Geotechnical Engineering Report

Proposed W. B. Mason Addition

Portland, Maine

December 4, 2009

Project No. J3095112

Prepared for:

BKA Architects
Brockton, Massachusetts

Prepared by:

Terracon Consultants, Inc.
Scarborough, Maine

December 4, 2009

BKA Architects
142 Crescent Street
Brockton, Massachusetts 02302-3104

Attn: Mr. Matt Pelletier
P: [508] 583 5603
F: [508] 583 2914
E: mpelletier@bkaarchs.com

Re: Geotechnical Engineering Report
Proposed W. B. Mason Addition
Portland, Cumberland County, Maine
Terracon Project No. J3095112

Dear Mr. Pelletier:

Terracon Consultants, Inc. (Terracon) is submitting, herewith, the results of our geotechnical evaluation for the above-referenced project. The purpose of this evaluation was to obtain information on subsurface conditions at the project site and, based on this information, to provide recommendations regarding the design and construction of foundations and site development for the proposed store.

In this report, we include our understanding of the project, a summary of the exploration program, and our design and construction recommendations. This report is subject to the General Comments in Section 5.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Wendell A. Shedd, III
Department Manager

Ryan R. Roy, P.E.
Principal/NE Division Manager

/pdc/J3095112

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING REPORT
PROPOSED W. B. MASON ADDITION
PORTLAND, MAINE

Project No. J3095112
December 4, 2009

1.0 INTRODUCTION

The geotechnical evaluation for the expansion of the proposed W. B. Mason building at 106 Pinetree Industrial Parkway, Portland, Maine, as shown on the Topographic Vicinity Map in Appendix A, has been completed. Four soil borings (B-1 through B-4) were drilled to depths up to 32 feet below existing ground surface. A Boring Location Diagram and individual boring logs are included in Appendix A.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- earthwork
- foundation design and construction
- seismic considerations
- slab design and construction

2.0 PROJECT INFORMATION

The site is within a small industrial park and located at 106 Pinetree Industrial Parkway in Portland, Cumberland County, Maine. The site is currently developed with an approximately 54,000 square-foot, premanufactured steel building, with associated paved parking areas, concrete sidewalks and landscaping around the building and property.

2.1 Project Description

The project consists of a 7,000 square-foot single-story, pre-manufactured steel building addition to the southern end of the existing W. B. Mason building. This addition is to provide a covered loading area for the W. B. Mason delivery vans. Additionally, a mezzanine level will be constructed within a portion of the existing building.

Existing pavements and grades are not proposed to be significantly changed for the proposed addition. Access to the site will be provided by existing driveways from Pinetree Industrial Parkway. Based on our observations, the site generally slopes downward to the north. Based on our experience with the site area, the grade at the site for the existing W. B. Mason building was likely slightly raised. Site development plans were not provided to us for preparation of this report, but are reported to remain unchanged from existing. A summary description of the project is presented below:

ITEM	DESCRIPTION
Site layout	Shown on Figure 2 - Boring Location Diagram
Proposed Building	One story with an approximate footprint of 7,000 square feet
Proposed Building Type	Steel-framed light industrial building
Finished Floor Elevation	102.4 to 102.8 feet
Maximum Loads	Columns: 60 kips (assumed) Walls: 2 kips per linear foot (assumed) Slabs: 175 psf max (assumed)
Maximum allowable settlement	Columns: 1-inch (assumed) Walls: ¾ inch over 40 feet (assumed)
Grading	Based on our observations of the proposed building plans, we expect that only minor grading will be required.
Cut and fill slopes	Not expected
Retaining walls	None proposed
Basement Level	A basement is not proposed for this building.

2.2 Site Location and Description

ITEM	DESCRIPTION
Location	106 Pinetree Industrial Parkway
Existing improvements	The site is currently developed with a pre-manufactured steel building, asphalt paved parking areas, concrete sidewalks, and landscaping.
Current ground cover	Asphalt pavement.
Existing topography	The site generally slopes slightly downward to the north

3.0 SUBSURFACE EXPLORATIONS AND CONDITIONS

3.1 Typical Profile

Based on the results of the borings and observations at the time of drilling, subsurface conditions on the project site can be generalized as follows:

Description	Approximate Depth to Bottom of Stratum (feet)	Material Encountered	Consistency / Relative Density
Stratum 1	1 to 4	Poorly-graded sand with silt and gravel, brown (Fill)	Medium dense
Stratum 2	>32	Lean clay, olive to gray (Glaciomarine Deposit)	Very soft to stiff

Conditions encountered at each boring location are indicated on the individual boring logs in Appendix A of this report. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; *in situ*, the transition between materials may be gradual.

Laboratory testing consisting of moisture content and Atterberg Limits was performed on samples collected during our exploration activities. A total of six moisture content tests were performed and the results ranged from 36.4% to 51.5% moisture. A total of three Atterberg Limits tests were performed and plasticity indices (PI) were observed to range from 14 to 24 and the liquid limits (LL) were observed to range from 37 to 46.

3.2 Groundwater

Groundwater did not appear in the boreholes during or soon after drilling. The high fines content of the native soils may have prevented the groundwater from appearing in the borehole. However, soil samples deeper than about 10 feet below existing ground surface had a higher moisture content, indicating the current groundwater elevation may be close to that level. Additionally, water may be temporarily perched above the relatively impermeable clay.

