

# REPORT

September 30, 2014  
14-0065 S

## Geotechnical Engineering Services

Proposed Senior Living Facility  
The Park Danforth  
Arbor Street & Forest Avenue  
Portland, Maine

### PREPARED FOR:

The Park Danforth  
c/o Mitchell & Associates  
Attention: Robert Metcalf  
70 Center Street  
Portland, Maine 04101

### PREPARED BY:

S. W. Cole Engineering, Inc.  
286 Portland Road  
Gray, Maine 04039  
207-657-2866



- *Geotechnical Engineering*
- *Construction Materials Testing*
- *GeoEnvironmental Services*
- *Ecological Services*

[www.swcole.com](http://www.swcole.com)

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Sheet 1	Exploration Location Plan
Sheets 2 - 15	Exploration Logs
Sheet 16	Key to the Notes and Symbols
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Sheets 22 & 23	Underdrain Details

14-0065 S

September 30, 2014

The Park Danforth  
c/o Mitchell & Associates  
Attention: Robert Metcalf  
70 Center Street  
Portland, Maine 04101

Subject: Geotechnical Engineering Services  
Proposed Senior Living Facility  
The Park Danforth  
Arbor Street and Forest Avenue  
Portland, Maine

Dear Bob:

In accordance with our Revised Proposal, dated February 21, 2014, we have performed subsurface explorations for the subject project. This report summarizes our findings and geotechnical recommendations and its contents are subject to the limitations set forth in Attachment A.

## **1.0 INTRODUCTION**

### **1.1 Scope and Purpose**

The purpose of our services was to obtain subsurface information at the site in order to develop geotechnical recommendations relative to foundations, earthwork and pavement associated with the proposed construction. Our scope of services included test boring explorations, soils laboratory testing, a geotechnical analysis of the subsurface findings and preparation of this report.

### **1.2 Site and Proposed Construction**

The site is located southwest of the intersection of Arbor Street and Forest Avenue in Portland, Maine. The site is currently occupied by residential and retail development and improvements associated with the existing Park Danforth facility.

We understand development plans call for demolition of existing improvements and construction of a new four and five story apartment building with below grade parking for senior housing. The new apartment building is proposed in the northeast portion of the site in the vicinity of an existing one-story retail building that will be demolished. We understand typical column loads for the apartment building may range from 180 to 460 kips. We anticipate finish floor elevations will be within 2 feet of existing grades.

Development plans also include a one-story, on-grade addition to the northwest wing of the existing Park Danforth building. Paved parking and access drive areas are proposed around the north, east, and west peripheries of the site, adjacent to Forest Avenue, Arbor Street, and Stevens Avenue.

Proposed and existing site features are shown on the "Exploration Location Plan" attached as Sheet 1.

## **2.0 EXPLORATION AND TESTING**

### **2.1 Explorations**

Fourteen test borings (B-101 through B-114) were made at the site on May 22 and 23, 2014 by Great Works Test Boring, Inc. of Rollinsford, New Hampshire working under subcontract to S. W. Cole Engineering, Inc. (S.W.COLE). The exploration locations were selected by Mitchell & Associates and established in the field by S.W.COLE based on measurements from existing site features. The exploration program consisted of the following:

- Five test borings (B-104 through B-108) made for the proposed apartment building in the northeast portion of the site;
- Three test borings (B-111 through B-114) made for the proposed one-story Park Danforth building addition;
- Six test borings (B-101 through B-103 and B-109 and B-110) made for the proposed paved areas.

The approximate exploration locations are shown on the “Exploration Location Plan” attached as Sheet 1. Logs of the test borings are attached as Sheets 2 through 15. The elevations shown on the logs were estimated based on topographic information shown on Sheet 1. A key to the notes and symbols used on the logs is attached as Sheet 16.

## **2.2 Testing**

The test borings were drilled using a combination of solid stem auger and hollow stem auger drilling techniques. The soils were sampled at 2 to 5 foot intervals using a split spoon sampler and Standard Penetration Testing (SPT) techniques. SPT blow counts are shown on the logs.

Soil samples obtained from the explorations were returned to our laboratory for further classification and testing. Laboratory testing included five gradation tests and five moisture content tests. Results of the gradation testing are attached as Sheets 17 through 21. Results of the moisture content tests are shown on the logs.

## **3.0 SITE AND SUBSURFACE CONDITIONS**

### **3.1 Surficial**

The site is currently occupied by residential and retail development and associated landscape and pavement areas. The site is relatively level and flat with existing grades generally dropping west to east from about elevation 127 to 120 feet. Existing site features are shown on Sheet 1.

It should be noted that the site is an urban site with likely previous development, including past structures that are not represented on Sheet 1.

### **3.2 Soil and Bedrock**

Underlying a surficial layer of topsoil or pavement the borings encountered a subsurface profile generally consisting of a thin layer of uncontrolled granular fill overlying native outwash sands overlying refusal surfaces (probable bedrock). The principal soils encountered at the explorations are summarized below; refer to the attached logs for more detailed descriptions of the subsurface findings.

Uncontrolled Fill: The borings encountered uncontrolled fill consisting of loose to medium dense, brown and dark brown sand with varying portions of silt, gravel, and miscellaneous debris such as coal, porcelain, glass, and brick fragments. Rootlets were observed in the fill at some of the explorations. The fill was penetrated at depths varying from approximately 1.5 to 6 feet at the explorations.

Outwash Sands: Underlying the uncontrolled fill, the borings encountered native outwash sands consisting of stratified medium dense to very dense sand with varying portions of silt and gravel. The borings, with the exception of B-104 through B-108, were terminated in the outwash sands at depths varying from 9 to 21 feet.

Refusal Surfaces: Underlying the outwash sands, borings B-104 through B-108 encountered refusal surfaces (probable bedrock) at depths varying from 22 to 28 feet. A zone of probable weathered bedrock was penetrated by as much as approximately 2 feet by the augers before encountering refusal.

### **3.3 Groundwater**

Free groundwater or saturated soils were encountered at depths varying from about 18 to 21 feet at borings B-105 through B-108. Free water was not encountered at the remainder of the borings. Long term groundwater information is not available. It should be anticipated that seasonal groundwater levels will fluctuate, especially during periods of snowmelt and precipitation.

### **3.4 Seismic and Frost**

The 25-year Air Freezing Index for the Portland, Maine area is about 1,290-Fahrenheit degree-days, which corresponds to a frost penetration depth on the order of 4.5 feet. Based on the subsurface findings, we interpret the site soils to correspond to Seismic Soil Site Class C according to 2009 IBC.

## **4.0 EVALUATION AND RECOMMENDATIONS**

### **4.1 General Findings**

Based on the subsurface findings, the proposed construction appears feasible from a geotechnical standpoint. The principle geotechnical considerations are as follows:

- The site is an urban site likely with past structures and underground improvements that may not become apparent until construction. An assessment of past site uses including historical structures should be completed during the planning phase of the project to help understand the impact of past site development to the proposed construction.
- A 2 to 6 foot layer of uncontrolled granular fill exists within the proposed apartment building and Park Danforth building addition footprints. The uncontrolled fill should be removed and replaced below foundations and densified below on-grade floor slabs. Areas that become soft after densifying should be removed and replaced prior to installing slab base gravels. Provided the building pads are properly prepared, spread footing foundations and on-grade floor slabs appear suitable for the proposed construction.
- Native sand subgrades below foundations and on-grade floor slabs should be densified. Pavement subgrades consisting of uncontrolled granular fill or native sands should be proof-rolled and soft areas repaired prior to installing pavement gravels.
- Imported Granular Borrow, Structural Fill, and Crushed Stone will be needed for construction. Existing native outwash sands appear suitable for reuse as Granular Borrow.
- We recommend completing a historical mapping and records review of the site to explore the potential for buried structures and foundations which may be encountered during construction. S.W.COLE is available to complete this task.

#### **4.2 Site and Subgrade Preparation**

We recommend that site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits. As much vegetation as possible should remain outside the construction areas to lessen the potential for erosion and site disturbance. All topsoil and organics should be completely removed from areas of proposed construction. Final cuts to subgrade elevation should be made with a smooth edge bucket to lessen subgrade disturbance. We offer the following subgrade preparation recommendations for proposed building and paved areas.

Proposed Building Areas: In addition to grubbing all organics, all existing pavement, utilities, foundations, structures, and uncontrolled fill should be completely removed beneath proposed foundations until undisturbed native sands are encountered. The removal of unsuitable materials should extend outward 1 foot laterally from edge of footing for every foot of vertical depth below bottom of footing (1H:1V bearing splay). Overexcavations should be backfilled with compacted Structural Fill. The native sand footing subgrade soils should be densified with 3 to 5 passes of a vibratory plate compactor having a static weight of at least 600 pounds prior to placing new fill or concrete.

Following installation and backfilling of building foundations, we recommend on-grade floor slab subgrade be densified with 3 to 5 passes of a vibratory roller having a static weight of at least 5 tons. Floor slab areas that become soft or continue to yield after densifying should be removed and replaced with compacted Structural Fill prior to installing slab gravels.

