Geotechnical Engineering Report

College Place Elementary & Middle School Campus
20401 76th Avenue W.
Lynnwood, Washington

Prepared For:
Edmonds School District #15
20420 68th Avenue W.
Lynnwood, WA

Attention:
Laura Bowers
Manager of Design and Construction

GEOTEST
An RMA Company

1.888.251.5276
Bellingham | Arlington | Oak Harbor
www.geotest-inc.com

GEOTEST
An RMA Company

1.888.251.5276
Bellingham | Arlington | Oak Harbor
www.geotest-inc.com

February 25, 2025
Project No. 00-241332-0

Edmonds School District #15
20420 68th Avenue W.
Lynnwood, WA 98036

Attention: **Laura Bowers**
Manager of Design and Construction

Regarding: **Geotechnical Engineering Report**
College Place Elementary and Middle School Campus
20401 76th Avenue W.
Lynnwood, Washington 98036
(Parcel Nos. 270420-0030-0200 and 270420-0030-0300)

Dear Project Team,

As requested, GeoTest Services, Inc. [GeoTest] is pleased to submit the following report summarizing our geotechnical engineering evaluation for the new College Place Elementary and Middle School Campus at 20401 76th Avenue W in Lynnwood, 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 7, 2024.

GeoTest appreciates the opportunity to provide geotechnical services on this project and look forward to assisting you during the construction phase. Should you have 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.

Engineering Geologist
19110664
2.25.2025.
HARRISON G. SIMONS

EDWARDO A. GARCIA
40819
02-25-25

Jeff Vanfossen
Geotechnical Technician

Harrison Simons, L.E.G.
Geotechnical Project Manager

Edwardo Garcia, P.E.
Geotechnical Department Manager

Enclosure: Geotechnical Engineering Report

TABLE OF CONTENTS

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 project design can be formulated. Our scope of services includes the following tasks:

- Subcontracting a utility location service provider to sweep proposed exploration locations for private utilities prior to advancing any subsurface explorations.

- Exploration of soil and groundwater conditions underlying the site by advancing a total of 10 hollow stem auger borings (B-1 through B-10) and 10 test pits (TP-1 through TP-12, excluding TP-5 and TP-6) across the subject area. The borings were advanced by a subcontracted, specialty driller and test pit explorations were advanced with the assistance of a subcontracted excavator and operator.

- Laboratory determinations of soil classification and engineering properties. GeoTest performed moisture content and sieve testing to help establish engineering properties of the encountered soils.

- Provide a written report containing a description of surface and subsurface conditions and exploration logs. The summary includes descriptions of subsurface classification criteria and the terminology and symbols used on the exploration logs.

- Recommendations for site preparation and earthwork, including estimated stripping depths for clearing/grubbing purposes, the reuse of site soil, and criteria for selection, placement, and compaction of Structural Fill. Grade changes across the site and final design may facilitate reuse of onsite soil as Structural Fill.

- Recommendations for foundation support of the structures and slabs including potential foundation types, allowable soil bearing pressures, bearing soil depths, frost penetration and depth, estimates of settlement (total and differential), and general foundation design. GeoTest has provided recommendations for the subgrade modulus for floor slab design and recommendations for a capillary waterbreak and/or moisture/vapor barrier.

- Recommendations for lateral earth pressures, including active and at-rest earth pressures, allowable passive soil resistance, coefficient of friction for sliding, groundwater considerations, drainage requirements, general dewatering recommendations (if required), sub-slab drainage recommendations (if required), and pavement subgrade preparation recommendations.

- A discussion of the effects of weather and/or construction equipment on subgrade soils, as well as comment on wet weather construction approaches, erosion and sedimentation control concerns, and DOE-mandated monitoring of stormwater discharge from the project site.

- Discussion of seismic site class considerations based on the 2021 IBC / ASCE 7-22
- Provide preliminary recommendations regarding the stormwater treatment capabilities of the on-site soils based on the observed field conditions and results obtained from submitting site soil samples for pH, organic content, and cation exchange capacity.
- Recommendations for standard, heavy duty, and concrete pavement surfaces. Also included are recommendations for the use of asphalt-treated base (ATB), pavement thickness substitutions when using ATB, and minimum ATB thicknesses.
- Discussion of excavation considerations including recommendations for allowable excavation slope inclinations for temporary and permanent slopes, pond slopes, utility excavations, and classification of soil types per OSHA regulations.
- Assessment of Geologically Hazardous Areas on and in the proximity of the project site. Our assessment is presented in accordance with the City of Lynnwood Municipal Code sections 17.10.100 through 17.10.104.
- Recommendations for geotechnical inspections, testing, and support during construction.

Please note that pilot infiltration testing and seasonal groundwater monitoring services will be addressed in a separate letter / report.

PROJECT DESCRIPTION

The rectangular subject area is composed of two parcels that collectively occupy about 27.4 acres to the northeast of the 208th Street Southwest and 76th Avenue West intersection in Lynnwood, Washington. The site currently supports a total of 14 single-story school buildings, numerous drive paths and parking areas, a covered play area, various sports fields, asphalt surfaced basketball courts, and a looped track facility.

Based on conversations with the Client, as well as our review of several development concepts that were provided, we understand that the subject properties will be largely redeveloped. Although final plans were not available at the time this report was written, we generally expect that the development will include a new, two to three-story school structure within the central/northern portion of the campus. The primary school building will include new classrooms, gymnasiums, common spaces, technology learning areas, and administrative spaces. Site development is also expected to include the construction of new softball and soccer fields, a new track and field space, hard and soft play areas, covered play areas, courtyards, and garden areas.

Furthermore, we expect that new access roadways, parking areas and bus loops will be constructed. We also anticipate that new underground utilities will be constructed to service the proposed development and that new stormwater management facilities may also be constructed in the southeastern corner of the site. Lastly, a new geothermal well field is planned to the west of the proposed school building. Wells are expected to extend to the necessary depths below the new track and field area. Aside from about 4 to 7 structures in the southwestern corner of the site, we expect that the existing buildings, sport fields, pavements and other accessory structures will be demolished to facilitate the construction of the planned site improvements.

Although structural details were not available at the time this proposal was written, we generally expect that the new primary school building will be two to three stories in height, that it will utilize conventional concrete foundations, and a combination of wood, reinforced masonry, cold formed steel and/or structural steel framing for vertical construction elements. As such, structural loading conditions are expected to be moderate in scale. Additionally, based on our experience on similar school projects, we anticipate that isolated brace frame foundations could be incorporated into the building's structural design and could impart increased bearing pressures relative to most of the school footprint. Due to the existing, terraced topography, we anticipate that substantial amounts of cut, and fill will be needed to establish the planned site grades for both foundation support and flatwork construction.

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 site is bound to the east by a dense row of large trees and then the City of Lynnwood Municipal Golf Course. Relatively dense, single-and-multi-family residential developments generally border the subject area to the north, west and south. The site currently supports a total of 14 single-story school buildings, numerous drive paths and parking areas, a covered play area, various sports fields, asphalt surfaced basketball courts, and a looped track facility. Several relatively short rockery walls exist across the site while various large trees are scattered across the existing school campus. Aside from areas which support existing development, the site is predominantly surfaced with landscaped grasses and, to a lesser extent, large trees. Site boundaries are commonly marked by chain link fencing.

Image 1 (above) – This image shows typical surface conditions within the central portion of the site along the western margin of the existing track and field facility. This image faces northwest and was captured on November 5, 2024.

Images 2 (left) and 3 (right) - Views of the project area. Image 2 shows the grade break along the southern margin of the existing track facility. Image faced east. Image 3 shows B-10 during drilling. Note gradual grass covered topography along the eastern site margin within the southern, grass covered portion of the project site. Images taken August 27, 28 and 29, 2024 during site drilling operations.

The subject area exists in a low gradient upland setting with no significant slopes within the immediate vicinity. In several locations across the site, slopes briefly exceed roughly 40 percent inclinations for a maximum of about 8 feet of total relief in most areas. These areas are located immediately south of 204th Street, along the upslope and downslope margins of the track and field facility, along the eastern margin of several of the southern school building locations, and in the southeastern corner of the project site. In the southeastern corner of the site, slopes exceeding 40 percent extend for up to about 10 feet of total relief. More broadly though, the site slopes at gentle to moderate inclinations towards the south and east and extends from about 440 feet ASL (above sea level) along the western site margin, and 450 feet ASL along the northern site margin, down to about 410 feet ASL in the southeastern corner of the site. In all locations where they were observed, the briefly steep site slopes are interpreted to be associated with historic site grading.

Images 4 (left) and 5 (right) – These images were captured on August 29th via a GeoTest drone operated by a licensed GeoTest drone pilot. Image 4 was taken from along the southeastern corner of the site and faced northwest. Image 5 was captured from just outside the northern property boundary and faces south. Note the gently sloping, largely developed site conditions with scattered trees, play areas, parking areas and sports fields.

Subsurface Soil Conditions

Subsurface conditions were explored by advancing 10 exploratory test pits (TP-1 through TP-12, excluding TP-5 and TP-6) on November 11, 2024, and by drilling 10 hollow stem auger borings (B-1 through B-10), on August 27, 28 and 29, 2024. Notably, Test Pit's TP-5 and TP-6 were unable to be advanced on the originally planned exploration date (November 11, 2024) due to time constraints and dense soil conditions which slowed test pit advancement.

Subsurface conditions encountered during explorations were observed and logged by a GeoTest Staff Geologist under the direction of a Licensed Engineering Geologist. Soil classification was performed in general accordance with the guidelines of the American Society for Testing and Materials (ASTM) D2487 and D2488. For further subsurface information, please reference the *Site and Exploration* Plan (Figure 2), a *Soil Classification System and Key* (Figure 6), *Exploration Logs* (Appendix A) and *Laboratory Testing* (Appendix B).

Drilling Exploration

Disturbed but representative samples were obtained by using the Standard Penetration Test (SPT) procedure in accordance with ASTM D1586 during drilling operations. This test and sampling method consists of driving a standard 2-inch outside diameter, split-barrel sampler a distance of 18 inches into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded and the number of blows required to drive the sampler the final 12 inches is known as the Standard Penetration Resistance ("N") or blow count. If a total of 50 blows is recorded within one 6-inch interval, the blow count is recorded as the number of blows for the corresponding penetration, measured in inches. The resistance or N-value provides a measure of the relative density of granular soils (sands and gravels) or the relative consistency of cohesive soils (silts and clays); these values are reported on the attached boring log.

GeoTest encountered somewhat variable conditions across the project site. Within several of the more northern boring locations, we encountered variable thicknesses of uncontrolled fill that was commonly described as medium dense, dark brown to orange brown, gravelly silty sand with occasional to numerous organics. These materials were encountered to depths of between 5 and 12 feet BGS in explorations B-1, B-3,B-4, B-5, and B-8. The thickest occurrence of uncontrolled fill was observed in boring B-3, which was advanced just south of the track facility at the top of the grade break that extends down to the softball field area. Within the majority of our boring explorations, weathered trending to unweathered glacial till materials, commonly described as dense to very dense, gray to brown, slightly gravelly, silty sand materials that exhibited blocky texture, were encountered. The glacial till materials were observed to extend to depths of between 15 and 30 BGS in explorations B-1, B-2, B-3, B-4, B-6, B-7, B-9 and B-10.

Images 6 (left), 7 (center) and 8 (right) - These images show typical subsurface soil conditions as observed via split spoon sampler at the time of drilling operations in late September of 2024. Image 6 depicts a sandy interbed (advance outwash), that was observed at 7.5 feet BGS, within the glacial till unit. Note the reddish oxidation related to staining and slightly moist conditions above the glacial till contact. Images 7 and 8 illustrate typical glacial till materials (Image 7) and a typical glacial outwash interbed as observed in B-4 at 15 feet BGS.

Within the deeper borings, and generally southeastern portion of the site, advance outwash materials were also observed below and to some extent to be interbedded with the lower portion of the till unit. GeoTest observed advance outwash deposits (or interbeds of outwash within the lower portion of the till unit) in explorations B-1, B-2, B-3, B-4 and B-5. These materials were typically described as very dense, brown to gray, gravelly, slightly silty sands. In various boring explorations, advance outwash deposits were observed below and/or as interbeds within the lower portions of the glacial till unit. In exploration B-5, advance outwash materials were observed below uncontrolled fill materials and extended from about 7 to 21.5 feet BGS in this location.

Test Pit Explorations

Our test pit explorations were advanced to depths of between 6.5 and 10 feet below ground surface (BGS) using a tracked excavator operated by PacNW Excavation. Test pits were terminated at the planned depth of 10 feet BGS, unless dense subsurface conditions resulted in practical equipment refusal at shallower depths. Test pit explorations consisted of the excavation of shallow open pits with the use of a rubber tracked excavator and operator subcontracted to GeoTest. Grab samples were obtained at approximately 2-foot intervals or upon changes in soil stratigraphy. Test pit excavations encountered somewhat variable conditions across the site. However, the findings were generally consistent with soil conditions encountered in boring explorations.

Images 9 (left), 10 (center) and 11 (right) - These images show typical subsurface soil conditions as observed during test pit excavation. Image 9 shows TP-7 and demonstrates conditions consisting of topsoil over glacial till deposits. Image 10 shows TP-1 and illustrates topsoil over weathered trending to unweathered advance outwash deposits. Image 11 shows TP-10 and depicts uncontrolled fill over relict topsoil over weathered trending to unweathered glacial till deposits.

In explorations TP-3, TP-4, TP-10 and TP-11 we observed medium dense to very dense, dark brown to gray-brown, damp, gravelly to very gravelly, very silty sand materials that commonly contained anthropogenic debris, and numerous organics. These materials were interpreted as uncontrolled fill materials and were observed to depths of between 1.75 and 3 feet BGS. In exploration TP-3, the uncontrolled fill materials were overlain by a roughly 6-inch-thick layer of topsoil described as loose, dark brown, damp, gravelly, silty sand with numerous organics. Additionally, in this location, relict topsoil deposits were observed below the uncontrolled fill materials as a thin, roughly 3- to 4-inch-thick layer that extended across the test pit sidewalls.

Below the uncontrolled fill and topsoil materials, GeoTest observed glacial till materials that were commonly described as dense to very dense, gray, damp, gravelly, very silty or silty sand with trace cobbles in explorations TP-3, TP-7, TP-8, TP-9, TP-10 and TP-11 (generally northern and western portions of the site). Excluding TP-3, Glacial till was observed to the terminal depths of these explorations which occurred at depths of between 6.5 and 9 feet BGS. In TP-3, very dense, gray, damp, slightly silty, very gravelly sand, interpreted as glacial outwash, was observed from 7 to 9.5 feet BGS (terminal exploration depth).

Within the remaining test pit explorations (TP-1, TP-2, and TP-4), that were advanced in the southeastern, lower elevation portion of the site, we encountered weathered trending to unweathered advance outwash deposits. These materials were commonly described as dense to very dense, gray-brown, damp, slightly silty, gravelly sand deposits. Some infrequent, and thin layers of relatively silty materials were observed periodically within the predominantly granular outwash deposits.

General Geologic Conditions

Geologic information for the project site was obtained from the *Geologic map of the Edmonds East and part of the Edmonds West quadrangles, Washington* (Minard, J.P., 1983). According to this publication, geologic deposits mapped within the project area consist of till (Unit Qvt). Additionally, advance outwash (Unit Qva) is mapped just south and east of the project site.

Till (Unit Qvt) – The informally named Vashon Till mostly mantles broad upland surfaces (generally higher than 30m in altitude). It crops out as the upper most unit in the region and is more extensive than that of all the other mapped units combined. The till also occurs as small isolated deposits on upland surfaces or as downhill extensions mantling slopes well below 30 meters in altitude as a result of its deposition on pre-existing topography. The till is described as a nonsorted mixture of clay, silt, sand, pebbles, cobbles and boulders, all in variable amounts. It includes some lenses of stratified material, particularly near its base. Distinctive features of the till are its compactness, the vertical slopes it maintains, and its heterogenous internal structure which resembles a concrete mix.

Advance Outwash (Unit Qva) – According to the referenced author, advanced outwash underlies the till. The outwash typically is a thick section of mostly clean, gray, pebbly sand with increasing amounts of gravel higher in the section. Distinctive features of the outwash are its well developed cross and horizontal stratification, and cut and fill structure. Locally some of these sediments are stained by iron oxide precipitated from groundwater. Fine grained sand and some silt are common in the lower part of the unit and also locally occur sparingly in the upper part. The advance outwash was deposited by meltwater flowing from the advancing front of the glacier, partly, at least, by braided streams. This unit is as much as 80 meters in thickness and is one of the thickest and most extensive aquifers in the region.