Fluctuations in groundwater level may occur because of seasonal variations in the amount of rainfall, runoff and other factors. Additionally, grade adjustments on and around the site, as well as surrounding drainage improvements, may affect the water table. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

The glaciomarine deposit, consisting of lean clay, is compressible and is expected to settle under the added weight of fill or moderate to heavy building loads. However, with the proposed light loads of the pre-manufactured steel building addition, we estimate that the glaciomarine deposit may consolidate within the range of acceptable settlements for this type of construction. This estimation is based on spread footings bearing on properly prepared subgrades, to include overexcavation of glaciomarine soils and placement of geotextile and crushed stone or a mud mat under footings.

Existing interior footings should be evaluated for the proposed mezzanine level loads, based upon our recommendations for allowable bearing and settlements. If the proposed mezzanine level induce loads that result in footing pressures and settlements greater than those recommended in this report, additional investigations for the design of deeper foundation support should be performed.
We have assumed that only minor grading, cuts and fills of less than one foot, will be required in the proposed addition and no other ancillary building structures are proposed. This should be reviewed when the site survey is available. With little to no increase in load expected outside of the building pad, surcharge or preload of these areas is not required.

4.2 Earthwork

4.2.1 Site Preparation

The site is slightly sloping in the areas of the proposed work. We estimate only minor grading, cuts and fills up to about a foot or so, will be required to establish finished grade. Prior to placing fill, asphalt and concrete pavements and otherwise unsuitable materials should be removed. The subgrade should be thoroughly compacted/proofrolled with a large roller compactor. Unstable subgrades should be removed and replaced with compacted structural fill or minus ¾-inch crushed stone, as necessary.

4.2.2 Material Types

Fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Structural Fill	GW [2]	All locations and elevations. The native glaciomarine soil is not suitable for use as structural fill; however, the poorly-graded sand fill may be selectively re-used as structural fill, provided it meets the gradation requirements in Note 2, below.
Common fill	Varies [3]	The existing poorly-graded sand fill may be re-used as common fill for minor site grading, provided it is free of organics and can be adequately compacted. The native glaciomarine soil may need to be blended with granular material to facilitate its re-use as common fill. Common fill should not be used under settlement sensitive structures.

1. Fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used. Fill should not be placed on a frozen subgrade.
2. Imported structural fill should meet the following gradation:

	Percent Passing by Weight
Sieve Size	Structural Fill
6”	100

Fill Type [1]	USCS Classification	Acceptable Location for Placement
	3”	70 – 100
	2”	(100)*
	¾”	45 – 95
	No. 4	30 – 90
	No. 10	25 – 80
	No. 40	10 – 50
	No. 200	0 - 12

* Maximum 2-inch particle size within 12 inches of the underside of footings or slabs

3. Common fill should have a maximum particle size of 6 inches and no more than 25 percent by weight passing the US No. 200 sieve.

4.2.3 Compaction Requirements

ITEM	DESCRIPTION
Fill Lift Thickness	8 inches or less in loose thickness
Compaction Requirements [1]	95% maximum modified Proctor dry density (ASTM D1557, Method C)
Moisture Content – Granular Material	+/- 2 percent of optimum

1. We recommend that structural fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested, as required, until the specified moisture and compaction requirements are achieved.

4.2.4 Utility Trench Backfill

Trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If backfilled with relatively clean granular material, utility trenches should be capped with at least 18 inches of low permeability fill in non-pavement areas to reduce the infiltration and conveyance of surface water through the trench backfill. Alternatively, trenches should be backfilled with material that approximately matches the permeability characteristics of the surrounding soil. Fill placed as backfill for utilities located below the slab should consist of compacted structural fill or suitable bedding material.

4.2.5 Grading and Drainage

Adequate drainage should be provided at the site to reduce the likelihood of an increase in moisture content of the foundation soils. Finished grade should be sloped away to reduce the likelihood of water ponding near the structures.

4.2.6 Construction Considerations

We expect the soil subgrade to consist primarily of glaciomarine clay for the footings and existing fill for the slab-on-grade. Such soils and site conditions are sensitive to moisture and unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. Should unstable subgrade conditions develop, stabilization measures will need to be employed. Contractors experienced in earthwork construction in New England should be aware of this soil behavior and the effect that moisture and site traffic have on workability. If construction starts in the wet or winter months, the contractor should include a contingency in his cost estimate to allow the use of imported fill and the disposal of unsuitable site soils.

Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, wet, or disturbed, the affected material should be removed, or should be scarified, moisture conditioned, and recompacted.

As a minimum, temporary excavations should be sloped or braced as required by Occupational Health and Safety Administration (OSHA) regulations to provide stability and safe working conditions. The contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations, as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, State and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; proofrolling; placement and compaction of controlled compacted fills; backfilling of excavations; and just prior to construction of foundations.

Should dewatering be required due to surface runoff or fluctuations in the groundwater table, dewatering can likely be accomplished by pumping from filtered pumps installed in crushed stone sumps. The contractor should prevent groundwater and surface water runoff from collecting in excavations. Subgrade soils that become unstable because of such water and/or reworking by construction activity should be removed and replaced, as necessary.

