Exhibit H

Geologic and Soil Stability

Umatilla-Morrow County Connect Project

750 West Elm Avenue
PO Box 1148
Hermiston, OR 97838

Cole Bode
Vice President of Engineering
541-567-6414
UMCCproject@umatillaelectric.com

Application for Site Certificate

May 2025

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ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

CSZ	Cascadia Subduction Zone
DOGAMI	Oregon Department of Geology and Mineral Industries
NESC	National Electric Safety Code
NRCS	Natural Resources Conservation Service
OAR	Oregon Administrative Rule
OSBGE	Oregon State Board of Geologist Examiners
ODOE	Oregon Department of Energy
OWRD	Oregon Water Resources Department
Project	Umatilla-Morrow County Connect Project
Project Order	Administrative Rules, and Other Requirements Applicable to the Proposed Umatilla-Morrow County Connect Project (First Amended Project Order; April 04, 2024)
ROW	Right-of-way
USDA	United States Department of Agriculture
USGS	United States Geologic Survey
WEG	Wind Erodibility Group

1.0 INTRODUCTION

Exhibit H provides information regarding geologic hazards and soil stability for the Umatilla-Morrow County Connect Project (Project) as required by Oregon Administrative Rule (OAR) 345-021-0010(1)(h). The information provided in Exhibit H demonstrates that Umatilla Electric Cooperative can design, engineer, and construct the Project to avoid dangers to human safety presented by seismic, geologic, and soil hazards.

2.0 ANALYSIS

2.1 Analysis Area

As noted in Table 7 of the Project Order (Oregon Department of Energy [ODOE] 2024), the analysis area for Exhibit H includes the Project site boundary, except for seismic hazards which are analyzed within 50 miles from the Project site boundary. The Project site boundary encompasses a typical 500-foot-wide corridor that includes the applicant-proposed transmission line alternative routes, new and improved access, and temporary work areas. Note that the Project site boundary has been widened in areas where Project features may extend outside of the right-of-way (ROW). The Project features are fully described in Exhibit B, and the Project site boundary for each Project feature is described in Exhibit C. The location of the Project features and the Project site boundary is provided in Exhibit C.

2.2 Methods

To complete the requirements of OAR 345-021-0010(1)(h), a detailed desktop study was completed to characterize the geologic setting and soil conditions within the Project analysis area and identify the extent of geologic and soil-related hazards that could affect the Project. The study consisted of collecting, reviewing, and analyzing available data from the Oregon Department of Geology and Mineral Industries (DOGAMI), the Oregon Water Resources Department (OWRD), the United States Geologic Survey (USGS), and the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Findings of the desktop study contained herein will inform the scope of the Project geotechnical exploration program, final route selection, and necessary mitigation measures required to design, construct, and operate the proposed facility.

2.3 Geologic Report

> OAR 345-021-0010(1)(h): Information from reasonably available sources regarding the geological and soil stability within the analysis area, providing evidence to support findings by the Council as required by OAR 345-022-0020, including: (A) A geologic report meeting the Oregon State Board of Geologist Examiners geologic report guidelines. Current guidelines shall be determined based on consultation with the Oregon Department of Geology and Mineral Industries, as per (B).

OAR 345-021-0010(1)(h)(A) requires submission of a geological report meeting the Oregon State Board of Geologist Examiners (OSBGE) geologic report guidelines. Following consultation with the DOGAMI on April 24, 2024 (McClaughry and Guerrero 2024), the current OSBGE report guidelines were determined to be the Second Edition, May 30, 2014, OSBGE, Guideline[s] for Preparing Engineering Geologic Reports. Reporting from site-specific geotechnical explorations meeting the 2014 guidelines will be submitted to ODOE and DOGAMI following completion.

2.3.1 Topographic Setting

The Project is in northeastern Oregon about five miles south of the Columbia River. The site is relatively flat with elevations ranging from about 400 to 600 feet above sea level, generally grading downwards to the Columbia River (USGS 2020). Based on NRCS soil survey data for Morrow and Umatilla Counties, slopes within the Project site boundary range from 0 to 20 percent gradient and are on average about six percent (USDA 2023a and 2023b).

2.3.2 Geologic Setting

The Project is located within the Deschutes-Columbia Plateau geologic province, bounded by the Blue Mountains to the south and High Cascades to the west (DOGAMI 2009). The Columbia Plateau is underlain by volcanic basalt left behind from lava flows 14 to 16 million years ago as the Yellowstone hot spot migrated across the region. Approximately 15,000 to 20,000 years ago, basalts across the Project analysis area were carved out by glacial outburst floods which left behind deposits of silt, sand, and gravel.

Figure H-1 (at the end of this report) is a surficial geology map of the Project analysis area, based on DOGAMI geologic mapping published by Madin and Geitgey in 2007. Unconsolidated quaternary age deposits are mapped across the entire Project site boundary. Missoula Flood deposits (Qmf) cover approximately four miles of the eastern site boundary, consisting of mixed silt, sand, gravel, and occasional boulders. The remaining Project site boundary is comprised of eolian sand and ash (Qe), consisting of primarily windblown sand, silt, and volcanic ash.

Based on OWRD well reporting, groundwater depths across the Project range from 10 to 80 feet below ground surface. Groundwater depths are generally expected to be shallower across the western side of the Project site boundary as terrain slopes gently down to the banks of the Columbia River. Well logs in the Project analysis area indicate lithology is generally comprised of about 50 feet or more of sands and gravels overlying varying thicknesses of mixed fine-grained silt and clay deposits. Basalt bedrock is anticipated to be greater than 100 feet below grade across most of the Project, although could be encountered at shallower depths near the Highway 730 Switchyard.

2.4 Consultation with DOGAMI

OAR 345-021-00010(1)(h)(B): A summary of consultation with the Oregon Department of Geology and Mineral Industries regarding the appropriate methodology and scope of the seismic hazards and geology and soil-related hazards assessments, and the appropriate site-specific geotechnical work that must be performed before submitting the application for the Department to determine that the application is complete.

In addition to consulting DOGAMI publications, a geotechnical engineer from POWER Engineers, Inc. met with DOGAMI's Geology Hazard Specialist Lalo Guerrero and Jason D. McClaughry, registered geologist and Program Manager of DOGAMI, to discuss the Project. Meeting minutes and correspondence for the April 24, 2024, Microsoft Teams call are included in Attachment H-1. General discussion topics are summarized below:

1. Project background and information including structure types, foundations, and proposed construction access.
2. Scope of geologic and soil stability desktop analyses and best available data sources.
3. Scope and status of the Project geotechnical investigation program and geologic report requirements.
4. Summary of mitigation measures and transmission line design methodologies proposed to reduce foreseeable impacts from area geologic hazards.

2.5 Site Specific Geotechnical Investigation

OAR 345-021-00010(1)(h)(C): A description and schedule of site-specific geotechnical work that will be performed before construction for inclusion in the site certificate as conditions.

Based on the anticipated subsurface characteristics along the proposed Project alternative routes gained through desktop reconnaissance, site-specific geotechnical field investigations are expected to consist of field reconnaissance, advancing borings, and obtaining suitable soil and rock samples for laboratory analysis. In accordance with the 2014 OSBGE guidelines, reporting for geotechnical field investigations will contain, at minimum:

- » A description of the Project, physiographic setting, geologic region, and soils encountered during the investigation.
- » Recommendations regarding appropriate foundation types and any unusual subsurface characteristics which could adversely affect foundations.
- » Analysis and discussion of regional seismicity and geologic hazards which may pose risk for the Project development, including site specific seismic design parameters.
- » Results of all field explorations including a map of field-testing locations, boring logs, soil resistivity testing results, laboratory test results, and foundation design parameters for the proposed transmission structures.

A qualified engineer and geologist will provide oversight throughout the investigation. Based on the results of the site-specific geotechnical investigation, structures will be sited to avoid or minimize geologic hazards and areas of poor foundation conditions. If these areas cannot be sited around or spanned, foundations will be designed to appropriate factors of safety for the anticipated conditions.

The Phase I geotechnical site investigation was completed by GN Northern, Inc. in February 2024 along approximately eight miles of the eastern portion of the proposed Project ROW, where all alternative routes are shared (Route A), and landowner right of entry was available. Following final route determination and receipt of right of entry along the remaining portions of the Project alignment, the Phase II geotechnical investigation will be conducted to inform final engineering design and construction.

The Phase I geotechnical report dated March 2024 (GN Northern 2024) meets the 2014 OSBGE guidelines for geologic reports, as required by OAR 345-021-0010(1)(h)(A) and was submitted electronically to DOGAMI in January, 2025 prior to submitting the Application for Site Certificate to ODOE. As required due to alignment or structure shifts within the final approved ROW, the Phase II geotechnical program will include supplemental explorations along the previously investigated areas covered within the Phase I report.