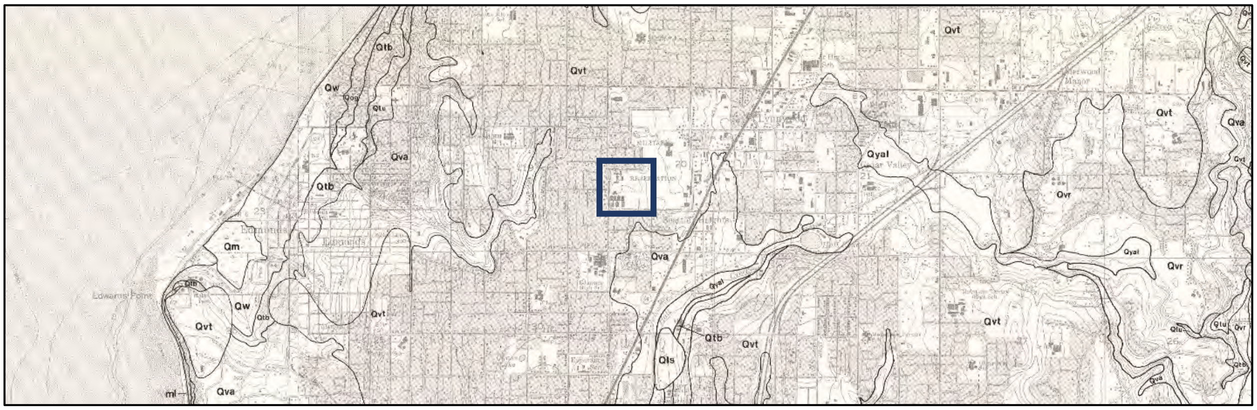


Image 12 - A portion of the *Geologic map of the Edmonds East and part of the Edmonds West quadrangles, Washington.* (Minard, J.P., 1983) Approximate subject area is shown in blue.

Based on the subsurface conditions encountered in our explorations, the site soils appear to be somewhat discordant with the mapped geology, as described above. The materials observed in our explorations appear to be representative of till (Unit Qvt) over advance outwash (Unit Qva). In some locations, these materials appeared to be interbedded to some extent. However, advance outwash deposits were observed near surface elevations within the southeasternmost portion of the project site. As such, surface exposures of this unit appear to extend further north than shown in the referenced mapped. It should be noted that the published geology is representative of regional conditions and that some variation between on-site soils and mapped geologic units should generally be anticipated.

Based on our review of the published local and regional geology, there are no mapped landslides or alluvial fans within the immediate vicinity of the project site. However, several strands of the South Whidbey Island Fault Zone exist within about 750 to 5,000 feet of the project site. This northwest to southeast trending fault system is considered to be capable of producing a 7.4 magnitude earthquake (FEMA, USGS, DNR, 2013), has a reverse, left lateral sense of movement, a roughly 0.6 mm/year slip rate and a recurrence interval of roughly 400 to 9,200 years (USGS, 2016).

Monitoring Well Installation

Following completion of borehole advance, a monitoring well was installed in one location (MW-1) by Boretec1, Inc. personnel (licensed well drillers). The well was installed at the existing ground surface with no benching or raising of well sites. At the well location, a two-inch outer diameter, SCH-40 PVC was inserted to depths of approximately 24 feet below ground surface (BGS), with the bottom 15 feet consisting of slotted screen PVC. The outside of the well casing was packed with 10/20 Colorado silica filter sand, then topped with bentonite clay chips in the upper foot. A steel flush-mounted well cover was installed to be level with the ground surface and set with quick curing concrete. Well construction and backfill was completed by the Boretec1, Inc. personnel in accordance with industry standard techniques and materials. At the time of drilling, groundwater was not encountered in the monitoring well location to a depth of 25 feet BGS.

Installation of one downhole automated piezometric data logger and one surface barometric logger was completed on November 26, 2024, by GeoTest staff. The logger was set at approximately 1 foot from the base of the well and tied off to the well cap with plastic coated steel cable to establish a consistent level reference for data collection. The downhole logger was set to record barometric pressure, temperature, and water level above the loggers at 1-hour intervals throughout the monitoring period. The surface barometric logger was placed near the well location. The barometric logger was set to record pressure and temperature at 1-hour intervals.

GeoTest plans to return to the site over the course of the 2024-2025 wet season to verify functionality of the downhole loggers and to download interim data. Additional information pertaining to the soil conditions observed in this exploration, and findings from our ongoing groundwater monitoring and stormwater infiltration feasibility study will be delivered to the client in a separate memo, pending the end of the 2024-2025 wet season such that our findings may be implemented into the design of site stormwater infiltration facilities.

Groundwater

Groundwater was only encountered as minor seepage atop glacial till materials (TP-7) during our subsurface explorations. Otherwise, groundwater was not encountered at the project site during test pit or drilling exploration. Perched water conditions are expected to develop atop glacial till materials at the project site during the wet season and/or following periods of extended precipitation. Perched water conditions occur above the regional groundwater table in the unsaturated zone and typically occur when loose, more permeable soil is underlain by denser, less permeable soil. The vertical movement of water through loose soils is restricted once a dense or less permeable soil is encountered at depth. Perched water conditions typically develop in the wet season (November through April) or after extended periods of rainfall.

Groundwater associated with the regional groundwater table was not encountered at the time of our subsurface explorations. Based on the encountered conditions in the southeastern portion of the site (coarse grained advance outwash deposits), GeoTest is in the process of evaluating soil and groundwater conditions within this area of the project site. As discussed in the groundwater section, final results from our infiltration feasibility evaluation study will be presented in a separate memorandum pending the end of the 2024-2025 wet season when seasonal high groundwater elevations have been recorded in the southeastern portion of the site.

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 will fluctuate depending on local subsurface conditions, precipitation, and changes in on-site and offsite use.

Web Soil Survey

According to the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) *Web Soil Survey* website, soils within the subject area are classified as Alderwood-Urban land complex, 2 to 8 percent slopes.

This soil unit is derived from a parent material of basal till. These soils are generally moderately well drained and are rated as having a **moderate** erosion susceptibility with an erosion K factor of 0.20. Values of K range from 0.02 to 0.69, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. Please keep in mind that the erosion K factor for whole soil accounts for the erosion potential of the soil only, including rock fragments, and does not account for other factors promoting soil loss, such as water sources and topography. Table 1, below, summarizes the soil properties that were obtained from the USDA Web Soil Survey website.

Table 1:
USDA Web Soil Survey Soil Classifications

Map Unit Symbol	5
Map Unit Name	Alderwood-Urban land complex, 2 to 8 percent slopes
Soil Description	Gravelly ashy sandy loam over very gravelly ashy sandy loam over gravelly sandy loam
Landform	Till Plains
Parent Material	Basal Till
Land Capability Classification	4s
Erosion K Factor, Whole Soil	0.20

Based on the low angle topography at the project site, we anticipate that erosion may be managed using conventional best management construction practices. However, the contractor should be aware of this potential if appropriate erosion control practices are not implemented during construction.

GEOLOGICALLY HAZARDOUS AREAS

Our geotechnical investigation included an assessment of potential geologic hazards on and in the vicinity of the project site. According to Lynwood Municipal Code section 17.10.100(A), *geologically hazardous areas are those areas that are naturally susceptible to geologic events such as landslides, seismic activity and severe erosion. Areas susceptible to one or more of the following types of hazards shall be designated as geologically hazardous areas*.

Lynnwood Municipal Code goes on to define geologically hazardous areas as the following:

<u>Landslide Hazard Areas</u> - Areas with slopes steeper than 40 percent. Areas with slopes between 15 to 40 percent that are underlain by soils largely consisting of silt and clay. Areas with slopes steeper than 15 percent with zones of emergent water such as ground water seepage or springs. Areas of landslide deposits regardless of slope.

<u>Erosion Hazard Areas</u> - Erosion hazards areas are lands underlain by soils identified by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) as having "severe" or "very severe" erosion hazards.

<u>Seismic Hazard Areas</u> - Seismic hazard areas are lands that are underlain by soft or loose saturated soils that are subject to liquefaction settlement or spreading during earthquake induced ground shaking.

The project site does contain several isolated areas where slope inclinations exceed 40 percent for up to roughly 10 feet of total vertical relief (*Bare Earth Imagery*, Figure 3). As such, these limited areas of the site **are considered Landslide Hazard Areas per Lynnwood Municipal Code**. However, these sloped areas are isolated in nature and appear to be associated with past episodes of site grading along the upslope and downslope margins of the track facility, within the southeastern corner of the site, and along the site's northern margin. In our opinion, these areas do not present significant risks associated with the potential for landslides within the subject area. Permanent soil slopes planned as part of the proposed site improvements should be sloped at inclinations of no greater than 2(Horizontal):1(Vertical). When this recommendation is incorporated into the plan for site development, we anticipate that these isolated "Landslide Hazard Areas" will be managed in accordance with Lynnwood Municipal Code section 17.10.102. In our opinion,

- The proposed development will not create a hazard to the subject property, surrounding properties, or rights-of-way, nor will it cause severe erosion, or deposit excessive sedimentation to off-site properties or bodies of water; and
- The proposed method of construction will reduce erosion, landslide, and seismic hazard potential, and will improve or not adversely affect the stability of slopes; and
- The proposal uses construction techniques which minimize disruption of existing topography and natural vegetation; and
- The proposal is consistent with the purposes and provisions of this chapter.

Based on our review of the information obtained over the course of this investigation, **the project is not considered to present erosion or seismic hazards as defined by Lynnwood Municipal Code**. This conclusion is tied to the presence of generally dense native soil conditions, and the NRCS designation of moderate erosion susceptibility for site soils. Thus, outside of compliance with current building codes, GeoTest does not recommend specific mitigations for the planned construction to address potential erosion or seismic hazards.

Although specific mitigations are not required to address the regional seismic hazard, please keep in mind that the Pacific Northwest is seismically active. Large Cascadia subduction zone earthquakes with possible magnitudes of 8 or 9 could produce ground shaking events with the potential to significantly impact the subject property regardless of the topography or subsurface conditions. Cascadia subduction zone earthquakes have occurred 6 times in the last 3,500 years with the most recent taking place in 1700, approximately 322 years ago. They have been determined to have an average recurrence interval of approximately 300 to 700 years (Atwater and Haley, 1997).

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.

GeoTest generally recommends that topsoil, previously reworked site soils, uncontrolled fill (when encountered), anthropogenically derived debris, and loose or soft native soils which cannot be readily compacted be removed from portions of the site that will support new fills, foundations, floor slabs, pavements, sidewalks, or other structural improvements. Within the vicinity of the planned building footprint, the contractor should anticipate typical stripping depths roughly 6 to 15 inches to remove topsoil and expose dense native soils for the majority of the footprint. However, increased stripping depths should be anticipated in the vicinity of explorations B-1 (uncontrolled fill to 5 feet BGS), B-3 (uncontrolled fill to 12 feet BGS), and B-4 (uncontrolled fill to 5 feet BGS), where uncontrolled fill materials were observed to extend to greater than average depths. In addition to the anticipated stripping depths in the vicinity of the primary school structure as noted above, the potential for increased stripping depths should be anticipated to expose native soil conditions in the vicinity of B-8 (uncontrolled fill to 8 feet BGS), B-5 (uncontrolled fill to 6.5 feet BGS) and TP-10 (uncontrolled fill to 3 feet BGS). GeoTest did not advance subsurface explorations in areas occupied by existing development, thus, the potential for increased stripping depths should also be anticipated for these areas of the site in the contract documents.

As detailed in the *Allowable Bearing Capacity* section of this report, native glacial till and/or advance outwash deposits, once appropriately prepared and approved by the Geotechnical Engineer, are considered suitable to provide a net allowable soil bearing pressure of 3,000 pounds per square foot (psf) for conventional concrete foundation loading conditions. GeoTest anticipates that larger brace frame foundations could be utilized on this project. For brace frame foundations that are embedded at least 1.5 feet into dense to very dense, glacially consolidated, till or advance outwash, these foundations may be proportioned using a net allowable soil bearing pressure of 5,000 psf. In all cases, new foundations must be placed on either firm and unyielding native soil, Structural Fill overlying firm and unyielding native soil, or on piles, piers, or ground improvement options that extend through the existing uncontrolled fill soil. Further, foundations must be sized and proportioned for the specific soil-support condition that underlies the foundation, as discussed in this report.

Based on our research and site investigation, the project site does not contain erosion or seismic hazards as defined by the Lynnwood Municipal Code. Thus, no specific mitigations, outside of the seismic design criteria of the applicable current building codes, are recommended to address these potential geologically hazardous areas. However, the site does contain limited areas which meet the LMC definition of a landslide hazard area based on slope inclination. In order to limit potential risks in these areas, GeoTest recommends that permanent soil slopes that are impacted or planned as part of the proposed site improvements be sloped at inclinations of no greater than 2(Horizontal):1(Vertical). No additional mitigations are expected to be needed to address geologically hazardous areas at the project site.

The native glacial till deposits encountered at shallow depths in the northern majority of our explorations were generally dense to very dense and contained fines contents up to about 30 percent. Perched water was observed atop these materials in TP-7 at the time of our site work in November of 2024. In our opinion, the presence of perched water or glacial till materials at depth constitutes the presence of a “hydraulic restriction layer” as defined by the Washington State Department of Ecology *Stormwater Management Manual for Western Washington* (SMMWW), dated 2019. However, within the southeastern corner of the project site, and more broadly across the site at greater depths (below the glacial till unit), GeoTest observed dense to very dense advance outwash deposits that commonly contained fines contents between about 2 and 10 percent. Although the density of these deposits will reduce the rate at which water can flow through these materials, they generally display physical characteristics which are likely to allow for stormwater infiltration. At the time of this report, an additional investigation concerning the feasibility of stormwater infiltration in the southeastern portion of the project site was ongoing. Final conclusions pertaining to the infiltration of stormwater at the project site will be presented in a separate memorandum pending the completion of groundwater monitoring and pilot infiltration testing that is planned for the 2024-2025 wet season.

Site Preparation and Earthwork

The portions of the site proposed for foundation(s), floor slabs, vaults, or sidewalk development should be prepared by removing existing fill (if present), topsoil, deleterious material, and significant accumulations of organics. 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 foundations, continuous foundations, or roadways should be recompacted to a firm and unyielding condition. The contractor should anticipate typical stripping depths of 6 to 15 inches to remove topsoil at most locations. However, increased stripping depths should be anticipated in the vicinity of explorations B-1 (uncontrolled fill to 5 feet BGS), B-3 (uncontrolled fill to 12 feet BGS), and B-4 (uncontrolled fill to 5 feet BGS), where uncontrolled fill materials were observed to extend to greater than average depths in the vicinity of the planned school building. The potential for increased fill depths should also be anticipated in the vicinity of B-8 (uncontrolled fill to 8 feet BGS), B-5 (uncontrolled fill to 6.5 feet BGS) and TP-10 (uncontrolled fill to 3 feet BGS). Please note that uncontrolled fill materials may also be encountered in the vicinity of existing structures, where explorations were unable to be advanced during our site investigation. For ancillary drive paths and pavement structures, GeoTest recommends stripping no more than 2 feet of uncontrolled fill.

We recommend that a GeoTest geotechnical professional be retained to document contact with firm and unyielding conditions below proposed areas of development. If possible, verification of these conditions should be accomplished through proof rolling. The purpose of this effort is to identify loose or soft soil deposits so that, if feasible, the soil disturbed during site work can be recompacted. 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. Further, we generally recommend that major earthworks take place during the dry summer months.

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. In some locations, on-site proof rolling may not be feasible due to the depth or the location of the excavation. In these circumstances we recommend that verification of subgrade conditions be performed using soil probe or Dynamic Cone Penetrometer methods to verify firm and unyielding conditions.

Please note the near surface native and existing site soils are expected to be moisture sensitive. As such, we recommend that earthwork be performed during extended periods of dry weather, such as the summer and early fall, when feasible. Earthwork performed during wet site conditions will likely incur significant unavoidable expense when to compared to dry weather construction.