4.3 Foundation Recommendations

We estimate that post-construction total settlements may be up to about 1 to 1½ inches with differential settlement about half the total settlement. Provided the risk of such settlements is acceptable, the foundations of the proposed building may derive support from the native soils following treatment as described below.

The footing subgrades should be overexcavated with a flat bladed bucket to avoid disturbing the subgrade, to at least 12 inches below the underside of footing. The excavation should be made sufficiently wide to allow a 5-ton (static weight) single steel drum roller compactor (with rubber drive wheels) to gain access. The exposed subgrade should be statically proofrolled with this compactor while being monitored by the Terracon geotechnical engineer. Too much proofrolling may disturb the subgrade. Soft subgrades that exhibit excessive displacement (pumping and weaving) may need to be excavated further or have stabilization measures applied.

Following successful completion of proofrolling, a woven geotextile (Mirafi 500X or equivalent) should be placed on the subgrade, which may then be raised to the underside of footing level by placing minus ¾-inch crushed stone. The crushed stone should be "seated" with several passes of a 5-ton roller. This compactive effort should also be monitored by the geotechnical engineer to avoid disturbance to the underlying sensitive fine grained soils. As an alternative to the 12 inches of overexcavation for crushed stone, a minimum 4-inch thick mud mat may be placed.

The proposed addition may be supported on shallow spread footings provided the subgrade preparation measures above and detailed in the Construction Considerations sections of this report are followed. Design recommendations for shallow foundations are presented in the following paragraphs.

4.3.1 Design Recommendations – Spread Footings

DESCRIPTION	VALUE
Net allowable bearing pressure [1]	1,500 psf
Minimum strip footing width	18 inches
Minimum isolated spread footing width	24 inches
Minimum embedment below finished grade for frost protection	4.5 feet
Approximate total settlement [2]	≤ 1-1/2 inch
Estimated differential settlement [2]	≤ ¾ inch
Total Unit Weight (γ)	120 pcf
Passive earth pressure coefficient, K_p [3]	3.0 (ultimate)
Coefficient of sliding friction [4]	0.5 (ultimate)

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.
2. Estimated post-surcharge settlements. Foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations.
3. Passive pressure calculated with this parameter should be reduced by at least a factor of safety of 3, to reflect the amount of movement required to mobilize the passive resistance.
4. A factor of safety of at least 1.5 should be applied to the sliding resistance.

Site underground utilities, light standard foundations, drainage structures, and the like may be soil supported in a similar manner to building footings. Foundations for site appurtenances may be designed on the basis of a net allowable bearing pressure of 2 ksf. However, the net allowable bearing pressure should be reduced to 1.5 ksf if the foundation dimensions are less than the recommended minimum.

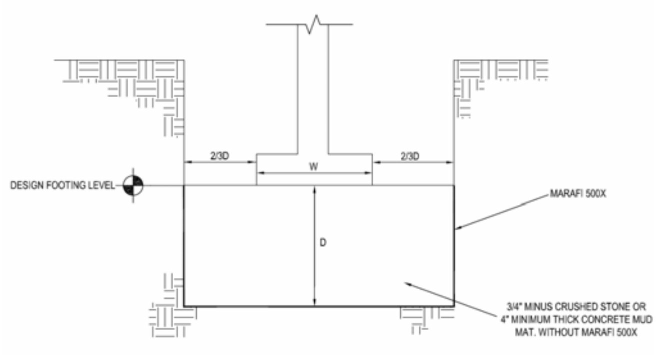
4.3.2 Construction Considerations

The existing fill and native glaciomarine clay is not suitable for foundation support in its current state. Existing fill should be removed within the foundation bearing zone, which is defined as the volume below 1H:1V lines extending outward and downward from the lower edges of the footings. Glaciomarine clay should be removed to a minimum of 12 inches below proposed footings if using crushed stone, or a minimum of 4 inches if using a mud mat, as discussed within this report.

Foundation subgrades consisting of glaciomarine clay should be carefully excavated with a flat blade bucket to reduce disturbance. The exposed subgrade should be proofrolled with a static heavy roller compactor under the direction of a geotechnical engineer. However, the degree of proofrolling should be reviewed by the site geotechnical engineer. Proofrolling should not be completed if it will disturb underlying sensitive soils or if the groundwater table has risen close to excavation level. During the proofrolling process, the subgrade should be observed by the geotechnical engineer or his representative to identify soft or loose areas. Soft/loose areas and unstable zones should be replaced with minus ¾-inch crushed stone, as needed.

The glaciomarine clay will be susceptible to disturbance due to a combination of precipitation/surface runoff and construction activities. Consideration should therefore be given to protecting the clay subgrade with a minimum 4-inch thick lean concrete mud mat. The use of a protective mud mat will depend on the conditions at time of construction.

The base of all foundation excavations should be free of water and loose soil prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become wet, disturbed or frozen, the affected soil should be removed prior to placing concrete. The geotechnical engineer should be retained to observe and test the soil foundation bearing materials.



Note: Excavation in sketch is shown vertical for convenience. Excavations should be sloped as necessary for safety.

