Geotechnical Engineering Report

The Point
19402 Smokey Point Boulevard
Arlington, WA

Prepared For:

Northwest Land Development, LLC
P.O. Box 12867
Mill Creek, WA

Attn: Mr. Michael Weeks

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September 16, 2022
Project No. 22-0727

Northwest Land Development, LLC
P.O. Box 12867
Mill Creek, WA

Attention: Mr. Michael Weeks

Regarding: Geotechnical Engineering Report
The Point
19402 Smokey Point Boulevard
Arlington, WA
(Parcel No. 31051700400600)

Dear Michael,

As requested, GeoTest Services, Inc. [GeoTest] is pleased to submit the following report summarizing the results of our geotechnical engineering evaluation for The Point project located at the above referenced address in Arlington, WA (see *Vicinity Map*, Figure 1). This report has been prepared in general accordance with the terms and conditions established in our services agreement dated August 5, 2022 and authorized by yourself.

GeoTest appreciates the opportunity to provide geotechnical services on this project and look forward to assisting you during the construction phase. Should you have any further questions regarding the information contained within the report, or if we may be of service in other regards, please contact the undersigned.

Respectfully,
GeoTest Services, Inc.

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PROFESSIONAL ENGINEER
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Enclosure: Geotechnical Engineering Report

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PURPOSE AND SCOPE OF SERVICES

The purpose of this evaluation is to establish general subsurface conditions beneath the site from which conclusions and recommendations pertaining to the project design can be formulated. Our scope of services includes the following tasks:

- Explore soil and groundwater conditions underlying the site by excavating ten test pits with a client-provided tracked excavator.
- Perform laboratory testing on representative samples to classify and evaluate the engineering characteristics of the soils encountered and to assess on-site infiltration capability.
- Provide a written report containing a description of subsurface conditions and exploration logs. The findings and recommendations in this report pertain to site preparation and earthwork, fill and compaction, seismic design, foundation recommendations, concrete slab-on-grade construction, foundation and site drainage, infiltration feasibility, utilities, temporary and permanent slopes, pavement structures, geotechnical consultation, and construction monitoring.
- Assess Geologically Hazardous Areas (if present) per Arlington Municipal Code (AMC).

PROJECT DESCRIPTION

GeoTest understands that the subject property will be developed to include a new multi-use complex that will include multi-family housing, retail buildings, and townhome-style residential structures. It is expected that much of the approximately 8-acre site will be paved or covered by roof area/hardscape surfaces. GeoTest understands that the planned buildings will be one to 3 stories in height, will utilize wood-frame construction, and will likely include slab-on-grade floors. The structural loads have not been provided but are expected to be light to moderate.

GeoTest generally anticipates that information regarding infiltration feasibility will be needed for the property. The use of Low Impact Development coupled with shallow infiltration facilities are strategies that are expected for the management of stormwater on this site.

SITE CONDITIONS

This section includes a description of the general surface and subsurface conditions observed at the project site during the time of our field investigation. Interpretations of site conditions are based on the results and review of available information, site reconnaissance, subsurface explorations, laboratory testing, and previous experience in the project vicinity.

Surface Conditions

The proposed project area is located within a trapezoidal shaped parcel west of Smokey Point Boulevard in Arlington, WA and is approximately 8 acres in size. Interstate 5 also borders the parcel to the west behind coniferous foliage which roughly comprises the western half of the subject property. Underbrush and other deciduous forest canopy also exist within the proposed project area, as well as an open grass field in the parcel's northeastern quadrant. A single-family residence also resides within the upper, southern half of the project area.

The parcel gently terraces and slopes up in elevation from north to south, with approximately 15 feet of vertical relief. Just east of the property and Smokey Point Boulevard is the Stillaguamish River floodplain, approximately 40 feet below the grade of the project site. For purposes of this report, we split the subject property into both an "upper half" and "lower half," as depicted in *Topographic Bare Earth Imagery Plan* attached at the end of this report (Figure 5).

Images 1 and 2. A southwestern view of the upper portion of the property and the single-family residence on site (Image 1), as well as a northwestern view of the lower portion of the subject parcel (Image 2).

Subsurface Soil Conditions

Subsurface conditions were explored by advancing ten test pits (TP-1 through TP-10) on August 11, 2022. The explorations were each advanced to an approximate depth of 8 to 10 feet below ground surface (BGS) using a track-mounted excavator. Approximate locations of these explorations have been plotted on the *Site and Exploration Plan* (Figure 2).

The test pits encountered similar subsurface conditions. In general, our explorations exhibited approximately 0.5 to 1.5 feet of topsoil overlying native soils throughout the proposed development area. The topsoil is comprised of loose, dark brown to black, dry, slightly silty, very gravelly sand with abundant organics. These surficial organic soils are underlain by native, medium dense, tan, dry to damp, silty to poorly graded sands and gravels. In general, these sands and gravels were siltier at higher elevations, and graded into less silty, both well and poorly

graded soils with depth. It should also be noted that Test Pit TP-3 exhibited a medium stiff, tan, dry, very sandy silt underlying the topsoil, further implying the higher silt contents of near surface, native soils throughout the project area. GeoTest interprets these granular soils as the Marysville Sand member of the Recessional Outwash mapped in the area (Minard, 1985). The Marysville Sand was encountered to the maximum explored depth of most of our explorations.

Within a few of our test pit explorations at depths ranging between 7 and 9.5 feet BGS (Test Pits TP-2 – TP-4, and TP-6), GeoTest also observed a gray, stiff, damp, slightly clayey, very sandy silt with trace gravel. Based on its existence, coupled with both the presence of perched groundwater observed in other exploration locations (refer to the *Groundwater* section of this report for more information) as well as the site's elevation above the Stillaguamish floodplain, it appears that this silt unit is present within the upper 10 to 15 feet of the site grade within the lower half of the proposed development area. Based on regional mapping, we interpret these soils to be that of the Clay Member of the Recessional Outwash unit mapped in the area (Minard, 1985).

For the purposes of this report, we refer to the Marysville Sand member of the Recessional Outwash as "Marysville Sand," and the Clay Member of the Recessional Outwash as the "Clay Member." More detailed logs of the subsurface conditions encountered within our explorations are presented in the enclosed *Test Pit Logs* attached to the end of this report.

Image 3. Subsurface soil conditions within test pit TP-3, exhibiting granular outwash overlying slightly clayey, very sandy silt at depth, with perched groundwater atop these finer soils.

General Geologic Conditions

Geologic information for the project site was obtained from the *Geologic map of the Arlington West 7.5-minute quadrangle, Snohomish County, Washington* (Minard, 1985) published by the U.S. Geological Survey. This map indicates that the project site is underlain by Vashon Drift Recessional Outwash consisting of the Marysville Sand Member (map unit Qvrm) and the Clay Member (map unit Qvrc), with alluvium also mapped nearby but at lower elevations off site.

Alluvium is located within the Stillaguamish River floodplain east of and topographically below the proposed development area. This unit generally consists of stratified gravels, sands, and silts within floodplains, active channels, and historic fluvial basins at elevations near the water table.

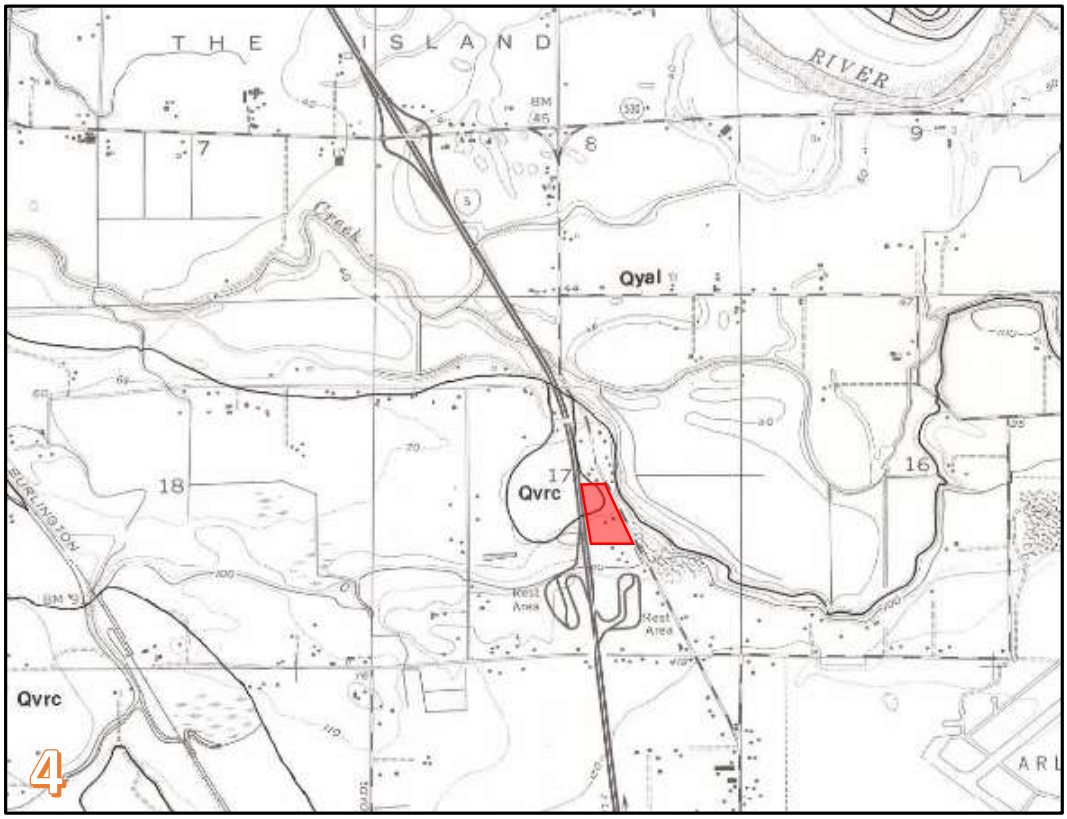

Image 4. Mapped geologic units within the vicinity of the project site (shown in red), as mapped by Minard, illustrating the presence of alluvium (map unit Qyal), Marysville Sand (map unit Qvrm), and the Clay Member (map unit Qvrc) in the area.

The Marysville Sand Member of the Recessional Outwash consists of mostly well-drained, outwash sand with minor amounts of gravel. The Clay Member is comprised of gray, olive gray, mottled, massive clay to silt and is associated with the Marysville Sand Member, such that it grades into and interfingers laterally with the Marysville Sand member. Recessional outwash deposits such as these were deposited as valley fill by meltwater flowing south from the stagnating and receding Vashon Glacier during the Pleistocene Epoch. Glaciofluvial environments

deposited different sediments depending on the depositional environments and energy levels. More granular outwash is representative of higher energy, glacial river environments, while silts and clays were likely deposited in lower energy fluvial and glaciolacustrine environments.

Our on-site explorations indicate that the encountered subsurface soil conditions are generally in accordance with the Marysville Sand and Clay Member soil units. For the purposes of this geotechnical report, we have referred to the Marysville Sand Member of the Recessional outwash as 'Marysville Sand'.

Groundwater

Groundwater seepage was encountered within test pits TP-1, TP-2, TP-4 – TP-6, TP-8, and TP-10 at the time of our investigation on August 11, 2022. The depth of observed seepage ranged between approximately 5 and 9 feet BGS, with shallower seepage observed within the sites lower half and the center portion of the subject property. GeoTest interprets the seepage as a perched groundwater horizon, in which groundwater is perched atop the silt exposed at depth within a few test pits. We also make this inference due to the proximity of floodplain to the east, which is approximately 40 to 50 feet lower in elevation, where a regional groundwater condition likely exists.

Perched water is not representative of a widespread, regional aquifer. Rather, it is representative of surface water and near-surface interflow that collects over denser or siltier soils with reduced hydraulic conductivities. Perched water is typically less than a few feet in thickness and is typically present during extended periods of wet weather.

The groundwater conditions reported on the exploration logs are for the specific locations and dates indicated, and therefore may not be indicative of other locations and/or times. Groundwater levels are variable and groundwater conditions fluctuate depending on local subsurface conditions, precipitation, and changes in on-site and off-site use.

GEOLOGIC HAZARDS

As the subject property is located within the City of Arlington, GeoTest reviewed Chapter 20.93.600 (Geologically Hazardous Areas) of the AMC. Because the subject property is relatively flat, it is GeoTest's opinion that the subject property does not contain hazards pertaining to erosion, landslides, or steep slopes (i.e., not an Erosion Hazard, Landslide Hazard, or Steep Slope Hazard). However, the subject property is mapped as having a low to moderate susceptibility to liquefaction and is discussed in the next section of this report.

Seismic and Liquefaction Hazards

AMC 20.93.600(4) defines "Seismic Hazard Areas" as "areas subject to severe risk of earthquake damage as a result of seismic induced settlement, shaking, slope failure or soil liquefaction. These conditions occur in areas underlain by cohesion less soils of low density usually in association with a shallow groundwater table."

