September 3, 2026

To All Plan Holders

Reference: **Central Linn School District**
Central Linn Elementary School Gym and Cafeteria Seismic Retrofit

Subject: **CM/GC Request for Proposals**
Addendum No. 1

This Addendum No. 1 is issued to all Plan Holders for the above-referenced project. This addendum forms a part of the Request for Proposals and shall be incorporated into and made a part of the Proposal Documents. Proposers shall acknowledge receipt of this Addendum in their Proposal.

Where provisions of the original RFP documents conflict with this Addendum, the provisions of this Addendum shall govern.p

Addendum Items:

1. **Attachments**
   The following documents are attached to and made a part of this Addendum:
   - **Exhibit A:** Mandatory Pre-Proposal Meeting Sign-In Sheet
   - **Exhibit B:** Geotechnical Engineering Report prepared by Apex Companies, dated July 10, 2026

2. **Corrections and Clarifications to the RFP Documents**
   a. **Page 19 of 30, Section 12.3 - USB Flash Drive Requirements**
      The following clarification is provided:
      The requirement stating that the USB flash drive shall contain "a copy of the complete RFP in PDF file format" is revised. The intent is that the USB flash drive shall contain an electronic copy of the Proposer's complete proposal and supporting attachments in PDF format.

   b. **Design Documents and GMP Development**
      Question:
      We understand construction documents are targeted for completion by the end of 2026. Please confirm the GMP will be developed on Construction Documents at least 75% complete per RFP Section 4.2.12.

      Response:
      Yes. The GMP will be developed based on Construction Documents that are at least 75% complete, consistent with Section 4.2.12 of the RFP. The current project schedule anticipates Design Finalization and GMP Determination occurring in March 2027.

c. **Design Team**

Question:

Please confirm the design team's composition and roles (ZCS and PIVOT Architecture), including which firm performs the contract-administration functions under the A133/A201, and identify the Owner's Representative.

Response:

The District's designated representative is Tim Walter, who will continue serving as the District's primary CM/GC procurement contact.

d. **Hazardous Materials**

Question:

We understand the hazardous materials survey is complete and abatement is carried within the construction budget. Will the survey be included in the documents provided to proposers or with the addendum?

Response:

A project-specific pre-renovation hazardous materials survey is currently underway and will be provided to the selected CM/GC during the preconstruction phase. Hazardous materials abatement, if required, is anticipated to be included within the project scope and construction budget.

e. **Occupancy and Early Work**

Question:

Please confirm the work areas will be fully available to the CM/GC during the June-September 2027 window. Is the District open to CM/GC-proposed early-work packages where they improve schedule certainty? Please also share the last day of school in June 2027 and the first day of the 2027-28 fall term when those calendars are set.

Response:

The District's intent is for the primary construction activities to occur during the June through September 2027 construction window identified in the RFP. The District is open to CM/GC recommendations regarding long-lead procurement, early bid packages, and other schedule-enhancing strategies that improve project delivery and schedule certainty. The District is also open to early work activities during spring break and on Fridays prior to June 2027, subject to coordination with District operations. School calendar information for summer and fall 2027 will be provided when available.

f. **Geotechnical**

Question:

Please confirm the geotechnical report will be made available, and that the representative-plan legend note referencing micropiles "designed by others" does not apply to this project.

Response:
The geotechnical report is included with this Addendum as Exhibit B. The micropile note shown within the representative documents is a standard legend note from the schematic-level sample drawings and is not anticipated to apply to this Project.

g. Roof Scope
Question:
We understand the existing roofing is primarily composite shingle, a full tear-off is contemplated across both buildings, and the covered play area and entry canopies are included in the retrofit. Please confirm, and advise (a) how sheathing replacement discovered at tear-off will be carried in the GMP and (b) the disposition of the mechanical unit located in the gym roof structure.

Response:
The project is anticipated to include reroofing work associated with the seismic rehabilitation. The covered play area is not included in the project scope. Final construction details, including roofing replacement scope, treatment of existing roof sheathing, and the disposition of the existing mechanical equipment located within the gym roof structure, will be developed in collaboration with the selected CM/GC during the preconstruction phase and incorporated into the Construction Documents and GMP.

h. Small Gym Boundary
Question:
We understand the small gym is excluded from the work except the wall it shares with the large gym. Please confirm the Construction Documents will define this boundary, including any seismic isolation-joint work at that interface.

Response:
Yes. The final Construction Documents will clearly identify the limits of work, including the interface between areas within and outside the project scope. Seismic isolation joint requirements and boundary conditions will be defined in the Construction Documents, as applicable.

i. Kitchen and Cafeteria Equipment
Question:
We understand the District will remove and manage mobile and plug-in equipment, with the CM/GC responsible for removal and reinstallation of built-in items (compartment sinks, serving line and tray slides). Please confirm.

Response:
The District anticipates removing and managing loose, movable, and plug-in equipment. The CM/GC should anticipate removal, protection, and reinstallation of permanently attached equipment impacted by construction unless specifically noted otherwise in the Construction Documents.

j. Record Drawings

Question:

When and how will the original construction record drawings be made available?

Response:

Available record drawings will be provided to the selected CM/GC during the preconstruction phase.

k. Budget and Funding

Question:

Please confirm the $2,061,353 construction budget represents the full GMP (Cost of the Work, General Conditions, fee, and contingencies). We understand the project is funded through the Oregon Seismic Rehabilitation Grant Program. Are any federal funds involved that would make federal Davis-Bacon requirements apply in addition to state prevailing wage?

Response:

The construction budget identified in the RFP is $2,061,353. The GMP will be developed in accordance with the CM/GC procurement documents and the selected CM/GC's cost proposal. The project is funded through the Oregon Seismic Rehabilitation Grant Program. No federal funding is provided for this project. Oregon prevailing wage requirements shall apply.

l. Insurance Requirements

Question:

RFP Section 13.8.4 references General Liability insurance requirements, but the draft agreement contains incomplete limits. Please provide the required coverage types and limits.

Response:

Insurance requirements have not yet been finalized. Final coverage types and limits will be established during contract negotiations with the selected CM/GC and incorporated into the executed CM/GC Agreement.

m. Contract Terms

Question:

Retainage and liquidated damages are not yet filled in within the sample agreement. Will these terms be established by addendum or during contract negotiation?

Response:

Retainage will be five percent (5%) of progress payments. Liquidated damages have not yet been established and will be finalized during GMP negotiations with the selected CM/GC and incorporated into the GMP Amendment, if applicable.

n. FRP System

Question:

Is the fiber-reinforced polymer strengthening specified as a performance specification or around a specific manufacturer/system? Installer availability and material lead times bear directly on the summer 2027 window.

Response:

The project currently includes fiber-reinforced polymer strengthening of existing masonry elements. The final design approach and product requirements are still under development and will be identified in the Construction Documents.

o. Staffing Estimate Format

Question:

Does the District have a preferred format for the Section 13.8.3 detailed staffing estimate beyond the Attachment D matrix?

Response:

No additional format is required beyond the requirements of Section 13.8.3 and Attachment D. Proposers may use their standard staffing estimate format provided it clearly identifies staffing classifications, durations, hourly rates, labor burden, and other project-specific costs necessary for evaluation.

3. Additional Information

All other provisions of the Request for Proposals remain unchanged.

END OF ADDENDUM NO. 1

Exhibit A

Central Linn ES Gym and Cafeteria Seismic Retrofit Sign-In Sheet

CM/GC Pre-Proposal Meeting

Set No.	Company	Contact	E-Mail Address	Phone
1	Ryan Thomas Construction	Ryan Thomas	ryan@rthomasconstruction.com	541-687-6918
2	Gerding Builders	Jorge Juarez	jorgejh@gerdingbuilders.com	541-243-4876
3	Gerding Builders	Matt Beachy	matthewb@gerdingbuilders.com	541-257-7734
4	Vitus Construction	Corey Vitus	corey@vitusconstruction.com	541-855-7177
5	Chambers Construction	John Wright	jwright@chambers-gc.com	541-868-8555
6	Chambers Construction	Tim Cabble	tcabble@chambers-gc.com	541-892-0599
7	Ausland Group	Brian Gray	bgray@auslandgroup.com	541-237-4377
8	Deacon	Mitch Stanley	mitch.stanley@deacon.com	971-468-9344
9	GBC Construction	Jack Wheeler	jack@gbcconstruction.com	541-554-3185
10	Andersen Construction	Dale Sovereign	dsovereign@andersenconstruction.com	971-271-2953
11	Andersen Construction	Bryan Krawczyk	bkrawczyk@andersenconstruction.com	503-758-3507
12	Woodburn Construction	Bert Bartholomen	bids@woodburnconstruction.com	503-981-9504
13	North Coast Carpenters Union	Don Stover	dstover@ncscarpenters.org	503-360-4764
14	North Coast Carpenters Union	John Snider	jsnider@ncscarpenters.org	971-438-8848
15				
16				
17				
18				
19				
20				

Exhibit B: Geotechnical Engineering Report

Geotechnical Engineering Report

Central Linn Elementary School Seismic Retrofit
239 W 2nd Street
Halsey, Oregon

Prepared for:
Central Linn School District
32433 OR-228
Halsey, Oregon 97348

July 10, 2026
Apex Project 26008007

APEX
4412 S CORBETT AVENUE
PORTLAND, OR 97239
503.248.1939 MAIN
866.727.0140 FAX
APEXCOS.COM

Geotechnical Engineering Report

Central Linn Elementary School Seismic Retrofit
239 W 2nd Street
Halsey, Oregon

Prepared for:
Central Linn School District
32433 OR-228
Halsey, Oregon 97348

July 10, 2026
Apex Project 26008007

Prepared by:

Jack Powel, RG
Sr. Geologist

Reviewed by:

REGISTERED PROFESSIONAL
ENGINEER
84397PE
OREGON
JULY 16, 2016
REED S. KISTLER
Exp:6/30/2027

Reed Kistler, PE
Sr. Geotechnical Engineer

Reviewed by:

Ryan White, PE, GE
Principal Geotechnical Engineer

Table of Contents

Supporting Data

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

1.1 General

This report presents results of Apex Companies, LLC (Apex) geotechnical engineering services for the proposed seismic retrofit of Central Linn Elementary School located at 239 W 2nd Street in Halsey, Oregon (site). The general site location is shown on the Vicinity Map, Figure 1. The locations of Apex's explorations in relation to existing site features are shown on the Site Plan, Figure 2.

1.2 Purpose and Scope

The purpose of Apex's services was to develop geotechnical design and construction recommendations in support of the planned seismic retrofit. This was accomplished by performing the following scope of services.

1.2.1 Literature and Records Review

Apex reviewed various published geologic maps of the area for information regarding geologic conditions and hazards at or near the site. Apex also reviewed previously completed reports for the project site and vicinity.

1.2.2 Subsurface Explorations

One boring, designated B-1, was advanced within the existing passenger loading area to a depth of approximately 40.5 feet below existing ground surface (bgs). The boring was logged and representative soil samples collected by a member of the Apex geotechnical engineering staff. The approximate boring location is shown on the Site Plan, Figure 2. The interpreted boring log is presented as Figure A1 in Appendix A, Field Explorations.

Two cone penetration test (CPT) probes, designated CPT-1 and CPT-2, were advanced to refusal at depths of approximately 16 and 19.5 feet bgs, respectively, within grass-covered areas northeast and southwest of the existing gym and locker rooms. The approximate CPT probe locations are shown on the Site Plan, Figure 2. The CPT logs are presented as Figures A2 and A3 in Appendix A, Field Explorations.

1.2.3 Soils Testing

Soil samples were returned to our laboratory and classified in general accordance with the Unified Soil Classification System (ASTM D2487) and/or the Visual-Manual Procedure (ASTM D2488). Laboratory tests included natural moisture contents, grain-size analyses, and Atterberg limits. Laboratory test results are included in the exploration logs in Appendix A, Field Explorations; and in Appendix B, Laboratory Testing.

1.2.4 Geophysical Testing

A subcontractor hired by Apex collected and processed refraction microtremor (ReMi) data to produce a 2-D shear wave velocity profile using a 350-foot-long line on the northeastern portion of the site. The location of the geophysical survey line is shown on the Site Plan, Figure 2. Results of the ReMi survey are presented in Appendix C.

1.2.5 Geotechnical Engineering Analysis

Data collected during the subsurface exploration, literature research, and testing were used to develop site-specific geotechnical design parameters and construction recommendations.

1.2.6 Report Preparation

This Geotechnical Engineering Report summarizes the results of our explorations, testing, and analyses, including information relating to the following:

- Field exploration logs and site plan showing approximate exploration locations

- Laboratory test results
- Groundwater considerations
- Description of surface conditions
- Description of regional and local geology
- Discussion of evidence of expansive soils
- Seismic and geologic hazards study in accordance with Oregon Structural Specialty Code (OSSC) section 1803.6:
    - Tectonic and seismic setting
    - Historical seismicity
    - Discussion of geologic and seismic hazards impacting the site, including:
        - Potential for surface rupture from mapped faults
        - Liquefaction and lateral spreading
        - Estimated duration of seismic shaking
    - The location of nearby faults
    - Evaluation of liquefaction and lateral spreading potential
- Shallow foundation design recommendations:
    - Minimum embedment
    - Allowable and ultimate bearing pressures
    - Estimated settlement (total and differential)
    - Sliding coefficient
- Earthwork and grading, cut, and fill recommendations:
    - Structural fill materials and preparation, and reuse of on-site soils
    - Wet weather considerations
    - Utility trench excavation and backfill requirements
    - Temporary and permanent slope inclinations
- Seismic design criteria in accordance with American Society of Civil Engineers (ASCE) 41-23

1.3 Project Understanding

Apex understands proposed improvements to Central Linn Elementary School will include seismic retrofit of the gym and locker rooms, cafeteria (southwest of the gym), entry/commons (south of the gym), and entry and west canopies.

Based on information provided by ZCS Engineering and Architecture (the project structural engineer), Apex understands as-built plans indicate exterior footings are embedded 24 inches bgs, interior footings are embedded around 12 inches below top of slab, and all footings bear on at least 2 feet of compacted fill.

Based on experience with similar projects, Apex assumes maximum sustained column and wall loads of the school structure do not exceed 55 kips and 4 kips per linear foot, respectively.

2 SITE CONDITIONS

2.1 Surface Description

The Central Linn Elementary School campus is located within the northwestern extent of the town of Halsey, Oregon. The campus consists of the main school buildings located near the central to southern extent of the site, with playgrounds and grass athletic fields making up the western to northern parts of the campus. The student drop-off and main entrance to the school is located on the east side of the building along with asphalt pavement parking areas. The site is roughly rectangular and is bordered to the north and northeast by

American Drive and an unnamed stream swale, to the east by W 2nd Street, to the south by W C Street, and to the west by W 5th Street.

