Geotechnical Interpretive Report for

The Seventy-Six, Mixed-Use Redevelopment

South End Neighborhood
City of Albany
Albany County, New York

July 13, 2020

THE Chazen COMPANIES®
Proud to be Employee Owned

Civil Engineers
Land Surveyors
Planners
Environmental & Safety Professionals
Landscape Architects
Transportation Planners & Engineers

Prepared for:

Mr. Corey Jones
South End Development, LLC
45 Hudson Ave. #213,
Albany, NY 12201

Geotechnical Interpretive Report for

The Seventy-Six, Mixed-Use Redevelopment

South End Neighborhood
City of Albany
Albany County, New York

July 13, 2020

THE Chazen COMPANIES®
Proud to be Employee Owned

Civil Engineers
Land Surveyors
Planners
Environmental & Safety Professionals
Landscape Architects
Transportation Planners & Engineers

Prepared by:

Chazen Engineering, Land Surveying & Landscape Architecture Co., D.P.C.
547 River Street
Troy, New York 12180
(518) 273-0055

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1.0 EXECUTIVE SUMMARY

The Chazen Companies (Chazen) was retained by South End Development, LLC to prepare a Geotechnical Interpretive Report. This report discusses our investigation, analyses, and recommendations relative to Phase 1 of the Seventy-Six Redevelopment, which includes the proposed three, 6 to 8-story mixed-use buildings with solar canopies and subsurface parking; elimination of Scott Street for conversion to pedestrian plaza; and associated utility improvements located in the South End Neighborhood off of Second Avenue in the City of Albany, Albany County, New York herein after referred to as the "project site."

The subsurface exploration program included eight (8) test borings performed between June 1, 2020 and June 8, 2020 to obtain representative subsurface information. Subsurface stratigraphy across the project site consists of Fill and Glaciolacustrine Deposits overlying a layer of Till and Bedrock. During the subsurface program, groundwater was observed within three of the test boring explorations at depths of 23.5-feet (B2, El. 59.5-feet), 30.5-feet (B8, El. 30.5-feet), and 66.5-feet (B1, El. 21-feet). Perched water was observed in the top 10-feet in test boring B4.

Based on findings from the subsurface explorations, deep foundations are recommended to support the 6 to 8-story mixed-use buildings. We recommend the use of driven H-piles bearing on the underlying bedrock with pile caps and grade beams to support a structural slab. Based on existing site conditions, the Site Class for the project site is "E".

Provided this Geotechnical Interpretive Report is read in its entirety and the recommendations and construction considerations outlined in this report are incorporated in design and during construction activities, the project site is considered suitable for the proposed structures.

2.0 PHYSICAL SETTING

The project site is located south of Second Avenue in the residential area between Leonard Street and Krank Street. The project site contains 32 parcels of land that will be rezoned to a single zoning district. Many of the parcels contain existing residences, and the remaining parcels consist of wooded area or previously developed land. Scott Street bisects the middle of the project site spanning east to west. The project site is bound by Second Avenue to the north, Leonard Street to the west, Seymour Street to the south, and Krank Street to the east.

Topographically, the project site is generally gently to very strongly sloping downward from north (El. 105-feet) to south (El. 62-feet). Existing conditions are depicted in **Figure 1, Exploration Location Plan.** Elevations noted herein are based on a topographic survey completed by Chazen on May 18, 2020 referencing the North American Vertical Datum 1988 (NAVD88).

3.0 SUBSURFACE EXPLORATIONS

This section summarizes the results of the subsurface explorations performed at the project site from June 1, 2020 and June 8, 2020 in support of interpretations made herein.

3.1 Test Explorations

Chazen conducted subsurface explorations to characterize the project site soil conditions and to collect representative soil samples based on the project layout at the time of the program. Samples were used for visual classification and as a basis for determining design criteria cited in this report. Eight (8) test boring explorations designated B1 through B8 were performed at the project site. As-drilled locations are documented on **Figure 1, Exploration Location Plan.**

Subsurface explorations were performed by Northeast Specialized Drilling (NSD) of Liverpool, New York utilizing a CME 55 Truck mounted drill rig capable of advancing a 3 1/2-inch internal diameter hollow stem auger with split spoon sampling. Test explorations were advanced to depths ranging from 42-feet (B3 and B5) and 87-feet (B1) below existing grades.

Explorations were monitored by a Chazen representative to advise the driller regarding location and depth of the test explorations, to record activities, and to modify the subsurface exploration as necessary. During soil sample collection, a 2-inch split spoon sampler was driven approximately 2-feet and the number of blows required to drive the sampler every 6-inches were recorded in accordance with ASTM D 1586 to measure the resistance of the soil to penetration of the sampler. Soil samples collected during the subsurface explorations were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. Logs detailing the explorations were prepared by Chazen to document subsurface conditions at the project site and are included within **Appendix A: Exploration Logs.**

3.2 Subsurface Stratigraphy

Explorations indicate that at least four distinct strata are present within the depth of explorations at the project site. The sequence of observed strata, working downward from existing site grade is generally: Fill, Glaciolacustrine Deposits, or Till overlying Bedrock. Each Stratum is described in greater detail below.

Fill: A stratum of Fill ranging in thickness from 5-feet to 10-feet was observed in all boring locations. This stratum was classified into predominantly fine-grained and predominantly coarse-grained substrata. Each sub-stratum is further described below.

- Predominantly fine-grained sub-stratum was visually classified as Silt (ML), Gravelly Silt with Sand (ML), and Sandy Silt with Gravel (ML), consisting of moist, dark brown to dark grey silt, with some to no percentage of gravel, some to a trace percentage of sand, a little to no percentage of clay, and a trace to no percentage of ash, wood fragments, cinders, and bricks

- Predominantly coarse-grained sub-stratum was visually classified as Silty Sand (SM), consisting of moist, brown sand, with some to a little percentage of silt, and a few percentage of gravel.

- In B5, an approximate 3-foot thick layer of Fill was observed at a depth of 5-feet below existing grade and consists of moist, black ash, cinders, brick, with a few percentage of sand and a trace percentage of gravel.

Glaciolacustrine Deposits: A stratum of Glaciolacustrine Deposits ranging in thickness from 32-feet to 75-feet was observed underlying the Fill in all boring locations. All boring terminated in this stratum excluding B1 and B8. This stratum was generally visually classified as Lean Clay (CL) or Fat Clay (CH), consisting of

moist to saturated, brown to grey clay, with some to no percentage of silt, a trace to no percentage of gravel, and a trace to no percentage of sand.

Till: In B1 and B8, an approximate 7-foot layer of Silty Sand (SM) was observed at a depth of 75-feet and 45-feet below existing grade, respectively. This layer consists of saturated, grey, mostly to a little percentage of sand, mostly to some percentage of silt, and a trace to no percentage of clay.

Bedrock: Bedrock was observed within boring B8 at a depth of 62.5-feet (El. 0.5-feet) below ground surface. According to a review of the Geologic Map of New York, bedrock at the project site is mapped as Normanskill Formation – Shale. Rock core samples were not obtained during the exploration, therefore detailed site-specific information regarding Bedrock lithology is not available.

3.3 Groundwater Conditions

Groundwater was observed within three (3) of the eight (8) test explorations at depths of 23.5-feet (B2, El. 59.5-feet), 30.5-feet (B8, El. 30.5-feet), and 66.5-feet (B1, El. 21-feet) below existing site grades. Perched water was observed flowing out of the hole in test exploration B4 when advancing the top 10-feet. Groundwater readings taken at termination of the explorations are typically considered unstabilized readings. Based on the soil type (CH and CL) long term observation wells would be required to obtain an accurate groundwater reading.

Groundwater levels recorded on the exploration logs are based on field observations and visual classification of soil samples. Groundwater will fluctuate with season, precipitation, nearby construction activity, and other factors.

3.4 Seismic Characterizations

Using an accepted procedure to determine liquefaction potential at the project site, soils are judged as not susceptible to liquefaction when examined under the following conditions: USGS published mean peak ground acceleration (0.252g), a maximum earthquake magnitude of 5.0, site recorded standard blow count values, observed groundwater levels, and percentage of fines in the underlying soils.

The soils across the project site have been characterized for seismic conditions in accordance with ASCE/SEI 7-16, “Minimum Design Loads for Buildings and Other Structures”, using the acceptable standard penetration resistance method. Based on the subsurface conditions observed, and our analysis and interpretation, Chazen calculated the project site as a Site Class E, with an S_S of 0.199g and S_1 of 0.06g.

Based upon blow counts (N-value) derived from the test boring explorations a Site Class E was calculated. A shear wave velocity test is recommended to more accurately determine seismic Site Class, anticipating that such data will support an improved Site Class.

4.0 RECOMMENDATIONS

This section presents our geotechnical recommendations for foundation design and construction of the proposed mixed-use structures based on the subsurface investigation. Our recommendations are in accordance with the related provisions of the 2020 Uniform Code of New York State which adopts the 2018 International Building Code (2018 IBC). At the time of this report, and based on “The Seventy-Six

Schematic Design Estimate Set" prepared by Garrison-Architects, dated June 26, 2020, we understand the Phase 1 buildings are as follows:

- Parking Lot D: ±43,000-sf, (El. 70'-6") extending from column line G to S,
- Parking Lot C: ±39,700-sf, (El. 81'-0") extending from column line G to P,
- Building B: 8-story, ±14,700-square foot (sf) footprint with Finished Floor Elevation (FFE) = 94'-6" and a Loading Dock FFE = 92'-0" extending from column line G to J,
- Building C: 7-story, ±10,900-sf footprint with FFE = 94'-6" extending from column line M to P,
- Building D: 7-story, ±5,700-sf footprint with FFE's = 79'-0", 67'-0", and 64'-0",
- Auxiliary Building: 2-story, ±6,200-sf footprint with below grade parking, extending from column line P to S,
- Greenhouse: 2-story, ±3,800-sf footprint with below grade parking and FFE = 71'-6", extending from column line P to S, and
- Mechanical Rooms: between Building C and D, (El. 74'-0") extending to the Greenhouse and Auxiliary Building.

4.1 Structures

4.1.1 Deep Foundation

Based on the observed subsurface conditions (i.e. weak clays), proposed locations of the structures, and finished exterior grades, Chazen recommends the use of deep foundation system. These structures should be founded on a reinforced concrete structural slab/pile cap supported by driven H-piles bearing on the underlying rock. Piles should have appropriate points determined by the manufacturer to protect the pile when driven on/into the bedrock.

Chazen recommends the use of driven H-piles (75-ton), deriving most of their capacity from end bearing on sound bedrock and some capacity from skin friction. It is recommended that driven piles are designed in accordance with the 2018 IBC Section 1810.3 and are sized, grouped and spaced under the pile cap to provide the required capacity.

In accordance with the BCNYS Section 1810.3.11, pile caps and connecting foundation elements shall be reinforced concrete. We recommend a minimum concrete compressive strength of 5,000 psi.

Pile groups and foundation systems shall be spaced and/or braced so that they are stable in all directions. Bracing shall be in accordance with the 2018 IBC Section 1810.2.2. Chazen recommends that piles are spaced at least 3 times the pile diameter to maintain full resistance and avoid partial loss of individual pile capacity when acting in a group. Pile elements should also have a minimum of 4-inch clearance from edge of the pile cap in accordance with the 2018 IBC Section 1810.3.11.

At the time of this report, Chazen was not informed of the lateral loads from the structure. If the below grade foundation walls are not sufficient to resist all lateral loads, separate battered piles are recommended to resist the lateral support. Chazen recommends if battered piles are used, that the piles should be battered at 15-degree angles and are used in compression only.

In accordance to 2018 IBC Section 1810.3.3.1.2, pile tests should be performed across the project site to validate and establish project specific embedment and driving criteria. Pile lengths will vary across the site to accommodate the increasing depth to bedrock from south to north.

Table 1 summarizes the soil and bedrock properties for the design of the pile system and other site features.

Table 1 – Estimated Strata Properties for Design

Stratum (in-situ)	**Approximate Depth Below Surface** (ft)	**Internal Friction Angle, ϕ** (degrees)	**Unit Weight, γ_T (pcf)[1]**	**Cohesion (c), (lbs/ft²)**	**Ca, Adhesion (psf)[3]**
Fill	0-10	30	110	150	150
Glaciolacustrine Deposits	5-75	-	100	300	280
Till	55-80	34	115	-	-
Bedrock	62-87.5+	Unconfined Compressive Strength = 5,000psi			

Notes:
1. Effective unit weights should be utilized for soil strata located below the groundwater elevation.
2. Estimate values based on the assumed Shale at the project site.
3. For tension (uplift) capacity: the capacity should be 30% of the theoretical calculated compression value.

A factor of safety (FS) of three (3) should be used when determining the allowable pile capacity. Lateral capacity of vertically driven piles should not be included in design, due to the potential for drift of the piles as result of the loose soils.

Chazen estimated piles will range from 62-feet to 70-feet in vertical length. The overall maximum pile length should consider bedrock at approximately El. -1 feet.

Total settlements and differential settlements (non-uniform settlement) for statically loaded driven H-piles founded on bedrock and designed using the recommended allowable bearing capacity are expected to be less than 0.125 inches.

We recommend corrosion protection of the steel piles due to the unknown corrosive potential of the soil. Corrosion control measure fall within either passive or active control. Passive control (i.e. metal loss allowance of 1/8-inch over the design life), galvanization or epoxy coated piles) and active control (i.e. sacrificial anodes) should be determined by the manufacturer and their corrosion protection engineer.

General Foundation Considerations

The bottom of all exterior foundations should be located a minimum of 4-feet below the lowest adjacent ground surface exposed to freezing. Additionally, the subgrade must be protected from freezing during construction. Foundations not exposed to freezing temperatures during construction (temporary condition) and located beneath continuously heated interior spaces should bear at least 18-inches below

the top of the soil supported slab (final condition). Foundation elements must be constructed in accordance with the 2018 IBC Sections 1807-1809.