Based on a review of information obtained from the Washington State Department of Natural Resources *Geologic Information Portal*, there are no mapped seismic features within the local vicinity of the proposed development area. The subject site is also classified as having a low to moderate liquefaction susceptibility. However, this map only provides an estimate of the likelihood that the soil will liquefy as a result of an earthquake and is meant as a general guide to delineate areas prone to liquefaction.

Liquefaction is defined as a significant rise in porewater pressure within a soil mass caused by earthquake-induced cyclic shaking. The shear strength of liquefiable soils is reduced during large and/or long duration earthquakes as the soil consistency approaches that of semi-solid slurry. Liquefaction can result in significant and widespread structural damage if not properly mitigated. Deposits of loose, granular soil below the groundwater table are most susceptible to liquefaction. Damage caused by foundation rotation, lateral spreading, and other ground movements can result from soil liquefaction.

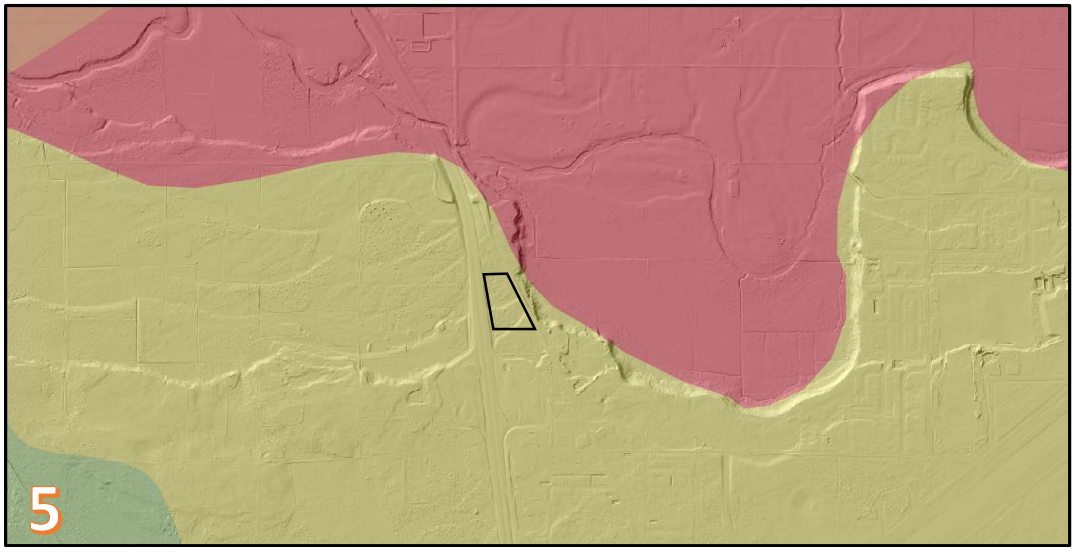

Image 5. Map showing liquefaction hazard susceptibility within the proposed development area shown in black. Yellow depicts "low to moderate" susceptibility in the vicinity of subject property (Data source: Washington Geologic Information Portal).

Based on our subsurface explorations, the site is underlain by native, medium dense, sandy soils with varying amounts of gravel. Groundwater seepage was encountered within medium dense, native soils. Due to these factors, it is GeoTest's opinion that the potential for liquefaction

underlying the subject property is generally low. For structures three stories tall or less, it is our opinion that no additional mitigations are required to address liquefaction for the proposed development. Should the development plan include structures for four stories or greater, GeoTest reserves the right to re-evaluate the liquefaction potential for the site.

Potential Volcanic Hazards

Based on a review of information obtained from the *Geologic Information Portal*, the project area is located approximately 750 feet from a mapped Volcanic Hazard Area (Lahar Hazard). The AMC does not define volcanic hazards; thus, no volcanic hazards exist on this property per AMC. However, the project's vicinity to a lateral perimeter of a mapped "volcanic hazard," as mapped by the Department of Nature Resources, should be noted.

It is GeoTest's opinion that the level of risk is not sufficient to prevent development of the subject property as proposed due to the elevation above the Stillaguamish River floodplain. No lahar mitigations are expected as part of site development.

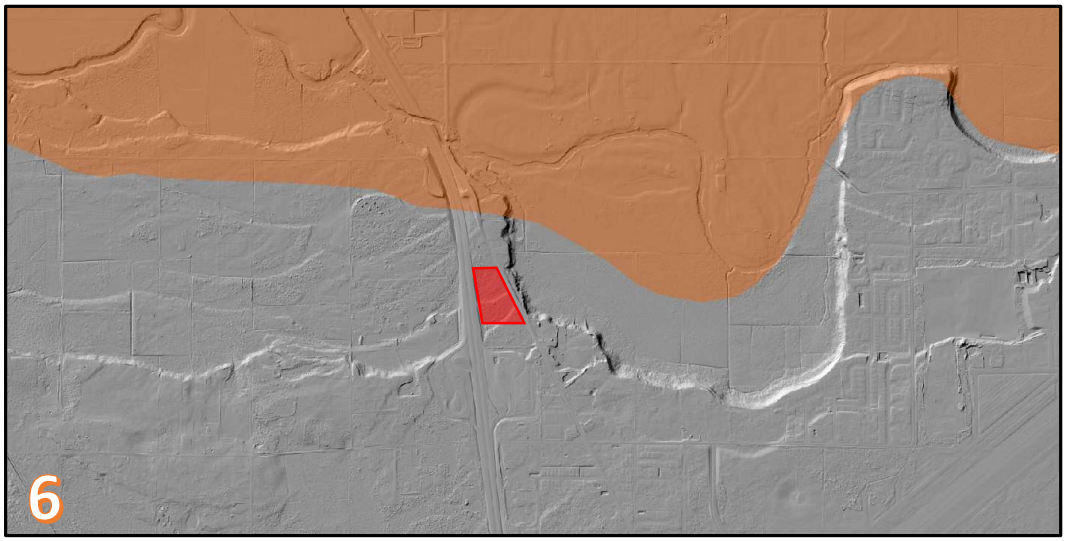

Image 6. Map showing the proposed development in red and its vicinity to a potential lahar flow path from a Glacier Peak volcanic event in orange (Data source: Washington Geologic Information Portal).

CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation of the data collected during this investigation, it is GeoTest's opinion that the subsurface conditions at the site are suitable for the proposed development, provided the recommendations contained herein are incorporated into the project design.

The subsurface explorations that were performed for this study generally encountered native, non-organic, medium dense, Marysville Sand within approximately 0.5 to 1.5 feet of existing grade. We recommend that the loose, near-surface topsoil be removed from the building

footprints, roadways, and parking lot areas down to the native Marysville Sand. Once stripping is completed, the subgrade should then be compacted to a firm and unyielding condition. GeoTest personnel should be on site to observe the excavation and confirm that adequate native subgrade has been exposed. The proposed buildings can then be constructed with conventional continuous or individual spread foundations bearing directly on firm and unyielding native soil, or on compacted structural fill placed atop firm and unyielding soils. Further recommendations regarding the placement and compaction of structural fill can be found in the *Fill and Compaction* section of this report.

Based on the native soils encountered in the test pits, it appears that the subject site is suitable for stormwater infiltration. The native Marysville Sand encountered in our explorations was medium dense and composed of sand with varying amounts of gravel. Perched groundwater seepage was observed at depths ranging between 5 and 9 feet BGS throughout various portions of the proposed development area. Perched groundwater seepage was specifically observed atop the Clay Member within the lower half of the proposed development area. This will present challenges associated with the placement, design, and implementation of infiltration facilities given the lower site elevations and the reduced amount of separation that will exist between facility bottoms and perched groundwater conditions. Our preliminary stormwater infiltration recommendations are presented in the *Stormwater Infiltration Potential* section of this report. It should be noted that Pilot Infiltration Testing and/or groundwater monitoring may be required by the City of Arlington, both of which are outside the scope of this report.

Site Preparation and Earthwork

The portions of the site proposed for foundations, floor slabs, pavements, and sidewalks should be prepared by removing existing topsoil, loose fill (if present), deleterious material, and significant accumulations of organics. GeoTest anticipates between 0.5 and 1.5 feet of removal as part of site stripping activities. Prior to placement of any foundation elements or structural fill, the exposed subgrade under all areas to be occupied by soil-supported floor slabs, spread, or continuous foundations should be recompacted to a firm and unyielding condition. Verification of compaction should be performed by qualified geotechnical personnel. The purpose of this effort is to identify loose or soft soil deposits so that, if feasible, the soil distributed during site work can be recompacted.

Proof rolling should be carefully observed by qualified geotechnical personnel. Areas exhibiting significant deflection, pumping, or over-saturation that cannot be readily compacted should be overexcavated to firm soil. Overexcavated areas should be backfilled with compacted granular material placed in accordance with subsequent recommendations for structural fill. During periods of wet weather, proof rolling could damage the exposed subgrade. Under these conditions, qualified geotechnical personnel should observe subgrade conditions to determine if proof rolling is feasible.

Fill and Compaction

Structural fill used to obtain final elevations for footings and soil-supported floor slabs must be properly placed and compacted. In most cases, suitable, non-organic, predominantly granular soil may be used for fill material provided the material is properly moisture conditioned prior to placement and compaction, and the specified degree of compaction is obtained. Material containing topsoil, wood, trash, organic material, or construction debris is not suitable for reuse as structural fill and should be properly disposed off-site or placed in nonstructural areas.

Soils containing more than approximately five percent fines are considered moisture sensitive and are difficult to compact to a firm and unyielding condition when over the optimum moisture content by more than approximately two percent. The optimum moisture content is that which allows the greatest dry density to be achieved at a given level of compactive effort.

Reuse of On-Site Soil

The on-site, non-organic, Marysville Sand is suitable for reuse as structural fill when placed at or near optimum moisture contents, as determined by ASTM D1557, and if allowed for in the project plans and specifications. The near-surface soils contain elevated silt contents and are expected to be difficult to use during periods of wet weather. The Clay Member deposits found at depth throughout the site may also be re-used in the same manner, but will be very moisture sensitive.

The Contractor and Owner should be prepared to manage over-optimum moisture content soils. Moisture content of the site soils may be difficult to control during periods of wet weather.

Imported Structural Fill

GeoTest recommends that imported structural fill consist of clean, well-graded sandy gravel, gravelly sand, or other approved naturally occurring granular material (pit run) with at least 30 percent retained on the No. 4 sieve, or a well-graded crushed rock. Structural fill for dry weather construction may contain up to 10 percent fines (that portion passing the U.S. No. 200 sieve) based on the portion passing the U.S. No. 4 sieve. The use of an imported fill having more than 10 percent fines may be feasible, but the use of these soils should generally be reviewed by the design team prior to the start of construction.

Imported structural fill with less than five percent fines should be used during wet weather conditions. Due to wet site conditions, soil moisture contents could be high enough that it may be difficult to compact even clean imported select granular fill to a firm and unyielding condition. Soils with an over-optimum moisture content should be scarified and dried back to a suitable moisture content during periods of dry weather or removed/replaced with drier structural fill.

Backfill and Compaction

Structural fill should be placed in horizontal lifts. The structural fill must measure 8 to 10 inches in loose thickness and be thoroughly compacted. All structural fill placed under load bearing areas should be compacted to at least 95 percent of the maximum dry density, as determined using test method ASTM D1557. The top of the compacted structural fill should extend outside all foundations and other structural improvements a minimum distance equal to the thickness of the fill. We recommend that compaction be tested after placement of each lift in the fill pad.

Wet Weather Earthwork

If construction takes place during wet weather, GeoTest recommends that structural fill consist of imported, clean, well-graded sand, or sand and gravel as described above. If fill is to be placed or earthwork is to be performed in wet conditions, the contractor may reduce soil disturbance by:

- Limiting the size of areas that are stripped of topsoil and left exposed
- Accomplishing earthwork in small sections
- Limiting construction traffic over unprotected soil
- Sloping excavated surfaces to promote runoff
- Limiting the size and type of construction equipment used
- Providing gravel 'working mats' over areas of prepared subgrade
- Removing wet surficial soil prior to commencing fill placement each day
- Sealing the exposed ground surface by rolling with a smooth drum compactor or rubber-tired roller at the end of each working day
- Providing up-gradient perimeter ditches or low earthen berms and using temporary sumps to collect runoff and prevent water from ponding and damaging exposed subgrades

Seismic Design Considerations

The Pacific Northwest is seismically active, and the site could be subject to movement from a moderate or major earthquake. Consequently, moderate levels of seismic shaking should be accounted for during the design life of the project, and the proposed structure should be designed to resist earthquake loading using appropriate design methodology.

