GeoStructures

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GEOTECHNICAL ENGINEERING CONSULTANTS

Project No. G21-204
January 4, 2022

Mr. Jeffrey J. Berntsen, PG
Groundwater & Environmental Services, Inc.
55820 Grand River Avenue, Suite 275
New Hudson, MI 48165

Re: Final Geotechnical Investigation Report
Proposed Jiffy Lube Multi-Care Service Center
1490 US Route 9 (Albany Post Road)
Wappingers Falls, Dutchess Co., NY

Dear Jeff:

GeoStructures, Inc. has completed a geotechnical investigation for the referenced Jiffy Lube project. *In the time since our previous report was submitted on 09/23/21 with the latest groundwater readings, a Site Grading Plan has been completed and the enclosed report has been finalized accordingly and given today's date.* Based on the soil borings and laboratory testing results, the subsurface conditions are suitable for conventional shallow foundations (strip and spread footings) and slab on grade for the proposed structures. However, the overburden is highly stratified in places and as a result, there are zones of significant perched water. The phreatic groundwater lies on top of the weathered rock at depths of 6 to 8.5 ft below existing grade. We have assigned a design groundwater Elevation of 153 ft to this site. As a result, dewatering of the service pit basement excavation during construction will be needed, along with permanent waterproofing, drainage, and/or structural measures such as a hydraulic slab or uplift anchors to safeguard the basement slab and walls against hydrostatic uplift and seepage unless an underslab drainage system can be reliably drained by gravity flow to an off-site location.

GeoStructures should be given the opportunity to review the subsurface drainage design for the building. It should be noted based on the boring data that the rock is sufficiently weathered such that it is not expected to pose significant difficulties during the bulk excavation for the service pit area. Pneumatic hammering is predicted to be minimal or unnecessary.

We appreciate the opportunity to provide our services to GES and Jiffy Lube on this project. Feel free to call if you have any questions or need assistance reviewing the construction documents.

Sincerely,

Eric J. Seksinsky, P.G., P.E.
Associate
NY PE License #084762

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FIGURES AND DRAWINGS

1. OBJECTIVES AND SCOPE OF STUDY

This submission documents a geotechnical investigation carried out by GeoStructures, Inc. for a proposed Jiffy Lube Multi-Care Service Center to be constructed at 1490 US Route 9 (Albany Post Road) in Wappingers Falls, New York. *The enclosed report is an update to our initial submission to include the Grading Plan prepared by Sevan Engineering, dated 9/23/21.* The objectives of our study have been to: (1) explore and characterize the subsurface conditions for geotechnical analysis and design purposes; (2) identify the geologic factors impacting the project; and (3) formulate recommendations for the design and construction of the proposed foundations, slabs, basement walls, pavements, and site improvements associated with the concept plans and land development scheme. Our completed tasks include test boring supervision, geotechnical laboratory testing, engineering analysis, and preparation of this report with supporting documentation.

2. PROJECT DESCRIPTION

2.1 Site Description

The subject site is located along the northbound side of US Route 9 (Albany Post Road) in the city of Wappingers Falls, Dutchess County, New York. It is bounded by US-9 on the east, a shopping center driveway on the north, and a shopping center and parking lot to the southwest (See Figure 1. Site Location Map). The existing plot of land is currently occupied by an unoccupied commercial, one-story Sonic restaurant building with a car canopy along the east side of the property. The existing building occupies the center of the property and is accessed along US-9 by a shopping center driveway immediately north of the building. The majority of the property is covered with asphalt pavement with curb-enclosed grass areas to the direct south of the existing building and lining US-9 to the east.

Based on the aforementioned grading plan prepared by Sevan Engineering, the site slopes down from northwest to southeast and ranges in elevation from approximately 156 ft to 163 ft. The existing building does not appear to have a basement and its FFE is approximately at the grade of the surrounding ground.

2.2 Proposed Construction

Based on the Site Grading Plan prepared by Sevan Engineering dated 9/23/2021, a new Jiffy Lube Multi-Care service center is proposed on the northern end of an existing shopping center. Construction will require demolition of the existing Sonic restaurant building and associated site features including the detached car canopy structure. Details of the site improvements as well as important design assumptions are discussed below and shown in Drawing 1 - Geotechnical Investigation Plan.

Service Center. The proposed service center building will occupy the center of the property. Based on our experience with similar Jiffy Lube store configurations, one part of it (southern end) will be utilized as a customer waiting room with slab on grade at ground level. The finished floor elevation (FFE) is set at 157.60', which will require minor fill <1 ft. The other part of the building will contain the vehicle service pits which we assume will be 9 ft below the service center finished floor or at an approximate elevation of 148.60'. We assume that the service center will utilize shallow foundations of strip and spread footings embedded for protection against ground frost along the perimeter of the customer service area and throughout the extent of the vehicle service bays.

Based on similar JLI projects, the typical maximum vertical column load for this type of construction is assumed to be 60 kips. Wall loads are 2 to 3 kips/ft. The estimated slab loads for the service bay and retail sales floors are 200 psf and 100 psf, respectively. We anticipate that the floors will consists of concrete slabs on grade cast over a vapor barrier and clean AASHTO No. 57 stone.

Trash enclosure, exterior concrete slabs, driveways, and asphalt pavement. A trash enclosure with concrete pad is proposed north of the building. The finished pad of the exterior slab will be established at about elevation 158.0', which will involve a slight cut <1 ft. Other exterior concrete slabs are also planned next to the service bays. Asphalt pavement is planned for the driveways and paved area around the facility.

Sign Structure. A commercial sign is proposed along the road at the southwest corner of the site. Initially, it was thought that the sign would be erected at the northwest corner of the site, but it is reasonable to assume that the subsurface conditions are comparable at both locations. The finished grade at the sign will remain unchanged or have negligible change (<1 ft) from existing conditions. Sonotube or similar cylindrical concrete pier foundation elements are typically used to support such signs.

3. FIELD EXPLORATION

To investigate the subsurface conditions for design purposes, 5 geotechnical borings, labeled as B-1 through B-5 in Drawing 1 were completed; B-1 through B-3 were drilled for the proposed service building; B-5 was drilled for the assumed sign structure location; and B-4 is in the area of the trash enclosure. The drilling was accomplished using a Diedrich D-120 truck rig, equipped with an automatic safety hammer. Summit Drilling performed the drilling under the direct supervision of GeoStructures and GES personnel on June 14 and 15, 2021. The drilling and sampling conformed to ASTM D1586 procedures for the standard penetration test (SPT). The equipment included a 2-inch (O.D.) split-barrel sampler equipped with a 140-pound hammer dropped from a height of 30 in. The borings were advanced using hollow stem augers to refusal or competent natural soils (depths of 13 to 18 ft).

In the field, each SPT split-spoon sample was visually classified by our engineer per ASTM D2488 guidelines and assigned a group name from the Unified Soil Classification System (USCS). Detailed field observations, such as SPT blow counts (N-values), material descriptions, relative moisture, and groundwater levels are recorded in the Engineer's Field Boring Logs of Appendix A. The ground surface elevations at the boring locations were not available, however it has been estimated that B-4 and B-5 are approximately 1' higher in elevation than B-1, B-2, and B-3. For longer term monitoring of the groundwater, GES and GeoStructures directed the installation of a piezometer at B-1 with a 10-ft screened interval between approximately 3 ft and 13 ft below the surface. New groundwater readings were taken by GES on 8/3/21 as shown in Figure 4; however, the monitoring well has since been abandoned so additional readings are not possible.

4. LABORATORY TESTING

Index tests were performed on selected soil samples in our in-house geotechnical laboratory to verify our visual classifications and determine the engineering properties of the load bearing materials for analysis and design. The classification tests included particle-size analysis per ASTM D422, Atterberg limits per ASTM D4318, and water content per ASTM D2216. The laboratory test results presented in Appendix B contain gradation curves and a summary table of the index properties.

5. SUBSURFACE CHARACTERIZATION

5.1 Geologic Setting

The *Geologic Map of New York*[1] per Figure 3 (Site Geologic Map) shows the site to be underlain by the *Austin Glen Formation (Oag)*, which consists of greywacke and shale. Glacial sediments commonly overlie the residual soils and bedrock. A geologic boundary with the *Wappinger Group (Ocw)* lies to the northwest and a boundary with the *Mount Merino and Indian River Formations (Omi)* lies to the east.

5.2 Soils

Asphalt pavement (about 6 in.) is present at B-1, B-2, and B-4. The asphalt material has not been distinguished from the stone subbase. Topsoil (about 6 in.) is present at B-3 and B-5. The various soil layers called out below the pavement or topsoil in the legend of Drawing 2 include Fill soils with a typically gravel composition with varying levels of sand and silt, as well as fine-grained glacial and coarse-grained glacial sediments and the underlying, residual, weathered shale. Each material is characterized below from the test boring and lab testing data.

Existing Fill. This layer is present in all borings at a depth of 0.5 ft to a maximum of 8.0 ft. It is described as loose to medium dense, light brown and gray, silty sand with gravel (SM), silty gravel with sand (GM), and silty, clayey gravel with sand (GC-GM), with lesser components of fine, poorly graded sand with silt (SP-SM). It is noted to contain trace to little asphalt and concrete fragments. Its moisture content is generally optimal or slightly above (moist to very moist), with

[1]Fisher, D.W., et. al., Lower Hudson Sheet, The University of the State of New York, reprinted 1995.

some locally wet sections noted near the base of the stratum due to sporadic perched groundwater. Lab testing has provided an average moisture content of 6.6%.

Stratum 1. This layer is present in borings B-2, B-4, and B-5 below the existing fill at depths of 1.5 ft to 15.0 ft below the surface. It is composed of fine-grained glacial outwash deposits and exists in a stiff to very stiff consistency. For engineering purposes, it is described as light brown with mottles, low-plasticity silt (ML) and sandy silt (ML). It is moist to very moist with a lab moisture content of 14.8%.

Stratum 2. Like Stratum 1, this layer also consists of poorly sorted glacial sediment, however this stratum represents the coarse-grained glacial outwash deposits and exists in a medium dense consistency. This layer is only present in B-2, directly underneath the Stratum 1 soil. For engineering purposes, it is described as gray and brown with mottles, clayey sand with subrounded gravel (SC-SM). It is very moist and is locally wet towards the base due to perched groundwater. Lab testing has provided a moisture content of 10.7%.

Stratum 3. This layer occupies the bottom portion of most borings except for B-5 beginning at a depth of 2.5 ft to 6.5 ft and is described as dense to very dense residual weathered shale of the *Austin Glen Formation (Oag)*. For engineering purposes, it is described as gray and reddish brown, angular shale fragments with relict bedding and seams of clayey sand (SC). Its moisture content is damp to wet, fluctuating with the presence of groundwater.

