Geotechnical Engineering Services Report

Pierce College Puyallup – Parking Lot Additions
Puyallup, Washington

for
Washington State Department of Enterprise Services

January 31, 2022

GeoEngineers
Earth Science + Technology

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File No. 21342-003-00

January 31, 2022

Prepared for:

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1.0 INTRODUCTION AND PROJECT UNDERSTANDING

This report presents the results of our geotechnical engineering services for the Pierce College Puyallup – Parking Lot Additions project. The project site is located at 1601 39th Avenue SE in Puyallup, Washington, as shown on the Vicinity Map, Figure 1. This report is preceded by a draft report dated August 16, 2021.

Our project understanding is based on discussions with you and AHBL, Inc. (project civil engineer) and review of Design Development Plans dated June 19, 2021 and prepared by AHBL, Inc. (Development Plans). Specific plan sheets reviewed include C0.1, C2.1 through C2.4, and C3.1 through C3.3.

Parking lot additions are proposed in the northwest, southwest and southeast portions of campus. For the purposes of this report, we refer to these additions individually as the “NW Parking Lot,” “SW Parking Lot,” and “SE Parking Lot.” The parking lots will be surfaced with asphalt concrete pavement (ACP). New luminaire poles are also planned for the parking lots.

Other site improvements include stormwater management facilities. A detention pond is planned for the NW Parking Lot, detention pipes for the SW Parking Lot, and a dispersion trench for the SE Parking Lot. Bioretention cell(s) are also planned for these parking lot additions. It is our understanding that these proposed stormwater management facilities will be designed in accordance with the Washington State Department of Ecology’s 2014 Stormwater Management Manual for Western Washington (SWMMWW).

2.0 SCOPE OF SERVICES

Our services have been provided in general accordance with our proposal for this project dated May 17, 2021 and our Signed Agreement No. 2020-546 C(3) dated June 13, 2021. A complete list of our scope or services is provided in this proposal.

During this study, it was determined that additional services and information not included in the above scope was required to assess the presence of groundwater and groundwater elevations near the proposed NW Parking Lot detention pond. A groundwater monitoring well was installed near this location on January 3, 2022 in order to collect groundwater data during the wet weather months (defined by the City of Puyallup as December 21 through April 1). A summary well log and data collected from the monitoring well will be presented in a supplemental report that will be presented around spring, after collection of groundwater data.

3.0 SITE CONDITIONS

3.1. Surface Conditions

The proposed NW Parking Lot area is currently occupied by undeveloped forest land in the northwest portion of the campus, generally north-northwest of the Health Education Center building. The proposed SW Parking Lot area currently consists of a grass field and is located east of the Garnero Child Development Center building. The proposed SE Parking Lot area is in the southeast corner of campus and currently consists of paved driveways, parking stalls, and vegetated planters.

Site vegetation in forested areas of the site generally consists of mature coniferous and deciduous trees and a dense understory layer, including brush, small trees, fallen trees, and forest duff. Developed parts of the site are generally vegetated with grass, plants, and shrubs. Campus site topography generally slopes upward toward the south-southeast from approximate Elevation 509 feet in the northwest campus corner to Elevation 551 feet in the southeast campus corner. Elevations are referenced to the North American Vertical Datum of 1988 (NAVD88).

3.2. Literature Review

3.2.1. Geologic Maps

Our understanding of the site geology is based on review of the *Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington* (Schuster, et al. 2015). The geologic map indicates the campus is mostly underlain by "Vashon Till" (Q_{gt}). "Recessional outwash" (Q_{go}) is also mapped along the eastern edge of campus and surrounds the Vashon till (glacial till) and project vicinity. Glacial till is glacially consolidated and is described as a low permeability, highly compact mixture of sand, gravel, silt, and clay that can contain cobbles and boulders dispersed throughout. Recessional outwash is generally described as variably sorted silt, clay, sand, and gravel deposited by receding glacial ice, and is typically underlain at some depth by glacial till. Recessional outwash deposits are not glacially consolidated and are generally medium dense.

3.2.2. Soil Survey

We reviewed the Natural Resources Conservation Service (NRCS) Web Soil Survey (accessed June 23, 2021). According to the survey, the site is underlain by three subunits of Kapowsin gravelly ashy loam: 0 to 6 percent slopes; 6 to 15 percent slopes; and 30 to 65 percent slopes. Kapowsin gravelly ashy loam is described as moderately well drained with a very low capacity of the most limiting layer to transmit water and categorized as Hydrologic Soil Group B.

3.2.3. Water Well Information

We searched the Washington State Department of Natural Resources Interactive Geologic Information Portal on May 4, 2021 for water well log reports in the project vicinity. Based on our search, we found a water well log report dated May 28, 2002 (Ecology Well ID Tag No. AFR 833) near the southwest corner of the campus property. This well log reported the static groundwater level at about 411 feet below the top of the well. We interpret this static groundwater level to be representative of the regional groundwater table in the project vicinity.

3.3. Subsurface Conditions

3.3.1. Subsurface Explorations and Laboratory Testing

We explored subsurface conditions at the proposed parking lot areas described above by excavating eight test pits (TP-1 through TP-8). Three test pits (TP-1 through TP-3) were located in the NW Parking Lot area, two test pits (TP-4 and TP-5) were located in the SW Parking Lot area, and three test pits (TP-6 through TP-8) were located in the SE Parking Lot area. The approximate locations of the proposed parking lot areas and the test pits are shown on the attached Site Plan, Figure 2. A description of our subsurface exploration program and summary exploration logs are provided in Appendix A. Two small-scale pilot infiltration tests (PITs) were completed in TP-2 (PIT-1) and TP-6 (PIT-2). The test results and methodology for the PITs are discussed in further detail in the "Stormwater Infiltration" section of this report.

Selected samples collected from our test pits were tested in our laboratory to confirm field classifications and to evaluate pertinent engineering properties. Our laboratory testing program included grain-size distribution analyses and moisture content determinations. A summary of our laboratory testing program and the test results are provided in Appendix A.

3.3.2. Soil Conditions

We observed about 12 inches of forest duff and/or organic-rich soil at the surface in test pits TP-1 through TP-3. Approximately 6 inches of sod was observed at the surface in the remaining test pits (TP-4 through TP-8). Descriptions of soils encountered below these surface materials in each parking lot area are discussed in the sections below.

3.3.2.1. NW Parking Lot Area

Below the forest duff and/or organic-rich soil in TP-1 through TP-3, we observed what we interpret to be glacial till. Glacial till was typically comprised of silty sand with variable gravel content and gravel with silt and sand. The upper approximately 3 feet of glacial till was observed to be in a weathered, medium dense condition. Roots up to about 1½-inch diameter were noted in the upper 2 to 3 feet of the glacial till. Below the weathered zone, glacial till generally included occasional cobbles and was observed to be dense to very dense. Test pits TP-1 through TP-3 were completed in glacial till soils at depths ranging from about 5½ to 11½ feet below ground surface (bgs). TP-2 (PIT-1) was terminated in hard, sandy silt.

3.3.2.2. SW Parking Lot Area

Below the sod in TP-4 and TP-5, we observed silty sand with variable gravel and cobbles content and occasional deleterious debris. Debris observed included nails, rubber particles, asphalt fragments and plastic waste. We interpret this material as fill. Fill was typically in a medium dense to dense condition and extended to depths between 2 and 3½ feet bgs.

Underlying the fill, we observed what we interpret to be glacial till. Glacial till typically consisted of silty sand with variable gravel and cobbles content and sand. The upper approximately 1½ to 3 feet of glacial till was observed to be weathered and generally in the medium dense to dense range. Underlying the weathered zone, very dense conditions were observed. Test pits TP-4 and TP-5 were completed in glacial till soils at depths of about 9 and 10½ feet bgs, respectively.

3.3.2.3. SE Parking Lot Area

Below the sod in TP-6 (PIT-2) through TP-8, we observed what we interpret to be fill material extending to about 1 to 4 feet bgs. Fill material typically consisted of loose, silty sand to medium stiff, sandy silt with gravel and occasional deleterious debris including asphalt fragments, metal cans and carbonized wood. Underlying the fill in TP-7, we observed what we interpret to be an old topsoil horizon from about 3 to 3½ feet bgs, which consisted of silty sand with organic matter (roots). TP-8 was completed in fill material at a depth of approximately 4 feet bgs.

