17425 NE Union Hill Road, Suite 250
Redmond, Washington 98052
425.861.6000

July 3, 2024

Benaroya Capital Company LLC
9675 SE 36th Street, Suite 115
Mercer Island, Washington 98040

Attention: Dave Vranizan

Subject: Letter Report
Geotechnical Engineering Services
Centeris South Utility Yard
Puyallup, Washington
File No. 4565-064-09, Task 400

Introduction

This letter presents the results of GeoEngineers, Inc.'s (GeoEngineers) geotechnical engineering services for earthwork and foundation design for the Centeris South Utility Yard located at the South Hill Business and Technology Center in Puyallup, Washington. The overall site location is shown in Figure 1, Vicinity Map and the locations of the borings completed in the South Utility Yard area are shown in Figure 2, Centeris South Yard Borings.

GeoEngineers has been requested to provide earthwork and foundation support recommendations for the new equipment pads. Four borings were requested within the yard area where 10 to 15 feet of cut is required to construct the stepped foundation pads. A summary of the site conditions, field exploration, laboratory testing and geotechnical design recommendations are provided below.

Field Explorations and Laboratory Testing

FIELD EXPLORATIONS

Subsurface soil and groundwater conditions were evaluated by drilling four borings at the approximate locations shown in the attached Figure 2. The borings were advanced to depths ranging from 16½ to 20½ feet below the ground surface (bgs). A detailed description of the field exploration and testing program and logs of the explorations are presented in Attachment A, Field Explorations and Laboratory Testing.

LABORATORY TESTING

Soil samples obtained from the explorations were transported to GeoEngineers' Redmond, Washington geotechnical laboratory and evaluated to confirm or modify field classifications, as well as to evaluate engineering and index properties of the soil. Selected samples were tested for the determination of moisture content, grain size distribution, percent fines and resistivity. A description of the laboratory testing and the test results are presented in Attachment A.

Geology

We reviewed available geologic maps, including the geologic map of the Tacoma quadrangle (Schuster et al. 2015). The project area is located on a glaciated upland west and south of a major glacial trough, now occupied by the Puyallup River.

Surficial soils mapped in the project vicinity generally consist of geologic units deposited during the Vashon Stade of the Fraser glaciation and include Vashon Till (Qgt), Recessional outwash (Qgo) and ice-contact deposits (Qgoi). Surficial fill is also present at the site from historic grading activities.

Vashon till generally consists of a non-sorted, non-stratified mixture of clay, silt, sand and gravel with larger constituents up to the size of cobbles and boulders. The till is very dense and relatively impermeable but can contain localized zones of interbedded stratified sand and gravel.

Recessional outwash and ice-contact deposits typically consist of stratified outwash sand with some gravel, and some areas of silt and clay. The sediments were deposited by meltwater from the stagnating and receding Vashon glacier and are typically loose to medium dense.

Site Conditions

Surface Conditions

The South Hill Business and Technology Center is located north of 39th Avenue SE, east of Bradley Lake and west of Pierce College in Puyallup, Washington. College Way borders the site to the north. The Centeris site is located at the north end of the business park. The existing ground surface elevations within the south utility yard area range from about Elevation 484 feet in the west to Elevation 507 feet in the east (North American Vertical Datum of 1988 [NAVD 88]).

Subsurface Conditions

Soils encountered in the explorations consist of fill overlying complex layering of recessional outwash/ice contact deposits. In general, medium dense silty sand and sand with silt with variable gravel content was encountered in each boring. The upper silty sand was loose in the upper portion of Boring B-4 to a depth of approximately 9 feet, and at the bottom of Boring B-2. Although not retrieved in the small diameter sampler, cobbles have been observed in test pits completed around the Centeris building.

Groundwater Conditions

Groundwater seepage was not observed in the borings at the time of drilling, however the borings were not left open for an extended period. Discontinuous perched zones may be encountered during site excavations. Groundwater conditions are expected to fluctuate as a result of season, precipitation and other factors.

Conclusions and Recommendations

Based on the results of our subsurface explorations and our geotechnical engineering evaluation, it is our opinion that the proposed South Utility Yard may be constructed successfully as planned. We understand the areal loading of the equipment pads are similar to the north pad area, in the range of 100 to 250 pounds per square foot (psf).

Based on the preliminary plan, up to about 12 feet of excavation will be required to form the utility slabs. Our borings encountered medium dense to dense silty sand and sand with silt at anticipated foundation depth. Recommendations for support of the equipment slabs, earthwork and seismic design considerations are presented below.

SHALLOW FOUNDATIONS

Footing Subgrade

We understand the pad perimeters, new walls and other individual equipment foundations will be supported on shallow foundations. We recommend shallow foundations be founded on recompacted medium dense to dense silty sand soils, or on a minimum 18 inch thickness of structural fill. If the exposed native soils cannot be recompacted due to excessive moisture, excavation and replacement with structural fill will be appropriate as recommended by the geotechnical engineer.

Allowable Bearing Pressure

Shallow foundations may be designed using an allowable soil bearing pressure of 2,500 psf for footings supported on subgrade soils prepared as described above. The allowable soil bearing pressure applies to the total of dead and long-term live loads and may be increased by up to one-third for wind or seismic loads. Frost penetration depth in the project area is typically 12 inches; therefore, we recommend that footings be founded at least 18 inches below the lowest adjacent finished grade.