Proposed Paved Areas: Following grubbing all organics, all pavement and deleterious materials should be removed beneath proposed paved areas. Existing utilities should be removed and existing foundations should be removed to at least 4.5 feet below finish grade and backfilled with compacted Granular Borrow. Pavement subgrades should be proof rolled and densified with 3 to 5 passes of a vibratory roller having a static weight of at least 10 tons. Pavement subgrade areas that become soft or continue to yield should be removed and replaced with compacted Granular Borrow prior to installing pavement gravels.



### **4.3 Excavation and Dewatering**

Excavation work will generally encounter existing uncontrolled granular fill and native outwash sands. Care must be exercised during construction to limit disturbance of the native bearing soils. Earthwork and grading activities should occur during drier summer and fall seasons. Final cuts to subgrade should be performed with a smooth-edged bucket to help minimize soil disturbance.

We recommend that the construction documents contain unit pricing for removal and replacement of existing uncontrolled fills, structures, and other unsuitable materials as described herein.

Groundwater was encountered in the explorations at depths on the order of 20 feet. Sumping and pumping dewatering techniques should be adequate to control groundwater in excavations. Excavations must be properly shored or sloped in accordance with OSHA trenching regulations to prevent sloughing and caving of the sidewalls during construction. Care must be taken to preclude undermining adjacent structures, utilities and roadways. The design and planning of excavations, excavation support systems, and dewatering is the responsibility of the contractor.

### **4.4 Foundations**

We recommend the proposed buildings be supported on spread footings founded on densified native outwash sands or properly compacted Structural Fill overlying densified native outwash sands. As presented herein, it will be necessary to remove and replace existing uncontrolled fills below foundations.

For foundations bearing on properly prepared subgrades, we recommend the following geotechnical parameters for design consideration:

- Design Frost Depth = 4.5 feet
- Net Allowable Soil Bearing Pressure = 4 ksf or less
- Base Friction Factor = 0.30 (concrete to sand)
- Total Unit Weight of Backfill = 130 pcf (compacted Structural Fill)
- At-Rest Lateral Earth Pressure Coefficient = 0.5 (compacted Structural Fill)
- Internal Friction Angle of Backfill = 30° (compacted Structural Fill)
- Seismic Soil Site Class = C (IBC 2009)

#### **4.5 Foundation Drainage**

The site soils consist of relatively dry, well-drained sands. However, it is good practice to provide perimeter underdrainage to help reduce the risk of frost heaving of entrance slabs and sidewalks. We recommend an underdrain system be installed along the outside edge the perimeter footings. The underdrain pipe should consist of 4-inch diameter, slotted foundation drain pipe bedded in Underdrain Sand. The underdrain pipe must have a positive gravity outlet protected from freezing, clogging and backflow. Surface grades should be sloped away from the building for positive drainage. General underdrain details are illustrated on Sheets 22 and 23.

#### **4.6 Slab-On-Grade**

On-grade floor slabs in heated areas may be designed using a subgrade reaction modulus of 100 pci (pounds per cubic inch) provided the slab is underlain by at least 12-inches of compacted Structural Fill placed over densified native sand subgrades or densified existing fill subgrades which have been repaired as necessary. On-grade slabs in the below grade parking garage should be underlain with at least 6 inches of Crushed Stone overlying a filter fabric. If the parking garage is unheated, we recommend floor slabs be underlain with at least 2 inches of foundation insulation for frost protection. The structural engineer or concrete consultant must design steel reinforcing and joint spacing appropriate to slab thickness and function.

We recommend a sub-slab vapor retarder particularly in areas of the building where the concrete slab will be covered with an impermeable surface treatment or floor covering that may be sensitive to moisture vapors. The vapor retarder must have a permeance that is less than the floor cover or surface treatment that is applied to the slab. The vapor retarder must have sufficient durability to withstand direct contact with the sub-slab base material and construction activity. The vapor retarder material should be placed according to the manufacturer's recommended method, including the taping and lapping of all joints and wall connections. The architect and/or flooring consultant should select the vapor retarder products compatible with flooring and adhesive materials.

The floor slab should be appropriately cured using moisture retention methods after casting. Typical floor slab curing methods should be used for at least 7 days. The architect or flooring consultant should assign curing methods consistent with current

applicable American Concrete Institute (ACI) procedures with consideration of curing method compatibility to proposed surface treatments, flooring and adhesive materials.

#### **4.7 Entrance Slabs and Sidewalks**

Entrance slabs and sidewalks adjacent to the building must be designed to reduce the effects of differential frost action between adjacent pavement, doorways, and entrances. We recommend that non-frost susceptible Structural Fill be provided to a depth of at least 4.5 feet below the top of entrance slabs. This thickness of Structural Fill should extend the full width of the entrance slab and outward at least 4.5 feet, thereafter transitioning up to the bottom of the adjacent sidewalk or pavement gravels at a 3H:1V or flatter slope. General details of this frost transition zone are attached as Sheets 22 and 23.

#### **4.8 Backfill and Compaction**

We recommend the following fill and backfill materials:

Granular Borrow: Sand or silty sand meeting the gradation requirements of MDOT Standard Specification 703.19 Granular Borrow. Granular Borrow is recommended for use as:

- Fill to raise site grades in proposed paved areas
- Backfill of overexcavations below proposed paved areas

Structural Fill: Clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below.

<b>Structural Fill</b>	
<b>Sieve Size</b>	<b>Percent Finer by Weight</b>
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
#40	0 to 30
#200	0 to 5

Structural Fill is recommended for use as:

- Backfill for overexcavations below footings and on-grade floor slabs

- Fill to raise grades in building areas
- Backfill against foundations
- Backfill within frost transition zones below entrances and sidewalks

Underdrain Sand: Underdrain Sand used around underdrain pipes should meet the gradation requirements of MDOT Standard Specification 703.22 “Underdrain Backfill Type B”.

Crushed Stone: Crushed Stone used below the basement parking garage slab should consist of clean angular stone meeting the requirements of MDOT Standard Specification 703.22 “Underdrain Backfill Type C”. A nominally sized 3/4-inch crushed stone typically meets this specification.

Reuse of Site Soils: The existing uncontrolled fills are unsuitable for reuse below proposed building areas, but may be suitable for reused in proposed pavement and landscape areas. The native sands appear suitable for reuse as Granular Borrow. The contractor should anticipate the need to moisture condition soils for reuse.

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in building and paved areas be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557.

#### **4.9 Weather Considerations**

Construction activity should be limited during wet and freezing weather and the site soils may require drying before construction activities may continue. The contractor should anticipate the need for water to temper fills in order to facilitate compaction during dry weather. If construction takes place during cold weather, subgrades, foundations and floor slabs must be protected during freezing conditions. Concrete and fill must not be placed on frozen soil; and once placed, the concrete and soil beneath the structure must be protected from freezing.

#### **4.10 Paved Areas**

We anticipate paved areas will be subjected primarily to passenger vehicle and light delivery truck traffic. Considering the site soils and proposed usage, we offer the following pavement section for consideration. Materials are based on Maine Department of Transportation Standard Specifications.

- 1 ¼ inches of 9.5 mm Hot Mix Asphalt (50 Gyration Design)
- 2 ¼ inches of 12.5 mm Hot Mix Asphalt (50 Gyration Design)
- 3 inches of MDOT 703.06 Type A, Crushed Aggregate Base
- 15 inches of MDOT 703.06 Type D, Crushed Aggregate Subbase

Pavement subgrades are anticipated to consist of densified existing fills, native sands or compacted Granular Borrow. The base and subbase materials should be compacted to at least 95 percent of their maximum dry density as determined by ASTM D-1557. Hot mix asphalt pavement should be compacted to 92 to 97 percent of its theoretical maximum density as determined by ASTM D-2041. A tack coat should be used between successive lifts of bituminous pavement.

It should be understood that frost penetration can be on the order of 4.5 feet in this area. In the absence of full depth excavation of frost susceptible soils below paved areas and subsequent replacement with non-frost susceptible compacted fill, frost penetration into the subgrade will occur and some heaving and distress of pavement must be anticipated.

#### **4.11 Recommendation for Additional Study**

Given the previously developed nature of the site, we recommend performing a historical mapping and records research review of the site. A review will help to establish the location of historical buildings and underground structures which could be encountered during construction. S.W.COLE is available to provide the historical research services.

#### **4.12 Design Review and Construction Testing**

S.W.COLE should be retained to review the civil and foundation construction documents to determine that our earthwork, foundation and pavement recommendations have been properly interpreted and implemented.

A soils and concrete testing program should be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE is available to provide subgrade observations for foundations as well as testing services for soils, concrete, asphalt, steel and spray-applied fireproofing construction materials.

## 5.0 CLOSURE

It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you during the construction phase of the project.

