JGI
EASTERN, Inc.

SERVICES
- Geotechnical
- Environmental
- Construction Monitoring
- Materials Testing

June 29, 2007

Steven J. Blevins, P.E.
Infinigy Engineering, PLLC
300 Great Oaks Boulevard, Suite 312
Albany, NY 12203

Advance Copy by Email

Re: Geotechnical Evaluation
Sprint Tower No. CT54XC773
150 Willow Street
Hamden, Connecticut

JGI Project No. J2075344

Dear Mr. Blevins:

This report, prepared by JGI EASTERN, Inc. (JGI), A Terracon Company, presents a geotechnical engineering evaluation of subsurface conditions as they relate to foundation design and earthwork construction for the above-referenced communications tower development. Our services were conducted in accordance with our June 4, 2007proposal, and are subject to the limitations contained in this report.

SITE AND PROJECT DESCRIPTION

The project site is located west of Willow Street, north of a high-tension power line easement, within the Hamden Fish & Game Club in Hamden, Connecticut. The site is currently undeveloped and moderately wooded. The site slopes down to the north approximately Elevation (El) 130 to 122 feet, with the exception of the southeast corner, which slopes steeply down to the south-southeast from approximately El 130 to 120. The fenced compound area slopes down to the north from approximately El 128 to 124. Ground surface elevations are in feet and refer to the contours depicted on a plan entitled *Grading Plan,* dated March 29, 2007 prepared by Infinigy Engineering of Roswell, Georgia.

The project involves constructing a new 160-foot tall steel monopole communications tower and associated equipment shelters within the approximately 50-foot square fenced compound area. Site access will be provided by a proposed drive extending south from an existing gravel access drive. Proposed site conditions are illustrated on Figure 1, Subsurface Exploration Location Plan.

☐77 Sundial Avenue, Suite 401W
Manchester, NH 03103
(603) 647-9700 Fax 647-4432

☒114 Woodlawn Road
Berlin, CT 06037-1535
(860) 829-1725 Fax 829-1745

☐15 Holly Street, Unit 105
Scarborough, ME 04074
(207) 396-5374 Fax 396-5394

www.jgieastern.com

SUBSURFACE EXPLORATIONS AND CONDITIONS

JGI monitored the advancement of one test boring (JB-1) and four test probes (JP-1 through JP-4) by New England Boring Contractors of Connecticut, Inc. of Glastonbury, Connecticut on June 26, 2007. The test boring was advanced at the approximate tower center with a 3¼-inch inside diameter hollow stem auger (HSA) to refusal at a depth of 47.0 feet below the existing ground surface. Soil samples were obtained semi-continuously to a depth of 7 feet and at 5-foot intervals thereafter with a standard 2.0-inch outside diameter split-barrel sampler. Standard Penetration Tests (SPTs) were performed at sampling intervals, in general accordance with ASTM D1586.

The soil profile at the site generally consists of forest mat, underlain by subsoil over a glaciofluvial deposit. The forest mat was approximately 4 inches thick. The underlying subsoil generally consists of medium dense, brown, medium to fine sand, some silt, trace gravel, with roots. The thickness of the subsoil ranged from approximately 24 to 30 inches. The underlying glaciofluvial deposit varies from a loose to medium dense, coarse to fine sand, trace to some gravel, little silt, to a loose to medium dense, silt and fine sand. Refusal, probably on bedrock, was encountered at a depth of 47 feet below existing grade.

Test probes were advanced with a 4-inch diameter auger (SSA) to further evaluate the subsurface soil conditions near the proposed tower. The probes, which encountered soil conditions similar to JB-1, were terminated at a depth of 10 feet. The approximate exploration locations are shown on Figure 1. The exploration logs are attached.

Groundwater was encountered at a depth of approximately 15 feet in JB-1 upon completion of drilling. Groundwater levels vary depending upon season, precipitation, and other conditions that may differ from those at the time of drilling.

