GEOTECHNICAL ENGINEERING SERVICES
PROPOSED COMNAV ENGINEERING BUILDING
1039 RIVERSIDE STREET
PORTLAND, MAINE

11-0446 JUNE 29, 2011

PREPARED FOR:

Hardy Pond Construction
Attention: Bob Gaudreau
7 Tee Drive
Portland, ME 04103

PREPARED BY:

S.W.COLE ENGINEERING, INC.
286 Portland Road
Gray, ME 04039-9586

TABLE OF CONTENTS

11-0446

June 29, 2011

Hardypond Construction
Attention: Bob Gaudreau
7 Tee Drive
Portland, ME 04103

Subject: Geotechnical Engineering Services
Proposed ComNav Engineering Building
1039 Riverside Street
Portland, Maine

Dear Mr. Gaudreau:

In accordance with our Proposal dated May 25, 2011, we have completed a subsurface investigation of the proposed ComNav Engineering Building located at 1039 Riverside Street in Portland, Maine. This report summarizes our findings and geotechnical recommendations relative to foundations and earthwork associated with the proposed building construction. The contents of this report are subject to the limitations set forth in Attachment A.

1.0 INTRODUCTION

1.1 Scope and Purpose

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

1.2 Proposed Construction

We understand development plans call for construction of a two story, light manufacturing and office building with associated paved areas. We understand the proposed building will be steel framed with EIFS siding. The proposed building will occupy a plan area of about 7,500 square feet with a finished floor elevation approximately 1 to 3 feet above existing grades at elevation 69.0 feet. A 33 foot by 75 foot future addition is planned off the south end of the building. Proposed column loads are estimated to range from 5 kips to 40 kips. Details regarding proposed grading are not available at this time. Proposed and existing site features are shown on the "Exploration Location Plan" attached as Sheet 1.

2.0 EXPLORATION AND TESTING

2.1 Explorations

Three test boring explorations (B-101 to B-103) were made at the site on June 3, 2011. The explorations were made by Great Works Test Boring, Inc. of Rollinsford, New Hampshire working under subcontract to S. W. COLE ENGINEERING, INC. The exploration locations were established in the field based on taped measurements from existing site features. The approximate exploration locations are shown on the "Exploration Location Plan" attached as Sheet 1. Logs of the explorations are attached as Sheets 2 through 5. A key to the notes and symbols used on the logs is attached as Sheet 6. Elevations shown on the logs were estimated based on topographic information shown on Sheet 1.

2.2 Testing

The test borings were made using a combination of solid-stem augers and cased wash-boring drilling techniques. The soils were sampled in the test borings at 5 to 10 foot intervals using a split spoon sampler and Standard Penetration Test (SPT) methods. Where stiffer clay soils were encountered, we performed Pocket Penetrometer Tests (PPT) to assess unconfined compressive strength. Where softer clay soils where encountered, we performed Vane Shear Tests (VST) to assess in-situ shear strength. SPT, PPT and VST results are shown on the attached logs. We obtained two undisturbed Shelby Tube samples of relatively soft compressible gray silty clay encountered beneath the site.

Soil samples obtained from the explorations were returned to our laboratory for classification and testing. Moisture content and Atterberg Limits test results are shown on the logs. The results of two one-dimensional consolidation tests are attached as Sheets 7 and 8.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

The site is a vacant lot in a commercial development located at 1039 Riverside Street in Portland, Maine. The site is bordered to the north by Riverside Street, existing single-story, light manufacturing and office buildings to the south and west, and a vacant undeveloped lot to the east. The site is generally grassed with some small brush and relatively flat between approximately elevation 66 and 68 feet. A western half to two-thirds of the proposed building pad appears to have been filled with topography dropping a few feet near the eastern portion of the proposed building pad. Based on DigSafe marks observed in the field at the time of drilling, it appears that active and abandoned subsurface utilities traverse the proposed building pad.

3.2 Subsurface Conditions

Below a surficial layer of topsoil (where encountered), the test borings generally encountered 2 to 3 feet of loose to medium dense brown silty sand with varying proportions of gravel and rootlets (granular fill), overlying loose to medium dense brown to gray silt and sand to a depth of approximately 9 feet, overlying glaciomarine clay. The glaciomarine clay was observed to extend to refusal surfaces (probable bedrock or dense glacial till) at depths varying between approximately 73 and 76 feet. The glaciomarine clays are typical of coastal Maine consisting of a thin crust of relatively stiff silt/clay overlying a thick layer of relatively soft, compressible silty clay. Not all the strata were encountered in each of the explorations. Please refer to the attached logs for more detailed descriptions of the subsurface findings.

3.3 Groundwater Conditions

Free groundwater was not observed within the boreholes within the short time-frame they remained opened. The soils were observed to be saturated below a depth of about 5 feet. In general, it should be anticipated that seasonal groundwater levels will fluctuate, especially during times of snowmelt and heavy precipitation.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General Findings

Based on the subsurface findings and our understanding of the proposed construction, it is our opinion that the proposed construction appears feasible from a geotechnical standpoint. The principal geotechnical concerns are the presence of sensitive, compressible glaciomarine clays beneath the site. The upper stiff clay/silt provides reasonable bearing for conventional spread footings, but it is sensitive to strength loss when disturbed. The underlying soft gray silty clay will consolidate under the weight of new fills and building loads and is sensitive to strength loss when disturbed.