Underlying the fill in TP-6 (PIT-2) and the old topsoil horizon in TP-7, we observed what we interpret to be glacial till. Glacial till typically consisted of silty sand with variable gravel and cobbles content. The upper approximate 1½ feet in TP-6 (PIT-2) was observed to be weathered and in a medium dense condition. Dense soil conditions were observed beneath the weathered zone to the completed depth of about 4¼ feet bgs. The glacial till in TP-7 was observed to be weathered and in a medium dense to dense condition to the completed depth of about 8½ feet bgs.

3.3.3. Groundwater Conditions

We did not observe what we interpret to be the regional groundwater table in our explorations. However, we observed moderate seepage in TP-5 beginning around 3 feet bgs. The seepage rate was observed to increase to rapid at about 9½ feet bgs. Moderate seepage is defined as 1 to 3 gallons per minute (gpm) and rapid seepage is greater than 3 gpm. We interpret the seepage observed in TP-5 to be perched groundwater.

Based on our experience, it is not uncommon for glacial soils to contain isolated zones of perched groundwater. We anticipate that perched groundwater could be present in other areas at the proposed parking lots depending on soil conditions, rainfall amounts, irrigation activities and other factors. We anticipate that perched groundwater levels will generally be highest during the wet season, typically October through May. Static groundwater is not anticipated at excavation depths proposed.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1. Primary Geotechnical Considerations

Based on our understanding of the project, the explorations performed for this study, review of subsurface information near or within the project vicinity and our experience, it is our opinion that the proposed improvements can be designed and constructed generally as envisioned with regards to geotechnical considerations. A summary of the primary geotechnical considerations for the project is provided below and is followed by our detailed recommendations.

- Clearing and stripping depths for forest duff in the NW Parking Lot area will typically be on the order of about 12 inches. Abundant roots were observed to a depth of about 2 to 3 feet bgs, which may require greater clearing and stripping efforts when establishing subgrades. In the SW and SE Parking Lots, clearing and stripping depths will be on the order of 6 inches to remove sod.
- Most of the soils observed at the proposed parking lot areas contain a significant quantity of fines and, therefore, could be difficult or impossible to work with when wet or become easily disturbed if exposed to wet weather. Depending on the intended use of the material and the moisture/weather conditions, it may be difficult to re-use on-site soils as structural fill.
- Based on our experience, subsurface conditions observed in our explorations, and results from our infiltration testing, it is our opinion that stormwater infiltration within proposed development areas related to this study is generally infeasible. We provide additional discussion in the "Stormwater Infiltration" section below.

4.2. Luminaire Poles

4.2.1. Design Parameters

We understand that luminaire poles are planned for parking lot improvements. It is our opinion that Washington State Department of Transportation (WSDOT) Standard Plans may be used, as applicable, for design of luminaire poles. Recommended soil properties and design parameters are provided in Table 1 below. These values are based on our experience in the area and review of the 2021 WSDOT Geotechnical Design Manual (WSDOT GDM), Chapter 17, "Foundation Design for Signals, Signs, Noise Barriers, Culverts, and Buildings," specifically referencing Table 17.2. We recommend that this document be referenced and reviewed during the design and selection process for luminaire pole foundations. The WSDOT GDM, Chapter 17 also provides design guidance if foundations other than indicated in the Standard Plans are required.

The allowable lateral bearing pressure listed below is for foundations constructed in relatively flat ground conditions, which is anticipated for this project. Special design considerations for foundations constructed on or near slopes are provided in WSDOT GDM, Chapter 17. We should be consulted further if sloping conditions are anticipated around luminaire poles.

TABLE 1. LUMINAIRE POLE DESIGN PARAMETERS

Proposed Parking Lot	Soil Unit Weight (pcf)	Soil Friction Angle (deg)	Allowable Lateral Bearing Pressure (psf)
Northwest	125	34	2,500
Southwest	125	34	2,500
Southeast	120	32	1,900

4.2.2. Construction and Additional Design Considerations

We present two conditions to consider when designing and constructing luminaire pole foundations (pole foundations).

- Condition #1, an excavation the same dimension of the designed pole foundation is developed, and the foundation is cast directly against undisturbed earth. Or,
- Condition #2, an excavation larger than the designed dimension of the pole foundation is developed, a corrugated metal pipe is placed into the excavation and the foundation concrete is cast inside the metal pipe. The corrugated metal pipe is left in place after pouring the foundation concrete. Any overexcavated area outside of the corrugated metal pipe is backfilled with controlled density fill (CDF) or structural fill.

Construction of foundation Condition #1 requires the sidewalls of the excavation to stay stable and not cave into the excavation. In the case of drilling installation methods, temporary steel casing or drill slurry can also be used if caving soil conditions are encountered. Excavations made for foundation Condition #2 should be in accordance with the "Temporary Excavations and Cut Slopes" section of this report if workers are expected to enter the excavation. Recommendations regarding backfilling around pole foundations are included in the "Backfill Placement and Compaction Around Luminaire Pole Foundations" section of this report.

In general, we expect that the majority of the luminaire pole foundations will be constructed in fill and/or weathered soil overlying glacial till. We expect that the majority of the excavations for the foundations will remain open for a short period of time. There could be sloughing and raveling in the upper approximate 5 feet or so, in the fill and/or weathered soils. The contractor should be prepared to use casing, as necessary, to stabilize the hole, especially within the upper approximate 5 feet.

4.3. Site Development and Earthwork

4.3.1. General

We anticipate that site development and earthwork will include clearing and grubbing, site grading, excavating for utilities and other improvements, establishing subgrades for structures and roadways, and placing and compacting fill and backfill materials. We expect that site grading and earthwork can be accomplished with conventional earthmoving equipment. The following sections provide specific recommendations for site development and earthwork.

4.3.2. Clearing and Stripping

We anticipate that clearing and stripping depths at the proposed NW Parking Lot area will be on the order of about 12 inches to remove forest duff and/or organic-rich soil. Roots were observed to about 3 feet bgs and mature trees were present in this area; therefore, it is likely that greater stripping depths will be required in areas of trees, heavier vegetation, or relatively lower lying areas. Clearing and stripping depths in the proposed SW and SE Parking Lot areas are anticipated to be on the order of about 6 inches to remove the sod.

During stripping operations excessive disturbance of surficial soils can occur, especially if left exposed to wet conditions. The site soils expected to be exposed after clearing and stripping have a relatively high fines content and can be easily disturbed during wet weather. Clearing and stripping at the site should be performed during dry weather and/or exposed soils should be promptly covered and protected to avoid excessive disturbance. Disturbed soils may require additional compaction or remediation during construction and grading.

Cobbles were encountered in our explorations. Although boulders were not encountered in our explorations, boulders are commonly present in glacial till soils in the project area. The contractor should be prepared to remove cobbles and boulders if encountered during grading or excavation. Boulders may be removed from the site or used in landscape areas. Voids caused by boulder removal should be backfilled with structural fill.

4.3.3. Erosion and Sedimentation Control

Erosion and sedimentation rates and quantities can be influenced by construction methods, slope length and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. Implementing an Erosion and Sedimentation Control Plan will reduce impacts to the project where erosion-prone areas are present. The plan should be designed in accordance with applicable city, county and/or state standards. The plan should incorporate basic planning principles, including:

- Scheduling grading and construction to reduce soil exposure;
- Re-vegetating or mulching denuded areas;
- Directing runoff away from exposed soils;
- Reducing the length and steepness of slopes with exposed soils;
- Decreasing runoff velocities;
- Preparing drainage ways and outlets to handle concentrated or increased runoff;

- Confining sediment to the project site; and
- Inspecting and maintaining control measures frequently.

Temporary erosion protection should be used and maintained in areas with exposed or disturbed soils to help reduce erosion and reduce transport of sediment to adjacent areas and receiving waters. Permanent erosion protection should be provided by paving, structure construction or landscape planting.

Until the permanent erosion protection is established, and the site is stabilized, site monitoring may be required by qualified personnel to evaluate the effectiveness of the erosion control measures and to repair and/or modify them as appropriate. Provisions for modifications to the erosion control system based on monitoring observations should be included in the Erosion and Sedimentation Control Plan. Where sloped areas are present, some sloughing and raveling of exposed or disturbed soil on slopes should be expected. We recommend that disturbed soil be restored promptly so that surface runoff does not become channeled.

