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Geotechnical Report

MDI Hospital Expansion
10 Wayman Lane, Bar Harbor, Maine

SUMMIT
GEOENGINEERING SERVICES

Client

Mount Desert Island Hospital
10 Wayman Lane
Bar Harbor, ME 04609

Project #: 22458
Date: 4/14/2023

April 14, 2023
Summit #22458

Attn: Michelle Smith, Chief Financial Officer
Mount Desert Island Hospital
10 Wayman Lane
Bar Harbor, ME 04609

Reference: Geotechnical Engineering Services
Mount Desert Island Hospital Expansion – 10 Wayman Lane, Bar Harbor, ME

Dear Ms. Smith;

Summit Geoengineering Services (SGS) has completed a geotechnical investigation for the new additions to the MDI Hospital campus. The scope of services included performing test boring and bedrock probe explorations at the site and preparing this report summarizing our findings and geotechnical recommendations for the new development.

Subgrade at the site consists of fill overlying glacial marine deposits or glacial till, overlying bedrock. Bedrock was encountered at depths ranging from 2.3 to 21 feet below ground surface (BGS). Groundwater is present in the western portion of the site at depths of 7.5 to 7.8 feet BGS. Geotechnical considerations identified for development include footings bearing differing subgrade across the site; bedrock to the east and soft marine clays to the west. SGS evaluated bearing capacity and potential for settlement of clay soils and determined the additions can be supported on conventional spread or strip footings with proper subgrade preparation.

Discussion of the geotechnical findings and considerations are included in this report along with geotechnical recommendations for site development and building foundations. The geotechnical evaluation herein is based on existing site and subsurface conditions, along with planned development details provided by SMRT, Inc. SGS appreciates the opportunity to serve you during this phase of your project. If there are any questions or additional information is required, please do not hesitate to call.

Sincerely yours,
Summit Geoengineering Services

Jason Barnes, E.I.
Geotechnical Engineer

STATE OF MAINE
ERIKA L. STEWART
No. 15008
LICENSED PROFESSIONAL ENGINEER

Erika Stewart, P.E.
Senior Geotechnical Engineer

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1.0 Project and Site Description

Summit Geoengineering Services (SGS) was asked to conduct a geotechnical investigation for an expansion proposed at Mount Desert Island Hospital in Bar Harbor. The project consists of a combination of building additions and new construction to be completed in two phases. Phase 1 will include a new Central Utility Plant (CUP) addition to the main building and additional temporary parking to the east. Under Phase 2, three more additions are planned for the main hospital building; including a new main entrance with lobby and lab, new emergency department (ED) entrance, and expansion to the emergency department connecting to the CUP. Phase 2 will include a new clinical engineering/maintenance building on the east side of the campus and an addition to the Cooper Gilmore Health Center on the north side of the campus.

The site is located just North of Wayman Lane and east of Main Street in Bar Harbor. The campus includes several buildings surrounded by paved parking and landscape areas. New access drives and renovated parking areas are also planned around the facility. The construction of new entrance drives and hospital park will require the demolition of several existing buildings on the west side of the property. Existing site topography grades downwards from north to south and east to west around the main building (elevation 48 feet to 40 feet). Information on each piece of the development is described below.

Central Utility Plant

A new Central Utility Plant (CUP) is proposed as an addition located north of the existing main entrance. The CUP will have a finish floor elevation (FFE) of 41.5 feet and an approximate footprint of 3,000 square feet. The addition will be supported by perimeter strip footings with areas of thickened slab to support interior structures. The addition will also include a tall exhaust stack supported by a 60-inch pier or caisson, which will be required to resist lateral and uplift loading.

Emergency Department (ED) Expansion

In Phase 2, an expansion to the emergency department is planned, which will connect the existing emergency department to the CUP. Details on this structure have not yet been established, but it is anticipated to be supported with conventional spread footing foundations. FFE will match the existing floor of the emergency department at elevation 41.5 feet.

Emergency Entrance

Currently, the emergency entrance is at the main entrance for the hospital. The new emergency entrance will be located on the south side of the main building with a footprint of approximately 1,150 square feet. FFE of the new emergency entrance is proposed at 45.5 feet, approximately 4.5 feet below the existing grade. The emergency entrance will connect to the emergency department (FFE of 41.5 feet) via an internal stair or ramp system.

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Main Entrance

The new main entrance will connect to the west side of the main building near existing grade with a FFE of 43.5 feet. The entrance is proposed to connect to the main floor (elevation 51.6 feet) via an internal ramp or stair system. The proposed main entrance has an approximate footprint of 3,350 square feet. The addition will be supported by perimeter frost wall and/or spread footing foundations.

Clinical Engineering/Maintenance Building

The proposed clinical engineering/maintenance building will be constructed in the southeastern portion of the site. The proposed FFE for the building is 45 feet, which matches the existing grade in the area. The proposed footprint of the building is approximately 1,500 square feet and the building foundation is anticipated to consist of slab on grade with perimeter frost wall.

Health Center Addition

The proposed addition to the Cooper Gilmore Health Center will be located on the northeast side of the building. FFE will match that of the existing building at 49.3 feet. The addition will have a footprint of approximately 1,925 square feet. The addition will be supported by perimeter frost wall and/or spread footing foundations.

2.0 Geologic Setting & Archive Data

Information on geology and subgrade conditions at the site compiled from mapping by the Maine Geologic Survey, SGS's experience with explorations nearby, and data by others provided via SMRT are summarized as follows:

- Mapping indicates Presumpscot Formation (Pp) silt and clay underlie the site
- Mapping indicates an overburden depth of 35 feet at the southwest corner of campus
- Soil condition summary of previous boring investigations by others passed along by SMRT (Shallow bedrock at 5 to 10 feet on north side of site for MRI Unit, transitioning to soft clays with depths of 25 feet in other areas. Soil conditions are known to be highly variable through the hospital campus area.)
- Test borings & probes for a private residence off Hancock Street (granular fill and reworked native glacial till soils, predominantly sand, overlying bedrock at 1.5 to 9 feet)
- Mapping indicates bedrock is Bar Harbor Formation (SObh) consisting of dark to light gray quartzite and argillite with layers of light gray meta-rhyolite tuff

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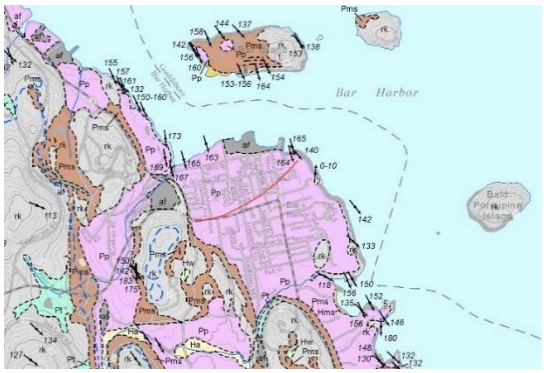

Surficial Geology Mapping by Maine Geological Survey

Subgrade conditions encountered at the site are consistent with the data and geology presented above. The east side of the site includes shallow bedrock (≤ 10 feet), transitioning to glacial marine deposit with overburden depths of 16.5 to greater than 20 feet to the west/southwest.

3.0 Subsurface Investigation & Laboratory Testing

3.1 Subsurface Explorations

SGS observed the subsurface conditions with the drilling of six test borings and seven ledge probes on January 25 and January 26, 2023. Test borings and probes were performed by SGS using a rubber track mounted AMS Power Probe 9500 VTR drill rig. Borings were advanced using a combination of 3-inch direct push casing and 2¼-inch hollow stem augers. Sampling was conducted with standard penetration tests (SPT-N) using a split spoon sampler and auto-drop hammer at 2-foot to 5-foot intervals. An undisturbed Shelby tube sample was obtained within glacial marine deposit at a depth of 12 feet in boring B-1. All test borings and ledge probes were advanced to a depth of 20 feet or refusal. Bedrock was encountered in all but 2 probes at a depth range of 2.3 to 21.0 feet below ground surface (BGS). No refusal was encountered in probes P-1 and P-3, explored to 20 feet BGS. Soils were visually classified using the Unified Soil Classification System (USCS).

Sampling at Test Boring B-1

The explorations were located by SGS relative to existing site features. Due to the presence of a hydroponic pavement heating system beneath the pavement in the footprint of the proposed ED

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expansion, SGS was unable to perform explorations in this area. An Exploration Location Plan is provided in Appendix A.

While on site performing the subsurface explorations, SGS measured the approximate elevation of ground surface at each boring and probe location using an auto level. Elevations were calculated using reference benchmarks provided on the Boundary & Topographic Plan by T.W. Benson Land Surveying, Inc, and rounded to the nearest tenth of a foot. Surface elevations are included on the boring logs and exploration summary table included in Appendix B.

The week prior to the start of the explorations, SGS held an onsite utility meeting with local utility representatives, ProMark Utility Locating, and a representative from MDIH. During this meeting the exploration locations were laid out with guidance from meeting attendees and then scanned by ProMark to ensure locations were clear of buried utilities. Dig Safe was notified following the meeting.

3.2 Laboratory Testing

Laboratory testing was conducted by (SGS) for soil samples collected onsite during the subsurface exploration. Five samples of marine deposit were tested for moisture content (ASTM D2216); moistures for marine clay ranged from 19.2 to 31.2 percent. A sample of stiff clay from boring B-1 was tested for unconfined compressive strength (ASTM D2166); indicating an unconfined compressive strength of 6,260 psf at 9.5 percent strain. A thin wall tube sample of the lower marine deposit (UT-1) obtained at boring B-1 was tested for Atterberg limit (ASTM D4318), one-dimensional consolidation (ASTM D2435), and unconfined compressive strength (ASTM D2166). A tube opening report along with reports of the individual laboratory tests are in Appendix C. Test results for the tube sample are summarized as follows:

LABORATORY TEST SUMMARY (B-1, UT-1)									
Depth	Moisture Content	Atterberg Limits			Consolidation			Unit Weight	Shear Strength* (UC)
		LL	PL	PI	P'c	Cc	Cr		
12'-14.5'	48.9%	39	21	18	3.4 ksf	0.55	0.03	114 pcf	630 psf

**Shear strength from UC test occurred at 4.5 percent strain.*

4.0 Subsurface Conditions

Borings and test probes performed indicated variable subsurface soil conditions at different areas onsite. For the purposes of this report, the areas will be distinguished as the eastern site (B-3 through B-5 and P-4 and P-5), the western site (B-1, B-2, and P-1 through P-3), and the northern site (B-6, P-6, and P-7). Eastern site includes the CUP, ED expansion, emergency entrance, clinical engineering/maintenance building. The western site includes the main entrance. The northern site includes the health center addition.

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Eastern Site

The subsurface conditions in the eastern portion of the site include 8 inches of ***topsoil,*** overlying ***fill*** or ***glacial till***, overlying ***bedrock***. ***Bedrock*** was encountered at depths ranging from 2.5 to 3.9 feet BGS in the Eastern Site explorations. No ***groundwater*** was observed in the explorations performed in the eastern portion of the site.

Western Site

The subsurface conditions in the western portion of the site include 6 inches of bituminous ***pavement*** overlying 6 to 36 inches of ***fill*** or ***reworked native***, overlying ***glacial marine deposit***, overlying ***bedrock. Bedrock*** was encountered at depths ranging from 16.5 to 21 feet below ground surface in the Western Site explorations. ***Groundwater*** was measured at depths ranging from 7.5 to 7.8 feet below ground surface.

Northern Site

The subsurface conditions in the northern portion of the site include 18 inches of ***fill*** overlying ***glacial marine deposit*** overlying ***bedrock***. ***Bedrock*** was encountered at depths ranging from 7.3 to 12.3 ft below ground surface. ***Groundwater*** was estimated to be present at 5 feet below ground surface by observing the moisture content of split spoon samples.

SGS's scope of services for this project did not include an environmental site assessment or investigation for the presence or absence of hazardous or toxic material on, below, or around the site. Observations by SGS of this nature are for informational purposes and are not intended to constitute an environmental assessment. SGS observed no notable synthetic odors, deleterious materials, or unusual conditions in soils samples collected during the subsurface explorations. A summary of the soil layers is provided below; detailed soil descriptions are included on the test boring logs and exploration summary table attached in Appendix B.

4.1 Soil Layers

Topsoil, where present, is 6 to 8 inches in thickness and described as dark brown sand with some silt, trace gravel, organics, and rootlets. The topsoil is classified as SM in accordance with the Unified Soil Classification System (USCS) and considered soft and damp.

Fill, where present, is overlain by topsoil or pavement and extends to a depth range of 0.5 to 4 feet. The fill is described as brown sand and gravel with some to little silt and occasional cobbles and is classified as SM and SP-SM in accordance with the USCS. A layer of deteriorated black asphalt was observed mixed within the fill in test boring B-2. Portions of the fill in borings B-2 and B-5 include ***reworked native*** soils. Reworked native consists of olive brown silt-clay with little gravel, and dark brown silty sand with gravel, in borings B-2 and B-5, respectively. Reworked native soils are visually classified as ML-CL and SM in accordance with USCS.

Glacial till was present in exploration B-3 overlying the bedrock surface. The ***glacial till*** is described as olive brown silt with some sand and gravel and occasional cobbles and boulders. The glacial till is

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visually classified as ML in accordance with the USCS. The till is considered compact to dense and moist.

Glacial marine deposit is present beneath the fill in northern and western portions of the site. At explorations B-1 and B-2, the deposit consists of two sub-units; a stiff upper clay and soft lower clay. The soft clay begins at a depth of approximately 12 feet BGS. The deposit corresponds to the geologic mapping from the Maine Geological Survey as being part of the Presumpscot Formation (Pp). At exploration B-6, the deposit includes olive brown to olive gray sandy silt with some clay, overlying stiff olive brown silty clay. The silt is visually classified as ML in accordance with the USCS. The silt is considered firm and damp to moist with depth.

The upper sub-unit is described as an olive brown and mottled silty clay. The upper clay is classified as CL in accordance with the USCS. Stiff clay is present beneath fill and marine silt in the northern portion of the site, and between fill and the lower sub-unit of soft clay in the western portion of the site. Pocket penetrometer tests indicate the unconfined compressive strength (q_u) of the stiff clay ranges from 6,000 to 9,000 psf. An unconfined compression test performed on a sample of stiff clay from boring B-1 exhibited an unconfined compressive strength of 6,260 psf at 9.5 percent strain. SPT-N values range from 8 to 12 blows per foot (bpf) indicating firm to stiff conditions. The upper marine deposit is considered damp to moist.

The lower sub-unit is present only in the western portion of the site and is described as gray silty clay with occasional fine sand-silt lenses and dropstones. The deposit is mixed with sand and gravel near the bedrock surface, and becomes silt-clay at the bottom of boring B-2. The soil is classified as CL and ML-CL in accordance with the USCS. Pocket penetrometer tests indicated the unconfined compressive strength (q_u) of the soft clay ranges from 2,000 to 500 psf with depth. An unconfined compression test performed on UT-1 indicates the clay has an unconfined compressive strength of 1,260 psf at 4.5 percent strain. Moisture content of the clay ranges from 37.3 to 40.1 percent. SPT-N values ranged from 3 bpf to weight of hammer (WOH) indicating soft to very soft conditions. The lower marine deposit is considered wet (saturated).

4.2 Bedrock

Bedrock was encountered at a depth range of 2.3 to 21.0 feet BGS in the explorations. Bedrock is interpreted to be generally intact based on auger resistance at the boring locations. Auger advancement into bedrock was possible at explorations B-3 and B-4, indicating medium to soft rock. No refusal was encountered at test probe P-1 or P-3, which each reached a depth of 20 feet BGS. Summary of bedrock depths and elevations determined from the explorations summarized in the Exploration Summary Table attached in Appendix B.

Mapping from the Maine Geological Survey indicates that bedrock is a part of the Ordovician-Silurian Bar Harbor Formation (SObh) consisting of dark to light gray lavender, layers of quartzite and argillite (sandstone and siltstone) intercalated with layers of very light gray metarhyolite tuff.

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4.3 Groundwater

Groundwater was measured at depth range of 7.3 to 7.8 feet below ground surface in borings B-1 and B-2 (elevation 36.2 feet to 34.7 feet), and estimated by sample moisture content at a depth of 6 feet below ground surface in boring B-6 (elevation 42.7). No groundwater was encountered in borings B-3 through B-5, where shallow bedrock was encountered. In general, groundwater is anticipated within glacial marine deposit and above the bedrock surface at lower elevations. The undulating bedrock formation may confine groundwater in portions of the site.

5.0 Geotechnical Evaluation

SGS expects two general soil conditions for bearing material of new foundation onsite: shallow bedrock and glacial marine deposit. Shallow bedrock is present in the eastern portions of the site, while the glacial marine deposits are present in the western and northern portions of the site. SGS anticipates conventional spread footing foundations will be suitable to support each of the new building structures. Consideration should be made for the interaction of new foundations adjacent to existing foundations. A plan should be made for foundation excavations performed next to existing structures to prevent undermining of existing foundations.