Based on the subsurface findings and our understanding of the proposed construction, we recommend the proposed building be supported on spread footing foundations with an on-grade floor slab. We recommend that footings be underlain with a 6-inch thick mat of Crushed Stone wrapped in a woven geotextile fabric. We recommend that excavations not penetrate the stiff clay/silt.

4.2 Site and Subgrade Preparation

Topsoil and organics must be removed from proposed building and paved areas. Following removal of organic soils, the existing fills in the building area should be spread to a depth of about 1-foot across the building pad and compacted prior to placing additional compacted fills. We recommend that active and abandoned utilities be completely removed from beneath the proposed building footprint and backfilled with compacted Granular borrow. We recommend the building pad be raised with imported sand and gravel meeting the requirements of compacted Granular Borrow or Structural Fill from off-site sources.

Footing Subgrades: Based on the subsurface findings and our understanding of the proposed construction, we anticipate that footing subgrades will consist of native stiff brown to gray clay/silt, silty sand and fine sand. We recommend that footing subgrades be excavated using a smooth-edged bucket to help reduce disturbance to subgrade soils. We recommend that footing subgrade be protected with at least 6 inches of Crushed Stone wrapped in a woven geotextile fabric such as Mirafi 500X. The Crushed Stone will provide a working mat for foundation construction and a drainage media for construction dewatering as well as long-term foundation drainage.

As discussed, it is imperative that foundation excavations do not penetrate or compromise the stiff clay/silt, as the stiff clay/silt provides a stable raft over softer gray clay that is unsuitable for direct support of foundations or utilities.

Utility Subgrades: Based on the subsurface findings and our understanding of the proposed construction, we anticipate the shallow utilities, such as storm drains, gas, water and power, will be founded on relatively stiff brown silty clay and that conventional bedding practices may be followed. Similarly, we anticipate that deeper utilities, such as sanitary sewer, may penetrate the relatively stiff clay/silt and be founded on soft gray silty clay. We recommend that utility trench subgrades be excavated with a smooth edged bucket to help preclude disturbing the sensitive clays. Pipes and conduits founded on the soft gray silty clay should be underlain with a 12-inch thick layer of Crushed Stone wrapped in woven geotextile fabric (fabric wrapped stone mats) below customary bedding materials. Utility structures, such as manholes and vaults, founded on the soft gray silty clay should be underlain by two 12-inch thick fabric wrapped crushed stone mats extending at least 2 feet beyond the edges of the structures.

Shoring and Dewatering: Groundwater seepage may be encountered during excavation work, particularly during periods of precipitation. Sumping and pumping from the Crushed Stone working mats should be adequate to control groundwater within excavations. Excavations must be properly sloped or shored according to OSHA Trenching Regulations.

4.3 Foundation Design

Based on the subsurface findings and our understanding of the proposed construction, the proposed building may be supported on spread footing foundations. The design freezing index for the Portland, Maine area is about 1,250-Fahrenheit degree-days, which corresponds to a frost penetration depth on the order of 4.5 feet. For spread footings, bearing on properly prepared subgrades, we recommend the following geotechnical parameters for design of spread footings:

- Allowable Soil Bearing Pressure 2.0 ksf
- Seismic Soil Site Class (IBC 2009) E
- Base Friction Factor 0.4

- Passive Lateral Earth Pressure Coefficient (K_p) 3.0
- At-Rest Lateral Earth Pressure Coefficient (K_o) 0.5
- Total Unit Weight of Backfill (γ_t) 125 pcf
- Internal Friction Angle (ϕ) 30 degrees

Wall footings should be at least 18 inches wide and column footings should be at least 36 inches in their least lateral dimension.

4.4 Settlement Analysis

We have made an analysis of the post-construction consolidation of the underlying compressible gray silty clay beneath the proposed structure. Our analysis has been based upon the following:

1. The subsurface information obtained at the borings
2. Prior existing grades in the building area of 66 feet
3. A finish floor elevation of 69± feet
4. The consolidation information from Boring B-101
5. Estimated floor loads of 100 psf or less, wall loads of 1 klf or less and column loads of 40 kips or less

Based on the above, we estimate that post-construction settlement due to consolidation of the gray silty clay may approach 1 inch of total settlement and ¾-inch of differential settlement. The project owner and designers should review estimated settlement to determine if it is within tolerable limits.

4.5 Foundation Drainage

We recommend that perimeter underdrains be installed in the fabric wrapped Crushed Stone mats beneath the perimeter footings. Underdrain pipe should consist of 4-inch diameter slotted foundation drain pipe enveloped in the Crushed Stone. The underdrains must have positive gravity outlets protected from freezing. General underdrain details are illustrated on Sheet 9.

4.6 Slab-on-Grade Floors

We recommend on-grade concrete floors be supported on a minimum of 12 inches of compacted Structural Fill. On-grade floor slabs founded on properly prepared subgrades, may be designed considering a modulus of subgrade reaction of 180 pci be considered in the floor slab design. The structural engineer or concrete consultant must design steel reinforcing and joint spacing appropriate to slab thickness and function.

We recommend consideration of 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 to reduce the potential for floor covering damage from moisture. The vapor retarder shall have a permeance that is less than the floor cover 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 shall 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 flooring and adhesive materials.

