

**PRELIMINARY GEOTECHNICAL SUMMARY  
FOR  
PROPOSED PARKING FACILITY  
SCHOOL STREET LOT  
DOVER, NH  
CITY OF DOVER  
OFFICE OF THE FINANCE DIRECTOR  
288 CENTRAL AVENUE  
DOVER, NH 03820-4169  
ATTN: DANIEL BARUFALDI**

**JTC Project # 11-GEO-005**



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## Geotechnical Summary

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## MEMORANDUM

**TO:** City of Dover  
Office of the Finance Director  
288 Central Avenue  
Dover, NH 03820-4169



**FROM:** Kyle Urso                      Kevin Martin, P.E.  
Field Engineer                      Geotechnical Engineer

**DATE:** February 24, 2011

**RE:**                      **PRELIMINARY GEOTECHNICAL SUMMARY**  
**PROPOSED PARKING FACILITY**  
**SCHOOL STREET LOT**  
**DOVER, NEW HAMPSHIRE**

Project No. 11-GEO-005

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This memorandum report presents the findings of a subsurface exploration program and a preliminary evaluation of the conditions encountered as they relate to the feasibility of a proposed parking facility. The contents of this report are subject to the attached *Limitations*.

### BACKGROUND

The purpose of this preliminary geotechnical study is to review the subgrade conditions and feasibility for potential re-use of city owned lots. Future development is uncertain but may include a parking lot or parking garage. A parking garage may be up to 4-7 stories with considerable load.

### SITE & PROJECT DESCRIPTION

The project site is presently utilized as a parking lot. The site is relatively level based on visual estimate. A *Site Plan* is in the process of being compiled for the project. Recent survey of the test bores indicates site grades to vary from elevation  $\approx 61-67$  ft possessing a gradual downward slope to the east. An *Environmental Site Assessment* (ESA) is also being completed for the project. This *ESA* report was not completed at the time of this study. It is noted that the site was prior used for residential development. Prior *Sanborn Fire Maps* show several dwellings throughout the property.

## SUBSURFACE EXPLORATIONS

### Test Borings

The subgrade conditions were reviewed with the completion of four (4) test borings throughout the lot. The test borings (identified as B1 to B4) were advanced to refusal depths of about  $\approx 3$ -25 ft utilizing continuous flight solid stem augers. Soil samples were typically retrieved at no greater than 5 ft intervals with a 2-inch diameter split-spoon sampler. Standard Penetration Tests (SPTs) were performed at the sampling intervals in general accordance with ASTM-D1586 (*Standard Method for Penetration Test and Split-Barrel Sampling of Soils*). Field descriptions and penetration resistance of the soils encountered, observed depth to groundwater, depth to apparent bedrock refusal and other pertinent data are contained on the attached *Test Boring Logs*. The test borings were located by survey as shown on the *Test Boring Location Plan*.

### SUBGRADE CONDITIONS

The subgrade conditions, in general, consist of (1) shallow granular Fill underlain by (2) a stiff Silt & Clay then (3) Refusal. The refusal was variable being met at depths of  $\approx 3$ -25 ft below grade.

A shallow, granular Fill was encountered throughout the site to shallow depths of  $\approx 2$ -3 ft. This fill is expected to be the pavement gravel base. Other fill should be expected being associated with intersecting utilities and past construction. The predominate overburden consists of a grey-brown, stiff to hard, Silt & Clay, trace fine sand. The Silt & Clay is typically stiff to hard at shallower depths ( $\approx 10$  ft) becoming progressively softer (medium to stiff) with depth. The Silt & Clay is expected to be encountered throughout most of the construction. The Silt & Clay is moisture sensitive, poor-draining and frost susceptible.

Test boring refusal, presumably bedrock, was met in all the test borings at depths of  $\approx 3$ -25 ft below grade. There was about  $\approx 2$ -3 ft of weathered ledge prior to refusal at most locations. The refusals were deepest at B1 & B2 ( $\approx 25$  ft) towards the east. The shallowest refusal ( $\approx 3$ -5 ft) was met at B3 where four (4) attempts resulted in similar shallow refusal suggesting a large obstruction or ledge. The variable depth to refusal suggests a sloping and/or undulating bedrock contour. The *USGS Bedrock Geologic Map of New Hampshire (1996)* depicts bedrock in the area to include biotite granofels, mica schist, quartzite and/or phyllite. Such rock types are characteristically hard and of sound quality.

Groundwater was encountered in the test borings about  $\approx 13$ -18 ft below grade. It should be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time of the measurements. The study was completed at a time of seasonally low groundwater.

## PRELIMINARY GEOTECHNICAL EVALUATION

The subgrade conditions are generally suitable for support of a spread footing foundation. The Silt & Clay is stable and consolidated which is favorable for shallow foundation support. The Silt & Clay can provide bearing strength of about  $\approx 4-5$  ksf while maintaining settlement less than 1 inch.