4.3.4. Temporary Excavations and Cut Slopes

Based on observations made during excavation of our test pits and our experience with other projects in similar soil conditions, we anticipate that shallow or even moderately deep (about 10-foot) excavations that do not encounter groundwater seepage could maintain vertical slopes for extended periods of time with only minor caving. However, excavations deeper than 4 feet should be shored or laid back at a stable slope if workers are required to enter. Shoring and temporary slope inclinations must conform to the provisions of Title 296 Washington Administrative Code (WAC), Part N, “Excavation, Trenching and Shoring.” Regardless of the soil type encountered in the excavation, shoring, trench boxes or sloped sidewalls will be required under Washington Industrial Safety and Health Act (WISHA). We recommend contract documents specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety, and providing shoring, as required, to protect personnel and structures.

In general, we recommend that for planning purposes all temporary cut slopes be inclined no steeper than about 1½H to 1V (horizontal to vertical) if workers are required to enter the excavation. This guideline assumes all surface loads are kept at a minimum distance of at least one-half the depth of the cut away from the top of the slope and that seepage is not present on the slope face. Flatter cut slopes will be necessary where seepage occurs or if surface surcharge loads are anticipated. Temporary covering with heavy plastic sheeting should be used to protect these slopes during periods of wet weather.

4.3.5. Permanent Cut and Fill Slopes

We recommend permanent slopes be constructed at a maximum inclination of 2H to 1V to manage erosion. Where 2H to 1V permanent slopes are not feasible, protective facings and/or retaining structures should be considered.

To achieve uniform compaction, we recommend fill slopes be overbuilt and subsequently cut back to expose well-compacted fill. Fill placement on existing slopes steeper than 5H to 1V should be benched into the slope face. The configuration of benches depends on the equipment being used and the inclination of the existing slope. Bench excavations should be level and extend into the slope face at least half the width of the compaction equipment used.

Exposed areas should be re-vegetated as soon as practical to reduce surface erosion and sloughing. Temporary protection should be used until permanent protection is established.

4.3.6. Groundwater Handling Considerations

It is common within glacial deposits encountered at this campus and in general, sites with similar soil conditions, to encounter perched groundwater. The interface between more permeable and less permeable soil types such as the contact between fill and/or weathered glacial till and glacial till are common conditions where perched groundwater can be present, as such, perched groundwater could be encountered in other excavations outside of our test pit explorations, especially where more permeable sand and gravel seams may overlie less permeable materials.

Groundwater handling needs will typically be lower during the summer and early fall months. We anticipate that shallow perched groundwater can be handled adequately with sumps, pumps, and/or diversion ditches, as necessary. Ultimately, we recommend that the contractor performing the work be made responsible for controlling and collecting groundwater encountered.

Based on our understanding of the proposed site improvements, we do not anticipate that the regional static groundwater table will be encountered during excavations for this project. Perched groundwater was observed in test pit TP-5 beginning around 3 feet bgs. Perched water or the presence of water was not noted in the other explorations. If it becomes necessary to complete deeper excavations near or around TP-5 and for the SW parking lot area, it may be necessary to consider higher volumes of water depending on the amount of rainfall and time of year. The use of larger pumps, storage tanks, and discharge permits could be necessary.

4.3.7. Surface Drainage

Surface water from driveways and landscape areas should be collected and controlled. Curbs or other appropriate measures such as sloping pavements, sidewalks and landscape areas should be used to direct surface flow away from buildings, erosion sensitive areas and from behind retaining structures. Roof and catchment drains should not be connected to wall or foundation drains.

4.3.8. Subgrade Preparation

Subgrades that will support structures, hardscapes and roadways should be thoroughly compacted to a uniformly firm and unyielding condition on completion of stripping and before placing structural fill. We recommend that subgrades for hardscapes and roadways be evaluated, as appropriate, to identify areas of yielding or soft soil. Probing with a steel probe rod or proof-rolling with a heavy piece of wheeled construction equipment are appropriate methods of evaluation.

If soft or otherwise unsuitable subgrade areas are revealed during evaluation that cannot be compacted to a stable and uniformly firm condition, we recommend that: (1) the unsuitable soils be scarified (e.g., with a ripper or farmer's disc), aerated and recompacted, if practical; or (2) the unsuitable soils be removed and replaced with compacted structural fill, as needed.

4.3.9. Subgrade Protection and Wet Weather Considerations

Near-surface soils observed at the proposed parking lot areas contain a significant quantity of fines and will be susceptible to disturbance during periods of wet weather. The wet weather season generally begins in October and continues through May in western Washington; however, periods of wet weather can occur during any month of the year. It may be possible to conduct earthwork at the site during wet weather months provided appropriate measures are implemented to protect exposed soil. If earthwork is scheduled during the wet weather months, we offer the following recommendations:

- Measures should be implemented to remove or eliminate the accumulation of surface water from work areas. The ground surface in and around the work area should be sloped so that surface water is directed away and graded so that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting.
- The contractor should take necessary measures to prevent on-site soils and other soils to be used as fill from becoming wet or unstable. These measures may include the use of plastic sheeting, sumps with pumps and grading. The site soils should not be left uncompacted and exposed to moisture. Sealing exposed soils by rolling with a smooth-drum roller prior to periods of precipitation will help reduce the extent to which these soils become wet or unstable.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are surfaced with working pad materials not susceptible to wet weather disturbance.
- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practical.
- Protective surfacing such as placing asphalt-treated base (ATB), or haul roads made of quarry spalls or a layer of free-draining material such as well-graded pit-run sand and gravel may be considered to limit disturbance to completed areas. Minimum quarry spall thicknesses should be on the order of 12 to 18 inches. Typically, minimum gravel thicknesses on the order of 24 inches are necessary to provide adequate subgrade protection.

4.4. Fill Materials

4.4.1. Structural Fill

The workability of material for use as structural fill will depend on the gradation and moisture content of the soil. Material used for structural fill should be free of debris, organic contaminants and rock fragments larger than 6 inches. For most applications, structural fill consisting of material similar to “Select Borrow” or “Gravel Borrow” as described in Section 9-03.14 of the WSDOT Standard Specifications will be appropriate.

Weather and site conditions should be considered when determining the type of import fill materials purchased and brought to the site for use as structural fill. If earthwork activities are scheduled during the wet weather months or during prolonged periods of wet weather, we recommend that washed crushed rock or select granular fill, as described below, be used for structural fill.

If prolonged dry weather prevails during the earthwork phase of construction, materials with a somewhat higher fines content may be acceptable.

4.4.2. Select Granular Fill

Select granular fill should consist of well-graded sand and gravel or crushed rock with a maximum particle size of 6 inches and less than 5 percent fines by weight based on the minus ¾-inch fraction. Organic matter, debris or other deleterious material should not be present. In our opinion, material with gradation characteristics similar to WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing), or 9-03.14 (Borrow) is suitable for use as select granular fill, provided that the fines content is less than 5 percent (based on the minus ¾-inch fraction) and the maximum particle size is 6 inches.

4.4.3. Pipe Bedding

Trench backfill for the bedding and pipe zone should consist of well-graded granular material similar to "Gravel Backfill for Pipe Zone Bedding" described in Section 9-03.12(3) of the WSDOT Standard Specifications. The material must be free of roots, debris, organic matter and other deleterious material. Other materials may be appropriate depending on manufacturer specifications and/or local jurisdiction requirements.

4.4.4. Trench Backfill

Trench backfill must be free of debris, organic material and rock fragments larger than 6 inches. We recommend that trench backfill material consist of material similar to "Select Borrow" or "Gravel Borrow" as described in Section 9-03.14 of the WSDOT Standard Specifications.

4.4.5. On-Site Soil

Based on our subsurface explorations and experience, it is our opinion that existing site soils, excluding the forest duff and/or organic-rich soil and sod, may be considered for use as structural fill and trench backfill, provided that it can be adequately moisture conditioned, placed and compacted as recommended and does not contain organic or other deleterious material. Based on our experience, the fill material and glacial till at the site are extremely moisture sensitive and will be very difficult or impossible to properly compact when wet.

