Real-World Geotechnical Solutions
Investigation • Design • Construction Support

Preliminary Geotechnical Engineering Report

Project:	**Golf Club Road Subdivision** **GeoPacific Project № 24-6715** **January 17, 2025**
Site Location:	**Marion County Tax Map 09 1W 04B** **Tax Lots 200, 900 & 1000** **9164, 9384 & 9474 Golf Club Road SE** **Stayton, Oregon**
Client:	**Brownstone Development** **PO Box 2201** **Lake Oswego, Oregon** **Email: randy@brownstonehomes.net**

14835 SW 72nd Avenue
Portland, Oregon 97224
503-598-8445
www.GeoPacificEng.com

TABLE OF CONTENTS

List of Appendices

List of Figures

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

January 17, 2025
Project № 24-6715

Randy Meyers
Brownstone Development
PO Box 2201
Lake Oswego, OR 97035
Email: randy@brownstonehomes.net

SUBJECT: PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
GOLF CLUB ROAD SUBDIVISION
MARION COUNTY TAX MAP 09 1W 04B TAX LOT 200, 900 & 1000
9164, 9384 & 9474 GOLF CLUB ROAD SE
STAYTON, OREGON

1.0 PROJECT INFORMATION

This report presents the results of a geotechnical engineering study conducted by GeoPacific Engineering, Inc. (GeoPacific) for the above-referenced project. The purpose of our investigation was to evaluate subsurface conditions at the site, assess potential geologic hazards at the property, and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with GeoPacific Proposal № P-8974, dated November 18th, 2024, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*. Our report is considered preliminary until we have observed a finalized grading plan.

2.0 SITE AND PROJECT DESCRIPTION

The subject site is located on the east side of Golf Club Road SE, between Oregon Highway 22 and the city of Stayton, Oregon (Figure 1). The property consists of three rectangular Marion County tax lots from tax map 09 1W04B: tax lot 200, (9164 Golf Club Road SE), tax lot 900, (9384 Golf Club Road SE), and tax lot 1000, (9474 Golf Club Road SE). Each tax lot contains one rural residential home with associated outbuildings located on the western portion of the parcels, closest to Golf Club Road SE. The properties combined total approximately 67.38 acres in size (Figure 2). The topography of the site is relatively smooth with a gentle slope of less than 5 percent grade down to the west. Site elevations range from 418 to 426 feet above mean sea level (amsl).

The northwest corner of the site is bordered by Mill Creek, which flows to the northwest through the neighboring golf course that forms the northern border of the site. The site is bordered by residential properties and Golf Club Road SE to the west, by residential properties to the south and by undeveloped land containing trees and agricultural fields to the east. Vegetation onsite primarily consists of field grass with sparse small trees along the perimeters and a wooded area at the eastern extent of the southern parcel, tax lot 1000 (9474 Golf Club Road SE). The parcels are currently being used for cattle grazing. The approximate latitude and longitude of the site are 44.819, -122.817.

Based upon communication with the client, we understand that preliminary plans for development include the construction of a subdivision for new residential homes, with new local streets, associated underground utilities, and open space. We anticipate cuts and fills for the project on the order of less than 5 feet.

3.0 REGIONAL GEOLOGIC SETTING

Regionally, the subject site lies within the Willamette Valley/Puget Sound lowland, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. A series of discontinuous faults subdivide the Willamette Valley into a mosaic of fault-bounded, structural blocks (Yeats et al., 1996). Uplifted structural blocks form bedrock highlands, while down-warped structural blocks form sedimentary basins.

Reginal geologic mapping displays Pleistocene age (approximately 2.6 million to 12,000 years ago) sediments of silt, sand, and gravel, in the vicinity of the subject site (Hampton, 1972; Gannett and Caldwell, 1998; O’Conner et al., 2001). Geologic mapping by O’Conner and others indicate that the site vicinity is underlain by post Missoula Flood, upper Pleistocene deposits originating from Cascade Range alluvium and glaciofluvial deposits transported by tributaries of the Willamette River produced during Pleistocene glaciations (Gannet and Caldwell, 1998; Tolan and Beeson, 1999; O’Conner et al., 2001). Areas adjacent to Mill Creek, in the northeast portion of the site, are mapped as modern alluvium (Hampton, 1972; Gannet and Caldwell, 1998).

Published geologic mapping indicates that the Upper Pleistocene Sediments are underlain by the Columbia River Basalt Group (Hampton, 1972; O’Conner et al., 2001). The Columbia River Basalt Group is a Miocene age (about 23 to 5.3 million years ago) sequence of lava flows, that cover large areas of Oregon and Washington and portions of western Idaho (Swanson et al., 1979; Hooper, 1982; Wells et al., 1989; Beeson and others, 1991). The Columbia River Basalt Group primarily erupted from vents within the eastern Columbia River Plateau (Swanson et al., 1979; Hooper, 1982; Wells et al., 1989; Beeson and others, 1991). The flows passed through an opening in the Cascade Range into the Willamette Valley and some lava flows extended as far as the Pacific Ocean (Beeson and others, 1979, 1985, 1989a; Beeson and Tolan, 1990, Beeson and others, 1991). The basalts are composed of dark gray, dense, finely crystalline rock, and the individual flows are mainly distinguished by chemical composition (Swanson et al., 1979, Schlicker and Finlayson, 1979; Hooper, 1982). The lava flows generally have a lower, fine grained crystalline portion, a middle portion of columnar vertical joints that may be massive and an upper vesicular portion that is often weathered to residual clay (Schicker and Deacon, 1967; Schlicker and Finalyson,1979). Individual basalt flow units typically range from 15 to 150 feet thick, and are sometimes separated by sediments, such as thin baked soil zones, tuff beds or gravel (Schlicker and Finlayson, 1979). Folding and faulting of the flows after placement has produced broad upland anticlines and valley synclines (Schlicker and Deacon, 1967).

The Columbia River Basalt Group is underlain by Tertiary Marine Sediments (approximately 21 to 56 million years ago). The Tertiary Marine Sediments consists of marine sandstone, siltstone, claystone and shale, as well as some conglomerate and includes the Tyee, Yamhill, Eugene, Spence, and Nestucca formations, as well as unnamed marine sedimentary units and mafic intrusions (Gannet and Caldwell, 1998; O'Conner et al., 2001).

4.0 REGIONAL SEISMIC SETTING

At least two major fault zones capable of generating damaging earthquakes are thought to exist in the vicinity of the subject site. These include the Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone.

4.1 Gales Creek-Newberg-Mt. Angel Structural Zone

The Gales Creek-Newberg-Mt. Angel Structural Zone is a 50-mile-long zone of discontinuous, NW-trending faults that lies about 14½ miles north of the subject site. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment (Yeats et al., 1996; Werner et al., 1992). A geologic reconnaissance and photogeologic analysis study conducted for the Scoggins Dam site in the Tualatin Basin revealed no evidence of deformed geomorphic surfaces along the structural zone (Unruh et al., 1994). No seismicity has been recorded on the Gales Creek Fault or Newberg Fault; however, these faults are considered to be potentially active because they may connect with the seismically active Mount Angel Fault and the rupture plane of the 1993 M5.6 Scotts Mills earthquake (Werner et al. 1992; Geomatrix Consultants, 1995).

According to the USGS Earthquake Hazards Program, the Mount Angel fault is mapped as a high-angle, reverse-oblique fault, which offsets Miocene rocks of the Columbia River Basalts, and Miocene and Pliocene sedimentary rocks. The fault appears to have controlled emplacement of the Frenchman Spring Member of the Wanapum Basalts, and thus must have a history that predates the Miocene age of these rocks. No unequivocal evidence of deformation of Quaternary deposits has been described, but a thick sequence of sediments deposited by the Missoula floods covers much of the southern part of the fault trace.

4.2 Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year (Goldfinger et al., 1996). A growing body of geologic evidence suggests that prehistoric subduction zone earthquakes have occurred (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). This evidence includes: (1) buried tidal marshes recording episodic, sudden subsidence along the coast of northern California, Oregon, and Washington, (2) burial of subsided tidal marshes by tsunami wave deposits, (3) paleoliquefaction features, and (4) geodetic uplift patterns on the Oregon coast. Radiocarbon dates on buried tidal marshes indicate a recurrence interval for major subduction zone earthquakes of 250 to 650 years with the last event occurring 300 years ago (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). The inferred seismogenic portion of the plate interface lies approximately along the Oregon Coast at depths of between 20 and 40 kilometers below the surface.

5.0 FIELD EXPLORATION AND SUBSURFACE CONDITIONS

Our subsurface explorations for this report were conducted on December 19, 2024. A total of eighteen exploratory test pits (TP-1 through TP-18) were excavated at the site to a maximum depth of 10 feet below existing ground surface (bgs) using a John Deere 50G tracked excavator with 2 feet wide toothed bucket provided by the client. The locations of the onsite explorations are displayed in Figure 2.

The explorations were conducted under the full-time observation of a GeoPacific geologist. During the explorations, pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrences were recorded. Soils were classified in accordance with the Unified Soil Classification System (USCS). At the completion of each exploration, the test pits were loosely backfilled with onsite soil.

