JOHN TURNER
CONSULTING

GEOTECHNICAL INVESTIGATION REPORT

BARTLETT STREET ROADWAY ASSESSMENT
Bartlett Street
Portsmouth, New Hampshire

Prepared for:

City of Portsmouth
680 Peverly Hill Road
Portsmouth, NH 03801

Prepared by:

John Turner Consulting, Inc.
19 Dover Street
Dover, NH 03820

JTC Project No. 23-04-062

July 31, 2023

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JOHN TURNER
CONSULTING

July 31, 2023

Marc Batchelder, P.E.
City of Portsmouth
680 Peverly Hill Road
Portsmouth, NH 03801
Phone: 603-766-1440
Email: mrbatchelder@cityofportsmouth.com

RE: Geotechnical Investigation Report
Bartlett Street Roadway Assessment
Bartlett Street
Portsmouth, NH

Dear Mr. Batchelder:

In accordance with our proposal and authorization to proceed, John Turner Consulting, Inc. (JTC) has performed a geotechnical investigation for the above captioned project. Presented herein and attached are the results of the site subsurface investigation.

This report completes our scope of services for this project. We appreciate the opportunity to assist you on this project and we look forward to working with you through its completion. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely,
JOHN TURNER CONSULTING, INC.

Stephen C. Lanne, PE
Vice President of Engineering
slanne@consultjtc.com
Ph: (413) 222-1675

Table of Contents

1.0 INTRODUCTION

John Turner Consulting, Inc. (JTC) is pleased to present this *Geotechnical Investigation Report* for the proposed subgrade assessment along Bartlett Street and Thornton Street in Portsmouth, NH. JTC conducted geotechnical explorations in general accordance with our proposed scope of services submitted to the City of Portsmouth in *JTC Proposal #23-0295*, dated March 21, 2023.

The purpose of the geotechnical investigation was to obtain information on the subsurface conditions at the site for the City of Portsmouth Department of Public Works. Geotechnical explorations services were performed in July of 2023. The contents of this report are subject to the attached Limitations.

2.0 PROJECT INFORMATION

The following subsections provide general descriptions of the site, the regional geologic setting, and the proposed development.

2.1 Site Description

The subject property is currently a residential neighborhood at the intersection of Bartlett Street and Thornton Street. The city requested that JTC drill test probes to investigate the possible presence of bedrock in the area.

2.2 Regional Geologic Setting

JTC's review of *Surficial Geologic Map of the Portsmouth and Kittery Quadrangles, Rockingham County, New Hampshire* indicates subsurface conditions at the site consist of glacial till consisting of sand, silt, clay, and sandstone deposits.

3.0 GEOTECHNICAL EXPLORATIONS

JTC subcontracted T&K Drilling to advance six (6) probes, designated as P-1 through P-6, along Bartlett Street and Thronton Street via a B-57 truck-mounted rig. The probes were advanced to depths ranging from 3.1 to 10 feet below the ground surface (bgs) utilizing 4.25-inch diameter hollow stem augers. JTC directed the drilling, testing, and sampling activities and logged the subsurface conditions encountered at each probe location.

The exploration locations were selected in relation to the existing site features, and under the constraints of drill rig access and utility conflicts. The attached *Exploration Location Plan* depicts the approximate exploration locations.

The probe explorations were backfilled with soil cuttings and topped with cold patch asphalt (as required) upon completion of drilling. Detailed records of the drilling performed, and the soil,

bedrock, and groundwater conditions observed at each probe location are provided in the tables below.

4.0 SUBSURFACE CONDITIONS

The following describes the site surface and subsurface conditions encountered, based on results of the explorations. The soil classifications shown were based on visual classification of the auger spoils at the time of drilling.

