REPORT

23-1147

July 26, 2023

Explorations and Geotechnical Engineering Services

Proposed Main Computer Room
Off Stoddard Street
VA Togus
Chelsea, Maine

Prepared For:
GDM Architects-Engineers
Attention: Conrad Chandler, P.E.
1401 W. 34th Avenue
Anchorage, AK 99503

Prepared By:
S. W. Cole Engineering, Inc.
26 Coles Crossing Drive
Sidney, ME 04330
T: 207.626.0600

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23-1147

July 26, 2023

GDM Architects-Engineers
Attention: Conrad Chandler, P.E.
1401 W. 34th Avenue
Anchorage, AK 99503

Subject: Explorations and Geotechnical Engineering Services
Off Stoddard Road
VA Togus Campus
Chelsea, Maine

Dear Conrad:

In accordance with our Proposal, dated June 7, 2023, 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 Appendix 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 and earthwork 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 in a moderately to heavily wooded area on the westerly side of Stoddard Street on the VA Togus campus. The site generally slopes downward from north to south with up to 20 feet of surface relief across the proposed development area. Surficial cobbles and boulders were observed across the proposed development area.

Based on the conceptual plan received 7/20/2023, we understand development plans call for construction of a new, ±110-foot by 40-foot, single-story building and ±30-foot by 40-foot utility area cut into the existing slope on the westerly side of Stoddard Street. We anticipate the building structure will be a combination of wood and metal stud framing with slab on-grade floor and spread footing foundations. We understand the utility area will include equipment supported on on-grade slab foundations. We understand the proposed cut slopes will taper up to ±10 feet in height and new site retaining walls with exposed heights of up to 7 feet tall are proposed.

Proposed and existing site features are shown on the "Exploration Location Plan" attached in Appendix B.

2.0 EXPLORATION AND TESTING

2.1 Explorations

Six test borings (B-23-1 through B-23-6) were made at the site on June 27 and 28, 2023 by S. W. Cole Explorations, LLC. The exploration locations were selected and established in the field, where accessible, by S. W. Cole Engineering, Inc. (S.W.COLE) using a mapping grade GPS. The approximate exploration locations are shown on the "Exploration Location Plan" attached in Appendix B. Logs of the explorations and a key to the notes and symbols used on the logs are attached in Appendix C.

2.2 Field Testing

The test borings were drilled using a combination of hollow-stem auger, cased wash-boring, and NQ2 rock core techniques. The soils were sampled at 2-to-5-foot intervals using a split spoon sampler and Standard Penetration Testing (SPT) methods. Pocket Penetrometer Tests (PPT) were performed where stiffer cohesive soils were encountered. Upon encountering refusal borings B-23-4 and B-23-6 were advanced 24 and 15 feet into bedrock, respectively, by rock core. SPT blow counts, PPT, and Rock Quality Designation (RQD) are shown on the logs. Photos of the rock core are attached in Appendix C.

2.3 Laboratory Testing

Soil and rock core samples obtained from the explorations were returned to our laboratory for further classification and testing. Soil moisture content and unconfined

rock core compressive strength test results are noted on the logs. The results of one soil gradation test are attached in Appendix D.

3.0 SUBSURFACE CONDITIONS

3.1 Soil and Bedrock

Test borings B-23-1 through B-23-6 were made in the area of the proposed building and encountered a soils profile generally consisting of forest duff overlying surficial sand overlying glacial till overlying refusal surfaces (bedrock) on the upland side of the site and forest duff over stiff clayey silt overlying glacial till overlying refusal surfaces (bedrock) on the downslope side of the site. The principal strata encountered are summarized below. Not all the strata were encountered at each exploration; refer to the attached logs for more detailed subsurface information.

Surficial: A surface layer of forest duff was encountered in each exploration. The forest duff generally varied from about 7 to 16 inches in thickness. Numerous cobbles and boulders were observed across the site.

Native Clayey Silt: Below the forest duff, borings B-23-1, B-23-2, and B-23-3 encountered, native, very stiff to stiff, clayey silt with sand. The native clayey silt with sand extended to depths of about 4.5 to 9.5 feet.

