

**PRELIMINARY GEOTECHNICAL SUMMARY
FOR
PROPOSED PARKING FACILITY
ORCHARD 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



TABLE OF CONTENTS

Geotechnical Summary

**Boring Location Plan
& Boring Logs**

Lab Results

Site Photos

Geotechnical Summary

JOHN TURNER CONSULTING, INC

19 DOVER STREET
DOVER, NEW HAMPSHIRE
603-749-1841 (p) / 603-516-6851 (f)
NH-MA-ME-VT
consultUTC.com

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
ORCHARD STREET LOT
DOVER, NEW HAMPSHIRE

Project No. 11-GEO-005

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. Based on a recent meeting, it is expected that the Orchard Street Lot may be the preferred candidate for a parking garage given the large footprint. It was further discussed that a basement level is being considered which would require a ≈ 10 -12 ft deep lower garage level. It is expected that the basement level of the garage will be accessed from Central Avenue Street to the east with first floor access along Chestnut Street to the west.

SITE & PROJECT DESCRIPTION

The project site is presently utilized as a parking lot. The Cocheco River is located to the immediate north of the site. The site is relatively level based on visual estimate. Recent survey of the test bores indicates grades to vary from elevation ≈ 53 -61 ft with an average grade near ≈ 57 ft. In general, the grades are shown to gradually slope downward to the east. A *Site Plan* is in the process of being compiled for the project. 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 as a tannery. Prior *Sanborn Fire Maps* show several dwellings throughout the property.

SUBSURFACE EXPLORATIONS & LABORATORY TESTING

Test Borings

The subgrade conditions were reviewed with the completion of six (6) test borings throughout the lot. The test borings (identified as B13 to B18) were advanced to refusal depths of about ≈ 38 -47 ft utilizing either continuous flight solid stem augers, hollow stem augers and/or NW casing. 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*.

Laboratory Testing

Three (3) selected split-spoon samples obtained from the test borings were submitted to our laboratory for sieve analyses or Atterberg Limits per ASTM Standards. The purpose of the testing was to assess engineering characteristics for design and to assess the suitability of the site soils for re-use as structural fill on the project. The test results are attached for review.

SUBGRADE CONDITIONS

The subgrade conditions were consistent across the site. The subgrade conditions, in general, consist of (1) shallow granular Fill underlain by (2) a clayey Silt, (3) very soft silty Clay then (4) Refusal. The clayey Silt and deeper silty Clay are unconsolidated alluvium deposits associated with the adjacent river. A *Subsurface Profile* depicting the subgrade conditions is attached for review.

A shallow, granular Fill was encountered throughout the site to depths of ≈ 3 -5 ft. Other fill should be expected being associated with intersecting utilities and past construction. A relatively stable clayey Silt was identified to a depth of about ≈ 13 -14 ft below grade. This deposit consists of a sandy Silt at shallow depths being more plastic (clayey) with depth. The clayey Silt is expected to be encountered throughout most of the basement level construction. The clayey Silt is moisture sensitive, poor-draining and frost susceptible. The predominate overburden consists of a grey, very soft, silty Clay. This deposit is very weak and unstable. The silty Clay will govern the foundation design for the parking garage.

Test boring refusal, presumably bedrock, was met in all the test borings at depths of ≈ 38 -43 ft below grade. The relatively consistent depth to refusal further suggests bedrock. 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. The bedrock is expected to possess a gradual contour.

Groundwater was encountered in the test borings about ≈ 9 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. The groundwater is expected to be directly impacted by the Cochecho River to the north. Monitoring wells should be considered for better survey of the groundwater table especially for a basement level foundation.

PRELIMINARY GEOTECHNICAL EVALUATION

The soft Silt & Clay will govern the foundation for the parking garage. The Silt & Clay is weak, compressible and unstable. Given the high foundation loads associated with a parking garage, the foundation will likely require deep pile support. More specifically, end-bearing piles driven to bedrock will likely be the most feasible means of foundation support. Driven piles may include steel (concrete filled pipe or H-sections) or precast concrete. Pile loads upwards of ≈ 50 -150 tons should be feasible given the bedrock. Pile loads greater than ≈ 100 tons will likely be necessary for a multi-level parking garage. It is possible to support the ground level floor on a conventional slab-on-grade. The lighter floor loads and basement level excavation should be feasible for this approach.

The subsurface conditions were reviewed with respect to seismic criteria set forth in the *International Building Code (2009)*. Based on the fine-grained composition of the site soils (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 "E" (Soft Soil). This Classification will likely impact the structural design of the garage due to increased shear (lateral) loads.

The groundwater table should also be considered with the final foundation design. A basement level foundation will require some means of groundwater control. The deeper the groundwater encroachment, the more difficulty with both short and long term water management. The flood elevation of the adjacent Cocheco River should also be considered in the final design.

