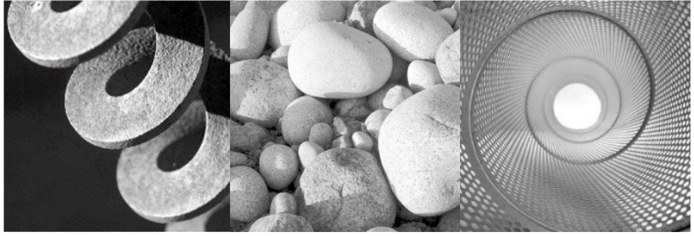


GEI Consultants

Consulting
Engineers and
Scientists

Geotechnical Report

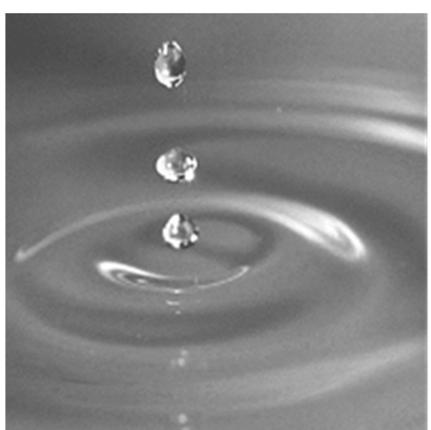
Vessel Residential

51 Kreiger Lane
Glastonbury, Connecticut

Submitted to:
Vessel Technologies, Inc.
46 West 55th Street
New York, NY 10019

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Drive, Suite 201
Glastonbury, CT 06033
860-368-5300

September 22, 2022
Project No. 2203016



Matthew Glunt, P.E.
Senior Geotechnical Engineer

Table of Contents

Figures

Appendices

1. Introduction

1.1 Project Summary

The approximately 0.93-acre site is located at 51 Kreiger Lane in Glastonbury, Connecticut.

We understand that the project will consist of sixty (60) prefabricated residential units stacked evenly over five floors, with a footprint of 7,725 square feet. The appurtenant site features include a parking area, access drive, and storm water management.

This report was prepared to address foundation and site preparation recommendations for the proposed construction.

1.2 Scope of Services

Our scope of work included the following tasks:

- Engaged a subcontractor to drill three (3) test borings on the property to depths of 27 feet each.
- Observed soil samples recovered from the test borings and prepared test boring logs.
- Installation of one (1) temporary monitoring well to a depth of 8 feet and conducted downhole infiltration testing.
- Engaged a testing laboratory to perform two (2) grain-size analyses on soil samples to verify visual classification and evaluate subsurface conditions regarding infiltration capacity.
- Developed recommendations for site preparation, pavement sections, excavation, backfill, seismic design, lateral wall pressures, foundation design, infiltration rate, and construction considerations.
- Prepared this *Geotechnical Report.*

1.3 Authorization

Our work was performed in general accordance with our proposal dated June 30, 2022, and our Standard Professional Services agreement executed August 2, 2022.

2. Site and Project Description

2.1 Site Description and History

The property slated for development is a vacant 0.93-acre lot located at 51 Kreiger Lane in Glastonbury, Connecticut. The site is bounded by Kreiger Lane to the south, and developed industrial properties on the north, east, and west sides. The property is maintained as a vacant lot within an industrial park, covered in low grasses. Aerial photos show occasional material storage on the northwest corner of the property.

Based on published sources and site observations, the site appears relatively level, with total relief on the order of 4 feet or less.

2.2 Proposed Construction

Our current understanding of the project is based on the limited information provided to GEI as shown on the Sketch Plan progress print dated 3/15/2022, as detailed below.

We understand that the project involves construction of a five-story residential building consisting of stacked prefabricated units with a footprint of 7,725-sf. We also understand the structure will likely be founded on a series of grade beams supporting load-bearing walls and an elevated cold-formed metal panel floor. Site grading is expected to largely follow existing contours, with most areas of improvement requiring cuts and fills less than 2 feet.

Preliminary plans provided to GEI show construction of 67 parking spaces to the south of the building. Stormwater management is expected to consist of a series of subsurface chambers installed below the southern portion of the parking area.

3. Exploration Procedures

3.1 Test Borings

The boring locations were laid out on the site from the provided conceptual plan using handheld GPS. Borings were located within the proposed building footprint. Approximate boring locations relative to the property boundary and conceptual site plan are shown on Figure 1.

Three (3) soil test borings (B-1 through B-3) were performed at the site on August 24 and August 25, 2022, by General Borings, under subcontract to GEI. The appropriate one-call utility location service (Call Before You Dig) was contacted prior to our arrival. All borings were advanced to depths of 27 feet using hollow-stem augering techniques and a track-mounted drilling rig. Boring logs are attached in Appendix A.

Standard Penetration Testing (SPT) and split-spoon sampling were performed continuously through the upper 8 feet of the borings and at 5-foot intervals thereafter using a 140-pound automatic hammer. Representative samples of the soils obtained by the sampler were classified by the on-site GEI engineer. The samples were placed in appropriately identified sealed glass jars and transported to our office for laboratory assignment. Borings were backfilled with drill cuttings upon completion.

3.2 Monitoring Well Installation

One (1) temporary PVC well (MW-1) was installed on the southern portion of the site. The well installation log is attached in Appendix A for reference.

Falling-head measurements were conducted within the well until stabilized readings were noted, the results of which are attached in Appendix D.

3.3 Laboratory Testing

Laboratory testing was conducted on representative soil samples to confirm field identification of the soils and establish engineering characteristics for design. Tests performed by GeoTesting Express, under subcontract to GEI, included the following:

- Two (2) grain-size analysis with standard sieve set (ASTM D6913)
- Two (2) moisture content analyses (ASTM D2216)

Results of the laboratory testing program are included in Appendix B.

4. Subsurface Conditions

4.1 Geologic Setting

The Surficial Geology Map of Connecticut (CT DEP, 2009) indicates that this area of Glastonbury is underlain by glacial sand and gravel outwash deposits.

4.2 Subsurface Conditions

The generalized subsurface conditions at the site are described below, in order of increasing depth. The subsurface conditions between boring locations may differ. The nature and extent of variations between the sampling points will not become evident until construction.