Native Glacial Till: Below the forest duff or native clayey silt, glacial till was encountered in each exploration. The glacial till generally consisted of dense to very dense, gravelly silty sand with cobbles and boulders.

Refusal Surfaces (Probable Bedrock): Each of the explorations was continued to a refusal surface (probable bedrock) at depths varying from about 6 to 15 feet below the ground surface. Rock coring performed at borings B-23-4 and B-23-6 encountered bedrock consisting of gray, Granodiorite with an RQD of 48 to 87 percent.

3.2 Groundwater

The soils encountered at the test borings were moist from the ground surface. Saturated soils were encountered in borings B-23-4 and B-23-6 at depths of about 9 to 12 feet. Groundwater will likely become perched on the relatively impervious clayey silt, glacial till, and bedrock encountered at the test borings. Long term groundwater information is not

available. It should be anticipated that groundwater levels will fluctuate, particularly in response to periods of snowmelt and precipitation, as well as changes in site use.

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 include:

- Relatively shallow bedrock is present at the site, including within proposed cut area for the proposed building and yard area. The bedrock will require blasting for excavation. Loose and over-blasted bedrock must be removed beneath the proposed building footprint.

- Spread footing foundations and a slab-on-grade floors bearing on properly prepared subgrades appear suitable for the proposed building. Footings should bear on at least 6 inches of compacted Crushed Stone covered with a geotextile fabric. On-grade floor slabs should bear on at least 18 inches of properly compacted Crushed Stone. Geotextile fabric should be used in areas with soil subgrade.

- Based on the findings at the explorations, foundation and slab subgrade for the proposed building is anticipated to transition from bedrock to glacial till soils along the westerly edge of the proposed building. The layer of crushed stone below footings is intended to help transition between bedrock and soil bearing conditions and to help minimize differential settlement between differing subgrade materials.

- Groundwater seepage should be anticipated from rock and soil cut slopes. The contractor should anticipate the need to dewater temporary excavations for foundations and utilities.

- Blasted bedrock may be processed on-site to reuse for mass fills in the proposed paved areas as well as gravels for pavements and foundation backfill. The existing site soils are generally silty and may be suitable for reuse as subgrade fill in paved areas, provided earthwork is completed during dry, non-freezing weather.

4.2 Site and Subgrade Preparation

We recommend site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits. Surficial organics, roots and topsoil should be completely removed from areas of proposed fill and construction. As much vegetation as possible should remain outside the construction areas to lessen the potential for erosion and site disturbance.

We anticipate subgrades for the proposed building and utility area will generally consist of bedrock with areas of glacial till soils along the southerly edge of the site. We recommend spread footings be underlain by at least 6 inches of Crushed Stone and the slab on grade floor be underlain by 18 inches of Crushed Stone. The layer of Crushed Stone below footings is intended to help transition between bedrock and soil bearing conditions and to help minimize differential settlement between differing subgrade materials.

Utility yard equipment foundations should bear on at least 6 inches of compacted Crushed Stone overlying compacted Structural Fill extending to frost depth (5 feet) or bedrock, whichever is shallower. The extent of soil removal below foundations should extend 1 foot laterally outward from outside edge of perimeter footings for every 1-foot of excavation depth (1H:1V bearing splay).

4.3 Excavation and Dewatering

Excavations will generally encounter forest duff, soils with organics, native clayey silt and sandy silt, glacial till, cobbles and boulders, and bedrock. Care must be exercised during construction to limit disturbance of soil bearing surfaces.

Based on the subsurface findings, we anticipate bedrock removal will be required to achieve proposed building and site grades. We understand bedrock removal with blasting will not be permitted at the site due to proximity to the VAMC hospital. Based on the bedrock present at the site, we anticipate hoe ramming will not be feasible for rock removal. We anticipate rock removal will require drilling and splitting with hydraulic wedges or expansive cement. We anticipate the closely-spaced, large-diameter drill hole (such as with an air-track) will be needed. We recommend a licensed contractor be engaged to provide bedrock removal.