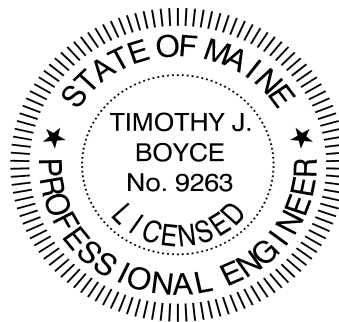
Sincerely,

**S. W. Cole Engineering, Inc.**

Evan M. Walker, P.E.  
Geotechnical Engineer



Timothy J. Boyce, P.E.  
Senior Geotechnical Engineer



EMW: tjb

## **Attachment A Limitations**

This report has been prepared for the exclusive use of The Park Danforth and Mitchell & Associates for specific application to the proposed Park Danforth Expansion in Portland, Maine. S.W.COLE has endeavored to conduct the work in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

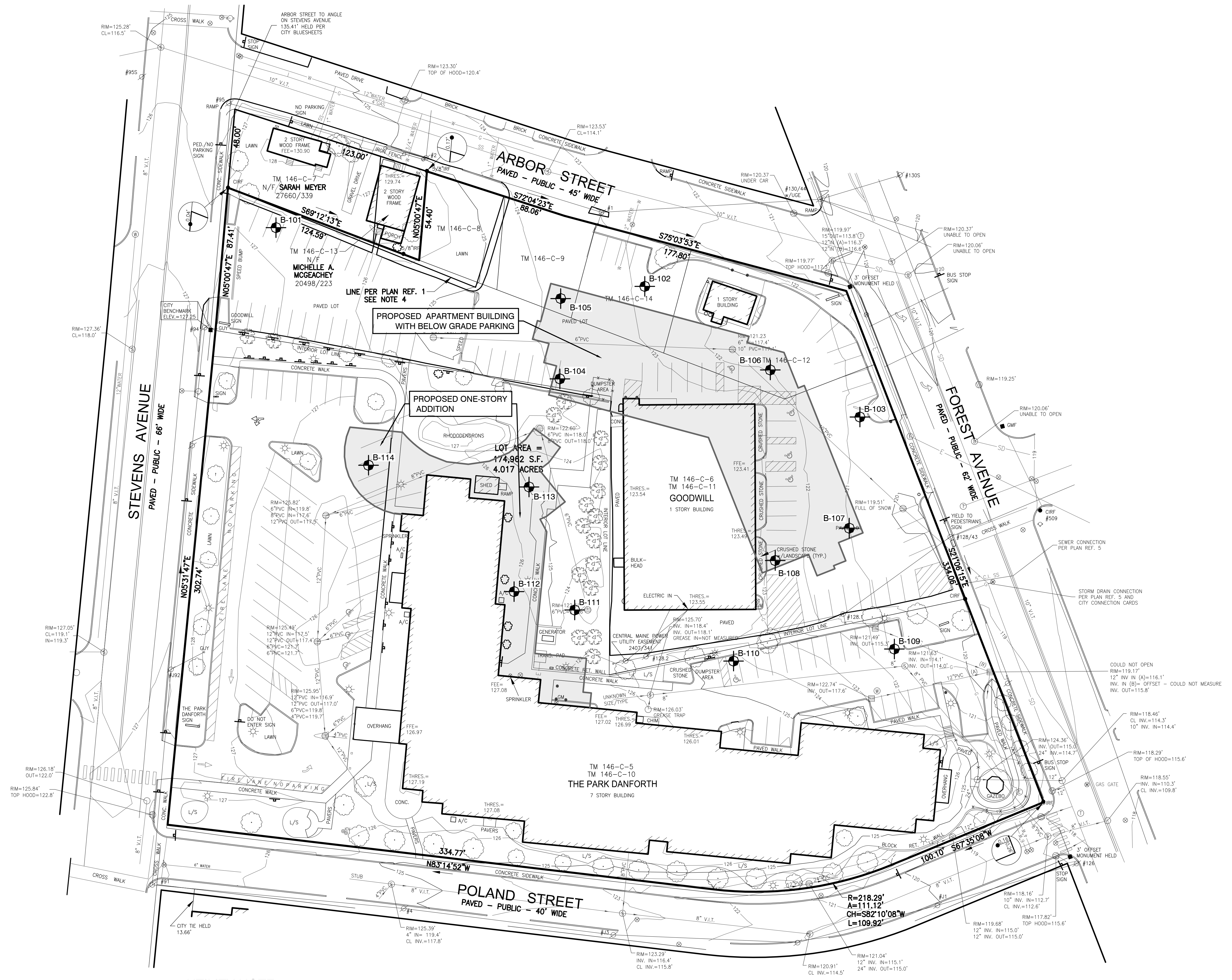
The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE's scope of work has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.



**LEGEND:**

APPROXIMATE BORING LOCATION

**NOTES:**

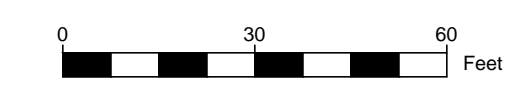
1. EXPLORATION LOCATION PLAN WAS PREPARED FROM A 1"=30' SCALE PLAN OF THE SITE ENTITLED "BOUNDARY & TOPOGRAPHIC SURVEY," PREPARED BY OWEN HASKELL, INC., DATED JANUARY 2, 2014.
2. THE BORINGS WERE LOCATED IN THE FIELD BY TAPED MEASUREMENTS FROM EXISTING SITE FEATURES.
3. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S. W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
4. THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE EXPLORATIONS IN RELATION TO THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.

NO.	DATE	DESCRIPTION	BY
2	09/30/2014	FINAL REPORT SUBMISSION	CEM
1	06/18/2014	REPORT SUBMISSION	CEM
-	05/30/2014	PRELIMINARY SUBMISSION	CEM

**S.W. COLE ENGINEERING, INC.**

THE PARK DANFORTH  
C/O MITCHELL & ASSOCIATES  
**EXPLORATION LOCATION PLAN**  
PROPOSED APARTMENT BUILDING  
ARBOR STREET AND FOREST AVENUE  
PORTLAND, MAINE

Job No.: 14-0065      Scale: 1" = 30'  
Date: 05/30/2014      Sheet: 1







# BORING LOG

BORING NO.: **B-101**  
 SHEET: 1 OF 1  
 PROJECT NO.: 14-0065  
 DATE START: 5/23/2014  
 DATE FINISH: 5/23/2014  
 ELEVATION: 127' ±  
 SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 NO FREE WATER OBSERVED

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES  
 LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE SSA SIZE I.D. 2 1/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
										4" ASPHALT DARK BROWN GRAVELLY SAND, SOME SILT WITH ROOTLETS AND BRICK (FILL) ~MEDIUM DENSE TO LOOSE~
	1D	24"	18"	2.5'	9	7	5	5		
	2D	24"	12"	4.5'	4	4	5	4	5.0'	
	3D	24"	18"	7.0'	5	12	24	24		
	4D	24"	16"	9.0'	24	25	18	16		BROWN SAND AND GRAVEL, TRACE SILT ~DENSE~  BOTTOM OF EXPLORATION AT 9.0'

SAMPLES: D = SPLIT SPOON C = 2" SHELBY TUBE S = 3" SHELBY TUBE U = 3.5" SHELBY TUBE  
 SOIL CLASSIFIED BY:  DRILLER - VISUALLY  SOIL TECH. - VISUALLY  LABORATORY TEST  
 REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.



# BORING LOG

BORING NO.: **B-102**  
 SHEET: 1 OF 1  
 PROJECT NO.: 14-0065  
 DATE START: 5/23/2014  
 DATE FINISH: 5/23/2014  
 ELEVATION: 123' ±  
 SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 NO FREE WATER OBSERVED

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES  
 LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE  
 CASING: TYPE HSA SIZE I.D. 2 3/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									2.0'	3"± ASPHALT DARK BROWN GRAVELLY SAND, SOME SILT (FILL) ~MEDIUM DENSE~
	1D	24"	20"	2.5'	4	5	7	9	5.0'	ORANGE-BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE SILT ~MEDIUM DENSE~
	2D	24"	18"	4.5'	7	9	7	7		
	3D	24"	18"	7.0'	5	8	16	17		LIGHT BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE SILT ~MEDIUM DENSE TO DENSE~
	4D	24"	19"	9.0'	16	21	22	20		
										BOTTOM OF EXPLORATION AT 9.0'

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

(3)

BORING NO.: **B-102**



# BORING LOG

BORING NO.: **B-103**  
 SHEET: 1 OF 1  
 PROJECT NO.: 14-0065  
 DATE START: 5/22/2014  
 DATE FINISH: 5/22/2014  
 ELEVATION: 121' ±  
 SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 NO FREE WATER OBSERVED

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES  
 LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE HSA SIZE I.D. 2 3/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									1.5'	4"± ASPHALT
	1D	24"	16"	2.5'	6	9	7	7	2.5'	BROWN SAND SOME GRAVEL, SOME SILT (FILL) ~MEDIUM DENSE~ ORANGE-BROWN FINE SAND SOME SILT ~MEDIUM DENSE~
	2D	24"	17"	4.5'	6	6	6	7		LIGHT BROWN FINE SAND TRACE SILT ~MEDIUM DENSE~
	3D	24"	16"	7.0'	4	6	7	7		
	4D	24"	18"	9.0'	8	7	8	10		
										BOTTOM OF EXPLORATION AT 9.0'

