Proactive by Design

Preliminary Geotechnical Engineering Report

PROPOSED MIXED-USE DEVELOPMENT

271-283 ORANGE STREET
NEW HAVEN, CONNECTICUT

September 16, 2018
File No. 05.0046334.00

PREPARED FOR:
Spring Rock Development
271-283 Orange Street
New Haven, Connecticut 06510

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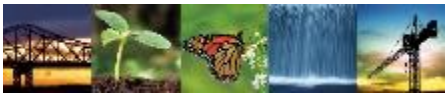

Proactive by Design

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September 16, 2018
File No. 05.0046334.00

Mr. James Carnavalla
Spring Rock Development
271-283 Orange Street
New Haven, Connecticut 06510

Re: Preliminary Geotechnical Engineering Report
Proposed Mixed-Use Development
271-283 Orange Street
New Haven, Connecticut

Dear Mr. Carnavalla:

In accordance with our proposal dated August 3, 2018, GZA GeoEnvironmental, Inc. (GZA) is pleased to submit this Preliminary Geotechnical Engineering Report for the subject project. This report summarizes our findings and presents our preliminary geotechnical engineering recommendations for design and construction. Report Limitations are attached in Appendix A.

We appreciate the opportunity to work for you on this project. Please contact the undersigned if you have any questions.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Pamela Waters, P.E.
Project Manager

Dan T. Kinard, P.E.
Consultant/Reviewer

David M. Barstow, P.E.
Associate Principal

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1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of GZA GeoEnvironmental, Inc.'s (GZA) geotechnical explorations and our preliminary geotechnical engineering recommendations for the proposed Mixed-Use Development at 271-283 Orange Street in New Haven, Connecticut. The report is subject to the Limitations presented in Appendix A.

1.2 EXISTING CONDITIONS

The property is bordered by Orange Street to the west, the Connecticut Children's Museum to the north, an asphalt-paved parking lot to the east and a restaurant building and associated asphalt-paved parking to the south. Based on the schematic plan[1] provided by you, the site has an area of approximately 0.76-acres. The site is occupied by a 2-story building with footprint of approximately 2,750 square feet, a single-story guard house and asphalt-paved parking. The existing topography was not provided, but existing grades appear to be relatively level.

1.3 PROPOSED CONDITIONS

Based on the building section plan[2] provided by you, we understand that there are three (3) proposed building configurations (Scheme A through Scheme C). The proposed building sections for Scheme A through C are presented on Figure 2. In each scheme, the proposed building will consist of a 7-story building and a below-grade basement level. The schemes include commercial retail space, amenities, residential units, and a parking garage.

Scheme A has a planned basement level in the proposed 7-story building footprint only; Scheme B has a planned basement level in both the proposed 7-story building and garage footprint; Scheme C has a planned basement level in the proposed 7-story building footprint and the detached retail building. The proposed basement finish floor will at about 10 feet below grade. We assume that the ground surface elevations will be at or near existing grades.

The proposed building column loads were not provided for any of the Schemes.

1.4 SCOPE OF SERVICES

This study was conducted in accordance with our revised proposal dated August 3, 2018. The scope of services included evaluating the subsurface conditions encountered in the test borings to determine the physical properties and characteristics of subsurface materials and prepare preliminary geotechnical design recommendations for the proposed development that is in the early planning stages.

Specifically, conclusions and preliminary recommendations are presented regarding the following:

1. Suitable foundation types, including allowable bearing pressure.
2. Slabs-on-grade.
3. Groundwater levels.
4. Lateral earth pressure for design of walls below grade.
5. Site Class and potential for soil liquefaction.

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[1] "Orange Street Mixed-Use, 271-283 Orange Street, New Haven, CT, Scheme B-92 Units-Ground Level Diagrams," by Newman Architects, dated June 28, 2018, Sheets B-1 to B-2.

[2] "Orange Street Mixed-Use, 271-283 Orange Street, New Haven, CT, Sections," by Newman Architects, dated June 28, 2018, Sheet ABC-3.

6. Reuse of existing soil materials.
7. Other subsurface conditions that may affect design or construction of the structure.

This preliminary report has been prepared for the exclusive use of Spring Rock Development, Orange, Connecticut, for specific application to the proposed Mixed-use Development at 271-283 Orange Street in New Haven, Connecticut. In the event the nature, design, or location of the proposed construction changes, the conclusions and recommendations in this report may no longer be valid.

2.0 GEOTECHNICAL INVESTIGATION

2.1 TEST BORINGS

Six test borings, GZ-1 through GZ-6 were drilled on August 9, 10, and 24, 2018 by Seaboard Drilling, Springfield, Massachusetts at the locations presented on the attached Figure 1, Exploration Location Plan. The test borings were monitored and logged by GZA personnel. Boring logs are provided in Appendix B.

Test borings GZ-1 through GZ-4 and GZ-6 were advanced using cased rotary-wash drilling methods with 4-inch-diameter casing and drilled with a roller bit. This method uses drilling fluid in the cased boreholes to flush the soil from the casing. Test boring GZ-5 was advanced with 4-1/4" I.D. hollow-stem augers that provided cased holes from which samples could be extracted. Samples were collected with a 1-3/8" I.D. split-spoon sampler driven 24 inches into the ground with a 140 lb. hammer falling 30 inches. Blows per 6 inches on the sampler were recorded. The number of hammer blows required to drive the sampler through the middle two six-inch increments were recorded as the standard penetration resistance (SPT N) value from which relative density and other soil characteristics can be estimated. The soils were classified according to the modified Burmister classification system. Details of the modified Burmister classification system are presented with the boring logs in Appendix B.

The test borings were located by line of sight and tape measurements from existing site features. Surface elevations at the test borings were approximated using a survey level. The existing manhole cover in the northeastern area of the site was used as a benchmark. The manhole cover elevation is not known and GZA used an assumed elevation of El. 100 feet.

2.2 WATER LEVEL READINGS

The rotary-wash drilling method requires drilling fluid to circulate through the cased borehole and groundwater levels cannot be accurately measured in the boring during drilling. Water level readings were attempted in the boreholes prior to water being introduced during drilling or at the time of their completion. A groundwater observation well was installed in test boring GZ-5. It should be noted that future water levels may vary due to seasonal and climatic fluctuations, changes caused by construction and stabilization time.

2.3 INFILTRATION TESTS

Two borehole infiltrometer tests were performed in borings GZ-1 and GZ-2 on August 9, 2018 in general accordance with USBR 7300-89 (Performing Field Permeability Testing by the Well Permeameter Method). The tests were performed in the New Haven Outwash Deposits at a depth of 7-feet below grade. The test method consisted of installing a 5-inch diameter flush-joint, steel casing to the desired test depth, removing the drilling spoils from the casing, adding water inside the casing to a test water height, and directly measuring the time and volume of water to keep a constant water height in the casing. A discussion of the infiltration test results and the recommended design infiltration rates are presented in Section 4.7 below.

