Geotechnical Engineering Report

Centennial Park – Parking Lot Expansion
17327 67th Avenue NE
Arlington, Washington

for
Williams Investments LLC

April 5, 2023

GeoEngineers
Earth Science + Technology

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17327 67th Avenue NE
Arlington, Washington

File No. 22450-002-01

April 5, 2023

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1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services for the proposed Centennial Park – Parking Lot Expansion project, located at 17327 67th Avenue NE in Arlington, Washington. This approximately 1.45 acre area identified as the "site" is an existing Category IV wetland that will be filled to support the proposed parking lot expansion (96 spaces). The general location of the site is shown in the Vicinity Map, Figure 1.

We understand the proposed development will consist of the addition of a paved surface parking lot to service the existing development. The project will require up to 8 feet of new fill within the wetland area to achieve desired site grades. Stormwater is planned to be managed by use of rain gardens and detention pipes. Short concrete retaining walls are planned for grade transitions. The site conditions are shown in the Site and Exploration Plan, Figure 2.

Geotechnical investigation and reporting have been requested by the civil engineer, CG Engineering. This request included site investigation and recommendations for the required earthwork, pavement, and stormwater management. This proposal is based on correspondence with CG Engineering, a review of project documents, our familiarity with the area, and our experience on similar projects.

The purpose of our geotechnical engineering services was to explore subsurface conditions at the site as a basis for developing geotechnical recommendations for the proposed parking lot development. The scope of our services included completing five hand auger investigations and five dynamic cone penetrometer tests (DCPTs), performing engineering analyses, and preparing this report. The scope of work is described in our proposal for the project dated February 1, 2023.

2.0 SITE CONDITIONS

2.1. Surface Conditions

The site is located just northeast of the intersection of 67th Avenue NE and 172nd Street NE within the Centennial Park Apartments in Arlington, Washington. This approximately 1.45 acre area identified as the "site" is an existing Category IV wetland that will be filled to support the proposed parking lot expansion (96 spaces). The site is bounded by 76th Avenue NE to the west, State Route (SR) 531 to the south, a church to the east and a residential neighborhood to the north. Based on a brief review of nearby available geotechnical information, the subsurface conditions at the site consist of existing fill overlying alluvium and sandy glacial outwash soils extending to significant depth.

2.2. Geology

We reviewed a U.S. Geological Survey (USGS) map for the project area, "Geologic map of the Arlington West 7.5 minute quadrangle, Snohomish County, Washington" by Minard (1985). Soil deposits in the site area are mapped as recessional outwash deposits of the Marysville Sand Member. Also mapped at near the site are older alluvium, transitional beds, and advance outwash (to the east). The sand, gravel, silt, and clay associated with the Marysville Sand Member were deposited by meltwater from the stagnating and receding Vashon Stade glacier and are typically medium dense/stiff. Most of the north-south trending valley in the vicinity of the site is covered with a thin layer, approximately 30 feet thick, of the recessional deposits.

Geologic descriptions of the area are consistent with the subsurface conditions observed in our shallow hand explorations and nearby deeper explorations.

2.3. Subsurface Explorations

Subsurface soil and groundwater conditions at the site were explored by completing five hand augers (HA-1 through HA-5) excavated to depths of 4 to 4½ feet below ground surface (bgs) with a shovel and a 3-inch-diameter hand auger, and five DCPTs (DCPT-1 through DCPT-5) using Triggs® Wildcat DCPT equipment. The explorations were completed on February 23, 2023 by a GeoEngineers, Inc. (GeoEngineers) staff. The approximate locations of the explorations are shown in Figure 2. Details of the field exploration program, laboratory testing, and the exploration logs are presented in Appendix A.

2.4. Subsurface Conditions

2.4.1. Soil Conditions

Subsurface soil conditions generally consisted of organic topsoil of variable thickness overlying native alluvial soils and outwash sand and gravel. Surficial soils at our exploration locations consisted of highly organic topsoil.

- **Topsoil** – Topsoil was observed in all of the hand augers. This unit generally consisted of very loose brown silty sand or soft brown silt with clay and organic matter. The moisture content varied from 39 to 424 percent, which indicates a peat-like topsoil layer for portions of this unit. This layer was typically 1- to 2-feet thick, and 3-feet thick in HA-2.
- **Alluvium** – Below the topsoil layer the alluvium consisted of very soft to soft gray and brown sandy silt in HA-1 and HA-2 and very loose to loose silty sand and/or sand with silt HA-3 through HA-5, with scattered organics in this unit. The alluvium was encountered to the depths explored of 4 feet before reaching practical refusal due to groundwater and caving.
- **Recessional Outwash** – The hand augers were not able to advance into this layer due to shallow groundwater and caving conditions of overlying alluvium. Deeper explorations from previous development nearby indicate that this layer extends to at least 50 feet below grade. The density profile observed in our DCPT's indicated a medium dense sand layer at depths of 4 to 6 feet below existing grade which is interpreted to be the recessional outwash unit.

2.5. Groundwater Conditions

Groundwater was observed on the date of our hand auger explorations at depths ranging from 1 to 2.5 feet bgs. Groundwater conditions should be expected to vary as a function of season, precipitation, and other factors.

3.0 CONCLUSIONS AND RECOMMENDATIONS

The site is underlain by highly organic topsoil, alluvium, and recessional outwash at depth. It is our opinion the site is suitable for the proposed development provided that remedial excavation is incorporated into the site development to mitigate the topsoil layer prior to aerial fill placement. Below-grade detention facilities and low-height site retaining walls may be constructed with earthwork considerations presented in this report.

3.1. Earthwork Considerations

In the area to be filled, we recommend that the existing upper 2 to 3 feet of soils that consist of highly organic topsoil should be removed prior to placement of fill. If not removed, these soils will contribute to a relatively high degree of long-term post construction settlement. The majority of the alluvial soils may remain in place. In some isolated areas with higher organic content, it may be necessary to overexcavate and replace with structural fill.

The exposed subgrade soils will not support construction equipment. We recommend the use of lightweight tracked equipment for removal of topsoil and placement of structural fill material until an adequate thickness is achieved as a working surface.

3.1.1. Subgrade Stabilization

The area is currently a wetland with very loose and soft soil that will be difficult to place initial fill lifts unless stabilized. We recommend that the fill be constructed with a base layer of permeable ballast a minimum of 12 inches thick. We recommend a geotextile fabric for separation be used between the native alluvial soil and the permeable ballast.

3.1.2. Fill Induced Settlement

As discussed, an aerial fill ranging from 4 to 8 feet thick is required to achieve the planned site grades. Placement of fill will result in settlement of the alluvial soils even after removal of the organic topsoil layer. We evaluated the settlement potential of the alluvial silt and sand using the computer program Settle3 from Rocscience Inc. (version 5.018). The estimated settlement is anticipated to be ¾ inch or less. The settlement in the alluvial soils is anticipated to occur rapidly, within 2 to 3 weeks of fill placement. Final grading could be delayed for this time period to allow the settlement to occur before paving.