4.7 Entrance Slabs and Sidewalks

Entrance slabs and sidewalks adjacent to buildings must be designed to reduce the effects of differential frost action between adjacent pavement, doorways, and entrances. We recommend that clean, non-frost susceptible sand and gravel meeting the requirements of 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 slabs and outward at least 4.5 feet, thereafter transitioning up to the bottom of the adjacent sidewalk or pavement subbase gravel at a 3H:1V or flatter slope. General details of this frost transition zone are illustrated on Sheet 9.

4.8 Backfill and Compaction

Based on the subsurface findings, the native clay/silt and clays are unsuitable for reuse as fill within building and paved areas. We recommend the following fill and backfill materials.

Granular Borrow: Compacted fill to raise site grades in pavement and building areas should be sand, silty sand or sand and gravel meeting the requirements of MDOT Standard Specification 703.19 "Granular Borrow" as given below.

MDOT 703.19 Granular Borrow	
Sieve Size	**Percent Finer by Weight**
6 inch	100
#40	0 to 70
#200	0 to 10

Structural Fill: Backfill for foundations and base gravel below floor slabs should be clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below.

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

Crushed Stone: Crushed Stone, used below footings and as foundation drainage aggregate, should meet the gradation requirements of MDOT Standard Specifications 703.22 "Underdrain Backfill Type C".

MDOT 703.22 Underdrain Backfill Material Type C	
Sieve Size	**Percent Finer by Weight**
1 inch	100
¾ inch	90-100
⅜ inch	0-75
#4	0-25
#10	0-5

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

The silt/clay and silty clay soils on-site are easily disturbed especially when wet. Construction activity should be limited during wet weather and the native 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.

In all cases, sitework and construction activities should take appropriate measures to protect exposed subgrades. This may require the use of temporary haul roads and staging areas to preclude subgrade damage due to construction traffic. Geotextile fabric may also be needed below haul roads and/or proposed paved areas to help stabilize subgrades for temporary construction traffic.

4.10 Design Review and Construction Testing

S. W. COLE ENGINEERING, INC. should be retained to review the final design and specifications to determine that our earthwork recommendations have been properly interpreted and implemented.

A soils and concrete testing program should also be implemented during construction to observe compliance with the design concepts, plans, and specifications. S. W. COLE ENGINEERING, INC. is available to provide field and laboratory testing services for soil, concrete, steel, masonry, spray-applied fire-proofing, and asphalt construction materials.

5.0 CLOSURE

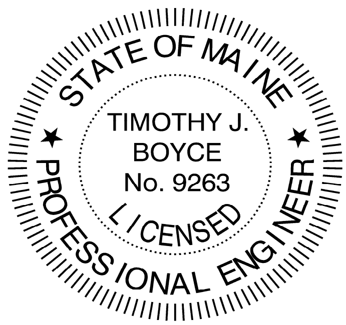
It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you as the design progresses and during the construction phase of this project.

Sincerely,

S. W. COLE ENGINEERING, INC.

Nathan B. Seguin, P.E.
Geotechnical Engineer

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



NBS/TJB:tjb

Attachment A - Limitations

This report has been prepared for the exclusive use of Associated Design Partners for specific application to the proposed Port Resources Office Building to be located at 280 Gannett Drive in South Portland, Maine. S. W. COLE ENGINEERING, INC. has endeavored to conduct the work in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

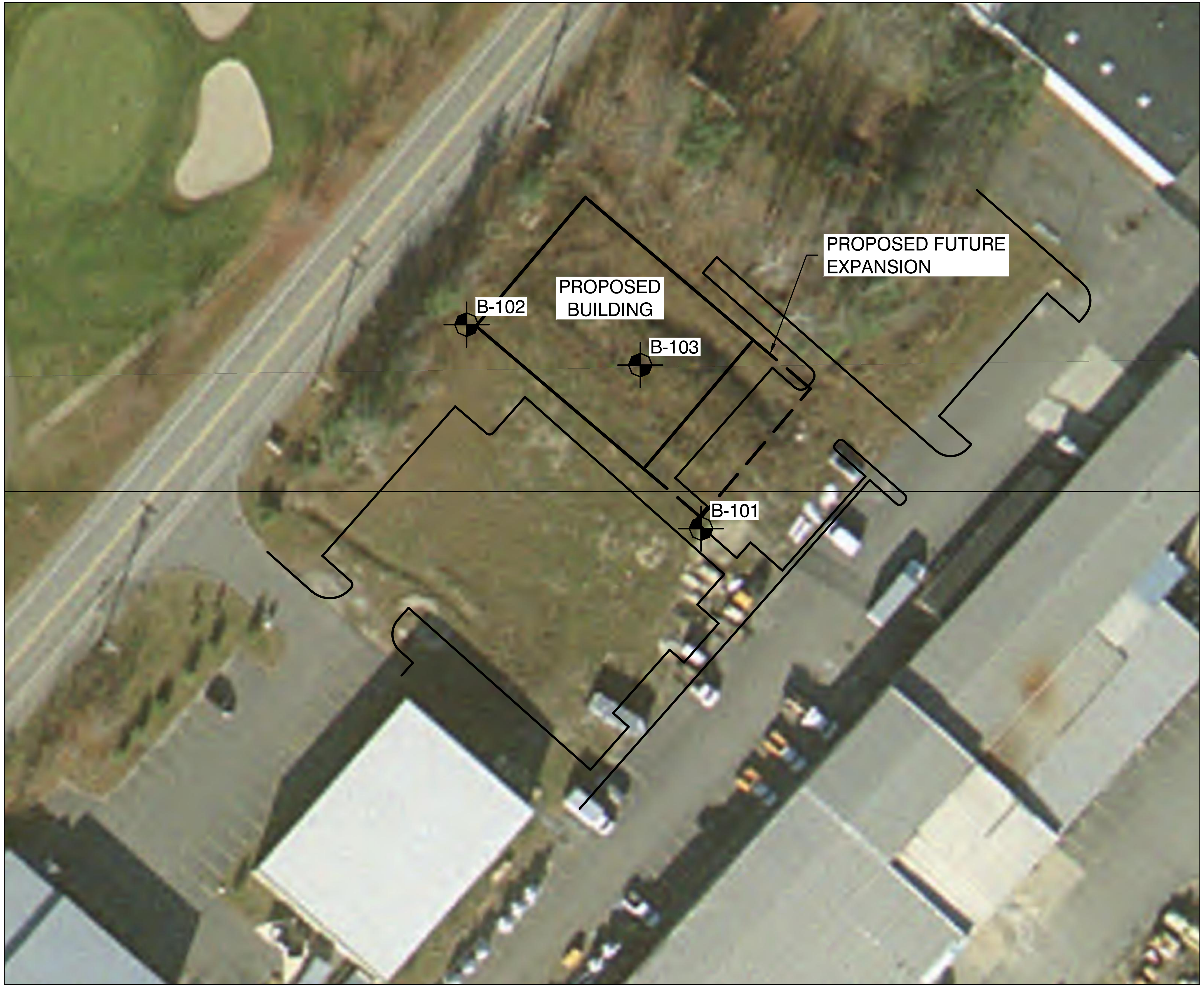
The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