3.0 SUBSURFACE CONDITIONS

Test borings GZ-1 through GZ-6 were drilled in the proposed building and garage footprints. Based on the results of the test borings, the subsurface conditions provide a generalized subsurface profile consisting, in descending order beneath the asphalt, existing fill and New Haven Outwash Deposits (naturally-deposited soil). Asphalt was encountered at the ground surface in the test borings and ranged in thickness from 2 to 6 inches thick. Fill was encountered in each test boring below the asphalt to depths between 2.5- and 6.4-feet below grade. The fill generally consisted of loose to medium dense sand with varying amounts of gravel and silt. Trace amounts of debris consisting of brick and ash was also encountered in the fill.

The New Haven Outwash Deposits were encountered beneath the fill to boring termination depths between 27- and 52-feet below existing grades. New Haven Outwash sediments overlay the bedrock which was not encountered. Based on published geologic data, bedrock depths are estimated to be 100 to 150 below existing ground surface. The Outwash Deposits consisted of loose to medium dense sand with varying amounts of gravel and silt.

3.1 GROUNDWATER DATA

During drilling, groundwater levels were encountered in test borings GZ-2 and GZ-4 at depths between 17- and 14.6-feet below existing grades, respectively. A groundwater observation well was installed in test boring GZ-5(OW). Groundwater was measured 20 days after installation at a depth of 21.6-feet below grade. Further details regarding groundwater are presented on the boring logs in Appendix B.

4.0 PRELIMINARY RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

The preliminary geotechnical design and construction recommendations are intended to be consistent with the 2012 International Building Code (IBC), and the Connecticut State Supplements, which together constitute the 2016 State of Connecticut Building Code.

4.1 GENERAL

The existing fill is not suitable for support of new foundations or slabs-on-grade. Building debris from demolition activities and other deleterious materials (pavement, utilities, etc., if encountered) are also considered unsuitable material. If encountered during construction, these unsuitable materials must be removed from the entire proposed building footprint and a lateral distance beyond the outside edge of the footings equal to the thickness of Controlled Fill to be placed.

The extent of fill encountered in the test borings was up to 6.4 feet below existing grades. Most of the existing fill will be removed during mass excavation for the basement level. Any existing utilities that are encountered should be removed from within the limits of the proposed building footprint and capped or rerouted during construction. Fill any excavations with compacted Controlled Fill. If utilities are to remain in-place, the utilities should be protected during construction activities.

4.2 FOUNDATIONS

The proposed building can be supported on spread footings bearing on naturally-deposited granular soils, compacted Controlled Fill or Crushed Stone over naturally-deposited granular soil. Proportion spread footings on the basis of a net allowable bearing pressure of 5,000 pounds per square foot (psf). The minimum footing width should be 2.5 feet for

rectangular footings and 2 feet for continuous footings. All footings exposed to frost should be embedded a minimum of 3.5 feet below finished grade.

Column loads for the proposed building were not provided. Based on the proposed design schemes, GZA assumed a maximum column load of 800 kips for the estimated settlement calculation. For site preparation and foundations designed and constructed in accordance with the recommendations of this report, estimated total and differential building settlements are expected to be on the order of 1 inch and ½ inch, respectively, the majority of which will occur during construction. GZA recommends being provided with the final design loads so that we check our preliminary foundation design recommendations.

4.3 SLABS-ON-GRADE

The existing fill is not suitable for support of slabs-on-grade and must be removed from the entire footprint of the proposed building. Suitable subgrades for slabs-on-grade include compacted Controlled Fill and naturally-deposited granular soil. A vapor barrier and a minimum of 12 inches of base course (¾" crushed stone) should be placed beneath all interior slabs-on-grade. The Crushed Stone should be separated from the subgrade soils with geotextile fabric (Mirafi 140N or equal).

4.4 TEMPORARY LATERAL EARTH SUPPORT

Where lateral constraints, such as property lines, underground utilities and existing parking, prevent cutting OSHA slopes in the soil along the exterior sides of the building excavation, temporary shoring will be required. Portions of the proposed building with a basement level are with 5 feet of the property boundary will require temporary lateral earth support for the proposed foundation construction. We assume the proposed excavation for the basement will be about 15-feet deep and a cantilever, soldier piles and lagging wall is a suitable method for temporary lateral earth support. GZA also considered a sheet pile wall for temporary lateral earth support. However, a sheet pile wall is not suitable due to potential vibration induced settlement of the adjacent existing buildings and utilities during installation. The temporary lateral earth support design should be prepared by a Professional Engineer registered in Connecticut.

4.5 LATERAL EARTH PRESSURES

Restrained walls should be designed on the basis of a lateral soil pressure equivalent to a fluid pressure of 55 psf per foot of depth, plus a uniform pressure equal to one half of any surcharge. Unrestrained walls should be designed on the basis of a lateral soil pressure equivalent to a fluid pressure of 35 psf per foot of depth, plus a uniform pressure equal to one third of any surcharge.

The recommendations provided above do not include an allowance for hydrostatic pressures on the walls. To reduce the possibility of hydrostatic pressures, Free Draining Backfill should be used for wall backfill within 3 feet laterally of the back of the wall. Wall drains are recommended for site retaining walls and for any building walls subject to unbalanced lateral earth pressures. Wall drains should consist of a 4-inch diameter perforated plastic (PVC) pipe with an annulus of ¾-inch size Crushed Stone, which is in turn separated from the wall backfill with a Mirafi 140N (or equal) non-woven geotextile fabric at footing grade.

For cast-in-place concrete, an ultimate friction factor of 0.45 can be used to determine the footing sliding resistance at the base.

4.6 SEISMIC DESIGN PARAMETERS

The on-site soils are not susceptible to liquefaction during the IBC design earthquake. In accordance with IBC 2012, the site may be classified at Site Class D. The 2016 Connecticut State Building Code indicates the site's design response spectra be constructed using the following coefficients:

S_S = 0.186g S_1 = 0.062g

where:

- S_S is the spectral acceleration coefficient at 0.2-sec period
- S_1 is the spectral acceleration coefficient at 1.0-sec period

4.7 DESIGN INFILTRATION RATES

Based on the 2004 Connecticut Stormwater Quality Manual (CSQM), measured infiltration rates and subsurface conditions encountered, GZA recommends an infiltration rate of 0.1 inches per hour. The CSQM published by the Connecticut Department of Environmental Protection recommends that the field-measured infiltration rates should be reduced by a Safety Factor of 2 for design to account for clogging over time. The recommended infiltration rate above has the factor of safety applied.