In accordance with the 2018 IBC, Section 1805, considering the basement/parking garage walls are below the finished grade for more than 25 percent of the perimeter, the walls shall be dampproofed in accordance with Section 1805.2.2. In addition, a foundation drain should be installed around the portions of the perimeter where the basement/parking garage floor is below ground level. The foundation drain should be maintained to ensure a continuous free draining condition and have continuous positive discharge to daylight downhill or be connected into the nearby storm water collection system or other approved and/or acceptable drainage system.

Care should be taken not to disturb soils at the bearing surface or within the zone of influence of a foundation. The "zone of influence" is defined as a line drawn outward and downward from the lower edge of the footing at a 1 Horizontal: 1 Vertical (1H: 1V) slope. Exposed soil subgrades should be lightly compacted (proof rolled) prior to placement of foundation elements using appropriate construction equipment in large, accessible excavations and hand-guided compaction equipment in smaller excavations where access is limited. All unsuitable soils (i.e. soil that is observed to pump or weave during proof-rolling or soil containing material such as organics, cobbles/boulders, elongated or irregularly shaped particles, frozen material, etc.) and disturbed soils should be over excavated up to 12-inches and replaced with compacted material meeting the Granular Fill gradation identified in Section 4.5 of this report. We recommend contacting Chazen if on-site conditions require removal of additional depth.

4.1.2 Soil Supported Slabs

While preparing ground floor slab subgrades, we recommend utilizing an allowable bearing capacity of 1 ksf for the soil supported slabs and a modulus of soil reaction (k) of 100 pci. The subgrades must be protected from freezing during construction.

All unsuitable materials within 12-inches of the slab subgrade elevation should be over excavated and replaced with compacted Granular Fill. We recommend at least 4-inches of gravel or crushed stone containing not more than 10 percent of material that passes through a No. 4 Sieve, should be placed over the prepared subgrade for the slab to bear on. For a moisture sensitive slab, and in accordance with 2018 IBC Section 1805.2.1, a damp proofing material (vapor barrier) should be installed.

In accordance with 2018 IBC Section 1907 and to account for ACI allowable construction tolerances, the minimum slab on grade thickness should be 4-inches. Additionally, the design and construction of the slab should consider potential differential shrinkage between the top and bottom surfaces of the slab that could result in curling. A coefficient of friction of 0.2 should be used between the slab and vapor barrier and 0.4 for concrete cast directly against proof rolled compacted Stone Fill.

4.2 Lateral Earth Pressures

For the planned structures at the project site; we recommend using the following equivalent fluid pressure values to model lateral earth pressures of the on-site clay soils to remain. These values assume a level back slope and no hydrostatic pressures (drained conditions), with an internal friction angles for backfill soil of 28° (Fill), 18° (Glaciolacustrine), and a unit weight of soil of 110 pcf (Fill), 100 (Glaciolacustrine):

Lateral Earth Pressure Type	Equivalent Fluid Pressure	
	Fill	**Glaciolacustrine**
At rest – Static, (*Restrained condition at top of wall*)	58 psf/ft	69 psf/ft
Active (*Wall allows for deflection at top*)	40 psf/ft	53 psf/ft
Passive (1/2 of calculated value*)	153 psf/ft	95 psf/ft
Active with Seismic (*PGA, 2% PE in 50 years*)	61 psf/ft	72 psf/ft

*The full amount of passive resistance is often not incorporated into design as a provision for an additional factor of safety and for other reasons including the large amount of movement required to mobilize passive resistance and for the potential of future removal of soil. The amount of passive resistance used in the design of the wall shall be determined by the structural engineer of record. Chazen does not recommend utilizing passive pressure for the design of site retaining walls on a slope.

Equivalent fluid pressures stated herein do not include safety factors. When recommended, equivalent fluid pressures are utilized, appropriate factors of safety as recommended by the design codes for sliding, overturning and bearing capacity should be applied to the final design.

4.3 Pavement Recommendations

We recommend use of a flexible pavement system incorporating an asphalt surface, binder and subbase course for paved areas founded on in-situ soils after removal of all loose, disturbed or unsuitable soils. Standard Duty Pavement is recommended for parking areas, and the Heavy Duty Section is recommended for the loading dock areas. To develop the pavement section recommendation, we made the following preliminary design/loading assumptions pertaining to the anticipated traffic at the project site:

1. Vehicular traffic equal to the following;
    a. Daily loading from cars and light weight trucks/SUV, (Both)
    b. Daily loading from 6,000 lb 2-axle pickup trucks/SUV, (Both)
    c. 2 trips/week with 70,000 lb 3 axle – garbage truck, (Heavy)
    d. 4 trips/year with a 75,000 lb 2 axle - fire truck, (Both)
    e. 1 trip/day with a 54,000 2 axle – snow plow (365 trips during winter season), (Both)
    f. 25 trips/week with a 35,000 lb 3 axle – delivery truck, (Heavy)
    g. 50 trips/week with 60,000 lb 5 axle – tractor trailer, (Heavy)
2. A design life of 15-years.
3. A subgrade California Bearing Ratio (CBR) value of 10. (Fill)

Based on these traffic trip assumptions, and using a reduced subgrade strength due to frost conditions, we recommend the following pavement section:

Table 1: Standard Duty Pavement Section (Parking Areas)

Pavement Course	Min Thickness (inches)	NYSDOT Specification
Top	1.5	12.5 F2 Top, or Type 6
Binder	2.5	19 F9 Binder, or Type 3
Sub-base	8	Type 2

Table 2: Heavy Duty Pavement Section (Loading Docks)

Pavement Course	Min Thickness (inches)	NYSDOT Specification
Top	2.0	12.5 F2 Top, or Type 6
Binder	3.0	19 F9 Binder, or Type 3
Sub-base	12	Type 2

In addition, we recommend use of a non-woven, geotextile fabric such as Mirafi 500X, located between prepared subgrade and subbase course. The properly prepared pavement subgrade should be sloped towards the pavement edges to prevent water from ponding below the pavement.

4.4 Utilities

In general, utility trenches and established trench invert elevations should be located outside the "zone of influence" of foundation elements. Trench excavation widths should extend a minimum of 12-inches beyond the outer edges of the utility elements to be installed. Exposed subgrades should be lightly compacted (proof rolled) and filled with placed and compacted Pipe Bedding Fill extending 6-inches (minimum) below and above each utility.

On-site soil may be used as backfill above the pipe bedding material, however, due to the percentage of fine-grained material, placement of the material may be affected if the moisture content is greater or less than 3-percent of the optimum moisture content. Installation of an underground trace line is recommended along the utility line to facilitate location of the utility in the future.

When utilities are located in trenches below slabs and/or pavements, trenches should be backfilled above this point with compacted Common Fill up to the proposed subgrade. In landscaped areas, utility trenches above this point may be backfilled with compacted Common Fill. Installation of visible markers at the surface and an underground trace line are recommended along the utility line to facilitate location of the utility in the future.

4.5 Fill Materials

Fill materials shall be free of unsuitable material such as organics, construction debris, cobbles/boulders, frozen material, etc. Fill areas shall be cleared of all vegetation, roots, and other organic materials prior to placement of fill. Stockpiled soils may require installation of run-off protection between drainage channels and the stockpile.

We recommend compaction consist of at least 4 systematic passes using a vibratory roller. In confined areas, hand guided vibratory equipment shall be used to compact the soil to the specified criteria. If soil weaving or other disturbance is noticed during compaction, vibratory compaction should be discontinued.

Heavy compaction equipment shall not be used within 3-feet of the foundation system. Compaction shall meet the requirements stated below or as approved by a qualified engineer.

4.5.1 Pipe Bedding Material

Pipe Bedding Material should be a clean, granular, bedding fill meeting the following gradation and be placed in lifts not exceeding 8-inches loose, measured and compacted to 95% of maximum dry density as defined by ASTM D 1557:

Sieve Size	Percent Passing by Weight
¾-inch	100
No. 60	0-35
No. 100	0-10

4.5.2 Common Fill

Common Fill similar to NYSDOT Select Fill should consist of inorganic, sand based, granular soils, free of debris and other deleterious material that meet the following gradation:

Sieve Size	Percent Passing by Weight
4-inch	100
No. 40	0-70
No. 200	0-15

Common Fill used for site grading and landscaping should be placed in lifts not exceeding 9-inches loose, measured and compacted to 90% of the maximum dry density as determined by ASTM D 1557. All fill should be placed to promote positive drainage away from structures.

4.5.3 Granular Fill

Granular Fill similar to NYSDOT Select Granular Subgrade should consist of inorganic, granular soils, free of debris and other deleterious material that meet the following gradation:

Sieve Size	Percent Passing by Weight
3 inch	100
¼ inch	30 to 100
No. 40	0-50
No. 200	0-10

Granular Fill should be placed in lifts not exceeding 12-inches loose measure and compacted to 95% of the maximum dry density as determined by ASTM D 1557. Additionally, we recommend the moisture content stay within 3% of the tested optimum. Granular Fill shall be utilized within 2 feet of the bottom of the floor slab and within the zone of influence of footings.

4.5.4 Stone Fill

Stone Fill with not more than 10-percent material passing the number 4 sieve, such as a well graded ¾-inch crushed stone, is recommended for prepared subgrades for footings and slab construction. Stone Fill should be placed in loose lifts not to exceed 12-inches in thickness for heavy compaction equipment and 8-inches for lighter compaction equipment.

When Stone Fill is used as a drainage medium, it should be uniformly graded. A non-woven, geotextile meeting AASHTO M288 Survivability Class 3, such as a Mirafi 140N or equivalent, should be placed between the Stone Fill and adjacent soils to prevent the migration of fines into the stone void space.

4.5.5 On-Site Soils

Based on Chazen's visual classification, the on-site soils anticipated to be excavated (ML, SM, or CH), are deemed not suitable for use as Pipe Bedding Material as described above due to the percentage of fines present. The ML and SM soils can be stockpiled and reused in landscape areas as Common Fill if screened to remove any 4-inch or greater particles, and any deleterious materials and debris, and meeting the gradation requirements noted for same. Chazen does not recommend reuse of the CH material due to the difficulty with compaction and maintaining the required moisture content.

5.0 OTHER CONSIDERATIONS

This section presents our preliminary construction considerations to address excavation and groundwater conditions.

5.1 Site Preparation

After completion of clearing, grubbing, and regarding activities at the project site, the area should be restored to an acceptable baseline condition. We recommend proof rolling lightly disturbed natural soils left in-place after excavation activities are complete. However, if during foundation preparation, subgrade materials are determined to be unsatisfactory (i.e. pumping, weaving, frozen, becoming saturated, organics or cobbles/boulders present) by the Special Inspector, the area should be over excavated by up to 12-inches and backfilled with placed and compacted Granular Fill to achieve a proper bearing area as previously indicated.

5.2 Excavation

We anticipate that excavations for subgrade preparation can be accomplished using conventional earthwork equipment and techniques (i.e. backhoes, scrapers, excavators, or dozers) based on the physical characteristics, relative density of the stratum observed and the anticipated excavation limits.

At the time of this report, based on our understanding of the planned grading, the structures will have multiple stories of below grade parking. As stated in Section 4.0, Building D will require excavations on the order of 30± feet. Chazen recommends utilizing soldier pile with lagging or steel sheet piles to adequately stabilize the deep excavations. Chazen recommends utilizing a geocomposite (J-drain) directly against the lagging, with a damproofing membrane placed on the backs side. Lateral soil pressures for the in-situ soils are provided in Section 4.2.

Generally, all temporary cut slope excavations should not be left open or unbraced for extended periods of time. Temporary cuts should be sloped as required for stability in accordance with OSHA regulations and protected from erosion. OSHA requires each type of material be benched at the following slope for temporary excavations:

- Type "A" – 3/4 Horizontal: 1 Vertical (3/4H: 1V),
- Type "B" – 1 Horizontal: 1 Vertical (1H: 1V), and
- Type "C" – 1-1/2 Horizontal: 1 Vertical (1-1/2H: 1V).

Based on the subsurface explorations, overburden soils are to be considered OSHA Type "B." However, this should be verified for each excavation by an OSHA competent person.

5.3 Piles

Provided below are Chazen's considerations and recommendations for the construction of the pile foundation system.

1. The contractor may require a sizable area to place equipment, tools and H-piles.
2. Construction phase observation of pile installation is recommended to confirm assumptions made during the design and prepare a log of each pile. Typically, pile dimensions, plumbness, driving force, and driving depth is monitored and recorded during pile installation.
3. Load testing of selected piles is recommended to confirm the pile capacities.
4. As discussed in Section 5.6 of this report, in accordance with the 2018 IBC Section 1705 the Owner shall employ a Special Inspector to provide special inspections.

5.4 Control of Water

Based on the proposed bottom of foundation elevations and observed depth to groundwater, perched ground water seepage into open excavations may occur. Dewatering measures (e.g., sumps, barriers) should be readily available during construction to remove surface water and precipitation if needed in open excavations.

Surface water must be controlled during construction and earthwork operations by using temporary swales, ditches or other means necessary. All surfaces shall be restored to vegetated conditions upon completion of construction.

5.5 Earthwork Special Inspection

In accordance with the 2018 IBC Section 1705.8, the Owner shall employ a Special Inspector to provide special inspections and verification of existing site soil conditions, fill placement and load-bearing capacity at the structure as outlined in Table 1705.6 *Required Special Inspections and Tests of Soils*. During fill placement, the Special Inspector shall determine that proper materials and procedures are used in accordance with the provisions of this geotechnical report.

5.6 Pile Special Inspection

In accordance with the 2018 IBC Section 1705.8 the Owner shall employ a Special Inspector to provide special inspections and verification of pile materials, sizes and length, to determine the capacity of the test piles, and conduct additional load tests, verify placement locations, and plumbness, record tip, and butt elevations, and document any pile damage as outlined in Table 1705.8 Required Special Inspections and Tests of Cast-in-Place Deep Foundation Elements. Additionally, the reinforcement, and grout used in the design shall be verified to ensure compliance with the construction documents.

6.0 CLOSURE

This report and the recommendations contained herein have been prepared for the exclusive use by South End Development, LLC and their representatives for specific application relative to the proposed mixed-use structures and below grade parking at the project site located in the South End Neighborhood off of Second Avenue in the City of Albany, Albany County, New York.