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 ENGINEERING, INC.'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 ENGINEERING, INC. 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 ENGINEERING, INC.



NORTH

0 25 50 100 150 200

SCALE IN FEET

LEGEND:

⌖ APPROXIMATE BORING LOCATION

NOTES:

1. EXPLORATION LOCATION PLAN WAS PREPARED FROM A 1"=50' SCALE SKETCH OF THE SITE DATED 05/12/2011 AND PROVIDED AS A PORTABLE DOCUMENT FORMAT (PDF) AND STATE OF MAINE AERIAL ORTHOPHOTOS PROVIDED BY THE STATE OF MAINE, MAINE OFFICE OF GIS AND MAINE GEOLIBRARY BOARD
2. THE LOCATIONS OF BORINGS ARE APPROXIMATE AND ARE BASED ON THE RELATIVE LOCATIONS TO EXISTING SITE FEATURES.
3. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S.W. COLE ENGINEERING, INC. 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.

S.W. COLE ENGINEERING, INC.

HARDYPOND CONSTRUCTION

EXPLORATION LOCATION PLAN

PROPOSED COMNAV BUILDING
1039 RIVERSIDE STREET
PORTLAND, MAINE

Job No.:	11-0446	Scale:	1" = 50' ±
Date :	06/23/2011	Sheet:	1

R:\2011\11-0446\CAD\Drawings\11-0446 Sheet 1 ELP.dwg, 6/23/2011 9:40:44 AM, 1:1, CEM, S.W. Cole Engineering, Inc.

S.W.COLE ENGINEERING, INC.

BORING LOG

BORING NO.:	**B-101**
SHEET:	1 OF 2
PROJECT NO.:	11-0446
DATE START:	6/3/2011
DATE FINISH:	6/3/2011
ELEVATION:	68' ±
SWC REP.:	NBS

PROJECT / CLIENT: PROPOSED COMNAV BUILDING / HARDYPOND CONSTRUCTION
LOCATION: 1039 RIVERSIDE STREET - PORTLAND, MAINE
DRILLING CO. : GREAT WORKS TEST BORING, INC. DRILLER: JEFF LEE

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:				
SAMPLER:	SS	1 3/8"	140 lbs	30"
CORE BARREL:				

WATER LEVEL INFORMATION
SOILS APPEAR SATURATED BELOW 5.0'

CASING BLOWS PER FOOT	SAMPLE NO.	PEN.	REC.	DEPTH @ BOT	SAMPLER BLOWS PER 6" 0-6	6-12	12-18	18-24	DEPTH	STRATA & TEST DATA
									0.1'	BROWN SILTY SAND WITH SOME ORGANICS (TOPSOIL)
	1D	24"	18"	2.0'	4	7	7	6	2.0'	LIGHT BROWN SILTY GRAVELLY SAND (FILL) ~ MEDIUM DENSE ~
									3.0'	ORANGE - BROWN SILTY FINE SAND (FILL) ~ MEDIUM DENSE ~
	2D	24"	18"	4.0'	8	8	7	7	4.0'	LIGHT BROWN FINE SAND WITH SOME SILT ~MEDIUM DENSE ~
										LIGHT BROWN FINE SANDY SILT
										~ MEDIUM DENSE ~
	3D	24"	20"	7.0'	3	8	8	10	6.8'	
										GRAY FINE SANDY SILT
	4D	24"	22"	9.0'	9	8	5	5	9.0'	~ MEDIUM DENSE ~
	5D	24"	24"	12.0'	WOH →					~ SOFT BECOMING…
										(OCCASIONAL FINE SAND SEAMS)
										W_L = 50
	1S	24"	24"	17.0'	HYDRAULIC PUSH					W_P = 25
	3 1/2" X 7" VANE			17.7'	HYDRAULIC PUSH					S_V = 0.57 / 0.05 ksf; w = 43.7%
	3 1/2" X 7" VANE			18.4'	HYDRAULIC PUSH					S_V = 0.52 / 0.10 ksf; …MEDIUM ~
										GRAY SILTY CLAY
										~ MEDIUM ~
										W_L = 49
	2S	24"	22"	27.0'	HYDRAULIC PUSH					W_P = 25
	3 1/2" X 7" VANE			27.7'	HYDRAULIC PUSH					S_V = 0.52 / 0.08 ksf; w = 47.1%
	3 1/2" X 7" VANE			28.4'	HYDRAULIC PUSH					S_V = 0.52 / 0.09 ksf
	3 1/2" X 7" VANE			35.7'	HYDRAULIC PUSH					S_V = 0.67 / 0.05 ksf
	3 1/2" X 7" VANE			36.4'	HYDRAULIC PUSH					S_V = 0.57 / 0.02 ksf