Temporary Erosion and Sedimentation Control

GeoTest anticipates that the project will require a Construction Stormwater General Permit issued through the Washington State Department of Ecology. In addition to mitigating the erosion potential for on-site soils during construction processes, Temporary Erosion and Sediment Control (TESC) measures will also limit the transport of sediment from the project site. GeoTest expects that a Stormwater Pollution Prevention Plan will be generated by others for the project site and that the plan will present Best Management Practices that must be maintained or modified during the entirety of the construction practice. Stated differently, it should be expected that TESC measures will be installed, inspected, maintained, and/or repaired during construction and until such time as the entire site has undergone final stabilization and all temporary BMP’s have been removed upon closure of the Construction Stormwater General Permit.

GeoTest anticipates that a Certified Erosion and Sediment Control Lead (CESCL) will be retained to perform inspections and document the presence and performance of TESC measures. GeoTest recommends that the CESCL be a third party contracted directly with the School District. GeoTest does not recommend that the Contractor be the designated CESCL for this project.

Fill and Compaction

Structural Fill 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 – Existing Fill

Due to the variability and numerous organics observed in the uncontrolled fill materials GeoTest does not recommend reusing uncontrolled fill in Structural Fill applications. If during construction, sufficient quantities of existing fill materials are encountered that are free of organics, are predominantly granular in nature, and it is desired to use existing fill soils for Structural Fill, GeoTest should be allowed to observe the soils in question to determine if they are suitable for Structural Fill. At the time of this report, existing fill soils may only be utilized in non-structural applications.

Reuse of On-Site Soil – Native Soil

The non-organic, native outwash and till materials may be 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 till soils found on site contain a relatively high percentage of fines and should be considered moisture sensitive. Reuse of till may be considerably more difficult to use at or near perched groundwater elevations and during the wet weather season (October 1 – April 30). Furthermore, the silty nature of the till may limit its use if being considered close to areas where infiltration or a stormwater vault may be planned. If using on-site materials, the Contractor or Owner should be prepared to manage over-optimum moisture content soils. The moisture content of the soils may be difficult to control during periods of wet weather.

During our investigation, in more than one instance, GeoTest observed oversized materials consisting of cobbles and scattered boulders within a few of the test pit excavations. It is GeoTest's opinion that there is a likelihood that cobbles and boulders will be encountered during grading and/or excavation activities. The Client and/or Owner should anticipate their presence and issues associated with them during the construction phase. Screening of oversized materials should be anticipated.

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) or a well-graded crushed rock. GeoTest recommends that Structural Fill for dry weather construction meet Washington State Department of Transportation (WSDOT) Standard Specification 9-03.14(2) for "Select Borrow" with the added requirement that 100 percent pass a 4-inch-square sieve.

Soil containing more than about 5 percent fines (that portion passing the U.S. No. 200 sieve) cannot consistently be compacted to a dense, non-yielding condition when the water content is greater than optimum. Accordingly, GeoTest recommends that imported Structural Fill for wet weather construction meet WSDOT Standard Specification 9-03.14(1) for "Gravel Borrow" with the added requirement that no more that 5 percent pass the U.S. No. 200 sieve. Due to wet weather or wet site conditions, soil moisture contents could be high enough that it may be very difficult to compact even 'clean' imported select granular fill to a firm and unyielding condition. Soils with over-optimum moisture contents should be scarified and dried back to more suitable moisture contents during periods of dry weather or removed and replaced with fill soils at a more suitable range of moisture contents.

Benching

Due to the gently sloping topography within the areas planned for improvement, grading activities may require appropriate benching to accommodate elevation changes. Structural fill used to support foundations and roadways should incorporate appropriate benching techniques where grades exceed 5(Horizontal):1(Vertical). On reaching suitable subgrade soils, foundation alignments and areas where structural fill will be placed should be benched flat by mechanical removal. Foundation alignments should be stepped or benched flat to accommodate the sloping grade on the site. We recommend a maximum step height of 18 inches vertically with a horizontal spacing of at least 5 feet.

Backfill and Compaction

Structural Fill should be placed in horizontal lifts. 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

Native till soils are susceptible to degradation during wet weather. As a result, it may be difficult to control the moisture content of site soils during the wet season. 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 International Building Code, the medium dense to very dense, glacially consolidated soils underlying the site are classified as Site Class D, according to ASCE 7-22. 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

GeoTest recommends that existing topsoil, uncontrolled fill materials and loose, upper portions of the native soil which cannot be readily recompacted be removed from beneath the building foundation area(s) to expose dense to very dense, glacially consolidated soil. Our site explorations, however, indicate extensive, historic site grading that has resulted in between 3 and 12 feet of uncontrolled fill below some portions of the planned building location.

Table 2- Exploration Location Depths to Bearing Stratum

Location	Existing Ground Elevation (ASL, Approximate)	Depth to Medium Dense Native Conditions (BGS) (3,000 PSF Capacity)	Depth to Dense to Very Dense Native Conditions (BGS) (3,000 or 5,000 PSF** Capacity)
TP-1	~416	NA	1.5’
TP-2	~417	NA	1.5’
TP-3	~426	NA	1.75’
TP-4	~418	NA	2.25’
TP-5*	NA*	NA*	NA*
TP-6*	NA*	NA*	NA*
TP-7	~427	NA	1.5’
TP-8	~435	NA	1.5’
TP-9	~435	NA	1.5’
TP-10	~435	NA	4.0’
TP-11	~439	NA	1.5’
TP-12	~440	NA	1.5’
B-01	~435	NA	5.0’
B-02	~437	NA	1.5’
B-03	~424	NA	12.5’
B-04	~431	NA	5.0’
B-05	~416	NA	6.5’
B-06	~437	1.5’	6.5’
B-07	~437	NA	1.5’
B-08	~434	NA	10.0’
B-09	~437	NA	1.5’
B-10	~427	NA	1.5’

*These Test Pits were not advanced due to dense digging conditions and time restrictions during fieldwork
Brace frame foundation require ***at least* 1.5 feet of embedment into dense to very dense soil. This table does not include 1.5 feet of embedment and only reports the depth to dense to very dense soil conditions.

GeoTest does not recommend that new foundations be placed on existing fill soil. In all cases, new foundations must be placed on either firm and unyielding native soil, Structural Fill overlying firm and unyielding native soil, or on piles, piers, or ground improvement options that extend through the existing fill soil. From a conceptual standpoint, a partial basement could be incorporated into the design to extend foundations deeper into the subsurface (and limit the need for imported structural fill) within the southern, and southwestern most portions of the footprint (where thicker uncontrolled fills are anticipated).

At the time of this report, GeoTest does not have a foundation plan or foundation elevations within which to provide more directive recommendations with regard to foundation types or soil bearing capacities. For the purposes of discussion, GeoTest is providing soil bearing capacities for shallow conventional foundations **assuming that these foundations will be either extended**

through existing uncontrolled fill soil or that existing uncontrolled fill will be entirely removed below the foundations and replaced with Structural Fill.

If utilized, continuous and isolated spread footings should be founded 18 inches (at 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, medium dense to very dense till or advanced outwash deposits, or on compacted Structural Fill placed directly above these native soils, may be proportioned using a net allowable soil bearing pressure of 3,000 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.

GeoTest anticipates that larger brace frame foundations could be utilized on this project. For brace frame foundations that are embedded at least 1.5 feet into dense to very dense, glacially consolidated till or advance outwash, these foundations may be proportioned using a net allowable soil bearing pressure of 5,000 psf. GeoTest does not recommend that granular Structural Fill be utilized under foundations proportioned for 5,000 psf. Controlled Density Fill, however, may be used in lieu of Structural Fill for higher-capacity foundations should the need arise and assuming that the CDF has a mix design that exceeds three times the foundation's proportioned bearing capacity.

The 'net allowable bearing capacity' 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

Conventional slab-on-grade floor construction is feasible for the planned site improvements. Floor slabs may be supported on suitably prepared native subgrade or on properly placed and compacted Structural Fill placed over suitably prepared native soil. Prior to placement of the Structural Fill, the native soil should be proof rolled as recommended in the *Site Preparation and Earthwork* section of this report.

GeoTest recommends that interior concrete slab-on-grade floors be underlain with at least 6 inches of clean, compacted, free-draining crushed gravel to serve as a capillary break. This material should be clear, crushed, ¾-inch rock with no fines or similar. The purpose of this gravel layer is to provide uniform support for the slab, provide a capillary break, and act as a drainage layer. To help reduce the potential for water vapor migration through floor slabs, a continuous 10- to 15-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. American Concrete Institute (ACI) guidelines suggest that the slab may be poured directly on the vapor barrier.

A Subgrade Modulus (k) of 200 pounds per cubic inch (pci) is recommended for use in the design of concrete slab elements placed on Structural Fill over very stiff to hard / dense to very dense soils.

Exterior concrete, such as for parking and sidewalks, may be supported directly on properly prepared existing site soils. However, long-term performance will be enhanced if exterior slabs are placed on a layer of clean, durable, well-draining granular material above existing site soils.

Foundation and Site Drainage

Positive surface gradients should be provided to direct surface water away from developed areas 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 the building 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 building foundations as shown in the *Conceptual Footing & Wall Drain Sections* (Figures 4 and 5) 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 floor 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.

GeoTest expects that perched groundwater seepage will be encountered atop the low permeability soils present on site depending on the time of year. Depending on the final building elevations, an underslab drainage system may be required for the proposed buildings. We can provide further recommendations for underslab drainage upon request.

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. GeoTest offers building science design, consultation and inspection services to support regulatory compliance for new building enclosures, as well as services to improve building performance and increase envelope durability. GeoTest would be pleased to provide these services for the project under a separate scope.

Elevator Pits

Although plans were not available at the time this report was written, we expect that an elevator may be included in the plan for site development. Elevator pits commonly will result in a local low spot within/near the building that is likely to collect subsurface sources of water. GeoTest generally recommends the inclusion of a gravity drain system to remove this water. If a gravity drain system cannot be included in the design, or if a pump system is determined to be infeasible for this project, GeoTest recommends that elevator pits be designed to resist buoyant forces. Where appropriate, submerged elements should have adequate water stops and waterproofing to resist the intrusion of water.

Resistance to Lateral Loads

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. The 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. GeoTest recommends that a seismic surcharge of approximately 8*H (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 300 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.

All retaining walls should include a drain system that will convey water to an approved area for discharge. GeoTest recommends that retaining walls include the use of a 12-inch minimum thickness layer of free draining backfill materials (drain rock, or clear crushed rock, wrapped in non-woven geotextile filter fabric) adjacent to the wall. GeoTest specifically recommends that drainage mats not be used in lieu of a 12-inch thick free draining material. If drainage mats are used, the wall should be designed for saturated soil conditions and the project team should plan for extensive waterproofing efforts on the buried portions of the wall. In design computations, the upper 12 inches of passive resistance should be neglected if the soil is not covered by floor slabs or pavement. If future plans call for the removal of the soil providing resistance, 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 native soils or 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.

Geofoam Considerations

GeoTest understands that the use of geofoam is being considered as backfill adjacent to the relatively tall, below grade concrete walls planned in certain areas of the structure. Geofoam could be used to reduce lateral earth pressures which would act on these walls; thus wall design would not need to be as robust and could potentially save costs on construction materials. We expect that expanded polystyrene (EPS) foam could be used for this application.

Because of its closed-cell structure and light weight, EPS geofoam is buoyant. If Geofoam is used as fill material behind retaining walls, buoyant forces could develop in the absence of a drainage system, with the potential to “float” geofoam used in the structure. Thus, if geofoam will be used for this purpose, we recommend that an adequate drainage layer be placed below geofoam materials and that a gravity drain system also be constructed to prevent the buildup of surface water below areas where geofoam will be used to fill adjacent to retaining walls.

GeoTest recommends that block foam be used in lieu of expanding foam products as expanding foam should be expected to exert lateral pressures on the planned walls. If expanding foam is used, a detailed review of the product is needed to determine how much lateral force will be exerted on the wall, coupled with a review of the retaining wall parameters used in the design. When foam blocks are used between a wall face and sloping soil/rock conditions, lateral earth pressures acting on the wall can be assumed to be 5 pcf when the cut slope angle is equal to or less than (flatter) than the assumed friction angle for the soil/rock that composes the slope. For the native glacial till, and advance glacial outwash soils expected to be encountered in deeper excavations, a recommended internal angle of friction of 36 degrees should be used in the design.

It is generally assumed that the project team will not want to grade or impact the existing slopes except to excavate horizontal benches that will allow for the placement of geofoam blocks and drainage rock at the block/slope interface to allow for drainage. GeoTest should be provided with the foam product being used as retaining wall backfill prior to the submittal of plans to the reviewing agency.

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 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 advance outwash or uncontrolled fill materials encountered at the project site are classified as a Type C soil according to WAC 296-155-66401 and may be sloped as steep as 1.5H :1V (Horizontal: Vertical). However, dense to very dense glacial till soils are classified as Type A soil and may be sloped as steep as 0.75H:1V. All soils encountered are classified as Type C soil in the presence of groundwater seepage. 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.

Shoring Considerations

Based on the conceptual plans at the time of this report, GeoTest anticipates that excavations could be required in proximity of existing structures on or adjacent to the project site. As such, a temporary shoring system designed by a licensed engineer may be needed as part of the construction plan in areas where sufficient horizontal separation does not exist between planned excavations and existing buildings or the City streets bordering the site. Based on the planned depth of specific excavations and proximity of adjacent structures, or public roadways, appropriate shoring systems should be implemented by the contractor during construction. We anticipate the shoring system, if needed, may consist of a soldier pile wall, sheet piles, or similar systems that could be incorporated into the final, below grade walls, if proposed.

The design of the shoring system should include appropriate lateral pressures caused by surcharge loads located within a horizontal distance equal to or less than the height of the system. 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 systems, respectively.

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 existing fill, advance outwash, or glacial till.

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 the project specifications. Please note that native soil will have elevated silt contents and will be moisture sensitive. 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 the 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.

Pavement Subgrade Preparation

GeoTest recommends that pavement sections be founded on firm and unyielding native or suitable existing fill soils, or on compacted Structural Fill placed directly over firm and unyielding subgrade. Where existing fill soils are present and consist of mineral soil, it should be expected that these fill soils will be scarified to a depth of 18 inches below the bottom of pavement elevations and recompacted to the requirements for Structural Fill. Existing fill with elevated levels of organics should be overexcavated and replaced with Structural Fill. GeoTest recommends stripping no more than 2 feet of existing, uncontrolled fill for ancillary drive paths, parking areas and other pavement structures**.** It is our opinion that 2 feet of Structural Fill over suitable prepared existing fill subgrade in pavement areas will adequately "bridge" over the existing fill materials.

Site grading plans should include provisions for the sloping of subgrade soils in the proposed pavement areas so that passive drainage of the pavement section(s) can proceed uninterrupted during the life of the project. The discussion below represents typical pavement sections used for similar projects in the region.

Light Duty Flexible Pavement

If utilized within light vehicle parking and lower traffic areas, GeoTest recommends a standard, or "light duty", pavement section that consists of 3 inches of Class ½-inch HMA asphalt above 2 inches of crushed surfacing top course (CSTC) meeting criteria set forth in the Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9[3]. The base material for the pavement section should consist of 6 inches of crushed surface base course (CSBC). This would result in a total of 8 inches of rock (CSTC and CSBC) underlying the asphalt.

If desired, 4 inches of CSBC may be substituted for 3 inches of Asphalt Treated Base, although GeoTest recommends that at least 4 inches of CSBC be used below any ATB section to promote drainage.

Heavy Duty Flexible Pavement

Fire truck and general heavy access or high-volume lanes will require a thicker asphalt section and should be designed using a paving section consisting of 4 inches of Class ½-inch HMA asphalt above 2 inches of CSTC meeting criteria set forth in the WSDOT Standard Specification 9-03.9[3]. The base material for the road section should consist of 6 inches of CSBC. This would result in a total of 8 inches of rock (CSTC and CSBC) underlying the asphalt.

If desired, 4 inches of CSBC may be substituted for 3 inches of Asphalt Treated Base, although GeoTest recommends that at least 4 inches of CSBC be used below any ATB section to promote drainage.