It should be noted that our explorations were located in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate. Summary exploration logs are attached. The stratigraphic contacts shown on the individual test pit logs represent the approximate boundaries between soil types. The actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific dates and locations reported, and therefore, are not necessarily representative of other locations and times. Soil and groundwater conditions encountered in the explorations are summarized in the following *Soil Descriptions* section.

5.1 Soil Descriptions

Topsoil Horizon: At the ground surface of all of our test pit explorations, we observed soft, organic SILT (OL) topsoil that was dark brown to black, contained trace gravel and grass roots, and was moist. The topsoil horizon observed in our test pit explorations extended to depths of 10 to 24 inches.

Alluvium: Under the topsoil horizon in our test pit explorations TP-1 through TP-4, we observed silty CLAY (CL) that was light brown with strong orange and gray mottling, moderately plastic and moist. The silty CLAY (CL) was generally soft to medium stiff near surface becoming more consolidated to a stiff consistency at depth. The silty CLAY (CL) was considered to be alluvium associated with nearby Mill Creek and extended to depths of 2 to 4 feet below existing grade.

Pleistocene Sediments: Beneath the alluvium in test pit explorations TP-1 through TP-4 and the topsoil horizon in exploration TP-7, we observed dense, well-rounded to sub-rounded GRAVEL (GC) and cobbles of basalt and andesite with silty clay matrix material. The clayey GRAVEL (GC) transitioned to dense, silty GRAVEL (GM) at depths of 3 to 6 feet below the surface in explorations

TP-1 through TP-4 and TP-7. Silty GRAVEL (GM) was observed under the topsoil horizon in explorations TP-5, TP-6, and TP-8 through TP-18. The silty GRAVEL (GM) transitioned to dense, poorly graded GRAVEL with sand (GP) at depths ranging from 3 to 9 feet below the surface in test pits TP-1, TP-3, TP-4, and TP-8 through TP-18. At depths of 7 to 9 feet in test pit TP-8 and depths of 4 to 5 feet in test pits TP-15 and TP-16, we observed medium dense to dense, poorly graded SAND with gravel (SP). The sand was medium- to coarse-grained and wet. Within the silty GRAVEL (GM) and poorly graded GRAVEL with sand (GP), we observed well-rounded to sub-rounded cobbles to boulders at depth and trace well-rounded cobbles exhibiting a lenticular shape. The clayey GRAVEL (GC), silty GRAVEL (GM) and poorly graded GRAVEL with sand (GP) and poorly graded SAND with gravel (SP) were interpreted to be Catastrophic Flood Deposits and extended behind the 10 feet maximum depth of our test pit explorations at the site.

5.2 Shrink-Swell Potential

Silty CLAY (CL), clayey GRAVEL (GC), silty GRAVEL (GM), poorly graded GRAVEL with sand (GP) and poorly graded SAND with gravel (SP) were encountered within the upper 10 feet of our test pit explorations conducted at the site. Based upon the results of our investigation and our local experience with the soil layers in the vicinity of the subject site,

- the plasticity of the silty CLAY (CL) soil is low to moderate, and the shrink-swell potential of that soil type is considered to be low.
- the plasticity of the GRAVEL (GC-GM-GP) soil is low to non-plastic, and the shrink-swell potential of that soil type is considered to be very low.
- the poorly graded SAND with gravel (SP) is non-plastic, and the shrink-swell potential of that soil type is considered to be very low.

Special design measures are not considered necessary to minimize the risk of damage to foundations as a result of potential soil expansion at this site.

5.3 Groundwater and Soil Moisture

Soils encountered in our explorations ranged from moist to wet. Groundwater was encountered in all of our test pit explorations. Groundwater was generally observed beginning at 2 to 4 feet below the surface grade and entering the excavation from multiple sidewalls at rates of several gallons per minute. The majority of test pit explorations contained several inches to several feet of water at completion. Based on our review of available well logs from the *Oregon Water Resources Department, Groundwater Information Mapping tool* (Oregon Water Resources Department, 2025), static ground water has been recorded near the site vicinity at depths of 4 feet and 20 feet but mab be shallower in wet weather events.

Experience has shown that temporary perched storm-related groundwater conditions often occur within the surface soils over fine-grained native deposits such as those beneath the site, particularly during the wet season. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors. Seeps and springs may exist in areas not explored and may become evident during site grading.

6.0 GEOLOGIC HAZARD

The Oregon Department of Geology and Mineral Industries (DOGAMI) Oregon HazVu: Statewide GeoHazards Viewer (2025) has mapped western and southern portions of the site as an area of *Moderate Volcanic Hazard* for Mount Jefferson, Distal Hazard as mapped by Walder et al., 1999. Potential hazards caused by volcanic activity associated with Mount Jefferson include lava flows, lava domes, pyroclastic flows and surges, lahars, debris avalanches, ballistic projectiles, tephra falls and outburst flooding from glacial moraine dam failures (Walder et al., 1999). Lava flows and collapsing lava domes produced during volcanic activity can generate pyroclastic flows that melt ice and snow at higher elevations, creating lahars (volcanic mudflow or debris flow). Debris avalanches may occur without volcanic activity in steeply sloping topography and in zones of weathered rock and may be activated by earthquakes , steam explosions and intense rainfall (Walder et al., 1999). Tephra falls refer to all clastic material ejected from a volcanic vent and can include ash, cinders, pumice and scoria. In some cases, high altitude lakes on the slopes of volcanoes that have been impeded by glacial moraines have the potential for dam failure and outburst flooding during a volcanic event (Walder et al., 1999).

Volcano-hazards zones for the Mount Jefferson area are mapped by Walder et al. (1999) into proximal and distal hazard zones based on distance from the volcano (Figure 3). Areas within the Proximal Hazard Zones for Mount Jefferson are subject to rapid pyroclastic flows and surges, lahars, debris flows, ballistic projectiles and lava flows. Proximal Hazard Zones include areas approximately 5 to 10 miles from the summit of Mount Jefferson. Distal Hazard Zones are subject to lahars and debris avalanches. Proximal and Distal areas adjacent to Mount Jefferson are primarily mapped in the vicinity of the South Fork Breitenbush River, North Santiam River, Whitewater River, Metolius River and Shitike Creek. Figure 3 displays the Mount Jefferson volcanic hazard zone mapping as currently presented on the Oregon Department of Geology and Mineral Industries statewide geohazards viewer, as modified from the Proximal (High) Hazard and Distal (Moderate) Hazard classifications by Walder, et al. (1999).

7.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Our site investigation indicates that the proposed construction appears to be geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project. Our report will remain preliminary until we have reviewed a finalized grading plan for the project. Primary geotechnical concerns for the development include:

1) The presence of shallow groundwater. We encountered groundwater within 2 to 4 feet below surface elevation in all of our test pit explorations on December 19, 2024. Groundwater was observed entering the test pits from multiple directions, at rates of several gallons per minute, and collected in the bottom of the excavations several inches to several feet deep. Groundwater elevation may fluctuate throughout the year.

   We recommend retention of a hydrogeologic firm to study seasonal groundwater fluctuations, for design of a trench dewatering system for underground utility installation and to provide suitable finish grade elevation recommendations for foundations with crawlspaces.

2) The presence of a thick topsoil layer. In our subsurface explorations we observed a topsoil layer of organic SILT (OL) that was dark brown to black. The organic topsoil layer observed in most areas of the site was approximately 12 inches thick, however thicker layers up to 24 inches deep were observed in some areas of the southern parcels currently being used for livestock.

   We recommend organic-rich topsoil be stripped from construction areas of the site or where engineered fill is to be placed.

3) The presence of gravel to cobbles and boulders at depth. In all of our subsurface explorations we encountered dense, well-rounded to sub-angular gravel within 1 to 4 feet of the surface. The gravels contained cobbles and boulders up to 18 inches in diameter. Practical refusal in dense gravel and cobbles using a John Deere 50G excavator with toothed bucket was encountered in test pit explorations TP-1 through TP-7, TP-9 through TP-16, and TP-18 at depths ranging from 5 to 9.5 feet. We anticipate difficult excavating conditions for utility trench installations. We also anticipate that utility trenches and any deep excavations will need to be shored.

   The well-rounded to sub-angular gravel is lacking in sufficient fines to be suitable for reuse as engineered fill without processing, due to the amount of cobbles to boulders. The native material may be a potential source for crushed aggregate engineered fill, if processed onsite by a mobile crusher or transported to an aggregate processing facility.

4) The presence of soft soils. Soft to medium stiff, silty CLAY (CL) was encountered in test pit explorations TP-1 through TP-4, to depths of 1 to 4 feet. Soft subgrade soils in structural areas will need to be over-excavated and replaced with compacted structural fill. After removal of organic SILT (OL) topsoil, some areas of clayey GRAVEL (GC) to silty GRAVEL (GM) may need to be over-excavated and recompacted.

5) The potential presence of undocumented fill. Undocumented fill was not encountered in our test pit explorations at the site, conducted on December 19, 2024. However undocumented fill is likely to be encountered in the vicinity of previous residences and accompanying structures onsite. Disturbed soils, underground utilities, and field drains from agricultural activity may also be encountered during development in areas outside of our explorations.