If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the footings could bear directly on these soils at the lower level. The footings could also bear on properly compacted minus ¾-inch crushed stone extending down to the suitable soils. Overexcavation for crushed stone placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation in lifts of 8 inches or less in loose thickness and compacted. The overexcavation and backfill procedure is described in the adjacent figure.

The contractor should be required to maintain a stable excavation and subgrade during construction. The contractor should prevent groundwater and surface water runoff from collecting in the excavation. Subgrade soils that become unstable because of water and/or reworking by construction activity should be replaced with compacted structural fill or minus ¾-inch crushed stone, as necessary.

4.4 Slabs-On-Grade

4.4.1 Design Recommendations

DESCRIPTION	VALUE
Floor Slab support [1]	12-inch thick layer compacted structural fill
Modulus of subgrade reaction	200 pounds per square inch per in (psi/in)

1. Floor slabs should be structurally independent of any building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.

Where appropriate, control joints should be saw-cut in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual.

A vapor retarder should be used beneath concrete slabs-on-grade. The slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

4.4.2 Construction Considerations

On most project sites, the site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed because of utility excavations, construction traffic, precipitation, etc. As a result, the slab subgrade may not be suitable for placement of concrete. In this event, corrective action will be required.

We recommend the existing fill underlying the floor slab be rough graded and then thoroughly compacted with at least four passes each way crosswise of a minimum 10-ton (static weight) vibratory roller compactor. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas with unsuitable conditions should be repaired by removing and replacing the affected material with properly compacted fill. Slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report, immediately prior to placement of the base material and concrete.

4.5 Seismic Considerations

DESCRIPTION	VALUE
Code Used	International Building Code (IBC) – 2009 Edition
Site Class	D
Maximum considered earthquake ground motions (5 percent damping)	0.078g (1.0 second spectral response acceleration)
	0.321g (0.2 second spectral response acceleration)
Liquefaction potential in event of an earthquake	Not susceptible

4.6 Pavement

4.6.1 Design Recommendations

Traffic Area	Bituminous Concrete Top Course	Bituminous Concrete Binder Course	Portland Cement Concrete	Gravel Base Course	Gravel Subbase Course	Total Thickness
Standard Duty	1.5	1.5	N/A	6	6	15
Heavy Duty	1.5	2.5	N/A	6	10	20
Rigid	N/A	N/A	6	6	10	22

N/A = Not Applicable

Pavement designs were based on *AASHTO Guide for Design of Pavement Structures (1993)* and our experience with similar projects. The thickness of each course is a function of subgrade strength, traffic, design life, serviceability factors, and frost susceptibility. The design of pavement thickness was based on the following:

- 30,000 18-kip Equivalent Axle Loads (EALs) for standard-duty parking lot
- 100,000 18-kip EALs for heavy-duty driveways and truck access lanes
- Soil characterization of “poor”, based on the encountered subsurface conditions
- Design life of 20 years

Pavements subjected to high traffic volumes and heavy trucks require thicker pavement sections. Rigid concrete pavement is recommended at the location of dumpsters where trash trucks will park, areas of channelized traffic, and loading dock areas. For dumpster pads, as a minimum, the concrete pavement area should be large enough to support the container and tipping axle of the refuse truck. The outer edges of concrete pavement are susceptible to damage as trucks move from the concrete to the adjacent bituminous concrete. Therefore, the concrete thickness of the outer 2 feet of the concrete pavement should be increased to 12 inches. Dowels should be placed across slab expansion joints to limit differential settlements. Welded wire mesh (¼ inch) should be incorporated into the rigid concrete pavement design to provide tensile strength and increase serviceability. The above sections represent minimum thicknesses and, as such, periodic maintenance should be anticipated.

Gravel base course should be Maine Department of Transportation (MDOT) Granular Base Section, Section 703.06, Type A. Gravel subbase course should be MDOT Granular Subbase Section 703.20, Gravel Borrow 1. Select pavement fills should be placed and compacted to at least 92 percent of the maximum dry density, as determined by ASTM D1557. 0Bituminous concrete should be an approved job mix formula (JMF) in accordance with MDOT, Section 401.03, Composition of Mixtures. The bituminous concrete should be placed in accordance with MEDOT standards and compacted to a range between 92.5 to 97.5 percent, as compared to the theoretical mix density for the job mix formula. Portland cement concrete should conform to MDOT Section 502 and have a minimum compressive strength of 5,000 psi.

4.6.2 Construction Considerations

Pavement subgrades prepared early in the project should be carefully evaluated as the time for pavement construction approaches. We recommend the pavement areas be stripped of existing organic material, rough graded, and then thoroughly compacted with a minimum 10-ton (static weight) vibratory roller compactor, before being proofrolled with a loaded tandem-axle dump truck. Particular attention should be paid to high traffic areas that were rutted and disturbed, areas where backfilled trenches are located, and where existing inorganic fill is to remain beneath the pavement. Areas where unsuitable conditions are located should be repaired by replacing the materials with properly compacted fill. When proofrolling/subgrade stabilization has been completed to the satisfaction of the geotechnical engineer, subbase and base may be placed.