In addition, it is likely that existing soils will be above optimum moisture content (OMC) when excavated, unless earthwork activities take place in the middle of summer. Even then, the soil could still be above OMC when excavated. Soils placed and compacted above OMC are typically difficult to work with and may have trouble achieving adequate compaction. If earthwork occurs during a typical wet season, or if the soils are persistently wet and cannot be dried back due to prevailing wet weather conditions or lack of drying space/time, we recommend the use of imported structural fill or select granular fill, as described above. We suggest we be contacted again should on-site material be considered for use as fill so that we can provide more specific review of the work and area being developed. Overall, we suggest that a provision for imported material be included in the project budget to account for the presence of fine-grained soil that is over-wet and cannot achieve compaction. We expect that this may be most prevalent for utility trench backfill but may also be relevant for general fills to achieve design grade.

4.5. Fill Placement and Compaction

4.5.1. General

To obtain proper compaction, fill and backfill soil should be compacted near the OMC and in uniform horizontal lifts. Lift thickness and compaction procedures will depend on the moisture content and gradation characteristics of the soil and the type of equipment used. The maximum allowable moisture content varies with the soil gradation and should be evaluated during construction. Generally, 8- to 12-inch loose lifts are appropriate for steel-drum vibratory roller compaction equipment. Compaction should be achieved by mechanical means. During fill and backfill placement, sufficient testing of in-place density should be conducted to check that adequate compaction is being achieved.

4.5.2. Area Fills and Pavement Bases

Fill placed to raise site grades and materials under pavements and should be placed on subgrades prepared as previously recommended. Fill material placed shallower than 2 feet below pavement sections should be compacted to at least 95 percent of the maximum dry density (MDD). Fill placed deeper than 2 feet below pavement sections should be compacted to at least 90 percent of the MDD. Fill material placed in landscaping areas should be compacted to a firm condition that will support construction equipment, as necessary, typically around 85 to 90 percent of the MDD.

4.5.3. Trench Backfill

For utility excavations, we recommend that the initial lift of fill over the pipe be thick enough to reduce the potential for damage during compaction, but generally should not be greater than about 18 inches above the pipe. In addition, rock fragments greater than about 1 inch in maximum dimension should be excluded from this lift.

Trench backfill material placed below structures and footings should be compacted to at least 95 percent of the MDD. In paved areas, trench backfill should be uniformly compacted in horizontal lifts to at least 95 percent of the MDD in the upper 2 feet below subgrade. Fill placed below a depth of 2 feet from subgrade in paved areas must be compacted to at least 90 percent of the MDD. In non-structural areas, trench backfill should be compacted to a firm condition that will support construction equipment as necessary.

4.5.4. Backfill Placement and Compaction Around Luminaire Pole Foundations

Backfill in overexcavated areas and around pole foundations must be compacted in accordance with WSDOT Standard Specifications Section 2-09.3(1)E. If the overexcavated area is large enough for compaction equipment to access, import fill material or on-site material conforming to the specifications and discussion outlined above can be used to backfill the excavations. Backfill material around pole foundations must be compacted to at least 95 percent of the theoretical MDD per ASTM International (ASTM) D 1557.

Alternatively, CDF could be used to backfill the excavation in accordance with WSDOT Standard Specification Section 2-09.3(1)E. CDF is a self-compacting, cementitious, flowable material requiring no subsequent vibration or tamping to achieve consolidation. CDF is included as an option for backfilling around pole foundations in the WSDOT Standard Signal Foundation Plans. If the area to backfill is too small for compaction equipment to access, CDF should also be used. Additionally, we recommend that CDF be used to backfill any large voids created during excavation if compaction equipment cannot access the void area.

4.6. Stormwater Infiltration

4.6.1. General

It is our understanding that stormwater infiltration facilities will be designed in general accordance with the Washington State Department of Ecology's 2014 SWMMWW. According to the SWMMWW, design infiltration rates in glacially consolidated soils (i.e., glacial till) should be determined via in-situ infiltration testing such as a PIT. The sections below further describe our methodology and provide recommended infiltration rates for design.

We developed design stormwater infiltration rates for the proposed NW and SE Parking Lots following general methodology presented in the SWMMWW and completed two small-scale PITs, PIT-1 and PIT-2. PIT-1 was completed during excavation of TP-2 and PIT-2 was completed during excavation of TP-6. PIT-1 was located approximately within the basal footprint of the planned detention pond for the proposed NW Parking Lot area. PIT-2 was located within a landscape planter in the vicinity of a planned bioretention cell for the proposed SE Parking Lot area.

A PIT was planned for TP-5 within the approximate basal footprint of the proposed detention pipes for the SW Parking Lot area; however, due to moderate to rapid groundwater seepage observed in the excavation, the PIT was unable to be completed. We provide further discussion on these detention pipes in the "Proposed SW Parking Lot Detention Pipe Design" section below.

The proposed dispersion trench in the SE Parking Lot area is currently located at the top of a slope near the east edge of College Way. We provide further discussion on this dispersion trench in the "Proposed SE Parking Lot Dispersion Trench" section below.

4.6.2. Pilot Infiltration Tests

4.6.2.1. Methodology

We completed the PITs generally following GeoEngineers' standard methodology for PITs, which is a synthesis of best practices and, in our opinion, meets the intended procedures for small-scale PITs set forth in the SWMMWW. Per the direction of the project civil engineer (AHBL), PIT-1 and PIT-2 were completed at depths of about 11 and 4 feet bgs, respectively. The approximate areas of the base of the PIT excavations were at least 16 square feet. Upon reaching the target depth for PIT-1, an extension ladder with a piezoelectric pressure transducer secured to near the bottom was lowered to the floor of the test pit to record water level readings during the PIT. Similarly, upon reaching the target depth for PIT-2, a graduated yard stick was driven into the floor of the test pit and a piezoelectric pressure transducer was secured to near the bottom of the yard stick. The piezoelectric pressure transducers were programmed to record water level readings at 20-second intervals.

GeoEngineers' PIT procedure consists of a 6-hour (minimum) saturation period where the water depth in the PIT is raised and lowered, over a small 1- to 3-inch interval, in a series of falling-head stages. Water level measurements collected by the pressure transducer during each falling-head stage are used to calculate the apparent infiltration rate for each stage. Manual water level measurements are also recorded in the event a transducer malfunctions during the test. The falling-head stage methodology is intended to fully saturate the soils below the base of the PIT while allowing for a direct measurement of when saturated or near-saturated conditions have been achieved. This is usually manifested by a progressive decline in the apparent infiltration rate until the rate approximately stabilizes. The stabilized rate corresponds to the saturated infiltration rate or the measured (initial) infiltration rate of the soil.

Generally, once a stabilized infiltration rate is observed and a minimum of 6 hours of saturation time has elapsed, the PIT is continued for one or more falling-head cycles or is left undisturbed until the water drains away completely. If left to drain away completely, the final drain-down period shows how infiltration changes over a continuous range of declining water depths.

Water was pumped into the PIT-1 excavation from a water truck, while a hose attached to a water hydrant was used to fill the PIT-2 excavation. PIT-1 and PIT-2 were filled with water to depths of about 16½ and

16 inches, respectively. The PITs completed for this study were only filled for one falling-head stage as they were observed to drain very slowly. At approximately 6 hours into each test, PIT-1 and PIT-2 had dropped about ½ inch and 1¾ inches, respectively. Based on the limited water level drops observed in the PITs over approximately 6 hours we elected to conclude the tests.

4.6.2.2. Test Results

We were able to download the transducer water level data from PIT-1, but the transducer used for PIT-2 did not record any water level data. Instead, we used our manual water level measurement to estimate the measured (initial) infiltration rate for PIT-2.

The SWMMWW recommends that correction factors be applied to the measured (initial) infiltration rate determined in the PIT to establish a long-term design infiltration rate. The correction factors account for uncertainties in site variability, testing procedures, and long-term reduction in permeability due to plugging. Table 2 below provides a summary of the correction factors outlined in the SWMMWW that are, in our opinion, appropriate for use at this site. The total correction factor is equal to the product of the individual factors.

TABLE 2. CORRECTION FACTORS FOR FIELD INFILTRATION MEASUREMENTS

Correction Factor	Recommended Value
Site Variability and Number of Locations Tested	CF_v=0.33 Selected because of number of test locations
Test Method	Small-scale PIT, CF_t = 0.50
Degree of Influent Control to Prevent Siltation and Bio-buildup	CF_m= 0.9
Total Correction Factor (CF_v x CF_t x CF_m)	CF_T= 0.15

The long-term design infiltration rate (K_{sat_design}) is obtained by multiplying the measured (initial) infiltration rate ($K_{sat\_initial}$) by the total correction factor:

$$K_{sat\_design} = K_{sat\_initial} * CF_T$$

Table 3 summarizes the measured (initial) and long-term design infiltration rates for the PITs.