The following report sections provide recommendations for site development and construction in accordance with the current applicable codes and local standards of practice.

7.1 Site Preparation Recommendations

Areas of proposed buildings, pavements, and areas to receive fill should be cleared of vegetation and any organic and inorganic debris. Inorganic debris should be removed from the site. Organic materials from clearing should either be removed from the site or placed as landscape fill in areas not planned for structures. The final depth of soil removal will be determined on the basis of a site inspection after the stripping/excavation has been performed.

Organic-rich topsoil should then be stripped from construction areas of the site or where engineered fill is to be placed. During our investigation, we encountered a layer of organic topsoil extending to depths of 10 to 24 inches. The estimated necessary depth of removal of organic soils is 10 to 24 inches. Deeper stripping to remove large tree roots or other organics may be necessary in localized areas. The final depth of soil removal will be determined on the basis of a site inspection after the stripping/excavation has been performed. Stripped topsoil should be stockpiled only in designated areas and stripping operations should be observed and documented by the geotechnical engineer or their representative.

In the influence zones of proposed buildings, fill areas, roadways, and other structures, soft/loose fills, buried topsoil, and subsurface structures should be removed, and the excavations backfilled with engineered fill. Examples of materials that should be removed include tile drains, basements, driveway and landscaping fill, old utility lines, cisterns, septic leach fields, etc. Undocumented fill was not encountered in our test pit explorations at the site, conducted on December 19, 2024. However undocumented fill is likely to be encountered in the vicinity of any residences or structures onsite. Disturbed soils and field drains from agricultural activity may also be encountered during development in areas outside of our explorations.

Exposed subgrade soils should be evaluated by the geotechnical engineer. For large areas, this evaluation is normally performed by proof-rolling the exposed subgrade with a fully loaded scraper or dump truck. For smaller areas where access is restricted, the subgrade should be evaluated by probing the soil with a steel probe. Soft/loose soils identified during subgrade preparation should be compacted to a firm and unyielding condition, over-excavated and replaced with engineered fill (as described below) or stabilized with rock prior to placement of engineered fill. The depth of over-excavation, if required, should be evaluated by the geotechnical engineer at the time of construction.

7.2 Engineered Fill

All grading for the proposed construction should be performed as engineered grading in accordance with the applicable building code at the time of construction with the exceptions and additions noted herein. Areas proposed for fill placement should be prepared as described in the *Site Preparation Recommendations* section. Surface soils should then be scarified and recompacted prior to placement of structural fill. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill. Soils containing greater than 5 percent organic content should not be used as structural fill. Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site.

We anticipate that existing silty clay soils can be used as engineered fill, provided they are adequately moisture conditioned. Native, well-rounded to sub-angular gravel to cobbles should be handled in special ways. The gravel to cobbles and boulders observed in our subsurface explorations may potentially be crushed to create angular gravel with a suitable gradation to be used as crushed aggregate structural fill. The native material may also be screened to remove large aggregate, leaving sandy fines and well-rounded gravel engineered fill. However, both materials would be non-plastic and require special care on erosional surfaces.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 95 percent of the maximum dry density determined by ASTM D698 (Standard Proctor) or equivalent. Soils should be moisture conditioned to within two percent of optimum moisture. Field density testing should conform to ASTM D2922 and D3017, or D1556. All engineered fill should be observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd^3, whichever requires more testing. Because testing is performed on an on-call basis, we recommend that the earthwork contractor be held contractually responsible for test scheduling and frequency.

Site earthwork may be impacted by shallow groundwater, soil moisture and wet weather conditions. Earthwork in wet weather would likely require extensive use of additional crushed aggregate, cement or lime treatment, or other special measures, at considerable additional cost compared to earthwork performed under dry-weather conditions.

7.3 Excavating Conditions and Utility Trench Backfill

We anticipate that onsite soils can generally be excavated using conventional heavy equipment. However, practical refusal in dense gravel and cobbles was encountered in test pit explorations TP-1 through TP-7, TP-9 through TP-16, and TP-18 at depths ranging from 5 to 9.5 feet. We anticipated that utility trench excavation may be difficult and that trench excavations will need to be shored. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions. All temporary cuts in excess of

4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926) or be shored. The existing native soils, to a depth of approximately 10 feet bgs, classify as Type C Soil and temporary excavation side slope inclinations as steep as 1.5H:1V may be assumed for planning purposes. This cut slope inclination is applicable to excavations above the water table only.

Shallow groundwater was encountered in our test pit explorations at the site and should be anticipated in excavations and utility trenches. Groundwater was encountered in all of our explorations at depths of 2 to 4 feet. Based on our review of available well logs from the *Oregon Water Resources Department, Groundwater Information Mapping tool* (Oregon Water Resources Department, 2025) and static ground water has been recorded near the site vicinity at depths of 4 feet and 20 feet. Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

Underground utility pipes should be installed in accordance with the procedures specified in ASTM D2321 and applicable city and county standards. We recommend that structural trench backfill be compacted to at least 95 percent of the maximum dry density obtained by the Standard Proctor (ASTM D698, AASHTO T-99) or equivalent. Initial backfill lift thicknesses for a ¾”-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, at least one density test is taken for every 4 vertical feet of backfill on each 100-lineal-foot section of trench.

7.4 Erosion Control Considerations

During our field exploration program, we observed sands and gravels which are considered susceptible to erosion. In our opinion, the primary concern regarding erosion potential will occur during construction in areas that have been stripped of vegetation. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw wattles, fiber rolls, and silt fences. If used, these erosion control devices should remain in place throughout site preparation and construction.

Erosion and sedimentation of exposed soils can also be minimized by quickly re-vegetating exposed areas of soil, and by staging construction such that large areas of the project site are not denuded and exposed at the same time. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets.

Areas of exposed soil requiring permanent stabilization should be seeded with an approved grass seed mixture, or hydroseeded with an approved seed-mulch-fertilizer mixture.

7.5 Wet Weather Earthwork

Soils underlying the site are likely to be moisture sensitive and will be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will require expensive measures such as cement treatment or imported granular material to compact areas where fill may be proposed to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than 5 percent passing the No. 200 sieve. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Geotextile silt fences, straw wattles, and fiber rolls should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, GeoPacific should be contacted to provide additional recommendations and field monitoring.

7.6 Spread Foundations

The proposed residential homes will likely be constructed on typical spread foundations with square column footings, continuous strip footings, and crawl spaces. We anticipate wood-framed construction above the foundations with maximum structural loading on column footings and continuous strip footings on the order of 10 to 35 kips, and 2 to 7 kips per foot, respectively. Residential structures may be supported on shallow foundations bearing on competent undisturbed, low expansive native soils and/or engineered fill, appropriately designed and constructed as recommended in this report. Ares of soft subgrade soil should be moisture conditioned and recompacted during mass grading or over-excavated and replaced with compacted structural fill during the home building phase.

Foundation design, construction, and setback requirements should conform to the applicable building code at the time of construction. For maximization of bearing strength and protection against frost heave, spread footings should be embedded at a minimum depth of 12 inches below exterior grade except where footing-to-slope setbacks require deeper embedment. Excavations near structural footings should not extend within a 1H:1V plane projected downward from the bottom edge of footings.

The anticipated allowable soil bearing pressure is 1,500 lbs/ft^2 for footings bearing on competent, low expansivity, native soil and/or engineered fill. A maximum chimney and column load of 40 kips is recommended for the site. The recommended maximum allowable bearing pressure may be increased by 1/3 for short-term transient conditions such as wind and seismic loading. For heavier loads, the geotechnical engineer should be consulted. The coefficient of friction between on-site soil and poured-in-place concrete may be taken as 0.42, which includes no factor of safety.

Footing excavations should penetrate through topsoil, undocumented fill, and any loose soil to competent subgrade that is suitable for bearing support. All footing excavations should be trimmed neat, and all loose or softened soil should be removed from the excavation bottom prior to placing reinforcing steel bars. Due to the moisture sensitivity of on-site native soils, foundations constructed during the wet weather season may require over-excavation of footings and backfill with compacted, crushed aggregate.

Our recommendations are for house construction incorporating raised wood floors and conventional spread footing foundations. If living space of the structures incorporate basements, a geotechnical engineer should be consulted to make additional recommendations for retaining walls, water-proofing, underslab drainage and wall subdrains. After site development, a Final Soil Engineer's Report should either confirm or modify the above recommendations.

7.7 Concrete Slabs-on-Grade

Preparation of areas beneath concrete slab-on-grade floors should be performed as described in the Site *Preparation Recommendations* and *Spread Foundations* sections of this report. Care should be taken during excavation for foundations and floor slabs, to avoid disturbing subgrade soils. If subgrade soils have been adversely impacted by wet weather or otherwise disturbed, the surficial soils should be scarified to a minimum depth of 8 inches, moisture conditioned to within about 3 percent of optimum moisture content and compacted to engineered fill specifications. Alternatively, disturbed soils may be removed, and the removal zone backfilled with additional crushed rock.