This report was prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made. The analyses, designs and recommendations presented in this report are based in part upon the data obtained from subsurface explorations available at the time of this investigation. The nature and extent of variations between these explorations may not become evident until construction. If significant variations appear, it may be necessary to reevaluate the recommendations cited in this report.

Prepared by,

Dean Anderson Jr.
Assistant Geotechnical Project Engineer

Reviewed and approved by;

Matthew A. Korn, PE
Principal
Manager of Geotechnical Engineering Services

Figure 1:

Exploration Location Plan

NOTES:

1. TOPOGRAPHIC INFORMATION SHOWN HEREON WAS COMPILED FROM A FIELD SURVEY COMPLETED BY CHAZEN ON MAY 18, 2020.
2. THE VERTICAL DATUM REFERENCES THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88).
3. SOIL TEST BORING LOCATIONS SHOWN HEREON WERE WITNESSED BY CHAZEN BETWEEN JUNE 1, 2020 AND JUNE 8, 2020.

B1 TEST BORING LOCATION

CHAZEN ENGINEERING, LAND SURVEYING & LANDSCAPE ARCHITECTURE CO., D.P.C.

Office Locations:

☐ Hudson Valley Office:
21 Fox Street
Poughkeepsie, New York 12601
Phone: (845) 454–3980

☐ North Country Office:
20 Elm Street (Suite 110)
Glens Falls, New York 12801
Phone: (518) 812–0513

☒ Capital District Office:
547 River Street
Troy, New York 12180
Phone: (518) 273–0055

☐ Westchester NY Office:
1 North Broadway, Suite 803
White Plains, New York 10601
Phone: (914) 997–8510

Nashville Tennessee Office:
2416 21st Ave S. (Suite 103)
Nashville, Tennessee 37212
Phone: (615) 380–1359

Chattanooga Tennessee Office:
1426 Williams St. (Suite 12)
Chattanooga, Tennessee 37408
Phone: (423) 241–6575

THE SEVENTY-SIX, MIXED USE REDEVELOPMENT

EXPLORATION LOCATION PLAN

CITY OF ALBANY, ALBANY COUNTY, NEW YORK

designed	checked
TMD	MAK
date	scale
06/15/20	1:50
project no.	
32019.00	
sheet no.	
FIG-1	

Drawing Name: Z:\projects\32000-32099\32019-00 South End Development Albany\DWG\99_FIG1_32019-00_EXPLORATION LOCATION PLAN.dwg Date Printed: Jul 09, 2020, 5:02pm

Appendix A:
Exploration Logs

INTERPRETATION OF SUBSURFACE LOGS

The Exploration Logs present observations and the results of tests performed in the field by the Driller, Technician, Geologists, and Geotechnical Engineers as noted. Soil/Rock classifications are made visually and modified accordingly based on laboratory results. The classification of soils or soil like material is subject to limitations imposed by the size of the sampler, the size of the sample and it's degree of disturbance and moisture.

The following defines some of the terms utilized in the preparation of the Subsurface Logs.

SOIL CLASSIFICATIONS

Soil classifications are visual descriptions on the basis of the Unified Soil Classification ASTM D-2488. The soil density or consistency is based on the penetration resistance determined by ASTM D 1586. Soil Moisture of the recovered materials is described as DRY, MOIST, WET or SATURATED.

SIZE DESCRIPTION		RELATIVE DENSITY/CONSISTENCY (BASIS ASTM D1586)			
Soil Type	Particle Size	Granular Soil		Cohesive Soil	
Boulder	>12"	Density	Blows/FT	Consistency	Blows/FT
Cobble	3"- 12"	Very Loose	< 4	Very Soft	< 2
Gravel-Coarse	3" – ¾"	Loose	5 – 10	Soft	2 - 5
Gravel-Fine	¾" - #4	Medium Dense	11 – 30	Medium Stiff	6 – 10
Sand-Coarse	#4 - #10	Dense	31- 50	Stiff	10 – 20
Sand-Medium	#10 - #40	Very Dense	50+	Very Stiff	20 – 30
Sand-Fine	#40 - #200			Hard	>30
Silt/NonPlastic	< #200				
Clay/Plastic	< #200				

SOIL STRUCTURE		RELATIVE PROPORTION OF SOIL TYPES	
Structure	Description	Description	% of Sample by Weight
Layer	6" Thick or Greater	Mostly	50 – 100
Seam	6" Thick or Less	Some	30 – 45
Parting	Less than ¼" thick	Little	15 – 25
Varved	Uniform horizontal partings or seams	Few	5 – 10
		Trace	Less than 5

Additional Notes:

1. Utilized c: coarse, m: medium, and f: fine when describing the size of sand or gravel.
2. WOH – weight of hammer.
3. WOR – weight of rods.
4. bgs – below ground surface
5. NA – Not Available
6. ▼ – Phreatic Surface, if observed

Refusal:

1. Split-spoon refusal is considered 50 blows over six inches.
2. Auger and Casing refusal occurs if the driller is unable to advance the boring.
3. Roller bit refusal occurs if the bit is worn and needs to be replaced or the bedrock is a dense very hard material.

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B1**
Total Depth: 87 ft.

Contractor: Northeast Specialized Drilling
Drill Rig: CME 55 Truck Rig
Driller: Marc Cheney
Inspector: Dean Anderson

Start Date: 1-Jun-2020
Finish Date: 1-Jun-2020
El. Datum: NAVD88
G.S. Elevation: 87.0

Northing: See Figure
Easting:
Latitude: 42.63796
Longitude: -73.76458

Borehole Dia.: 3.5 in.
Water Depth: 66.5 ft.
Bedrock Depth: n/a ft.
Sample Hammer: Manual

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery (in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
		SS-1	3	14		SM	Silty Sand (SM): Mostly Sand, little Silt, few Gravel, brown, moist (Fill)	3" Topsoil
1	86		4					
			3					
2	85		4					
3	84							
4	83							
5	82							Approximate Strata Change
		SS-2	2	12		CH	Fat Clay (CH): Mostly Clay, little Silt, brown, moist (Glaciolacustrine)	
6	81		2					
			3					
7	80		4					
8	79							
9	78							
10	77							
		SS-3	2	14		CH	Fat Clay (CH): Mostly Clay, some Silt, trace Sand, trace Gravel, grey, moist to wet	
11	76		1					
			2					
12	75		3					
13	74							
14	73							
15	72							
		SS-4	2	14		CH	Fat Clay (CH): Mostly Clay, some Silt, grey, moist	
16	71		3					
			2					
17	70		3					
18	69							
19	68							
20	67							
		SS-5	3	20		ML	Silt (ML): Mostly Silt, some Clay, brown, moist	

METHODS: **HA**- Hollow Stem Auger, **RWH**- Rotary Wash, **SSA**- Solid Stem Auger, **DC**-Diamond Core, **DP**-Direct Push

SAMPLE TYPES: **SS-Split Spoon, RC-Bedrock Core, GS-Geoprobe Sleeve, ST-Shelby Tube**

STANDARD 1. Samples classified in accordance with ASTM D-2488 unless otherwise noted.

NOTES: 2. Test Boring Log Page 1: 0 - 20 feet. Each subsequent page: Additional 25 feet.

3. Refer to the "Interpretation of Subsurface Logs" for additional symbology and abbreviation definitions.

ADDITIONAL NOTES:

DRILLING INFORMATION

Method:	HA	0 to	85.0
		Sample	Core
Type		SS	
Int Diam.		3.25	
Weight		140 lb.	
Fall		30"	

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B1**
Total Depth: 87 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
21	66		4					
			7					
22	65		7					
23	64							
24	63							
25	62	SS-6	1	24		CH	Fat Clay (CH): Mostly Clay, grey, moist to wet	
26	61		2					
			2					
27	60		2					
28	59							
29	58							
30	57	SS-7	1	24		CH	Fat Clay (CH): Mostly Clay, grey, moist to wet	
31	56		2					
			1					
32	55		3					
33	54							
34	53							
35	52	SS-8	1	24		CH	Fat Clay (CH): Mostly Clay, grey, moist to wet	
36	51		2					
			3					
37	50		2					
38	49							
39	48							
40	47	SS-9	3	24		CH	Fat Clay (CH): Mostly Clay, grey, saturated	
41	46		2					
			3					
42	45		4					
43	44							
44	43							
45	42	SS-10	2	24		CH	Fat Clay (CH): Mostly Clay, grey, saturated	

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B1**
Total Depth: 87 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
46	41		3					
			3					
47	40		3					
48	39							
49	38							
50	37							
		SS-11	2	24		CH	Fat Clay (CH): Mostly Clay, grey, saturated	
51	36		3					
			2					
52	35		3					
53	34							
54	33							
55	32							
		SS-12	2	24		CH	Fat Clay (CH): Mostly Clay, trace Sand, grey, saturated	
56	31		2					
			2					
57	30		4					
58	29							
59	28							
60	27							
		SS-13	2	24		CH	Fat Clay (CH): Mostly Clay, grey, saturated	
61	26		3					
			3					
62	25		3					
63	24							
64	23							
65	22							
		SS-14	3	24		CH	Fat Clay (CH): Mostly Clay, grey, saturated	
66	21		2					
			3		▼			
67	20		4					
68	19							
69	18							
70	17							
		SS-15	4	24		CH	Fat Clay (CH): Mostly Clay, grey, saturated	

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B1**
Total Depth: 87 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
71	16		4					
			4					
72	15		6					
73	14							
74	13							
75	12							Approximate Sub-Strata Change
		SS-16	4	24		ML	Silt with Sand (ML): Mostly Silt, little Sand, trace Clay, grey, saturated	
76	11		4					
			5					
77	10		5					
78	9							
79	8							
80	7							Approximate Strata Change
		SS-17	7	22		SM	Silty Sand (SM): Mostly Sand, some Silt, grey, saturated (Till)	
81	6		8					
			12					
82	5		18					
83	4							
84	3							
85	2							
		SS-18	10	24		SM	Silty Sand (SM): Mostly Sand, some Silt, grey, saturated	
86	1		10					
			12					
87	0		16					
							Boring Terminated at 87-feet below ground surface	
88	-1							
89	-2							
90	-3							
91	-4							
92	-5							
93	-6							
94	-7							
95	-8							

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B2**
Total Depth: 47 ft.

Contractor: Northeast Specialized Drilling
Drill Rig: CME 55 Truck Rig
Driller: Marc Cheney
Inspector: Dean Anderson

Start Date: 2-Jun-2020
Finish Date: 2-Jun-2020
El. Datum: NAVD88
G.S. Elevation: 83.0

Northing: See Figure
Easting:
Latitude: 42.63787
Longitude: -73.76422

Borehole Dia.: 3.5 in.
Water Depth: 23.5 ft.
Bedrock Depth: n/a ft.
Sample Hammer: Manual

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery (in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
0	83	SS-1	4	6		ML	Gravelly Silt with Sand (ML): Mostly Silt, some Gravel, little Sand, dark grey, moist (Fill)	2" Topsoil
			3					
1	82		3					
			2					
2	81							
3	80							
4	79							
5	78	SS-2	1	10		ML	Sandy Silt with Gravel (ML): Mostly Silt, little Sand, little Gravel, trace Organics, dark brown, moist	Organics consist of ash and wood fragments
			1					
6	77		1					
7	76							
8	75							
9	74							
10	73							Approximate Strata Change
		SS-3	2	20		CH	Fat Clay (CH): Mostly Clay, little Silt, brown, moist (Glaciolacustrine)	
			3					
11	72		4					
12	71		3					
13	70							
14	69							
15	68							
		SS-4	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, brown, moist	
16	67		4					
			6					
17	66		7					
18	65							
19	64							
20	63							
		SS-5	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, brown, moist	

METHODS: **HA**- Hollow Stem Auger, **RWH**- Rotary Wash, **SSA**- Solid Stem Auger, **DC**-Diamond Core, **DP**-Direct Push

SAMPLE TYPES: **SS-Split Spoon, RC-Bedrock Core, GS-Geoprobe Sleeve, ST-Shelby Tube**

STANDARD 1. Samples classified in accordance with ASTM D-2488 unless otherwise noted.

NOTES: 2. Test Boring Log Page 1: 0 - 20 feet. Each subsequent page: Additional 25 feet.

3. Refer to the "Interpretation of Subsurface Logs" for additional symbology and abbreviation definitions.

ADDITIONAL NOTES:

DRILLING INFORMATION

Method:	HA	0 to	45.0
		Sample	Core
Type		SS	
Int Diam.		3.25	
Weight		140 lb.	
Fall		30"	

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B2**
Total Depth: 47 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
21	62		4					
			3					
22	61		4					
23	60							
					▼			
24	59							
25	58							
		SS-6	2	24		CH	Fat Clay (CH): Mostly Clay, grey, wet	
26	57		2					
			3					
27	56		3					
28	55							
29	54							
30	53							
		SS-7	1	24		CH	Fat Clay (CH): Mostly Clay, grey, wet	
31	52		2					
			1					
32	51		3					
33	50							
34	49							
35	48							
		SS-8	2	24		CH	Fat Clay (CH): Mostly Clay, grey, wet	
36	47		3					
			2					
37	46		3					
38	45							
39	44							
40	43							
		SS-9	2	24		CH	Fat Clay (CH): Mostly Clay, grey, wet	
41	42		3					
			2					
42	41		3					
43	40							
44	39							
45	38							
		SS-10	2	24		CH	Fat Clay (CH): Mostly Clay, grey, wet	

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B2**

Total Depth: 47 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
46	37		2					
			2					
47	36		2					
							Boring Terminated at 47-feet below ground surface	
48	35							
49	34							
50	33							
51	32							
52	31							
53	30							
54	29							
55	28							
56	27							
57	26							
58	25							
59	24							
60	23							
61	22							
62	21							
63	20							
64	19							
65	18							
66	17							
67	16							
68	15							
69	14							
70	13							

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B3**
Total Depth: 42 ft.