Truck or construction traffic may disturb subgrades and overexcavation or ground stabilization may be required prior to paving. Future performance of pavements constructed on the site will be dependent upon maintaining stable moisture content of the subgrade soil. The performance of pavements may be enhanced by reducing excess moisture that can reach the subgrade soils. The following recommendations should be considered at minimum:

- Site grading at a minimum 2 percent grade away from the pavements;
- Sealing landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils;
- Placing compacted backfill against the exterior side of curb and gutter; and,
- Placing curb, gutter and/or sidewalk directly on subgrade soils without the use of base course materials.

Preventative maintenance should be planned and provided through an on-going pavement management program in order to enhance future pavement performance. Preventative

maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.
Preventative maintenance consists of both localized maintenance, e.g., crack and joint sealing and patching, and global maintenance, e.g., surface sealing. Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to assess the type and extent of preventative maintenance.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications, so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

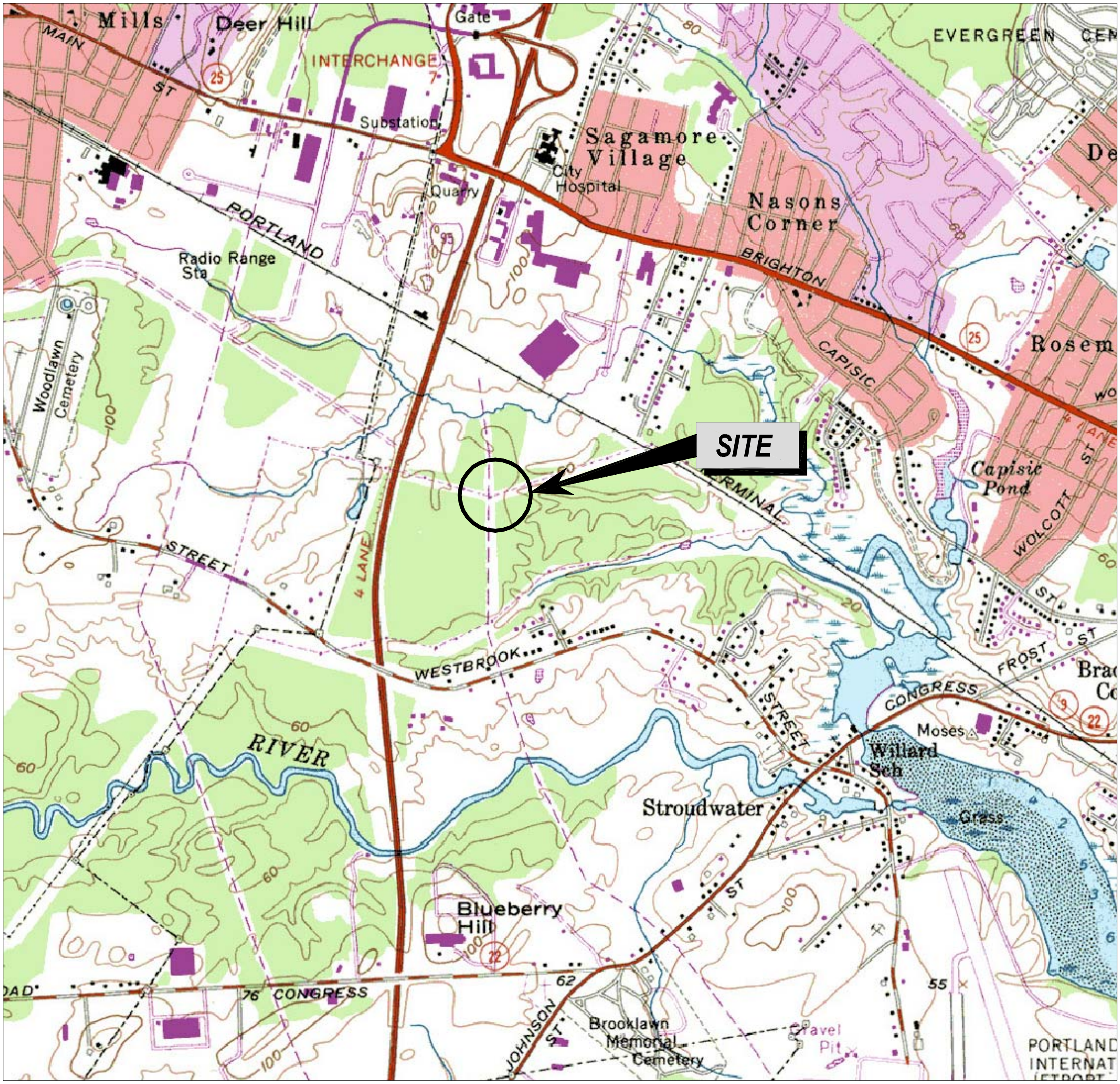
The analysis and recommendations presented in this report are based upon the data obtained from the explorations performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between explorations, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION



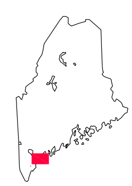
SCALE: 1:24 000

1 — 1/2 — O — 1 MILE

1000 — 0 — 1000 — 2000 — 3000 — 4000 — 5000 — 6000 — 7000 FEET

1 — 5 — 0 — 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929



QUADRANGLE LOCATION

SOURCE:
USGS PORTLAND WEST, MAINE
1978

Project Mngr: WS	Project No. J3095112		
Drawn By: MCR	Scale: AS SHOWN		
Checked By: WS	File No. J3095112.dwg		
Approved By: WS	Date: December 2009		