Where shallow bedrock is present, SGS recommends a minimum 2-foot cover of soil. Footings on soil will be constructed 4 feet below exterior finish grade for frost protection. Based on this, foundations for the CUP, ED addition, new emergency entrance, and the clinical engineering/maintenance building will all be constructed on bedrock. Depending on bedrock undulation, portions of these structures may transition from bedrock to soil or require footings to step down to contour the bedrock surface. This condition is most likely for the CUP and ED addition, where unknowns remain about the profile of the bedrock surface. Additionally, portions of these structures may require bedrock removal to construct foundations in bedrock cuts. This condition is anticipated for the emergency entrance and the north end of the CUP. Shallow bedrock will also be a consideration for construction of new stormwater features on eastern portions of the site.

The foundations for the main entrance and the health center addition are expected to be constructed on glacial marine deposit. Bearing material for the health center addition will consist of sandy silt, while the soils for the main entrance foundation will consist of stiff silty clay. Elastic settlement of the stiff clay and the marine silt were evaluated and considered to be minimal for the recommended bearing pressure.

SGS evaluated consolidation settlement of the soft clay using allowable bearing capacity, assumed footing widths, and results of soils laboratory testing. The soft clay layer is deep enough below anticipated footings that most of the applied footing stress will dissipate before reaching that depth, which will limit settlement. Minimal site fill is anticipated, which will also limit new loading. Analysis indicates total settlement of the marine deposit at ½ inch or less, which is anticipated to be tolerable for the new additions. Column loading and foundation plans were not available at the

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time of this report. When available, this information should be provided to SGS for review to confirm the analysis and recommendations in this report are suitable for final design conditions.

Considerations for the exhaust stack proposed within the footprint of the CUP include the presence of shallow bedrock and the need to resist uplift and lateral loads. SGS anticipates the exhaust stack foundation will need to be anchored and/or socketed to bedrock. Section 6.3 provides discussion on the CUP and the associated exhaust stack. However, details on this foundation were not available at the time of this report and SGS anticipates supplemental recommendations will be required when information becomes available.

Due to the presence of a hydroponic pavement heating system beneath the pavement in the southern footprint of the proposed CUP, SGS was unable to perform explorations in this area. The underlying materials are therefore unknown. SGS expects glacial till and/or stiff marine clay overlying shallow bedrock to be present in this area. SGS should be retained to inspect footing subgrade, and/or perform additional subsurface explorations in this area prior to construction, to provide supplemental recommendations as necessary.

The geotechnical recommendations provided in this report are based on the results of our site investigation and information provided for the proposed building additions summarized above. Final foundation plans for each structure and any significant changes to site layout, grading, or design modification to the project should be reviewed by SGS to evaluate possible implications to the recommendations provided in this report.

6.0 Geotechnical Design Recommendations

SGS recommends the following design parameters be used for foundation design:

PARAMETER	GRANULAR BACKFILL [1 & 2]	EXISTING FILL & GLACIAL TILL	STIFF MARINE CLAY & SILT	SOFT MARINE CLAY
Total Natural (moist) Unit Weight (Υ_t)	130 pcf	125 pcf	120 pcf	115 pcf
Submerged (buoyant) Unit Weight (Υ_s)	73 pcf	68 pcf	63 pcf	53 pcf
Friction Coefficient (f)	0.55	0.45	0.35	0.30
Passive Earth Pressure Coefficient (K_p)	3.54	3.25	--	--
Active Earth Pressure Coefficient (K_a)	0.28	0.31	--	--
At Rest Pressure Coefficient (K_o)	0.44	0.47	0.50	0.50
Effective Friction Angle (ϕ')	34^0	32^0	0^0	0^0
Undrained Shear Strength (S_u)	0 psf	0 psf	2,000 psf	500 psf

[1] Based on 95% compaction by ASTM D1557, Modified Proctor Test Method
[2] Design values for compacted Foundation Backfill or Structural Backfill

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6.1 Foundations on Bedrock

SGS anticipates the proposed CUP, ED expansion, emergency entrance, and clinical engineering/maintenance building foundations will be constructed directly on bedrock. If bedrock drops off within the building footprint, footings may transition to soil in accordance with Section 6.2 and the Footing Transition Detail provided in Appendix D. Portions of foundations may also be constructed in bedrock cuts. The following recommendations apply to these structures.

SGS recommends that footings on bedrock be designed with an allowable bearing pressure of 8,000 psf. Total settlement will be negligible for footings constructed on bedrock. Where footings transition to soil, differential settlement is estimated at or less than a deflection of 1/300 (δ/L, deflection divided by span length), which is anticipated to be within tolerable limits for the proposed structures. The bearing pressure and associated settlement is based on the following conditions:

- Pavement, existing foundations & structures, topsoil, and vegetation are removed in entirety from within the building footprint prior to placing fill or constructing footings.

- Where bedrock is within 4 feet of finished exterior grade, footings are constructed directly on the intact bedrock surface, or on a leveling pad over intact bedrock. Any loose or weathered rock should be removed to expose a clean, hard surface. Areas beneath footings with undulating bedrock may be leveled with Crushed Stone, lean concrete or flowable fill, or footings may be extended to contour the bedrock surface.

- Footings are transitioned from bedrock to soil in accordance with the Footing Transition Detail included in Appendix D.

- SGS should be retained to inspect subgrade for footings in the CUP and ED expansion to provide supplemental recommendations as deemed necessary. To provide additional information on bedrock profiling prior to construction, SGS could perform supplemental borings or test pits after demolition of the hydroponic pavement.

Where bedrock removal is required to construct foundations, controlled blasting may be required. Where possible, a hoe ram or large excavation equipment may be used to create the final shape of the excavation. Blasting required adjacent to existing buildings should be performed with consideration for preventing damage to existing foundations. A pre-blast survey and blasting plan should be developed and implemented to control flyrock and to limit peak particle velocity, vibration frequency, and air-blast overpressure as appropriate. General blasting recommendations are included in Appendix D.

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6.2 Foundations on Soil

SGS anticipates the main entrance foundation will be constructed on stiff glacial marine clay and the health center addition will be constructed on a sandy silt. Foundations constructed on soil should be designed using an allowable bearing pressure of 4,000 psf. SGS anticipates total settlement of ½ inch or less. Differential settlement is estimated at or less than a deflection of 1/300 (δ/L, deflection divided by span length), which is anticipated to be within tolerable limits for the proposed structures. The bearing pressure and associated settlement is based on the following conditions:

- Pavement, existing foundations & structures, topsoil, and vegetation are removed in entirety from within the building footprint prior to placing fill or constructing footings.
- Footing subgrade that becomes softened or disturbed is stabilized prior to constructing footings. Stabilization should consist of over-excavating disturbed soil and replacing with 12 inches of Crushed Stone. Crushed Stone should be should be tamped to lock the stone structure together.
- All fill placed within the building footprints should meet specification, placement, and compaction recommendations provided in Section 6.8.

SGS recommends that open excavations are protected from surface water to reduce the potential of softening the existing marine clays. Excavations may also be performed with a smoot edged bucket to reduce disturbance. SGS should be notified to inspect any significantly disturbed subgrade beneath foundations and provide supplemental stabilization recommendations as necessary.

6.3 CUP Considerations

The proposed CUP footprint is located north of the existing main entrance. Due to an existing hydroponic pavement heating system, SGS was limited with where explorations could be performed in this area. Boring B-3 was performed at the north edge of the CUP footprint in an elevated landscape area behind a retaining wall. Bedrock was encountered at a depth of 3.5 feet BGS in boring B-3, elevation 41.9 feet. Finish floor elevation (FFE) of the CUP is proposed at elevation 41.5 feet. SGS anticipates bedrock cuts will be necessary to facilitate the construction of the CUP foundation.

Based on observed subsurface conditions and surface topography, SGS anticipates bedrock slopes down from north to south. Bedrock encountered at boring B-3 may be a high spot of bedrock within the CUP footprint. Depending on slope and undulation of bedrock, CUP footings may be constructed on both bedrock and soil. SGS recommends the base of footings transitioning from bedrock to native soil be prepared with 12 inches of Crushed Stone to provide a uniform and stable

base for foundation construction. The Footing Transition Detail provided in Appendix D depicts the recommended transition of foundation on bedrock to soil.

Due to uncertainty of subgrade conditions in the remainder of the CUP footprint, is recommended that SGS be retained to further inspect the subgrade prior to construction. This may be done by performing additional subsurface explorations after demolition of the hydroponic pavement in the form of test pits (by contractor or SGS) or test borings by SGS. A supplemental test boring may be a good opportunity to perform rock core sampling and obtain refined bedrock parameters. At a minimum, SGS should be retained to inspect subgrade during construction and provide supplemental recommendations as necessary.

A new exhaust stack is proposed within the footprint of the CUP with an estimated height of 65 feet. The exhaust stack is anticipated to be supported with a 60-inch diameter pier or caisson. SGS was not made aware of this structure until after completion of explorations, thus consideration for it was not made in the geotechnical scope of services. SGS understands the stack foundation will need to resist significant overturning and uplift forces. To provide resistance to lateral loads and uplift, the exhaust stack foundation may be pinned to the bedrock using grouted rock anchors, rock bolts, or similar reinforcing. For additional lateral resistance, the foundation may be socketed into bedrock. Information on loading conditions was not available at the time of this report. When details on the stack loading and foundation are available, SGS should be notified to review the foundation plan.

Based on geologic mapping, bedrock at the site is expected to consist of siltstone and sandstone, which are classified as sedimentary rocks with medium strength. No bedrock core samples were obtained; thus, the competency of the bedrock is unknown. Supplemental explorations may be necessary to obtain rock core data in order to assist with providing recommendations for anchoring the exhaust foundation to bedrock. If deemed necessary, building foundations constructed over shallow bedrock may also be pinned to bedrock. For this condition, SGS could also provide additional recommendations for foundation pinning.

6.4 Building Slabs

Slab subgrade for the new buildings is anticipated to consist of variable conditions; including stiff marine silt-clay, glacial till, existing fill, and isolated bedrock. The building slabs should be constructed on a 12-inch thick layer of Structural Fill. Where constructed over bedrock, slab subgrade thickness may be reduced 6-inches. Crushed Stone is recommended in lieu of Structural Fill for slabs beneath groundwater or within bedrock cuts.

Dry, granular soils (free from debris) exposed in the slab footprint should be proof rolled prior to placing Structural Fill or Crushed Stone. Proof rolling should consist of a minimum of five passes in a north-south direction and then five passes in an east-west direction using a vibratory roller or plate compactor. Where additional site fill is required beneath slabs, it should consist of Structural Fill.

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The coefficient of subgrade reaction, k (per 12-inch plate) applies to the design of reinforced concrete foundations over soil and is considered rigid over bedrock. For the conditions described above, the slabs can be designed using a coefficient of subgrade reaction of 150 tons/ft^3.

Due to the potential for perching of water on bedrock or groundwater within the bedrock formation, a vapor barrier is recommended for the slabs in bedrock cuts.

6.5 Frost Protection

The design air freezing index for the Bar Harbor area is estimated at 1,000-degree F days (10-year, 90% probability). Based on this, exterior footings on soil should be constructed at a minimum depth of 4 feet below finished grade for frost protection. Where footings are constructed on bedrock, minimum frost depth can be reduced to 2 feet below finished grade, provided it is properly dewatered. Interior and exterior portions of foundation walls should be backfilled with Foundation Backfill as specified in Section 6.8.

6.6 Groundwater Control

Where encountered, groundwater was observed at a depth range of 6 to 7.8 feet below ground surface. SGS anticipates footings on soil will be above groundwater. However, the marine silt and clay is considered susceptible to perching of infiltrating water. Where foundations are constructed on bedrock or within bedrock cuts, there is potential for infiltrating water to perch at the bedrock surface or groundwater to be present within the rock formation. Based on this, SGS recommends that foundation underdrains be installed for all buildings and additions, where possible, to prevent accumulation of groundwater adjacent to footings. A leveling base of Crushed Stone over bedrock may also facilitate drainage where undulating bedrock makes underdrain installation difficult. Exterior grades should also be sloped away from the building footprints to reduce runoff water from infiltrating the foundation backfill soils.

Where used, perimeter underdrains should consist of 4-inch rigid perforated PVC placed adjacent to the exterior footings and surrounded by a minimum of 6 inches of crushed stone wrapped in filter fabric to prevent clogging from the migration of the fine soil particles in the foundation backfill soils. The underdrain pipe should be outlet to a location where it will be free flowing. Where exposed at the ground surface, the ends of pipes should be screened or otherwise protected from entry and nesting of wildlife, which could cause clogging.

6.7 Seismic Design

Bedrock was encountered at a depth range of 2.3 to 21.3 feet below ground surface with variable soil density. The average SPT-N for the 100-ft profile (overburden soil and rock) across the site ranges from 23 to 89.7 bpf, which identifies as Site Class B to D. Marine clay encountered in western portions of the site do not meet special criteria for Site Class E.

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The site is categorized as Site Class D and Seismic Design Category C in accordance with ASCE 7-10, as referenced by the 2015 International Building Code. The site is a hospital which is considered risk category IV. The following are seismic site coefficients should be used for design:

SUBGRADE SITE SEISMIC DESIGN COEFFICIENTS (ASCE 7-10)	
Seismic Coefficient	**Site Class D**
Peak Ground Acceleration (PGA)	0.124
Site Modified Peak Ground Acceleration (PGA_M)	0.192
Short period spectral response (S_S)	0.221
1 second spectral response (S_1)	0.064
Maximum short period spectral response (S_{MS})	0.353
Maximum 1 second spectral response (S_{M1})	0.154
Design short period spectral response (S_{DS})	0.235
Design 1 second spectral response (S_{D1})	0.102

Soils encountered at the site are considered resistant to liquefaction during earthquake magnitude 6.0 or less with a mapped peak ground acceleration (PGA_M) of 0.192g.

6.8 Material Specifications

Foundation Backfill should be compacted to 95 percent of its maximum dry density in accordance with ASTM D1557. The maximum particle size should be limited to 6 inches and portion passing a 3-inch sieve should meet the following gradation:

FOUNDATION BACKFILL	
Sieve Size	**Percent Passing**
¼ inch	25 to 100
No. 40	0 to 50
No. 200	0 to 7

Reference: MDOT Specification 703.06, Type E (2020)

Structural Fill should be compacted to 95 percent of its maximum dry density in accordance with ASTM D1557. Structural Fill should have a maximum particle size limited to 6 inches and the portion passing a 3-inch sieve should meet the following gradation specification:

STRUCTURAL FILL	
Sieve Size	**Percent Passing**
½ inch	35 to 80
¼ inch	25 to 65
No. 40	0 to 30
No. 200	0 to 7

Reference: MDOT Specification 703.06, Type D (2020)

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Crushed Stone should be tamped to lock the stone structure together and meet the following gradation:

CRUSHED STONE ¾ INCH	
Sieve Size	**Percent Passing**
1 inch	100
¾ inch	90 to 100
½ inch	20 to 55
⅜ inch	0 to 15
No. 4	0 to 5

Reference: MDOT Specification 703.13, Crushed Stone ¾-Inch (2020)

7.0 Stormwater Considerations

SGS understands upgrades are proposed to the existing stormwater system, which may include the addition of new drains, pipes, and catch basins. Details of the new system were not available at the time of this report. Ledge probes P-1 through P-5 were performed at location requested by SMRT with the intent of evaluating depth to bedrock for installation of new stormwater features. Results of ledge probes and test borings performed in the eastern portion of the site indicate shallow bedrock is present at a depth range of 2.3 to 2.8 feet BGS, elevation 41.6 to 46.9 feet. Bedrock removal is anticipated in these areas to facilitate the addition or expansion of any stormwater systems or structures.

Ledge probes and borings performed in the western portion of the site indicate overburden depths of 16.5 feet to greater than 20 feet. SGS anticipates that bedrock will not impede the addition and construction of stormwater collection systems in these areas. Subgrade conditions for stormwater structures in the western portion of the site are expected to consist of glacial marine silt and clay soils with potential for groundwater near a depth of 7.5 feet BGS.

8.0 Pavement Recommendations

The project includes new bituminous pavement sections east and west of the building. Subgrade soil in these areas is expected to consist of a combination of existing granular fill, reworked native soils, and/or imported fill. The mean annual freezing index for the Bar Harbor area is estimated at 680 degree-days. Based on the subgrade and mean annual freezing index, the anticipated mean annual frost penetration depth is 36 inches.