TABLE 3. INFILTRATION RATE SUMMARY

Pilot Infiltration Test Number	Proposed Parking Lot	Approximate Depth of PIT (feet bgs)	Approximate Elevation of PIT[1] (feet; NAVD88)	Measured (Initial) Infiltration Rate ($K_{sat\_initial}$; in/hr)	Long-Term Design Infiltration Rate[2] (K_{sat_design}; in/hr)
TP-2 (PIT-1)	Northwest	11	504	0.10	0.015
TP-6 (PIT-2)	Southeast	4	532	0.29	0.043

Notes:

[1] Elevation should be considered approximate.

[2] Long-term design infiltration rate with appropriate correction factors applied.

4.6.2.3. Discussion of PIT Results and Stormwater Infiltration Feasibility

Based on the subsurface conditions observed in our explorations and the results of the PITs, it is our opinion that stormwater infiltration is generally infeasible at the proposed parking lot areas for this project. We take no issue with preliminary use of the long-term design infiltration values listed in Table 3 at this time, corresponding to the areas studied; however, it is our understanding that values below 0.3 inches per hour are also considered infeasible for infiltration, according to the City of Puyallup. Similar soil conditions were also noted within the other explorations completed for the project. As such, we ultimately recommend that infiltration not be considered as an option for stormwater management on this project. If a small amount of infiltration is absolutely necessary, we recommend we be consulted first to review proposed location, the proposed design, and overall use before final determination of design.

4.6.3. Additional Considerations

4.6.3.1. General

The SWMMWW indicates PITs should be completed between December 1st and April 1st (wet season). Testing during this time range is to help provide an accurate representation of soil saturation and groundwater information. However, based on previous explorations and work in the project vicinity and our review of regional groundwater conditions, the static groundwater levels are reported and expected to be well below the project excavation depths, even during the wet season. In addition, subsurface soils are fine-grained and dense at proposed infiltration locations and not expected to be different during the wet season. While there is a potential for the presence of seepage to be greater during the wetter times of the year, we conclude that the presence and condition of the glacial till is the primary controlling factor in infiltration rate design for depths proposed at this project. Because of this and based on review of groundwater data nearby, it is our opinion that the time of year of PIT completion is not a controlling factor for stormwater design.

We did not investigate the suitability of site soils for stormwater treatment purposes as part of this study. If soils at the site are to be used for stormwater treatment, additional testing and/or the use of soil amendments may be necessary.

4.6.3.2. Proposed SW Parking Lot Detention Pipe Design

TP-5 was completed approximately within the basal footprint of the proposed detention pipes area. Groundwater seepage was encountered about 3 feet bgs to the depth explored. Based on conditions observed in TP-5 and our other explorations, we expect that there could be times of year where the detention pipes may be constructed in the presence of seepage and at depths where there is a potential for the pipes to be surrounded by water. As such, we recommend that the proposed detention pipes be considered and checked for buoyancy effects. For the SW parking lot detention pipe design, we recommend the following considerations for review:

- Groundwater elevation assumed to be at 534 feet (NAVD88);
- Total soil unit weight (above groundwater): 125 pounds per cubic foot (pcf);
- Effective soil unit weight (below groundwater): 62.6 pcf;
- Follow detention pipe system manufacturer recommendations for mitigating buoyancy effects.

Based on our explorations, we conclude that design for this groundwater elevation and this condition is conservative and that seepage in this area will be intermittent, discontinuous, and variable in depth and location. As such, we do not expect the pipe in this area to become submerged and the soil to become fully saturated enough to represent the buoyant condition. If buoyancy becomes an issue at this elevation, we recommend that we re-evaluate our design and considerations presented above, including the effects of multiple groundwater depths, alternative backfill options and/or anchors or weight options for the pipe, should it be determined necessary.

4.6.3.3. Proposed SE Parking Lot Dispersion Trench

Per sheet C2.4 of the Development Plans, two dispersion trenches that are 50 and 20 feet long (system), respectively, are proposed on the east edge of College Way. This system will be located near the top of a slope that is more than 20 feet in height. The slope grade in the vicinity of the proposed trenches ranges between about 4H to 1V and 2.4H to 1V, which equates to about a 25 to 42 percent slope. The slope is densely forested and based on literature and our experience on campus, soils are likely to consist of dense glacial till or recessional outwash. We understand that this slope area east of College Way is regulated and not expected to be built upon or cleared.

We reviewed the "Design Criteria for Dispersion Trenches" subsection under section "3.1.2 Downspout Dispersion Systems (BMP T5.10B)" of the SWMMWW. Per criterion number 5, discharge points of these trenches should not be placed on or above slopes that are greater than 15 percent "without evaluation by a geotechnical engineer or qualified geologist and jurisdiction approval."

Based on our understanding of the subsurface and geologic conditions in the project vicinity, inclinations of the slope, and provided that the current vegetation of the down slope portion of the slope remains intact and the area remains uninhabited, it is our opinion that these proposed dispersion trenches can be constructed as envisioned at the top of the slope with limited risk. We provide the following additional considerations and recommendations:

- Based on nearby explorations, site geology, and review of the system, it is our opinion that the location and proposed use of the infiltration trench will not cause global instability or deep-seated slope failure.
- The current configuration of the slope is less steep than our recommendations for permanent slope construction; 2H to 1V.
- Near surface slope erosion and saturation at the outlets within the trench and downhill flooding could occur from the system. This will ultimately depend on volume, frequency, and flow rate of discharging stormwater from the trenches. Based on site review, slope inclinations and dense vegetative nature of the forest and the expected limited use and long term limited disturbance of the slope area, it is our opinion that this area can accommodate the additional influx of proposed dispersion trench water without causing excessive or significant surface or shallow failures.
- We recommend that this area be inspected yearly and maintained. We also suggest at a minimum that inspections be completed during the rainy season after periods of heavy precipitation to evaluate if maintenance is necessary. There could be some repairs and slope surface care that will need to be addressed over time. Options for additional slope surface care, should some erosion or issues be observed, could include placement of straw wattles or other similar erosion control products. Re-planting, energy dissipaters such as quarry spalls and/or silt fencing could also be placed near drain inlets/outlets to further slow water and the effects of erosion, should it seem to be an issue. Ultimately, we recommend that the SWMMWW be reviewed for guidance on incorporating permanent erosion control measures for the slope and the dispersion trench system.

4.7. Pavement Recommendations

4.7.1. General

Pavements for the proposed improvements will include new parking areas and driveways. Our recommended pavement sections provided below are based on our explorations and experience in the area. We understand ACP is planned for the proposed improvements.

The recommended pavement sections below may not be adequate for heavy construction traffic loads such as those imposed by concrete transit mixers, dump trucks or cranes. Additional pavement thickness may be necessary to prevent pavement damage during construction. An ATB section can also be used during construction to protect partially constructed pavement sections and pavement subgrades. The recommended sections assume final improvements surrounding the pavement areas will be designed and constructed such that stormwater or excess irrigation water from landscape areas does not accumulate below the pavement section or pond on pavement surfaces. If pavements in parking areas slope inward (toward the center of the parking area) full depth curbs or other measures should be used to prevent water from entering and ponding on the subgrade and within the base section.

4.7.2. Construction Considerations

Existing pavements, hardscaping or other structural elements should be removed prior to placement of new pavement sections. Pavement subgrade should be prepared to a uniformly firm, dense and unyielding condition as previously described. Crushed surfacing base course (CSBC) and subbase should be moisture conditioned to near optimum moisture content and compacted to at least 95 percent of the MDD (ASTM D 1557).

Crushed surfacing base course should conform to applicable sections of 4-04 and 9-03.9(3) of the WSDOT Standard Specifications. Hot mix asphalt should conform to applicable sections of 5-04, 9-02 and 9-03 of the WSDOT Standard Specifications.

Some areas of pavement may exhibit settlement and subsequent cracking over time. Cracks in the pavement will allow water to infiltrate to the underlying base course, which could increase the amount of pavement damage caused by traffic loads. To prolong the effective life of the pavement, cracks should be sealed as soon as possible.