Contractor: Northeast Specialized Drilling
Drill Rig: CME 55 Truck Rig
Driller: Marc Cheney
Inspector: Dean Anderson

Start Date: 3-Jun-2020
Finish Date: 3-Jun-2020
El. Datum: NAVD88
G.S. Elevation: 88.0

Northing: See Figure
Easting:
Latitude: 42.63806
Longitude: -73.7644

Borehole Dia.: 3.5 in.
Water Depth: n/a ft.
Bedrock Depth: n/a ft.
Sample Hammer: Manual

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
		SS-1	3	12		ML	Silt (ML): Mostly Silt, little Clay, brown, moist (Fill)	3" Topsoil
1	87		4					
			5					
2	86		6					
3	85							
4	84							
5	83							Approximate Strata Change
		SS-2	4	16		CL	Lean Clay (CL): Mostly Clay, little Silt, brown, moist (Glaciolacustrine)	
6	82		5					
			6					
7	81		6					
8	80							
9	79							
10	78							
		SS-3	4	18		CL	Lean Clay (CL): Mostly Clay, brown, moist	
11	77		4					
			5					
12	76		5					
13	75							
14	74							
15	73							
		SS-4	3	18		CL	Lean Clay (CL): Mostly Clay, some Silt, brown, moist	
16	72		3					
			4					
17	71		5					
18	70							
19	69							
20	68							
		SS-5	3	24		CH	Fat Clay (CH): Mostly Clay, grey, moist	

METHODS: **HA**- Hollow Stem Auger, **RWH**- Rotary Wash, **SSA**- Solid Stem Auger, **DC**-Diamond Core, **DP**-Direct Push

SAMPLE TYPES: **SS-Split Spoon, RC-Bedrock Core, GS-Geoprobe Sleeve, ST-Shelby Tube**

STANDARD 1. Samples classified in accordance with ASTM D-2488 unless otherwise noted.

NOTES: 2. Test Boring Log Page 1: 0 - 20 feet. Each subsequent page: Additional 25 feet.

3. Refer to the "Interpretation of Subsurface Logs" for additional symbology and abbreviation definitions.

ADDITIONAL NOTES:

DRILLING INFORMATION

Method:	HA	0 to	40.0
		Sample	Core
Type		SS	
Int Diam.		3.25	
Weight		140 lb.	
Fall		30"	

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B3**
Total Depth: 42 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
21	67		2					
			3					
22	66		3					
23	65							
24	64							
25	63							
		SS-6	2	24		CH	Fat Clay (CH): Mostly Clay, grey, wet	
26	62		2					
			4					
27	61		3					
28	60							
29	59							
30	58							
		SS-7	2	24		CH	Fat Clay (CH): Mostly Clay, grey, wet	
31	57		3					
			3					
32	56		4					
33	55							
34	54							
35	53							
		SS-8	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
36	52		3					
			3					
37	51		4					
38	50							
39	49							
40	48							
		SS-9	3	24		CH	Fat Clay (CH): Mostly Clay, grey, wet	
41	47		3					
			4					
42	46		3					
							Boring Terminated at 42-feet below ground surface	
43	45							
44	44							
45	43							

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B4**
Total Depth: 47 ft.

Contractor: Northeast Specialized Drilling
Drill Rig: CME 55 Truck Rig
Driller: Marc Cheney
Inspector: Dean Anderson

Start Date: 3-Jun-2020
Finish Date: 3-Jun-2020
El. Datum: NAVD88
G.S. Elevation: 81.0

Northing: See Figure
Easting:
Latitude: 42.63771
Longitude: -73.76426

Borehole Dia.: 3.5 in.
Water Depth: n/a ft.
Bedrock Depth: n/a ft.
Sample Hammer: Manual

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
		SS-1	2	12		SM	Silty Sand (SM): Mostly Sand, some Silt, grey to brown, moist (Fill)	
1	80		2					
			2					
2	79		2					
								Perched water flowing, coming up hole when augering
3	78							
4	77							
5	76							
		SS-2	2	8		SM	Silty Sand (SM): Mostly Sand, some Silt, grey to brown, moist	
6	75		1					
			2					
7	74		1					
8	73							
9	72							
10	71							Approximate Strata Change
		SS-3	2	15		CL	Lean Clay (CL): Mostly Clay, little Silt, grey, wet (Glaciolacustrine)	
11	70		2					
			2					
12	69		2					
13	68							
14	67							
15	66							
		SS-4	2	12		CL	Lean Clay (CL): Mostly Clay, little Silt, grey, wet	
16	65		1					
			2					
17	64		2					
18	63							
19	62							
20	61							
		SS-5	1	20		CH	Fat Clay (CH): Mostly Clay, trace Silt, grey, wet	

METHODS: **HA**- Hollow Stem Auger, **RWH**- Rotary Wash, **SSA**- Solid Stem Auger, **DC**-Diamond Core, **DP**-Direct Push

SAMPLE TYPES: **SS-Split Spoon, RC-Bedrock Core, GS-Geoprobe Sleeve, ST-Shelby Tube**

STANDARD 1. Samples classified in accordance with ASTM D-2488 unless otherwise noted.

NOTES: 2. Test Boring Log Page 1: 0 - 20 feet. Each subsequent page: Additional 25 feet.

3. Refer to the "Interpretation of Subsurface Logs" for additional symbology and abbreviation definitions.

ADDITIONAL NOTES:

DRILLING INFORMATION

Method:	HA	0 to	45.0
		Sample	Core
Type		SS	
Int Diam.		3.25	
Weight		140 lb.	
Fall		30"	

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B4**
Total Depth: 47 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
21	60		1					
			1					
22	59		2					
23	58							
24	57							
25	56	SS-6	2	24		CH	Fat Clay (CH): Mostly Clay, trace Silt, grey, wet	
26	55		2					
			3					
27	54		4					
28	53							
29	52							
30	51	SS-7	2	24		CH	Fat Clay (CH): Mostly Clay, trace Silt, grey, wet	
31	50		2					
			2					
32	49		3					
33	48							
34	47							
35	46	SS-8	1	24		CH	Fat Clay (CH): Mostly Clay, trace Silt, grey, wet	
36	45		2					
			2					
37	44		2					
38	43							
39	42							
40	41	SS-9	2	24		CH	Fat Clay (CH): Mostly Clay, trace Silt, grey, wet	
41	40		2					
			2					
42	39		3					
43	38							
44	37							
45	36	SS-10	2	24		CH	Fat Clay (CH): Mostly Clay, trace Silt, grey, wet	

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B4**
Total Depth: 47 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
46	35		2					
			3					
47	34		3					
							Boring Terminated at 47-feet below ground surface	
48	33							
49	32							
50	31							
51	30							
52	29							
53	28							
54	27							
55	26							
56	25							
57	24							
58	23							
59	22							
60	21							
61	20							
62	19							
63	18							
64	17							
65	16							
66	15							
67	14							
68	13							
69	12							
70	11							

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B5**
Total Depth: 42 ft.

Contractor: Northeast Specialized Drilling
Drill Rig: CME 55 Truck Rig
Driller: Marc Cheney
Inspector: Dean Anderson

Start Date: 3-Jun-2020
Finish Date: 3-Jun-2020
El. Datum: NAVD88
G.S. Elevation: 87.0

Northing: See Figure
Easting:
Latitude: 42.63772
Longitude: -73.7646

Borehole Dia.: 3.5 in.
Water Depth: n/a ft.
Bedrock Depth: n/a ft.
Sample Hammer: Manual

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
0	87	SS-1	4	14		ML	Silt (ML): Mostly Silt, trace Sand, trace Clay, brown, moist (Fill)	3" Topsoil
			7					
1	86		4					
			5					
2	85							
3	84							
4	83							
5	82	SS-2	3	10			Fill: Mostly Ash, few Sand, trace Gravel, black, moist	
			2					
6	81		2					
			1					
7	80							
8	79							
9	78							
10	77	SS-3	2	18		ML	Silt (ML): Mostly Silt, some Clay, brown, moist (Glaciolacustrine)	Approximate Strata Change
			4					
11	76		4					
			5					
12	75							
13	74							
14	73							
15	72	SS-4	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
			3					
16	71		4					
			5					
17	70							
18	69							
19	68							
20	67	SS-5	3	20		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	

METHODS: **HA**- Hollow Stem Auger, **RWH**- Rotary Wash, **SSA**- Solid Stem Auger, **DC**-Diamond Core, **DP**-Direct Push

SAMPLE TYPES: **SS-Split Spoon, RC-Bedrock Core, GS-Geoprobe Sleeve, ST-Shelby Tube**

STANDARD 1. Samples classified in accordance with ASTM D-2488 unless otherwise noted.

NOTES: 2. Test Boring Log Page 1: 0 - 20 feet. Each subsequent page: Additional 25 feet.

3. Refer to the "Interpretation of Subsurface Logs" for additional symbology and abbreviation definitions.

ADDITIONAL NOTES:

DRILLING INFORMATION

Method:	HA	0 to	40.0
		Sample	Core
Type		SS	
Int Diam.		3.25	
Weight		140 lb.	
Fall		30"	

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B5**
Total Depth: 42 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
21	66		2					
			3					
22	65		4					
23	64							
24	63							
25	62	SS-6	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
26	61		3					
			2					
27	60		3					
28	59							
29	58							
30	57	SS-7	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
31	56		3					
			3					
32	55		3					
33	54							
34	53							
35	52	SS-8	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
36	51		3					
			3					
37	50		3					
38	49							
39	48							
40	47	SS-9	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
41	46		3					
			3					
42	45		3					
							Boring Terminated at 42-feet below ground surface	
43	44							
44	43							
45	42							

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B6**
Total Depth: 52 ft.

Contractor: Northeast Specialized Drilling
Drill Rig: CME 55 Truck Rig
Driller: Marc Cheney
Inspector: Dean Anderson

Start Date: 4-Jun-2020
Finish Date: 4-Jun-2020
El. Datum: NAVD88
G.S. Elevation: 90.0

Northing: See Figure
Easting:
Latitude: 42.63773
Longitude: -73.76496

Borehole Dia.: 3.5 in.
Water Depth: n/a ft.
Bedrock Depth: n/a ft.
Sample Hammer: Manual

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery (in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
		SS-1	2	12		ML	Silt (ML): Mostly Silt, little Clay, trace Sand, brown, moist (Fill)	3" Topsoil
1	89		4					
			6					
2	88		5					
3	87							
4	86							
5	85							Approximate Strata Change
		SS-2	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet (Glaciolacustrine)	
6	84		2					
			3					
7	83		3					
8	82							
9	81							
10	80							
		SS-3	2	18		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
11	79		2					
			2					
12	78		3					
13	77							
14	76							
15	75							
		SS-4	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
16	74		2					
			2					
17	73		3					
18	72							
19	71							
20	70							
		SS-5	2	20		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	

METHODS: **HA**- Hollow Stem Auger, **RWH**- Rotary Wash, **SSA**- Solid Stem Auger, **DC**-Diamond Core, **DP**-Direct Push

SAMPLE TYPES: **SS-Split Spoon, RC-Bedrock Core, GS-Geoprobe Sleeve, ST-Shelby Tube**

STANDARD 1. Samples classified in accordance with ASTM D-2488 unless otherwise noted.

NOTES: 2. Test Boring Log Page 1: 0 - 20 feet. Each subsequent page: Additional 25 feet.

3. Refer to the "Interpretation of Subsurface Logs" for additional symbology and abbreviation definitions.

ADDITIONAL NOTES:

DRILLING INFORMATION

Method:	HA	0 to	50.0
		Sample	Core
Type		SS	
Int Diam.		3.25	
Weight		140 lb.	
Fall		30"	

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B6**
Total Depth: 52 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
21	69		1					
			3					
22	68		2					
23	67							
24	66							
25	65							
		SS-6	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
26	64		2					
			2					
27	63		3					
28	62							
29	61							
30	60							
		SS-7	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
31	59		3					
			2					
32	58		3					
33	57							
34	56							
35	55							
		SS-8	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, saturated	
36	54		1					
			3					
37	53		2					
38	52							
39	51							
40	50							
		SS-9	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, saturated	
41	49		2					
			2					
42	48		3					
43	47							
44	46							
45	45							
		SS-10	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, saturated	

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B6**
Total Depth: 52 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
46	44		3					
			3					
47	43		3					
48	42							
49	41							
50	40							
		SS-11	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, saturated	
51	39		3					
			3					
52	38		3					
							Boring Terminated at 52-feet below ground surface	
53	37							
54	36							
55	35							
56	34							
57	33							
58	32							
59	31							
60	30							
61	29							
62	28							
63	27							
64	26							
65	25							
66	24							
67	23							
68	22							
69	21							
70	20							

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B7**
Total Depth: 47 ft.

Contractor: Northeast Specialized Drilling
Drill Rig: CME 55 Truck Rig
Driller: Marc Cheney
Inspector: Dean Anderson

Start Date: 5-Jun-2020
Finish Date: 5-Jun-2020
El. Datum: NAVD88
G.S. Elevation: 85.0

Northing: See Figure
Easting:
Latitude: 42.63751
Longitude: -73.76501

Borehole Dia.: 3.5 in.
Water Depth: n/a ft.
Bedrock Depth: n/a ft.
Sample Hammer: Manual

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery (in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
0		SS-1	2	16		ML	Silt (ML): Mostly Silt, little Sand, trace Gravel, brown, moist (Fill)	
1	84		4					
			5					
2	83		5					
3	82							
4	81							
5	80							Approximate Strata Change
		SS-2	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, moist (Glaciolacustrine)	
6	79		2					
			3					
7	78		3					
8	77							
9	76							
10	75							
		SS-3	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, moist	
11	74		3					
			3					
12	73		4					
13	72							
14	71							
15	70							
		SS-4	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	ST Sample
16	69		3					
			3					
17	68		3					
18	67							
19	66							
20	65							
		SS-5	2	24		CH	Fat Clay (CH: Mostly Clay, little Silt, grey, moist	

METHODS: **HA**- Hollow Stem Auger, **RWH**- Rotary Wash, **SSA**- Solid Stem Auger, **DC**-Diamond Core, **DP**-Direct Push

SAMPLE TYPES: **SS-Split Spoon, RC-Bedrock Core, GS-Geoprobe Sleeve, ST-Shelby Tube**

STANDARD 1. Samples classified in accordance with ASTM D-2488 unless otherwise noted.