Probe #	Approximate Location	Probe Depth (ft)	Refusal Encountered (Yes or No)	Groundwater Depth (ft)	Bituminous Concrete Pavement Thickness (in)	Pavement Base Thickness (in)	Soil Classification
P-1	325 Bartlett St	10	No	NE	8	4	Grey clayey Sand
P-2	346 Thornton St	3.6	Yes	NE	10	4	Brown silty Sand with gravel
P-3	333 Thornton St	10	No	NE	4	7	Brown silty Sand with gravel
P-4	397 Bartlett St	3.9	Yes	NE	4	8	Brown poorly graded Sand with gravel
P-5	378 Thornton St	10	No	NE	3.5	3.5	Brown silty Sand with gravel
P-6	221 Woodbury Ave	3.1	Yes	NE	3.5	3	Brown silty Sand, trace Clay
P-6A	377 Thornton St	4.9	Yes	NE	3.5	4	Brown poorly graded Sand with gravel

5.0 CLOSING

We trust the contents of this 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.

APPENDIX A: LIMITATIONS

Explorations

1. The analyses and recommendations presented in this report are based in part upon the data obtained from widely-spaced subsurface explorations. Subsurface conditions between exploration locations may vary from those encountered at the exploration locations. The nature and extent of variations between explorations may not become evident until construction. If variations appear, 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 strata 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 John Turner Consulting, Inc. be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the geotechnical engineering 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.