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

SOIL CLASSIFIED BY:
[ ] DRILLER - VISUALLY
[X] SOIL TECH. - VISUALLY
[X] LABORATORY TEST

REMARKS:

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

2

BORING NO.: **B-101**

S.W.COLE ENGINEERING, INC.

BORING LOG

BORING NO.: **B-101**
SHEET: 2 OF 2
PROJECT NO.: 11-0446

PROJECT / CLIENT: PROPOSED COMNAV BUILDING / HARDYPOND CONSTRUCTION
LOCATION: 1039 RIVERSIDE STREET - PORTLAND, MAINE
DRILLING CO. : GREAT WORKS TEST BORING, INC. DRILLER: JEFF LEE

DATE START: 6/3/2011
DATE FINISH: 6/3/2011
ELEVATION: 68' ±
SWC REP.: NBS

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:				
SAMPLER:	SS	1 3/8"	140 lbs	30"
CORE BARREL:				

WATER LEVEL INFORMATION
SOILS APPEAR SATURATED BELOW 5.0'

CASING BLOWS PER FOOT	SAMPLE NO.	PEN.	REC.	DEPTH @ BOT	SAMPLER BLOWS PER 6" 0-6	6-12	12-18	18-24	DEPTH	STRATA & TEST DATA
	3 1/2" X 7" VANE			45.7'	HYDRAULIC PUSH					S_V = 0.61 / 0.01 ksf
	3 1/2" X 7" VANE			46.4'	HYDRAULIC PUSH					S_V = 0.59 / 0.01 ksf
										GRAY SILTY CLAY ~ MEDIUM ~
	3 1/2" X 7" VANE			55.7'	HYDRAULIC PUSH					S_V = 0.74 / 0.01 ksf
	3 1/2" X 7" VANE			56.4'	HYDRAULIC PUSH					S_V = 0.73 / 0.01 ksf
	3 1/2" X 7" VANE			65.7'	HYDRAULIC PUSH				65.7'	S_V = 0.93 / 0.01 ksf
										PROBABLE GRAY SILTY CLAY WITH FREQUENT SAND SEAMS (ROLLER CONE PROBE - NO SAMPLING)
									73.0'	
										REFUSAL @ 73.0 FEET (PROBABLE BEDROCK OR BOULDER)

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

SOIL CLASSIFIED BY:
[ ] DRILLER - VISUALLY
[X] SOIL TECH. - VISUALLY
[X] LABORATORY TEST

REMARKS:

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

3

BORING NO.: **B-101**

S.W.COLE ENGINEERING, INC.

BORING LOG

BORING NO.: **B-102**
SHEET: 1 OF 1
PROJECT NO.: 11-0446

PROJECT / CLIENT: PROPOSED COMNAV BUILDING / HARDYPOND CONSTRUCTION
LOCATION: 1039 RIVERSIDE STREET - PORTLAND, MAINE
DRILLING CO. : GREAT WORKS TEST BORING, INC. DRILLER: JEFF LEE

DATE START: 6/3/2011
DATE FINISH: 6/3/2011
ELEVATION: 68' ±
SWC REP.: NBS

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:	0	0		
SAMPLER:	SS	1 3/8"	140 lbs	30"
CORE BARREL:				

WATER LEVEL INFORMATION
SOILS APPEAR SATURATED BELOW 5.0'

CASING BLOWS PER FOOT	SAMPLE NO.	SAMPLE PEN.	SAMPLE REC.	SAMPLE DEPTH @ BOT	SAMPLER BLOWS PER 6" 0-6	6-12	12-18	18-24	DEPTH	STRATA & TEST DATA
										BROWN SILTY FINE SAND WITH TRACE ORGANICS (FILL)
	1D	24"	16"	2.0'	2	2	4	3		~ LOOSE ~
									3.0'	
	2D	24"	18"	4.0'	3	5	6	7	3.8'	GRAY - LIGHT BROWN FINE SANDY SILT ~ LOOSE TO MEDIUM DENSE ~
										LIGHT BROWN FINE SAND WITH SOME SILT
										~ MEDIUM DENSE ~
	3D	24"	18"	7.0'	4	7	7	7	6.3'	
									7.8'	LIGHT BROWN FINE SANDY SILT ~ MEDIUM DENSE ~
	4D	24"	20"	9.0'	6	9	10	12	9.0'	GRAY FINE SANDY SILT ~ MEDIUM DENSE ~
										GRAY SILTY CLAY WITH SOME FINE SAND SEAMS
									11.0'	~ SOFT ~
	5D	24"	24"	12.0'	WOH	3	1	→		
	3 1/2" X 7" VANE			15.7'	HYDRAULIC PUSH					S_V = 0.50 / 0.05 ksf
	3 1/2" X 7" VANE			16.4'	HYDRAULIC PUSH					S_V = 0.52 / 0.05 ksf
										GRAY SILTY CLAY
										~ SOFT TO MEDIUM ~
	3 1/2" X 7" VANE			25.7'	HYDRAULIC PUSH					S_V = 0.51 / 0.05 ksf
	3 1/2" X 7" VANE			26.4'	HYDRAULIC PUSH				26.4'	S_V = 0.52 / 0.06 ksf
										ROD PROBE 26.4 TO 76 FEET (NO SAMPLING)
									76.0'	REFUSAL @ 76 FEET (PROBABLE BOULDER OR TILL)