2.6 Geotechnical Investigation Locations

OAR 345-021-00010(1)(h)(D): For all transmission lines, and for all pipelines that would carry explosive, flammable or hazardous materials, a description of locations along the proposed route where the applicant proposes to perform site specific geotechnical work, including but not limited to railroad crossings, major road crossings, river crossings, dead ends (for transmission lines), corners (for transmission lines), and portions of the proposed route where geologic reconnaissance and other site specific studies provide evidence of existing landslides, marginally stable slopes or potentially liquefiable soils that could be made unstable by the planned construction or experience impacts during the facility’s operation.

At minimum, geotechnical investigations will be conducted to characterize subsurface conditions at the following locations:

- Dead-end structures and at points-of-inflection (angle changes).
- Crossings of highways, major roadways, railroads, and bodies of water.
- Foreseeable changes in lithology.
- Areas of anticipated geologic hazards or poor soils.

On straight portions of alignment absent of any of the above listed features or locations, distance between borings will typically be 0.5 mile, but will not exceed 1.0 mile. These criteria were shared with DOGAMI during the consultation documented in Attachment H-1.

2.7 Seismic Hazards

OAR 345-021-00010(1)(h)(E): An assessment of seismic hazards, in accordance with standard-of-practice methods and best practices, that address all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries under (B), and an explanation of how the applicant will design, engineer, construct, and operate the facility to avoid dangers to human safety and the environment from these seismic hazards. Furthermore, an explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters. The applicant shall include proposed design and engineering features, applicable construction codes, and any monitoring and emergency measures for seismic hazards, including tsunami safety measures if the site is located in the DOGAMI-defined tsunami evacuation zone.

Seismic sources in Oregon generally include earthquakes, tsunamis, and volcanoes. Based on DOGAMI's tsunami data compilation contained within the Oregon statewide geohazards Viewer, HazVu (DOGAMI 2023), the Project is not located in or near a tsunami or volcanic hazard area. Following consultation with DOGAMI, the desktop review of seismic hazards for the Project analysis area will address earthquakes, fault displacement, and liquefaction potential.

2.7.1 Earthquake Sources

Earthquakes result from ground shaking produced by fault rupture and movement of rocks along the fault line (DOGAMI 2010). Earthquakes in northeast Oregon are predicted to originate from two primary sources, including continental plate movement along the Cascadia Subduction Zone (CSZ), or crustal faults surrounding the Project analysis area (Madin and Mabey 1996). Along the CSZ, continental plates converging and subducting under the coast of Oregon and Washington have the potential to trigger a magnitude 9.0 earthquake once every 230 to 540 years (Madin et al. 2021). Relatively shallow crustal faults are the most common causes of earthquakes across Oregon, some of which have potential to produce a magnitude 6.0 to 7.0 earthquake.

Active quaternary faults which have moved in the last 1.6 million years are shown within the Project 50-mile seismic hazards buffer area in Figure H-2 (at the end of this report). Based on consultation with DOGAMI, the mapping includes the most current available data from the 2018 USGS quaternary fault and fold database and more recent fault mapping updates for Washington State (Angster et al. 2020). Aeromagnetic survey results for the Pasco Area of Washington and Oregon (Blakely et al. 2020) were also reviewed to determine the potential presence of additional faults across the Project analysis area. Although the aeromagnetic data do not appear to show abrupt signal variations indicating recently active faults across the Project ROW, a review by a qualified geophysicist would be required to verify, which is outside of the scope of this analysis.

According to the Oregon Seismic Hazards Database, perceived shaking across the Project analysis area resulting from a magnitude 9.0 earthquake along the CSZ would range from light to moderate, or a range of IV to V on the Modified Mercalli Intensity Scale (USGS 1989), resulting in very little to no damage (Madin et al. 2021). More severe shaking is anticipated in the Project analysis area resulting from crustal fault rupture along the Horse Heaven Fault system, which is estimated to be capable of producing a magnitude 7.1 earthquake (Williams et al. 2024). The Horse Heaven Hills structure includes northeast and northwest trending faults in Washington's Klickitat, Yakima, and Benton Counties, located at nearest about 25 miles north of the proposed Project (USGS 2018).

The Wallula Fault system is also notable within the analysis area, trending generally northwest from the Milton-Freewater area in northeast Umatilla County and across the Columbia River. In 1936, a magnitude 6.0 known as the State Line earthquake occurred between Milton-Freewater and Walla Walla, becoming the largest historical earthquake in northeastern Oregon (Seismological Society of America 2018). Historic earthquakes magnitude 2.5 or greater within the Project analysis area are summarized on Figure H-2 and in Attachment H-2. Although there are multiple faults within the 50-mile Project seismic analysis area, no active faults are mapped across the proposed Project ROW. Given the nearest mapped fault is about eight miles away from the nearest proposed alignment, the probability of fault displacement impacting the Project is considered low.

If evidence of active faults crossing the Project alignment is documented during the remaining geotechnical field explorations, a site-specific fault study may be required to understand the depth, extent, age, and probability of movement. Although faults cannot always be avoided by transmission lines, structures can be sited to avoid and span if the fault location is well understood. Where avoidance and spanning are not anticipated to be sufficient, additional design measures would be implemented to appropriately size foundations for the estimated forces associated with fault rupture. Additional discussion on seismic design of transmission structures is provided in Section 2.9.

2.7.2 Liquefaction and Lateral Spread

Liquefaction is a seismic-related phenomenon which occurs in saturated soils subjected to ground vibrations. If a soil cannot drain rapidly enough, the decrease in volume results in an increase in pore pressures, resulting in a complete loss of shear strength, liquefied soil state, and ground settlement. If liquefaction occurs on slopes, typically unarmored banks adjacent to water bodies, lateral soil movement (lateral spread) may occur as soil flows downhill. In general, two conditions must exist for liquefaction to occur: (1) the soil must be susceptible to liquefaction (typically loose, water-saturated silty and/or sandy soil); and (2) ground shaking (seismic event) must be strong enough to induce liquefaction of the soil.

Based on Oregon Seismic Hazards Database mapping, liquefaction susceptibility across the Project site boundary is moderate (Madin et al. 2021). However, based on OWRD well logs in the Project analysis area, as well as findings of the Phase I geotechnical investigation, the relative depth of groundwater and density of near surface soils is not conducive of liquefaction. Although liquefaction potential is generally considered low across the Project, findings and recommendations of the Phase II geotechnical investigation will confirm if soils along the western portion of the Project are susceptible to liquefaction or lateral spread. As required, transmission structure foundations will be designed to sustain the additional forces resulting from liquefaction settlement.

2.8 Non-Seismic Soil and Geologic Hazards

OAR 345-021-00010(1)(h)(F): An assessment of geology and soil-related hazards which could, in the absence of a seismic event, adversely affect or be aggravated by the construction or operation of the facility, in accordance with standard-of-practice methods and best practices, that addresses all issues relating to the consultation with the Oregon

Department of Geology and Mineral Industries under (B). An explanation of how the applicant will design, engineer, construct and operate the facility to adequately avoid dangers to human safety and the environment presented by these hazards.

2.8.1 Mass Wasting and Landslides

Based on a review of DOGAMI's Statewide Landslide Information Database, no landslide features are mapped within the Project site boundary. As shown on the attached Geologic Landscape map (Figure H-1 at the end of this report), one historic landslide feature is located within the map boundary along Interstate 84, reported by the Federal Highway Administration in 1996. The accuracy of the mapped landslide point was not verified but is suspected to be associated with roadway construction and poses no risk to the Project.

Landslide susceptibility mapping developed by DOGAMI documents perceived landslide susceptibility based on mapped shallow- and deep-seated landslides, as well as regional susceptibility based on state LiDAR data. No deep or shallow landslide susceptibility data were available within the Project analysis area. However, based on regional susceptibility mapping the Project analysis area is predominately low risk for landslides, with a few areas of moderate susceptibility related to moderately steep terrain along isolated embankments and drainages.

Due to the relatively flat terrain across the analysis area, the overall risk of landslides impacting the Project development is considered low. Areas of steeper terrain will be avoided by transmission structures to the extent possible by structure spotting and spanning. If slope stability issues are identified during the remaining field investigations or at the time of construction, structures will either be relocated, or slopes remediated to mitigate future slope stability problems. If areas of slope instability cannot be avoided, appropriate soil improvement, site drainage, and foundation design measures would be implemented to mitigate foreseeable slope instabilities.

2.8.2 Flooding

To assess flood risk in the Project site boundary, Federal Emergency Management Agency National Flood Hazards data were reviewed (FEMA 2024). Based on the latest flood mapping, no regulatory floodways, 100-year or 500-year floodplains are within the Project analysis area. The nearest mapped floodplain to the Project site boundary is about 0.75 mile east of Ordnance Switchyard. To the extent possible, grading would be minimized, and existing ground elevations would be maintained throughout design and construction to prevent the introduction of flood risk on the Project.