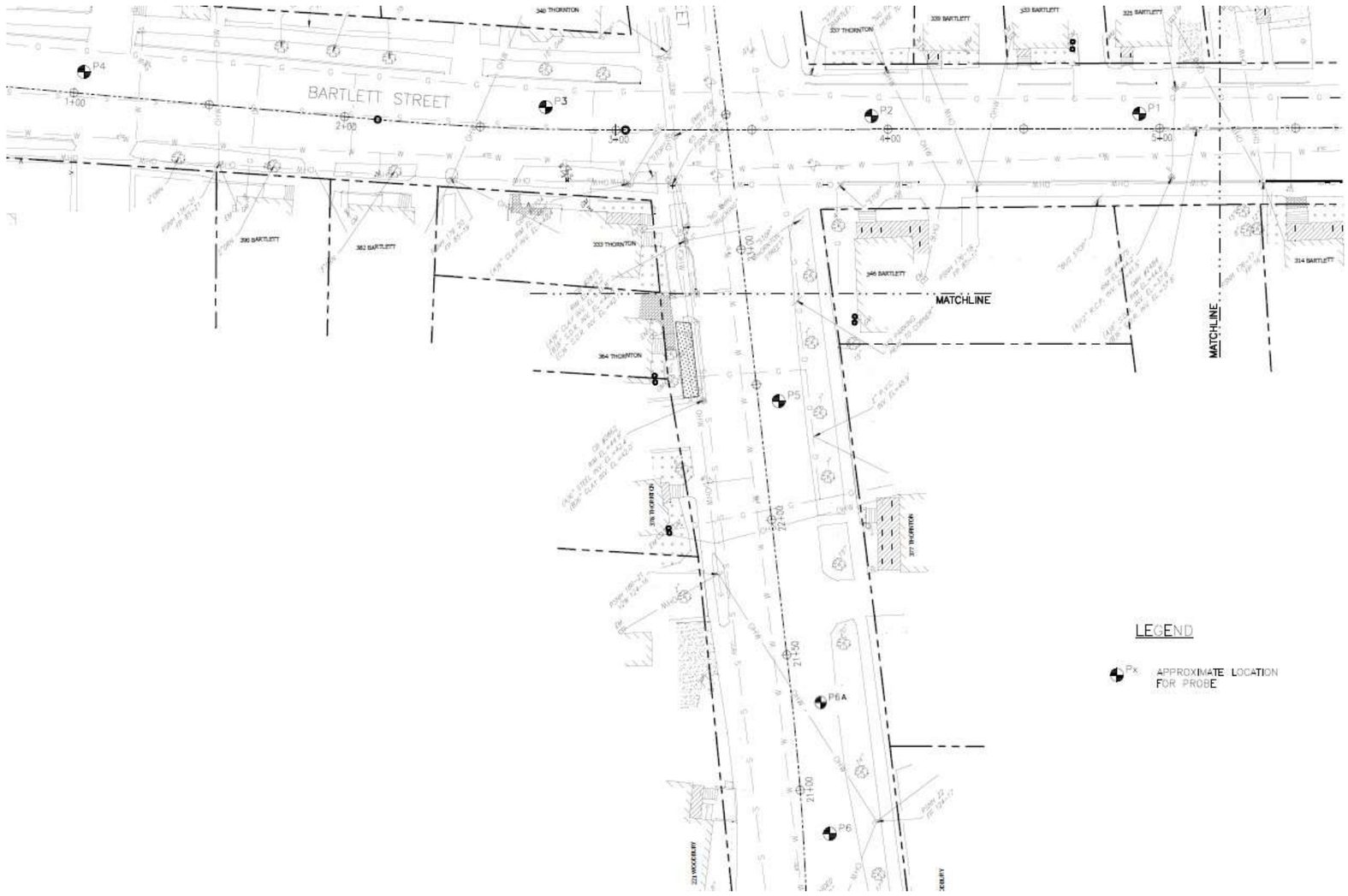
Construction

6. It is recommended that John Turner Consulting, Inc. be retained to provide geotechnical engineering services during the installation 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 addressee for the referenced project. All considerations are based on the available information and is 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 preliminary geotechnical design consideration.

APPENDIX B: EXPLORATION LOCATION PLAN



Notes:

1. Explorations were performed on July 14, 2023 under the direction of JTC. Exploration locations should be considered approximate.
2. Refer to the Exploration Logs for the subsurface conditions encountered at each exploration location.
3. Basemap source(s): March 17, 2023 "Bartlett Street Area Reconstruction" prepared by Department of Public Works City of Portsmouth, NH
4. Not to Scale.

Marc Batchelder **City of Portsmouth** **680 Peverly Hill Road** **Portsmouth, NH 03801**	**Proposed Bartlett Street Area Reconstruction** **Bartlett Street** **Portsmouth, NH**
JOHN TURNER CONSULTING	**EXPLORATION LOCATION PLAN**

APPENDIX C: EXPLORATION LOGS & KEY TO SYMBOLS AND DESCRIPTIONS

JOHN TURNER CONSULTING

LOG OF BORING No. P-1

PROJECT: Bartlett Street Roadway Assessment **PROJECT NO.:** 23-04-062
CLIENT: City of Portsmouth
PROJECT LOCATION: Bartlett Street & Thornton Street, Portsmouth, NH
LOCATION: 325 Bartlett St **ELEVATION:** 50
DRILLER: T&K Drilling **LOGGED BY:** A. Pryor
DRILLING METHOD: 4.25-inch HSA **DATE:** 7/14/23
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[PAVEMENT] 8 inches bituminous concrete pavement 4 inches pavement base		50			
	[GLACIAL TILL] Grey, clayey Sand (SC)					
2.5			47.5			
5			45			
7.5			42.5			
10	Boring terminated at 10 ft.		40			
12.5			37.5			
15			35			
17.5			32.5			

TEST RESULTS
Plastic Limit ⊢⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicative of the site.

JOHN TURNER CONSULTING

LOG OF BORING No. P-2

PROJECT: Bartlett Street Roadway Assessment **PROJECT NO.:** 23-04-062

CLIENT: City of Portsmouth

PROJECT LOCATION: Bartlett Street & Thornton Street, Portsmouth, NH

LOCATION: 346 Thornton St **ELEVATION:** 51

DRILLER: T&K Drilling **LOGGED BY:** A. Pryor

DRILLING METHOD: 4.25-inch HSA **DATE:** 7/14/23

DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[PAVEMENT] 10 inches bituminous concrete pavement 4 inches pavement base		51			
	1.2					
	[GLACIAL TILL] Brown, silty Sand (SM) with gravel					
2.5			48.5			
	Auger Refusal					
	Boring terminated at 3.6 ft.					
5			46			
7.5			43.5			
10			41			
12.5			38.5			
15			36			
17.5			33.5			

TEST RESULTS

Plastic Limit ⊢⊣ Liquid Limit

Water Content - ●

Penetration - ▨

10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicative of the site.