For structures designed using the seismic design provisions of the 2018 International Building Code, the medium dense Marysville Sand is classified as Site Class D, according to ASCE 7-16. The structural engineer should select the appropriate design response spectrum based on Site Class D soil and the geographical location of the proposed construction.

Foundation Support

Foundation support for the proposed development can be established via continuous or isolated spread footings founded on firm and unyielding native soils (Marysville Sand or Clay Member), or on properly compacted structural fill placed directly over firm and unyielding native soil. GeoTest expects that at least 0.5 to 1.5 feet of excavation will be required to remove organic topsoil and loose fill soils (if present) and reveal competent bearing soils beneath foundation areas. GeoTest recommends that qualified geotechnical personnel confirm that suitable bearing conditions have been reached prior to placement of structural fill or foundation formwork.

To provide proper support, GeoTest recommends that existing topsoil, existing fill (if present), and/or loose upper portions of the native soil be removed from beneath the building foundation areas. If footings or structural fill will be placed atop the native Marysville Sand, the surface should be compacted to a firm and unyielding condition with a smooth-drum roller, hoe-pack, or a similar piece of construction equipment. Once suitable bearing conditions have been confirmed by the Geotechnical Engineer or their representative, then foundations can bear directly on native soils or on properly compacted structural fill as described in the *Fill and Compaction* section of this report.

Continuous and isolated spread footings should be founded 18 inches, minimum, below the lowest adjacent final grade for freeze/thaw protection. The footings should be sized in accordance with the structural engineer's prescribed design criteria and seismic considerations.

Allowable Bearing Capacity

Assuming the above foundation support criteria are satisfied, continuous or isolated spread footings founded directly on remedially compacted, firm, and unyielding native soil (Marysville Sand or Clay Member), or on compacted structural fill placed directly atop these native soils may be proportioned using a net allowable soil bearing pressure of 2,500 pounds per square foot (psf). The 'net allowable bearing pressure' refers to the pressure that can be imposed on the soil at foundation level. This pressure includes all dead loads, live loads, the weight of the footing, and any backfill placed above the footing. The net allowable bearing pressure may be increased by one-third for transient wind or seismic loads.

The 'net allowable bearing pressure' refers to the pressure that can be imposed on the soil at foundation level. This pressure includes all dead loads, live loads, the weight of the footing, and any backfill placed above the footing. The net allowable bearing pressure may be increased by one-third for transient wind or seismic loads.

Foundation Settlement

Settlement of shallow foundations depends on foundation size and bearing pressure, as well as the strength and compressibility characteristics of the underlying soil. If construction is accomplished as recommended and at the maximum allowable soil bearing pressure, GeoTest estimates the total settlement of building foundations to be less than one inch. Differential settlement between two adjacent load-bearing components supported on competent soil is estimated to be less than one half the total settlement.

Floor Support

Floor slabs for the proposed buildings can be supported on firm and unyielding, properly prepared native subgrade or on properly placed and compacted structural fill placed over firm and unyielding native soil. The native subgrade should be proof rolled as recommended in the *Site Preparation and Earthwork* section of this report.

GeoTest recommends that concrete slab-on-grade floors be underlain with at least 6 inches of clean, compacted, free-draining gravel. The gravel should contain less than 3 percent passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The purpose of this gravel layer is to provide uniform support for the slab, provide a capillary break, and act as a drainage layer. If water vapor migration through concrete slabs is a concern, a continuous 10-mil minimum thick polyethylene sheet with tape-sealed joints should be installed below the slab to serve as an impermeable vapor barrier. The vapor barrier should be installed and sealed in accordance with the manufacturer's instructions.

A Subgrade Modulus (k) of 200 pounds per cubic inch (pci) is recommended for use in design of concrete slab elements placed on firm and unyielding native soil or on properly placed structural fill over remedially compacted existing site soils. These values assume site preparations prior to slab installation follow the minimum soil preparation measures recommended above.

Exterior concrete slabs-on-grade, such as for parking and sidewalks, may be supported directly on properly prepared native soils or existing fill soils; however, long-term performance will be enhanced if exterior slabs are placed on a layer of clean, durable, well-draining granular material as recommended herein.

Foundation and Site Drainage

Positive surface gradients should be provided adjacent to new foundation areas to direct surface water away from the building and toward suitable drainage facilities. Roof drainage should not be introduced into the perimeter footing drains but should be separately discharged directly to the stormwater collection system or similar municipality-approved outlet. Pavement and sidewalk areas, if present, should be sloped and drainage gradients should be maintained to carry

surface water away from foundation areas towards an approved stormwater collection system. Surface water should not be allowed to pond and soak into the ground surface near buildings or paved areas during or after construction. Construction excavations should be sloped to drain to sumps where water from seepage, rainfall, and runoff can be collected and pumped to a suitable discharge facility.

To reduce the potential for groundwater and surface water to seep into interior spaces, GeoTest recommends that an exterior footing drain system be constructed around the perimeter of new foundations as shown in the *Conceptual Footing and Wall Drain Section* (Figure 6) of this report. The drain should consist of a perforated pipe measuring 4 inches in diameter at minimum, surrounded by at least 12 inches of filtering media. The pipe should be sloped to carry water to an approved collection system.

The filtering media may consist of open-graded drain rock wrapped in a nonwoven geotextile fabric such as Mirafi 140N (or equivalent) or wrapped with a graded sand and gravel filter. For foundations supporting retaining walls, drainage backfill should be carried up the back of the wall and be at least 12 inches wide. The drainage backfill should extend from the foundation drain to within approximately 1 foot of the finished grade and consist of open-graded drain rock containing less than 3 percent fines by weight passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The invert of the footing drainpipe should be placed at approximately the same elevation as the bottom of the footing or 12 inches below the adjacent concrete slab grade (whichever is deeper) so that water will be contained. This process prevents water from seeping through walls or floor slabs. The drain system should include cleanouts to allow for periodic maintenance and inspection.

Please understand that the above recommendations are intended to assist the design engineer and/or architect in development of foundation and site drainage parameters and are based on our experience with similar projects in the area. The final foundation and site drainage plan that will be incorporated into the project plans is to be determined by the design team.

Resistance to Lateral Loads

The lateral earth pressures that develop against retaining walls will depend on the method of backfill placement, degree of compaction, slope of backfill, type of backfill material, provisions for drainage, magnitude and location of any adjacent surcharge loads, and the degree to which the wall can yield laterally during or after placement of backfill. If the wall is allowed to rotate or yield so the top of the wall moves an amount equal to or greater than about 0.001 to 0.002 times its height (a yielding wall), the soil pressure exerted comprises the active soil pressure. When a wall is restrained against lateral movement or tilting (a nonyielding wall), the soil pressure exerted comprises the at rest soil pressure. Wall restraint may develop if a rigid structural network is constructed prior to backfilling or if the wall is inherently stiff.

GeoTest recommends that yielding walls under drained conditions be designed for an equivalent fluid density of 40 pounds per cubic foot (pcf) for structural fill in active soil conditions. Nonyielding walls under drained conditions should be designed for an equivalent fluid density of 60 pcf for structural fill in at-rest conditions. Design of walls should include appropriate lateral pressures caused by surcharge loads located within a horizontal distance equal to or less than the height of the wall. For uniform surcharge pressures, a uniformly distributed lateral pressure equal to 35 percent and 50 percent of the vertical surcharge pressure should be added to the lateral soil pressures for yielding and nonyielding walls, respectively.

For structures designed using the seismic design provisions of the International Building Code, GeoTest recommends that retaining walls include a seismic surcharge in addition to the equivalent fluid densities presented above. We recommend that a seismic surcharge of approximately 8H (where H is the height of the wall) be used for design purposes. This surcharge assumes that the wall is allowed to rotate or yield. If the wall is restrained, GeoTest should be contacted so that we can provide a revised seismic surcharge pressure.

Passive earth pressures developed against the sides of building foundations, in conjunction with friction developed between the base of the footings and the supporting subgrade, will resist lateral loads transmitted from the structure to its foundation. For design purposes, the passive resistance of well-compacted fill placed against the sides of foundations is equivalent to a fluid with a density of 275 pcf. The recommended value includes a safety factor of about 1.5 and is based on the assumption that the ground surface adjacent to the structure is level in the direction of movement for a distance equal to or greater than twice the embedment depth. The recommended value also assumes drained conditions that will prevent the buildup of hydrostatic pressure in the compacted fill. Retaining walls should include a drain system constructed in general accordance with the recommendations presented in the *Foundation and Site Drainage* section of this report. In design computations, the upper 12 inches of passive resistance should be neglected if the soil is not covered by concrete slabs or pavement. If future plans call for the removal of the soil providing resistance, the passive resistance should not be considered.

An allowable coefficient of base friction of 0.35, applied to vertical dead loads only, may be used between the underlying imported granular structural fill and the base of the footing. If passive and frictional resistance are considered together, one half the recommended passive soil resistance value should be used since larger strains are required to mobilize the passive soil resistance as compared to frictional resistance. A safety factor of about 1.5 is included in the base friction design value. GeoTest does not recommend increasing the coefficient of friction to resist seismic or wind loads.

Buoyant Forces

Buoyant forces develop when a submerged structural element is placed below a water table, with the resultant force having the potential to “float” the structure. Buoyant forces are likely to

develop if structural elements are included in the design that are more than about 5 to 9 feet below existing site grades. Below grade elements such as vaults and elevator pits that extend below the water table should be designed to resist buoyant forces. GeoTest also recommends that, where appropriate, submerged elements have adequate water stops and waterproofing to resist the intrusion of water into the structural element.

GeoTest recommends that additional information be provided for our review once a construction plan has been developed so that we can get a better understanding of where buoyant forces may develop. GeoTest should be allowed to revise our recommendations if submerged structural elements are included in the final design.

Temporary and Permanent Slopes

The contractor is responsible for construction slope configurations and maintaining safe working conditions, including temporary excavation stability. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored during and after excavation for any evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring.

Temporary excavations in excess of 4 feet should be shored or sloped in accordance with Safety Standards for Construction Work Part N, WAC 296-155-66403.

Temporary unsupported excavations in the native soils encountered at the project site are classified as a Type B soil according to WAC 296-155-66401 and may be sloped as steep as 1H: 1V (Horizontal: Vertical). All soils encountered are classified as Type C soil in the presence of groundwater seepage and may be sloped as steep as 1.5:1. Flatter slopes or temporary shoring may be required in areas where groundwater flow is present and unstable conditions develop.

Temporary slopes and excavations should be protected as soon as possible using appropriate methods to prevent erosion from occurring during periods of wet weather.

GeoTest recommends that permanent cut or fill slopes be designed for inclinations of 2H: 1V or flatter. Permanent cuts or fills used in earth slopes intended to hold water should be 3H: 1V or flatter. All permanent slopes should be vegetated or otherwise protected to limit the potential for erosion as soon as practical after construction.

Utilities

Utility trenches must be properly backfilled and compacted to reduce cracking or localized loss of foundation, slab, or pavement support. Excavations for new shallow underground utilities are expected to be placed within native Marysville Sand and/or Clay Member soils.

Trench backfill in improved areas (beneath structures, pavements, sidewalks, etc.) should consist of structural fill as defined in the *Fill and Compaction* section of this report. Outside of improved areas, trench backfill may consist of reused native material provided the backfill can be compacted to project specifications. Trench backfill should be placed and compacted in general accordance with the recommendations presented in the *Fill and Compaction* section of this report.

Surcharge loads on trench support systems due to construction equipment, stockpiled material, and vehicle traffic should be included in the design of any anticipated shoring system. The contractor should implement measures to prevent surface water runoff from entering trenches and excavations. In addition, vibration as a result of construction activity and traffic may cause caving of trench walls.

The contractor is responsible for trench configurations. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored by the contractor during excavation for any evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring. If groundwater or groundwater seepage is present, and the trench is not properly dewatered, the soil within the trench zone may be prone to caving, channeling, and running. Trench widths may be substantially wider than under dewatered conditions.

Stormwater Infiltration Potential

Based on the presence of predominantly granular materials, it is our opinion that the on-site infiltration of stormwater is feasible for this project site. However, both slightly clayey, very sandy silt at depth and a perched groundwater horizon that will make the design of infiltration systems challenging. These conditions may present challenges with infiltration due to stipulations referenced in the 2019 Washington State Department of Ecology *Stormwater Management Manual for Western Washington* [Manual], which has been adopted by the City of Arlington, per AMC 13.28.060.

The Manual has requirements and limitations for the design of stormwater facilities when shallow restriction layers exist below a facility. Stormwater management strategies that include elements of Low Impact Development (LID) may be feasible but should have a fundamental expectation that there will be some areas where shallow restriction layers are present that might influence the overall design of stormwater systems.