Topsoil – Topsoil thickness on the site was measured in the borings as 3 to 5 inches.

Native Sand – Thick, stratified deposits of glacial outwash sands were encountered to termination depth of the borings. Below the topsoil, sands were generally sampled as fine to coarse-grained reddish-brown sand with about 5 to 10 percent non-plastic fines and up to 10 percent fine gravel.

Standard Penetration Test (SPT) N-values typically ranged between 11 to 27 blows/foot, indicating medium-dense conditions.

4.3 Groundwater Conditions

Groundwater was encountered in the borings at depths of 20.1 feet to 21.7 feet below grade.

Groundwater levels are subject to seasonal and weather-related variations. Groundwater measurements made at different times and different locations may be significantly different than the measurements taken as part of this investigation.

5. Design Recommendations

5.1 Foundation Design

The proposed structure may be supported on shallow foundations bearing on a subgrade consisting of native sands or compacted structural fill. We recommend that all footing subgrades be evaluated by a GEI representative prior to concrete placement.

The maximum allowable bearing pressures for the design of footings are:

Table 1: Allowable Bearing Pressure

Bearing Stratum	Net Allowable Bearing Pressure
Crushed Stone over Native Sands or Structural Fill	3,000 lb/ft^2

Minimum individual column footing and wall footing widths should be at least 36 and 18 inches, respectively. Exterior footings should bear at least 3½ feet below the adjacent exterior grade for frost protection. Interior footings should be founded at least 18 inches below the bottom of the floor slab. The tops of all footings should be at least 6 inches below the bottom of the overlying floor slab.

As shown on conceptual plans, we recommend that the grade beams bear on a minimum 6-inch working pad of crushed stone wrapped on the sides by a geotextile fabric, placed over a soil subgrade prepared in accordance with Section 6.1. This will serve to protect subgrades and improve expediency of foundation construction. Crushed Stone meeting the specifications in Appendix C may be considered non-frost susceptible.

5.2 Settlement

We understand structure loads on the 18-inch-wide grade beams will be on the order of 3.5 kips/ft. Assuming the design and construction recommendations herein are followed, we estimate total settlement of the building will be less than 1 inch, and differential settlement will be less than ½ inch. We expect nearly all expected settlements will occur during construction or soon after.

5.3 Seismic Design

The 2018 edition of the Connecticut Building Code document mirrors the 2015 International Building Code, with exception of the revisions and supplemental information provided by state building officials.

Based on the criteria of Building Code Section 1613.3.2 and the SPT N-values measured on site, we recommend the use of Site Class D for seismic design. The Site Class was used in conjunction with the seismic hazard (S_S, S_1) for this location to determine spectral design values, as follows:

Table 2: Seismic Design Values

2018 Connecticut Building Code	
S_S	0.180 g
S_1	0.063 g
S_{DS}	0.192 g
S_{D1}	0.101 g
PGA_M	0.145 g
Seismic Design Category (Risk Category I, II, or III)	B

We calculated the spectral response parameters for the site using general procedures outlined in Building Code Section 1613.3. Peak ground acceleration (PGA_M) is adjusted for Site Class effects, per ASCE 7-10 Section 11.8.3.

The soils below the foundation level at this site are not considered susceptible to liquefaction.

5.4 Lateral Earth Pressures

All earth retaining structures used on the project should be designed using the earth pressures shown in Table 3. Note that no factor of safety has been applied to these values. Below-grade walls that are restrained from movement should be designed for at-rest earth pressures. Retaining walls free to rotate at the top should be designed for active earth pressures. In addition to the lateral loads exerted by the soil against the walls, allowance should be included for lateral stresses imposed by any temporary or long-term surcharge loads, such as cars or trucks adjacent to the walls or adjacent footing loads.

Table 3: Wall Design Parameters

Material	Total Unit Weight (γ, pcf)	Friction Angle (Φ)	Cohesion (c)	At-Rest Earth Pressure Coeff (K_o)	Active Earth Pressure Coeff, (K_a)	Passive Earth Pressure Coeff, (K_p)
Native Sands	120	32º	0	0.47	0.31	3.00
Structural Fill	125	34º	0	0.44	0.28	3.00

We recommend limiting the passive pressure coefficient to 3.00 as shown above, due to the relatively high movement required to fully engage passive resistance. The minimum factors of safety for sliding and overturning under static loads should be 1.5 and 2.0, respectively. An allowable coefficient of friction of 0.50 between the grade beam and crushed stone over granular bearing soil may be assumed.

The recommended wall design parameters do not consider the development of hydrostatic pressure behind the walls. As such, positive wall drainage must be provided for all earth retaining structures. These drainage systems can be constructed of open-graded washed stone isolated from the soil backfill with a geosynthetic filter fabric and drained by perforated pipe, or several wall drainage products made specifically for this application. Where backfill soils are not drained using an appropriately designed drainage system, the lateral soil pressure on proposed retaining walls must consider hydrostatic forces and submerged soil unit weight.

The earth pressures given in Table 3 assume placement and compaction of the backfill in accordance with recommendations elsewhere in this report. Compact backfill directly behind walls with light, hand-operated compactors. Heavy compactors and grading equipment should not be allowed to operate within 10 feet of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

5.5 Pavement Design

Soils similar to the native sands at the site, as well as any new structural fill, are generally considered to be well-suited to support of pavements, assuming the subgrade is prepared as recommended in this report.

The front tenant parking area may be designed with light-duty pavements, while those areas expected to receive repeated truck traffic, such as dumpster pads, should be designed as a rigid pavement section. We recommend the following pavement sections for these areas:

Light-Duty Parking Area
3.0 inches bituminous concrete
- 1.5 inches wearing course (CTDOT M.04.03 Class 2 or Superpave HMA S0.5)
- 1.5 inches binder course (CTDOT M.04.03 Class 1 or Superpave HMA S1.0)

8.0 inches of processed aggregate base (CTDOT Form 818 M05.01)

Heavy-Duty Rigid Concrete Section
6.0 inches of 4,000-psi jointed concrete (CTDOT M.03.01 Portland Cement)
8.0 inches of processed aggregate base (CTDOT Form 818 M05.01)

Recommended pavement sections are based on AASHTO Guide for Design of Pavement Structures (1993) and ACI 330R. Pavement materials should conform with and be placed in accordance with the *Connecticut Department of Transportation (CTDOT) Standard Specifications for Road, Bridges, and Incidental Construction (Form 818), 2020.* CTDOT-compliant reclaimed miscellaneous aggregate with a loss on abrasion of less than 50 percent may be used as base course for pavements.