Construction Considerations

Where footings are supported on structural fill, the zone of structural fill should extend laterally beyond the footing edges a horizontal distance at least equal to the thickness of the fill. The condition of all subgrade areas should be observed by GeoEngineers to evaluate whether the subgrade preparation is completed in accordance with our recommendations and whether the subsurface conditions are as anticipated.

Provided all loose soil is removed and the subgrade is prepared as recommended, we estimate that the total settlement of shallow foundations will be less than about ¾ inch. The settlement will occur rapidly, essentially as loads are applied. Differential settlements between footings could be half of the total settlement.

LATERAL RESISTANCE

Lateral foundation loads may be resisted by passive resistance on the sides of footings and by friction on the base of the shallow foundations. For shallow foundations supported on the recompacted native soils or on structural fill, the allowable frictional resistance may be computed using a coefficient of friction of 0.4 applied to vertical dead-load forces.

The allowable passive resistance may be computed using an equivalent fluid density of 300 pounds per cubic foot (pcf) (triangular distribution). These values are appropriate for foundation elements that are surrounded by medium dense to dense native soils or compacted structural fill. The structural fill should extend out from the face of the foundation for a distance equal to at least 2½ times the depth of the foundation element. These values also assume the ground surface in front of the footing will be level for a horizontal distance equal to at least 2 times the depth of the footing. If soils adjacent to footings are disturbed during construction, the disturbed soils must be recompacted; otherwise, the lateral passive resistance value must be reduced.

Resistance to passive pressure should be calculated from the bottom of adjacent slabs and paving, or below a depth of 1 foot where the adjacent area is unpaved, as appropriate. The above coefficient of friction and passive equivalent fluid density values incorporate a factor of safety of about 1.5.

BELOW-GRADE WALLS AND RETAINING WALLS

Design Parameters

Lateral earth pressures for design of below-grade walls and retaining structures should be evaluated using an equivalent fluid density of 35 pcf provided that the walls will not be restrained against rotation when backfill is placed. If the walls will be restrained from rotation, we recommend using an equivalent fluid density of 55 pcf. Walls are assumed to be restrained if top movement during backfilling is less than H/1000, where H is the wall height. These lateral soil pressures assume that the ground surface behind the wall is horizontal. For unrestrained walls with backfill sloping up at 2H:1V (horizontal to vertical), the design lateral earth pressure should be increased to 55 pcf, while restrained walls with a 2H:1V sloping backfill should be designed using an equivalent fluid density of 75 pcf. These lateral soil pressures do not include the effects of surcharges such as slab/floor loads, traffic loads or other surface loading. Surcharge effects should be included as appropriate. Seismic earth pressures should also be considered in design using a rectangular distribution of 8H in psf, where H is the wall height.

These recommendations assume that all retaining walls will be provided with adequate drainage. The values for soil bearing, frictional resistance and passive resistance presented above for foundation design are applicable to retaining wall design. Walls located in level ground areas should be founded at a depth of 18 inches below the adjacent grade.

Wall Drainage

To reduce the potential for hydrostatic water pressure buildup behind retaining walls, we recommend that the walls be provided with adequate drainage. Wall drainage can be achieved by using free draining wall drainage material with perforated pipes to discharge the collected water.

Wall drainage material may consist of Gravel Backfill for Walls per Washington State Department of Transportation (WSDOT) Standard Specification Section 9-03.12(2) surrounded with a nonwoven geotextile filter fabric such as Mirafi 140N (or approved equivalent), or imported Gravel Borrow with less than 5 percent fines may be used in conjunction with a geocomposite wall drainage layer. The zone of wall drainage material should be 2 feet wide and should extend from the base of the wall to within 2 feet of the ground surface. The wall drainage material should be covered with a geotextile separator (such as Mirafi 140N) and then 2 feet of less permeable material, such as the on-site silty sand that is properly moisture conditioned and compacted.

A 4-inch-diameter perforated drain pipe should be installed within the free-draining material at the base of each wall. We recommend using either heavy-wall solid pipe (SDR-35 PVC) or rigid corrugated polyethylene pipe (ADS N-12, or equal). We recommend against using flexible tubing for the wall drain pipe. The footing drain recommended above can be incorporated into the bottom of the drainage zone and used for this purpose. If gravel borrow is used against the wall in conjunction with a geocomposite wall drainage layer, then the drainage pipe at the base of the wall should be surrounded with at least 12 inches of Gravel Backfill for Drains per WSDOT Standard Specification Section 9-03.12(4) that is wrapped with a nonwoven geotextile filter fabric such as Mirafi 140N (or approved equivalent).

The pipes should be laid with minimum slopes of one-quarter percent and discharged to a suitable discharge. The pipe installations should include a cleanout riser with cover located at the upper end of each pipe run. The cleanouts could be placed in flush mounted access boxes. Where applicable, collected downspout water should be routed to appropriate discharge points in separate pipe systems.