Vibrations from construction should be controlled below threshold limits of 0.5 in/sec for structures, water supply wells and infrastructure within 500 feet of the project site. More restrictive vibration limits may be warranted in specific cases with sensitive equipment, historic structures, or artifacts on-site or within close proximity.

Groundwater seepage should be anticipated from rock and soil cut slopes. Sumping and pumping dewatering techniques should be adequate to control groundwater in smaller excavations. Construction of ditches and swales will likely be needed to assist groundwater control within deeper rock cut area. Controlling the water levels to at least one foot below planned soil excavation depths will help stabilize subgrades during construction. Excavations must be properly shored or sloped in accordance with OSHA 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 building be supported on spread footings founded on at least 6 inches of Crushed Stone bearing on properly prepared glacial till or bedrock. Exterior equipment supported on shallow mat foundations, should be founded on at least 6 inches of compacted Crushed Stone overlying compacted Structural Fill extending to frost depth or bedrock, whichever is shallower. For foundations bearing on properly prepared subgrades, we recommend the following geotechnical parameters for design consideration:

Geotechnical Parameters for Spread Footings and Foundation Walls	
Design Frost Depth (100-year AFI)	5 feet
Allowable Soil Bearing Pressure	5.0 ksf
Allowable Bedrock Bearing Pressure	10.0 ksf
Base Friction Factor	0.35
Total Unit Weight of Backfill	125 pcf
At-Rest Lateral Earth Pressure Coefficient	0.5
Internal Friction Angle of Backfill	30°
Seismic Soil Site Class	C (IBC 2015)
Estimated Total Settlement	1-inch or less
Differential Settlement	½-inch or less

4.5 Foundation Drainage

We recommend an underdrain system be installed on the outside edge of perimeter footings. The underdrain pipe should consist of 4-inch diameter, perforated SDR-35 foundation drainpipe bedded in Crushed Stone and wrapped in non-woven geotextile fabric. 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 surface water drainage. General underdrain details are illustrated on the "Foundation Detail Sketch" attached in Appendix B.

4.6 Slab-On-Grade

On-grade floor slabs in heated areas may be designed using a subgrade reaction modulus of 120 pci (pounds per cubic inch) provided the slab is underlain by at least 18 inches of compacted Crushed Stone placed over properly prepared subgrades. The structural engineer or concrete consultant must design steel reinforcing and joint spacing appropriate to slab thickness and function.

The presence of shallow bedrock beneath the proposed building increases the risk of radon intrusion in the building. We recommend building design consider a sub-slab radon venting system and positive building pressurization. Radon design should be provided by a qualified radon consultant.

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 non-frost susceptible Structural Fill be provided to a depth of at least 5 feet below the top of entrance slabs. This thickness of Structural Fill should extend the full footprint of the entrance slab, 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 shown on the "Foundation Detail Sketch" attached in Appendix B.

4.8 Segmental Retaining Wall

Based on the anticipated variable subsurface conditions, we recommend the proposed site retaining walls consist of segmental-block retaining walls (SRWs). We recommend the segmental block consist of wet-cast segmental retaining wall units. We recommend the facing blocks be founded on a minimum 6-inch-thick leveling course of compacted Crushed Stone overlying properly prepared subgrades. For design of Segmental Retaining Walls (SRW), such as Redi-Rock, we recommend the following geotechnical parameters for design:

Geotechnical Parameters for Segmental Retaining Wall		
Wall Zone	**Unit Weight (pcf)**	**Friction Angle**
Reinforced Soil	130	34
Retained Soil	125	30
Foundation Soil	125	30

Design of the retaining wall and evaluation of base sliding, overturning and internal stability of the wall are the responsibility of the wall design engineer. The wall designer must account for construction surcharge loads and future live load conditions. S.W.COLE should be retained to perform a global stability analysis of the SRW and to review the SRW submittal if designed by others.

We recommend SRW walls meet the requirements of current NCMA design methodologies and material requirements.

4.9 Fill, Backfill and Compaction

We recommend the following fill and backfill materials: recycled products must also be tested in accordance with applicable environmental regulations and approved by a qualified environmental consultant.