4.8 EXCAVATION SLOPES

The Contractor is responsible for construction site safety and should be aware that slope height, slope inclination and excavation depths should in no case exceed those specified in local, state, or federal safety regulations (e.g. OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926). Temporary cut and fill slopes in soil should be no steeper than 1.5H:1V. As a safety measure, it is recommended that all vehicles and earth stockpiles be kept a lateral distance away from the edge of excavations at least equal to the slope height. Protect slope faces against the weather elements.

4.9 RECOMMENDED BACKFILL

Considering project requirements and available on-site and local materials, it is recommended that earth materials for fill, backfill and refill for this project be specified as follows:

Controlled Fill is defined as an inorganic, well-graded granular material with a maximum size of 3", 25% to 70% passing the #4 sieve and less than 10% by weight passing the #200 sieve.

Crushed Stone should consist of 3/8- to 3/4-inch minus angular crushed stone and should conform to CTDOT Form 817, Division III, Section M.01.01, No. 8 or No. 6. Crushed stone should be compacted to an unyielding surface.

Free-Draining Backfill is defined as a well-graded granular material with a maximum size of 3", 25% to 70% passing the #4 sieve, and less than 6% by weight passing the #200 sieve.

Processed Aggregate Base below pavements should consist of CTDOT Form 817, Division III, Section M.05.01, Processed Aggregate Base.

Pavement Subbase below pavements should consist of CTDOT Form 817, Division III, Section M.02.06, Grading B.

The recommended minimum degree of compaction for fill and backfill, based on percentage of maximum dry density as determined by ASTM D1557 (modified Proctor), is:

Below Structures	-	95%
Retaining Wall Backfill	-	95%
Pavement/Sidewalk Base and Subbase	-	95%
Utility Trenches (within 1½ feet of surface)	-	95%
Utility Trenches (more than 1½ feet below surface)	-	92%
Areas of General Landscape	-	92%

Recommended maximum loose lift thicknesses for soil fill and the minimum number of passes of compaction equipment are summarized on the following table.

		Maximum Loose Lift Thickness		**Minimum Number of Passes**	
Compaction Method	**Maximum Stone Size**	**Below Structures and Pavement**	**Less Critical Areas**	**Below Structures and Pavement**	**Less Critical Areas**
Hand-operated vibratory plate or light roller in confined areas	3”	6”	8”	6	4
Hand-operated vibratory drum rollers weighing at least 1,000# in confined areas	6”	8”	10”	6	4
Light vibratory drum roller, minimum dynamic force 3,000# per foot of drum width	6”	10”	14”	6	4
Medium to heavy vibra. drum roller, min. dynamic force 5,000-8,000# per foot drum width	8”	12”	18”	6	4

The Contractor should reduce or stop drum vibration if pumping or weaving of the subgrade is observed. Crushed Stone should be compacted to create an unyielding surface.

Compaction within 3-feet of retaining and foundation walls should be performed using hand-operated roller or plate compactors to reduce the potential for construction-induced damage to the walls. Extra care should be used when compacting adjacent to walls.

5.0 FINAL DESIGN, CONSTRUCTION TESTING, AND OBSERVATION

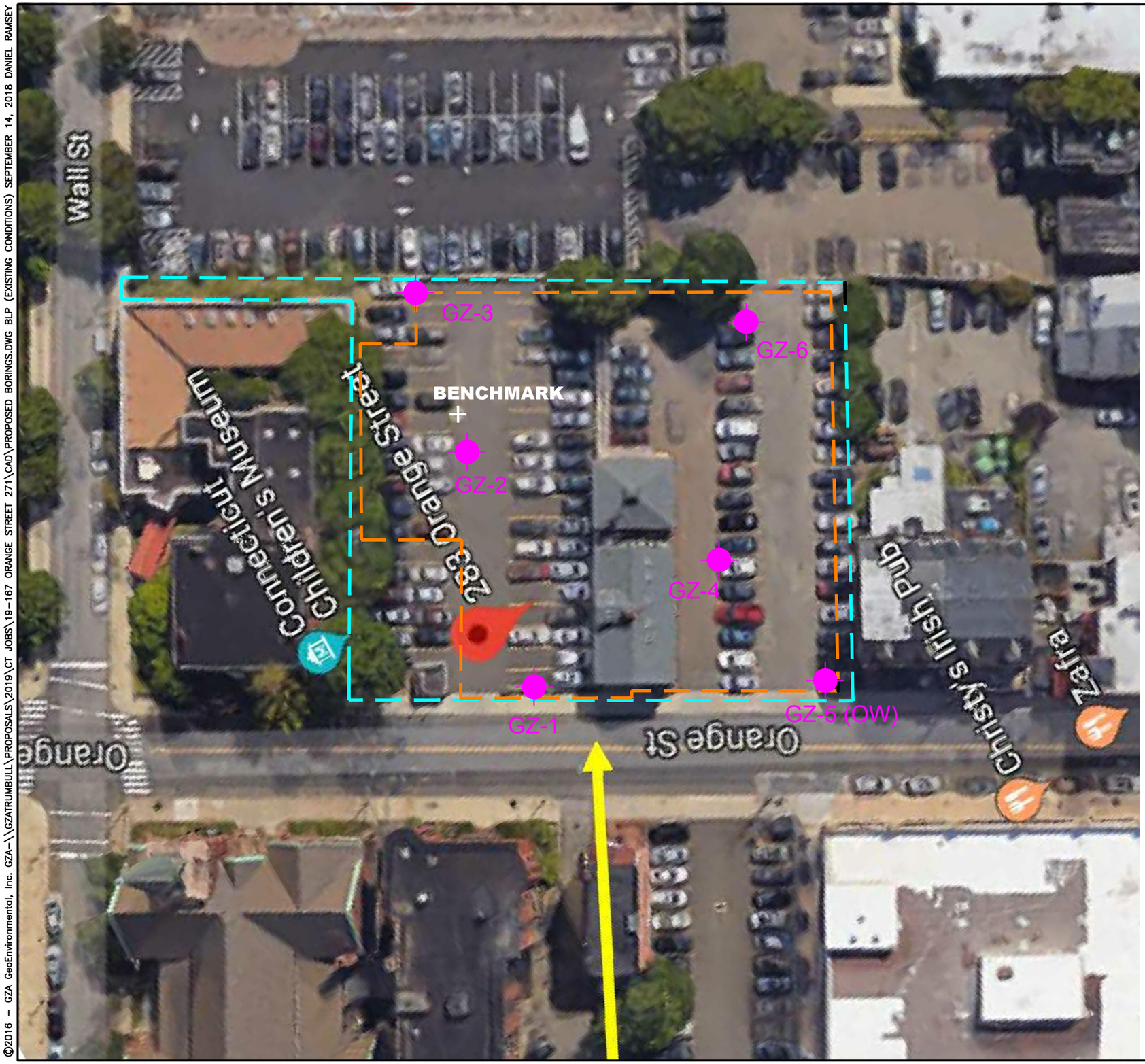
The proposed building schemes are preliminary. This Preliminary Geotechnical report provides a summary of the subsurface condition encountered in the widely-spaced test borings and preliminary recommendations for cost estimating and project development purposes. GZA should be provided with an opportunity to review final plans and specifications prior to bidding to determine that our geotechnical recommendations have been properly interpreted and implemented. Based on the final building design, additional explorations may be required to further evaluate the subsurface conditions. This information would be used to prepare our final design geotechnical report and assist the team in preparing specification for earthwork and temporary or permanent lateral support.