SGS recommends a minimum total pavement section thickness of 18 inches for light duty pavement sections and 22 inches for heavy duty pavement sections. It is recommended that pavement sections consist of the following materials:

MATERIAL	LIGHT DUTY THICKNESS (in)	HEAVY DUTY THICKNESS (in)	SPECIFICATION
Asphalt Surface Course	1	2	MDOT 703.09 Type 9.5 mm*
Asphalt Binder Course	2	3	MDOT 703.09 Type 19 mm
Base Soil	3	3	MDOT 703.06 Type A
Subbase Soil	12	14	MDOT 703.06 Type D

*Asphalt surface course may consist of Type 12.5 mm or Type 9.5 mm

Based and subbase soil (MDOT Type A and Type D) should be free from organic matter, balls of clay, and other deleterious substances. The portion of soil passing a 3-inch sieve shall meet the following gradation specification:

Sieve Designation	Percent Passing a 3-inch Sieve	
	MDOT Type A (Base)	MDOT Type D (Subbase)
2 Inch	100	--
½ Inch	45 – 70	35 – 80
¼ Inch	30 – 55	25 – 65
No. 40	0 – 20	0 – 30
No. 200	0 – 6	0 – 7

Reference: MDOT Specification 703.06, Aggregate for Base and Subbase (2020)

Base and Subbase Gravel should be compacted to a minimum of 95 percent of its maximum dry density, determined in accordance with ASTM D1557, Modified Proctor Density. Additional fill required beneath pavement sections should consist of additional Subbase Gravel (Structural Fill). Based on observed groundwater conditions, pavement underdrains are not considered necessary.

9.0 Segmental Block Wall Recommendations

New retaining walls at the site are expected to consist of segmental block retaining walls with either mechanically stabilized earth (MSE) reinforcement or gravity blocks. A retaining wall is planned between the proposed ambulance drive aisle and parking lot on the east side of the building. The wall will retain soil for the parking lot and is expected to taper down to the north and south. Finish grade of the proposed ambulance drop-off zone is proposed at elevation 41 feet. The adjacent parking lot is currently at elevation 45 feet; finish grade is yet to be determined, but will likely remain the same or be raised slightly. The new retaining wall may extend above grade to act as a barrier between the parking lot and ambulance drive aisle. Maximum wall height is anticipated at 8 feet with 4 to 5 feet of wall retaining soil.

Due to the existing hydroponic pavement heating system, no explorations were able to be performed in the footprint of the proposed retaining wall, therefore, subgrade conditions in this area are unknown. Based on explorations performed in the surrounding areas, SGS anticipates

subgrade conditions will consist of glacial till and/or glacial marine deposit overlying bedrock. Based on bedrock topography at the surrounding explorations (B-3, B-4, and B-5), bedrock in this area undulates from elevation 41.9 to elevation 46.9 feet. SGS expects the segmental block walls will be constructed over bedrock, glacial till, or stiff marine clay.

A potential second retaining wall is proposed at the southeast corner of the existing building. Closest exploration data to this area includes borings B-4 and B-5 and probes P-4 and P-5. Bedrock is anticipated near elevation 41.5 feet in this area and subgrade beneath the wall foundation will likely consist of bedrock.

The base of the retaining walls should be placed on a minimum of 6 inches of ¾-inch Crushed Stone. Where overlying soil, geotextile fabric such as Mirafi 180N or equivalent should be placed between subbase soil and Crushed Stone. Walls overlying bedrock will require a Crushed Stone or concrete leveling pad to create a uniform base for wall blocks. The base blocks may be pinned to the foundation, and /foundation pinned to bedrock for additional sliding resistance. The wall footprint should be cleared, stripped, and grubbed of topsoil, organic matter, and other deleterious materials prior to construction.

SGS recommends that segmental block walls be backfilled with Structural Fill specified in Section 6.8, compacted to 95% of its maximum dry density in accordance with ASTM D1557. Soil behind the retained and/or reinforced zone is expected to be a combination of fill, glacial till, and/ or stiff clay. SGS recommends the following soil properties be used for the design of segmental block retaining walls at this site.

DESIGN PARAMETERS - SEGMENTAL BLOCK RETAINING WALLS					
Location	**Soil Description**	**Unit Weight**	**Shear Strength**		**Friction Coefficient (f)[1]**
			Ø	**c**	
Foundation	Stiff Marine Clay	120 pcf	0°	2,000 psf	0.25
	Glacial Till	125 pcf	32°	0 psf	0.30
	Crushed Stone	115 pcf	40°	0 psf	0.80
Retained	Structural Fill	130 pcf	34°	0 psf	0.40
Reinforced	Structural Fill	130 pcf	34°	0 psf	0.40

[1] Friction factor of formed concrete (precast blocks) relative to various soil materials

Coulomb earth pressure coefficients can be calculated for retaining walls using the soil parameters provided in the table above and consideration for specific wall geometry and conditions.

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Since segmental type block walls are tolerant of some movement and shifting, no minimum frost depth is required. A minimum embedment depth of 6 inches is recommended at the toe of the wall, or as governed by wall height and toe slope. Underdrains should be provided behind the segmental wall near its base to prevent the buildup of hydrostatic pressures.

10.0 Earthwork Considerations

Subgrade Preparation & Groundwater Control

Existing foundations, pavement, underground structures, and deleterious materials should be removed from beneath new foundations and slabs as detailed in Sections 6.1 and 6.2 for each building addition. Structural Fill and Foundation Backfill should be placed in a maximum 12-inch lifts and be compacted to a minimum of 95 percent of the maximum dry density, determined in accordance with ASTM D1557, Modified Proctor Density. Crushed Stone should be tamped to lock the structure together.

Glacial marine soils may be susceptible to disturbance, particularly when wet. Footing subgrade that becomes softened or disturbed should be over-excavated and replaced with 12 inches of Crushed Stone. SGS should be retained to conduct subgrade inspections to confirm that soil conditions and construction methods are consistent with this report. SGS will provide additional recommendations for subgrade preparation as deemed necessary based on these observations. It is recommended that a qualified testing agency inspect soil materials gradation and compaction during construction for conformance to the project specifications. Soil materials testing reports should be made available to the geotechnical engineer for review.

Groundwater is anticipated near elevation 35 feet in western portions of the site and near 43 feet in northern portions of the site. Groundwater may be present near the bedrock surface or within bedrock cuts in eastern portions of the site. Where encountered, SGS anticipates shallow sumps and conventional submersible pumps will be sufficient to control groundwater and infiltrating water during construction. The contractor should furnish, install, operate, maintain, and remove temporary dewatering systems to control groundwater and permit construction free from standing water.

Excavations & Bedrock Removal

Foundation excavations for the CUP, ED expansion, emergency entrance, and potentially eastern stormwater structures may require bedrock removal. Depending on the competency and quantity of rock to be removed, controlled blasting may be required to create the excavation for new foundations. A large excavator, hoe ram, or jackhammer may be effective for removing small quantities of bedrock to create the final shape of the rock excavation.

Care should be taken during the blasting process not to excessively disturb the rock, forming the sidewalls and base of the excavation. All detached and fragmented rock should be removed from

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the bottom and sides of the excavation prior to foundation construction. A pre-construction survey and a blasting plan should be developed and implemented to control flyrock and to limit peak particle velocity, vibration frequency, and air-blast overpressure as appropriate. General blasting recommendations are in Appendix D.

Utility trenching and general excavations below 4 feet should be sloped no greater than 1H to 1V (OSHA type B) for cohesive soils. Slopes should be reduced to 1.5H to 1V in granular soils (glacial till, imported fill, existing fill, etc.) and below groundwater. These slopes are based on the current OSHA Excavation Guidelines.

Cold Weather Construction

The following recommendations apply to earthwork construction during freezing conditions. In general, these recommendations are intended to minimize the penetration of frost into soil beneath foundations and slabs. The native marine deposit soils are highly reactive to frost and should be protected from freezing.

- Footing excavations should be protected from frost overnight by the use of insulated blankets or by tenting and heating.

- Footings should not be cast on frozen soil. The frozen zone should be removed and replaced as specified with the appropriate material.

- Fill areas should be sealed with a 6 or 12 inch loose layer of soil (or otherwise insulated) at the end of the day to protect the compacted soil from freezing. The frozen layers should be removed in the morning prior to placing and compacting the next lift. Alternatively, the frozen surface layer can be removed down to unfrozen soil prior to placing the next lift.

- Due to the difficulty of thawing previously frozen soils (even within a heated building shell), SGS recommends that the building slab subgrade soil be protected from frost penetration where practical, especially if slabs are planned to be placed during periods of freezing.

- Frozen foundation and slab subgrade soils will become soft during thaw in the spring. SGS recommends that heavy traffic be avoided during thawing. Once the soil thaws and the accumulated water in the soil has drained, the subgrade should return to a firm condition. If placement of the footings or slabs occurs during thaw, SGS recommends that soft areas be removed and replaced as specified with appropriate material. An alternative may be to use a geotextile fabric and crushed stone to stabilize soft areas.

SGS recommends that all winter concrete construction be performed in accordance with ACI 306, Cold Weather Concreting.

11.0 Closure

The recommendations provided in this report are based on professional judgment and generally accepted principles of geotechnical engineering and project information provided by others. No other warranty is expressed or implied. Our evaluations and recommendations are based on discrete and widely spaced data points. Some changes in subsurface conditions from those presented in this report are anticipated to occur. Should these conditions differ materially from those described in this report, SGS should be notified so that SGS can re-evaluate these recommendations.

It is recommended that this report be made available to contractors for informational purposes and be incorporated in the construction Contract Documents. SGS should be retained to review final construction documents relevant to the recommendations in this report. SGS appreciates the opportunity to serve you during this phase of your project. If there are any questions or additional information is required, please do not hesitate to call.

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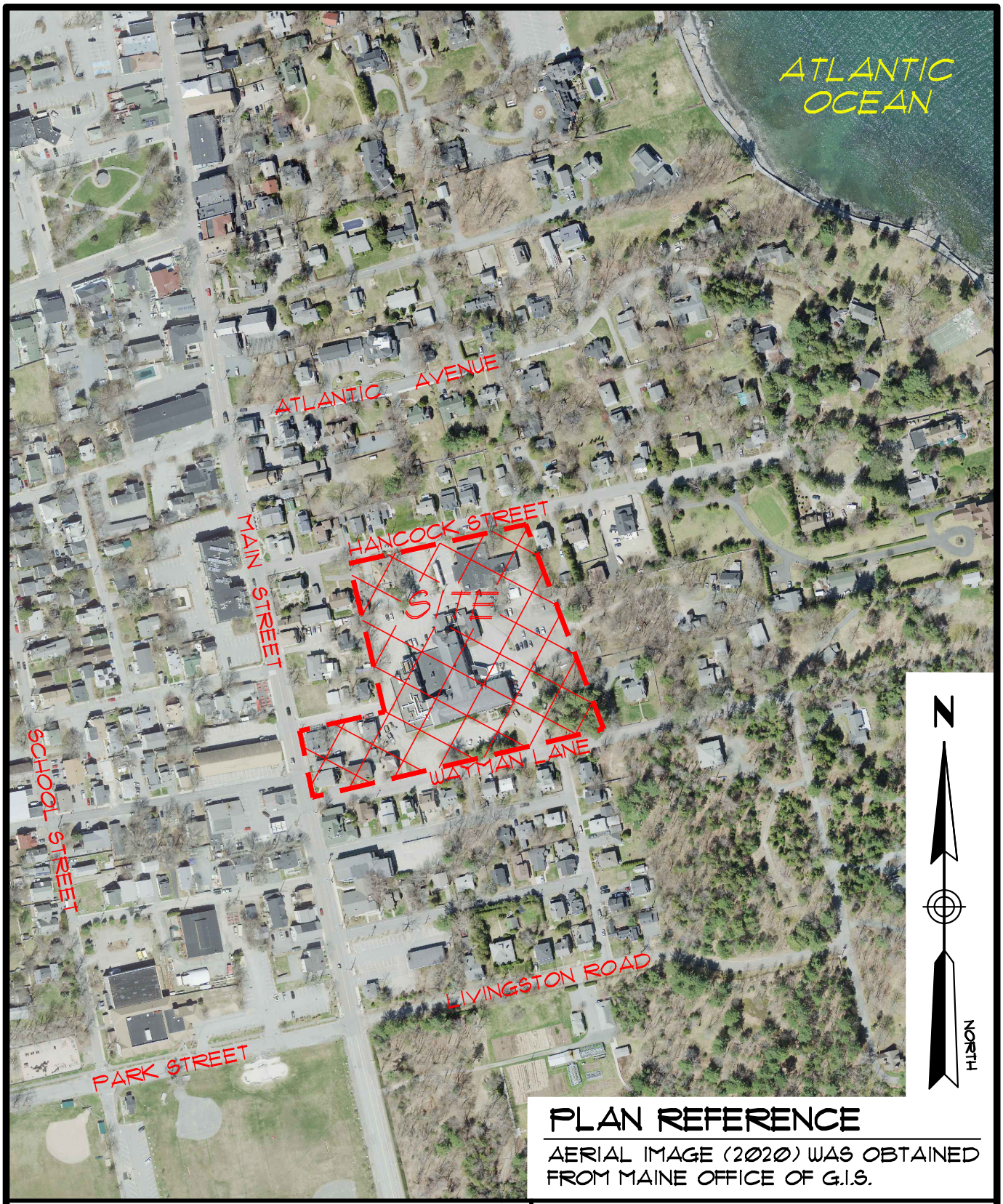
APPENDIX A

SITE LOCATION MAP

EXPLORATION LOCATION PLAN

GEOLOGICAL MAPPING



PLAN REFERENCE

AERIAL IMAGE (2020) WAS OBTAINED FROM MAINE OFFICE OF G.I.S.

SITE LOCATION MAP
MDIH CAMPUS EXPANSION

10 WAYMAN LANE - BAR HARBOR, MAINE

PREPARED FOR

MOUNT DESERT ISLAND HOSPITAL

DATE: 2-3-2023	DRAWN BY: KRF	CHECKED BY: ELS
JOB: 22458	SCALE: 1" = 300'	FILE: 22458 MAPS

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PLAN REFERENCE

"BOUNDARY & TOPOGRAPHIC PLAN FOR MOUNT DESERT ISLAND HOSPITAL", REVISION DATED SEPTEMBER 29, 2022, PREPARED BY THOMAS BENSON, PLS.

LEGEND

B-1 SUMMIT TEST BORING (JANUARY 24-25, 2023)

P-1 SUMMIT LEDGE PROBE (JANUARY 24-25, 2023)

SCALE: 1" = 50'

0 25 50 100 150

NORTH

PROPOSED CENTRAL UTILITY PLANT

PROPOSED HEALTH CENTER ADDITION

PROPOSED ED EXPANSION

PROPOSED MAIN ENTRANCE

PROPOSED EMERGENCY ENTRANCE

PROPOSED CLINICAL ENGINEERING/MAINTENANCE BUILDING

B-1 B-2 B-3 B-4 B-5 B-6 P-1 P-2 P-3 P-4 P-5 P-6 P-7

MAIN STREET

STANWOOD PLACE

WAYMAN LANE

Sidewalk

Building

Garage

Tax Map 108 7

Tax Map 108 8

Tax Map 108 8-1 and 8-2

Congregational Church 436/250

Swan 5952/113

Layout Town Book 4, Page 86 33' Wide

REV #1 - 4-11-2023 : ADDED PROPOSED ED EXPANSION

PROJECT: MDIH CAMPUS EXPANSION
10 WAYMAN LANE - BAR HARBOR, MAINE

CLIENT: MOUNT DESERT ISLAND HOSPITAL

TITLE: EXPLORATION LOCATION PLAN

SCALE: 1" = 50'