3.2. Stormwater Infiltration Considerations

Based on infiltration infeasibility discussed below, we understand that the project will be designed with rain gardens for stormwater quality and detention pipes for storage.

The Washington Department of Ecology's (Ecology's) 2019 *Stormwater Management Manual for Western Washington* (2019 SMMWW) provides guidelines for determining infiltration rates for stormwater systems and allows for the use of grain size analyses as a substitute for pilot infiltration tests (PITs) on site with soils unconsolidated by glacial advance. The 2019 SMMWW states that the preferred stormwater management techniques include infiltration, dispersion, and retainage of stormwater runoff as part of site development "to the extent feasible without causing flooding or erosion impacts." The Ecology Stormwater Manual describes how the feasibility can be evaluated when site conditions are appropriate, and also provides infeasibility criteria for each best management practice (BMP).

The 2019 Ecology Manual allows for some infeasibility criteria which may be "cited as reasons for a finding of infeasibility without further justification." Such criteria which are applicable to the proposed project include:

- "Where the minimum vertical separation of 1 foot to the seasonal high water table, bedrock, or other impervious layer would not be achieved…" for drainage areas with less than 10,000 square feet of impervious surface.

- "Where the minimum vertical separation of 3 feet to the seasonal high water table, bedrock, or other impervious layer would not be achieved…" for drainage areas exceeding 10,000 square feet of impervious surface and ¾ acres of pervious surfaces. It is our opinion that this condition applies to the proposed development.

Based on groundwater separation guidelines for infiltration systems presented in the 2019 SMMWW, the very shallow seasonal high groundwater, relatively low permeability of the fine-grained soils, as well as the general subsurface variability, it is our opinion that site conditions preclude the use of infiltration systems for stormwater management for this specific portion of the development.

3.3. CMP Storm Detention Pipe Design

As currently proposed, the stormwater detention is planned to consist of a series of connected 4- to 6-foot-diameter corrugated metal pipe (CMP) structures. The detention structure is planned to be founded with an invert at approximately Elevation 137 to 138 feet. Based on the results of our site explorations and review of nearby information, we anticipate that base of the culvert will bear in native alluvial soils. We recommend that subgrade soils be prepared as described in Section 3.3.1 of this report.

Backfill material around the culvert should be free of rocks larger than 3-inches diameter and backfill should proceed up equally on both sides of the pipe to avoid unbalanced loading on either side of the pipe.

3.3.1. Subgrade Preparation and Foundation Support

The results of our explorations indicate that soft/loose alluvial soils will likely be encountered at the proposed culvert subgrade elevation. We recommend that any soil disturbed during excavation at the foundation subgrade be thoroughly compacted to a firm condition or removed. The subgrade should be prepared to a uniformly firm surface and should be shaped to fit the pipe bottom before placement. Backfill should also be carefully tamped under the pipe haunches as recommended by the manufacturer. We expect that dewatering of perched groundwater may be required to stabilize the base of the excavation prior to compaction.

To provide uniform support, we recommend that the detention pipes bear on a minimum of 12 inches of foundation material consisting of crushed surface base course (CSBC) meeting criteria in section 9-03.9(3) of the Washington State Department of Transportation (WSDOT) Standard Specifications. For additional protection, a woven geotextile fabric for stabilization with a 200-pound tensile strength in accordance with ASTM International (ASTM) D 4632 (Mirafi HP270 or equivalent) should be placed over the native alluvial subgrade prior to placing the foundation material, especially if the subgrade is wet at the time of construction. We recommend that the condition of the pipe subgrade be observed by a representative of GeoEngineers to confirm that work is completed in accordance with our recommendations and that the subsurface conditions are as expected and provide recommendations for additional overexcavation, if necessary, based on conditions encountered during construction.

3.3.2. Buoyancy and Uplift

The below-grade pipes may extend below the groundwater level; therefore, buoyancy and uplift is a consideration and hydrostatic pressures should be considered up to Elevation 140 feet unless drainage provisions are provided. Resistance to uplift can be developed by the dead weight of the structure and backfill soil with unit weight of 120 pounds per cubic foot (pcf) above the groundwater table and 60 pcf below the groundwater table. In addition to the above means of resisting uplift, the structure may be anchored or ballasted to resist uplift.

Buoyancy and uplift can be controlled to some extent by installing a gravity relief drain at the desired design elevation that outfalls to the site discharge. This relief drain will limit the level that groundwater can rise in the vicinity of the below-grade pipe structures.

3.4. Site Retaining Walls

Low-height conventional cast-in-place walls may be necessary for retaining structures for grade separation at the site. Retaining wall design recommendations are provided in the following sections.

3.4.1. Shallow Foundation Design

The small cast-in-place walls will be supported on traditional shallow foundations. We anticipate that they will be lightly loaded.

3.4.1.1. Footing Subgrade Preparation

We recommend the footings bear on a minimum of 2 feet of structural fill. The structural fill described later in this report should be compacted to 95 percent of the maximum dry density (MDD) in accordance with ASTM D 1557. The overexcavation should extend 1 foot beyond the edges of the footings or a minimum lateral distance equivalent to one-half the depth below the footings, whichever is greater.

We suggest the excavations for the footings be accomplished with a smooth bucket to minimize subgrade disturbance. Any soft or disturbed material should be removed from the excavation or compacted to a dense condition. The fill subgrade soils will be susceptible to disturbance when wet. We recommend that we observe the subgrade and compaction of the subgrade to confirm suitable bearing conditions are present before fill placement.

3.4.1.2. Footing Design

Isolated or continuous spread footings founded on the minimum thickness of compacted structural fill as described above will provide adequate support for the proposed retaining walls. A maximum allowable soil bearing pressure of 1,500 pounds per square foot (psf) for dead plus live loads can be used for design. The allowable soil bearing pressure may be increased by up to one-third for wind or seismic loads.

3.4.1.3. Settlement

We estimate that the total settlement of spread footings founded on compacted structural fill prepared in accordance with our recommendations will be less than ¾-inch with differential settlement limited to less than ½-inch over 50 feet. The settlement will occur rapidly as loads are applied.

3.4.2. Lateral Earth Pressures

The lateral soil pressures acting on conventional cast-in-place subsurface walls will depend on the nature, density, and configuration of the soil behind the wall and the amount of lateral wall movement which can occur as backfill is placed.