Rigid pavement sections should be designed and constructed in accordance with appropriate American Concrete Institute (ACI) recommendations and with the applicable specifications of the CTDOT Standard Specifications. An adequate number of smooth steel dowels should be provided at all control and construction joints. All dowels should be coated and lubricated and affixed with metal or plastic caps. The size and spacing of dowels should conform to recommendations in ACI 330R. All joints should also be sealed with a flexible fuel resistant sealer to minimize surface water infiltration into the prepared base.

According to AASHTO design guidelines, the recommended pavement sections shown above are suitable for a 20-year design life. However, pavement maintenance such as sealing of cracks and localized patching due to normal weathering should be expected within the first 5 to 10 years of life.

5.6 Subsurface Drainage Design

We understand below-ground infiltration chambers will likely be constructed on the property for stormwater management purposes. Based on the results of the investigation, these systems will likely be founded in highly permeable sand deposits. Groundwater was encountered at the time of investigation in excess of 20 feet below present grade.

The hydraulic conductivity at the monitoring well location (MW-1) was estimated using downhole falling-head field measurements and published equations for borehole permeability. The calculations presented in Appendix D are consistent with highly permeable soil. Though the field-measured data indicate infiltration rates of over 100 inches/hour, we recommend assuming an infiltration rate of **40.0 inches/hour** for stormwater system design. Per CT DEEP regulations, a factor of safety of 2.0 must be applied to this value for design.

6. Construction Considerations

6.1 Subgrade Preparation

6.1.1 General

To prepare the site for grading operations, topsoil, organic matter, and other deleterious material should be stripped from the building and site improvement areas. Soft, wet, loose, or otherwise un-suitable soils should be removed and replaced, or potentially re-compacted in-place.

6.1.2 Pavements

Following the required stripping, excavation to rough grade, and before placing new fill to achieve design grades, the resulting subgrade should be firm, stable, and unyielding. Stabilization, where required, may consist of removing unsuitable material and replacement with compacted structural fill, or where unsuitable soils are relatively thin, drying and compacting in place.

Soil subgrades should be proof-rolled with at least four (4) passes of a minimum 10-ton vibratory roller in open areas, or a 1-ton vibratory roller or large plate compactor, such as Wacker DPU4545 or equivalent, in trenches. Proof-rolling in close proximity to groundwater, if encountered, may need to be accomplished without vibratory action to reduce the potential for disturbance to the subgrade.

6.1.3 Foundations

Footings should bear on a subgrade consisting of native sands or compacted Structural Fill. Bearing surfaces should be free of standing water, frost, and loose soil before placement of reinforcing steel and concrete.

We recommend that a GEI representative observe the final preparation of all subgrades prior to footing construction. Subgrade soils that require undercutting should be replaced with either compacted structural fill or crushed stone.

As shown on conceptual plans, we recommend that the grade beams bear on a minimum 6-inch working pad of crushed stone wrapped on the sides by a geotextile fabric, placed over an approved soil subgrade. This will serve to protect subgrades and improve expediency of foundation construction. Crushed Stone meeting the specifications in Appendix C may be considered non-frost susceptible.

6.2 Excavation and Dewatering

Excavations can be accomplished with conventional earthmoving equipment. Excavations should be sloped or shored in accordance with the local, state, and federal regulations, including Occupational Safety and Health Agency (OSHA 29 CFR Part 1926) excavation trench safety standards.

Groundwater is relatively deep at the site and is not likely to impact grading operations. That said, site relief is very low, and maintaining proper site drainage during initial grading may become very difficult unless measures to control surface water are put in place before grading starts and maintained throughout.

6.3 Freezing Conditions

The native sands that will form the subgrades for grade slabs, footings, and pavements can be expected to have a low to moderate susceptibility to frost. Accordingly, we do not believe that special measures beyond the design and construction recommendations provided herein are required to guard against potential frost heave of subgrade soils.

That said, we recommend certain precautions for cold-weather earthwork. All subgrades should be free of frost before placement of concrete. Frost-susceptible soils that have frozen should be removed and replaced with compacted Structural Fill. The footing and the soil adjacent to the footing should be insulated until they are backfilled. Soil placed as fill should be free of frost, as should the ground on which it is placed.

If slabs-on-grade or footings are built and left exposed during the winter, precautions should be taken to prevent freezing of the underlying soil.

6.4 Backfilling and Compaction

Recommended specifications for gradation and compaction of backfill soils are provided in the attached recommended Material Specifications (Appendix C).

Native sands excavated as part of earthwork activities can likely be re-used on site as Structural Fill or Ordinary Fill, provided they do not contain oversize, organic, or otherwise deleterious material and can meet the appropriate compaction requirements.

Fill imported from off site should meet the attached gradation requirements. Fill placed within the building limits, within a 3-foot-wide zone outside foundation walls, under pavements, and behind retaining walls should meet the compaction requirements for Structural Fill. Backfill placed in non-structural areas should meet the compaction requirements for Ordinary Fill. Proposed borrow materials that fall slightly outside of these specifications may also be suitable for use, subject to review and approval by GEI.