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

(4)

BORING NO.: **B-103**



# BORING LOG

BORING NO.: **B-104**  
 SHEET: 1 OF 1  
 PROJECT NO.: 14-0065  
 DATE START: 5/23/2014  
 DATE FINISH: 5/23/2014  
 ELEVATION: 124' ±  
 SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 NO FREE WATER OBSERVED

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES  
 LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE HSA SIZE I.D. 2 3/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									2.0'	3"± ASPHALT BROWN SAND, SOME GRAVEL, SOME SILT WITH GLASS & WOOD PIECES (FILL) ~MEDIUM DENSE~
	1D	24"	16"	2.5'	5	6	5	8		
	2D	24"	18"	4.5'	12	16	18	20		w = 3.4% BROWN GRAVELLY MEDIUM TO COARSE SAND, TRACE SILT ~DENSE TO VERY DENSE~
	3D	24"	17"	7.0'	13	23	25	33		
	4D	18"	16"	8.5'	28	28	31		10.0'	
	5D	24"	18"	12.0'	10	14	16	23		w = 4.3% ~DENSE~ BROWN MEDIUM SAND, TRACE GRAVEL, TRACE SILT ~MEDIUM DENSE~
	6D	24"	20"	17.0'	12	12	15	21	19.5'	
										WEATHERED BEDROCK
										REFUSAL AT 21.8' (PROBABLE BEDROCK)

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

(5)

BORING NO.: **B-104**



# BORING LOG

BORING NO.: **B-105**

SHEET: 1 OF 1

PROJECT NO.: 14-0065

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES

DATE START: 5/23/2014

LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME

DATE FINISH: 5/23/2014

DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

ELEVATION: 124' ±

CASING: TYPE HSA SIZE I.D. 2 3/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 SOILS WET AT 21'

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
										3'± ASPHALT
	1D	24"	15"	2.5'	5	9	18	8	3.0'	BROWN SAND SOME GRAVEL, SOME SILT WITH CONCRETE FRAGMENTS (FILL) ~MEDIUM DENSE~
	2D	24"	16"	4.5'	5	6	6	8	5.0'	BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE SILT ~MEDIUM DENSE~
	3D	24"	17"	7.0'	6	16	22	23		~DENSE~
	4D	24"	19"	9.0'	16	20	22	24		BROWN GRAVELLY MEDIUM TO COARSE SAND, TRACE SILT
	5D	24"	20"	12.0'	15	23	29	49		~VERY DENSE~
	6D	24"	20"	17.0'	16	23	31	38		
									21.0'	
	7D	18"	15"	21.5'	24	34	45		23.0'	BROWN GRAVELLY FINE TO MEDIUM SAND, TRACE SILT ~VERY DENSE~
										REFUSAL AT 23' (PROBABLE BEDROCK)

SAMPLES:  
 D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.



# BORING LOG

BORING NO.: **B-106**  
 SHEET: 1 OF 1  
 PROJECT NO.: 14-0065  
 DATE START: 5/22/2014  
 DATE FINISH: 5/22/2014  
 ELEVATION: 122' ±  
 SWC REP.: PJO

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES  
 LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE HSA SIZE I.D. 2 3/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

WATER LEVEL INFORMATION  
 SOILS SATURATED AT 20'

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
										2 1/2" ± ASPHALT
	1D	24"	15"	2.5'	8	9	8	8	3.0'	DARK BROWN TO BROWN SAND, SOME GRAVEL, SOME SILT (FILL) ~MEDIUM DENSE~
	2D	24"	15"	4.5'	9	9	7	3		BROWN FINE TO COARSE SAND, SOME GRAVEL, TRACE SILT ~MEDIUM DENSE~
	3D	24"	16"	7.0'	6	12	16	19	7.0'	
	4D	24"	16"	9.0'	12	15	16	16	10.0'	w = 4.1% BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE SILT ~DENSE~
	5D	24"	20"	12.0'	15	25	23	25		~DENSE~ BROWN GRAVELLY MEDIUM TO COARSE SAND, TRACE SILT
	6D	24"	18"	17.0'	15	28	32	40		w = 2.4% ~VERY DENSE~
	7D	24"	22"	22.0'	15	17	24	30	21.2'	w = 19.5% BROWN FINE TO MEDIUM SAND SOME SILT ~DENSE~ ~ DENSE ~
									28.0'	REFUSAL 28.0' (PROBABLE BEDROCK)

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

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BORING NO.: **B-106**



# BORING LOG

BORING NO.: **B-107**  
 SHEET: 1 OF 1  
 PROJECT NO.: 14-0065  
 DATE START: 5/22/2014  
 DATE FINISH: 5/22/2014  
 ELEVATION: 121' ±  
 SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 SOILS SATURATED AT 18'

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES  
 LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE HSA SIZE I.D. 2 3/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									2.5'	3" ASPHALT DARK BROWN SAND, SOME GRAVEL, SOME SILT (FILL) ~MEDIUM DENSE~
	1D	24"	14"	2.5'	6	9	9	9	4.5'	ORANGE-BROWN SAND SOME SILT ~MEDIUM DENSE~
	2D	24"	15"	4.5'	12	8	7	6	23.0'	~MEDIUM DENSE~  LIGHT BROWN FINE TO MEDIUM SAND, TRACE SILT WITH OCCASIONAL SILT SEAMS BETWEEN 10-12' AND 10" SAND AND GRAVEL LAYER FROM 15.2-16.0'
	3D	24"	17"	7.0'	5	9	9	10		
	4D	24"	18"	9.0'	12	13	12	12		
	5D	24"	22"	12.0'	8	11	16	23		
	6D	24"	22"	17.0'	12	16	15	18		
	7D	24"	18"	22.0'	4	8	9	22	24.0'	~MEDIUM DENSE~  WEATHERED BEDROCK
										REFUSAL AT 24.0' (PROBABLE BEDROCK)

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

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BORING NO.: **B-107**



# BORING LOG

BORING NO.: **B-108**

SHEET: 1 OF 1

PROJECT NO.: 14-0065

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES

LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME

DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

DATE START: 5/22/2014

DATE FINISH: 5/22/2014

ELEVATION: 123' ±

CASING: TYPE HSA SIZE I.D. 2 3/4" HAMMER WT. HAMMER FALL

SAMPLER: SS 1 3/8" 140-LBS 30"

CORE BARREL:

SWC REP.: PJO

WATER LEVEL INFORMATION

SOILS SATURATED AT 20'

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									2.5'	2 1/4" ASPHALT BROWN SAND SOME GRAVEL, SOME SILT (FILL)
	1D	24"	14"	2.5'	5	8	7	6	6.0'	BROWN MEDIUM TO COARSE SAND TRACE GRAVEL, TRACE SILT, TRACE ROOTLETS ~LOOSE~ (FILL)
	2D	24"	18"	4.5'	5	4	3	2		
	3D	24"	14"	7.0'	2	10	13	20	10.0'	~MEDIUM DENSE~ BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE SILT
	4D	24"	16"	9.0'	10	15	20	16		
	5D	24"	18"	12.0'	10	12	18	25	19.0'	~MEDIUM DENSE~ BROWN FINE TO MEDIUM SAND, TRACE GRAVEL, TRACE SILT
	6D	24"	22"	17.0'	10	13	15	16		
	7D	24"	22"	22.0'	13	18	21	18		BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, SOME SILT ~MEDIUM DENSE~
										REFUSAL AT 26.5' (PROBABLE BEDROCK)

SAMPLES:  
 D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.





