GEOTECHNICAL REPORT

50 - 62 INDIA STREET
PORTLAND, MAINE

March 29, 2016

GSI Project No. 212234A

Prepared for:

Mr. Joe Dasco
Atlas Investment Group, LLC.
35 Fay Street, Suite 107B
Boston, Massachusetts 02118

Prepared by:

Harry K. Wetherbee, P.E.
Geotechnical Services, Inc.
55 North Stark Highway
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Geotechnical Services Inc.

Geotechnical Engineering ◣ Environmental Studies ◣ Materials Testing ◣ Construction Monitoring

March 29, 2016

Mr. Joe Dasco
Atlas Investment Group, LLC
35 Fay Street, Suite 107B
Boston, Massachusetts 02118

RE: Geotechnical Report Addendum
Proposed Residential Development
50-62 India Street
Portland, ME **GSI Project No. 212234A**

Dear Mr. Dasco:

Geotechnical Services, Inc. (GSI) is pleased to submit this report in connection with a geotechnical investigation for the above-referenced project. This study is an extension of our earlier preliminary geotechnical investigation and comprises supplemental investigations and analysis for foundation design. Our scope of service included subsurface explorations involving the retrieval of undisturbed clay samples, laboratory strength and consolidation testing, and data synthesis and evaluation. The work described herein has been conducted in accordance with our proposal of January 26, 2016.

EXECUTIVE SUMMARY

Our principal findings reveal the site to be underlain with loose, anthropogenic fills and very soft clay soils which will consolidate following the application of foundation loads. Consideration has been given to the support of the proposed structure on a spread footing foundation on undisturbed soil. However, it is estimated that as much as 5 inches of vertical soil compression due to consolidation will occur as a result of the applied foundation loads. This amount of settlement is considered excessive for the type of construction and we have reviewed several options as technically feasible for foundation support. At this time, GSI recommends that the subgrade be improved with a ground improvement technique involving the installation of drilled and pumped grout columns termed “Rigid Inclusion Columns” or “Controlled Modulus Columns”. As with the grout columns installed for the Bay House I and II projects, the elements will terminate in a soil “Load Transfer Platform”. However, unlike the installation of the grout columns which were installed using a vibratory mandrel, the application herewith involves installation by drilling and as such, there are minimal vibrations transmitted to the surrounding properties. Following subgrade improvement procedures, an allowable bearing pressure of 3,000 psf may be adopted for design of spread footings. The ground floor may be a concrete slab-on-grade.

Purpose and Scope

This report presents the results of a supplemental geotechnical investigation completed by Geotechnical Services, Inc. (GSI) for the proposed development at the corner of India and Newbury Streets in Portland, ME. The scope included the advancement of two additional soil borings and collection of undisturbed "Shelby tube" samples for laboratory testing. The laboratory tests included Atterberg Limits determinations, Unconfined Compression Tests, and One-Dimensional Consolidation Tests. These tests were performed to establish the soil index, strength, and compressibility properties. Such properties were used in an analysis of post-construction foundation settlement due to compression of the underlying clay deposit.

This report is subject to the Limitations outlined in Appendix A.

Applicable Building Code

International Building Code, IBC (2009) is the Code, which the State of Maine requires for compliance for the proposed building, including geotechnical-foundation engineering applications.

Preliminary Findings

As discussed in the preliminary geotechnical report, the site subsurface profile was determined to contain significant compressible silty clay. This silty clay presented geotechnical issues related to settlement and bearing capacity. GSI recommended additional exploration and testing with the following objectives:

- Determine the technical feasibility of a spread footing foundation;
- Define the subsurface soil properties as they relate to bearing capacity and settlement;
- Determine the compatibility of the subsurface conditions for ground improvement techniques, and;
- Consider other foundation options such as timber piles.

Site Description and Project Description

The project site comprises two separate lots at 50 and 62 India Street at the corner of India and Newbury Streets. The lot at 62 India Street is approximately 0.25 acres and is roughly square in shape. The topography ascends towards the north with the lowermost elevation around 31 feet and upper at 35 feet. At the time of our investigation the 62 India Street parcel was a vacant paved parking lot. The 50 India Street lot was occupied by the Portland Glass Company building which was razed and removed from the site during the course of this investigation. The Portland Glass Building was a single story, masonry structure resting on a spread footing foundation.

The project site is in an area surrounded with commercial and residential properties. The proposed structure will be a multi-story structure with ground-level parking in the west section. Construction will be wood framed residential and the area over the parking may be supported with steel columns. Column loads are expected to be no greater than 150 tons and exterior strip footing loads will be on the order of 3 to 5 tons per lineal foot.

SUBSURFACE EXPLORATION PROGRAM

Supplemental Subsurface Explorations

The subsurface exploration program for this project included the advancement of 2 test borings within the footprint of the proposed building. The explorations were advanced by wash and drive methods utilizing 4-inch casing to depths of 18 feet within the building areas. Soil samples were obtained continuously. Standard Penetration Tests (SPTs) were performed at the sampling intervals in general accordance with ASTM-D1586. The soils encountered during the preliminary exploration program were classified in the field by a representative from GSI. The samples obtained were furthered viewed in the laboratory and classified by a professional engineer. The soil classifications generally follow after the Burmister System. These soil descriptions, the observed depth to groundwater, and other pertinent data are contained in the test boring logs included in Appendix B.

During the supplemental exploration program two, 2.8-inch diameter undisturbed shelby tube samples were retrieved using a standard push sampler. The samples were retrieved within the cohesive silty clay deposit at varying depths. The shelby tube samples were sealed within the tube with wax upon removal from the ground to protect against moisture loss. All samples were transported in an upright position such that minimal disturbance was imparted to the tube. The exploration locations were determined in the field by taping from existing site features. The test boring locations are illustrated on Figure 2.

Soil Laboratory Testing

The soil laboratory tests were performed to estimate the engineering properties of the existing soils and to evaluate the suitability of the surface soils for use as structural fill and the impact the underlying silty clay layer would impart on foundation recommendations. The laboratory testing program for the supplemental exploration program included the completion of the following tests:

Four Atterberg limit tests per ASTM-D 4318 were performed in order to determine the liquid limit (LL), plastic limit (PL) and natural moisture content (Wn) of the sample tested. From these values the plasticity index (PI) can be determined and this value is used to infer soil properties, particularly as they relate to published values for the Presumptscott Formation. In addition, moisture content determinations were performed to compare the insitu conditions to the Atterberg Limits particularly with respect to the liquid limit.

Two unconfined compressive strength tests per ASTM-D 2166 were performed in order to determine the compressive strength of the material. This value is used to determine the undrained-unconfined shear strength of the clay. The shear strength of the clay is used in determining bearing capacity and to make an assessment of seismic parameters in accordance with IBC 2009.

Two consolidation tests per ASTM-D 2435 were performed in order to define the stress history of the silty clay soils and develop a stress-strain hysteresis. These properties are used in calculations to estimate settlement and the time required for settlement to occur based on theory developed by Terzarghi and others.

The soil samples chosen for testing were from varied representative depths. Our aim was to evaluate the degree of uniformity of the compressible strata and to determine which portions of the soil were the most susceptible to consolidation due to loading from either building foundation loads or earth fill.

The laboratory results are included in Appendix C.

STRATIGRAPHIC DEVELOPMENT

The subsurface explorations performed for this investigation are described in descending order as follows:

Urban Fill

A fill unit composed of black to dark brown, SAND and Gravel with Silty Clay, ash, porcelain, and brick fragments, was encountered beneath the pavement. The thickness of this unit ranges from 6 to 8 feet.

Silty Clay

The next unit the borings encountered was a very soft to soft grey silty clay. The SPT procedure indicated a soft consistency as sampling resistance was on the order of 2 blows per foot (bpf) to where the clay yielded to the weight of the drill rods. The blow counts are based on a 140 lb. hammer dropping 30 inch to drive the split spoon sampler. The clay exhibits poor shear strength with unconfined compression results ranging from nil to .25 tsf.

Sand and Gravel

Sand and Gravel soil was encountered underlying the silty clay materials at 14 to 16 feet. It is believed that this soil may originate as an ablation till. Glacial till is a non-sorted, non-stratified natural deposit of sand, silt, gravel, and boulders, mixed in various proportions and deposited directly by the glaciers in a non-aqueous depositional environment. SPT procedures indicated very dense conditions as sampling resistance was on the order of 17 to 11 bpf.

Groundwater

Groundwater was encountered at depths varying from 5 to 6 feet below existing surface elevation. The groundwater depths were measured immediately upon completion of the borings. The drilling was accomplished by wash-casing methods and water was introduced into the borehole. Groundwater readings at these locations would be expected to be shallower than at borings advanced by hollow-stem augers. All the groundwater levels should be anticipated to fluctuate from those measured during drilling operations in response to differences in equilibration time, rainfall, snowmelt, and seasonal fluctuations.

FOUNDATION DESIGN CONSIDERATIONS

The subsurface conditions encountered beneath the footprint of the proposed building are not considered suitable for support of a spread footing foundation. It is apparent that the fill soils have been placed in an uncontrolled manner as the relative density is highly variable. Moreover, the underlying clay is soft and weak and is prone to compression when subject to loading.

The behavior of the clay was mimicked in laboratory consolidation tests performed on undisturbed shelby tube samples obtained during the supplemental boring operation using a loading frame and precision measurement devices. From this testing, compressibility characteristics were derived for various portions of the underlying silty clay. Those characteristics of primary interest are overconsolidation ratio (OCR), compression index (C_c') and rebound coefficient (C_r').

OCR is the ratio of the preconsolidation stress to the existing vertical effective overburden stress. Soils become overconsolidated due to the following: a change in the total stress (removal of overburden), change in pore water pressure or desiccation of the upper layers due to surface drying. The rebound coefficient, C_r', also known as recompression index, is the slope of either the recompression curve or the unload rebound curve. This value is used during calculation of the primary consolidation settlement that occurs until such time that the applied load exceeds the past preconsolidation pressure. The compression index, C_c', is the slope of the virgin curve. This value is used during calculation of the primary consolidation settlement that occurs after the past preconsolidation pressure has been exceeded.

SPREAD FOOTING FOUNDATION SETTLEMENTS

GSI modeled and analyzed the anticipated foundation settlements based on loading from the foundation loads based on an 8 foot square footing with an allowable bearing pressure of 3000 pounds per square foot. The calculated primary consolidation settlement for the model is estimated to be 5 to 8 inches. Secondary compression is based on a 100 year design life and the resulting settlement from secondary compression is calculated to be 0.2 inches. This estimate was determined by obtaining the coefficient of secondary compression from the time versus deformation graphs created during the consolidation tests. The coefficient of secondary compression appeared comparable to published values for coefficient of secondary compression versus natural water content (Mesri, 1971).

FOUNDATION RECOMMENDATIONS

Spread Footings on Improved Subgrade

It is GSI's recommendation that the proposed structure be supported on an improved subgrade consisting of vertical grout elements comprising "Rigid Inclusion Columns" or "Controlled Modulus Columns" which would be constructed through the FILL and soft clay soils with termination in the underlying sand and gravel. The foundation elements installed for the Bay House I and II projects, "Vibrated Grout Columns", would also be acceptable but are not recommended at this time because of concerns with respect to the effect vibrations would have on the surrounding properties. However, if the vibrations can be run at high frequency, the attendant effects may be kept with innocuous levels.

We anticipate that the vertical grout elements, as proposed, would be a cost saver as compared to using end-bearing or friction piles. It is also expected that for a foundation system supported on such an improved subgrade, the maximum post-construction settlement at a column location would not exceed one inch, and the maximum differential settlement between adjacent columns (assumed at a nominal distance of 30 ft) would not exceed ¾ inch. The allowable bearing pressure with ground improvement would be 3,000 psf.

The vertical grout elements should terminate in a 2 foot thick layer of structural fill which acts as a "load transfer platform". The structural fill should be placed in compacted lifts as specified hereinbelow.

For rigid inclusion columns contact:

David P. Mazzei, P.E. | Project Manager
Hayward Baker Inc. | www.HaywardBaker.com
9 Whipple Street | Unit 1 | Cumberland, RI 02864-5399
☎: (401)334-2565 | 🖷: (401)334-3337 | Cell: (401)500-0535
✉: DPMazzei@HaywardBaker.com

For controlled modulus columns contact:

MENARD USA

150 East Main Street, Suite 500
Carnegie, PA 15106
412-620-6000
Email: info@menardusa.com

OTHER FOUNDATION OPTIONS

Timber Piles

The proposed building may also be supported upon a timber pile foundation. The timber piles would derive their support from a combination of tip bearing and friction resistance along the shaft in the competent sand and gravel bearing strata. The piles may be 8-inch tip units with natural taper in general accordance with ASTM D 25. The piles are to be southern yellow pine with a minimum compressive strength parallel to the grain of 1200 psi in accordance with ASTM D 2899. These units will derive their capacity through a combination of tip bearing and friction resistance. Assuming that the critical section occurs at the pile mid-depth, the piles are rated for an allowable capacity of **35 tons**.

Concerns with respect to timber pile foundations are the vibrations that would be generated during impact driving and the need for a structural slab and grade beams. It is our opinion therefore that timber piles, or other deep foundation systems, are not as cost-effective for this project as the afore-mentioned ground improvement procedures.

Removal of Anthropogenic Fill and Replacement with Lightweight Fill

The removal of the anthropogenic fill and replacement with lightweight material such as “Solite” (expanded vermiculite) or “Elastizell” material would relieve the subsurface of its present stae of effective vertical stress such that the imposition of building loads would have a neutral effect. However, this is not considered practical for this project because the anthropogenic fill may contain environmental contaminants which would require management at considerable cost. Also, the cost for lightweight fill is on the order of $90/cy delivered thus it is not a cost-effective option for this project.

Seismic Design Parameters

In accordance with IBC2009, we have evaluated susceptibility of the project site to earthquake-induced liquefaction and have determined that the site would is susceptible to earthquake induced liquefaction. According to the criteria set in IBC2009, and based on the results of unconfined compressive strength testing by GSI, the project site has been evaluated to belong to Site Class E. However, with the subgrade improvement procedures imparted by the ground improvements, the site stiffness will be upgraded to Site Class D. Other seismic design parameters are attached in Appendix

Slab-On-Grade

GSI recommends that a concrete slab-on-grade be constructed following subgrade improvement of the underlying clay soils. Structural fill should be placed in 8 inch lifts and compacted to at least 95 percent relative compaction as determined by the Modified Proctor Test (ASTM-D1557) until floor slab base course subgrade is achieved. The concrete floor slabs should rest on a minimum 8-inch layer of floor slab base course soil meeting the gradation requirements for Structural Fill. The floor slab base course material should be compacted to at least 95 percent relative compaction as determined by the Modified Proctor Test (ASTM-D1557). Based upon the foregoing slab base preparation a modulus of subgrade reaction (Ks) of 250 pci may be used for design.

