24. Geotechnical Report

Please refer to the following report prepared by Ransom Consulting Inc.

GEOTECHNICAL ENGINEERING REPORT
FRONT STREET REDEVELOPMENT
FRONT STREET AND WEST PRESUMPSCOT STREET
PORTLAND, MAINE

Prepared for:

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1.0 INTRODUCTION

Ransom Consulting, Inc. (Ransom) has prepared this project Geotechnical Engineering Report for the proposed redevelopment of properties located along Front Street and West Presumpscot Street near Payson Park and the Seaside Healthcare facility in Portland, Maine (referred to as the "Site" in this report). This geotechnical engineering report has been prepared in accordance with our June 28, 2016 Scope of Work and Cost Estimate submitted to you (Ransom Reference no. 151.06170).

This geotechnical engineering evaluation was performed to obtain site-specific subsurface soil information and to make geotechnical evaluations and recommendations for the proposed development project. As completed, Ransom's scope of services included the following items:

1. Subcontracting and coordinating with a drilling contractor, marking the site for utility clearance, and contacting the underground utility clearance system as required by law.

2. Providing technical monitoring for the subsurface explorations, obtaining soil samples, and preparing test boring logs.

3. Submitting selected soil samples for geotechnical soil tests.

4. Evaluating the field and laboratory data with respect to the proposed development and preparing this report of our findings, evaluations, and recommendations for the proposed design and construction.

2.0 SITE AND PROJECT DESCRIPTIONS

The Site consists of two parcels of land with street addresses of 37 and 63 Front Street in Portland, Maine. The Site parcels are located on the north side of Front Street, nearly bisected by West Presumpscot Street, and total approximately 3.94 acres combined. The Site is identified by the City of Portland Assessor's Office as Lot 1, of Block B, on Tax Map 166 (166-B-1), which corresponds to 37 Front Street; and Lot 1, of Block E on Tax Map 167 (167-E-1), which corresponds to 63 Front Street. A Site Location Map and a Subsurface Exploration Plan showing the existing conditions and the proposed Site layout are provided as Figure 1 and Figure 2, respectively.

2.1 Existing Conditions

The Site is located within the Portland West, Maine, U.S. Geological Survey 7.5-minute topographic quadrangle. Site topography generally slopes down to the south from an approximate elevation of 18 feet above mean sea level (MSL) at the northern Site boundary to approximately 12 feet above MSL at the southern Site boundary. The topography in the vicinity of the Site generally slopes down to the south and east, towards Back Cove and the Atlantic Ocean.

The Site is currently improved with 19 buildings, which include 18 multi-unit residential buildings, and 1 building used as a community center. Each building is a two-story, wood-framed, vinyl-sided structure, with footprints ranging from approximately 1,150 to 2,300 square feet. The Site buildings were constructed in 1971 on concrete mat foundations with full basements and concrete block basement walls. Ransom conducted a reconnaissance of the existing Site buildings and observed indications of significant differential settlement in these structures' foundation systems.

2.2 Proposed Redevelopment

Ransom understands that Portland Housing Development Corporation Authority intends to demolish the existing buildings at the Site and construct eight new buildings containing approximately 100 residential housing units (Figure 2). In addition to the new housing buildings, the redevelopment project will include a new community center, new utility services, parking areas and access driveways, green space, and pedestrian pathways. Our current understanding of the proposed development is based on review of the "Front Street Development" plan (dated August 22, 2016), as prepared by Carroll Associates Landscape Architects of Portland, Maine.

Proposed grading plans were not available for review at the time this report was finalized. Based on existing Site topography, Ransom estimates that cuts and fill generally less than approximately 1 to 2 feet will be required within the proposed building footprints. However, the existing Site buildings have basement levels that will require approximately 6 to 8 feet of fill to reach the design grades. Elsewhere across the Site, cuts and fills of generally less than 1 to 2 feet will likely be required to meet the proposed design elevations. The geotechnical design criteria used in our evaluations are as follows:

1. Load bearing wall loads of 5.5 to 6.3 kips per linear foot (klf), provided by Allied Engineering, Inc. (project structural engineers);

2. Maximum total and differential foundation settlements of 1 and ½ inch, respectively.

It is our understanding that the foundation elements for the proposed building will be interior and exterior strip footings, with no individual column footings.

3.0 SUBSURFACE INVESTIGATION

The geotechnical subsurface exploration program was conducted for the Site on August 10 through 12, 2016 and consisted of 15 test borings (designated B101 through B115) as shown on Figure 2. The explorations were not surveyed; their locations and elevations should be considered approximate.

3.1 Subsurface Explorations

Test drilling was performed by New England Boring Contractors, Inc. of Derry, New Hampshire, with a truck-mounted drill rig using 2.25-inch inside-diameter hollow-stem augers. Split-barrel sampling with standard penetration testing (ASTM D 1586), using a safety drive hammer, was generally conducted continuously from the ground surface to depths of 6 feet below ground surface (bgs), and at 5-foot intervals generally thereafter to the bottoms of the borings. Borings B114 and B115 were advanced as ledge probes from depths deeper than approximately 20 feet. Ledge probes were conducted by pushing the drilling rods to assess the depth to a dense stratum (i.e., glacial till or bedrock); soil samples were not collected in the ledge probe intervals.

A Ransom representative monitored subsurface exploration activities and prepared soil boring logs. Soil samples were placed in sealed containers and returned to Ransom's office for further evaluation. Soil samples were visually classified in general accordance with visual manual procedures (ASTM D 2488) and described using modified Burmister Soil Classification System descriptors. Exploration logs are included as Appendix A.

3.2 Laboratory Testing

Laboratory testing was performed on selected soil samples from the test borings. The geotechnical soil index testing (grain-size distributions, moisture content, Atterberg limits) was performed by ConTest Consultants, Inc. of Goffstown, New Hampshire; the laboratory report is included in Appendix B. The geotechnical laboratory tests were performed in general accordance with the applicable ASTM procedures.

4.0 SUBSURFACE CONDITIONS

Subsurface conditions at the Site were characterized by drilling into the unconsolidated, overburden soil formations at locations approximately within the proposed building footprints at the Site property. Test boring locations were limited to accessible portions of the Site.

Figure 2 illustrates the existing Site features, proposed buildings, and approximate exploration locations. The general characteristics of the subsurface strata are described below; refer to the logs in Appendix A for more detailed soil descriptions at specific locations and depths.

4.1 Subsurface Soils

Test borings were advanced to depths ranging from approximately 22 to 66 feet below existing grades. The subsurface explorations generally encountered surficial layers of asphalt pavement or topsoil overlying Fill Materials, marsh deposits, glaciomarine clay, and bedrock. The general characteristics of the subsurface layers are described below in order of increasing depth encountered below the ground surface.

Surficial Layers

Asphalt pavements or topsoil were penetrated at ground surface in each boring. The pavement consisted of asphalt concrete approximately 4 inches thick. Where encountered, the topsoil was approximately 3 to 6 inches thick (Appendix A).

Fill Materials

Fill Materials were observed in each of the test borings from directly below the surficial layers to depths of approximately 8 to 14 feet below grade. The Fill Materials generally consisted of two separate, distinct units. The upper unit, which was observed to extend to depths of approximately 1 to 9 feet below grade, generally consisted of brown fine to coarse sand with varying amounts of silt, clay, and gravel. A separate, distinct unit of Fill Materials was observed directly underlying the upper layer of Fill Materials notably containing a significant amount of refuse. This lower unit of Fill Materials was observed to extend to depths of approximately 8 to 14 feet below grade. The lower unit of Fill Materials generally consisted of brown to black, silty sand with gravel containing glass, plastic, rubber, wood, and ash. Standard penetration testing indicates that the Fill Materials are in a loose to medium dense condition.

Marsh Deposit

Test borings B102, B103, B107, B108, and B109 encountered a marsh deposit immediately below the Fill Materials (Appendix A). The thickness of the marsh deposit ranged from approximately 4 feet (in B102) to 9 feet (in B103 and B109). The marsh deposit generally consisted of gray silt and clay with sea shells and organics. Standard penetration testing indicates that the marsh deposits are in a very soft to soft condition, and we classify this soil formation as organic silt (USCS designation OL).

Glaciomarine Clay

A native clay deposit was encountered immediately below the Fill Materials or marsh deposit (where present) in each of the test borings. The full thickness of the clay ranged from approximately 36 feet (in B114) to 48 feet (in B115). Based on the results of laboratory testing and visual classification, the native clay is a medium to high plasticity clay (USCS designation: CH). This clay formation is typically

referred to as the Presumpscot Formation, and is encountered in the coastal areas of eastern New England that were formally submerged sea floor.

The Glaciomarine Clay formation is composed of two units: an upper, overconsolidated clay and a deeper, normally consolidated clay. Where the entire thickness of the overconsolidated zone was penetrated, the overconsolidated zone consisted of the uppermost 5 to 13 feet of the clay; standard penetration testing indicated that this zone of the clay is a medium stiff to hard, gray to olive gray silty clay.

The underlying deeper clay was a gray to olive gray silty clay. Standard penetration testing indicates that this zone of the clay is very soft to soft, and is likely normally consolidated.

Laboratory index tests (Appendix B) performed on samples of the Glaciomarine Clay deposit indicate that the clay has the following characteristics.