5.3 Groundwater

At Time of Drilling and Recent Readings by GES. The groundwater levels at the time of drilling, as documented in the test boring logs and profiles, range from depths of 2 to 9 ft. Apparent perched water was detected at the time of drilling 2 ft below grade in B-1. The monitoring well installed by GES at B-1 has been gauged recently by GES and they recorded a *depth to perched GW just below the surface* (see Figure 4, which is annotated GES Figure 2 from their report). GES also obtained a new reading from the open borehole at geotechnical boring B-4 near the proposed trash enclosure (2.9 ft to perched GW) plus a reading at one of their environmental locations, S-2, which showed a depth to perched GW at 5.2 ft. These readings, together with the condition of the soils

(redoximorphic features or mottles) strongly indicate intermittent zones of saturation (perched groundwater) as shallow as just below the surface. The deeper groundwater levels measured at the time of drilling in B-1 and B-2 (6 to 8.5 ft below grade) are judged to be phreatic. All things considered for this site, we have assigned a design groundwater elevation at 153.0 ft to be accounted for when calculating hydraulic uplift forces and hydrostatic pressures against the basement walls.

6. CONCLUSIONS AND RECOMMENDATIONS

Based on the soil borings and laboratory testing results, the subsurface conditions are suitable for conventional shallow foundations (strip and spread footings) and slab on grade for the proposed structures. However, the overburden is highly stratified in places and as a result, there are zones of perched water in the upper 2 ft and phreatic groundwater on top of the weathered rock at a depth of 6 to 8.5 ft below existing grade. Dewatering of the service pit basement excavation during construction will be needed, along with permanent waterproofing, drainage, and/or structural measures to safeguard the basement slab and walls against hydrostatic uplift and seepage. Based on final grades the use of a hydraulic slab or uplift anchors is required for the service pit slab unless an underslab drainage system can be reliably drained by gravity to an off-site location. It should be noted that the rock is sufficiently weathered such that it is not expected to pose significant difficulties when performing the bulk excavation for the service pit area. Pneumatic hammering is predicted to be minimal or unnecessary based on the boring data. Detailed recommendations addressing these issues and the design of foundations, basement walls, slab on grade, and pavement are presented below.

6.1 Foundations

1. A net allowable soil bearing pressure of 3,000 psf is recommended for the shallow strip and spread footings of the service center, sign structure and the trash enclosure provided the subgrade is prepared per Section 6.6. As illustrated in Drawing 2, the foundations will bear on compacted *structural fill*, stiff to very stiff clayey soils of *Stratum 1*, or the dense to very dense weathered shale residual soils of *Stratum 3*.

2. For protection against ground frost, the minimum embedment of the perimeter service center footings and the footings of the trash enclosure is 3.5 ft below final grade for this part of New York unless local building codes require deeper embedment. The 3.5-ft depth

was obtained from a verbal inquiry we made to the municipality of Wappinger. Interior footings should be placed per functional considerations but at a minimum depth of 2 ft below finished floor. The foundations of the service pit automatically meet the frost depth.

3. The estimated maximum settlements of footings constructed on properly prepared subgrade conforming to this report are as follows: 1 in. (total), ½ in. (differential), and 1/400 (angular distortion).

4. Seismic site class C applies to this site per the International Building Code (IBC).

5. *Sonotube* type cylindrical foundation is recommended for the sign structure along Route 9. We recommend a minimum diameter of 2 ft plus a minimum embedment of 5 ft below final grade, as needed to satisfy stability. These recommended embedment depths are based on data from the test boring B-5, which is assumed to have similar subsurface conditions as the southwest corner and the assumed finished ground elevation at the proposed sign location remaining the same as the existing grade. A spread footing may also be used.

6. The sign foundation along US Route 9 should be designed to resist lateral forces and checked to ensure minimum factors of safety of 1.5 against sliding and 2.0 against overturning to resist shear and moment during the design wind speed. The maximum allowable soil bearing pressure is 3,000 psf. The sign foundations should be designed using lateral earth pressure and base friction coefficients per Table 1.

7. The site work and structural fill placement as well as the foundation excavation and construction should be carried out under the direction of a NY-licensed geotechnical engineer for conformance to our site characterization and the recommendations of this report before steel reinforcement is placed or concrete is poured. GeoStructures should be informed of any deviations in the subsurface conditions. Approved open trenches should not be exposed to precipitation or freezing conditions.

8. The subgrade at the bottom of all footing trenches should be compacted with 6 passes of a walk-behind roller in vibratory mode and verified to be stable by the geotechnical inspector. This is especially important since the borings show that a foot or two of the existing fill may underlie some of the footings in the slab on grade area of the building. If upon rolling, the existing fill is unstable it should be undercut and backfilled with lean concrete (2,000-psi strength at 28 days) to planned bottom of footing. If subgrade is then deemed stable, footing construction may proceed.

6.2 Concrete Slab on Grade for Customer Area

Concrete slab on grade may be used to construct the at grade floor of the customer area as well as the trash compound pad and other exterior slabs provided the subgrade is properly prepared per Section 6.6 and the structural fill meets the criteria presented herein. To set a capillary break, all slabs on grade should be poured on a minimum of 6 in. of clean drainage stone such as AASHTO No. 57. A 4-in. thick slab will suffice for the customer service area of the building, while the slabs

subject to vehicle loads should be 6 in. thick. A 15-mil vapor barrier is recommended for the interior slab. Ancillary, exterior slabs such as those for the sidewalks and other lightly loaded pads should be poured on a 6-in. bed of AASHTO No. 57 stone and do not need vapor barrier. A design subgrade modulus of 150 psi/in applies for slab on grade design at this site.

6.3 Service Pit Hydraulic Slab, Basement Walls and Special Measures

The presence of shallow groundwater will require the design and construction of special, permanent waterproofing and structural measures to safeguard the basement slab and walls against hydrostatic uplift and seepage unless the basement area can be effectively drained by gravity, which is unlikely. Options include a reinforced structural slab to resist the uplift pressures, thickened to develop the uplift resistance needed or *helical pile* anchors can be installed into the weathered shale to anchor the slab. Even with waterproofing measures, a subsurface drainage collection system should be incorporated into the basement area to keep the floor dry in case the waterproofing is not completely tight. ***A design groundwater elevation of 153 ft has been assigned to this site.***

The basement walls may need to be designed to withstand hydrostatic pressure using the design GW Elevation of 153 ft. Considering the restrained condition of the service pit walls by the floor slabs, the basement and foundation walls should be designed to resist the lateral earth pressures corresponding to the at-rest conditions. The earth pressure coefficients for the on-site soils are listed in Table 1. It is important to note that backfill against basement walls should not take place until the first floor slab is installed or the walls are properly braced.

Table 1. Design Soil Properties for Basement Walls and Shoring

Material	Effective Cohesion, c' (ksf)	Effective Friction Angle, φ' (°)	Moist Unit Weight, γ_t (pcf)	Active Earth Coeff., K_a	Passive Earth Coeff., K_p	At Rest Earth Coeff., K_o
Fill & Stratum 1	0	30	115	0.33	3.00	0.50
Stratum 2	0	32	120	0.30	3.25	0.47
Stratum 3	0	38	135	0.24	4.20	-

Note: Base friction coefficient of 0.5 should be used between the cast-in-place concrete and bearing soils

Waterproofing and perimeter foundation drainage should be installed along the exterior sides of the basement walls to intercept any incoming perched water. The basement wall drainage system should consist of geo-composite sheet drains which feed into non-woven, filtration geotextile-encapsulated clean stone (AASHTO No. 57) and a perforated 4-in. diameter drainage pipe placed at bottom of the basement walls. The pipe should be sloped 0.5% minimum and flow by gravity or via pumping and discharge into nearby stormwater system or sump pit. GeoStructures should review the layout, design details and specifications of the perimeter foundation drainage system during final design.

6.4 Asphalt Pavement and Subbase

Based on the type and conditions of the sandy subgrade soils at the site, we recommend using the following minimum pavement section for sandy soils—1.5 in. of surface mix, 3.5 in. of base course, and 8 in. of aggregate subbase. A design California Bearing Ratio (CBR) value of 10 has been assigned. The materials used should meet New York DOT specifications. Well-graded quarry gravel-sand aggregate is recommended for the subbase. To enforce stone quality, gradation and Atterberg limits testing should be conducted on a representative aggregate sample *before* bulk delivery to verify that it meets the gradation specifications and has non-plastic fines.

6.5 Excavation, Shoring and Construction Dewatering

The overburden soils can be excavated using standard equipment such as a trackhoe or backhoe. All existing building elements such as foundations and slabs should be completely removed and backfilled properly per the requirements of this report. Due to the shallow water table and perched water, temporary shoring should be used in the service pit basement area to support the excavations and facilitate dewatering. The excavation support system should be designed based on the soil properties presented in Table 1. The shoring design calculations and shop drawings submitted by the contractor at the start of construction should be reviewed by a licensed geotechnical engineer. Construction dewatering, such as sump pumps and/or well points are needed to lower the groundwater table during construction of the service pit. Removal of the weathered shale can likely be accomplished with little to no pneumatic hammering due to advanced weathering.

6.6 Subgrade Preparation and Structural Fill

After demolition of the existing building and the car canopy, all remnants of the existing structure should be removed. The topsoil to the south of the building, as well as the surrounding curb, should be stripped. After stripping of the topsoil and demolition of the existing building and car canopy, the exposed subgrade across the entire building pad + 5 ft laterally in all directions, the trash enclosure pad, sign structure, and the pavement areas should be proofrolled under the direction of the inspecting engineer. The proofrolling should be accomplished with 6-8 passes of a heavy-duty, vibratory roller having a minimum static weight of 10 tons. The proofrolling operation should be conducted under the supervision of a NY-licensed geotechnical engineer. The maximum permissible deflection of the subgrade under the roller is 1 in. If the deflection exceeds 1 in., the inspecting engineer should investigate the cause and determine whether undercutting and replacement with approved granular structural fill or aeration and re-compaction are warranted.

All of the existing soils have some zones or sublayers that contain some excess moisture, which means that they may need to be aerated to dry them or they can be amended with dry quarry sand and gravel to facilitate compaction. At any rate, the project would benefit from doing the site work construction during the warm months of the year. It is critical to address the stability of the subgrade soils prior to the placement of any structural fill. The clayey soil of Stratum 1 should not be used in structural areas and should be placed only in landscaped locations.

If imported select structural fill is needed, samples from potential borrow sources should be tested and approved before they are brought to the site. We recommend importing clean granular soils such with the USCS designations SM, SW, GM, GW, or dual symbol combinations thereof. The testing program for borrow fill includes: water content, sieve analysis, Atterberg Limits, and standard Proctor. Recommended properties of the select granular structural fill used in the structural pads and pavement areas are as follows. If a suitable natural source cannot be found, a well-graded mix of sand and gravel sized, recycled crushed concrete (RCC) is recommended for structural fill in the building and pavement areas.