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

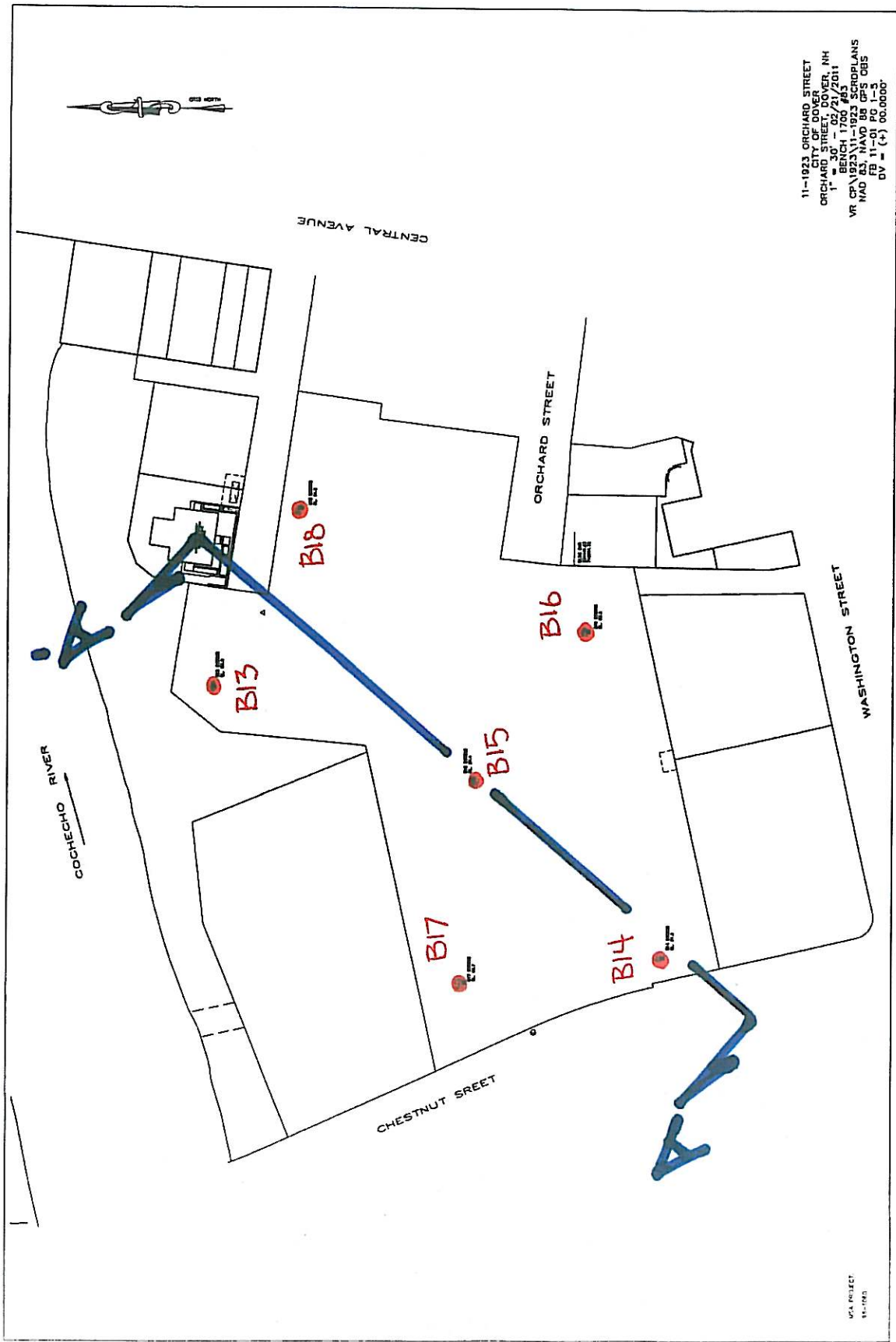
4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.
5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the 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.