For walls that are free to yield at the top at least 0.1 percent of the height of the wall, soil pressures will be less than if movement is limited by such factors as wall stiffness or bracing. Assuming that the walls are backfilled and drainage is provided as outlined in the following paragraphs, we recommend that yielding walls supporting horizontal backfill be designed using an equivalent fluid density of 35 pcf (triangular distribution), while non-yielding walls supporting horizontal backfill be designed using an equivalent fluid density of 55 pcf (triangular distribution). For seismic loading conditions, a rectangular earth pressure equal

to 7H psf, where H is the height of the wall, should be added to the active/at-rest pressures presented above. Traffic surcharges can be approximated by increasing the wall height (H) by 2 feet. Other surcharge loading should be applied as appropriate. GeoEngineers can assist in developing recommendations for other surcharge loading, as necessary.

Lateral resistance for conventional cast in place walls can be provided by frictional resistance along the base of the wall and passive resistance in front of the wall as previously below in the "Shallow Foundations" section of this report.

The above soil pressures assume that wall drains will be installed to prevent the buildup of hydrostatic pressure behind the walls, as discussed below.

3.4.3. Lateral Resistance

Lateral loads (e.g., wind and seismic) on the structure can be resisted by a combination of passive earth pressures on buried foundation elements, and frictional resistance, which can develop on the base of slabs or footings.

The passive resistance on the face of embedded foundation elements may be computed using an equivalent fluid density of 135 pcf for structural fill, which assumes a saturated condition. We recommend an allowable frictional resistance be computed using a coefficient of friction of 0.42 applied to vertical dead-load forces. The above values include a factor of safety of about 1.5.

3.5. Pavement Recommendations

3.5.1. Subgrade Preparation

We recommend the subgrade and subbase soils in new pavement areas be prepared and evaluated as described in Section 3.7. All pavement areas should be supported on at least 2 feet of structural fill compacted to at least 95 percent of the MDD. Prior to placing the 2-foot-thick structural fill layer, if the exposed subgrade soils are excessively loose or soft, it may be necessary to excavate localized areas and replace them with structural fill. Pavement subgrade conditions should be observed during construction and prior to placing the subbase materials in order to evaluate the presence of unsuitable subgrade soils and the need for over-excavation.

3.5.2. New Hot Mix Asphalt Pavement

In light-duty pavement areas (e.g., automobile parking), we recommend a pavement section consisting of at least 3 inches of ½-inch hot mix asphalt (HMA) (PG 58-22) per WSDOT Sections 5-04 and 9-03, over 4 inches of densely compacted crushed rock base course per WSDOT Section 9-03.9(3). Alternatively, the site development may follow the City of Arlington typical roadway standards, which consist of 3 inches of Class B asphalt over 4 inches of asphalt-treated base (ATB) over 6 inches of crushed rock base course as shown in the City of Arlington standard detail R-020. The base course and upper 24 inches of subgrade soils should be compacted to at least 95 percent of the MDD per ASTM D 1557. The pavement subgrade soils which will consist of imported structural fill should be compacted with a heavy smooth-drum vibratory roller to specified compaction per Section 3.6.3 below.

The pavement sections recommended above are based on our experience. Thicker asphalt sections may be needed based on the actual traffic data, truck loads, and intended use. All paved and landscaped areas should be graded so surface drainage is directed to appropriate catch basins.

3.6. Earthwork

Based on the subsurface soil conditions encountered in the explorations, we anticipate the soils at the site may be excavated using conventional construction equipment. The materials we encountered include topsoil, and soft/loose silty and sandy alluvium. The underlying glacial soils in the area commonly contain cobbles and boulders that may be encountered during deeper excavation. Accordingly, the contractor should be prepared to deal with cobbles and boulders.

Ideally, earthwork should be undertaken during extended periods of dry weather (June through September) when the surficial soils will be less susceptible to disturbance and provide better support for construction equipment. If possible, deeper excavations should be completed at times of the year when groundwater levels are deeper to reduce the amount of temporary dewatering required. Dry weather construction will help reduce earthwork costs.

3.6.1. Clearing and Site Preparation

Areas to be developed or graded should be cleared of surface and subsurface deleterious matter, including any debris, shrubs, trees and associated stumps and roots. Graded areas should be stripped of organic soils. Based on our observations, stripping depths on the order of 24 inches will be needed to remove organic topsoil and root mass materials in most areas but could range up to 3 feet. Deeper zones of organic soils should be expected in areas of dense vegetation or where large tree bulbs are located. We expect that the excavated topsoil and onsite native soils will be excavated and removed offsite.

3.6.2. Subgrade Preparation

Prior to placing new fills or pavement base course materials, subgrade areas for pavements should be evaluated to locate any soft or pumping soils. Native subgrade soils after stripping will likely not be suitable for a proof roll. We recommend the exposed subgrade areas be probed and evaluated by an engineer from our firm to determine the extent of any remaining soft unsuitable soils. If soft or pumping soils are observed, they should be removed and replaced with structural fill.

We recommend that the subgrade be compacted to the extent possible without causing undue weaving or pumping of the subgrade soils, or any loose/disturbed soil be removed. Subgrade disturbance or deterioration could occur if the subgrade is wet and cannot be dried. If the subgrade deteriorates during compaction, it may become necessary to modify the compaction criteria or methods.

3.6.3. Structural Fill

All newly placed fill should meet the criteria for structural fill presented below. The suitability of soil for use as structural fill depends on its gradation and moisture content.

3.6.3.1. Materials

Materials used to construct the surface parking and drive aisle areas, or to backfill utility trenches are classified as structural fill for the purpose of this report. Structural fill material quality varies depending upon its use as described below:

- A non-woven geotextile fabric such as Mirafi 140N, or other as approved by GeoEngineers, should be placed between the native alluvial subgrade and the permeable ballast.

- Structural fill placed as the permeable ballast drainage layer below the remainder of the fill should conform to Section 9-03.9(2) of the most recent WSDOT Standard Specifications.
- Structural fill placed to construct parking and roadway areas and to backfill utility trenches should consist of Imported Gravel Borrow as described in Section 9-03.14(1) of the most recent WSDOT Standard Specifications, with the additional restriction that the fines content be limited to no more than 5 percent.
- Structural fill placed as crushed surfacing base course below pavements or as support of the detention pipe structures should conform to Section 9-03.9 (3) of the most recent WSDOT Standard Specifications.

3.6.3.2. Reuse of On-site Soils

The near surface on-site soils consist of topsoil and upper silty sand or sandy silt alluvial soils. The topsoil should be stripped and removed from all areas were improvements are planned. The project consists of a fill with very little excavation of onsite soils with exception of the topsoil layers. Therefore, we do not expect large quantities of excavated materials will be generated for reuse. Site soils are not suitable for reuse as structural fill. For planning and budgeting purposes, we recommend that the project include imported gravel borrow for use as structural fill where other specific materials are not specified.