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

SOIL CLASSIFIED BY:
[ ] DRILLER - VISUALLY
[X] 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-102**

S.W.COLE ENGINEERING, INC.

BORING LOG

BORING NO.: **B-103**
SHEET: 1 OF 1
PROJECT NO.: 11-0446
DATE START: 6/3/2011
DATE FINISH: 6/3/2011
ELEVATION: 68' ±
SWC REP.: NBS

PROJECT / CLIENT: PROPOSED COMNAV BUILDING / HARDYPOND CONSTRUCTION
LOCATION: 1039 RIVERSIDE STREET - PORTLAND, MAINE
DRILLING CO. : GREAT WORKS TEST BORING, INC. DRILLER: JEFF LEE

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:	0	0		
SAMPLER:	SS	1 3/8"	140 lbs	30"
CORE BARREL:				

WATER LEVEL INFORMATION
SOILS APPEAR SATURATED BELOW 5.0'

CASING BLOWS PER FOOT	SAMPLE NO.	PEN.	REC.	DEPTH @ BOT	SAMPLER BLOWS PER 6" 0-6	6-12	12-18	18-24	DEPTH	STRATA & TEST DATA
										BROWN SILTY FINE SAND WITH TRACE ORGANICS (FILL)
	1D	24"	18"	2.0'	4	5	2	5	2.0'	~ LOOSE ~
									3.0'	LIGHT BROWN SILTY FINE SAND ~ LOOSE TO MEDIUM DENSE ~
	2D	24"	20"	4.0'	5	7	7	9		LIGHT BROWN FINE SAND WITH SOME SILT AND SILTY FINE SAND SEAMS
										~ MEDIUM DENSE ~
									5.3'	
	3D	24"	20"	7.0'	4	6	7	8	6.5'	LIGHT BROWN FINE SANDY SILT ~ MEDIUM DENSE ~
										GRAY FINE SANDY SILT
	4D	24"	18"	9.0'	5	6	3	2	9.0'	~ LOOSE TO MEDIUM DENSE ~
	5D	24"	24"	12.0'	WOH →					
	3 1/2" X 7" VANE			15.7'	HYDRAULIC PUSH					S_V = 0.57 / 0.06 ksf
	3 1/2" X 7" VANE			16.4'	HYDRAULIC PUSH					S_V = 0.56 / 0.06 ksf
										GRAY SILTY CLAY
										~ MEDIUM TO SOFT ~
	3 1/2" X 7" VANE			25.7'	HYDRAULIC PUSH					S_V = 0.47 / 0.05 ksf
	3 1/2" X 7" VANE			26.4'	HYDRAULIC PUSH				26.4'	S_V = 0.48 / 0.06 ksf
										ROD PROBE 26.4 TO 75 FEET (NO SAMPLING)
									75.0'	REFUSAL @ 75 FEET (PROBABLE BOULDER OR TILL)

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

SOIL CLASSIFIED BY:
[ ] DRILLER - VISUALLY
[X] 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-103**

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_u	-	unconfined compressive strength, kips/sq. ft. - based on laboratory unconfined compressive test
S_v	-	field vane shear strength, kips/sq. ft.
L_v	-	lab vane shear strength, kips/sq. ft.
q_p	-	unconfined compressive strength, kips/sq. ft. based on pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W_L	-	liquid limit - Atterberg test
W_P	-	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. RQD is computed from recovered core samples.
γ_T	-	total soil weight
γ_B	-	buoyant soil weight