Protection of Foundation Subgrades

The contractor should maintain stable-dewatered subgrades for foundations, pavement areas, utility trenches and other concerned areas during construction. Subgrade disturbance may be influenced by excavation methods, moisture, precipitation, groundwater control, and construction activities. The silty soils overlying the clay are inherently vulnerable to disturbance when exposed to wet conditions. The moisture sensitivity of these soils is related to their high composition of fine-grained constituent (silt-clay) which acts to retain water.

The contractor should be aware of the sensitivity of the silty soils and take precautions to reduce subgrade disturbance. Such precautions may include diverting storm run-off away from construction areas, reducing traffic in sensitive areas, and maintaining an effective de-watering program.

Soils exhibiting weaving or instability should be over-excavated to more competent bearing soil and replaced with structural fill. It may be desirable for the contractor to place a lean concrete mud mat or a lift of free-draining gravel atop the prepared silty soil subgrade for protection against weakening/softening as construction progresses. A qualified engineer should inspect bearing subgrades throughout construction.

Temporary Excavations

For slope layback design, the on-site soils should be considered Type C soils in accordance with Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926). The maximum temporary slope for Soil Type C soils is 1.5H:1V provided the groundwater is lowered below the bottom of the excavation. The foregoing slope geometry precludes surcharge loads at the crest of the slope. It should be noted that these slope requirements are minimums required by OSHA regulations.

CONSTRUCTION SPECIFICATIONS

Structural Fill (Compacted Granular Fill) - Structural Fill should consist of clean sand and gravel free of organic material, snow, ice, or other objectionable materials and should be well-graded within the following limits:

Sieve Size	Percent Finer by Weight
6 in.	100
No. 4	30-70
No. 40	10-50
No. 200	0-10

Structural Fill should be placed in lift thickness not exceeding 12 in. loose measure. Cobbles and boulders having a size exceeding 2/3 of the loose lift thickness should be removed prior to compaction. Compaction in open areas should consist of self-propelled vibratory rollers such as a BoMag BW-60S or equivalent. In confined areas, hand guided equipment such a s a large vibratory plate compactor, should be used and the loose lift thickness should not exceed 6 in. A minimum of four systematic passes of the compaction equipment should be used to compact each lift. Compaction effort should be verified by field density testing.

Common Fill - Common fill may be used to raise grades in paved and landscaped areas, subject to pavement design criteria and landscape planting or drainage requirements. Common fill should be granular mineral soil free from organic materials, loam, wood, trash, snow, ice, frozen soil, and other compressible materials. Common fill should not contain stones larger than 2/3 of the placement lift thickness, and have a maximum 80 percent passing the No. 40 sieve, and a maximum of 30 percent passing the No. 200 sieve. These soils typically would require moisture control during placement and compaction. The on-site FILL soils are anticipated to meet the Common Fill requirements.

Backfilling - We recommend that Structural Fill be used as backfill around and beneath the caps to receive the and beneath the slab (pavement)-on-grade. Backfill outside the building footprint may generally consist of Common Fill with the exception of special filling requirements for pavements or other site structures. Recommended compaction requirements are as follows:

Location	Minimum Compaction Recommendation
Beneath and around caps, grade beams, under slabs	95 %
Parking, roadways, and sidewalks	92 % up to 3 ft below finished grade; 95% in the upper 3 ft
Landscaped areas	90 %

Minimum compaction requirements refer to percentages of the maximum dry density determined in accordance with ASTM D1557.

Construction Dewatering - It is anticipated that groundwater control during foundation excavation will not be a serious concern as long as the surface runoff is controlled in an effective way.

Construction Monitoring - It is recommended that a geotechnical engineer or experienced technical personnel be present during foundation construction to:

1. Monitor the foundation excavation and removal of the existing foundations, and preparation of subgrade to receive the ground improvements elements;
2. Monitor the construction of the ground improvement elements;
3. Confirm that backfill materials meet the requirements of the project plans and specifications, and make judgments regarding the suitability of excavated soils for reuse as Structural Fill or Common Fill;
4. Observe placement and test Structural Fill (as required by the Building Code) to meet as-placed density requirements.

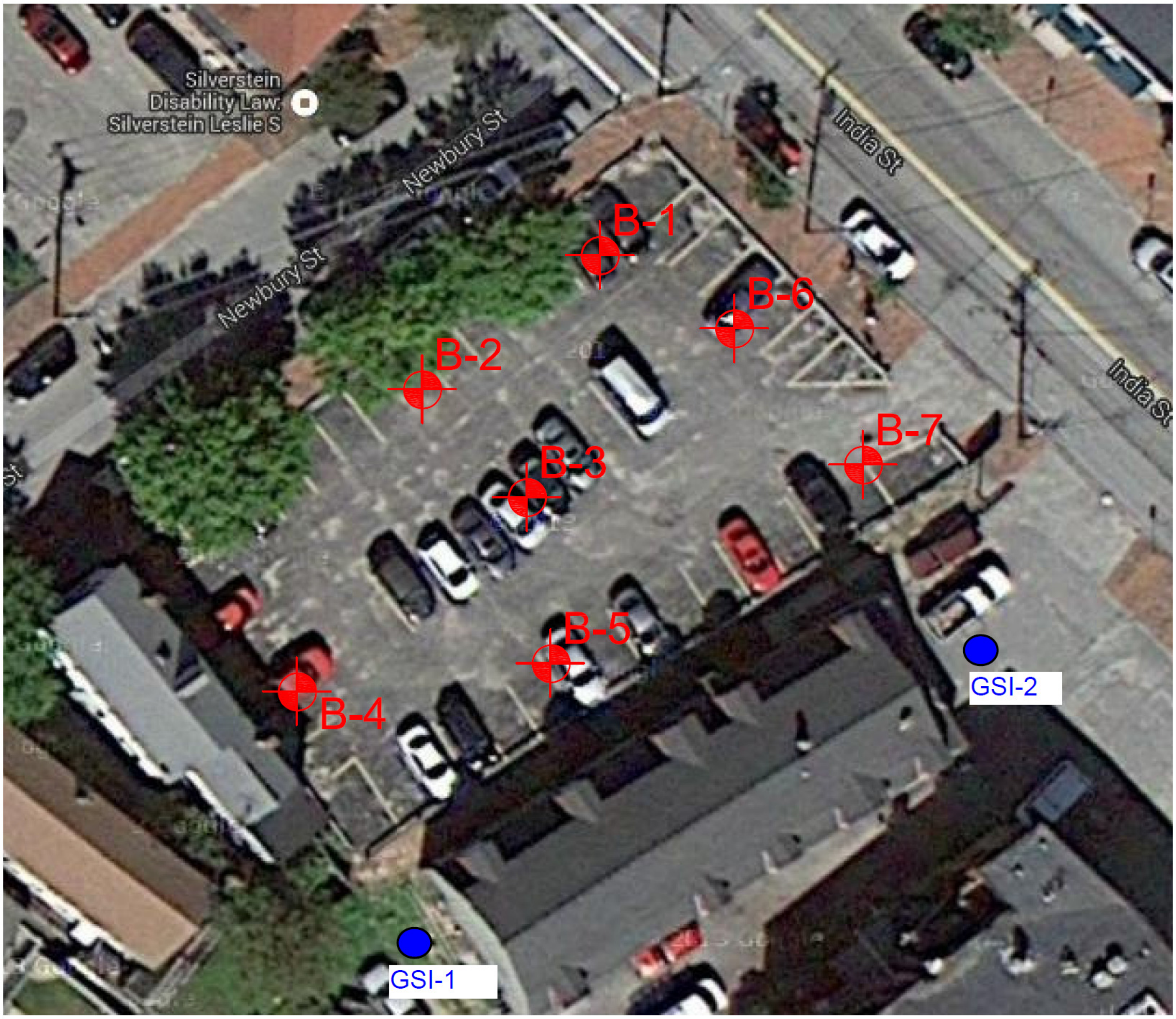
It is recommended that GSI be retained to provide the recommended monitoring services. This will enable us to observe compliance with the project specific design requirements.

It has been a pleasure to serve you during the design phase of this project, and we look forward to its successful completion. If you have any questions on the content of this report, please do not hesitate to contact us.

GEOTECHNICAL SERVICES INC.

Harry K. Wetherbee, P.E.
Principal Engineer

Figures
Appendix A - Limitations
Appendix B – Exploration Logs
Appendix C – Laboratory Test Results
Appendix D – Seismic Design Parameters
Appendix E – Preliminary Geotechnical Report (March 2014)



GSI-1 Test Boring Location (Approximate)

BORING LOCATION PLAN	GEOTECHNICAL SERVICES INC. 55 NORTH STARK HIGHWAY, WEARE, NH 03281 TEL. (603) 529-7766 FAX. (603) 529-7780		
INDIA STREET DEVELOPMENT **PORTLAND, ME**	DRAWN BY: KJM CHECKED BY: HKW FILE NAME: Holderness SBP.dwg	DATE: February 2014 SCALE: 1"=@30' PROJECT NO.: 214112	FIGURE NO. 2

APPENDIX A

LIMITATIONS

LIMITATIONS

Explorations

1. The analyzes, recommendations and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.

3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

4. It is recommended that this firm be given the opportunity to review final design drawings and specifications associated with development of this site to evaluate the appropriate implementation of the recommendations provided herein.

5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by Geotechnical Services, Inc.

Construction

6. It is recommended that this firm be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

7. This report has been prepared for the exclusive use of Atlas Development and the design team in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

8. This report has been prepared for this project by Geotechnical Services, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to evaluation considerations only.

APPENDIX B

EXPLORATION LOGS

Geotechnical Services, Inc. 55 North Stark Highway, Weare, NH 03281 Phone 603/529-7766 Fax 603/5297080 - 30 Newbury St. 3rd Floor, Boston, MA 02116 Phone 617/455-4248 Fax 617/745-4308

TEST BORING LOG

Boring No. **GSI-1**

Project	India Street	GSI Project No.	212234	Elevation	
Location	Portland, Maine	Project Mgr.	HKW	Datum	N/A
Client	Atlas Investment Group, LLC.	Inspector	John Roth	Date Started	3/8/2016
Contractor	New England Boring	Checked By		Date Finished	3/8/2016
Driller	Greg Levett	Rig Make & Model	Failing	Rig Model	Strata Star 15

Item:	Auger	Casing	Sampler	Core Barrel
Type		4"	SS	
Inside Diameter (in.)			1-3/8"	
Hammer Weight (lb)		300	140	
Hammer Fall (in.)		30"	30"	

Rig: ☑ Truck ☐ Skid ☐ Track ☐ ATV ☐ Bomb. ☐ Geoprobe ☐ Tripod ☐ Other

Hammer Type: ☑ Safety Hammer ☐ Doughnut ☐ Automatic

☑ Winch ☐ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	"N" Value	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0		SS-1	0 - 2	2415	7 9 7 8	16		URBAN FILL	Moist, medium dense, brown, fine to coarse, SAND and GRAVEL, trace to little silt. Brick pieces present. Anthropogenic Fill.
2		SS-2	2 - 4	24/16	3 4 4 2	8			Wet, loose, gray-black, fine to coarse, SAND and GRAVEL, little to little to some silt. Brick pieces present. Anthropogenic Fill.
4		SS - 3	4 - 6	24/17	2 2 5 5	7		CLAYEY SILT	Wet, medium stiff, gray, CLAYEY SILT, little orange-brown fine to medium, sand.
6		US - 1	6 - 8						Shelby Tube Taken
8		SS - 4	8 - 10	24/19	1 1 2 3	3		SAND AND SILT	Wet, very loose, dark gray, fine to medium, SAND and SILT.
10		SS - 5	10 - 12	24/0	3 6 5	11			No Recovery.
12		SS - 6	12 - 14	24/18	4 4 6 8	10			Wet, loose, dark gray, fine to medium, SAND and SILT.
14		SS - 7	14 - 16	24/18	3 5 3 9	8		CLAYEY SILT	Wet, medium stiff, gray, CLAYEY SILT, little small gravel.
16		SS - 8	16 - 18	24/22	14 7 10 9	17		SAND	Wet, medium dense, gray, fine to medium, SAND, trace to little silt.
24									Auger and Split Spoon Refusal at 24.5 feet. See note 2 below. Boring terminated at 24.5 feet and backfilled with cuttings.

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
3/8	EOD	8'	24.5	6'

Sample Identification
O = Open Ended Rod
U = Undisturbed
S = Split Spoon
C = Rock Core
G = Geoprobe

Cohesive Soils N-Value
0 to 2: Very Soft
2 to 4: Soft
4 to 8: Medium Stiff
8 to 15: Stiff
15 to 30 Very Stiff
Over 30: Hard

Granular Soils N- Value
0 to 4: Very Loose
4 to 10: Loose
11 to 30: Medium Dense
31 to 50: Dense
Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:
1. EOD = End of drilling, WR = Weight of Rods, WH = Weight of Hammer.
2. Spun the roller bit for 5 minutes with no advancement to confirm auger refusal. Spoon bounced on rock.
3. Due to rotary wash method of drilling, water level data may not not reflect actual water table level.