3.6.3.3. Fill Placement and Compaction

Structural fill should be compacted at moisture contents that are within 3 percent of the optimum moisture content as determined by ASTM Test Method D 1557 (Modified Proctor). The optimum moisture content varies with gradation and should be evaluated during construction. Fill material that is not near the optimum moisture content should be moisture conditioned prior to compaction.

Fill and backfill material should be placed in uniform, horizontal lifts, and compacted with appropriate equipment. The appropriate lift thickness will vary depending on the material and compaction equipment used. Fill material should be compacted in accordance with Table 1, below. It is the contractor's responsibility to select appropriate compaction equipment and place the material in lifts that are thin enough to meet these criteria. However, in no case should the loose lift thickness exceed 18 inches.

TABLE 1. COMPACTION CRITERIA

Fill Type	Compaction Requirements		
	Percent Maximum Dry Density Determined by ASTM Test Method D 1557 at ± 3% of Optimum Moisture		
	0 to 2 Feet Below Subgrade	> 2 Feet Below Subgrade	Pipe Zone
Imported Granular, maximum particle size < 1¼ inch	95	92	-----
Imported Granular (Permeable Ballast)	n/a (proof-roll)	n/a (proof-roll)	-----
Retaining Wall Backfill*	92	92	------
Nonstructural Zones	90	90	90
Trench Backfill	95	90	90

Note:

* Measures should be taken to prevent overcompaction of the backfill behind retaining walls. We recommend placing the zone of backfill located within 5 feet of the wall in lifts not exceeding about 6 inches in loose thickness and compacting this zone with hand-operated equipment such as a vibrating plate compactor and a jumping jack.

A representative from GeoEngineers should evaluate compaction of each lift of fill. Compaction should be evaluated by compaction testing unless other methods are proposed for oversized materials and are approved by GeoEngineers during construction. These other methods typically involve procedural placement and compaction specifications together with verifying requirements such as proof-rolling.

3.6.4. Weather Considerations

Disturbance of near surface soils should be expected, especially if earthwork is completed during periods of wet weather. During dry weather the soils will: (1) be less susceptible to disturbance; (2) provide better support for construction equipment; and (3) be more likely to meet the required compaction criteria.

The wet weather season generally begins in October and continues through May in western Washington; however, periods of wet weather may occur during any month of the year. For earthwork activities during wet weather, we recommend that the following steps be taken:

- The ground surface in and around the work area should be sloped so that surface water is directed away from the work area. The ground surface should be 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. Measures should be implemented to remove surface water from the work area.
- Earthwork activities should not take place during periods of moderate to heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting.
- The contractor should take necessary measures to prevent on-site soils and 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 the surficial soils by rolling with a smooth-drum roller prior to periods of precipitation will help reduce the extent that these soils become wet or unstable.
- The contractor should cover all soil stockpiles that will be used as structural fill with plastic sheeting.

3.7. Excavations

The stability of open cut slopes is a function of soil type, groundwater seepage, slope inclination, slope height and nearby surface loads. The use of inadequately designed open cuts could impact the stability of adjacent work areas, existing utilities, and endanger personnel. The contractor performing the work has the primary responsibility for protection of workmen and adjacent improvements. In our opinion, the contractor will be in the best position to observe subsurface conditions continuously throughout the construction process and to respond to variable soil and groundwater conditions. Therefore, the contractor should have the primary responsibility for deciding whether or not to use open cut slopes for much of the excavations rather than some form of temporary excavation support, and for establishing the safe inclination of the cut slope. Acceptable slope inclinations for utilities and ancillary excavations should be determined during construction. Because of the diversity of construction techniques and available shoring systems, the design of temporary shoring is most appropriately left up to the contractor proposing to complete the installation. Temporary cut slopes and shoring must comply with the provisions of Title 296 Washington Administrative Code (WAC), Part N, “Excavation, Trenching and Shoring.”

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 the slopes.

3.7.1. Temporary Cut Slopes

For planning purposes, temporary unsupported cut slopes more than 4 feet high and completed above the groundwater level may be inclined at 1.5H:1V (horizontal to vertical). These slopes may need to be flattened by the contractor if significant caving/sloughing or groundwater seepage occurs. Deeper excavations near or below the water table may require dewatering and/or shoring to maintain safe working 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;
- The excavation does not encroach on a 1H:1V influence line projected down from the edges of nearby or planned foundation elements;
- Exposed soil along the slope be protected from surface erosion using waterproof tarps, plastic sheeting, or flash coating with shotcrete;
- 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; and
- The general condition of the slopes be observed periodically by GeoEngineers to confirm adequate stability.

3.7.2. Temporary Dewatering

Excavations which extend below the groundwater level will require temporary dewatering. Dewatering via open pumping is therefore likely to be needed, as well as keeping excavations as shallow as possible below the groundwater table.

To the extent possible, the design should consider limiting the required excavations below the groundwater level and planned excavations should be completed during periods of lower groundwater levels. The Contractor should be made responsible for design, installation and operation of a suitable dewatering system to accommodate deeper excavations, which may require a series of dewatering wells or vacuum wellpoints to lower the groundwater below the base of the excavation during construction.

3.7.3. Utility Trenches

Trench excavation, pipe bedding, and trench backfilling should be completed using the general procedures described in the most recent WSDOT Standard Specifications or other suitable procedures specified by the project civil engineer. The recessional outwash and upper sand soils encountered at the site are generally of low corrosivity based on our experience in the Puget Sound area.

Utility trench backfill should consist of structural fill and should be placed in loose lifts not exceeding 12 inches in thickness when using heavy compaction equipment, or 6 inches when using light-weight hand operated compaction equipment. The actual thickness will be dependent on the structural fill material used, and the type and size of compaction equipment. Each lift should be conditioned to within 2 percent of the soils optimum moisture content and compacted to the specified density before placing subsequent lifts. The backfill should be compacted in accordance with the criteria discussed above.

3.7.4. Sedimentation and Erosion Control

In our opinion, the erosion potential of the on-site soils is low to moderate. Construction activities, including stripping and grading, will expose soils to the erosion effects of wind and water. The amount and potential impacts of erosion are partly related to the time of year that construction actually occurs. Wet weather construction will increase the amount and extent of erosion and potential sedimentation.

Erosion and sedimentation control measures may be implemented by using a combination of interceptor swales, straw bale barriers, silt fences and straw mulch for temporary erosion protection of exposed soils. All disturbed areas should be finish graded and seeded as soon as practicable to reduce the risk of erosion. Erosion and sedimentation control measures should be installed and maintained in accordance with the requirements of the City of Arlington.