For evaluation of the concrete slab-on-grade floors using the beam on elastic foundation method, a modulus of subgrade reaction of 150 kcf (87 pci) should be assumed for the stiff, fine -grained soils anticipated to be present at foundation subgrade elevation following adequate site preparation as described above. This value assumes the concrete slab system is designed and constructed as recommended herein, with a minimum thickness of 8 inches of 1½”-0 crushed aggregate beneath the slab. The total thickness of crushed aggregate will be dependent on the subgrade conditions at the time of construction and should be verified visually by proof-rolling. Under-slab aggregate should be compacted to at least 95 percent of its maximum dry density as determined by ASTM D698 (Standard Proctor) or equivalent.

In areas where moisture will be detrimental to floor coverings or equipment inside the proposed structure, appropriate vapor barrier and damp-proofing measures should be implemented. Appropriate design professionals should be consulted regarding vapor barrier and damp proofing systems, ventilation, building material selection and mold prevention issues, which are outside GeoPacific’s area of expertise.

In the influence zones of proposed concrete slabs, undocumented fills, buried topsoil, and subsurface structures (tile drains, basements, driveway and landscaping fill, old utility lines, cisterns, septic leach fields, etc.) should be removed and the excavations backfilled with engineered fill.

7.8 Footing and Roof Drains

The outside edge of perimeter footings should be provided with a drainage system consisting of 3-inch diameter, slotted, flexible plastic pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining gravel or 1 1/2” - 3/4” drain rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. Down spouts and roof drains should not be connected to the foundation drains in order to reduce the potential for clogging. The footing drains should include clean-outs to allow periodic maintenance and inspection. Grades around the proposed structure should be sloped such that surface water drains away from the building.

Footing drains are recommended to prevent detrimental effects of surface water runoff on foundations – not to dewater groundwater. Footing drains should not be expected to eliminate all potential sources of water entering a basement or beneath a slab-on-grade. An adequate grade to a low point outlet drain in the crawlspace, if utilized, is required by code.

7.9 Seismic Design

The Oregon Department of Geology and Mineral Industries (DOGAMI), Oregon HazVu: 2025 Statewide GeoHazards Viewer indicates that the site is in an area where *severe* ground shaking is anticipated during an earthquake. Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2021 International Building Code (IBC) with applicable Oregon Structural Specialty Code (OSSC) revisions (current 2024). We recommend Site

Class D be used for design as defined in ASCE 7-16, Chapter 20, and Table 20.3-1. We recommend seismic design category D_0 as defined in 2021 International Residential Code (IRC) Table R301.2.2.1.1. Design values determined for the site using the ASCE Hazards Tool website are summarized in Table 2.

Table 2 - Recommended Earthquake Ground Motion Parameters (ASCE-7-16)

Parameter	Value
Location (Lat, Long), degrees	44.819, -122.814
Horizontal Design Response, 2% Probability of Exceedance in 50 years	
Site Modified Peak Ground Acceleration PGA_M	0.423 g
Short Period, S_s	0.725 g
1.0 Sec Period, S_1	0.369 g
Soil Factors for Site Class D:	
F_a	1.22
* F_v	1.931
SD_s = 2/3 x F_a x S_s	0.590 g
*SD_1 = 2/3 x F_v x S_1	0.475 g
Seismic Design Category	D (D_0 per 2021 IRC)

7.10 Soil Liquefaction

The Oregon Department of Geology and Mineral Industries (DOGAMI) Oregon HazVu: Statewide GeoHazards Viewer (2025) has mapped the area adjacent to Mill Creek as an area of *high* to *very high* susceptibility to liquefaction during an earthquake, and the majority of the site is mapped as *low* susceptibility to liquefaction during an earthquake. Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to ground shaking caused by strong earthquakes. Soil liquefaction is generally limited to loose sands and granular soils located below the water table, and fine-grained soils with a plasticity index less than 15.

The subsurface profile observed within our subsurface explorations, which extended to a maximum depth of 10 feet bgs, indicated that the site is underlain by layers of CLAY, clayey GRAVEL (GC), silty GRAVEL (GM), poorly graded GRAVEL with sand (GP) and poorly graded SAND with gravel (SP). Groundwater was encountered in all of our test pit explorations, at depths of 2 to 4 feet. Based on our review of available well logs from the *Oregon Water Resources Department, Groundwater Information Mapping tool* (Oregon Water Resources Department, 2025), static ground water has been recorded near the site vicinity at depths of 4 feet and 20 feet. Based on the results of our subsurface investigation and our understanding of the geologic conditions in the site vicinity, it is our opinion that the risk of liquefaction on the site is negligible and that no special measures are needed to address liquefaction.

It is our understanding that for construction of single-family and two-family structures, a quantitative evaluation of liquefaction hazards and special design or construction measures is not required by code to mitigate the effects of liquefaction. However, GeoPacific may be consulted to perform further study of seismic hazards on the site if desired.

8.0 UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and their consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. The checklist attached to this report outlines recommended geotechnical observations and testing for the project. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

This report should not be relied upon by third parties unless a reliance letter has been issued by GeoPacific specifically to that third party, otherwise the third party should rely upon their own due diligence and geotechnical studies only. Foundations, wood floors and slab-on-grade performance should be evaluated in accordance with ASCE Guidelines for the Evaluation and Repair of Residential Foundations (ASCE Texas Chapter, 2009) when exceeding L/100 for overall tilting and L/360 for overall deflection across the length of the home, unless superseded by the builder's warranty guidelines. Localized deflections may exceed these tolerances due to other factors such as built-in uneveness.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.

Michael T. Baker, R.G.
Staff Geologist

James D. Imbrie, P.E.
Principal Geotechnical Engineer

REFERENCES

American Society of Civil Engineers (ASCE), 2025, ASCE Hazard Tool, https://ascehazard.org

American Society of Civil Engineers Texas Section, 2009, Guidelines for the Evaluation and Repair of Residential Foundations, Version 2, 17 pages.

Atwater, B.F., 1992, Geologic evidence for earthquakes during the past 2,000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

Beeson, M.H., and Moran, M.R., 1979, Columbia River Basalt Group stratigraphy in western Oregon: Oregon Geology, published by the Oregon Department of Geology and Mineral Industries, v. 41, no. 1, p. 11-14.

Beeson, M.H., Fecht, K.R., Reidal, S.P., and Tolan, T.L., 1985, Regional correlation within the French Springs Member of the Columbia River Basalt Group: New insights into the middle Miocene tectonics of the northwestern Oregon: Oregon Geology, v. 47, no. 8, p. 87-96.

Beeson, M.H., Tolan, T.L., and Anderson, J.L., 1989, The Columbia River Basalt Group in western Oregon; Geologic structures and other factors that controlled flow emplacement patterns: Geological Society of America Special Paper 239, in Volcanism and tectonicism in the Columbia River flood-basalt province published by the Geological Society of America, p. 223-246.

Beeson, M.H., Tolan, T.L., and Madin, I.P., 1991, Geologic map of the Portland Quadrangle, Multnomah, and Washington Counties, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-75, scale 1:24,000.

Carver, G.A., 1992, Late Cenozoic tectonics of coastal northern California: American Association of Petroleum Geologists-SEPM Field Trip Guidebook.

Gannet, M. W., and Caldwell, R. R., 1998, Generalized Geologic Map of the Willamette Lowland, U.S. Department of the interior, U.S. Geological Survey.

Goldfinger, C., Kulm, L.D., Yeats, R.S., Appelgate, B, MacKay, M.E., and Cochrane, G.R., 1996, Active strike-slip faulting and folding of the Cascadia Subduction-Zone plate boundary and forearc in central and northern Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, v. 1: U.S. Geological Survey Professional Paper 1560, p. 223-256

Geomatrix Consultants, 1995, Seismic Design Mapping, State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

Hampton, E.R., 1972, Geology and groundwater of the Mollala – Salem Slope area, Oregon: U.S. Geological Survey Water Supply Paper 1997.

Hooper, P.R., 1982, The Columbia River Basalts, Science, March 19, 1982, Volume 215, Number 4539.

O'Connor, J.E., Sarna-Wojcicki, A., Wozniak, K.C., Polette, D.J., and Fleck, R.J., 2001, Origin, extent, and thickness of Quaternary geologic units in the Willamette Valley, Oregon: U.S. Geological Survey, Professional Paper 1620, scale 1:250,000.

Oregon Department of Geology and Mineral Industries, 2025, Statewide Geohazards Viewer, www.oregongeology.org/hazvu.

Oregon Water Resources Department, 2025, Well Report Query: https://apps.wrd.state.or.us/apps/gw/well_log/

Schlicker, H.G. and R.J. Deacon, 1967, Geologic and Surficial Deposits of the Tualatin River Valley, Oregon and Geologic Hazards Map of the Tualatin River Valley, Oregon; Oregon Department of Geology and Mineral Industries, scale 1:48,000.

Schlicker, H.G. and Finlayson, C.T., 1979, Geology and Geologic Hazards of northwestern Clackamas County, Oregon: Oregon Department of Geology and Mineral Industries, Bulletin No. 99, 79 p., scale 1:24,000.