Property	**Overconsolidated Clay Zone**	**Normally Consolidated Clay Zone**
Water content	27%	43%
Liquid limit	58	50
Plastic limit	26	23
Plasticity index	32	27
Liquidity index	0.15	0.42

Drilling Refusal/Bedrock Surface

Drilling refusal, the depth at which the drilling equipment was not able to penetrate the deeper geologic units, was encountered in two soil borings (B1114 and B115). The depths of refusal were approximately 48 to 66 feet below existing grades. These refusals were encountered in ledge probes. It could not be determined whether the drilling refusals were the result of encountering competent bedrock, large boulders, or very dense soils at all locations. Additional geotechnical test drilling is recommended to further assess the drilling refusal surfaces at the Site.

4.2 Groundwater

Groundwater was encountered in each of the Site test borings. The depths to groundwater, as measured in the test borings, ranged from approximately 6 to 18 feet below ground surface; corresponding to elevations ranging from approximately 8 to -4 feet MSL. Note that groundwater levels at the Site will fluctuate due to season, temperature, precipitation, nearby underground utilities, tidal influence, and construction activity. Therefore, water levels at other times may differ from the observations and measurements made during drilling.

5.0 ENGINEERING EVALUATIONS

Evaluation of the subsurface conditions at the Site indicates that the building footprints are proposed for an area underlain by undocumented Fill Materials and soft, compressible Glaciomarine Clay. These subsurface conditions are considered to be unfavorable for the design and construction of a shallow, conventional spread footing foundation system for supporting the proposed structures without improvement of the soil conditions (for example, through preloading or impact piers) or employment of a deep foundation system (such as piles, drilled shafts, or piers).

Based on the soil index properties from our laboratory testing program and the structural loads, we estimate that the stresses imposed by the proposed buildings will cause immediate and long-term consolidation-related settlement exceeding several inches. Several technically feasible alternatives that are capable of supporting the proposed building were briefly evaluated and are outlined below.

Alternative	**Benefits**	**Cons**	**Conclusion**
Excavate and Replace Unsuitable Soils	Removes compressible materials that are the source of the consolidation-related settlement	Deep excavations and dewatering required Extensive lateral support required Export and disposal of geotechnically unsuitable and environmentally impacted soils Import and placement of granular fills required Cost	Infeasible due to cost, and the construction and logistical considerations
Preload surcharge	Mitigates post-construction settlement Relatively inexpensive	Requires excavation and replacement of Fill Materials Can require an extensive time period to compress the clay soils	Infeasible due to presence of thick Fill Materials overlying clay
Ground improvement (impact piers, controlled modulus columns)	Support of structures, roadways, and fills Mitigates post-construction settlement of structures and roadways	Possible obstructions Cost	Ground improvement by impact piers is a viable option for the vast majority of the Site. Additional test drilling will be required to further assess the viability in the southeast corner of the Site
Deep foundations (H piles, pipe piles, concrete piles, drilled piers or shafts)	Direct support of the building; structural loads transferred to underlying bedrock and/or stiff soils	Requires a structural slab and stiffer structural elements Overall costs	Recommend piles as viable option

It is our opinion that ground improvement and deep foundations are all viable options for supporting the proposed structural loads at the Site. The choice of solutions will depend on the final design plans and cost. Where feasible, ground improvement will generally be a more cost-competitive solution than deep foundations.

Note that the test borings drilled within the southeast corner of the Site property (B109 and B115, and possibly B108) did not appear to encounter the stiff, overconsolidated clay zone. We recommend

additional explorations to confirm the presence of the stiff clay zone in this area. If the stiff clay is not present in this area of the Site, buildings in this area would likely need to be supported on a deep foundation.

6.0 DESIGN RECOMMENDATIONS

Based on the subsurface explorations and our geotechnical evaluations, Ransom presents the following recommendations for the design of the proposed Front Street redevelopment project in Portland, Maine.

6.1 Site Grades

We anticipate that engineered fills will be minimal to achieve the design Site grades outside the proposed building footprints. The presence of undocumented Fill Materials and soft, compressible clay soils below the Site indicates that addition of raise-in-grade fills should be minimized in order to reduce the degree of consolidation, and hence the post-construction settlement that could potentially occur with high fills. Proximity of landscaping berms or other features that require raise-in-grade fills to the building locations should be taken into account in the Site civil design.

6.2 Foundation Systems

The subsurface conditions beneath the Site include undocumented Fill Materials and soft, compressible glaciomarine clay. The subsurface conditions beneath the proposed building footprints are considered to be unsuitable for supporting the proposed buildings on a conventional, shallow foundation system. The conditions encountered and detailed in this Report will require either ground improvement (that would allow the buildings to be supported on a conventional shallow foundation) or a deep foundation system (such as driven piles, drilled shafts, or piers). It is our opinion that ground improvement by impacts piers and supporting the buildings on pile foundations are the most feasible methods to support the proposed structural loads.

6.2.1 Ground Improvement Considerations

Ground improvement methods such as impact piers are considered technically feasible and economically viable alternatives capable of sufficiently improving the subsurface soils in-place to support the proposed construction. These alternative ground improvement methods densify the existing soils through lateral displacement methods and reinforce the existing soils by creating relatively stiff columns within the soil mass. Generation of spoils is minimized or eliminated.

We anticipate that 20-inch-diameter grouted impact piers would extend through the full thickness of the Fill Materials below the Site, and would extend to, and derive their strength from the stiff overconsolidated clay.

Footings for the buildings could be supported directly upon the impact piers. Shallow foundation design parameters (such as the soil bearing capacity) would be provided by the impact pier designer in conjunction with the project geotechnical engineer and the project structural engineer during the final design phase. When so prepared, we anticipate that the post-construction total and differential settlements would be less than 1 inch and ½ inch, respectively, following installation of ground improvement. Ransom estimates that ground improvement by impact piers to support the proposed building foundation systems would likely range in cost from $275,000 to $350,000 (approximately $18,000 to $24,000 per 3,000 square feet of building footprint, plus design and mobilization fees).

Based on the geotechnical test drilling that has been conducted at the Site, ground improvement by impact piers appears feasible in all areas of the Site, with the exception of the southeastern corner of the Site (B109 and B115) where the relatively stiff overconsolidated clay unit was not

observed. Prior to design of an impact pier ground improvement system, additional geotechnical test drilling will be required to further define the thickness of the Fill Materials and the overconsolidated clay unit, and to determine if the stiff overconsolidated clay unit is present at the southeastern corner of the Site. If the stiff clay unit is not present, proposed buildings in this area of the Site will require a deep foundation system.

6.2.2 Deep Foundation Alternatives

A deep foundation system was also identified as a technically feasible and economically viable alternative capable of providing support to the proposed buildings. The support of the structures would be from a pile system penetrating the Fill Materials and the clay deposit and deriving support from the underlying bedrock tied into a network of pile caps and grade beams that support a structural slab. Ransom conducted a preliminary evaluation of driven steel "H" piles and concrete-filled pipe piles for this project. Timber piles are considered to be infeasible for this project due to the likelihood for damage in an end-bearing configuration.

Design capacities of driven, steel, "H" piles, such as HP8x36 and HP10x42, can be expected in the 60 ton to 100 ton range, respectively. Allowable uplift capacities of 50-foot long, driven, steel HP8x36 "H" piles are estimated to be approximately 12 tons (factor of safety of 2.0). Greater uplift capacities can be expected with larger "H" pile sections (HP10x42).

Design capacities of driven, concrete-filled pipe piles, such as 8.625" outside diameter pipe piles with 0.322" wall thickness, can be expected in the 40- to 50-ton range. Allowable uplift capacities of 50-foot long, concrete-filled pipe piles are estimated to be approximately 10 tons (factor of safety of 2.0). Larger diameter pipe piles will provide a higher capacity at increased cost.

Ransom has estimated two potential deep foundation styles:

1. Timber piles driven through the Fill Materials to bearing on the underlying stiff clay would cost approximately $200,000 to $250,000 for the entire proposed development of six to eight buildings (40,000 square feet of footprint).

2. Steel "H" piles or concrete-filled pipe piles driven to end-bearing on the bedrock (estimated depths 50 to 60 feet) would cost approximately $600,000 for the entire proposed development of six to eight buildings (40,000 square feet of footprint).

Pile Lengths

Proposed finished floor elevations have not yet been designed. For this analysis, Ransom has assumed that the proposed finished floor elevations will nearly match the existing Site grades. Assuming a pile cap thickness of 2.5 feet and pile embedment into the pile cap of 0.5 feet, we estimate the piles will be driven until their heads are at approximate elevations ranging from 9 to 16 feet above MSL. The piles should be designed as end-bearing piles that derive their capacity by fully penetrating the clay to termination on the bedrock surface at anticipated depths of 50 to 70 feet.

Negative Skin Friction

It is unlikely that downward-directed friction on the piles due to consolidation or settlement of the soils surrounding the piles will develop because the existing Fill Materials have been in-place for several decades. Accordingly, it is our opinion that the pile design does not need to account for the effects of negative skin friction on the pile shafts.

Rock Socketing

It is our opinion that the piles would not have to be socketed into the bedrock.