JOHN TURNER CONSULTING

LOG OF BORING No. P-3

PROJECT: Bartlett Street Roadway Assessment **PROJECT NO.:** 23-04-062
CLIENT: City of Portsmouth
PROJECT LOCATION: Bartlett Street & Thornton Street, Portsmouth, NH
LOCATION: 333 Thornton St **ELEVATION:** 52
DRILLER: T&K Drilling **LOGGED BY:** A. Pryor
DRILLING METHOD: 4.25-inch HSA **DATE:** 7/14/23
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[PAVEMENT] 4 inches bituminous concrete pavement 7 inches pavement base		52			
	[GLACIAL TILL] Brown, silty Sand (SM) with gravel					
2.5			49.5			
5			47			
7.5			44.5			
10	Boring terminated at 10 ft.		42			
12.5			39.5			
15			37			
17.5			34.5			

TEST RESULTS
Plastic Limit ⊢⊣ Liquid Limit
Water Content - •
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicative of the site.

JOHN TURNER CONSULTING

LOG OF BORING No. P-4

PROJECT: Bartlett Street Roadway Assessment **PROJECT NO.:** 23-04-062
CLIENT: City of Portsmouth
PROJECT LOCATION: Bartlett Street & Thornton Street, Portsmouth, NH
LOCATION: 397 Bartlett St **ELEVATION:** 51
DRILLER: T&K Drilling **LOGGED BY:** A. Pryor
DRILLING METHOD: 4.25-inch HSA **DATE:** 7/14/23
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[PAVEMENT] 4 inches bituminous concrete pavement 8 inches pavement base		51			
	[GLACIAL TILL] Brown, poorly graded Sand (SP) with gravel					
2.5			48.5			
	Auger Refusal					
	Boring terminated at 3.9 ft.					
5			46			
7.5			43.5			
10			41			
12.5			38.5			
15			36			
17.5			33.5			

TEST RESULTS
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - •
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicative of the site.

JOHN TURNER CONSULTING

LOG OF BORING No. P-5

PROJECT: Bartlett Street Roadway Assessment **PROJECT NO.:** 23-04-062
CLIENT: City of Portsmouth
PROJECT LOCATION: Bartlett Street & Thornton Street, Portsmouth, NH
LOCATION: 378 Thornton St **ELEVATION:** 52
DRILLER: T&K Drilling **LOGGED BY:** A. Pryor
DRILLING METHOD: 4.25-inch HSA **DATE:** 7/14/23
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[PAVEMENT] 3.5 inches bituminous concrete pavement 3.5 inches pavement base		52			
	0.6					
	[GLACIAL TILL] Brown, silty Sand (SM) with gravel					
2.5			49.5			
5			47			
7.5			44.5			
10			42			
	Boring terminated at 10 ft.					
12.5			39.5			
15			37			
17.5			34.5			

TEST RESULTS
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - •
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicative of the site.

JOHN TURNER CONSULTING

LOG OF BORING No. P-6

PROJECT: Bartlett Street Roadway Assessment **PROJECT NO.:** 23-04-062
CLIENT: City of Portsmouth
PROJECT LOCATION: Bartlett Street & Thornton Street, Portsmouth, NH
LOCATION: 221 Woodbury Ave **ELEVATION:** 56
DRILLER: T&K Drilling **LOGGED BY:** A. Pryor
DRILLING METHOD: 4.25-inch HSA **DATE:** 7/14/23
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[PAVEMENT] 3.5 inches bituminous concrete pavement 3 inches pavement base		56			
	0.6					
	[GLACIAL TILL] Brown, silty Sand (SM)					
2.5	Auger Refusal		53.5			
	Boring terminated at 3.1 ft.					
5			51			
7.5			48.5			
10			46			
12.5			43.5			
15			41			
17.5			38.5			

TEST RESULTS
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - •
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicative of the site.

JOHN TURNER CONSULTING

LOG OF BORING No. P-6A

PROJECT: Bartlett Street Roadway Assessment **PROJECT NO.:** 23-04-062
CLIENT: City of Portsmouth
PROJECT LOCATION: Bartlett Street & Thornton Street, Portsmouth, NH
LOCATION: 377 Thornton St **ELEVATION:** 54
DRILLER: T&K Drilling **LOGGED BY:** A. Pryor
DRILLING METHOD: 4.25-inch HSA **DATE:** 7/14/23
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[PAVEMENT] 3.5 inches bituminous concrete pavement 4 inches pavement base		54			
	0.6					
	[GLACIAL TILL] Brown, poorly graded Sand (SP) with gravel					
2.5	Auger Refusal		51.5			
	Boring terminated at 3.1 ft.					
5			49			
7.5			46.5			
10			44			
12.5			41.5			
15			39			
17.5			36.5			

TEST RESULTS
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicative of the site.