# BORING LOG

BORING NO.: **B-109**

SHEET: **1 OF 1**

PROJECT NO.: **14-0065**

PROJECT / CLIENT: **PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES**

DATE START: **5/22/2014**

LOCATION: **ARBOR STREET & FOREST AVENUE, PORTLAND, ME**

DATE FINISH: **5/22/2014**

DRILLING CO.: **GREAT WORKS TEST BORINGS, INC.** DRILLER: **JEFF LEE**

ELEVATION: **121' ±**

CASING: TYPE **SSA** SIZE I.D. **2 1/4"**  
 SAMPLER: TYPE **SS** SIZE I.D. **1 3/8"** HAMMER WT. **140-LBS** HAMMER FALL **30"**  
 CORE BARREL: \_\_\_\_\_

SWC REP.: **PJO**  
 WATER LEVEL INFORMATION  
**NO FREE WATER OBSERVED**

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	24"	16"	2.5'	7	14	8	8	2.5'	2 1/2"± ASPHALT BROWN GRAVELLY SAND, SOME SILT (FILL) ~MEDIUM DENSE~
	2D	24"	18"	4.5'	8	10	11	8	4.5'	BROWN FINE TO MEDIUM SAND, SOME GRAVEL, SOME SILT ~MEDIUM DENSE~
	3D	24"	18"	7.0'	3	5	5	5		LIGHT BROWN FINE TO MEDIUM SAND, TRACE SILT WITH COARSE SAND LAYERS BETWEEN 8-9'  ~MEDIUM DENSE~
	4D	24"	17"	9.0'	6	9	9	12		
	5D	24"	16"	12.0'	7	11	14	15		
										BOTTOM OF EXPLORATION AT 12.0'

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

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BORING NO.: **B-109**



# BORING LOG

BORING NO.: **B-110**  
 SHEET: 1 OF 1  
 PROJECT NO.: 14-0065  
 DATE START: 5/22/2014  
 DATE FINISH: 5/22/2014  
 ELEVATION: 125' ±  
 SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 NO FREE WATER OBSERVED

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES  
 LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE SSA SIZE I.D. 2 1/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	12"	6"	1.5'	19	50			3.0'	2 1/2" ASPHALT DARK BROWN GRAVELLY SAND, SOME SILT (FILL) <<BLOW COUNT OVERSTATED - PUSHED GRAVEL>>
	2D	24"	15"	5.0'	4	5	5	4	5.0'	ORANGE-BROWN FINE TO MEDIUM SAND TRACE GRAVEL ~LOOSE TO MEDIUM DENSE~
	3D	24"	16"	7.0'	5	4	9	13		~MEDIUM DENSE~ BROWN FINE TO MEDIUM SAND, SOME GRAVEL, TRACE SILT <<BLOW COUNT OVERSTATED - PUSHED GRAVEL>>
	4D	24"	16"	9.0'	17	21	15	14		
	5D	24"	14"	12.0'	9	10	12	14		
										BOTTOM OF EXPLORATION AT 12.0'

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

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BORING NO.: **B-110**



# BORING LOG

BORING NO.: **B-111**  
 SHEET: **1 OF 1**  
 PROJECT NO.: **14-0065**  
 DATE START: **5/22/2014**  
 DATE FINISH: **5/22/2014**  
 ELEVATION: **124' ±**  
 SWC REP.: **PJO**  
 WATER LEVEL INFORMATION  
**NO FREE WATER OBSERVED**

PROJECT / CLIENT: **PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES**  
 LOCATION: **ARBOR STREET & FOREST AVENUE, PORTLAND, ME**  
 DRILLING CO.: **GREAT WORKS TEST BORINGS, INC.** DRILLER: **JEFF LEE**

TYPE: **HSA** SIZE I.D.: **2 3/4"** HAMMER WT.: **140-LBS** HAMMER FALL: **30"**  
 CASING: **HSA**  
 SAMPLER: **SS**  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									0.3'	DARK BROWN SAND AND SILT WITH ROOTLETS (TOPSOIL) ~LOOSE~
	1D	24"	18"	2.0'	4	4	5	5	1.5'	DARK BROWN SILTY SAND, SOME GRAVEL (FILL) ~LOOSE~
										ORANGE-BROWN MEDIUM TO COARSE SAND
	2D	24"	18"	4.0'	5	4	8	12	3.5'	TRACE GRAVEL, TRACE SILT ~MEDIUM DENSE~
										BROWN MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE SILT ~MEDIUM DENSE~
	3D	24"	18"	7.0'	4	11	16	19	7.0'	
										BROWN GRAVELLY MEDIUM TO COARSE SAND, TRACE SILT ~MEDIUM DENSE~
	4D	24"	17"	9.0'	17	20	18	24		
										BROWN SAND AND GRAVEL, TRACE SILT ~DENSE~
	5D	24"	20"	12.0'	21	20	23	22	12.0'	
										BOTTOM OF EXPLORATION AT 16.0'
	6D	12"	10"	16.0'	15	50				

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

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 BORING NO.: **B-111**



# BORING LOG

BORING NO.: **B-112**

SHEET: **1 OF 1**

PROJECT NO.: **14-0065**

DATE START: **5/22/2014**

DATE FINISH: **5/22/2014**

ELEVATION: **126' ±**

SWC REP.: **PJO**

WATER LEVEL INFORMATION

NO FREE WATER OBSERVED

PROJECT / CLIENT: **PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES**

LOCATION: **ARBOR STREET & FOREST AVENUE, PORTLAND, ME**

DRILLING CO.: **GREAT WORKS TEST BORINGS, INC.** DRILLER: **JEFF LEE**

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:	HSA	2 3/4"		
SAMPLER:	SS	1 3/8"	140-LBS	30"
CORE BARREL:				

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									0.4'	DARK BROWN SAND AND SILT WITH ROOTLETS (TOPSOIL / FILL) ~LOOSE~
	1D	24"	18"	2.0'	2	2	6	8		~LOOSE~ DARK BROWN GRAVELLY SILTY SAND WITH BRICK AND COAL FRAGMENTS (FILL)
	2D	24"	22"	4.0'	5	7	13	20	5.0'	~MEDIUM DENSE~
	3D	24"	14"	7.0'	7	17	18	17		~DENSE~ BROWN SAND AND GRAVEL, TRACE SILT
	4D	11"	11"	9.0'	26	50/5"				~VERY DENSE~
	5D	24"	18"	12.0'	24	29	28	30		
	6D	24"	22"	17.0'	10	26	26	25		

BOTTOM OF EXPLORATION AT 17.0'

SAMPLES:  
D = SPLIT SPOON  
C = 2" SHELBY TUBE  
S = 3" SHELBY TUBE  
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.



# BORING LOG

BORING NO.: **B-113**  
 SHEET: 1 OF 1  
 PROJECT NO.: 14-0065  
 DATE START: 5/23/2014  
 DATE FINISH: 5/23/2014  
 ELEVATION: 125' ±  
 SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 NO FREE WATER OBSERVED

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES  
 LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE HSA SIZE I.D. 2 3/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	24"	16"	2.0'	2	6	5	11	2.0'	GRASS / DARK BROWN SILTY SAND, TRACE GRAVEL WITH PORCELAIN AND COAL FRAGMENTS (FILL) ~MEDIUM DENSE~
	2D	24"	16"	4.0'	19	15	12	14	5.0'	BROWN GRAVELLY SAND SOME SILT ~MEDIUM DENSE~
	3D	24"	19"	7.0'	11	17	20	25		~DENSE~  BROWN GRAVELLY MEDIUM TO COARSE SAND, TRACE SILT
	4D	18"	16"	8.5'	14	19	33			
	5D	24"	18"	12.0'	11	18	27	30		
	6D	24"	22"	17.0'	19	25	28	37		~VERY DENSE~
										BOTTOM OF EXPLORATION AT 17.0'

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

(14)

BORING NO.: **B-113**



# BORING LOG

BORING NO.: **B-114**  
 SHEET: 1 OF 1  
 PROJECT NO.: 14-0065  
 DATE START: 5/23/2014  
 DATE FINISH: 5/23/2014  
 ELEVATION: 126' ±  
 SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 NO FREE WATER OBSERVED

PROJECT / CLIENT: PROPOSED SENIOR LIVING FACILITY / THE PARK DANFORTH c/o MITCHELL & ASSOCIATES  
 LOCATION: ARBOR STREET & FOREST AVENUE, PORTLAND, ME  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE HSA SIZE I.D. 2 3/4" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 1 3/8" 140-LBS 30"  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									1.5'	3 1/2" ASPHALT
	1D	24"	16"	2.5'	5	8	8	8	3.0'	BROWN GRAVELLY SAND, SOME SILT (FILL) ~MEDIUM DENSE~ BROWN FINE TO MEDIUM SAND, TRACE SILT ~MEDIUM DENSE~
	2D	24"	15"	4.5'	11	20	25	25		~DENSE TO VERY DENSE~
	3D	24"	18"	7.0'	13	23	31	31		BROWN SAND AND GRAVEL, TRACE SILT
	4D	9"	7"	7.7'	31	50/3"				
	5D	22"	17"	11.8'	9	14	21	50/5"		~DENSE~
	6D	24"	16"	17.0'	22	18	25	29		
	7D	12"	10"	21.0'	29	48				~VERY DENSE~
										BOTTOM OF EXPLORATION AT 21.0'

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

(15)

BORING NO.: **B-114**



**KEY TO THE NOTES & SYMBOLS**  
**Test Boring and Test Pit Explorations**

All stratification lines represent the approximate boundary between soil types and the transition may be gradual.