Pile Corrosion

Close proximity to the ocean and the marine origin of the clays through which the piles would be driven suggests that groundwater at deep levels below the Site may be brackish. Testing of soil or groundwater from these deep levels was not performed. The deep foundation system should be designed for subsurface conditions in which the corrosion potential is high; design should include reduction of the pile section to simulate the effects of corrosion (corrosion loss of ⅛ inch (0.125")).

Lateral Loads

Lateral loads could be carried by the horizontal component of batter piles. All the batter piles should be driven to an angle no steeper than three vertical to one horizontal (3V:1H).

Transient lateral loads from seismic forces could also be resisted by the passive pressures generated by engineered fills placed between and against the grade beams. The passive pressures should be computed using the soil unit weights of 120 pcf (if using excavated, compacted native soils) or 135 pcf (if using imported granular structural fill) as the engineered fill.

Obstructions

The test borings drilled within the proposed building footprints did not encounter obstructions (large boulders, granite foundation blocks, for example). We do not anticipate the need for pre-augering through obstructions during driving of the piles.

Additional Geotechnical Analysis

A deep foundation alternative will require additional geotechnical test drilling to further define the depth to competent bedrock and confirm that the drilling refusals encountered in the initial test borings were on the competent bedrock surface.

6.3 Seismic Considerations

For the purposes of seismic design, the soil profile constitutes a "soft soil profile" and we assign a seismic site class of "E" to the Site (based on the conditions encountered to a depth of 66 feet). It is our opinion that the Site soils are not susceptible to liquefaction.

6.4 Groundwater and Drainage Issues

Groundwater was measured in the Site test borings at depths ranging from approximately 6 to 18 feet below the existing grades, corresponding to approximate elevations of 8 to -4 feet MSL. Due to the poor water-transmitting capability of the clay soils, the proposed building should be constructed with a perimeter foundation drainage system. It is our opinion that underslab drainage systems and/or vapor barriers are not necessary at this Site, based on geotechnical considerations.

Foundation Drains

Based on the observed depths to groundwater and poor water-transmitting capability of the clay soils, it is our opinion that the buildings should be constructed with perimeter foundation drainage systems. The perimeter drainage systems should consist of 4-inch diameter, rigid polyvinyl chloride (PVC) SDR35 pipe with perforations of ¼ to ½ inch (openings should be oriented downward). The drain lines should be surrounded by a minimum of 6 inches of ¾-inch crushed stone wrapped in a nonwoven geotextile filter fabric (Mirafi 140N or approved equivalent). The foundation drains should be placed adjacent to the exterior sides of the spread footings at a minimum depth of 5 feet below adjacent exterior grades to protect against frost.

Where possible, the foundation drains should be pitched down at a minimum slope of 0.5 percent in the direction of flow. Cleanouts should be provided at every other 90 degree bend in order to provide for future flushing the system as needed.

The foundation drains should be gravity drained to daylight or to a suitable system outlet. The final outlet of the drainage systems should be designed by the project Civil Engineer in consideration of all applicable municipal, state, and federal regulations. Roof downspout drains should not be connected to the foundation drain system, but rather should be separately tightlined to their discharge outlets.

Surrounding Site grades should be sloped away from the building in order to reduce the moisture available for forming frost and ice. Crushed stone drip edges, underlain by a sand drain that provides a hydraulic connection to the perimeter foundation drains, could be installed along the perimeter of the buildings.

7.0 EARTHWORK AND CONSTRUCTION RECOMMENDATIONS

Based on the subsurface explorations and our geotechnical evaluations, Ransom presents the following recommendations for the construction of the proposed Front Street redevelopment project in Portland, Maine.

7.1 Demolition of Existing Structures

The Site is currently occupied by several existing buildings which occupy a large portion of the proposed building footprints, parking and driveway areas. The Site buildings will be demolished as part of the proposed redevelopment. The Site buildings, foundation elements, underground utilities, and backfill soils will require removal to expose the subgrade soils prior to installation of impact piers or deep foundation systems.

All demolition debris, existing surficial or subsurface structural and related elements, floor slabs, basement walls, footings, drywells, drainage structures, septic tanks, catch basins, piping, underground storage tanks, leachfields and abandoned utilities located within the proposed building footprints and foundation bearing zones should be completely removed and disposed of off-site in a legal manner or reused in the on-site construction as recycled or reclaimed materials. In-place building foundation elements and slabs-on-grade may be left in place below parking and landscaped areas if the footings are not disturbed or moved during demolition and if they are at least 2 feet below the design grades. However, installation of ground improvement and/or deep foundations will require removal of these elements in order to allow for unobstructed installation.

7.2 Subgrade Preparation

All topsoil, debris, frozen soils, and loose or disturbed soils should be removed from areas receiving new construction. These materials should be stockpiled for potential reuse in later stages of construction, based on the recommendations of this report.

Existing foundations, slabs, and/or utilities associated with past uses should be removed from below the proposed building footprints. Subgrades should be compacted with at least four complete passes of a 10-ton vibratory drum roller in directions perpendicular to one another. Silty subgrades which are saturated or are observed to pump and weave during rolling should be rolled statically.

Unstable subgrade areas would be characterized by weaving or rutting of more than one inch during proofrolling. Any unstable areas identified should be undercut at least 12 inches, or to competent soil, and replaced with compacted structural fill or crushed stone. The depth of undercutting and type of backfill material should be selected with consideration of proposed use (i.e., building or pavement) and soil and weather conditions encountered during construction.

The contractor is responsible for construction means and methods and should anticipate the need for methods to prevent disturbance, softening, or rutting of subgrades, or damage to overlying soils resulting from construction traffic. Care must be taken to avoid disturbing subgrades by keeping construction traffic off of subgrades during wet conditions and/or inclement weather until a firm fill layer has been placed. Subgrade soils that become unstable should be undercut and replaced with structural fill or crushed stone as necessary.

Final foundation and floor slab subgrade preparation should include re-compaction of bearing surfaces. Care should be taken to limit disturbance to bearing surfaces prior to placement of concrete. Any loose,

softened, or disturbed material should be removed and replaced with compacted structural fill prior to placement of concrete. Excavated subgrades should not be left exposed overnight unless the forecast calls for above-freezing, clear conditions.

7.3 Earthwork in Wet Environments

Foundation subgrade soils will likely consist of the existing Fill Materials. Care must be taken to avoid disturbing subgrades by keeping construction traffic off of silty subgrades during wet conditions and/or inclement weather until a firm fill layer has been placed. To reduce disturbance of exposed subgrade soils, it will be important to divert runoff, provide positive grading to shed seepage and runoff, and to compact exposed subgrades to reduce rutting, ponding, and surface water infiltration.

The existing Fill Materials may be selectively reused as common fill, provided they are relatively dry and their moisture content can be controlled such that they can be compacted to at least 95 percent of the maximum dry density determined from ASTM D 1557. The existing Fill Materials will be sensitive to moisture and difficult to place and compact during wet weather and freezing conditions. Moisture-density relationships (proctor tests) should be determined at the start of construction to determine the appropriate range of working moisture contents.

7.4 Temporary Excavations

Construction Site safety, means and methods, and sequencing of construction activities is the sole responsibility of the Contractor. Under no circumstances should the following information be interpreted to mean that Ransom is assuming responsibility for construction Site safety, trench protection, or the Contractor's responsibilities. Such responsibility is not being implied and should not be inferred.

All temporary excavations should be performed according to Occupational Safety and Health Administration (OSHA) Standards (29 CFR 1926 Subpart P). It is our opinion that the existing Fill Materials that are likely to be excavated are OSHA Type C soils. Accordingly, temporary unbraced excavations should be cut no steeper than 1.5H:1V under dry or dewatered conditions.

7.5 Dewatering and Runoff Control

Groundwater was measured in the Site test borings at depths ranging from approximately 6 to 18 feet below the existing grades, corresponding to approximate elevations of 8 to -4 feet MSL. Because of the poor permeability of the clay soils, groundwater may be encountered in foundation and deep utility excavations and the contractor should be prepared to implement water controls as needed.

The contractor should anticipate the need for controlling runoff during wet periods; pumping from open sumps will likely provide adequate control of water within excavations during construction. Earthwork should be completed "in the dry." Subgrade soils that become unstable should be undercut and replaced with structural fill or crushed stone, as necessary. Excavation side slopes should be monitored for potential seepage and maintained to promote stability, accordingly.

Surface water runoff should be directed away from excavations to reduce dewatering efforts and to protect subgrades from becoming soft and unstable.

Temporary detention ponds, trenches, ditches, and dewatering sumps should not be made in areas to be filled.

7.6 Placement of Granular Engineered Fills

Engineered fills may be required to achieve the final design grades in areas of the proposed Site development. The table below is the gradation specifications for soils used in fills at the Site. Reference is made to materials, described by the Maine Department of Transportation (MDOT) Standard Specifications, as possible alternatives. The different fill types should be used as follows:

1. Structural Fill should be used for engineered fills below building footprint areas and in foundation bearing zones.

2. Common Fill should be used for engineered fills below non-structural areas.

All granular fills should be placed in 12-inch maximum loose lifts and should be compacted to a minimum of 95 percent of the material's maximum dry density, as determined by ASTM D 1557 (modified proctor test) and field density testing (ASTM D 6938 or equivalent method). Lift thickness should be a maximum of 6-inch loose lifts when compacted with hand-guided equipment.