GZA should observe and document key geotechnical components of construction, and provide ongoing geotechnical consulting including the following:

- Pre and post construction surveys or adjacent buildings;
- Vibration monitoring during support of excavation installation;
- Observation/documentation of temporary lateral earth support installation;
- Observation/documentation of unsuitable soil excavation and replacement and testing;
- Observation/documentation of foundation subgrade preparation; and
- Placement of compacted fill.

We recommend that GZA be retained to provide observation and services during these operations in order to mitigate potential delays to the project schedule. Our involvement during construction will: 1) allow evaluation of actual conditions exposed during excavation; and 2) allow for a prompt response should unanticipated conditions be encountered.

Figures



GENERAL NOTES

1. BASE MAP DEVELOPED FROM A GOOGLE EARTH SCREENSHOT DEPICTING 271–283 ORANGE STREET, NEW HAVEN, CT.
2. THE PURPOSE OF THIS DRAWING IS TO LOCATE, DESCRIBE, AND REPRESENT THE POSITIONS OF TEST BORINGS IN RELATION TO THE SUBJECT SITE. THIS DRAWING IS NOT CONSIDERED A LAND SURVEY. THE LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USE.

LEGEND

GZ-1 — INDICATES APPROXIMATE LOCATION OF TEST BORINGS PERFORMED BY SEABOARD DRILLED AND OBSERVED BY GZA PERSONNEL.

INDICATES APPROXIMATE PROPERTY BOUNDARY LINE

INDICATES APPROXIMATE BUILDING FOOTPRINT

N

0 20' 40' 80' 240'

SCALE IN FEET 1" = 40'

NO.	ISSUE/DESCRIPTION	BY	DATE

271-283 ORANGE STREET
NEW HAVEN, CONNECTICUT

EXPLORATION LOCATION PLAN

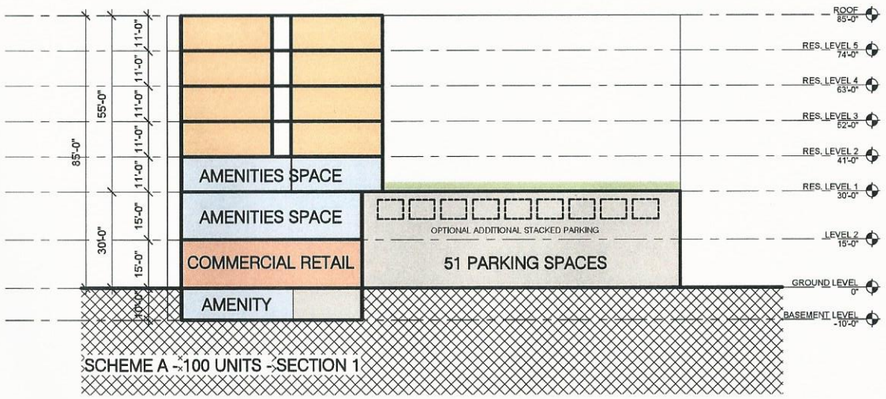
PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
SPRING ROCK DEVELOPMENT
271 ORANGE STREET
NEW HAVEN, CT

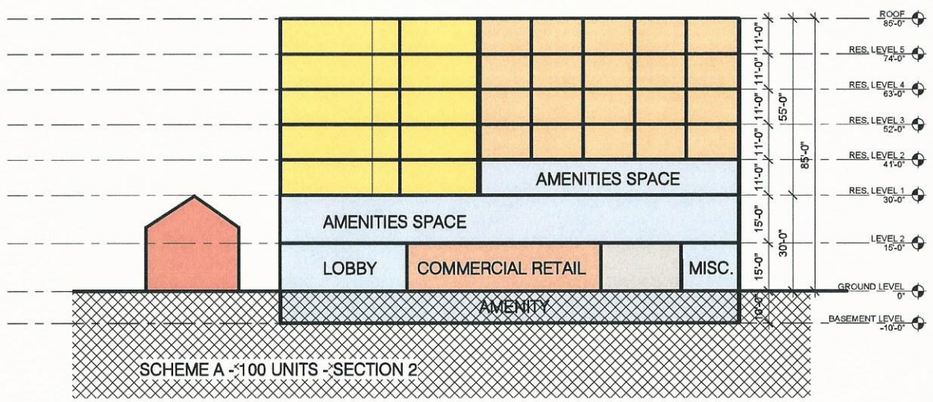
PROJ MGR: PW	REVIEWED BY: PW	CHECKED BY: DMB	FIG OR DWG 1
DESIGNED BY: BC	DRAWN BY: BC	SCALE: 1" = 40'	
DATE: SEPTEMBER 2018	PROJECT NO. 05.0046334.00	REVISION NO.	SHEET NO. 1 OF 1

FIGURE 2 - PROPOSED DESIGN SCHEMES

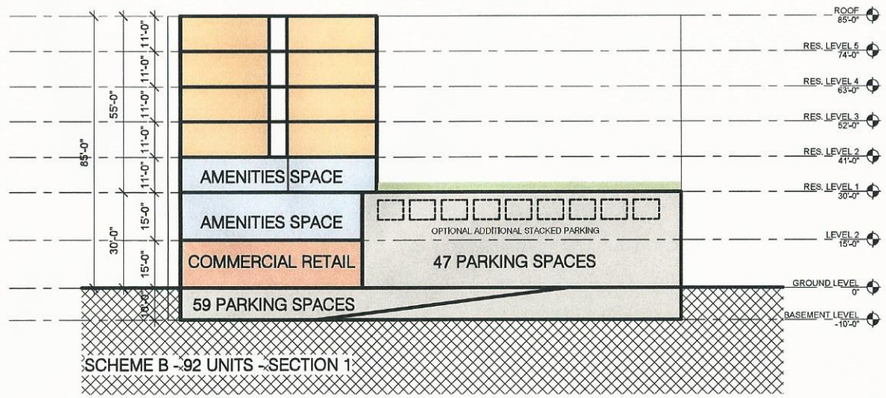
MIXED-USE RESIDENTIAL DEVELOPMENT
271-283 ORANGE STREET, NEW HAVEN, CT
GZA PROJECT NO. 05.0046334.00