DRAWN BY: KRF

APPR. BY: ELS

DATE: FEBRUARY 3, 2023

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OFFICE: 210 MAINE AVENUE FARMINGDALE, MAINE
TEL: (207) 588-1579

PROJ.#: 22458

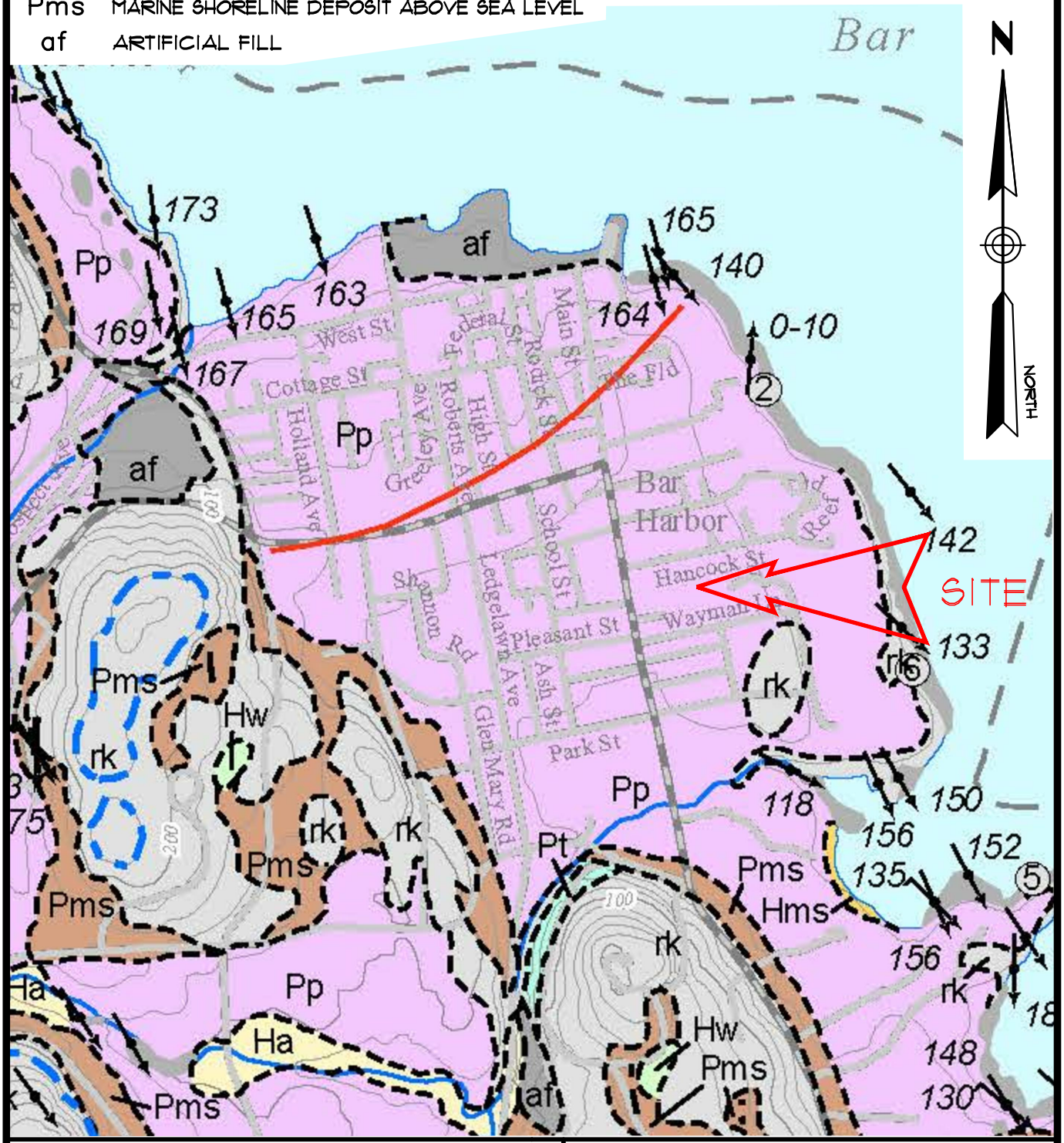
FIGURE: 1

LEGEND

Pp	PRESUMPSCOT FORMATION
rk	BEDROCK
Pms	MARINE SHORELINE DEPOSIT ABOVE SEA LEVEL
af	ARTIFICIAL FILL

MAP REFERENCE

MAINE GEOLOGICAL SURVEY, SURFICIAL GEOLOGY MAP, BAR HARBOR QUADRANGLE, DATED 2016.



SURFICIAL GEOLOGY MAP
MDIH CAMPUS EXPANSION

10 WAYMAN LANE - BAR HARBOR, MAINE

PREPARED FOR

MOUNT DESERT ISLAND HOSPITAL

DATE: 2-3-2023	DRAWN BY: KRF	CHECKED BY: ELS
JOB: 22458	SCALE: 1"= 1000'	FILE: 22458 MAPS

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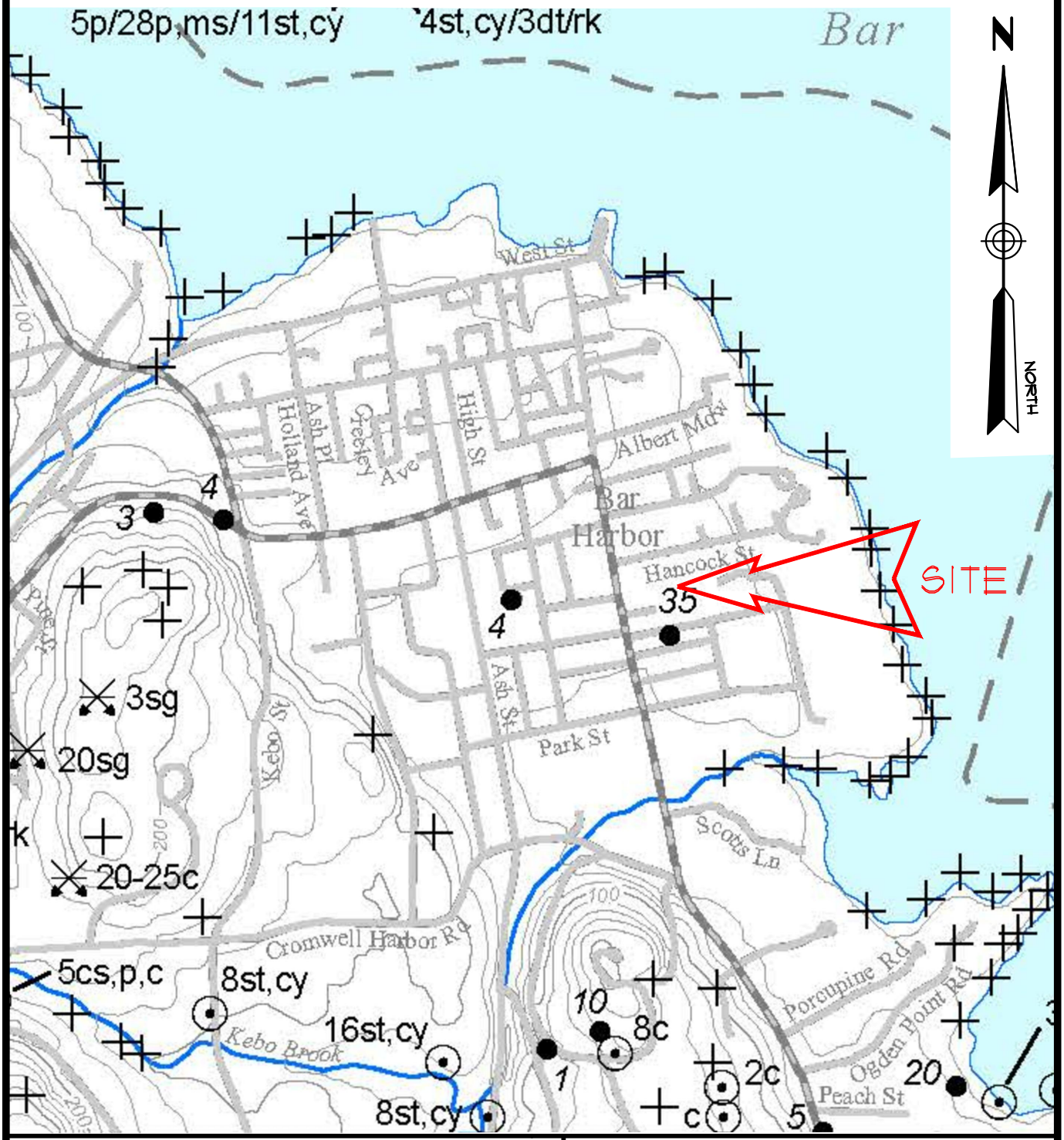
LEGEND

- ⊙ MATERIALS DATA POINT
- \+ BEDROCK OUTCROP
- 19● BEDROCK WELL WITH DEPTH TO BEDROCK

PLAN REFERENCE

SURFICIAL MATERIALS OF THE BAR HARBOR QUADRANGLE, DATED 2015, PREPARED BY MAINE GEOLOGICAL SURVEY.



SURFICIAL MATERIALS MAP
MDIH CAMPUS EXPANSION

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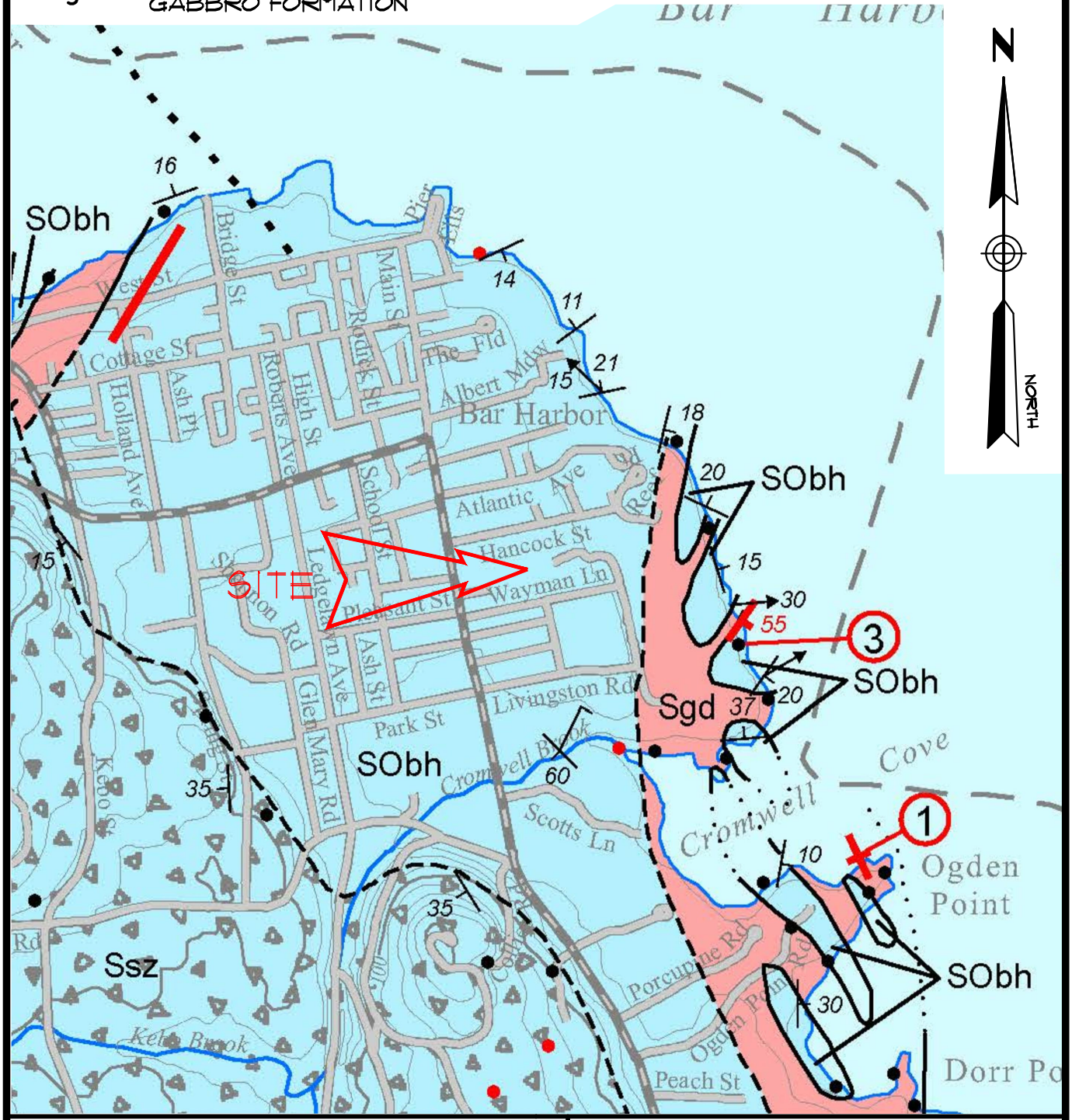
LEGEND

SObh	SILURIAN-ORDOVICIAN COMPLEX BAR HARBOR FORMATION
Sgd	SILURIAN COMPLEX GABBRO FORMATION

PLAN REFERENCE

BEDROCK GEOLOGY OF THE WASHINGTON QUADRANGLE, DATED 2006, PREPARED BY MAINE GEOLOGICAL SURVEY.



BEDROCK GEOLOGY MAP
MDIH CAMPUS EXPANSION

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PREPARED FOR

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APPENDIX B

EXPLORATION SUMMARY TABLE

TEST BORING LOGS

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Project Name: MDI Hospital Campus Expansion
Location: 10 Wayman Lane, Bar Harbor, Maine

Project Number: 22458
Date: 01/30/2023

EXPLORATION SUMMARY TABLE

EXPLORATION NUMBER	SURFACE ELEVATION (ft)	BEDROCK DEPTH (ft)	BEDROCK ELEVATION (FT)	GROUNDWATER DEPTH (ft)	GROUNDWATER ELEVATION (ft)	NOTES
B-1	42.5	21	21.5	7.8	34.7	
B-2	43.7	16.5	27.2	7.5	36.2	Offset probe refusal at 16.5'
B-3	45.8	3.5	42.3	NE	N/A	Offset probe refusal at 3.1'
B-4	49.2	2.3	46.9	NE	N/A	Offset probe refusals at 2.3' and 2.1'
B-5	44.1	2.5	41.6	NE	N/A	Offset probe refusal at 2.5'
B-6	48.7	12.3	36.4	5.0	43.7	
P-1	42.1	NR	N/A	NE	N/A	End of probe at 20', no refusal
P-2	44.4	20.2	24.2	NE	N/A	
P-3	41.8	NR	N/A	NE	N/A	End of probe at 20', no refusal
P-4	44.1	2.3	41.8	NE	N/A	
P-5	44.5	2.8	41.7	NE	N/A	
P-6	48.7	7.3	41.4	NE	N/A	
P-7	48.5	7.8	40.7	NE	N/A	

NOTES:

1.) Boring and probes were performed by SGS using a Power Probe 9500 VTR on January 24 & 25, 2023. Borings were advanced to a depth of bedrock refusal using a combination of 2¼. hollow stem augers and 3-inch casing. Probes were advanced using solid stem augers to a depth of 20 feet or refusal at planned locations. Additional offset probes were performed within a 5-foot radius of some borings to verify bedrock depth, using solid stem augers or probe rods. All refusals are presumed to be on bedrock. Refusal depths were measured to the nearest tenth of a foot from the ground surface.

2.) Surface elevations were measured on site using an auto level and benchmark elevations provided on the Boundary & Topographic Plan by T.W. Benson Land Surveying, Inc. Surface elevations are rounded to the nearest tenth of a foot.

3.) Where present, groundwater was measured in each boring location to the nearest tenth of a foot below the ground surface.

4.) NR = No Refusal. N/A = Not Applicable. NE = None encountered.

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EXPLORATION COVER SHEET

The exploration logs are prepared by the geotechnical engineer from both field and laboratory data. Soil descriptions are based upon the Unified Soil Classification System (USCS) per ASTM D2487 and/or ASTM D2488 as applicable. Supplemental descriptive terms for estimated particle percentage, color, density, moisture condition, and bedrock may also be included to further describe conditions.

Drilling and Sampling Symbols:

S = Split Spoon Sample
UT = Thin Wall Shelby Tube
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RW = Rotary Wash
SV = Lab Shear Vane (Torvane)
PP = Pocket Penetrometer
C = Rock Core Sample
FV = Field Vane Shear Test
SP = Concrete Punch Sample

Hyd = Hydraulic Advancement of Drilling Rods
Push = Direct Push of Drilling Rods
WOH = Weight of Hammer
WOR = Weight of Rod
PI = Plasticity Index
LL = Liquid Limit
MC = Natural Moisture Content
USCS = Unified Soil Classification System
Su = Undrained Shear Strength
Su(r) = Remolded Shear Strength

Water Level Measurements:

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable groundwater levels. In impervious soils, the accurate determination of groundwater elevations may not be possible, even after several days of observations. Groundwater monitoring wells may be required to record accurate depths and fluctuation.

Gradation Description and Terminology:

Boulders:	Over 12 inches	Trace:	Less than 5%
Cobbles:	12 inches to 3 inches	Little:	5% to 15%
Gravel:	3 inches to No.4 sieve	Some:	15% to 30%
Sand:	No.4 to No. 200 sieve	Silty, Sandy, etc.:	Greater than 30%
Silt:	No. 200 sieve to 0.005 mm		
Clay:	less than 0.005 mm		

Density of Granular Soils and Consistency of Cohesive Soils:

CONSISTENCY OF COHESIVE SOILS		DENSITY OF GRANULAR SOILS	
SPT N-value blows/ft	**Consistency**	**SPT N-value blows/ft**	**Relative Density**
0 to 2	Very Soft	0 to 4	Very Loose
2 to 4	Soft	5 to 10	Loose
5 to 8	Firm	11 to 30	Compact
9 to 15	Stiff	31 to 50	Dense
16 to 30	Very Stiff	>50	Very Dense
>30	Hard		

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Boring #: **B-1**

Project: MDI Hospital Expansion | Project #: 22458
Location: 10 Wayman Lane | Sheet: 1 of 1
City, State: Bar Harbor, Maine | Chkd by: ELS

Drilling Co: Summit Geoengineering Services
Driller: S. Floyd
Summit Staff: E. Stewart, P.E., J. Barnes, E.I.