Material	Sieve Size	% Passing
Structural Fill Standard Specification 703.06, Type C	4" (100 mm)	100
	3" (75 mm)	90 - 100
	2" (50 mm)	75 – 100
	1" (25 mm)	50 – 80
	1/2" (12.5 mm)	30 – 60
	No. 4 (4.75 mm)	15 - 40
	No. 200 (75 µm)	0 - 6
Common Fill	8"	100
	No. 200 (75 µm)	0 - 15 when placed within 2.5 feet of finished grade in paved areas

Where subgrades become saturated, unstable, and/or difficult to compact, crushed stone should be placed and compacted in lieu of structural fill. Crushed stone, when used, should be wrapped in a geotextile filter fabric, such as Mirafi 140N or equal. At no time should structural fill or common fill be placed over crushed stone that has not been wrapped in a geotextile filter fabric.

7.7 Reuse of Site Soils

A preliminary assessment of the suitability of using the unconsolidated soils at the Site in the proposed construction is based on the soil classifications and observations at the Site. The suitability of these materials is summarized below.

1. Portions of the existing Fill Materials that will be excavated may be suitable for reuse as common fill below non-structural areas and landscaped areas.

2. The clay soils that might be excavated are not suitable for reuse as structural fill or common fill at the Site.

Materials to be used as structural fill will need to be imported to the Site. Representative samples of all proposed fills should be submitted for testing during construction to compare their gradation

characteristics to the requirements of the project specifications, and to establish their optimum water contents and maximum dry densities (modified proctor testing, ASTM D 1557). The geotechnical engineer must approve use and reuse of on-site or borrow soils for structural and common fills. Use of fills assumes that the moisture content of the material will be strictly controlled in order to allow for proper placement and compaction.

7.8 Underground Utilities

Bedding placed below utilities should be in accordance with the utility and manufacturer requirements. In general, utilities may be supported directly on a minimum 6-inch-thick layer of compacted structural fill, crushed stone, or other suitable pipe bedding materials. Fill placed as backfill for utilities below building floor slabs should consist of compacted structural fill or crushed stone. Elsewhere, fill placed as backfill for utilities should consist of compacted common fill.

7.9 Construction Monitoring

Ransom should observe the earthwork for compliance with the recommendations of this report, identify changes in subsurface conditions as they become apparent, and assist in design changes should subsurface conditions differ from those anticipated in this report. The project geotechnical engineer should be present at the Site, during several critical construction junctures, in order to:

1. If a ground improvement program such as impact piers is selected, Ransom should be provided the opportunity to review the impact pier system design and specifications. Ransom should observe the installation of impact piers to confirm their construction in conformance with the design, and to document and consult should subsurface obstructions be encountered;

2. If a deep foundation system is selected, Ransom should observe the installation of the piles to confirm their construction is in conformance with the design, and to document and consult should subsurface obstructions be encountered;

3. Provide geotechnical observation of foundation and floor slab subgrade preparations following installation of impact piers or piles;

4. Confirm that the soils used as fills and backfills conform to the project specifications; and

5. Document the preparation of foundation bearing surfaces and other subgrades.

8.0 RECOMMENDED ADDITIONAL EXPLORATIONS

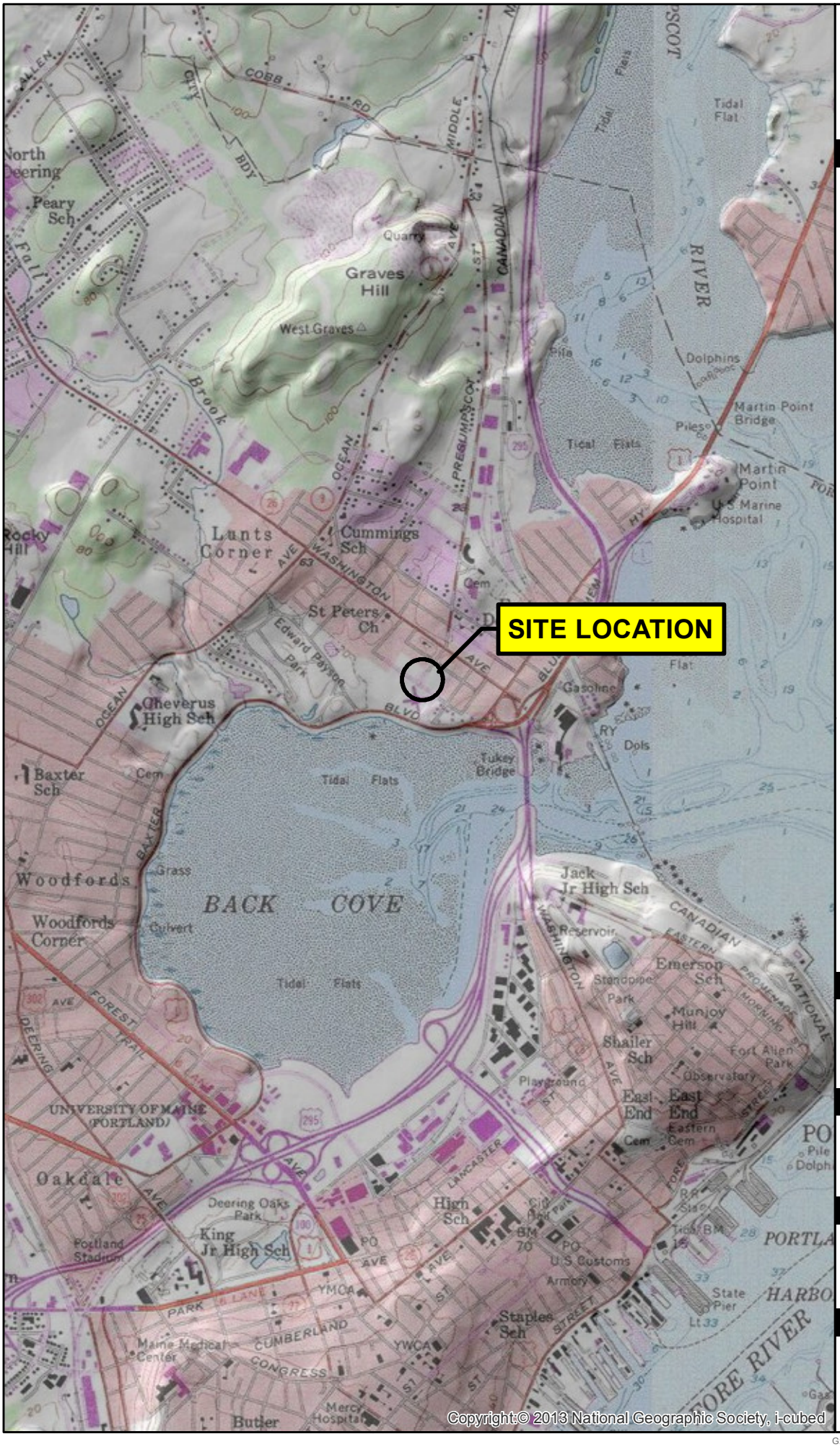
This geotechnical engineering investigation provides a general evaluation of subsurface conditions at the Site. Additional geotechnical test drilling and laboratory analyses should be performed to further define the depth to competent bedrock at the Site and to further assess the presence and thickness of the stiff overconsolidated clay.

9.0 CLOSING COMMENTS

This report has been prepared to assist the site and structural engineers in the design and construction of foundations and Site structures related to the proposed Front Street redevelopment project in Portland, Maine. In the event that changes in the design or location of the proposed structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless they have been reviewed and modified or verified in writing by Ransom. Our recommendations are based in part upon data obtained from widely spaced test borings. Ransom recommends conducting additional geotechnical test drilling prior to preparing the final design plans and project specifications. The nature and extent of variations between explorations will not become evident until construction. If significant variations then appear, it may be necessary to reevaluate and revise the recommendations of this report.

We recommend that Ransom be provided the opportunity to review the final design plans and project specifications in order to confirm that the recommendations made in this report were interpreted and implemented as intended.

The findings, recommendations, specifications, and professional opinions contained within this project geotechnical report have been prepared in accordance with generally accepted professional geotechnical engineering practice. No other warranties are implied or expressed.



RANSOM
Consulting Engineers and Scientists

Regional Locator Map

Notes

1. Data Source: USGS National Map Seamless Server, 24K DRG, 1/3" NED
2. USGS Quad Name: Portland-West
3. Latitude: 43° 40' 50" N
   Longitude: 70° 15' 42" W
   UTM Northing: 4837178 mN
   UTM Easting: 398290 mE

Scale and Orientation

0 1,000 2,000

1 inch = 2,000 feet

Prepared For

Portland Housing Development Corporation
14 Baxter Boulevard
Portland, Maine

Site Address

Front Street Redevelopment
Front Street and
West Presumpscot Street
Portland, Maine

151.06170 | Sept 2016

Figure 1

Site Location

G:\Data\ME\Project\151_06170\Maps\Figure_1a.mxd

NOTES:

1. SITE PLAN BASED ON SITE DESIGN DEVELOPMENT PLAN DATED AUGUST 22, 2016, PROVIDED BY CARROLL ASSOCIATES LANDSCAPE ARCHITECTS MEASUREMENTS AND OBSERVATIONS MADE BY RANSOM CONSULTING, INC. FROM AUGUST 10 TO AUGUST 12, 2016.
2. SOME FEATURES ARE APPROXIMATE IN LOCATION AND SCALE.
3. THIS PLAN HAS BEEN PREPARED FOR PORTLAND HOUSING DEVELOPMENT CORPORATION. ALL OTHER USES ARE NOT AUTHORIZED, UNLESS WRITTEN PERMISSION IS OBTAINED FROM RANSOM CONSULTING, INC.