**Key to Symbols Used:**

- w - water content, percent (dry weight basis)
- q<sub>u</sub> - unconfined compressive strength, kips/sq. ft. - laboratory test
- S<sub>v</sub> - field vane shear strength, kips/sq. ft.
- L<sub>v</sub> - lab vane shear strength, kips/sq. ft.
- q<sub>p</sub> - unconfined compressive strength, kips/sq. ft. – pocket penetrometer test
- O - organic content, percent (dry weight basis)
- W<sub>L</sub> - liquid limit - Atterberg test
- W<sub>P</sub> - plastic limit - Atterberg test
- WOH - advance by weight of hammer
- WOM - advance by weight of man
- WOR - advance by weight of rods
- HYD - advance by force of hydraulic piston on drill
- RQD - Rock Quality Designator - an index of the quality of a rock mass.
- γ<sub>T</sub> - total soil weight
- γ<sub>B</sub> - buoyant soil weight

**Description of Proportions:**

- Trace: 0 to 5%
- Some: 5 to 12%
- “Y” 12 to 35%
- And 35+%
- With Undifferentiated

**Description of Stratified Soils**

- Parting: 0 to 1/16” thickness
- Seam: 1/16” to 1/2” thickness
- Layer: ½” to 12” thickness
- Varved: Alternating seams or layers
- Occasional: one or less per foot of thickness
- Frequent: more than one per foot of thickness

**REFUSAL: Test Boring Explorations** - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

**REFUSAL: Test Pit Explorations** - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

Project Name PORTLAND ME - PROPOSED SENIOR LIVING - THE PARK  
DANFORTH - GEOTECHNICAL ENGINEERING SERVICES

Project Number 14-0065

Client THE PARK-DANFORTH

Lab ID 18232G

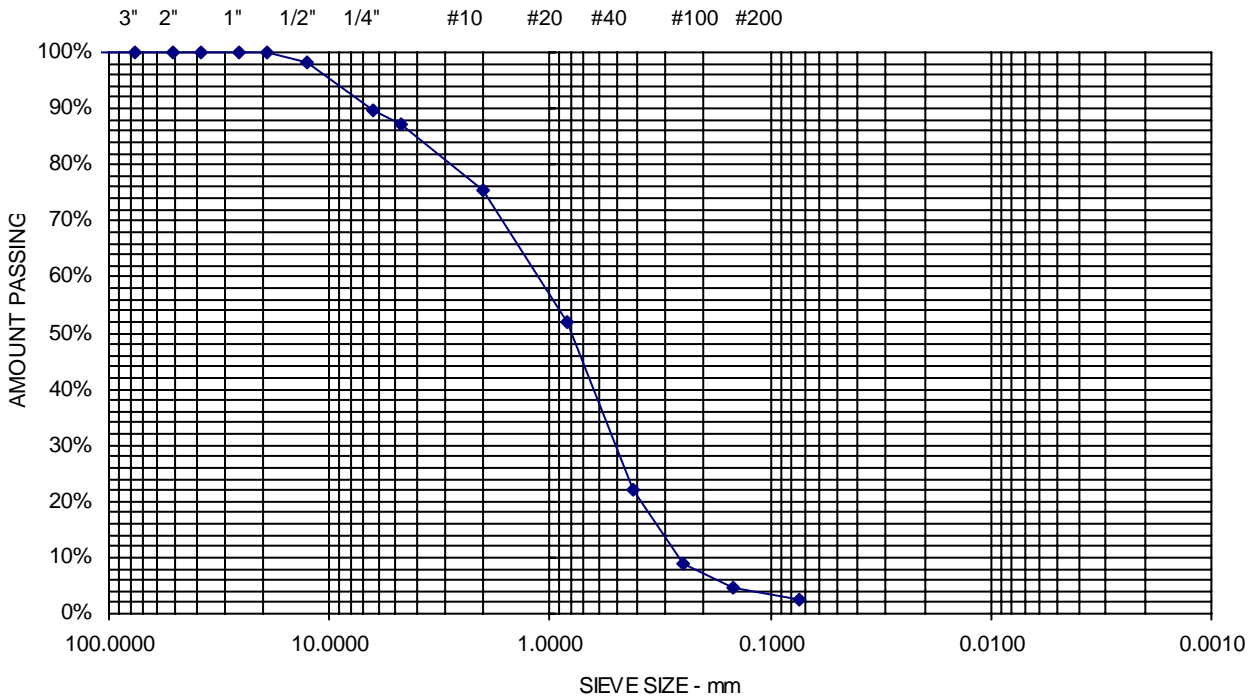
Date Received 5/28/2014

Date Completed 5/30/2014

Material Source B-104 2D 2.5-4.5

Tested By JUSTIN BISSON

<u>STANDARD DESIGNATION (mm/μm)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
150 mm	6"	100	
125 mm	5"	100	
100 mm	4"	100	
75 mm	3"	100	
50 mm	2"	100	
38.1 mm	1-1/2"	100	
25.0 mm	1"	100	
19.0 mm	3/4"	100	
12.5 mm	1/2"	98	
6.3 mm	1/4"	90	
4.75 mm	No. 4	87	12.8% Gravel
2.00 mm	No. 10	75	
850 μm	No. 20	52	
425 μm	No. 40	22	84.8% Sand
250 μm	No. 60	9	
150 μm	No. 100	5	
75 μm	No. 200	2.4	2.4% Fines





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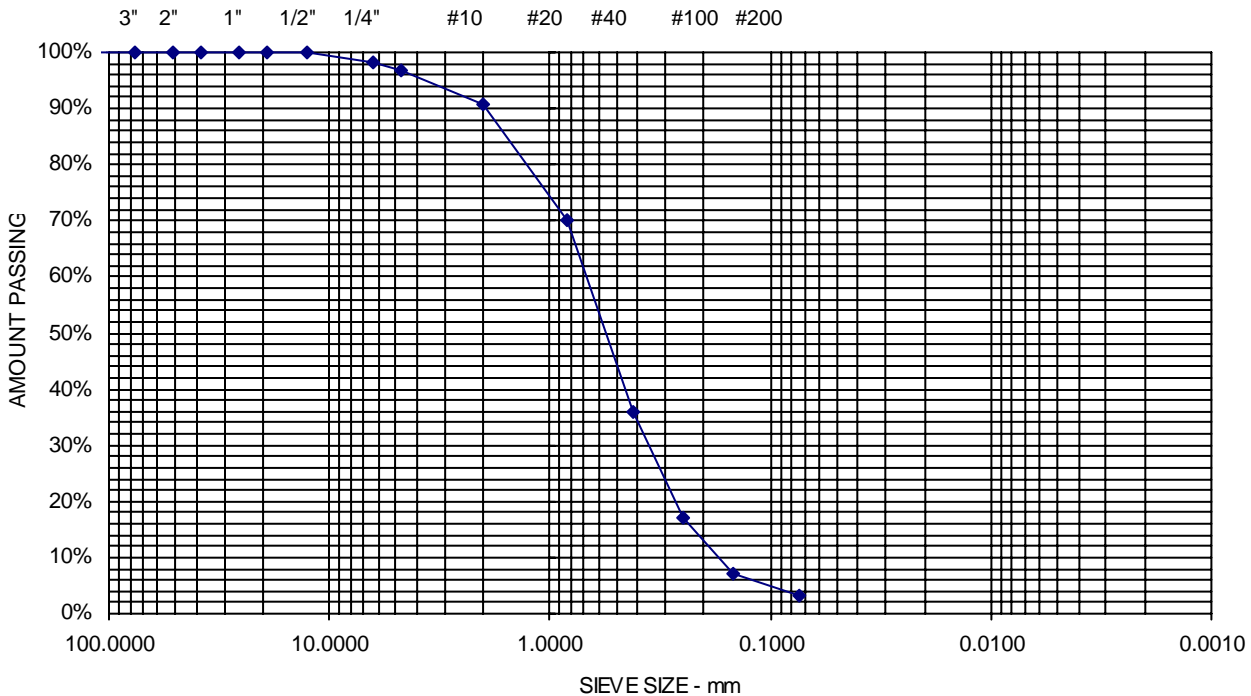
Date Received 5/28/2014

Date Completed 5/30/2014

Material Source B-104 5D 10-12

Tested By JUSTIN BISSON

<u>STANDARD DESIGNATION (mm/μm)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
150 mm	6"	100	
125 mm	5"	100	
100 mm	4"	100	
75 mm	3"	100	
50 mm	2"	100	
38.1 mm	1-1/2"	100	
25.0 mm	1"	100	
19.0 mm	3/4"	100	
12.5 mm	1/2"	100	
6.3 mm	1/4"	98	
4.75 mm	No. 4	97	3.2% Gravel
2.00 mm	No. 10	91	
850 μm	No. 20	70	
425 μm	No. 40	36	93.4% Sand
250 μm	No. 60	17	
150 μm	No. 100	7	
75 μm	No. 200	3.3	3.3% Fines