GSI-1

Geotechnical Services, Inc. 55 North Stark Highway, Weare, NH 03281 Phone 603/529-7766 Fax 603/5297080 - 30 Newbury St. 3rd Floor, Boston, MA 02116 Phone 617/455-4248 Fax 617/745-4308

TEST BORING LOG

Boring No. GSI-2

Project	India Street	GSI Project No.	212234	Elevation	
Location	Portland, Maine	Project Mgr.	HKW	Datum	N/A
Client	Atlas Investment Group, LLC.	Inspector	John Roth	Date Started	3/8/2016
Contractor	New England Boring	Checked By		Date Finished	3/8/2016
Driller	Greg Levett	Rig Make & Model	Failing	Rig Model	Strata Star 15

Item:	Auger	Casing	Sampler	Core Barrel
Type		4"	SS	
Inside Diameter (in.)			1-3/8"	
Hammer Weight (lb)		300	140	
Hammer Fall (in.)		30"	30"	

☑ Truck ☐ Skid ☐ Track ☐ ATV ☐ Bomb. ☐ Geoprobe ☐ Tripod ☐ Other

Hammer Type: ☑ Safety Hammer ☐ Doughnut ☐ Automatic

☑ Winch ☐ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	"N" Value	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0								ASPHALT	3 Inches of Asphalt.
1		SS - 1	1 - 3	15/3	4 18 100/<3	118		URBAN FILL	Moist, very dense, black, fine to coarse SAND, little small gravel, trace silt. Piece of rock in tip of SS. Anthropogenic Fill.
		SS - 2	3 - 5	24/15	3 4 4 3	8			Wet, loose, gray-black, fine to coarse, SAND and SILT, some small gravel, red brick pieces. Anthropogenic Fill.
5		SS - 3A	5 - 7	24/14	68 31 12 7	43			Top 11 inches. moist, very dense GRAVEL, some fine to coarse sand silt, red brick pieces. Anthropogenic Fill.
		SS - 3B						CLAYEY SILT	Bottom 3 inches. Wet, gray, CLAYEY SILT, little small gravel.
									Attempted undisturbed sample 7 - 9 feet, unsuccessful.
		SS - 4	8 - 10	24/16	WH WH WH WH	0		SILT	Wet, very loose, gray SILT.
10		US - 1	10 -12						Shelby Tube Taken.
		SS - 5	12 - 14	24/24	WR WR WH WH	0			Wet, very loose, gray SILT.
		SS - 6	14 - 16	24/14	7 8 5 3	13		SAND	Wet, medium dense, gray fine SAND, little small gravel, trace silt.
15		SS - 7	16 - 18	24/24	3 3 8 6	11			Wet, medium dense, gray fine SAND, little small gravel, trace silt.
									Boring terminated at 18 feet and backfilled with cuttings.
20									

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
3/8	EOD	13'	18'	5'

Sample Identification
- O = Open Ended Rod
- U = Undisturbed
- S = Split Spoon
- C = Rock Core
- G = Geoprobe

Cohesive Soils N-Value
- 0 to 2: Very Soft
- 2 to 4: Soft
- 4 to 8: Medium Stiff
- 8 to 15: Stiff
- 15 to 30 Very Stiff
- Over 30: Hard

Granular Soils N- Value
- 0 to 4: Very Loose
- 4 to 10: Loose
- 11 to 30: Medium Dense
- 31 to 50: Dense
- Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:
1. EOD = End of drilling, WR = Weight of Rods, WH = Weight of Hammer.
2. Due to rotary wash method of drilling, water level data may not not reflect actual water table level.

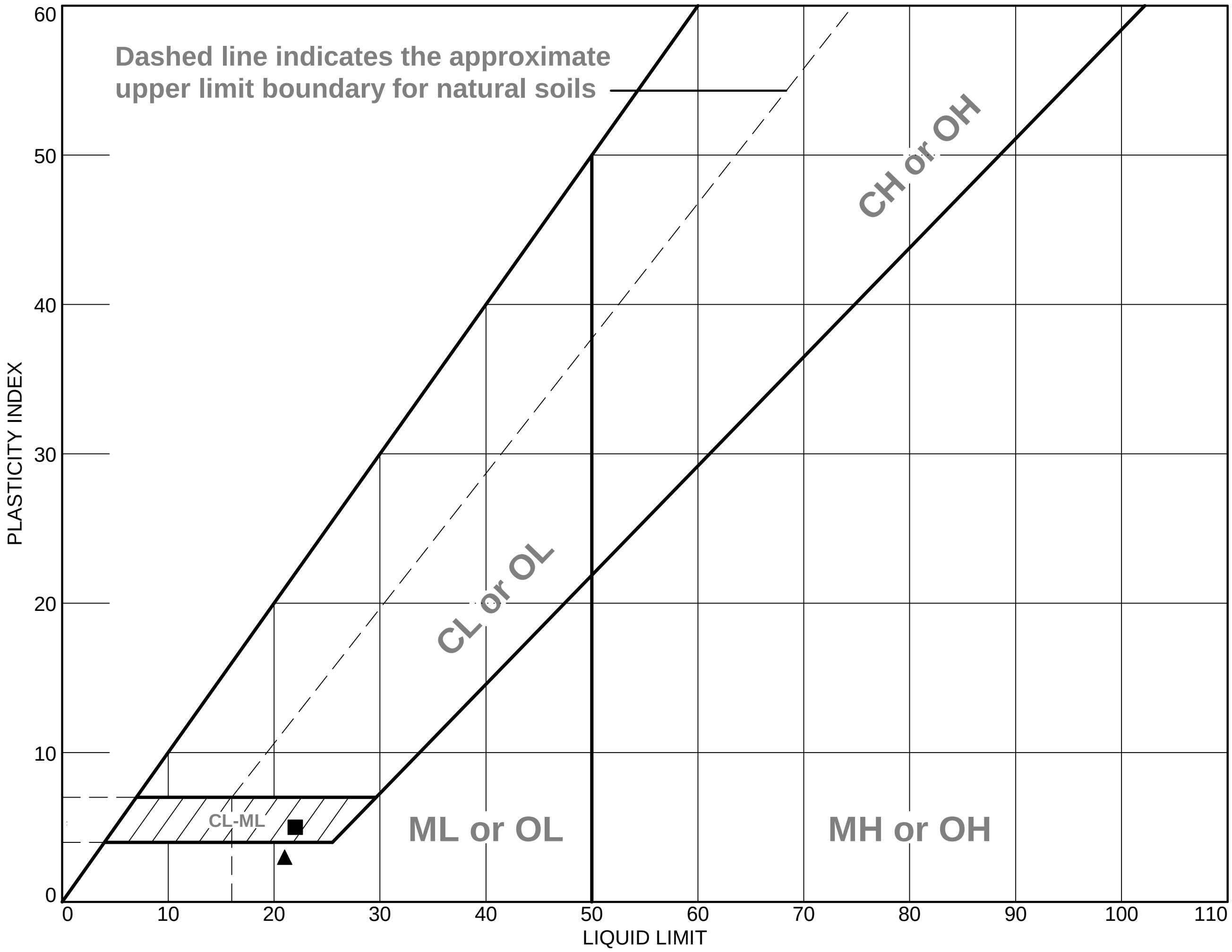
GSI-2

APPENDIX C

LABORATORY RESULTS

GSI

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		NV	NP	NP			
■		22	17	5			
▲		21	18	3			
◆		NV	NP	NP			

Project No. 214131 **Client:** Atlas Investment Group

Project: India Road 62
Portland, Maine

● **Location:** GSI-1; SS-7 **Depth:** 14-16' **Sample Number:** L-154-16
■ **Location:** GSI-1; SS-4 **Depth:** 8-10' **Sample Number:** L-153-16
▲ **Location:** GSI-2; SS-4 **Depth:** 8-10' **Sample Number:** L-155-16
◆ **Location:** GSI-2; SS-5 **Depth:** 16-18' **Sample Number:** L-156-16

Remarks:

GEOTECHNICAL SERVICES, INC.

Weare, New Hampshire

Plate

Tested By: ○ K. Maynard □ A. Osborne △ T. Hymens ◇ K. Maynard

UNCONFINED COMPRESSIVE STRENGTH

PROJECT:	India Street	**SAMPLED BY:**	Others
PROJECT No.:	214131	**DATE SAMPLED:**	N/A
SAMPLE No.:	L-146-16	**TESTED BY:**	A.Osborne
DEPTH:	10'-12'	**DATE TESTED:**	3/23/2016
LOCATION:	GSI-2/U-2	**PLOTTED BY:**	A.Osborne
SOURCE:	On-Site	**DATE PLOTTED:**	3/28/2016

DESCRIPTION:

REMARKS:

ASTM D 2166

SAMPLE DATA

LENGTH (in)= 6.30 | DIAMETER (in)= 2.88

WEIGHT (g)= 1286.3 | MOISTURE (%)= 30.3

WET UNIT WEIGHT (pcf)= 119.4 | AREA, A_0 (in^2)= 6.51

Unconfined Compressive Strength (psi) / (psf)= 3.8

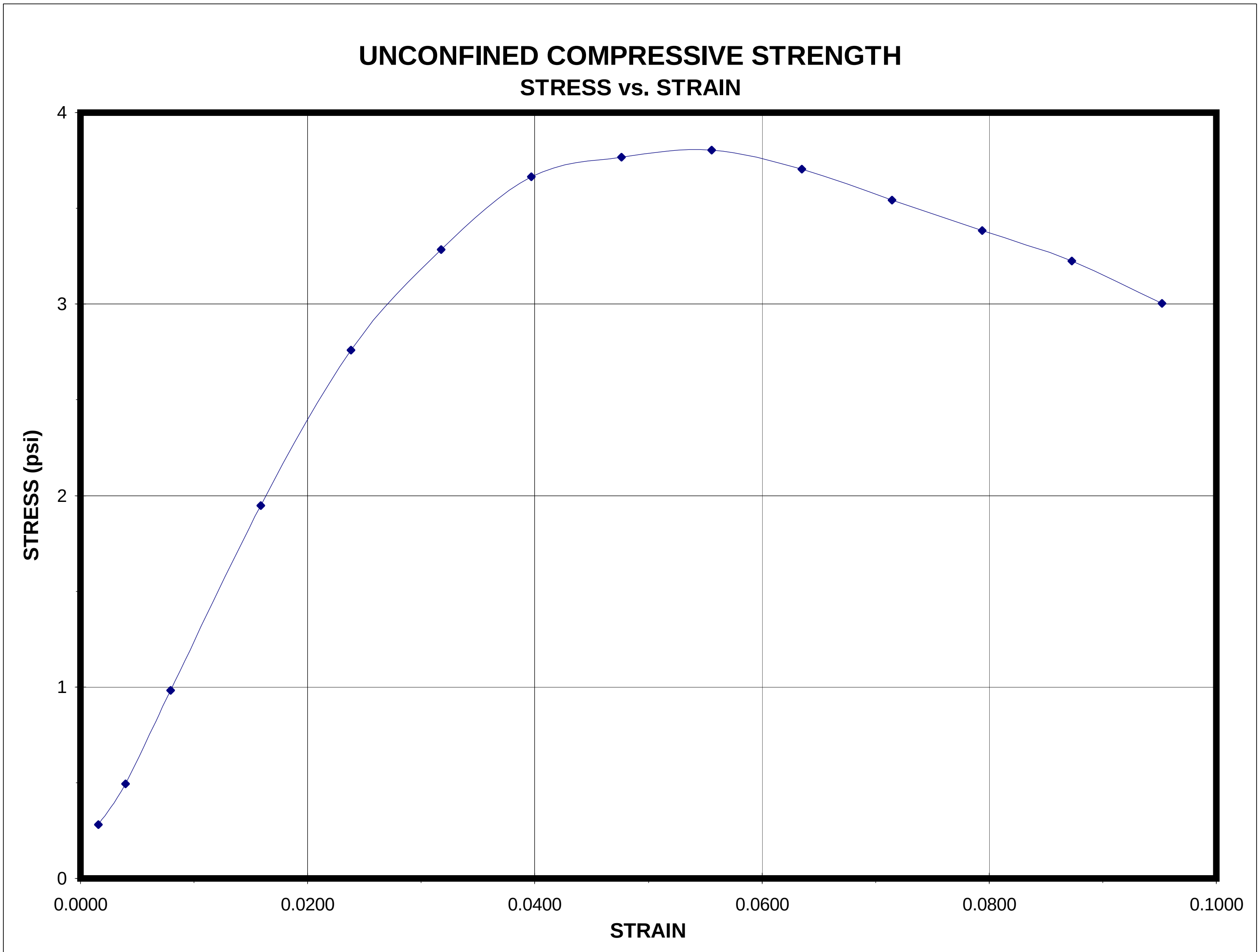
Specimen Deformation	Vertical Strain	Proving Ring Dial Reading	Load	Corrected Area	Stress
(ΔL)	$\varepsilon = (\Delta L / L)$	(# of small divisions)	Col. (3) * Cal. Factor	$A_c = A_0 / (1-\varepsilon)$	Col 4 / Col5
(1/1000 in) (1)	(2)	(3)	(lb) (4)	(in^2) (5)	(lb/in^2) (6)
10	0.0016	4	1.8	6.52	0.28
25	0.0040	7	3.2	6.54	0.49
50	0.0079	14	6.4	6.56	0.98
100	0.0159	28	12.9	6.62	1.95
150	0.0238	40	18.4	6.67	2.76
200	0.0317	48	22.1	6.72	3.28
250	0.0397	54	24.8	6.78	3.66
300	0.0476	56	25.8	6.84	3.77
350	0.0556	57	26.2	6.89	3.80
400	0.0635	56	25.8	6.95	3.71
450	0.0714	54	24.8	7.01	3.54
500	0.0794	52	23.9	7.07	3.38
550	0.0873	50	23.0	7.13	3.22
600	0.0952	47	21.6	7.20	3.00

GEOTECHNICAL SERVICES, INC.

Geotechnical Engineering · Environmental Studies · Material Testing · Construction Monitoring

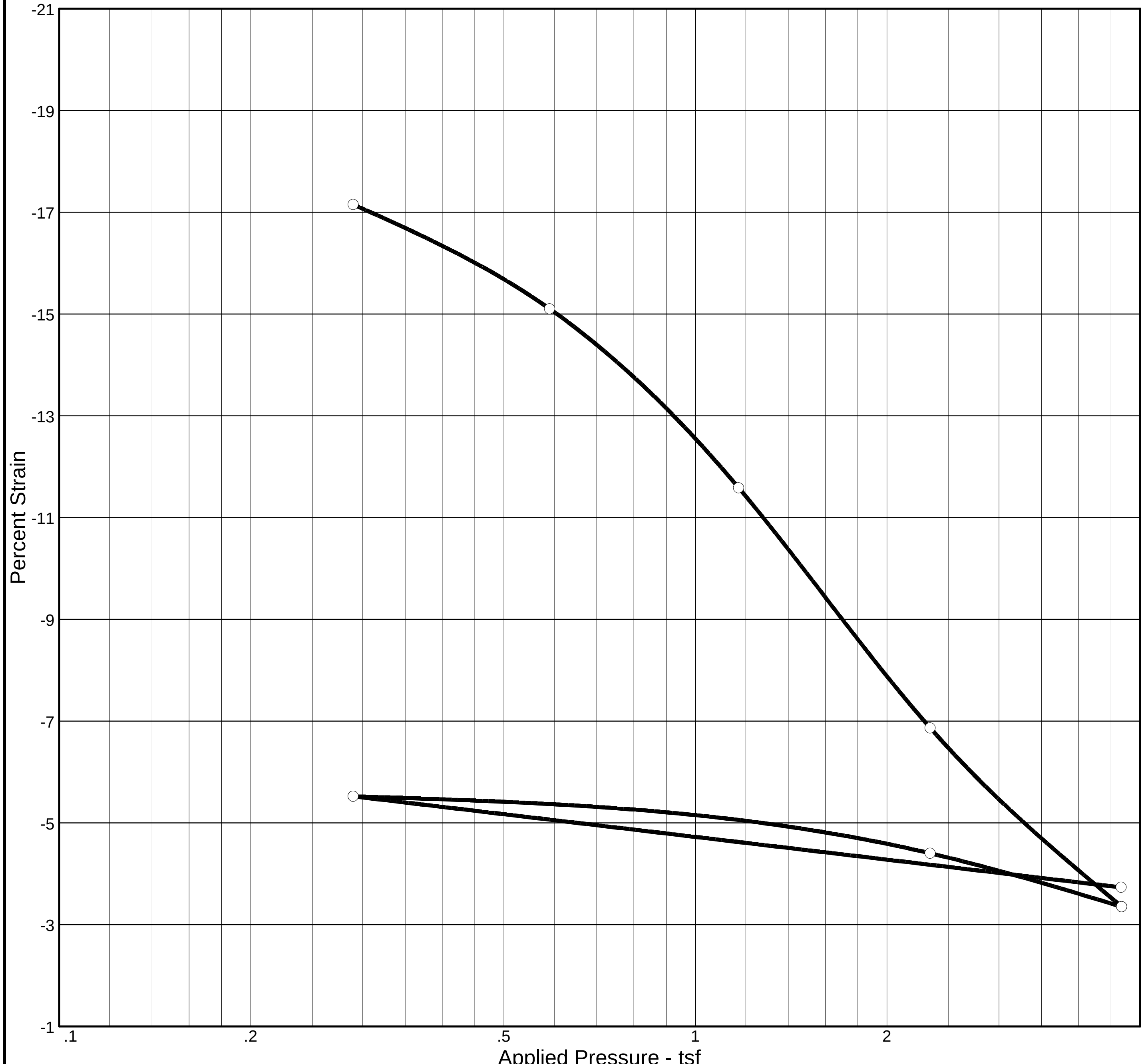
UNCONFINED COMPRESSIVE STRENGTH

PROJECT:	India Street	**SAMPLED BY:**	Others
PROJECT No.:	214131	**DATE SAMPLED:**	N/A
SAMPLE No.:	L-146-16	**TESTED BY:**	A.Osborne
ELEVATION:	10'-12'	**DATE TESTED:**	3/23/2016
LOCATION:	GSI-2/U-2	**PLOTTED BY:**	A.Osborne
SOURCE:	On-Site	**DATE PLOTTED:**	3/28/2016
DESCRIPTION:			
REMARKS:			