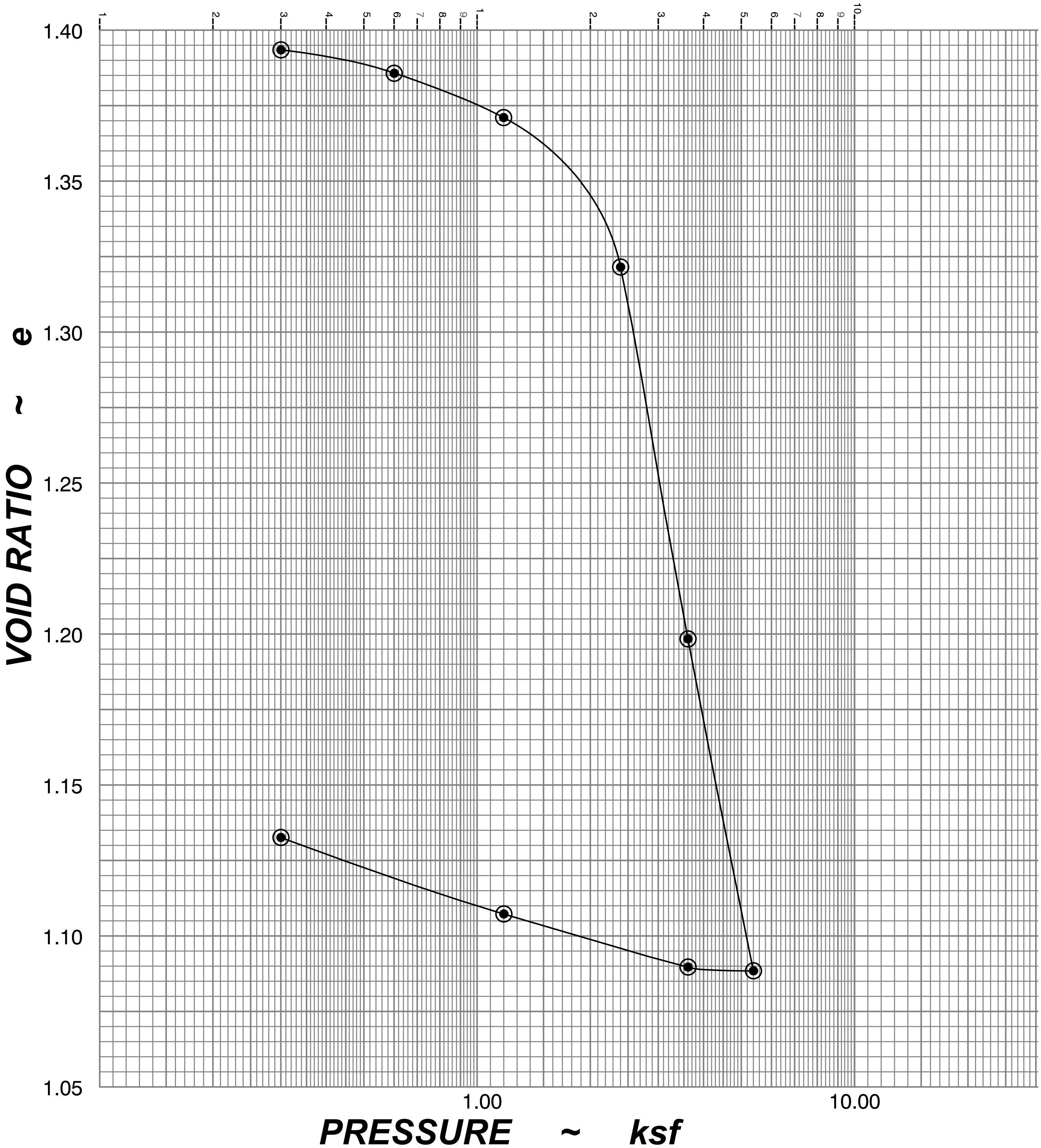
Description of Proportions:

0 to 5% TRACE
5 to 12% SOME
12 to 35% "Y"
35+% AND

RE□USA□□ **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.

RE□USA□□ **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.



B-101, 1S

Depth 15-17'

P_C = 2.1± ksf

C_C = 0.66

C_R = 0.03

W = 43.7 %

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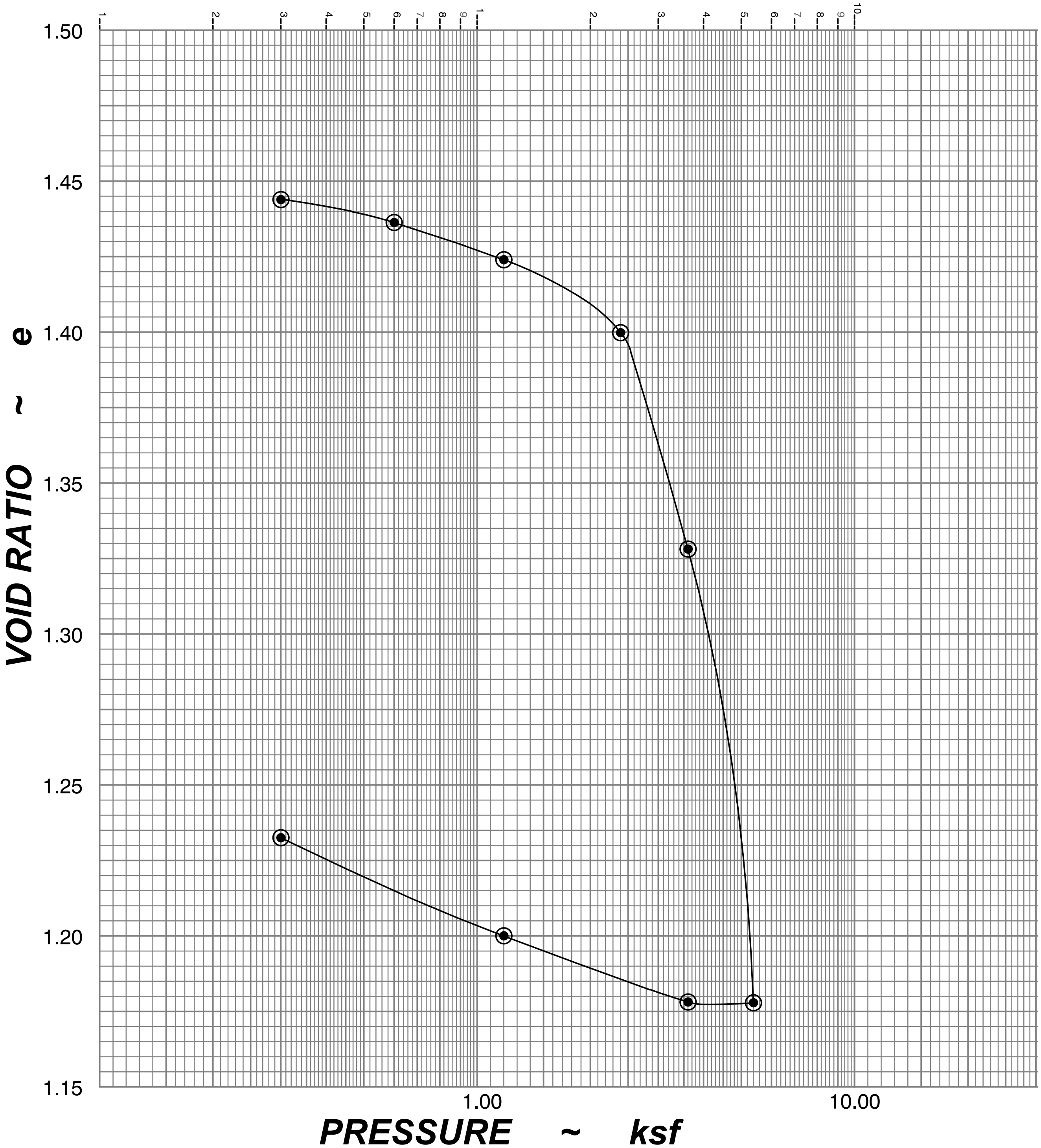