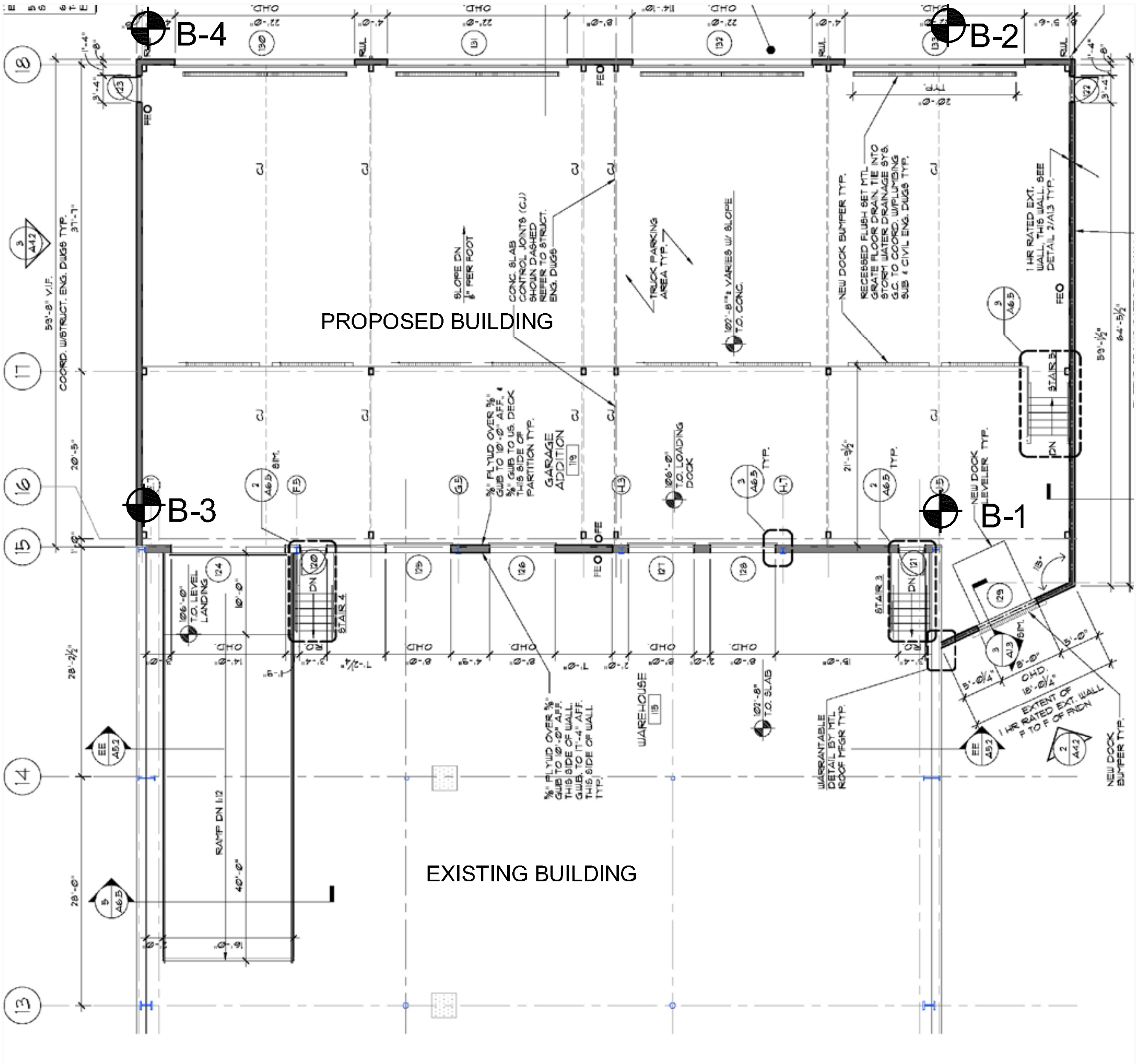
Terracon
15 Holly Street, Unit 105 Scarborough, ME 04074
Ph. (207) 396-5374 Fax (207) 396-5394

TOPOGRAPHIC VICINITY MAP

W. B. MASON ADDITION
106 PINETREE INDUSTRIAL PARKWAY
PORTLAND, MAINE

Exhibit No.

A-1



NOTES:

1. THIS FIGURE WAS PREPARED FROM A PLAN OBTAINED FROM BKA ARCHITECTS.

2. TEST BORINGS SHOWN AS B-1 THROUGH B-4 WERE ADVANCED ON NOVEMBER 13, 2009 UNDER THE DIRECTION OF TERRACON WITH EQUIPMENT OWNED AND OPERATED BY NORTHERN TEST BORINGS OF GORHAM, MAINE.

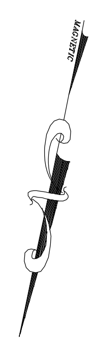
3. THE APPROXIMATE LOCATIONS OF THE SUBSURFACE EXPLORATIONS WERE LOCATED BY CLIENT PRIOR TO MOBILIZATION FOR DRILLING. THE LOCATIONS SHOULD BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.