Perched groundwater was observed at depths ranging between 5 and 9 feet BGS within the proposed development area (approximate elevations of 77 to 80 feet above mean sea level [MSL] in lower half and 86 feet MSL in upper half). For these reasons, it is our opinion that the infiltration of stormwater is more favorable in the upper half of the proposed development area. Infiltration within the lower half of the project site is not infeasible but will be more challenging

due to there being less vertical spacing between the surface, silty soils, and/or perched groundwater. It should also be noted that the groundwater conditions are variable and may fluctuate depending on local subsurface conditions, precipitation, and changes in on-site and off-site use.

Test Pit Gradation Results

From the explorations excavated in the areas of interest, 13 representative soil samples were selected and mechanically tested for grain size distribution and calculation according to the soil grain size analysis method per the Manual. A summary of these results has been broken into two sections between both halves of the property and reproduced in Tables 1 and 2 below. Refer to the *Topographic Bare Earth Imagery Plan* for a representation of these two areas.

The rates presented in Tables 1 and 2 are representative of loose soil conditions and do not take the relative density of the soil into account. Stormwater infiltration potential is a function of the relatively permeability of the site soils, and the separation between the base of the proposed stormwater facility and the groundwater table.

Table 1
Preliminary Infiltration Results Based on Grain Size Analysis
Lower Half of Property

Test Pit ID & Depth	Approximate Elevation (ft MSL)	Geologic Unit	Corrected K_{sat} Infiltration Rate [in/hr]
TP-2 (1.3 ft)	83.7	Marysville Sand	1.6
TP-2 (3.3ft)	81.7	Marysville Sand	5*
TP-2 (8.0 ft)	77.0	Marysville Sand	5*
TP-2 (10.0 ft)	75.0	Clay Member	0.1
TP-3 (1.5 ft)	83.5	Marysville Sand	0.3
TP-6 (1.7 ft)	85.3	Marysville Sand	3.2
TP-6 (4.0 ft)	83.0	Marysville Sand	5*
TP-6 (6.0 ft)	81.0	Marysville Sand	5*

Notes:
-Ksat = Initial Saturated Hydraulic Conductivity
-Correction Factors Used: CFv = 0.5, CFt = 0.40, CFm =0.9, CFg = 0.5**
-Total Correction Factor = 0.09
* GeoTest recommends utilizing a preliminary infiltration rate that is less than 5 inches per hour for preliminary design purposes.
** GeoTest has applied an additional variability factor due to the varied profile of perched groundwater and silty soils observed throughout the subsurface of the site.

GeoTest assumes that the base of infiltration facilities will be at a depth of at least 3 feet BGS following site grading activities. For facilities based in clean Marysville Sand within the lower half of the site and at depths greater than about 3 feet BGS (approximately 82 feet MSL), we recommend a preliminary design infiltration rate of 5 inches per hour, with the assumption that

at least 5 vertical feet of separation exists between the bottom of proposed facilities and seasonal groundwater.

Table 2
Preliminary Infiltration Results Based on Grain Size Analysis
Upper Half of Property

Test Pit ID & Depth	Approximate Elevation (ft MSL)	Geologic Unit	Corrected K_{sat} Infiltration Rate [in/hr]
TP-8 (6.0 ft)	89.0	Marysville Sand	0.6
TP-9 (1.5 ft)	100.5	Marysville Sand	1.9
TP-9 (2.5 ft)	99.5	Marysville Sand	5*
TP-9 (6.0 ft)	96.0	Marysville Sand	5*
TP-9 (9.0 ft)	93.0	Marysville Sand	5*

Notes:
-Ksat = Initial Saturated Hydraulic Conductivity
-Correction Factors Used: CFv = 0.5, CFt = 0.40, CFm =0.9, CFg = 0.5**
-Total Correction Factor = 0.09
* GeoTest recommends utilizing a preliminary infiltration rate that is less than 5 inches per hour for preliminary design purposes.
** GeoTest has applied an additional variability factor due to the varied profile of perched groundwater and silty soils observed throughout the subsurface of the site.

For facilities based in clean Marysville Sand within the upper half of the site and at depths greater than about 3 feet BGS (approximately 92 feet MSL), we recommend a preliminary design infiltration rate of 5 inches per hour, with the assumption that at least 5 vertical feet of separation exists between the bottom of proposed facilities and seasonal groundwater.

It should be noted that adequate separation between the bottom of the facility and groundwater may not be feasible given that the shallowest groundwater was encountered at or near elevations 77 to 80 feet MSL in the lower half of site and approximately 86 feet MSL in its upper half, during our August 2022 field investigation. If facilities are designed with less than 5 vertical feet of separation between the bottom of the facility and groundwater, it seems likely that additional studies would be needed to confirm the design.

At the time of this report, GeoTest is not aware of a specific stormwater plan, nor is GeoTest aware of the depths of proposed facilities. The final design is likely to require a collaborative effort between GeoTest and the Civil designer. Should stormwater facilities be designed with less than 5 feet of separation, GeoTest recommends that a Pilot Infiltration Test be performed to confirm the infiltration rate. Both pilot infiltration testing and seasonal groundwater monitoring services are currently outside the scope of this report.

If a greater rate is desired for design purposes in this area, GeoTest recommends that a pilot infiltration test be conducted in accordance with Manual to verify its infiltration potential. This is

due to the proximity of perched groundwater and/or silty soils at varying depths throughout the project site.

Stormwater Treatment

The on-site stormwater facilities may require some form of pollutant pretreatment with an amended soil prior to on-site infiltration or off-site discharge. The reuse of on-site topsoil is often the most sustainable and cost-effective method for pollutant treatment purposes. Cation exchange capacities, organic contents, and pH of site subsurface soils were also tested to determine possible pollutant treatment suitability.

Cation exchange capacity, organic content, and pH tests were performed (by Northwest Agricultural Consultants) on eight soil samples collected from the explorations performed for this project. A summary of the laboratory test results is presented in Table 3 below:

Table 3
Cation Exchange Capacity, Organic Content, and pH Laboratory Test Results

Test Pit ID	Sample Depth (ft)	Geologic Unit	Cation Exchange Capacity (meq/100 grams)	Organic Content (%)	pH
TP-1	0.3	Topsoil	20.9	9.33	5.3
TP-1	1.4	Marysville Sand	14.6	5.45	5.8
TP-1	2.7	Marysville Sand	5.5	1.40	5.9
TP-1	8.6	Marysville Sand	4.3	1.19	6.0
TP-7	0.5	Topsoil	41.8	29.05	4.3
TP-7	1.5	Marysville Sand	15.3	5.00	5.2
TP-7	4.0	Marysville Sand	6.0	1.91	5.4
TP-7	6.0	Marysville Sand	5.9	1.50	6.0

Suitability for on-site pollutant treatment is determined in accordance with SSC-6 of the Manual. Soils with an organic content of greater than or equal to 1 percent and a cation exchange capacity of greater than or equal to 5 meq/100 grams are characterized as suitable for stormwater treatment. Based on the results shown in Table 3, soils within the upper 6 feet of the proposed development area (Topsoil and Marysville Sand) are suitable for stormwater treatment. The Marysville Sand found at depths greater than 6 feet BGS are not suitable for stormwater treatment.

On-site soils can be amended by mixing higher silt content soils or adding mulch (or other admixtures) to elevate the cation exchange capacity and organic contents. This would result in slower infiltration rates due to the higher silt content. On-site amended soil requires additional testing to confirm compliance with ecological regulations. GeoTest is available to perform additional laboratory testing as part of an expanded scope of services if the soil is to be amended.

Alternatively, the Owner may elect to import amended soils with the desired properties for planned treatment facilities.

Geotechnical Consultation and Construction Monitoring

GeoTest recommends that we be involved in the project design review process. The purpose of the review is to verify that the recommendations presented in this report are understood and incorporated in the design and specifications.

We also recommend that geotechnical construction monitoring services be provided. These services should include observation by GeoTest personnel during structural fill placement, compaction activities, and subgrade preparation operations to confirm that design subgrade conditions are obtained beneath the areas of improvement.

Periodic field density testing should be performed to verify that the appropriate degree of compaction is obtained. The purpose of these services is to observe compliance with the design concepts, specifications, and recommendations of this report. In the event that subsurface conditions differ from those anticipated before the start of construction, GeoTest Services, Inc. would be pleased to provide revised recommendations appropriate to the conditions revealed during construction.

GeoTest is available to provide a full range of materials testing and special inspection during construction as required by the local building department and the International Building Code. This may include specific construction inspections on materials such as reinforced concrete, reinforced masonry, wood framing, and structural steel. These services are supported by our fully accredited materials testing laboratories.

USE OF THIS REPORT

GeoTest Services, Inc. has prepared this report for the exclusive use of Northwest Land Development, LLC and their design consultants for specific application to the design of The Point development located at 19402 Smokey Point Boulevard in Arlington, WA. Use of this report by others is at the user's sole risk. This report is not applicable to other site locations. Our services are conducted in accordance with accepted practices of the geotechnical engineering profession; no other warranty, express or implied, is made as to the professional advice included in this report.

Our site explorations indicate subsurface conditions at the dates and locations indicated. It is not warranted that these conditions are representative of conditions at other locations and times. The analyses, conclusions, and recommendations contained in this report are based on site conditions to the limited depth and time of our explorations, a geological reconnaissance of the area, and a review of previously published geological information for the site. If variations in

subsurface conditions are encountered during construction that differ from those contained within this report, GeoTest should be allowed to review the recommendations contained in this report and, if necessary, make revisions. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations at or adjacent to the project site, we recommend that we review this report to determine the applicability of the conclusions and recommendations contained herein.

The earthwork contractor is responsible to perform all work in conformance with all applicable WISHA/OSHA regulations. GeoTest Services, Inc. is not responsible for job site safety on this project; this responsibility is specifically disclaimed.

Attachments:	Figure 1	Vicinity Map
	Figure 2	Site and Exploration Plan
	Figure 3	Global Bare Earth Imagery Plan
	Figure 4	Bare Earth Exploration Plan
	Figure 5	Topographic Bare Earth Imagery Plan
	Figure 6	Conceptual Footing and Wall Drain Section
	Figure 7	Soil Classification System and Key
	Figures 8 – 17	Test Pit Logs
	Figures 18 – 20	Grain Size Test Data
	Attached	Northwest Agricultural Consultants Results
	Attached	Report Limitations and Guidelines for its Use

REFERENCES

Arlington Municipal Code, *Chapter 20.93.600 (Geologically Hazardous Areas).* Retrieved in September 2022 from https://library.municode.com/wa/arlington/codes/code_of_ordinances

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Palmer, S., Magsino, S., Bilderback, E., Poelstra, J., Folger, D., Niggemann, R., 2004. *Liquefaction Susceptibility Map of Snohomish County, Washington [map].* 1:150,000. Washington State Department of Natural Resources – Map 31A. Retrieved September 2022.