4.7.3. Asphalt Concrete Pavement Design

4.7.3.1. Standard-Duty ACP – Automobile Driveways and Parking Areas

- 2 inches of hot mix asphalt, class ½ inch, PG 58-22
- 4 inches of CSBC
- 6 inches of subbase consisting of select granular fill, previously described, to provide a uniform grading surface, to provide pavement support, to maintain drainage, and to provide separation from subgrade soil.
- Subgrade consisting of proof-compacted firm and unyielding conditions, or structural fill prepared in accordance with the “Subgrade Preparation” and “Area Fills and Pavement Bases” sections of this report.

4.7.3.2. Areas Subject to Occasional Heavy Truck Traffic

- 3 inches of hot mix asphalt, class ½ inch, PG 58-22
- 6 inches of CSBC
- 6 inches of subbase consisting of select granular fill, previously described, to provide a uniform grading surface, to provide pavement support, to maintain drainage, and to provide separation from subgrade soil.
- Subgrade consisting of proof-compacted firm and unyielding conditions, or structural fill prepared in accordance with the "Subgrade Preparation" and "Area Fills and Pavement Bases" sections of this report.

4.7.3.3. Temporary Construction Surfacing

A temporary surfacing of ATB can be used to protect partially constructed pavement sections and pavement subgrades during construction. This can provide a relatively clean working surface, prevent construction traffic from damaging final paving surfaces and reduce subgrade repairs required for final paving. A 2-inch-thick section of ATB can be substituted for the upper 2 inches of CSBC in either the light-duty or heavy-duty pavement sections. Prior to placement of the final pavement surface sections, we recommend that any areas of ATB pavement failure be removed, and the subgrade repaired. If ATB is used and is serviceable when final pavements are constructed, the design asphalt concrete pavement thickness can be placed directly over the ATB.

Cement treatment of subgrades is sometimes used to create construction surfacing or to control soil moisture during wet weather construction. In our opinion cement treatment would not likely be cost effective for creating a wet weatherproof construction surface due to the high fines content in the soil. Cement treatment or cement stabilization would likely only be cost effective as an emergency or contingency action for reducing soil moisture in the on-site material if excavated and re-used as a structural fill. We estimate that it would take a significant amount of cement, likely on the order of 12 percent by weight, to create a firm and stable working surface that could handle wet weather construction. If used as a structural fill, likely on the order of 6 to 8 percent cement by weight would be required.

5.0 LIMITATIONS

We have prepared this report for the Washington State Department of Enterprise Services (DES) for the Pierce College Puyallup – Parking Lot Additions project located in Puyallup, Washington. DES may distribute copies of this report to owner's authorized agents and regulatory agencies as may be required for the Project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices for geotechnical engineering in this area at the time this report was prepared. The conclusions, recommendations, and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty, express or implied, applies to the services or this report.

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

FIGURES

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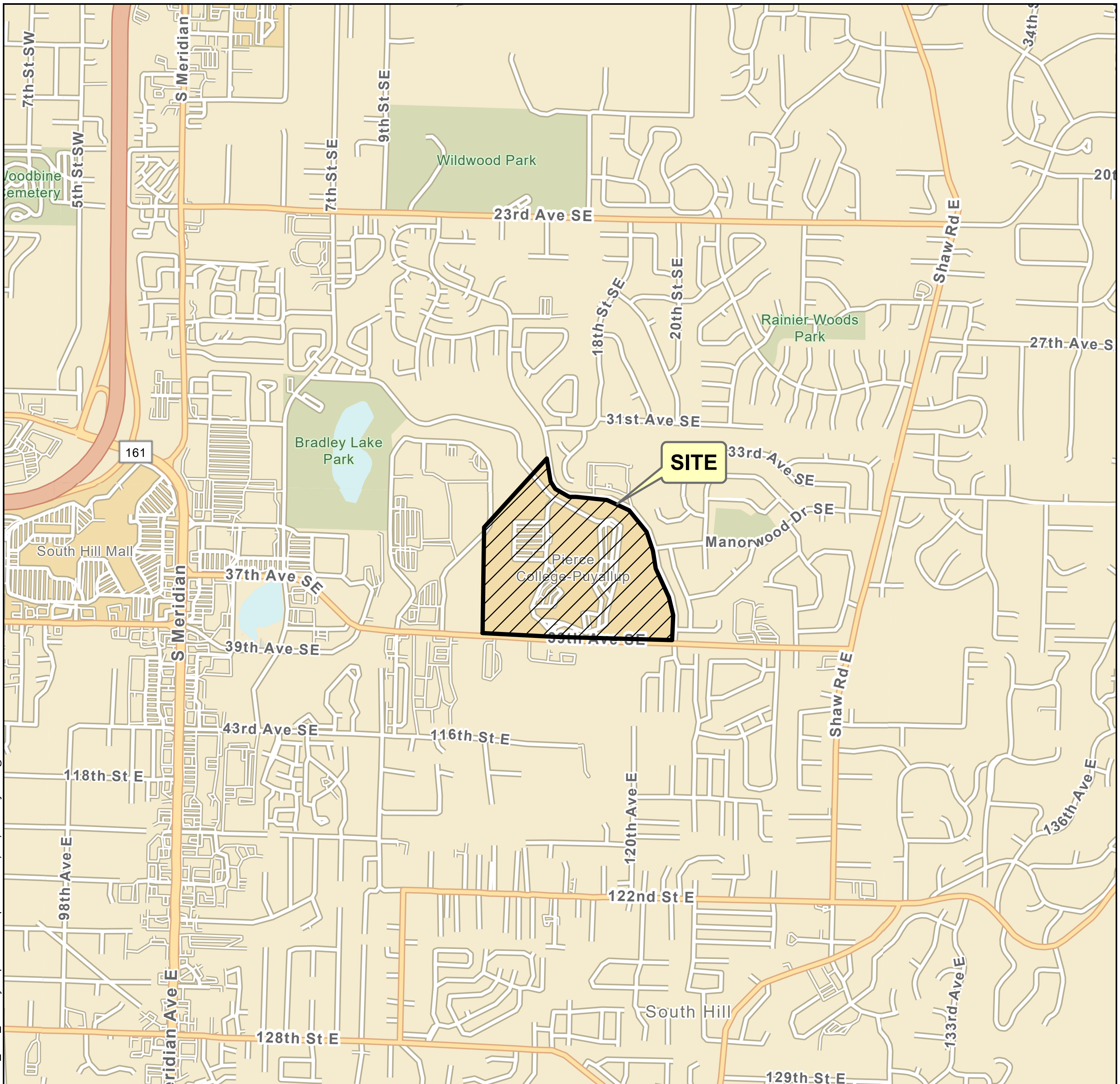

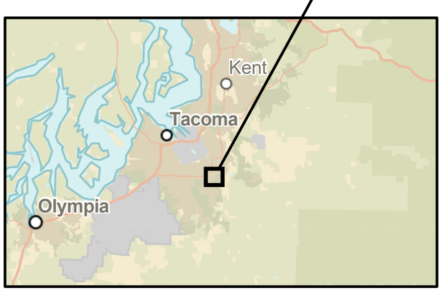

N W E S

2,000 0 2,000

Feet

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

P:\21\21342003\GIS\21342003_Project\21342003_Project.aprx\2134200300_F01_VicinityMap Date Exported: 07/26/21 by maugust

Vicinity Map

Pierce College Puyallup - Parking Lot Additions
Puyallup, Washington

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Figure 1

Legend

TP-1 ⊕ Test Pit by GeoEngineers, Inc., 2021

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: Background from AHBL, Inc., dated 06/24/2021.
Aerial from Google Earth Pro dated 08/14/2020.

Projection: Washington State Plane, South Zone, NAD83, US Foot

N W E S

250 0 250
Feet

Site Plan

Pierce College Puyallup - Parking Lot Additions
Puyallup, Washington

GEOENGINEERS

Figure 2

P:\21\21342003\CAD\00\Geotech Report\2134200300_F02_Site Plan.dwg TAB:F02 - Site Plan Date Exported: 07/16/21 - 11:40 by gregister

APPENDICES

GeoEngineers

APPENDIX A
Subsurface Explorations and Laboratory Testing

APPENDIX A
SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

Subsurface Explorations

Subsurface conditions for the proposed Pierce College Puyallup – Parking Lot Additions project were explored by excavating eight test pits between June 17 and June 21, 2021 at the approximate locations shown on the Site Plan, Figure 2. Pilot infiltration tests (PITs) were completed at about 11 feet and 4 feet below ground surface (bgs) at TP-2 (PIT-1) and TP-6 (PIT-2), respectively. The test pits were excavated to depths between about 4 and 11½ feet bgs using an excavator provided and operated by Kelly's Excavating, Inc. under subcontract to GeoEngineers. After each test pit was completed, the excavation was backfilled using the generated material and compacted using the bucket of the excavator.

