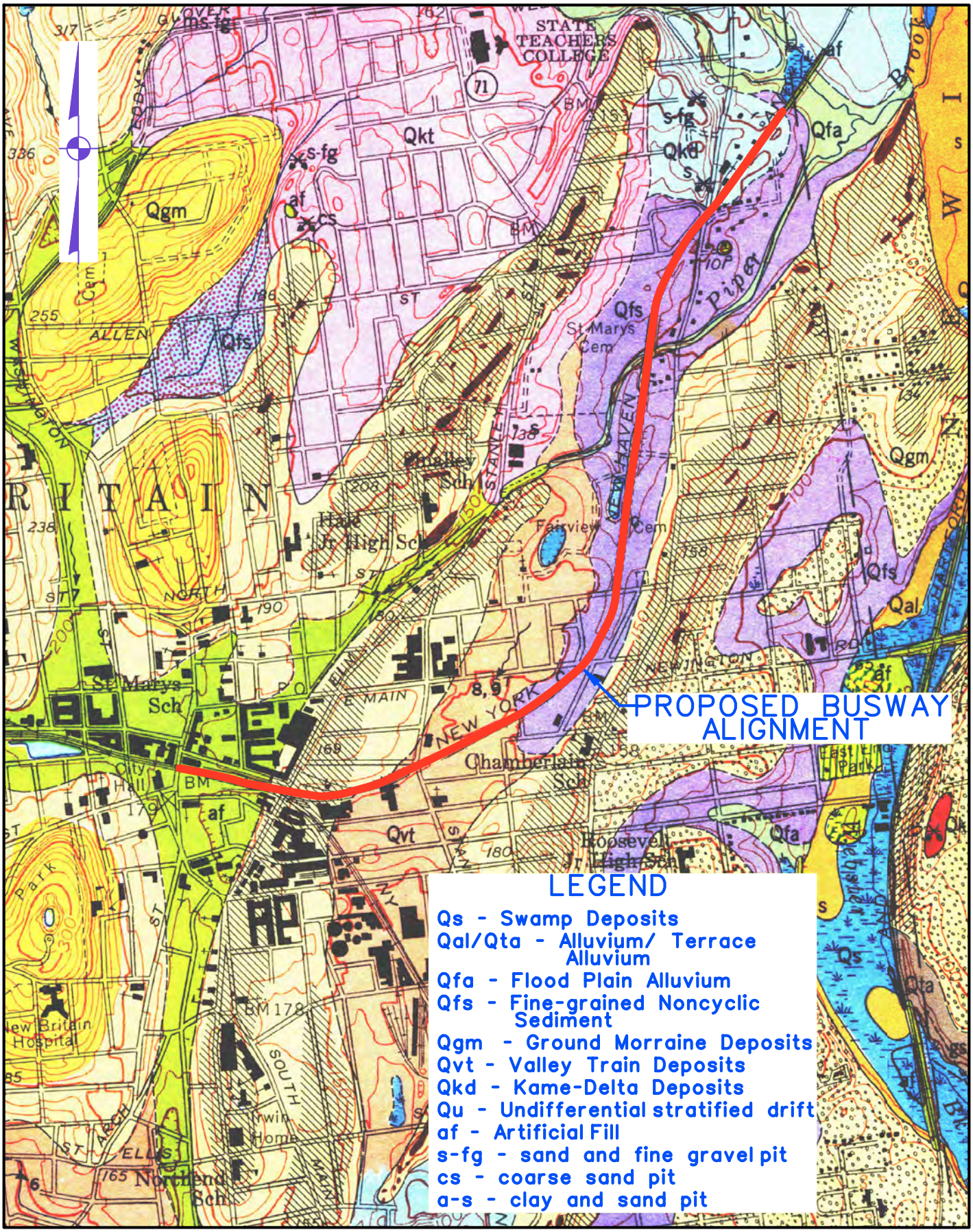
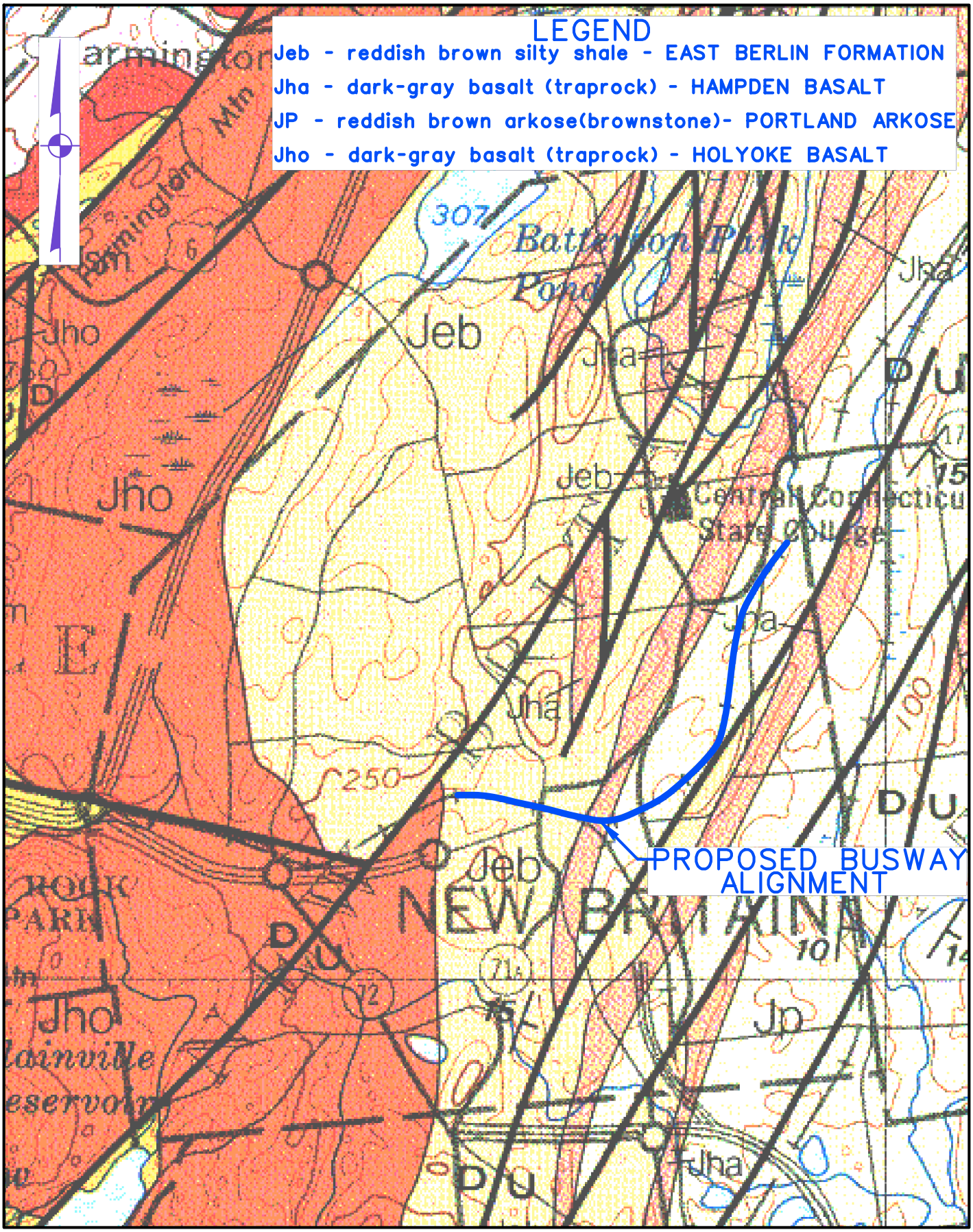