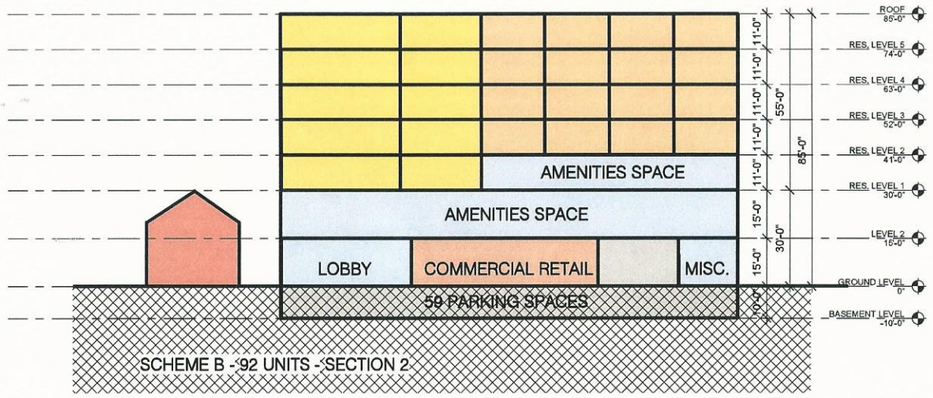
SCHEME A - 100 UNITS - SECTION 1



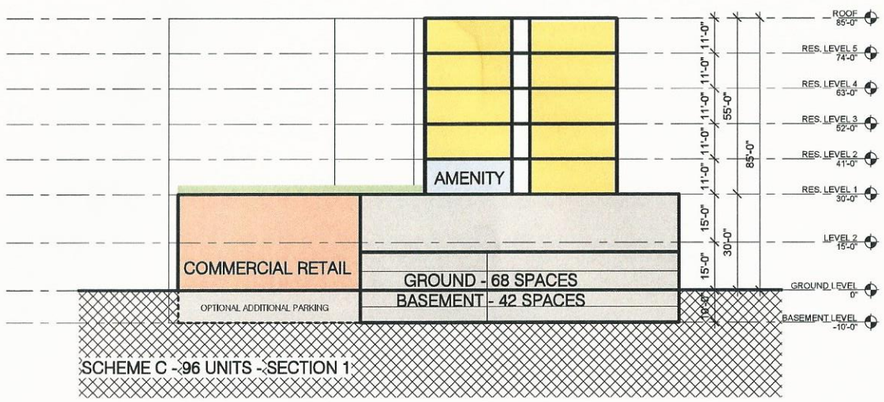
SCHEME A - 100 UNITS - SECTION 2



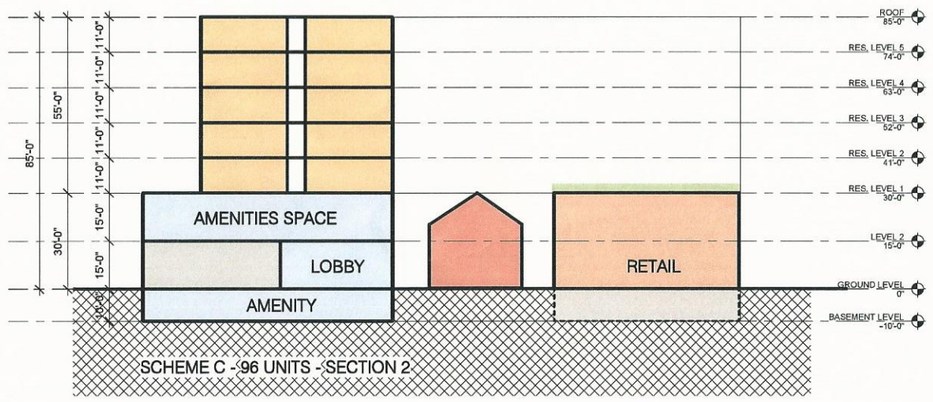
SCHEME B - 92 UNITS - SECTION 1



SCHEME B - 92 UNITS - SECTION 2



SCHEME C - 96 UNITS - SECTION 1



SCHEME C - 96 UNITS - SECTION 2

Appendix A – Limitations

USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the contract documents, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report,as appropriate, to reflect the unanticipated changed conditions .

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, express or implied, is made.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

SUBSURFACE CONDITIONS

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

7. Water level readings have been made in test holes (as described in this Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

8. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

9. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

COMPLIANCE WITH CODES AND REGULATIONS

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

ADDITIONAL SERVICES

11. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

Appendix B – Test Boring Logs

LOG KEY

GZA
Geo Environmental, Inc.
Engineers and Scientists

BURMISTER SOIL CLASSIFICATION

COMPONENT	NAME	PROPORTIONAL TERM	PERCENT BY WEIGHT
MAJOR	GRAVEL, SAND, FINES*		>50
Minor	Gravel, Sand, Fines*	and	35 - 50
		some	20-35
		little	10-20
		trace	0-10

*See identification of fines table.

IDENTIFICATION OF FINES

Material	PI	Atterberg Thread Dia.
SILT	0	Cannot Roll
Clayey SILT	1-5	1/4"
SILT & CLAY	5-10	1/8"
CLAY & SILT	10-20	1/16"
Silty CLAY	20-40	1/32"
CLAY	>40	1/64"

GRADATION DESIGNATION	PROPORTION OF COMPONENT
Fine to coarse	All fractions > 10%
Medium to coarse	<10% fine
Fine to medium	<10% coarse
Coarse	<10% fine and medium
Medium	<10% coarse and fine
Fine	<10% coarse and medium

PLASTIC SOILS

Consistency	Blows/Ft. SPT N-Value
Very Soft	< 2
Soft	2 - 4
Medium Stiff	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	>30

GRAVEL & SAND

Density	Blows/Ft. SPT N-Value
Very Loose	< 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) (ASTM D 2487)

MAJOR DIVISIONS			Group Symbols
Coarse Grained Soils More than 50% of material larger than No. 200 sieve.	Gravel More than 50% larger than No. 4 sieve.	Clean Gravels (Little or no fines)	GW GP
		Gravels with Fines (Appreciable amount of fines)	GM GC
	Sand More than 50% smaller than No. 4 sieve.	Clean Sands (Little or no fines)	SW SP
		Sands with Fines (Appreciable amount of fines)	SM SC
Fine Grained Soils More than 50% of material smaller than No. 200 sieve.		Silts and Clays Liquid Limit <50	ML CL
		Silts and CLays Liquid Limit >50	OL MH CH OH
		Highly Organic Soils	Pt