1. Maximum fines (silt/clay) content, finer than No. 200 sieve $\leq$ 30% (ASTM D422)
2. Plasticity index <5 (ASTM D4318)
3. Zero organic content (ASTM D2974).

4. Moisture content within +/- 2% of optimum (ASTM D2216 & D698)
5. Clean Fill Certificate

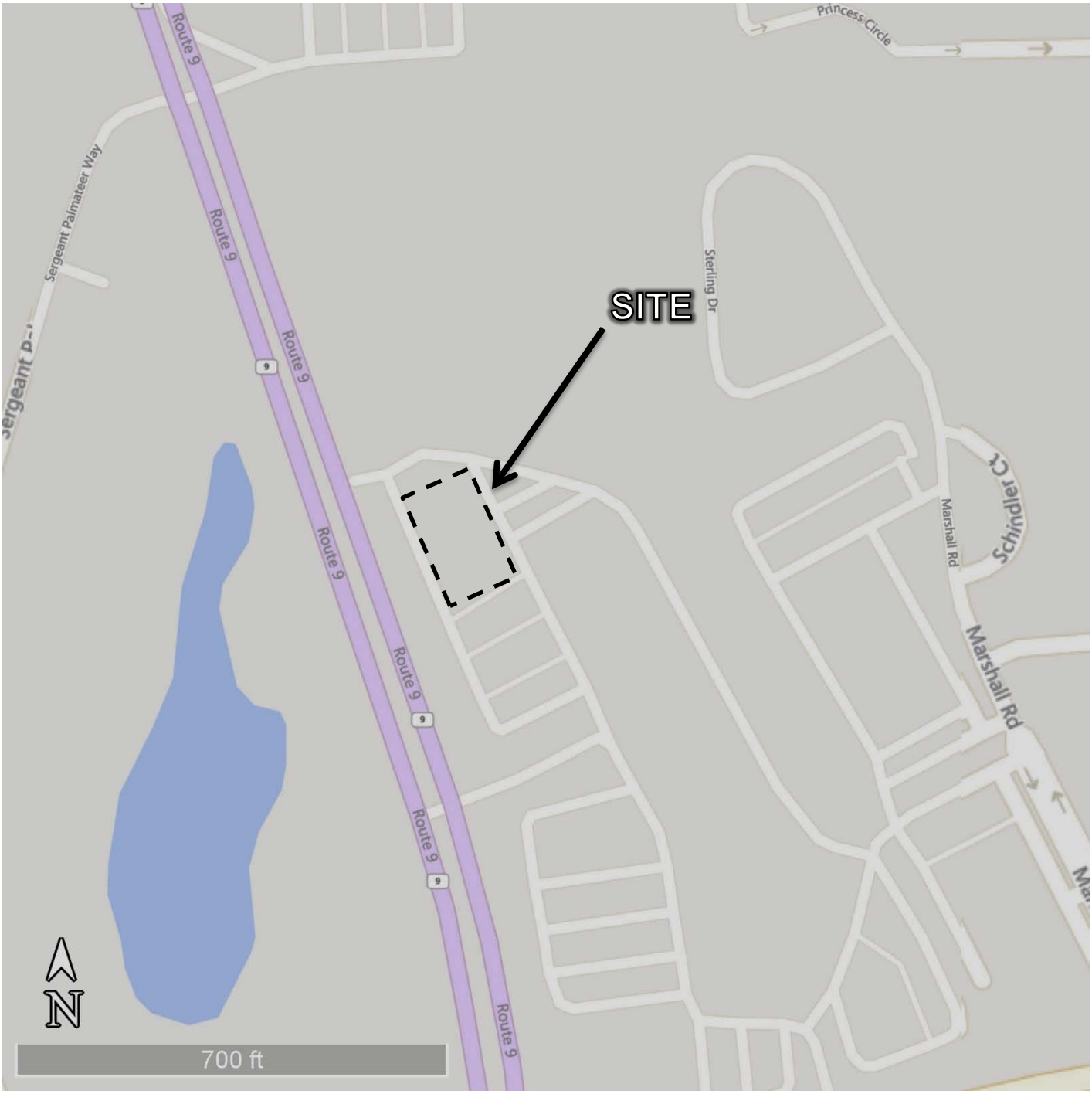
The maximum recommended lift thickness for structural fill is 6 in. when light duty compactors are used and 10 in. when heavy-duty rollers (10-ton static weight or higher) are used. Existing slopes should be benched prior to placement of structural fill to "key in" the fill. Each lift of structural fill or backfill should be tested for water content and compaction using a nuclear moisture-density gauge (ASTM D6938). For building and pavement areas, at least 1 test should be conducted for every 2,000 SF with no fewer than 3 tests per lift. Foundation wall and trench backfill tests should be conducted every 50 ft, with no fewer than 3 tests per lift.

The minimum required compactions are as follows: 98% for the building and trash enclosure pads and under footings; 95% under pavements and exterior concrete slabs and inside utility trenches Per ASTM D698. For compaction control of poorly graded sands using *relative density criteria (ASTM D4253 and D4254),* the general requirement is 80% for all structural and pavement areas.

7. LIMITATIONS

The findings and recommendations presented in this report are based on the subsurface information from the documented geotechnical borings, laboratory testing together with the design assumptions in Section 2. The subsurface information has been idealized for geotechnical purposes. This idealization is strictly for engineering analysis and design and it is not implied in this report that the conditions as depicted on the test boring profiles are identical to what will be encountered during construction. Therefore, GeoStructures should be informed during construction of any deviations in the conditions so that adjustments to our recommendations can be made in the field, if necessary. When the building drainage plan is complete, we should be given the opportunity to review plans to confirm our recommendations are still valid. The soils-related work and foundation construction should be inspected under the direction of a NY-licensed geotechnical engineer.

Figures and Drawings



Source:

"Google Maps in Google Earth." *Google Maps in Google Earth*. N.p., n.d. Web. 7/7/2021. <http://ge-map-overlays.appspot.com/google-maps/road>.

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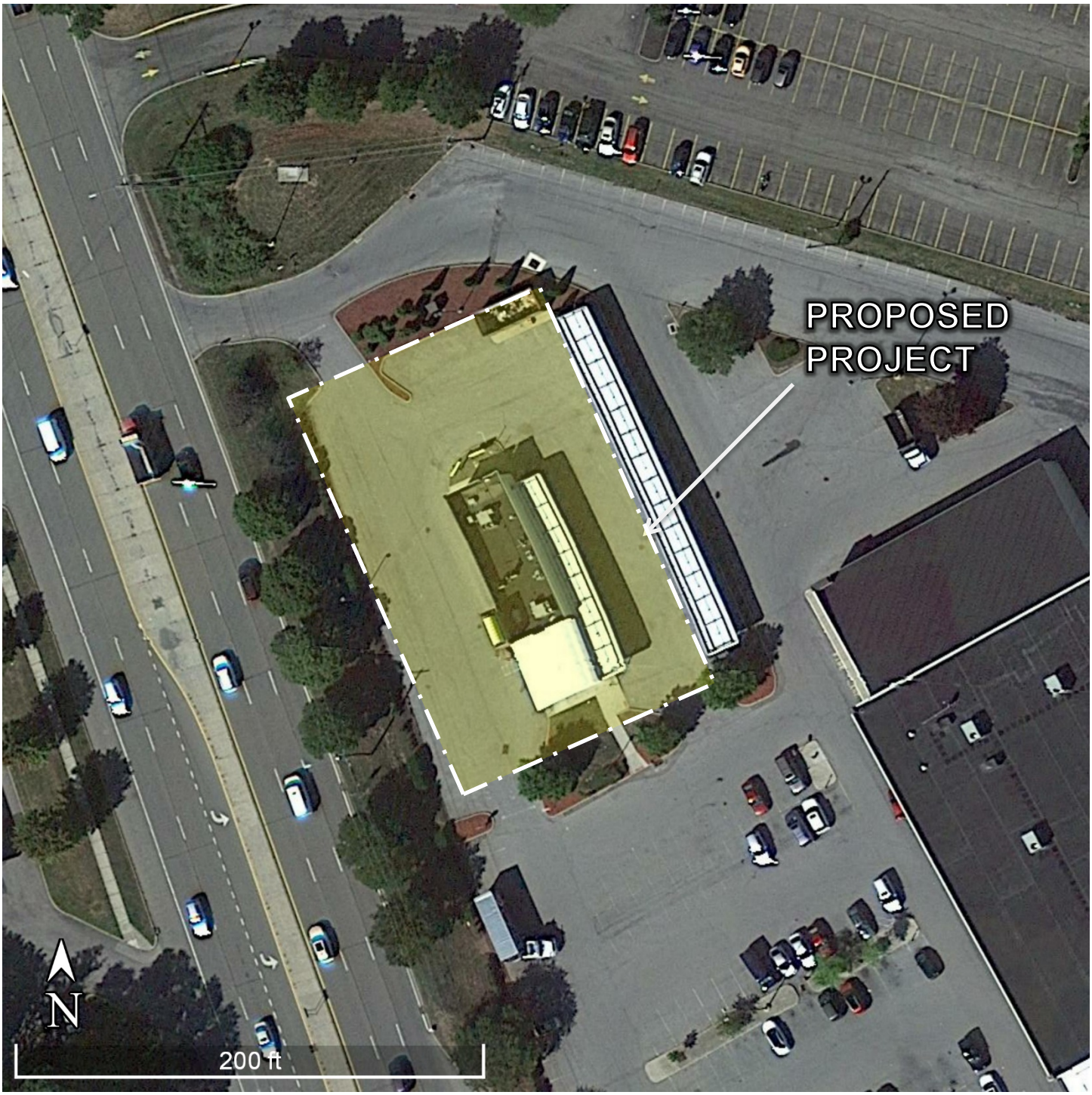
FIGURE 1. SITE LOCATION MAP

JIFFY LUBE MULTI-CARE SERVICE CENTER
1490 ROUTE 9, WAPPINGERS FALLS, NY



Source:

"Google Maps in Google Earth." *Google Maps in Google Earth*. N.p., n.d. Web. 7/7/2021. <http://ge-map-overlays.appspot.com/google-maps/road>.

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FIGURE 2. SITE AERIAL PHOTO MAP

JIFFY LUBE MULTI-CARE SERVICE CENTER
1490 ROUTE 9, WAPPINGERS FALLS, NY

Oag: Austin Glen Formation:
Graywacke, shale.

Ocw: Wappinger Group:
(Including Fishkill limestone and dolostone): Copake Formation ?-limestone, dolostone; Rochdale Formation-limestone, dolostone; Halcyon Lake Dolostone-locally cherty; Briarcliff Dolostone; Pine Plains Formation-dolostone, shale, oolite; Stissing Formation-dolostone, shale.

Omi: Mount Merino and Indian River Formations:
Shale, argillite, chert.