Concrete Pavement Sections

Concrete pavements could be used for parking or access areas. The design of concrete pavements is a function of concrete strength, reinforcement steel, and the anticipated loading conditions for the roads. For design purposes, a vertical modulus of subgrade reaction of 200 pounds per cubic inch (pci) should be expected for concrete elements constructed over properly prepared, firm and unyielding native, or properly placed and compacted Structural Fill over properly prepared subgrade. GeoTest expects that concrete pavement sections, if utilized, will be at least 6 inches thick and be founded on a minimum of 8 inches of compacted CSBC. The design of concrete pavements will need to be performed by a Structural Engineer. GeoTest recommends that subgrade soils supporting concrete pavement sections include minor grade changes to allow for passive drainage away from the pavement.

GeoTest is available to further consult, review, and/or modify our pavement section recommendations based on further discussion with the project team/Owner. The above pavement sections are initial recommendations and may be accepted and/or modified by the site Civil Engineer based on the actual finished site grading elevations and/or the Owner's preferences.

Stormwater Infiltration Potential

The native, glacial till deposits encountered at shallow depths in the majority of our explorations were generally dense to very dense and contained fines contents up to about 30 percent. Perched water was observed atop these materials in TP-7 at the time of our site work in November of 2024. We anticipate that perched groundwater conditions will occur at the project site following periods of wet weather. In our opinion, the presence of perched water or glacial Till materials at depth constitutes the presence of a "hydraulic restriction layer" as defined by the Washington State Department of Ecology *Stormwater Management Manual for Western Washington* (SMMWW), dated 2019. However, within the southeastern corner of the project site, and more broadly at greater depths below the glacial till unit, GeoTest observed dense to very dense advance outwash deposits that commonly contained fines contents between about 2 and 10 percent. Although the density of these deposits will reduce the rate at which water can flow through these materials, they generally display physical characteristics which would allow for stormwater infiltration. In TP-1, TP-2 and TP-4, advance outwash was observed within about 2.25 feet of existing surface elevations. GeoTest installed a monitoring well (MW-1) at the project site, to the southeast of B-5, on November 27, 2024, and did not observe groundwater to a depth of 25 feet BGS at the time of drilling.

GeoTest is currently monitoring groundwater elevations in monitoring well MW-1, and performed a Pilot Infiltration Test in this area of the site in January of 2025, as part of a separate scope of services. Final conclusions pertaining to the feasibility of stormwater infiltration at the project site will be released in a separate addendum pending the completion of groundwater monitoring and pilot infiltration testing that is planned for the 2024-2025 wet season.

Stormwater Treatment

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 six soil samples collected from the explorations shown in Table 3. 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	1.0	Weathered Advance Outwash Deposits	5.0	1.15	5.9
TP-2	0.5	Topsoil	7.3	3.15	5.7
TP-2	2.0	Advance Outwash Deposits	7.1	1.10	5.8
TP-7	4.0	Glacial Till	3.5	1.08	6.9
TP-8	1.75	Weathered Glacial Till	8.8	1.55	5.8
TP-9	0.25	Topsoil	19.3	9.45	5.8

Suitability for on-site pollutant treatment is determined in accordance with SSC-6 of the Manual. Soils with an organic content 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 soils for stormwater treatment. Based on the results shown in Table 3, the topsoil and weathered advance outwash and weathered glacial till materials observed on-site appear to be suitable for stormwater treatment purposes. However, glacial till materials are not suitable for this purpose. Although weathered glacial till appears to be suitable for treatment purposes, these materials contain elevated fines contents, and it should be anticipated that using these materials may reduce the overall hydraulic conductivity for systems where it is used to provide stormwater treatment.

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 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 the Edmonds School District and their design consultants for specific application to the design of the proposed new College Place Campus Improvement Project in Lynnwood, 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 differs from those contained within this report, GeoTest should be allowed to review the recommendations 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, and this responsibility is specifically disclaimed.

Attachments:	Figure 1	Vicinity Map
	Figure 2	Site and Exploration Plan
	Figure 2B	Site Development Plan
	Figure 3	Bare Earth Imagery
	Figure 4	Conceptual Footing and Wall Drain Section (slab)
	Figure 5	Conceptual Footing and Wall Drain Section (crawl space)
	Figure 6	Soil Classification System and Key
	Appendix A	Exploration Logs
	Appendix B	Laboratory Test Results
	Northwest Agricultural Consultants Results (1 Page)	
	Report Limitations and Guidelines for its Use (4 Pages)	

REFERENCES

American Society of Civil Engineers, *(2022). Minimum design loads and associated criteria for buildings and other structures: ASCE/SEI 7-22.* Reston, Virginia: American Society of Civil Engineers.

American Society for Testing and Materials (ASTM). *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).* ASTM D2487 – 17e1.

American Society for Testing and Materials (ASTM). *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures).* ASTM D2488 – 17e1.

American Society for Testing and Materials (ASTM). (2017). ASTM D6938, *Standard Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods.*

American Society for Testing and Materials (ASTM). *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.* ASTM D1557 – 12e1.

Atwater, B.F., and Haley, E. H., (1997) *Recurrence Intervals for Great Earthquakes of the Past 3,500 Years at Northeastern Willapa Bay, Washington*. USGS Survey Professional Paper 1576.

City of Lynnwood Municipal Code, Lynnwood, Washington. Retrieved December 2024, from https://codepublishing.com/WA/OakHarbor

Minard, J.P., 1983, Geologic map of the Edmonds East and part of the Edmonds West quadrangles, Washington, U.S. Geological Survey, Miscellaneous Field Studies Map MF-1541, 1:24,000

Gariepy, D., Graul, C., Heye, A., Howie, D., Labib, F., & Song, K. (n.d.), *2019 Stormwater Management Manual for Western Washington* (2019 SMMWW) (pp. 1-1108) (United States, Washington State Department of Ecology).

International Building Code (IBC), 2021. International Code Council.

USDA Web Soil Survey. (2017, August 21). Retrieved November 2024 from https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

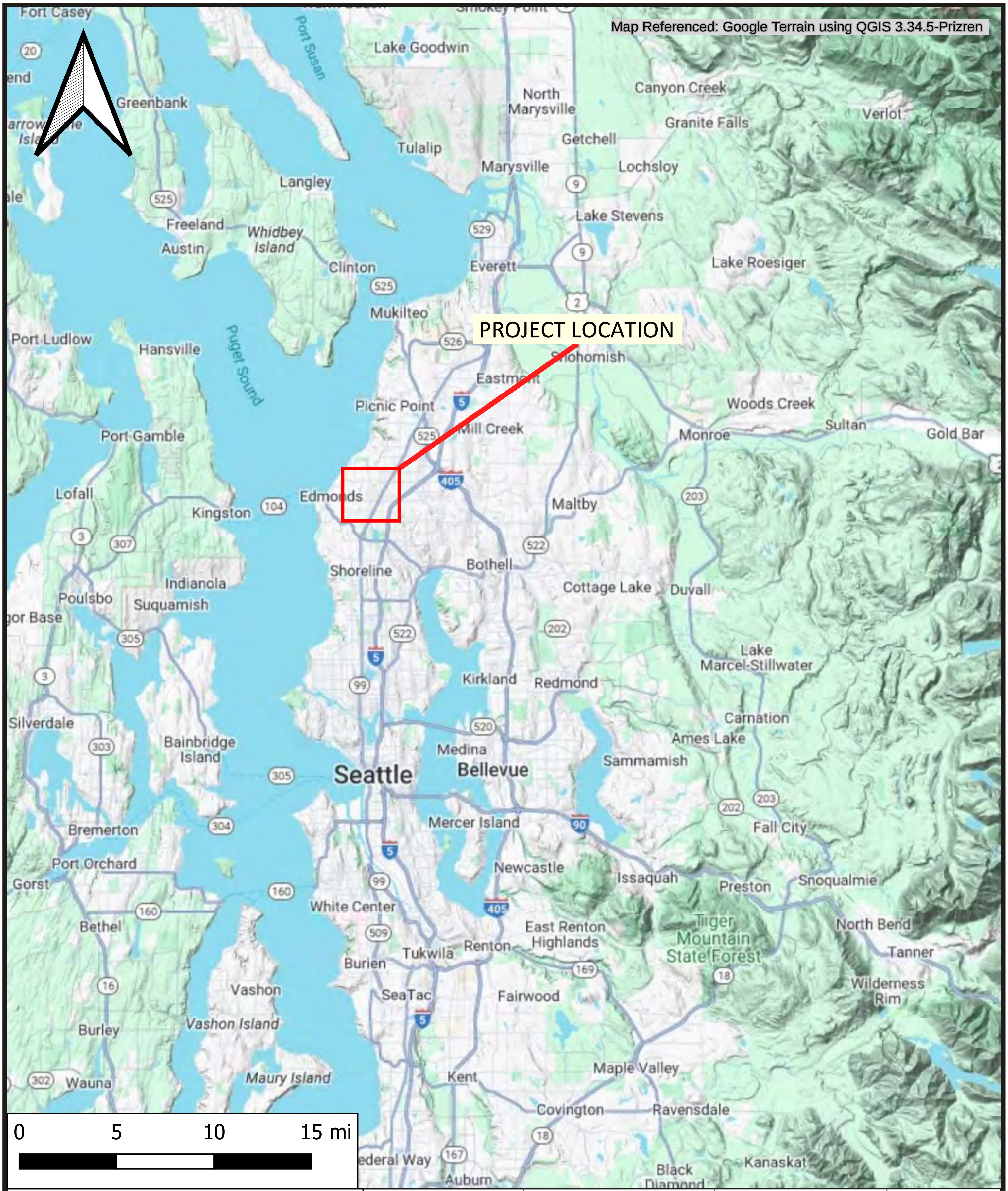
United States Geological Survey (USGS), *Quaternary Fault and Fold Database of the United States*. Retrieved August 2024, from https://earthquake.usgs.gov/cfusion/qfault/show_report_AB.cfm?fault_id=598&section_id=

Washington Military Department, Emergency Management Division. Washington State Department of Natural Resources. United States Geological Survey. Federal Emergency Management Administration. 2013. *Understanding Earthquake Hazards in Washington State. Modeling a Magnitude 7.4 Earthquake on the Southern Whidbey Island Fault Zone.*

Washington Administrative Code (WAC). (2020). *WAC 296-155-66401 & 66403,* Retrieved November 2024, from https://app.leg.wa.gov/wac/default.aspx?cite=296-155.

Washington Lidar Portal. (n.d.). Retrieved November 2024. from http://lidarportal.dnr.wa.gov/ .

Washington State Department of Natural Resources - Online Web Services. *Washington Geologic Information Portal.* Retrieved in November 2024.



Map Referenced: Google Terrain using QGIS 3.34.5-Prizren

PROJECT LOCATION

GEOTEST

An RMA Company

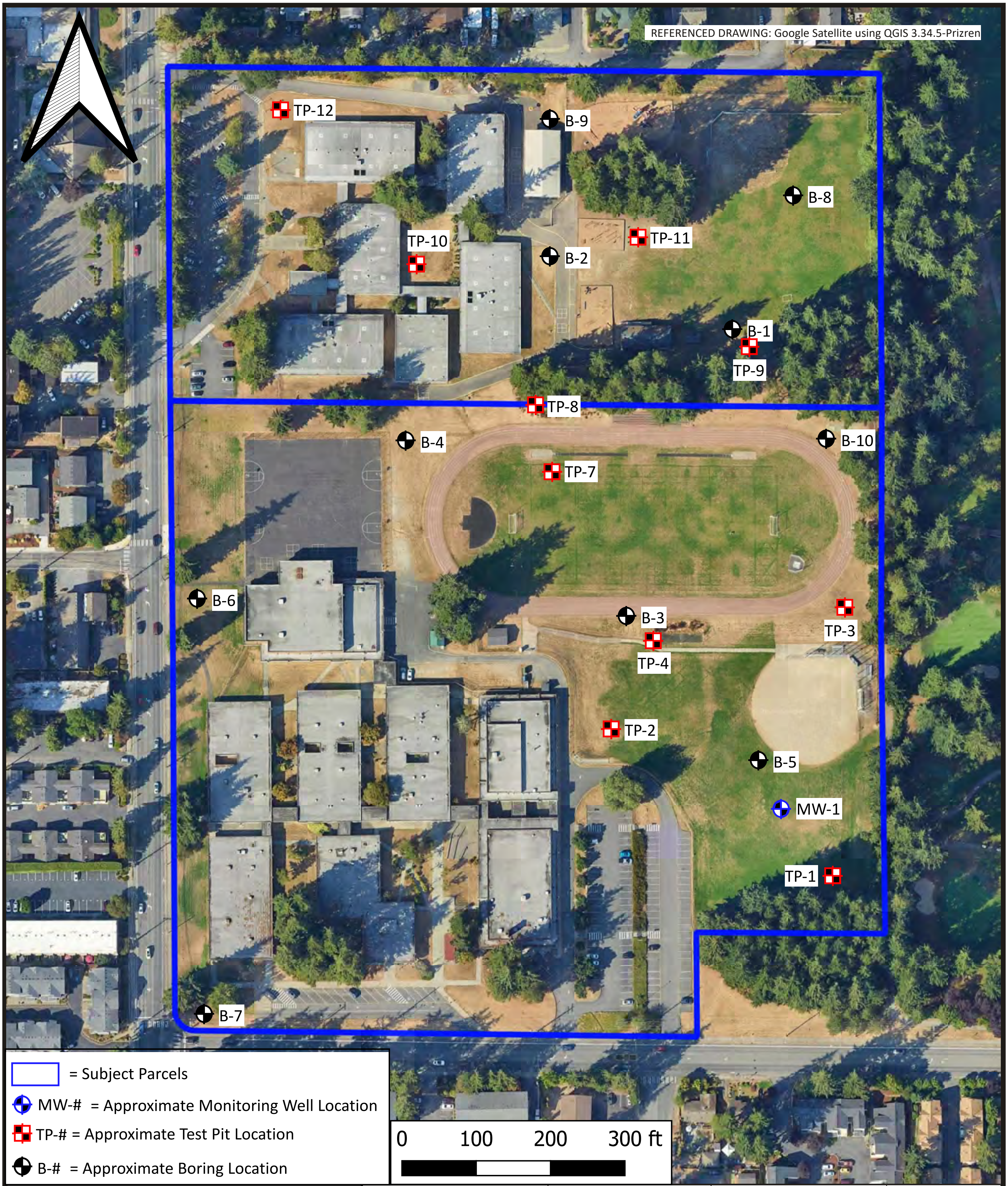
Date: 8-23-2024	By: JV	Scale: As Shown	Project
			24-1332

VICINITY MAP

NEW COLLEGE PLACE ELEMENTARY AND MIDDLE SCHOOL CAMPUS
20401 76TH AVENUE W AND 7501 208TH STREET SW
LYNNWOOD, WASHINGTON

Figure

1



Date: 11-14-2024	By: JV	Scale: As Shown	Project
			24-1332
			Figure
			2

SITE AND EXPLORATION PLAN

New College Place Elementary and Middle School Campus
20401 76th Avenue W and 7501 208th Street SW
Lynnwood, Washington