During the exploration program, our field representative obtained soil samples, classified the soils encountered, and maintained a detailed log of each exploration. The relative densities noted on the test pit logs are based on the difficulty of excavation and our experience and judgment. The samples were collected and retained in sealed plastic bags and then transported back to our office. The soils were classified visually in general accordance with the system described in Figure A-1, which includes a key to the exploration logs. Summary logs of the explorations are included as Figures A-2 through A-9.

The locations of the test pits were determined using an electronic tablet equipped with global positioning system (GPS) software. The locations of the explorations should be considered approximate.

Laboratory Testing

Soil samples obtained from the explorations were transported to GeoEngineers' laboratory. Representative soil samples were selected for laboratory tests to evaluate the pertinent geotechnical engineering characteristics of the site soils and to confirm our field classifications.

Our testing program consisted of the following:

- Three grain-size distribution analyses (sieve analyses [SA])
- Eight moisture content determinations (MC)

Tests were performed in general accordance with test methods of ASTM International (ASTM) or other applicable procedures. The following sections provide a general description of the tests performed.

Sieve Analysis (SA)

Grain-size distribution analyses were completed on selected samples in general accordance with ASTM Test Method C 136. This test method covers the quantitative determination of the distribution of particle sizes in soils. Typically, the distribution of particle sizes larger than 75 micrometers (μm) is determined by sieving. The results of the tests were used to verify field soil classifications and determine pertinent engineering characteristics. Figure A-10 presents the results of our sieve analyses.

Moisture Content (MC)

The moisture content of selected samples was determined in general accordance with ASTM Test Method D 2216. The test results are used to aid in soil classification and correlation with other pertinent engineering soil properties. The results are presented on the test pit logs at the depth tested.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	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
MORE THAN 50% PASSING NO. 200 SIEVE	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

- 2.4-inch I.D. split barrel / Dames & Moore (D&M)
- 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 lead 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

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Figure A-1

Date Excavated	6/17/2021	Total Depth (ft)	6.5	Logged By	OA	Excavator	Kelly's Excavating	Groundwater not observed
				Checked By	CRN	Equipment	Komatsu PC120 Excavator	Caving not observed

Surface Elevation (ft)	509	Easting (X)	1198929	Coordinate System	WA State Plane South
Vertical Datum	NAVD88	Northing (Y)	671191	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0–1				DUFF	12 inches forest duff			
508	1–3				SM	Orange silty fine to medium sand with occasional gravel and organic matter (roots) (medium dense, moist) (weathered glacial till)			Roots up to 1½-inch diameter
507	2	▯	1 / MC				17		
506	3				SM	Gray silty fine to medium sand with gravel (dense, moist) (glacial till)			
505	4								
504	5					Grades to with occasional cobbles			
503	6	▯	2						

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Date:1/28/22 Path:P:\21\21342003\GINT\2134200300.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

Log of Test Pit TP-1

GeoEngineers

Project: Pierce College Puyallup - Parking Lot Additions
Project Location: Puyallup, Washington
Project Number: 21342-003-00

Date Excavated	6/17/2021	Total Depth (ft)	11.5	Logged By	OA	Excavator	Kelly's Excavating	Groundwater not observed
				Checked By	CRN	Equipment	Komatsu PC120 Excavator	Caving not observed

Surface Elevation (ft)	515	Easting (X)	1198837	Coordinate System	WA State Plane South
Vertical Datum	NAVD88	Northing (Y)	671027	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
515–514	0–1				DUFF	12 inches forest duff			
514–512	1–3		1 MC		SM	Orange silty fine to medium sand with occasional gravel and organic matter (roots) (medium dense, moist) (weathered glacial till)	16		Roots ¼- to 1½-inch diameter
512–510	3–5				SM	Gray silty fine sand with occasional gravel (dense, moist) (glacial till)			
510–505	5–10		2		SM	Gray silty fine to medium sand with gravel and occasional cobbles (dense, moist)			
						Grades to very dense			Increased excavation resistance
						Grades to with occasional gravel			
505–503.5	10–11.5		3 SA		ML	Dark gray sandy silt with occasional gravel (hard, moist)	18	56	PIT completed at approximately 11 feet bgs

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-2 (PIT-1)

GeoEngineers

Project: Pierce College Puyallup - Parking Lot Additions
Project Location: Puyallup, Washington
Project Number: 21342-003-00

Date Excavated	6/17/2021	Total Depth (ft)	5.5	Logged By: OA; Checked By: CRN	Excavator: Kelly's Excavating; Equipment: Komatsu PC120 Excavator; Groundwater not observed; Caving not observed

Surface Elevation (ft)	509	Easting (X)	1199017	Coordinate System	WA State Plane South
Vertical Datum	NAVD88	Northing (Y)	671023	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
509–508	0–1			DUFF	12 inches forest duff			
508–506	1–3	2–2.5	1 / MC	SM	Orange silty fine to medium sand with occasional gravel and organic matter (roots) (medium dense, moist) (weathered glacial till)	15		Roots ¼- to ½-inch diameter to approximately 2 feet bgs
506–503.5	3–5.5	5–5.5	2	GP-GM	Gray fine to coarse gravel with silt, sand and occasional cobbles (dense, moist) (glacial till)			3-inch lense of iron-oxide stained soil

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-3

GeoEngineers

Project: Pierce College Puyallup - Parking Lot Additions
Project Location: Puyallup, Washington
Project Number: 21342-003-00

Date Excavated	6/18/2021	Total Depth (ft)	9	Logged By	OA	Excavator	Kelly's Excavating	Groundwater not observed
				Checked By	CRN	Equipment	Komatsu WB140 Backhoe	Caving not observed

Surface Elevation (ft)	537	Easting (X)	1198927	Coordinate System	WA State Plane South
Vertical Datum	NAVD88	Northing (Y)	670105	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				SOD	Approximately 6 inches sod			
536	1				SM	Brownish-gray silty fine to coarse sand with gravel, occasional cobbles and deleterious debris (dense, moist) (fill)			
535	2	▯	1 MC				11		Deleterious debris consists of nails and rubber particles
534	3								
533	4				SM	Gray with occasional iron-oxide staining silty fine sand with occasional gravel (dense, moist) (weathered glacial till)			
532	5	▯	2						
					SM	Brownish-gray silty fine to medium sand with gravel and occasional cobbles (very dense, moist) (glacial till)			
531	6	▯	3						
530	7								
529	8								
528	9								

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-4

GeoEngineers

Project: Pierce College Puyallup - Parking Lot Additions
Project Location: Puyallup, Washington
Project Number: 21342-003-00

Date Excavated	6/18/2021	Total Depth (ft)	10.5	Logged By	OA	Excavator	Kelly's Excavating	See "Remarks" section for groundwater observed
				Checked By	CRN	Equipment	Komatsu WB140 Backhoe	See "Remarks" section for caving observed

Surface Elevation (ft)	539	Easting (X)	1199070	Coordinate System	WA State Plane South
Vertical Datum	NAVD88	Northing (Y)	670068	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				SOD	Approximately 6 inches sod			
538	1				SM	Brown silty fine to coarse sand with gravel, occasional cobbles and deleterious debris (medium dense, moist) (fill)			Deleterious debris consists of asphalt fragments and plastic waste
537	1.5–2	X	1 MC				10		
	2–2.5	X	2		SM	Gray silty fine sand with occasional gravel (medium dense, moist) (weathered glacial till)			
536	3					Grades to wet			Moderate groundwater seepage observed from approximately 3 feet bgs to 9½ feet bgs
535	4					Grades to dense			
534	5	X	3		SM	Gray silty fine sand with occasional gravel (very dense, wet) (glacial till)			Minor caving observed at approximately 5 feet bgs
533	6								
532	7								
531	7.5				SP	Dark gray fine sand, trace silt (very dense, wet)			
530	9	X	4 SA				22	2	Rapid groundwater seepage observed at approximately 9½ feet bgs
529	10								

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-5

GeoEngineers

Project: Pierce College Puyallup - Parking Lot Additions
Project Location: Puyallup, Washington
Project Number: 21342-003-00