LEGEND:

B106 APPROXIMATE LOCATION OF TEST BORING

PROPERTY BOUNDARY

0 30 60 120

SCALE in FEET
1"=60'

RANSOM Consulting, Inc.

PREPARED FOR:
PORTLAND HOUSING DEVELOPMENT CORPORATION
14 BAXTER BOULEVARD
PORTLAND, MAINE

SITE:
FRONT STREET DEVELOPMENT
FRONT STREET AND WEST PRESUMPSCOT STREET
PORTLAND, MAINE

SUBSURFACE EXPLORATION PLAN

DATE: SEPTEMBER 2016
PROJECT: 151.06170
FIGURE: 2

O:\ME-DWGS\2015\151.06170\151.06170-GEO.dwg Aug 30, 2016 - 10:41am

APPENDIX A

Exploration Logs

Geotechnical Engineering Report
Proposed Front Street Redevelopment
Portland, Maine

RANSOM
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Engineers
and Scientists

B101

Reviewed by:		Total Depth:	22 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/10/16 to 08/10/16
Surface Elevation:	14 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, Brown, SAND and GRAVEL, moist.	Fill		S1	11-11-7-7	18	24/6	<1	
2									
3	S2 (2-4') Loose, brown SAND and GRAVEL, some Clay, moist.			S2	4-5-5-3	10	24/8	<1	
4									
5	S3 (4-6') Loose, brown SAND and GRAVEL, some Clay, moist.			S3	5-3-4-3	7	24/7	<1	
6	Auger to 10'. Soft drilling at 9'.								
7									
8									
9									
10	S4 (10-12') Very stiff, gray, CLAY, iron staining, moist to wet. WT @ 12')	Clay		S4	11-12-14-15	236	24/20.5	<1	
11									
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Stiff, gray, CLAY, iron staining, wet.	Clay		S5	1-4-5-5	9	24/24	<1	
16									
17	Auger to 20'.								
18									
19									
20	S6 (20-22') 24" Medium stiff, brownish gray CLAY, iron staining, wet.			S6	2-3-2-3	5	24/24	<1	
21									
22	End of Boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 12' End of Boring Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170 Page: 1

RANSOM
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Engineers
and Scientists

B102

Reviewed by:		Total Depth:	22 Feet	Logged By:	EPP
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/10/16 to 08/10/16
Surface Elevation:	13 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, brown, fine to coarse SAND, little gravel, moist.	Fill		S1	5-8-5-4	13	24/7	<1	
2									
3	S2 (2-4') Very dense, brown, fine to coarse SAND and GRAVEL, mixed with glass, coal ash, anthropogenic materials.			S2	8, 50/.2	50+	24/8	<1	
4									
5	S3 (4-6') Loose, brown, fine to coarse SAND, some Gravel, moist.			S3	4-4-2-1	6	24/2	NM	
6	Auger to 10'. Bits of plastic, rubber & glass in drill cuttings.								
7									
8									
9									
10	S4 (10-12') Very soft, gray, marine CLAY, decaying organic odor, moist to wet.	Clay		S4	1/12, 1, 2	1	24/20	<1	
11									
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Medium stiff, gray, CLAY, moist to wet.								
16		Clay		S5	2-2-4-5	6	24/24	<1	
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Soft, gray CLAY, some fine Sand, wet.								
21				S6	2-1-1-1	2	24/24	<1	
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling	End of Boring	Date:
5.5'		

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting Engineers and Scientists

B103

Reviewed by:		Total Depth:	22 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/10/16 to 08/10/16
Surface Elevation:	12 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') 6.5" Medium dense, tan SAND and GRAVEL, over 4.5" dark brown SAND, some Clay, moist.			S1	5-9-9-5	18	24/11	NM	
2	S2 (2-4') Loose, dark brown, SAND, some Gravel and Clay, moist.	Fill		S2	5-5-2-3	7	24/6	1.6	
3									
4	S3 (4-6') Loose, dark brown and black SAND, some Clay, demolition debris, moist.			S3	2-4-5-4	9	24/5.5	<1	
5									
6	Auger to 10'.								
7									
8									
9									
10	No Recovery.			S4	4-1-1-1	2	24/0	-	
11									
12	S4 (12-14') Soft, blackish gray, CLAY, sea shell pieces in sample, wet.	Clay		S5	1-2-1-2	3	24/24	4.8	
13									
14	Auger to 15'.								
15	S5 (15-17') Soft, black/gray, CLAY, sea shell pieces in sample, wet.			S6	1-1-1-4	2	24/21.5	5.6	
16									
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Stiff, greenish gray CLAY, iron staining, wet.								
21		Clay		S7	3-3-5-5	8	24/24	<1	
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 8' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting
Engineers
and Scientists

B104

Reviewed by:		Total Depth:	22 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/10/16 to 08/10/16
Surface Elevation:	13 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Dense, brown SAND and SILT, dry.			S1	6-14-22-16	36	24/9	<1	
2									
3	S2 (2-4') No recovery. Loose, brown SAND and SILT, little brown gravel, dry (as observed in drill cuttings).			S2	3-7-4-2	11	24/0	<1	
4									
5	S3 (4-6') Loose, orange-brown SAND and SILT, demolition debris and iron staining, dry.			S3	5-4-4-5	8	24/12	<1	
6	Auger to 10'.								
7									
8									
9									
10									
11	S4 (10-12') Loose brown SAND and SILT, demolition debris, moist.			S4	4-2-2-3	4	24/5	<1	
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Stiff, olive gray CLAY, iron staining, wet.			S5	2-5-6-8	11	24/24	<1	
16									
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Stiff, olive gray CLAY, wet.			S6	2-5-4-6	9	24/24	<1	
21									
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 15' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

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Consulting Engineers and Scientists

B105

Reviewed by:		Total Depth:	22 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/10/16 to 08/10/16
Surface Elevation:	13 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, brown, SAND and SILT, some Gravel, iron staining, dry.	Fill		S1	4-9-8-8	17	24/11	<1	
2									
3	S2 (2-4') Loose, orange-brown, SAND and GRAVEL, some Clay, iron statining, demolition debris, moist.			S2	3-4-1-2	5	24/13	<1	
4									
5	S3 (4-6') Loose, orange CLAY and SILT, iron staining, demolition debris, moist.			S3	4-2-2-8	4	24/8	<1	
6	Auger to 10'.								
7									
8									
9									
10	S4 (10-12') Very loose, black, urban fill materials, strong creosote odor, moist.	Fill		S4	4-2-1-1	3	24/5	3428	
11									
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Very stiff, greenish-gray, CLAY, iron staining, wet.	Clay		S5	8-12-12-14	24	24/24	16.9	
16									
17									
18									
19									
20	S6 (20-22') Stiff, greenish-gray, CLAY, iron staining, wet.	Clay		S6	4-5-6-6	11	24/24	21.3	
21									
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 15' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

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B106

Reviewed by:		Total Depth:	22 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/11/16 to 08/11/16
Surface Elevation:	13 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, light brown SAND and SILT, little gravel, dry.			S1	5-15-13-9	24	24/12	<1	
2									
3	S2 (2-4') Medium dense, brown SAND and SILT, moist.	Fill		S2	4-6-6-3	12	24/11	<1	
4									
5	S3 (4-6') Very loose, dark brown, SAND and SILT, moist.			S3	3-1-1-1	2	24/14	<1	
6	Auger to 10'.								
7									
8									
9									
10									
11	S4 (10-12') Medium stiff, gray CLAY, saturated, includes anthropogenic waste.	Fill		S4	4-3-2-2	5	24/17	42.5	
12	Auger to 15'.								
13									
14									
15									
16	S5 (15-17') Very stiff, olive green CLAY, iron staining, wet.	Clay		S5	5-10-13-13	23	24/24	0.8	
17	Auger to 20'.								
18									
19									
20									
21	S6 (20-22') Very stiff, olive green CLAY, iron staining, wet.	Clay		S6	5-10-15-15	25	24/24	<1	
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 10' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170 | Page: 1

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B107

Reviewed by:		Total Depth:	22 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/11/16 to 08/11/16
Surface Elevation:	12 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, brown SAND, and SILT, dry.			S1	3-5-6-6	11	24/12	5.2	
2									
3	S2 (2-4') Medium dense, brown SAND and SILT, little clay, demolition debris, dry.			S2	9-10-7-3	17	24/11	<1	
4									
5	S3 (4-6') Loose brown SAND and SILT, some Gravel, demolition debris, dry.	Fill		S3	4-3-5-6	8	24/13	<1	
6									
7	S4 (6-8') Medium dense, brown SAND and CLAY, moist.			S4	9-6-9-6	15	24/12	<1	
8									
9	S5 (8-10') 5" Medium dense, brown SAND over 3" gray CLAY, and demolition debris.	Fill		S5	6-9-6-8	15	24/8	<1	
10									
11	S6 (10-12') Stiff, gray, CLAY, wet.	Clay		S6	4-2-1-1	3	24/12	<1	
12	Auger to 15'.								
13									
14									
15	S7 (15-17') Medium stiff, gray CLAY, sea shells throughout, wet.								
16		Clay		S7	1-3-4-9	7	24/13.5	<1	
17	Auger to 20'.								
18									
19									
20	S8 (20-22') Very stiff, greenish gray CLAY, iron staining, wet.								
21				S8	7-11-13-19	24	24/24	<1	
22	End of borning 22'.								
23									
24									