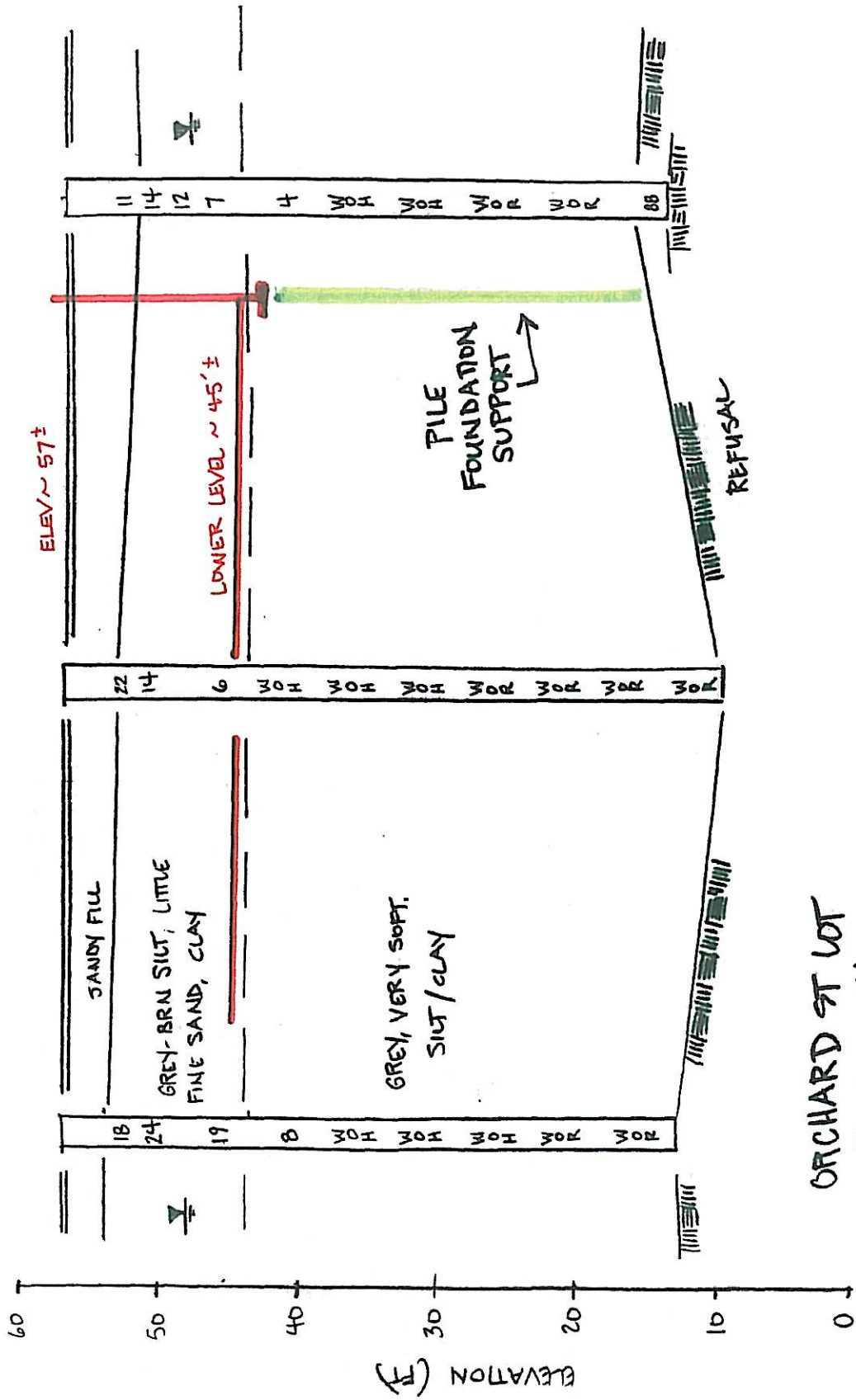
11-1923 ORCHARD STREET
 CITY OF DORCHESTER, MASS.
 ORCHARD STREET, DORCHESTER, MASS.
 1" = 30' - 02/21/2011
 BENCH 1700 #43
 VR CPA1923.11-1923 SCRDPLANS
 NAD 83 11-01 PG 4 OF 5 OBS
 DV - (+) 00.0000'