Unconfined Compressive Strength (psi) / (psf)= 3.8

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
			22	5			0.34			

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. 214131 **Client:** Atlas Investment Group

Project: India Road 62
Portland, Maine

Location: GSI-1

Remarks:
L-146-16 A

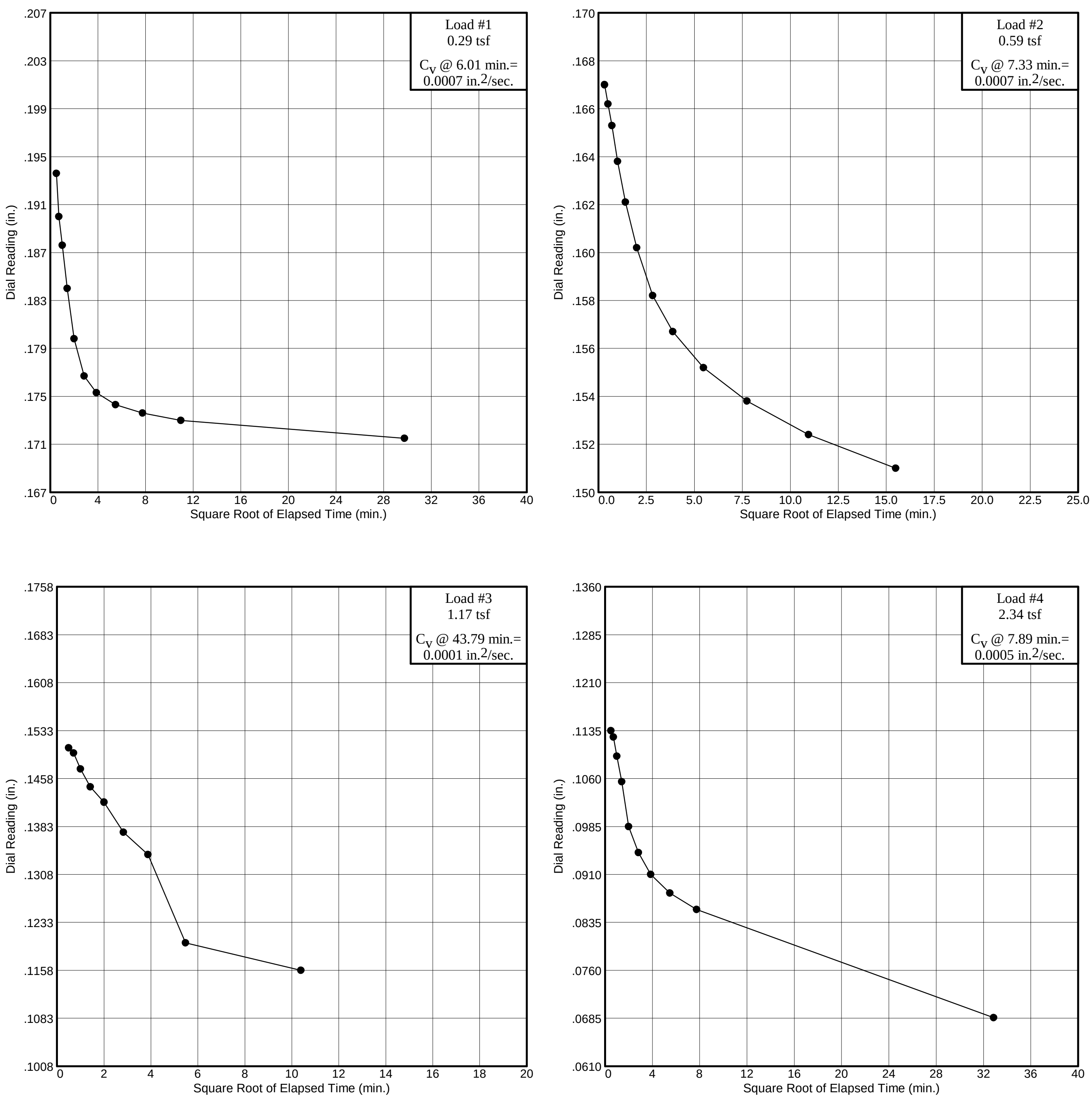
GEOTECHNICAL SERVICES, INC.

Weare, New Hampshire

Plate

Dial Reading vs. Time

Project No.: 214131
Project: India Road 62
Portland, Maine
Location: GSI-1



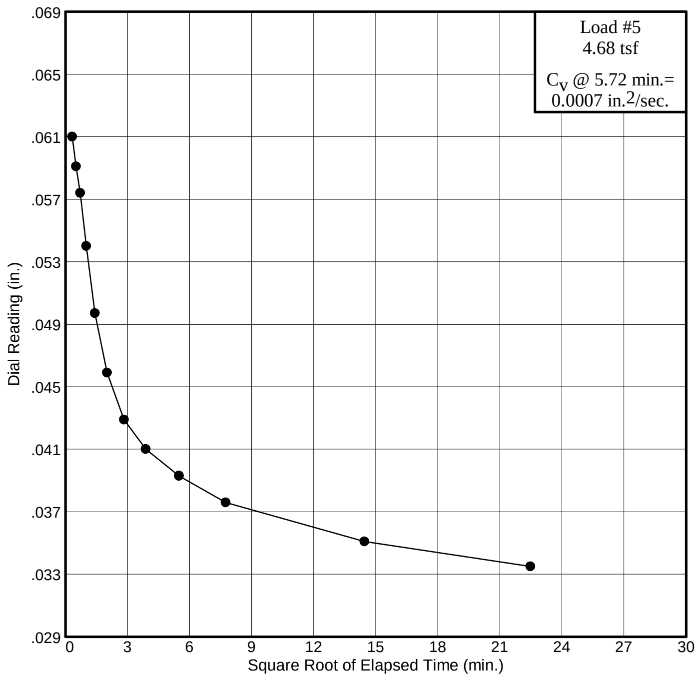
GEOTECHNICAL SERVICES, INC.

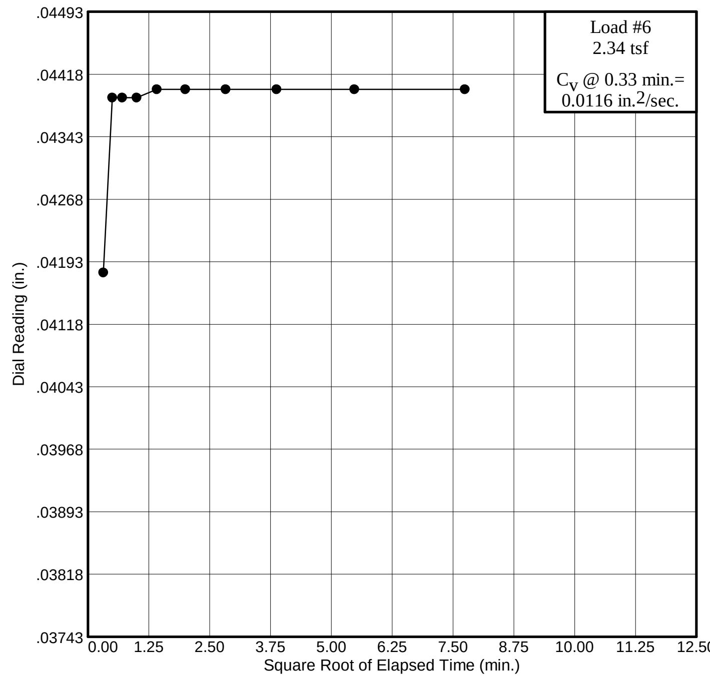
Weare, New Hampshire

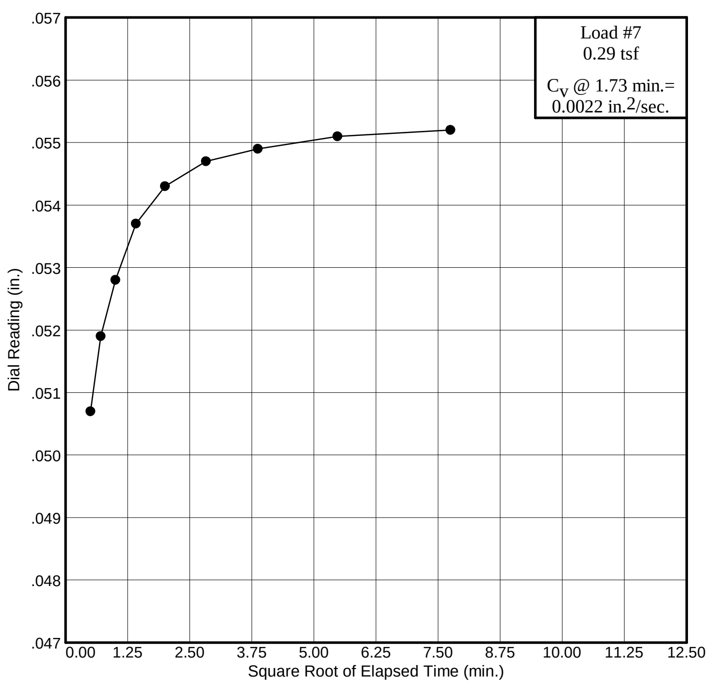
Plate

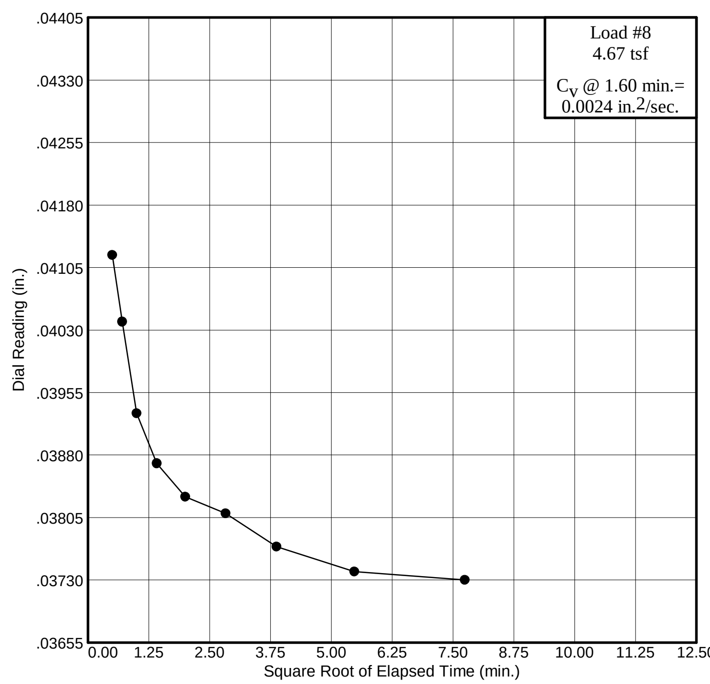
Dial Reading vs. Time

Project No.: 214131
Project: India Road 62
Portland, Maine
Location: GSI-1







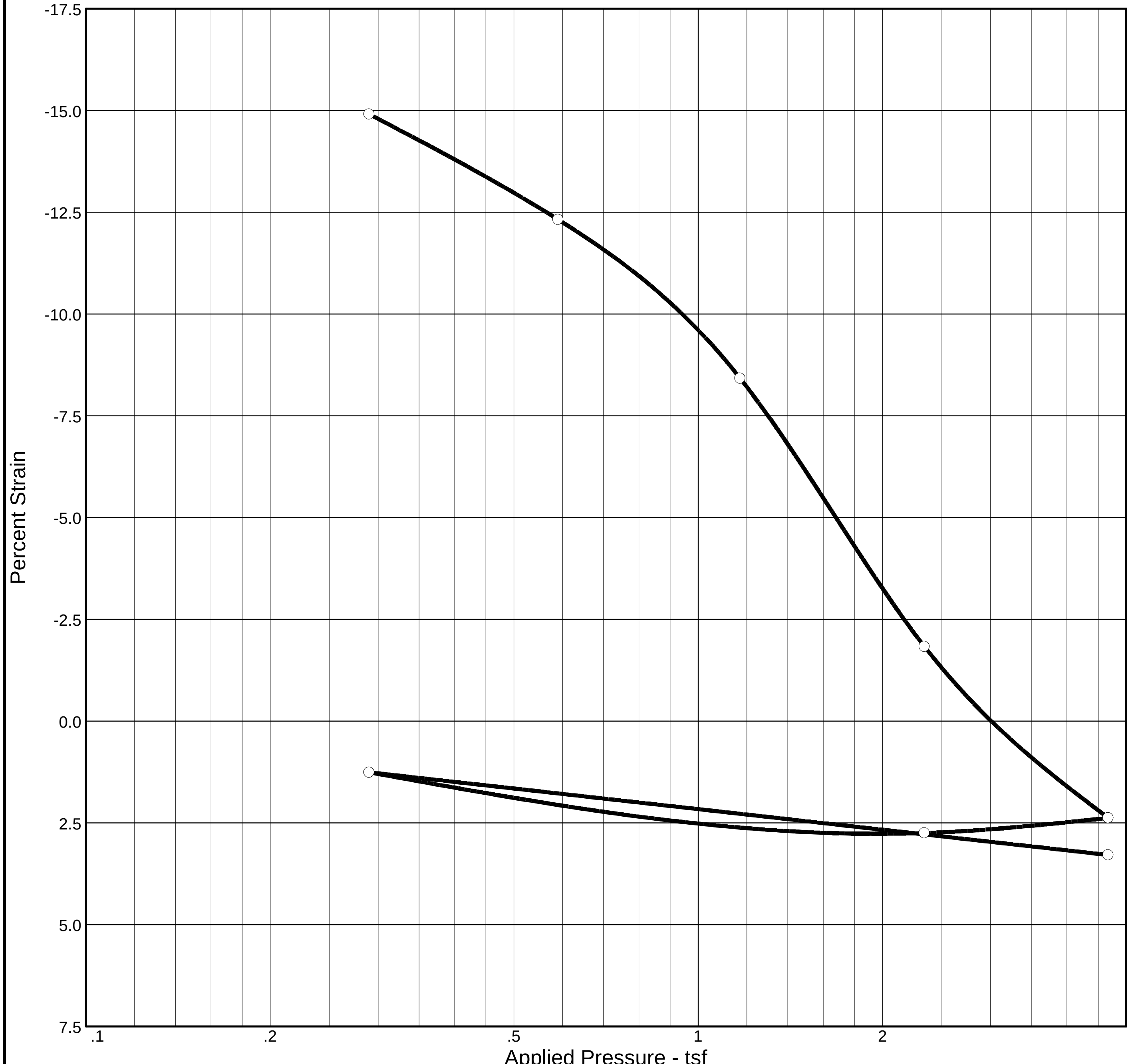


GEOTECHNICAL SERVICES, INC.