Sources:

(1) "Google Maps in Google Earth." *Google Maps in Google Earth*. N.p., n.d. Web. 7/7/2021. <http://ge-map-overlays.appspot.com/google-maps/road>.

(2) Fisher, D.W., Isachsen, Y.W., and Rickard, L.V., 1970, Geologic Map of New York State

(3) http://mrdata.usgs.gov/geology/state/state.php?state=NY

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FIGURE 3. SITE GEOLOGIC MAP

JIFFY LUBE MULTI-CARE SERVICE CENTER
1490 ROUTE 9, WAPPINGERS FALLS, NY

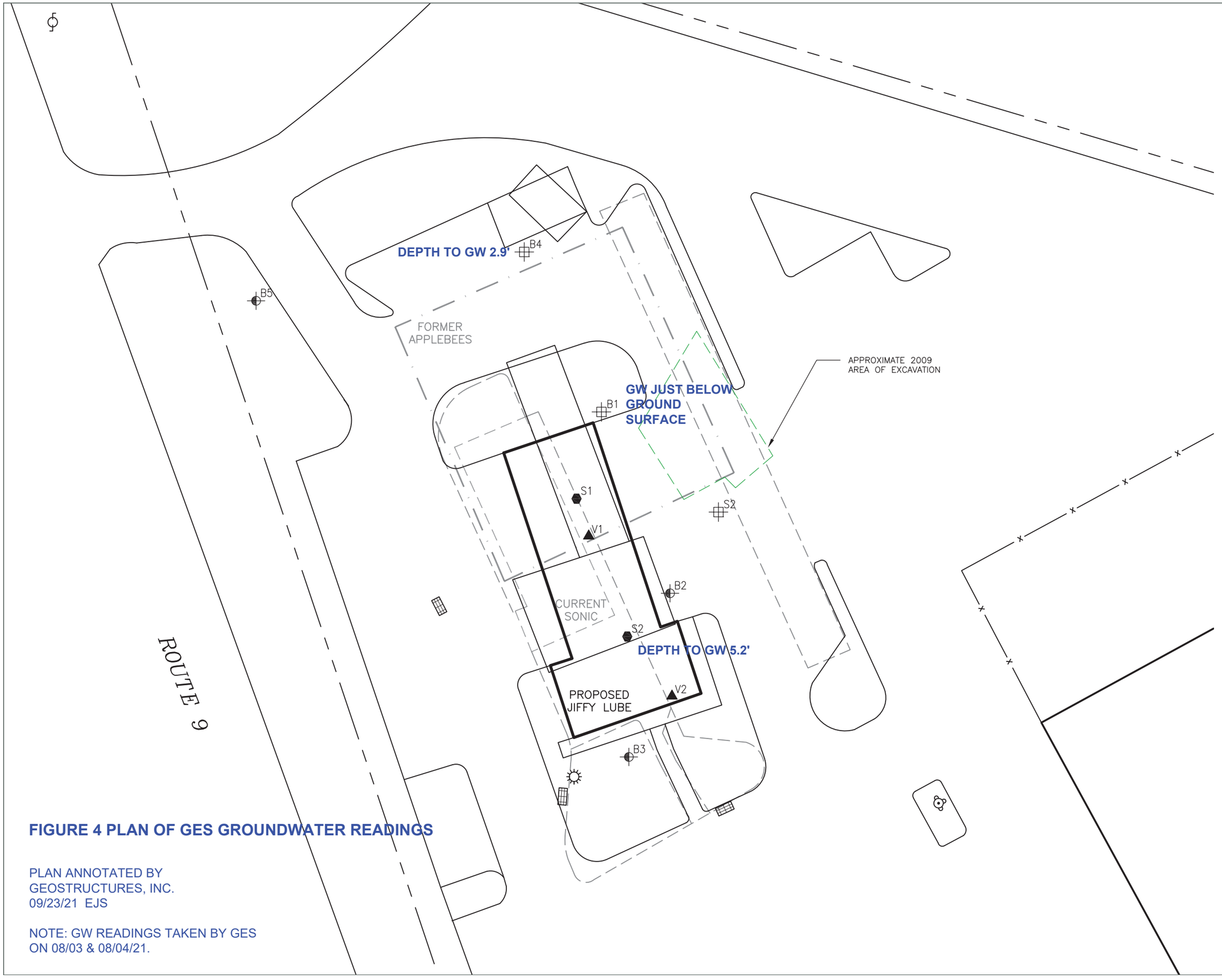


FIGURE 4 PLAN OF GES GROUNDWATER READINGS

PLAN ANNOTATED BY
GEOSTRUCTURES, INC.
09/23/21 EJS

NOTE: GW READINGS TAKEN BY GES
ON 08/03 & 08/04/21.

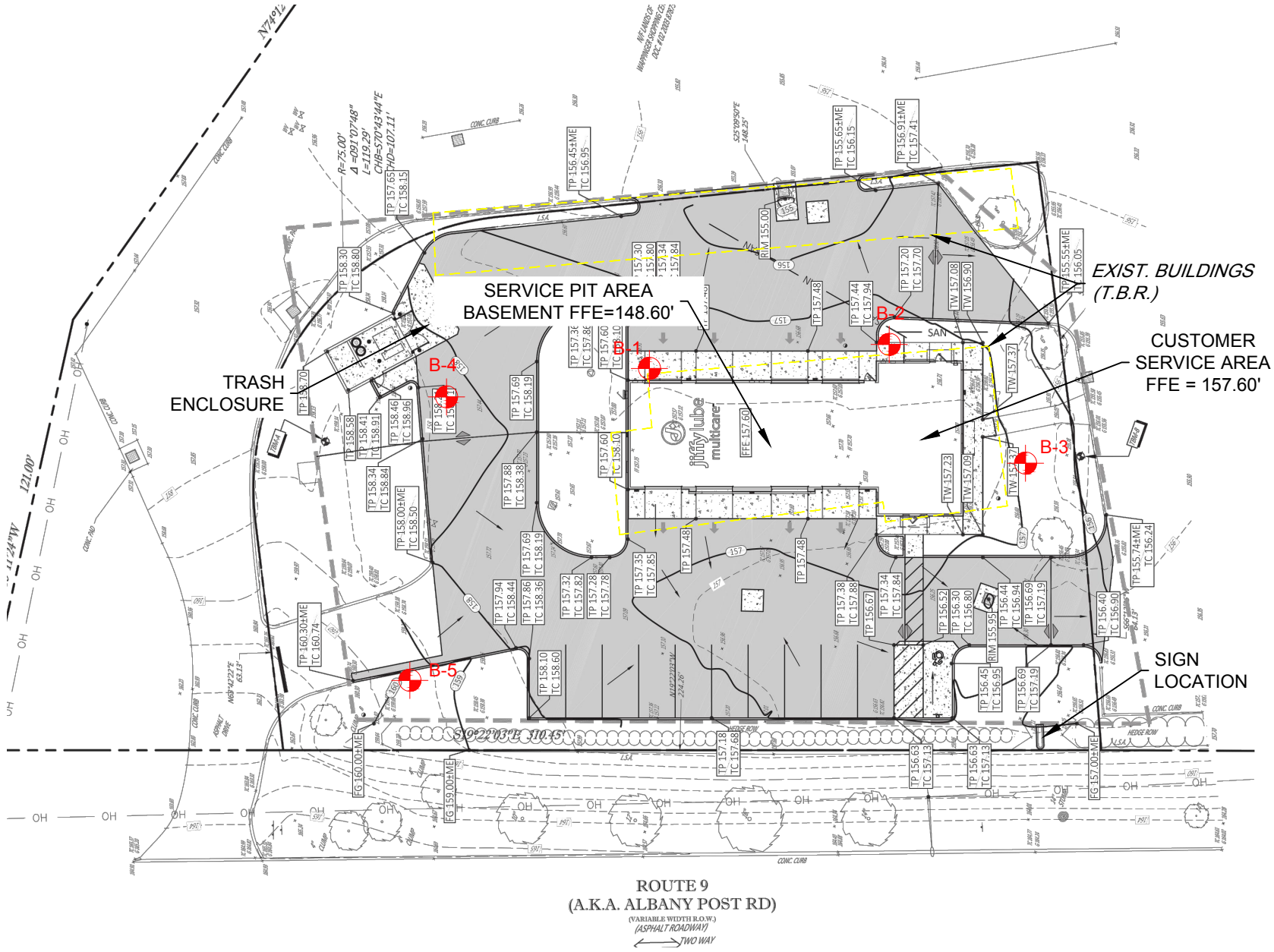
Site Map

Jiffy Lube International, Inc.
1506 Route 9
Wappingers Falls, New York

Drawn W.G.S.
Designed K.B.
Approved M.D.
Date 8/31/21
Figure 2

Scale In Feet
0 30

Groundwater & Environmental Services, Inc.



LEGEND

TEST BORING

40' 20' 0 40'

SCALE: 1" = 40'

NOTE: THIS DRAWING IS BASED ON A GRADING PLAN PREPARED BY SEVAN ENGINEERING DATED 9/23/2021.

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GEOTECHNICAL INVESTIGATION PLAN

JIFFY LUBE MULTI-CARE SERVICE CENTER
1490 ROUTE 9, WAPPINGERS FALLS, NY

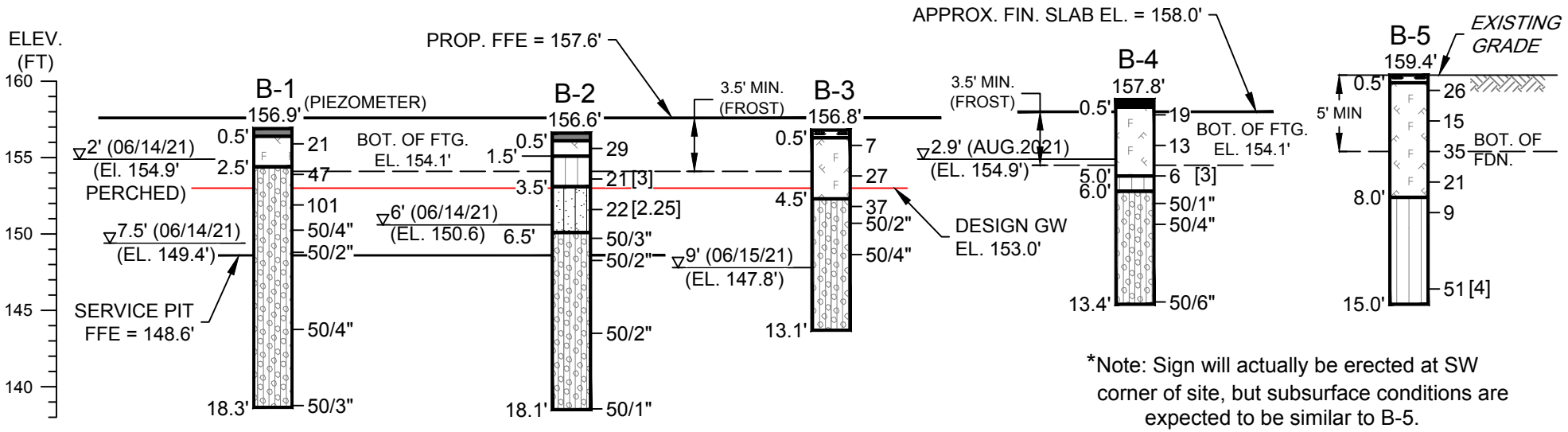
SCALE: 1" = 40'	DRAWN BY: NRC	PROJECT NO: G21-204
DATE: 1/4/2022	CHECKED BY: EJS	DRAWING NO: 1

PLOTTED: 1/4/2022 3:07:01 PM | BY: TECH1 | PLOTSTYLE:--- | PLOTTER:DWG TO PDF.PC3
FILE PATH: \\GSIDC2\FILES\PROJECT FOLDERS\2021\G21-204 JIFFY LUBE, WAPPINGERS FALLS, NY\DRAWINGS\BORING PLAN - DRAWING1 12-27-2021.DWG

SERVICE CENTER BUILDING

TRASH ENCLOSURE

SIGN



*Note: Sign will actually be erected at SW corner of site, but subsurface conditions are expected to be similar to B-5.