Boring Elevation: 42.5 ft
Reference: Measured with auto level, benchmarks on plan by T.W. Benson Land Surveying, Inc.
Date started: 1/24/2023 Date Completed: 1/24/2023

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	2¼" HSA, 3" Casing	Hammer:	140 lb
Hammer Style:	AUTO	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/24/2023	7.8 ft	34.7 ft	Measured in open borehole

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	SP-1	12/12	0 - 1	PUSH		6" Bituminous Pavement		PAVEMENT
1					42.0	Brown Gravelly SAND to SAND, some Gravel, little Silt,		0.5'
	S-1	24/15	1 - 2	8		compact, damp, SP-SM		FILL
2				5	41.0	Olive brown Silty CLAY, mottled, firm to stiff, damp,		1.5'
				3		CL	PP = 6,000 to	GLACIAL MARINE
3				3			8,000 psf	DEPOSIT
4								
5								
	S-2	24/24	5 - 7	3		Olive brown Silty CLAY, heavily mottled, stiff, damp,	PP = 6,000 to	
6				5		CL	9,000 psf	
				7			MC = 19.2%	
7				9			q = 6260 psf	
							τ = 3130 psf	
8					▼		Water at 7.8'	
9								
10								
	S-3	24/24	10 - 12	1		Olive brown to olive gray Silty CLAY, slightly mottled,	PP = 1,500 to	
11				3		damp to moist, soft to firm, CL	2,000 psf	
				2			MC = 22.9%	
12				3				
	UT-1	30/28	12 - 14.5'	PUSH		Olive gray to gray Silty CLAY, occasional fine Sand-Silt	LL = 39, PI = 18	(Offset with casing
13						lenses and dropstones, soft, wet, CL	MC = 37.3%	to collect Shelby
							Qu =1,260 psf	tube sample)
14							ɣ = 114 pcf	
15				▼				
	S-4	24/24	15 - 17	WOH		Gray Silty CLAY, soft, wet, CL	PP ≤ 500 psf	
16				2		Gray SILT-CLAY, some to little Sand & Gravel, soft,		16.3'
				1		wet, ML-CL		
17				WOH				
18								
19								
20								
	S-5	8/8	20 - 20.7	5		Gray SILT-CLAY, some to little Sand and Gravel,	MC = 15.6%	
21				50/2"		rock fragment in spoon tip, soft to firm, wet, ML-CL		
					21.5	End of Exploration at 21', Auger Refusal on Bedrock		21.0'
22								BEDROCK

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength
Qu = Unconfined Compressive Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

SOIL BORING LOG

SUMMIT GEOENGINEERING SERVICES

Project:	MDI Hospital Expansion	Boring #:	**B-2**
Location:	10 Wayman Lane	Project #:	22458
City, State:	Bar Harbor, Maine	Sheet:	1 of 1
		Chkd by:	ELS

Drilling Co:	Summit Geoengineering Services	Boring Elevation: 43.7 ft	
Driller:	S. Floyd	Reference:	Measured with auto level, benchmarks on plan by T.W. Benson Land Surveying, Inc.
Summit Staff:	E. Stewart, P.E., J. Barnes, E.I.	Date started: 1/24/2023	Date Completed: 1/24/2023

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	3" CASING	Hammer:	140 lb
Hammer Style:	AUTO	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/25/2023	7.5 ft	36.2 ft	Measured in open borehole

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/20	0 - 2	2		Olive brown SILT-CLAY, trace Gravel, rootlets, stiff,		REWORKED NATIVE
1				6		moist, ML-CL		
				9	42.7	Black asphalt (deteriorated into particles)		1.0' ASPHALT
2				5	41.7	Brown SAND, some Gravel, mixed with reclaim/asphalt,		1.5'+/-
						little Silt, compact, damp, SM		FILL
3								
						(Lower portions may include reworked native soils)		
4								
								4'+/-
5								GLACIAL MARINE
	S-2	24/24	5 - 7	2		Olive brown Silty CLAY, slightly mottled, stiff, damp,	PP = 7,000 to	DEPOSIT
6				3		CL	8,000 psf	
				5			MC = 18.5%	
7				5				
					▼		Water at 7.5'	
8								
9								
10								
	S-3	24/24	10 - 12	2		Olive gray Silty CLAY, firm to stiff, damp, CL	PP = 4,000 to	
11				3			6,000 psf	
				5			MC = 20.2 %	
12				5				
13								
14								
15								
	S-4	18/18	15 - 16.5	WOH		Olive gray Silty CLAY, very soft, wet, CL	MC = 31.2%	
16				WOH				
				2		Olive gray Gravelly SAND, very loose, saturated, SP-SM		16.3'
17				50/0"	27.2	End of Exploration at 16.5', Spoon Refusal on Probable		16.5'
						Bedrock		BEDROCK
18								
						Offset solid stem rod probe, refusal at 16.5' on		
19						Bedrock		
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Project:	MDI Hospital Expansion	Boring #:	**B-3**
Location:	10 Wayman Lane	Project #:	22458
City, State:	Bar Harbor, Maine	Sheet:	1 of 1
		Chkd by:	ELS

Drilling Co:	Summit Geoengineering Services	Boring Elevation: 45.8 ft	
Driller:	S. Floyd	Reference:	Measured with auto level, benchmarks on plan by T.W. Benson Land Surveying, Inc.
Summit Staff:	E. Stewart, P.E., J. Barnes, E.I.	Date started: 1/24/2023	Date Completed: 1/24/2023

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	2-1/4" HSA	Hammer:	140 lb
Hammer Style:	AUTO	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/24/2023	NE	N/A	None observed

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/12	0 - 2	1		Brown SAND, some Silt, little Gravel, trace wood &		TOPSOIL
1				2		organics, loose, damp, SM		
				2	44.8	Light to olive brown SILT, some Sand & Gravel,		1'
2				23		compact to dense, damp to moist, ML		GLACIAL TILL
	S-2	0/0	2	50/0"				
3						Spoon Refusal at 2.0' on cobble or boulder		
4					42.3	Slow auger advancement into bedrock		3.5' BEDROCK
					41.9	End of Exploration, Solid Stem Auger Refusal at 3.9'		3.9'
5								
						Offset solid stem auger probe 2' north: Refusal at 3.1'		
6						on Bedrock		
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Project:	MDI Hospital Expansion	Boring #:	**B-4**
Location:	10 Wayman Lane	Project #:	22458
City, State:	Bar Harbor, Maine	Sheet:	1 of 1
		Chkd by:	ELS

Drilling Co:	Summit Geoengineering Services	Boring Elevation: 49.2 ft	
Driller:	S. Floyd	Reference:	Measured with auto level, benchmarks on plan by T.W. Benson Land Surveying, Inc.
Summit Staff:	E. Stewart, P.E., J. Barnes, E.I.	Date started: 1/24/2023	Date Completed: 1/24/2023

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	2-1/4" HSA	Hammer:	140 lb
Hammer Style:	AUTO	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/24/2023	NE	N/A	None Encountered

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	21/10	0 - 1.8	2		Dark brown medium SAND, some Silt, trace Gravel,		TOPSOIL
1				6		roots, loose, damp, SM		
				15	48.5	Olive brown coarse SAND, some Silt & Gravel, compact,		0.7'
2				50/3"		damp, SM		FILL
						Spoon Refusal at 1.8', cobble in spoon tip		
3					46.9	End of Exploration at 2.3', Auger Refusal on Probable		2.3'
						Bedrock		PROBABLE
4								BEDROCK
						Offset Solid Stem Auger Probe 2.5' East:		
5						Refusal at 2.3' on Probable Bedrock		
6						Offset Solid Stem Auger Probe 3' Northeast:		
						Refusal at 2.1' on Probable Bedrock		
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Project:	MDI Hospital Expansion	Boring #:	**B-5**
Location:	10 Wayman Lane	Project #:	22458
City, State:	Bar Harbor, Maine	Sheet:	1 of 1
		Chkd by:	ELS

Drilling Co:	Summit Geoengineering Services	Boring Elevation: 44.1 ft	
Driller:	S. Floyd	Reference:	Measured with auto level, benchmarks on plan by T.W. Benson Land Surveying, Inc.
Summit Staff:	E. Stewart, P.E., J. Barnes, E.I.	Date started: 1/25/2023	Date Completed: 1/25/2023

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	2-1/4" HSA	Hammer:	140 lb
Hammer Style:	AUTO	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/25/2023	NE	N/A	None encountered

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/10	0 - 2	2		Dark brown Silty SAND, little Gravel, rootlets, compact,		TOPSOIL
1				9		damp, SM		
				6		(Tree root at 1.8')		0.5'+/-
2				5		Dark brown Silty SAND, little Gravel, rootlets, cobble in		FILL OR REWORKED
	S-2	4/4	2 - 2.3	50/4"		spoon tip, compact, damp, SM		NATIVE
3						(Spoon refusal at 2.3' on cobble)		2.5'
						End of Exploration at 2.5', Solid Stem Auger Refusal		BEDROCK
4						on Bedrock		
5						Offset 3' East, Refusal at 2.5' on Bedrock		
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Project:	MDI Hospital Expansion	Boring #:	**B-6**
Location:	10 Wayman Lane	Project #:	22458
City, State:	Bar Harbor, Maine	Sheet:	1 of 1
		Chkd by:	ELS

Drilling Co:	Summit Geoengineering Services	Boring Elevation: 48.7 ft	
Driller:	S. Floyd	Reference:	Measured with auto level, benchmarks on plan by T.W. Benson Land Surveying, Inc.
Summit Staff:	E. Stewart, P.E., J. Barnes, E.I.	Date started:	1/25/2023 Date Completed: 1/25/2023

DRILLING METHOD		SAMPLER	
Vehicle:	ATV	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	2-1/4" HSA	Hammer:	140 lb
Hammer Style:	AUTO	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
1/25/2023	6 ft +/-	42.7 ft	Observed moisture content of samples

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
	S-1	24/10	0 - 2	2		Brown Gravelly SAND, trace Silt, cobble at 1.8', loose		FILL
1				1		damp, SP-SM		
				3				
2				4	46.9	Dark brown Sandy SILT, rootlets, firm, damp, ML		1.8'
								GLACIAL MARINE
3								DEPOSIT
4								
5								
	S-2	24/10	5 - 7	5		Olive brown to olive gray Sandy SILT, some Clay,		
6				4		damp to moist, firm, ML		
				7		(Cobble fragments at 6'+/-)		
7				6				
8								
9								
10								
	S-3	24/12	10 - 12	7		Olive brown Silty CLAY, some Gravel, trace to little		
11				16		Sand, very stiff, moist, CL		
				17		(Cobble in spoon tip)		
12				20				
13					36.4	End of Exploration, Auger Refusal on Bedrock 12.3'		12.3'
								BEDROCK
14								
15								
16								
17								
18								
19								
20								
21								
22								

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

APPENDIX C

LABORATORY TEST RESULTS

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GEOENGINEERING SERVICES

UNCONFINED COMPRESSIVE STRENGTH OF COHESIVE SOILS - ASTM D2166

PROJECT NAME:	MDI Hospital Expansion	PROJECT #:	22458
PROJECT LOCATION:	10 Wayman Lane, Bar Harbor, Maine	CLIENT:	MDI Hospital
COLLECTION DATE:	1/25/2023	TECHNICIAN:	Jason Barnes, E.I.
TEST DATE:	2/8/2023	CHECKED BY:	Erika Stewart, P.E.

Sample & Testing Information

Boring Number:	B-1	**Trimming Method:**	End Trim
Sample Number:	S-2	**Liquid Limit (LL):**	--
Sample Depth:	5' - 7'	**Plasticity Index (PI):**	--
Sample Type:	Split Spoon	**Rate of Strain:**	0.05 in/min
Sample State:	Intact	**H/D Ratio:**	2.1

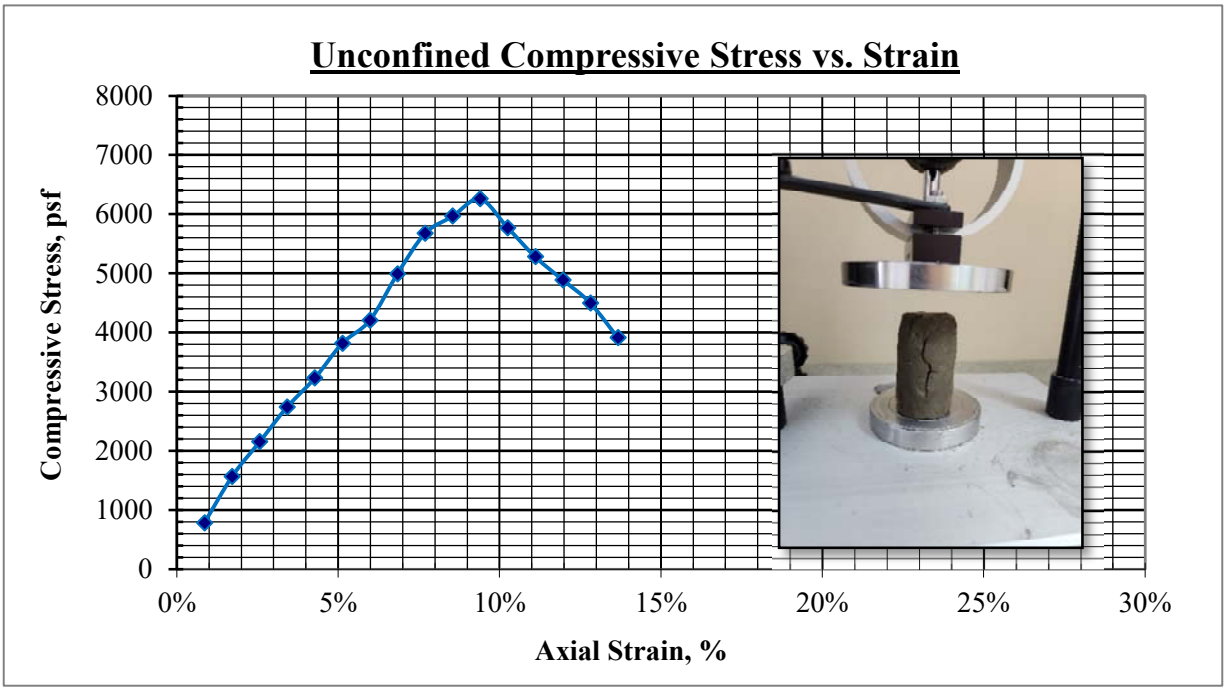
Sample Height:	2.93 in	**Sample Mass:**	140.0 g
Sample Diameter:	1.37 in	**Moisture Content:**	27.9%
Sample Volume:	4.31 in^3	**Moist Unit Weight:**	124 pcf
Cross Sectional Area:	1.47 in^2	**Dry Density:**	97 pcf

Sample Description & Classification

Olive brown Silty CLAY, mottled, stiff, CL

Test Results

Unconfined Compressive Strength:	6260 psf	**Strain at Failure:**	9%
Shear Strength:	3130 psf	**Failure Type:**	Shear



REMARKS:

Mailing: PO Box 515, Gardiner, ME 04345
Office: 210 Maine Avenue, Farmingdale, ME 04344

SUMMIT
GEOENGINEERING SERVICES

THIN WALLED TUBE SAMPLING - ASTM D1587

PROJECT NAME:	MDI Hospital Campus Expansion	PROJECT #:	22458
PROJECT LOCATION:	10 Wayman Lane, Bar Harbor, Maine	CLIENT:	MDI Hospital
COLLECTION DATE:	1/25/2023	SAMPLE #:	UT-1
TEST DATE:	2/2/2023	TECHNICIAN:	Jason Barnes, E.I.

Test Boring Information

Boring Number: B-1
Drilling Method: Direct Push
Drilling Tooling: 3-inch Casing
Sampling Method: Tube Push

Sample Information

Tube Length: 30"
Recovery: 28"
Tube Diameter: 2.5"
Depth: 12'-14.5'

Trial / Specimen Number	Moisture Content	Unit Weight	Torvane	
1	34.8%	114 pcf	300 psf	*
2	40.8%	114 pcf	180 psf	
3	41.0%	112 pcf	292 psf	
Average	38.9%	114 pcf	260 psf	

*First specimen included fine Sand lenses

Visual Description (ASTM D2488):

Gray Silty CLAY, ocassional fine Sand/Silt lenses, dropstones, CL

Photograph of cross sectional sample view.

Photograph of longitudinal sample view.