Structural Fill: Backfill for foundations and material below exterior entrances 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
No. 40	0 to 30
No. 200	0 to 6

Crushed Stone: Crushed Stone, used beneath foundations and for underdrain aggregate should be washed ¾-inch crushed stone meeting the requirements of 2020 MaineDOT Standard Specification 703.13 Crushed Stone ¾-Inch.

Reuse of Site Soils: The non-organic on-site soils are silty and unsuitable for reuse in building areas but may be suitable for reuse as subgrade fill in paved and landscape areas, provided earthwork is completed during dry, non-freezing weather and the soils are at a compactable moisture content at the time of 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. Crushed Stone should be compacted with 3 to 5 passes of a vibratory plate compactor having a static weight of at least 500 pounds.

4.10 Weather Considerations

Construction activity should be limited during wet and freezing weather and the site soils may require drying or thawing 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.

4.11 Design Review and Construction Testing

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

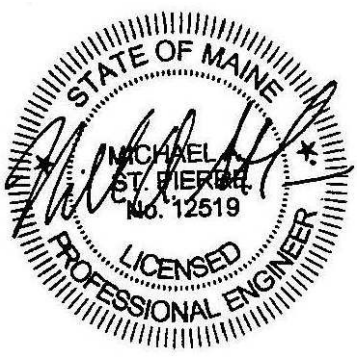
A construction material testing and quality assurance program should be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE is available to observe earthwork activities, the preparation of foundation bearing surfaces and pavement subgrades, as well as to provide testing and IBC Special Inspection services for soils, concrete, steel, spray-applied fireproofing, fire-stopping, structural masonry 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 during the construction phase of the project.

Sincerely,

S. W. Cole Engineering, Inc.



Michael St. Pierre, P.E.
Senior Geotechnical Engineer

MAS:rec

APPENDIX A

Limitations

This report has been prepared for the exclusive use of GDM Architects-Engineers for specific application to the proposed Main Computer Room project at the Togus VA off Stoddard Street in Chelsea, Maine. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct our services 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 services 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.

APPENDIX B

Figures

N

LEGEND

APPROXIMATE BORING LOCATION

NOTES:

1. EXPLORATION LOCATION PLAN PREPARED FROM ORTHOIMAGERY ENTITLED "ORTHOREGIONAL2018," PROVIDED BY THE MAINE GEOLIBRARY.

2. PROPOSED BUILDING OVERLAID FROM A GEOREFERENCED CAD FILE PROVIDED BY GDM ARCHITECTS-ENGINEERS, RECEIVED VIA E-MAIL 6/13/2023.

3. THE BORINGS LOCATED IN THE FIELD BY GPS SURVEY BY S. W. COLE ENGINEERING, INC. USING A MAPPING GRADE GPS RECEIVER.

4. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S. W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.

5. 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.

0 15 30 60 90
Feet

S.W.COLE ENGINEERING, INC.