LEGEND

ASPHALT PAVEMENT AND GRAVEL SUBBASE (APPROXIMATE)

TOPSOIL.

EXISTING FILL: LOOSE TO MEDIUM DENSE, LIGHT BROWN AND GRAY, SILTY SAND WITH GRAVEL (SM), SILTY GRAVEL WITH SAND (GM), AND SILTY, CLAYEY GRAVEL WITH SAND (GC-GM), CONTAINS LESSER COMPONENT OF FINE, POORLY GRADED SAND WITH SILT (SP-SM), MOIST TO VERY MOIST EXCEPT LOCALLY WET TOWARDS BASE DUE TO SPORADIC PERCHED GROUNDWATER. TRACE TO LITTLE ASPHALT AND CONCRETE FRAGMENTS.

GLACIAL OUTWASH DEPOSITS:

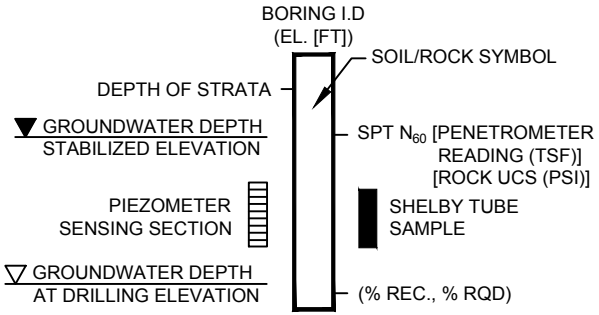
STRATUM 1 (FINE-GRAINED GLACIAL): STIFF TO VERY STIFF, LIGHT BROWN WITH MOTTLES, LOW-PLASTICITY SILT (ML) AND SANDY SILT (ML), MOIST TO VERY MOIST.

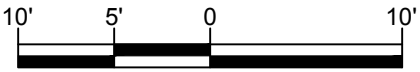
STRATUM 2: (COARSE-GRAINED GLACIAL): MEDIUM DENSE, GRAY AND BROWN WITH MOTTLES, SILTY, CLAYEY SAND WITH SUBROUNDED GRAVEL (SC-SM), VERY MOIST EXCEPT LOCALLY WET TOWARDS BASE DUE TO PERCHED GROUNDWATER.

RESIDUAL MATERIALS DERIVED FROM THE AUSTIN GLEN FORMATION (OAG):

STRATUM 3: (WEATHERED SHALE): DENSE TO VERY DENSE, GRAY AND REDDISH BROWN, ANGULAR SHALE FRAGMENTS WITH RELICT BEDDING AND SEAMS OF CLAYEY SAND (SC), DAMP TO WET.

KEY





SCALE: 1" = 10'

GeoStructures

TEST BORING PROFILES

JIFFY LUBE MULTI-CARE SERVICE CENTER
1490 ROUTE 9, WAPPINGERS FALLS, NY

SCALE: 1"=10' (V)	DRAWN BY:YY	PROJECT NO: G21-204
DATE: 1/4/2022	CHECKED BY: EJS	DRAWING NO: 2

Appendix A
Test Boring Logs

GeoStructures

TEST BORING LOG

Test Boring: B-1
Sheet: 1 of 1
Elevation (ft): 156.90

Project Name: Jiffy Lube Wappingers Falls | Project No: G21-204 | Date: 06/14/21 - 06/14/21

Location: NY Route 9 | Twp.: Wappingers Falls | County: Dutchess | State: NY

Driller/Company:Summit Drilling | Rig Type: Diedrich 120 Truck Rig, Automatic Safety Hammer.

Drilling Methods:4-1/4" I.D. Hollow Stem Auger. | Logged By: MRK

Water Depth ▽ : 2' During drilling (06/14/21) | Water Depth ▽ : 0' After drilling (08/03/21) | Checked By: DWE

Elevation (ft)	Depth (ft)	Sample Type	Sample No.	Sample Interval (ft)	SPT Blows or RQD (ft/%)	SPT N_{60}	Recovery (ft/%)	W_C (%)	LL/PL (%)	USCS/AASHTO	Strength (tsf) (rock UCS: psi)	Symbol	Material Description	Strata Div.(ft)	Remarks
													Asphalt pavement.	0.5	▽
			S-1	0.0-2.0	8-6-10-13	21	1.1/55						Medium dense, tan and light brown, well-graded sand with subrounded gravel and silt (SW-SM), moist (Possible FILL).	1.5	▽ Possible perched water.
155	2		S-2	2.0-4.0	4-16-20-40	47	1.2/60						Same SW-SM as above except wet (Possible FILL).	2.5	
	4		S-3	4.0-6.0	16-40-36-24	101	1.8/90						Dense to very dense, reddish brown to gray, shale fragments, damp (WEATHERED SHALE).	4.0	Quartz sublayer at 4.0'-4.5', oily odor
	6		S-4	6.0-7.3	10-50-50/4"	133	1.1/85						Very dense, gray, silty gravel with sand (GM) with sublayers of quartz, wet sand, and an oily odor (WEATHERED SHALE).		Clayey fines in residual rock. Rock in spoon tip at 7.3'. GW at 7.5'. Stronger oil odor, sample S-5 given to environmental engineer.
150	8		S-5	8.0-8.2	50/2"		0.2/100								
	10														
145	12		S-6	13.0-13.3	50/4"		0.3/100								Rough augering.
	14														
	16														
140	18		S-7	18.0-18.3	50/3"		NR							18.3	Auger refusal at 18.25' (Top of rock).
													Bottom of borehole at 18.3'.		

SAMPLE LEGEND

- SPT Sample
- Rock Core
- Bulk Sample
- Shelby Tube

GENERAL NOTES

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GeoStructures

TEST BORING LOG

Test Boring: B-2
Sheet: 1 of 1
Elevation (ft): 156.60

Project Name: Jiffy Lube Wappingers Falls | Project No: G21-204 | Date: 06/14/21 - 06/14/21

Location: NY Route 9 | Twp.: Wappingers Falls | County: Dutchess | State: NY

Driller/Company:Summit Drilling | Rig Type: Diedrich 120 Truck Rig, Automatic Safety Hammer.

Drilling Methods:4-1/4" I.D. Hollow Stem Auger. | Logged By: MRK

Water Depth ▽ : 6' During drilling (06/14/21) | Water Depth ▽ : 8.5' During drilling (06/14/21) | Checked By: DWE

Elevation (ft)	Depth (ft)	Sample Type	Sample No.	Sample Interval (ft)	SPT Blows or RQD (ft/%)	SPT N_{60}	Recovery (ft/%)	W_C (%)	LL/PL (%)	USCS/AASHTO	Strength (tsf) (rock UCS: psi)	Symbol	Material Description	Strata Div.(ft)	Remarks
													Asphalt surface.	0.5	
			S-1	0.0-2.0	6-11-11-6	29	1.9/95	5.9				F	Medium dense, gray to light brown, silty sand with subrounded gravel (SM), very moist (POSSIBLY FILL).	1.5	
155	2		S-2	2.0-4.0	10-7-9-8	21	1.5/75	14.8	21 / 17		3.0		Very stiff, light brown with mottling, low-plasticity sandy silt (ML), trace subrounded gravel, moist (GLACIAL).	3.5	Rock in tip.
	4		S-3	4.0-6.0	7-8-9-11	22	1.7/85	10.7	22 / 16		2.25		Medium dense, gray and brown, mottled, silty, clayey sand with subrounded gravel (SC-SM), very moist (GLACIAL).	6.0	▽ Possible perched water at 6' on top of weathered rock.
	6													6.5	
150			S-4	6.0-7.8	6-12-37-50/3"	65	1.3/74						Same SC as above except wet (GLACIAL).		
	8		S-5	8.0-8.7	23-50/2"		0.7/104						Very dense, gray, shale fragments (WEATHERED SHALE).		▽ Brown sand sublayers, saturated. Rough augering.
	10														
145	12													13.0	
			S-6	13.0-13.2	50/2"		0.2/100						Same weathered shale as above except no brown sand and no water (WEATHERED SHALE).		
	14														
	16														
140															
	18		S-7	18.0-18.1	50/1"									18.1	Auger refusal at 18.1' (top of rock).
													Bottom of borehole at 18.1'.		

SAMPLE LEGEND

- SPT Sample
- Rock Core
- Bulk Sample
- Shelby Tube

GENERAL NOTES

GeoStructures

TEST BORING LOG

Test Boring: B-3
Sheet: 1 of 1
Elevation (ft): 156.80

Project Name: Jiffy Lube Wappingers Falls | Project No: G21-204 | Date: 06/15/21 - 06/15/21

Location: NY Route 9 | Twp.: Wappingers Falls | County: Dutchess | State: NY

Driller/Company:Summit Drilling | Rig Type: Diedrich 120 Truck Rig, Automatic Safety Hammer.