7. Closure

7.1 Follow-on Services

We recommend that GEI be kept on the project through the final design and construction phases for the following services:

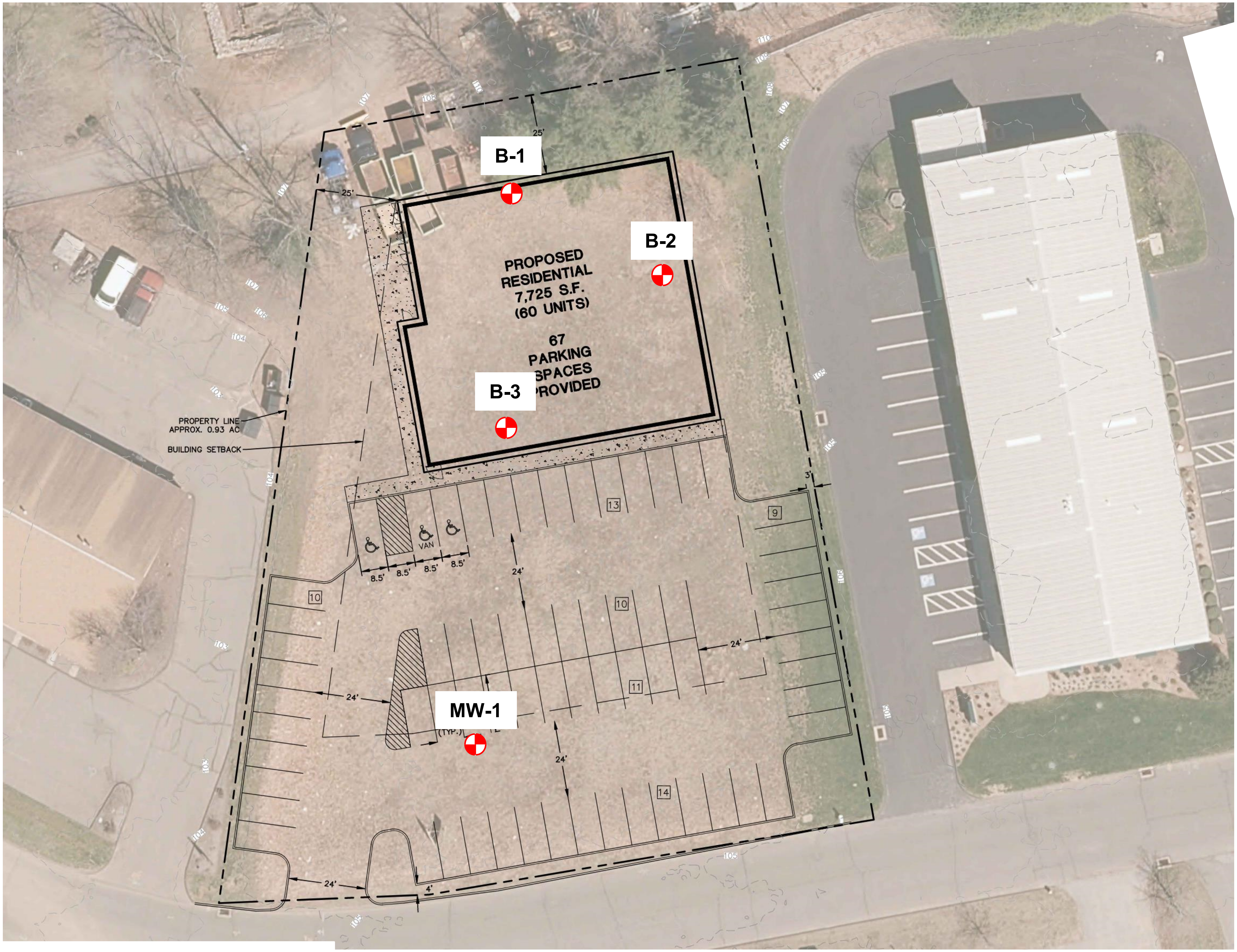
- Review geotechnical-related contractor submittals and assist in developing responses to questions from the contractor (i.e. RFI's).
- Provide periodic site visits during construction to view subgrades and consult on geotechnical-related issues that occur.

7.2 Limitations

This report was prepared for the use of the project team, exclusively. Our recommendations are based on the project information provided to us at the time of this report and may require modification if there are any changes in the nature, design, or location of the proposed building. We cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations, and whether our recommendations have been properly implemented in the design.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No warranty, expressed or implied, is made.

Figures



LEGEND

APPROXIMATE BORING/MON. WELL LOCATION

SOURCE:

SITE PLAN (SK-1) PROGRESS PRINT, BL COS., 3/15/22

GEI Consultants

BORING LOCATION PLAN 51 KREIGER LANE GLASTONBURY, CT	FIGURE NO. 1
GEI PROJECT NO: **2203016**	

Appendix A

Boring and Monitoring Well Logs

BORING INFORMATION		BORING B-1
LOCATION: See Boring Location Plan.		
GROUND SURFACE EL. (ft): NM	DATE START/END: 8/24/2022 - 8/24/2022	
VERTICAL DATUM:	DRILLING COMPANY: General Borings	
TOTAL DEPTH (ft): 27.0	DRILLER NAME: Jim Casson	
LOGGED BY: T. Rezzani	RIG TYPE: Diedrich D-50 ATV	PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic	CASING I.D./O.D.: NA / NA	CORE BARREL TYPE:
AUGER I.D./O.D.: 4.25 inch / NA	DRILL ROD O.D.: NM	CORE BARREL I.D./O.D. NA / NA

DRILLING METHOD: Hollow Stem Auger

WATER LEVEL DEPTHS (ft): ⊻ 20.1 8/24/2022 11:22 am

ABBREVIATIONS:

Pen. = Penetration Length	S = Split Spoon Sample	Qp = Pocket Penetrometer Strength	NA, NM = Not Applicable, Not Measured
Rec. = Recovery Length	C = Core Sample	Sv = Pocket Torvane Shear Strength	Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%	U = Undisturbed Sample	LL = Liquid Limit	
WOR = Weight of Rods	SC = Sonic Core	PI = Plasticity Index	
WOH = Weight of Hammer	DP = Direct Push Sample	PID = Photoionization Detector	
	HSA = Hollow-Stem Auger	I.D./O.D. = Inside Diameter/Outside Diameter	

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/17	2-4-5-7		NATIVE SAND	S1: WIDELY GRADED SAND (SW); ~90% F-C sand, ~5% F gravel, ~5% NP fines, some organic fibers from 0-5", reddish brown, dry.
		S2	2 to 4	24/17	7-6-7-9			S2: WIDELY GRADED SAND (SW); ~90% F-C sand, ~10% F-C gravel, reddish brown, dry.
	5	S3	4 to 6	24/16	5-7-8-9			S3: Similar to S2.
		S4	6 to 8	24/18	9-11-11-13			S4: NARROWLY GRADED SAND (SP); ~95% F-M sand, ~5% F gravel, reddish brown, dry.
	10	S5	10 to 12	24/18	6-8-12-13			S5: WIDELY GRADED SAND WITH GRAVEL (SW); ~85% F-C sand, ~15% F-C gravel, reddish brown, dry.
	15	S6	15 to 17	24/18	6-8-9-12			S6: WIDELY GRADED SAND (SW); ~95% F-C sand, ~5% F gravel, reddish brown, dry.
	20	S7	20 to 22	24/19	5-6-6-8			S7: Similar to S6, wet.