NOTES: 2. Test Boring Log Page 1: 0 - 20 feet. Each subsequent page: Additional 25 feet.

3. Refer to the "Interpretation of Subsurface Logs" for additional symbology and abbreviation definitions.

ADDITIONAL NOTES:

DRILLING INFORMATION

Method:	HA	0 to	45.0
		Sample	Core
Type		SS	
Int Diam.		3.25	
Weight		140 lb.	
Fall		30"	

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B7**
Total Depth: 47 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
21	64		2					
			3					
22	63		3					
23	62							
24	61							
25	60							
		SS-6	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, moist to wet	
26	59		2					
			3					
27	58		2					
28	57							
29	56							
30	55							
		SS-7	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, moist to wet	
31	54		3					
			3					
32	53		3					
33	52							
34	51							
35	50							
		SS-8	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, moist to wet	
36	49		2					
			2					
37	48		3					
38	47							
39	46							
40	45							
		SS-9	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, moist to wet	
41	44		3					
			2					
42	43		3					
43	42							
44	41							
45	40							
		SS-10	3	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, moist to wet	

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B7**
Total Depth: 47 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
46	39		2					
			3					
47	38		3					
							Boring Terminated at 47-feet below ground surface	
48	37							
49	36							
50	35							
51	34							
52	33							
53	32							
54	31							
55	30							
56	29							
57	28							
58	27							
59	26							
60	25							
61	24							
62	23							
63	22							
64	21							
65	20							
66	19							
67	18							
68	17							
69	16							
70	15							

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B8**
Total Depth: 62.3 ft.

Contractor: Northeast Specialized Drilling
Drill Rig: CME 55 Truck Rig
Driller: Marc Cheney
Inspector: Dean Anderson

Start Date: 8-Jun-2020
Finish Date: 8-Jun-2020
El. Datum: NAVD88
G.S. Elevation: 63.0

Northing: See Figure
Easting:
Latitude: 42.63722
Longitude: -73.76479

Borehole Dia.: 3.5 in.
Water Depth: 30.5 ft.
Bedrock Depth: 62.3 ft.
Sample Hammer: Manual

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery (in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
		SS-1	2	9		ML	Sandy Silt (ML): Mostly Silt, some Sand, grey to brown, moist (Fill)	2" Topsoil
1	62		4					
			5					
2	61		4					
3	60							
4	59							
5	58							Approximate Strata Change
		SS-2	4	12		ML	Silt (ML): Mostly Silt, little Clay, brown, moist (Glaciolacustrine)	
6	57		7					
			8					
7	56		10					
8	55							
9	54							
10	53							
		SS-3	5	19		CH	Fat Clay (CH): Mostly Clay, some Silt, grey, moist	
11	52		6					
			8					
12	51		8					
13	50							
14	49							
15	48							
		SS-4	3	24		CH	Fat Clay (CH): Mostly Clay, some Silt, grey, moist	
16	47		4					
			4					
17	46		5					
18	45							
19	44							
20	43							
		SS-5	2	20		CH	Fat Clay (CH): Mostly Clay, some Silt, grey, moist	

METHODS: **HA**- Hollow Stem Auger, **RWH**- Rotary Wash, **SSA**- Solid Stem Auger, **DC**-Diamond Core, **DP**-Direct Push

SAMPLE TYPES: **SS-Split Spoon, RC-Bedrock Core, GS-Geoprobe Sleeve, ST-Shelby Tube**

STANDARD 1. Samples classified in accordance with ASTM D-2488 unless otherwise noted.

NOTES: 2. Test Boring Log Page 1: 0 - 20 feet. Each subsequent page: Additional 25 feet.

3. Refer to the "Interpretation of Subsurface Logs" for additional symbology and abbreviation definitions.

ADDITIONAL NOTES:

DRILLING INFORMATION

Method:	HA	0 to	62.3
		Sample	Core
Type		SS	
Int Diam.		3.25	
Weight		140 lb.	
Fall		30"	

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B8**
Total Depth: 62.3 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
21	42		3					
			3					
22	41		4					
23	40							
24	39							
25	38	SS-6	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
26	37		3					
			3					
27	36		3					
28	35							
29	34							
30	33	SS-7	2	24	▼	CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
31	32		2					
			3					
32	31		3					
33	30							
34	29							
35	28	SS-8	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
36	27		2					
			3					
37	26		3					
38	25							
39	24							
40	23	SS-9	2	24		CH	Fat Clay (CH): Mostly Clay, little Silt, grey, wet	
41	22		3					
			3					
42	21		3					
43	20							
44	19							
45	18							Approximate Sub-Strata Change
		SS-10	3	24		ML	Sandy Silt (ML): Mostly Silt, some Sand, some Clay, grey, saturated	

ADDITIONAL NOTES:

TEST BORING LOG

THE Chazen COMPANIES
547 River Street
Troy, New York 12180
Phn: (518) 273-0055
Fax: (518) 273-8391

PROJECT: The Seventy-Six Mixed-Use Redevelopment
LOCATION: South End Neighborhood, Albany, NY
CLIENT: South End Development, LLC
PROJECT NO.: 32019.00

Test Boring No.: **B8**
Total Depth: 62.3 ft.

Depth (Ft)	Elevation (Ft)	Sample No.	SPT Blows	Recovery(in)	Groundwater	Group Symbol	Stratum Descriptions:	Field Notes, Comments:
46	17		4					
			5					
47	16		5					
48	15							
49	14							
50	13							Approximate Sub-Strata Change
		SS-11	3	24		ML	Sandy Silt (ML): Mostly Silt, some Sand, some Clay, grey, saturated	
51	12		4					
			6					
52	11		9					
53	10							
54	9							
55	8							Approximate Strata Change
		SS-12	9	24		SM	Silty Sand (SM): Mostly Sand, some Silt, grey, saturated (Till)	
56	7		11					
			13					
57	6		14					
58	5							
59	4							
60	3							
		SS-13	10	24		SM	Silty Sand (SM): Mostly Sand, some Silt, grey, saturated	
61	2		12					
			19					
62	1		23					
63	0						Boring Terminated at 62.5-feet below ground surface on bedrock	Auger Refusal
64	-1							
65	-2							
66	-3							
67	-4							
68	-5							
69	-6							
70	-7							

ADDITIONAL NOTES:

GIFFORD ENGINEERING
Geotechnical and Geoenvironmental Services

GEOTECHNICAL ENGINEERING REPORT

THE SEVENTY SIX HOUSING PROJECT

located at
72-86 Second Ave.
Albany, NY 12202

prepared for:
South End Development, LLC
Attn: Mr. Corey Jones
45 Hudson Ave, #213
Albany, NY 12201

prepared by:
Gifford Engineering
Gregory P Gifford PhD PE
April 2018
File No. 1805

865 Pearse Rd Niskayuna NY 12309 Tel (518) 382-2545 giffeng@nycap.rr.com

GEOTECHNICAL ENGINEERING REPORT

The Seventy Six Project
72-86 Second Ave.
Albany, NY 12202

TABLE OF CONTENTS

INTRODUCTION:

This is a report on a subsurface investigation for the proposed Seventy-Six housing project to be located at 76-82 Second Ave in Albany, NY. The project was expanded to investigate a failed retaining wall at the church parking lot. Vehicle driveway access will be along a right-of–way off of Krank St situated along this wall. Five soil borings have been completed by Martin Geo Environmental, located in Belchertown, MA within the building footprint and parking lot. Three test pits were excavated by others along the retaining wall. A location diagram has been prepared by the civil engineer and is included with the boring and test pit logs in the appendix.

It is understood that the proposed project will include 3.5 story wood framed housing building to be located approximately as shown on the location diagram. There will be 16 apartments in the building. Maximum loading is expected to be light to moderate. Normal settlement tolerances of as much as one inch are acceptable. Finished first floor slab will reportedly be about 4 feet below finished grade.

Environmental issues are beyond the scope of this report and should be addressed by a qualified environmental firm.

This report is intended to; 1) present the findings obtained during the investigation, 2) discuss the analysis of the data gathered during the investigation, and 3) make recommendations for the design and construction of the feasible foundation systems as well as the earthwork requirements of the project.

SUBSURFACE INVESTIGATION PROCEDURES:

The borings were advanced with a truck-mounted drill rig advancing a 4.25-inch inside diameter hollow-stem auger. Continuous samples were obtained to 8 feet and at 5 foot increments thereafter by the split-spoon sampling technique in conjunction with standard penetration testing as specified by ASTM D 1586. The number of blows required to advance the sampler two feet, in six-inch increments is recorded on the boring logs. The blow count or N value (blows per foot) is numerically equal to the summation of the middle two.

These samples were examined at the boring site, sealed in jars or tubes, and transported to the laboratory. The samples were then visually classified and subjected to appropriate testing.

Test pits were excavated with a Case CX57C mini excavator. The pits were logged by the geotechnical engineer by measuring down the sidewalls of the pit to changes in stratigraphy and water conditions. Bulk samples were obtained as necessary and sealed in plastic bags.

The water level within the boreholes and test pits was measured at various times during the investigation. The depth to the water level is affected by boring and excavation procedures and may require some period of time to equilibrate. The measurements of water level are given on the boring and test pit logs along with the time. All boreholes were filled with cuttings and test pits with spoils prior to leaving the site. There may be minor settlement of the boreholes and pits with time, the client must repair this settlement.

The site was also visited by the geotechnical engineer. The borehole locations had been assigned by others and were laid out by the geotechnical engineer by measuring or pacing from existing improvements at the site.

LABORATORY WORK:

In addition to the field identification recorded by the drillers, all samples were examined by a geotechnical engineer. The samples were visually classified using the Unified Soil Classification System as specified by ASTM D 2487. The resulting classification symbol and description are indicated on the soil boring logs. Because the visual classification technique is approximate, variations of a few percent of a particular grain size can result in an inaccurate classification. When inaccurate classification would have a large impact on the recommendations reported herein, further testing was performed or is recommended.

Samples which were mainly fine-grained, organic soils, or cohesive by nature were tested for moisture content as specified by ASTM D 2216 and Atterberg limits as specified by ASTM D 4318. Where appropriate these samples were subjected to penetration testing with a pocket penetrometer. These tests are used to estimate the unconfined compressive strength of the material. The results of these tests are included in the appendix.

SITE EVALUATION:

The site is located on the south side of Second Ave in a residential area of Albany. Vehicular access will be from the east along a right-of-way off Krank St. There is brick church at the corner of Second Ave and Krank St. The church parking lot ends at the failed retaining wall. This retaining wall will need to be replaced to build the driveway.

The grade is relatively flat at the frontage on Second Ave and through the building area. It then slopes down to the south through the parking lot area and further downward to the east along the proposed driveway. Adequate design of drainage will be required to handle runoff.

SUBSURFACE EVALUATION:

The boring and test pit logs indicate the specific subsurface conditions at each investigation location. The subsurface conditions can vary significantly between locations. To aid in the evaluation, a general description of the subsoil conditions has been prepared.

At the building and parking lot borings, the site is underlain with fill comprised of moist silt with varying amounts of sand and debris such as brick and concrete fragments. This is overlain with a couple inches of gravel in parking areas and topsoil in lawn areas. Based on blow counts this fill layer is loose.

Subjacent to this fill, the native soil is glacial Lake Albany varved clay. This lacustrine (lake

deposited) stratum was deposited under the lake that filled much of the Hudson River Valley about 12,000 years ago. It is comprised of thin alternating layers of moist to wet brown or grey clay and silt with occasional layers of fine sand. There is a layer of organics at the top of the native stratum, revealing the original vegetation at the site. The layer extends to a depth of at least 52 feet, the maximum depth of boring. Based on blow counts the stratum is medium stiff to hard. The clay turns from brown to grey at a depth of about 14 feet. This change occurs at the historical low water table, where the lower grey clay has not oxidized and turned brown.

At the test pits near the failed retaining wall there is a layer of topsoil with roots that varies from 4 to 12 inches thick. Fill was encountered at test pits 1 and 3. The fill is comprised of moist to wet silt with apparent building demolition debris including ash, concrete, brick, caution tape, and plastic. At TP-3 there is a layer of debris without soil from a depth of 1 to 1.8 feet. Subjacent to this is a fill comprised of moist silt and clay with little sand.

Subjacent to the fill is the native varved clay described above.

Based on the testing performed and experience with similar soils, the following design parameters are recommended.

	Unit Weight (pcf)		Friction	Unc. compressive
Material	Moist	Saturated	angle (degrees)	strength (psf)
Silt fill	110	115	26	---
Brown Clay	115	125	26	1000 to 4000*

*Brown clay has higher strength. Strength for short term loading case only, not to be used with friction angle.

SUBSURFACE WATER:

The water level measurements taken during the boring investigation are presented on the boring logs. This information is coupled with the estimated degree of saturation of the samples to yield an approximate groundwater level. The depth to the historic low groundwater table is 14 feet below the ground surface. The seasonal water tables are expected at shallower depths.

The low permeability clay soil may result in perched water tables at elevations above the phreatic water surface. The flow rates and quantity of water associated with these water tables will however be small. Seasonal changes in the phreatic water surface and perched water tables are expected due to variable precipitation and runoff.

GEOTECHNICAL CONSIDERATIONS:

This section addresses the geotechnical considerations for the sitework, foundations, and construction procedures which are recommended. Professional services for this investigation are reported and recommendations made in accordance with generally accepted geotechnical engineering practice. An attachment entitled “Important Information about Your Geotechnical Engineering Report” is prepared by the ASFE, Association of Engineering Firms Practicing in the

Geosciences should be reviewed and understood. It contains guidelines and outlines the context in which the report should be used.

It should be understood that this report is based on information provided to us and the results of a limited number of borings and test pits. The borings were advanced at specific locations and the overburden soils sampled at limited and specific depths. Conditions are known at these locations to the depths investigated. Conditions may vary at other locations and depths and the differences may impact the conclusions reached and recommendations made herein. For these reasons it is strongly recommended that Gifford Engineering be retained to provide construction observation and testing services. No warranty, expressed or implied is made.

As the design progresses and plans become finalized, we should be afforded the opportunity to review them and evaluate the effects that changes made during the design may have on the recommendations made herein.