Based on review of available Oregon Department of Geology and Mineral Industries (DOGAMI) topographic and lidar data, the site is generally flat, with ground surface elevations ranging from approximately 280 to 285 feet (NAVD88; DOGAMI, 2026). Outside of the site, the ground surface remains relatively flat with gentle slopes grading down toward the unnamed tributary of Muddy Creek along the northeast edge of the site.

2.2 Geologic Setting

The site is located within the southern extent of the Willamette Valley, a broad alluvial basin within the physiographic province of the Puget-Willamette Lowland, which separates the Cascade Range to the east from the Coast Range to the west and extends from the Puget Sound, Washington, to Eugene, Oregon (Yeats et al., 1996). The Willamette Valley is situated along the Cascadia Subduction Zone (CSZ) where oceanic rocks of the Juan de Fuca Plate are subducting beneath the North American Plate, resulting in deformation and uplift of sedimentary and mafic volcanic bedrock in the Coast Range and volcanism in the Cascade Range (DOGAMI, 2026). Northwest-trending faults accommodating clockwise rotation of the North American Plate are found throughout the Puget-Willamette lowland (Brocher et al., 2017; USGS, 2026).

The Willamette Valley forms a broad alluvial basin, with the Willamette River draining northward along the axis of the valley. Extensive valley infilling and catastrophic flooding related to the Missoula Floods during the Quaternary have subsequently buried older Oligocene and Eocene sedimentary and volcanic basement rocks and concealed many of the structural features throughout the valley (Wiley, 2006). Willamette River tributaries exiting the Coast Range and Cascade Range have contributed to terrace formations and broad alluvial fans protruding from range fronts into the valley (O'Connor et al., 2001).

The southern Willamette Valley terminates south of Eugene where the Cascade and coastal mountains converge (McClaughry et al., 2010). Along the eastern margin of the valley, Oligocene volcanic rocks of the Cascade mountains begin to emerge from younger valley sediments that are interfingered with alluvial fans and debris fans formed from Cascade detritus. West of the Willamette Valley, accreted Eocene to Oligocene deep marine sedimentary sequences and subaerial volcanism are encountered.

Structural features of the southern Willamette Valley include the north-northeast-oriented Eocene age Harrisburg anticline, numerous northwest- and northeast-trending normal faults, as well as northwest-trending strike slip faults. Similar structures exist outside of the valley and in the surrounding Coast Range and Cascade Range. These structures are responsible for deforming and offsetting basement rocks and are perceived as inactive tectonic features.

2.3 Local Geology

Geologic mapping (McClaughry et al., 2010) indicates the site is underlain by Willamette Silt of the upper Pleistocene, consisting of unconsolidated silt with minor clay and sand deposited by repeated Missoula Flood events. These light gray to brown sediments are generally thin to medium bedded and composed primarily of quartz, feldspar, and mica. The unit is reported to be up to 30 feet thick in the area and likely underlain by older Pleistocene terrace deposits consisting of unconsolidated to semi-consolidated gravel, sand, silt, and clay.

2.4 Subsurface Conditions

The site was explored by drilling one boring, designated B-1, to a depth of 40.5 feet bgs and advancing two CPTs, designated CPT-1 and CPT-2, to refusal depths of approximately 16 and 19.5 feet bgs, respectively. The drilling was performed by Holt Services, Inc., of Vancouver, Washington, using a truck-mounted Mobile Drill B-58 drill rig with mud-rotary drilling techniques. The CPTs were performed by Oregon Geotechnical Explorations, Inc., using a track-mounted CPT rig.

Apex has summarized the subsurface units as follows:

ASPHALT, BASE ROCK:	Approximately 2 inches of asphalt concrete (AC) pavement overlying approximately 4 inches of base rock was encountered at the ground surface in boring B-1.
Lean CLAY (CL), Fat CLAY (CH):	Lean to fat clay with variable amounts of fine-grained sand was encountered just below the base rock in boring B-1, continuing to depths of approximately 19 feet bgs. The soil was primarily brown-orange to gray-blue and exhibited medium to high plasticity. This unit, interpreted as Willamette Silt, was generally composed of medium stiff lean to fat clay, except for a very soft lean clay encountered between 5 and 7.5 feet bgs in boring B-1. Logs from CPT-1 and CPT-2 also indicated approximately 16 to 17 feet of clayey silt to silty clay in both profiles before transitioning to denser, coarse-grained material where refusal was encountered, presumably on gravel, at depths of 16 to 19.5 feet bgs.
Silty GRAVEL (GM):	Very dense gravel with varying amounts of silt and sand was encountered at 20 feet bgs and extended to the 40.5-foot depth explored in B-1. The gravel, interpreted as Pleistocene terrace deposits, was generally brown-gray to orange and contained fine to coarse, subangular to rounded gravel with fine- to coarse-grained sand within a silty matrix.

2.5 Groundwater

Groundwater was encountered in all explorations at depths of approximately 10 feet bgs. Groundwater at the site is likely influenced by an adjacent drainage/irrigation ditch located within the northeastern site boundary. A review of well logs from the Oregon Water Resources Department (OWRD) suggests that groundwater levels in the area may rise to depths as shallow as 5 feet bgs during wetter months; however, these conditions may represent perched groundwater rather than consistent, fully saturated groundwater conditions.

Please note that groundwater levels can fluctuate during the year depending on climate, irrigation season, extended periods of precipitation, drought, and other factors.

3 GEOLOGIC HAZARDS

Geologic and seismic hazards are defined as conditions associated with the geologic and seismic environment that could influence existing and/or proposed improvements. Geologic and seismic hazards that could affect the site's development are identified below and should be considered during the planning process. Apex reviewed GIS layers within the Oregon HazVu Statewide Geozhazards Viewer and associated reports to assess potential geologic hazards for the study area. In general, the geologic and seismic hazards most commonly associated with the physical and chemical characteristics of near-surface soil, rock, and groundwater include the following:

- Slope stability
- **Adverse soils**
- **Hydrology and drainage**
- Hazardous minerals
- Volcanic hazards
- Permafrost and freeze-thaw

- Land subsidence
- Subsurface voids
- Erosion and sedimentation
- Hydrogeology and groundwater
- Seismic hazards (**liquefaction**, lateral spreading, earthquake-induced landslides, ground shaking, fault ground rupture, tsunamis, and seiches)

Those shown in bold above are geologic and seismic hazards that could affect the site development and should be considered in the planning process. Ground shaking is a geologic hazard at the site related to seismicity, which is discussed further in the following sections.

3.1 Slope Stability

Review of the Statewide Landslide Information Database for Oregon (SLIDO) indicates no mapped landslides are within the site boundary. Based on a review of Oregon HazVu, the majority of the site is shown as having a low susceptibility to landslides. Small, localized areas along the northeast edge of the existing school building are mapped as having moderate landslide susceptibility that appears to be related to site grading performed for the original construction of the school building. However, overall site slopes appeared relatively flat, with gentle, short slope segments existing adjacent to the unnamed stream in the northeastern area of the site. Apex observed no obvious signs of recent slope instability in the area.

3.2 Expansive Soils

Soils exhibiting moderate to high plasticity were encountered in portions of the explorations. However, based on the observed depths of these soils and the relative age and apparent performance of the existing school building, the subgrade soils are judged to be in relative moisture equilibrium. Therefore, the presence of potentially expansive soils is not anticipated to adversely affect the performance of existing or proposed foundations.

3.3 Seismicity and Faulting

3.3.1 Historical Seismicity

Regional historical seismicity information was acquired from the Advanced National Seismic System (ANSS) Comprehensive Catalog, hosted by the Northern California Earthquake Data Center (NCEDC), and is presented on Figure 3. These data include earthquakes with magnitudes exceeding M 2.5, within a 150-km radius of the city of Halsey, Oregon, and recorded between 1963 and 2017 (NCEDC, 2017). Magnitudes within the ANSS dataset are recorded as local magnitude, surface-wave magnitude, body-wave magnitude, moment magnitude, and magnitude of completeness.

3.3.2 Seismic Sources

Several types of seismic sources exist in the Pacific Northwest, which are outlined below. Volcanic sources beneath the Cascade Range are not considered further in this study. Cascade Range earthquakes rarely exceed about M 5.0 in size and are believed to be far enough removed to not pose a threat to the site (NCEDC, 2017).

3.3.2.1 Crustal Earthquakes and Faults

Review of the USGS Quaternary Fault Database indicates the site is located within close proximity (less than 15.5 miles or 25 km) to numerous Quaternary faults (Figure 4; USGS, 2026). Due to their proximity, the crustal faults are significant seismic sources for severe ground motion and shaking within the area in addition to the larger CSZ event. A summary of crustal faults located within 25 kilometers of the site is presented in Table 1, below.

Table 1. Faults within the Site Vicinity

Fault Zone Name	Fault ID	Approximate Distance to Site (surface projection in km)
Owl Creek fault	870	13
Corvallis fault zone	869	24

3.3.2.2 Cascadia Subduction Zone (CSZ) – Interface Earthquakes

The CSZ represents the boundary between the subducting Juan de Fuca tectonic plate and the overriding North American tectonic plate (Figure 5). Recurrence intervals for subduction zone earthquakes are based on studies of the geologic record, with studies estimating a recurrence interval between 500 to 530 years for a full rupture event, and on the order of 300 years for smaller events exceeding Mw 8.0+ (Goldfinger et al., 2012). Geologic evidence and written records from Japan suggest the most recent earthquake occurred in January 1700. The 1700 earthquake probably ruptured much of the approximate 620-mile (1,000 km) length of the CSZ and was estimated at moment magnitudes of M_W 9.0. The horizontal distance from the edge of the CSZ megathrust is located approximately 110 miles from Halsey, Oregon. The current US Geological Survey risk-based maximum credible earthquake for CSZ megathrust is M_W 9.0±0.2 (USGS, 2008).

3.3.2.3 Intraslab Earthquakes

Intraslab earthquakes occur within the subducting slab. They are problematic in the sense that they do not have a surface expression or rupture the ground surface and their seismicity generates deformation along many faults within the slab (Kirby et al., 2002). The CSZ has generated significant intraslab destructive earthquakes including the 2001 M_W 6.8 Nisqually earthquake in the Puget lowland. The estimated depth to the subducting Juan de Fuca plate under the Willamette Valley is approximately 28 miles (40 km) (Blair et al., 2011) and should therefore be considered a seismic source.

3.3.2.4 Liquefaction and Cyclic Softening

Liquefaction and cyclic softening are seismic processes that can result in significant loss of soil strength and stiffness during cyclic loading from earthquakes. Liquefaction occurs in loose, saturated, cohesionless soil (e.g., sand), due to the buildup of significant excess pore pressure during an earthquake, temporarily causing the soil to behave like a viscous fluid. Cyclic softening, by contrast, is often associated with fine-grained, moderate to high plasticity soils, (e.g., clays), when repeated cyclic loading causes progressive degradation of shear strength and some excess pore pressure generation. Both liquefaction and cyclic softening can result in ground settlement, foundation bearing capacity failure, and lateral deformation of ground.

Based on a review of Oregon HazVu, the site is shown as having moderate liquefaction hazard. Based on the soil the soil types and presence of groundwater observed in our explorations, our opinion is the risk of liquefaction during a design-level seismic event should be considered moderate for design. Based on the CPT results, Apex estimates up to approximately 2.6 inches of total seismically induced settlement following a 2% probability of exceedance in 50 years seismic event.

ASCE 41-23 defines four seismic hazard levels based on different probabilities of exceedance in a 50-year period. These are categorized into "E" for existing buildings and "N" for new building standards equivalent and include BSE-1E, BSE-2E, BSE-1N, and BSE-2N. These hazard levels are combined with specific structural and nonstructural performance levels to define the overall performance objective for a given evaluation or retrofit project.

Apex has estimated the range of potential differential seismically induced settlement associated with each ASCE 41-23 hazard level, summarized in Table 2. The listed differential seismically induced settlements are anticipated to occur over a horizontal distance of approximately 100 feet.

Table 2. Estimated Differential Settlement for Each Seismic Hazard Level

Seismic Hazard Level	Return Period (years)	Total Seismic Settlement (inches)	Estimated Differential Seismic Settlement* (inches)
BSE-1E	225	Less than 0.25	Less than 0.25
BSE-2E	975	2.6	0.7
BSE-1N	475	2.6	0.7
BSE-2N	2,475 (return period considered for new structures)	2.6	0.7

* Over a distance of 100 feet

The potential for seismic settlement and the associated design implications are discussed further in section 4.1, Geotechnical Design Considerations.

3.3.3 Other Seismic Hazards

Other site-specific seismic hazards considered include earthquake-induced landslides, fault rupture, seiche and tsunami inundation, and earthquake shaking. Based on the gentle surface topography and geology at the site, the risk from landslides and earthquake-induced landslides is low. Due to the location of the site, the risks of seiche and tsunami inundation are absent. Though faults are mapped within 15 km of the site, no faults are mapped as crossing the site; subsequently, the risk of fault rupture at the site is low. Strong to very strong/severe earthquake ground shaking will occur during a code-based seismic event on the CSZ and from local faults. Shaking duration during a CSZ event is expected to last for 5 to 7 minutes along the coast, decreasing inland to around 2 minutes closer to Portland and the Willamette Valley (Oregon Emergency Management, 2025; Hickey, 2017). Based on our current project understanding, our opinion is that effects of earthquake ground motions can be accounted for by using code-based design procedures and the code-based design response spectrum.

3.4 Flooding

Flooding occurs when local creeks, streams, rivers, and bays are not able to transfer water away from a local area faster than the rate of accumulating water. This can occur on a local or regional scale and is highly variable based upon the configuration of individual watersheds. Distant upland precipitation or rapid snowmelt can have significant impact far downstream where the weather may be different. Regardless, destruction of land, infrastructure, and personal property can occur when banks, levees, and flood plains are inundated with stormwater or rapid snowmelt.

Review of available FEMA National Flood Hazard maps indicate the northeast corner of the campus is mapped within the 500-year mapped flood zone (Figure 6). The flood-zone designated area appears to encompass the aforementioned drainage/irrigation ditch.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Geotechnical Design Considerations

Based on our explorations, testing, and analyses, our opinion is the project site is suitable for the proposed retrofit of Central Linn Elementary School, provided the recommendations in this report are incorporated into project design and implemented during construction.

The subsurface conditions at the site generally consist of alluvial silt, clay, and fine-grained sand. Excavation with conventional equipment is feasible at the site.

Apex assumes the existing structure likely consists of concrete and/or masonry wall systems. Whether mitigation measures are required by code is largely dependent on the magnitude of anticipated differential seismic settlement, which is a function of the selected seismic hazard level.

Per Table 12.13-3 of ASCE 7-22, Risk Category IV single-story structures with concrete masonry walls have an allowable differential settlement threshold of 0.002L, where *L* represents the applicable span or structural length, typically based on column spacing. Based on this criterion, the anticipated seismically induced differential settlement is not expected to exceed the ASCE 7-22 threshold for the four seismic hazard levels defined in ASCE 41-23. However, an assessment in accordance with Sections 8.2.2.2.1 and/or 8.2.2.2.2 of ASCE 41-23 may be required to determine whether mitigation measures are necessary. If requested, Apex can assist with these assessments.