Conceptual Site Plan Provided by Client

Date: 12-2-2024

By: JV

Scale: As Shown

Project

24-1332

SITE DEVELOPMENT PLAN

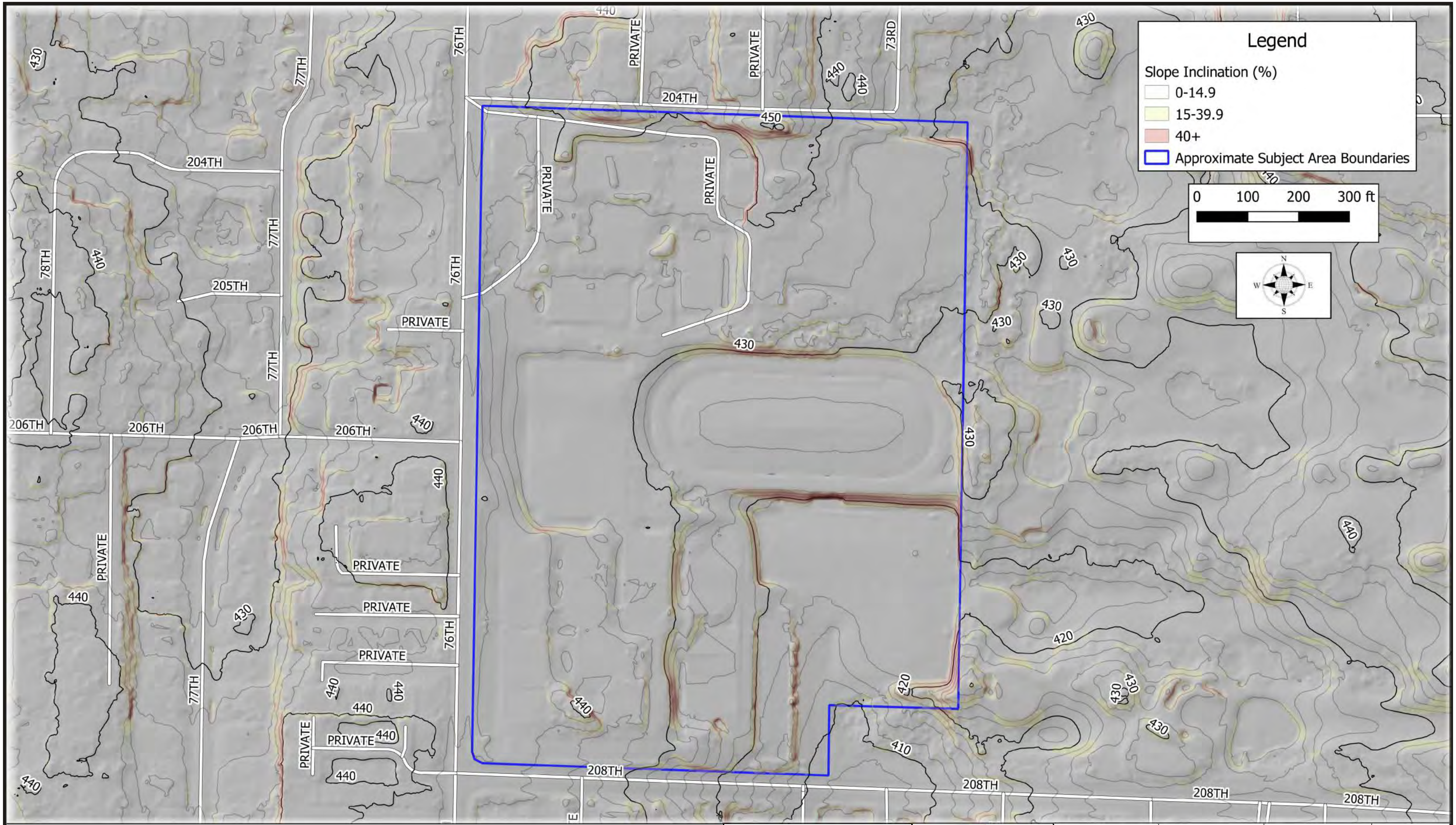
NEW COLLEGE PLACE ELEMENTARY AND MIDDLE SCHOOL CAMPUS

20401 76TH AVENUE W AND 7501 208TH STREET SW

LYNNWOOD, WASHINGTON

Figure

2B



Data Source(s):

Contours and hillshade:
derived from North Puget_2017 Data Set
accessed from WA DNR Lidar Portal website
using QGIS 3.4.15.
Parcels and Roadways: WA State Public Data

GEOTEST
An RMA Company

Date: 11.18.2024
By: HS
Scale: As Shown

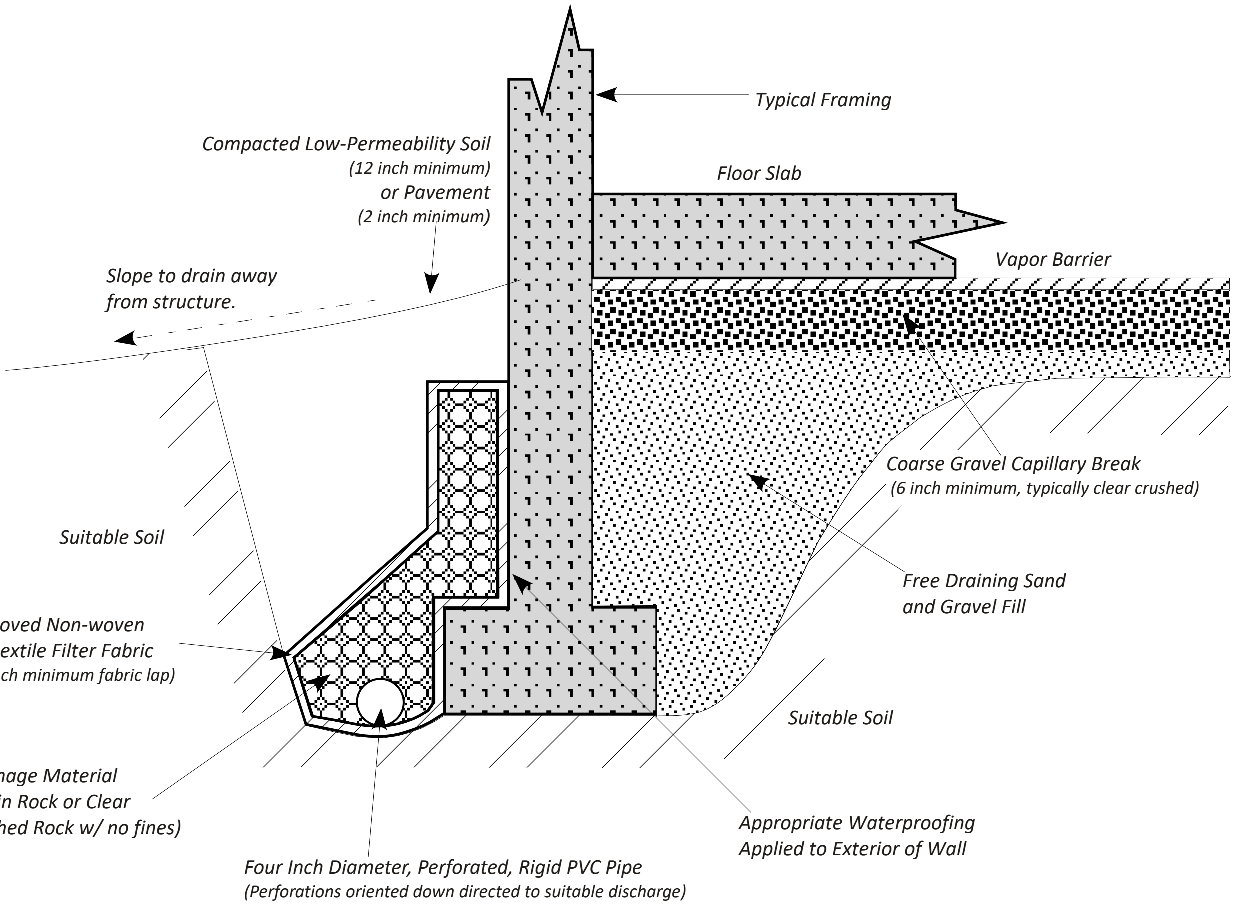
BARE EARTH IMAGERY

New College Place Elementary and Middle School Campus
20401 76th Avenue W and 7501 208th Street SW
Lynnwood, Washington

Project
24-1332

Figure
3

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.

This footing drain detail may need to be modified from this conceptual drawing to fit the dimensions of the planned footing and slab configuration.

GEOTEST
An RMA Company

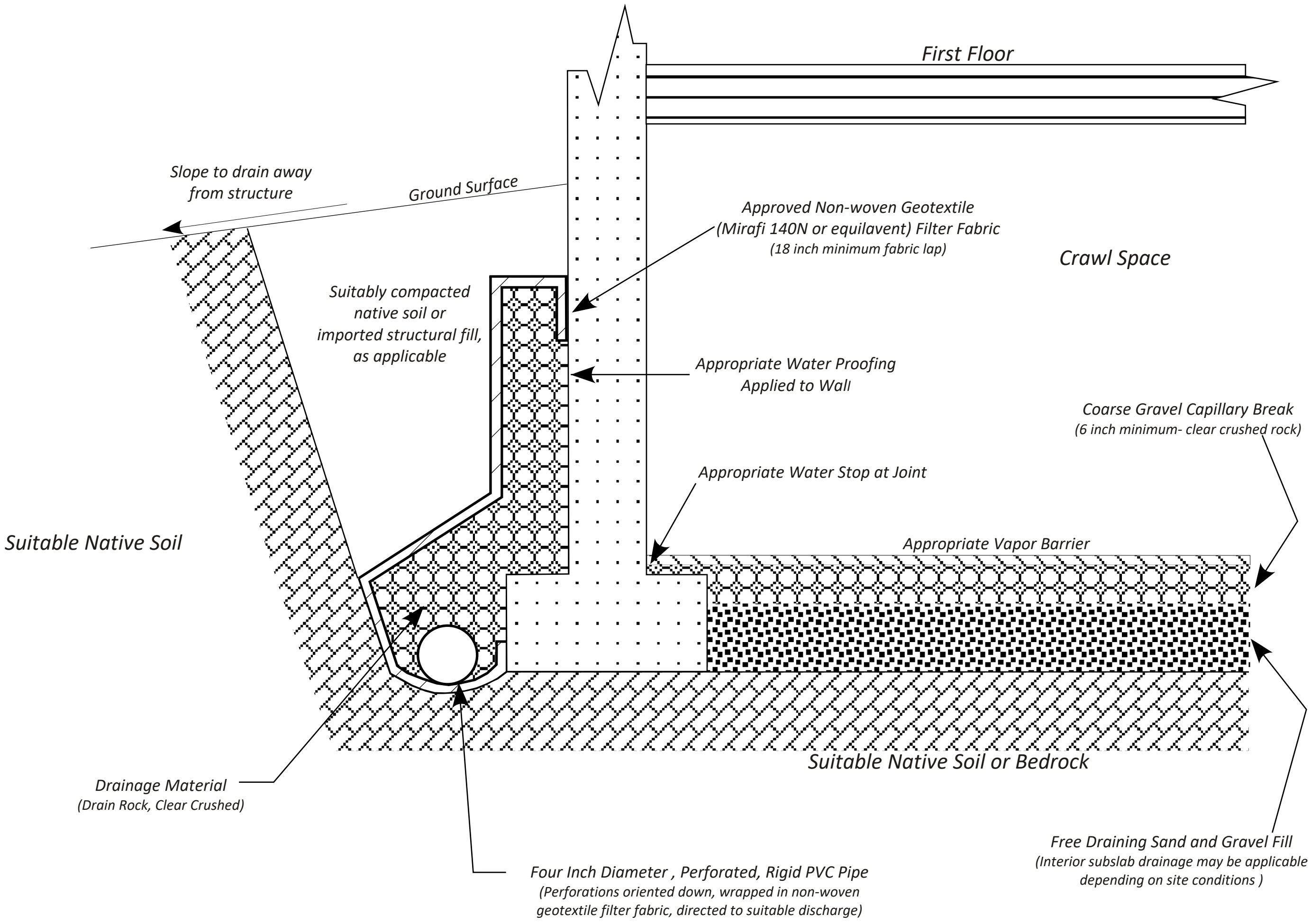
Date: 9-4-2024 | By: JV | Scale: None

CONCEPTUAL FOOTING & WALL DRAIN SECTION
NEW COLLEGE PLACE ELEMENTARY AND MIDDLE SCHOOL CAMPUS
20401 76TH AVENUE W AND 7501 208TH STREET SW
LYNNWOOD, WASHINGTON

Project
24-1332

Figure
4

SHALLOW FOOTINGS WITH INTERIOR CRAWL SPACE



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 the design. In all cases, refer to the Civil plan sheet for drain details and elevations.

This footing drain detail may need to be modified from this conceptual drawing to fit the dimensions of the planned footing configuration.

GEOTEST
An RMA Company

Date: 9-4-2024	By: JV	Scale: Shown	Project
CONCEPTUAL FOOTING & WALL DRAIN SECTION **NEW COLLEGE PLACE ELEMENTARY AND MIDDLE SCHOOL CAMPUS** **20401 76TH AVENUE W AND 7501 208TH STREET SW** **LYNNWOOD, WASHINGTON**			**24-1332** Figure 5

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

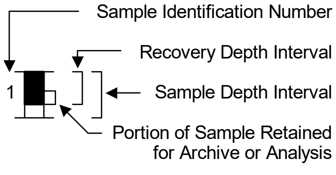
Notes: 1. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, as outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test 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

New College Place Elementary and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Soil Classification System and Key

Figure
6

Appendix A:

Exploration Logs

B-01

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): ~435 Drilled By: Boretec1 Inc. / JV	
0						SM	Medium dense, light brown to orange brown, damp, gravelly, silty SAND with occasional organics (Uncontrolled Fill)	Groundwater not encountered.
	1	b2	16	W = 7 GS				
5	2	b2	50/ 1"			SM	Very dense, orange-brown, dry to damp, slightly gravelly, silty SAND with occasional organics (Weathered Glacial Till)	
	3	b2	43			SM	Dense, gray-brown, damp, gravelly, silty SAND (Glacial Till)	
10	4	b2	46					
15	5	b2	36			SP-SM	Dense, gray-brown, damp, slightly gravelly, slightly silty SAND (Advance Outwash Interbed)	
20	6	b2	74			SM	Very dense, gray-brown, damp, gravelly, silty SAND (Glacial Till)	
25	7	b2	50/ 6"				GeoTest observed an increase in gravel content below 25 feet.	

Boring Completed 08/27/24
Total Depth of Boring = 26.5 ft.

Boring terminated at planned depth.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-01

Figure
A-1

B-02

Drilling Method: Hollow-stem Auger
Ground Elevation (ft): ~437
Drilled By: Boretec1 Inc. / JV

SAMPLE DATA					SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol		
0					SM	Very dense, light brown, dry, gravelly, silty SAND, trace cobbles observed during drilling (Weathered Glacial Till)	
	8	b2	66				Groundwater not encountered.
	9	b2	50/ 6"		SM	Very dense, gray-brown, damp, gravelly, silty SAND (Glacial Till)	
	10	b2	50/ 5"				
10	11	b2	50/ 4"				
	12	b2	50/ 5"	W = 9 GS			
20	13	b2	50/ 6"			GeoTest observed an increase in silt and gravel content below 20 feet.	
	14	b2	50/ 5"			GeoTest observed an increase in gravel content below 25 feet.	
30	15	b2	50/ 4"	W = 9 GS	SP-SM	Very dense, gray-brown, damp to moist, slightly silty, gravelly SAND (Advance Outwash Deposits)	
	16	b2	50/ 6"			GeoTest observed a decrease in silt content below 35 feet.	
40	17	b2	50/ 5"				
	18	b2	50/ 4"			GeoTest observed a decrease in gravel content below 45 feet.	
50	19	b2	50/ 4"				
	20	b2	50/ 4"				
60	21	b2	50/ 4"				

Boring terminated at planned depth.

Boring Completed 08/27/24
Total Depth of Boring = 61.5 ft.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-02

Figure
A-2

B-03

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
22	b2	30	
24	b2	16	W = 8 GS
25	b2	17	
26	b2	23	
27	b2	74	W = 5 GS
28	b2	50/ 6"	
29	b2	50/ 5"	
30	b2	50/ 5"	
31	b2	51	
32	b2	50/ 5"	
33	b2	50/ 5"	
34	b2	50/ 5"	
35	b2	50/ 5"	
36	b2	50/ 6"	W = 6 GS

Depth (ft): 0, 10, 20, 30, 40, 50, 60

Boring Completed 08/28/24
Total Depth of Boring = 61.5 ft.

SOIL PROFILE

Drilling Method: Hollow-stem Auger
Ground Elevation (ft): ~424
Drilled By: Boretec1 Inc. / JV

USCS Symbol	Description
SM	Medium dense, dark brown to orange brown, damp, gravelly, silty SAND with numerous organics (Uncontrolled Fill) GeoTest observed an increase in gravel content and deleterious debris below 5 feet.
SM	Very dense, gray-brown, damp, gravelly, silty SAND (Glacial Till)
SW-SM	Very dense, brown, damp, slightly silty, gravelly SAND (Advance Outwash Deposits) GeoTest observed a 4-inch thick layer of gravelly, silty sand interbeds at 16 feet. GeoTest observed a decrease in silt and gravel content below 20 feet. GeoTest observed an 8-inch thick layer of gravelly, silty sand interbed at 21 feet. GeoTest observed a 6-inch thick layer of gravelly, silty sand interbed at 31 feet. GeoTest observed a 1-inch thick layer of gravelly, silty sand interbed at 36 feet. GeoTest observed a 4-inch thick layer of gravelly, silty sand interbed at 45 feet. GeoTest observed a decrease in gravel content below 55 feet.