ORGANIC SOIL CLASSIFICATION

Fibrous PEAT (Pt) - Lightweight, spongy, mostly visible organic matter, water squeezes readily from sample. Typically near top of deposit.
Fine Grained PEAT (Pt) - Lightweight, spongy, little visible organic matter, water squeezes readily from sample. Typically below fibrous peat.
Organic Silt (OL) - Typically gray to dark gray, often has strong H2S odor. Typically contains shells or shell fragments. Lightweight. Usually found near coastal regions. May contain wide range of sand fractions.
Organic Clay (OH) - Typically gray to dark gray, high plasticity. Usually found near coastal regions. May contain wide range of sand fractions. Need organic content test for final identification.

ABBREVIATIONS

MR = Mud Rotary
HSA = Hollow Stem Auger
SSA = Solid Stem Auger
SS = Split Spoon Sampler
U = Undisturbed Sample (Shelby Tube)
MC = Modified California Sampler
V = Vibracore
M = Macrocore

USCS = Unified Soil Classification System (ASTM D2487)
NYCBC = New York City Building Code
WOR = Weight of Rods
WOH= Weight of Hammer
SPT = Standard Penetration Test (ASTM D1586)

Tv = Field Vane Shear Test (Torvane) Shear Strength
PP = Pocket Penetrometer Shear Strength
PI = Plasticity Index
Wn = Moisture Content
CO = Consolidation
UC = Unconfined Compression Test
UU = Unconsolidated Undrained (Triaxial) Test
SI = Sieve Analysis
DS = Direct Shear
PID = Photoionization Detector
ppm = Parts Per Million
REC = Recovery
RQD = Rock Quality Designation
▼ = Measured Water Level

N-Value = Cumulative number of uncorrected blows for the middle two six-inch intervals (blows/foot).

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

271-283 Orange Street
New Haven, Connecticut

EXPLORATION NO.: GZ-1
SHEET: 1 of 1
PROJECT NO: 05.0046334.00
REVIEWED BY: P. Waters

Logged By: J. Bedoya
Drilling Co.: Seaboard Drilling
Foreman: D. Robeau

Type of Rig: Truck
Rig Model: Mobile B53
Drilling Method: Cased Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 101.2
Final Boring Depth (ft.): 27
Date Start - Finish: 8/9/2018 - 8/9/2018

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/9/18		See Note 2	

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		SS-1	0.5-2.5	24	19	4 3 2 2	5	SS-1 : Loose, reddish brown, fine to coarse SAND, little Silt, trace fine Gravel, trace Brick, trace Ash			0.3	ASPHALT	100.9
		SS-2	2.5-4.5	24	15	2 2 2 4	4	SS-2 : Loose, reddish brown, fine to coarse SAND, trace fine Gravel, trace Silt				FILL	
5		SS-3	4.5-6.5	24	14	9 10 17 19	27	SS-3 : Medium dense, grey/red, fine to coarse SAND, some fine to coarse Gravel, trace Silt	1		6		95.2
10		SS-4	10-12	24	5	6 7 8 9	15	SS-4 : Medium dense, reddish brown, fine to coarse SAND, little Silt, little fine to coarse Gravel					
15		SS-5	15-17	24	0	6 8 7 6	15	SS-5 : No Recovery				OUTWASH DEPOSITS	
20		SS-6	20-22	24	4	5 3 3 4	6	SS-6 : Loose, reddish brown, fine to coarse SAND, little fine to coarse Gravel, trace Silt					
25		SS-7	25-27	24	7	5 6 5 7	11	SS-7 : Medium dense, brown, fine to coarse SAND, trace Silt			27		74.2
30								End of exploration at 27 feet below grade.	2				

REMARKS

1 - Infiltration test done at 7 ft., 4" casing
2 - Groundwater not observed due to introduction of water for infiltration testing

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-1

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

271-283 Orange Street
New Haven, Connecticut

EXPLORATION NO.: GZ-2
SHEET: 1 of 2
PROJECT NO: 05.0046334.00
REVIEWED BY: P. Waters

Logged By: D. Ramsey
Drilling Co.: Seaboard Drilling
Foreman: D. Robeau

Type of Rig: Truck
Rig Model: Mobile B53
Drilling Method: Cased Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 100.7
Final Boring Depth (ft.): 31
Date Start - Finish: 8/24/2018 - 8/24/2018

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/24/18	1035	17'	25 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		SS-1	0.5-2.5	24	13	6 5 7 11	12	SS-1 : Medium dense, reddish brown, fine to coarse SAND, litlte fine to coarse Gravel, little Silt, trace Brick			0.2	ASPHALT	100.5
												FILL	
		SS-2	2.5-4.5	24	0	11 11 11 12	22	SS-2 : No Recovery	1		2.5		98.2
5		SS-3	4.5-6.5	24	16	18 28 22 19	50	SS-3 : Dense, reddish brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt	2				
10		SS-4	10-12	24	12	16 15 12 9	27	SS-4 : Medium dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt					
15		SS-5	15-17	24	9	6 7 9 8	16	SS-5 : Medium dense, reddish brown, fine to medium SAND, trace Silt				OUTWASH DEPOSITS	
20		SS-6	20-22	24	8	5 5 6 7	11	SS-6 : Medium dense, reddish brown, fine SAND, little Silt					
25		SS-7	25-27	24	0	4 4 5 6	9	SS-7 : No Recovery					
		SS-8	27-29	24	7	2 3 6 7	9	SS-8 : Loose, reddish brown, fine to medium SAND, little fine Gravel, trace Silt					
30		SS-9	29-31	24	18	4 5	13	SS-9 : Medium dense, reddish brown, fine to medium SAND,					

REMARKS

1 - Possible cobble at 2.5 ft.
2 - Infiltration test performed at 7 ft. below grade

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-2

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

271-283 Orange Street
New Haven, Connecticut

EXPLORATION NO.: GZ-2
SHEET: 2 of 2
PROJECT NO: 05.0046334.00
REVIEWED BY: P. Waters

Logged By: D. Ramsey
Drilling Co.: Seaboard Drilling
Foreman: D. Robeau

Type of Rig: Truck
Rig Model: Mobile B53
Drilling Method: Cased Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 100.7
Final Boring Depth (ft.): 31
Date Start - Finish: 8/24/2018 - 8/24/2018