On June 26, 2007, *in situ* soil resistivity testing was completed. Resistivity testing was performed in accordance with ASTM G57 by the Wenner Four Probe Method using a 16gl Earth Resistivity Meter. Two resistivity lines were completed with electrodes spaced at 5, 10, 20, 30, and 40 feet. At the time of resistivity testing, the surficial soil was relatively dry. The location and orientation of resistivity lines are shown on Figure 1. The resistivity test results are summarized below:

	Resistivity (ohm-cm)	
Electrode Spacing (ft)	**Line 1**	**Line 2**
5	974,565	921,275
10	1,210,430	1,090,570
20	505,455	488,275
30	110,900	187,145
40	196,450	191,485

FOUNDATION TYPE AND DESIGN RECOMMENDATIONS

Tower Foundation Design Criteria

The tower may be supported on either a monolithic mat or a pier and pad foundation bearing directly on the glaciofluvial sand or on compacted structural fill or minus ¾-inch crushed stone placed on the glaciofluvial sand. The tower foundation may be designed on the basis of a net allowable bearing pressure of 4.0 kips per square foot (ksf). The allowable bearing pressure may be increased by one third for transient loadings, such as wind and seismic. Bearing pressure is unlikely to govern the design, with overturning determining the size of the foundation. We estimate that settlement of the tower foundation will be less than 1 inch, and depending on the actual size of the footing, the settlement may be less than ½ inch.

An ultimate friction factor (tan δ) of 0.5 may be used for calculation of the sliding resistance between the bearing materials and concrete surfaces. A factor of safety of at least 1.5 should be applied to the sliding resistance. A total unit weight (γ) of 120 pounds per cubic foot and an ultimate passive earth pressure coefficient, K_p, of 3.0 should be used for the calculation of passive resistance provided by compacted backfill adjacent to the tower foundation. The passive pressure calculated with these parameters should be reduced by at least a factor of safety of 3, to reflect the amount of movement required to mobilize the passive resistance.

The underside of the tower foundation should be at least 3.5 feet below existing grade to provide protection from freezing temperatures. To increase the overturning resistance of the footing, the mat or pad could be extended to the surface with a pier. This would reduce the volume of the concrete foundation and utilize the mass of the fill placed above the footing to increase overturning resistance. The excavation around and above the foundation should be backfilled with compacted fill.

Control of backfill compaction above and around the foundation will be required to provide uplift and lateral resistance. Care should be exercised during excavation for the tower foundation to minimize disturbance to the soil surrounding the excavation; disturbance to the adjacent soils will influence resistance to lateral loads.

Equipment Cabinets

The equipment cabinet pads may be supported on either concrete pier foundations or slabs-on-grade. Heavily loaded equipment cabinets should be founded on the native medium dense glaciofluvial sand, which was encountered at a depth of about 2 to 2.5 feet below existing grade. Footings on the glaciofluvial sand may be designed using a maximum net allowable bearing pressure of 3.0 ksf. Settlements will likely be less than about 1 inch, most of which will occur as load in applied. Strip footings should have a minimum width of 12 inches. Piers should have a minimum side dimension/diameter of 12 inches.

Slabs-on-grade should be underlain by a minimum 12-inch thick layer of compacted structural fill or minus ¾-inch crushed stone, placed on the existing glaciofluvial sand or on inorganic subsoil, i.e. subsoil without visible roots. The structural fill/crushed stone should extend 12 inches out from the perimeter of the pad. A modulus of subgrade reaction (k_s) of 225 pounds per cubic inch may be used for design of slabs constructed in this way. Consideration should be given to using dense insulation boards (Dow Styrofoam Highload, or similar) under and adjacent to lightly loaded slabs-on-grade, to provide the equivalent of 3.5 feet of earth cover, thus reducing frost penetration.

Air entraining admixtures should be used for concrete exposed to freezing. To reduce the likelihood of frost heave, the underside of foundation elements should be at least 3.5 feet below finish ground surface, unless adequately protected by insulation boards.

Seismic Design Criteria

Seismic design requirements for the State of Connecticut are based on the Connecticut State Building Code, which incorporates the Seismic Design Category approach from the 2003 International Building Code. The Seismic Design Category determination is based on:

- Building Importance (grouping based on use of building)
- Mapping factors (expected maximum considered ground motions)
- Site classification (soil type)

From our test borings, we consider that the site subsurface conditions match the General Soil Description of "stiff soil profile". The Site Class is therefore D. We expect that the communications tower will be designated a facility intended to survive to provide essential services in the post-event environment, i.e. Category III Seismic Use Group. Based on the above, and a review of USGS National Seismic Hazard Mapping, we would consider the facility to be in Seismic Design Category B. This determination should be confirmed by the structural engineer. The site does not appear to be susceptible to liquefaction in the event of an earthquake.