WATER LEVELS:

During Drilling 10' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting Engineers and Scientists

B108

Reviewed by:		Total Depth: 22 Feet	Logged By: RED
Date Reviewed:		Boring Diameter: 6 Inches	Date Drilled: 08/11/16 to 08/11/16
Surface Elevation:	11 +/-	Well Stickup: NA	Driller: NEBC

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') 11" Medium dense, brown SAND and GRAVEL, some Silt over 3" CLAY, little sand, moist.	Fill		S1	5-21-5-7	26	24/14	<1	
2									
3	S2 (2-4') Medium dense, CLAY and GRAVEL, some Sand, moist.			S2	5-9-6-5	15	24/10	<1	
4									
5	S3 (4-6') COAL ASH mixed with anthropogecnic debris, some soft Clay throughout, wet.			S3	4-4-6-9	10	24/17	<1	
6	Auger to 10'.								
7									
8									
9									
10									
11	S4 (10-12') 3" Black, ANTHROPOGENIC WASTE, over 2" greenish-gray CLAY, wet.	Fill		S4	1-2-1-1	3	24/5	<1	
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Soft, greenish-gray CLAY, sea floor debris, wet.	Clay		S5	1-1-1-1	2	24/18	<1	
16									
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Medium stiff, greenish-gray CLAY, iron staining, wet.	Clay		S6	2-3-4-5	5	24/24	<1	
21									
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 10' End of Boring Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170 Page: 1

RANSOM
Consulting Engineers and Scientists

B109

Reviewed by:		Total Depth:	22 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/11/16 to 08/11/16
Surface Elevation:	12 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, brown SAND and SILT, dry.			S1	3-5-6-8	11	24/14	<1	
2									
3	S2 (2-4') 5" ANTHROPOGENIC WASTE over 11" very loose SAND and SILT, some Gravel, dry.	Fill		S2	3-2-1-1	3	24/16	<1	
4									
5	S3 (4-6') COAL ASH, dry.			S3	2-1-1-7	2	24/11	<1	
6	Auger to 10'.								
7									
8									
9									
10	S4 (10-12') Soft, black CLAY and SILT, little sand, anthropogenic debris througout, wet.								
11		Fill		S5	1-1-1-1	2	24/9	<1	
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Soft, gray CLAY, some Sea Shells, wet.								
16		Clay		S5	1-2-1-1	3	24/24	<1	
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Soft, gray CLAY, sea floor debris, wet.								
21		Clay		S6	1-1-1-2	2	24/24	<1	
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 10' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170 | Page: 1

RANSOM
Consulting
Engineers
and Scientists

B110

Reviewed by:		Total Depth: 22 Feet	Logged By: RED
Date Reviewed:		Boring Diameter: 6 Inches	Date Drilled: 08/11/16 to 08/11/16
Surface Elevation: 14 +/-		Well Stickup: NA	Driller: NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') 21" Medium dense, light brown SILT, some Sand, over 1" concrete, dry.	Fill		S1	4-9-14-25	23	24/22	<1	
2									
3	S2 (2-4') Loose, brown SILT, some Sand, over 0.5" coal ash, dry.			S2	3-4-5-3	9	24/11.5	<1	
4									
5	S3 (4-6') 3" Loose SILT, some Sand, over 5" loose SAND and SILT, over 4" coal ash, dry.			S3	2-1-2-1	3	24/12	<1	
6	Auger to 10'.								
7									
8									
9									
10	S4 (10-12') Very stiff, greenish-gray, CLAY, iron staining, moist.	Clay		S4	4-12-16-20	28	24/14	<1	
11									
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Stiff, greenish-gray. CLAY, iron staining, wet.	Clay		S5	4-6-8-10	14	24/21	<1	
16									
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Soft, light gray, CLAY, iron staining, wet.			S6	2-3-2-3	5	24/24	<1	
21									
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 15' End of Boring Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting Engineers and Scientists

B111

Reviewed by:		Total Depth: 22 Feet	Logged By: RED
Date Reviewed:		Boring Diameter: 6 Inches	Date Drilled: 08/11/16 to 08/11/16
Surface Elevation: 15 +/-		Well Stickup: NA	Driller: NEBC

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, brown SILT, dry.			S1	4-9-7-7	16	24/15	NM	
2									
3	S2 (2-4') Medium dense, brown, SILT, COAL ASH and DEMOLITION DEBRIS, dry.	Fill		S2	6-7-3-2	10	24/11	NM	
4									
5	S3 (4-6') 3" Loose SILT and ANTHROPOGENIC WASTE, over 5" COAL ASH, over 5" soft, greenish-gray CLAY, moist.			S3	2-2-3-2	5	24/13	NM	
6	Auger to 10'.								
7									
8									
9									
10	S4 (10-12') Stiff, brownish-gray CLAY, iron staining, moist.								
11		Clay		S4	4-6-8-11	14	24/16	NM	
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Stiff, greenish-gray CLAY, iron staining, moist.								
16		Clay		S5	3-6-6-8	12	24/19	NM	
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Soft, greenish-gray CLAY, iron staining, wet.								
21		Clay		S6	2-2-2-4	4	24/24	NM	
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 20' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting Engineers and Scientists

B112

Reviewed by:		Total Depth: 22 Feet	Logged By: RED
Date Reviewed:		Boring Diameter: 6 Inches	Date Drilled: 08/11/16 to 08/11/16
Surface Elevation:	18 +/-	Well Stickup: NA	Driller: NEBC

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, SAND and SILT, dry.			S1	4-8-8-6	16	24/10	NM	
2									
3	S2 (2-4') 15" Medium dense, SAND and SILT, over 3" COAL ASH, over 4" dark brown, SAND and SILT, some Clay, moist.	Fill		S2	5-12-10-6	22	24/22	NM	
4									
5	S3 (4-6') 5" Medium dense, dark brown, SAND and SILT, some Clay, over 4" ANTHROPOGENIC DEBRIS and COAL ASH, over 7" loose dark brown, SAND, some Silt.			S3	8-3-6-3	9	24/16	NM	
6	Auger to 10'.								
7									
8									
9									
10									
11	S4 (10-12') 1" ANTHROPOGENIC DEBRIS with iron staining, over 5" gray CLAY, wet.	Fill		S4	5-3-3-5	6	24/6	NM	
12	Auger to 15'.								
13									
14									
15									
16	S5 (15-17') No recovery. Very stiff, gray CLAY, with sea floor debris, wet (as described from drill cuttings).	Clay		S5	8-11-14-14	25	24/0	NM	
17	Auger to 20'.								
18									
19									
20									
21	S6 (20-22') Stiff, greenish-gray, CLAY, wet.	Clay		S6	3-4-6-6	10	24/24	NM	
22	End of boring 22'.								
23									
24									

WATER LEVELS:

During Drilling 10' | End of Boring | Date:

WELL LEGEND:

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting Engineers and Scientists

B113

Reviewed by:		Total Depth:	22 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/12/16 to 08/12/16
Surface Elevation:	16 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, brown, SILT, dry.	Fill		S1	6-8-9-8	17	24/8	<1	
2	S2 (2-4') Loose, brown SILT over 7" dark brown SAND and SILT some Gravel, moist.			S2	3-2-2-3	4	24/17	<1	
3									
4	S3 (4-6') 6" Loose, SAND and SILT, some Clay, over 4" GRAVEL, some Sand, and Gravel, moist.			S3	4-4-5-6	9	24/10	<1	
5									
6	Auger to 10'.								
7									
8									
9									
10	S4 (10-12') Hard, gray CLAY, moist,	Clay		S4	17-18-20-15	38	24/6	<1	
11									
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Stiff, gray, CLAY, iron staining, wet.	Clay		S5	6-7-8-9	15	24/24	<1	
16									
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Medium stiff, gray, CLAY, iron staining, wet.	Clay		S6	1-2-4-3	6	24/24	<1	
21									
22	End of boing 22'.								
23									
24									

WATER LEVELS:

During Drilling 15' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting Engineers and Scientists

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Reviewed by:		Total Depth: 48.3 Feet	Logged By: RED
Date Reviewed:		Boring Diameter: 6 Inches	Date Drilled: 08/12/16 to 08/12/16
Surface Elevation:	14 +/-	Well Stickup: NA	Driller: NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') 6" Medium dense, brown SILT, over 5" COAL ASH, over 4" stiff, CLAY and SILT.			S1	4-5-7-6	12	24/15	<1	
2									
3	S2 (2-4') 7" Stiff, brown, CLAY and SILT, over 4" COAL ASH.	Fill		S2	8-8-7-6	15	24/11	<1	
4									
5	S3 (4-6') ANTHROPOGENIC WASTE with COAL ASH, moist.			S3	8-5-4-4	9	24/18.5	<1	
6	Auger to 10'.								
7									
8									
9									
10	S4 (10-12') 10" Soft, brown CLAY, over 9" COAL ASH, wet.								
11		Fill		S4	1-2-2-2	4	24/19	2.4	
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Very stiff, gray, CLAY, iron staining, wet.								
16		Clay		S5	5-11-14-15	25	24/24	<1	
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Stiff, gray, CLAY, iron staining, wet.								
21		Clay		S6	3-3-5-5	8	24/24	<1	
22									
23									
24									

WATER LEVELS:

During Drilling 10' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting Engineers and Scientists

B114

Reviewed by:		Total Depth: 48.3 Feet	Logged By: RED
Date Reviewed:		Boring Diameter: 6 Inches	Date Drilled: 08/12/16 to 08/12/16
Surface Elevation:	14 +/-	Well Stickup: NA	Driller: NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
26	Boring advanced as ledge probe to 48.3' bgs.								
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49	Refusal, end of exploration 48.3'.								