Weare, New Hampshire

Plate

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
			21	3			0.28			

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. 214131 **Client:** Atlas Investment Group

Project: India Road 62
Portland, Maine

Location: GSI-1

Remarks:
L-146-16 B

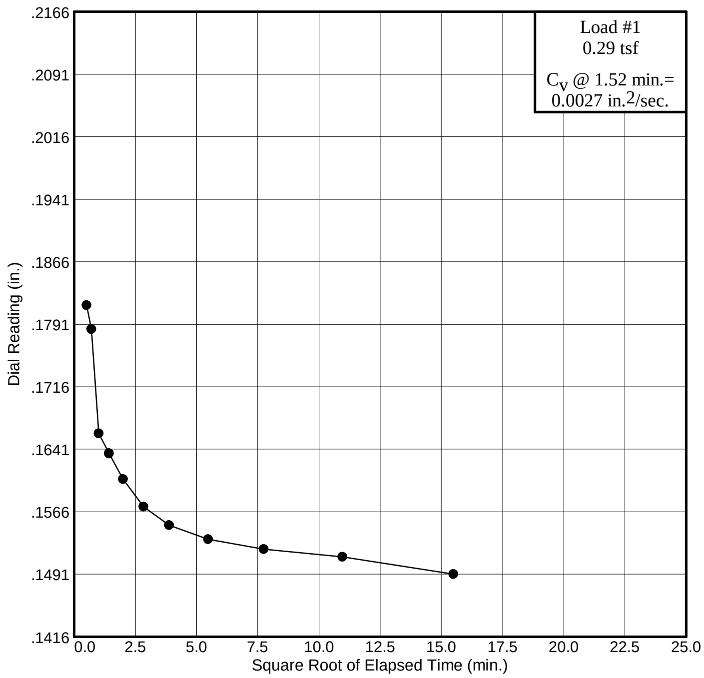
GEOTECHNICAL SERVICES, INC.

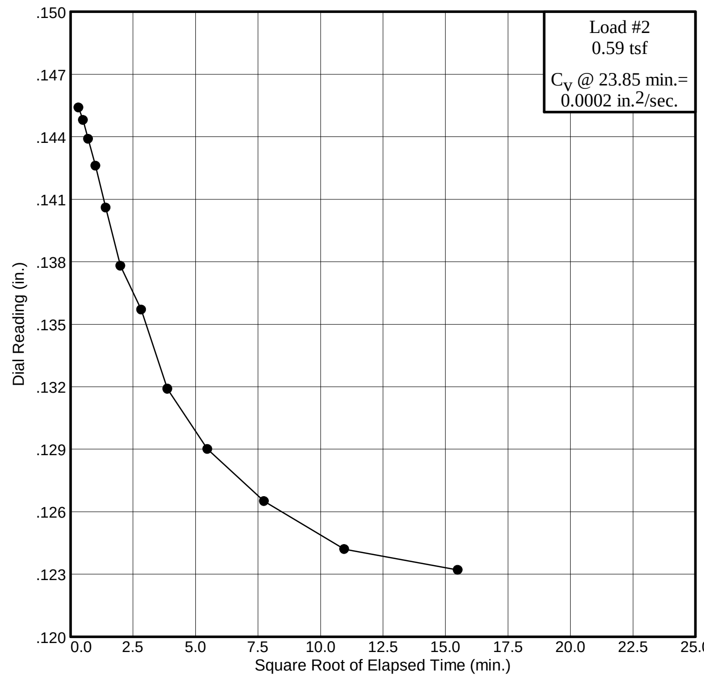
Weare, New Hampshire

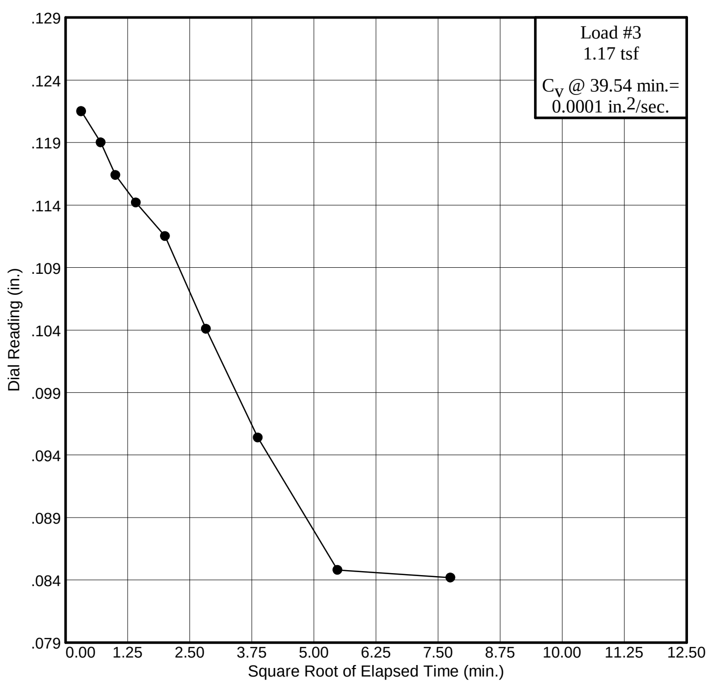
Plate

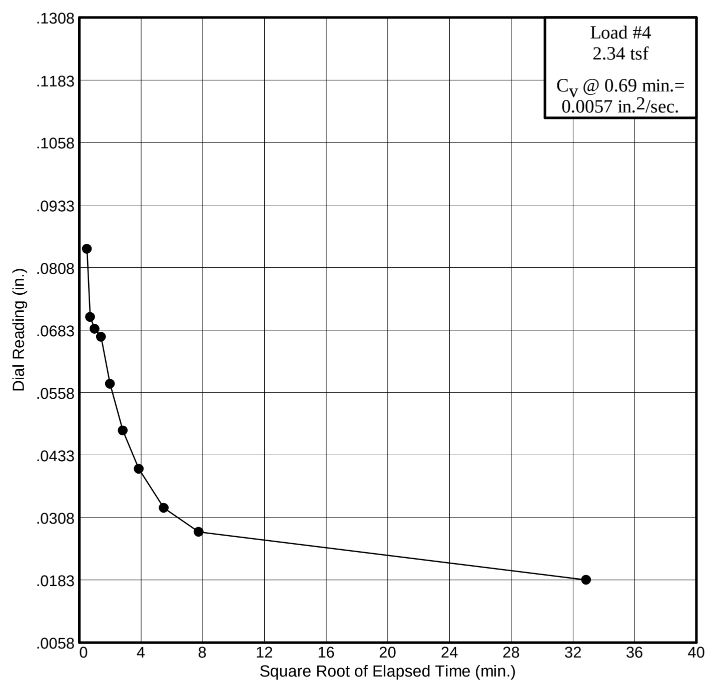
Dial Reading vs. Time

Project No.: 214131
Project: India Road 62
Portland, Maine
Location: GSI-1









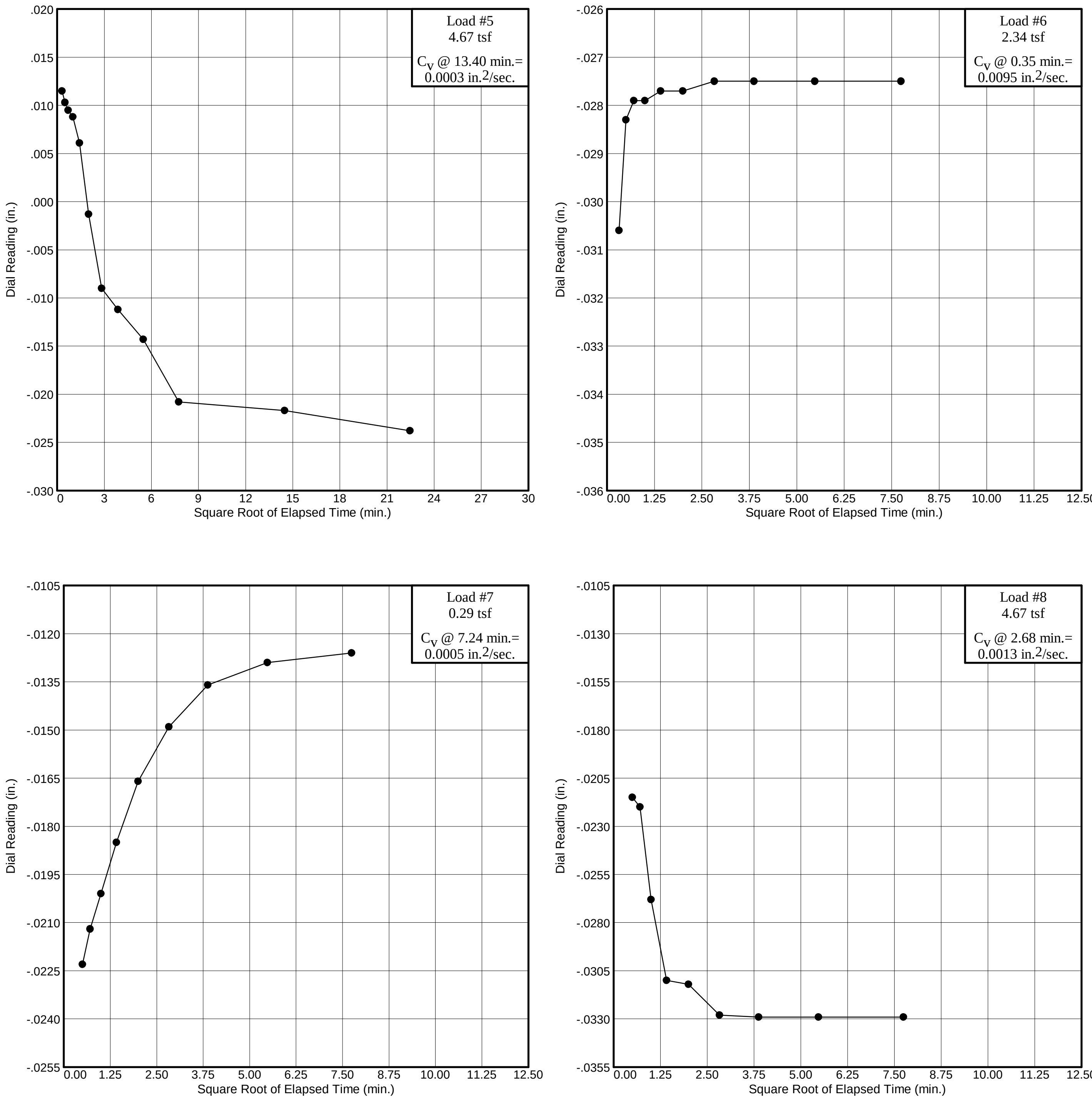
GEOTECHNICAL SERVICES, INC.

Weare, New Hampshire

Plate

Dial Reading vs. Time

Project No.: 214131
Project: India Road 62
Portland, Maine
Location: GSI-1



GEOTECHNICAL SERVICES, INC.

Weare, New Hampshire

Plate

APPENDIX D

SEISMIC DESIGN

GSI

Design Maps Detailed Report

2006/2009 International Building Code (43.66063°N, 70.25039°W)

Site Class D – "Stiff Soil", Occupancy Category I/II/III

Section 1613.5.1 — Mapped acceleration parameters

Note: Maps in the 2006 and 2009 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.5.3.

From Figure 1613.5(1) [1]	S_S = 0.314 g
From Figure 1613.5(2) [2]	S_1 = 0.077 g

Section 1613.5.2 — Site class definitions

SITE CLASS	SOIL PROFILE NAME	Soil shear wave velocity, $\bar{v}_s$, (ft/s)	Standard penetration resistance, $\bar{N}$	Soil undrained shear strength, $\bar{s}_u$, (psf)
A	Hard rock	$\bar{v}_S$ > 5,000	N/A	N/A
B	Rock	2,500 < $\bar{v}_S$ ≤ 5,000	N/A	N/A
C	Very dense soil and soft rock	1,200 < $\bar{v}_S$ ≤ 2,500	$\bar{N}$ > 50	>2,000 psf
D	Stiff soil profile	600 ≤ $\bar{v}_S$ < 1,200	15 ≤ $\bar{N}$ ≤ 50	1,000 to 2,000 psf
E	Stiff soil profile	$\bar{v}_S$ < 600	$\bar{N}$ < 15	<1,000 psf
E	—	Any profile with more than 10 ft of soil having the characteristics: 1. Plasticity index *PI* > 20, 2. Moisture content *w* ≥ 40%, and 3. Undrained shear strength $\bar{s}_u$ < 500 psf		
F	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays (*H* > 10 feet of peat and/or highly organic clay where *H* = thickness of soil) 3. Very high plasticity clays (*H* > 25 feet with plasticity index *PI* > 75) 4. Very thick soft/medium stiff clays (*H* > 120 feet)		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 1613.5.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.5.3(1)
VALUES OF SITE COEFFICIENT F_a

Site Class	Mapped Spectral Response Acceleration at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = D and S_S = 0.314 g, F_a = 1.549

TABLE 1613.5.3(2)
VALUES OF SITE COEFFICIENT F_v

Site Class	Mapped Spectral Response Acceleration at 1–s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.077 g, F_v = 2.400

In the equations below, the equation number corresponding to the 2006 edition is listed first, and that corresponding to the 2009 edition is listed second.