Date Excavated 6/21/2021	Total Depth (ft) 4.25	Logged By OA Checked By CRN	Excavator Kelly's Excavating Equipment Komatsu WB140 Backhoe	Groundwater not observed Caving not observed

Surface Elevation (ft) 536 Vertical Datum NAVD88	Easting (X) 1199935 Northing (Y) 669625	Coordinate System WA State Plane South Horizontal Datum NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					SOD	Approximately 6 inches sod			
535	1	▯	1 MC		ML	Dark brown sandy silt with gravel and occasional deleterious debris (medium stiff, moist) (fill)	18		Deleterious debris consists of asphalt fragments and metal cans Fine roots (<¼-inch diameter) observed to bottom of test pit
534	2				SM	Brownish-gray silty fine to medium sand with gravel, occasional cobbles and organic matter (roots) (medium dense, moist) (weathered glacial till)			
533	3	▯	2		SM	Gray silty fine to medium sand with gravel, occasional cobbles and organic matter (roots) (dense, moist) (glacial till)			
532	4	▯	3 SA				19	40	PIT completed at approximately 4 feet bgs

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-6 (PIT-2)

GEOENGINEERS

Project: Pierce College Puyallup - Parking Lot Additions
Project Location: Puyallup, Washington
Project Number: 21342-003-00

Date Excavated	6/21/2021	Total Depth (ft)	8.5	Logged By	OA	Excavator	Kelly's Excavating	Groundwater not observed
				Checked By	CRN	Equipment	Komatsu WB140 Backhoe	Caving not observed

Surface Elevation (ft)	545	Easting (X)	1199872	Coordinate System	WA State Plane South
Vertical Datum	NAVD88	Northing (Y)	669433	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				SOD	Approximately 6 inches sod			
544	1				SM	Brown silty fine to medium sand with gravel (loose, moist) (fill)			
543	2	▯	1 MC				10		
542	3	▯	2		SM	Dark brown to black silty fine to medium sand with organic matter (roots) (loose, moist) (old topsoil horizon)			
541	4	▯	3		SM	Orangish-brown with occasional iron-oxide staining silty fine sand with occasional gravel and cobbles (medium dense, moist) (weathered glacial till)			
540	5								
539	6								
538	7	▯	4			Grades to gray with iron-oxide staining, dense			
537	8								

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-7

GEOENGINEERS

Project: Pierce College Puyallup - Parking Lot Additions
Project Location: Puyallup, Washington
Project Number: 21342-003-00

Figure A-8
Sheet 1 of 1

Date Excavated 6/21/2021	Total Depth (ft) 4	Logged By OA Checked By CRN	Excavator Kelly's Excavating Equipment Komatsu WB140 Backhoe	Groundwater not observed Caving not observed

Surface Elevation (ft) 546 Vertical Datum NAVD88	Easting (X) 1199869 Northing (Y) 669367	Coordinate System WA State Plane South Horizontal Datum NAD83 (feet)

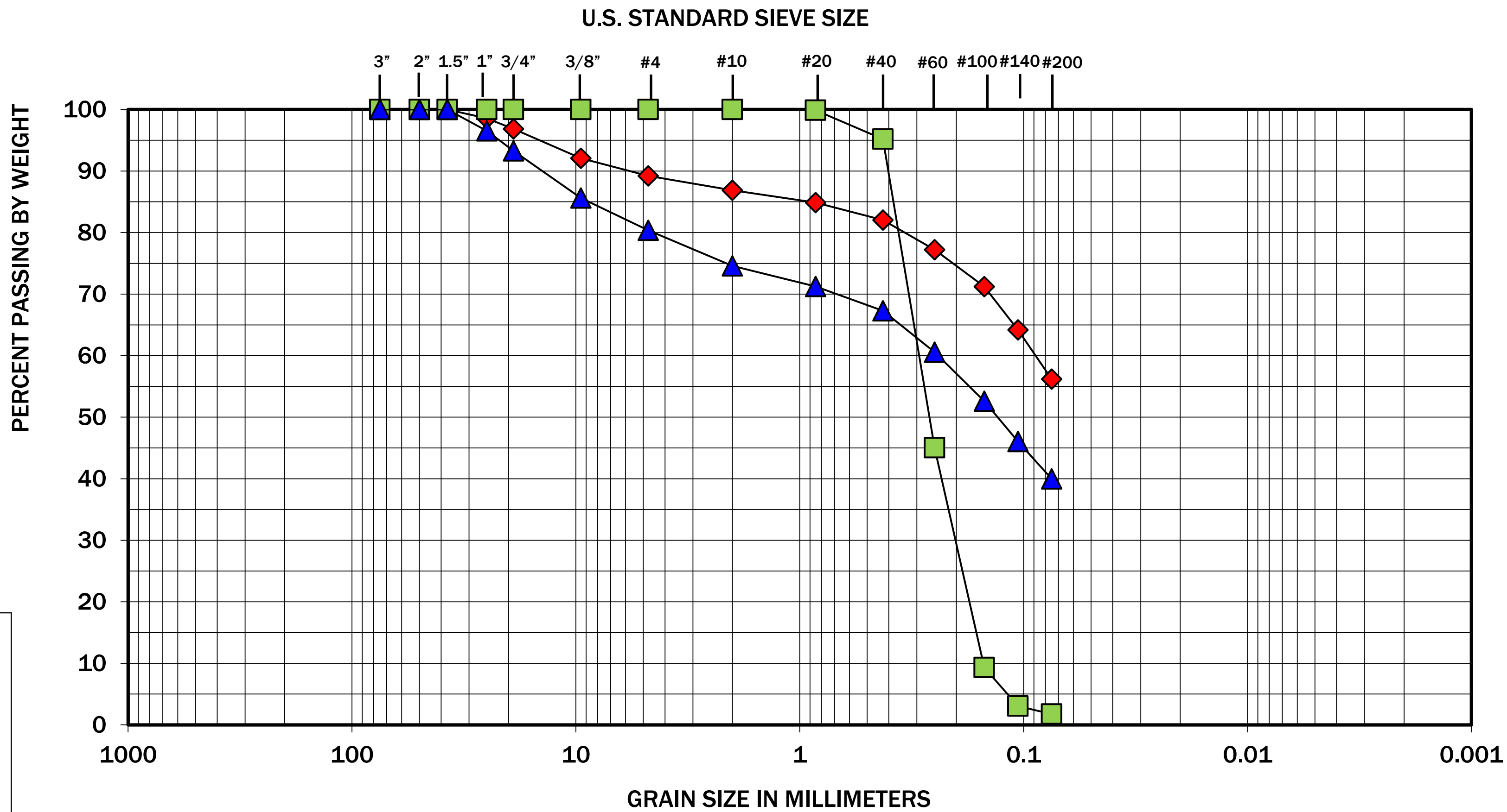
Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				SOD	Approximately 6 inches sod			
545	1				SM	Brown silty fine to medium sand with gravel, occasional cobbles, deleterious debris (wood fragments) and organic matter (roots) (loose, moist) (fill)			Roots (<¼-inch diameter) to approximately 3 feet bgs
544	2								
543	3		1 / MC				19		
542	4								3-inch-diameter carbonized wood log observed at approximately 3½ feet bgs

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-8

GEOENGINEERS

Project: Pierce College Puyallup - Parking Lot Additions
Project Location: Puyallup, Washington
Project Number: 21342-003-00



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Test Pit Number	Depth (feet)	Moisture (%)	Soil Description
◆ (red diamond)	TP-2	11	18	Sandy silt (ML)
■ (green square)	TP-5	9	22	Poorly graded sand (SP)
▲ (blue triangle)	TP-6	4	19	Silty sand with gravel (SM)

AASHTO ACCREDITED

The grain size analysis results were obtained in general accordance with ASTM C 136. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

GEOENGINEERS

Sieve Analysis Results

Pierce College Puyallup - Parking Lot Additions
Puyallup, Washington

Figure A-10

APPENDIX B
Report Limitations and Guidelines for Use

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix 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 Washington State Department of Enterprise Services (DES) 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 DES signed on June 22, 2021 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 Pierce College Puyallup – Parking Lot Additions 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.

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

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

- 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 changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

Environmental Concerns are Not Covered

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

Information Provided by Others

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

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.

Information Provided by Others

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

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.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

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.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable, but separating logs from the report can create a risk of misinterpretation.

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 confer with GeoEngineers and/or 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.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

GeoEngineers