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Lab ID 18234G

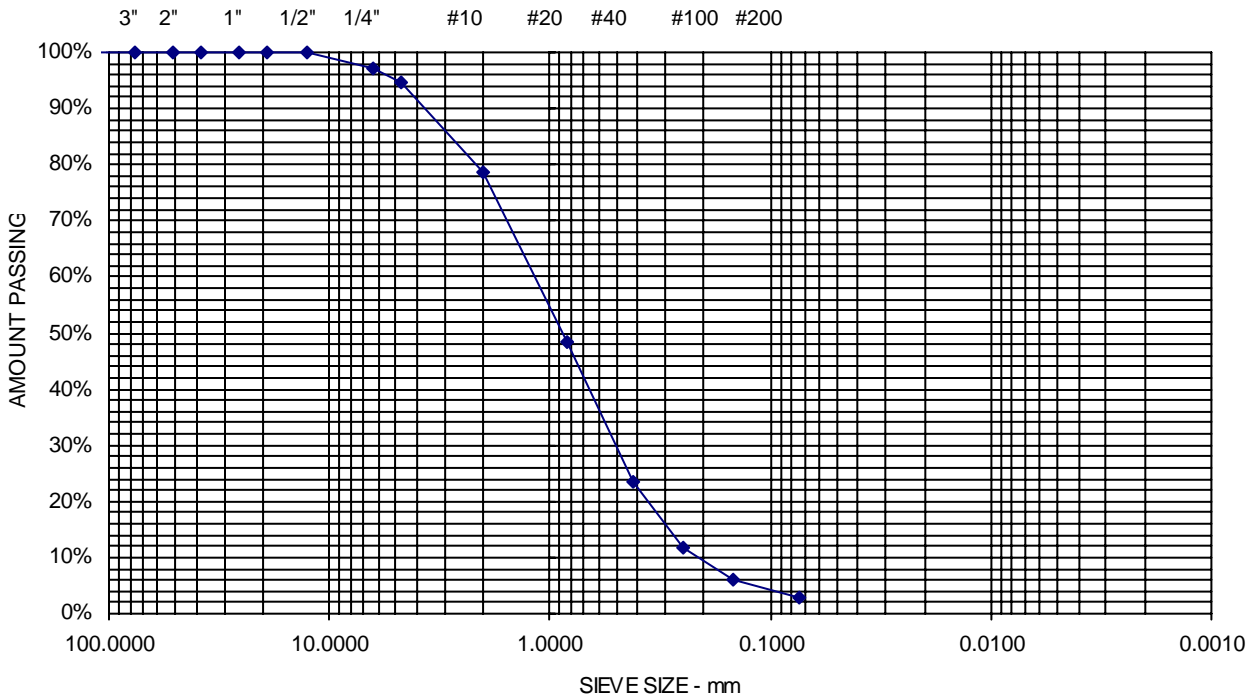
Date Received 5/28/2014

Date Completed 5/30/2014

Material Source B-106 4D 7-9

Tested By JUSTIN BISSON

<u>STANDARD DESIGNATION (mm/μm)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
150 mm	6"	100	
125 mm	5"	100	
100 mm	4"	100	
75 mm	3"	100	
50 mm	2"	100	
38.1 mm	1-1/2"	100	
25.0 mm	1"	100	
19.0 mm	3/4"	100	
12.5 mm	1/2"	100	
6.3 mm	1/4"	97	
4.75 mm	No. 4	95	5.4% Gravel
2.00 mm	No. 10	79	
850 μm	No. 20	48	
425 μm	No. 40	24	91.7% Sand
250 μm	No. 60	12	
150 μm	No. 100	6	
75 μm	No. 200	2.9	2.9% Fines



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Lab ID 18235G

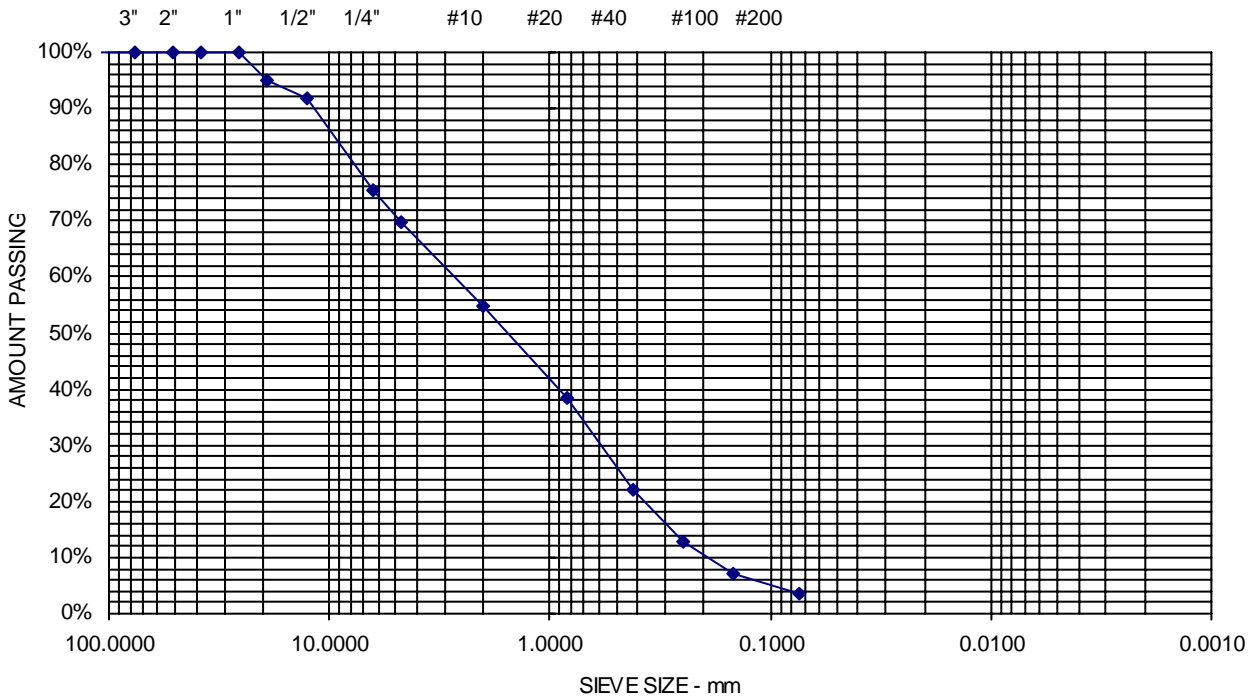
Date Received 5/28/2014

Date Completed 5/30/2014

Material Source B-106 6D 15-17

Tested By JUSTIN BISSON

<u>STANDARD DESIGNATION (mm/μm)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
150 mm	6"	100	
125 mm	5"	100	
100 mm	4"	100	
75 mm	3"	100	
50 mm	2"	100	
38.1 mm	1-1/2"	100	
25.0 mm	1"	100	
19.0 mm	3/4"	95	
12.5 mm	1/2"	92	
6.3 mm	1/4"	75	
4.75 mm	No. 4	70	30.3% Gravel
2.00 mm	No. 10	55	
850 μm	No. 20	39	
425 μm	No. 40	22	66.2% Sand
250 μm	No. 60	13	
150 μm	No. 100	7	
75 μm	No. 200	3.6	3.6% Fines



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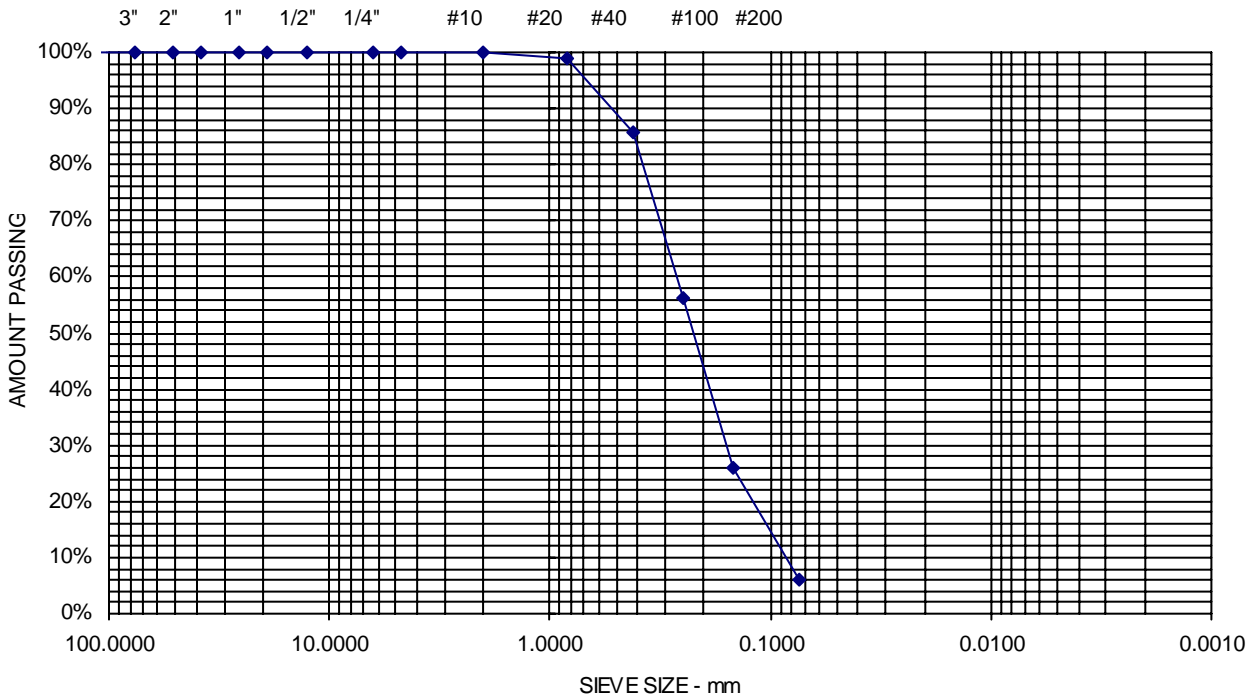
Date Received 5/28/2014