Drilling Methods:4-1/4" I.D. Hollow Stem Auger. | Logged By:

Water Depth ▽ : 9' During drilling (06/15/21) | Water Depth : | Checked By: DWE

Elevation (ft)	Depth (ft)	Sample Type	Sample No.	Sample Interval (ft)	SPT Blows or RQD (ft/%)	SPT N_{60}	Recovery (ft/%)	W_C (%)	LL/PL (%)	PID (ppm)	Strength (tsf) (rock UCS: psi)	Symbol	Material Description	Strata Div.(ft)	Remarks
													Dark brown, Topsoil with roots (TOPSOIL).	0.5	
155	2		S-1	0.0-2.0	1-3-3-3	7				0.0			Loose, brown, silty sand with gravel (SM), contains asphalt and concrete fragments, moist (FILL).	2.0	
	4		S-2	2.0-4.0	7-10-11-12	27				3.5			Same SM as above except medium dense (FILL).	4.5	
	6		S-3	4.0-6.0	6-20-8-30	37				2.7			Dense to very dense, reddish brown and gray, shale fragments, damp (WEATHERED SHALE).		
150			S-4	6.0-6.2	50/2"					3.2					
	8		S-5	8.0-8.3	50/4"					4.1					▽Groundwater at 9.0' during drilling.
	10														
145	12		S-6	13.0-13.1	50/1"									13.1	
													Bottom of borehole at 13.1'.		

SAMPLE LEGEND

- SPT Sample
- Rock Core
- Bulk Sample
- Shelby Tube

GENERAL NOTES

GeoStructures

TEST BORING LOG

Test Boring: B-4
Sheet: 1 of 1
Elevation (ft): 157.80

Project Name: Jiffy Lube Wappingers Falls | Project No: G21-204 | Date: 06/15/21 - 06/15/21

Location: NY Route 9 | Twp.: Wappingers Falls | County: Dutchess | State: NY

Driller/Company:Summit Drilling | Rig Type: Diedrich 120 Truck Rig, Automatic Safety Hammer.

Drilling Methods:4-1/4" I.D. Hollow Stem Auger. | Logged By:

Water Depth ▽ : Dry During drilling (06/15/21) | Water Depth ▽ : 2.9' After drilling (08/03/21) | Checked By: DWE

Elevation (ft)	Depth (ft)	Sample Type	Sample No.	Sample Interval (ft)	SPT Blows or RQD (ft/%)	SPT N_{60}	Recovery (ft/%)	W_C (%)	LL/PL (%)	USCS/AASHTO	Strength (tsf) (rock UCS: psi)	Symbol	Material Description	Strata Div.(ft)	Remarks
													Asphalt pavement.	0.5	
	2		S-1	0.0-2.0	4-8-7-11	19		6.0	23 / 18				Loose to medium dense, brown and gray, silty, clayey gravel with sand (GC-GM) and silty sand with gravel (SM), contains concrete and asphalt fragments, moist to very moist (FILL).		▽
155			S-2	2.0-4.0	6-8-2-3	13									
	4		S-3	4.0-6.0	1-1-4-5	6					3.0			5.0	
													Very stiff, light brown with mottling, low plasticity silt (ML), moist (GLACIAL).	6.0	
	6		S-4	6.0-7.6	18-19-24-50/1"	57							Dense, gray to brown, clayey sand with gravel (SC), moist (RESIDUAL).	7.5	Oily odor fron 5'-8'
150	8		S-5	8.0-8.3	50/4"								Very dense, reddish brown, shale fragments, damp (WEATHERED SHALE).		
	10														
	12														
145			S-6	13.0-13.5	50/6"									13.4	
													Bottom of borehole at 13.4'.		

SAMPLE LEGEND

- SPT Sample
- Rock Core
- Bulk Sample
- Shelby Tube

GENERAL NOTES

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TEST BORING LOG

Test Boring: B-5
Sheet: 1 of 1
Elevation (ft): 159.40

Project Name: Jiffy Lube Wappingers Falls | Project No: G21-204 | Date: 06/15/21 - 06/15/21

Location: NY Route 9 | Twp.: Wappingers Falls | County: Dutchess | State: NY

Driller/Company:Summit Drilling | Rig Type: Diedrich 120 Truck Rig, Automatic Safety Hammer.

Drilling Methods:4-1/4" I.D. Hollow Stem Auger. | Logged By:

Water Depth : | Water Depth : | Checked By: DWE

Elevation (ft)	Depth (ft)	Sample Type	Sample No.	Sample Interval (ft)	SPT Blows or RQD (ft/%)	SPT N_{60}	Recovery (ft/%)	W_C (%)	LL/PL (%)	USCS/AASHTO	Strength (tsf) (rock UCS: psi)	Symbol	Material Description	Strata Div.(ft)	Remarks
													Dark brown, topsoil with roots (TOPSOIL).	0.5	
	2		S-1	0.0-2.0	7-6-14-12	26							Medium dense, brown, fine, poorly graded sand with silt (SP-SM), trace subrounded gravel, moist to very moist (FILL).		
			S-2	2.0-4.0	4-6-6-10	15								4.0	
155	4		S-3	4.0-6.0	15-14-13-17	35		8.0	21 / 17				Medium dense to dense, brown, silty sand with subrounded gravel (SM), trace concrete fragments, moist to very moist (FILL).	6.0	
	6		S-4	6.0-8.0	6-7-9-14	21							Same SM as above except very moist to moist (FILL).		
	8		S-5	8.0-10.0	3-4-3-6	9							Stiff, brown, non-plastic, sandy silt (ML), very moist (GLACIAL).	8.0	
150	10												Very stiff, light brown, low-plasticity silt (ML), very moist (GLACIAL).	10.0	
	12														
145	14		S-6	13.0-15.0	16-18-21-24	51					4.0			15.0	
													Bottom of borehole at 15.0'.		

SAMPLE LEGEND

- SPT Sample
- Rock Core
- Bulk Sample
- Shelby Tube

GENERAL NOTES

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Appendix B
Geotechnical Laboratory Testing Results

Summary of Index Properties

Boring	Sample	Depth (ft)	Water Content[1]	Stratum	LL[2]	PI[2]	USCS[3]
B-2	S-1	0.5 - 1.5	5.9%	FILL	-	-	sm
B-4	S-1	0.5 - 2.0	6.0%	FILL	23	5	GC-GM
B-5	S-3	4.0 - 6.0	8.0%	FILL	21	4	SM
		Averages	***6.6%***	***FILL***	***22***	***5***	***SM & GC-SM***
B-2	S-2	2.0 - 3.5	14.8%	1	21	4	ML
B-2	S-3	4.0 - 6.0	10.7%	2	22	6	SC-SM

[1] ASTM D2216.

[2] ASTM D4318.

[3] Upper case denotes classification per ASTM D2487; lower case is visual classification per ASTM D2488.

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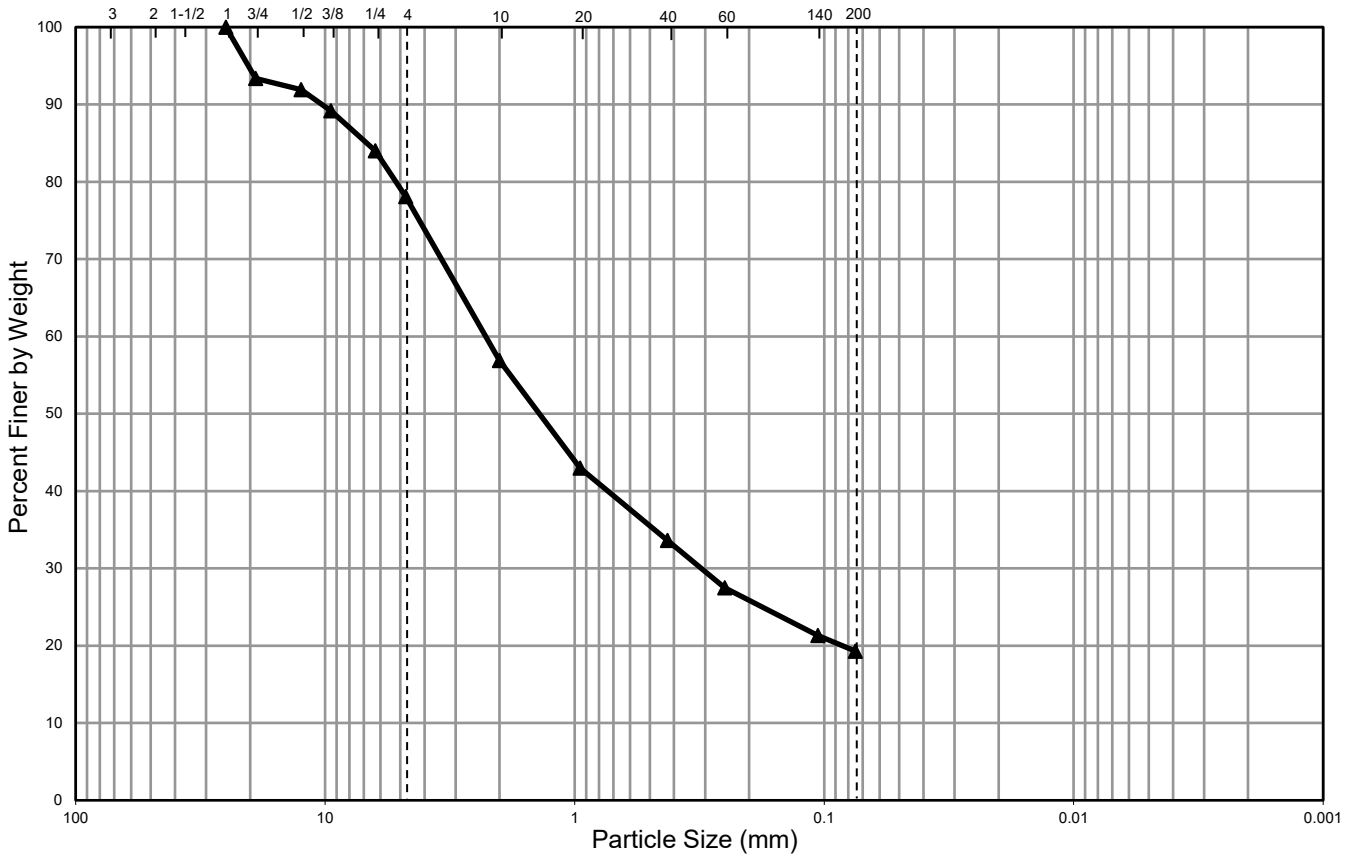
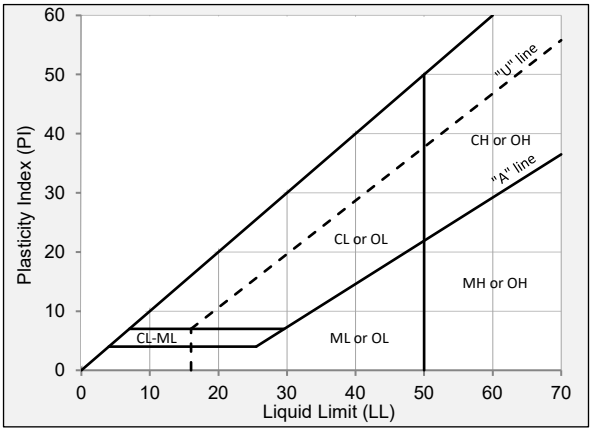
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	21.9		58.8			19.3

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	100.0
3/4"	93.4
1/2"	91.9
3/8"	89.2
1/4"	84.0
No. 4	78.1
No. 10	56.9
No. 20	43.0
No. 40	33.6
No. 60	27.5
No. 140	21.3
No. 200	19.3

	▲
Stratum	FILL
Boring	B-2
Sample	S-1
Depth (ft)	0.5 - 1.5
C_u	
C_c	
w (%)	5.9
LL	
PL	
PI	
USCS	sm (vis.)