SLAB-ON-GRADE OR UTILITY SLABS

Equipment slabs may be supported on a minimum 4-inch thickness of base rock overlying the recompacted medium dense to dense native soils. To provide a level foundation pad and prevent disturbance, we recommend placing a minimum 4-inch-thick layer of crushed rock beneath new slabs. The exposed subgrade soils should be compacted to 95 percent of the maximum dry density (MDD) in accordance with ASTM International (ASTM) D-1557 prior to crushed rock placement. If this is not possible or if soft soils are encountered, we recommend that the unsuitable soils be overexcavated and replaced with compacted crushed rock or structural fill. The thickness of the crushed rock layer will depend on the condition of the subgrade soils at the time of construction. Placing a geotextile fabric such as Mirafi 500X (or similar material) may also be necessary to help stabilize the subgrade during inclement weather.

Provided the slab foundations are constructed on the recommended base layer, the foundation performance can be evaluated using a modulus of subgrade reaction of 100 pounds per cubic inch (pci). We recommend the geotechnical engineer observe the excavation for base rock, evaluate the exposed subgrade by proof-rolling or performing hand probing, monitor the compaction of the base rock and recommend modifications if required.

SEISMIC DESIGN CONSIDERATIONS

Regional Seismicity

The Puget Sound region is located at the convergent continental boundary known as the Cascadia Subduction Zone (CSZ), which extends from mid-Vancouver Island to Northern California. The CSZ is the zone where the westward advancing North American Plate is overriding the subducting Juan de Fuca Plate. The interaction of these two plates results in three potential seismic source zones: (1) a shallow crustal source zone; (2) the Benioff source zone and (3) the CSZ interplate source zone.

The shallow crustal source zone is used to characterize shallow crustal earthquake activity within the North American Plate at depths ranging from 3 to 19 miles bgs. The closest fault traces are located approximately 9 miles north of the site, suspected traces of the Tacoma Fault Zone.

The Benioff source zone is used to characterize intraplate, intraslab or deep subcrustal earthquakes. Benioff source zone earthquakes occur within the subducting Juan de Fuca Plate at depths between 20 and 40 miles. In recent years, three large Benioff source zone earthquakes occurred that resulted in some liquefaction in loose alluvial deposits and significant damage to some structures. The first earthquake, which was centered in the Olympia area, occurred in 1949 and had a Richter magnitude of 7.1. The second earthquake, which was centered between Seattle and Tacoma, occurred in 1965 and had a Richter magnitude of 6.5. The third earthquake, which was located in the Nisqually Valley north of Olympia, occurred in 2001 and had a Richter magnitude of 6.8.

The CSZ interplate source zone is used to characterize rupture of the convergent boundary between the subducting Juan de Fuca Plate and the overriding North American Plate. The depth of CSZ earthquakes is greater than 40 miles. No earthquakes on the CSZ have been instrumentally recorded; however, through the geologic record and historical records of tsunamis in Japan, it is believed that the most recent CSZ event occurred in 1700.

2021 IBC Seismic Design Parameters

The 2021 International Building Code (IBC) references the 2016 version of Minimum Design Loads for Buildings and Other Structures (American Society of Civil Engineers [ASCE] 7-16) for the Site Class determination and the development of seismic design parameters. Based on the subsurface conditions in current and historic borings at the site, and per ASCE 7-16 Section 20.3.1, the site is classified as Site Class C. IBC seismic parameters are provided in Table 1, 2021 IBC Seismic Parameters.

TABLE 1. 2021 IBC SEISMIC PARAMETERS

2018 IBC PARAMETER1	VALUE
Site Class	C
Mapped MCE_R Spectral Response Acceleration at Short Period, S_s (g)	1.257
Mapped MCE_R Spectral Response Acceleration at 1-second period, S_1 (g)	0.434
Short Period Site Coefficient, F_a	1.20
Long Period Site Coefficient, F_v	1.5
Design Spectral Acceleration at 0.2-second period, S_{DS} (g)	1.006
T_S (sec)	0.62

Notes:

1. Parameters developed based on latitude 47.16084 and longitude -122.27953 using the ASCE Hazard Tool

In accordance with IBC 2021 and ASCE 7-16 and consistent with the parameters presented above, we recommend a modified peak ground acceleration (PGA_M) of 0.6 g.

Liquefaction and Liquefaction-induced Settlement

Liquefaction refers to the condition when vibration or shaking of the ground, usually from earthquake forces, results in the development of excess pore pressures in saturated soils with subsequent loss of strength in the deposit of soil so affected. In general, soils that are susceptible to liquefaction include very loose to medium dense clean to silty sands and some silts that are below the water table. Liquefaction usually results in ground settlement and loss of bearing capacity, resulting in settlement of structures that are supported on foundations that are constructed within or above the liquefied soils.

Based on the site geology, and the subsurface soil and groundwater conditions encountered in our borings, in our opinion the site has low potential for liquefaction.

EARTHWORK

Subgrade Preparation

The exposed subgrade in structure areas should be evaluated after grading is complete and prior to placing base rock by probing or proof-rolling, as appropriate. Proof-rolling should be observed by a representative from our firm to recommend removal of soft or unsuitable soils as appropriate. The exposed soil should be firm and unyielding, and without significant groundwater.