REMARKS:

Mailing: PO Box 515, Gardiner, ME 04345
Office: 210 Maine Avenue, Farmingdale, ME 04344

SUMMIT
GEOENGINEERING SERVICES

UNCONFINED COMPRESSIVE STRENGTH OF COHESIVE SOILS - ASTM D2166

PROJECT NAME:	MDI Hospital Expansion	PROJECT #:	22458
PROJECT LOCATION:	10 Wayman Lane, Bar Harbor, Maine	CLIENT:	MDI Hospital
COLLECTION DATE:	1/25/2023	TECHNICIAN:	Jason Barnes, E.I.
TEST DATE:	2/3/2023	CHECKED BY:	Erika Stewart, P.E.

Sample & Testing Information

Boring Number:	B-1	**Trimming Method:**	End Trim	
Sample Number:	UT-1	**Liquid Limit (LL):**	39	
Sample Depth:	12' - 14.5'	**Plasticity Index (PI):**	18	
Sample Type:	Shelby Tube	**Rate of Strain:**	0.05	in/min
Sample State:	Intact	**H/D Ratio:**	2.2	

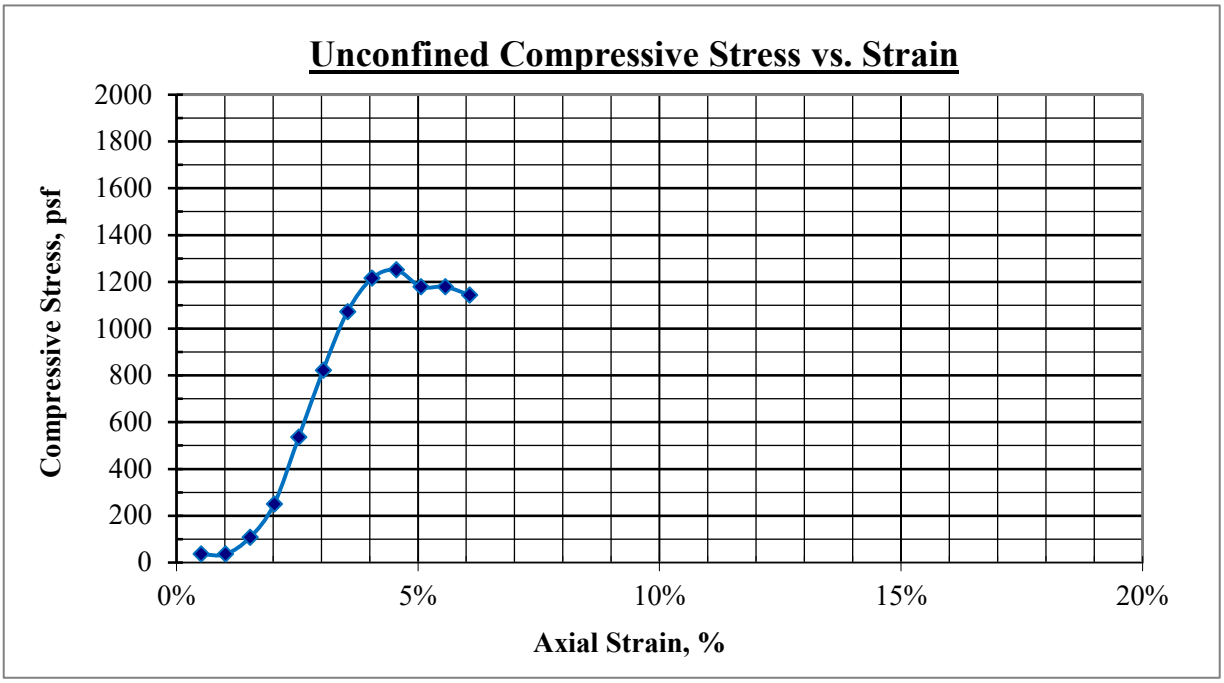
Sample Height:	4.95	in	**Sample Mass:**	657.6	g
Sample Diameter:	2.26	in	**Moisture Content:**	34.0%	
Sample Volume:	19.92	in^3	**Moist Unit Weight:**	126	pcf
Cross Sectional Area:	4.03	in^2	**Dry Density:**	94	pcf

Sample Description & Classification

Gray Silty CLAY, occasional fine Sand/Silt seams, dropstones, CL

Test Results

Unconfined Compressive Strength:	1260	psf	**Strain at Failure:**	5%
Shear Strength:	630	psf	**Failure Type:**	Bulge



REMARKS:

Mailing: PO Box 515, Gardiner, ME 04345
Office: 210 Maine Avenue, Farmingdale, ME 04344

SUMMIT
GEOENGINEERING SERVICES

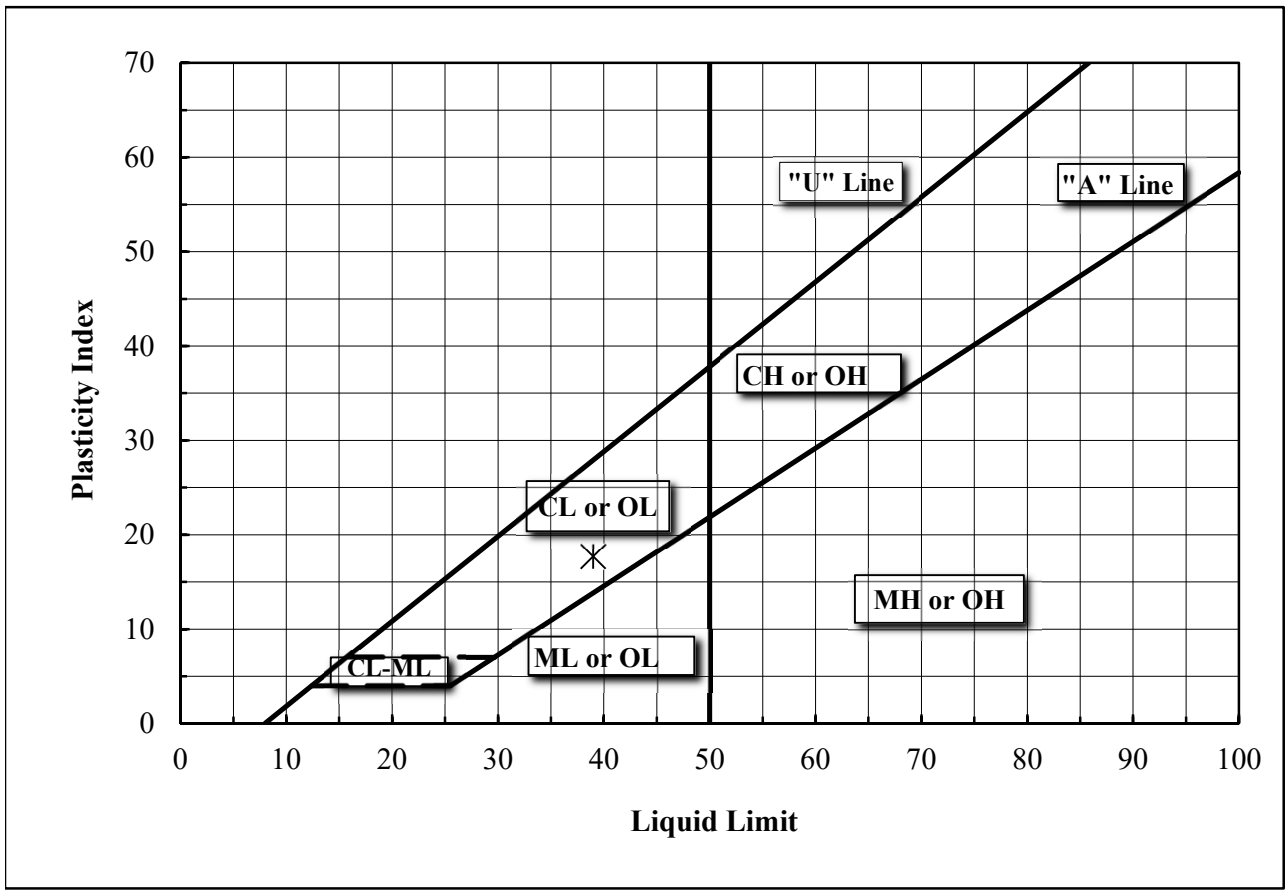
ATTERBERG LIMIT TEST - ASTM D4318

Method "A" (Multi-point)

PROJECT NAME:	MDI Hospital Expansion	PROJECT NUMBER:	22458
LOCATION:	10 Wayman Lane, Bar Harbor, Maine	SAMPLE NUMBER:	UT-1
CLIENT:	MDI Hospital	DEPTH:	12' - 14.5'
TEST DATE:	2/8/2023	TECHNICIAN:	Jason Barnes, E.I.

DATA

Source	Depth	LL	PL	PI	Classification
B-1	12' - 14.5'	39	21	18	Gray Silty CLAY, occasional fine Sand/ Silt lenses, CL



Notes: Moisture Content = 37.3%

Mailing: PO Box 515, Gardiner, ME 04345
Office: 210 Maine Avenue, Farmingdale, ME 04344

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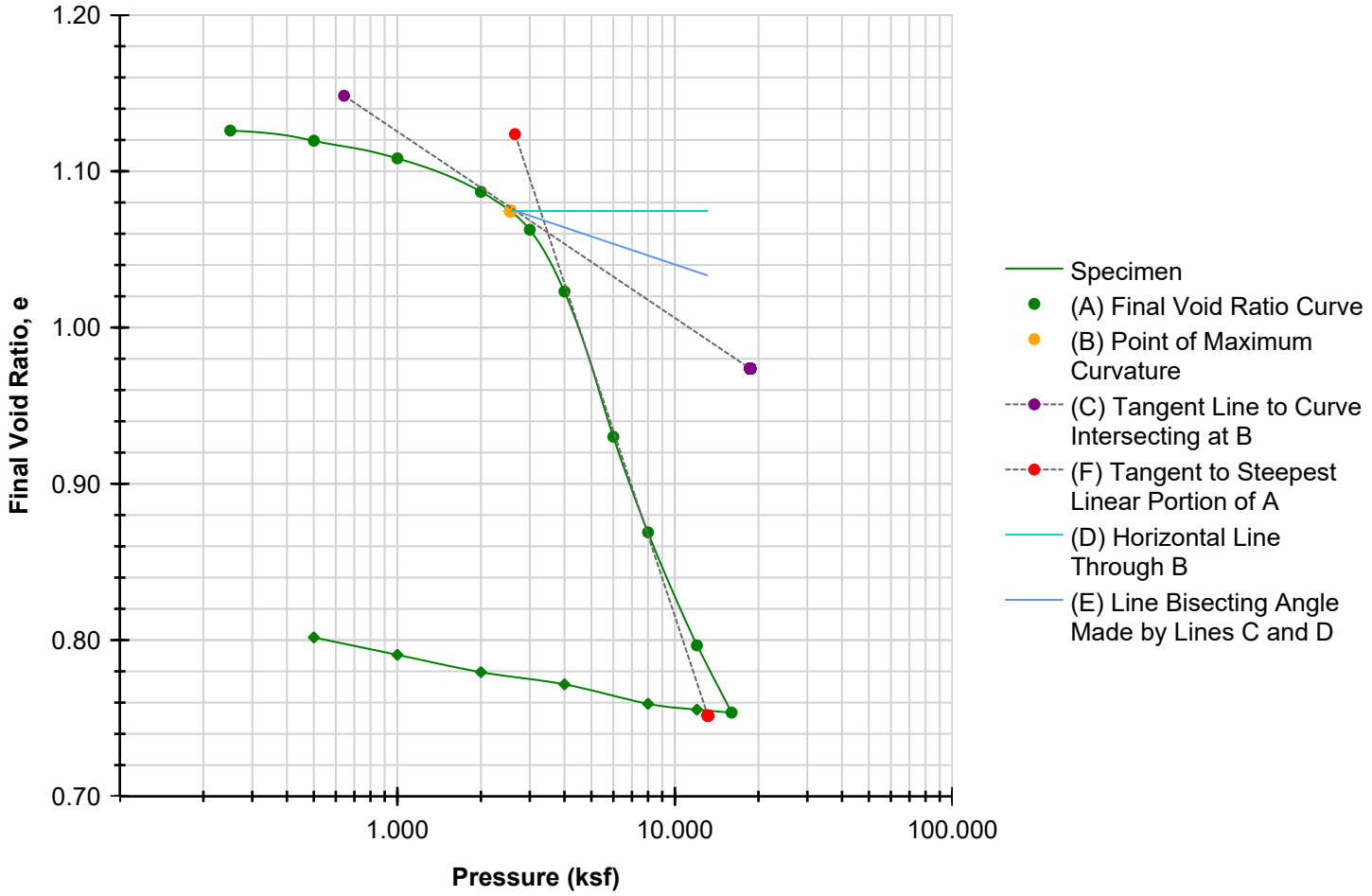
Final Voids [Log]

ASTM D2435



Preconsolidation Stress (ksf)	3.363	**Cc**	0.529	**Cr**	0.032

	BEFORE	AFTER			
			Liquid Limits	39	**Test Date** 2/2/2023
Moisture (%)	40.1	31.6	**Plastic Limits**	21	
Dry Density (pcf)	80.6	94.3			
Saturation (%)	97.5	105.7			
Void Ratio	1.13	0.82	**Specific Gravity**	2.75	ASSUMED

Sample Description	Gray Silty CLAY, occasional Silt/fine Sand seams and dropstones			
Project Number	22458	**Depth (ft)**	12'-14.5'	**Remarks**
Sample Number	UT-1	**Boring Number**	B-1	
Project	MDI Hospital Expansion			
Client	MDI Hospital			
Location	10 Wayman Lane, Bar Harbor, Maine			

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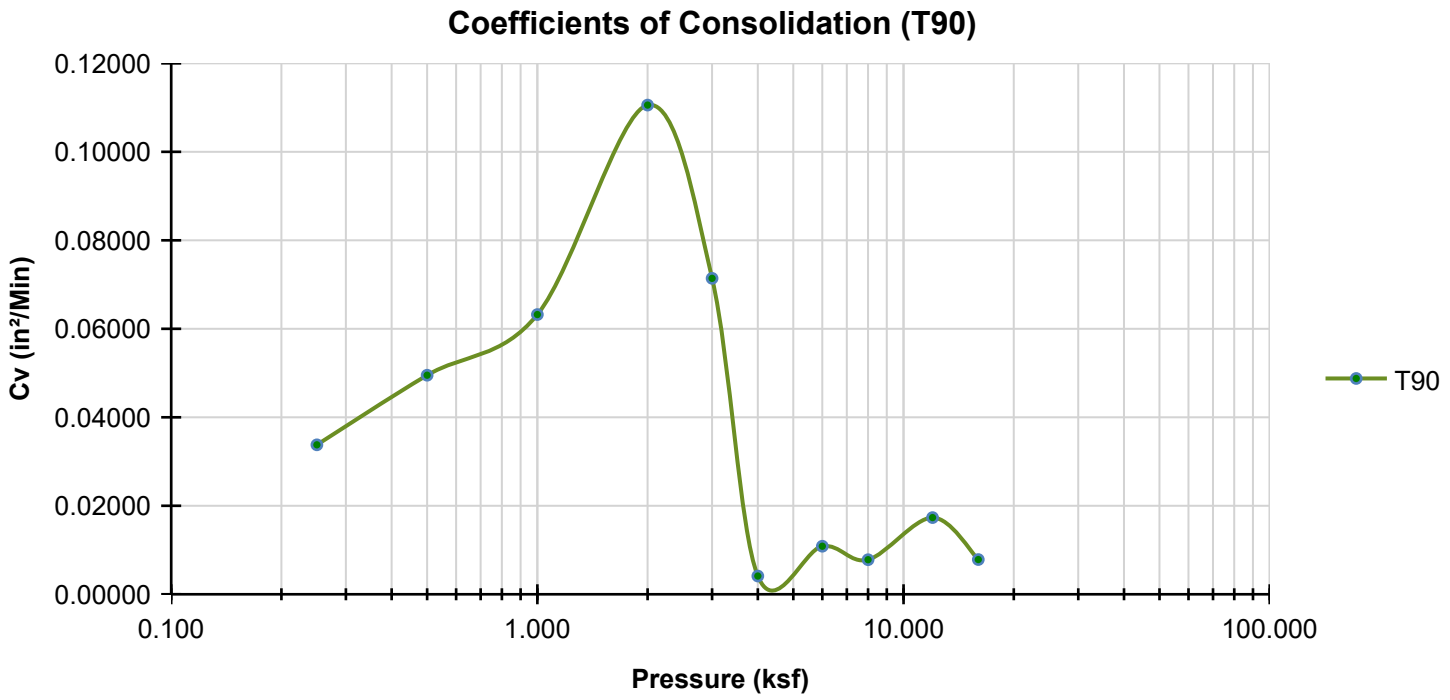
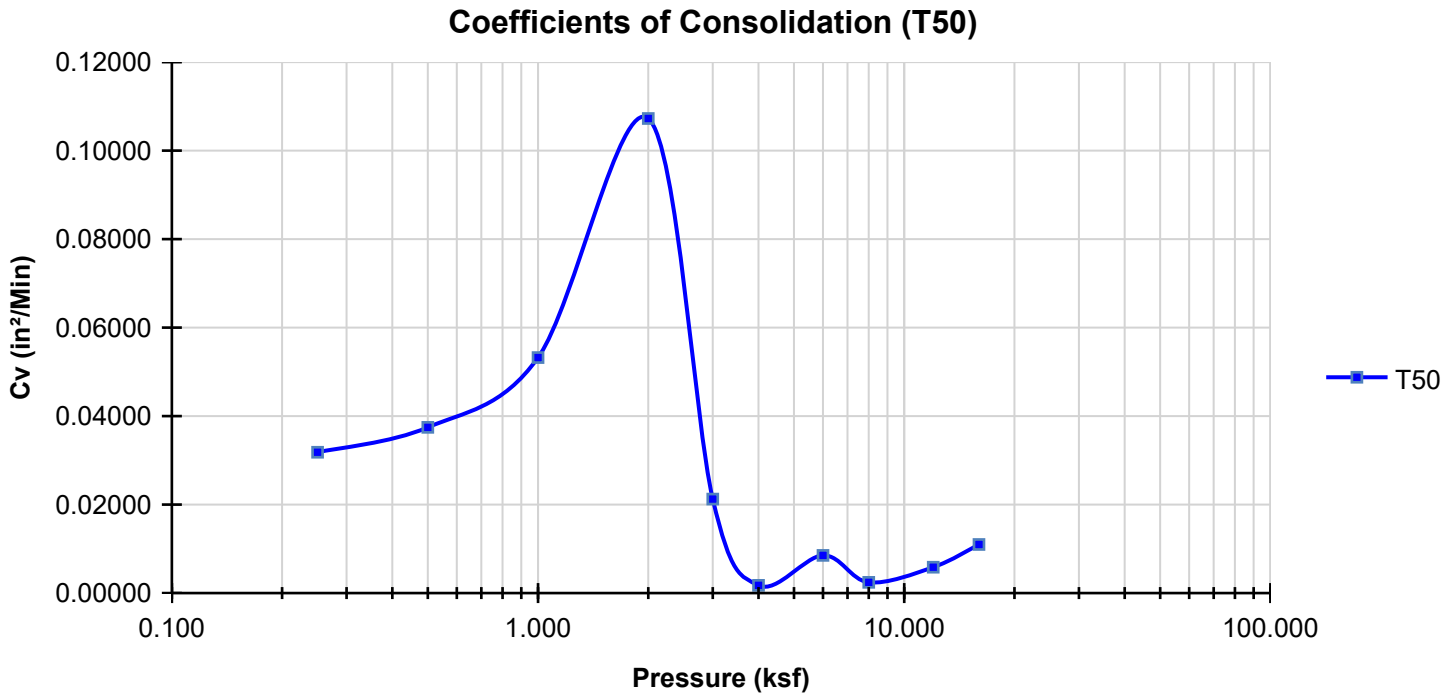
Coefficients of Consolidation