4.0 LIMITATIONS

We have prepared this report for use by Williams Investments LLC, and other members of the design team for consideration in preliminary design of the proposed Centennial Park – Parking Lot Expansion development project in Arlington, Washington.

Within the limitation of scope, schedule and budget, our services have been executed in accordance with generally accepted geotechnical practices in the area at the time the 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 the Appendix C, "Report Limitations and Guidelines for Use," for additional information pertaining to use of this report.

5.0 REFERENCES

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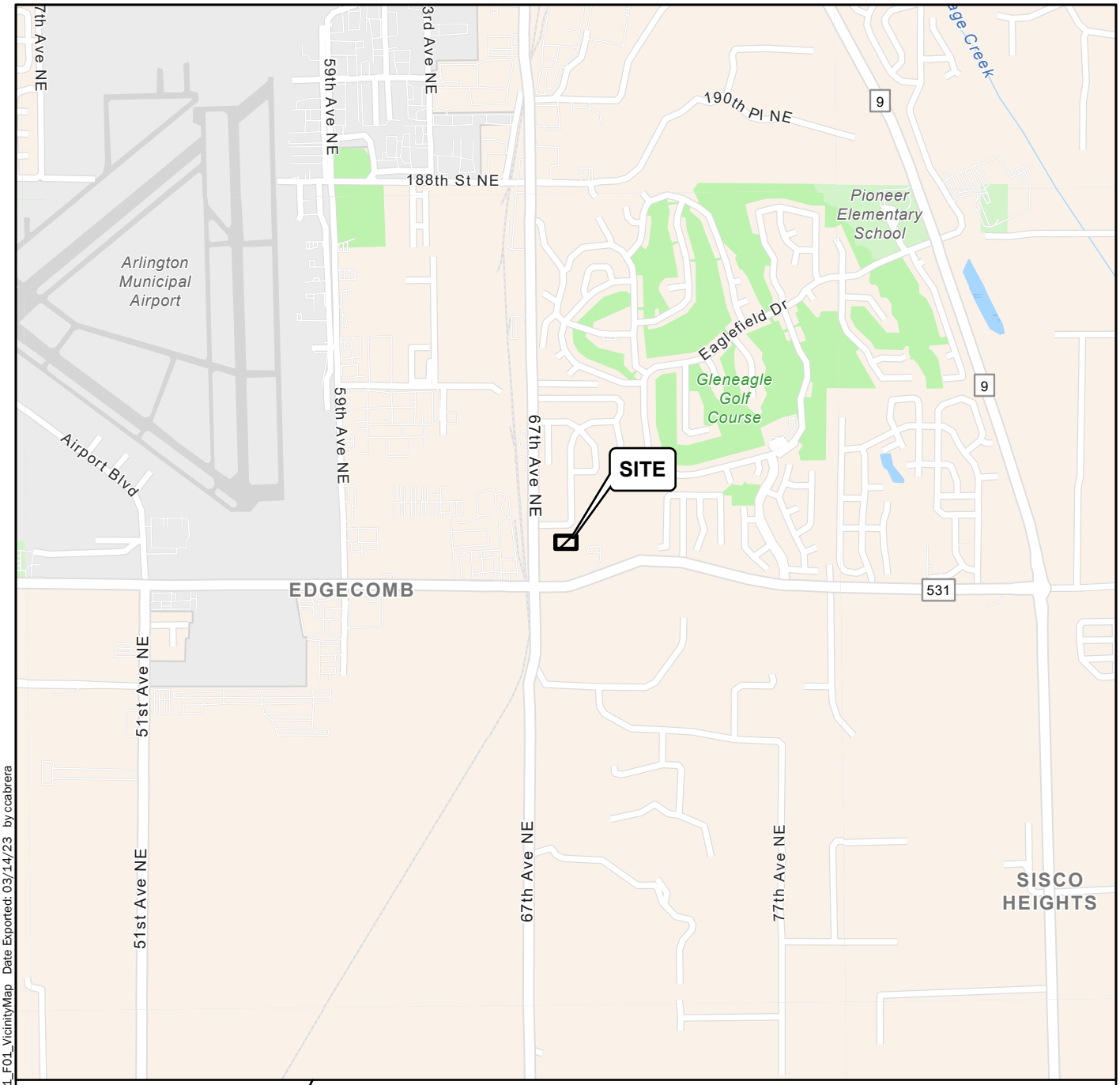
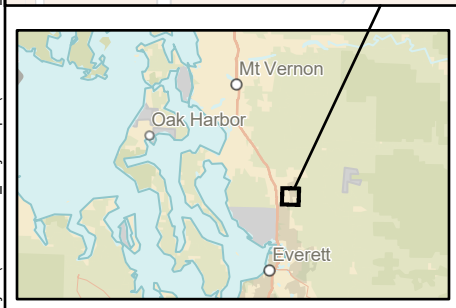
FIGURES

GeoEngineers





N

0 2,000

Feet

Source(s):
- ESRI

Coordinate System: NAD 1983 UTM Zone 10N

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.

Vicinity Map

Centennial Park Parking Expansion
Arlington, Washington

GeoEngineers

Figure 1

P:\22\22450002\GIS\22450002_Project\22450002_Project.aprx\2245000201_F01_VicinityMap Date Exported: 03/14/23 by ccabrera

Legend

Site Boundary

DCPT-1 Hand Auger and Dynamic Cone Penetration Test by GeoEngineers, 2023

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: Basemap survey by ORCA Land Surveying 3/15/2023.

Projection: WA State Plane, North Zone, NAD83, US Foot

N W E S

30 0 30
Feet

Site and Exploration Plan

Centennial Park Parking Expansion
Arlington, Washington

GeoEngineers

Figure 2

P:\22\22450002\CAD\01\Geotech Report\22450002O1_F02_Site Plan.dwg F02 Date Exported:4/4/2023 4:11 PM - by Gabby Register

APPENDICES

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APPENDIX A
Field Exploration and Laboratory Testing

APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING

Hand Auger Explorations

Subsurface conditions at the site were explored by completing five hand auger explorations (HA-1 through HA-5) at the site on February 23, 2023. Handhole explorations were completed to a maximum depth of about 4 feet below the existing surface. The approximate locations of the explorations are shown in the Site and Exploration Plan, Figure 2. The locations of the explorations were determined by hand-held global positioning system (GPS); therefore, the locations shown in the figures should be considered approximate.

Disturbed soils samples were obtained from the cuttings of the hand auger. The samples were placed in plastic bags to maintain the moisture content and transported back to our laboratory for analysis and testing.

The explorations were continuously monitored by a staff geotechnical engineer from our firm who examined and classified the soils encountered, obtained representative soil samples, observed groundwater conditions and prepared a detailed log of each exploration. Soils encountered in hand auger explorations were classified visually in general accordance with ASTM International (ASTM) D-2488-90, which is described in Figure A-1. An explanation of the symbols for the hand augers is also shown in Figure A-1.