Permanent Slopes

Any cut slopes in the subsoil, and if required in the glaciofluvial sand, should be constructed no steeper than 2H:1V. Fill slopes, if required, should also be constructed at 2H:1V. The forest mat and organic subsoil, i.e. subsoil with visible roots, should be removed from fill slope areas before placing fill.

Common fill may be used to construct permanent slopes, and should consist of mineral soil, free from frozen soil, debris, and organic, or other deleterious, material. Excavated inorganic subsoil and glaciofluvial sand may be selectively used as common fill, provided they have a maximum particle size of 8 inches and can be properly compacted. Soil placed to create fill slopes should be compacted to at least 92 percent of maximum dry density, as determined by ASTM D1557. Excavated organic subsoil should only be used only within 12 inches of the finished grade of the slopes.

Permanent fill and cut slope surfaces should be vegetated, or covered with an erosion mat, to protect against erosion. Temporary sedimentation and erosion control methods should be implemented during construction and left in place until the slope surface has been permanently stabilized.

EARTHWORK AND CONSTRUCTION RECOMMENDATIONS

Compacted Structural Fill

Excavated glaciofluvial sand and inorganic subsoil may be selectively re-used as fill adjacent to and over the tower foundation, provided they can be adequately compacted, and are generally free from organics. However, the inorganic subsoil and portions of the glaciofluvial deposit have an elevated silt content and will therefore be difficult to compact when wet. Because of the high silt content, the inorganic subsoil and portions of the glaciofluvial deposit will also be sensitive to moisture and lose strength quickly when wet. Consequently, the recommendation for reusing these soils is only applicable during periods when the climate and moisture are favorable for reusing silty soil as compacted fill.

Imported structural fill should conform to the gradation requirements for Bank or Crushed Gravel (M.02.06, Grading B) as defined by the *State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction (Form 816) 2004*. Crushed stone, where used, should have a maximum particle size of ¾ inch.

Structural fill or crushed stone should be placed in loose lifts not exceeding 12 inches in thickness. Structural fill should be compacted to at least 95 percent of the maximum dry density, as determined by ASTM D1557, Method C.

Mat and Equipment Foundation Subgrades

The foundation bearing subgrades should be prepared by the contractor as outlined in this report and observed by the geotechnical engineer, prior to foundation construction. Neither fill nor concrete should be placed on frozen subgrades. Frozen materials should not be used as fill. Forest mat and organic subsoil are not suitable for foundation support and should be removed within the foundation bearing zone, defined as the volume beneath 1H:1V lines extending downward and outward from the lower edges of the footing, mat, or slab.

Upon the completion of the tower foundation excavation, subgrade consisting of native glaciofluvial sand should be proofrolled with at least 6 passes of a plate compactor, before placing the formwork and reinforcing steel for the footing. During the proofrolling process, the glaciofluvial sand subgrade should be observed to identify soft or loose areas. Such soft/loose, unstable areas, if encountered, should be overexcavated and replaced with compacted structural fill or minus ¾-inch crushed stone, as necessary.

Under slabs-on-grade, the subgrade will consist of glaciofluvial sand or inorganic subsoil. The exposed subgrade, which will be at least 12 inches below the underside of the slab-on-grade to allow the required layer of compacted structural fill to be placed, should be compacted with at least 4 passes each way (crosswise) of a vibratory roller or heavy plate compactor. During the compaction process, the subgrade should be observed to identify soft or loose areas. Such soft/loose, unstable areas, if encountered, should be overexcavated and replaced with compacted structural fill or minus ¾-inch crushed stone, as necessary.

Temporary Excavation and Dewatering

Excavations greater than 4 feet deep will be required for construction of the tower foundation. Temporary construction slopes in the subsoil and glaciofluvial sand should be designed in compliance with recent governing regulations. Construction slopes should be cut to a stable incline or braced, depending upon the excavation depth and encountered subsurface conditions.

Construction slopes should be reviewed for signs of mass movement. If movement/potential stability problems are observed, work should cease; the geotechnical engineer should be immediately contacted. The responsibility for excavation safety and stability of temporary construction slopes should lie solely with the contractor.