NOTES:

PROJECT NAME: Vessel - Glastonbury

CITY/STATE: Glastonbury, Connecticut

GEI PROJECT NUMBER: 2203016

GEI Consultants

LOCATION: See Boring Location Plan.
GROUND SURFACE EL. (ft): NM
VERTICAL DATUM:
DATE START/END: 8/24/2022 - 8/24/2022
DRILLING COMPANY: General Borings

BORING B-1

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S8	25 to 27	24	5-6-8-10		NATIVE SAND	S8: NARROWLY GRADED SAND (SP); ~90% F-M sand, ~5% NP fines, ~5% F gravel, reddish brown, wet.
								End of boring at 27'. Planned Extent. Backfilled with drill cuttings
	30							
	35							
	40							
	45							
	50							
	55							

NOTES:

PROJECT NAME: Vessel - Glastonbury
CITY/STATE: Glastonbury, Connecticut
GEI PROJECT NUMBER: 2203016

GEI Consultants

BORING INFORMATION

LOCATION: See Boring Location Plan.

GROUND SURFACE EL. (ft): NM | **DATE START/END:** 8/24/2022 - 8/24/2022

VERTICAL DATUM: | **DRILLING COMPANY:** General Borings

TOTAL DEPTH (ft): 27.0 | **DRILLER NAME:** Jim Casson

LOGGED BY: T. Rezzani | **RIG TYPE:** Diedrich D-50 ATV

BORING B-2

DRILLING INFORMATION

HAMMER TYPE: Automatic | **CASING I.D./O.D.:** NA / NA | **CORE BARREL TYPE:**

AUGER I.D./O.D.: 4.25 inch / NA | **DRILL ROD O.D.:** NM | **CORE BARREL I.D./O.D.** NA / NA

DRILLING METHOD: Hollow Stem Auger

WATER LEVEL DEPTHS (ft): ▽ 20.9 8/26/2022 9:39 am

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/21	3-10-14-15		NATIVE SAND	S1: WIDELY GRADED SAND (SW); ~85% F-C sand, ~10% F gravel, ~5% NP fines, some organic fibers from 0-3", reddish brown, dry.
		S2	2 to 4	24/20	10-13-14-14			S2: WIDELY GRADED SAND WITH SILT (SW-SM); 91.0% F-C sand, 7.6% NP fines, 1.4% F gravel, reddish brown, dry.
	5	S3	4 to 6	24/18	3-9-8-12			S3: Similar to S2
		S4	6 to 8	24/17	10-10-11-12			S4: Similar to S2
	10	S5	10 to 12	24/18	8-9-9-12			S5: Similar to S2
	15	S6	15 to 17	24/16	6-8-9-10			S6: WIDELY GRADED SAND (SW); ~95% F-C sand, ~5% NP fines, reddish brown, dry.
	20	S7	20 to 22	24/24	5-6-6-8			S7: Similar to S6, wet.

NOTES:

PROJECT NAME: Vessel - Glastonbury

CITY/STATE: Glastonbury, Connecticut

GEI PROJECT NUMBER: 2203016

GEI Consultants

LOCATION: See Boring Location Plan.
GROUND SURFACE EL. (ft): NM
DATE START/END: 8/24/2022 - 8/24/2022
VERTICAL DATUM:
DRILLING COMPANY: General Borings

BORING B-2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	25	S8	25 to 27	24/24	7-8-10-15		NATIVE SAND	S8: WIDELY GRADED SAND (SW); ~95% F-C sand, ~5% F gravel, reddish brown, wet.
								End of boring at 27'. Planned Extent. Backfilled with drill cuttings
	30							
	35							
	40							
	45							
	50							
	55							

NOTES:

PROJECT NAME: Vessel - Glastonbury
CITY/STATE: Glastonbury, Connecticut
GEI PROJECT NUMBER: 2203016

GEI Consultants

BORING INFORMATION

LOCATION: See Boring Location Plan.

GROUND SURFACE EL. (ft): NM | **DATE START/END:** 8/25/2022 - 8/25/2022

VERTICAL DATUM: | **DRILLING COMPANY:** General Borings

TOTAL DEPTH (ft): 27.0 | **DRILLER NAME:** Jim Casson

LOGGED BY: T. Rezzani | **RIG TYPE:** Truck Mounted Rig

DRILLING INFORMATION

HAMMER TYPE: Automatic | **CASING I.D./O.D.:** NA / NA | **CORE BARREL TYPE:**

AUGER I.D./O.D.: 4.25 inch / NA | **DRILL ROD O.D.:** NM | **CORE BARREL I.D./O.D.** NA / NA

DRILLING METHOD: Hollow Stem Auger

WATER LEVEL DEPTHS (ft): ⊻ 21.7 8/25/2022 9:38 am

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0 to 2	24/17	2-6-10-12		NATIVE SAND	S1: WIDELY GRADED SAND (SW); ~85% F-C sand, ~10% F gravel, ~5% NP fines, some organic fibers from 0-4", reddish brown, dry.
		S2	2 to 4	24/17	6-7-8-9			S2: WIDELY GRADED SAND (SW); ~90% F-M sand, ~10% F-C gravel, reddish brown, dry.
	5	S3	4 to 6	24/19	5-5-6-8			S3: WIDELY GRADED SAND WITH SILT (SW-SM); 88.2% F-C sand, 9.8% NP fines, 2.0% F gravel, reddish brown, dry.
		S4	6 to 8	24/20	6-8-10-12			S4: Similar to S3.
	10	S5	10 to 12	24/18	7-7-11-11			S5: Similar to S3.
	15	S6	15 to 17	24/20	8-8-12-13			S6: WIDELY GRADED SAND (SW); ~90% F-C sand, ~5% NP fines, ~5% F gravel, reddish brown with orange striations, dry.
	20	S7	20 to 22	24/18	6-6-7-8			S7: Similar to S6, absent striations, wet.