MSA PROJECT
 11-1923

B14

B15

B16

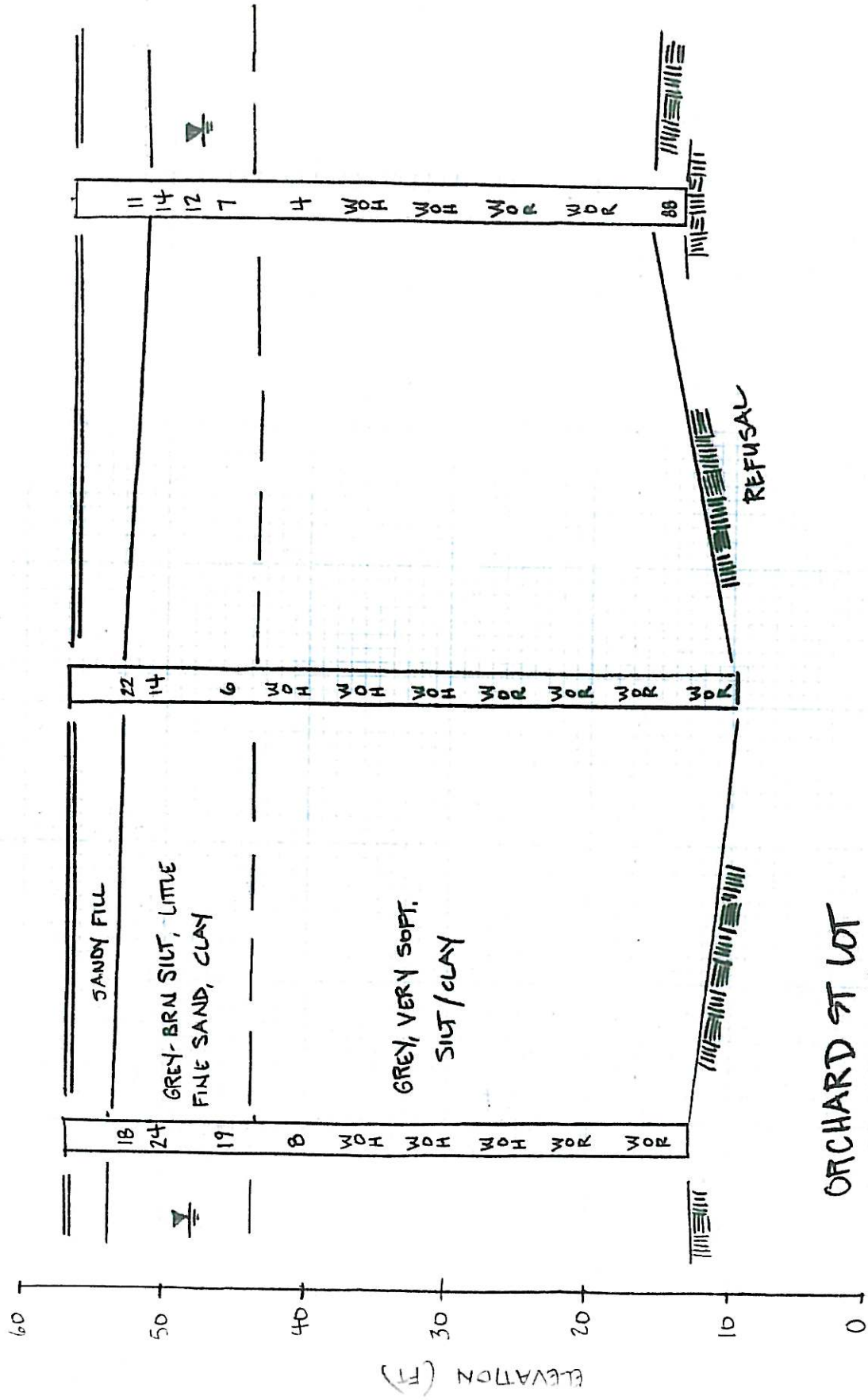


ORCHARD ST LOT
DOVER, NH

B14

B15

B16



ORCHARD ST LOT
DOVER, NH

Boring Location Plan & Boring Logs



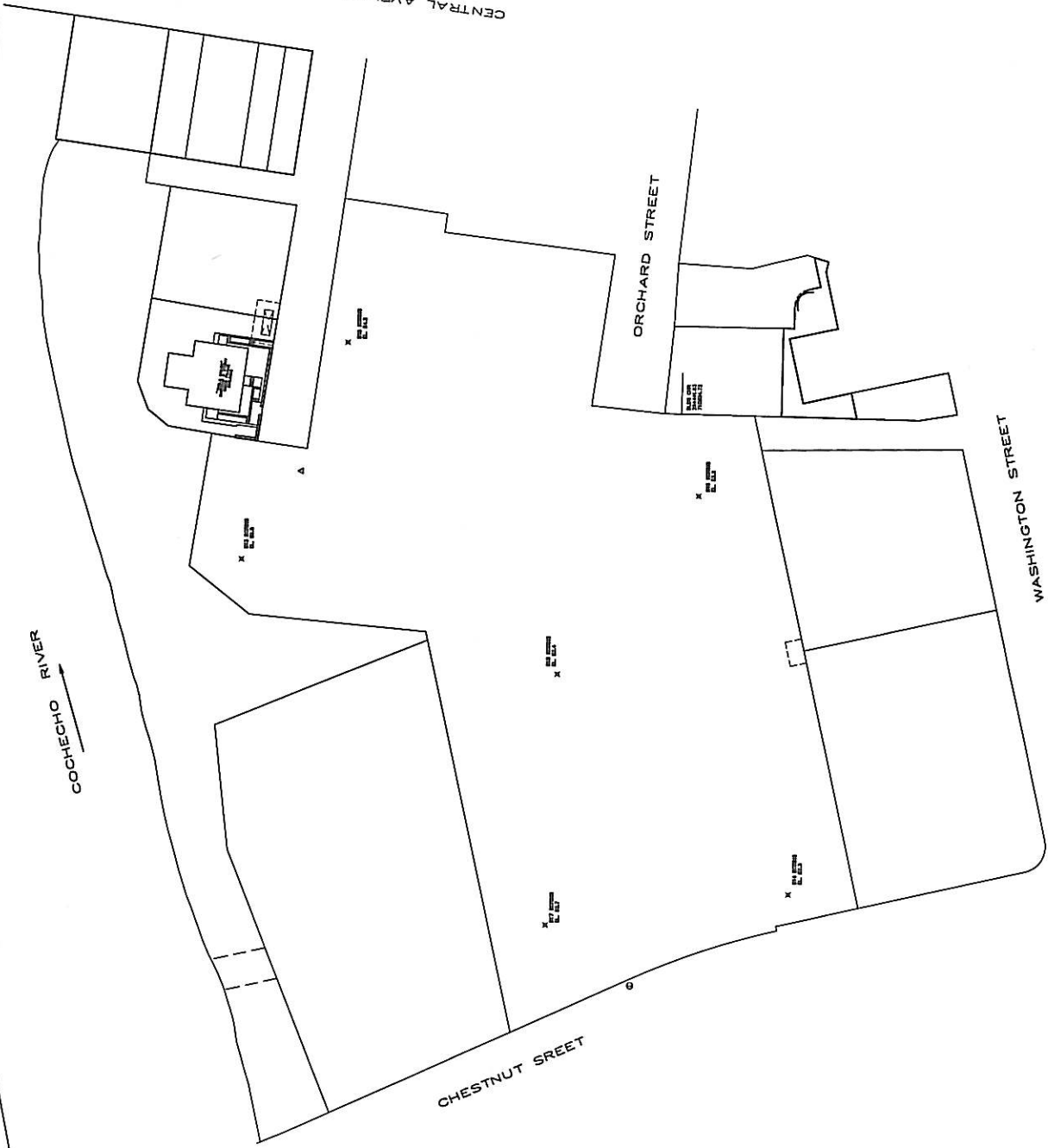
COACHECHO RIVER

CENTRAL AVENUE

ORCHARD STREET

WASHINGTON STREET

CHESTNUT SREET



11-19223 ORCHARD STREET
CITY OF DOVER
ORCHARD STREET, DOVER, NH
1" = 30' - 02/21/2011
VR CE \ BENCH 1700 #83
NAD 83 NAVD 83 SCORPLANS
PG 1-5
DV = (+) 00.0000'