Boring terminated at planned depth.

GROUNDWATER

Groundwater not encountered.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST
An RMA Company

New College Place Elementary and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-03

Figure A-3

B-04

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Drilling Method: Hollow-stem Auger
Ground Elevation (ft): ~431
Drilled By: Boretec1 Inc. / JV

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol		
0						SM	Medium dense, orange-brown to dark brown, damp to moist, silty, very gravelly SAND with occasional organics (Uncontrolled Fill)	Groundwater not encountered.
2								
	37	b2	14					
4								
	38	b2	50/ 5"			SM	Very dense, light brown to brown, dry to damp, silty, very gravelly SAND (Weathered Glacial Till)	
6								
8	39	b2	50/ 6"	W = 5 GS		SM	Very dense, gray-brown, dry to damp, silty, very gravelly SAND (Glacial Till)	
10	40	b2	50/ 6"			SP	Dense to very dense, gray, damp, gravelly, poorly graded SAND (Advance Outwash Interbed)	
12								
14								
	41	b2	50/ 4"			SM	Very dense, gray-brown, damp, silty, very gravelly SAND (Glacial Till)	
16								
18								
20								
	42	b2	50/ 6"					
22								

Boring Completed 08/28/24
Total Depth of Boring = 21.5 ft.

Boring terminated at planned depth.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

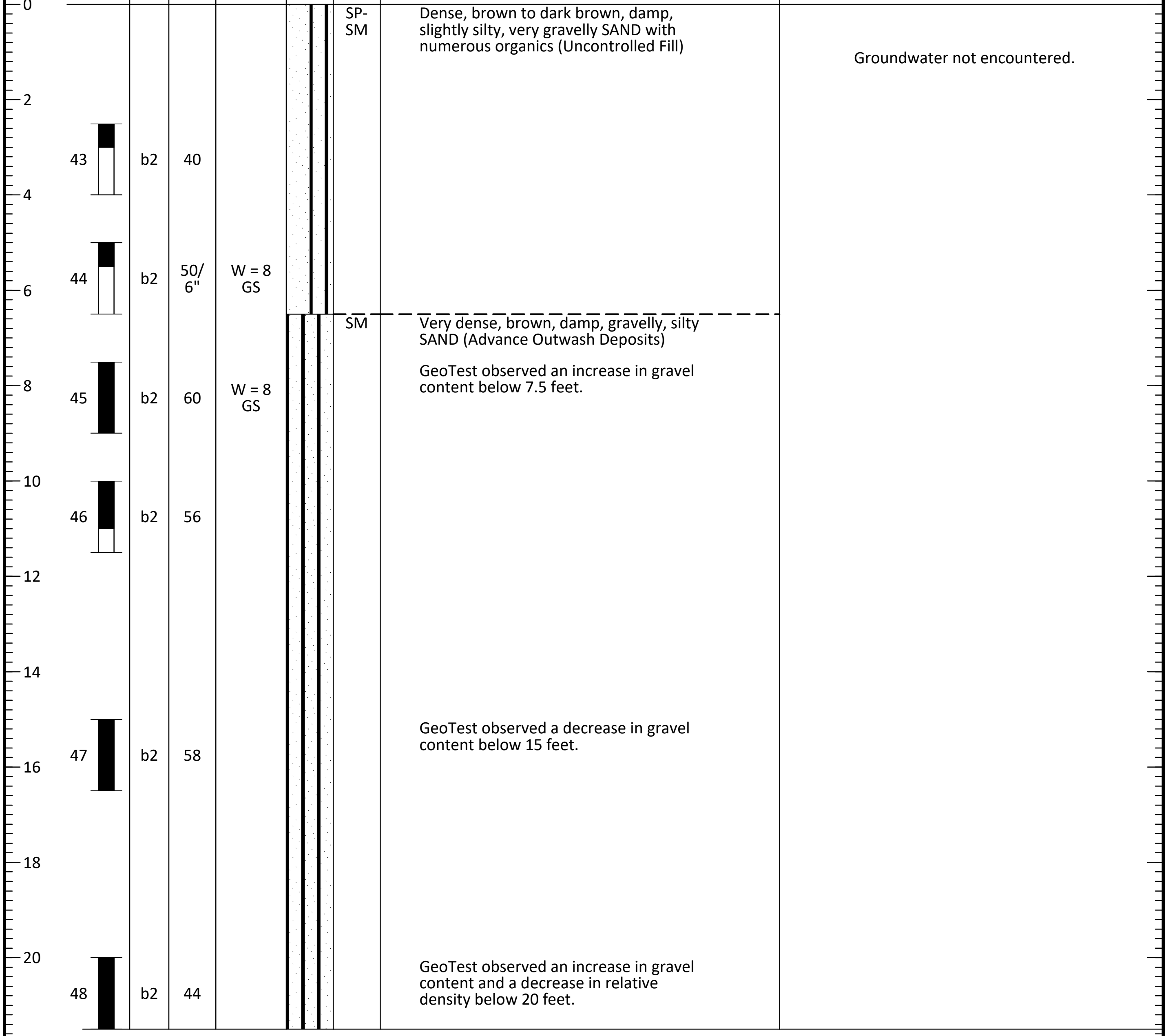
GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-04

Figure
A-4

B-05



SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): ~416 Drilled By: Boretec1 Inc. / JV	
					SP-SM	Dense, brown to dark brown, damp, slightly silty, very gravelly SAND with numerous organics (Uncontrolled Fill)	Groundwater not encountered.
43	b2	40					
44	b2	50/ 6"	W = 8 GS				
					SM	Very dense, brown, damp, gravelly, silty SAND (Advance Outwash Deposits) GeoTest observed an increase in gravel content below 7.5 feet.	
45	b2	60	W = 8 GS				
46	b2	56					
47	b2	58				GeoTest observed a decrease in gravel content below 15 feet.	
48	b2	44				GeoTest observed an increase in gravel content and a decrease in relative density below 20 feet.	

Boring Completed 08/28/24
Total Depth of Boring = 21.5 ft.

Boring terminated at planned depth.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-05

Figure
A-5

B-06

SAMPLE DATA

SOIL PROFILE

GROUNDWATER

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): ~437

Drilled By: Boretec1 Inc. / JV

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
49	b2	17	
50	b2	50/ 5"	
51	b2	73	
52	b2	50/ 5"	
53	b2	50/ 3"	
54	b2	50/ 5"	W = 8 GS

USCS Symbol	Description
SM	Medium dense, orange-brown, damp, gravelly, silty SAND with occasional organics (Weathered Glacial Till) GeoTest observed an increase in relative density to very dense below 5 feet.
SM	Very dense, gray-brown, damp, silty, very gravelly SAND (Glacial Till) GeoTest observed a decrease in gravel content below 10 feet.

Groundwater not encountered.

Boring Completed 08/29/24
Total Depth of Boring = 21.5 ft.

Boring terminated at planned depth.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-06

Figure
A-6

B-07

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): ~437 Drilled By: Boretec1 Inc. / JV	
0						SM	Very dense, orange-brown, dry, gravelly, silty SAND with occasional organics (Weathered Glacial Till)	Groundwater not encountered.
2								
						SM	Very dense, gray-brown, dry to damp, gravelly, silty SAND (Glacial Till)	
	55	b2	50/ 6"					
4								
	57	b2	53					
6								
8	58	b2	65					
10							GeoTest observed an increase in moisture content below 10 feet.	
	59	b2	60					
12								
14								
	60	b2	50/ 4"					
16								
18								
20								
	61	b2	50/ 6"					
22								

Boring Completed 08/29/24
Total Depth of Boring = 21.5 ft.

Boring terminated at planned depth.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-07

Figure
A-7

B-08

Drilling Method: Hollow-stem Auger
Ground Elevation (ft): ~434
Drilled By: Boretec1 Inc. / JV

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
62	b2	2	
63	b2	4	W = 13 GS
64	b2	7	
66	b2	45	
67	b2	45	
68	b2	44	

SOIL PROFILE

USCS Symbol	
SM	Very loose, brown to gray-brown, moist, slightly gravelly, very silty SAND with occasional organics (Uncontrolled Fill) GeoTest observed an increase in gravel content below 5 feet. GeoTest observed an increase in relative density to loose below 7 feet.
SM	Loose, orange-brown, damp, slightly gravelly, silty SAND (Weathered Glacial Till)
SM	Dense, gray-brown, damp, gravelly, silty SAND (Glacial Till) GeoTest observed an increase in moisture content to moist below 15 feet.

GROUNDWATER

Groundwater not encountered.

Boring Completed 08/27/24
Total Depth of Boring = 21.5 ft.

Boring terminated at planned depth.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

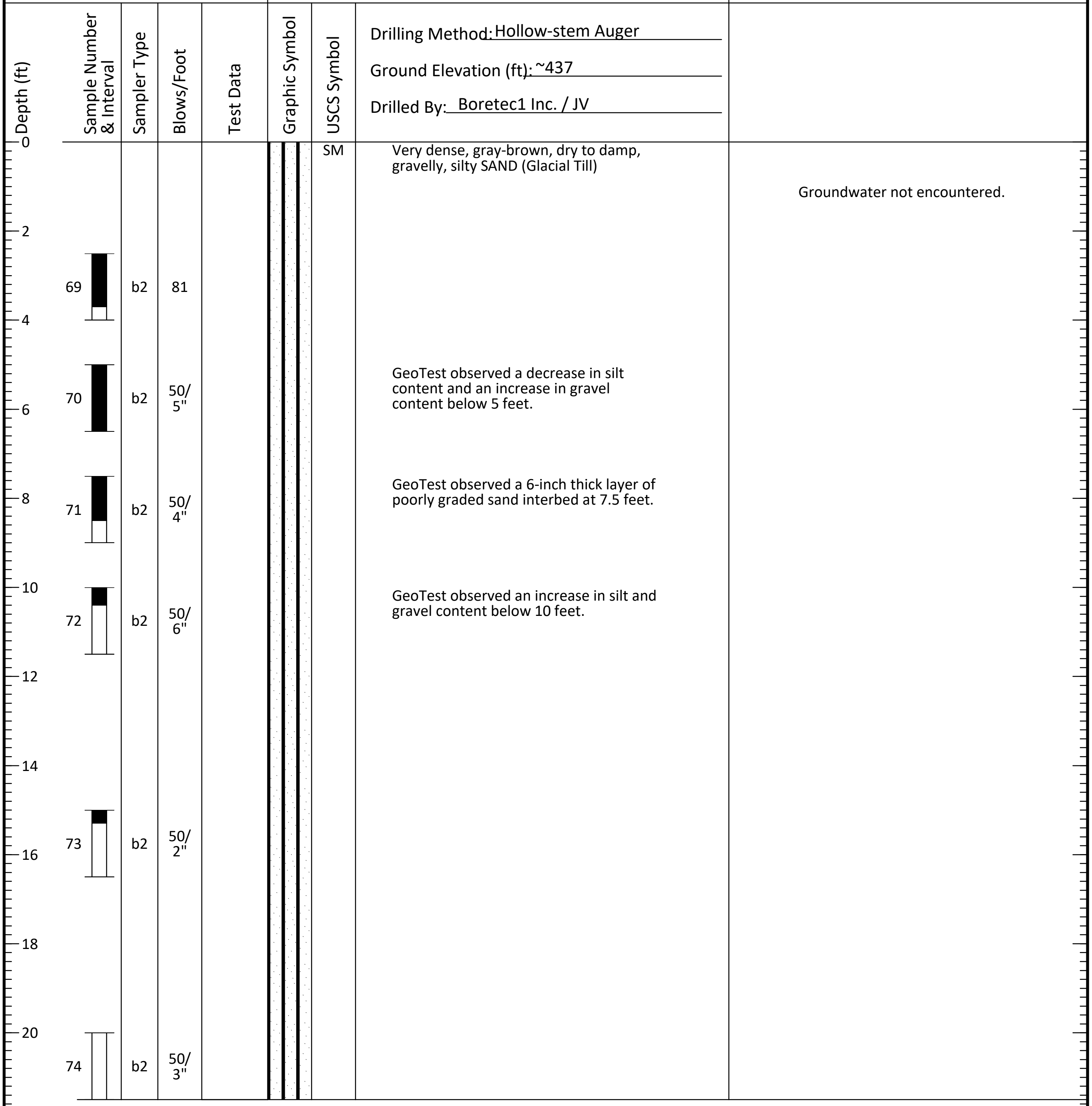
New College Place Elementary and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-08

Figure
A-8

B-09

Drilling Method: Hollow-stem Auger
Ground Elevation (ft): ~437
Drilled By: Boretec1 Inc. / JV



Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
					SM	Very dense, gray-brown, dry to damp, gravelly, silty SAND (Glacial Till)	Groundwater not encountered.
69	b2	81					
70	b2	50/ 5"				GeoTest observed a decrease in silt content and an increase in gravel content below 5 feet.	
71	b2	50/ 4"				GeoTest observed a 6-inch thick layer of poorly graded sand interbed at 7.5 feet.	
72	b2	50/ 6"				GeoTest observed an increase in silt and gravel content below 10 feet.	
73	b2	50/ 2"					
74	b2	50/ 3"					

Boring Completed 08/27/24
Total Depth of Boring = 21.5 ft.

Boring terminated at planned depth.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-09

Figure
A-9

B-10

Drilling Method: Hollow-stem Auger
Ground Elevation (ft): ~427
Drilled By: Boretec1 Inc. / JV

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol		
0						SM	Dense, gray-brown, dry to damp, slightly gravelly, silty SAND (Glacial Till)	Groundwater not encountered.
2								
	75	b2	39	W = 6 GS				
4								
	76	b2	29				GeoTest observed a decrease in gravel content below 5 feet.	
6								
8	77	b2	32				GeoTest observed an increase in silt and gravel content below 7.5 feet.	
10	78	b2	48				GeoTest observed a decrease in silt content below 10 feet.	
12								
14								
16	79	b2	50/ 5"				GeoTest observed an increase in silt content below 15 feet.	
18								
20	80	b2	50/ 6"				GeoTest observed a decrease in silt content and an increase in gravel content below 20 feet.	
22								

Boring Completed 08/28/24
Total Depth of Boring = 21.5 ft.

Boring was terminated at planned depth.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Boring B-10

Figure
A-10

TP-1

Excavation Method: Tracked Excavator
Ground Elevation (ft): ~416
Excavated By: PacNW Excavation LLC

Sampler Type	Test Data	USCS Symbol	Soil Profile	Groundwater
		SM	Loose, dark brown, damp, gravelly, silty SAND with numerous organics (Topsoil)	Groundwater not encountered.
d d		SP-SM	Dense, orange-brown, damp, slightly silty, gravelly SAND with occasional organics, trace cobbles (Weathered Advance Outwash Deposits)	
d d d d	W = 10 GS W = 9 GS	SP-SM	Dense to very dense, gray-brown, damp, slightly silty, gravelly SAND, trace cobbles (Advance Outwash Deposits) GeoTest observed a decrease in silt content below 6 feet.	

Depth (ft): 0, 2, 4, 6, 8, 10

Excavation terminated at planned depth.

Test Pit Completed 11/11/24
Total Depth of Test Pit = 10.0 ft.

TP-2

Excavation Method: Tracked Excavator
Ground Elevation (ft): ~417
Excavated By: PacNW Excavation LLC

Sampler Type	Test Data	USCS Symbol	Soil Profile	Groundwater
		SM	Loose, dark brown, damp, gravelly, silty SAND with numerous organics (Topsoil)	Groundwater not encountered.
d d	W = 7 GS	SP-SM	Dense, orange-brown, damp, slightly silty, very gravelly SAND with occasional organics, trace cobbles (Weathered Advance Outwash Deposits)	
d d d d d	W = 4 GS	SP	Dense to very dense, gray-brown, damp, very gravelly SAND (Advance Outwash Deposits)	

Depth (ft): 0, 2, 4, 6, 8, 10

Excavation terminated at planned depth.