GDM ARCHITECTS-ENGINEERS

EXPLORATION LOCATION PLAN

PROPOSED MAIN COMPUTER ROOM
OFF STODDARD STREET
VA TOGUS CAMPUS, CHELSEA, MAINE

Job No.	23-1147	Scale	1" = 30'
Date:	07/20/2023	Sheet	1

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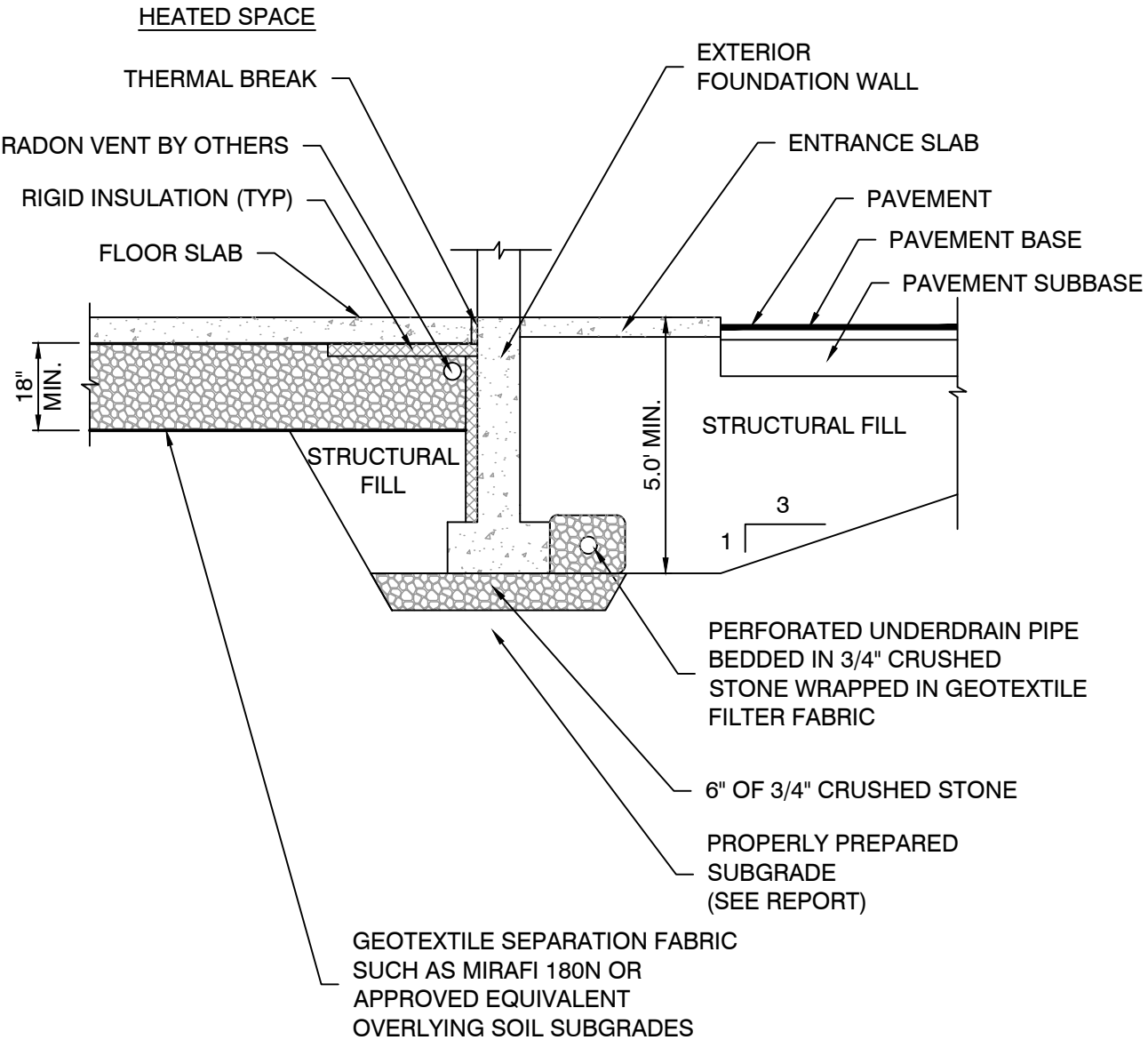

NOTE:

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.

GDM ARCHITECTS-ENGINEERS

FOUNDATION DETAIL SKETCH

PROPOSED MAIN COMPUTER ROOM
OFF STODDARD STREET
VA TOGUS CAMPUS, CHELSEA, MAINE

Job No.:	23-1147	Scale:	Not to Scale
Date :	07/20/2023	Sheet:	2

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APPENDIX C

Exploration Logs and Key

KEY TO NOTES & SYMBOLS

Test Boring and Test Pit Explorations

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. - laboratory 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. – 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.
γ_T	-	total soil weight
γ_B	-	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.