The subsurface conditions revealed during this investigation are adequate to support the proposed construction. The building and wall should be founded on the native varved clay or on controlled fill that bears on the native clay. It is recommended that the building be supported by conventional reinforced concrete footings and frost walls. At the driveway and parking lot all fill should be removed, subgrade proof rolled, and the undercut replaced with controlled fill. The driveway and parking lot can be supported on the existing fill, provided the owner is willing to accept inferior performance, decreased pavement life, and increased maintenance. To lessen the impact, the fill should be heavily proof rolled prior to placement of the pavement system. Use of a geotextile such as Mirafi 180N or Geotex 801 or a biaxial geogrid under the subbase will provide reinforcement to increase the pavement life.

The retaining wall can be sheet piles, a cast in place reinforced concrete wall, a precast wall such as T Wall or large precast concrete blocks such as Redi Rock, or rock filled gabion baskets. These walls should have adequate embedment to prevent sliding and overturning. Global stability should be evaluated by a qualified engineer.

Per Chapter 16 of the New York State Building Code, the site class is D. The following values are provided at the USGS website, confirmed in Section 1615 of the Code, and are recommended for design. The soils encountered are not considered liquefiable in the event of an earthquake.

	Short Period (0.2 Sec)	Long Period (1.0 Sec)
Mapped Spectral Response Acceleration	18%g	6.9%g
Site Coefficient	1.6	2.4
Maximum Earthquake Spectral Response	28.8%g	6.7%g
Design Earthquake Spectral Response	19.2%g	11.1%g

Sitework:

Prior to foundation placement the following remedial actions are recommended for a quality product. The proposed areas of construction should be stripped of all organic soils and vegetation.

Any fill material which was not placed in a controlled manner should be removed from the site. The geotechnical engineer should inspect the subgrade. He will require proof rolling of the subgrade with a minimum 10-ton static weight vibratory roller. A heavily loaded truck can be used instead of the roller if approved. The purpose of the proof rolling is to compact the subgrade and locate any soft areas. All soft areas should be removed and replaced with a controlled fill soil as directed by the engineer. The proof rolling should be witnessed by the geotechnical engineer to evaluate its effectiveness and make recommendations for stabilization.

The following stabilization techniques may be recommended depending upon the site specifics encountered. The first alternative stabilization technique involves a separation or reinforcement geotextile applied to the subgrade and covered with a layer of clean granular fill. The thickness of this layer usually varies between 1 and 3 feet as dictated at the site. The soil should be compacted with a vibratory roller to obtain a stable working mat. It may be necessary to limit vibration during compaction of initial lifts.

A second alternative stabilization technique involves rolling or pounding coarse fill into the upper reaches of a soft spongy subgrade. This coarse material could be brick waste, slag, cobbles, or crushed rock and must be completely embedded to ensure minimal void spaces.

A third alternative stabilization technique involves lowering the groundwater table thereby increasing the stability of the subgrade. The dewatering system may employ temporary or permanent drainage. Tile drains or pump dewatering system may be designed to lower the water table.

Controlled Fill:

A controlled fill can be constructed of granular fill in horizontal lifts not exceeding 9 to 12 inches in loose thickness. If hand operated compaction equipment is used, lift thickness should be limited to 4 to 6 inches. All lifts should maintain a minimum density of 95 percent modified Proctor density, as specified by ASTM D 1557. A material that meets the requirements of NYSDOT 203-2.02 type B or C or 304-2.02 is recommended.

203-2.02 Select Materials and Subgrade Area Material Requirements. The requirements for select materials and subgrade area materials are described below. All removal of oversize material, blending, or crushing operations shall be completed at the source of the material. The procedure for acceptance or rejection of these materials shall be as described in the appropriate Soil Control Procedure (SCP) manual.

A. Subgrade Area Material. Subgrade area material shall consist of any suitable material having no particles greater than 6 inches in maximum dimension.

B. Select Borrow and Select Fill.

1. Gradation. Material furnished for these items shall be suitable material having

no particles greater than 3 feet in maximum dimension. Of the portion passing the 4 inch square sieve, the material shall have the following gradation:

Sieve Size	Percent Passing by Weight
No. 40	0 to 70
No. 200	0 to 15

2. Soundness. The material shall be sound and durable. When the State elects to test for the soundness requirement, a material with a Magnesium Sulfate Soundness Loss exceeding 35 percent will be rejected.

C. Select Granular Fill and Select Structural Fill. Materials furnished under these items shall be suitable and conform to the following requirements:

1. Gradation. The material shall have the following gradation:

Sieve Size	Percent Passing by Weight
4 inch	100
No. 40	0 to 70
No. 200	0 to 15

2. Soundness. The materials shall be substantially free of shale or other soft, poor durability particles. Where the Sate elects to test for this requirement, a material with a Magnesium Sulfate Soundness Loss exceeding 30 percent will be rejected.

A controlled fill can be constructed of cohesive or fine-grained soils in horizontal lifts not exceeding 6 to 8 inches in loose thickness. If hand operated compaction equipment is used, lift thickness should be limited to 3 to 4 inches. All lifts should maintain a minimum density of 95 percent modified Proctor density, as specified by ASTM D 1557. Proper compaction of these materials requires control of moisture. Drying of the material can be difficult during wet and cold periods.

Backfill which has been designed to resist structural loading such as pavements or lateral forces should also meet the compaction requirements above. The requirements of compaction for fill beneath ancillary areas can be lessened to 90 to 92 percent of the cited standard, if desired.

The native fill soils and varved clay are not suitable for use as controlled fill or backfill.

A Quality Assurance, Quality Control, and Special Inspection program should be developed and overseen by the geotechnical engineer of record. Conductance of this quality assurance program is required for proper execution and confirmation that the recommendations contained in this report are followed. Conductance of this program does not relieve the contractor of his responsibility to construct the project in accordance with the plans and specifications, Building Code, and normal industry standards.

Retaining Wall Recommendations:

It is recommended that the replacement retaining wall be constructed on native soil. Due to space constraints both behind the wall and in front, wall types that require anchorage behind the wall are not suitable at this site. Retaining walls such as sheet piles with a concrete cap, reinforced concrete cast-in-place footings and cantilever walls, precast walls such as T Walls or Redi Rock walls, or stone filled gabion baskets are suitable for use at this site. The design of these walls can be done by engineers who specialize in the various systems. The internal stability as well as global stability of the walls should be evaluated by a competent engineer.

Sheet piles can be designed as a cantilever system as minor movement will not affect any nearby structures. Usually the embedment is two times the exposed height of the sheet pile wall. Installation of the walls should be relatively easy with the clay soils encountered. Sheet pile walls do not drain as well as other options.

A cast-in-place retaining wall usually has a wider heel of the footing extending behind the face so that backfill soils on the footing helps resist overturning and sliding. The footing bearing level should be protected from frost by extending a minimum 4 feet below the downhill grade. Drainage is critical to these types of walls so a footing drain situated on the side of the footing on the uphill side as well as weeps through the wall are recommended. The footing drain should be directed around or under the wall and pitched to a drainage structure so water cannot flow onto the driveway and create an ice hazard.

The precast concrete options should bear below frost and require drainage behind the wall. The manufacturers of these systems have design recommendations and guidelines that can be used to assist the designer. Again drainage should be intercepted behind the wall and directed away from the driveway.

A gabion basket system is more of a rustic look than others outlined above. The baskets should have enough embedment to resist sliding and aid in overturning resistance. The rock filled baskets are more likely to allow seepage through that may impact the driveway.

Building Foundation Recommendations:

It is recommended that the proposed construction be supported by spread or continuous footings founded on virgin inorganic soils or a controlled structural fill founding on virgin soils. This controlled fill should extend in all directions horizontally from the edge of footing a dimension at least as great as the undercut dimension.

Care should be exercised during excavation so as not to loosen the subgrade soils. If loosened the soil should be recompacted then proof rolled or removed and replaced with controlled fill or lean concrete.

In lieu of structural fill, a lean concrete or flowable fill with a minimum compressive strength of 2000 psi and 200 psi at 28 days, respectively, may be utilized to raise the subgrade from the virgin soils to the footing base elevation. This fill material should extend in all directions horizontally from the edge of footing a dimension at least as great as ten and twenty percent of the undercut dimension for the concrete and flowable fill, respectively.

Footings can be designed for a maximum net allowable bearing capacity of 1.0 TSF. It is recommended that load bearing continuous footings should be minimum 2.0 feet wide and isolated pier footings a minimum 3.0 feet wide.

Exterior footings should maintain a minimum 4.0 feet of cover from frost action. Interior footings should bear at least 2.0 feet below finished grade.

All foundation walls and particularly ones which retain soil should be drained. A tile drain can be placed at the footing level and pitched to a drainage structure. If the drainage structure could back flush the footing drain during periods of high flow, a back flow preventer is recommended. An acceptable tile drain consists of a 4 inch diameter perforated pipe, surrounded with at least 6 inches of freely draining gravel or washed stone, all wrapped in a drainage geotextile such as Geotex 801 or Mirafi 180N.

A controlled freely draining backfill is recommended. This material should extend a horizontal dimension at least two-thirds the depth of the backfill. The surface material and grade should allow minimal water infiltration. The properly backfilled foundation wall can be designed to resist a linearly increasing soil pressure (equivalent hydrostatic) equal to the unit weight of the soil times the appropriate coefficient in psf per vertical foot. For resistance to sliding, a coefficient of friction for the interface between native soils and concrete of 0.4 is recommended.

Recommended lateral earth pressure coefficients based on Rankine Theory are presented. Values are ultimate and a factor of safety should be applied, particularly to passive. Full passive resistance is mobilized only after significant movement.

Soil	At Rest	Active	Passive
Silt fill and Brown Clay	0.56	0.39	2.57

Slab On Grade:

The floor slabs can be designed to rest on virgin inorganic material or on controlled fill resting on these materials. It is recommended that a minimum 6-inch thick layer of freely draining granular material such as NYS DOT 304-2.02, be compacted beneath the slabs. This layer will provide drainage, a capillary break, and more uniform bearing. This layer should be designed to drain to the perimeter footing drain. Proof rolling is recommended prior to placement of the granular material. This granular layer may be useful for radon collection, if necessary.

304-2.02 Materials Requirements. Materials for Subbase Course shall consist of Sand and Gravel,

approved Blast Furnace Slag or Stone. All materials furnished shall be well graded from coarse to fine and free from organic or other deleterious materials.

It shall be the Contractor's responsibility to provide a material which meets this specification and is within his capabilities to fine grade to the required tolerances. Should the subbase course become unstable at any time prior to the placement of the overlaying course due to the gradation of the material furnished, the Contractor shall, at his own expense, correct the unstable condition to the satisfaction of the Engineer.

Materials furnished for Types 1, 3 and 4 shall consist of approved Blast Furnace Slag, Stone, Sand and Gravel or blends of these materials. Material furnished for Type 2 shall consist solely of approved Blast Furnace Slag or of Stone which is the product of crushing ledge rock.

A. Gradation

Type	Sieve Size Designation	Percent Passing By Weight
1	3 inch	100
	2 inch	90 – 100
	¼ inch	30 – 65
	No. 40	5 – 40
	No. 200	0 – 10
2	2 inch	100
	¼ inch	25 – 60
	No. 40	5 – 40
	No. 200	0 – 10
3	4 inch	100
	¼ inch	30 – 75
	No. 40	5 – 40
	No. 200	0 – 10
4	2 inch	100
	¼ inch	30 – 65
	No. 40	5 – 40
	No. 200	0 - 10

B. Soundness. Material for Types 1, 2, and 4 will be accepted on the basis of a Magnesium Sulfate Soundness Loss after 4 cycles of 20 percent or less. Material for Type 3 will be accepted on the basis of a Magnesium Sulfate Soundness Loss after 4 cycles of 30 percent or less.

C. Plasticity Index. The Plasticity Index of the material passing the NO. 40 mesh sieve shall not exceed 5.0.

D. Elongated Particles. Not more than 30 percent, by weight, of the particles retained on a ½ sieve shall consist of flat or elongated particles. A flat or elongated particle is defined herein as one which has its greatest dimension more than 3 times its least dimension. Acceptance for this requirement will normally be based on a visual inspection by the Engineer. When the State elects to test for this requirement, material with a percentage greater than 30 will be rejected.

All material shall meet the specified gradation prior to placement on the grade. All processing shall be completed at the source.

The use of a vapor barrier should be evaluated by the architect or engineer. If used, it is recommended that a sturdy membrane be used to avoid damage during construction.

The possibility of slab curl should be minimized by appropriate design and construction techniques. Shrinkage and curling of the slab must be controlled. This problem is caused by differential shrinkage of the concrete and may be partially related to soil conditions. It should be addressed by the architect or engineer. The American Concrete Institute presents recommendations for design and control of floor slabs, which may be useful.

A pavement design can be used to analyze slabs or asphalt pavements, which will be subjected to traffic loading.

CONSTRUCTION RECOMMENDATIONS:

All excavations of more than 4 feet should be braced or laid back as necessary to prevent sloughing of the sidewalls. Site safety as dictated by regulating organizations such as OSHA and the NYS Department of Labor should be addressed and maintained during construction by the contractors.

Special inspections and reports that are required by Chapter 17 of the NYS Building Code should be performed by a qualified engineer to ensure compliance with the recommendations of this report.

Excavations adjacent to existing foundations or improvements should not extend below them without adequate sheeting, bracing, and/ or underpinning having been installed. This should be designed and stamped by a registered professional engineer.

Temporary dewatering may be necessary in excavation or low areas if groundwater is encountered or during wet periods. Water from precipitation should be removed from excavations immediately rather than allowed to percolate into the subgrade.

Temporary access roadways may be necessary during wet or thaw weather. This may include geofabric and/or coarse fill.

All subgrades and fill material should be kept from freezing during construction. Water, snow, and

ice should not be allowed to collect in low areas and excavations.

Some obstacles including boulders or rubble may be encountered in excavations. If necessary, rippers, breaking tools, and drilling and blasting may be required to remove such materials.

All proof rolling operations should be witnessed by a qualified geotechnical engineer. All subgrades should be inspected by a qualified geotechnical engineer.