2.8.3 Soil Erosion

Soil erosion is a naturally occurring process primarily tied to water runoff and wind forces. While all natural landscapes are subject to varying levels of water- and wind-related erosion, the processes can be accelerated by construction disturbance. Many properties contribute to a soil's erosion potential including particle size distribution, moisture content, density, and vegetation cover. In general, unvegetated areas of dry, fine-grained, and loosely packed soils are at the highest risk for wind and water erosion. Ground slope and hydraulic conductivity are also tied closely to water erosion.

As described in Exhibit I, the USDA has developed multiple factors and criteria to characterize soil erosion potential for cultivated areas due to wind and water. As documented in the National Soil Survey Handbook (USDA 2019), wind erosion susceptibility is represented by the Wind Erodibility Group (WEG) and susceptibility to water erosion is represented by the K factor. WEG ranges from **1** (high wind erosion risk) to **8** (low wind erosion risk) based on soil composition, while K factors range from 0.02 (low water erosion risk) to 0.64 (high water erosion risk) based on soil composition as well as hydraulic conductivity.

In addition to WEG and K factor, NRCS soil survey data provide an "erosion hazard rating" intended to inform the design and implementation of new forest roads and trails. As defined in the USDA Soil Survey Manual, the erosion hazard rating is the possibility of erosion damage occurring as a result of site preparation and clearing (USDA 2018). The USDA erosion hazard rating system ranges from slight to very severe based on a wide range of factors including soil composition, slope, estimated K factor, and area climate.

The NRCS soil survey data (USDA 2023a and 2023b) predict an average WEG of about **2** (moderately high wind erosion risk) for soils within the Project site boundary, with isolated areas of **1** (high risk) and **7** (low risk). The average K factor within the Project site boundary is about 0.23 (moderate water erosion risk), with isolated areas of 0.49 (high risk) associated with slopes up to about 20 percent. Overall, a moderate erosion hazard rating is assigned by the NRCS for all soil units within the Project site boundary, indicating some erosion is expected and erosion control measures will be required for Project access roads and temporary work areas.

To the extent possible, existing roads will be used for construction and maintenance. Existing roads would not be widened but improved as required to mitigate existing soil erosion hazards and prevent sediment transport from wind or water. The extent of new access developments is expected to be minimal due to the number of existing access routes within the proposed Project site boundary. Where existing access is not available for construction access, overland (drive and crush) access would be utilized to the extent possible to reduce erosion impacts associated with clearing and blading new roads.

Soil erosion impacts associated with proposed access routes and temporary work areas are expected to be temporary and will be minimized through the use of Best Management Practices including, but not limited to, preserving and restoring vegetation, dust control, silt fence and straw wattles, and surface armoring as necessary. Any grading required for structures and access roads would be restored to pre-construction condition in accordance with the Project revegetation plan (Exhibit P, Attachment P-3). A site-specific Erosion and Sediment Control Plan will be prepared to meet the requirements of the Project's National Pollutant Discharge Elimination System Construction Stormwater 1200-C permit, which will be submitted to ODOE prior to construction based on the final Project design; a preliminary National Pollutant Discharge Elimination System 1200-C permit has been submitted with this Application (see Exhibit E, Attachment E-1).

2.8.4 Soil Expansion and Collapse

The causes of soil expansion or collapse are related to the type of deposit including soil type, structure, and density. Soils form in-place by weathering of rocks, or they can be transported and deposited by gravity, water, or wind. Significant changes in soil moisture content can cause soils to swell or to lose strength and consolidate. Soil collapse occurs when the land surface is saturated at depths greater than those reached by typical rain events. This saturation eliminates the bond holding the soil grains together.

The presence of expansive and collapsible soils can be detected by direct observation and laboratory testing. Polygonal soil cracking (mud cracks) or popcorn texture in exposures is indicative of shrink/swell clayey soils. The phenomenon of hydro-compaction or collapsible soils often consist of loose, dry, low-density materials that collapse and compact under the addition of water or excessive loading. These soils are typically found in areas of young alluvial fans, debris flow sediments, loess (wind-blown sediment), and playa lake deposits.

Soil expansion and collapse is most common near the ground surface when dry soils are inundated with moisture, thus posing the greatest risk to shallow slab foundation types. Transmission structure foundations are typically embedded sufficiently below the zone of seasonal moisture fluctuation, further reducing the risk of soil instabilities resulting from moisture change. Moreover, the anticipated Project structures are primarily moment-type, meaning the downward axial load from the structure is relatively small compared to the lateral load the structures will be designed to withstand. In general, laterally controlled structures rely primarily on skin friction along the sides of the embedded foundations, which further limits the risk of bearing failure due to soil expansion or collapse.

Soil collapse is a potential concern for wind-blown silts and loess in some locations across the Project region. However, based on the desktop research and Phase I geotechnical investigation (GN Northern 2024) performed to date, the eolian and Missoula flood deposits across the Project are well drained, contain major parts sand and gravel, and become dense at relatively shallow depths. Given the available soil properties and proposed structure types, the risk of soil collapse or expansion impacting the proposed Project development is considered low. Although subsurface conditions are not anticipated to vary significantly across the remaining Project analysis area, field sampling and laboratory testing associated with the Phase II geotechnical investigation will confirm if design or construction measures are required to mitigate soil instability.

2.9 Disaster Resilience

OAR 345-021-00010(1)(h)(F)(i): An explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters.

The proposed Project will be designed and constructed to meet or exceed the requirements of all applicable design codes pertaining to transmission facilities. The prevailing structural code for Oregon includes the 2022 Oregon Structural Specialty Code, which is based on the 2021 International Building Code. Additional codes governing the design and construction of transmission structures to be followed include all applicable requirements set forth by the Institute of Electrical and Electronics Engineers, National Electric Safety Code (NESC) and American Society of Civil Engineers. Structural concrete for transmission structure foundations will be designed and constructed in accordance with American Concrete Institute codes.

The Project will be designed to withstand extreme wind and ice loading as required by the 2023 NESC, which mandates structure loading based on statistical weather models for specific

Project regions. Appropriate factors of safety will also be applied to extreme weather, construction, and maintenance loading to account for uncertainties. As specified by NESC Section 250.A.4, the structural capacity provided by meeting the extreme wind and ice loading requirements of the NESC code provide sufficient capability to resist earthquake ground motions. Similar provisions are documented by Wong and Miller in the 2010 American Society of Civil Engineers 74 manual of practice, which states:

> *Transmission structures need not be designed for ground-induced vibrations caused by earthquake motion because historically, transmission structures have performed well under earthquake events, and transmission structure loadings caused by wind/ice combinations and broken wire forces exceed earthquake loads. This may not be the case if the transmission structure is partially erected or if the foundations fail due to earth fracture or liquefaction.*
>
> *Transmission structures are designed to resist large, horizontal loads of wind blowing on the wires and structures. These loads and the resulting strengths provide ample resistance to the largely transverse motions of the majority of earthquakes. Decades of experience with lines of all sizes has shown that very infrequent line damages have resulted from soil liquefaction or when earth failures affect the structural capacity of the foundation.*

As required based on the results and recommendations from the site-specific geotechnical investigations, design and construction requirements will be modified for resilience against foreseeable seismic, geologic, and soil hazards which would exceed the requirements of the governing structural design codes. A qualified engineer has assessed and reviewed the seismic, geologic, and soil hazards associated with the Project facilities, and will provide oversight for the duration of the remaining geotechnical investigations, Project design, and construction.

The applicant maintains comprehensive operations plans and programs to ensure their facilities are designed, constructed, and maintained to mitigate the threat of natural disasters. Throughout construction and prior to energization, qualified engineers and inspectors will provide oversight to verify the Project has been built according to the design specifications. Once in service, detailed line inspections will be conducted annually and following any significant geologic or climate-related event. High-resolution aerial imagery and ground surveys collected during inspections will identify structural damage, broken hardware, or conductor clearance issues, which will be addressed in order of severity.

While the design, construction, and maintenance measures detailed above have historically proven to be effective at preventing unplanned outages, the applicant also maintains an “Emergency Response and Disaster Recovery Plan” documenting their response protocol in the event of outages caused by natural disasters. The applicant will coordinate with local emergency response offices and mobilize response crews as soon as safely possible to isolate, inspect, and repair damages. Emergency structures and line hardware will be staged locally to expedite repairs and service restoration following any disaster-related structure damages.

2.10 Climate Change

OAR 345-021-00010(1)(h)(F)(i)(ii) An assessment of future climate conditions for the expected life span of the proposed facility and the potential impacts of those conditions on the

proposed facility.

As outlined in Section 2.9, the Project will be designed, constructed, and maintained for disaster resilience and extreme weather events. Furthermore, one of the primary objectives of the Project is to provide energy resilience to the grid in northeast Oregon and expand the capability of delivering power generated from an expanding number of local generation sources. The Project is intended to support the projected increase in electric demands due to extreme temperatures, as well as reinforce the grid in the event of outages on older electric infrastructure due to climate-related events.