The recommendations presented herein assume the structure is capable of tolerating the estimated seismically induced settlements noted above.

4.2 Shallow Foundations

Due to the presence of soft soils, we recommend that new or enlarged shallow spread footings be founded on minimum 2-foot-thick crushed rock pads. Enlarged footings will likely require techniques to minimize the risk of undermining the existing footing, such as excavating and backfilling only on one side of the existing footing at a time.

4.2.1 Minimum Footing Widths and Design Bearing Pressure

Allowable and ultimate bearing resistances are presented in Figure 7 as a function of footing width. Allowable bearing resistances considered an allowable stress design (ASD) factor of safety equal to 3. The bearing pressures shown in Figure 7 are net bearing pressures that can be used to evaluate existing footings or design new footings. The weight of the footing and overlying backfill can be disregarded in calculating footing sizes. The recommended bearing pressures apply to the total of dead plus long-term live loads.

Any new continuous wall and isolated spread footings should be at least 18 and 24 inches wide, respectively. New footings will settle in response to column and wall loads. Based on our evaluation of the subsurface conditions and our analysis, we estimate post-construction settlement will be less than 1 inch for the column and perimeter foundation loads. Differential settlement will be on the order of one-half of the total settlement between new footings.

4.2.2 Footing Embedment Depths

Apex recommends that all new footings be founded at a minimum of 18 inches below the lowest, adjacent grade. The footings should be founded below an imaginary line projecting upward at a 1H:1V (horizontal to vertical) slope from the base of any adjacent, parallel utility trenches or deeper excavations.

4.2.3 Granular Pads

Crushed rock pads should be planned to extend a minimum of 1-foot laterally beyond the edges of footings. The 2-foot-thick granular pads should consist of imported select granular fill meeting the requirements presented in the Structural Fill section of this report.

4.2.4 Footing Preparation

Excavations for footings should be carefully prepared to a neat and undisturbed state and compacted until stiff. A representative from Apex should confirm suitable bearing conditions and evaluate all exposed footing subgrades. Observations should also confirm that loose or soft materials have been removed from new footing excavations and concrete slab-on-grade areas. Localized deepening of footing excavations may be required to penetrate loose, wet, or deleterious materials.

Apex recommends a layer of compacted, crushed rock be placed over the footing subgrades to help protect them from disturbance due to foot traffic and the elements. Placement of this rock is the prerogative of the contractor; regardless, the footing subgrade should be in a dense or stiff condition prior to pouring concrete. Based on our experience, approximately 4 inches of compacted crushed rock will be suitable beneath the footings.

4.2.5 Lateral Resistance

Lateral loads can be resisted by passive earth pressure on the sides of footings and grade beams, and by friction at the base of the footings. A passive earth pressure calculated using an equivalent fluid weight (EFW) of 250 pounds per cubic foot (pcf) may be used for footings confined by native soils and new structural fills. The allowable passive pressure has been reduced by a factor of two to account for the large amount of deformation required to mobilize full passive resistance. Adjacent floor slabs, pavements, or the upper 12-inch depth of adjacent unpaved areas should not be considered when calculating passive resistance. For footings supported on existing or new structural fills, use a coefficient of friction equal to 0.40 when calculating resistance to sliding. These values do not include a factor of safety (FS).

4.3 Floor Slab Repair

In areas where floor slabs are removed and replaced for the construction of improvements, the new slab should be founded on a minimum 6-inch-thick layer of imported granular material. Imported granular material beneath slabs should be composed of crushed rock or crushed gravel that is relatively well graded between coarse and fine, contains no deleterious materials, has a maximum particle size of 1 inch, and has less than 5% by dry weight passing the US Standard No. 200 Sieve.

4.4 Seismic Design Considerations

4.4.1 ASCE 41-23 Code-Based Seismic Design Parameters

Apex understands the seismic evaluation for existing structures will be completed in accordance with ASCE 41-23 (Seismic Evaluation and Retrofits of Existing Buildings), which also references ASCE 7-22 (Minimum Design Loads for Buildings and Other Structures), with additional criteria provided in the 2025 Oregon Structural Specialty Code (OSSC). ASCE 41-23 provides recommendations for evaluating seismic hazards based on four hazard levels: BSE-1N, BSE-2N, BSE-1E, and BSE-2E. These hazard levels represent the Basic Performance Objective Equivalent to New Building Standards (BPON) and Basic Performance Objective for Existing Buildings (BPOE).

The seismic design criteria, in accordance with ASCE 41-23, are summarized in Table 3.

Table 3. ASCE 41-23 Seismic Design Parameters

Parameter	Short Period	1 Second
Site Class	F/C*	
BSE-2N: Adjusted Spectral Acceleration	S_{XS} = 1.05 g	S_{X1} = 0.56 g
BSE-1N: Adjusted Spectral Acceleration	S_{XS} = 0.70 g	S_{X1} = 0.37 g
BSE-2E: Adjusted Spectral Acceleration**	S_{XS} = 0.70 g	S_{X1} = 0.36 g
BSE-1E: Adjusted Spectral Acceleration***	S_{XS} = 0.18 g	S_{X1} = 0.084 g

g= Acceleration due to gravity

* Site Class C can be used if the fundamental period of the structure is less than 0.5 seconds. Site Class determined from shear wave velocities estimated from ReMi.

** 2025 OSSC Table 3403.4.3.2 indicates BSE-1E shall not be taken less than 75% of the BSE-1N. Above values have not been revised to meet the standard.

*** 2025 OSSC Table 3403.4.3.2 indicates BSE-2E shall not be taken less than 75% of the BSE-2N. Above values have not been revised to meet the standard.

4.5 Temporary and Permanent Slopes

All temporary cut slopes should be excavated with a smooth-bucket excavator, with the slope surface repaired if disturbed. In addition, upslope surface runoff should be rerouted to not run down the face of the slopes. Equipment should not be allowed to induce vibration or infiltrate water above the slopes, and no surcharges are allowed within 25 feet of the slope crest.

Based on our current understanding, no permanent cut or fill slopes are planned.

5 CONSTRUCTION RECOMMENDATIONS

5.1 Excavation

The near-surface soils at the site can be excavated with conventional earthwork equipment. All excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. The contractor is solely responsible for adherence to the OSHA requirements. Trench cuts should stand relatively vertical to a depth of approximately 4 feet bgs, provided no groundwater seepage is present in the trench walls. Open excavation techniques may be used provided the excavation is configured in accordance with the OSHA requirements, groundwater seepage is not present, and with the understanding that some sloughing may occur. Trenches/excavations should be flattened if sloughing occurs or seepage is present. Use of a trench shield or other approved temporary shoring is recommended if vertical walls are desired for cuts deeper than 4 feet bgs. If dewatering is used, we recommend that the type and design of the dewatering system be the responsibility of the contractor, who is in the best position to choose systems that fit the overall plan of operation.

5.1.1 Dry Weather Conditions

Clay soils should be covered within 4 hours of exposure by a minimum of 4 inches of crushed rock or plastic sheeting during the dry season. Exposure of these materials should be coordinated with the geotechnical engineer so that the subgrade suitability can be evaluated prior to being covered.

5.2 Construction of Haul Roads and Staging Areas

Due to the presence of fine-grained soils in the near-surface materials at the site, construction equipment may have difficulty operating on the near-surface soils when the moisture content of the surface soil is more than a few percentage points above the optimum moisture required for compaction.

Construction of granular haul roads to the project site entrance may help reduce the risk of damage pavements and disturbance of site soils. The actual thickness of haul roads and staging areas should be based on the contractors' approach to site development, and the amount and type of construction traffic. The imported granular material should be placed in one lift over the prepared undisturbed subgrade and compacted using a smooth-drum, non-vibratory roller. A geotextile fabric should be used to separate the subgrade from the imported granular material in areas of repeated construction traffic. The geotextile should meet the specifications of Oregon Department of Transportation standard specification (ODOT SS) Section 02320.10 and SS 02320.20, Table 02320-4 for soil separation. The geotextile should be installed in conformance with ODOT SS Section 00350 – Geosynthetic Installation.

5.3 Structural Fill

Apex assumes negligible site grading will be required for the construction of the proposed improvements; however, the use of structural fill may be necessary for staging areas, haul roads, and backfill material. Structural fill material should consist of relatively well-graded soil, or an approved rock product that is free of organic material and debris, and contains particles not greater than 4 inches nominal dimension.

The suitability of soil for use as compacted structural fill will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (material finer than the US Standard No. 200 Sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and compaction becomes more difficult to achieve. Soils containing more than about 5% fines cannot consistently be compacted to a dense, non-yielding condition when the water content is significantly greater (or significantly less) than optimum.

5.3.1 On-Site Soil

Based on the limited amount of site grading, Apex does not recommend the use of on-site soil as structural fill. The fine-grained fraction of the site soils are moisture sensitive, and during wet weather, may become unworkable because of excess moisture content.

5.3.2 Select Granular Fill

Selected granular fill should meet the specifications provided in ODOT SS 00330.14 – Selected Granular Backfill. The imported granular material should be uniformly moisture conditioned to within about 2% of the optimum moisture content and compacted in relatively thin lifts using suitable mechanical compaction equipment. Selected granular backfill should be placed in lifts with a maximum uncompacted thickness of 8 to 12 inches and be compacted to not less than 95% of the maximum dry density, as determined by ASTM D1557.

5.3.3 Utility Trench Backfill

Pipe bedding placed to uniformly support the barrel of pipe should meet specifications provided in ODOT SS 00405.12 – Bedding. The pipe zone that extends from the top of the bedding to at least 8 inches above utility lines should consist of material prescribed by ODOT SS 00405.13 – Pipe Zone Material. The pipe zone material should be compacted to at least 90% of the maximum dry density, as determined by ASTM D1557, or as required by the pipe manufacturer.

Under pavements, paths, slabs, or beneath building pads, the remainder of the trench backfill should consist of well-graded granular material with less than 10% by dry weight passing the US Standard No. 200 Sieve, and should meet standards prescribed by ODOT SS 00405.14 – Trench Backfill, Class B or D. This material should be compacted to at least 92% of the maximum dry density, as determined by ASTM D1557 or as required by the pipe manufacturer. The upper 2 feet of the trench backfill should be compacted to at least 95% of the maximum dry density, as determined by ASTM D1557. Controlled low-strength material (CLSM), ODOT SS 00405.14 – Trench Backfill, Class E, can be used as an alternative.

Outside of structural improvement areas (e.g., pavements, sidewalks, or building pads), trench material placed above the pipe zone may consist of general structural fill materials that are free of organics and meet ODOT SS 00405.14 – Trench Backfill, Class A. This general trench backfill should be compacted to at least 90% of the maximum dry density, as determined by ASTM D1557, or as required by the pipe manufacturer or local jurisdictions.

5.3.4 Stabilization Material

Stabilization rock should consist of pit or quarry run rock that is well-graded, angular, crushed rock consisting of 4- or 6-inch-minus material with less than 5% passing the US Standard No. 4 Sieve. The material should be free of organic matter and other deleterious material. ODOT SS 00330.16 – Stone Embankment Material can be used as a general specification for this material with the stipulation of limiting the maximum size to 6 inches.

6 ADDITIONAL SERVICES AND CONSTRUCTION OBSERVATIONS

In most cases, other services beyond completion of a final geotechnical engineering report are necessary or desirable to complete the project. Occasionally, conditions or circumstances arise that require additional work that was not anticipated when the geotechnical report was written. Apex offers a range of environmental, geological, geotechnical, and construction services to suit the varying needs of our clients.

Apex should be retained to review the plans and specifications for this project before they are finalized. Such a review allows us to verify that our recommendations and concerns have been adequately addressed in the design.

Satisfactory earthwork performance depends on the quality of construction. Sufficient observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. We recommend that Apex be retained to observe general excavation, stripping, fill placement, footing subgrades, and/or pile installation. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

7 LIMITATIONS

This report has been prepared for the exclusive use of the addressee, and their architects and engineers, for aiding in the design and construction of the proposed development and is not to be relied upon by other parties. It is not to be photographed, photocopied, or similarly reproduced, in total or in part, without express written consent of the client and Apex. It is the addressee's responsibility to provide this report to the appropriate design professionals, building officials, and contractors to ensure correct implementation of the recommendations.

The opinions, comments, and conclusions presented in this report are based upon information derived from our literature review, field explorations, laboratory testing, and engineering analyses. It is possible that soil, rock, or groundwater conditions could vary between or beyond the points explored. If soil, rock, or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that Apex is notified immediately so that we may reevaluate the recommendations of this report.

Unanticipated fill, soil and rock conditions, and seasonal soil moisture and groundwater variations are commonly encountered and cannot be fully determined by merely taking soil samples or completing explorations such as soil borings or test pits. Such variations may result in changes to our recommendations and may require additional funds for expenses to attain a properly constructed project; therefore, we recommend a contingency fund to accommodate such potential extra costs.

The scope of work for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, if conditions have changed due to natural causes or construction operations at or adjacent to the site, or if the basic project scheme is significantly modified from that assumed, this report should be reviewed to determine the applicability of the conclusions and recommendations presented herein. Land use, site conditions (both on and off site), or other factors may change over time and could materially affect our findings; therefore, this report should not be relied upon after three years from its issue, or in the event that the site conditions change.

8 REFERENCES

ASCE. (2022). Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-22). American Society of Civil Engineers.

ASCE. (2023). Seismic Evaluation and Retrofit of Existing Buildings (ASCE/SEI 41-23). American Society of Civil Engineers.

Blair, J. L., McCrory, P. A., Oppenheimer, D. H., and Waldhauser, F. (2011, revised 2013). A Geo-referenced 3D model of the Juan de Fuca Slab and associated seismicity: US Geological Survey Data Series 633, v.1.2, https://pubs.usgs.gov/ds/633/.

Brocher, T. M., Wells, R. E., Lamb, A. P., and Weaver, C. S. (2017). Evidence for distributed clockwise rotation of the crust in the northwestern United States from fault geometries and focal mechanisms. Tectonics, Vol. 36, No.5, pp. 787-818.

DOGAMI. (2026). [Interactive Map]. Oregon HazVu: Statewide Geohazards Viewer. Oregon Department of Geology and Mineral Industries, Earthquake Liquefaction, accessed April 2026 from website https://gis.dogami.oregon.gov/maps/hazvu/.

DOGAMI. (2026). [Interactive Map]. DOGAMI Lidar Viewer. Oregon Department of Geology and Mineral Industries, Oregon Lidar Consortium, accessed April 2026 from website: https://gis.dogami.oregon.gov/maps/lidarviewer/.

FEMA. (2017). Federal Emergency Management Agency Flood Map Service Center, accessed November 2025 from website: https://msc.fema.gov/.