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/24/18	1035	17'	25 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
						8 10		trace Silt			31	OUTWASH DEPOSITS	69.7
								End of exploration at 31 feet below grade.					
35													
40													
45													
50													
55													
60													

REMARKS

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-2

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

271-283 Orange Street
New Haven, Connecticut

EXPLORATION NO.: GZ-3
SHEET: 1 of 1
PROJECT NO: 05.0046334.00
REVIEWED BY: P. Waters

Logged By: J. Bedoya
Drilling Co.: Seaboard Drilling
Foreman: D. Robeau

Type of Rig: Truck
Rig Model: Mobile B53
Drilling Method: Cased Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 103.2
Final Boring Depth (ft.): 27
Date Start - Finish: 8/9/2018 - 8/9/2018

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/9/18		See Note 2	

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		SS-1	0.5-2.5	24	6	5 5 3 2	8	SS-1 : Loose, black, reddish brown, fine to coarse SAND and SILT, little fine Gravel			0.3	ASPHALT	102.9
		SS-2	2.5-4.5	24	9	2 4 10 18	14	SS-2 : Medium dense, reddish brown, fine to coarse SAND, some fine to coarse Gravel, little Silt				FILL	
5		SS-3	4.5-6.5	24	19	19 11 10 9	21	SS-3 : Top 7": Reddish brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt Bottom 12": Brown, fine to medium SAND, trace Silt	1		5		98.2
10		SS-4	10-12	24	11	18 38 23 24	61	SS-4 : Very dense, reddish brown, fine to coasre SAND and fine to coarse GRAVEL, little Silt					
15		SS-5	15-17	24	6	8 7 8 8	15	SS-5 : Medium dense, reddish brown, fine to coarse SAND, little Silt, trace fine Gravel				OUTWASH DEPOSITS	
20		SS-6	20-22	24	0	10 8 9 8	17	SS-6 : No Recovery					
25		SS-7	25-27	24	10	6 6 7 8	13	SS-7 : Medium dense, reddish brown, fine to medium SAND, trace Silt			27		76.2
30								End of exploration at 27 feet below grade.	2				

REMARKS

1 - Rollter bit chatter from 4.5 ft. to 15 ft.
2 - Water table not observed due to the introduction of drilling water

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-3

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

271-283 Orange Street
New Haven, Connecticut

EXPLORATION NO.: GZ-4
SHEET: 1 of 2
PROJECT NO: 05.0046334.00
REVIEWED BY: P. Waters

Logged By: D. Ramsey
Drilling Co.: Seaboard Drilling
Foreman: D. Robeau

Type of Rig: Truck
Rig Model: Mobile B53
Drilling Method: Cased Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 103.7
Final Boring Depth (ft.): 52
Date Start - Finish: 8/10/2018 - 8/10/2018

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/10/18		14.6	3 hrs.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-1	0-2	24	16	30 7 6 6	13	SS-1 : Top 6": ASPHALT Bottom 10": Brown, fine to coarse SAND, trace fine Gravel, trace Silt			0.5	ASPHALT	103.2
		SS-2	2-4	24	13	3 2 2 2	4	SS-2 : Loose, brown, fine to medium SAND, little Silt				FILL	
5		SS-3	4-6	24	17	2 6 10 9	16	SS-3 : Top 16": Brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt. Bottom 1": Brown, red/brown, fine to medium SAND, trace Silt			5.9		97.8
		SS-4	6-8	24	16	7 5 4 5	9	SS-4 : Loose, reddish brown, fine to medium SAND, trace Silt	1				
10		SS-5	10-12	24	11	21 31 33 28	64	SS-5 : Very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace Silt	2				
15		SS-6	15-17	24	0	13 12 10 10	22	SS-6 : No Recovery				OUTWASH DEPOSITS	
20		SS-7	20-22	24	15	6 12 11 10	23	SS-7 : Medium dense, brown, fine to medium SAND, trace Silt					
25		SS-8	25-27	24	14	9 9 6 8	15	SS-8 : Medium dense, brown, fine to medium SAND, trace Silt					
30													

REMARKS

1 - Groundwater was not encountered prior to the introduction of drilling fluid at 8 ft.
2 - Piece of coarse gravel stuck in spoon tip

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-4

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

271-283 Orange Street
New Haven, Connecticut

EXPLORATION NO.: GZ-4
SHEET: 2 of 2
PROJECT NO: 05.0046334.00
REVIEWED BY: P. Waters

Logged By: D. Ramsey
Drilling Co.: Seaboard Drilling
Foreman: D. Robeau

Type of Rig: Truck
Rig Model: Mobile B53
Drilling Method: Cased Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 103.7
Final Boring Depth (ft.): 52
Date Start - Finish: 8/10/2018 - 8/10/2018

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/10/18		14.6	3 hrs.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-9	30-32	24	14	6 5 7 7	12	SS-9 : Medium dense, brown, fine to coarse SAND, trace fine Gravel, trace Silt					
		SS-10	32-34	24	8	6 6 7 9	13	SS-10 : Medium dense, brown, fine to coarse SAND, trace Silt					
35		SS-11	35-37	24	12	9 11 13 13	24	SS-11 : Medium dense, brown, fine to medium SAND, trace Silt					
40		SS-12	40-42	24	17	5 6 7 6	13	SS-12 : Medium dense, brown, fine to medium SAND, trace Silt				OUTWASH DEPOSITS	
		SS-13	42-44	24	17	6 8 7 5	15	SS-13 : Medium dense, brown, fine to medium SAND, trace Silt					
45		SS-14	45-47	24	12	4 6 8 8	14	SS-14 : Medium dense, brown, fine to medium SAND, trace fine Gravel, trace Silt					
		SS-15	47-49	24	16	6 8 10 13	18	SS-15 : Medium dense, brown, fine to medium SAND, trace Silt					
50		SS-16	50-52	24	13	8 10 8 9	18	SS-16 : Medium dense, brown, fine to medium SAND, trace Silt			52		51.7
								End of exploration at 52 feet below grade.					
55													
60													

REMARKS

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-4

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

271-283 Orange Street
New Haven, Connecticut

EXPLORATION NO.: GZ-5 (OW)
SHEET: 1 of 1
PROJECT NO: 05.0046334.00
REVIEWED BY: P. Waters

Logged By: D. Ramsey
Drilling Co.: Seaboard Drilling
Foreman: D. Robeau

Type of Rig: Truck
Rig Model: Mobile B53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 102.3
Final Boring Depth (ft.): 27
Date Start - Finish: 8/10/2018 - 8/10/2018