If the exposed subgrade is not acceptable based on the proof-roll, we recommend that unsuitable soils be overexcavated to a maximum depth of 2 feet and replaced with imported structural fill. We anticipate that unsuitable soils will not be able to be moisture-conditioned and recompacted. Areas that are overexcavated and replaced with structural fill should be re-evaluated by proof-rolling and completing in-place density tests.

The on-site soils contain a significant amount of fines (silt) and are moisture-sensitive. Operation of equipment on these exposed soils will be difficult under wet conditions. Disturbance of shallow subgrade soils should be expected if subgrade preparation is completed on wet subgrade or during periods of wet weather.

Structural Fill

MATERIALS

Materials used as backfill at the site should meet the requirements below.

- Structural fill placed below structure areas should meet the requirements of WSDOT gravel borrow, per WSDOT Standard Specification 9-03.14(1). Recycled concrete may be substituted for this material, per WSDOT Standard Specification 9-03.21(1)C.
- Crushed rock base below utility slabs should consist of clean crushed aggregate with negligible sand or fines, or meet the requirements of WSDOT Standard Specification 9-03.9(3) with the exception that the fines content (material passing the U.S. No. 200 sieve) should not exceed 5 percent.

REUSE OF ON-SITE SOILS

Medium dense fine-grained silty sand and sand with silt was encountered in our borings completed in the utility yard. This soil is suitable for foundation and slab support but can become easily disturbed due to the fines content. These soils will be suitable for re-use if they can be moisture conditioned to within 2 percent of the optimum moisture content required for compaction.

FILL PLACEMENT AND COMPACTION CRITERIA

Structural fill should be mechanically compacted to a firm, non-yielding condition. Structural fill should be placed in loose lifts not exceeding 12 inches in thickness. Each lift should be conditioned to the proper moisture content and compacted to the specified density before placing subsequent lifts. The moisture content should not vary more than about two percent above or below the optimum moisture content (OMC). Structural fill should be compacted to the following criteria:

- Structural fill placed below foundations and utility slabs should be compacted to 95 percent of the MDD estimated in general accordance with ASTM D 1557.
- Structural fill in pavement areas, including utility trench backfill, should be compacted to 90 percent of the MDD estimated in general accordance with ASTM D 1557, except that the upper 2 feet of fill below final subgrade should be compacted to 95 percent of the MDD.
- Structural fill placed as crushed rock base course below pavements should be compacted to 95 percent of the MDD estimated in general accordance with ASTM D 1557.

We recommend that GeoEngineers be present during proof-rolling and/or probing of the exposed subgrade soils, and during placement of structural fill. We will evaluate the adequacy of the subgrade soils and identify areas needing further work, perform in-place moisture-density tests in the fill to verify compliance with the compaction specifications and advise on any modifications to the procedures that may be appropriate for the prevailing conditions.

TEMPORARY CUT SLOPES

All temporary cut slopes and shoring must comply with the provisions of Title 296 Washington Administrative Code (WAC), Part N, “Excavation, Trenching and Shoring.” The contractor performing the work has the primary responsibility for protection of workers and adjacent improvements.

We recommend temporary cut slope inclinations of 1.5H:1V in the native medium dense soils encountered at the site. Some raveling/sloughing of the cut slopes may occur at this inclination. The inclination may need to be flattened by the contractor if significant sloughing or seepage occurs. These cut slope recommendations apply to fully dewatered conditions. For open cuts at the site, we recommend that:

- No traffic, construction equipment, stockpiles or building supplies be allowed at the top of the cut slopes within a distance of at least 5 feet from the top of the cut.
- Exposed soil along the slope be protected from surface erosion using waterproof tarps or plastic sheeting.
- Construction activities be scheduled so that the length of time the temporary cut is left open is reduced to the extent practicable.

- Erosion control measures be implemented as appropriate such that runoff from the site is reduced to the extent practicable.
- Surface water be diverted away from the excavation.
- The general condition of the slopes should be observed periodically by GeoEngineers to confirm adequate stability.

Because the contractor has control of the construction operations, the contractor should be made responsible for the stability of cut slopes, as well as the safety of the excavations. The contractor should take all necessary steps to ensure the safety of the workers near slopes.

Where excavations could impact existing utilities, provisions for temporary support should be made by the contractor. We recommend that any excavation which extends under existing facilities or difficult access areas be backfilled with controlled-density fill (CDF).

TEMPORARY SHORING

The installation of deeper excavations or utilities may require shoring to support temporary excavations and maintain the integrity of the surrounding soils, to reduce disruption of adjacent improvements and to protect the personnel working within the excavations.

Because of the diversity of available shoring systems and construction techniques, the design of temporary shoring is most appropriately left up to the contractor proposing to complete the installation. The following paragraphs present recommendations for the type of shoring systems and design parameters that we conclude are appropriate for the subsurface conditions at the project.