Equation (16-37; 16-36):	$S_{MS} = F_a S_S = 1.549 \times 0.314 = 0.486$ g
Equation (16-38; 16-37):	$S_{M1} = F_v S_1 = 2.400 \times 0.077 = 0.184$ g

Section 1613.5.4 — Design spectral response acceleration parameters

Equation (16-39; 16-38):	$S_{DS} = ⅔ S_{MS} = ⅔ \times 0.486 = 0.324$ g
Equation (16-40; 16-39):	$S_{D1} = ⅔ S_{M1} = ⅔ \times 0.184 = 0.123$ g

Section 1613.5.6 — Determination of seismic design category

TABLE 1613.5.6(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD RESPONSE ACCELERATION

VALUE OF S_{DS}	OCCUPANCY CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Occupancy Category = I and S_{DS} = 0.324 g, Seismic Design Category = B

TABLE 1613.5.6(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	OCCUPANCY CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Occupancy Category = I and S_{D1} = 0.123 g, Seismic Design Category = B

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Occupancy Categories I, II, and III, and **F** for those in Occupancy Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 1613.5.6(1) or 1613.5.6(2)" = B

Note: See Section 1613.5.6.1 for alternative approaches to calculating Seismic Design Category.

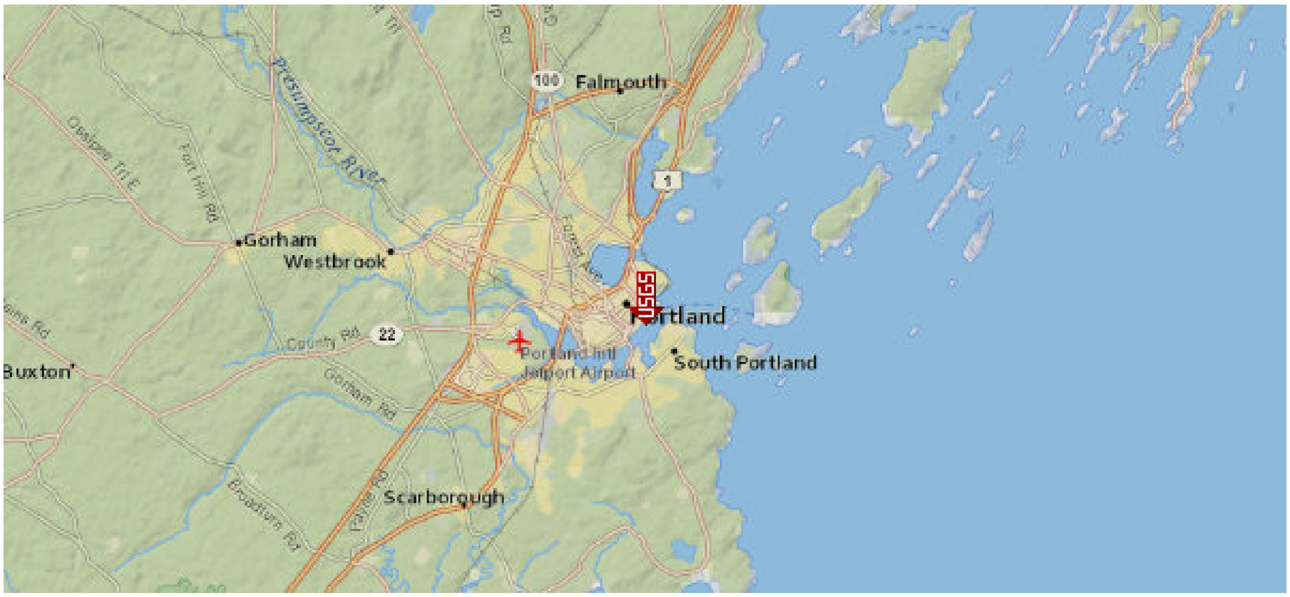
References

1. *Figure 1613.5(1)*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2006-Figure1613_5(01).pdf
2. *Figure 1613.5(2)*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2006-Figure1613_5(02).pdf

Design Maps Summary Report

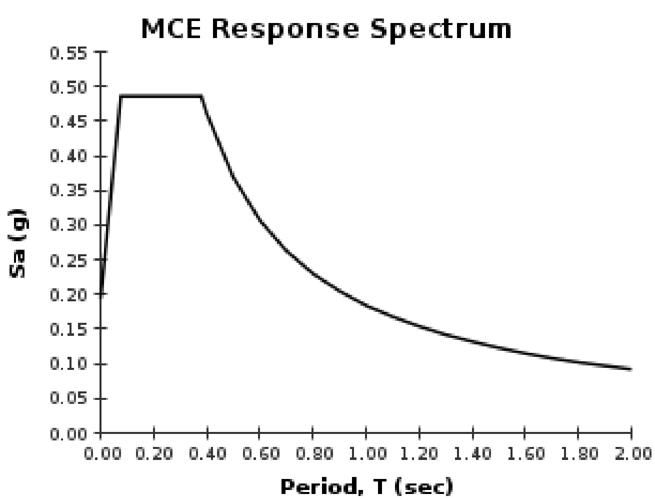
User–Specified Input

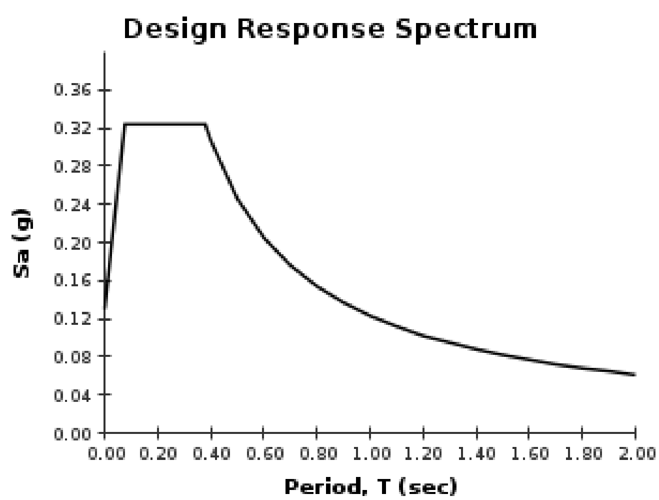
Report Title	50 - 62 India Street Tue March 29, 2016 15:42:50 UTC
Building Code Reference Document	2006/2009 International Building Code (which utilizes USGS hazard data available in 2002)
Site Coordinates	43.66063°N, 70.25039°W
Site Soil Classification	Site Class D – "Stiff Soil"
Occupancy Category	I/II/III



USGS–Provided Output

S_S =	0.314 g	S_{MS} =	0.486 g	S_{DS} =	0.324 g
S_1 =	0.077 g	S_{M1} =	0.184 g	S_{D1} =	0.123 g





APPENDIX E

PRELIMINARY REPORT OF MARCH 2014

GEOTECHNICAL REPORT

62 INDIA STREET

PORTLAND, MAINE

March 31, 2014

GSI Project No. 212234A

Prepared for:

Mr. Demetri Dasco
Atlas Investment Group, LLC.
35 Fay Street, Suite 107B
Boston, Massachusetts 02118

Prepared by:

Harry K. Wetherbee, P.E.
Geotechnical Services, Inc.
55 North Stark Highway
Weare, NH 03281

Geotechnical Services Inc.

Geotechnical Engineering ◣ Environmental Studies ◣ Materials Testing ◣ Construction Monitoring

March 31, 2014

Mr. Demetri Dasco
Atlas Investment Group, LLC.
35 Fay Street, Suite 107B
Boston, Massachusetts 02118

RE: Geotechnical Investigation Report
New Residential Construction
62 India Street
Portland, Maine **GSI Project No. 212234**

Dear Mr. Dasco:

Geotechnical Services, Inc. (GSI) presents the following geotechnical report for the above referenced project. The contents of this report are subject to the Limitations outlined in Appendix A.

PROJECT OVERVIEW AND SITE CONDITIONS

The following narrative summarizes the geotechnical recommendations pertaining to the proposed project. The project consists of the construction of a multi-story residential structure on India Street in Portland, Maine. At the time of this writing, the presence of below grade space within the proposed structure has not been confirmed.

PURPOSE AND SCOPE

The scope of services performed by GSI to meet the above-stated objectives for geotechnical engineering services included the following:

1. Review of available project plans and documents.
2. Coordination and observation of test borings at the locations illustrated on Figure 2. The soil exploration program was observed by a field representative from GSI.
3. Preparation of recommendations for foundation support of the proposed structure, including estimated bearing capacity and settlement values.
4. Preparation of recommendations regarding seismic considerations for the site and the proposed development.

SUBSURFACE INVESTIGATIONS

A series of seven (7) test borings designated B-1 through B-7, were advanced on February 27 and 28, 2014 for the purpose of evaluating the geotechnical properties of the existing soils and developing a subsurface profile which could assist in the design of the proposed improvements. These explorations classified the on-site soils according to their color, grain size, and other material properties.

The test boring program was conducted by New Hampshire Boring, Inc. of Derry, New Hampshire, utilizing a track mounted drill rig turning 2.25 inch inside diameter augers. Test borings were advanced to refusal depths of 13 to approximately 21 feet below existing surface grades. Soil explorations were performed in accordance with methods prescribed by ASTM D1586.

Soil samples were obtained at the surface and at five-foot intervals with a 1⅜ inch diameter split-spoon sampler. Standard Penetration Tests (SPTs) were performed at the sampling intervals in accordance with ASTM D1586. Field descriptions and penetration resistance of the soils encountered, observed depth to groundwater while drilling when observed, and other pertinent observations are contained in the attached test boring logs. The test boring locations are illustrated on Figure 2 of this report. Soil samples recovered were preserved in marked glass jars and transported to the GSI Soils Laboratory for temporary storage. Test boring logs are presented in Appendix B.

SUBSURFACE CONDITIONS

Based on the results of the subsurface investigations, the following generalized soil strata underlie the site:

Structural Test Borings

A series of seven structural test borings were advanced within an existing paved parking area. Soil conditions were extremely variable across the set of borings completed. At grade, 2 to 2.5 inches of asphalt overlay over 20 inches of frozen ground. Fill soils extended to a depth of at least 5 to 8 feet below existing ground surface. At test boring B-1, very loose coarse to fine Sand, little to some Gravel, little Silt, trace ash was present to a depth of 6 feet. Ash was also present at B-5, indicating that fill soils are present at a depth of 10 feet. At the remaining test boring locations, loose brown coarse to fine Sand, trace to little Gravel, trace Silt was observed to a depth of up to 10 feet below grade.

The soils below the fill material varied considerably between test borings. At test boring B-1, a medium dense coarse to fine Sand, trace to some Gravel, little Silt was present to a depth of 14 feet. At 8 feet, a 6 inch stratum of very stiff Silty Clay was observed. At 14 feet, dense gray coarse to fine Sand, little Gravel, trace Silt was encountered, suggesting the presence of a glacial till soil. At test boring B-2, vey soft to stiff Silty Clay was present to a depth of 12 feet, transitioning into a medium stiff gray Silt and gray Silty Clay at 14 feet. At test boring B-3, loose coarse to fine Sand at 6 to 8 feet overlay soft to stiff brown/gray Silty Clay to a depth of 20 feet. Two Shelby tubes were retrieved, the first at 11 feet, and the second at 15 feet. Loose gray coarse to fine Sand, trace Gravel, trace Silt was encountered at a depth of 20 feet.

Test boring B-4 encountered fill soils to a depth of at least 9 feet below grade. An obstruction was struck at 10 feet below grade and consisted of a large wood fragment. The nature of this wood obstruction and its origin is unknown. At a depth of 13 to 20 feet, very loose gray fine Sand, little Silt was observed, which transitioned into hard gray Clayey Silt, trace Sand. At test boring location B-5, fill soils containing ash were present to a depth of 9 feet. The fill soils overlay medium stiff to stiff brown Silt, trace to little fine Sand which continued to a depth of 14 feet. From 14 to 20 feet below grade, very soft gray Clayey Silt, trace Gravel was observed. A Shelby tube was attempted at a depth of 16 feet, but there was no recovery. At a depth of 21 feet, hard gray Silt, trace coarse Sand, trace Gravel was encountered.

At test boring B-6, fill soils consisting of loose black coarse to fine Sand, little Silt, trace ash were observed to a depth of 5 feet below grade, transitioning into medium dense brown coarse to fine Sand, trace to little Silt. The medium dense sands continued to a depth of 12 feet below grade. Very loose fine Sand, overlay stiff gray Silt, little fine Sand, trace Gravel at a depth of 14 to 16 feet. At test boring B-7, loose to medium dense coarse to fine Sand, trace Gravel, trace Silt was present to a depth of 10 feet below grade. At 10 feet very loose black fine Sand, trace Silt was observed to a depth of 12 feet. Loose sands continued to a depth of 20 feet below grade, transitioning to a very dense gray fine Sand, little Silt, trace Gravel.

Refusal

Refusal was encountered at all test boring locations between a depth of 18 to 23 feet below grade, with a majority of the test borings refusing over 20 feet in depth. Refusal was encountered almost immediately upon entering a dense glacial till material. The nature of the refusals are unknown.

Groundwater Conditions

Groundwater encountered consistently at a depth of 6 to 8 feet below grade. Test boring B-7 indicated a ground water depth of 16.5 feet, but levels at this location may not have stabilized prior to the reading. Due to the scope of the project and the expected depth to subgrade of the proposed structure, groundwater could be a factor during the excavation of footing subgrades dependent upon the final depth of excavation and the actual groundwater conditions for that time of year. It should be noted that groundwater conditions may vary depending upon factors such as temperature, season, precipitation, and other unknowns that may be different from those at the time these explorations were made. Groundwater levels at other times, therefore, may differ from those observed and described in this report.

PRELIMINARY FOUNDATION DESIGN RECOMMENDATIONS

Foundation Design

The zone of soft, compressible soils encountered beneath the footprint of the proposed building present geotechnical issues related to settlement and bearing capacity. The potential settlement of these soils will vastly influence the technical feasibility of a spread footing foundation for the building. Although the medium dense sands encountered during the test boring program are considered a competent bearing stratum for spread footing support, the soft materials in the area of test borings B-3 through B-5 at depths of 15 to 20 feet below grade may be prone to compression when subject to loading. The degree of compression is related to the stress history of the material, the consolidation properties of the soil, and the magnitude and manner of the surface loading. In order to determine the geotechnical characteristics of the material, GSI recommends a series of further tests at the GSI laboratory to determine potential settlement. Shelby tubes were obtained during the test boring process.