Swanson, R.D., Wright, T.L., Hooper, P.R., and Bentley, R.D., 1979, Revisions in Stratigraphic Nomenclature of the Columbia River Basalt Group, Geological Survey Bulletin 1457-G.

Tolan, T.I., and Beeson, M.H., 1999, Geologic Map of the Silverton and Scotts Mills 7.5 Minute Quadrangles, Northwest Oregon, U.S. Geological Survey, Open File Report O-99-141.

United States Geological Survey, USGS Earthquake Hazards Program Website (earthquake.usgs.gov), 2025.

Unruh, J.R., Wong, I.G., Bott, J.D., Silva, W.J., and Lettis, W.R., 1994, Seismotectonic evaluation: Scoggins Dam, Tualatin Project, Northwest Oregon: unpublished report by William Lettis and Associates and Woodward Clyde Federal Services, Oakland, CA, for U. S. Bureau of Reclamation, Denver CO (in Geomatrix Consultants, 1995).

Wells, R.E., Simpson, R.W., Bentley, R.D., Beeson, M.H., Mangan, M.T., and Wright, T.L., 1989, Correlation of Miocene flows of the Columbia River Basalt Group from the central Columbia River Plateau to the coast of Oregon and Washington, Geological Society of America, Special Paper 239.

Werner, K.S., Nabelek, J., Yeats, R.S., Malone, S., 1992, The Mount Angel fault: implications of seismic-reflection data and the Woodburn, Oregon, earthquake sequence of August 1990: Oregon Geology, v. 54, p. 112-117.

Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996, Tectonics of the Willamette Valley, Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, v. 1: U.S. Geological Survey Professional Paper 1560, P. 183-222, 5 plates, scale 1:100,000.

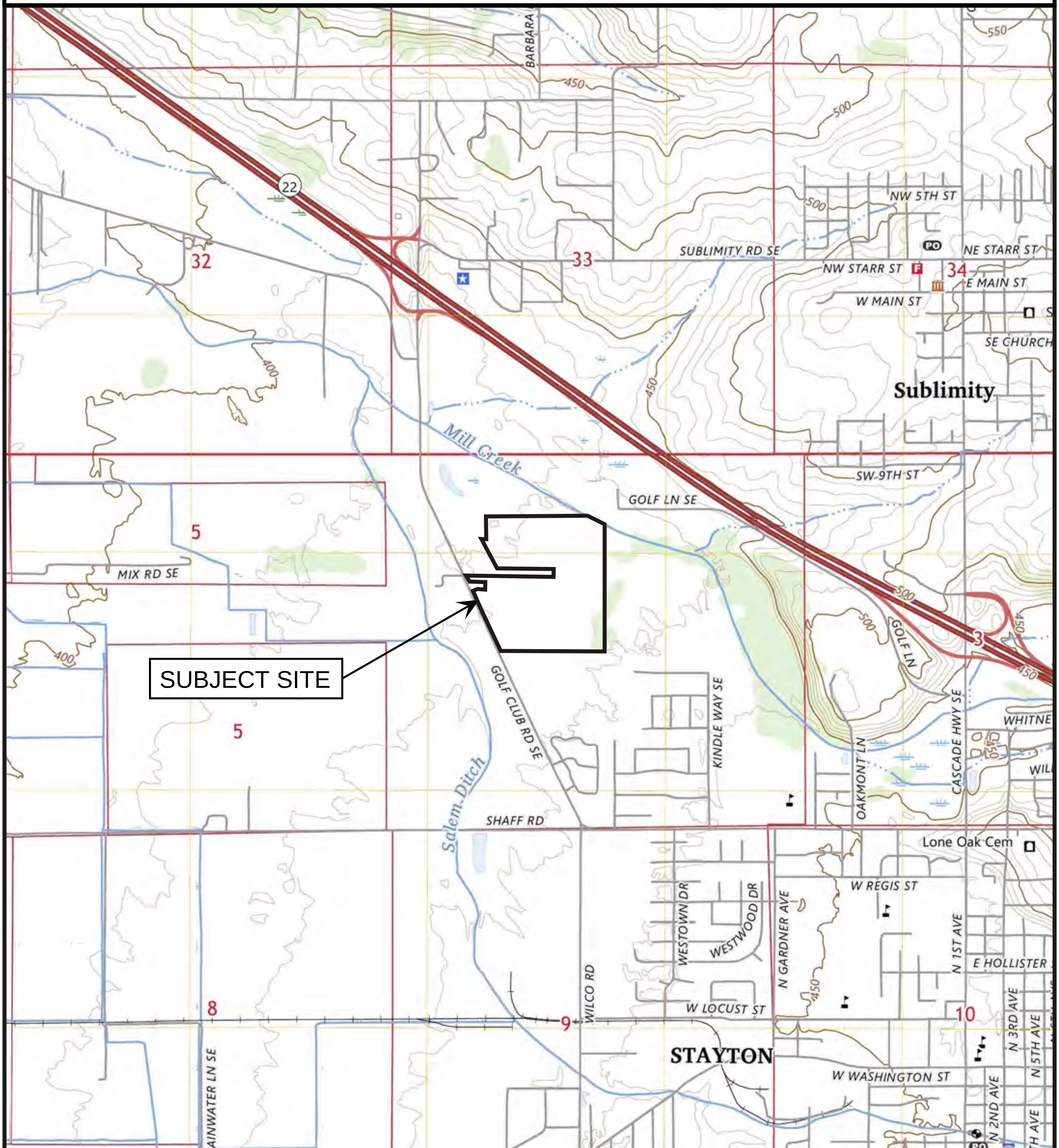
Yelin, T.S., 1992, An earthquake swarm in the north Portland Hills (Oregon): More speculations on the seismotectonics of the Portland Basin: Geological Society of America, Programs with Abstracts, v. 24, no. 5, p. 92.

FIGURES

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
Phone: 503-598-8445

VICINITY MAP



Legend

Approximate Scale 1 in = 2,000 ft

Base map: U.S. Geological Survey 7.5 minute Topographic Map Series, Stayton, Oregon Quadrangle, 2023.

Drawn by: MTB
Date: 1.6.2025

North

Project: Golf Club Road Subdivision Stayton, Oregon	Project No. 24-6715	FIGURE 1

Legend

Date: 12.26.2024

Note: Location of all geotechnical information is approximate.