NOTES:

PROJECT NAME: Vessel - Glastonbury

CITY/STATE: Glastonbury, Connecticut

GEI PROJECT NUMBER: 2203016

GEI Consultants

LOCATION: See Boring Location Plan.
GROUND SURFACE EL. (ft): NM
VERTICAL DATUM:
DATE START/END: 8/25/2022 - 8/25/2022
DRILLING COMPANY: General Borings

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	25	S8	25 to 27	24/17	2-3-4-16		NATIVE SAND	S8: Similar to S6, absent striations, wet.
								End of boring at 27'. Planned Extent. Backfilled with drill cuttings
	30							
	35							
	40							
	45							
	50							
	55							

NOTES:

PROJECT NAME: Vessel - Glastonbury
CITY/STATE: Glastonbury, Connecticut
GEI PROJECT NUMBER: 2203016

GEI Consultants

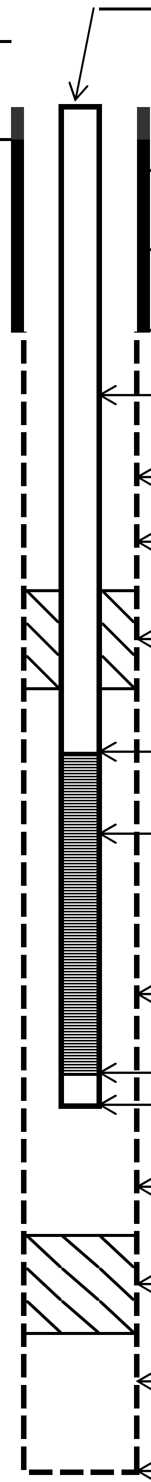
Monitoring Well Installation Log

MW-1

Project	Vessel Residential Glastonbury
City / Town	51 Kreiger Lane, Glastonbury
Client	Vessel Technologies
Contractor	General Borings
Driller	J. Casson
GEI Rep.	T. Rezzani
GEI Proj. No.	2203016
Location	Proposed Parking Area/ South Side
Install Date	8/25/2022

Survey Datum: N/A

Ground Elevation: NM



Length of Riser Pipe above Ground	2.0 ft
Type of Seal around Surface Casing	No Seal
Type of Surface Casing	N/A
Surface Casing ID	No Casing
ID and OD of Riser Pipe	2-inch ID
Type of Riser Pipe	PVC
Type of Backfill around Riser Pipe	Cuttings
Diameter of Borehole	3.25 in.
Depth Top of Seal	N/A
Type of Seal	N/A
Depth Bottom of Seal	N/A
Depth Top of Screened Section	3.0 ft BGS
Type of Screen	Sch. 40 PVC
Description of Screen Openings	0.010 in. slots
ID and OD of Screened Section	2-inch ID
Type of Filter Material	#2 Sand
Depth Bottom of Screened Section	8.0 ft BGS
Depth Bottom of Silt Trap	N/A
Depth Bottom of Filter Material	N/A
Depth Top of Seal	N/A
Type of Seal	N/A
Depth Bottom of Seal	N/A
Type of Backfill below Filter Material	N/A
Bottom of Borehole	8.0 ft BGS

Date	Time	Distance to GW below ground surface
8/25/2022	11:30:00 AM	21.0 ft

Notes: No survey information available at time of well installation.

GEI Consultants

Appendix B

Laboratory Test Results

THIELSCH ENGINEERING

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
thielsch.com
Let's Build a Solid Foundation

Client Information:	Project Information:
GEI Consultants, Inc	**Krieger Lane Vessel**
Glastonbury, CT	**Glastonbury, CY**
PM: Matt Glunt	Client Project Number: 2203016
Assigned By: Matt Glunt	Summary Page: 1 of 1
Collected By: Client	Report Date: 09.07.22