In order to proceed further with the establishment of foundation design parameters, GSI requests that preliminary building layout and grading plans be provided. If the site is to be excavated, there may be a net stress relief that will obviate the potential for future settlements. In such case, a conventional spread footing foundation with slab on grade may be suitable.

CLOSURE

We appreciate the opportunity to perform this investigation and look forward to working with you on the design and construction phases of this project. If you have any questions as to the contents of this report, please do not hesitate to contact us.

Very truly yours,

GEOTECHNICAL SERVICES, INC.

Harry K. Wetherbee, P.E.
Principal Engineer

Figure 1: Locus Map
Figure 2: Boring Location Plan

Appendix A: Limitations
Appendix B: Exploration Logs

APPENDIX A

LIMITATIONS

LIMITATIONS

Explorations

1. The analyses, recommendations, and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.

3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.

5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by Geotechnical Services, Inc.

Construction

6. It is recommended that this firm be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

7. This report has been prepared for the exclusive use of Atlas Development and their assigns, in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

8. This report has been prepared for this project by Geotechnical Services, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to evaluation considerations only.

APPENDIX B

EXPLORATION LOGS

Geotechnical Services, Inc. ◆ 55 North Stark Highway Tel. 603.529.7766 Fax. 603.529.7080 ◆ 30 Newbury Street, Boston, MA 02116 Tel. 617.455.4248 Fax. 617.745.4308

TEST BORING LOG

Project	India Street	GSI Project No.	212234	Elevation	Existing Grade
Location	Portland, Maine	Project Mgr.	HKW	Datum	N/A
Client	Atlas Investment Group, LLC.	Inspector	CMP	Date Started	2/27/2014
Contractor	East Coast Exploration, Inc.	Checked By	HKW	Date Finished	2/28/2014
Driller	Chris Powell	Rig Make	CME	Rig Model	550

Item:	Auger	Casing	Sampler	Core Barrel
Type	HS Aug		SS	
Inside Diameter (in.)	2.25"		ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☐ Track ☑ ATV
☐ Bomb. ☐ Geoprobe
☐ Tripod ☐ Other

Hammer Type:
☑ Safety Hammer
☐ Doughnut
☐ Automatic

☐ Winch ☐ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	"N" Value	Rock RQD (%)	PID Rdg. (ppm)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0									2.5" Asphalt 20" Frost
		S-1	2-4	6	2 1 1 1	2			Very loose dark brown coarse to fine sand some gravel little silt trace ash
5		S-2	4-6	9	1 1 1 3	2			Very loose dark brown coarse to fine sand little gravel little silt trace ash
		S-3	6-8	20	22 10 13 7	23			10" Medium dense brown coarse to fine sand some gravel 10" Very stiff gray clayey silt little fine sands
		S-4	8-10	18	11 11 11 11	22			6" Very stiff gray silty clay 12" Medium dense brown fine sand little silt
10		S-5	10-12	8.5	4 8 6 6	14			4" Medium dense brown coarse to fine sand trace silt trace gravel 4.5" gray coarse to fine sand trace silt
		S-6	12-14	8.5	9 3 2 2	5			Loose wet gray coarse to fine sand little gravel trace silt
15		S-7	14.5-16.5	24	5 19 14 21	33			6" Dense gray coarse to fine sand little gravel trace silt 3" Dense gray/brown coarse to fine sand trace silt
									Auger refusal at 21' Boring terminated at 21'
20									
25									

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
27-Feb	8:15	20	21	8
	9:30			

Sample Identification
O = Open Ended
U = Undisturbed
S = Split Spoon
C = Rock Core
G = Geoprobe

Cohesive Soils N-Value
0 to 2: Very Soft
2 to 4: Soft
4 to 8: Medium Stiff
8 to 15: Stiff
15 to 30 Very Stiff
Over 30: Hard

Granular Soils N- Value
0 to 4: Very Loose
4 to 10: Loose
11 to 30: Medium Dense
31 to 50: Dense
Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

TEST BORING LOG

Boring No.	B-2
Page	1 of 1

Project	India Street	GSI Project No.	212234	Elevation	Existing Grade
Location	Portland, Maine	Project Mgr.	HKW	Datum	N/A
Client	Atlas Investment Group, LLC.	Inspector	CMP	Date Started	2/27/2014
Contractor	East Coast Exploration, Inc.	Checked By	HKW	Date Finished	2/28/2014
Driller	Chris Powell	Rig Make	CME	Rig Model	550

Item:	Auger	Casing	Sampler	Core Barrel
Type	HS Aug		SS	
Inside Diameter (in.)	2.25"		ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

Rig: ☐ Truck ☐ Skid ☐ Track ☑ ATV ☐ Bomb. ☐ Geoprobe ☐ Tripod ☐ Other

Hammer Type: ☑ Safety Hammer ☐ Doughnut ☐ Automatic

☐ Winch ☐ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	Sample Data: No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	"N" Value	Rock RQD (%)	PID Rdg. (ppm)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0									2.5" Asphalt 20" Frost
		S-1	2-4	8	5 4 5 6	9			Loose dark brown coarse to medium sand and gravel trace silt
5		S-2	4-6	9.5	5 3 1 4	4			Loose dark brown coarse to medium sand little gravel trace silt
		S-3	6-8	10	4 4 4 3	8			4" Loose orange red clay 4.5" Loose gray brown silt trace fine sand
		S-4	8-10	18	4 5 6 6	11			12" Stiff gray brown silty clay trace fine sand 4" Stiff gray silty clay
10		S-5	10-12	18	1 1 1 1	2			4.5" Very soft gray brown silty clay 13.5" Very soft gray silt
		S-6	12-14	24	WOH 2 5 4	7			20" Medium stiff gray silt 4" Loose gray brown fine sand little silt
15		S-7	14-16	18	WOR 2 4 2	6			Medium stiff gray silty clay trace coarse to fine sand trace gravel
									Auger refusal at 18' Boring terminated at 18'
20									
25									

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
27-Feb	10:55	18	18	7
	12:00			

Sample Identification	Cohesive Soils N-Value	Granular Soils N- Value
O = Open Ended	0 to 2: Very Soft	0 to 4: Very Loose
U = Undisturbed	2 to 4: Soft	4 to 10: Loose
S = Split Spoon	4 to 8: Medium Stiff	11 to 30: Medium Dense
C = Rock Core	8 to 15: Stiff	31 to 50: Dense
G = Geoprobe	15 to 30 Very Stiff	Over 50: Very Dense
	Over 30: Hard	

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

B-2

Geotechnical Services, Inc. ◆ 55 North Stark Highway Tel. 603.529.7766 Fax. 603.529.7080 ◆ 30 Newbury Street, Boston, MA 02116 Tel. 617.455.4248 Fax. 617.745.4308

TEST BORING LOG

Boring No.	B-3
Page	1 of 1

Project	India Street	GSI Project No.	212234	Elevation	Existing Grade
Location	Portland, Maine	Project Mgr.	HKW	Datum	N/A
Client	Atlas Investment Group, LLC.	Inspector	CMP	Date Started	2/27/2014
Contractor	East Coast Exploration, Inc.	Checked By	HKW	Date Finished	2/28/2014
Driller	Chris Powell	Rig Make	CME	Rig Model	550

Item:	Auger	Casing	Sampler	Core Barrel
Type	HS Aug		SS	
Inside Diameter (in.)	2.25"		ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☐ Track ☑ ATV
☐ Bomb. ☐ Geoprobe
☐ Tripod ☐ Other
☐ Winch ☐ Cat Head ☑ Roller Bit ☐ Cutting Head

Hammer Type:
☑ Safety Hammer
☐ Doughnut
☐ Automatic

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	"N" Value	Rock RQD (%)	PID Rdg. (ppm)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0									2.5" Asphalt 20" Frost
		S-1	2-4	10	4 3 1 2	4			Loose brown coarse to fine sand little silt trace clay
5		S-2	4-6	8	3 2 2 2	4			Loose dark brown coarse to fine sand little silt trace gravel
		S-3	6-8	14.5	2 3 3 2	6			8.5" Loose dark brown silt little coarse to fine sand trace gravel 6" Loose dark brown silt trace fine sand
		S-4	8-10	22	2 2 5 5	7			5.5" Medium stiff dark brown orange silt trace coarse to fine sand trace gravel 16.5" Medium stiff brown gray silty clay
10		S-5	10-12	10	3 2 1	3			3" Spoon- 5" brown gray silty clay trace fine sand 5" gray silt
		S-6	11-13						Shelby Tube
		S-7	13-15	24	WOH 3 9 5	12			19" Medium dense wet brown fine sand little silt 5" Medium dense gray fine sand little silt
15		S-8	15-17						Shelby Tube
20		S-9	20-22	11	6 4 3 100	7			Loose gray coarse to fine sand trace gravel trace silt Auger refusal at 21.5' Boring terminated at 21.5'
25									

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
27-Feb	1:20	20	21.5	8
	3:40			

Sample Identification
O = Open Ended
U = Undisturbed
S = Split Spoon
C = Rock Core
G = Geoprobe

Cohesive Soils N-Value
0 to 2: Very Soft
2 to 4: Soft
4 to 8: Medium Stiff
8 to 15: Stiff
15 to 30 Very Stiff
Over 30: Hard

Granular Soils N- Value
0 to 4: Very Loose
4 to 10: Loose
11 to 30: Medium Dense
31 to 50: Dense
Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

B-3

Geotechnical Services, Inc. ◆ 55 North Stark Highway Tel. 603.529.7766 Fax. 603.529.7080 ◆ 30 Newbury Street, Boston, MA 02116 Tel. 617.455.4248 Fax. 617.745.4308

TEST BORING LOG

Boring No.	B-4
Page	1 of 1

Project	India Street	GSI Project No.	212234	Elevation	Existing Grade
Location	Portland, Maine	Project Mgr.	HKW	Datum	N/A
Client	Atlas Investment Group, LLC.	Inspector	CMP	Date Started	2/27/2014
Contractor	East Coast Exploration, Inc.	Checked By	HKW	Date Finished	2/28/2014
Driller	Chris Powell	Rig Make	CME	Rig Model	550

Item:	Auger	Casing	Sampler	Core Barrel
Type	HS Aug		SS	
Inside Diameter (in.)	2.25"		ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

Rig: ☐ Truck ☐ Skid ☐ Track ☑ ATV ☐ Bomb. ☐ Geoprobe ☐ Tripod ☐ Other

Hammer Type: ☑ Safety Hammer ☐ Doughnut ☐ Automatic

☐ Winch ☐ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	"N" Value	Rock RQD (%)	PID Rdg. (ppm)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0									2" Asphalt 20" Frost
		S-1	2-4	15	7 5 1 2	6			11" Loose dark brown coarse to fine sand trace silt 4" Loose brown coarse to fine sand trace gravel trace silt
5		S-2	4-6	7	2 1 3 3	4			2" Loose brown coarse to fine sand trace gravel trace silt 5" Loose black coarse to medium sand trace gravel trace silt
		S-3	6-8	10.5	7 5 4 3	9			1.5" Loose dark brown coarse to medium sand trace gravel trace silt 2" Stiff orange red clay 7" Stiff dark brown silt little fine sand trace gravel trace wood pieces
		S-4	8-10	9.5	2 1 2 2	3			Soft brown moist clayey silt trace fine sand
10		S-5	10-12	0	32 5 3 4	8			Hit obstruction, wood piece
		S-6	13-15	16	6 4 1 1	5			2" Medium stiff brown wet clayey silt trace fine sand 14" Medium stiff gray wet silt
15		S-7	15-17	11	WOR WOR WOR WOH	0			Very Loose gray fine sand little silt
20		S-8	20-22	11	3 11 37 100	48			Hard gray wet clayey silt trace silt sand Auger refusal at 21.5' Boring terminated at 21.5'
25									

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
27-Feb	4:20	20	21.5	7
	5:45			

Sample Identification	Cohesive Soils N-Value	Granular Soils N- Value
O = Open Ended	0 to 2: Very Soft	0 to 4: Very Loose
U = Undisturbed	2 to 4: Soft	4 to 10: Loose
S = Split Spoon	4 to 8: Medium Stiff	11 to 30: Medium Dense
C = Rock Core	8 to 15: Stiff	31 to 50: Dense
G = Geoprobe	15 to 30 Very Stiff	Over 50: Very Dense
	Over 30: Hard	

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

B-4

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TEST BORING LOG

Boring No. **B-5**

Project	India Street	GSI Project No.	212234	Elevation	Existing Grade
Location	Portland, Maine	Project Mgr.	HKW	Datum	N/A
Client	Atlas Investment Group, LLC.	Inspector	CMP	Date Started	2/27/2014
Contractor	East Coast Exploration, Inc.	Checked By	HKW	Date Finished	2/28/2014
Driller	Chris Powell	Rig Make	CME	Rig Model	550

Item:	Auger	Casing	Sampler	Core Barrel
Type	HS Aug		SS	
Inside Diameter (in.)	2.25"		ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☐ Track ☑ ATV
☐ Bomb. ☐ Geoprobe
☐ Tripod ☐ Other

Hammer Type: ☑ Safety Hammer ☐ Doughnut ☐ Automatic

☐ Winch ☐ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	"N" Value	Rock RQD (%)	PID Rdg. (ppm)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0									2" Asphalt 48" Frost
		S-1	2.5-4	11	15 17 4	21			Medium Dense dark brown medium to fine sand little silt
		S-2	4-6	9.5	5 2 2 3	5			Loose brown orange coarse to fine sand trace gravel trace silt
5									
		S-3	6-8	17.5	3 4 7 12	19			4.5" Medium dense brown orange coarse to fine sand trace gravel trace silt 6" Medium dense brown coarse to fine sand trace gravel trace silt 7" Medium dense black coarse sand trace silt trace ash
		S-4	8-10	24	7 5 4 3	7			2" Loose black coarse sand little silt trace ash 22" Medium stiff black silt little fine sand trace ash
10		S-5	10-12	20	5 1 2 4	6			5" Medium stiff brown silt little fine sand 2" Loose coarse to medium sand little silt 7" Medium stiff brown silt little fine sand 1" Very loose brown coarse to medium sand little silt 5" Medium stiff brown silt little fine sand
		S-6	12-14	19	6 3 10 5	15			7.5" Stiff brown clayey silt trace fine sand 11.5" Stiff gray clayey silt trace fine sand
		S-7	14-16	7.5	3 1 WOH WOH	0			7.5" Very soft gray clayey silt trace gravel
15					1				
		S-8							Shelby tube - no recovery
20									
		S-9	21-23	22	6 18 21 18	39			18" Hard gray silt trace coarse sand trace gravel 4" Hard gray silt trace coarse sand trace gravel trace clay
									Auger refusal at 23' Boring terminated at 23'
25									