Based on the depth to groundwater in the test boring, we do not anticipate significant construction dewatering. The contractor should prevent groundwater, if encountered, and surface water runoff from collecting in excavations. Subgrade soils that become unstable because of such water and/or reworking by construction activity should be replaced with compacted granular structural fill or minus ¾-inch crushed stone, as necessary.

LIMITATIONS

The analyses, recommendations, and designs submitted in this report are based in part upon the data obtained from a single test boring and four auger probes. The nature and extent of variations from these explorations may not become evident until construction. If variations then appear evident, JGI should reevaluate the recommendations in this report.

We request the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of our recommendations. In the event that changes in the nature, design, or location of the proposed project are planned, the conclusions and recommendations contained in this report shall not be considered valid unless we review the changes, and conclusions of the report are modified or verified by us in writing.

A geotechnical engineer should be retained to provide testing and monitoring services during the earthwork phases of the project. This is to observe compliance with our design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

This report has been prepared for the exclusive use of Infinigy Engineering, PLLC in accordance with generally accepted foundation engineering practices. No other warranty, expressed or implied, is made. This report has been prepared for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to evaluation only.

If you have questions, please contact us. It was a pleasure working with you on this project. We look forward to working with you again in the future.

Very truly yours,

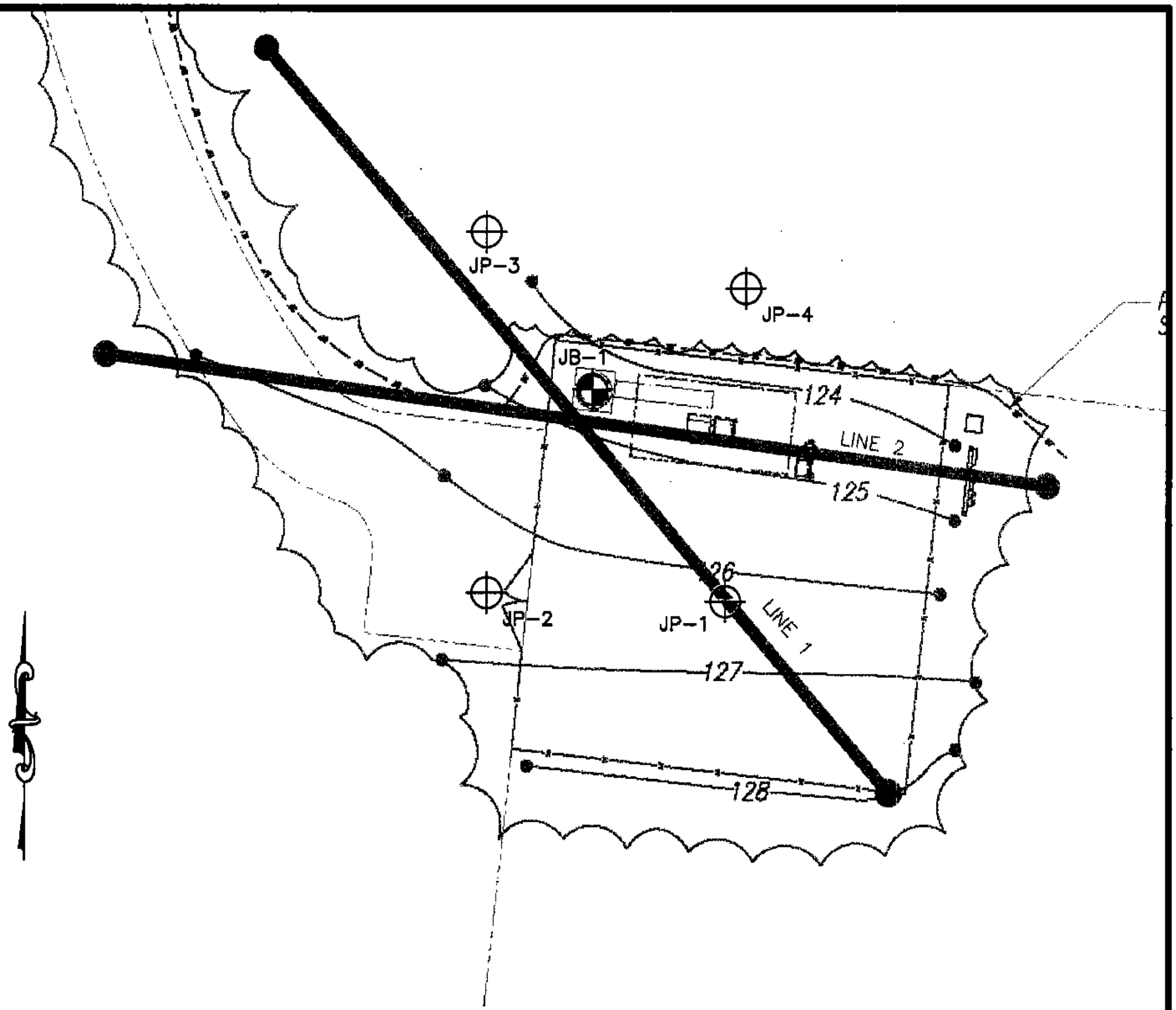
JGI EASTERN, Inc.
A Terracon Company

Robert W. Olah, EIT
Engineer IV

Richard W.M. McLaren, P.E.