Goldfinger, C., Nelson, C. H., Morey, A. E. Johnson, J. E., Patton, J. R., Karabanov, E., Gutiérrez-Pastor, J., … Vallier, T. (2012). Turbidite Event History—Methods and Implications for Holocene Paleoseismicity of the Cascadia Subduction Zone. US Geological Survey. Professional Paper 1661-F.

Hickey, Hannah (2017). 50 Simulations of the 'Really Big One' Show How a 9.0 Cascadia Earthquake Could Play Out. UW News, University of Washington.

Kirby, S., Wang, K., and Dunlop, S. (2002). The Cascadia Subduction Zone and Related Subduction Systems – Seismic Structure, Intraslab Earthquakes and Processes, and Earthquake Hazards. US Geological Survey Open File Report 02-328 and Geological Survey of Canada Open File 4350.

McClaughry, J. D., Wiley, T. J., Ferns, M. L., and Madin, I. P. (2010). Digital Geologic Map of the Southern Willamette Valley, Benton, Lane, Linn, Marion, and Polk Counties, Oregon. Oregon Department of Geology and Mineral Industries (DOGAMI), open-file report O-10-03.

NCEDC. (2017). Northern California Earthquake Data Center. UC Berkeley Seismological Laboratory. Dataset. doi:10.7932/NCEDC.

O'Connor, J. E., Sarna-Wojcicki, A., Wozniak, K. C., Polette, D. J., Fleck, R. J. (2001). Geologic Map of Quaternary Units in the Willamette Valley, Oregon. U. S. Geological Survey, professional paper 1620, Plate 1.

ODOT SS. (2024). Oregon Standard Specifications for Construction. Salem, Oregon. Oregon Department of Transportation.

Oregon Department of Emergency Management: Cascadia Subduction Zone: Hazards and Preparedness. Accessed June 2025 from website: https://www.oregon.gov/oem/hazardsprep/pages/cascadia-subduction-zone.aspx.

Oregon Water Resources Department (OWRD). (2026). Well Log Records, accessed April 2026, from OWRD website: http://apps.wrd.state.or.us/apps/gw/well_log/.

OSSC. (2025). Oregon Structural Specialty Code (OSSC). Based on IBC. (2024 International Building Code). Country Club Hills, IL International Code Council, Inc.

US Geological Survey (USGS). (2008). Earthquake hazards program: Conterminous states probabilistic maps and data. https://pubs.er.usgs.gov/publication/sim3325.

US Geological Survey (USGS). (2026). Quaternary fault and fold database for the United States, accessed April 2026 from website: http//earthquake.usgs.gov/hazards/qfaults/.

Wiley, T. J. (2006). Preliminary Geologic Map of the Albany Quadrangle, Linn, Marion, and Benton Counties, Oregon. Oregon Department of Geology and Mineral Industries (DOGAMI), open-file report O-06-26.

Yeats, R. S., Graven, E. P., Werner, K. S., Goldfinger, Chris, and Popowski, T. A. (1996). Tectonics of the Willamette Valley, Oregon, in Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., eds., Assessing earthquake hazards and reducing risk in the Pacific Northwest: US Geological Survey Professional Paper 1650, v. 1, p. 183–222.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of 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.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

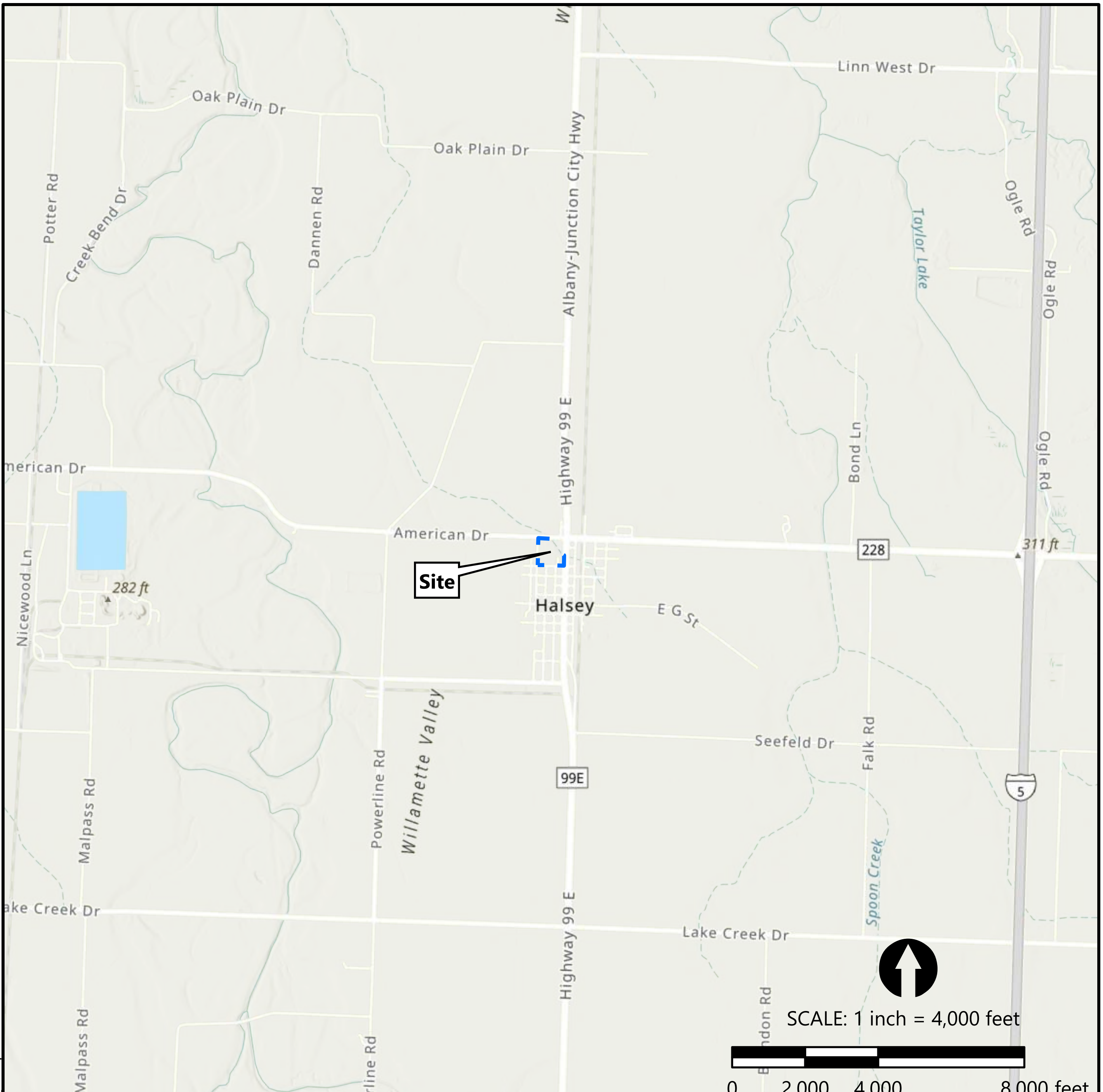
Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

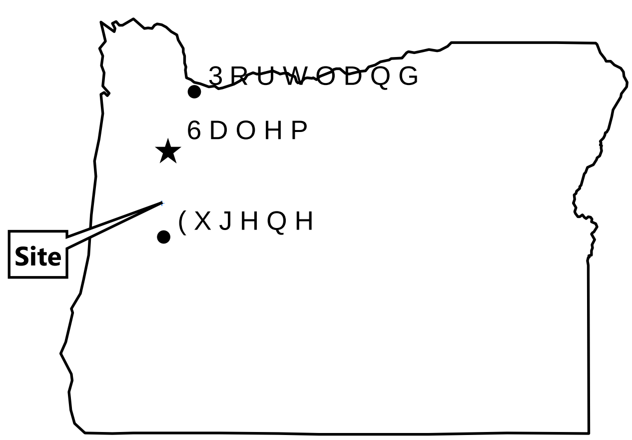
While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Figures





VICINITY MAP

CENTRAL LINN ELEMENTARY SCHOOL SEISMIC RETROFIT
HALSEY, OREGON

DATE: JUL 2026 · PROJECT: 26008007

APEX

FIGURE

1

Path: L:\Gis\GEOTECH-GIS\project\26008007\26008007.aprx User: Jack.Powell Date Saved: 5/4/2026 3:10 PM

EXPLANATION

- CPT-1 - CPT name and approximate locaiton
- B-1 - Boring name and approximate location
- Approximate site boundary
- Approximate location of ReMi array

Notes: Google Earth 2024 imagery

Coordinate System: NAD 1983 2011 StatePlane Oregon North FIPS 3601 Ft Intl

SCALE: 1 inch = 100 feet

0 50 100 200 feet

SITE PLAN

CENTRAL LINN ELEMENTARY SCHOOL SEISMIC RETROFIT
HALSEY, OREGON

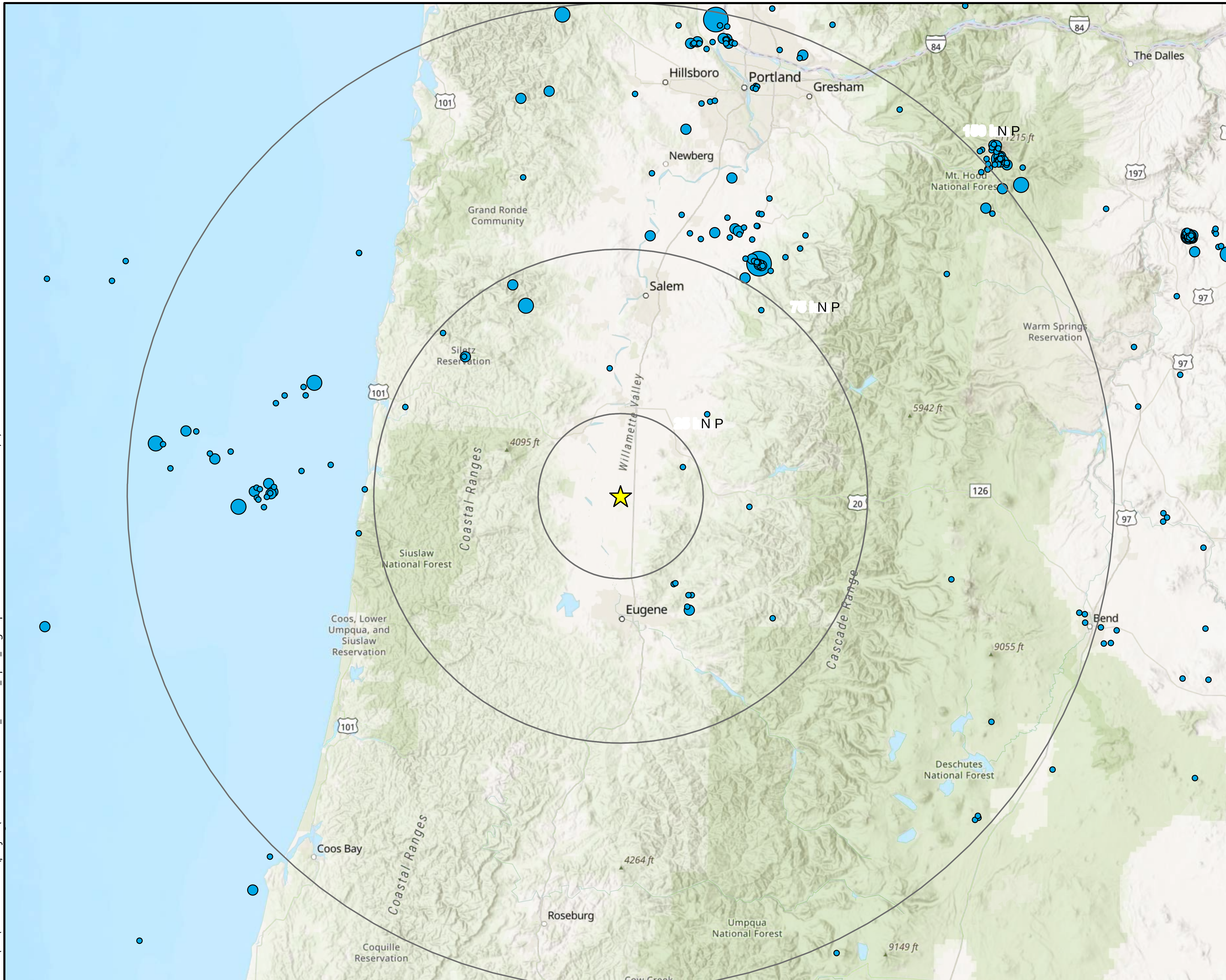
DATE: JUL 2026 · PROJECT: 26008007

APEX.

FIGURE

2

Path: L:\Gis\GEOTECH-GIS\project\26008007\26008007.aprx User: Jack.Powell Date Saved: 5/7/2026 4:00 PM



EXPLANATION

Site location

Site proximity buffer (km)

Independent seismicity (1963 - 2017)