ASTM D2435





Project Name: MDI Hospital Expansion Project Number: 22458

Technician: Jason Barnes, E.I. Test Date: 2/2/2023 Checked By: _____ Date: _____

Summary

ASTM D2435

Sample Description	Gray Silty CLAY, occasional Silt/fine Sand seams and dropstones			
Project Number	22458	**Depth (ft)**	12'-14.5'	**Remarks**
Sample Number	UT-1	**Boring Number**	B-1	
Project	MDI Hospital Expansion			
Client	MDI Hospital			
Location	10 Wayman Lane, Bar Harbor, Maine			

Index	Loading Sequence (ksf)	Cummulative Change in Height (in)	Specimen Height (in)	Height of Voids (in)	Vertical Strain (%)	Void Ratio	T90 Fitting Time (Hr)	T50 Fitting Time (Hr)	T90 Cv (in²/Min)	T50 Cv (in²/Min)	Sequence Status
0	0.000	0.0000	0.7890	0.0000	0.0	1.131	0.000	0.000	0.00000	0.00000	ENABLED
1	0.250	0.0005	0.7885	0.4176	0.1	1.126	0.065	0.016	0.03378	0.03183	ENABLED
2	0.500	0.0029	0.7861	0.4152	0.4	1.120	0.044	0.014	0.04951	0.03746	ENABLED
3	1.000	0.0071	0.7819	0.4110	0.9	1.108	0.034	0.009	0.06322	0.05323	ENABLED
4	2.000	0.0151	0.7739	0.4031	1.9	1.087	0.019	0.005	0.11056	0.10726	ENABLED
5	3.000	0.0241	0.7649	0.3941	3.1	1.063	0.029	0.023	0.07140	0.02124	ENABLED
6	4.000	0.0387	0.7503	0.3794	4.9	1.023	0.482	0.264	0.00413	0.00175	ENABLED
7	6.000	0.0732	0.7158	0.3449	9.3	0.930	0.167	0.049	0.01086	0.00852	ENABLED
8	8.000	0.0959	0.6931	0.3223	12.2	0.869	0.217	0.162	0.00781	0.00243	ENABLED
9	12.000	0.1227	0.6663	0.2954	15.6	0.797	0.091	0.062	0.01733	0.00585	ENABLED
10	16.000	0.1386	0.6504	0.2795	17.6	0.754	0.190	0.032	0.00785	0.01098	ENABLED
11	12.000	0.1379	0.6511	0.2802	17.5	0.755	0.000	0.000	0.00000	0.00000	ENABLED
12	8.000	0.1366	0.6524	0.2816	17.3	0.759	0.000	0.000	0.00000	0.00000	ENABLED
13	4.000	0.1319	0.6571	0.2862	16.7	0.772	0.000	0.000	0.00000	0.00000	ENABLED
14	2.000	0.1290	0.6600	0.2891	16.4	0.779	0.000	0.000	0.00000	0.00000	ENABLED
15	1.000	0.1249	0.6641	0.2932	15.8	0.791	0.000	0.000	0.00000	0.00000	ENABLED
16	0.500	0.1208	0.6682	0.2973	15.3	0.802	0.000	0.000	0.00000	0.00000	ENABLED

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Consolidated Test Results

ASTM D2435

Project:	MDI Hospital Expansion
Project Number:	22458
Job Number:	22458
Test Date:	2/2/2023

Sampling Date:	1/25/2023
Sample Number:	UT-1
Depth (ft)	12'-14.5'
Boring Number:	B-1
Location:	10 Wayman Lane, Bar Harbor, Maine
Client Name:	MDI Hospital
Remarks:	

Specific Gravity:	2.75	Plastic Limit:	21	Liquid Limit:	39
Specific Gravity Method:	ASSUMED			Weight of Ring (g)	59.1
Sampling Method:	Shelby Tube	Soil Classification:	CL		
Specimen Description:	Gray Silty CLAY, occasional Silt/fine Sand seams and dropstones				

Parameters	Initial	Final
Height (in)	0.7890	0.6682
Height Source	NA	TEST RESULTS
Diameter (in)	2.0000	NA
Area (in²)	3.142	NA
Volume (in³)	2.4787	2.0992
Weight of Container (g)	13.0	13.1
Weight of Wet Soil + Container (g)	74.7	79.2
Weight of Dry Soil + Container (g)	56.8	63.4
Moisture Content (%)	40.1	31.6
Moist Weight + Ring Weight (g)	132.6	127.5
Dry Density (pcf)	80.6	94.3
Wet Density (pcf)	112.9	124.0
Saturation (%)	97.5	105.7
Void Ratio	1.1	0.8

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Consolidation Test Results

ASTM D2435

Specimen 1

Test Description:	One Dimensional Consolidation		
Other Associated Tests:	Tube Opening, AL, MC, UC		
Device Details:	HM-2470A		
Test Specification:			
Test Time:	2/2/2023 12:00:00 AM		
Technician:	Jason Barnes, E.I.	Sampling Method:	Shelby Tube
Specimen Code:	UT-1	Specimen Lab #:	UT-1
Specimen Description:	Gray Silty CLAY, occasional Silt/fine Sand seams and dropstones		
Specimen Preparation:	Ring-Lined Sampler		
Large Particle:			
Moisture Content:	Natural Moisture		
Test Condition:	Saturated		
Test Procedure:	ASTM D2435		
Seating Pressure Used:	YES	Seating Pressure (ksf):	0.100
Preconsolidation Stress:			
Percent Strain [LOG] Graph (ksf):	NA	Final Voids Graph (ksf):	3.363

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Laboratory Determination of Water (Moisture) Content of Soil ASTM D2216

PROJECT NAME:	MDI Hospital Expansion	PROJECT #:	22458
PROJECT LOCATION:	10 Wayman Lane, Bar Harbor, Maine	DRYING METHOD:	Oven Dried
CLIENT:	MDI Hospital	DESCRIPTION:	Glacial Marine
SOURCE:	Borings	TECHNICIAN:	Jason Barnes, E.I.
COLLECTION DATE:	01/25/23	TESTING DATE:	02/03/23

Location	Sample No.	Depth	Moisture Content	Remarks
B-1	S-2	5' - 7'	19.2%	Stiff Clay
B-1	S-3	10' - 12'	22.9%	
B-1	UT-1	12' - 14.5'	37.3%	(Atterberg)
B-1	S-4	15' - 17'	16.7%	Clay w/ Silt & Sand
B-1	S-5	20' - 20.5'	15.6%	Silt-Clay, some Sand & Gravel
B-2	S-2	5' - 7'	18.5%	Stiff Clay
B-2	S-3	10' - 12'	20.2%	
B-2	S-4	15' - 16.5'	31.2%	

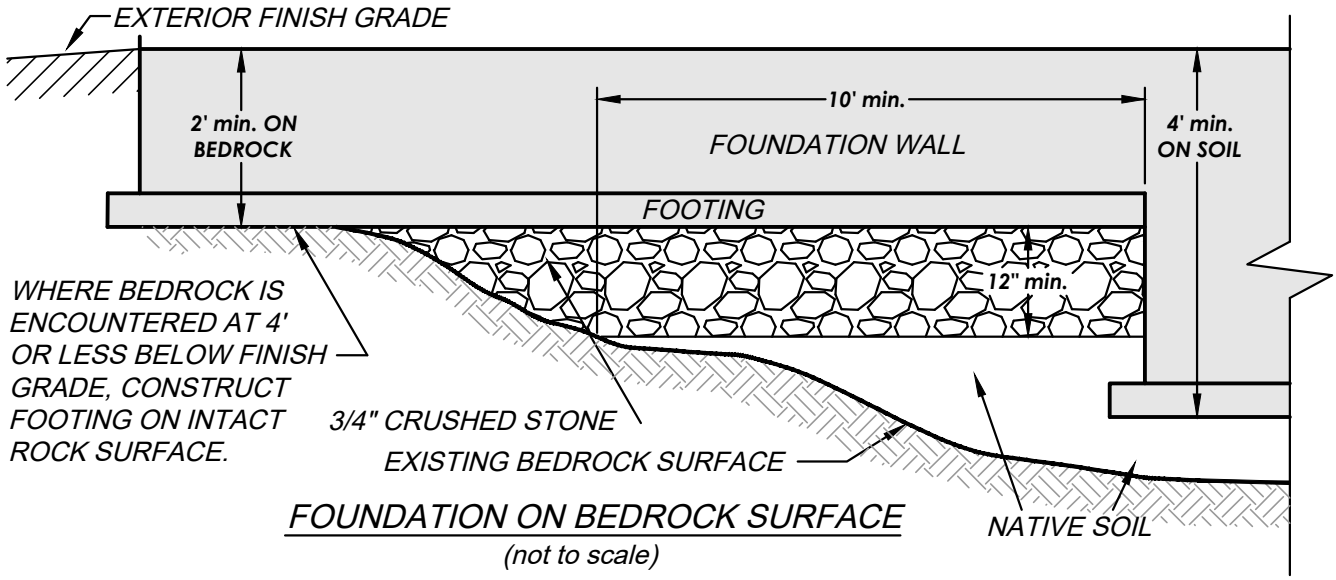
REMARKS:

Mailing: PO Box 515, Gardiner, ME 04345
Office: 210 Maine Avenue, Farmingdale, ME 04344

APPENDIX D

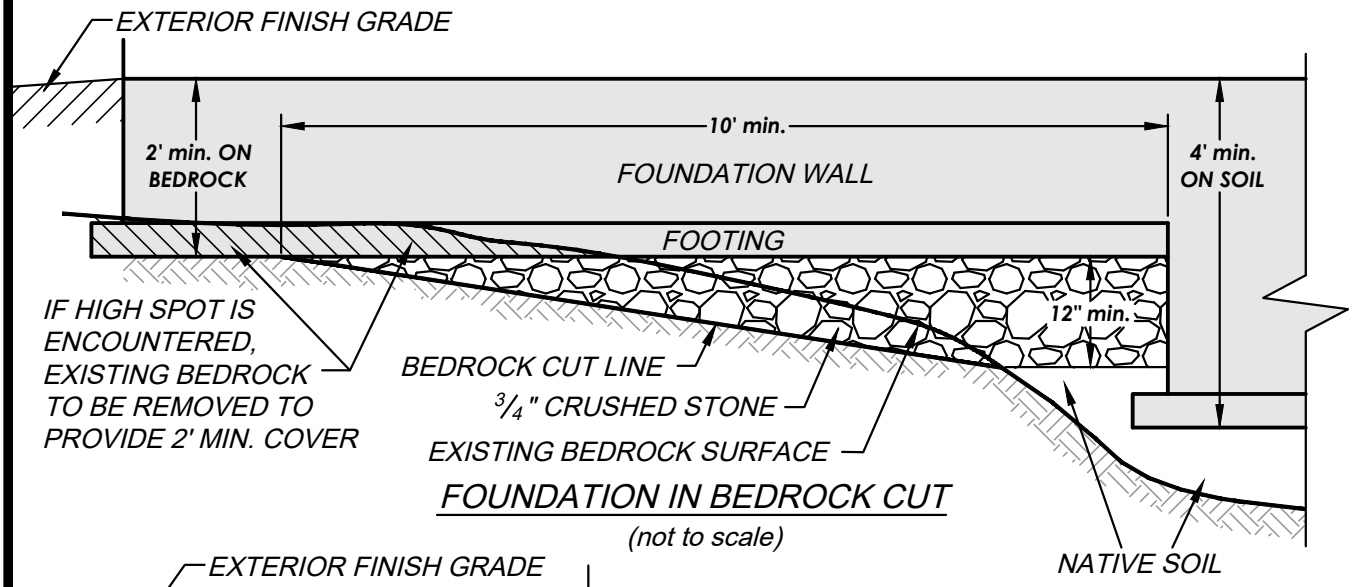
FOOTING TRANSITION DETAIL

GENERAL BLASTING RECOMMENDATIONS



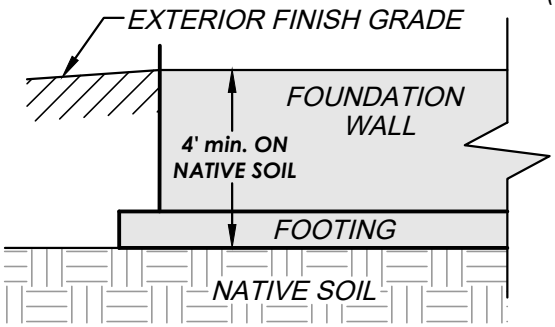
FOUNDATION ON BEDROCK SURFACE

(not to scale)



FOUNDATION IN BEDROCK CUT

(not to scale)



FOOTING - NO BEDROCK

(not to scale)

FOOTING TRANSITION DETAIL
MDIH CAMPUS EXPANSION

10 WAYMAN LANE - BAR HARBOR, MAINE

PREPARED FOR

MDI HOSPITAL

DATE: 2-14-2023	DRAWN BY: KRF	CHECKED BY: JNB
JOB: 22458	NOT TO SCALE	FILE: 22458 BOR

OFFICE: 210 MAINE AVENUE
FARMINGDALE, MAINE
TEL: (207) 588-7579

MAIL: P.O. BOX 515
GARDINER, ME 04345

SUMMIT
GEOENGINEERING SERVICES
www.summitgeoeng.com

GENERAL BLASTING RECOMMENDATIONS

Introduction

Blasting operations will be performed in general accordance with the applicable U.S. Department of the Interior Rules, the recommendations provided below, and a normal standard of care.

Blast Design

The blasting contractor shall submit a blasting plan to the Owner for approval prior to blasting operations. The blasting plan shall include a schedule, sketches of the drill patterns (hole spacing and depth), type and amount of explosives, number and sequence of delays, methods for minimizing flyrock, and any other information pertinent to demonstrating compliance with the applicable U.S. Department of the Interior Rules and the recommendations provided below.