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: N/A

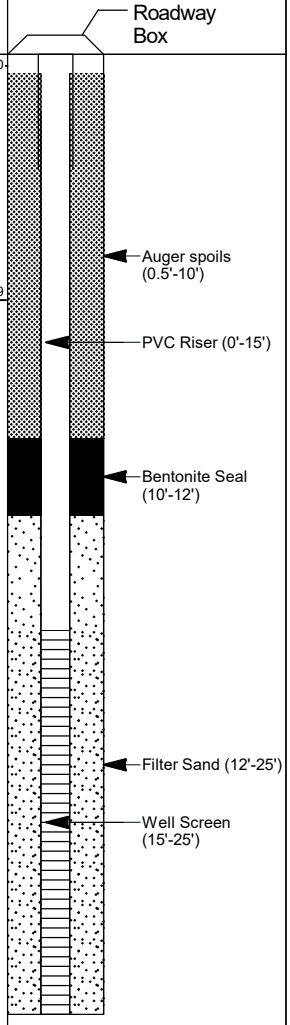
Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/10/18		See Note 3	
8/30/18	0650	21.6	20 days

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows per 6"	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
		SS-1	0.5-2.5	24	13	8 9 6 3	15	SS-1 : Medium dense, reddish brown, black, BRICK and ASPHALT, trace fine to medium Sand, trace Silt		
		SS-2	2.5-4.5	24	16	1 2 9 12	11	SS-2 : Top 8": Brown, fine to medium SAND, little Silt, trace fine Gravel		
5		SS-3	5-7	24	17	7 8 6 6	14	Bottom 8": Brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt		
		SS-4	7-9	24	0	12 14 18 28	32	SS-3 : Top 10": Brown, fine to coarse GRAVEL and fine to coarse SAND, trace Silt		
10		SS-5	10-12	24	12	12 15 12 13	27	Bottom 7": Brown, fine to medium SAND, trace Sil	1	
								SS-4 : No Recovery		
								SS-5 : Medium dense, reddish brown fine to coarse GRAVEL, some fine to coarse Sand, trace Silt		
15		SS-6	15-17	24	0	9 11 10 10	21	SS-6 : No Recovery	2	
		SS-7	17-19	24	0	11 11 11 8	22	SS-7 : No Recovery		
20		SS-8	20-22	24	18	4 4 6 5	10	SS-8 : Medium dense, brown, fine to medium SAND, trace Silt (Wet)		
25		SS-9	25-27	24	18	2 4 6 8	10	SS-9 : Medium dense, brown, fine to medium SAND, trace Silt (Wet)		
30								End of exploration at 27 feet.	3	

Stratum Description

Depth (ft.)	Elev. (ft.)	Description
0.3	102.0	ASPHALT
		FILL
6.4	95.9	
		OUTWASH DEPOSITS
27	75.3	



REMARKS

1 - Cobbles observed in auger spoils.
2 - Layer change around 16' (easier drilling).
3 - Well installed, 10' of screen set from 15' to 25', 15' of riser set from 0 to 15'. Auger spoils from 0.5' to 10. Filter sand from 12' to 25'. Bentonite from 10' to 12'. Roadbox installed.

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

Exploration No.: GZ-5 (OW)

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

271-283 Orange Street
New Haven, Connecticut

EXPLORATION NO.: GZ-6
SHEET: 1 of 2
PROJECT NO: 05.0046334.00
REVIEWED BY: P. Waters

Logged By: D. Ramsey
Drilling Co.: Seaboard Drilling
Foreman: D. Robeau

Type of Rig: Truck
Rig Model: Mobile B53
Drilling Method: Cased Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 103
Final Boring Depth (ft.): 32
Date Start - Finish: 8/24/2018 - 8/24/2018

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/24/18	1500	18.6	15 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-1	0-2	24	9	10 4 4 2	8	SS-1 : Loose, red, BRICK, trace fine to medium Sand			0.3	ASPHALT	102.7
		SS-2	2-4	24	14	3 2 1 2	3	SS-2 : Very loose, reddish brown, fine to medium SAND, trace Silt				FILL	
5		SS-3	4-6	24	18	3 3 3 4	6	SS-3 : Top 8": Reddish brown, fine to coarse SAND, little Brick, trace Silt Bottom 10": Brown, fine to medium SAND, trace Silt			5.2		97.8
		SS-4	6-8	24	17	4 4 3 3	7	SS-4 : Loose, brown, fine to medium SAND, trace fine Gravel, trace Silt					
10		SS-5	10-12	24	13	18 18 19 19	37	SS-5 : Dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt					
15		SS-6	15-17	24	11	8 7 7 10	14	SS-6 : Medium dense, reddish brown, fine SAND, trace Silt				OUTWASH DEPOSITS	
20		SS-7	20-22	24	9	8 8 7 9	15	SS-7 : Medium dense, reddish brown, fine to medium SAND, trace Silt					
25		SS-8	25-27	24	9	7 5 5 6	10	SS-8 : Medium dense, reddish brown, fine SAND, trace Silt					
		SS-9	27-29	24	16	8 8 11 12	19	SS-9 : Medium dense, reddish brown, fine SAND, trace Silt					
30													

REMARKS

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-6

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

271-283 Orange Street
New Haven, Connecticut

EXPLORATION NO.: GZ-6
SHEET: 2 of 2
PROJECT NO: 05.0046334.00
REVIEWED BY: P. Waters

Logged By: D. Ramsey
Drilling Co.: Seaboard Drilling
Foreman: D. Robeau

Type of Rig: Truck
Rig Model: Mobile B53
Drilling Method: Cased Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 103
Final Boring Depth (ft.): 32
Date Start - Finish: 8/24/2018 - 8/24/2018

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: N/A

Groundwater Depth (ft.)

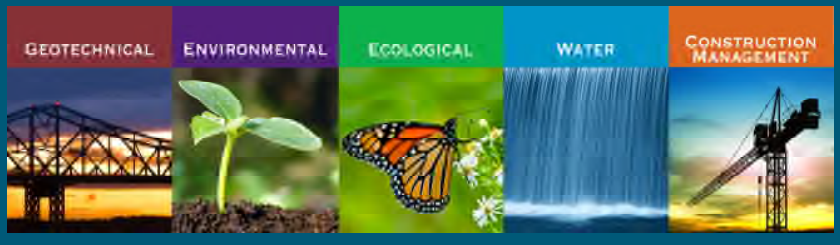
Date	Time	Water Depth	Stab. Time
8/24/18	1500	18.6	15 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		SS-10	30-32	24	7	6 6 8 7	14	SS-10 : Medium dense, reddish brown, fine SAND, little Silt				OUTWASH DEPOSITS	
											32		71.0
								End of exploration at 32 feet below grade.					
35													
40													
45													
50													
55													
60													

REMARKS

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-6



GZA GeoEnvironmental, Inc.