USA PROJECT:
99-1000

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 #: B13
PROJECT: Geo-Analysis: 4 City Parking Lots Orchard Street Parking Lot	LOCATION: See Plan
PROJECT NO: 11-GEO-005	SURFACE ELEVATION: 56.5
	DATE: 04-Feb-11

TYPE OF BORING: 2.25" H.S.A.	GROUNDWATER OBSERVATIONS		
DRILLING CO: Great Works Test Boring	DATE: 04-Feb-11	DEPTH: 12.5	TIME: Upon Completion
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	0.17		
				Moist, Dark Brown, Medium-Fine Sand, Some Gravel, little Silt (FILL)	1.5		
	S-1	3-5	24	Moist, Grayish Brown, Silty Clay, little fine Sand		6-12-14-18	26
5	S-2	5-7	24	Moist, Grayish Brown, Silty Clay, little fine Sand		7-14-15-21	29
10	S-3	10-12	24	Moist, Grayish Brown, Silty Clay, little fine Sand		8-9-11-13	20
15	S-4	15-17	24	Moist, Grayish Brown, Silty Clay, little fine Sand	17	4-5-7-8	12
20	S-5	20-22	24	Wet, Gray, CLAY, some Silt		WOH/12-2-2	2
25		25-27	24	Wet, Gray, CLAY, some Silt		WOH/24	0
30		30-32		Wet, Gray, CLAY, some Silt		WOH/24	0

REMARKS: Acker Drill Rig, 2.25" 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%)

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 #: B14	Page 1 of 2
PROJECT: Geo-Analysis: 4 City Parking Lots Orchard Street Parking Lot	LOCATION: See Plan	
PROJECT NO: 11-GEO-005	SURFACE ELEVATION: 57.3	
	DATE: 08-Feb-11	

TYPE OF BORING: 2.25" H.S.A./Casing @ 5.0'	GROUNDWATER OBSERVATIONS		
DRILLING CO: Great Works Test Boring	DATE:	DEPTH:	TIME:
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	0.17		
				Moist, Brown, Medium-Fine Sand, Some Gravel, little Silt (FILL)			
	S-1	3-5	17	Moist, Brown, Medium-Fine Sand, Some Gravel, little Silt (FILL)	4	6-7-11-14	18
				Moist, Grayish Brown, SILT, little fine Sand			
5	S-2	5-7	22	Moist, Grayish Brown, SILT, little fine Sand		5-10-14-17	24
10	S-3	10-12	24	Moist, Grayish Brown, Silty Clay, trace fine Sand		5-9-10-11	19
					13		
15	S-4	15-17	24	Moist, Gray, Silty Clay		2-4-4-5	8
20	S-5	20-22	24	Wet, Gray, Silty Clay		WOH/24	0
25	S-6	25-27	24	We, Gray, Silty Clay		WOH/24	0
30	S-7	30-32	24	Wet, Gray, Silty Clay		WOR/24	0

REMARKS: Steel Track Drill Rig, 2.25" Internal Diameter Hollow Stem Auger, Automatic Hammer

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%)

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 #: B15	Page 1 of 2
PROJECT: Geo-Analysis: 4 City Parking Lots Orchard Street Parking Lot	LOCATION: See Plan	
PROJECT NO: 11-GEO-005	SURFACE ELEVATION: 57.4	
	DATE: 08-Feb-11	

TYPE OF BORING: 2.25" H.S.A./Casing @ 5.0'	GROUNDWATER OBSERVATIONS		
DRILLING CO: Great Works Test Boring	DATE:	DEPTH:	TIME:
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	0.17		
				Moist, Brown, Medium-Fine Sand, Some Gravel, little Silt (FILL)	3		
	S-1	3-5	17	Moist, Grayish Brown, SILT, little fine Sand		5-11-11-12	22
5	S-2	5-7	24	Moist, Grayish Brown, SILT, little fine Sand		4-6-8-10	14
10	S-3	10-12	24	Wet, Grayish Brown, Silty Clay, trace fine Sand		2-3-3-4	6
					13		
15	S-4	15-17	24	Wet, Gray, Silty Clay		WOH/24	0
20	S-5	20-22	24	Wet, Gray, Silty Clay		WOH/24	0
25	S-6	25-27	24	Wet, Gray, Silty Clay		WOH/24	0
30	S-7	30-32	24	Wet, Gray, Silty Clay		WOR/24	0

REMARKS: Steel Track Drill Rig, 2.25" Internal Diameter Hollow Stem Auger, Automatic Hammer

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%)

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 #: B15	Page 2 of 2
PROJECT: Geo-Analysis: 4 City Parking Lots Orchard Street Parking Lot	LOCATION: See Plan	
PROJECT NO: 11-GEO-005	SURFACE ELEVATION: 57.4	
	DATE: 08-Feb-11	