The logs of the hand auger explorations are presented in Figures A-2 through A-6. The exploration logs are based on our interpretation of the field and laboratory data and indicate the various types of soils encountered. It also indicates the depths at which these soils or their characteristics change, although the change might actually be gradual. If the change occurred between samples, it was interpreted.

Dynamic Cone Penetrometer Testing

Dynamic cone penetration tests (DCPTs) were also completed at hand exploration locations (DCPT-1 through DCPT-5). The test records blow counts for 10-centimeter (cm) intervals from a 35-pound hammer falling a height of 15 inches. The blow counts can then be corrected to obtain equivalent Standard Penetration Test (SPT) blow counts. The logs of the DCPT soundings are presented in Figures A-7 through A-11. The DCPT explorations were completed to depths of 10 feet bgs. The exploration logs are based on empirical relationships developed by Triggs Technologies, Inc.

Laboratory Testing

Soil samples obtained from the hand auger explorations were transported to our laboratory and examined to confirm or modify field classifications, as well as to evaluate index properties of the soil samples. Representative samples were selected for laboratory testing consisting of moisture content determination, percent fines, and grain size distribution. The tests were performed in general accordance with ASTM test methods or other applicable procedures.

Moisture Content Testing

The natural moisture contents of selected soil samples obtained from the explorations were determined in general accordance with ASTM D 2216 test procedures. The results from the moisture content determinations are displayed in the column labeled "Moisture Content (%)" adjacent to the corresponding samples on the summary logs.

Percent Passing U.S. No. 200 Sieve

Selected samples were "washed" through the U.S. No. 200 mesh sieve to determine the relative percentage 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 in general accordance with ASTM D 1140. The results from the percent fines determinations are displayed in the column labeled "Fines Content (%)" adjacent to the corresponding samples on the summary exploration logs.

Sieve Analyses

Sieve analyses were performed on selected samples in general accordance with ASTM D 422 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-12.

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

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

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.

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 2/23/2022	Total Depth (ft) 4.5	Logged By PU Checked By AJH	Excavator N/A Equipment Hand Auger	See "Remarks" section for groundwater observed Caving not observed
Surface Elevation (ft) 137 Vertical Datum NAVD88		Easting (X) 1321685 Northing (Y) 423504	Coordinate System WA State Plane North 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
					TS	Brown silty sand with clay, rootlets and straw with mixed organic matter (very loose, moist) (topsoil)			
			1 MC				55		
136	1					Becomes wet			Slow groundwater seepage observed at 1 foot
135	2				ML	Gray sandy silt (very soft, wet) (alluvium)			
			2 %F				40	56	
134	3								
					SM	Gray silty fine to coarse sand (very loose to loose, wet)			
133	4		3 %F				24	30	

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

Log of Hand Auger HA-1

GeoEngineers

Project: Centennial Park Parking Expansion
Project Location: Arlington, Washington
Project Number: 22450-002-01

Figure A-2
Sheet 1 of 1

Date Excavated	2/23/2022	Total Depth (ft)	4.5	Logged By PU Checked By AJH	Excavator N/A Equipment Hand Auger	See "Remarks" section for groundwater observed Caving not observed
Surface Elevation (ft) Vertical Datum	138 NAVD88	Easting (X) Northing (Y)	1321775 423504	Coordinate System Horizontal Datum	WA State Plane North NAD83 (feet)	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					TS	Brown silty sand with clay, rootlets and straw with mixed organic matter (very loose, moist) (topsoil)			
137	1				ML/OL	Dark brown organic sandy silt (very soft, wet)			Slow groundwater seepage observed at 1 foot
136	2		1 MC				204		
135	3				ML	Gray sandy silt (soft, wet) (alluvium)			
134	4		2 MC				82		

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

Log of Hand Auger HA-2

GeoEngineers

Project: Centennial Park Parking Expansion
Project Location: Arlington, Washington
Project Number: 22450-002-01

Figure A-3
Sheet 1 of 1

Date Excavated 2/23/2022	Total Depth (ft) 4	Logged By PU Checked By AJH	Excavator N/A Equipment Hand Auger	See "Remarks" section for groundwater observed Caving not observed
Surface Elevation (ft) 142 Vertical Datum NAVD88		Easting (X) 1321861 Northing (Y) 423502	Coordinate System WA State Plane North 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
141	1		1 MC		TS	Brown silty sand with clay, rootlets and straw with mixed organic matter (very loose, moist) (topsoil)	57		
					SP-SM	Gray fine to coarse sand with silt and gravel (very loose, moist) (alluvium)			
140	2		2 SA				17	5	Slow groundwater seepage observed at 2½ feet
						Becomes wet			
139	3		3 %F		SM	Dark brown silty fine to medium sand with organics (very loose to loose, wet)	66	22	
138	4								

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

Log of Hand Auger HA-3

GeoEngineers

Project: Centennial Park Parking Expansion
Project Location: Arlington, Washington
Project Number: 22450-002-01

Figure A-4
Sheet 1 of 1

Date Excavated 2/23/2022	Total Depth (ft) 4	Logged By PU Checked By AJH	Excavator N/A Equipment Hand Auger	See "Remarks" section for groundwater observed Caving not observed
Surface Elevation (ft) 138 Vertical Datum NAVD88		Easting (X) 1321716 Northing (Y) 423428		Coordinate System WA State Plane North 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
					TS	Brown sandy silt with clay, grass, rootlets, roots and straw with mixed organic matter (very loose, moist) (topsoil)			
			1 MC				39		
137	1				SM	Gray silty fine to medium sand (very loose, moist) (alluvium)			
						Becomes wet			Slow groundwater seepage observed at 1½ feet
136	2		2 SA				29	29	
135	3				SP-SM	Gray fine to coarse sand with silt (very loose, wet)			
			3 %F				22	6	
134	4								

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

Log of Hand Auger HA-4

GeoEngineers

Project: Centennial Park Parking Expansion
Project Location: Arlington, Washington
Project Number: 22450-002-01

Figure A-5
Sheet 1 of 1

Date Excavated 2/23/2022	Total Depth (ft) 4	Logged By PU Checked By AJH	Excavator N/A Equipment Hand Auger	See "Remarks" section for groundwater observed Caving not observed
Surface Elevation (ft) 140 Vertical Datum NAVD88		Easting (X) 1321835 Northing (Y) 423428	Coordinate System WA State Plane North 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
139	1		1 MC		TS	Brown organic silty sand with clay, rootlets and straw with mixed organic matter (very loose, moist) (topsoil)	424		
138	2				SM	Gray silty sand (very loose to loose, wet) (alluvium)			Slow groundwater seepage observed at 2 feet
137	3								
136	4		2 SA				62	36	