M 2.5 - 3.0

M 3.1 - 4.0

M 4.1 - 5.0

M >5.1

Notes: Historical seismicity compiled from ANSS Comprehensive Earthquake Catalog

Coordinate System: NAD 1983 2011 StatePlane Oregon North FIPS 3601 Ft Intl

SCALE: 1 inch = 30 km

0 15 30 60 km

HISTORICAL SEISMICITY

CENTRAL LINN ELEMENTARY SCHOOL SEISMIC RETROFIT

HALSEY, OREGON

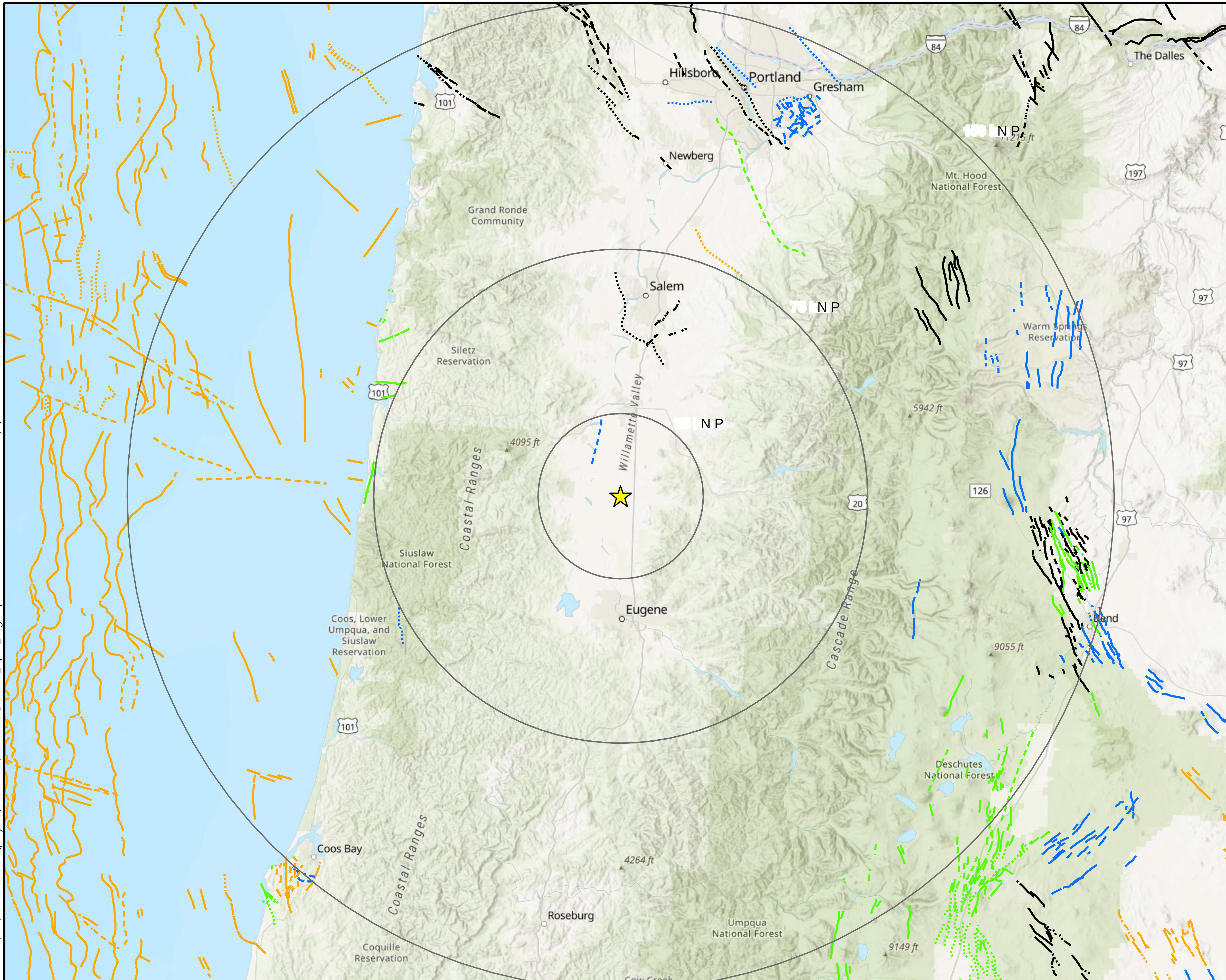
DATE: JUL 2026 · PROJECT: 26008007

APEX

FIGURE

3

Path: L:\Gis\GEOTECH-GIS\project\26008007\26008007_Hazard_Apex_Logo.aprx User: Jack.PowellDate Saved: 5/4/2026 3:53 PM



EXPLANATION

Site location

Site proximity buffer (km)

Fault trace - solid where well constrained, dashed where moderately constrained, and dotted where inferred

<15,000 years - latest Quaternary

<130,000 years - late Quaternary

<750,000 years - middle and late Quaternary

<1.6 million years - undifferentiated Quaternary

Notes: ESRI World Topographic basemap, USGS Quaternary Faults and Fold Database

Coordinate System: NAD 1983 2011 StatePlane Oregon North FIPS 3601 Ft Intl

SCALE: 1 inch = 30 km

0 15 30 60 km

REGIONAL FAULT MAP

CENTRAL LINN ELEMENTARY SCHOOL SEISMIC RETROFIT HALSEY, OREGON

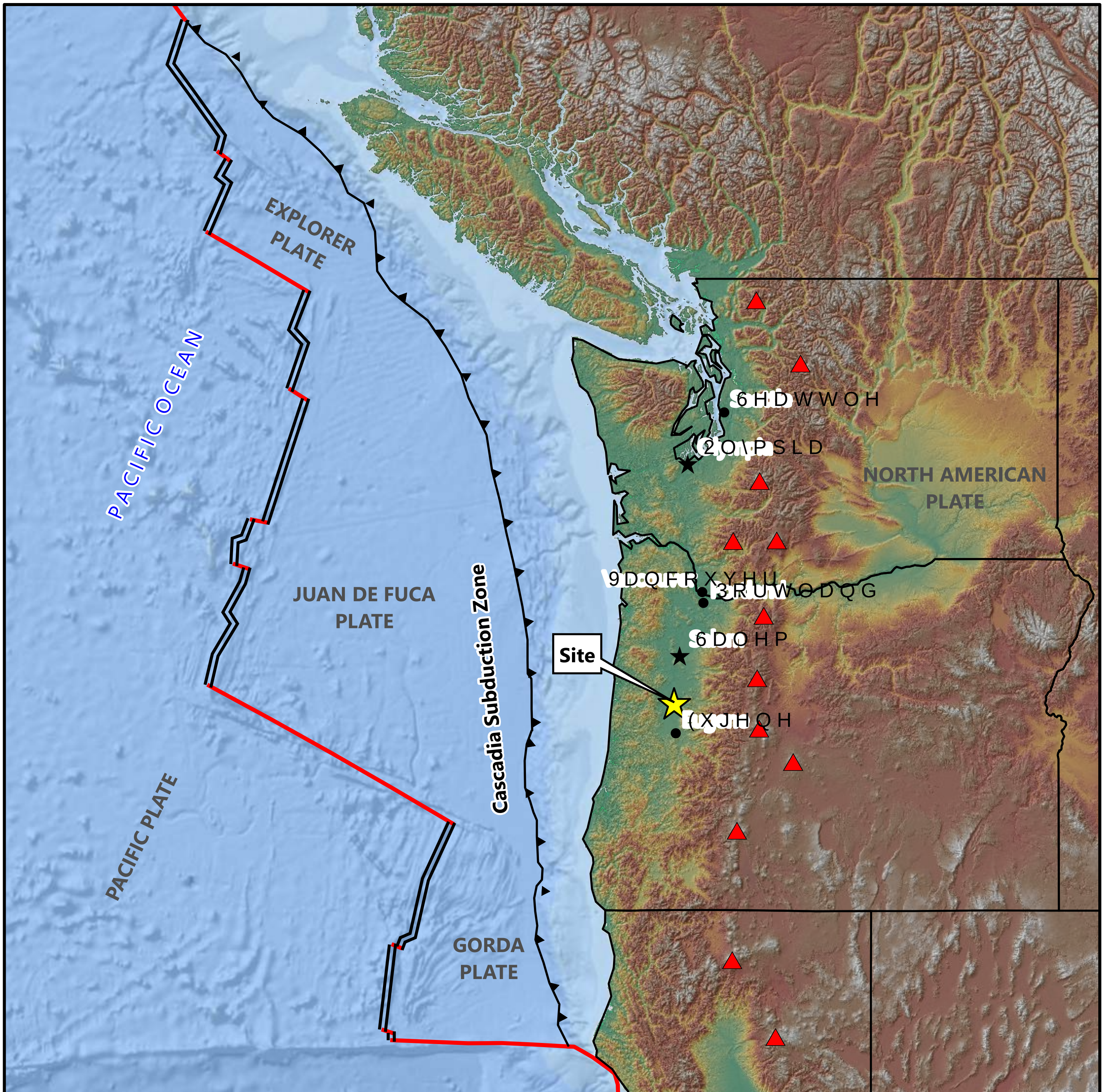
DATE: JUL 2026 · PROJECT: 26008007

APEX

FIGURE

4

Path: L:\Gis\GEOTECH-GIS\project\26008007\26008007_Hazard_Apex_Logo.aprx User: Jack.Powell Date Saved: 5/4/2026 3:53 PM



EXPLANATION

- Active volcano
- Transform boundary
- Spreading ridge
- Thrust fault

Notes: SRTM 30-meter DEM, ESRI World Oceans Basemap, USGS Tectonic Plate Boundaries

TECTONIC SETTING OF THE PACIFIC NORTHWEST

CENTRAL LINN ELEMENTARY SCHOOL SEISMIC RETROFIT
HALSEY, OREGON

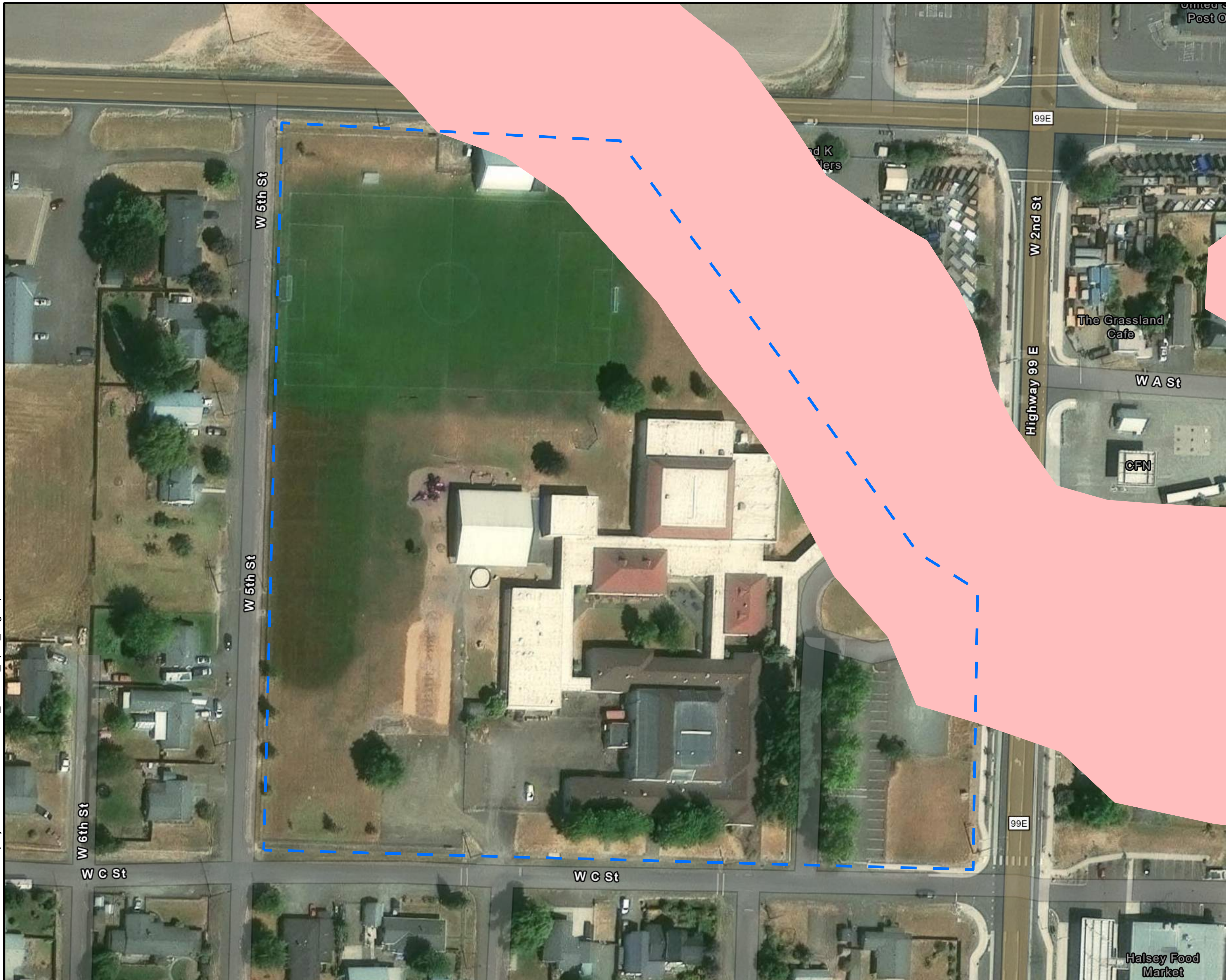
DATE: JUL 2026 · PROJECT: 26008007

APEX

FIGURE

5

Path: L:\Gis\GEOTECH-GIS\project\26008007\26008007_Hazard_Apex_Logo.aprx User: Jack.PowellDate Saved: 5/4/2026 3:53 PM



EXPLANATION

- FEMA 500 year floodplain (0.2% annual chance flood)
- Approximate site boundary

Notes: Contours and hillshade derived from lidar retrieved from WADNR or DOGAMI Lidar Portal

FEMA flood hazard layers derived from Oregon Explorer Natural Resources Digital Library

Coordinate System: NAD 1983 2011 StatePlane Oregon North FIPS 3601 Ft Intl

SCALE: 1 inch = 100 feet

0 50 100 200 feet

FLOODPLAIN MAP

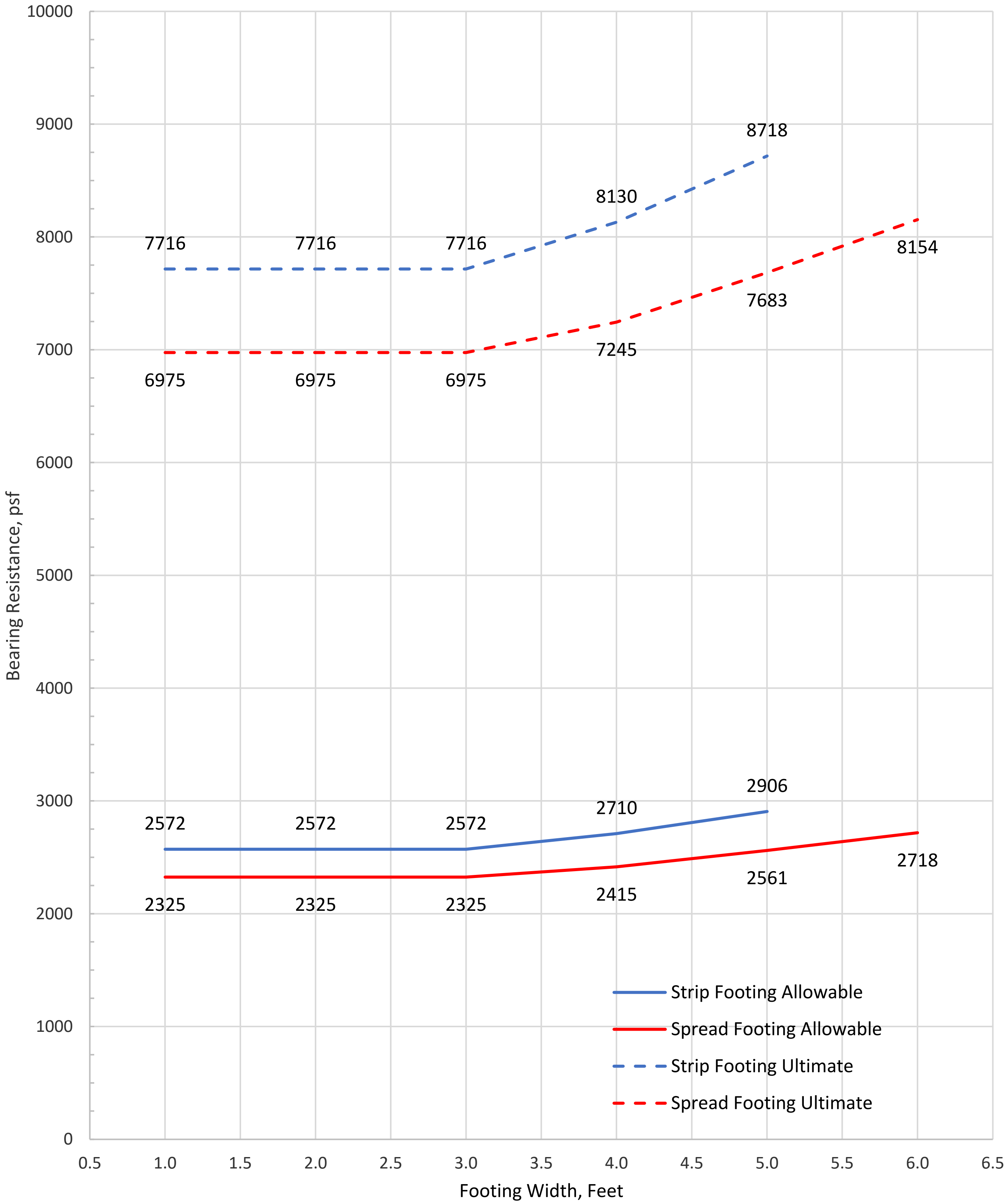
CENTRAL LINN ELEMENTARY SCHOOL SEISMIC RETROFIT
HALSEY, OREGON

DATE: JUL 2026 · PROJECT: 26008007

APEX

FIGURE

6



APEX

FOOTING BEARING CAPACITY

CENTRAL LINN ELEMENTARY SCHOOL SEISMIC RETROFIT
HALSEY, OREGON

JULY 2026
26008007
FIGURE
7

Appendix A
Field Explorations

Appendix A: Field Explorations

A1 GENERAL

Apex explored subsurface conditions at the project site by advancing one boring to a depth of approximately 40.5 feet bgs on April 29, 2026. Two cone penetration test (CPT) probes were also completed to depths of approximately 16 to 19.5 feet bgs on April 27, 2026. The approximate locations of the explorations are shown on Figure 2, Site Plan. The procedures used to advance the borings and CPTs, collect samples, and other field techniques are described in detail in the following paragraphs. Unless otherwise noted, all soil sampling and classification procedures followed engineering practices in general accordance with relevant ASTM procedures. "General accordance" means that certain local drilling/excavation and descriptive practices and methodologies have been followed.