TYPE OF BORING: 2.25" H.S.A./Casing @ 5.0'		GROUNDWATER OBSERVATIONS		
DRILLING CO: Great Works Test Boring	DATE:	DEPTH:	TIME:	
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)
35	S-8	35-37	24	Wet, Gray, Silty Clay		WOR/24	0
40	S-9	40-42	24	Wet, Gray, Silty Clay		WOR/24	0
45					47		
50				Tri-Cone Drill Bit Refusal @ 47.0' on Probable intact BEDROCK			

REMARKS: Steel Track Drill Rig, 2.25" Internal Diameter Hollow Stem Auger, Automatic Hammer

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%)

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 #: B16	Page 1 of 2
PROJECT: Geo-Analysis: 4 City Parking Lots Orchard Street Parking Lot	LOCATION: See Plan	
PROJECT NO: 11-GEO-005	SURFACE ELEVATION: 53.2	
	DATE: 18-Feb-11	

TYPE OF BORING: 2.25" H.S.A./Casing @ 5.0'	GROUNDWATER OBSERVATIONS		
DRILLING CO: Great Works Test Boring	DATE:	DEPTH:	TIME:
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		
				Moist, Light Brown, Medium-Fine Sand, Some Gravel, little Silt (Fill)	2.75		
	S-1	3-5	18	Moist, Grayish Brown, SILT, little fine Sand		6-9-15-17	24
5	S-2	5-7	24	Moist, Grayish Brown, SILT, little fine Sand		6-10-12-17	22
10	S-3	10-12	24	Wet, Grayish Brown, Silty Clay, trace fine Sand		4-6-8-10	14
					13		
15	S-4	15-17	24	Wet, Gray, Silty Clay		WOH/24	0
20				Wet, Gray, Silty Clay			
25	S-5	25-27	24	Wet, Gray, Silty Clay		WOR/6-WOH/18	0
30				Wet, Gray, Silty Clay			

REMARKS: Steel Track Drill Rig, 2.25" Internal Diameter Hollow Stem Auger, Automatic Hammer

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%)

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 #: B17	Page 1 of 1
PROJECT: Geo-Analysis: 4 City Parking Lots Orchard Street Parking Lot	LOCATION: See Plan	
PROJECT NO: 11-GEO-005	SURFACE ELEVATION: 60.7	
	DATE: 18-Feb-11	

TYPE OF BORING: S.S.A	GROUNDWATER OBSERVATIONS		
DRILLING CO: Great Works Test Boring	DATE: 18-Feb-11	DEPTH: 14.5'	TIME: Upon Completion
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	0.1		
				Moist, Light Brown, Medium-Fine Sand, Some Gravel, little Silt (Fill)	3		
	S-1	3-5	21	Moist, Grayish Brown, SILT, little fine Sand		4-4-7-9	11
5	S-2	5-7	24	Moist, Grayish Brown, SILT, little fine Sand		5-6-8-11	14
10	S-3	10-12	24	Moist, Grayish Brown, Silty Clay, trace fine Sand		2-3-4-5	7
					13		
15	S-4	15-17	24	Wet, Gray, Silty Clay		WOH/6-2-2-2	0
20				Wet, Gray, Silty Clay			
25	S-5	25-27	24	Wet, Gray, Silty Clay		WOH/24	0
30				Wet, Gray, Silty Clay			

REMARKS: Steel Track Drill Rig, Solid Stem Auger, Automatic Hammer

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%)

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 #: B18	Page 1 of 2
PROJECT: Geo-Analysis: 4 City Parking Lots Orchard Street Parking Lot	LOCATION: See Plan	
PROJECT NO: 11-GEO-005	SURFACE ELEVATION: 54.2	
	DATE: 18-Feb-11	

TYPE OF BORING: S.S.A	GROUNDWATER OBSERVATIONS		
DRILLING CO: Great Works Test Boring	DATE: 18-Feb-11	DEPTH: 7.5	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	0.13		
				Moist, Light Brown, Medium-Fine Sand, Some Gravel, little Silt (FILL)			
	S-1	3-5	21	Moist, Grayish Brown, SILT, some, Gravel, little fine Sand (FILL)		8-5-6-11	11
					5		
5	S-2	5-7	24	Moist, Grayish Brown, SILT, little fine Sand	6.5	5-6-8-11	14
				Wet, Light Brown Medium-Fine SAND, little Silt, trace Gravel			
				Seam @ 6.5'	7.5		
	S-3	7-9	24	Moist, Grayish Brown, SILT, little fine Sand		4-6-6-6	12
10	S-3	10-12	24	Moist, Grayish Brown, SILT/CLAY, trace fine Sand	11	2-3-4-6	7
				Wet, Light Brown Medium-Fine SAND, little Silt, trace Gravel			
				Seam @ 11'	11.5		
15	S-4	15-17	24	Wet, Gray, Silty Clay		2-2-2-2	4
20		20-22		Wet, Gray, Silty Clay			
25	S-5	25-27	24	Wet, Gray, Silty Clay		WOH/24	0
30		30-32					

REMARKS: Steel Track Drill Rig, Solid Stem Auger, Automatic Hammer

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%)