MAJOR DIVISIONS			SYMBOLS		TYPICAL NAMES
COARSE-GRAINED SOILS OVER 50% > No.200 SIEVE SIZE	GRAVELS MORE THAN 1/2 OF COARSE FRACTION > No.4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW		Well-graded gravels or gravel-sand mixtures, little or no fines
			GP		Poorly graded gravels or gravel-sand mixtures, little or no fines
		GRAVELS WITH OVER 15% FINES	GM		Silty gravels, gravel-sand mixtures
			GC		Clayey gravels, gravel-sand-clay mixtures
	SANDS MORE THAN 1/2 OF COARSE FRACTION < No.4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW		Well-graded sand or gravelly sands, little or no fines
			SP		Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH OVER 15% FINES	SM		Silty sand, sand-silt mixtures
			SC		Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS OVER 50% < No.200 SIEVE SIZE	SILTS & CLAYS LIQUID LIMIT 50% OR LESS		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LIQUID LIMIT GREATER THAN 50%		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS			PT		Peat and other highly organic soils

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KEY TO SYMBOLS AND DESCRIPTIONS

TYPICAL SYMBOLS

- Shelby Tube
- Auger Cuttings
- Standard Split Spoon Sample
- 3" Split Spoon Sample
- Rock Core
- Dynamic Cone Penetrometer
- Vane Shear
- Bulk/Grab Sample
- Geoprobe Sample
- Sonic or Vibro-Core Sample
- Water Table (at time of drilling)
- Water Table (after 24 hours)

SOIL MOISTURE MODIFIERS

Term	Description
Dry	Absence of moisture; dusty, dry to touch
Moist	Damp but no visible water
Wet	Visible free water

The descriptor "damp" should not be used (use "moist").
The descriptor "saturated" should not be used (use "wet").

WELL SYMBOLS

- Recessed Cover Set in Concrete
- Top of Well, Recessed Pipe
- Covered Riser
- Capped Riser w/ Locking Cover
- Pipe Riser
- Concrete Seal
- Gravel Backfill
- Assorted Cuttings
- Bentonite Slurry
- Bentonite Pellets
- Silica Sand, blank PVC
- Slotted Pipe w/ Sand
- Endcap on Pipe Packed in Sand
- Silica Sand, No Pipe (End Plug)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.75
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.75
SAND	No. 4 to No. 200	4.75 to 0.075
coarse	No. 4 to No. 10	4.75 to 2.00
medium	No. 10 to No. 40	2.00 to 0.425
fine	No. 40 to No. 200	0.425 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

RELATIVE DENSITY/CONSISTENCY

Gravel, Sand, and Silt (nonplastic)		Silt (plastic) and Clay		
N-Value	Relative Density	N-Value	Su	Consistency
0 - 4	Very Loose	0 - 2	0 - 250	Very Soft
5 - 10	Loose	3 - 4	251 - 500	Soft
11-30	Medium Dense	5 - 8	501 - 1000	Medium Stiff
31 - 50	Dense	9 - 15	1001 - 2000	Stiff
51 +	Very Dense	16 - 30	2001 - 4000	Very Stiff
		31 +	4001+	Hard

Standard Penetration Testing (SPT) N_{60} based on blows per 12 inches.
WR = Weight of Rods; WH = Weight of Hammer

PERCENT OR PORTIONS OF SOIL

Term	Description
Parting:	> 1/16 in.
Seam:	0.5 in. to 1/16 in.
Layer:	12 in. to 0.5 in.
Stratum:	> 12 in.
Pocket:	Small erratic deposit
Lens:	Lenticular deposit
Occasional:	One or less per foot of thickness
Frequent	More than one per foot of thickness
Varved	Alternating seams or layers of silt and/or clay and sometimes f. sand