A2 BORING

A2.1 Drilling

The boring was advanced using a truck-mounted Mobile Drill B-58 drill rig provided and operated by Holt Services, Inc., of Vancouver, Washington, using mud rotary drilling techniques. The boring was observed by a member of the Apex geotechnical staff, who maintained a detailed log of the subsurface conditions and materials encountered during the course of the work.

A2.2 Sampling

Disturbed soil samples were taken in the boring at selected depth intervals. The samples were obtained using a standard 2-inch outside diameter, split-spoon sampler following procedures prescribed for the standard penetration test (SPT). Using the SPT, the sampler is driven 18 inches into the soil using a 140-pound hammer dropped 30 inches. The number of blows required to drive the sampler the last 12 inches is defined as the standard penetration resistance (N-value). The N-value provides a measure of the relative density of granular soils such as sands and gravels, and the consistency of cohesive soils such as clays and plastic silts. The disturbed soil samples were examined by a member of the Apex geotechnical staff and then sealed in plastic bags for further examination and physical testing in our laboratory.

A2.3 Boring Log

The boring log shows the various types of materials that were encountered in the boring and the depths where the materials and/or characteristics of these materials changed, although the changes may be gradual. Where material types and descriptions changed between samples, the contacts were interpreted. The types of samples taken during drilling, along with their sample identification number, are shown to the right of the classification of materials. The N-values and natural water (moisture) contents are shown farther to the right.

A3 CONE PENETRATION TESTS (CPTs)

A3.1 Field Procedures

CPTs were advanced using a track-mounted CPT rig operated by Oregon Geotechnical Explorations, Inc., of Keizer, Oregon, and results were reviewed and used for site specific seismic design calculations.

Before the start of testing, the rig is jacked up and leveled on four pads to provide a stable reaction for the cone thrust. During the test, the instrumented cone is hydraulically pushed into the ground at the rate of about 2 centimeters per second (cm/s), and readings of cone tip resistance, sleeve friction, and pore pressure are digitally recorded every second. As the cone advances, additional cone rods are added such that a "string" of rods continuously advances through the soil. As the test progresses, the CPT operator monitors the cone resistance and its deviation from vertical alignment.

A3.2 CPT Logs

In accordance with the applicable ASTM standard, the vertical axis is designated for the depth, while the horizontal axis displays the magnitude of the test values recorded. Recorded values include tip and shaft resistance and pore pressure. Final plotting scales are determined after all the tests are complete and take into consideration maximum test values and depths recorded for the project. This information is used to calculate the friction ratio and is correlated to material types, which are presented graphically in a column to the right.

A4 MATERIAL DESCRIPTION

Initially, samples were classified visually in the field. Consistency, color, relative moisture, degree of plasticity, and other distinguishing characteristics of the soil samples were noted. Afterward, the samples were reexamined in the Apex laboratory, various standard classification tests were conducted, and the field classifications were modified where necessary. The terminology used in the soil classifications and other modifiers are defined in Table A-1, Terminology Used to Describe Soil.

Soil Descriptions

Soils exist in mixtures with varying proportions of components. The predominant soil, i.e., greater than 50% based on total dry weight, is the primary soil type and is capitalized in our log descriptions (SAND, GRAVEL, SILT, or CLAY). Smaller percentages of other constituents in the soil mixture are indicated by modifier words in general accordance with the ASTM D2488 Visual-Manual Procedure. "General Accordance" means that certain local and common descriptive practices may have been followed. In accordance with ASTM D2488, group symbols (such as GP or CH) are applied on the portion of soil passing the 3-inch (75mm) sieve based on visual examination. The following explains the soil names and modifying terms used to describe fine- and coarse-grained soils.

Fine-Grained Soils (50% or greater fines passing 0.075mm, No. 200 sieve)
The primary soil type, i.e., SILT or CLAY, is designated through visual-manual procedures to evaluate soil toughness, dilatancy, dry strength, and plasticity. The following outlines the terminology used to describe fine-grained soils and may vary from ASTM D2488 terminology in the use of some common terms.

Primary Soil NAME, Symbols, and Adjectives			Plasticity Description	Plasticity Index (PI)
SILT (ML & MH)	**CLAY (CL & CH)**	**ORGANIC SOIL (OL & OH)**		
SILT		Organic SILT	Non-plastic	0 – 3
SILT		Organic SILT	Low plasticity	4 – 10
SILT/Elastic SILT	Lean CLAY	Organic SILT/ Organic CLAY	Medium Plasticity	10 – 20
Elastic SILT	Lean/Fat CLAY	Organic CLAY	High Plasticity	20 – 40
Elastic SILT	Fat CLAY	Organic CLAY	Very Plastic	>40

Modifying terms describing secondary constituents, estimated to 5% increments, are applied as follows:

Description	% Composition	
With Sand	% Sand ≥ % Gravel	15% to 25% plus No. 200
With Gravel	% Sand < % Gravel	
Sandy	% Sand ≥ % Gravel	≤30% to 50% plus No. 200
Gravelly	% Sand < % Gravel	

Borderline Symbols, for example, CH/MH, are used when soils are not distinctly in one category or when variable soil units contain more than one soil type. **Dual Symbols,** for example, CL-ML, are used when two symbols are required in accordance with ASTM D2488.

Soil Consistency terms are applied to fine-grained, plastic soils (i.e., PI ≥ 7). Descriptive terms are based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586, as follows. SILT soils with low to non-plastic behavior (i.e., PI < 7) may be classified using relative density.

Consistency Term	SPT N-value	Unconfined Compressive Strength tsf	kPa
Very soft	Less than 2	Less than 0.25	Less than 24
Soft	2 – 4	0.25 – 0.5	24 – 48
Medium stiff	5 – 8	0.5 – 1.0	48 – 96
Stiff	9 – 15	1.0 – 2.0	96 – 192
Very stiff	16 – 30	2.0 – 4.0	192 – 383
Hard	Over 30	Over 4.0	Over 383

Soil Descriptions

Coarse-Grained Soils (less than 50% fines)

Coarse-grained soil descriptions, i.e., SAND or GRAVEL, are based on the portion of materials passing a 3-inch (75mm) sieve. Coarse-grained soil group symbols are applied in accordance with ASTM D2488 based on the degree of grading, or distribution of grain sizes of the soil. For example, well-graded sand containing a wide range of grain sizes is designated SW; poorly graded gravel, GP, contains high percentages of only certain grain sizes. Terms applied to grain sizes follow.

Material NAME	Particle Diameter	
	Inches	Millimeters
SAND (SW or SP)	0.003 – 0.19	0.075 – 4.8
GRAVEL (GW or GP)	0.19 – 3	4.8 – 75
Additional Constituents:		
Cobble	3 – 12	75 – 300
Boulder	12 – 120	300 – 3050

The primary soil type is capitalized and the fines content in the soil are described as indicated by the following examples. Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5%. Other soil mixtures will have similar descriptive names.

Example: Coarse-Grained Soil Descriptions with Fines

>5% to < 15% fines (Dual Symbols)	≥15% to < 50% fines
Well-graded GRAVEL with silt: GW-GM	Silty GRAVEL: GM
Poorly graded SAND with clay: SP-SC	Silty SAND: SM

Additional descriptive terminology applied to coarse-grained soils follow.

Example: Coarse-Grained Soil Descriptions with Other Coarse-Grained Constituents

Coarse-Grained Soil Containing Secondary Constituents	
With sand or with gravel	≥ 15% sand or gravel
With cobbles; with boulders	Any amount of cobbles or boulders.

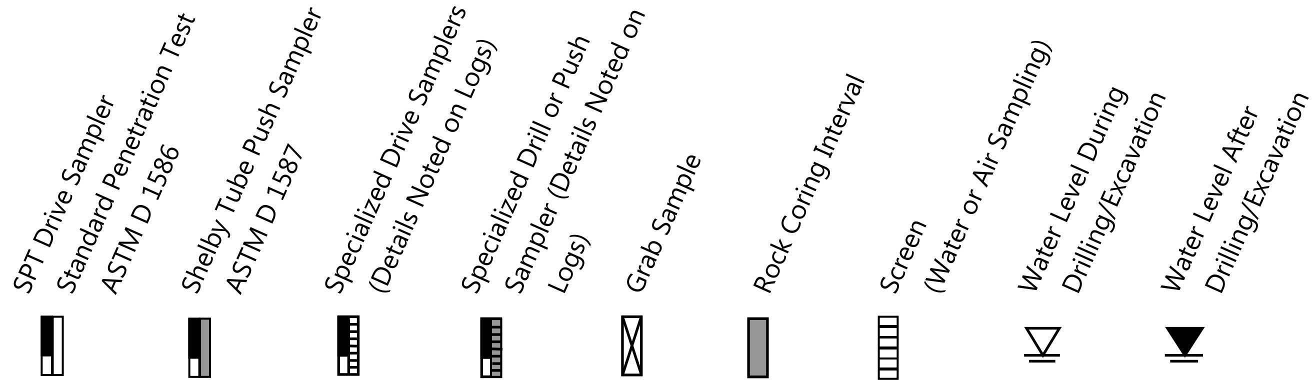
Cobble and boulder deposits may include a description of the matrix soils, as defined above.

Relative Density terms are applied to granular, non-plastic soils based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586.

Relative Density Term	SPT N-value
Very loose	0 – 4
Loose	5 – 10
Medium dense	11 – 30
Dense	31 – 50
Very dense	> 50

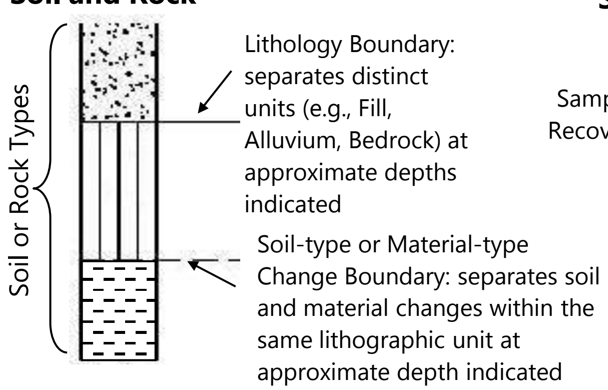
Table A-2
Key To Test Pit and Boring Log Symbols

SAMPLING DESCRIPTIONS

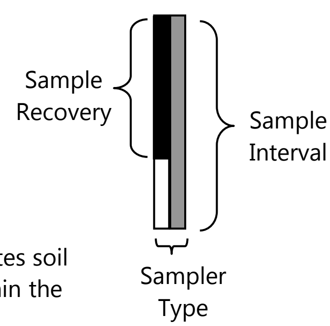


LOG GRAPHICS

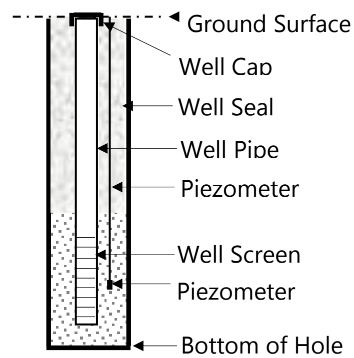
Soil and Rock



Sampling Symbols



Instrumentation Detail



Geotechnical Testing Acronym Explanations

PP	Pocket Penetrometer	HYD	Hydrometer Gradation
TOR	Torvane	SIEV	Sieve Gradation
DCP	Dynamic Cone Penetrometer	DS	Direct Shear
ATT	Atterberg Limits	DD	Dry Density
PL	Plasticity Limit	CBR	California Bearing Ratio
LL	Liquid Limit	RES	Resilient Modulus
PI	Plasticity Index	VS	Vane Shear
P200	Percent Passing US Standard No. 200 Sieve	bgs	Below Ground Surface
OC	Organic Content	amsl	Above Mean Sea Level
CON	Consolidation	HCL	Hydrochloric Acid
UC	Unconfined Compressive Strength		

CENTRAL LINN ELEMENTARY SEISMIC RETROFIT HALSEY, OREGON		**BORING B-1**
APEX PROJECT NUMBER: 26008007	APEX	APPROX. BORING B-1 LOCATION: (See Site Plan) Lat: 44.38773 Long: -123.11064

NOTE: Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.