Lab Results



REPORT OF ATTERBERG LIMITS TEST RESULTS

CLIENT: City of Dover
Dover, NH 03820

PROJECT: Orchard Street Parking Lot

DATE: February 21, 2010

REPORT #: 11-GEO-005-006

Sampled Source: B14-S6 (25.0-27.0 ft)

Soil Type: Clay (Lean)

Soil ID#: 11-588-008

Intended Use: GEO

Date Received: 02/11/11

Sampled By: Kyle Urso

Tested By: Kyle Urso

ATTERBERG LIMITS TEST RESULTS

Plastic Limit: 24

Liquid Limit: 45

Plasticity Index: 21

Remarks: In-Situ Moisture: 44.0%
USCS-Lean Clay

NH ME MA

CONSULTJTC.COM

JOHN TURNER CONSULTING, INC.

19 DOVER STREET
DOVER NH 03820
T 603.749.1841 F 603.516.6851

6 CLINTON AVENUE
WESTFIELD MA 01085
T 413.642.0138 F 413.642.0164

15 HOLLY STREET, UNIT 109
SCARBOROUGH ME 04074
T 207.883.7878



REPORT OF ATTERBERG LIMITS TEST RESULTS

CLIENT: City of Dover
Dover, NH 03820

PROJECT: Orchard Street Parking Lot

DATE: February 21, 2010

REPORT #: 11-GEO-005-007

Sampled Source: B13-S14 (15.0-17.0 ft)

Soil Type: Clay (Heavy)

Soil ID#: 11-588-003

Intended Use: GEO

Date Received: 02/11/11

Sampled By: Kyle Urso

Tested By: Kyle Urso

ATTERBERG LIMITS TEST RESULTS

Plastic Limit: 26

Liquid Limit: 52

Plasticity Index: 26

Remarks: In-Situ Moisture: 36.3%
USCS-Fat Clay

NH ME MA

CONSULTJTC.COM

JOHN TURNER CONSULTING, INC.

19 DOVER STREET
DOVER NH 03820
T 603.749.1841 F 603.516.6851

6 CLINTON AVENUE
WESTFIELD MA 01085
T 413.642.0138 F 413.642.0164

15 HOLLY STREET, UNIT 109
SCARBOROUGH ME 04074
T 207.883.7878



REPORT OF ATTERBERG LIMITS TEST RESULTS

CLIENT: City of Dover
Dover, NH 03820

PROJECT: Orchard Street Parking Lot

DATE: February 21, 2010

REPORT #: 11-GEO-005-008

Sampled Source: B6-S16 (90.0-92.0 ft) **Soil Type:** Clay (Lean)

Soil ID#: 11-588-005 **Intended Use:** GEO

Date Received: 02/11/11 **Sampled By:** Kyle Urso

Tested By: Kyle Urso

ATTERBERG LIMITS TEST RESULTS

Plastic Limit: 22

Liquid Limit: 36

Plasticity Index: 14

Remarks: In-Situ Moisture: 32.2%
USCS-Lean Clay

NH ME MA

CONSULTJTC.COM

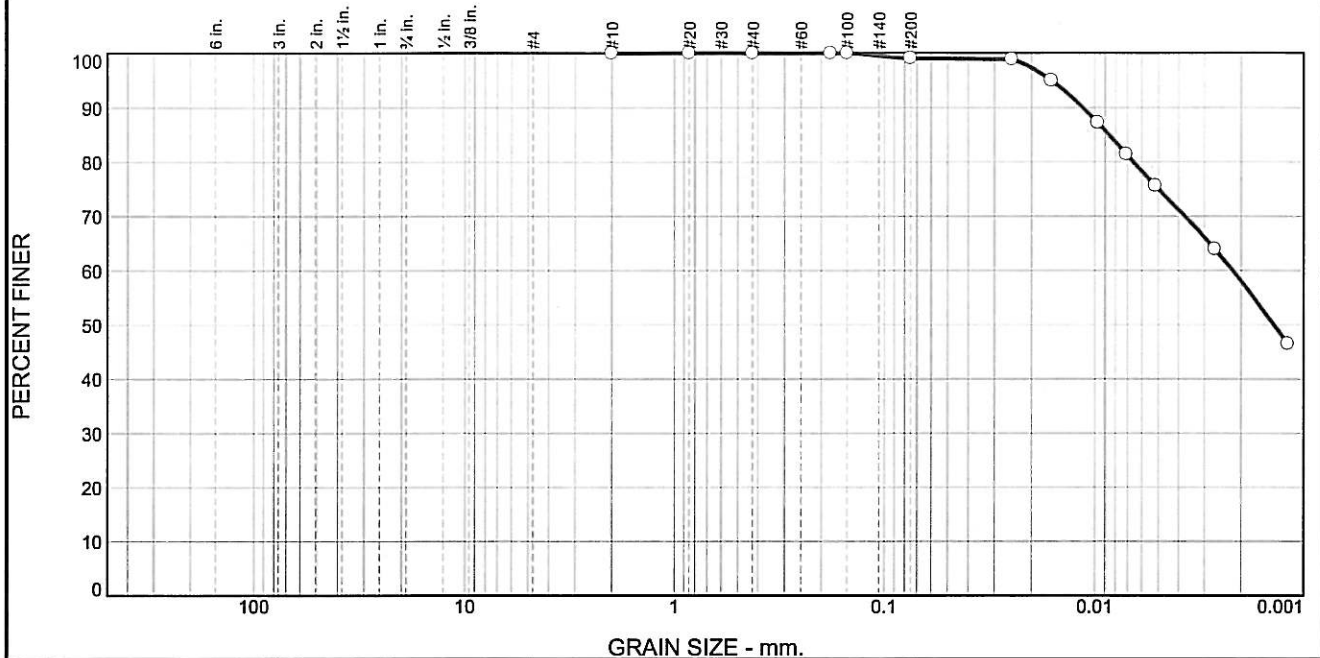
JOHN TURNER CONSULTING, INC.