	Color	USCS Group Name
▲	Brown	Silty, clayey sand with gravel (visual)

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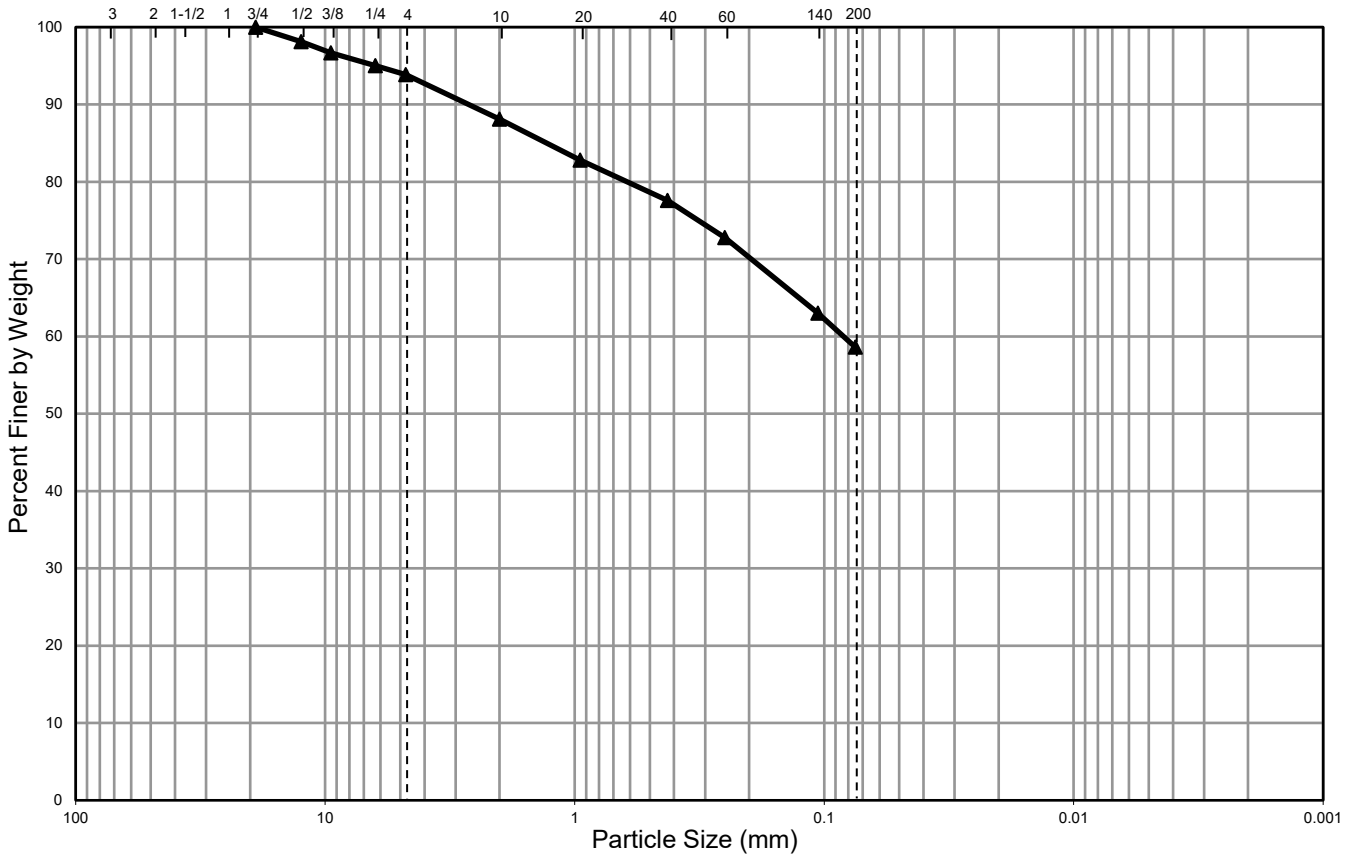
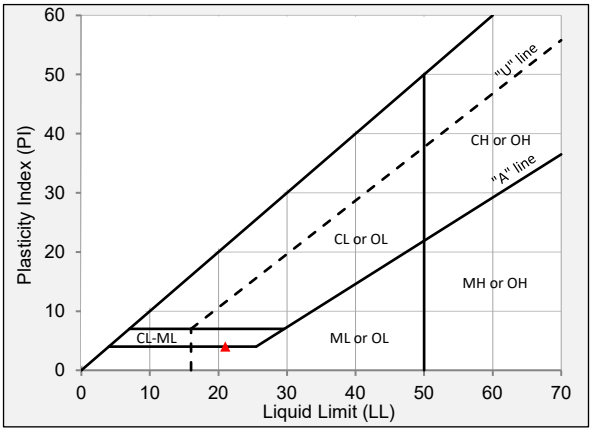
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	6.2		35.2			58.6

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	100.0
1/2"	98.1
3/8"	96.7
1/4"	95.0
No. 4	93.8
No. 10	88.1
No. 20	82.8
No. 40	77.6
No. 60	72.8
No. 140	63.0
No. 200	58.6

	▲
Stratum	1
Boring	B-2
Sample	S-2
Depth (ft)	2.0 - 3.5
C_u	
C_c	
w (%)	14.8
LL	21
PL	17
PI	4
USCS	ML



	Color	USCS Group Name
▲	Brown	Sandy silt (ML)

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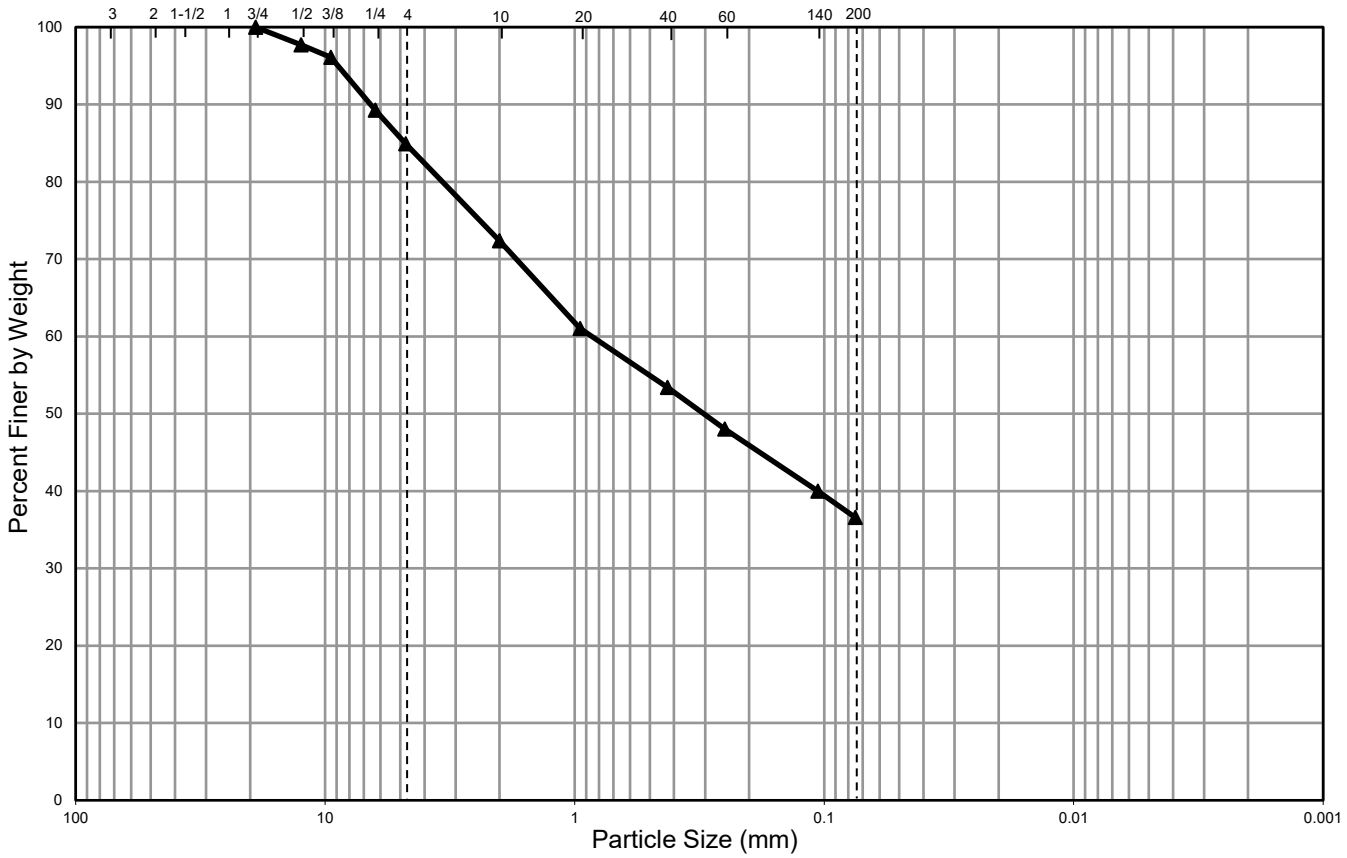
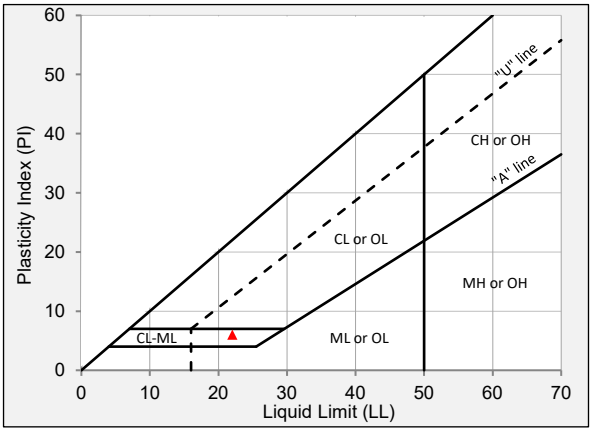
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	15.1		48.3			36.6

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	100.0
1/2"	97.7
3/8"	96.1
1/4"	89.3
No. 4	84.9
No. 10	72.4
No. 20	61.0
No. 40	53.4
No. 60	48.0
No. 140	40.0
No. 200	36.6

	▲
Stratum	2
Boring	B-2
Sample	S-3
Depth (ft)	4.0 - 6.0
C_u	
C_c	
w (%)	10.7
LL	22
PL	16
PI	6
USCS	SC-SM