APPENDIX:

General Qualifications
Location Diagram
Boring Logs
Test Pit Logs
Laboratory and Field Test Results
USGS Design Maps Summary Report
General Notes
Unified Soil Classification System
Important Information About Your Geotechnical Engineering Report

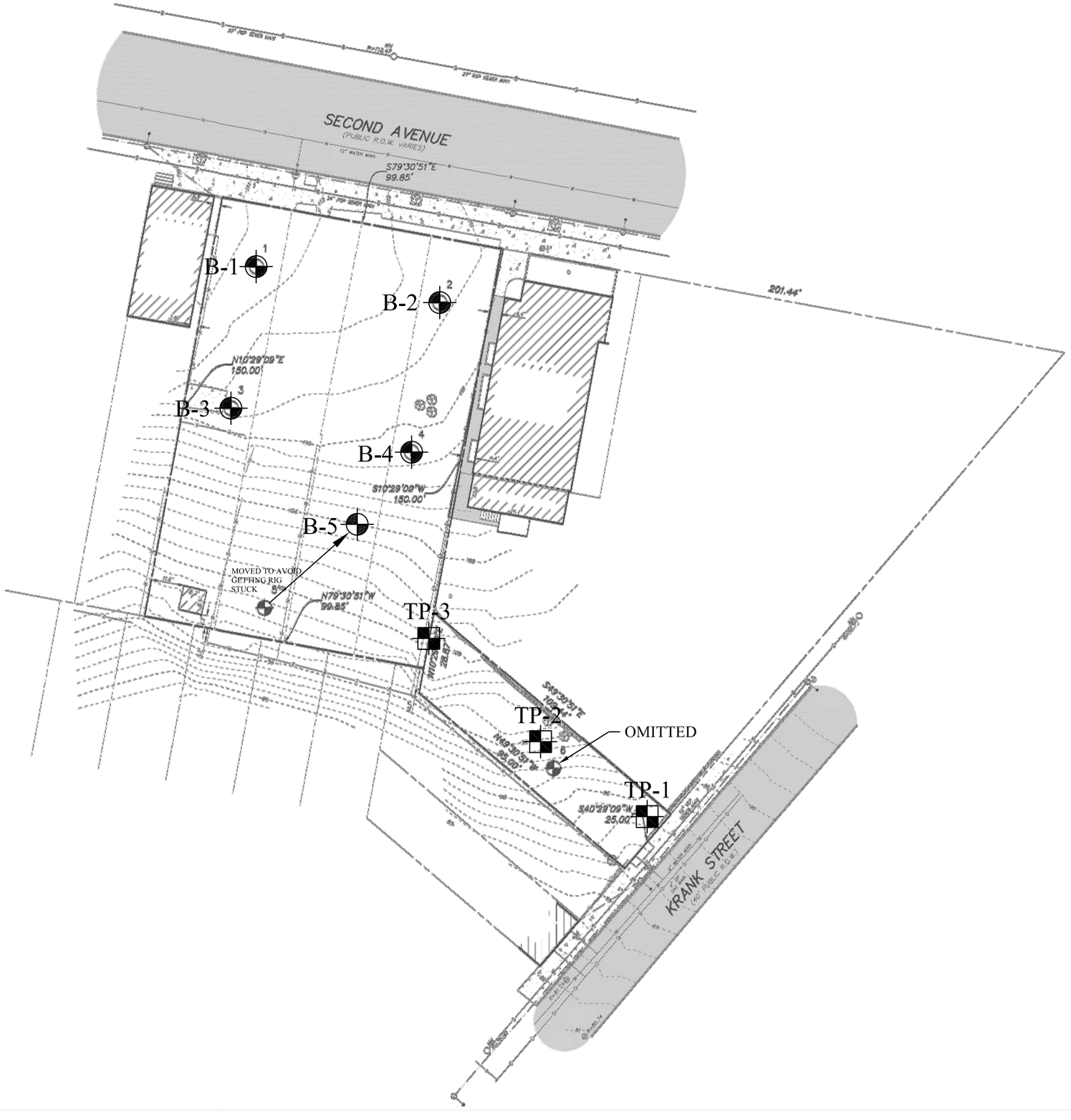
GENERAL QUALIFICATIONS:

This report has been prepared to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope of the project and location described herein, and description of the project represents my understanding of the significant aspects relevant to soil and foundation characteristics. In the event that any changes in the design or location of the proposed facilities, as outlined in this report, are planned, the geotechnical engineer should be informed so the changes can be reviewed and the conclusions of this report modified in writing, if necessary.

It is recommended that all construction operations dealing with earthwork and foundations be inspected by an experienced geotechnical engineer to ensure that the design requirements are fulfilled in the actual construction. If desired, the geotechnical engineer would review the plans and specifications when they have been prepared to ensure that the geotechnical recommendations have been incorporated into the design, plans, and specifications.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and/or test pits performed at the locations indicated on the location diagram and from any other information discussed in the report. This report does not reflect any variations which may occur between these locations. In the performance of subsurface investigations, specific information is obtained at specific locations at specific times. However, it is a well-known fact that variations in soil and rock conditions exist on most sites between subsurface investigation locations and also such situations as groundwater conditions vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear

evident, it will be necessary for a reevaluation of the recommendations of this report after performing on-site observations during the construction period and noting the characteristics of any variations.



Dig Safely. New York
800-962-7962
www.digsafelynewyork.org

- ☐ Call Before You Dig
- ☐ Wait The Required Time
- ☐ Confirm Utility Response
- ☐ Respect the Marks
- ☐ Dig With Care

Date	Revisions

GENERAL NOTES:
1. PLAN PROVIDED BY CLIENT.
2. BORINGS AND TEST PITS LAID OUT BY GEOTECHNICAL ENGINEER BY MEASURING OFF EXISTING IMPROVEMENTS.

LEGEND

BORING LOCATION

TEST PIT LOCATION

THE SEVENTY SIX HOUSING PROJECT

76-82 SECOND AVE.
ALBANY, NY 12202

GIFFORD ENGINEERING
Geotechnical and Geoenvironmental Services
865 Pearse Road
Schenectady, NY 12309
(518) 382-2545

LOCATION DIAGRAM

CAD by: JCB Date: 03/21/2018
Approved By: GPG File No.: 1805
Scale: NOT TO SCALE Sheet: 1 of 1

PROJECT NAME:	The Seventy Six Housing Project								**FILE NO.:**	1805	
BORING NO.:	B-1									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	South End Development, LLC								**TYPE:**	HSA	SS	
SITE LOCATION:	76-82 Second Ave, Albany, NY 12202								**SIZE I.D.:**	4.25"	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	3	3			1.0'			3 inches of grey/ black gravel over brown, moist to
					5	6			2'	wet, loose, Silt, little Sand, ML, fill with brick and
	S-2	2.0' - 4.0'	4	5			0.8'			concrete fragments.
					9	10				Brown, moist, stiff, Clay with Silt seams and
5	S-3	4.0' - 6.0'	7	8			1.5'			organics from original native grade, CH, native.
					12	14				Similar except very stiff from 4.0 to 6.0 feet.
	S-4	6.0' - 8.0'	11	20			1.1'			Similar except hard.
					19	22				
10	S-5	10.0' - 12.0'	8	10			2.0'			Similar except very stiff.
					10	13			12'	
										End of boring at 12 feet.
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No water encountered.

DRILLER: Martin Geo-Environmental, LLC - JM **DATE:** 19-Mar-18

APPROVED BY: JCB **DATE:** 20-Mar-18

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
865 Pearse Road
Niskayuna, NY 12309-2909
Phone: (518) 382-2545

PROJECT NAME:	The Seventy Six Housing Project							**FILE NO.:**	1805	
BORING NO.:	B-2								**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	South End Development, LLC							**TYPE:**	HSA	SS	
SITE LOCATION:	76-82 Second Ave, Albany, NY 12202							**SIZE I.D.:**	4.25"	1.375"	
BORING LOCATION:	See Location Diagram							**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram							**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	2	4			0.5'			Brown, moist to wet, loose, Silt, little Sand, ML, fill with brick and concrete fragments.
					3	4				
	S-2	2.0' - 4.0'	3	4			1.3'			Similar except medium dense.
					8	11			4'	
	S-3	4.0' - 6.0'	15	18			1.6'			Brown, moist, hard, Clay with Silt seams and organics from original native grade, CH, native.
5					26	32				
	S-4	6.0' - 8.0'	27	25			1.2'			Similar.
					26	23				
10	S-5	10.0' - 12.0'	9	11			1.8'			Similar except very stiff.
					16	20			12'	
										End of boring at 12 feet.
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No water encountered.

DRILLER: Martin Geo-Environmental, LLC - JM **DATE:** 19-Mar-18

APPROVED BY: JCB **DATE:** 20-Mar-18

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
865 Pearse Road
Niskayuna, NY 12309-2909
Phone: (518) 382-2545

PROJECT NAME:	The Seventy Six Housing Project							**FILE NO.:**	1805	
BORING NO.:	B-3								**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	South End Development, LLC							**TYPE:**	HSA	SS	
SITE LOCATION:	76-82 Second Ave, Albany, NY 12202							**SIZE I.D.:**	4.25"	1.375"	
BORING LOCATION:	See Location Diagram							**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram							**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	2	3			1.3'			2 inches of grey/ black gravel over brown, moist to
					6	9			2'	wet, loose, Silt, little Sand, ML, fill with brick and
	S-2	2.0' - 4.0'	6	7			1.4'			concrete fragments.
					8	11				Brown, moist, stiff, Clay with Silt seams and
	S-3	4.0' - 6.0'	7	7			1.4'			organics from orignal native grade, CH, native.
5					12	14				Similar except very stiff from 4.0 to 6.0 feet.
	S-4	6.0' - 8.0'	15	15			1.5'			Similar except hard.
					21	18				
10	S-5	10.0' - 12.0'	4	6			2.0'			Similar except stiff.
					7	7			12'	
										End of boring at 12 feet.
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No water encountered.

DRILLER: Martin Geo-Environmental, LLC - JM **DATE:** 19-Mar-18

APPROVED BY: JCB **DATE:** 20-Mar-18

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
865 Pearse Road
Niskayuna, NY 12309-2909
Phone: (518) 382-2545

PROJECT NAME:	The Seventy Six Housing Project								**FILE NO.:**	1805	
BORING NO.:	B-4 (page 1 of 2)									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	South End Development, LLC								**TYPE:**	HSA	SS	
SITE LOCATION:	76-82 Second Ave, Albany, NY 12202								**SIZE I.D.:**	4.25"	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	3	4			0.8'			3 inches of topsoil over brown, moist to wet, loose,
					4	5			2'	Silt, little Sand, ML, fill with brick and concrete
	S-2	2.0' - 4.0'	4	5			1.4'			fragments.
					7	11				Brown, moist, stiff, Clay with Silt seams and
5	S-3	4.0' - 6.0'	4	6			1.3'			organics from original native grade, CH, native.
					8	10				Similar from 4.0 to 6.0 feet.
	S-4	6.0' - 8.0'	10	13			1.1'			Similar except very stiff.
					13	15				
10	S-5	10.0' - 12.0'	6	8			2.0'			Similar except moist to wet.
					10	10				
15	S-6	15.0' - 17.0'	4	6			2.0'			Similar except stiff and grey.
					7	11				
20	S-7	20.0' - 22.0'	4	5			1.7'			Similar.
					6	6				
25	S-8	25.0' - 27.0'	3	4			2.0'			Similar except wet and medium stiff.
					4	5				
30	S-9	30.0' - 32.0'	4	5			2.0'			Similar except stiff.
					5	5				
35	S-10	35.0' - 37.0'	6	7			2.0'			Similar.
					7	8				
40	S-11	40.0' - 42.0'	4	3			2.0'			Similar except medium stiff.
					4	7				

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: Driller notes possible water at about 25 feet.

DRILLER: Martin Geo-Environmental, LLC - JM **DATE:** 19-Mar-18

APPROVED BY: JCB **DATE:** 20-Mar-18

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
865 Pearse Road
Niskayuna, NY 12309-2909
Phone: (518) 382-2545

PROJECT NAME:	The Seventy Six Housing Project								**FILE NO.:** 1805		
BORING NO.:	B-4 (page 2 of 2)									**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	South End Development, LLC								**TYPE:**	HSA	SS	
SITE LOCATION:	76-82 Second Ave, Albany, NY 12202								**SIZE I.D.:**	4.25"	1.375"	
BORING LOCATION:	See Location Diagram								**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram								**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-12	45.0' - 47.0'	3	3			2.0'			Similar grey, wet, medium stiff, Clay, CH, native.
					4	5				
50	S-13	50.0' - 52.0'	2	3			2.0'			Similar.
					3	3			52'	
										End of boring at 52 feet.
55										
60										
65										
70										
75										
80										
85										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: Driller notes possible water at about 25 feet.

DRILLER: Martin Geo-Environmental, LLC - JM **DATE:** 19-Mar-18

APPROVED BY: JCB **DATE:** 20-Mar-18

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
865 Pearse Road
Niskayuna, NY 12309-2909
Phone: (518) 382-2545

PROJECT NAME:	The Seventy Six Housing Project							**FILE NO.:**	1805	
BORING NO.:	B-5								**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	South End Development, LLC							**TYPE:**	HSA	SS	
SITE LOCATION:	76-82 Second Ave, Albany, NY 12202							**SIZE I.D.:**	4.25"	1.375"	
BORING LOCATION:	See Location Diagram							**HAMMER WT:**		140#	
SURFACE ELEVATION:	See Location Diagram							**HAMMER FALL:**		30"	

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0.0' - 2.0'	4	4			0.8'			4 inches of topsoil over brown, moist to wet, loose,
					4	9			2'	Silt, little Sand, ML, fill with brick and concrete
	S-2	2.0' - 4.0'	7	9			0.9'			fragments and ash.
					11	18				Brown, moist, very stiff, Clay with Silt seams and
	S-3	4.0' - 6.0'	7	7			1.2'			oganics from original native grade, CH, native.
5					8	11				Similar except stiff from 4.0 to 6.0 feet.
	S-4	6.0' - 8.0'	10	13			1.7'			Similar except very stiff.
					16	22				
10	S-5	10.0' - 12.0'	11	5			1.7'			Similar except stiff.
					5	7			12'	
										End of boring at 12 feet.
15										
20										
25										
30										
35										
40										

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL: No water encountered.