TP-1 — Test Pit Designation and Approximate Location

SCALE

0 250 500 FEET

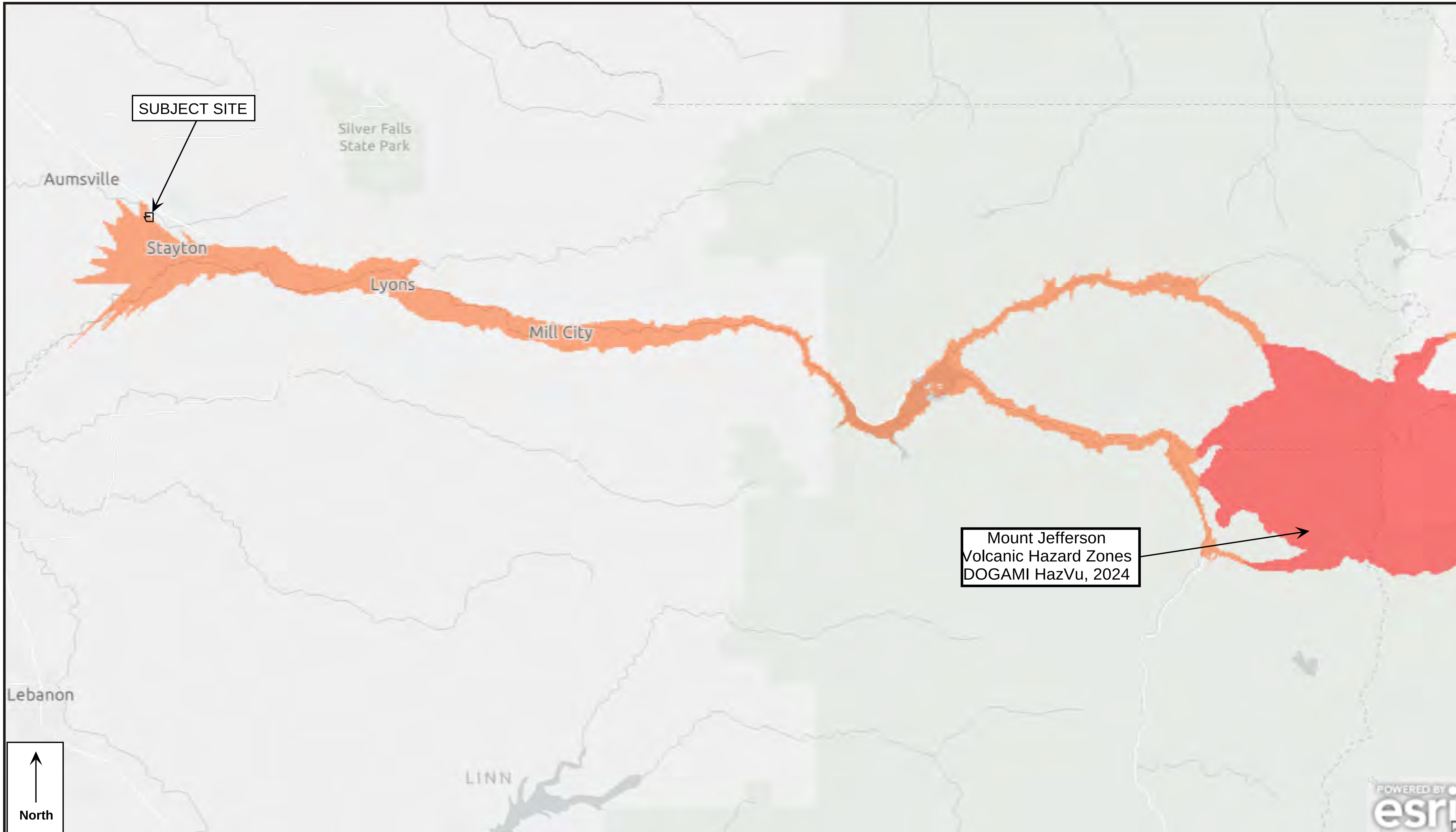
1 INCH = 250 FEET

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
503-598-8445

SITE AERIAL AND EXPLORATION LOCATIONS

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Drawn By: MTB	FIGURE 2



GEOPACIFIC 14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445

SITE AND VOLCANIC HAZARD AREAS

Project: Golf Club Road Subdivision Stayton, Oregon	Project No. 24-6715	Drawn By: MTB	FIGURE 3

Legend

High Hazard Zone — Moderate Hazard Zone

Base image from DOGAMI HazVu, 2025

SCALE

0 — 4 — 8 miles

1 inch = 8 miles

EXPLORATION LOGS

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-1**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1					Soft, organic SILT (OL), dark brown to black, grass roots, trace gavel, moist [Topsoil Horizon]
1		2.0			Medium stiff to stiff, silty CLAY (CL), light brown with strong orange and gray mottling, moderately plastic, trace roots in upper three feet, moist [Alluvium]
2	Bag Sample (100 to 1,000 g)	2.5			
3		3.0			
4		1.5		Seepage	Dense, clayey GRAVEL (GC), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, silty clay, moist [Pleistocene Sediments]
5					
6					Grades from clay matrix to sandy silt (GM)
7					
8					Grades to (GP)
9					Test pit exploration terminated at 8.5 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 4 feet, visually estimated at one to several gallons per minute.
10					
11					

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 424 Feet

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-2**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0					Soft, organic SILT (OL), dark brown to black, grass roots, trace gavel, moist [Topsoil Horizon]
1		1.0			Soft to medium stiff, silty CLAY (CL), light brown with strong orange and gray mottling, moderately plastic, trace roots in upper three feet, moist [Alluvium]
2		1.5			
3		2.0		Seepage	Dense, clayey GRAVEL (GC), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, silty clay, moist [Pleistocene Sediments]
4		4.5			
5					Grades from clay matrix to sandy silt (GM), with sparse boulders
6					Test pit exploration terminated at 6 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 4 feet, visually estimated at one to several gallons per minute.
7					
8					
9					
10					
11					

LEGEND

Bag Sample (100 to 1,000 g) · Split-Spoon · Shelby Tube Sample · Seepage · Static Water Table · Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 424 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon

Project No. 24-6715

Exploration **TP-3**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1					Soft, organic SILT (OL), dark brown to black, grass roots, trace gavel, moist [Topsoil Horizon]
1		1.0			Soft to medium stiff, silty CLAY (CL), light brown with strong orange and gray mottling, moderately plastic, trace roots in upper three feet, moist [Alluvium]
2		1.0			
3		2.0		Seepage	Dense, clayey GRAVEL (GC), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, silty clay, moist [Pleistocene Sediments]
4		4.0			
5					Grades from clay matrix to sandy silt (GM), with sparse boulders
6					Grades to (GP)
7					Test pit exploration terminated at 6.5 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 3 feet, visually estimated at one to several gallons per minute.
8					
9					
10					
11					

LEGEND

- Bag Sample (100 to 1,000 g)
- Split-Spoon
- Shelby Tube Sample
- Seepage
- Static Water Table
- Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 423 Feet

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-4**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1					Soft, organic SILT (OL), dark brown to black, grass roots, trace gavel, moist [Topsoil Horizon]
1		2.0			
1–2					Soft to medium stiff, silty CLAY (CL), light brown with strong orange and gray mottling, moderately plastic, trace roots in upper three feet, moist [Alluvium]
2		3.5			Dense, clayey GRAVEL (GC), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, silty clay, moist [Pleistocene Sediments]
3		4.5			Grades from clay matrix to sandy silt (GM), with sparse boulders
3.5				Seepage	
4		4.5			
5					
6					Grades to (GP)
7					
8					
8.5					Test pit exploration terminated at 8.5 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 3.5 feet, visually estimated at one to several gallons per minute.
9					
10					
11					

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

Date Excavated: 12.4.2024

Logged By: MTB

Surface Elevation: 422 Feet

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-5**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1					Soft, organic SILT (OL), dark brown to black, grass roots, trace gavel, moist [Topsoil Horizon]
1–5					Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, lean clay, moist [Pleistocene Sediments]
1.5				💧	
2		4.0			
3		4.0			Grades to sparse boulders
5					Test pit exploration terminated at 5 feet in dense cobbles. Groundwater seepage encountered at 1.5 feet, visually estimated at one to several gallons per minute.

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

LEGEND

Bag Sample (100 to 1,000 g) · Split-Spoon · Shelby Tube Sample · 💧 Seepage · ▽ Static Water Table · ▨ Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 421 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision
Stayton, Oregon

Project No. 24-6715

Exploration **TP-6**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	**Material Description**
0–1					Soft, organic SILT (OL), dark brown to black, grass roots, trace gavel, moist [Topsoil Horizon]
1–5				💧	Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, lean clay, moist [Pleistocene Sediments] Grades to sparse boulders
5					Test pit exploration terminated at 8.5 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 4 feet, visually estimated at one to several gallons per minute.

Depth scale: 1 2 3 4 5 6 7 8 9 10 11

LEGEND

100 to 1,000 g

Bag Sample | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 423 Feet

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-7**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.7					Medium stiff, organic SILT with gravel (OL), dark brown to black, grass roots, moist [Topsoil Horizon]
0.7–5.5		1.5 (at 1 ft)		Seepage (at 2 ft)	Dense, clayey GRAVEL (GC), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, silty clay, moist [Pleistocene Sediments]
3					Transition from clay matrix to sandy silt (GM), with sparse boulders

Test pit exploration terminated at 5.5 feet, due to refusal in dense cobbles.

Groundwater seepage encountered at 2 feet,
visually estimated at one to several gallons per minute.

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

LEGEND

Bag Sample (100 to 1,000 g) — Split-Spoon — Shelby Tube Sample — Seepage — Static Water Table — Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 424 Feet

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-8**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1					Soft, organic SILT (OL), dark brown to black, grass roots, trace gavel, moist [Topsoil Horizon]
1–7				Seepage at 3	Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, lean clay, moist [Pleistocene Sediments]
7–9					Medium dense to dense, poorly graded SAND with gravel (SP), gray, medium- to coarse-grained sand, well-rounded to sub-rounded gravel, wet [Upper Pleistocene Sediments]
9–10					Dense, poorly sorted GRAVEL (GP), well-rounded to sub-rounded, gravel to cobbles, moist [Upper Pleistocene Sediments]
10–11					Test pit exploration terminated at 10 feet in dense cobbles. Groundwater seepage encountered at 3 feet, visually estimated at one to several gallons per minute.

LEGEND

100 to 1,000 g Bag Sample | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 424 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon

Project No. 24-6715

Exploration **TP-9**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	**Material Description**
0–1.9					Medium stiff to stiff, organic SILT with gravel (OL), dark brown to black, grass roots, moist [Topsoil Horizon]
1		3.0			
1.9–9					Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, sandy silt to silty sand, moist [Pleistocene Sediments]
2		4.0		Seepage	
3		4.5			
~3.5					Trace boulders
4					
5					
6					Grades to (GP)
7					
8					
9					
10					
11					

Test pit exploration terminated at 9 feet in dense cobbles.

Groundwater seepage encountered at 2 feet,
visually estimated at one to several gallons per minute.