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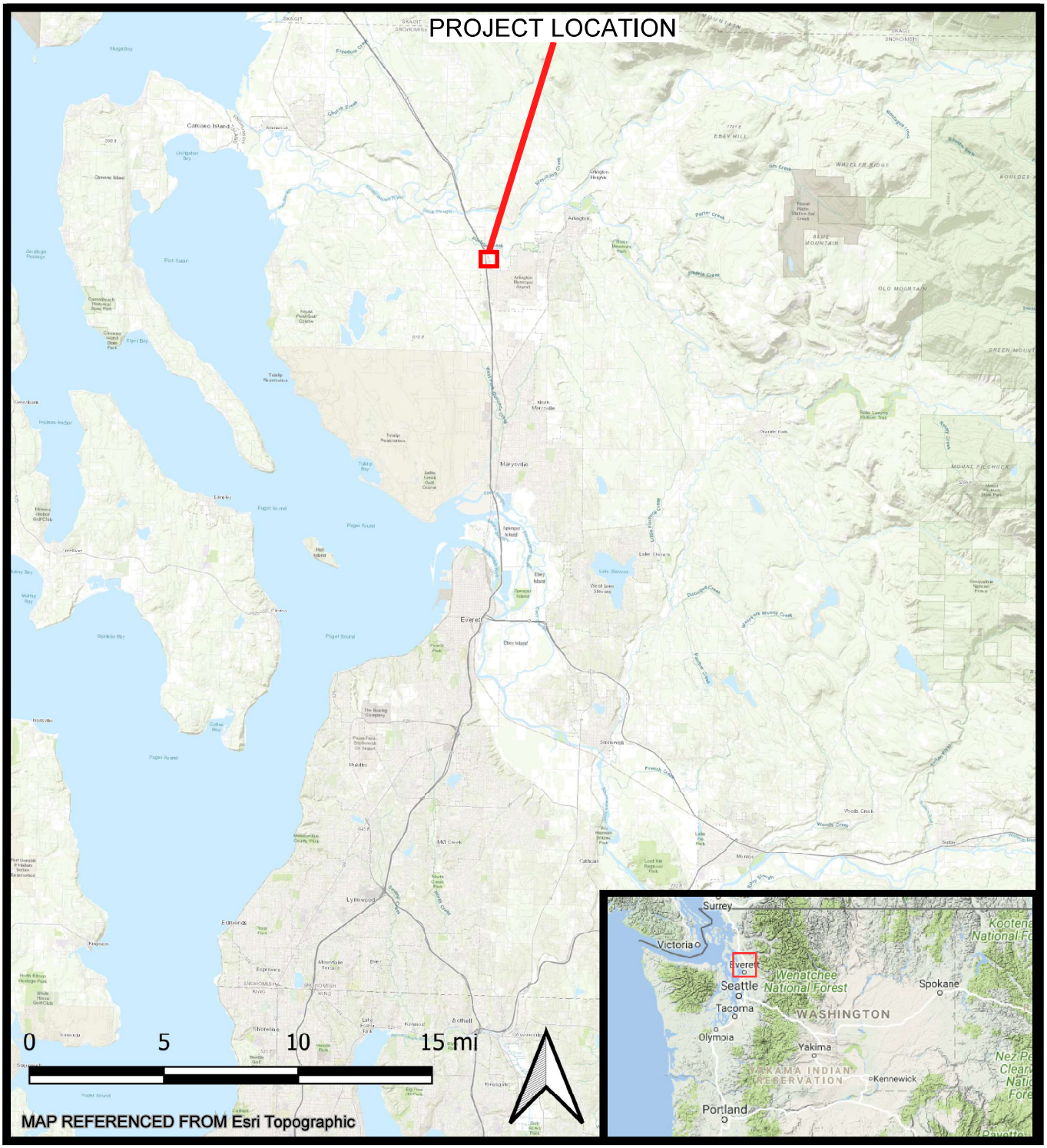
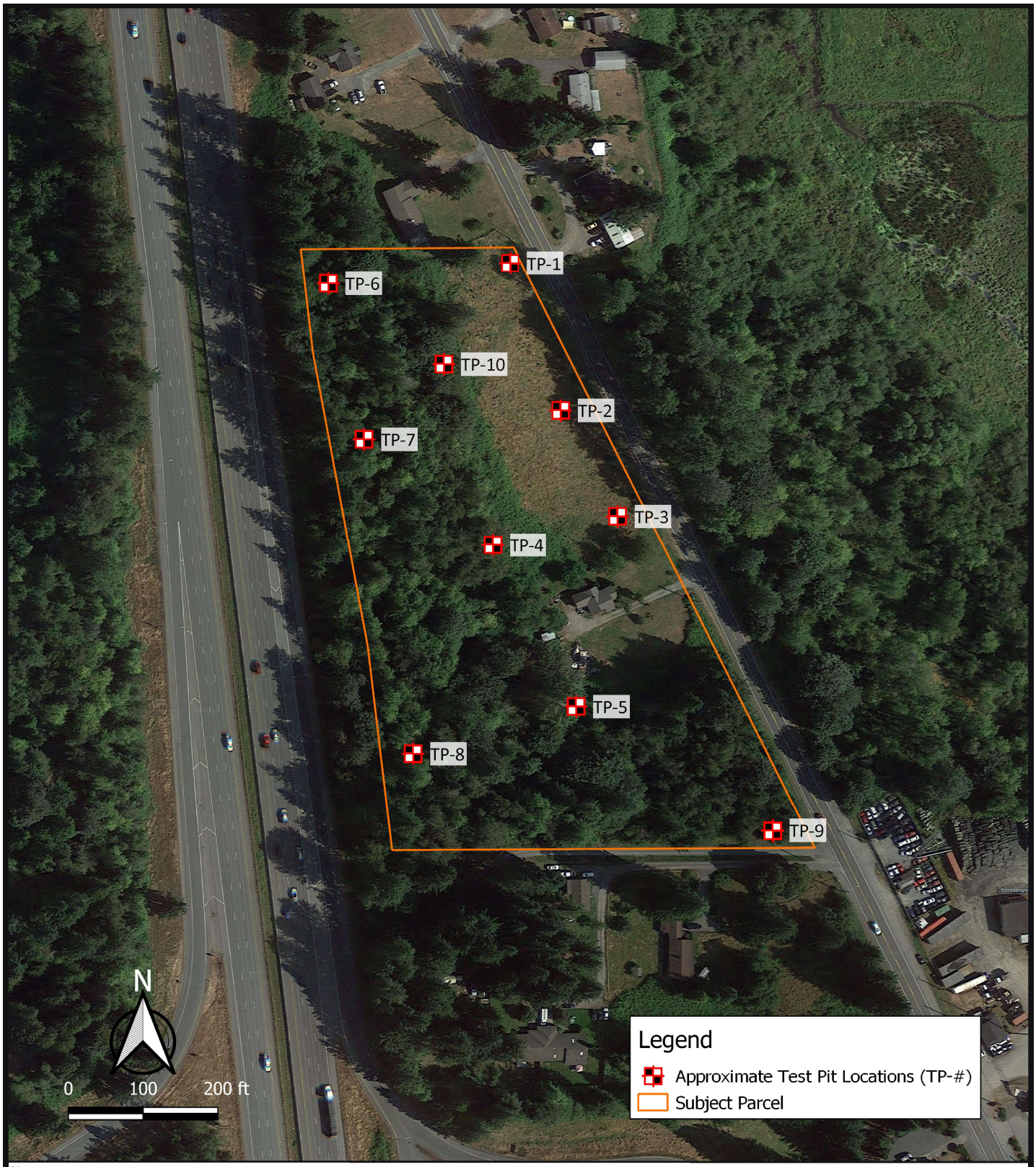


GEOTEST

Date: 8-22-2022	By: TAC	Scale: As Shown	Project 22-0727

VICINITY MAP
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Figure 1



Notes:

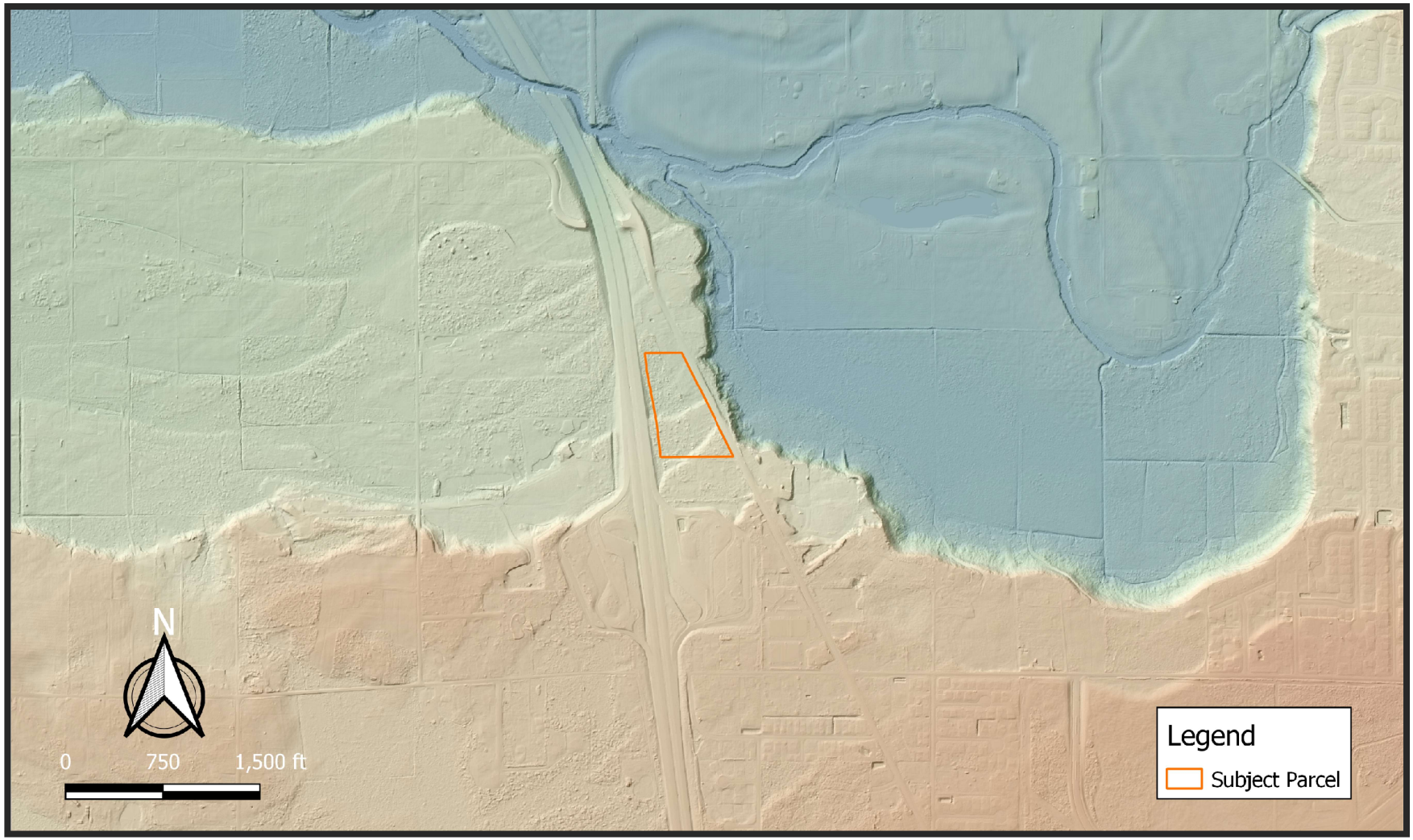
1) Parcel shapefile sourced from Snohomish County's PDS Map Portal
2) Scale, north arrow, and site plan referencing North Puget 2017 digital elevation model (sourced from Washington Lidar Portal)
3) Map image created using QGIS 3.22.6 and Google Earth aerial imagery

GEOTEST	Date: 8-23-2022	By: TAC	Scale: As Shown

SITE AND EXPLORATION PLAN
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Project
22-0727

Figure
2



Notes:

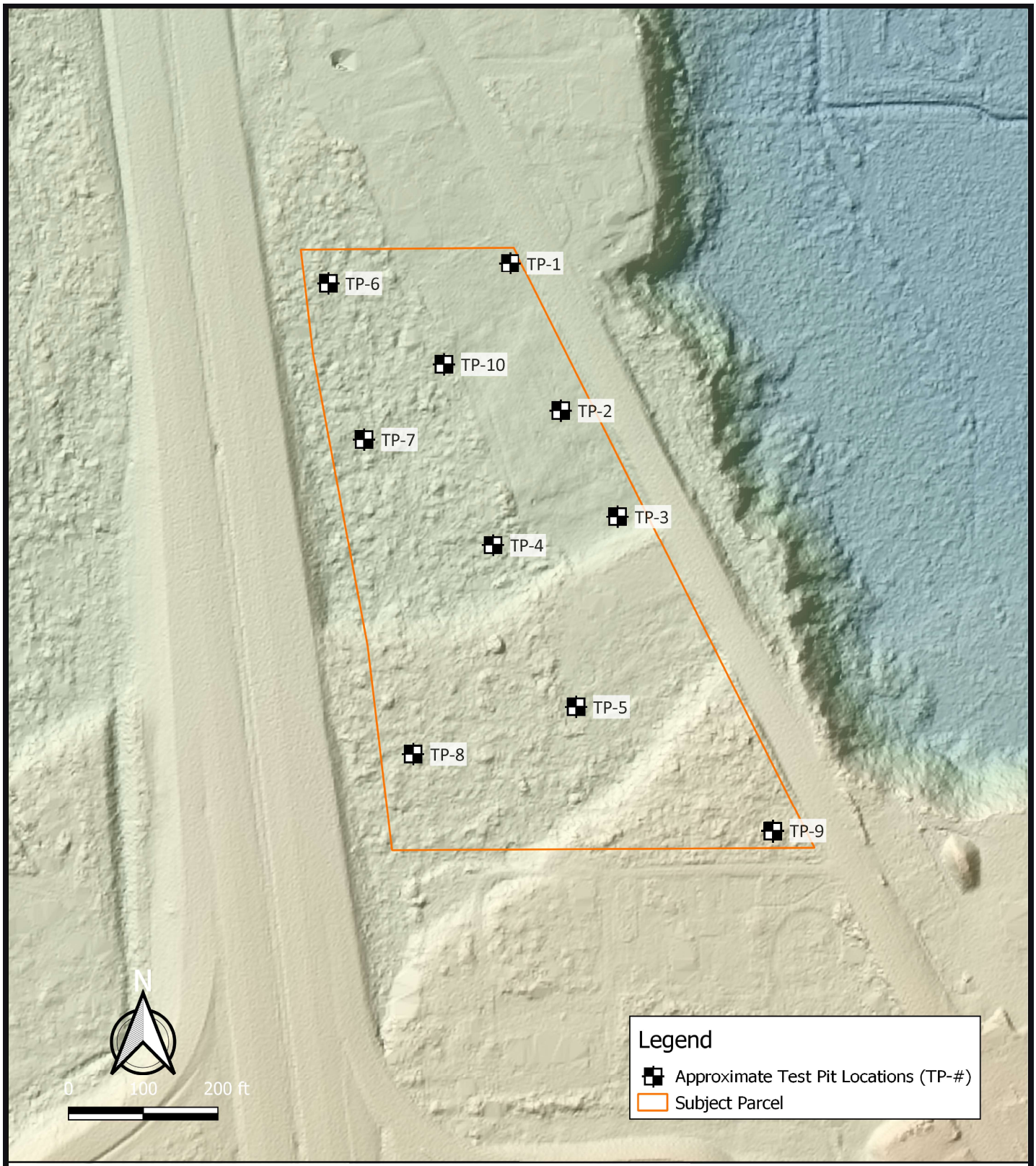
1) Parcel shapefile sourced from Snohomish County's *PDS Map Portal*
2) Scale, north arrow, digital elevation model, and hillshade created using North Puget 2017 digital elevation model (*sourced from Washington Lidar Portal*)
3) Map image created using *QGIS 3.22.6*