The subsurface conditions were reviewed with respect to seismic criteria set forth in the *International Building Code (2009)*. Based on the stability and fine-grained composition of the site soils (silt and clay), the site is not susceptible to liquefaction (complete loss of shear resistance) in the event of an earthquake. Based on interpretation of the *Building Code* together with the project and site conditions, the *Site Classification* (Table 1613.5.2) is "D" (Stable Soil).

We trust the contents of this memorandum report are responsive to your needs at this time. Should you have any questions or require additional assistance, please do not hesitate to contact our office.

## LIMITATIONS

### Explorations

1. The analyses, recommendations and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.
2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.
3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been 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, temperature, and other factors differing from the time the measurements were made.

### Review

4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.
5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by John Turner Consulting, Inc.

### Construction

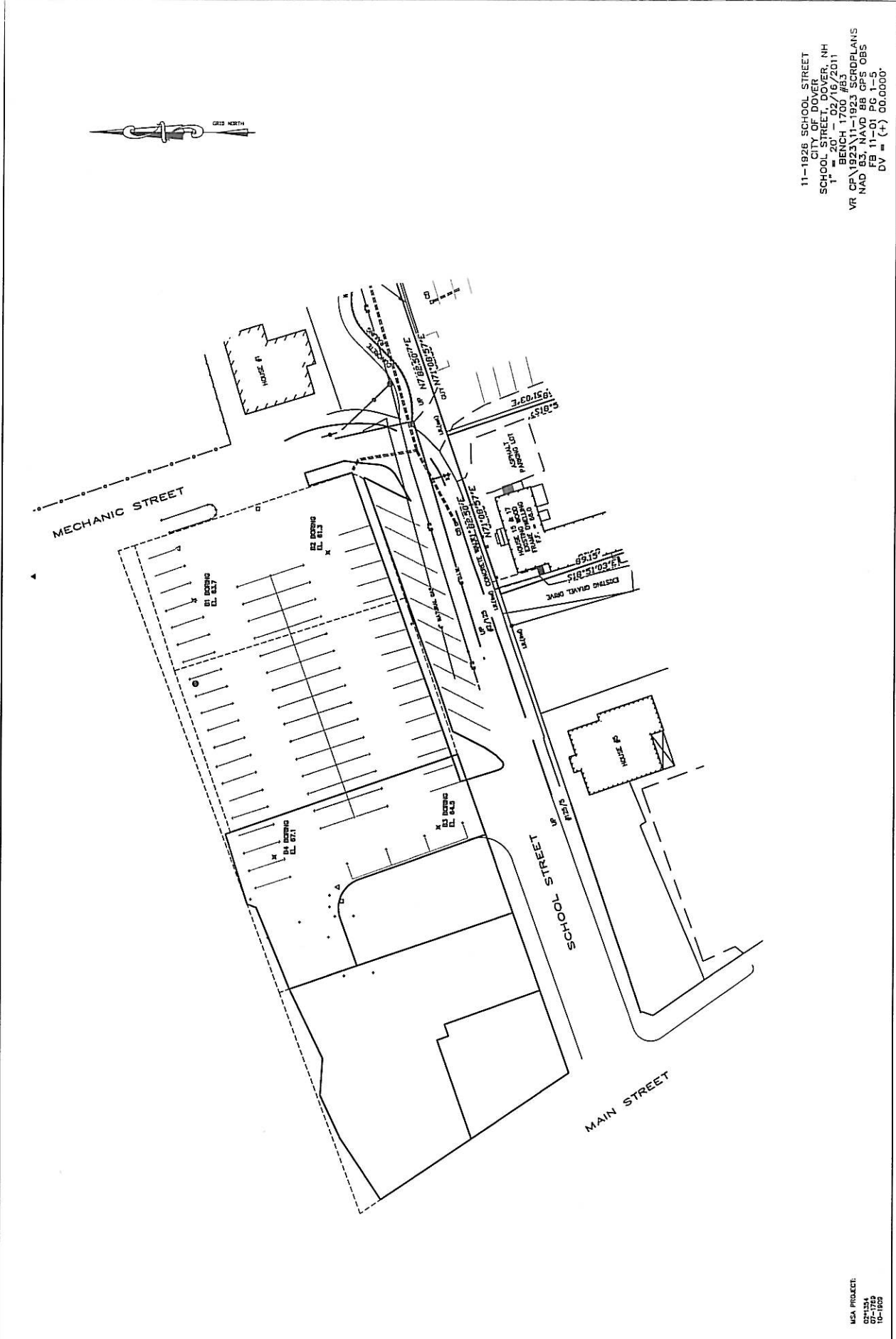
6. It is recommended that this firm be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

### Use of Report

7. This report has been prepared for the exclusive use of the City of Dover in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.
8. This report has been prepared for this project by John Turner Consulting, Inc. This report was completed 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 geotechnical design considerations.