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

Log of Hand Auger HA-5

GeoEngineers

Project: Centennial Park Parking Expansion
Project Location: Arlington, Washington
Project Number: 22450-002-01

Figure A-6
Sheet 1 of 1

WILDCAT DYNAMIC CONE LOG

GeoEngineers
554 West Bakerview Road
Bellingham, WA 98226

PROJECT NUMBER: 22450-002-01
DATE STARTED: 02-23-2023
DATE COMPLETED: 02-23-2023

HOLE #: DCPT-1
CREW: Piradeepan Uthayakumar
PROJECT: Centennial Parking Expansion
ADDRESS: 17327 67th Avenue NE
LOCATION: Arlington, WA

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 1 ft	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 2 ft	0	0.0		0	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 3 ft	0	0.0		0	VERY LOOSE	VERY SOFT
- 1 m	3	13.3	•••	3	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
- 4 ft	3	11.6	•••	3	VERY LOOSE	SOFT
-	4	15.4	••••	4	VERY LOOSE	SOFT
-	2	7.7	••	2	VERY LOOSE	SOFT
- 5 ft	9	34.7	•••••••••	9	LOOSE	STIFF
-	11	42.5	••••••••••••	12	MEDIUM DENSE	STIFF
-	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
- 6 ft	14	54.0	•••••••••••••••	15	MEDIUM DENSE	STIFF
-	15	57.9	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 2 m	15	57.9	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 7 ft	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
-	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
-	16	54.7	•••••••••••••••	15	MEDIUM DENSE	STIFF
- 8 ft	13	44.5	••••••••••••	12	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
- 9 ft	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
-	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
- 3 m 10 ft	16	54.7	•••••••••••••••	15	MEDIUM DENSE	STIFF
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure A-7

WILDCAT DYNAMIC CONE LOG

GeoEngineers
554 West Bakerview Road
Bellingham, WA 98226

PROJECT NUMBER: 22450-002-01
DATE STARTED: 02-23-2023
DATE COMPLETED: 02-23-2023

HOLE #: DCPT-2
CREW: Piradeepan Uthayakumar
PROJECT: Centennial Parking Expansion
ADDRESS: 17327 67th Avenue NE
LOCATION: Arlington, WA

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 1 ft	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 2 ft	0	0.0		0	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 3 ft	2	8.9	••	2	VERY LOOSE	SOFT
- 1 m	2	8.9	••	2	VERY LOOSE	SOFT
-	2	7.7	••	2	VERY LOOSE	SOFT
- 4 ft	2	7.7	••	2	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
-	2	7.7	••	2	VERY LOOSE	SOFT
- 5 ft	11	42.5	••••••••••••	12	MEDIUM DENSE	STIFF
-	14	54.0	••••••••••••••	15	MEDIUM DENSE	STIFF
-	15	57.9	•••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 6 ft	17	65.6	••••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
-	15	57.9	•••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 2 m	16	61.8	••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
- 7 ft	16	54.7	••••••••••••••	15	MEDIUM DENSE	STIFF
-	15	51.3	•••••••••••••	14	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••	13	MEDIUM DENSE	STIFF
- 8 ft	13	44.5	••••••••••••	12	MEDIUM DENSE	STIFF
-	15	51.3	•••••••••••••	14	MEDIUM DENSE	STIFF
-	15	51.3	•••••••••••••	14	MEDIUM DENSE	STIFF
- 9 ft	15	51.3	•••••••••••••	14	MEDIUM DENSE	STIFF
-	15	51.3	•••••••••••••	14	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••	13	MEDIUM DENSE	STIFF
- 3 m 10 ft	15	51.3	•••••••••••••	14	MEDIUM DENSE	STIFF
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure A-8

WILDCAT DYNAMIC CONE LOG

GeoEngineers
554 West Bakerview Road
Bellingham, WA 98226

PROJECT NUMBER: 22450-002-01
DATE STARTED: 02-23-2023
DATE COMPLETED: 02-23-2023

HOLE #: DCPT-3
CREW: Piradeepan Uthayakumar
PROJECT: Centennial Parking Expansion
ADDRESS: 17327 67th Avenue NE
LOCATION: Arlington, WA

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 1 ft	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 2 ft	3	13.3	•••	3	VERY LOOSE	SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 3 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 m	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	2	7.7	••	2	VERY LOOSE	SOFT
- 4 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
-	1	3.9	•	1	VERY LOOSE	VERY SOFT
-	1	3.9	•	1	VERY LOOSE	VERY SOFT
- 5 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	2	7.7	••	2	VERY LOOSE	SOFT
- 6 ft	2	7.7	••	2	VERY LOOSE	SOFT
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
- 2 m	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
- 7 ft	8	27.4	•••••••	7	LOOSE	MEDIUM STIFF
-	12	41.0	••••••••••••	11	MEDIUM DENSE	STIFF
-	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
- 8 ft	13	44.5	••••••••••••	12	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
- 9 ft	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
-	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
-	16	54.7	•••••••••••••••	15	MEDIUM DENSE	STIFF
- 3 m 10 ft	17	58.1	•••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure A-9

WILDCAT DYNAMIC CONE LOG

GeoEngineers
554 West Bakerview Road
Bellingham, WA 98226

PROJECT NUMBER: 22450-002-01
DATE STARTED: 02-23-2023
DATE COMPLETED: 02-23-2023

HOLE #: DCPT-4
CREW: Piradeepan Uthayakumar
PROJECT: Centennial Parking Expansion
ADDRESS: 17327 67th Avenue NE
LOCATION: Arlington, WA

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 1 ft	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 2 ft	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 3 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	2	7.7	••	2	VERY LOOSE	SOFT
- 4 ft	2	7.7	••	2	VERY LOOSE	SOFT
-	4	15.4	••••	4	VERY LOOSE	SOFT
-	8	30.9	••••••••	8	LOOSE	MEDIUM STIFF
- 5 ft	10	38.6	••••••••••	11	MEDIUM DENSE	STIFF
-	15	57.9	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
- 6 ft	18	69.5	••••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
-	15	57.9	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 2 m	14	54.0	•••••••••••••••	15	MEDIUM DENSE	STIFF
- 7 ft	13	44.5	••••••••••••	12	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
- 8 ft	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
-	15	51.3	•••••••••••••••	14	MEDIUM DENSE	STIFF
-	16	54.7	•••••••••••••••	15	MEDIUM DENSE	STIFF
- 9 ft	17	58.1	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	18	61.6	••••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
-	17	58.1	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 3 m 10 ft	15	51.3	•••••••••••••••	14	MEDIUM DENSE	STIFF
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure A-10