3.0 CONCLUSIONS

In accordance with the Structural Standard set forth by OAR 345-022-0020, Exhibit H includes the application information provided for in OAR 345-021-0010(1)(h). Based on the assessment of regional geologic information contained herein, the risk of geologic and soil hazards impacting the Project implementation is considered low. Furthermore, this exhibit demonstrates the applicant can design, engineer, and construct the Project to avoid dangers to human safety and can recover quickly if a natural disaster occurred.

4.0 COMPLIANCE CROSS-REFERENCES

Table H-1 identifies the location within the application for site certificate of the information responsive to the application submittal requirements OAR 345-021-0010(1)(h), the Structural Standard at OAR 345-022-0020, and the relevant Project Order provisions.

TABLE H-1. COMPLIANCE REQUIREMENTS AND RELEVANT CROSS-REFERENCES

REQUIREMENT	LOCATION
OAR 345-021-0010(1)(h) Exhibit H. Information from reasonably available sources regarding the geological and soil stability within the analysis area, providing evidence to support findings by the Council as required by OAR 345- 022-0020, including:	
(A) A geologic report meeting the Oregon State Board of Geologist Examiners geologic report guidelines. Current guidelines shall be determined based on consultation with the Oregon Department of Geology and Mineral Industries, as per (B).	Exhibit H, Section 2.3
(B) A summary of consultation with the Oregon Department of Geology and Mineral Industries regarding the appropriate methodology and scope of the seismic hazards and geology and soil-related hazards assessments, and the appropriate site-specific geotechnical work that must be performed before submitting the application for the Department to determine that the application is complete.	Exhibit H, Section 2.4; Attachment H-1
(C) A description and schedule of site-specific geotechnical work that will be performed before construction for inclusion in the site certificate as conditions.	Exhibit H, Section 2.5

REQUIREMENT	LOCATION
(D) For all transmission lines, and for all pipelines that would carry explosive, flammable or hazardous materials, a description of locations along the proposed route where the applicant proposes to perform site specific geotechnical work, including but not limited to railroad crossings, major road crossings, river crossings, dead ends (for transmission lines), corners (for transmission lines), and portions of the proposed route where geologic reconnaissance and other site specific studies provide evidence of existing landslides, marginally stable slopes or potentially liquefiable soils that could be made unstable by the planned construction or experience impacts during the facility's operation.	Exhibit H, Section 2.6
(E) An assessment of seismic hazards, in accordance with standard-of-practice methods and best practices, that address all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries under (B), and an explanation of how the applicant will design, engineer, construct, and operate the facility to avoid dangers to human safety and the environment from these seismic hazards. Furthermore, an explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters. The applicant shall include proposed design and engineering features, applicable construction codes, and any monitoring and emergency measures for seismic hazards, including tsunami safety measures if the site is located in the DOGAMI-defined tsunami evacuation zone.	Exhibit H, Section 2.7 and 2.9; Figure H-2
(F) An assessment of geology and soil-related hazards which could, in the absence of a seismic event, adversely affect or be aggravated by the construction or operation of the facility, in accordance with standard-of-practice methods and best practices, that addresses all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries under (B). An explanation of how the applicant will design, engineer, construct and operate the facility to adequately avoid dangers to human safety and the environment presented by these hazards, as well as:	Exhibit H, Section 2.8 and 2.9; Figure H-3
(F)(i) An explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters.	Exhibit H, Section 2.9
(F)(ii) An assessment of future climate conditions for the expected life span of the proposed facility and the potential impacts of those conditions on the proposed facility.	Exhibit H, Section 2.10

5.0 REFERENCES

Angster, S.J., Sherrod, B., Barnett, E., Bretthauer, J.L., and Anderson, M.L. 2020. *2020 Update to the Quaternary Fault and Fold Database for Washington State*. U.S. Geological Survey data release available at https://www.usgs.gov/data/2020-update-quaternary-fault-and-fold-database-washington-state. Accessed April 2024.

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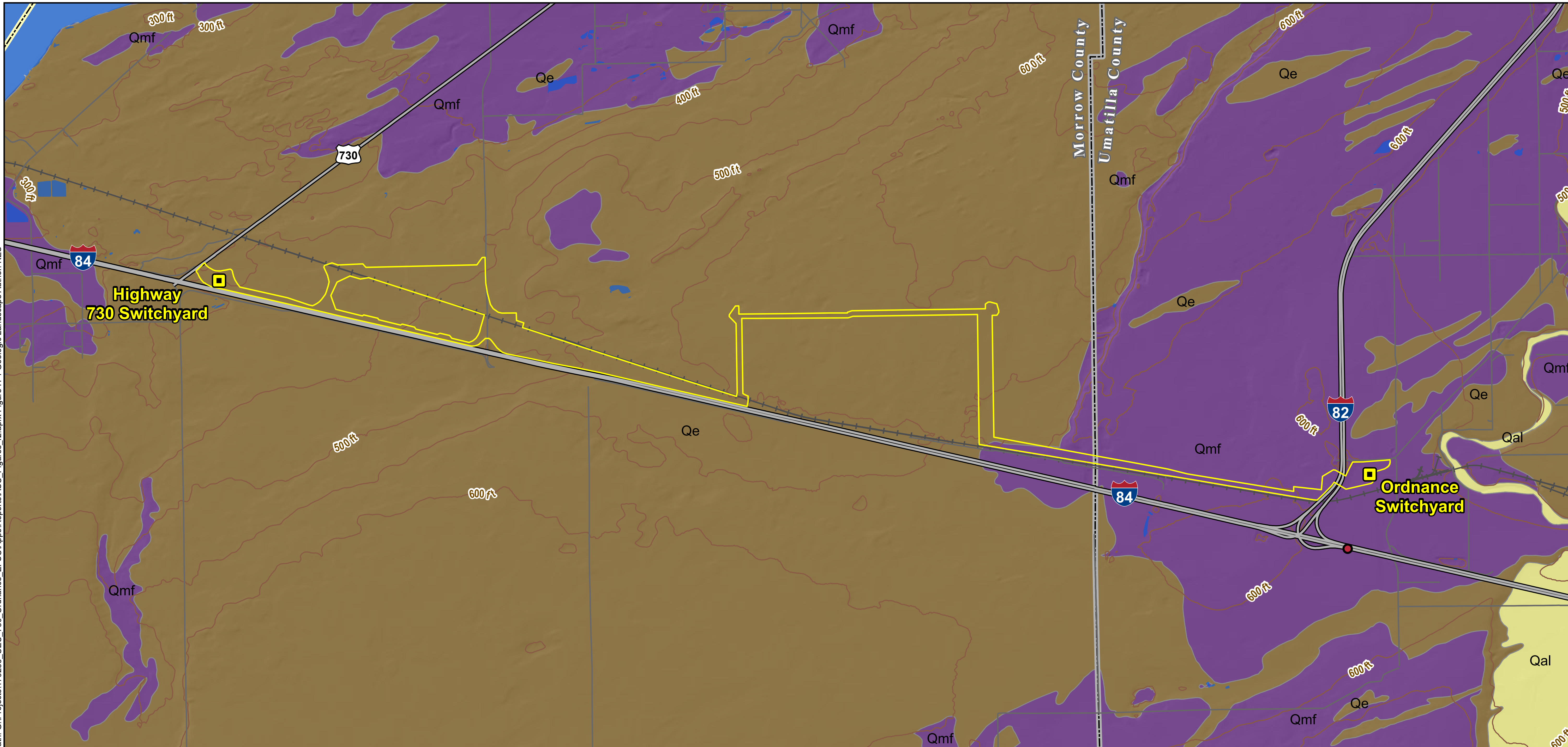
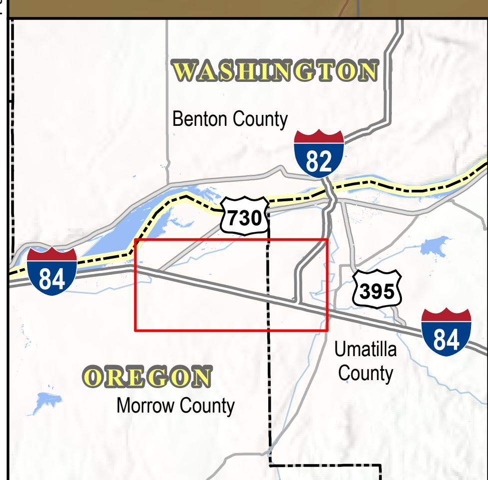
FIGURE H-1 GEOLOGIC LANDSCAPE



Path: G:\Projects\179233_UEC_730_Ordnance_EFSC\Apps\Reports\ASC_Figures_r2.aprx Figure H-1 Geologic Landscape Author: KES