FIGURE 3
SURFICIAL GEOLOGY MAP
N.T.S.

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.

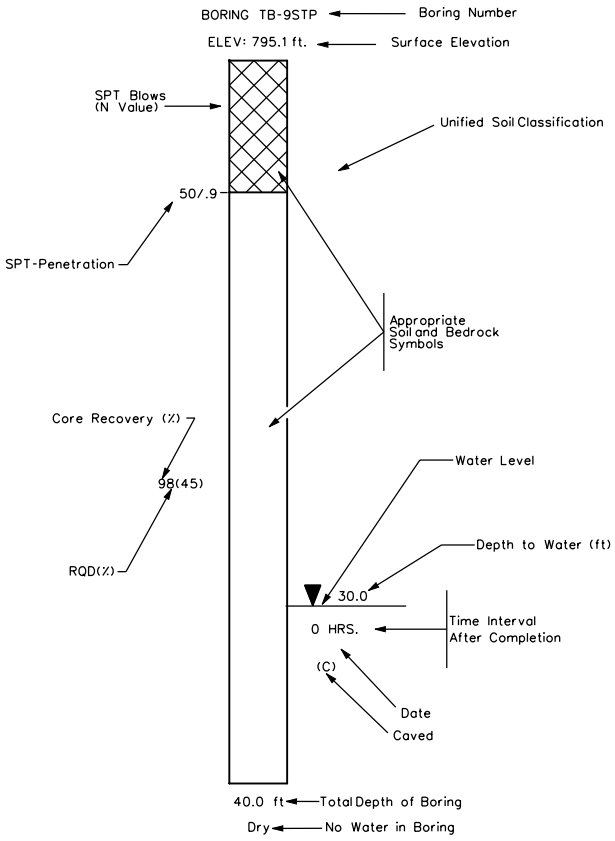
New Britain-Hartford Busway
New Britain, CT

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.