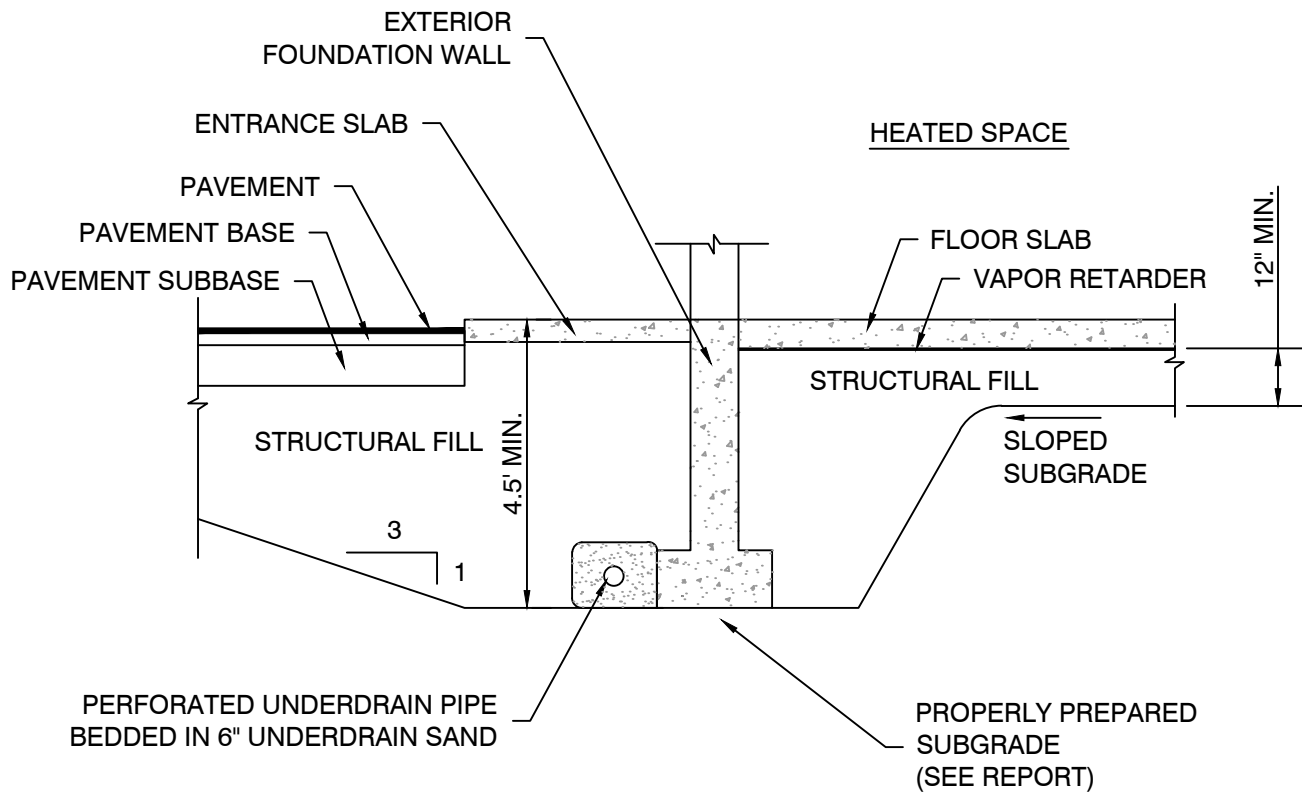
Date Completed 5/30/2014

Material Source B-106 7D 20-22

Tested By JUSTIN BISSON

<u>STANDARD DESIGNATION (mm/μm)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
150 mm	6"	100	
125 mm	5"	100	
100 mm	4"	100	
75 mm	3"	100	
50 mm	2"	100	
38.1 mm	1-1/2"	100	
25.0 mm	1"	100	
19.0 mm	3/4"	100	
12.5 mm	1/2"	100	
6.3 mm	1/4"	100	
4.75 mm	No. 4	100	0% Gravel
2.00 mm	No. 10	100	
850 μm	No. 20	99	
425 μm	No. 40	86	94.1% Sand
250 μm	No. 60	56	
150 μm	No. 100	26	
75 μm	No. 200	5.9	5.9% Fines





**NOTE:**

1. UNDERDRAIN INSTALLATION AND MATERIAL GRADATION RECOMMENDATIONS ARE CONTAINED WITHIN THIS REPORT.
2. DETAIL IS PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY, NOT FOR CONSTRUCTION.



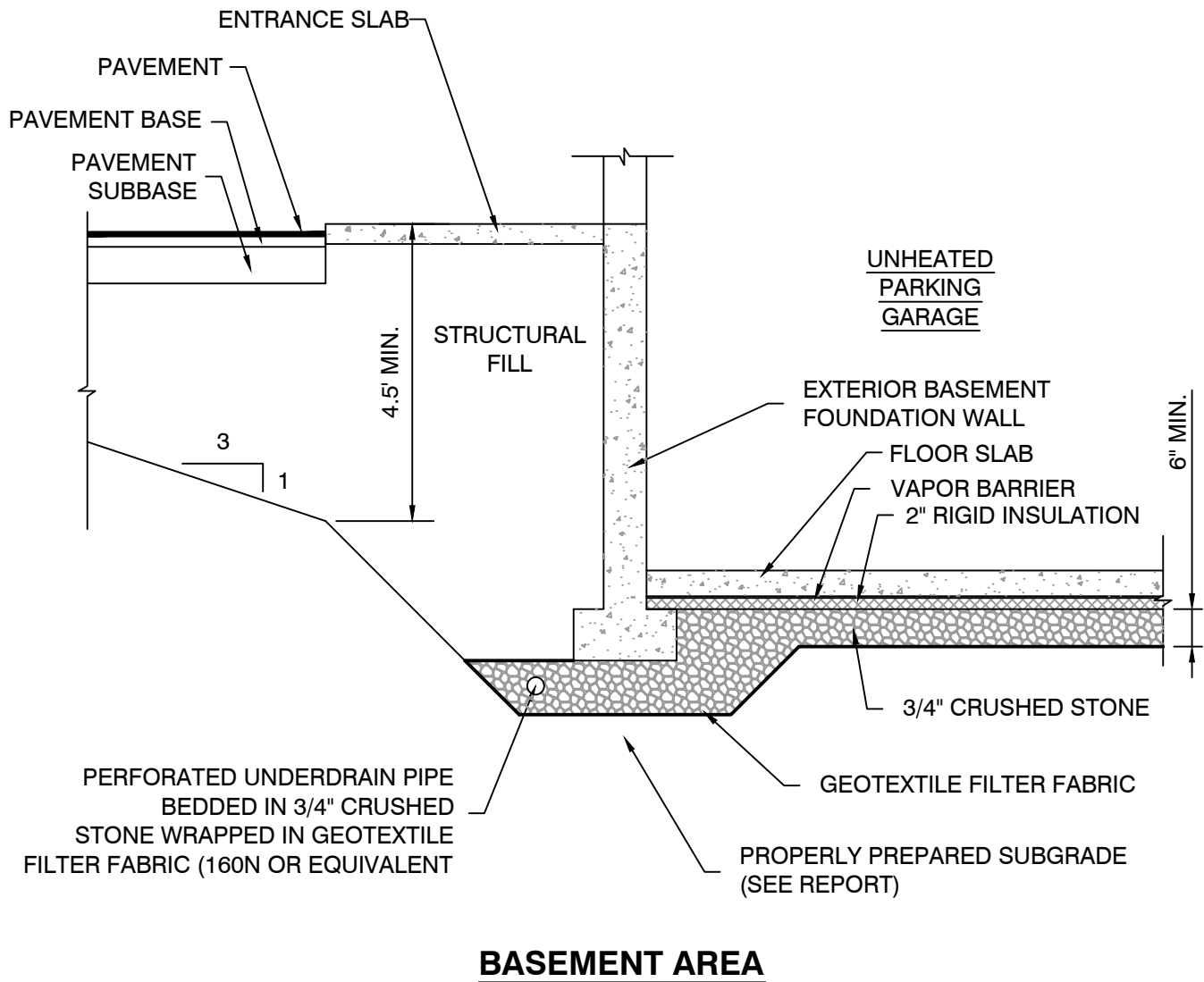
**S.W. COLE**  
ENGINEERING, INC.

THE PARK DANFORTH  
C/O MITCHELL & ASSOCIATES

**UNDERDRAIN DETAIL**

PROPOSED APARTMENT BUILDING  
ARBOR STREET AND FOREST AVENUE  
PORTLAND, MAINE

Job No.:	14-0065	Scale:	Not to Scale
Date :	09/30/2014	Sheet:	22



**BASEMENT AREA**

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Date :	09/30/2014	Sheet:	23