B-101, 2S

Depth 25-27'

P_C = 3.0± ksf

C_C = 0.85

C_R = 0.04

W = 47.1 %

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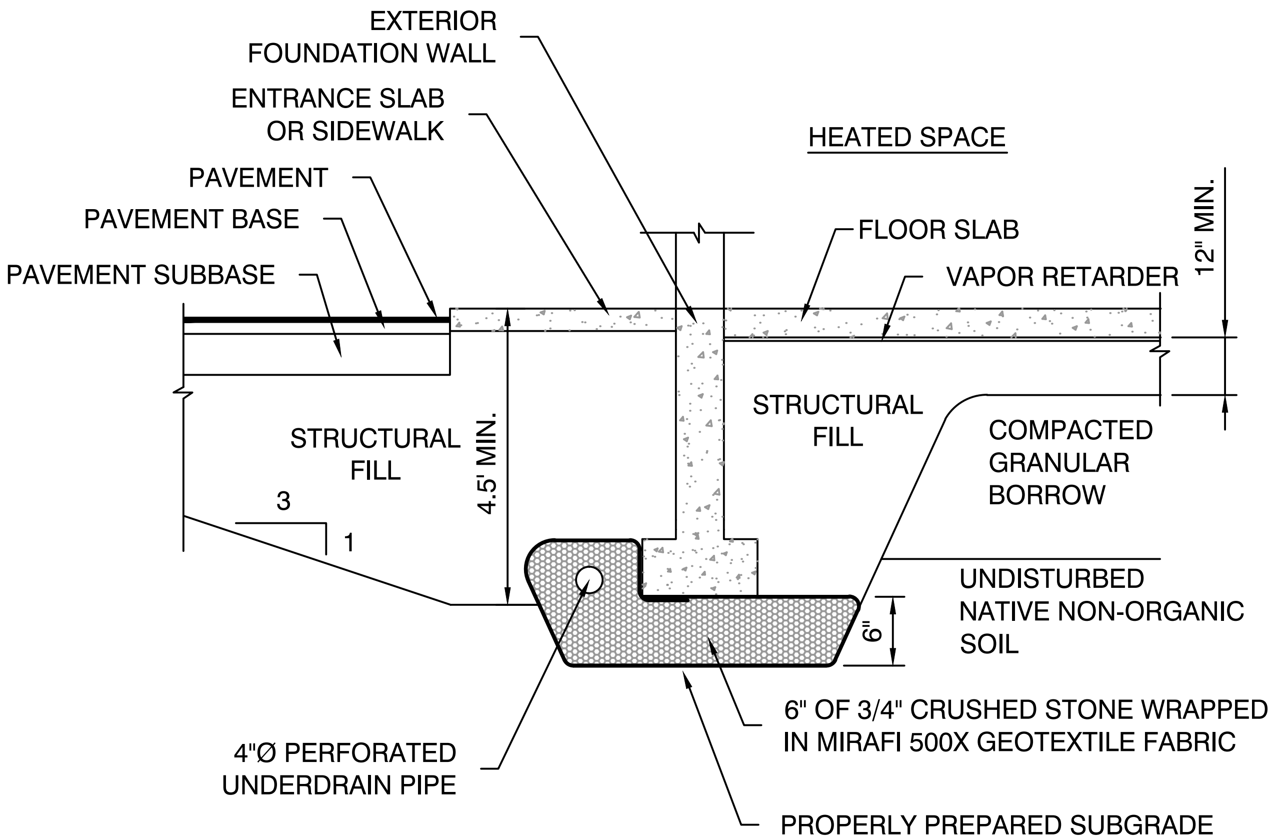

NOTE:

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.

HARDYPOND CONSTRUCTION

UNDERDRAIN DETAIL

PROPOSED COMNAV BUILDING
1039 RIVERSIDE STREET
PORTLAND, MAINE

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