LABORATORY TESTING DATA SHEET, Report No.: 7422-H-206

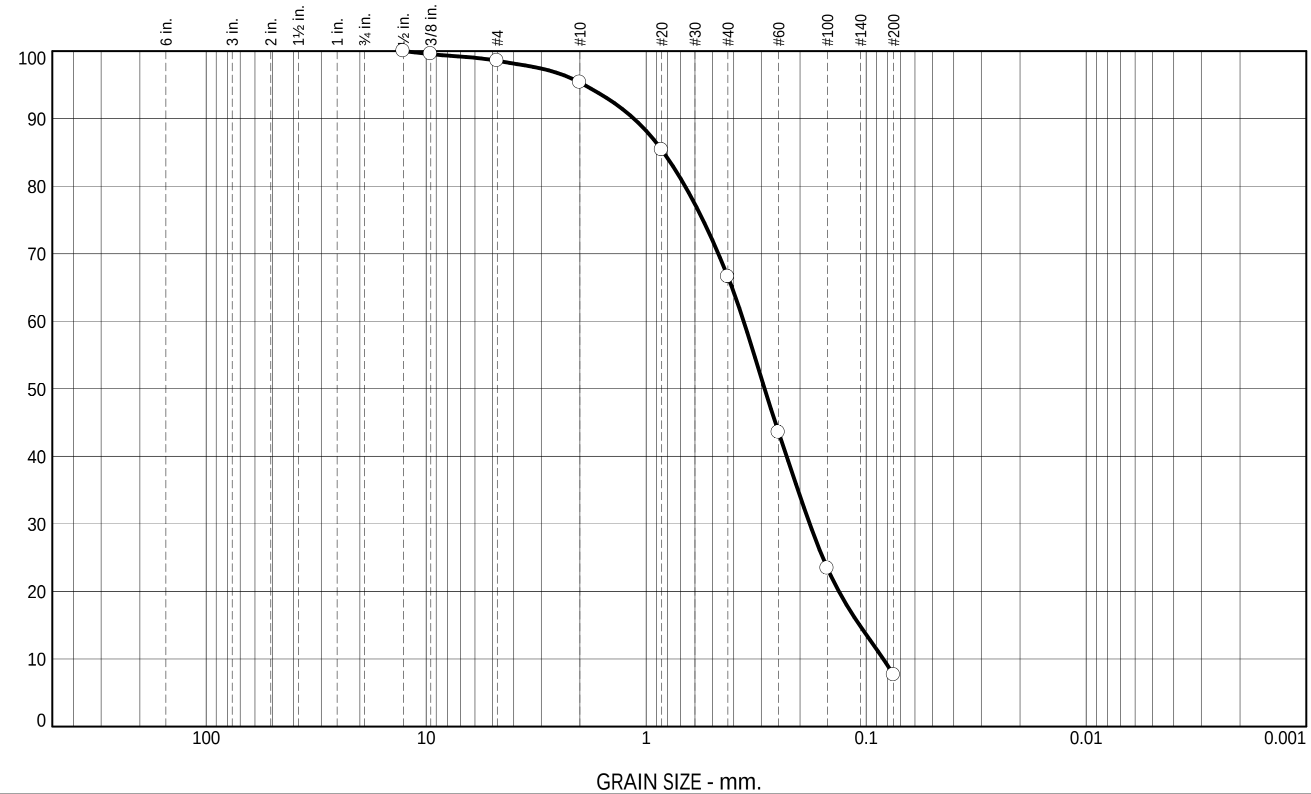
Boring	Sample No.	Depth (ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Received Moisture Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	pH	Dry unit wt. (pcf)	Test Moisture Content %	γ_d MAX (pcf) W_{opt} (%)	γ_d MAX (pcf) W_{opt} (%) (Corr.)	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318		D6913			D2974	D4792			D1557						
B-2	S-2	2.0-4.0	22-S-3335				1.4	91.0	7.6											Red - Brown poorly graded sand with silt
B-3	S-4	6.0-8.0	22-S-3336				2.0	88.2	9.8											Red - Brown poorly graded sand with silt

Date Received: *08.30.22*   Reviewed By: ______   Date Reviewed: *09.07.22*

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.4	3.3	28.7	59.0	7.6	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1/2"	100.0			
3/8"	99.6			
#4	98.6			
#10	95.3			
#20	85.4			
#40	66.6			
#60	43.5			
#100	23.4			
#200	7.6			

* (no specification provided)

Material Description

Red - Brown poorly graded sand with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.1369 D_{85}= 0.8339 D_{60}= 0.3605
D_{50}= 0.2896 D_{30}= 0.1805 D_{15}= 0.1071
D_{10}= 0.0837 C_u= 4.31 C_c= 1.08

Classification

USCS= SP-SM AASHTO= A-3

Test Remarks

Source of Sample: Borings Depth: 2.0-4.0'
Sample Number: B-2 / S-2 Sample Date: 09.02.22

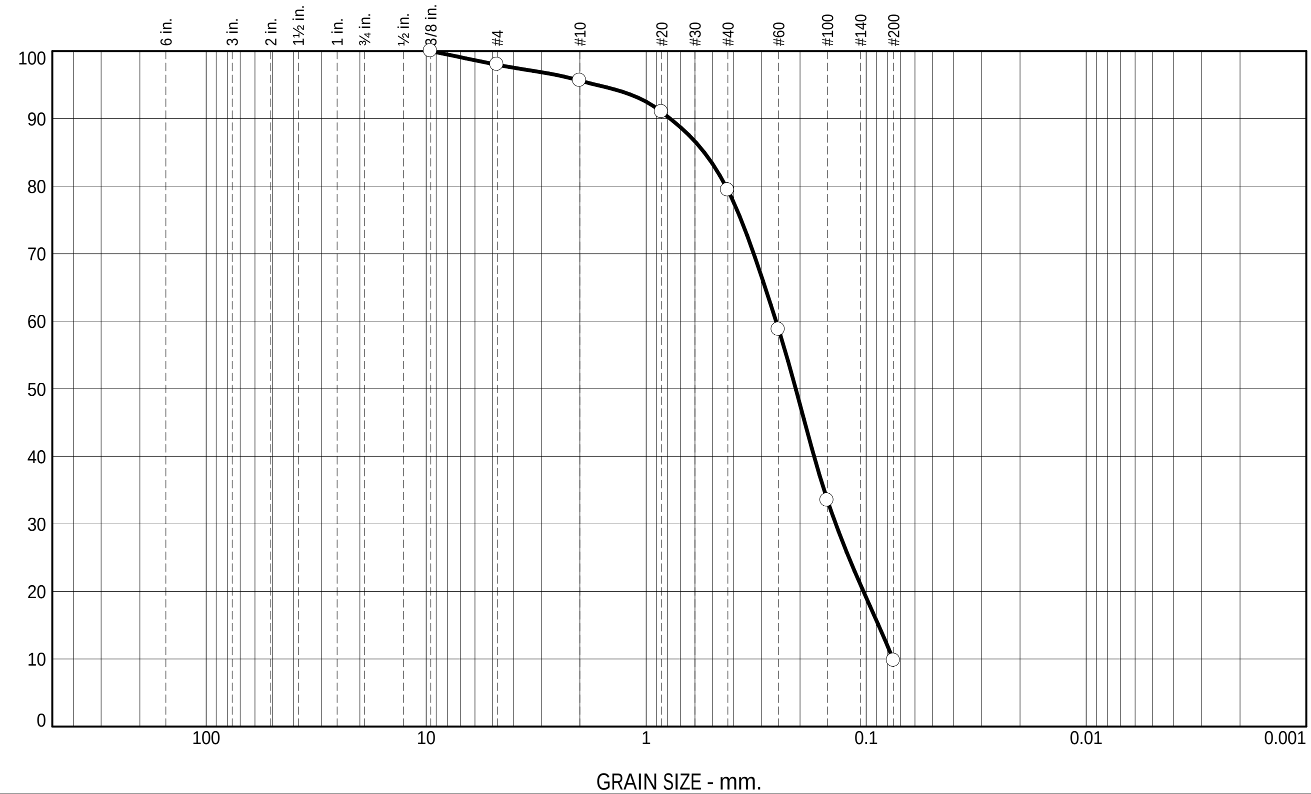
Thielsch Engineering Inc.
Cranston, RI

Client: GEI Consultants, Inc
Project: Kreiger Vessel
Glastonbury, CT
Project No: 2203016 Figure 22-S-3335