WILDCAT DYNAMIC CONE LOG

GeoEngineers
554 West Bakerview Road
Bellingham, WA 98226

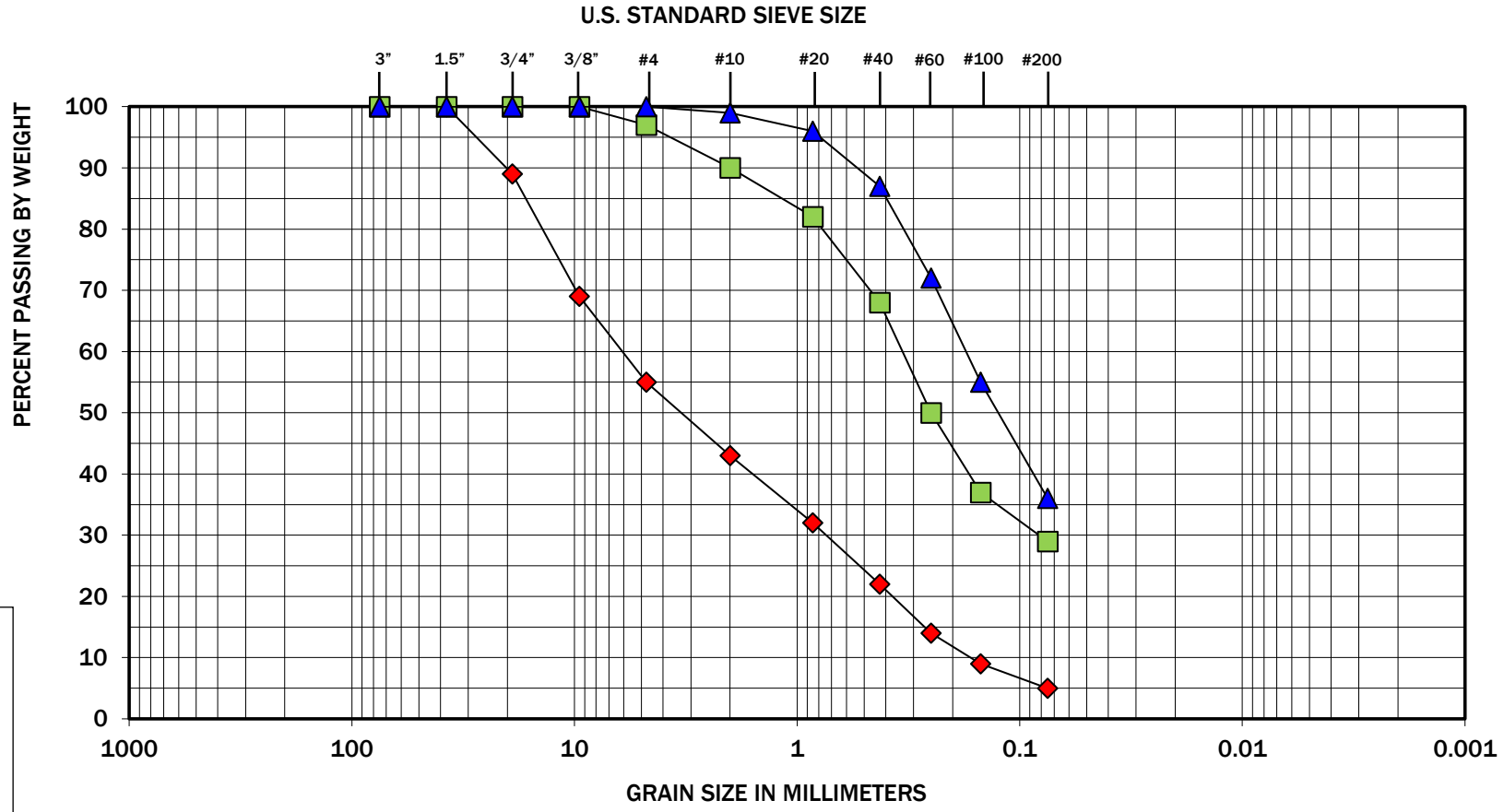
PROJECT NUMBER: 22450-002-01
DATE STARTED: 02-23-2023
DATE COMPLETED: 02-23-2023

HOLE #: DCPT-5
CREW: Piradeepan Uthayakumar
PROJECT: Centennial Parking Expansion
ADDRESS: 17327 67th Avenue NE
LOCATION: Arlington, WA

SURFACE ELEVATION:
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 3 ft	3	13.3	•••	3	VERY LOOSE	SOFT
- 1 m	3	13.3	•••	3	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
- 4 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
-	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
-	4	15.4	••••	4	VERY LOOSE	SOFT
- 5 ft	3	11.6	•••	3	VERY LOOSE	SOFT
-	2	7.7	••	2	VERY LOOSE	SOFT
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
- 6 ft	12	46.3	••••••••••••	13	MEDIUM DENSE	STIFF
-	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
- 2 m	14	54.0	•••••••••••••••	15	MEDIUM DENSE	STIFF
- 7 ft	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
-	13	44.5	•••••••••••••	12	MEDIUM DENSE	STIFF
-	13	44.5	•••••••••••••	12	MEDIUM DENSE	STIFF
- 8 ft	12	41.0	••••••••••••	11	MEDIUM DENSE	STIFF
-	13	44.5	•••••••••••••	12	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
- 9 ft	16	54.7	•••••••••••••••	15	MEDIUM DENSE	STIFF
-	13	44.5	•••••••••••••	12	MEDIUM DENSE	STIFF
-	14	47.9	••••••••••••••	13	MEDIUM DENSE	STIFF
- 3 m 10 ft	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure A-11



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	HA-3	2	17	Sand with silt and gravel (SP-SM)
■	HA-4	2	29	Silty sand (SM)
▲	HA-5	3.5	62	Silty sand (SM)

The grain size analysis results were obtained in general accordance with ASTM D 6913. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

GeoEngineers

Centennial Park Parking Expansion
Arlington, Washington

Sieve Analysis Results

Figure A-12

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 Williams Investments 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 Williams Investments LLC dated and authorized on February 1, 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 proposed Centennial Park – Parking Lot Expansion project in Arlington, 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:

- The function of the proposed structure;
- Elevation, configuration, location, orientation or weight of the proposed structure;

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

- 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.

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

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.

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.

Topsoil

For the purposes of this report, we consider topsoil to consist of generally fine-grained soil with an appreciable amount of organic matter based on visual examination and to be unsuitable for direct support of the proposed improvements. However, the organic content and other mineralogical and gradational characteristics used to evaluate the suitability of soil for use in landscaping and agricultural purposes was not determined, nor considered in our analyses. Therefore, the information and recommendations in this report and our logs and descriptions should not be used as a basis for estimating the volume of topsoil available for such purposes.

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