Project Components

- Project Endpoint
- Project Site Boundary

Boundaries

- State
- County

Contours

- 50 foot

Water Resources

- Waterbody

Geologic Features

Landslide Features

Surface Geology

- Qal - Alluvium
- Qe - Eolian sand and ash
- Qmf - Missoula Flood Deposits

UMATILLA-MORROW COUNTY CONNECT PROJECT
APPLICATION FOR SITE CERTIFICATE

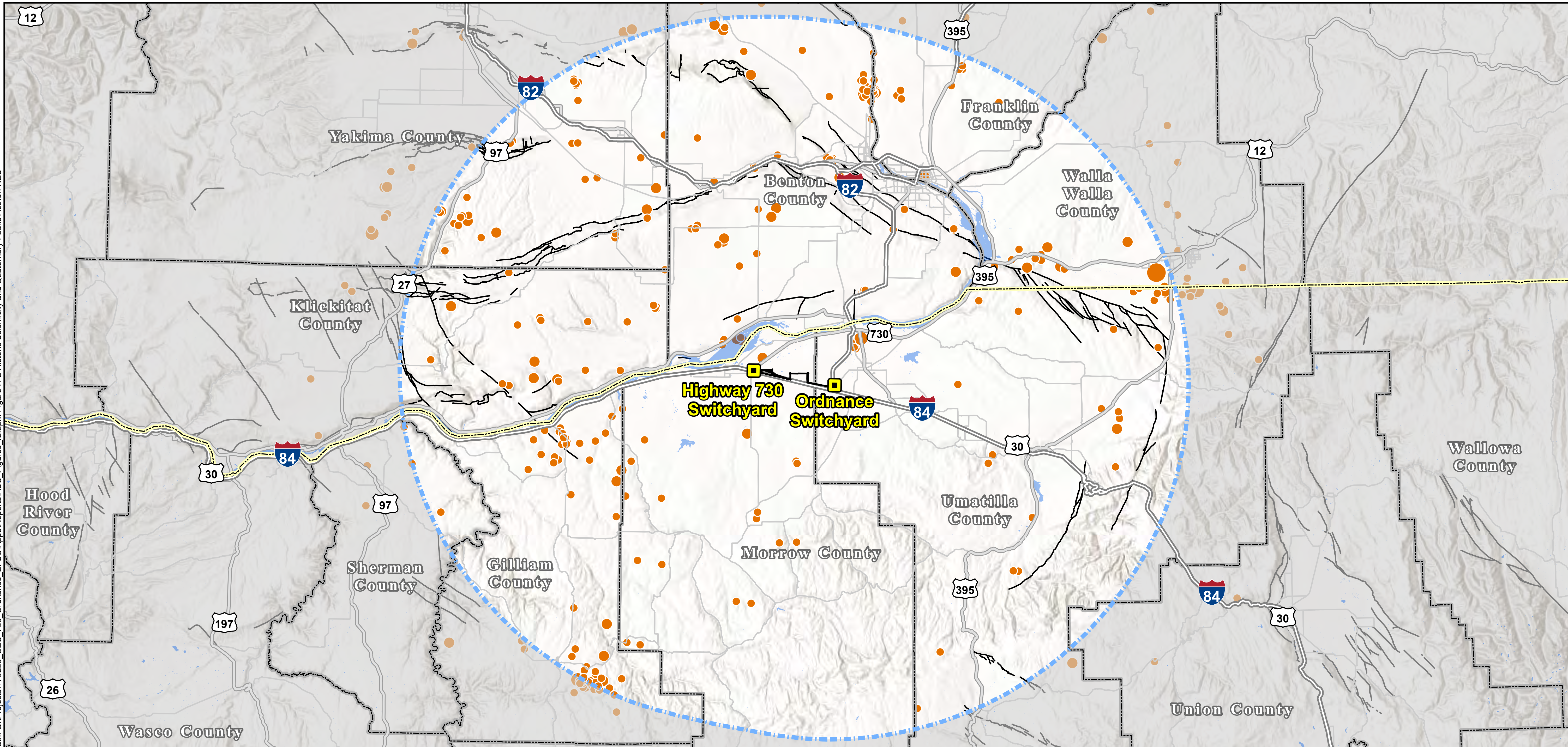
Figure H-1
Geologic Landscape

0 0.5 1 1.5 2
Miles

N

Date: 2/11/2025

FIGURE H-2 HISTORIC SEISMICITY AND QUATERNARY FAULTS



Project Components

- Project Endpoint
- Project Site Boundary
- Geologic Landscape Analysis Area (50 miles)