	Color	USCS Group Name
▲	Brown	Silty, clayey sand with gravel

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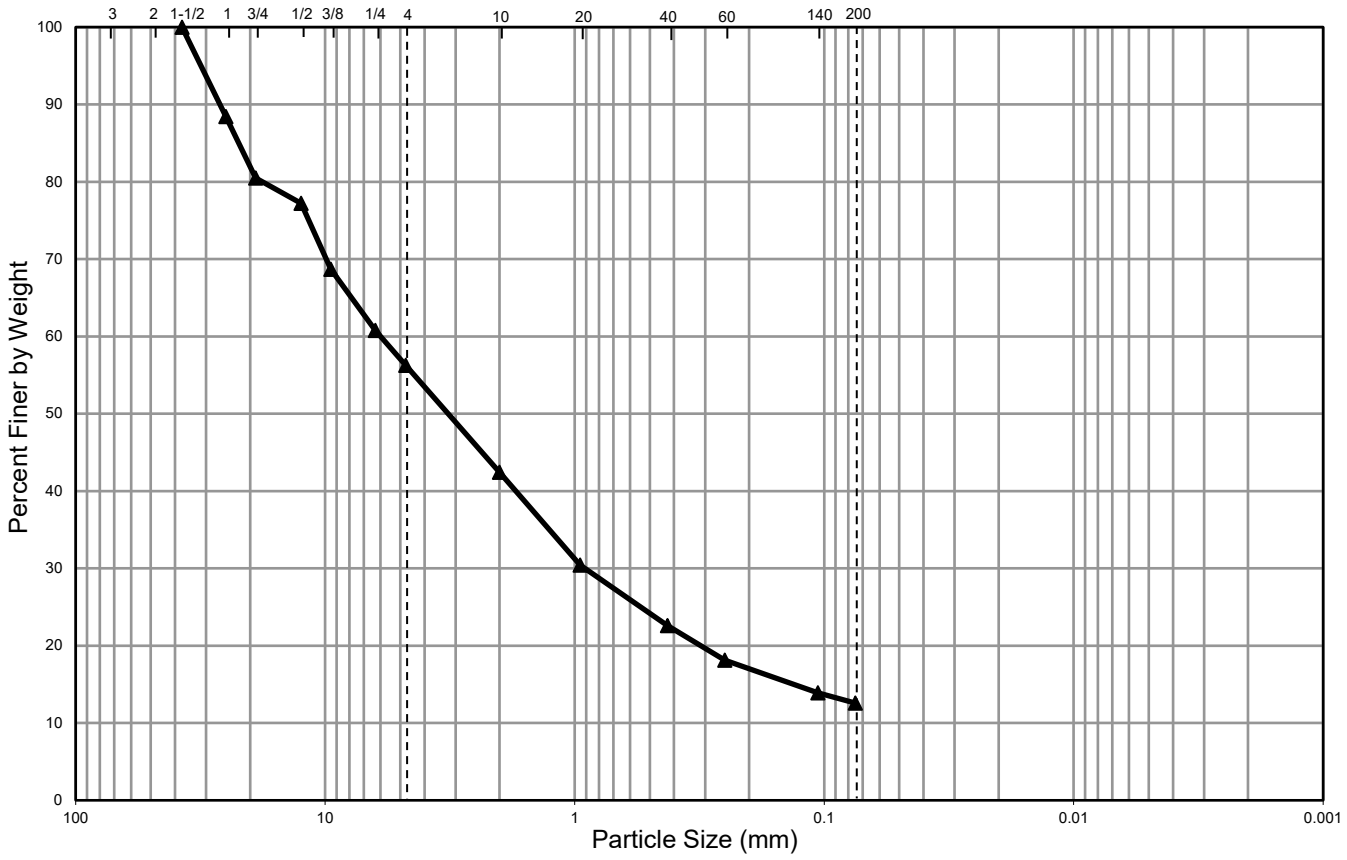
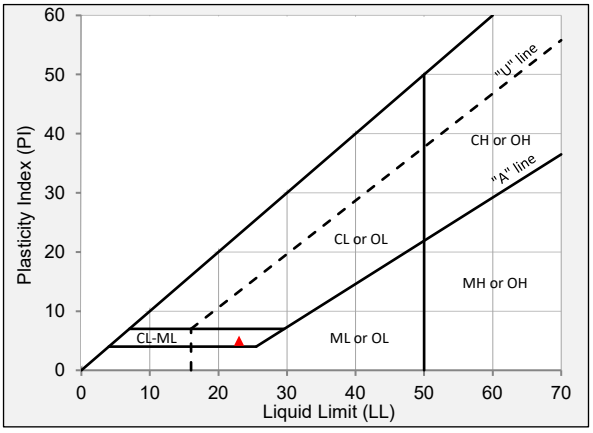
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	43.7		43.7			12.6

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	100.0
1"	88.4
3/4"	80.5
1/2"	77.2
3/8"	68.7
1/4"	60.8
No. 4	56.3
No. 10	42.4
No. 20	30.4
No. 40	22.6
No. 60	18.1
No. 140	13.9
No. 200	12.6

	▲
Stratum	FILL
Boring	B-4
Sample	S-1
Depth (ft)	0.5 - 2.0
C_u	
C_c	
w (%)	6.0
LL	23
PL	18
PI	5
USCS	GC-GM



	Color	USCS Group Name
▲	Dark brown	Silty, clayey gravel with sand

GeoStructures

Jiffy Lube Service Center, 1490 NY Route 9, Wappingers Falls, NY

GeoStructures Project No.: G21-204 | Tested By: VM | 7/7/2021

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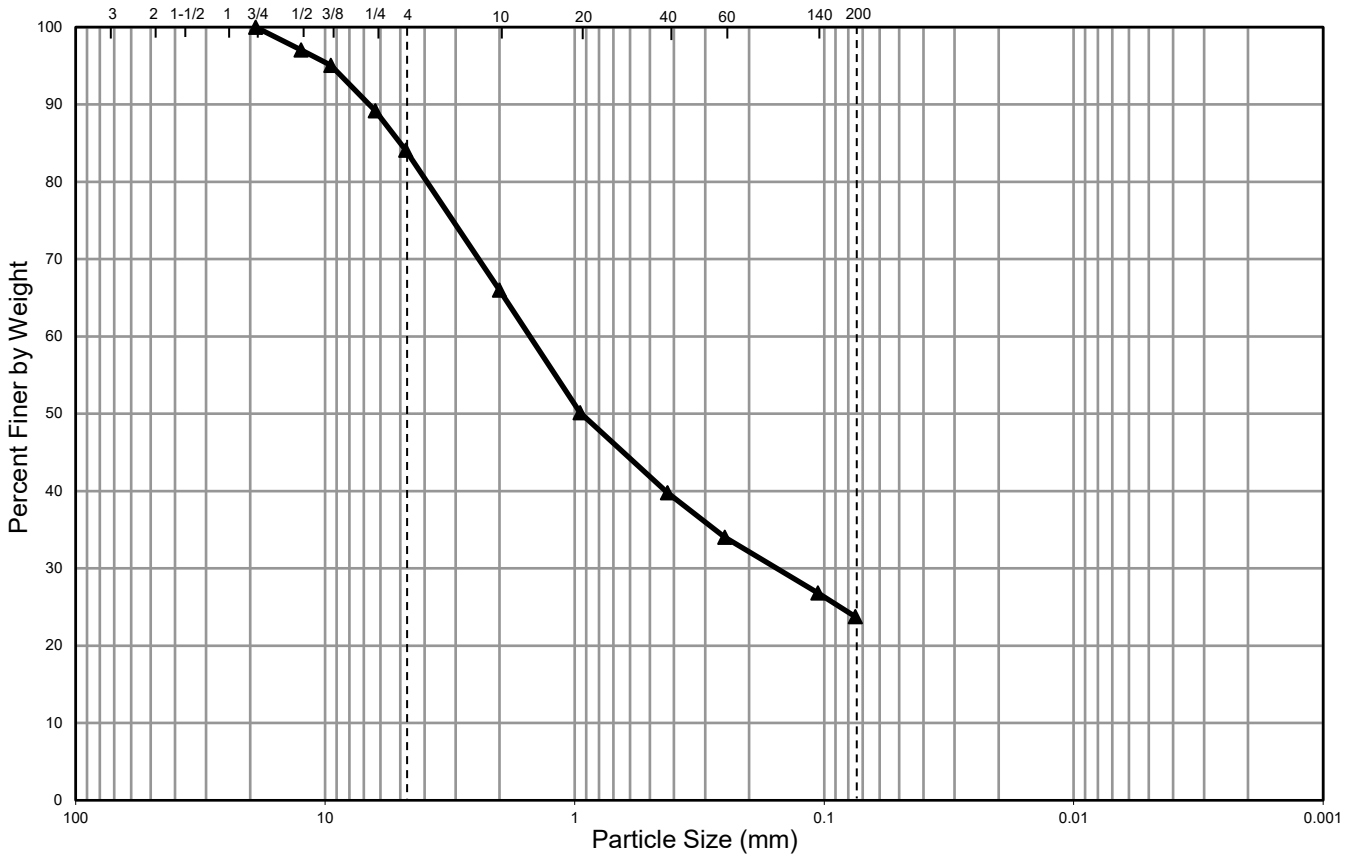
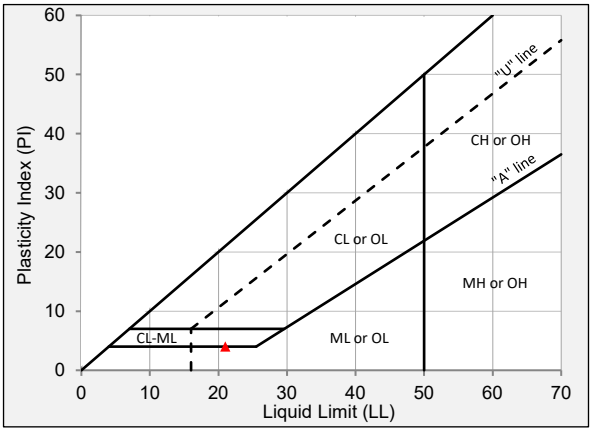
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	15.9		60.3			23.7

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	100.0
1/2"	97.0
3/8"	95.0
1/4"	89.2
No. 4	84.1
No. 10	66.0
No. 20	50.1
No. 40	39.8
No. 60	34.0
No. 140	26.8
No. 200	23.7

	▲
Stratum	FILL
Boring	B-5
Sample	S-3
Depth (ft)	4.0 - 6.0
C_u	
C_c	
w (%)	8.0
LL	21
PL	17
PI	4
USCS	SM



	Color	USCS Group Name
▲	Dark brown	Silty sand with gravel (SM)

GeoStructures

Jiffy Lube Service Center, 1490 NY Route 9, Wappingers Falls, NY

GeoStructures Project No.: G21-204 | Tested By: VM | 7/7/2021

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