WATER LEVELS:

During Drilling 10' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

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Reviewed by:		Total Depth:	66 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/12/16 to 08/12/16
Surface Elevation:	12 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
1	S1 (0-2') Medium dense, brown, SILT, some Gravel, dry.	Fill		S1	4-11-2-3	13	24/16	<1	
2	S2 (2-4') ANTHROPOGENIC WASTE and COAL ASH. Abundant iron staining, wet.			S2	4-8-5-4	13	24/14	<1	
3									
4	S3 (4-6') ANTHROPOGENIC WASTE, moist.			S3	3-3-3-3	6	24/14	<1	
5									
6	Auger to 10'.								
7									
8									
9									
10	S4 (10-12') Black, ANTHROPOGENIC WASTE and CLAY, wet.	Fill		S4	3-2-1-2	3	3	<1	
11									
12	Auger to 15'.								
13									
14									
15	S5 (15-17') Soft, gray, CLAY, sea shell debris, wet.	Clay		S5	3-2-1-1	24/17	3	<1	
16									
17	Auger to 20'.								
18									
19									
20	S6 (20-22') Medium stiff, gray, CLAY, wet.	Clay		S6	1-2-2-2	24/24	4	<1	
21									
22									
23									
24									

WATER LEVELS:

During Drilling 10' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting
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and Scientists

B115

Reviewed by:		Total Depth:	66 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/12/16 to 08/12/16
Surface Elevation:	12 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49	Boring advanced as ledge probe to 66' bgs.								

WATER LEVELS:

During Drilling 10' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

RANSOM
Consulting
Engineers
and Scientists

B115

Reviewed by:		Total Depth:	66 Feet	Logged By:	RED
Date Reviewed:		Boring Diameter:	6 Inches	Date Drilled:	08/12/16 to 08/12/16
Surface Elevation:	12 +/-	Well Stickup:	NA	Driller:	NEBC

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									
63									
64									
65									
66	Refusal, end of exploration 66'.								
67									
68									
69									
70									
71									
72									
73									
74									

WATER LEVELS:

During Drilling 10' | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Boring advanced using truck-mounted drilling rig with 2 1/4" I.D. hollow-stem augers.
2. Sample designated with solid fill submitted for laboratory analysis.
3. NA=Not applicable; NM=measured.

CLIENT:
Portland Housing Redevelopment

SITE:
Front Street Redevelopment
Front Street
Portland, Maine

Project No.: 151.06170

APPENDIX B

Laboratory Test Results

Geotechnical Engineering Report
Proposed Front Street Redevelopment
Portland, Maine

ConTest Consultants, Inc.

Providing Inspection/Testing & Consulting Services

LETTER OF TRANSMITTAL

TO: Ransom Consulting

DATE: 8/24/2016

PROJECT: Front Street - Portland, ME 151.0617 (PO 9296)

CTC PROJECT NO.: 216178

Attached are the following for your use:

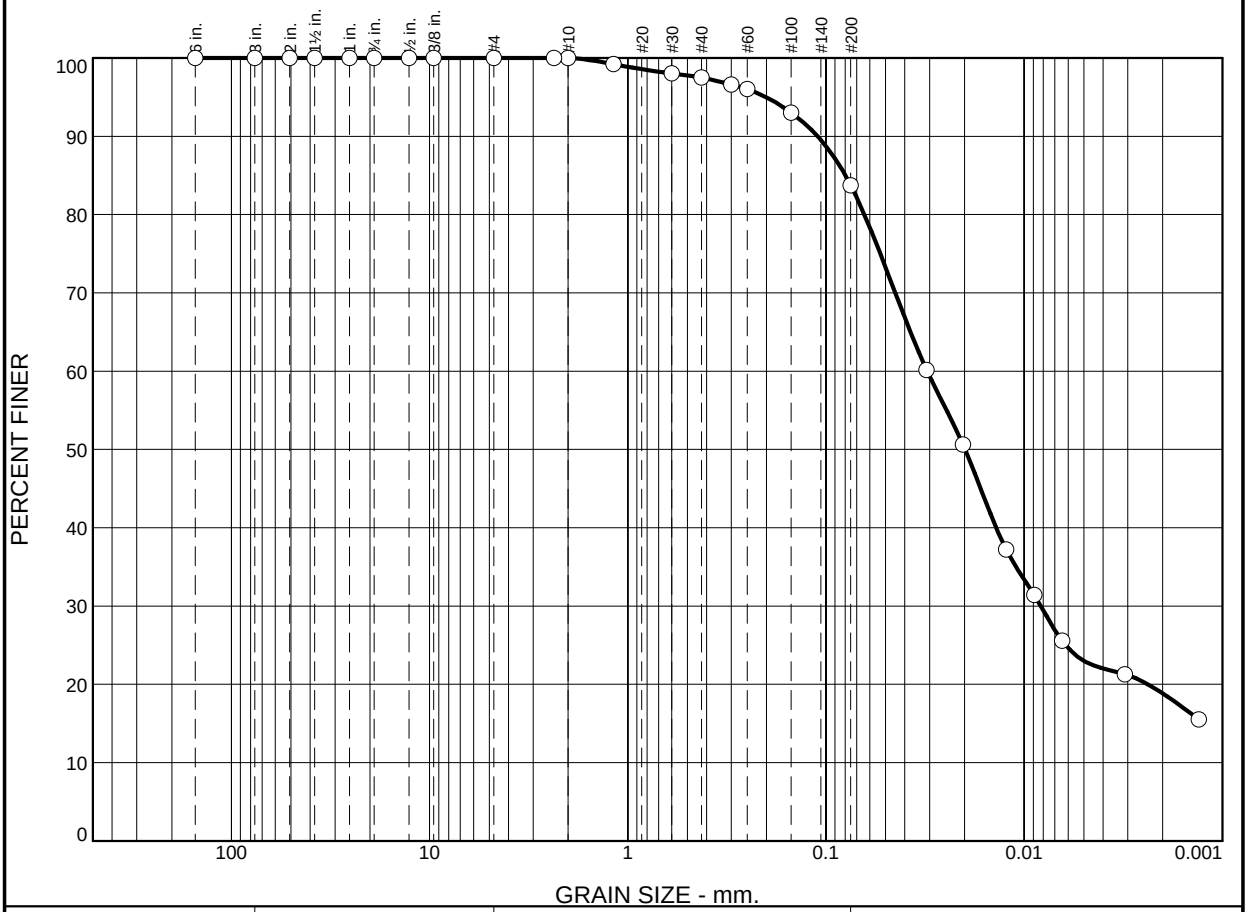
COPIES	DATE	LAB NUMBER	DESCRIPTION
			Concrete Reports - Cylinders
			Concrete Inspection Report
			Reinforcing Steel Inspection Report
			Field Density Report
			Field Report
2		L-358-16 L-359-16	Particle Size Distribution Report w/ Hydrometer
2		L-358-16 L-359-16	Atterberg Limits

CC: Kenneth Milender & Jay Johonnett

Reviewed By: Donald Walden

18 Cote Ave. Unit 11 Goffstown, NH 03045
p (603) 626-4422 • *f* (603) 782-0064
www.contestconsultantsinc.com

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.5	13.8	60.7	23.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6"	100.0		
3"	100.0		
2"	100.0		
1.5"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.2		
#30	98.0		
#40	97.5		
#50	96.6		
#60	96.0		
#100	93.0		
#200	83.7		
0.0311 mm.	60.1		
0.0204 mm.	50.6		
0.0123 mm.	37.2		
0.0089 mm.	31.4		
0.0064 mm.	25.6		
0.0031 mm.	21.3		
0.0013 mm.	15.5		

* (no specification provided)

Soil Description

fat clay with sand

Atterberg Limits

PL= 26 LL= 58 PI= 32

Coefficients

D_{90}= 0.1102 D_{85}= 0.0798 D_{60}= 0.0309
D_{50}= 0.0199 D_{30}= 0.0082 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(29)