Transportation

- Interstate
- Highway
- Major Road

Boundaries

- State
- County

Water Resources

- Waterbody

Geologic Features

Earthquake by Magnitude

- 2.5 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- 5.1 - 6.0

Faults

- Undifferentiated Quaternary Fault

UMATILLA-MORROW COUNTY CONNECT PROJECT
APPLICATION FOR SITE CERTIFICATE

Figure H-2
Historic Seismicity and Quaternary Faults

0 10 20 30
Miles

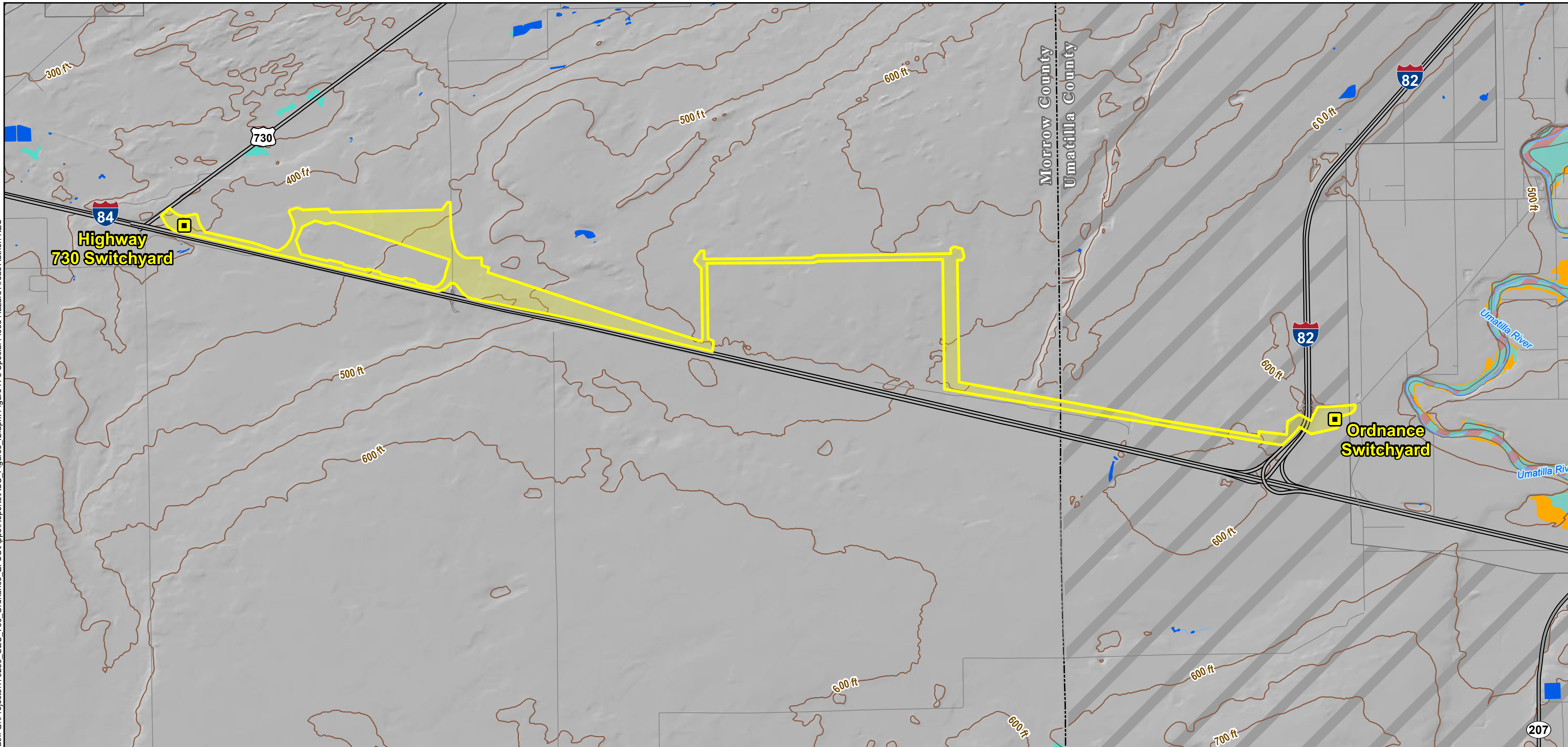
N

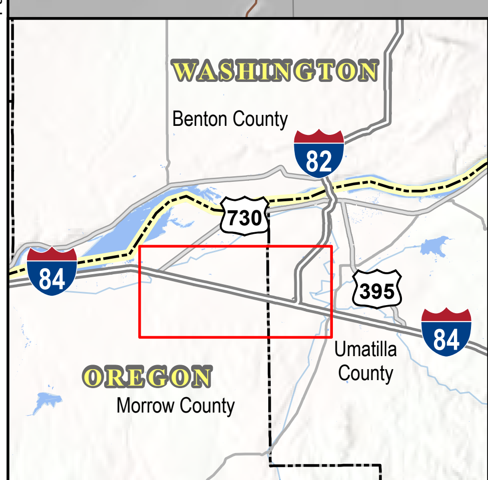
POWER ENGINEERS MEMBER OF WSP

UEC UMATILLA ELECTRIC COOPERATIVE

Date: 2/11/2025

FIGURE H-3 SPECIAL FLOOD HAZARD AREAS





Project Components

- Project Endpoint
- Project Site Boundary

Boundaries

- County

Contours

- 50 foot

Water Resources

- Waterbody

Flood Hazards

- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard

UMATILLA-MORROW COUNTY CONNECT PROJECT
APPLICATION FOR SITE CERTIFICATE

Figure H-3
Special Flood Hazard Areas

0 0.5 1 1.5 2
Miles

N

POWER ENGINEERS MEMBER OF WSP

UEC UMATILLA ELECTRIC COOPERATIVE

Date: 2/11/2025

Path: G:\Projects\179233_UEC_730_Ordnance_EFSC\Apps\Reports\ASC_Figures_r2.aprx Figure H-3 Special Flood Hazard Areas Author: KES

ATTACHMENT H-1 RECORD OF CONSULTATION WITH DOGAMI

POWER ENGINEERS

MEETING MINUTES

DATE:	April 24, 2024	TIME OF CALL:	3:00 PM MDT
ATTENDEES:	Jason McClaughry & Lalo Guerrero (DOGAMI)	PHONE NUMBER:	MS Teams
TYPED BY:	Henry Ross (POWER Engineers)	PROJECT NUMBER:	0179233
CLIENT:	Umatilla Electric Cooperative (UEC)		
PROJECT NAME:	Umatilla-Morrow County Connect (UMCC)		
SUBJECT:	UMCC Application for Site Certificate Consultation		

MESSAGE

1) **Background:**
   a) POWER Engineers is preparing an application for site certificate (ASC) for UEC for a new transmission line between Boardman and Hermiston in Morrow and Umatilla counties.
   b) Oregon Department of Energy (ODOE) Energy Facilities Citing Council (EFSC) application rules require proof of consultation with DOGAMI per OAR 345-021-0010(1)(h)(C).
   c) Notice of Intent (NOI) submitted to ODOE September 2023; Public NOI submitted October 2023
   d) ODOE issued Project Order February 2024; First Amended Project Order April 2024
   e) Planning to submit the ASC by September 2024.

2) **Project Info:**
   a) Double-circuit 230-kV alternating current (AC) transmission line from the existing UEC Highway 730 Switchyard to the existing UEC Ordnance Switchyard.
      i) The purpose of the proposed transmission project is to connect existing lines, improve grid reliability, and allow for area growth.
   b) Existing substations will not be expanded.
   c) Three (3) route alternatives under review as of 4/17/24 (previously 4)
   d) Approximately 14 to 15 miles long depending on route.
   e) Approximately 120 to 130 structures total (600-foot structure spans)
   f) 100 to 150-foot ROW width (varies along route)
   g) Structure Types:
      i) Steel monopole and 2 Pole structures
      ii) Typically, 90 to 120-foot tall
   h) Foundation Types:
      i) Directly embedded native, aggregate, or concrete backfill.
      ii) Reinforced concrete drilled piers for deadend/angle structures.
   i) Construction facilities:
      i) Construction yards and staging areas will utilize previously disturbed areas.
      ii) Access via existing roads where possible; new temporary and permanent access roads as required (typically 14 feet wide)

3) **Scope of Geologic and Soil Stability Exhibit:**
   a) Seismic Hazards within 50-miles of the project (per DOGAMI comments in the Project Order)
      i) Seismic shaking and liquefaction: DOGAMI Oregon Seismic Hazards Database (OSHD-1)
      ii) Historic Earthquakes: USGS Earthquake Catalog
      iii) Fault Displacement: USGS Quaternary Faults
         (1) Most notably the Walulla Fault zone near Milton-Freewater
         (2) USGS database hasn't been updated since 2016. Oregon Geologic Database Compilation (interactive DOGAMI website map) and Washington Geologic Survey Quaternary Faults database may contain more up-to-date info.
         (3) Aeromagnetic data from USGS (Pasco Area Data) is a potential dataset for interpreting unmapped faults in the area. However, data is absent of age and potentially difficult to interpret for the project's design.
   b) Non-seismic Hazards within the project site boundary (500-foot-wide corridor including proposed lines, access, and work areas)
      i) Landslides: SLIDO and Oregon HazVu
         (1) Historic points or deposits - none within site boundary
         (2) Susceptibility - appears to be isolated and small-scale across the site (HazVu)
         (3) SLIDO v4.5 Released April 2024
      ii) Flooding: FEMA
         (1) Floodways, 100- and 500-year floodplain – none within site boundary
      iii) Soil Stability (erosion, expansion, and collapse potential): USDA NRCS Soil Survey

4) **Geotechnical Investigations:**
   a) Phase I geotechnical investigation completed February 2024 for about 8 miles of the proposed alignment where all route alternatives are shared, and right-of-entry (ROE) was available.
   b) Phase II geotechnical investigations will be conducted to capture remaining alignment once the final route is determined, and ROE is granted (dates unknown currently).
   c) Geotechnical program requirements:
      i) Borings at heavy angles, HWY/Road/RR crossings, lithology changes
      ii) Typically, 0.5- to 1.0-mile max. between borings
         (1) POWER to confirm investigation locations w/ DOGAMI Engineering Geologist
      iii) Boring depths 30 feet to 60 feet typically.
      iv) Evaluation of seismic and non-seismic hazards based on the investigation.
         (1) Site specific seismic design parameters will be provided in project geotechnical report.
   d) Geotechnical report will inform final foundation designs and construction methods.

5) **Geologic Report Requirements:**
   a) Current Oregon State Board of Geologist Examiners (OSBGE) report guidelines:
      i) Second Edition, May 30, 2014, Oregon State Board of Engineering Geology Reports Guidelines, available at: engineeringgeologicreports_5.2014.pdf (oregon.gov)
      ii) Phase I geotechnical report is in accordance with the 2014 OSBGE guidelines.
         (1) Report will be included with ASC submittal and ODOE will forward to DOGAMI for review.
         (2) Phase II report will be provided once investigation is completed.

6) **Summary of Mitigation:**
   a) To the extent possible, structures and line routes will be sited to avoid foreseeable geologic and soil hazards.
   b) Engineering Design Codes: Oregon Structural Specialty Code and International Building Code.
   c) Transmission structure/foundation design codes, standards, manuals: NESC 2023, ASCE 7-22, ASCE 74, ACI 318-22, ACI 336.
   d) Standard seismic design approach for transmission line structures:
      i) NESC 2023, Rule 250.A.4. states the structural capacity provided by meeting the extreme loading and strength requirements of the code provides sufficient capability to resist earthquake ground motions.
      ii) ASCE 74 states "Transmission structures need not be designed for ground-induced vibrations caused by earthquake motion because historically, transmission structures have performed well under earthquake events, and transmission structure loadings caused by wind/ice combinations and broken wire forces exceed earthquake loads."
   e) If geologic and seismic hazards cannot be avoided (e.g. known faults crossed, liquefiable soils, lateral spread) structures and their foundations will be designed according to the project geotechnical report recommendations.