Legend: ▲ UNCORRECTED N-VALUE; ◆ DYNAMIC CONE PENETROMETER; ● MOISTURE CONTENT %; RQD%; CORE REC%

INSTALLATION AND COMMENTS — Surface Conditions: Asphalt

DEPTH (FEET)	MATERIAL DESCRIPTION
0.0–0.2	ASPHALT (~2 inches)
0.2–0.5	BASE ROCK (~4 inches)
0.5–7.0	Very soft, brown-gray, lean CLAY (CL); medium plasticity; moist to wet
7.0–15.0	Medium stiff, light brown-gray with orange mottling, lean CLAY (CL) with sand; medium plasticity; fine sand; moist to wet
15.0–20.0	Medium sitff, brown-orange to gray-blue, fat CLAY (CH) with trace sand; high plasticity; fine sand; moist
20.0–	Very dense, brown-gray and orange, silty GRAVEL (GM) with sand; non-plastic; fine to coarse sand; fine to coarse, subrounded to subangular gravel; wet

Sample ID	Testing	Uncorrected N-Value	Installation and Comments
S-1	ATT	1	LL = 39 PL = 22 PI = 17
S-2			
S-3		5	
S-4	ATT	5	∇ 04/29/26 Estimated LL = 40 PL = 26 PI = 14
S-5	ATT	6	LL = 60 PL = 22 PI = 38
S-6		26-50/5"	

DRILLING METHOD: Mud Rotary - Tricone
DRILLED BY: Holt Services, Inc.
LOGGED BY: J. Powell

BIT DIAMETER: 5 inches
HAMMER EFFICIENCY PERCENT: 85.7
LOGGING COMPLETED: 4/29/2026

FIGURE A1

BORING LOG 26008007 B1 20260507.GPJ PBS DATATMPL GEO.GDT PRINT DATE: 5/21/26:RPG

CENTRAL LINN ELEMENTARY
SEISMIC RETROFIT
HALSEY, OREGON

APEX PROJECT NUMBER:
26008007

APEX

BORING B-1
(continued)

APPROX. BORING B-1 LOCATION:
(See Site Plan)
Lat: 44.38773 Long: -123.11064

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE / SAMPLE ID	▲ UNCORRECTED N-VALUE / ✥ DYNAMIC CONE PENETROMETER / ● MOISTURE CONTENT % / RQD% / CORE REC% (0 – 50 – 100)	INSTALLATION AND COMMENTS (Surface Conditions: Asphalt)
25.0–40.5	GM	Very dense, brown-gray and orange, silty GRAVEL (GM) with sand; non-plastic; fine to coarse sand; fine to coarse, subrounded gravel; wet	25.0		S-7	85	Rig chatter 25 to 40.5 feet bgs
30.0		becomes brown-gray; rounded to subrounded gravel			S-8	20-50/6	
35.0					S-9	31-50/3	
40.0					S-10	50/4	
40.5		Final depth 40.5 feet bgs due to refusal in very dense gravel; boring backfilled with grout, gravel, and AC surface patch.	40.5				

NOTE: Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.

Depth scale: 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0, 42.0, 44.0, 46.0, 48.0, 50.0

DRILLING METHOD: Mud Rotary - Tricone
DRILLED BY: Holt Services, Inc.
LOGGED BY: J. Powell

BIT DIAMETER: 5 inches
HAMMER EFFICIENCY PERCENT: 85.7
LOGGING COMPLETED: 4/29/2026

FIGURE A1

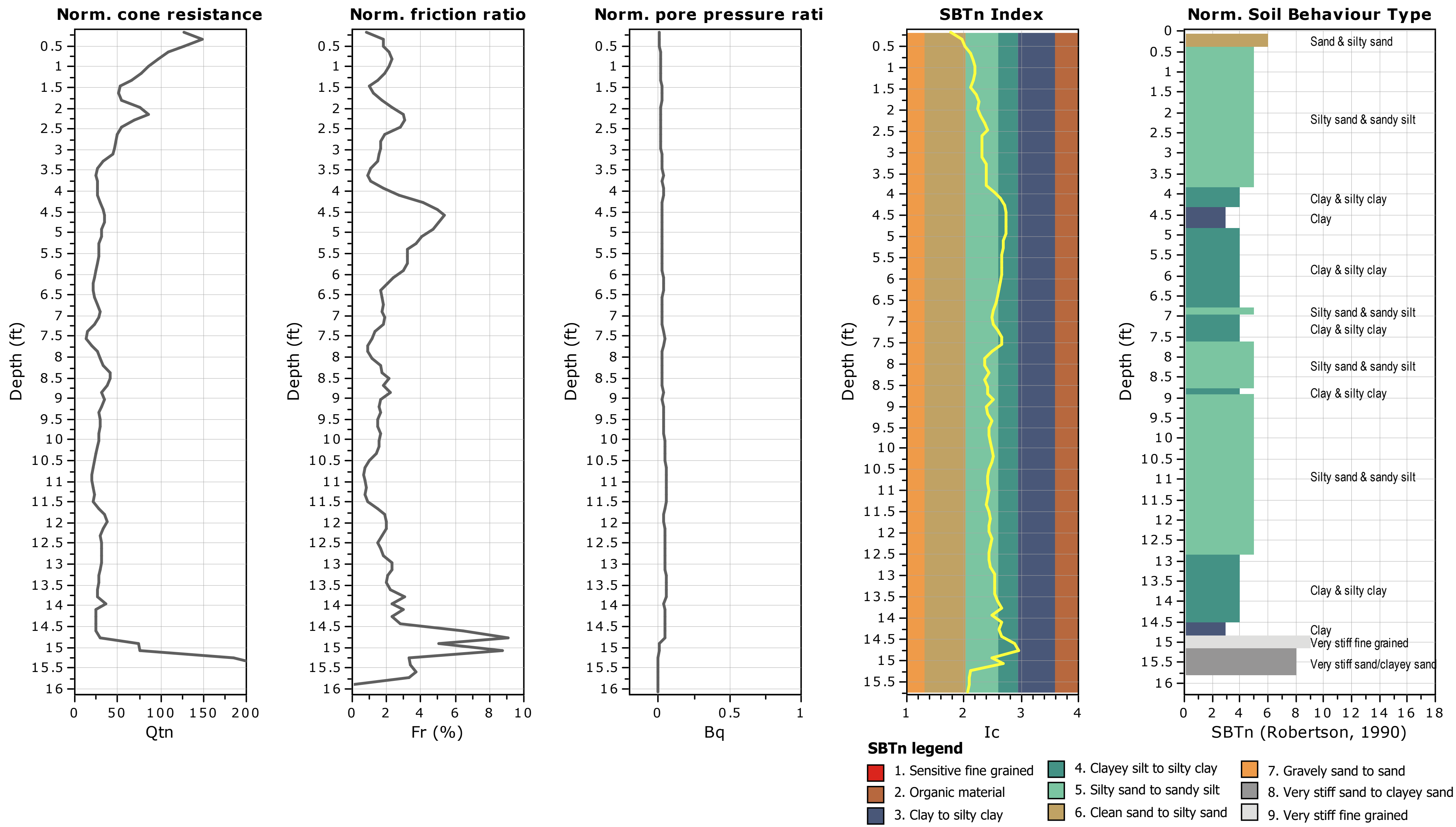
CPT: 26070 CPT-1 Text File

Total depth: 16.08 ft

Est. GWL: 10.00 ft

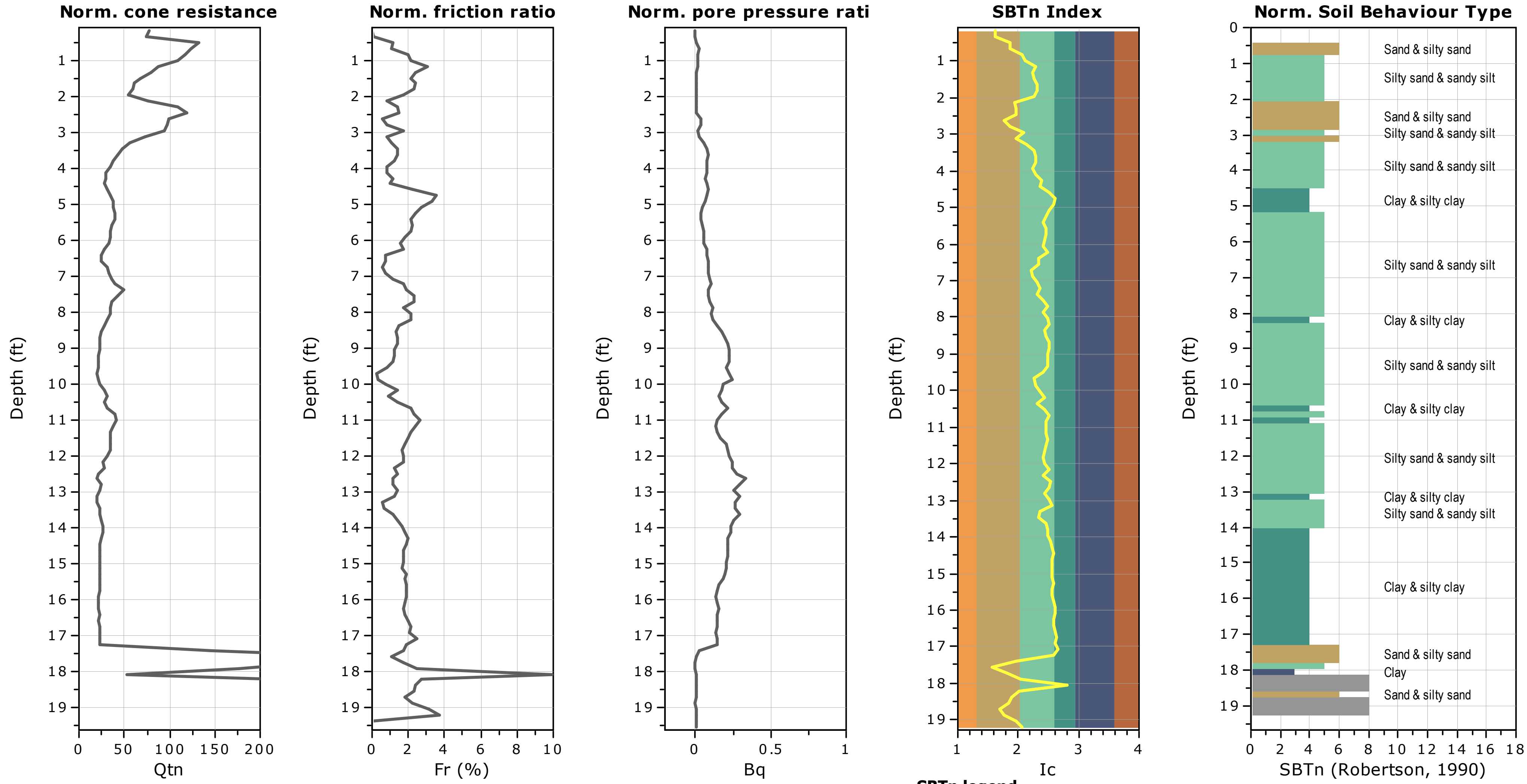
Project: Central Linn Elementary School Seismic Retrofit

Location: Halsey, OR



Project: Central Linn Elementary School Seismic Retrofit
Location: Halsey, OR

CPT: 26070 CPT-2 Text File
Total depth: 19.52 ft
Est. GWL: 10.00 ft



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Appendix B

Laboratory Testing

Appendix B: Laboratory Testing

B1 GENERAL

Samples obtained during the field explorations were examined in the Apex laboratory. The physical characteristics of the samples were noted and field classifications were modified where necessary. During the course of examination, representative samples were selected for further testing. The testing program for the soil samples included standard classification tests, which yield certain index properties of the soils important to an evaluation of soil behavior. The testing procedures are described in the following paragraphs. Unless noted otherwise, all test procedures are in general accordance with applicable ASTM standards. "General accordance" means that certain local and common descriptive practices and methodologies have been followed.

B2 CLASSIFICATION TESTS

B2.1 Visual Classification

The soils were classified in accordance with the Unified Soil Classification System with certain other terminology, such as the relative density or consistency of the soil deposits, in general accordance with engineering practice. In determining the soil type (that is, gravel, sand, silt, or clay) the term that best described the major portion of the sample is used. Modifying terminology to further describe the samples is defined in Table A-1, Terminology Used to Describe Soil, in Appendix A.

B2.2 Moisture (Water) Contents

Natural moisture content determinations were made on samples of the fine-grained soils (that is, silts, clays, and silty sands). The natural moisture content is defined as the ratio of the weight of water to dry weight of soil, expressed as a percentage. The results of the moisture content determinations are presented on the exploration logs in Appendix A and on Figure B1, Summary of Laboratory Data, in Appendix B.

B2.3 Atterberg Limits

Atterberg limits were determined on select samples for the purpose of classifying soils into various groups for correlation. The results of the Atterberg limits test, which included liquid and plastic limits, are plotted on Figure B2, Atterberg Limits Test Results, and on the exploration logs in Appendix A, where applicable.

B2.4 Grain-Size Analyses (P200 Wash)

Washed sieve analyses (P200) were completed on samples to determine the portion of soil samples passing the No. 200 Sieve (i.e., silt and clay). The P200 test results are presented on the exploration logs in Appendix A and on Figure B1, Summary of Laboratory Data, in Appendix B.

SUMMARY OF LABORATORY DATA

CENTRAL LINN ELEMENTARY
SEISMIC RETROFIT
HALSEY, OREGON

APEX PROJECT NUMBER:
26008007

SAMPLE INFORMATION				MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT (PERCENT)	PLASTIC LIMIT (PERCENT)	PLASTICITY INDEX (PERCENT)
B-1	S-1	2.5		36.4					39	22	17
B-1	S-3	7		38.5							
B-1	S-4	10		40.3					40	26	14
B-1	S-5	15		34.5					60	22	38