BORING LOG

BORING NO.: B-23-1
SHEET: 1 of 1
PROJECT NO. 23-1147
DATE START: 6/27/2023
DATE FINISH: 6/27/2023

CLIENT: GDM Architects-Engineers
PROJECT: Proposed Main Computer Room
LOCATION: Togus VAMC Campus, off Stoddard Street, Chelsea, Maine

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** **TOTAL DEPTH (FT):** 12.0 **LOGGED BY:** Kevin Hanscom
DRILLING CO.: S. W. Cole Explorations, LLC **DRILLER:** Kevin Hanscom **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER CORRECTION FACTOR: 1.53 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/24	1-2-5-7	q_P=8.5-9.0 ksf		Forest Duff		
										1.0 Very stiff, brown, clayey SILT, trace fine sand		
			2D		2-4	24/24	6-7-10-12	q_P=7.5-8.0 ksf				
										3.0 Very stiff, gray and brown mottled, clayey SILT		
	5		3D		5-7	24/24	3-5-7-8	q_P=5.0-7.0 ksf				
										9.5 Dense, brown, gravelly silty SAND with cobbles (Glacial Till)		
	10		4D		10-12	24/15	17-17-11-10					

Auger Refusal at 12.0 feet
Probable Bedrock

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 10-12-2022 23-1147.GPJ SWCE TEMPLATE.GDT 7/26/23

BORING LOG

BORING NO.: B-23-2
SHEET: 1 of 1
PROJECT NO. 23-1147
DATE START: 6/27/2023
DATE FINISH: 6/27/2023

CLIENT: GDM Architects-Engineers
PROJECT: Proposed Main Computer Room
LOCATION: Togus VAMC Campus, off Stoddard Street, Chelsea, Maine

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 13.7 | **LOGGED BY:** Kevin Hanscom
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Kevin Hanscom | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:** N/A
HAMMER CORRECTION FACTOR: 1.53 | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: Water Level; ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/18	1-2-3-6	q_P=5.0-5.5 ksf		Forest Duff (0.6)		
			2D		2-4	24/16	5-7-8-11	q_P=6.0-8.0 ksf		Very stiff, brown, clayey SILT, trace fine sand		
	5		3D		5-7	24/24	13-27-27-40	ID 14919A w =8.1 %		(4.3) Dense to very dense, brown, silty gravelly SAND with cobbles (Glacial Till)		
	10		4D		10-12	24/6	11-10-19-22					

Auger Refusal at 13.7 feet
Probable Bedrock

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 10-12-2022 23-1147.GPJ SWCE TEMPLATE.GDT 7/26/23

BORING LOG

CLIENT: GDM Architects-Engineers
PROJECT: Proposed Main Computer Room
LOCATION: Togus VAMC Campus, off Stoddard Street, Chelsea, Maine

BORING NO.: B-23-3
SHEET: 1 of 1
PROJECT NO. 23-1147
DATE START: 6/27/2023
DATE FINISH: 6/27/2023

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 6.2
LOGGED BY: Kevin Hanscom
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Kevin Hanscom
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL: N/A
HAMMER CORRECTION FACTOR: 1.53
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level
▽ At time of Drilling
▼ At Completion of Drilling
▼ After Drilling
D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/16	2-3-4-3	q_P=6.0-7.0 ksf		0.8 Forest Duff		
			2D		2-4	24/24	3-6-8-8	q_P=7.5-8.5 ksf		Very stiff, brown and gray mottled, clayey SILT		
	5		3D		5-6.2	14/10	10-20-50/2"					

Auger Refusal at 6.2 feet
Probable Bedrock

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 10-12-2022 23-1147.GPJ SWCE TEMPLATE.GDT 7/26/23

BORING LOG

CLIENT: GDM Architects-Engineers
PROJECT: Proposed Main Computer Room
LOCATION: Togus VAMC Campus, off Stoddard Street, Chelsea, Maine