19 DOVER STREET
DOVER NH 03820
T 603.749.1841 F 603.516.6851

6 CLINTON AVENUE
WESTFIELD MA 01085
T 413.642.0138 F 413.642.0164

15 HOLLY STREET, UNIT 109
SCARBOROUGH ME 04074
T 207.883.7878

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	1.0	24.0	75.0

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	100.0		
#80	100.0		
#100	100.0		
#200	99.0		
0.0248 mm.	98.9		
0.0161 mm.	95.0		
0.0097 mm.	87.2		
0.0071 mm.	81.4		
0.0052 mm.	75.6		
0.0027 mm.	63.9		
0.0012 mm.	46.5		

Material Description

CLAY, some silt

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D₉₀= 0.0114 D₈₅= 0.0086 D₆₀= 0.0022
D₅₀= 0.0014 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Remarks

Date Received: 02-11-11 Date Tested: 02-18-11
Tested By: Nate Cutter
Checked By: Kyle Urso
Title: Staff Engineer

* (no specification provided)

Location: B13 S3 (Orchard Street) Depth: 10.0 - 12.0 ft Date Sampled: 02-04-11

JOHN TURNER Dover, NH	Client: City of Dover Project: City Parking Lots Project No: 11-GEO-005	Report # 002
--------------------------------------	---	--------------

Site Photos

City of Dover
Orchard Street
Dover, NH 03820



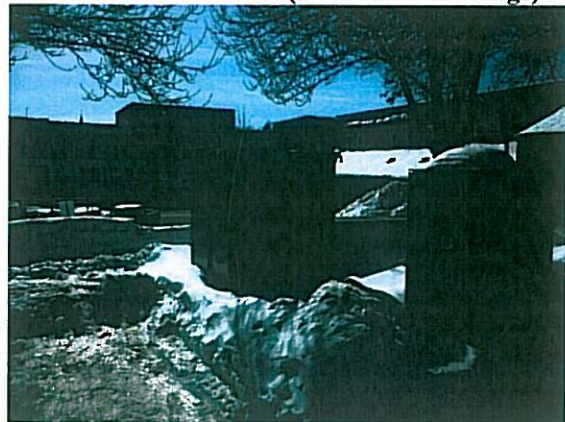
South End of Property Looking North to Apartment Complex



South End of Property Looking Southwest to Aubuchon Hardware (~15 elevation change)



South End of Property looking South to Washington Street



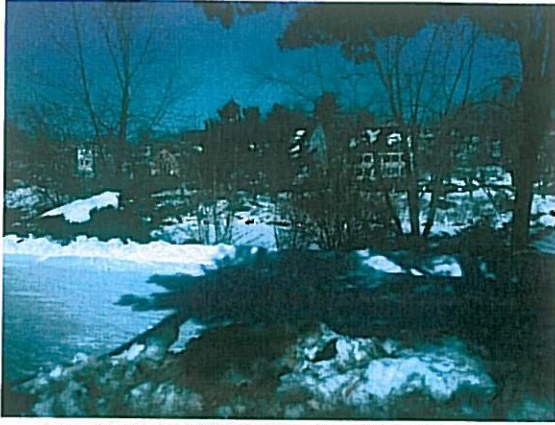
South End of Property Looking at 1 of 4 Transformers located on Property



Southeast End of Property Looking East down Orchard St



Southeast End of Property Looking North



North End of Property Looking North to Cocheco River



North End of Property Looking SouthEast



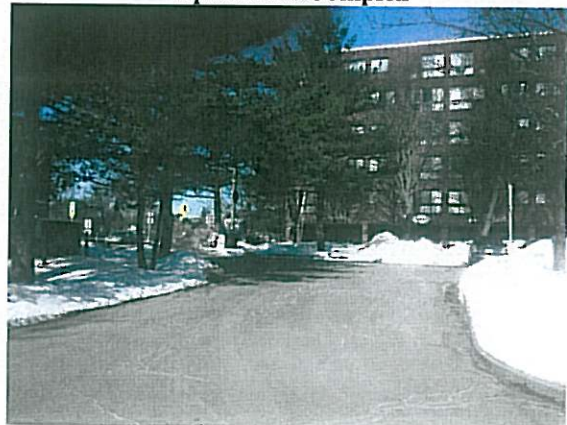
East End of Property



Center of Property Looking North toward Apartment Complex



West End of Parking Lot Looking East



West end of Parking Lot Looking North toward Apartment Complex