The site soils can be retained using conventional shoring systems such as trench boxes or slide rail systems. The design of temporary shoring should allow for lateral pressures exerted by the adjacent soil, and for surcharge loads resulting from structures, traffic, construction equipment, temporary stockpiles adjacent to the excavation, etc. Lateral load resistance can be mobilized through the use of braces, tiebacks, anchor blocks and passive pressures on members that extend below the bottom of the excavation. Temporary shoring used to support trench excavations typically uses internal bracing such as hydraulic shoring or trench boxes.

The lateral soil pressures acting on shoring walls will depend on the nature and density of the soil behind the wall and the inclination of the backfill surface. For walls that are free to yield at the top at least one thousandth of the height of the wall (i.e., wall height times 0.001), soil pressures will be less than if movement is restrained. We recommend that yielding walls retaining medium dense to dense fill and native soils be designed using an equivalent fluid density of 35 and 65 pcf, for horizontal ground surfaces and ground surfaces inclined at 1½ H:1V above the horizontal, respectively. For non-yielding (i.e., braced) systems, we recommend that the shoring be designed for a uniform lateral pressure of 26*H in psf, where H is the depth of the planned excavation in feet below a level ground surface. Similarly, for a ground surface inclined at 1½H:1V above partial shoring, we recommend that shoring be designed for a uniform lateral pressure of 46*H.

These lateral soil pressures do not include traffic, structure or construction surcharges that should be added separately, if appropriate. These soil pressure recommendations are predicated upon the construction being essentially dewatered; if effective dewatering methods are used to lower the groundwater level below the bottom of the excavation, hydrostatic pressures need not be added to the soil pressures within the exposed height of shoring.

If portions of the shoring use passive elements such as anchor or reaction blocks, available soil resistance can be estimated using passive soil pressures assuming an equivalent fluid density of 300 pcf above the water table and 150 pcf below the water table.

Limitations

We have prepared this report for the exclusive use of the Benaroya Capital Company, LLC and members of the design team for the Centeris South Utility Yard project in Puyallup, Washington. The data and report should be provided to prospective contractors for their bidding or estimating purposes, but our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Attachment B "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

We appreciate the opportunity to provide continued services on the South Hill Business and Technology Center site. Please contact us if you have any questions or if you need additional information.

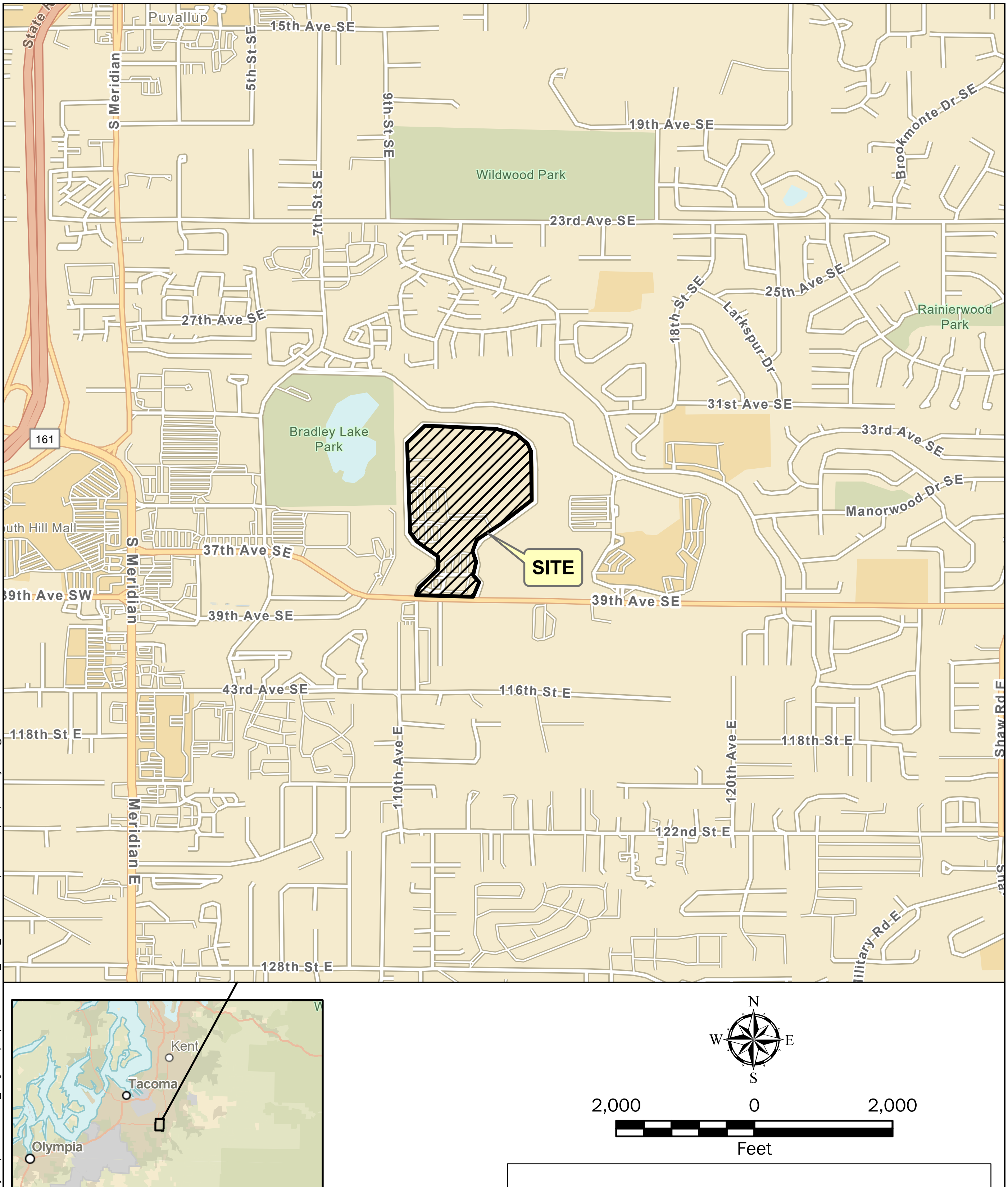
Sincerely,
GeoEngineers, Inc.