Test Pit Completed 11/11/24
Total Depth of Test Pit = 10.0 ft.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Test Pits

Figure
A-11

TP-3

SAMPLE DATA

SOIL PROFILE

GROUNDWATER

Excavation Method: Tracked Excavator

Ground Elevation (ft): ~426

Excavated By: PacNW Excavation LLC

Sampler Type	Test Data
d	
d	
d	
d	
d	
d	
d	
d	

USCS Symbol	Soil Profile
SM	Loose, dark brown, damp, gravelly, silty SAND with numerous organics (Topsoil)
SM	Dense, dark-brown, damp, silty, very gravelly SAND with occasional organics, trace cobbles (Uncontrolled Fill)
SM	Dense, dark brown, damp, silty, very gravelly SAND with numerous organics (Relict Topsoil)
SM	Very dense, gray, damp, gravelly, very silty SAND, trace cobbles (Glacial Till)
SP	Very dense, gray, damp, slightly silty, very gravelly, SAND, trace cobbles (Advance Outwash Deposits)

Groundwater not encountered.

Excavation terminated at planned depth.

Test Pit Completed 11/11/24
Total Depth of Test Pit = 9.5 ft.

TP-4

SAMPLE DATA

SOIL PROFILE

GROUNDWATER

Excavation Method: Tracked Excavator

Ground Elevation (ft): ~418

Excavated By: PacNW Excavation LLC

Sampler Type	Test Data
d	W = 11 GS W = 5 GS
d	
d	
d	
d d	W = 9 GS

USCS Symbol	Soil Profile
SM	Medium dense, dark brown, damp, silty, gravelly SAND with occasional organics, deleterious debris (Uncontrolled Fill)
SP	Dense to very dense, gray-brown, damp, slightly gravelly SAND, trace cobbles (Advance Outwash Deposits)

Groundwater not encountered.

GeoTest observed an icnrease in gravel content below 9 feet.

Excavation terminated at planned depth.

Test Pit Completed 11/11/24
Total Depth of Test Pit = 9.3 ft.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Test Pits

Figure
A-12

TP-7

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): ~427 Excavated By: PacNW Excavation LLC	
0					SM	Loose, dark brown, damp, gravelly, silty SAND with numerous organics (Topsoil)	Groundwater not encountered.
		d d			SP-SM	Very dense, gray, damp, slightly silty, very gravelly SAND, trace cobbles (Glacial Till)	
4		d					
7		d	W = 8 GS				

Test Pit Completed 11/11/24
Total Depth of Test Pit = 7.0 ft.

Excavation terminated at planned depth.

TP-8

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): ~435 Excavated By: PacNW Excavation LLC	
0					SM	Loose, dark brown, damp, gravelly, silty SAND with numerous organics (Topsoil)	Groundwater not encountered.
		d			SM	Very dense, light brown, dry, very silty, very gravelly SAND with occasional organics, trace cobbles (Weathered Glacial Till)	
2		d					
3					SM	Very dense, gray, dry, very silty, very gravelly SAND, trace cobbles to boulders (Glacial Till)	
4		d					
6		d					

Test Pit Completed 11/11/24
Total Depth of Test Pit = 6.5 ft.

Excavation terminated at planned depth.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

TP-9

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): ~435
Excavated By: PacNW Excavation LLC

Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	Soil Profile	Groundwater
0	■	d		SM SM	Loose, dark brown, damp, gravelly, silty SAND with numerous organics (Topsoil)	Groundwater not encountered.
	■	d				
2	■	d		SM	Very dense, orange-brown, damp, silty, very gravelly SAND with occasional organics, trace cobbles to boulders (Weathered Glacial Till)	
4					Very dense, gray, damp, very gravelly, very silty SAND, trace cobbles to boulders (Glacial Till)	
6	■	d				
8	■	d				
	■	d				

Excavation terminated at planned depth.

Test Pit Completed 11/11/24
Total Depth of Test Pit = 9.0 ft.

TP-10

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): ~435
Excavated By: PacNW Excavation LLC

Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	Soil Profile	Groundwater
0				SM	Dense to very dense, gray-brown to brown, damp, silty, very gravelly SAND, deleterious debris, trace cobbles and boulders (Uncontrolled Fill)	Groundwater not encountered.
	■	d	W = 10 GS			
2						
	■	d		SM	Medium dense, dark brown to black, damp, gravelly, silty SAND with numerous organics, trace roots (Relict Topsoil)	
4	■	d		SM	Very dense, orange-brown, damp, gravelly, very silty SAND with occasional organics, trace cobbles (Weathered Glacial Till)	
6	■	d		SM	Very dense, gray, damp, slightly silty, very gravelly SAND, trace cobbles to boulders (Glacial Till, Outwash?)	
	■	d				
8						

Excavation terminated at planned depth.

Test Pit Completed 11/11/24
Total Depth of Test Pit = 8.0 ft.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Log of Test Pits

Figure
A-14

TP-11

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): ~439 Excavated By: PacNW Excavation LLC	
0	■	d		SM	Dense to very dense, dark brown, damp, silty, very gravelly SAND with numerous organics, trace cobbles (Uncontrolled Fill)	Groundwater not encountered.
2	■	d	W = 9 GS	SM	Very dense, orange-brown, damp, silty, gravelly SAND, trace cobbles (Weathered Glacial Till)	
4	■	d		SM	Very dense, gray, dry to damp, gravelly, very silty SAND, trace cobbles (Glacial Till)	
6	■	d				
8	■	d				
10					Excavation terminated at planned depth.	

Test Pit Completed 11/11/24
Total Depth of Test Pit = 9.0 ft.

TP-12

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): ~440 Excavated By: PacNW Excavation LLC	
0				SM	Loose, dark brown, damp, gravelly, silty SAND with numerous organics (Topsoil)	Groundwater not encountered.
	■	d		SM	Dense, orange-brown, damp, silty, very gravelly SAND, with occasional organics, trace cobbles (Weathered Glacial Till)	
	■	d				
2	■	d		SM	Very dense, gray-brown, damp, gravelly, very silty SAND, trace cobbles (Glacial Till)	
4	■	d			GeoTest observed a decrease in silt content below 4.5 feet.	
6	■	d				
	■	d				
8					Excavation terminated at planned depth.	

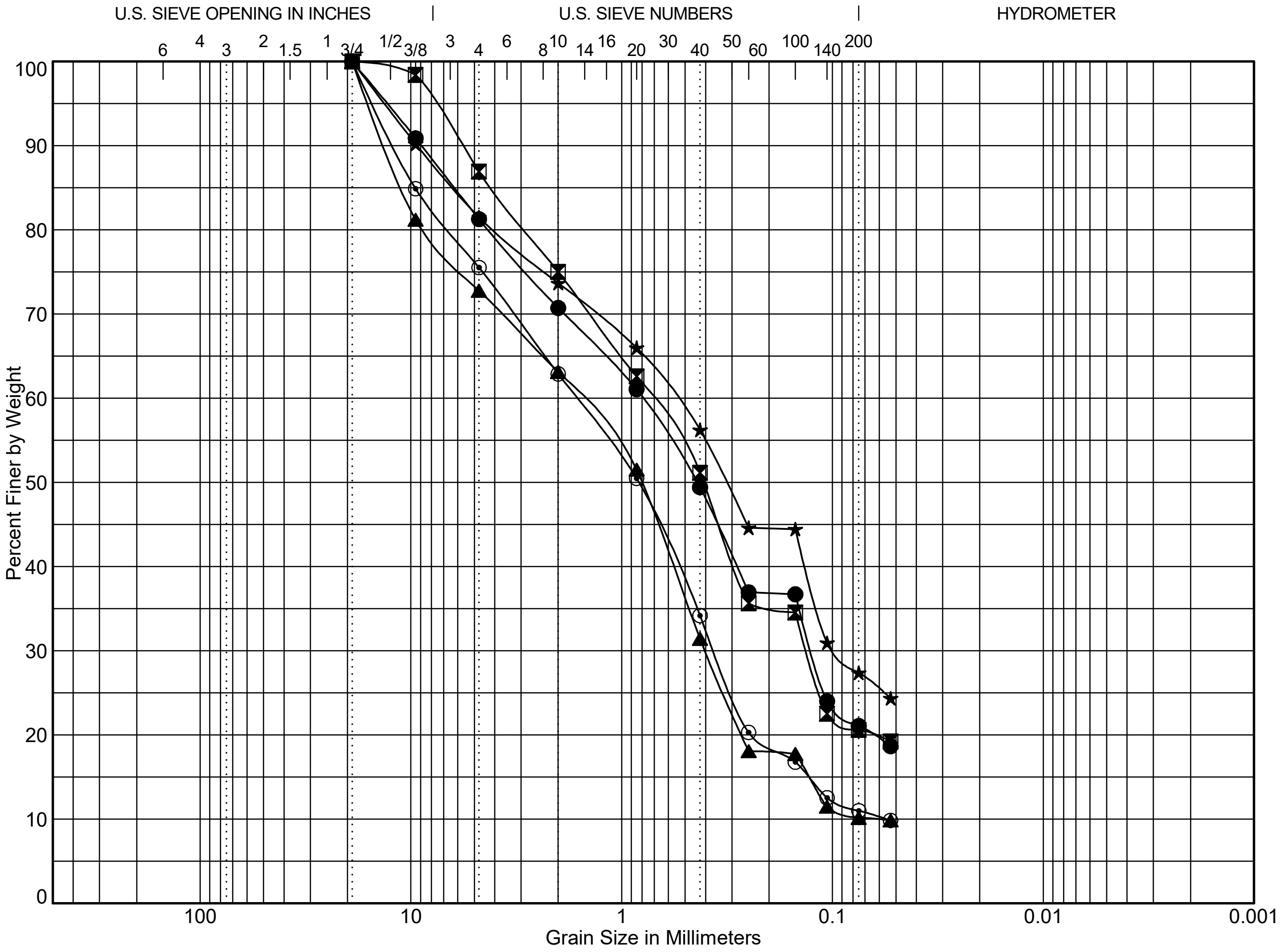
Test Pit Completed 11/11/24
Total Depth of Test Pit = 7.5 ft.

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 explanation of graphics and symbols.
4. Approximate elevations obtained from CalTopo online interactive web portal.

GEOTEST An RMA Company	New College Place Elementary and Middle School Campus 20401 76th Avenue W Lynnwood, Washington	Log of Test Pits	Figure A-15

Appendix B:

Laboratory Data



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Point	Depth	Classification	LL	PL	PI	C_c	C_u
● B-1	2.5	Gravelly, silty SAND (SM)					
⧗ B-2	15.0	Gravelly, silty SAND (SM)					
▲ B-2	30.0	Slightly silty, gravelly SAND (SW-SM)				1.60	25.06
★ B-3	5.0	Gravelly, silty SAND (SM)					
⊙ B-3	15.0	Slightly silty, gravelly SAND (SW-SM)				1.44	29.44

Point	Depth	D_{90}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
● B-1	2.5	8.919	0.798	0.44	0.125		0.0	18.7	10.5	21.3	28.4	21.1
⧗ B-2	15.0	5.724	0.726	0.409	0.132		0.0	13.1	11.9	23.9	30.5	20.6
▲ B-2	30.0	13.143	1.589	0.807	0.402	0.063	0.0	27.2	9.7	31.7	21.3	10.1
★ B-3	5.0	9.344	0.555	0.32	0.097		0.0	18.5	7.8	17.4	28.9	27.4
⊙ B-3	15.0	12.014	1.64	0.833	0.362	0.056	0.0	24.5	12.6	28.7	23.2	11.0

$C_c = D_{30}^2/(D_{60} * D_{10})$ To be well graded: $1 < C_c < 3$ and

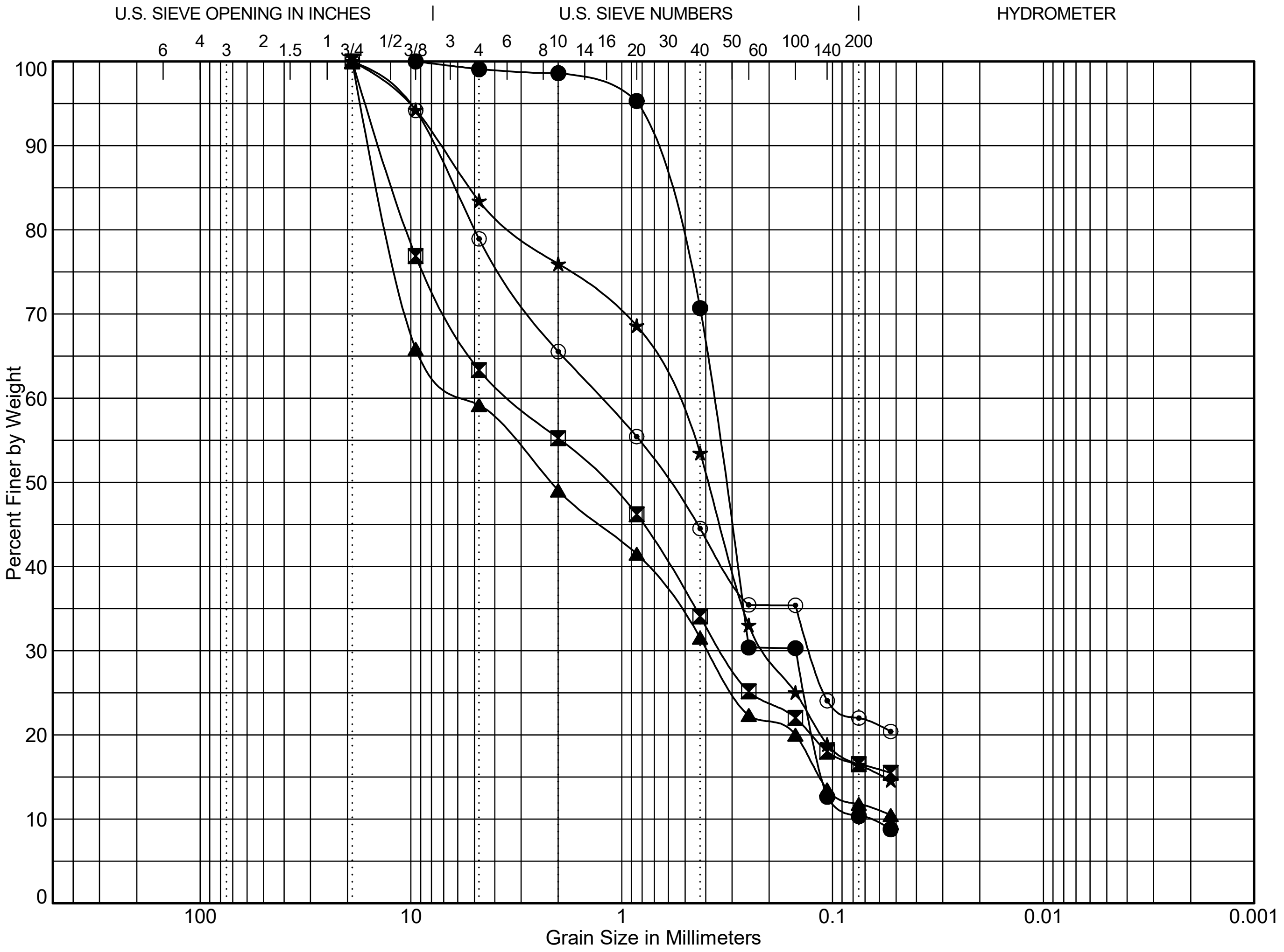
$C_u = D_{60}/D_{10}$ $C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Grain Size Test Data

Figure
B-1



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Point		Depth	Classification	LL	PL	PI	C_c	C_u
●	B-3	60.0	Slightly silty SAND (SP-SM)				0.87	5.30
☒	B-4	7.5	Silty, very gravelly SAND (SM)					
▲	B-5	5.0	Slightly silty, very gravelly SAND (SP-SM)					
★	B-5	7.5	Gravelly, silty SAND (SM)					
⊙	B-6	20.0	Gravelly, silty SAND (SM)					

Point		Depth	D_{90}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
●	B-3	60.0	0.732	0.369	0.324	0.149	0.07	0.0	0.9	0.5	27.9	60.4	10.3
☒	B-4	7.5	14.079	3.323	1.218	0.333		0.0	36.6	8.1	21.2	17.5	16.5
▲	B-5	5.0	15.509	5.169	2.169	0.389		0.0	40.8	10.1	17.5	19.8	11.8
★	B-5	7.5	7.237	0.573	0.388	0.206		0.0	16.6	7.5	22.5	37.0	16.4
⊙	B-6	20.0	7.857	1.251	0.602	0.127		0.0	21.1	13.4	21.0	22.5	22.0