Remarks

Moisture Content as received - 42.8%

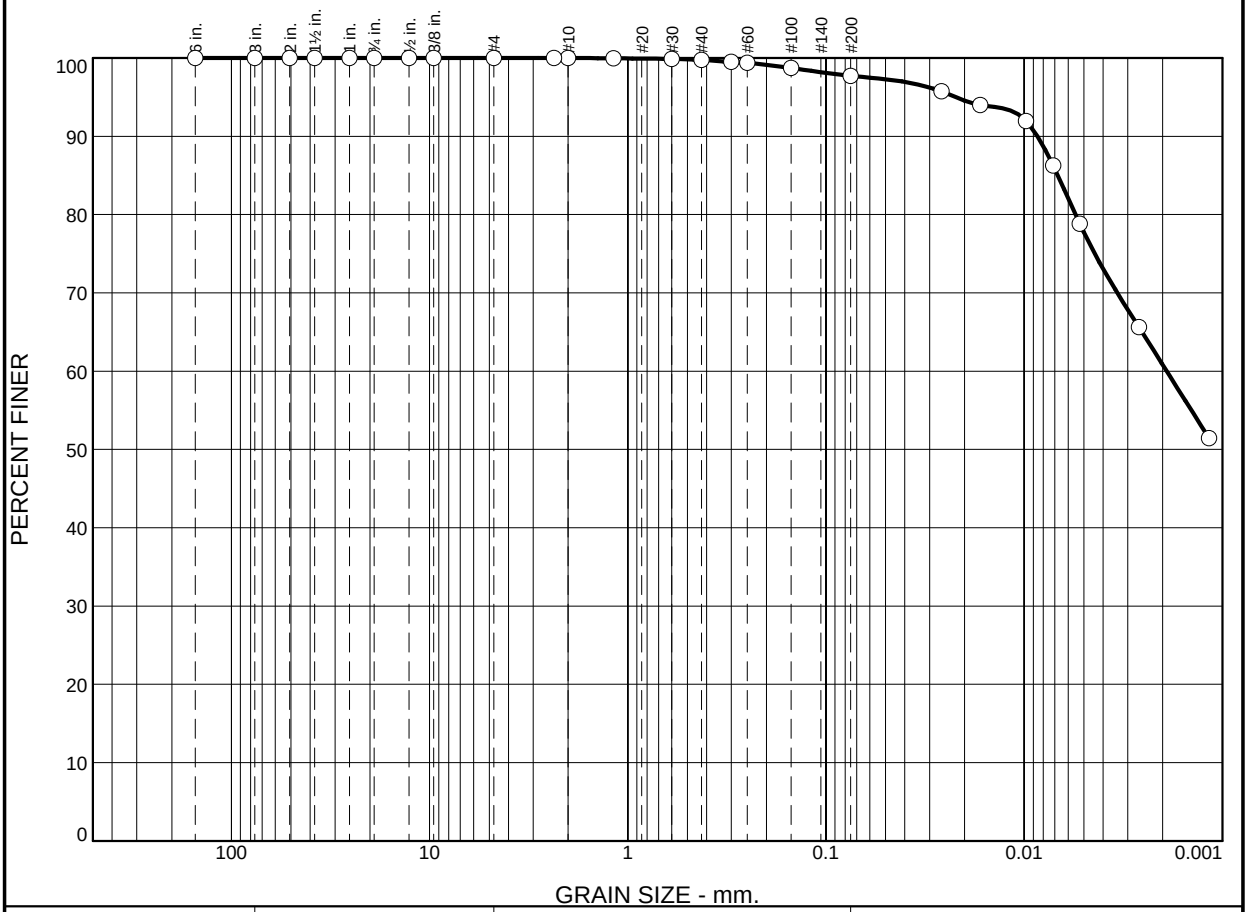
Location: B-109, S-5
Sample Number: L-358-16 **Depth:** 15'-17' **Date:** 8/24/2016

ConTest Consultants, Inc.

Goffstown, New Hampshire

Client: Ransom Consulting, Inc.
Project: Front Street (151.0617)
Portland, Maine
Project No: 216178 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	2.0	20.0	77.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6"	100.0		
3"	100.0		
2"	100.0		
1.5"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#30	99.9		
#40	99.7		
#50	99.5		
#60	99.4		
#100	98.7		
#200	97.7		
0.0262 mm.	95.7		
0.0167 mm.	94.0		
0.0098 mm.	91.9		
0.0071 mm.	86.3		
0.0052 mm.	78.8		
0.0026 mm.	65.6		
0.0012 mm.	51.4		

* (no specification provided)

Soil Description

fat clay

Atterberg Limits

PL= 23 LL= 50 PI= 27

Coefficients

D_{90}= 0.0086 D_{85}= 0.0068 D_{60}= 0.0019
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(30)

Remarks

Moisture Content as received = 27.0%

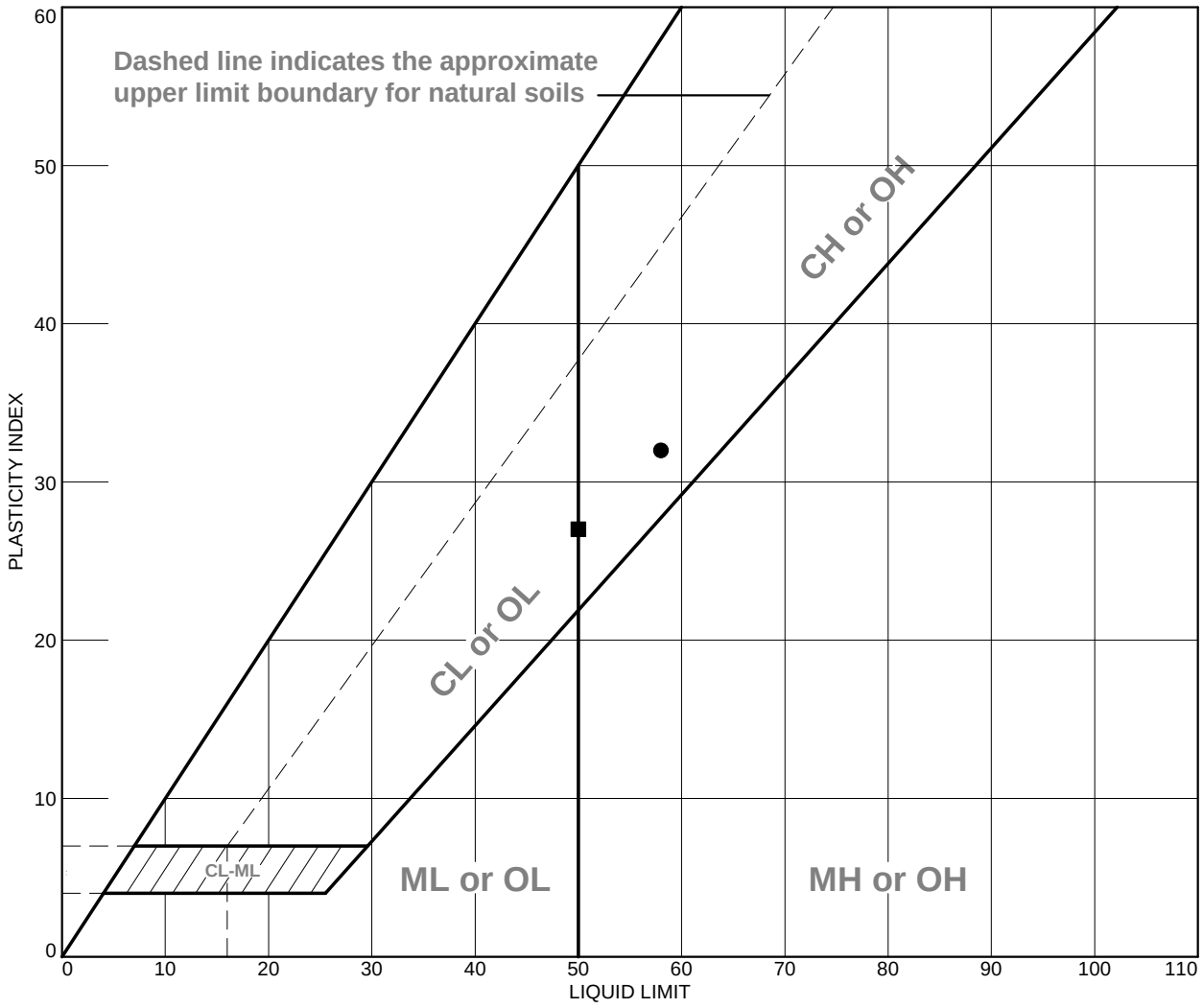
Location: B-110, S-5
Sample Number: L-359-16 **Depth:** 15'-17' **Date:** 8/24/2016

ConTest Consultants, Inc.

Goffstown, New Hampshire

Client: Ransom Consulting, Inc.
Project: Front Street (151.0617)
Portland, Maine
Project No: 216178 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	fat clay with sand	58	26	32	97.5	83.7	CH
■	fat clay	50	23	27	99.7	97.7	CH

Project No. 216178 **Client:** Ransom Consulting, Inc.

Project: Front Street (151.0617)

Portland, Maine

● **Location:** B-109, S-5 **Depth:** 15'-17' **Sample Number:** L-358-16

■ **Location:** B-110, S-5 **Depth:** 15'-17' **Sample Number:** L-359-16

Remarks:

■ Moisture Content as received:
B-109, S-5, 15'-17' - 42.8%
B-110, S-5, 15'-17' - 27.0%

ConTest Consultants, Inc.

Goffstown, New Hampshire

Figure