Debra C. Overbay
Associate Geotechnical Engineer

DCO:atk

Attachments
Figure 1. Vicinity Map
Figure 2. Centeris South Utility Yard Borings
Attachment A. Field Explorations and Laboratory Testing
Attachment B. Report Limitations and Guidelines for Use One electronic copy submitted

Figures



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Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI

Projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Vicinity Map

Benaroya Capital Company, LLC
South Hill Business & Technology Center
Puyallup, Washington

GeoEngineers

Figure 1

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Legend

Boring Completed by GeoEngineers, 2024

Source(s):
- Bing Maps

Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

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Centeris South Utility Yard Borings

Benaroya Capital Company, LLC
South Hill Business & Technology Center
Puyallup, Washington

GEOENGINEERS

Figure 2

Appendices

Attachment A

Field Explorations and Laboratory Testing

Attachment A
Field Explorations and Laboratory Testing

FIELD EXPLORATIONS

Subsurface conditions at the site were explored on May 21, 2024 by drilling four borings (B-1 through B-4) at the approximate locations shown on the Site Plan (Figure 2). The approximate exploration locations were established in the field by measuring distances from existing site features. The borings were completed to depths of 161½ to 21½ feet below existing ground surface (bgs) using track mounted hollow-stem auger (HSA) drilling equipment owned and operated by Advance Drill Technologies, Inc. of Snohomish, Washington.

The borings were continuously monitored by a representative from our firm who examined and classified the soils encountered, obtained representative soil samples and observed groundwater conditions. Our representative maintained a detailed log of each boring. Disturbed samples of the representative soil types were obtained using a 2-inch outside-diameter Standard Penetration Test (SPT) split-spoon sampler.

The soils encountered in the borings were typically sampled at 5-foot vertical intervals with the SPT split-spoon sampler through the full depth of the explorations. SPT sampling was performed using a 2-inch outside diameter split-spoon sampler driven with a standard 140-pound autohammer in accordance with ASTM International (ASTM) D 1586. During the test, a sample is obtained by driving the sampler 18 inches into the soil with a hammer free-falling 30 inches. The number of blows required for each 6 inches of penetration is recorded. The SPT resistance ("N-value") of the soil is calculated as the number of blows required for the final 12 inches of penetration (blows/foot). This resistance, or N-value, provides a measure of the relative density of granular soils and the relative consistency of cohesive soils. If the high penetration resistance encountered in the very dense soils precluded driving the total 18-inch sample interval, the penetration resistance for the partial penetration is entered on logs as follows: if the penetration is greater than 6 inches and less than 18 inches, then the number of blows is recorded over the number of inches driven; 30 blows for 6 inches and 50 for 3 inches, for instance, would be recorded as 80/9". The blow counts are shown on the boring logs at the respective sample depths. The SPT is a useful quantitative tool from which soil density/consistency was evaluated.

Soils encountered in the borings were classified in the field in general accordance with ASTM D 2488, the Standard Practice for Classification of Soils, Visual-Manual Procedure, which is summarized in Figure A-1, Key to Exploration Logs. The boring log symbols are also described in Figure A-1, and logs of the borings are provided in Figures A-2 through A-5. The borings were backfilled in accordance with Washington State Department of Ecology.

GROUNDWATER CONDITIONS

Groundwater was not observed during drilling as noted on the exploration logs; these observations represent a short-term condition that may not be representative of the long-term groundwater conditions at the site. Groundwater conditions observed during drilling should be considered approximate.

LABORATORY TESTING

Soil samples obtained from the explorations were transported to our laboratory and evaluated to confirm or modify field classifications, as well as to evaluate engineering properties of the soil samples. Representative samples were selected for laboratory testing consisting of moisture content testing, percent fines (material passing the U.S. No. 200 sieve), grain-size distribution (sieve analysis) and resistivity in general accordance with test methods of the ASTM or other applicable procedures.

MOISTURE CONTENT TESTING

Moisture content tests were completed in general accordance with ASTM D 2216 for representative samples obtained from the borings. The results of these tests are presented on the boring logs at the depths at which the samples were obtained.

PERCENT PASSING U.S. NO. 200 SIEVE (%F)

Selected samples were "washed" through the No. 200 mesh sieve to estimate the relative percentages of coarse and fine-grained particles in the soil. The percent passing value represents the percentage by weight of the sample finer than the U.S. No. 200 sieve. These tests were conducted to verify field descriptions and to estimate the fines content for analysis purposes. The tests were conducted in accordance with ASTM D 1140, and the results are shown on the exploration logs at the respective sample depths.