ATTACHMENT H-2 EARTHQUAKES WITHIN 50 MILES OF PROJECT SITE BOUNDARY

EARTHQUAKES WITHIN 50 MILES OF THE PROJECT BOUNDARY

MAGNITUDE	LOCATION	DATE	DEPTH	LATITUDE	LONGITUDE	MILES FROM PROJECT BOUNDARY
M 3.0	21 km NW of Bickleton, Washington	8/13/2022	21 km	46.13149	-120.50165	47.1
M 2.9	14 km NW of Bickleton, Washington	10/9/2018	14 km	46.10316	-120.42065	42.8
M 2.7	25 km NW of Bickleton, Washington	12/30/2017	25 km	46.15399	-120.54265	49.6
M 3.4	25 km NW of Bickleton, Washington	10/12/2017	25 km	46.15583	-120.54015	49.5
M 2.9	3 km WSW of Adams, Oregon	2/15/2017	3 km	45.75283	-118.59532	37.8
M 3.5	3 km N of Cayuse, Oregon	1/23/2015	3 km	45.71099	-118.55032	40.3
M 2.7	3 km S of Finley, Washington	4/7/2014	3 km	46.12233	-119.02549	27.5
M 3.2	13 km NNE of West Richland, Washington	11/17/2013	13 km	46.41149	-119.27082	41.2
M 2.5	5 km SSW of West Richland, Washington	10/26/2012	5 km	46.25966	-119.38399	29.9
M 3.2	3 km WNW of Touchet, Washington	4/10/2012	3 km	46.04549	-118.71232	35.9
M 2.6	5 km NW of Highland, Washington	3/12/2012	5 km	46.16483	-119.17115	26.6
M 2.7	22 km NNW of West Richland, Washington	2/22/2012	22 km	46.49199	-119.47299	45.5
M 3.4	13 km N of Richland, Washington	10/15/2011	13 km	46.40833	-119.26232	41.0
M 2.8	13 km N of Richland, Washington	9/5/2011	13 km	46.40716	-119.26599	40.9
M 3.7	14 km N of Richland, Washington	9/4/2011	14 km	46.41083	-119.25999	41.2
M 2.5	13 km N of Richland, Washington	8/27/2011	13 km	46.40733	-119.26182	41.0
M 3.3	13 km N of Richland, Washington	5/1/2011	13 km	46.40449	-119.25532	40.9
M 2.5	21 km NW of Bickleton, Washington	1/12/2011	21 km	46.14733	-120.47765	46.6
M 2.5	8 km SSE of Bickleton, Washington	10/27/2010	8 km	45.93466	-120.24215	30.8
M 2.6	7 km SE of Bickleton, Washington	10/19/2010	7 km	45.94049	-120.24482	31.0
M 2.7	11 km SE of Arlington, Oregon	7/29/2010	11 km	45.64849	-120.09532	26.4
M 2.8	4 km SSE of Adams, Oregon	5/16/2010	4 km	45.73233	-118.54249	40.5
M 2.7	2 km SSE of Adams, Oregon	5/15/2010	2 km	45.74616	-118.54565	40.2
M 2.5	8 km S of Bickleton, Washington	3/31/2010	8 km	45.92466	-120.31049	33.9
M 2.5	2 km WSW of Arlington, Oregon	3/1/2010	2 km	45.70866	-120.22782	30.6
M 2.7	11 km NNE of West Richland, Washington	2/4/2010	11 km	46.39933	-119.29599	40.1
M 2.5	14 km NNE of West Richland, Washington	12/22/2009	14 km	46.41499	-119.26349	41.5

MAGNITUDE	LOCATION	DATE	DEPTH	LATITUDE	LONGITUDE	MILES FROM PROJECT BOUNDARY
M 2.6	1 km SE of Arlington, Oregon	11/30/2009	1 km	45.70616	-120.18515	28.7
M 2.8	14 km NNE of West Richland, Washington	9/11/2009	14 km	46.41549	-119.27165	41.4
M 2.8	16 km ESE of Bickleton, Washington	8/16/2009	16 km	45.93299	-120.10432	24.3
M 2.6	24 km WNW of Boardman, Oregon	8/11/2009	24 km	45.93299	-119.98799	19.0
M 2.5	14 km NNE of West Richland, Washington	7/23/2009	14 km	46.41333	-119.26749	41.3
M 2.5	7 km SSW of Arlington, Oregon	7/20/2009	7 km	45.65899	-120.23749	32.2
M 2.5	4 km SSW of West Richland, Washington	6/4/2009	4 km	46.27016	-119.38332	30.6
M 2.8	8 km SW of Umapine, Oregon	5/29/2009	8 km	45.91549	-118.55699	40.1
M 2.7	11 km NNE of West Richland, Washington	5/16/2009	11 km	46.39466	-119.29432	39.8
M 2.7	14 km ESE of Wasco, Oregon	5/15/2009	14 km	45.53833	-120.52882	48.5
M 2.8	12 km NNE of West Richland, Washington	5/13/2009	12 km	46.40349	-119.28915	40.5
M 2.9	12 km NNE of West Richland, Washington	5/13/2009	12 km	46.40733	-119.28732	40.7
M 2.5	12 km NE of Roosevelt, Washington	5/10/2009	12 km	45.83299	-120.11015	23.7
M 2.5	11 km N of Richland, Washington	5/5/2009	11 km	46.38666	-119.26949	39.5
M 3.0	13 km NNE of West Richland, Washington	5/4/2009	13 km	46.41349	-119.27282	41.3
M 2.6	11 km NNE of West Richland, Washington	4/14/2009	11 km	46.39566	-119.29332	39.9
M 2.6	13 km N of Richland, Washington	4/8/2009	13 km	46.40499	-119.26482	40.8
M 2.7	11 km NNE of West Richland, Washington	4/7/2009	11 km	46.40149	-119.29699	40.2
M 2.5	12 km NNE of West Richland, Washington	4/7/2009	12 km	46.41099	-119.29315	40.9
M 2.5	13 km NNE of West Richland, Washington	4/7/2009	13 km	46.41099	-119.29149	40.9
M 2.7	11 km N of Richland, Washington	4/4/2009	11 km	46.38599	-119.26699	39.5
M 2.7	Washington	4/4/2009	0 km	46.39583	-119.29232	39.9
M 2.7	12 km NNE of West Richland, Washington	4/3/2009	12 km	46.40733	-119.28849	40.7
M 2.9	13 km N of Richland, Washington	3/18/2009	13 km	46.40566	-119.26499	40.8
M 2.9	13 km NNE of West Richland, Washington	3/18/2009	13 km	46.40399	-119.27032	40.7
M 2.6	12 km NNE of West Richland, Washington	3/16/2009	12 km	46.39966	-119.28482	40.2
M 2.8	12 km NNE of West Richland, Washington	3/12/2009	12 km	46.40316	-119.27132	40.6
M 2.9	13 km NNE of West Richland, Washington	3/8/2009	13 km	46.40999	-119.27732	41.0
M 2.9	12 km NNE of West Richland, Washington	2/21/2009	12 km	46.40766	-119.29165	40.7
M 2.5	13 km NNE of West Richland, Washington	2/10/2009	13 km	46.40783	-119.28015	40.8
M 2.5	9 km ENE of Zillah, Washington	6/10/2008	9 km	46.42099	-120.14465	47.6

MAGNITUDE	LOCATION	DATE	DEPTH	LATITUDE	LONGITUDE	MILES FROM PROJECT BOUNDARY
M 3.7	11 km SSW of Benton City, Washington	5/18/2008	11 km	46.16766	-119.55015	22.9
M 2.6	7 km WNW of Touchet, Washington	5/2/2008	7 km	46.05883	-118.76815	34.0
M 2.5	5 km WSW of Arlington, Oregon	4/10/2008	5 km	45.68916	-120.25999	32.5
M 2.8	3 km SE of Arlington, Oregon	3/31/2008	3 km	45.69683	-120.16965	28.2
M 2.7	9 km ENE of Zillah, Washington	12/7/2007	9 km	46.42416	-120.13782	47.6
M 2.8	1 km ESE of Arlington, Oregon	11/30/2007	1 km	45.71383	-120.18215	28.4
M 2.6	11 km NW of Roosevelt, Washington	5/2/2007	11 km	45.79999	-120.33365	34.5
M 2.7	10 km NNW of West Richland, Washington	4/16/2007	10 km	46.39699	-119.39282	39.3
M 2.5	4 km SSW of West Richland, Washington	1/31/2007	4 km	46.26699	-119.38532	30.4
M 2.7	4 km SE of Arlington, Oregon	1/8/2007	4 km	45.68549	-120.16199	28.2
M 3.4	9 km WNW of Garrett, Washington	12/20/2006	9 km	46.09483	-118.51299	46.0
M 2.6	12 km WNW of Roosevelt, Washington	8/21/2006	12 km	45.80349	-120.35332	35.5
M 2.5	9 km SSE of Mabton, Washington	11/10/2005	9 km	46.14633	-119.93099	26.2
M 2.5	4 km SSW of West Richland, Washington	7/18/2005	4 km	46.26699	-119.39115	30.4
M 2.5	4 km WNW of Benton City, Washington	2/1/2005	4 km	46.27683	-119.54599	30.4
M 2.6	3 km SE of Arlington, Oregon	3/31/2004	3 km	45.69416	-120.16715	28.2
M 2.5	8 km S of Arlington, Oregon	3/8/2004	8 km	45.64233	-120.20049	31.1
M 3.3	10 km WSW of Wallula, Washington	2/28/2004	10 km	46.03633	-119.02049	23.3
M 2.5	Oregon	12/1/2003	16 km	45.42133	-118.85732	36.5
M 2.6	9 km ENE of Zillah, Washington	11/10/2003	9 km	46.43066	-120.15115	48.4
M 2.5	6 km SSW of Milton-Freewater, Oregon	10/16/2003	6 km	45.87699	-118.42665	46.0
M 2.8	7 km S of Pilot Rock, Oregon	9/12/2003	7 km	45.42066	-118.84215	37.0
M 2.6	11 km SSW of Arlington, Oregon	5/16/2003	11 km	45.62783	-120.27482	34.8
M 2.6	9 km WNW of Touchet, Washington	2/23/2003	9 km	46.06216	-118.78599	33.4
M 2.7	5 km SSW of West Richland, WA	1/24/2003	5 km	46.26166	-119.38499	30.1
M 2.9	4 km SSE of Arlington, Oregon	1/17/2003	4 km	45.68016	-120.17749	29.0
M 2.7	4 km SW of West Richland, Washington	12/30/2002	4 km	46.27299	-119.40199	30.8
M 2.5	10 km ESE of Condon, Oregon	10/25/2002	10 km	45.18433	-120.06499	49.8
M 2.7	8 km ESE of Condon, Oregon	10/25/2002	8 km	45.19266	-120.09365	49.9
M 2.7	4 km SE of Arlington, Oregon	1/31/2002	4 km	45.68516	-120.16599	28.4
M 2.5	7 km ESE of Condon, Oregon	6/15/2001	7 km	45.20166	-120.10765	49.7