Tested By: JB Checked By: Rebecca Roth

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.0	2.4	16.2	69.6	9.8	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
3/8"	100.0			
#4	98.0			
#10	95.6			
#20	91.0			
#40	79.4			
#60	58.8			
#100	33.5			
#200	9.8			

* (no specification provided)

Material Description

Red - Brown poorly graded sand with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7786 D_{85}= 0.5446 D_{60}= 0.2570
D_{50}= 0.2090 D_{30}= 0.1375 D_{15}= 0.0880
D_{10}= 0.0755 C_u= 3.40 C_c= 0.97

Classification

USCS= SP-SM AASHTO= A-3

Test Remarks

Source of Sample: Borings Depth: 6.0-8.0'
Sample Number: B-3 / S-4

Sample Date: 09.02.22

Thielsch Engineering Inc.

Cranston, RI

Client: GEI Consultants, Inc
Project: Kreiger Vessel
Glastonbury, CT
Project No: 2203016

Figure 22-S-3336

Tested By: JB

Checked By: Rebecca Roth

Appendix C

Recommended Material Specifications

Recommended Material Specifications
Vessel – 51 Kreiger Lane
Glastonbury, CT

Native sands excavated as part of earthwork activities can likely be re-used on site as Structural Fill or Ordinary Fill, provided they do not contain oversize, organic, or otherwise deleterious material and can meet the appropriate compaction requirements.

Fill imported from off site should meet the attached gradation requirements. Fill placed within the building limits, within a 3-foot-wide zone outside foundation walls, under pavements, and behind retaining walls should meet the compaction requirements for Structural Fill. Backfill placed in non-structural areas should meet the compaction requirements for Ordinary Fill. Proposed borrow materials that fall slightly outside of these specifications may also be suitable for use, subject to review and approval by GEI.

Structural Fill

Imported Structural Fill should consist of hard, durable sand and gravel. It should be free of clay, organic matter, surface coatings, and other deleterious materials. Soil finer than the No. 200 sieve (the "fines") should be non-plastic. Structural Fill shall meet the following gradation requirements:

Sieve Size	Percent Passing by Weight
3 inches	100
1 - ½ inch	55 – 100
No. 4	35 – 85
No. 16	20 – 65
No. 50	5 – 40
No. 200 (fines)	0 – 10

Structural Fill should be compacted in maximum 12-inch-thick, loose lifts to at least 95 percent of the maximum dry density determined in accordance with ASTM D1557 (Modified AASHTO Compaction). The moisture content should be held to within +/- 3 percent of optimum moisture content (as determined by ASTM D1557).

Ordinary Fill

Ordinary fill should consist of hard, durable sand and gravel, free of clay, organic matter, surface coatings, and other deleterious materials. Soil finer than the No. 200 sieve (the "fines") should be nonplastic. Ordinary Fill shall meet the following gradation requirements:

Sieve Size	Percent Passing by Weight
6 inches	100
3 inches	80 – 100
No. 4	20 – 100
No. 200 (fines)	0 – 20

Ordinary fill should be compacted in maximum 12-inch-thick, loose lifts to at least 92 percent of the maximum dry density determined in accordance with ASTM D1557 (Modified AASHTO Compaction). The moisture content should be held to within +/- 3 percent of optimum moisture content (as determined by ASTM D1557).

Crushed Stone

Crushed Stone should consist of a ¾-inch size durable crushed rock or durable crushed gravel stone and shall conform to the requirements of the ConnDOT Form 818, Section M.01.01, No. 6. Crushed stone should be compacted with at least four passes of a vibratory compactor.

Geotextile Fabric

Geotextile fabric should be a non-woven fabric, consisting of Mirafi 140N or an approved equal product.

Appendix D

Infiltration/Permeability Testing Results

51 Kreiger Lane
Glastonbury, CT
Soil Permeability Calculations

WELL CALCULATIONS

$$k'_v = \frac{d^2(\frac{\pi}{11}\frac{k'_v}{k_v}\frac{D}{m} + L)}{D^2(t_2 - t_1)} \ln \frac{H_1}{H_2}$$

("Soil in casing in uniform soil," Lambe and Whitman, 1969.)

Diameter, sand pack	8.26	D (cm)
Diam., PVC riser	5.08	d (cm)
Length, slotted PVC	152	L (cm)
k'v/kv	1	*Assumed*

Test 1

Height H (cm)	Time t (seconds)	Vertical Perm. k'v (cm/sec)	Vertical Perm. k'v (in/hr)
241	0		
247	10	1.46E-01	206.89
253	20	1.42E-01	201.84
258	30	1.05E-01	148.21
262	40	1.03E-01	145.60
267	50	1.01E-01	143.09
271	60	9.92E-02	140.66
274	70	6.52E-02	92.46

Test 2

Height H (cm)	Time t (seconds)	Vertical Perm. k'v (cm/sec)	Vertical Perm. k'v (in/hr)
256	0		
259	10	6.91E-02	97.9
264	20	1.02E-01	144.8
270	30	1.33E-01	189.2
274	40	9.81E-02	139.1

Test 3

Height H (cm)	Time t (seconds)	Vertical Perm. k'v (cm/sec)	Vertical Perm. k'v (in/hr)
247	0		
250	10	7.16E-02	101.54
251	20	3.55E-02	50.30
256	30	1.05E-01	149.10
264	40	1.71E-01	242.69