SIEVE ANALYSES

Sieve analyses were performed on selected samples in general accordance with ASTM D 6913 to determine the sample grain size distribution. The wet sieve analysis method was used to determine the percentage of soil greater than the U.S. No. 200 mesh sieve. The results of the sieve analyses were plotted, classified in general accordance with the Unified Soil Classification System (USCS) and are presented in Figure A-6, Sieve Analysis Results.

RESISTIVITY

Soil resistivity tests were completed on representative samples in accordance with ASTM G 187) The results of resistivity tests are shown below.

RESISTIVITY TEST RESULTS

BORING	SAMPLE DEPTH (FEET)	VALUE (OHM-CM)
B-1	15	13,000
B-2	15	12,000
B-3	10	19,000
B-4	15	30,000

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

- Modified California Sampler (6-inch sleeve) or Dames & Moore
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab
- Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
UU	Unconsolidated undrained triaxial compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Rev. 03/2024

Drilled	Start 5/21/2024	End 5/21/2024	Total Depth (ft) 16.5	Logged By AAE / Checked By DCO	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger
Surface Elevation (ft) Undetermined / Vertical Datum NAVD88			Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment D-50	
Easting (X) / Northing (Y)			System Datum WA State Plane South NAD83 (feet)		Groundwater not observed at time of exploration	
Notes:						

FIELD DATA

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						SOD	Approximately 1 inch of sod			
							SM	Brown fine to medium sand with occasional gravel (medium dense, moist) (fill)			
	5	9	41		1A						
					1B		SM	Brown fine to medium silty sand with gravel (dense, moist)	6	16	
	10	12	47		2			Grades with increased gravel			
							SM	Light brown fine to medium silty sand (medium dense, moist)			
	15	18	22		3 %F				16	26	

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-1

GEOENGINEERS

Project: South Hill Business Park Centeris South Utility Yard
Project Location: Puyallup, Washington
Project Number: 4565-064-09

Date:6/13/24 Path:P:\4\4565064\GINT\456506409.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Drilled	Start 5/21/2024	End 5/21/2024	Total Depth (ft)	21.5	Logged By AAE / Checked By DCO	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum: Undetermined / NAVD88	Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment: D-50	
Easting (X) / Northing (Y)	System Datum: WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration	
Notes:			

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							SOD	Approximately 1 inch of sod			
								SM	Brown silty sand with gravel (medium dense, moist) (fill)			
								SM	Brown fine to coarse silty sand with occasional gravel (medium dense, moist)			
	5		10	23		1 / SA						
	10		14	40		2						
	15		14	38		3			Grades with silt pockets			
	20		14	8		4 / %F				15	21	

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-2

GEOENGINEERS

Project: South Hill Business Park Centeris South Utility Yard
Project Location: Puyallup, Washington
Project Number: 4565-064-09

Figure A-3
Sheet 1 of 1

Drilled	Start 5/21/2024	End 5/21/2024	Total Depth (ft) 16.5	Logged By AAE / Checked By DCO	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft): Undetermined Vertical Datum: NAVD88	Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment: D-50
Easting (X) Northing (Y)	System Datum: WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							SOD	Approximately 1 inch of sod			
								SM	Light brown fine to medium sand with silt and gravel (loose to medium dense, moist) (fill)			
								SP-SM	Brown-gray fine to medium sand with silt and occasional gravel and organic matter (fine roots) (medium dense, moist)			
	5		16	12		1						
								SM	Brown fine to medium silty sand (dense, moist)			
	10		0	45		2 %F				10	29	No recovery, re-sampled
			14	29								
	15		18	24		3			Grades to medium dense			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-3

GEOENGINEERS

Project: South Hill Business Park Centeris South Utility Yard
Project Location: Puyallup, Washington
Project Number: 4565-064-09

Figure A-4
Sheet 1 of 1

Drilled	Start 5/21/2024	End 5/21/2024	Total Depth (ft) 21.5	Logged By AAE Checked By DCO	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) Undetermined Vertical Datum NAVD88	Hammer Data Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment D-50
Easting (X) Northing (Y)	System Datum WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration

Notes:

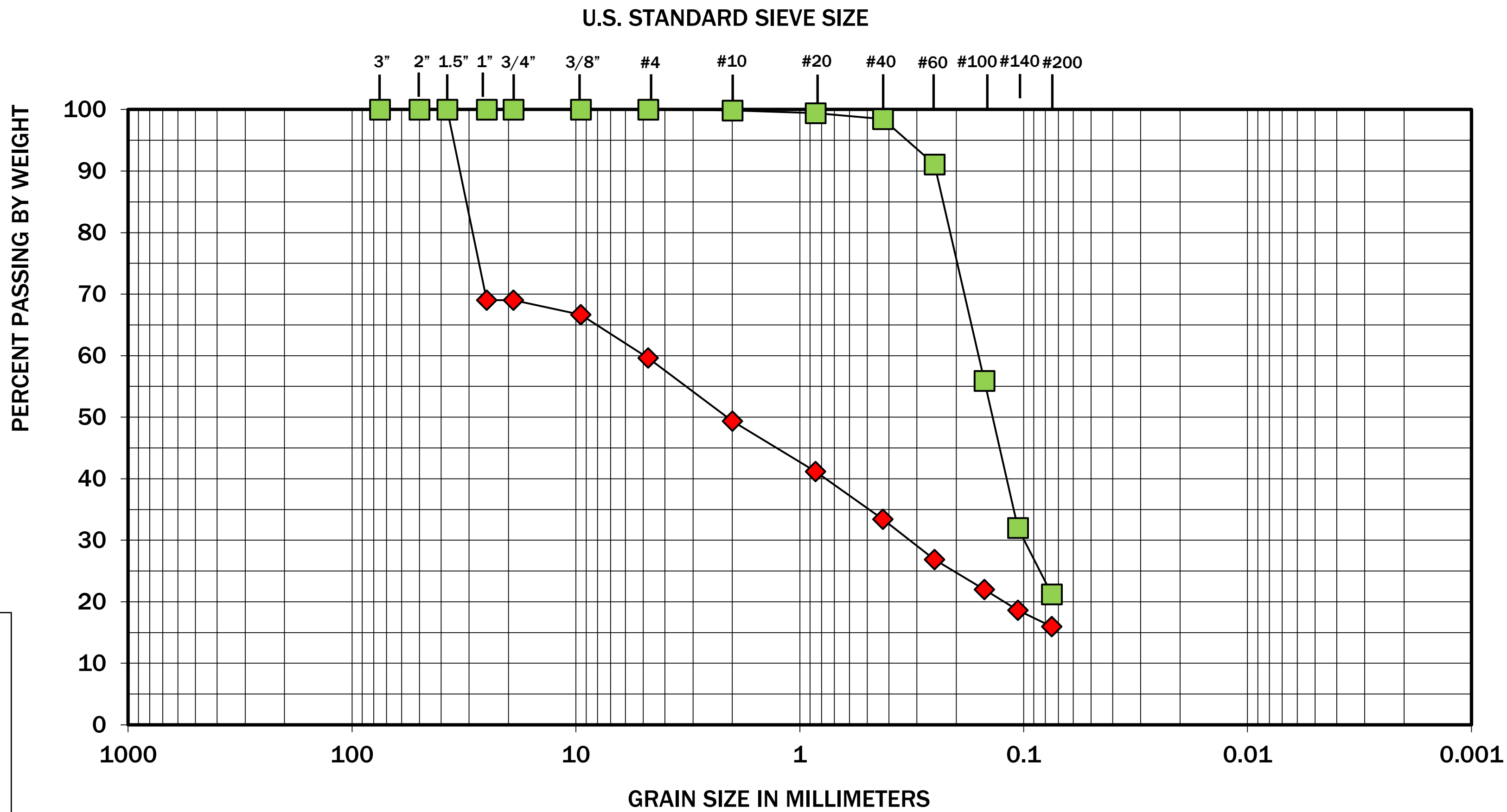
Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							SOD	Approximately 1 inch of sod			
								SP-SM	Light brown sand with silt and gravel (loose, moist) (fill)			
	5		4	7		1		SM	Light brown silty fine sand (loose, moist)			
								SM	Brown fine to coarse silty sand with occasional gravel (medium dense, moist)	12		
	10		9	25		2A 2B						
	15		18	15		3 SA				12	21	
	20		18	33		4						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring B-4

GEOENGINEERS

Project: South Hill Business Park Centeris South Utility Yard
Project Location: Puyallup, Washington
Project Number: 4565-064-09



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-1	5	6	Silty sand with gravel (SM)
■	B-4	15	12	Silty sand (SM)

Note: This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations, or generated by separate operations or processes.

The grain size analysis results were obtained in general accordance with ASTM D6913. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

AASHTO ACCREDITED

GeoEngineers

Benaroya South Hill
Puyallup, Washington

Sieve Analysis Results

Figure-A-6

Attachment B

Report Limitations and Guidelines for Use

Attachment B
Report Limitations and Guidelines for Use[1]

This attachment provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

It is important to recognize that the geoscience practices (geotechnical engineering, geology, and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

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

This report has been prepared for the Benaroya Capital Company, LLC and for the Project(s) specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with the Benaroya Capital Company, LLC dated April 5, 2023 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A Geotechnical Engineering or Geologic Report is Based on a Unique Set of Project-Specific Factors

This report has been prepared for the Centeris South Utility Yard project in Puyallup, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it 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.

[1] Developed based on material provided by GBA, GeoProfessional Business Association; www.geoprofessional.org.

For example, changes that can affect the applicability of this report include those that affect:

- The function of the proposed structure;
- Elevation, configuration, location, orientation or weight of the proposed structure;
- Composition of the design team; or
- Project ownership.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Geotechnical and Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

Geotechnical Engineering Report Recommendations Are Not Final

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

Give Contractors a Complete Report and Guidance

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- Advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- Encourages contractors to conduct additional study to obtain the specific types of information they need or prefer.

Contractors Are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule, or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.