4. USE OF THIS PLAN IS LIMITED TO THE ILLUSTRATION OF THE APPROXIMATE LOCATION OF THE SUBSURFACE EXPLORATIONS AND OTHER PERTINENT SITE FEATURES. OTHER USE OF THIS PLAN WITHOUT PERMISSION FROM TERRACON IS PROHIBITED.

LEGEND

B-1 APPROXIMATE TEST BORING LOCATION

GRAPHIC SCALE
5 0 5 10 20
(IN FEET)



Project Mngr: WS	Project No. J3095112	Terracon	BORING LOCATION DIAGRAM
Drawn By: MCR	Scale: 1" = 20'	15 Holly Street, Unit 105 Scarborough, ME 04074	W. B. MASON ADDITION
Checked By: WS	File No. J3095112.dwg	Ph. (207) 396-5374 Fax (207) 396-5394	106 PINETREE INDUSTRIAL PARKWAY
Approved By: WS	Date: December 2009		PORTLAND, MAINE

Exhibit No. A-2

LOG OF BORING NO. B-1

CLIENT
BKA Architects

SITE LOCATION **106 Pine Tree Industrial Parkway**
Portland, Maine

PROJECT NAME **W.B. Mason Addition**

GRAPHIC LOG	DESCRIPTION (Approx. Surface Elev.:)	ELEV.	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - Blows per 0.5 ft.	TESTS WATER CONTENT,%	PI	LL	Other Tests
1	~2.75-inches asphalt. ~8-inches processed gravel. **(ASPHALT/GRAVEL)**											PP SHEAR STRENGTH (tsf)
				CL	1	SS	13	8 - 4 - 4 - 6				1.25
			5	CL	2	SS	21	2 - 3 - 3 - 3				
			10	CL	3	SS	18	2 - 1 - 2 - 1	36	24	46	0.75
	LEAN CLAY, olive to gray.		15	CL	4	SS	24	WOH/12" - 1 - 1				
			20	CL	5	SS	24	WOH/24"	48	15	39	
			25	CL	6	SS	24	WOH/24"				
			30	CL	7	SS	24	WOH/24"	52	14	37	
32	**(GLACIOMARINE)**											
	Boring Terminated at 32 feet											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

Casing Type: HSA
Casing Dia: 3.25-inch
Hammer Type: Automatic
Hammer Wt: 140 lbs.
Drop Method: Automatic Hammer

PP = Pocket penetrometer
TSF = Tons per Square Foot.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ WD N/E	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	11-13-09
BORING COMPLETED	11-13-09
RIG Diedrich	FOREMAN Nick
LOGGED WAS	JOB # J3095112

LOG OF BORING NO. B-2

CLIENT: **BKA Architects**

SITE LOCATION: **106 Pine Tree Industrial Parkway, Portland, Maine**

PROJECT NAME: **W.B. Mason Addition**

GRAPHIC LOG	DESCRIPTION (Approx. Surface Elev.:)	ELEV.	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - Blows per 0.5 ft.	TESTS WATER CONTENT, %	TESTS PI	TESTS LL	TESTS Other Tests
	~3-inches asphalt. ~8-inches processed gravel. **(ASPHALT/GRAVEL)**		1									PP SHEAR STRENGTH (tsf)
	Fill - POORLY-GRADED SAND, with silt and gravel, Brown. Change at approx. 4 feet. **(FILL)**		4	FILL	1	SS		7 - 8 - 6 - 4				
	LEAN CLAY, olive to gray. **(GLACIOMARINE)**		5	CL	2	SS		3 - 3 - 2 - 2	39			1.0
			10	CL	3	SS		WOH/12" - 1/12"				
			15	CL	4	SS		WOH/12" - 1/12"				
			20	CL	5	SS	24	WOH/24"				
			25	CL	6	SS	24	WOH/24"				
			30	CL	7	SS	24	WOH/24"				
	Boring Terminated at 32 feet		32									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

Casing Type: HSA
Casing Dia: 3.25-inch
Hammer Type: Automatic
Hammer Wt: 140 lbs.
Drop Method: Automatic Hammer

PP = Pocket penetrometer
TSF = Tons per Square Foot.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ WD N/E	▼
WL	▼	∇
WL		

Terracon

BORING STARTED	11-13-09
BORING COMPLETED	11-13-09
RIG Diedrich	FOREMAN Nick
LOGGED WAS	JOB # J3095112

LOG OF BORING NO. B-3

CLIENT **BKA Architects**

SITE LOCATION **106 Pine Tree Industrial Parkway, Portland, Maine**

PROJECT NAME **W.B. Mason Addition**

GRAPHIC LOG	DESCRIPTION (Approx. Surface Elev.:)	ELEV.	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - Blows per 0.5 ft.	TESTS WATER CONTENT, %	TESTS PI	TESTS LL	TESTS Other Tests
	1 ~4-inches asphalt. ~8-inches processed gravel. **(ASPHALT/GRAVEL)**											PP SHEAR STRENGTH (tsf)
	4 Fill - POORLY-GRADED SAND, with silt and gravel, Brown. Change at approx. 4 feet. **(FILL)**			FILL	1	SS	12	6 - 5 - 5 - 6				
	LEAN CLAY, olive to gray.		5	CL	2	SS	24	2 - 3 - 3 - 2	43			1.0
			10	CL	3	SS	24	1/12" - 1/12"				
			15	CL	4	SS		WOH/24"				
			20	CL	5	SS		WOH/24"				
			25	CL	6	SS		WOH/24"				
	32 **(GLACIOMARINE)**		30	CL	7	SS		WOH/24"				
	Boring Terminated at 32 feet											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

Casing Type: HSA
Casing Dia: 3.25-inch
Hammer Type: Automatic
Hammer Wt: 140 lbs.
Drop Method: Automatic Hammer

PP = Pocket penetrometer
TSF = Tons per Square Foot.