DRILLER: Martin Geo-Environmental, LLC - JM **DATE:** 19-Mar-18

APPROVED BY: JCB **DATE:** 20-Mar-18

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
865 Pearse Road
Niskayuna, NY 12309-2909
Phone: (518) 382-2545

April 2, 2018

TEST PIT LOGS
The Seventy Six Housing Project, File No. 1805
76-82 Second Ave
Albany, NY 12202
Excavated by WPNT Construction with a Case CX57C rubber tracked mini excavator on March 19, 2018.
Logged by J. Bazan.

Excavated at about 8:00am.
TP – 1
0.0' – 0.3' Dark brown, moist, topsoil with sod and roots up to about 1 inch diameter.
0.3' – 4.0' Brown, moist to wet, Silt, little Sand, trace Gravel, ML, fill with asbestos caution tape, brick, pieces of concrete slabs and other building demolition debris. Concrete footing for demolished brick wall adjacent to sidewalk was encountered at about 2 feet deep, approximately 10 inches thick with 3 to 4 courses of brick attached. Fill did not appear to be compacted based on ease of excavation and machine rutted about 10 inches into ground surface.
4.0' – 5.0' Brown, moist, varved Clay with Silt seams and organics, CH, native. Sidewalls of test pit collapsing at fill layer.
End of test pit at 5.0 feet. No water encountered.

Excavator track caught in rut and fell off machine while backfilling TP-1. I left the site while machine was repaired.

Returned to site and resumed excavation at about 1:45pm.
TP – 2
0.0' – 1.0' Dark brown, moist, loamy topsoil with sod and roots up to about 1 inch in diameter.
1.0' – 7.0' Brown, moist, varved Clay with Silt seams and organics, CH, native. Appeared to be very stiff and was difficult to excavate
7.0' – 8.0' Grey, moist, varved Clay with organics, CH.
End of test pit at 8.0 feet. No water encountered.

TP – 3
0.0' – 1.0' Dark brown, moist, loamy topsoil with sod and roots up to about 3 inches in diameter.
1.0' – 1.8' Grey, moist to wet, fill comprised of ash, plastic, garbage and other deleterious debris.
1.8' – 4.0' Brown, moist, Silt and Clay, little Sand, ML, fill.
4.0' – 9.0' Brown, moist, varved Clay with Silt seams and organics, CH, native. Appeared to be very stiff and was difficult to excavate.
9.0' – 10.0' Grey, moist, varved Clay with organics, CH.
End of test pit at 10.0 feet. No water encountered.

GIFFORD ENGINEERING
Geotechnical & Geoenvironmental Services

LABORATORY TEST RESULTS
The Seventy Six Housing Project
76-82 Second Ave., Albany, NY 12202
File No. 1805

Atterberg Limits ASTM D 4318 of representative samples

	B-4 S-5 10'-12'
Liquid Limit	54.2%
Plastic Limit	28.7%
Plasticity Index	25.0%
Natural Moisture	36.5%

Moisture Contents ASTM D 2216 and Pocket Penetrometer, Unconfined Compressive Strength (TSF) of representative samples.

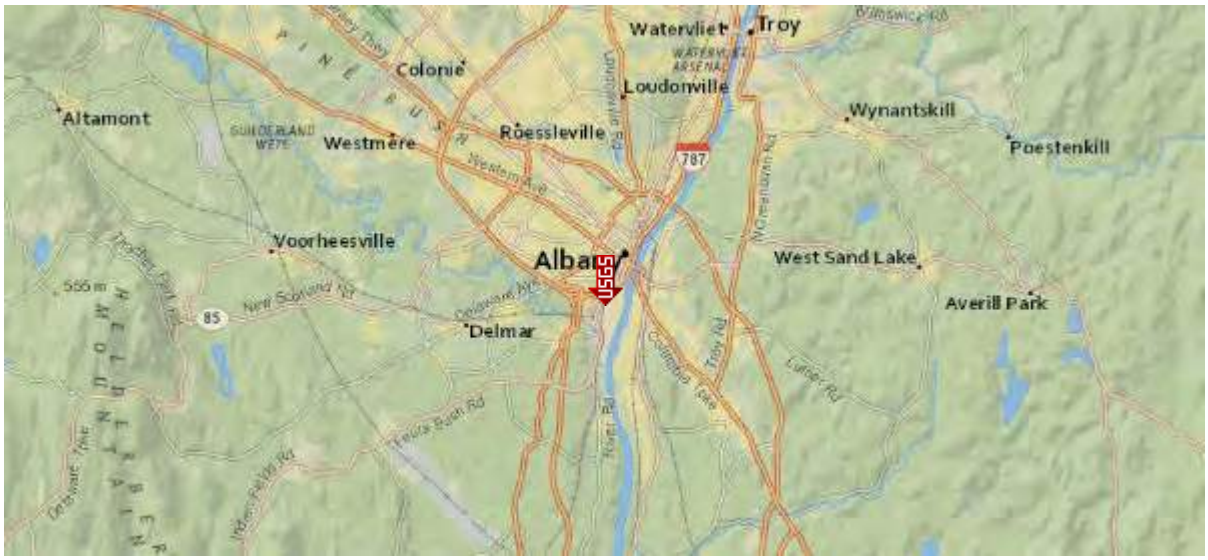
Boring	Sample	Depth	Moisture Content (%)	Unconfined Compressive Strength (TSF)
B-1	S-2	2'-4'	28.5	3.5
B-1	S-3	4'-6'	28.9	3.5
B-1	S-4	6'-8'	27.0	4.5
B-1	S-5	10'-12'	36.2	3.0
B-2	S-3	4'-6'	25.9	4.5
B-2	S-4	6'-8'	32.6	4.0
B-2	S-5	10'-12'	27.7	4.5
B-3	S-2	2'-4'	30.1	3.0
B-3	S-3	4'-6'	35.8	4.0
B-3	S-4	6'-8'	37.4	3.5
B-3	S-5	10'-12'	33.0	2.5
B-4	S-2	2'-4'	31.3	3.5
B-4	S-3	4'-6'	35.3	3.5
B-4	S-4	6'-8'	34.0	3.5
B-4	S-5	10'-12'	36.5	2.5
B-4	S-6	15'-17'	34.2	1.5
B-4	S-7	20'-22'	32.4	1.5
B-4	S-8	25'-27'	29.3	0.5
B-4	S-9	30'-32'	35.6	0.5
B-4	S-10	35'-37'	33.3	1.0
B-4	S-11	40'-42'	42.3	1.0
B-4	S-12	45'-47'	37.5	1.0
B-4	S-13	50'-52'	30.8	0.5
B-5	S-2	2'-4'	37.3	3.0
B-5	S-3	4'-6'	41.4	3.0
B-5	S-4	6'-8'	41.8	2.5
B-5	S-5	10'-12'	43.8	2.0

865 Pearse Road Niskayuna, NY 12309 Tel: (518) 382-2545 giffeng@nycap.rr.com

USGS Design Maps Summary Report

User–Specified Input

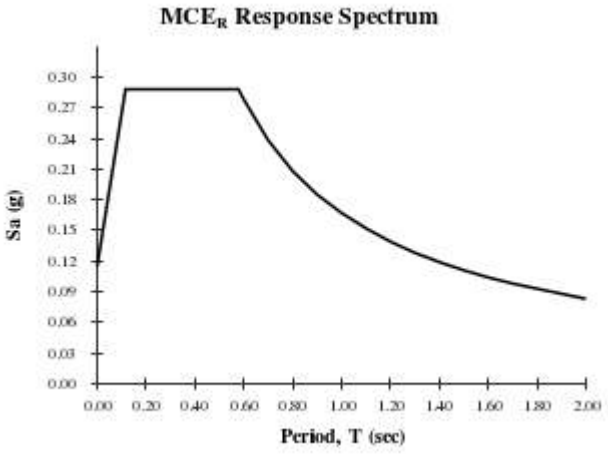
Report Title	The 76 Housing Project, File No.: 1805 Mon March 26, 2018 12:43:11 UTC
Building Code Reference Document	2012/2015 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	42.63857°N, 73.76408°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

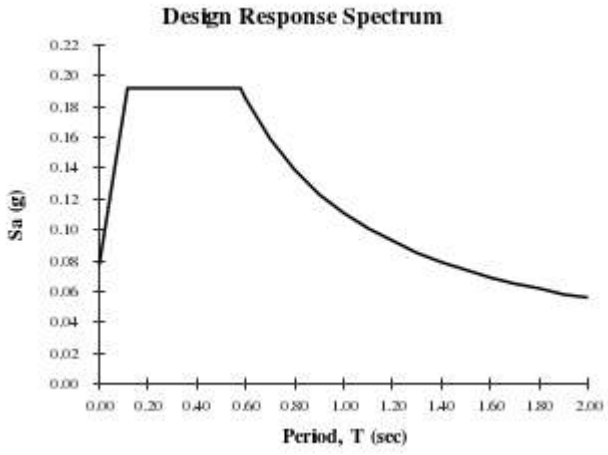


USGS–Provided Output

S_S =	0.180 g	S_{MS} =	0.288 g	S_{DS} =	0.192 g
S_1 =	0.069 g	S_{M1} =	0.167 g	S_{D1} =	0.111 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





GENERAL NOTES

DRILLING & SAMPLING SYMBOLS*

SS	Split Spoon – 1 3/8" I.D., 2" O.D.
ST	Shelby Tube – 3" O.D.
OS	Osterberg Sampler – 3" Shelby Tube
PA	Power Auger Sample
DB	Diamond Core – NQ, BX, HQ
WR	Weight of Rod
WH	Weight of Hammer
RD	Rotary Drill Bit
DC	Driven Casing, Washed
WB	Washed Boring
HSA	Hollow Stem Auger
OH	Open Hole

WATER LEVEL SYMBOLS**

WL	Water Level
WCI	Wet Cave In
DCI	Dry Cave In
WS	While Sampling
WD	While Drilling
BCR	Before Casing Removal
ACR	After Casing Removal
AB	After Boring

***Standard "N" Penetration:** Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon, except where noted.

**** Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible in even several days observation, and additional evidence on ground water elevations must be sought.

CLASSIFICATION

COHESIONLESS SOILS

"Trace"	1% - 10%
"Little"	10% - 20%
"Some"	20% - 35%
"And"	35% - 50%
Loose	0 – 9 Blows
Medium Dense	10 – 29 Blows
Dense	30 – 50 Blows
Very Dense	> 50 Blows

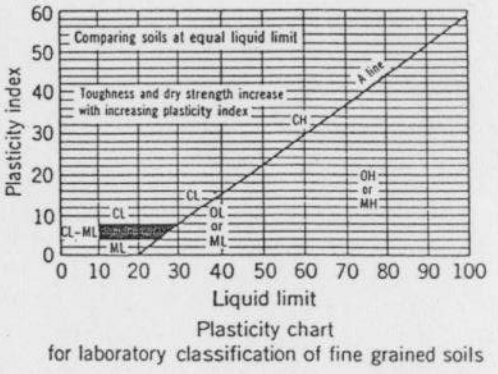
COHESIVE SOILS*

	N (Blows/ft)	$\mathbf{Q_c}$ (TSF)
Soft	0 – 4	0.00 – 0.49
Medium	5 – 8	0.50 – 0.99
Stiff	9 – 15	1.00 – 1.99
Very Stiff	16 – 30	2.00 – 3.99
Hard	> 30	≥ 4.00

* If Clay content is sufficient so that clay dominates soil properties, then Clay becomes the principal known with the other major soil constituent as modifier: i.e., Silty Clay. Other minor soil constituents may be added according to classification breakdown for cohesionless soils: i.e., Silty Clay, little Sand, trace Gravel. Additional explanation available upon request. See attached Unified Soil Classification sheet.

Table 3.5 Unified Soil Classification

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)				Group Symbols[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is *larger* than No. 200 sieve size[b] (The No. 200 sieve size is about the smallest particle visible to naked eye)	Gravels More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the ¼ in. size may be used as equivalent to the No. 4 sieve size)	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand*, gravelly; about 20% hard, angular gravel particles ½-in. maximum size; rounded and subangular sand grains coarse to fine, about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	Use grain size curve in identifying the fractions as given under field identification Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows: Less than 5% *GW, GP, SW, SP* More than 12% *GM, GC, SM, SC* 5% to 12% *Borderline* cases requiring use of dual symbols $C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing	*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for *GW*
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)	*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		Atterberg limits below "A" line, or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)	*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		Atterberg limits above "A" line, with *PI* greater than 7
	Sands More than half of coarse fraction is smaller than No. 4 sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	*SW*	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing	*SP*	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for *SW*
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)	*SM*	Silty sands, poorly graded sand-silt mixtures		Atterberg limits below "A" line or *PI* less than 5 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)	*SC*	Clayey sands, poorly graded sand-clay mixtures		Atterberg limits below "A" line with *PI* greater than 7
Fine-grained soils More than half of material is *smaller* than No. 200 sieve size (The No. 200 sieve size is about the smallest particle visible to naked eye)	Identification Procedures on Fraction Smaller than No. 40 Sieve Size						
		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)			
	Silts and clays liquid limit less than 50	None to slight	Quick to slow	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)
		Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity	
	Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays	
		Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity	
Highly Organic Soils		Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils	



Plasticity chart
for laboratory classification of fine grained soils

From Wagner, 1957.

[a] *Boundary classifications*. Soils possessing characteristics of two groups are designated by combinations of group symbols. For example *GW–GC*, well graded gravel-sand mixture with clay binder.

[b] All sieve sizes on this chart are U.S. standard.

Field Identification Procedure for Fine Grained Soils or Fractions

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking):

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics):

After removing particles larger than No. 40 sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit):

After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eight inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you* - should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from alight industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes - even minor ones - and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ-sometimes significantly from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the express purpose of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in-this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer For Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone:' 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

IIGER06045.0M