LEGEND

Bag Sample (100 to 1,000 g) · Split-Spoon · Shelby Tube Sample · Seepage · Static Water Table · Water Bearing Zone

Date Excavated: 12.4.2024

Logged By: MTB

Surface Elevation: 423 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-10**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1					Medium stiff to stiff, organic SILT (OL), dark brown to black, grass roots, trace gravel, moist [Topsoil Horizon]
1		1.0			Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, sandy silt to silty sand, moist [Pleistocene Sediments]
2		3.0		Seepage	
3		4.0			
4					Grades to (GP) with trace boulders
5					
6					
7					Test pit exploration terminated at 6.5 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 2 feet, visually estimated at one to several gallons per minute.
8					
9					
10					
11					

LEGEND

Bag Sample (100 to 1,000 g) · Split-Spoon · Shelby Tube Sample · Seepage · Static Water Table · Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 424 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon

Project No. 24-6715

Exploration **TP-11**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1					Medium stiff to stiff, organic SILT (OL), dark brown to black, grass roots, trace gravel, moist [Topsoil Horizon]
1		2.0			Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, sandy silt to silty sand, moist [Pleistocene Sediments]
2		2.5		Seepage	
3		3.0			
4		1.5			Grades to (GP) with trace boulders
5					
6					
7					
8					
9					Test pit exploration terminated at 8.5 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 4 feet, visually estimated at one to several gallons per minute.
10					
11					

LEGEND

Bag Sample (100 to 1,000 g) — Split-Spoon — Shelby Tube Sample — Seepage — Static Water Table — Water Bearing Zone

Date Excavated: 12.4.2024

Logged By: MTB

Surface Elevation: 424 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon

Project No. 24-6715

Exploration **TP-12**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1.9					Soft to medium stiff, organic SILT (OL), dark brown to black, grass roots, trace gravel, moist [Topsoil Horizon]
1.9–7				Seepage (at 2 ft)	Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, sandy silt to silty sand, moist [Pleistocene Sediments] Grades to (GP) with trace boulders

Test pit exploration terminated at 7 feet, due to refusal in dense cobbles.

Groundwater seepage encountered at 2 feet,
visually estimated at one to several gallons per minute.

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 425 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-13**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
					Medium stiff, organic SILT (OL), dark brown to black, grass roots, trace gravel, moist [Topsoil Horizon]
1		2.0			
2		4.0		Seepage	Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, sandy silt to silty sand, moist [Pleistocene Sediments]
3					Grades to (GP) with trace boulders
4					
5					
6					Test pit exploration terminated at 5.5 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 2 feet, visually estimated at one to several gallons per minute.
7					
8					
9					
10					
11					

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 426 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-14**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.9					Medium stiff, organic SILT (OL), dark brown to black, grass roots, trace gravel, moist [Topsoil Horizon]
1		1.5			Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, sandy silt to silty sand, moist [Pleistocene Sediments]
2		3.5		Seepage	
3					Grades to (GP) with trace boulders
4					
5					
6					
6.5					Test pit exploration terminated at 6.5 feet, due to refusal in dense cobbles.
7					Groundwater seepage encountered at 2 feet, visually estimated at one to several gallons per minute.
8					
9					
10					
11					

LEGEND

Bag Sample (100 to 1,000 g) — Split-Spoon — Shelby Tube Sample — Seepage — Static Water Table — Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 427 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-15**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1					Soft, organic SILT (OL), dark brown to black, grass roots, trace gavel, moist [Topsoil Horizon]
1–4		1.0 (1 ft); 2.0 (2 ft); 4.0 (3 ft)		Seepage (3 ft)	Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, silt to silty sand, moist [Pleistocene Sediments]
4–4.7					Dense, poorly graded SAND with gravel (SP), gray, medium- to coarse-grained sand, well-rounded to sub-rounded gravel, wet [Pleistocene Sediments]
4.7–8					Dense, poorly sorted GRAVEL (GP), well-rounded to sub-rounded, gravel to cobbles, moist [Pleistocene Sediments]
8–12					Test pit exploration terminated at 8 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 3 feet, visually estimated at one to several gallons per minute.

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 426 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration TP-16

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–1					Soft, organic SILT (OL), dark brown to black, grass roots, trace gavel, moist [Topsoil Horizon]
1–4				Seepage (3 ft)	Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, silt to silty sand, moist [Pleistocene Sediments]
4–4.6					Dense, poorly graded SAND with gravel (SP), gray, medium- to coarse-grained sand, well-rounded to sub-rounded gravel, wet [Pleistocene Sediments]
4.6–9.5					Dense, poorly sorted GRAVEL (GP), well-rounded to sub-rounded, gravel to cobbles, moist [Pleistocene Sediments]

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

Test pit exploration terminated at 9.5 feet in dense cobbles.

Groundwater seepage encountered at 3 feet,
visually estimated at one to several gallons per minute.

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 425 Feet

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-17**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–2					Medium stiff, organic SILT (OL), dark brown to black, grass roots, trace gravel, moist [Topsoil Horizon]
2–10				3 (seepage)	Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, sandy silt to silty sand, moist [Pleistocene Sediments]
4					Grades to (GP) with trace boulders
7					Grades to sub-rounded to sub-angular cobbles
10					Test pit exploration terminated at 10 feet in dense cobbles. Groundwater seepage encountered at 3 feet, visually estimated at one to several gallons per minute.

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 427 Feet

GEOPACIFIC

14835 SW 72nd Avenue
Portland, Oregon 97224
Telephone 503-598-8445

TEST PIT LOG

Project: Golf Club Road Subdivision, Stayton, Oregon	Project No. 24-6715	Exploration **TP-18**

Depth (ft)	Sample Type	Tons per Square Foot	Moisture Content (%)	Water Bearing Zone	Material Description
0–2					Medium stiff, organic SILT (OL), dark brown to black, grass roots, trace gravel, moist [Topsoil Horizon]
1		1.0			
1.5		2.5			
2		3.0			Dense, silty GRAVEL (GM), well-rounded to sub-rounded, gravel to cobbles of dark gray to gray basalt, gray to greenish-gray andesite and trace brick red rhyolite, matrix of light brown, sandy silt to silty sand, moist [Pleistocene Sediments]
3				Seepage	
4					Grades to (GP) with trace boulders and well-rounded lenticular cobbles
5					
6					
7					Test pit exploration terminated at 7 feet, due to refusal in dense cobbles. Groundwater seepage encountered at 3 feet, visually estimated at one to several gallons per minute.
8					
9					
10					
11					

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Seepage | Static Water Table | Water Bearing Zone

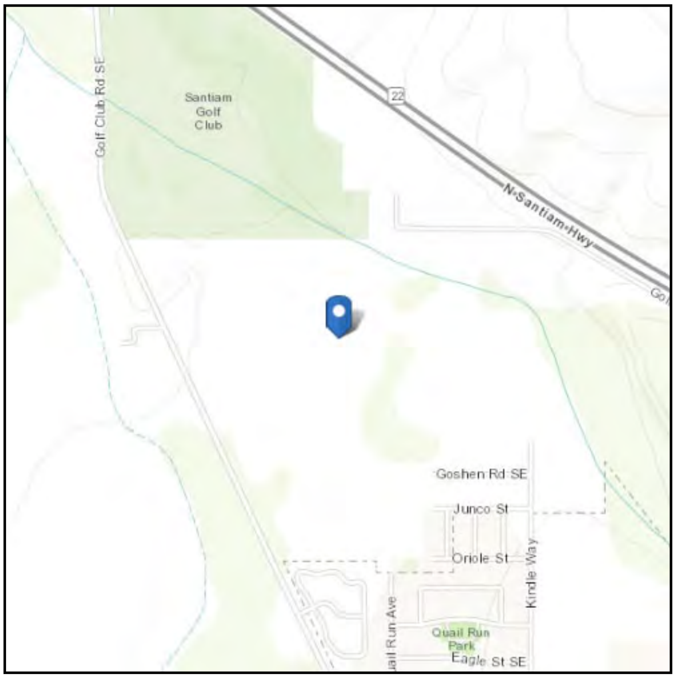
Date Excavated: 12.4.2024
Logged By: MTB
Surface Elevation: 428 Feet

SITE RESEARCH

ASCE Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-16	**Latitude:**	44.819125
Risk Category:	II	**Longitude:**	-122.814863
Soil Class:	D - Stiff Soil	**Elevation:**	423.7097027220958 ft (NAVD 88)



ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	0.725	S_{D1} :	N/A
S_1 :	0.369	T_L :	16
F_a :	1.22	PGA :	0.334
F_v :	N/A	PGA_M :	0.423
S_{MS} :	0.885	F_{PGA} :	1.266
S_{M1} :	N/A	I_e :	1
S_{DS} :	0.59	C_v :	1.163

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Thu Jan 16 2025

Date Source: USGS Seismic Design Maps

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE Hazard Tool.