Senior Engineer

/dew/J2075344

Attachments: Figure 1 - Subsurface Exploration Location Plan
Exploration Logs



NOTES:

1. THIS PLAN WAS PREPARED FROM INFINIGY ENGINEERING OF ROSWELL, GEORGIA PROJECT NUMBER: CT54XC773 SHEET NUMBER: C-3A TITLED: "GRADING PLAN" DATED: 3/29/07.

2. THE SUBSURFACE EXPLORATIONS SHOWN AS JB-1 AND JP-1 THROUGH JP-4 WERE ADVANCED ON JUNE 26, 2007 UNDER THE DIRECTION OF JGI WITH EQUIPMENT OWNED AND OPERATED BY NEW ENGLAND BORING CONTRACTORS, INC. OF GLASTONBURY, CONNECTICUT.

3. RESISTIVITY TESTING WAS PERFORMED ON JUNE 26, 2007 BY A JGI FIELD ENGINEER.

4. THE APPROXIMATE LOCATIONS OF THE SUBSURFACE EXPLORATIONS AND RESISTIVITY TESTS WERE TAPED FROM EXISTING SITE FEATURES. THE LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

5. USE OF THIS PLAN IS LIMITED TO THE ILLUSTRATION OF THE APPROXIMATE LOCATIONS OF THE SUBSURFACE EXPLORATIONS, RESISTIVITY TESTS AND OTHER PERTINENT SITE FEATURES. ANY OTHER USE OF THIS PLAN WITHOUT PERMISSION FROM JGI EASTERN INC. IS PROHIBITED.

LEGEND

JB-1 TEST BORING LOCATION

JP-1 TEST PROBE LOCATION (TYP)

LINE 1 RESISTIVITY TEST LOCATION (TYP)

GRAPHIC SCALE

10 0 10 20 40

(IN FEET)

SPRINT TOWER No. CT54XC773
150 WILLOW STREET
HAMDEN, CONNECTICUT

PREPARED FOR:
INFINIGY ENGINEERING, PLLC
300 GREAT OAKS BOULEVARD
SUITE 312
ALBANY, NY 12203

DATE: JUNE 2007
SCALE: 1" = 20'
PROJECT NO: J2075344

FIGURE 1
SUBSURFACE EXPLORATION LOCATION PLAN

JGI EASTERN, Inc.
A Terracon COMPANY

J2075344

TEST BORING LOG

PROJ. NAME:	Sprint Tower No. CT54XC733	HAMMER		SAMPLER	CASING	SHEET 1 OF 2
LOCATION:	Hamden, Connecticut	TYPE:	Safety	SS	H S A	BORING: JB-1
PROJECT NO.:	J2075344	SIZE:	140 lbs.	2" OD	3 1/4" ID	LOCATION: See Plan
DATE START:	June 26, 2007	FALL:	30"	Drop Method:	Winch/Cable	
DATE END:	June 26, 2007					SURF. EL.: 124' ±
BORING CO.:	New England Boring Contractors	GROUNDWATER OBSERVATIONS				
CO. LOCATION:	Glastonbury, CT	DATE	DEPTH	CASING AT	DURATION AFTER DRILLING	
FOREMAN:	Tim Carpenter	6/26/07	15'	Removed	30 Minutes	
JGI REP:	Doug Yates					