REFERENCE: UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488-93

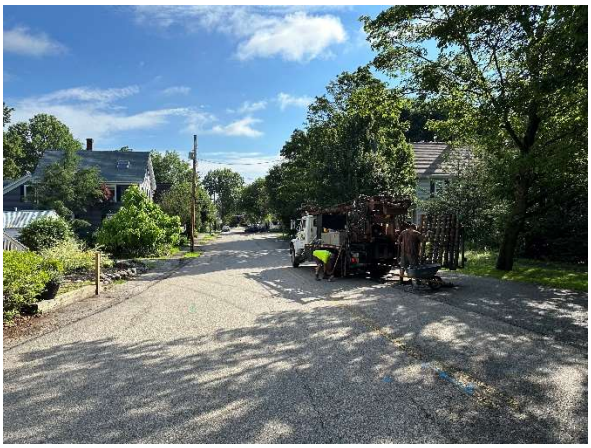
APPENDIX D: SITE PHOTOGRAPHS

JOHN TURNER CONSULTING

PHOTO LOG

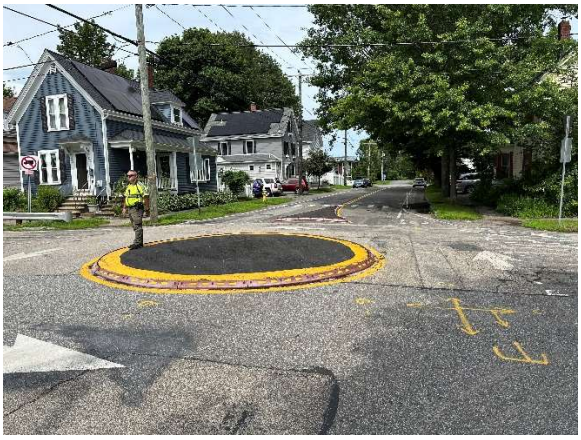
John Turner Consulting, Inc.	Site Location: Bartlett Street & Thornton Street

Photo No. 1	Date: 7/14/23



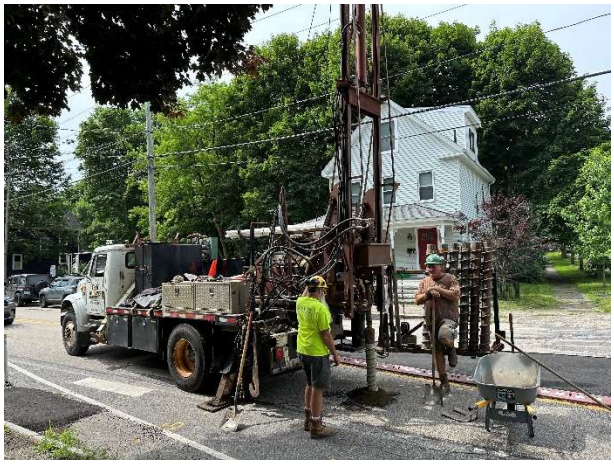
Description: Thornton Street (P-6)

Photo No. 2	Date: 7/14/23



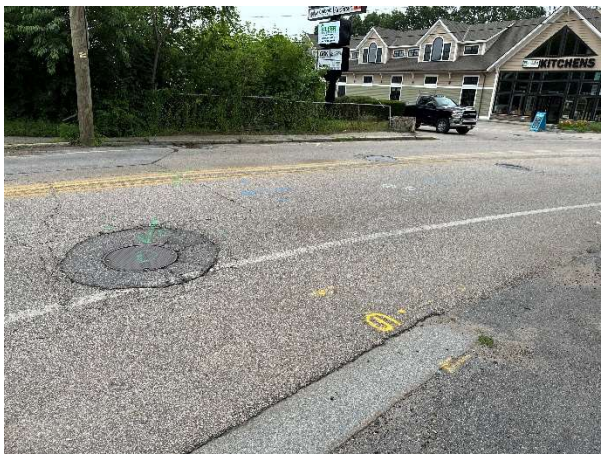
Description: Bartlett Street, Facing NW

Photo No. 3	Date: 7/14/23



Description: Typical Drill Rig Setup

Photo No. 4	Date: 7/14/23



Description: Bartlett Street, Facing SE