BORING NO.: B-23-4
SHEET: 1 of 1
PROJECT NO. 23-1147
DATE START: 6/28/2023
DATE FINISH: 6/28/2023

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 30.3
LOGGED BY: Kevin Hanscom
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Kevin Hanscom
DRILLING METHOD: Cased Boring
RIG TYPE: Track Mounted Diedrich D-50
AUGER ID/OD: N/A / N/A
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: 4 in / 4 1/2 in
CORE BARREL: NQ2 / 2
HAMMER CORRECTION FACTOR: 1.53
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▼ 11.8 ft measured in open borehole after coring
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/8	1-1-2-7			Forest Duff		
										1.3		
			2D		2-3.1	13/4	17-46-50/1"			Very dense, brown, gravelly silty SAND, with cobbles and boulders (Glacial Till)		
	5		3D		5-6.3	16/16	37-38-50/4"					
			1R		6.3-11.3	60/58	48	ID 14920A UCT=20,440psi		6.3 Gray, fine-grained, GRANODIORITE, hard, fresh to very slightly weathered, joints are horizontal to low angle (0-35° from horizontal), close to moderately close, and tight to slightly open.		
	10		2R		11.3-16.3	60/60	72				▼	
	15		3R		16.3-21.3	60/60	62					
	20		4R		21.3-26.3	60/60	87					
	25		5R		26.3-30.3	48/48	54					
	30									Bottom of Exploration at 30.3 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 10-12-2022 23-1147.GPJ SWCE TEMPLATE.GDT 7/26/23

BORING LOG

CLIENT: GDM Architects-Engineers
PROJECT: Proposed Main Computer Room
LOCATION: Togus VAMC Campus, off Stoddard Street, Chelsea, Maine

BORING NO.: B-23-5
SHEET: 1 of 1
PROJECT NO. 23-1147
DATE START: 6/28/2023
DATE FINISH: 6/28/2023

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 4.6
LOGGED BY: Kevin Hanscom
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Kevin Hanscom
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL: N/A
HAMMER CORRECTION FACTOR: 1.53
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level
▽ At time of Drilling
▼ At Completion of Drilling
▼ After Drilling
D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/14	6-7-29-8			Forest Duff (1.0) Dense, brown, gravelly silty SAND with cobbles and boulders (Glacial Till)		

Auger Refusal at 4.6 feet
Probable Bedrock

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 10-12-2022 23-1147.GPJ SWCE TEMPLATE.GDT 7/26/23

BORING LOG

BORING NO.:	B-23-6
SHEET:	1 of 1
PROJECT NO.	23-1147
DATE START:	6/28/2023
DATE FINISH:	6/28/2023

CLIENT: GDM Architects-Engineers
PROJECT: Proposed Main Computer Room
LOCATION: Togus VAMC Campus, off Stoddard Street, Chelsea, Maine

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** **TOTAL DEPTH (FT):** 30.1 **LOGGED BY:** Kevin Hanscom
DRILLING CO.: S. W. Cole Explorations, LLC **DRILLER:** Kevin Hanscom **DRILLING METHOD:** Cased Boring
RIG TYPE: Track Mounted Diedrich D-50 **AUGER ID/OD:** N/A / N/A **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** 4 in / 4 1/2 in **CORE BARREL:** NQ2 / 2
HAMMER CORRECTION FACTOR: 1.53 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 8.8 ft measured in open borehole prior to coring
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-1.8	22/13	1-2-7-50/4"			Forest Duff		
										1.0 Dense to very dense, brown, gravelly silty SAND with cobbles and boulders (Glacial Till)		
	5		2D		5-7	24/18	20-21-25-30					
											▽	
	10		3D		10-12	24/15	15-17-15-10					
	15		4D		15-15.1	1/0	50/1"			15.1 Gray, fine-grained, GRANODIORITE, hard, fresh to very slightly weathered, joints are horizontal to low angle (0-35° from horizontal), close to moderately close, and tight to slightly open.		
			1R		15.1-20.1	60/60	62	ID 14921A UCT=15,400psi				
	20		2R		20.1-25.1	60/60	82					
	25		3R		25.1-30.1	60/60	68					
	30									Bottom of Exploration at 30.1 feet		

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BORING / WELL 10-12-2022 23-1147.GPJ SWCE TEMPLATE.GDT 7/26/23

B-23-4, 1R 6.3-11.3 ft
B-23-4, 2R 11.3-16.3 ft
B-23-4, 3R 16.3-21.3 ft
B-23-4, 4R 21.3-26.3 ft