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

^ Input

Edition

Dynamic: Conterminous U.S. 2014 (update) (unknown)

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

44.818

Time Horizon

Return period in years

2475

Longitude

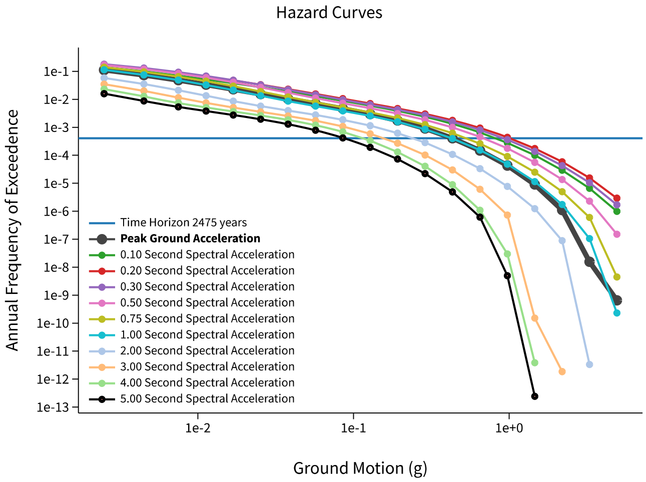
Decimal degrees, negative values for western longitudes

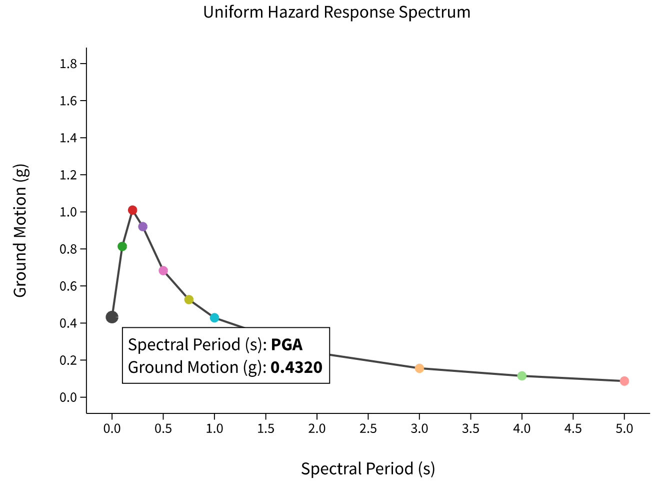
-122.815

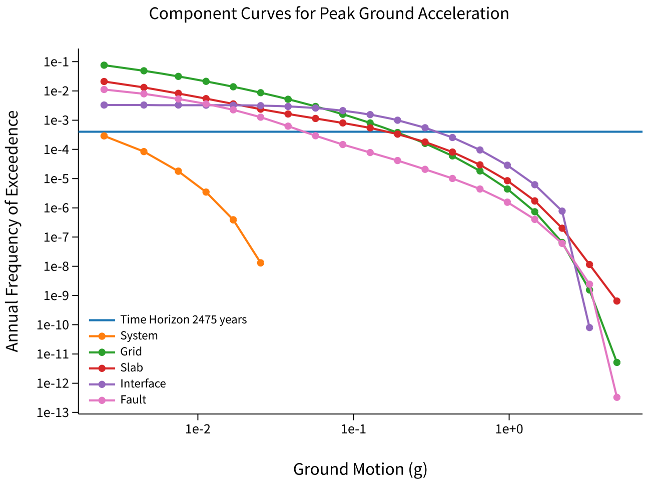
Site Class

537 m/s (Site class C)

Hazard Curve





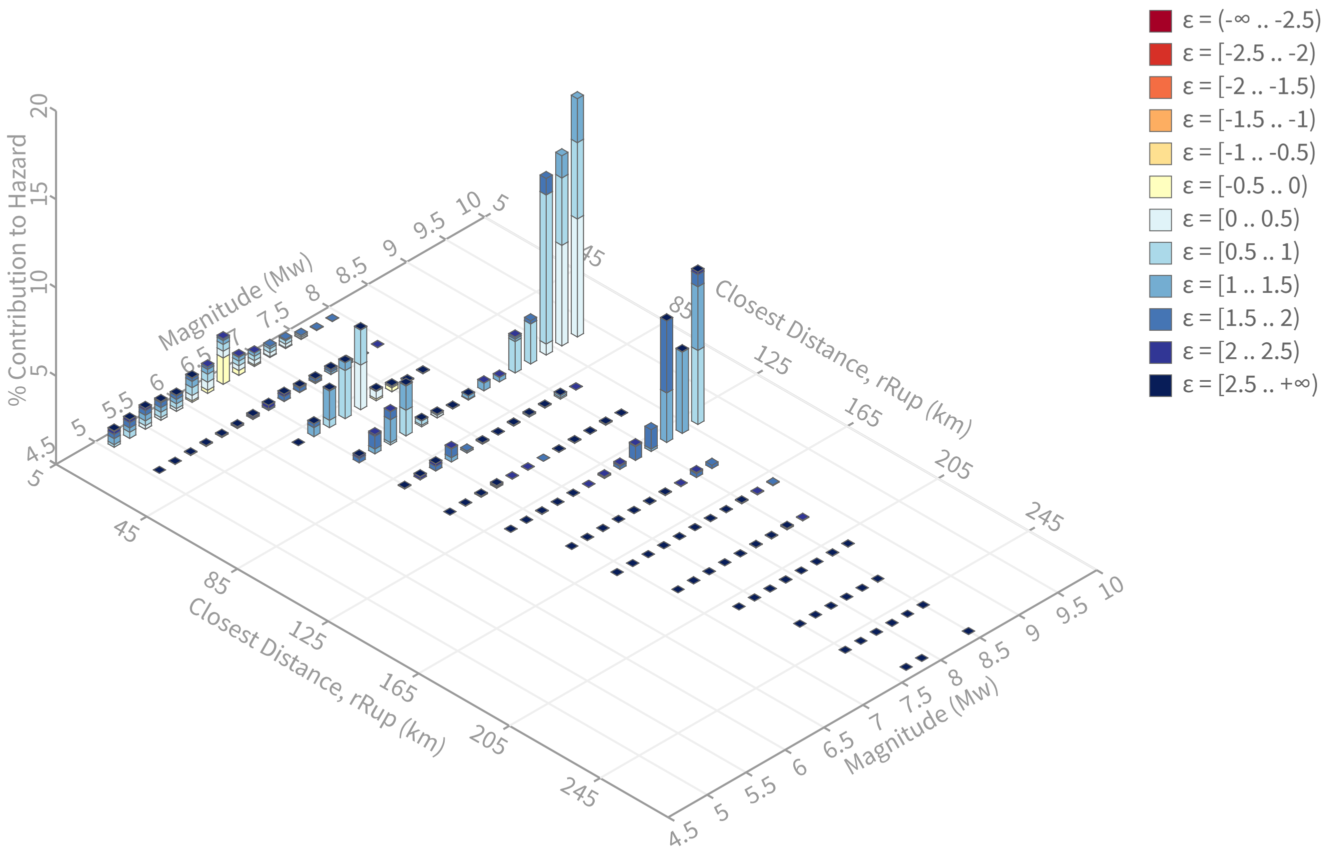


View Raw Data

^ Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.43203695 g

Recovered targets

Return period: 2509.3439 yrs
Exceedance rate: 0.00039851054 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.43 %

Mean (over all sources)

m: 8.12
r: 76.08 km
ε_0: 0.95 σ

Mode (largest m-r bin)

m: 9.34
r: 78.43 km
ε_0: 0.48 σ
Contribution: 13.49 %

Mode (largest m-r-ε_0 bin)

m: 8.85
r: 78.4 km
ε_0: 0.65 σ
Contribution: 8.44 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
sub0_ch_bot.in	Interface							32.49
Cascadia Megathrust - whole CSZ Characteristic		78.43	9.10	0.60	123.702°W	45.000°N	286.47	32.49
sub0_ch_mid.in	Interface							15.38
Cascadia Megathrust - whole CSZ Characteristic		123.81	8.92	1.28	124.356°W	44.742°N	266.59	15.38
coastalOR_deep.in	Slab							12.21
coastalOR_deep.in	Slab							5.11
sub0_ch_top.in	Interface							3.60
Cascadia Megathrust - whole CSZ Characteristic		139.11	8.83	1.54	124.567°W	44.738°N	266.94	3.60
sub2_ch_bot.in	Interface							2.90
Cascadia Megathrust - Goldfinger Case C Characteristic		77.91	8.73	0.80	123.702°W	45.000°N	286.47	2.90
WUSmap_2014_fixSm.ch.in (opt)	Grid							2.20
noPuget_2014_fixSm.ch.in (opt)	Grid							2.20
WUSmap_2014_fixSm.gr.in (opt)	Grid							2.16
noPuget_2014_fixSm.gr.in (opt)	Grid							2.16
sub1_ch_bot.in	Interface							1.45
Cascadia Megathrust - Goldfinger Case B Characteristic		77.92	8.86	0.73	123.702°W	45.000°N	286.47	1.45
sub1_GRb0_bot.in	Interface							1.38
Cascadia floater over southern zone - Goldfinger Case B		81.18	8.47	1.02	123.702°W	45.000°N	286.47	1.38
coastalOR_deep.in	Slab							1.04
sub1_GRb1_bot.in	Interface							1.04
Cascadia floater over southern zone - Goldfinger Case B		81.88	8.36	1.11	123.702°W	45.000°N	286.47	1.04

PHOTOGRAPHIC LOG

TEST PIT TP-1

TEST PIT TP-2

TEST PIT TP-3

TEST PIT TP-4

TEST PIT TP-5

TEST PIT TP-6

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

TEST PIT TP-7

TEST PIT TP-8

TEST PIT TP-9

TEST PIT TP-10

TEST PIT TP-11

TEST PIT TP-12

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

TEST PIT TP-13

TEST PIT TP-14

TEST PIT TP-15

TEST PIT TP-16

TEST PIT TP-17

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

TEST PIT TP-18