$C_c = D_{30}^2/(D_{60} * D_{10})$

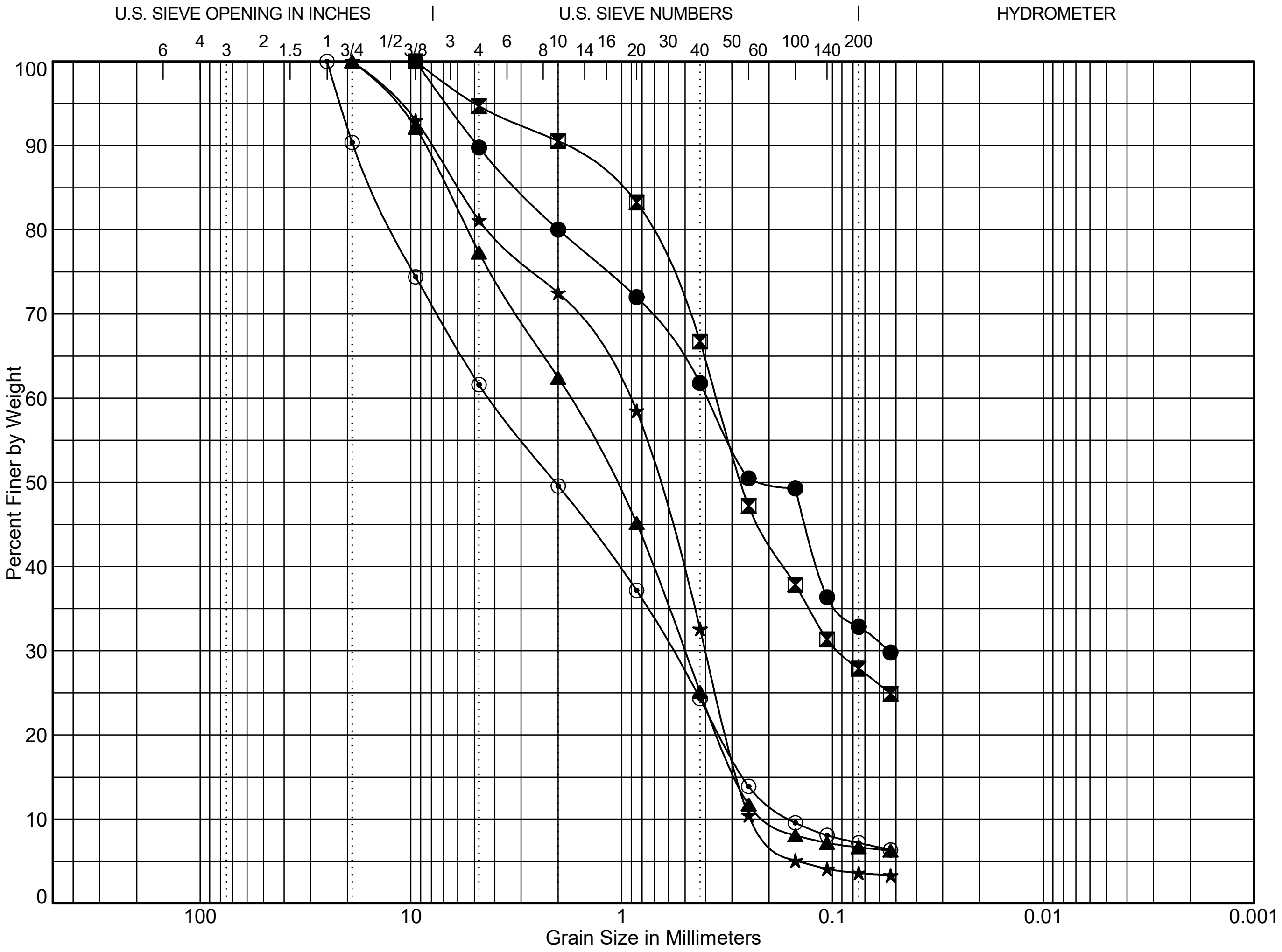
$C_u = D_{60}/D_{10}$

To be well graded: $1 < C_c < 3$ and $C_u > 4$ for GW or $C_u > 6$ for SW

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Grain Size Test Data

Figure
B-2



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

	Point	Depth	Classification	LL	PL	PI	C_c	C_u
●	B-8	5.0	Slightly gravelly, very silty SAND (SM)					
⧗	B-10	2.5	Slightly gravelly, silty SAND (SM)					
▲	TP-1	3.5	Slightly silty, gravelly SAND (SP-SM)				0.73	9.03
★	TP-1	9.0	Gravelly SAND (SP)				0.71	3.89
⊙	TP-2	1.0	Slightly silty, very gravelly SAND (SP-SM)				0.50	26.79

	Point	Depth	D_{90}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
●	B-8	5.0	4.824	0.391	0.204	0.054		0.0	10.2	9.7	18.2	28.9	32.8
⧗	B-10	2.5	1.877	0.354	0.27	0.093		0.0	5.3	4.1	23.8	38.9	27.9
▲	TP-1	3.5	8.599	1.775	1.081	0.504	0.197	0.0	22.7	14.9	37.3	18.4	6.6
★	TP-1	9.0	7.972	0.932	0.677	0.399	0.24	0.0	18.9	8.6	39.9	29.0	3.6
⊙	TP-2	1.0	18.691	4.233	2.063	0.578	0.158	9.6	28.8	12.0	25.3	17.1	7.2

$C_c = D_{30}^2/(D_{60}* D_{10})$

$C_u = D_{60}/D_{10}$

To be well graded: $1 < C_c < 3$ and

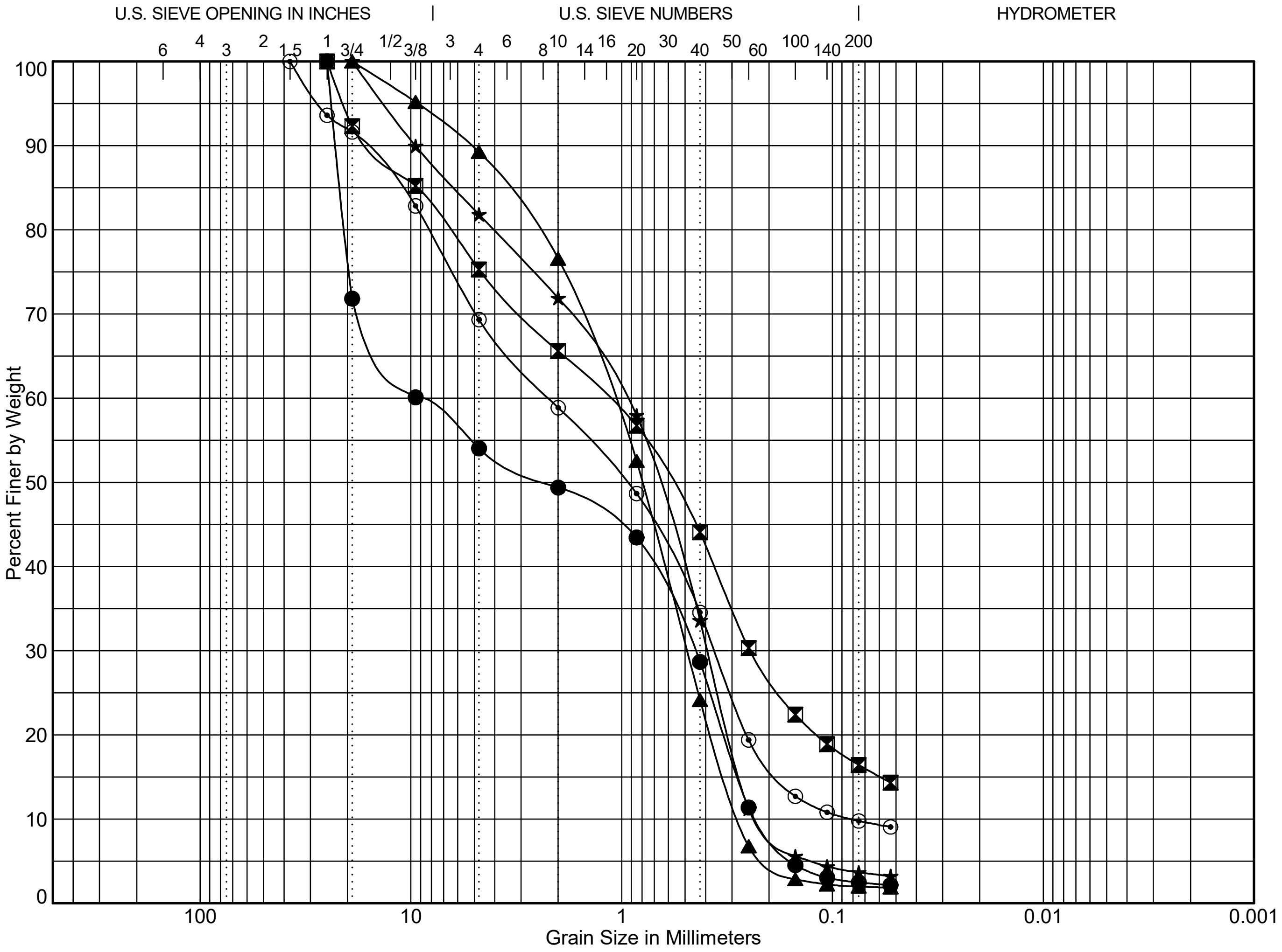
$C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Grain Size Test Data

Figure
B-3



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

	Point	Depth	Classification	LL	PL	PI	C_c	C_u
●	TP-2	6.5	Very gravelly SAND (SP)				0.10	41.62
⧗	TP-4	1.0	Silty, gravelly SAND (SM)					
▲	TP-4	2.3	Slightly gravelly SAND (SP)				0.79	4.02
★	TP-4	8.5	Gravelly SAND (SP)				0.71	4.31
⊙	TP-7	6.5	Slightly silty, very gravelly SAND (SP-SM)				0.74	27.15

	Point	Depth	D_{90}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
●	TP-2	6.5	22.68	9.389	2.246	0.452	0.226	28.2	17.8	4.7	20.7	26.2	2.5
⧗	TP-4	1.0	15.182	1.166	0.588	0.245		7.7	17.0	9.7	21.5	27.6	16.4
▲	TP-4	2.3	5.183	1.109	0.799	0.49	0.276	0.0	10.7	12.7	52.4	22.2	2.0
★	TP-4	8.5	9.534	0.963	0.678	0.39	0.223	0.0	18.2	9.9	38.3	29.9	3.7
⊙	TP-7	6.5	16.708	2.197	0.951	0.362	0.081	8.4	22.3	10.5	24.3	24.8	9.8

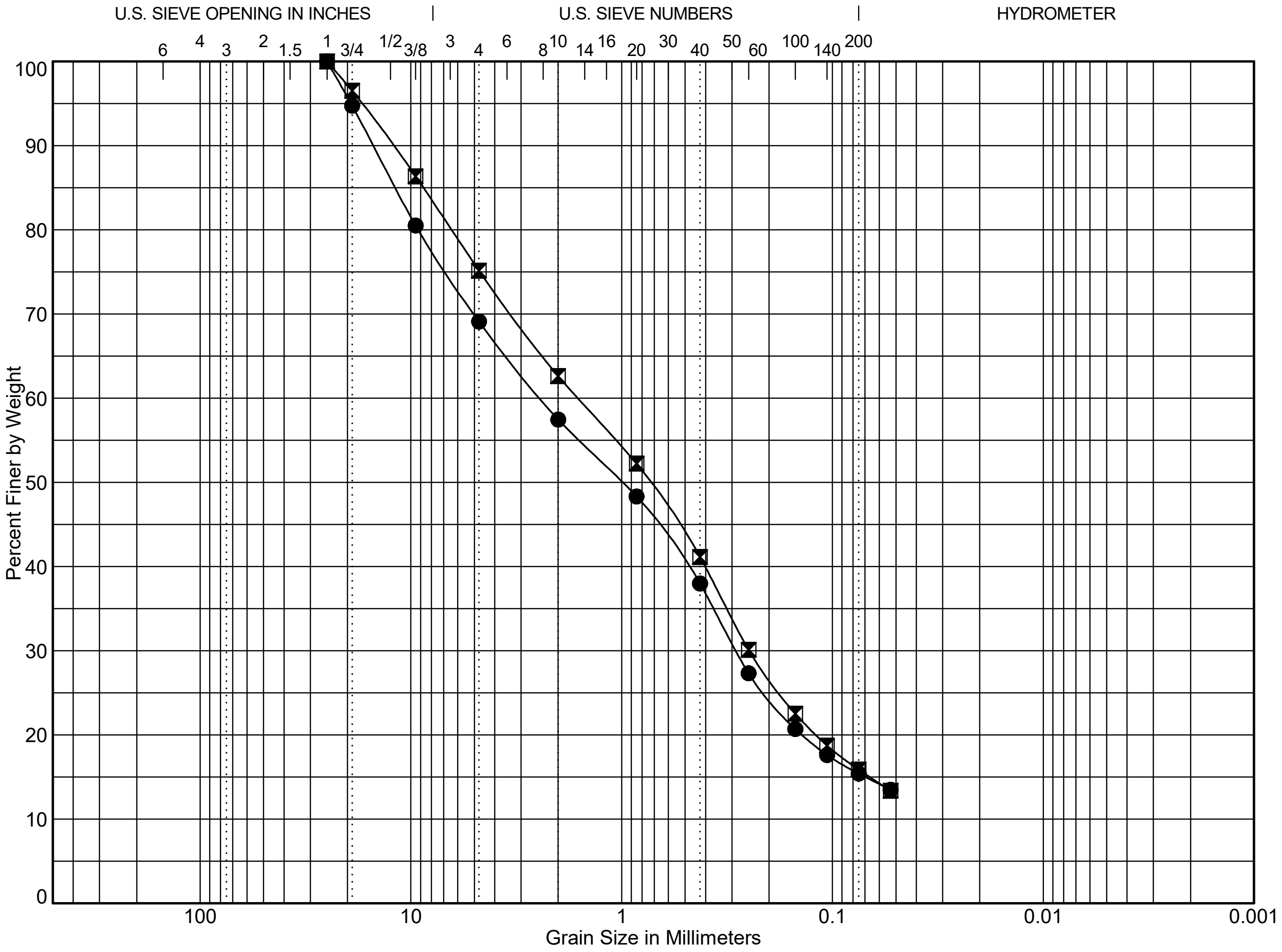
$C_c = D_{30}^2/(D_{60} * D_{10})$ To be well graded: $1 < C_c < 3$ and
$C_u = D_{60}/D_{10}$ $C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Grain Size Test Data

Figure
B-4



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Point		Depth	Classification	LL	PL	PI	C_c	C_u
●	TP-10	1.0	Silty, very gravelly SAND (SM)					
⧗	TP-11	2.0	Silty, gravelly SAND (SM)					

Point		Depth	D_{90}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
●	TP-10	1.0	15.083	2.416	0.994	0.286		5.3	25.6	11.7	19.5	22.6	15.4
⧗	TP-11	2.0	12.178	1.612	0.74	0.248		3.5	21.4	12.5	21.5	25.3	15.9

$C_c = D_{30}^2/(D_{60} * D_{10})$

$C_u = D_{60}/D_{10}$

To be well graded: $1 < C_c < 3$ and $C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST
An RMA Company

New College Place Elementary
and Middle School Campus
20401 76th Avenue W
Lynnwood, Washington

Grain Size Test Data

Figure
B-5

Northwest Agricultural Consultants

2545 W Falls Avenue
Kennewick, WA 99336
509.783.7450
www.nwag.com
lab@nwag.com

PAP-Accredited
NAPT

GeoTest Services Inc.
741 Marine Drive
Bellingham, WA 98225

Report: 71004-1-1
Date: November 18, 2024
Project No: 00-241332-0
Project Name: New College Place Campus

Sample ID	pH	Organic Matter	Cation Exchange Capacity
TP-1 @ 1.0’	5.9	1.15 %	5.0 meq/100g
TP-2 @ 0.5’	5.7	3.15 %	7.3 meq/100g
TP-2 @ 2.0’	5.8	1.10 %	7.1 meq/100g
TP-7 @ 4.0’	6.9	1.08 %	3.5 meq/100g
TP-8 @ 1.75’	5.8	1.55 %	8.8 meq/100g
TP-9 @ 0.25’	5.8	9.45 %	19.3 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.

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.