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
28-Feb	8:20	20	23	8
	10:35			

Sample Identification
- O = Open Ended
- U = Undisturbed
- S = Split Spoon
- C = Rock Core
- G = Geoprobe

Cohesive Soils N-Value
- 0 to 2: Very Soft
- 2 to 4: Soft
- 4 to 8: Medium Stiff
- 8 to 15: Stiff
- 15 to 30 Very Stiff
- Over 30: Hard

Granular Soils N- Value
- 0 to 4: Very Loose
- 4 to 10: Loose
- 11 to 30: Medium Dense
- 31 to 50: Dense
- Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

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TEST BORING LOG

Boring No. **B-6**

Page 1 of 1

Project	India Street	GSI Project No.	212234	Elevation	Existing Grade
Location	Portland, Maine	Project Mgr.	HKW	Datum	N/A
Client	Atlas Investment Group, LLC.	Inspector	CMP	Date Started	2/27/2014
Contractor	East Coast Exploration, Inc.	Checked By	HKW	Date Finished	2/28/2014
Driller	Chris Powell	Rig Make	CME	Rig Model	550

Item:	Auger	Casing	Sampler	Core Barrel
Type	HS Aug		SS	
Inside Diameter (in.)	2.25"		ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☐ Track ☑ ATV
☐ Bomb. ☐ Geoprobe
☐ Tripod ☐ Other

Hammer Type: ☑ Safety Hammer ☐ Doughnut ☐ Automatic

☐ Winch ☐ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	"N" Value	Rock RQD (%)	PID Rdg. (ppm)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0									2.5" Asphalt 20" Frost
		S-1	2-4	9	2 2 2 2	4			3" Loose black medium to fine sand little silt trace ash 6.25" Loose gray coarse to fine sand little gravel trace silt
5		S-2	4-6	7	1 1 3 5	4			Loose black coarse to fine sand little silt trace gravel
		S-3	6-8	11	1 3 30 12	33			5" Dense dark brown coarse to fine sand some silt trace gravel 5.5" Hard brown silt some coarse to fine sand
		S-4	8-10	19	9 6 6 8	12			9.5" Medium dense dark brown coarse to fine sand little silt trace gravel 9.5" Medium dense dark brown coarse to fine sand trace silt
10		S-5	10-12	24	4 6 5 3	11			17.5" Medium dense black coarse to fine sand trace silt trace gravel 6.5" Stiff gray silt trace coarse to fine sand trace gravel
		S-6	12.5 - 14.5	24	1 1 1 2	2			16" Medium dense black coarse to fine sand trace silt trace gravel trace organics 8" Very loose gray fine sand trace coarse sand trace silt
15		S-7	14-16	10	2 5 7 6	12			Stiff gray silt little fine sand trace gravel
20									Auger refusal at 18' Boring terminated at 18'
25									

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
28-Feb	11:20	18	18	6
	1:15			

Sample Identification
- O = Open Ended
- U = Undisturbed
- S = Split Spoon
- C = Rock Core
- G = Geoprobe

Cohesive Soils N-Value
- 0 to 2: Very Soft
- 2 to 4: Soft
- 4 to 8: Medium Stiff
- 8 to 15: Stiff
- 15 to 30 Very Stiff
- Over 30: Hard

Granular Soils N- Value
- 0 to 4: Very Loose
- 4 to 10: Loose
- 11 to 30: Medium Dense
- 31 to 50: Dense
- Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

B-6

Geotechnical Services, Inc. ◆ 55 North Stark Highway Tel. 603.529.7766 Fax. 603.529.7080 ◆ 30 Newbury Street, Boston, MA 02116 Tel. 617.455.4248 Fax. 617.745.4308

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TEST BORING LOG

Boring No. B-7

Project	India Street	GSI Project No.	212234	Elevation	Existing Grade
Location	Portland, Maine	Project Mgr.	HKW	Datum	N/A
Client	Atlas Investment Group, LLC.	Inspector	CMP	Date Started	2/27/2014
Contractor	East Coast Exploration, Inc.	Checked By	HKW	Date Finished	2/28/2014
Driller	Chris Powell	Rig Make	CME	Rig Model	550

Item:	Auger	Casing	Sampler	Core Barrel
Type	HS Aug		SS	
Inside Diameter (in.)	2.25"		ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

Rig: ☐ Truck ☐ Skid ☐ Track ☑ ATV ☐ Bomb. ☐ Geoprobe ☐ Tripod ☐ Other

Hammer Type: ☑ Safety Hammer ☐ Doughnut ☐ Automatic

☐ Winch ☐ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	"N" Value	Rock RQD (%)	PID Rdg. (ppm)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0									2.5" Asphalt 20" Frost
		S-1	2-4	9	3 3 3 4	6			Loose brown coarse to fine sand trace silt trace gravel
5		S-2	4-6	3	4 5 7 5	12			Medium dense brown coarse to fine sand trace gravel trace silt
		S-3	6-8	16	4 5 7 6	12			Medium dense brown coarse to fine sand trace gravel trace silt
		S-4	8-10	19	5 6 10 5	16			8" Medium dense coarse to fine sand trace gravel trace silt 11" Black fine sand trace silt
10		S-5	10-12	20	2 1 1 1	2			7" Very loose black fine sand trace silt 13" Very loose moist gray fine sand little silt
		S-6	12-14	24	2 2 9 9	11			Stiff moist gray silt trace fine sand trace gravel
15		S-7	14-16	7	3 4 5 6	9			Loose gray fine sand trace silt
20		S-8	20-22	21	13 19 50 100	69			16" very dense moist gray fine sand little silt trace gravel 5" Very dense dry gray fine sand little silt trace gravel Auger refusal at 21.5' Boring terminated at 21.5'
25									

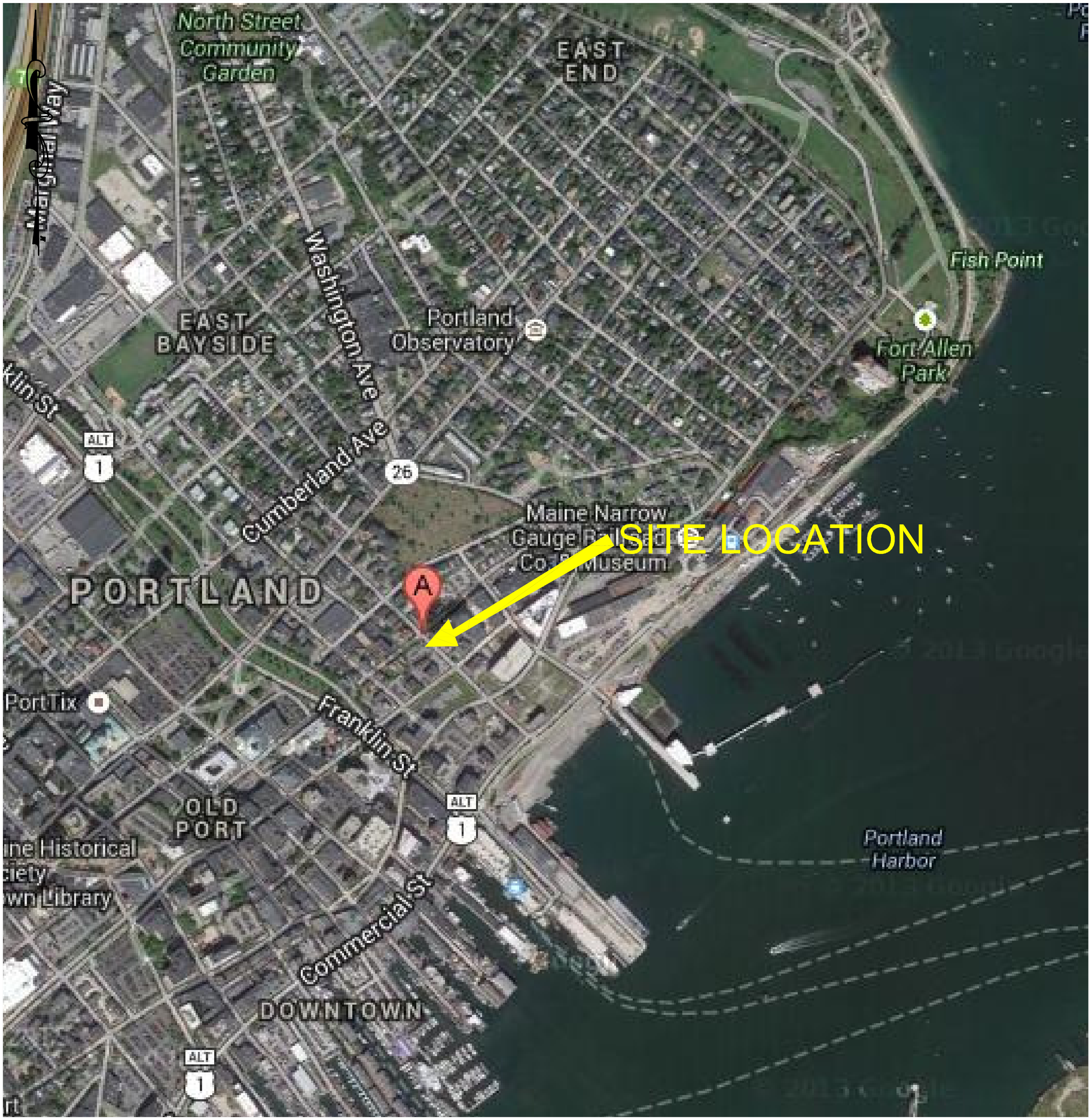
Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
28-Feb	1:55	20	21.5	16.5
	3:50			

Sample Identification	Cohesive Soils N-Value	Granular Soils N- Value
O = Open Ended	0 to 2: Very Soft	0 to 4: Very Loose
U = Undisturbed	2 to 4: Soft	4 to 10: Loose
S = Split Spoon	4 to 8: Medium Stiff	11 to 30: Medium Dense
C = Rock Core	8 to 15: Stiff	31 to 50: Dense
G = Geoprobe	15 to 30 Very Stiff	Over 50: Very Dense
	Over 30: Hard	

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

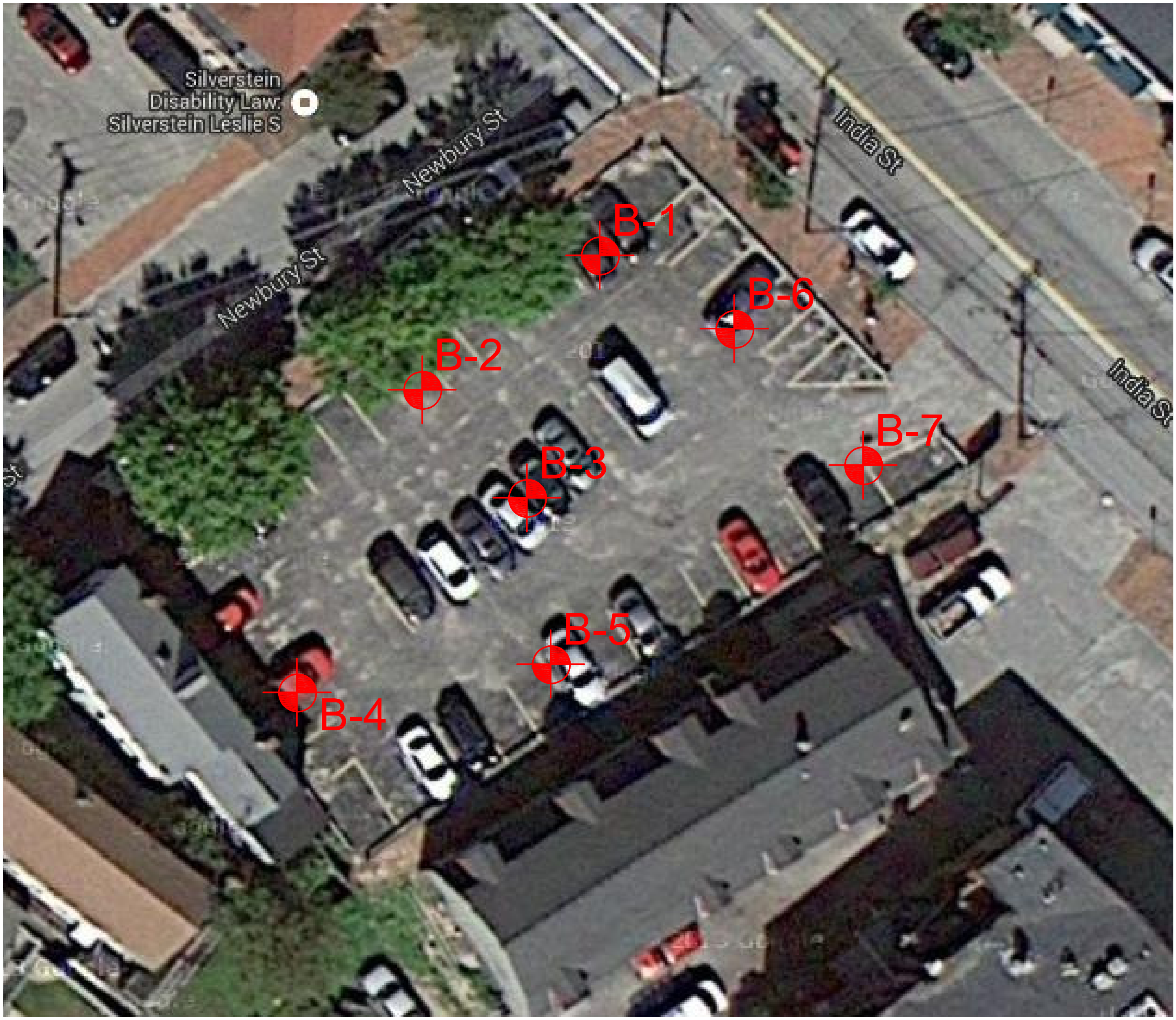


LOCUS MAP

GEOTECHNICAL SERVICES INC.
55 NORTH STARK HIGHWAY, WEARE, NH 03281
TEL. (603) 529-7766 FAX. (603) 529-7780

62 India Street
Portland, Maine

DRAWN BY: KJM	DATE: March 2014	FIGURE NO. 1
CHECKED BY: HKW	SCALE: 1" = @800'	
FILE NAME: 62 India Street.dwg	PROJECT NO.: 212234	



GSI-1 Test Boring Location (Approximate)

BORING LOCATION PLAN	GEOTECHNICAL SERVICES INC. 55 NORTH STARK HIGHWAY, WEARE, NH 03281 TEL. (603) 529-7766 FAX. (603) 529-7780

INDIA STREET DEVELOPMENT PORTLAND, ME	DRAWN BY: KJM	DATE: February 2014	FIGURE NO. 2
	CHECKED BY: HKW	SCALE: 1"=@30'	
	FILE NAME: Holderness SBP.dwg	PROJECT NO.: 214112	