Depth (ft)	SAMPLING No.	Depth (ft.)	Blows/ 6"	Penet./ Rec. (in)	Sample Description	Strata Change Depth (ft)	Notes
					Forest Mat	0.3	
	SS-1	0-2	1-3	24/5	SS-1: Medium dense, brown, medium to fine SAND, some Silt, trace Gravel with Roots.		
			8-11		(Subsoil)	2.5	
	SS-2	2-4	9-18	24/7	SS-2: Dense, brown, coarse to fine SAND, some Gravel, little Silt.		
			19-30				
5							
	SS-3	5-7	19-12	24/5	SS-3: Similar to SS-2, except occasional Cobbles.		
			20-42				
10							
	SS-4	10-12	12-10	24/0	SS-4: Medium dense. No Recovery.		
			7-6				
15							
	SS-5	15-17	8-11	24/5	SS-5: Medium dense, brown, coarse to fine SAND, little Gravel and Silt.		
			4-6				
20							
	SS-6	20-22	2-2	24/14	SS-6: Loose, brown, coarse to fine SAND, little Silt., trace Gravel.		
			4-3				
25							
	SS-7	25-27	14-11	24/22	SS-7: Medium dense, brown, medium to fine SAND, little Silt.		
			8-7				
30							

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Notes:

Proportions Used: trace (1-10%), little (10-20%), some (20-35%), and (35-50%).

Cohesive Consistency (Blows/ft.)		Cohesionless Relative Density (Blows/ft)	
very soft	0-2	very loose	0-4
soft	2-4	loose	4-10
medium stiff	4-8	medium dense	10-30
stiff	8-15	dense	30-50
very stiff	15-30	very dense	50+
hard	30+		

Boring No. JB-1

TEST BORING LOG

PROJ. NAME:	Sprint Tower No. CT54XC733	HAMMER	SAMPLER	CASING	SHEET 2 OF 2	
LOCATION:	Hamden, Connecticut	TYPE: Safety	SS	H S A	BORING:	JB-1
PROJECT NO.:	J2075344	SIZE: 140 lbs.	2" OD	3 1/4" ID	LOCATION:	See Plan
DATE START:	June 26, 2007	FALL: 30"	Drop Method:	Winch/Cable		
DATE END:	June 26, 2007				SURF. EL:	124' ±
BORING CO.:	New England Boring Contractors	GROUNDWATER OBSERVATIONS				
CO. LOCATION:	Glastonbury, CT	DATE	DEPTH	CASING AT	DURATION AFTER DRILLING	
FOREMAN:	Tim Carpenter	6/26/07	15'	Removed	30 Minutes	
JGI REP:	Doug Yates					

Depth (ft)	SAMPLING No.	Depth (ft.)	Blows/ 6"	Penet./ Rec. (in)	Sample Description	Strata Change Depth (ft)	Notes
	SS-8	30-32	3-4	24/24	SS-8: Medium dense, brown SILT and fine Sand.		
			6-8				
35							
	SS-9	35-37	2-2	24/18	SS-9: Similar to SS-8, except loose.		
			5-4				
40							
	SS-10	40-42	2-3	24/16	SS-10: Loose, brown, medium to fine SAND, some Silt.		
			5-7				
45							
	SS-11	45-46.8	5-10	24/12	SS-11: Medium dense, brown, medium to fine SAND, some Silt, trace Gravel.		
			13-50/4"		(Glaciofluvial Deposit)	47.0	
					Auger Refusal at 47 feet, Probably on Bedrock.		
50							
55							
60							

JGI EASTERN, Inc. A Terracon COMPANY

Notes:

Proportions Used: trace (1-10%), little (10-20%), some (20-35%), and (35-50%).

Cohesive Consistency (Blows/ft.)		Cohesionless Relative Density (Blows/ft)	
very soft	0-2	very loose	0-4
soft	2-4	loose	4-10
medium stiff	4-8	medium dense	10-30
stiff	8-15	dense	30-50
very stiff	15-30	very dense	50+
hard	30+		

Boring No. JB-1