GEOTEST

Date: 8-23-2022	By: TAC	Scale: As Shown	Project 22-0727

GLOBAL BARE EARTH IMAGERY PLAN
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Figure 3



Notes:

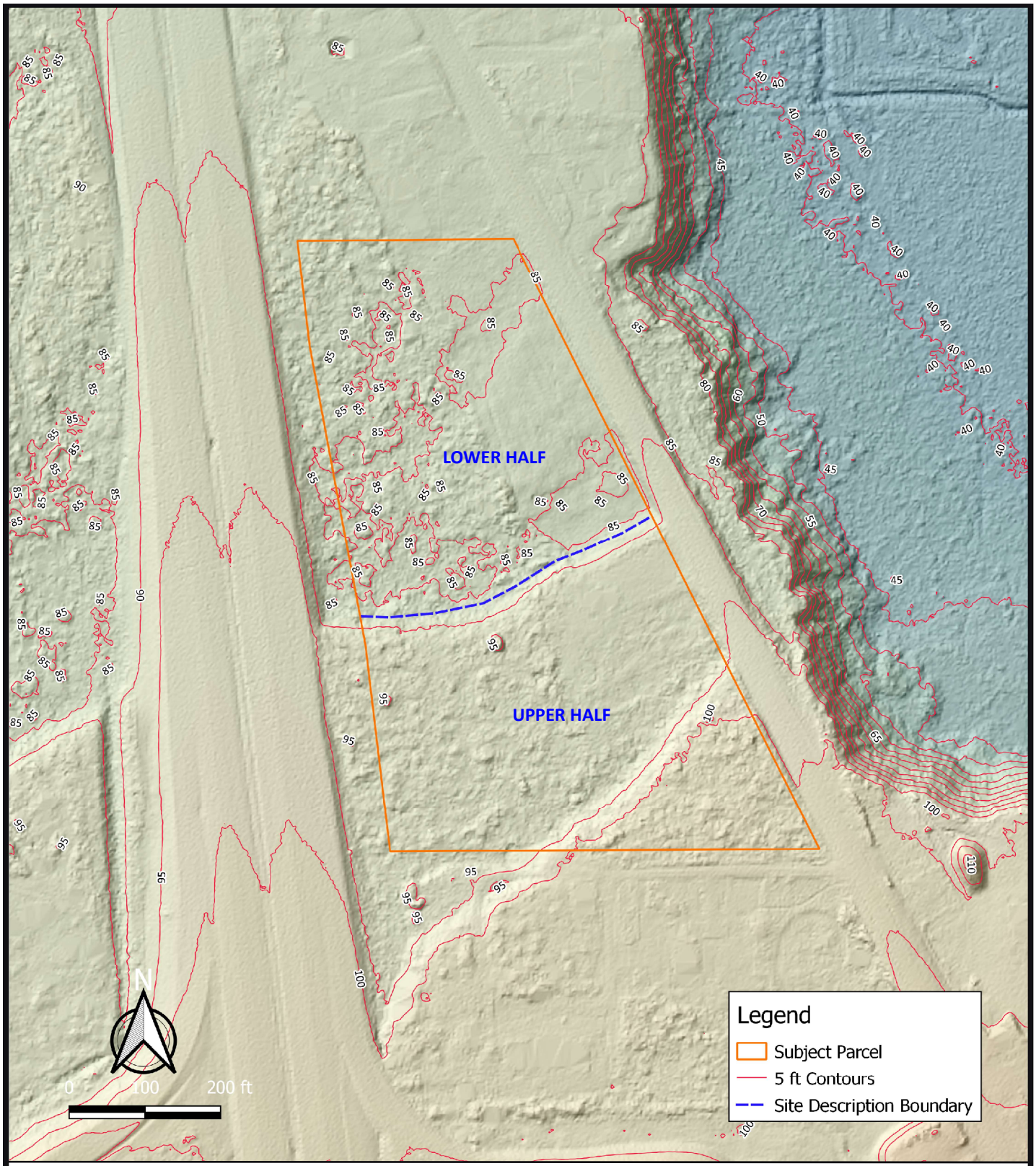
1) Parcel shapefile sourced from Snohomish County's PDS Map Portal
2) Scale, north arrow, digital elevation model, and hillshade created using North Puget 2017 digital elevation model (sourced from Washington Lidar Portal)
3) Map image created using QGIS 3.22.6

GEOTEST

Date: 8-23-2022	By: TAC	Scale: As Shown	Project 22-0727

BARE EARTH EXPLORATION PLAN
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Figure 4



Notes:

1) Parcel shapefile sourced from Snohomish County's PDS Map Portal
2) Scale, north arrow, digital elevation model, hillshade, and contours created using North Puget 2017 digital elevation model (Washington Lidar Portal)
3) Map image created using QGIS 3.22.6

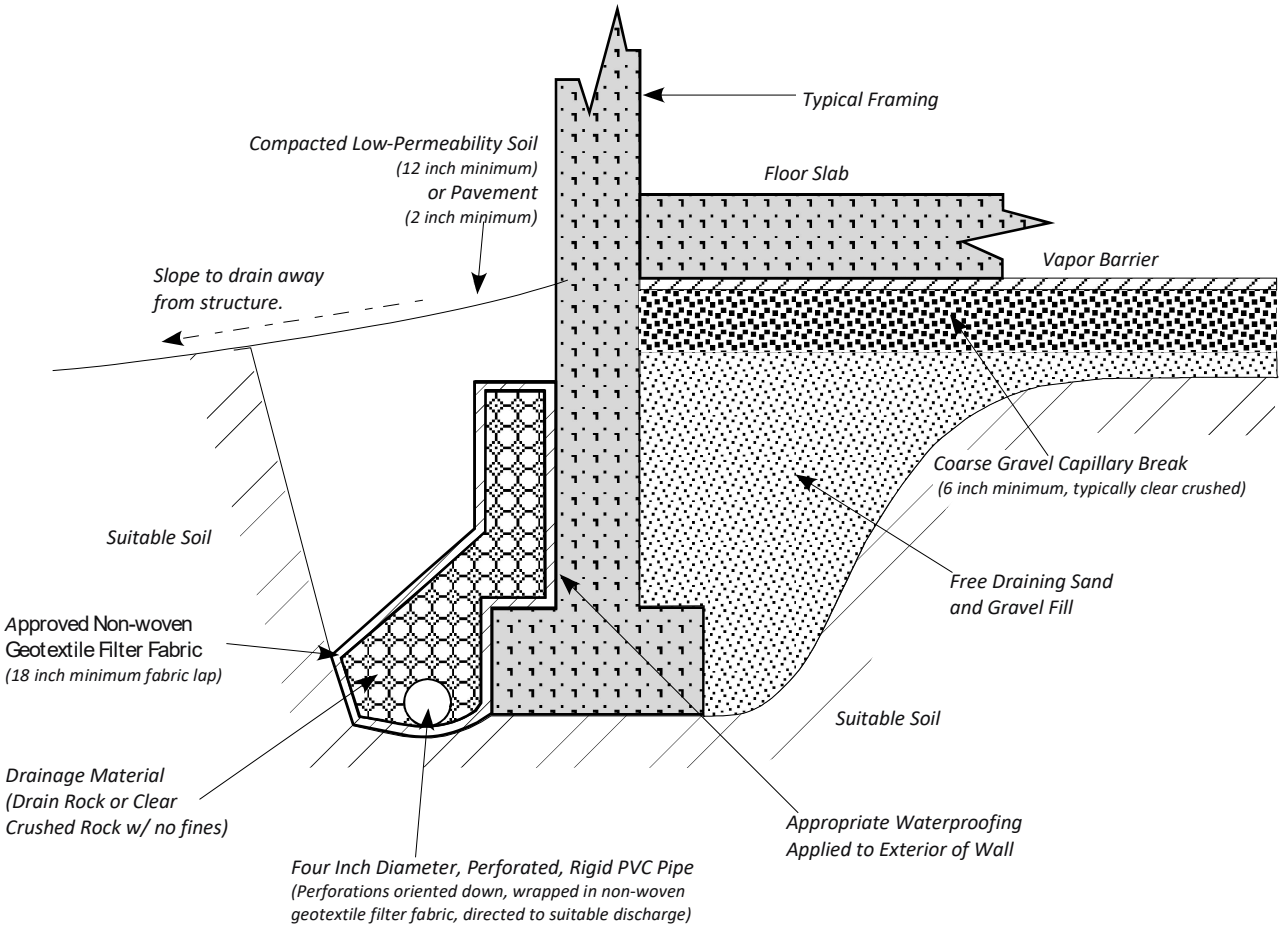
GEOTEST

Date: 8-23-2022	By: TAC	Scale: As Shown	Project 22-0727

TOPOGRAPHIC BARE EARTH IMAGERY PLAN
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Figure 5

CONCEPTUAL FOOTINGS WITH INTERIOR SLAB-ON-GRADE



Notes:

Footings should be properly buried for frost protection in accordance with International Building Code or local building codes (Typically 18 inches below exterior finished grades).

This figure is not intended to be representative of a design. This figure is intended to present concepts that can be incorporated into a functional foundation drain designed by a Civil Engineer. In all cases, refer to the Civil plan sheet for drain details and elevations.

GEOTEST	Date: 8-23-2022	By: TAC	Scale: None	Project 22-0727
	CONCEPTUAL FOOTING & WALL DRAIN SECTION **THE POINT** **19402 SMOKEY POINT BOULEVARD** **ARLINGTON, WA**			Figure 6

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL	TYPICAL DESCRIPTIONS[1][2]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

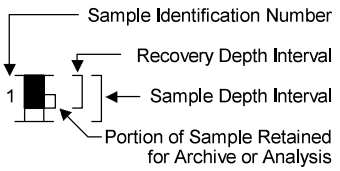
OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, as outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test Method for Classification of Soils for Engineering Purposes*, as outlined in ASTM D 2487.
2. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
> 12% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents: > 5% and ≤ 12% - "slightly gravelly," "slightly sandy," "slightly silty," etc.
≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLE NUMBER & INTERVAL



SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Other - See text if applicable

Groundwater

▽ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

GEOTEST

The Point
19402 Smokey Point Blvd.
Arlington, WA

Soil Classification System and Key

Figure 7

TEST PIT LOG

Test Pit No. TP-1

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 8 **CAVING** C 9

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 — 0	1	d	GT	SP-SM	Dark brown, loose, dry, slightly silty, very gravelly SAND, poorly graded, rootlets (Topsoil)
1				GP-GM	Tan, medium dense, dry, slightly silty, very sandy GRAVEL, poorly graded, rootlets (Marysville Sand)
83 — 2	2	d	GT		
				SP	Gray, loose, damp, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	3	d	GT		
	4	d			
81 — 4					
5	5	d			
79 — 6	6	d			
7				GW	Gray, medium dense, wet, sandy GRAVEL, trace silt, well-graded (Marysville Sand)
77 — 8	7	d			Minor seepage @ 8' BGS
	8	d	GT		
9	9	d			Terminated @ 9' BGS due to caving

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-1 was terminated at 9 ft below site grades on 8/11/22