LAB SUMMARY 26008007_B1_20260507.GPJ PBS_DATATMPL_GEO.GDT PRINT DATE: 5/19/26:RPG

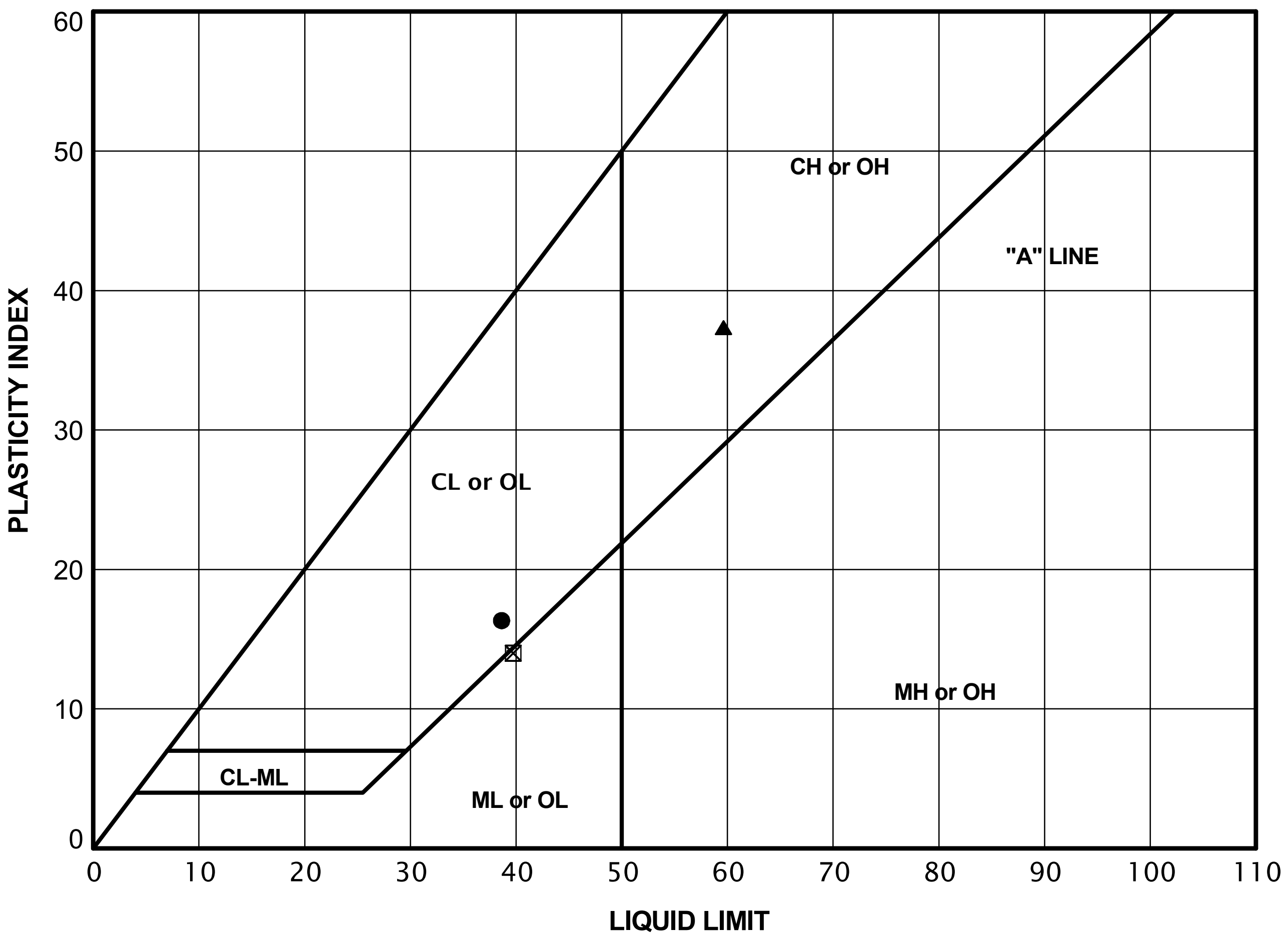
FIGURE B1

ATTERBERG LIMITS TEST RESULTS

CENTRAL LINN ELEMENTARY
SEISMIC RETROFIT
HALSEY, OREGON

APEX PROJECT NUMBER:
26008007

TEST METHOD: ASTM D4318



KEY	EXPLORATION NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (FEET)	NATURAL MOISTURE CONTENT (PERCENT)	SOIL CLASSIFICATION	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
●	B-1	S-1	2.5	36.4	CL	39	22	17
⊠	B-1	S-4	10.0	40.3	CL	40	26	14
▲	B-1	S-5	15.0	34.5	CH	60	22	38

Appendix C
Geophysical Testing

Appendix C: Geophysical Testing

C1 GENERAL

A refraction microtremor (ReMi) seismic survey was conducted at the site on April 28, 2026, by Earth Dynamics LLC. The results of the survey were used to develop a shear wave velocity profile and estimate the average shear wave velocity in the upper 100 feet (V_{s100}) in accordance with ASCE 7-22, Chapter 20. ReMi testing is a non-destructive, surface-based geophysical method that utilizes surface waves recorded by an array of geophones to evaluate subsurface shear wave velocity conditions. The approximate location of the geophone array is shown on Figure 2, Site Plan. The summary report prepared by Earth Dynamics, including the estimated V_{s100} value, is provided in Appendix C.

Report on

Shear Wave Refraction Microtremor Analysis (ReMi)
Central Linn Elementary School
Halsey, Oregon

Data Acquisition Date: April 28, 2026
Report Date: May 8, 2026

Prepared for:

Apex Companies, LLC
4412 S Corbett Ave.
Portland, OR 97239

Prepared by:

EARTH DYNAMICS LLC
2284 N.W. Thurman St.
Portland, OR 97210
(503) 227-7659

Project No. 26219

1.0 INTRODUCTION

Apex Companies, LLC engaged Earth Dynamics LLC to conduct a geophysical exploration at Central Linn Elementary School located at 239 W 2nd St. Halsey, Oregon. This study was requested and authorized by Mr. Jack Powell of Apex. The geophysical field work was completed by Mr. Daniel Lauer of Earth Dynamics LLC on April 28, 2026. This report describes the methodology and results of the geophysical investigation.

2.0 SCOPE OF WORK

The purpose of this study is to characterize the subsurface shear wave velocity at the site. These data are needed to help determine the seismic response of the site to earthquake loading. The exploration consisted of Seismic Refraction Microtremor Analysis (ReMi) of one twenty-four channel ReMi array.

3.0 METHOD

The ReMi technique provides a simplified characterization of relatively large volumes of the subsurface. The method can be used to estimate one-dimensional shear wave velocity profiles and provide site-specific soil classification data as described in ASCE 7-22 (2022). In a ReMi survey, geophones are deployed at designated intervals along a linear array. The resolution and depth of investigation depend upon the geophone cut-off frequency, spacing of the geophones, the total array length, and the frequency characteristics of the Rayleigh waves at the site. For "rule of thumb" survey planning, the nominal depth of investigation is assumed to be approximately one-third of the geophone array length.

The theoretical basis of the ReMi method is the same as Spectral Analysis of Surface Waves (SASW) and Multi-channel Analysis of Surface Waves (MASW) as first described to the earthquake engineering community by Nazarian and Stokoe (1984). However, ReMi does not require a frequency-controlled source and the field equipment is much more compact and economical. A complete description of the theoretical basis for ReMi is described by Louie (2001). In ReMi analysis all interpretation is done in the frequency domain, and the method assumes that the most energetic arrivals recorded are Rayleigh waves. By applying a time-domain velocity analysis, Rayleigh waves can be separated from body waves, air waves, and other coherent noise. Transforming the time-domain velocity results into the frequency domain allows combination of many arrivals over a long time period and yields recognition of dispersive surface waves.

Data reduction is completed in two steps. First, the time versus amplitude seismic records are transformed into spectral energy shear wave frequency versus shear wave velocity (or slowness). The data are graphically presented in what is commonly termed a p-f plot. The interpreter determines a dispersion curve from the p-f plot by selecting the lower bound of the spectral energy shear wave velocity versus frequency trend. The second phase of the analysis consists of fitting the measured dispersion curve with a theoretical dispersion curve that is based upon a model of multiple layers with various shear wave velocities. The model velocities and layer thicknesses are adjusted until a 'best fit' to the measured data is obtained. This type of interpretation does not provide a unique model. Interpreter experience and knowledge of the existing geology is important to provide a realistic solution. The data are presented as one-dimensional velocity profiles that represent the average shear wave velocities of the subsurface layers over the length of the geophone array.

For this project, data were acquired along one ReMi array consisting of twenty-four 4.5 Hz vertical geophones spiked in firm soil with a geophone spacing of fifteen feet and a total array length of 345 feet. More than thirty 30-second-long seismic records of ambient seismic noise were recorded. Data were acquired when vehicles, and people were moving on and near the site.

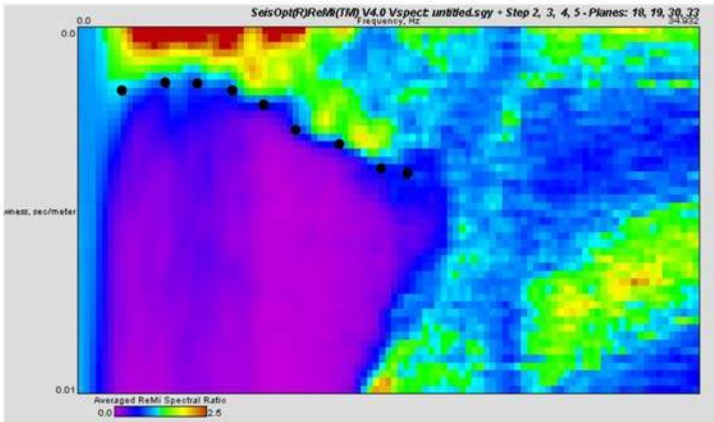
4.0 <u>RESULTS</u>

The approximate location of the ReMi array is shown on the Google Earth image in Figure 4-1. The ReMi analysis and results for ReMi Array 1 are contained in Figure 4-2. Figure 4-2 includes the p-f plot, the dispersion curve, the derived velocity versus depth model that best fits the data and expected geology of the site and a table containing the shear wave velocity with depth for the array.

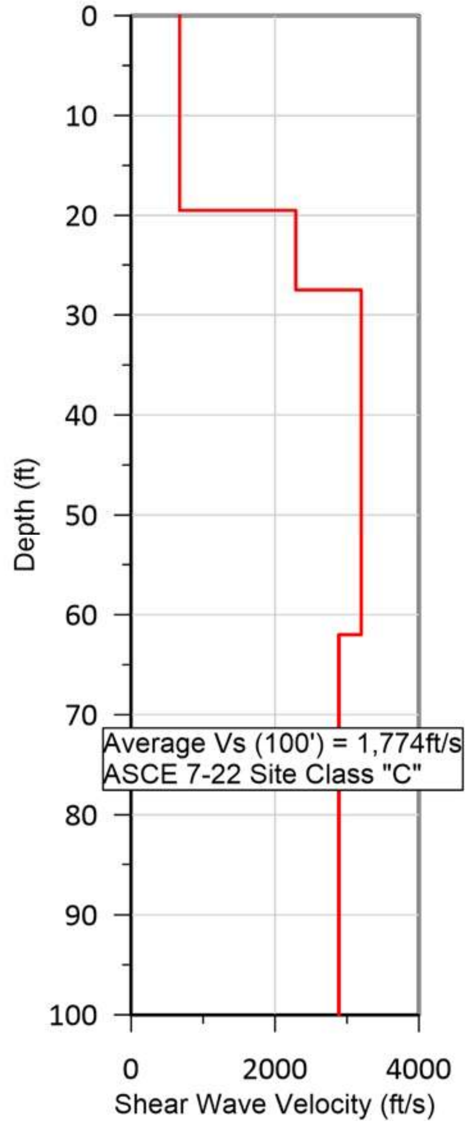
The dispersion curve is well developed. The resulting model appears to agree with expected geology at the site. The RMS error of the model fit to the data is less than 120 ft/s. The dispersion curve data suggest that the depth of investigation for this project is at least 100 feet bgs.

Figure 4-1. Site layout showing location of ReMi array.

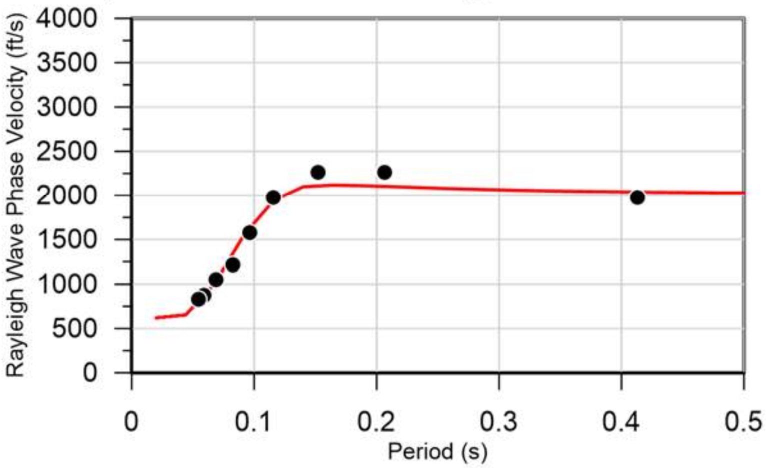
p-f Image with Dispersion Modeling Picks



Vs Model



Dispersion Curve Showing Picks and Fit



Depth Interval (ft)	Shear-wave velocity (ft/s)
0 – 19.5	674
19.5 – 27.5	2,288
27.5 – 62.0	3,198
62.0 – 100	2,887

Figure 4-2. ReMi Array 1 Results

5.0 DISCUSSION

5.1 Site Geology

Logs from exploratory borings completed to a depth of 40.5 feet bgs by Apex Companies at this site indicate that the site is underlain by material described as silt to a depth of 20 feet bgs with dense gravel below. The modelled ReMi profile appears to agree well with the information in the boring logs.

5.2 ASCE Classifications

ASCE 7-22 (2022) defines eight site classes based upon the average shear-wave velocity of the soil to a depth of 30 Meters (100 feet). The ASCE classification is summarized in Table 5-1. Earthquake shaking is expected to be stronger where shear-wave velocity is lower. Average shear wave velocity to a depth of 100 ft (V_{s100}) is calculated using Equation 5-1.

$$Vs(100) = \frac{100}{\sum_{i=1}^{i=n}\left(\frac{d_i}{Vs_i}\right)} \qquad \text{Equation 5-1}$$

Where:

n = the number of intervals
i = the interval number
d_i = the thickness of the i^{th} interval in feet
Vs_i = the velocity of the i^{th} interval

Using Equation 5-1 and the data in Figure 4-2, the average shear wave velocity to a depth of 100 ft is calculated to be 1,774 ft/s for this ReMi Array. The modelled velocity is within the range for ASCE 7-22 seismic design site classification "C".

Table 5-1. Summary of ASCE 7-22 soil classification.

Class	Average S-wave Velocity (ft/sec)	Description
A	> 5,000	Hard rock
B	>3,000 – 5,000	Medium hard rock
BC	>2,100 – 3,000	Soft rock
C	>1,450 – 2,100	Very dense sand or very stiff clay
CD	>1,000 – 1,450	Dense sand or very stiff clay
D	>700 – 1,000	Medium dense sand or stiff clay
DE	>500 – 700	Loose sand or medium stiff clay
E	≥500	Very loose sand or soft clay

6.0 LIMITATIONS

The geophysical method used in this study involves the inversion of measured data. Theoretically, the inversion process yields an infinite number of models which will fit the data. Further, many geologic materials have the same seismic velocity. We have presented models and interpretations which we believe to be the best fit given the geology and known conditions at the site. However, no warranty is made or intended by this report or by oral or written presentation of this work. Earth Dynamics accepts no responsibility for damages because of decisions made or actions taken based upon this report.

7.0 REFERENCES

ASCE/SEI ASCE 7-22, Minimum Design Loads and Associated Criteria for Buildings and other Structures, American Society of Civil Engineers, Structural Engineering Institute, Reston, VA.

Louie, J.N. (2001). "Faster, better: shear-wave velocity to 100 meters depth from refraction microtremor arrays", Bull. Seism. Soc. Am., 91, 347-364.

Nazarian, S., and Stokoe II, K.H., (1984), "In situ shear-wave velocities from spectral analysis of surface waves", Proceedings for the World Conference on Earthquake Engineering Vol. 8, San Francisco, Calif., July 21-28, v.3, 31-38.

IBC (2021) 2021 International Building Code , International Code Council, Washington D.C.

RESPECTFULLY SUBMITTED
EARTH DYNAMICS LLC

Daniel Lauer
Partner - Senior Geophysicist