B-23-4, 5R, 26.3-30.0 ft
B-23-6, 1R, 15.1-20.1 ft
B-23-6, 2R, 20.1-25.1 ft
B-23-6, 3R, 25.1-30.1 ft

APPENDIX D

Laboratory Test Results

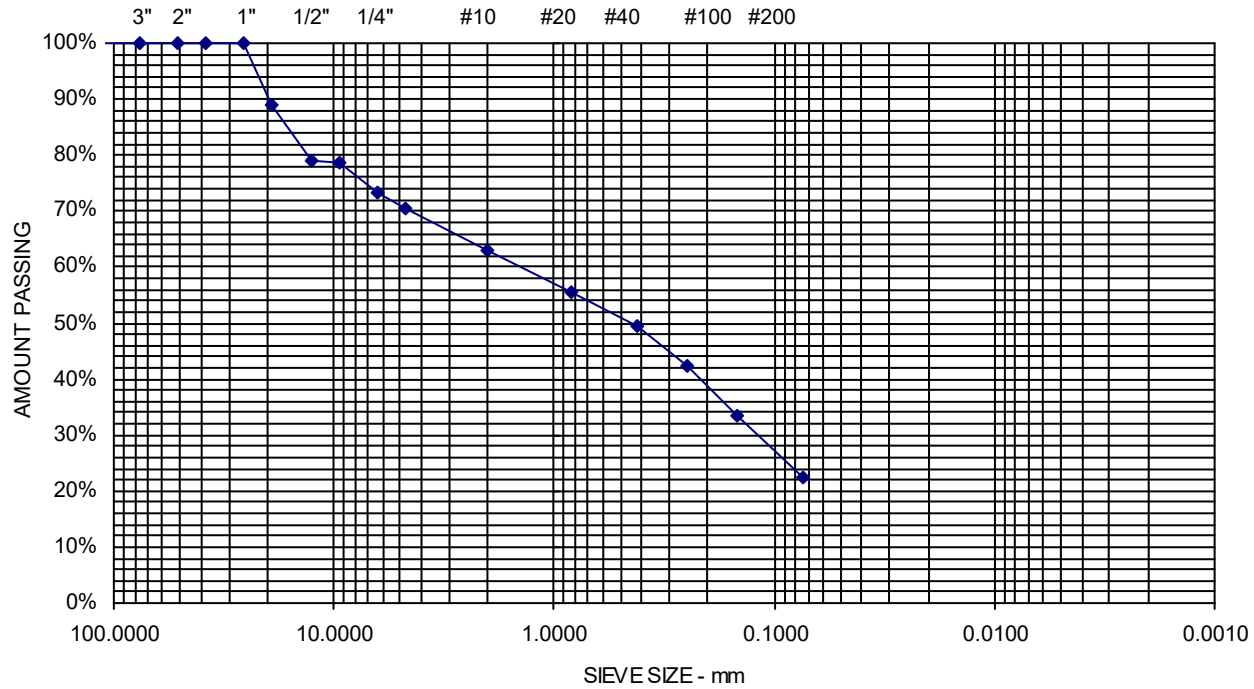
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	AUGUSTA ME - PROPOSED VA TOGUS CAMPUS MAIN COMPUTER ROOM - EXPLORATIONS AND GEOTECHNICAL ENGINEERING	Project Number	23-1147
Client	GDM, INC.	Lab ID	14919A
		Date Received	7/17/2023
		Date Completed	7/21/2023
Material Source	**B-23-2, 3D, 5FT**	Tested By	TRAVIS SMITH

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**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"**	**89**	
12.5 mm	**1/2"**	**79**	
9.5 mm	**3/8"**	**79**	
6.3 mm	**1/4"**	**73**	
4.75 mm	**No. 4**	**70**	29.5% Gravel
2.00 mm	**No. 10**	**63**	
850 um	**No. 20**	**56**	
425 um	**No. 40**	**49**	48.2% Sand
250 um	**No. 60**	**42**	
150 um	**No. 100**	**34**	
75 um	**No. 200**	**22.3**	22.3% Fines



Comments: As Delivered MC: 8.1%

Sheet