Figure: 8

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-2

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 8 **CAVING** ☾ NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
	SAMPLE & TEST DATA				
85 / 0	10	d	W = 5.6 GS	SP-SM	Dark brown, loose, dry, slightly silty, very gravelly SAND, poorly graded, rootlets (Topsoil)
1				GP-GM	Tan, organic, medium dense, slightly silty, very sandy GRAVEL, poorly graded (Marysville Sand)
	11	d	W = 5.3 GS		
83 / 2				SP	Gray, medium dense, dry, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	12	d	W = 3.6 GS		Damp @ 6' BGS
81 / 4	13	d			
5					
79 / 6	14	d			
7					
77 / 8	15	d	W = 5.9 GS	GW	Wet, medium dense, gray, sandy GRAVEL, trace silt, well-graded (Marysville Sand)
9					Perched seepage observed @ 8' BGS
				ML	Gray, stiff, damp, slightly sandy SILT, trace gravel (Clay Member)
75 / 10	16	d	W = 35.2 GS		

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-2 was terminated at 10 ft below site grades on 8/11/22

Figure: 9

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-3

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: NA **PERCHED WATER:** NA **CAVING** NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 / 0	17	d		SP-SM	Dark brown, loose, dry, slightly silty, very gravelly SAND, poorly graded, rootlets (Topsoil)
1				ML	Tan, dry, medium dense, slightly clayey, very sandy SILT, trace gravel, rootlets (Marysville Sand)
83 / 2	18	d	GS GT		
	19	d		SP	Gray, medium dense, dry, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3					
81 / 4	20	d			Damp @ 4.5' BGS
5					
79 / 6	21	d			
7	22	d		ML	Gray, stiff, damp, slightly clayey, very sandy SILT, trace gravel (Clay Member)
77 / 8					Becomes coarser w/ depth
9					
75 / 10	23	d			

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-3 was terminated at 10 ft below site grades on 8/11/22

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Figure: 10

TEST PIT LOG

Test Pit No. TP-4

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: NA **PERCHED WATER:** 5 **CAVING** NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA	SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 / 0	24 d	SP-SM	Black, loose, dry, slightly silty, very gravelly SAND, poorly graded, organics (Topsoil)
1	25 d	SP-SM	Tan, loose, dry, slightly silty, slightly gravelly SAND, poorly graded (Marysville Sand)
83 / 2		SP	Gray, medium dense, dry, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	26 d		
81 / 4	27 d		Seepage observed @ 5' BGS
5			
79 / 6	28 d		
7			
77 / 8		ML	Gray, stiff, damp, slightly sandy SILT, trace gravel (Clay Member)
	29 d		

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-4 was terminated at 8.5 ft below site grades on 8/11/22

Figure: 11

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-5

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 95'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 9 **CAVING** ℄ 9.6

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA	SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
95 / 0	30 d	SP-SM	Dark brown, loose, dry, slightly silty, slightly gravelly SAND, poorly graded, roots, rootlets (Topsoil)
93 / 2	31 d	SP	Tan, medium dense, dry, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
91 / 4	32 d	GP	Gray to tan, medium dense, dry, very sandy GRAVEL, trace silt, poorly graded (Marysville Sand)
89 / 6	33 d		
87 / 8	34 d		Becomes damp @ 8' BGS Seepage @ 9' BGS Caving @ 9.6' BGS
85 / 10			

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-5 was terminated at 10 ft below site grades on 8/11/22

Figure: 12

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-6

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 87'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 8.5 **CAVING** ⊂ NA

ELEVATION/ DEPTH	SAMPLE & TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
87 — 0	35	d		SP-SM	Dark brown, dry, loose, slightly silty, very gravelly SAND, poorly graded, roots, rootlets (Topsoil)
1				SP-SM	Tan, dry, medium dense, slightly silty, slightly gravelly SAND, poorly graded (Marysville Sand)
85 — 2	36	d	W = 27.3 GS		
3				SP	Gray, dry, medium dense, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
	37	d			
83 — 4	38	d	W = 2.9 GS		Cobbles @ 5' BGS
5					
81 — 6	39	d	W = 4 GS	GP	Gray, damp, medium dense, very sandy GRAVEL, trace silt, poorly graded (Marysville Sand)
7					Seepage observed @ 8.5' BGS
79 — 8	40	d			
9	41	d		ML	Gray to tan, stiff, damp, slightly sandy SILT, trace gravel (Clay Member)

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-6 was terminated at 9.5 ft below site grades on 8/11/22

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Figure: 13

TEST PIT LOG

Test Pit No. TP-7

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 5.5 **CAVING** ℄ NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 — 0					
	42	d	GT	SP-SM	Dark brown, very loose, damp, slightly gravelly, silty SAND, roots (Topsoil)
1				SP-SM	Tan, medium dense, damp, slightly silty, slightly gravelly SAND, poorly graded (Marysville Sand)
83 — 2	43	d	GT	SP	Gray, dry, medium dense, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	44	d			
81 — 4	45	d	GT	GP	Gray, medium dense, damp, very sandy GRAVEL, trace silt, poorly graded (Marysville Sand)
5					Seepage @ 5.5' BGS
79 — 6	46	d	GT		
7					
77 — 8	47	d			

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-7 was terminated at 8 ft below site grades on 8/11/22

Figure: 14

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-8

PROJECT: The Point | **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA | **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator | **ELEVATION:** 95'
CONTRACTOR/DRILLER: Mike Weeks | **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA | **PERCHED WATER:** ▽ 9 | **CAVING** C NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
95 / 0	48	d		SM	Loose, dark brown, dry, slightly gravelly, silty SAND, poorly graded, organics (Topsoil)
1				SP	Tan, medium dense, dry, gravelly SAND, trace silt, poorly graded (Marysville Sand)
93 / 2	49	d			
3				SM	Gray, dry, medium dense, gravelly, very silty SAND, rootlets (Marysville Sand)
91 / 4	50	d			
5					
89 / 6	51	d	W = 12 GS		
7					
87 / 8	52	d		GW	Gray, medium dense, damp, very sandy GRAVEL, trace silt, well-graded (Marysville Sand) Wet @ 9' BGS Seepage @ 9.5'BGS
9	53	d			

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-8 was terminated at 9.5 ft below site grades on 8/11/22

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Figure: 15

TEST PIT LOG

Test Pit No. TP-9

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 102'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ NA **CAVING** C 5

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
102 / 0				SM	Loose, dark brown, dry, slightly gravelly, silty SAND, poorly graded, organics (Topsoil)
1	54	d	W = 14.6 GS	SM	Tan, dry, medium dense, slightly gravelly, silty SAND, roots (Marysville Sand)
100 / 2	55	d	W = 4.3 GS	SP	Gray, dry, loose, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	56	d	W = 1.8 GS		Caving @ 5 moderate
98 / 4	57	d			
5					
96 / 6	58	d	W = 2.5 GS	GW	Gray, dry, medium dense, very sandy GRAVEL, trace silt, well-graded (Marysville Sand)
7					
94 / 8	59	d		SP	Gray, dry, medium dense, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
9	60	d	W = 2.7 GS		

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-9 was terminated at 9.5 ft below site grades on 8/11/22

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Figure: 16

TEST PIT LOG

Test Pit No. TP-10

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: NA **PERCHED WATER:** 7 **CAVING** NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA	SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 / 0			
	61 d	SP-SM	Loose, dark brown, dry, slightly silty, very gravelly SAND, poorly graded, organics (Topsoil)
1			
	62 d	GP-GM	Tan, medium dense, dry, slightly silty, very sandy GRAVEL, poorly graded (Marysville Sand)
83 / 2			
	63 d	SP	Gray, medium dense, dry, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3			
81 / 4	64 d		
5			
79 / 6	65 d		
7		GW	Gray, medium dense, wet, sandy GRAVEL, trace silt, well-graded Seepage @ 7' BGS
77 / 8			

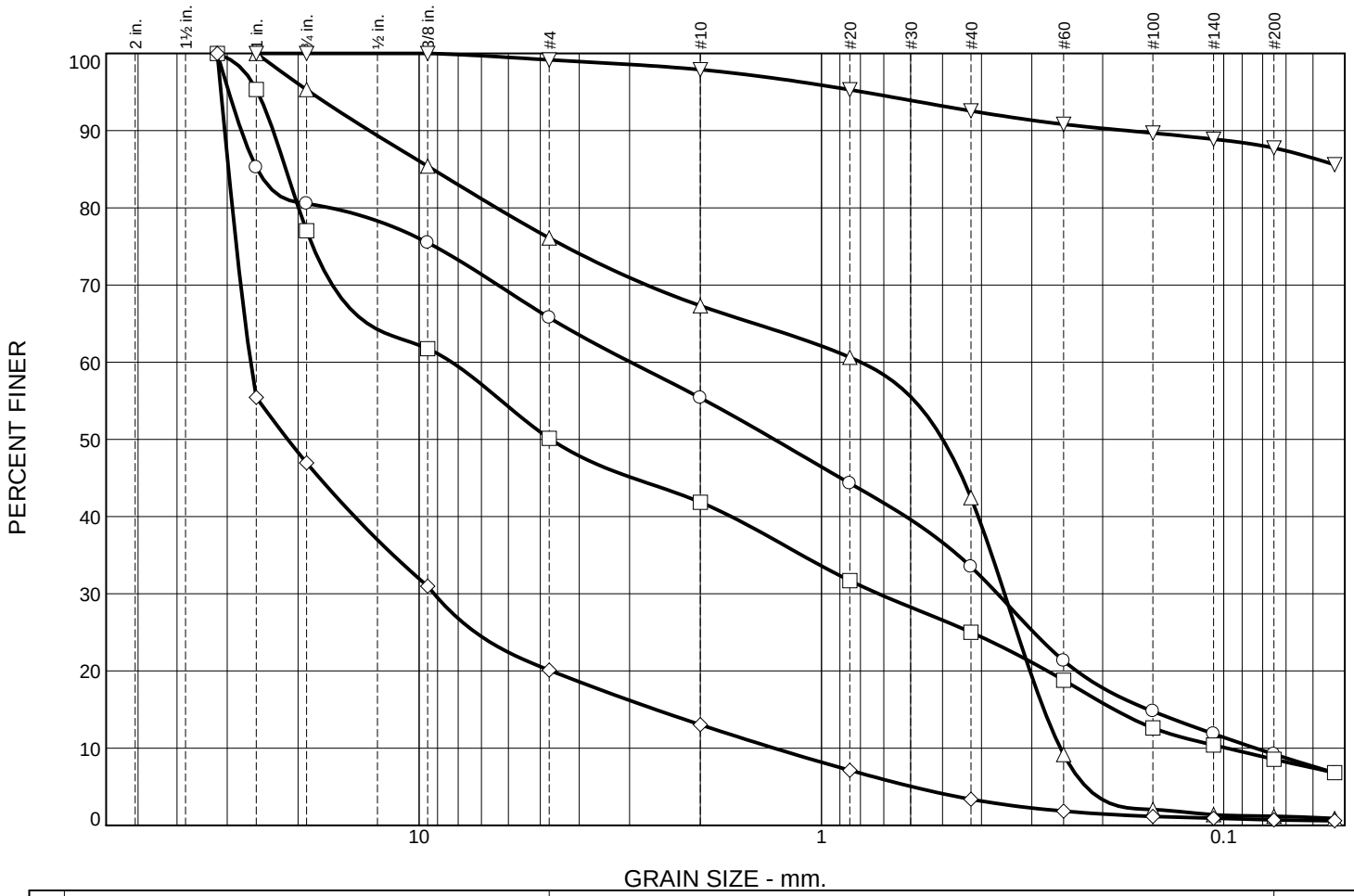
Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-10 was terminated at 8 ft below site grades on 8/11/22

Figure: 17

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Sieve Analysis Test Report - ASTM C136/C117



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	Silt
○	0	19	15	11	22	24	9
□	0	23	27	8	17	16	9
△	0	5	19	9	25	41	1
◇	0	53	27	7	10	2	1
▽	0	0	1	1	5	5	88

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP-2	10	0.2	Slightly silty, very gravelly SAND, poorly graded	SP-SM
□	TP-2	11	1.3	Slightly silty, very sandy GRAVEL, poorly graded	GP-GM
△	TP-2	12	3.3	Gravelly SAND, trace silt, poorly graded	SP
◇	TP-2	15	8.0	Sandy GRAVEL, trace silt, well-graded	GW
▽	TP-2	16	10.0	Slightly sandy SILT, trace gravel	ML