WATER LEVEL OBSERVATIONS, ft		
WL	WD N/E	
WL		
WL		

Terracon

BORING STARTED	11-13-09
BORING COMPLETED	11-13-09
RIG Diedrich	FOREMAN Nick
LOGGED WAS	JOB # J3095112

LOG OF BORING NO. B-4

CLIENT **BKA Architects**

SITE LOCATION **106 Pine Tree Industrial Parkway Portland, Maine**

PROJECT NAME **W.B. Mason Addition**

GRAPHIC LOG	DESCRIPTION (Approx. Surface Elev.:)	ELEV.	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - Blows per 0.5 ft.	TESTS WATER CONTENT,%	TESTS PI	TESTS LL	TESTS Other Tests
1	~3-inches asphalt. ~8-inches processed gravel. **(ASPHALT/GRAVEL)**											PP SHEAR STRENGTH (tsf)
	Fill - POORLY-GRADED SAND, with silt and gravel, Brown. Change at approx. 4 feet.			FILL	1	SS	18	10 - 8 - 8 - 7				
4	**(FILL)**											
			5	CL	2	SS	24	4 - 4 - 3 - 3	38			1.25
			10	CL	3	SS	24	1/12" - 1/12"				
	LEAN CLAY, olive to gray.		15	CL	4	SS	24	WOH/24"				
			20	CL	5	SS	24	WOH/24"				
			25	CL	6	SS	24	WOH/24"				
			30	CL	7	SS	24	WOH/24"				
32	**(GLACIOMARINE)**											
	Boring Terminated at 32 feet											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

Casing Type: HSA
Casing Dia: 3.25-inch
Hammer Type: Automatic
Hammer Wt: 140 lbs.
Drop Method: Automatic Hammer

PP = Pocket penetrometer
TSF = Tons per Square Foot.

WATER LEVEL OBSERVATIONS, ft		
WL	∇ WD N/E	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	11-13-09
BORING COMPLETED	11-13-09
RIG Diedrich	FOREMAN Nick
LOGGED WAS	JOB # J3095112

Field Exploration Description

Terracon monitored the advancement of four test borings (B-1 through B-4) throughout the proposed building area on November 13, 2009. The explorations were advanced using a Diedrich all terrain vehicle-mounted rotary drill rig, owned and operated by Northern Test Boring, Inc. of Gorham, Maine. The borings were advanced using 3-1/4 inch I.D. continuous flight hollow-stem augers (HSA) and terminated in the glaciomarine deposit.

In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler typically the middle 12 inches of the total 24-inch penetration by means of a 140-pound autohammer with a free fall of 30 inches is the Standard Penetration Test (SPT) resistance value “N”. This “N” value is used to estimate the *in-situ* relative density of cohesionless soils and consistency of cohesive soils. The samples were placed in labeled glass jars and taken to our Scarborough (Portland) laboratory for further review, possible testing, and classification.

In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample. The samples were tagged for identification, sealed to reduce moisture loss, and taken to our Rocky Hill (Hartford) laboratory for further examination, testing, and classification.

Information provided on the boring logs attached to this report includes soil descriptions, relative density and/or consistency evaluations, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled with auger cuttings prior to the drill crew leaving the site.

Field logs of the borings were prepared by a Terracon field engineer. These logs included visual classifications of the materials encountered during drilling as well as interpretation by our field engineer of the subsurface conditions between samples. Final boring logs included with this report represent further interpretation by the geotechnical engineer of the field logs and incorporate, where appropriate, modifications based on laboratory classification of the samples.

Ground surface elevation was not available to us for preparation of this report. All borings were completed from existing grade. The approximate boring locations were measured by taping from existing features in the field and by estimating right angles. The locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

APPENDIX B

SUPPORTING DOCUMENTS

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon – 1-$^{3}/_{8}$" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	<2	Very Soft
500 – 1,000	2-3	Soft
1,001 – 2,000	4-6	Medium Stiff
2,001 – 4,000	7-12	Stiff
4,001 – 8,000	13-26	Very Stiff
8,000+	26+	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Relative Density
0 – 3	0-6	Very Loose
4 – 9	7-18	Loose
10 – 29	19-58	Medium Dense
30 – 49	59-98	Dense
50+	99+	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines Classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	$PI > 7$ and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			$PI < 4$ or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay
[E] $Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains $\geq$ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] $PI \geq 4$ and plots on or above "A" line.
[O] $PI < 4$ or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.