Notification

Oral notification to the abutters within one-half mile of the blast area shall be provided prior to blasting. Warning and all clear signals of different character or pattern that are audible within one-half mile from the point of the blast shall be given. The meaning of the signals shall be conveyed to the abutters at the time they are notified.

Pre-blast Surveys

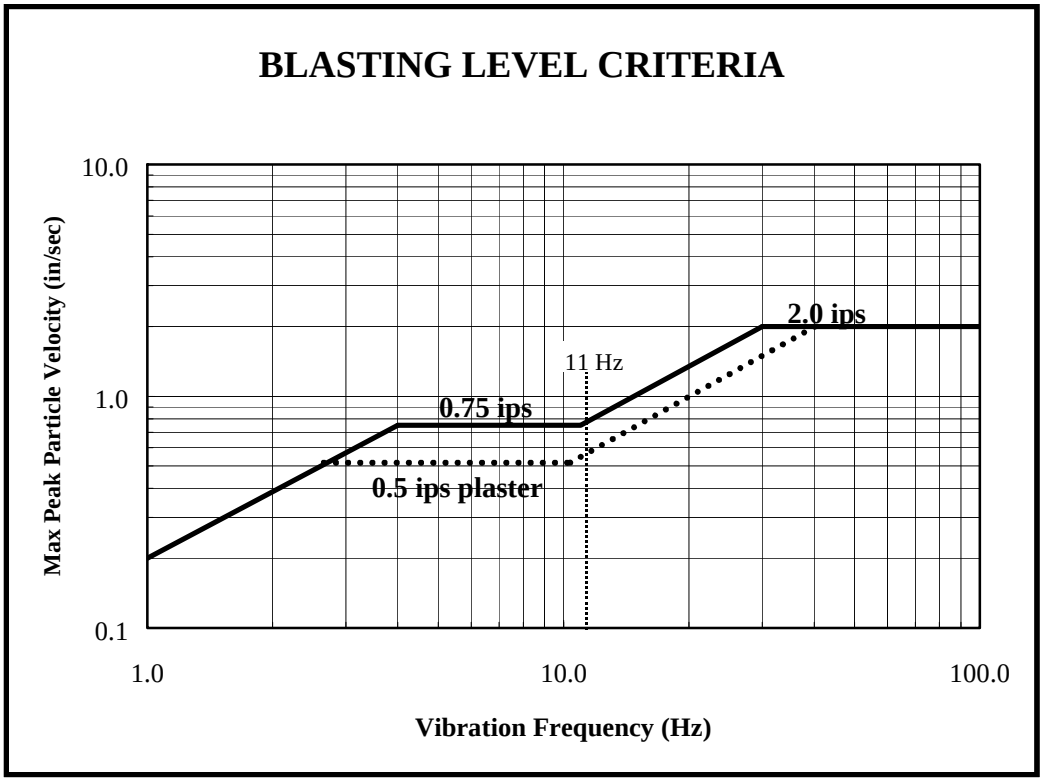
All blasting operations are the direct responsibility of the Blasting Contractor. Reports of damage to structures caused by blasting operations are the sole responsibility of the Blasting Contractor. Therefore, it is incumbent upon the Blasting Contractor to perform pre-blast surveys as they deem necessary.

Airblast Limits

Airblast overpressure shall not exceed 136 dB (0.018 psi) at the nearest structure.

Ground Vibration Limits

The maximum ground vibration at any structure shall not exceed the limits presented in the following chart:



REFERENCE: OSM alternative blasting criteria (Modified from figure B-1, Bureau of Mines, RI 8507)

The Blasting Contractor shall provide a seismographic record to the Owner for each blast event at the nearest off-site structure. The record shall include the date and time of the blast, peak and resultant particle velocities and associated frequencies, and the airblast overpressure.

Flyrock

Blasting mats shall be used to cover the area which will be blasted, such that flyrock traveling along the ground or in the air shall not be cast more than one-half the distance to the nearest structure or beyond the property line, whichever is less.

WATERSHED RESOURCE CONSULTANTS, LLC
NATURAL RESOURCE AND SOIL SCIENCE CONSULTING

WRC 24147
January 6, 2025

SMRT
Attention: Emily Sprecher EI, Civil Designer
74 Harlow Street
Bangor, ME 04401
via email: esprecher@smrtinc.com

Subject: Soil Documentation Report
Proposed Stormwater System Areas
MDI Hospital Project
Bar Harbor, Maine

Dear Emily,

This Soil Documentation Report presents findings of soil documentation services conducted by Watershed Resource Consultants, LLC (WRC) within proposed stormwater system areas for a project at MDI Hospital on Wayman Lane in Bar Harbor, Maine (i.e., the "site").

Exploration and Methodology

Watershed Resource Consultants, LLC (WRC) visited the site on December 12, 2024 to document and classify soils within two of the proposed stormwater system areas. The stormwater system locations were shown on a plan provided by SMRT.

Two test pits, labeled TP SW 1 and TP SW 2, were excavated by Sargent Corporation, an on-site contractor. The test pits were located by WRC using a mapping grade GPS receiver. The Soil Documentation Plan attached in Appendix B shows the locations of the test pits.

The test pit labeled TP SW 1 was in a lawn area between a former residence now used for hospital purposes, the sidewalk along Wayman Lane, the residence driveway, and an entrance walkway. The test pit labeled TP SW 2 was in a lawn area between a former residence now used for hospital purposes, Stanwood Place, and a hospital parking lot access road.

At the test pits, WRC documented soil horizon depths, soil texture, color, consistence, structure, depth of observed fill, depth to seasonal water table, depth to restrictive layer, depth to observed seeping, and

depth to bedrock (if observed) to the depth of the test pit. Using the collected soil data, WRC then classified the observed soils to the closest Maine soil series based on data published by the Natural Resources Conservation Service (NRCS). WRC used published NRCS data on the soil series and the Maine Department of Environmental Protection (MDEP) E&SC BMP's[1] to obtain hydrologic soil group information. The hydrologic soil group presented is based on NRCS published soils data/MDEP BMP's and does not represent laboratory or in-situ testing results.

Findings

Soil classifications and hydrologic soil groups for the test pits are included in Table 1, below.

Table 1 – Test Pit Documentation Summary

Test Pit	Depth to Seasonal Water Table	Depth to Restrictive Layer	Depth to Bedrock	Soil Series	Hydrologic Soil Group (NRCS)
TP SW 1	28"	28"	N/O	Scantic silt loam, buried	D
TP SW 2	16"	16"	N/O	Buxton silt loam	C/D

N/O = Not Observed to the depth of the Test Pit

The Scantic, buried soils documented at TP SW 1 are poorly drained soils formed in glaciolacustrine/marine sediments that were historically buried under fill, presumably during construction of the nearby residence and/or road pre-1970's. The test pit revealed 23 inches of loamy fill over apparently native soils. The hydrologic soil group (HSG) listed above for the Scantic, buried soil is for a non-buried Scantic soil, and does not take into account fill textures or restrictions. In-situ testing would be required to determine hydrologic soil group of this soil with the fill included. Alternatively, a "D" HSG can be used for design purposes.

The Buxton soils on the site are moderately well drained soils formed in glaciolacustrine/marine sediments. These soils are somewhat disturbed as they are in a lawn area and may have a minor amount of surface fill and/or grading. This disturbance does not change the hydrologic soil group as listed above for this soil.

[1] Maine Department of Environmental Protection. MAINE EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMPs) Manual for Designers and Engineers, October 2016.

Closing

WRC appreciates the opportunity to assist you during this phase of the project. If you have any questions, please contact us.

Sincerely,

Aleita M. Burman, Certified Soil Scientist #CSS430
Principal | *Watershed Resource Consultants, LLC*

APPENDIX A

Limitations

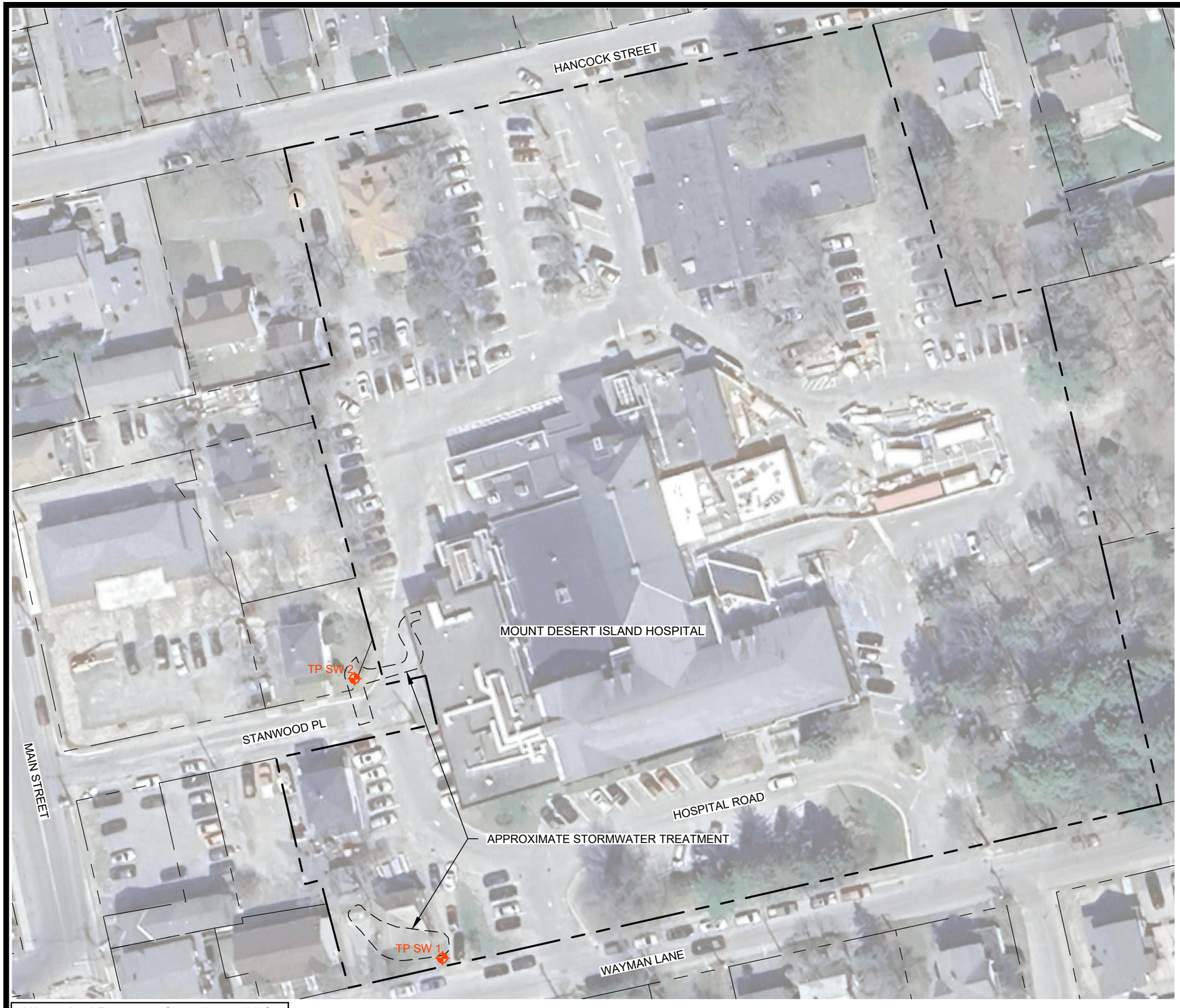
Appendix A – Limitations

The scope of Watershed Resource Consultants, LLC services has been limited to soil documentation services within proposed stormwater system areas for a project at MDI Hospital on Wayman Lane in Bar Harbor, Maine. This Report has been prepared for the exclusive use of SMRT and MDI Hospital. No warranty, expressed or implied, is made. The conclusions made in this report are based on the data obtained from the areas explored at the time of services.

APPENDIX B

Soil Documentation Plan

Test Pit Logs



SITE LOCATION MAP
SCALE: 1" = 2,000'

NOTES:

1. THIS PLAN IS FOR PLANNING AND STORMWATER PERMITTING ONLY, IT IS NOT A SURVEY.
2. THIS PLAN IS TO ACCOMPANY WATERSHED RESOURCES CONSULTANTS LLC'S SOIL DOCUMENTATION REPORT DATED JANUARY 2025.
3. THIS PLAN WAS DEVELOPED USING MAPPING GRADE GPS RECEIVER. THIS PLAN IS A COMPILATION OF THE GPS DATA, PLAN SUPPLIED BY SMRT AND PUBLICLY AVAILABLE DATA (MEGIS).
4. PLAN REFERENCE: "MAIN ENTRANCE OPTION" DATED: AUGUST 30, 2024, PROVIDED BY SMRT. CAD FILE: CB-22005_01.dwg.

LEGEND

- PROJECT PARCEL
- TP SW 1 - TEST PIT

Watershed Resource Consultants, LLC.
1366 State Hwy 102
#6 Bar Harbor, ME 04609
(207) 944-7288
rstamand@wrcmaine.com
PO Box 145
Orrington, ME 04474
(207) 385-6056
lburman@wrcmaine.com

Do Not Use for Construction
For Regulatory Review Only

0 60' 120' 180'

Soil Documentation Plan

SMRT
MDI Hospital
Bar Harbor, Maine

Job No.: 24147	Scale: 1" = 60'
Date: 1/6/2025	Sheet: 1

FORM F (SS2) Rev. 7/21

SOIL PROFILE / CLASSIFICATION INFORMATION

SOIL SCIENTIST DESCRIPTION OF SOIL CONDITIONS AT PROJECT SITES

Project Name:	Applicant Name:	Project Location (municipality):
Hospital Project	MDI Hospital	Bar Harbor

Exploration Symbol # TP SW 1 ☒ Test Pit ☐ Boring ☐ Probe

0 " Organic horizon thickness Ground surface elev. _____

78 " Depth: ☒ of exploration, or ☐ to refusal

Depth below mineral soil horizon *(inches)*

Horizon	Color	Texture	Structure	Consistence	Redox
Fill 1	10YR 3/3	loam	no structure	friable	none
		very gravelly	no	compact to	
Fill 2	2.5Y 4/3	silt loam	structure	firm	none
----- Seep @ 20" on one side of TP -----					
Apb	10YR 3/2	silt loam	blocky	friable	none
Bgb	5Y 6/2	silt loam	blocky	firm	cm 5Y6/1 fm 10YR 3/6
BCb	2.5Y 4/2	silt loam	blocky	firm	cm 5Y5/2 fm 10YR 3/6
Cgb_1	5Y 4/2	silty clay loam	platey breaks blocky	very firm	mm 10YR4/6 mm Gley 1 6/10Y
Cgb_2	5Y 4/2	silty clay	platey, breaks blocky	very firm	cm 10YR 2/2

LOI = 78"

Buried soil under historic fill likely pre-1970's.

Soil Details

Soil Series/Phase Name: Scantic loam, buried

Limiting Factor: 28 " Depth ☒ Groundwater ☒ Restrictive Layer ☐ Bedrock

Drainage Class: ☐ ED ☐ SED ☐ WD ☒ MWD ☐ SPD ☐ PD ☐ VPD

Slope: 3 Percent

Hydric Soil: ☒ No ☐ Yes

Hydrologic: D Soil Group

Exploration Symbol # TP SW 2 ☒ Test Pit ☐ Boring ☐ Probe

0 " Organic horizon thickness Ground surface elev. _____

78 " Depth: ☒ of exploration, or ☐ to refusal

Depth below mineral soil horizon *(inches)*

Horizon	Color	Texture	Structure	Consistence	Redox
Ap	10YR 3/3	loam (potentially partial fill	weak fine granular	friable	none
Bs	10YR 3/6	grav. fine sandy loam	blocky	friable	none
BC_g	Gley 1 6/10Y	silt loam	blocky	very firm	mm 10YR 3/6 mm 10YR4/6
Cg1	5Y 4/2	silty clay loam	platey breaks blocky	very firm	mm Gley 1 6/10Y
Cg_2	5Y 4/2	silty clay 1% cobble	platey breaks blocky	very firm	cm 10YR 2/2

LOI = 78"

Soil Details

Soil Series/Phase Name: Buxton loam

Limiting Factor: 16 " Depth ☒ Groundwater ☒ Restrictive Layer ☐ Bedrock

Drainage Class: ☐ ED ☐ SED ☐ WD ☒ MWD ☐ SPD ☐ PD ☐ VPD

Slope: 1 Percent

Hydric Soil: ☒ No ☐ Yes

Hydrologic: C/D Soil Group

SOIL SCIENTIST INFORMATION AND SIGNATURE

Aleita M. Burman

Signature

Aleita Burman

Name Printed

12/12/24

Date

SS430

SS License No.

STATE OF MAINE ALEITA M. BURMAN NO. SS430 CERTIFIED SOIL SCIENTIST