GEOTEST
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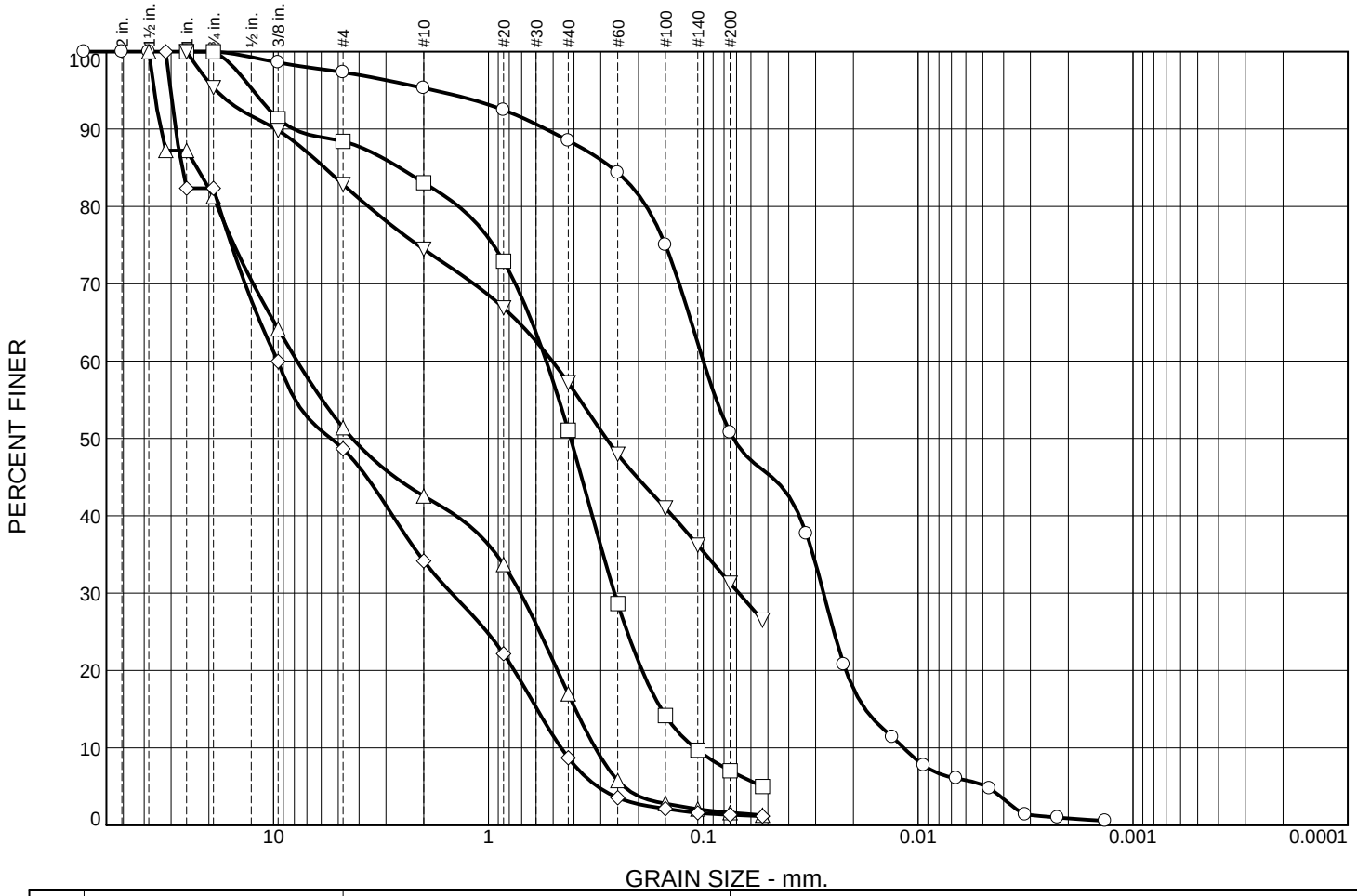
www.geotest-inc.com

Client: Northwest Land Development. LLC
Project: The Point
Project No.: 22-0727 **Figure** 18

Tested By: MFP **Checked By:** TAC

Sieve Analysis Test Report - ASTM C136/C117



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	3	2	6	38	46	5
□	0	0	12	5	32	44	7	
△	0	19	30	8	26	15	2	
◇	0	18	33	15	25	8	1	
▽	0	5	12	9	17	26	31	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP-3	18	1.5	Slightly clayey, very sandy SILT, trace gravel	ML
□	TP-6	36	1.7	Slightly silty, slightly gravelly SAND, poorly graded	SP-SM
△	TP-6	38	4.0	Very gravelly SAND, trace silt, poorly graded	SP
◇	TP-6	39	6.0	Very sandy GRAVEL, trace silt, poorly graded	GP
▽	TP-8	51	6.0	Gravelly, very silty SAND	SM

GEOTEST
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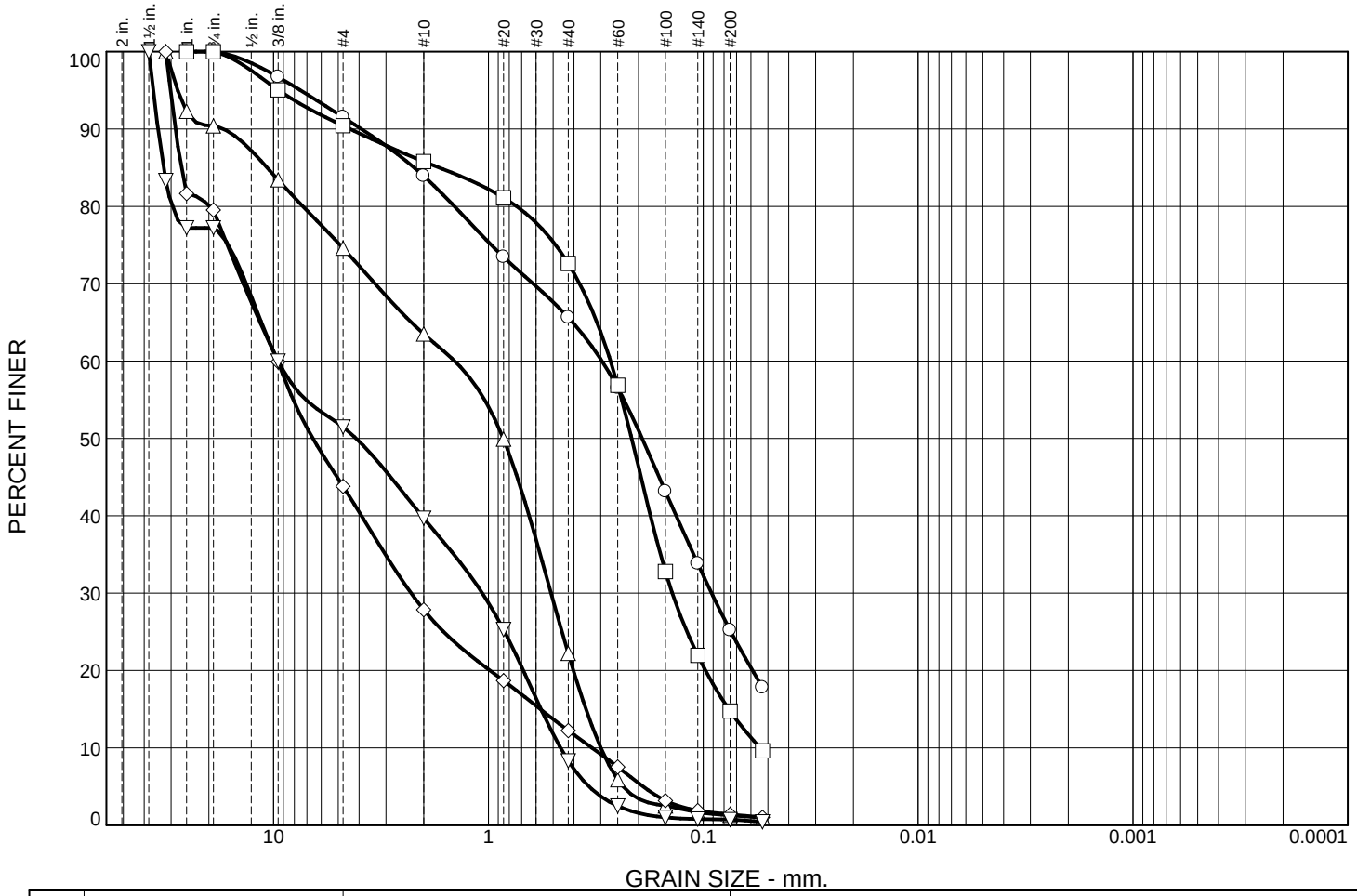
Bellingham | Arlington | Oak Harbor
www.geotest-inc.com

Client: Northwest Land Development. LLC
Project: The Point
Project No.: 22-0727 **Figure** 19

Tested By: ○ CD/BF □ MFP △ MFP ◇ MFP ▽ MFP **Checked By:** TAC

Sieve Analysis Test Report - ASTM C136/C117



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	8	8	18	41	25	
□	0	0	10	4	13	58	15	
△	0	10	15	11	42	21	1	
◇	0	20	36	16	16	11	1	
▽	0	23	26	11	32	7	1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP-9	54	0.7	Slightly gravelly, silty SAND	SM
□	TP-9	55	1.5	Slightly gravelly, silty SAND	SM
△	TP-9	56	2.5	Gravelly SAND, trace silt, poorly graded	SP
◇	TP-9	58	6.0	Very sandy GRAVEL, trace silt, well graded	GW
▽	TP-9	60	9.0	Very gravelly SAND, trace silt, poorly graded	SP

GEOTEST
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Client: Northwest Land Development. LLC
Project: The Point
Project No.: 22-0727 **Figure** 20

Tested By: MFP **Checked By:** TAC

Northwest Agricultural Consultants

2545 W Falls Avenue
Kennewick, WA 99336
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PAP-Accredited
NAPT

GeoTest Services Inc.
741 Marine Drive
Bellingham, WA 98225

Report: 60347-1-1
Date: August 23, 2022
Project No: 22-0727
Project Name:

Sample ID	pH	Organic Matter	Cation Exchange Capacity
TP-1 @ 0.3’	5.3	9.33%	20.9 meq/100g
TP-1 @ 1.4’	5.8	5.45%	14.6 meq/100g
TP-1 @ 2.7’	5.9	1.40%	5.5 meq/100g
TP-1 @ 8.6’	6.0	1.19%	4.3 meq/100g
TP-7 @ 0.5’	4.3	29.05%	41.8 meq/100g
TP-7 @ 1.5’	5.2	5.00%	15.3 meq/100g
TP-7 @ 4.0’	5.4	1.91%	6.0 meq/100g
TP-7 @ 6.0’	6.0	1.50%	5.9 meq/100g
Method	**SM 4500-H^+ B**	**ASTM D2974**	**EPA 9081**

REPORT LIMITATIONS AND GUIDELINES FOR ITS USE[1]

Subsurface issues may cause construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help:

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

At GeoTest our geotechnical engineers and geologists structure their services to meet specific needs of our clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of an owner, a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineer who prepared it. And no one – not even you – should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

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

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

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

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

1Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

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

- the function of the proposed structure, as when it's changed, for example, from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed construction,
- alterations in drainage designs; or
- composition of the design team; the passage of time; man-made alterations and construction whether on or adjacent to the site; or by natural alterations and events, such as floods, earthquakes or groundwater fluctuations; or project ownership.

Always inform GeoTest's geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. Do not rely on the findings and conclusions of this report, whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact GeoTest before applying the report to determine if it is still relevant. A minor amount of additional testing or analysis will help determine if the report remains applicable.

Most Geotechnical and Geologic Findings are Professional Opinions

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

1Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

A Report's Recommendations are Not Final

Do not over-rely on the construction recommendations included in this report. Those recommendations are not final, because geotechnical engineers or geologists develop them principally from judgment and opinion. GeoTest's geotechnical engineers or geologists can finalize their recommendations only by observing actual subsurface conditions revealed during construction. GeoTest cannot assume responsibility or liability for the report's recommendations if our firm does not perform the construction observation.

A Geotechnical Engineering or Geologic Report may be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. Lower that risk by having GeoTest confer with appropriate members of the design team after submitting the report. Also, we suggest retaining GeoTest to review pertinent elements of the design teams plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having GeoTest participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do not Redraw the Exploration Logs

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

Give Contractors a Complete Report and Guidance

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

1Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

In addition, it is recommended that a contingency for unanticipated conditions be included in your project budget and schedule.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering or geology is far less exact than other engineering disciplines. This lack of understanding can create unrealistic expectations that can lead to disappointments, claims, and disputes. To help reduce risk, GeoTest includes an explanatory limitations section in our reports. Read these provisions closely. Ask questions and we encourage our clients or their representative to contact our office if you are unclear as to how these provisions apply to your project.

Environmental Concerns Are Not Covered in this Geotechnical or Geologic Report

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

Obtain Professional Assistance to Deal with Biological Pollutants

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts biological pollutants from growing on indoor surfaces. Biological pollutants includes but is not limited to molds, fungi, spores, bacteria and viruses. To be effective, all such strategies should be devised for the express purpose of prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional biological pollutant prevention consultant. Because just a small amount of water or moisture can lead to the development of severe biological infestations, a number of prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of this study, the geotechnical engineer or geologist in charge of this project is not a biological pollutant prevention consultant; none of the services preformed in connection with this geotechnical engineering or geological study were designed or conducted for the purpose of preventing biological infestations.

1Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)