## **Boring Location Plan & Boring Logs**





11-1926 SCHOOL STREET  
CITY OF DOVER, NH  
SCHOOL STREET OBS. NH  
1" = 20' 02/16/2011  
BENCH 1700 #83  
VR CF\1923\1-1923 SCROPLANS  
NAD 83, NAVD 86 GFS OBS  
FB 11-01 PG 1-5  
DV = (+) 00.0000

USA PROJECT:  
07-134  
07-729  
10-1000



# BORING LOG

JOHN TURNER CONSULTING, INC.  
19 DOVER STREET  
DOVER, NH 03820

PHONE: 603-749-1841  
FAX: 603-516-6851

CLIENT: City of Dover	BORING #: B2
PROJECT: Geo-Analysis: 4 City Parking Lots School Street Parking Lot	LOCATION: See Plan
PROJECT NO: 11-GEO-005	SURFACE ELEVATION: 61.3
	DATE: 04-Feb-11

TYPE OF BORING: 2.25" H.S.A.		GROUNDWATER OBSERVATIONS		
DRILLING CO: Great Works Test Boring	DATE: 4-Feb-11	DEPTH: ~18.0 ft	TIME: During Drilling	
DRILLER: Jeff Lee				
JTC REP.: Kyle Urso				

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	PEN (N)
0				Asphalt	0.21		
	S-1	1-3	3	Moist, Brown, Medium-Fine SAND, little Gravel, little Silt (FILL)	3	50/3"	50+
	S-2	3-5	20	Grayish Brown, CLAY/SILT, trace fine Sand		7-11-14-21	25
5	S-3	5-7	24	Grayish Brown, CLAY/SILT, trace fine Sand		12-14-16-18	30
10	S-4	10-12	24	Grayish Brown, CLAY/SILT, trace fine Sand		6-8-8-9	16
15	S-5	15-17	24	Grayish Brown, CLAY/SILT, trace fine Sand		4-4-6-6	10
20	S-6	20-22	24	Wet, Gray, CLAY/SILT		3-3-4-4	7
					23		
				Weather Rock			
25	S-7	25-27	0	No Recovery	25	50/0"	50+
				Spoon Refusal @ 25.0' in Probable Intact Bedrock Auger Refusal @ 25.0' in Probable Intact Bedrock			

REMARKS: Cat Head Hammer, 4.25" Internal Diameter Hollow Stem Auger

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)  
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted  
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made. Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)





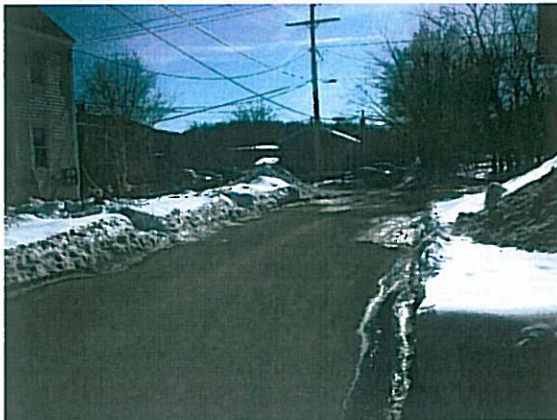
City of Dover  
School Street  
Dover, NH 03820



**Northeast Corner of Property Looking Southwest**



**East Entrance to Parking Lot Looking Northwest down Mechanic Street**



**East Entrance to Parking Lot Looking Southeast Down Mechanic Street**



**Southwest Corner of Property Looking East**



**Northwest Corner of Property Looking East**



**Northwest Corner of Property Looking Southeast**

**Site Photos**

City of Dover  
School Street  
Dover, NH 03820



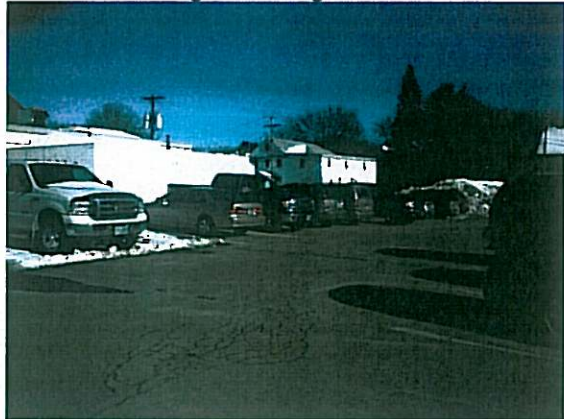
**Boring 3 Looking Southeast**



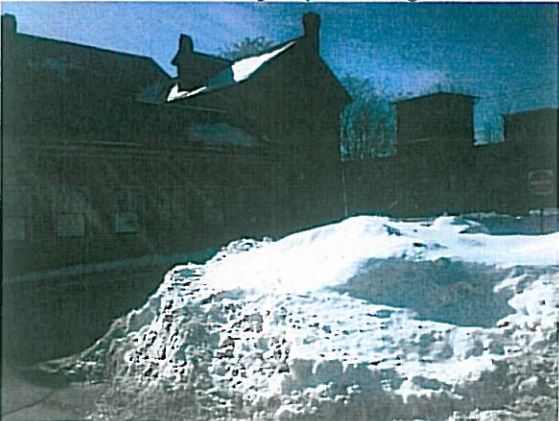
**Boring 4 Looking Northwest**



**West End of Property Looking North**



**West End of Property Looking Northeast**



**Northwest Corner of Property Looking  
Southwest to abutting structure**



**Northwest Entrance looking South**