MAGNITUDE	LOCATION	DATE	DEPTH	LATITUDE	LONGITUDE	MILES FROM PROJECT BOUNDARY
M 2.6	5 km N of Boardman, Oregon	12/29/2000	5 km	45.88683	-119.70832	5.5
M 3.2	14 km NE of Condon, Oregon	8/17/2000	14 km	45.31199	-120.04149	41.5
M 2.8	9 km ESE of Condon, Oregon	8/3/2000	9 km	45.20866	-120.07332	48.5
M 2.5	7 km ESE of Arlington, Oregon	2/21/2000	7 km	45.68283	-120.12482	26.6
M 2.6	10 km ESE of Arlington, Oregon	2/15/2000	10 km	45.68766	-120.07915	24.4
M 2.6	20 km E of Arlington, Oregon	1/13/2000	20 km	45.69083	-119.93465	18.2
M 2.8	11 km E of Arlington, Oregon	1/5/2000	11 km	45.70416	-120.04949	22.6
M 2.7	16 km ENE of Arlington, Oregon	12/21/1999	16 km	45.75449	-120.00015	19.2
M 3.1	22 km NNW of Benton City, Washington	9/19/1999	22 km	46.44133	-119.62582	41.8
M 2.9	6 km NE of Granger, Washington	9/19/1999	6 km	46.38683	-120.13849	45.5
M 2.6	10 km E of Umatilla, Oregon	7/24/1999	10 km	45.92816	-119.21365	11.4
M 2.9	13 km ESE of Condon, Oregon	3/21/1999	13 km	45.18033	-120.03232	49.4
M 2.6	2 km NNE of Umapine, Oregon	3/10/1999	2 km	45.99916	-118.48049	45.1
M 2.9	25 km WSW of Echo, Oregon	9/5/1998	25 km	45.64816	-119.49082	11.2
M 2.6	11 km ENE of Lexington, Oregon	4/14/1998	11 km	45.48033	-119.53949	23.0
M 2.7	22 km NNE of Burbank, Washington	3/23/1998	22 km	46.38383	-118.88965	46.2
M 2.6	7 km NNE of Grandview, Washington	3/1/1998	7 km	46.31733	-119.88182	35.5
M 3.1	8 km NNE of Roosevelt, Washington	2/3/1998	8 km	45.81383	-120.19215	27.7
M 2.7	20 km NW of Bickleton, Washington	1/21/1998	20 km	46.14883	-120.45832	45.8
M 3.3	19 km NW of Bickleton, Washington	11/18/1997	19 km	46.13699	-120.46099	45.5
M 3.9	20 km NW of Bickleton, Washington	11/18/1997	20 km	46.14316	-120.47082	46.1
M 2.5	21 km NW of Bickleton, Washington	11/18/1997	21 km	46.14449	-120.48232	46.7
M 2.8	20 km E of Goldendale, Washington	11/11/1997	20 km	45.85099	-120.56465	45.6
M 2.7	22 km SE of Desert Aire, Washington	11/9/1997	22 km	46.53849	-119.70382	48.7
M 3.4	22 km SE of Desert Aire, Washington	11/6/1997	22 km	46.53299	-119.70832	48.3
M 3.1	14 km NNW of Bickleton, Washington	10/13/1997	14 km	46.11399	-120.37615	41.2
M 2.7	6 km S of Arlington, Oregon	9/10/1997	6 km	45.65433	-120.19799	30.6
M 2.8	7 km S of Arlington, Oregon	8/17/1997	7 km	45.64833	-120.18632	30.3
M 2.7	1 km N of Umapine, Oregon	7/23/1997	1 km	45.99233	-118.49715	44.2
M 2.7	12 km NNE of Lexington, Oregon	5/13/1997	12 km	45.54316	-119.60332	19.4
M 3.2	9 km ESE of Condon, Oregon	4/17/1997	9 km	45.18849	-120.08199	49.9

MAGNITUDE	LOCATION	DATE	DEPTH	LATITUDE	LONGITUDE	MILES FROM PROJECT BOUNDARY
M 2.6	10 km ESE of Condon, Oregon	3/28/1997	10 km	45.20049	-120.05615	48.6
M 3.1	10 km E of Condon, Oregon	3/23/1997	10 km	45.24633	-120.04932	45.6
M 3.1	11 km ESE of Condon, Oregon	3/23/1997	11 km	45.19516	-120.05082	48.8
M 3.9	10 km ESE of Condon, Oregon	3/22/1997	10 km	45.19733	-120.06715	49.1
M 2.7	9 km ESE of Condon, Oregon	3/22/1997	9 km	45.21399	-120.07365	48.2
M 2.5	25 km WSW of Echo, Oregon	3/21/1997	25 km	45.64349	-119.48799	11.5
M 2.9	11 km NNE of Lexington, Oregon	2/13/1996	11 km	45.52999	-119.60649	20.3
M 3.1	13 km SSW of Benton City, Washington	11/2/1995	13 km	46.14999	-119.56432	21.6
M 3.1	4 km S of Grandview, Washington	8/29/1995	4 km	46.20816	-119.90549	29.1
M 3.3	13 km N of Richland, Washington	6/12/1995	13 km	46.40449	-119.26282	40.8
M 2.7	2 km SE of Arlington, Oregon	11/17/1994	2 km	45.70116	-120.17749	28.5
M 2.6	3 km SE of Arlington, Oregon	11/3/1994	3 km	45.69399	-120.17182	28.4
M 2.7	4 km SE of Arlington, Oregon	10/6/1994	4 km	45.68066	-120.16349	28.4
M 2.6	5 km NNE of Pilot Rock, Oregon	9/25/1994	5 km	45.53049	-118.80032	33.6
M 2.9	4 km SE of Arlington, Oregon	9/22/1994	4 km	45.69149	-120.16332	28.1
M 2.6	7 km NNE of Roosevelt, Washington	5/24/1994	7 km	45.80983	-120.18849	27.5
M 2.9	9 km ESE of Condon, Oregon	12/18/1993	9 km	45.19183	-120.07315	49.5
M 3.0	8 km ESE of Condon, Oregon	12/16/1993	8 km	45.19583	-120.08982	49.6
M 2.8	4 km N of Milton-Freewater, Oregon	9/23/1992	4 km	45.97499	-118.38965	48.9
M 3.9	8 km WSW of Irrigon, Oregon	8/7/1992	8 km	45.86033	-119.58949	1.6
M 2.8	5 km SSW of College Place, Washington	8/6/1992	5 km	46.00283	-118.40582	48.6
M 2.8	12 km NNE of Condon, Oregon	4/20/1991	12 km	45.34449	-120.13782	42.1
M 2.5	5 km E of Wallula, Washington	4/4/1991	5 km	46.08183	-118.83349	32.3
M 2.5	9 km SSW of Prosser, Washington	3/25/1991	9 km	46.12483	-119.80099	21.8
M 2.5	4 km NW of Bickleton, Washington	12/17/1990	4 km	46.03183	-120.33649	37.1
M 2.5	4 km NW of Bickleton, Washington	11/2/1990	4 km	46.03183	-120.33799	37.2
M 2.6	17 km NW of Ukiah, Oregon	8/15/1990	17 km	45.25549	-119.07165	40.6
M 3.3	20 km SE of Desert Aire, Washington	4/22/1990	20 km	46.54399	-119.73415	49.2
M 2.8	11 km WSW of Pendleton, Oregon	3/2/1990	11 km	45.64266	-118.92832	24.3
M 2.5	15 km NNE of Heppner, Oregon	12/28/1989	15 km	45.48166	-119.48915	22.5
M 2.7	16 km ENE of Condon, Oregon	8/18/1989	16 km	45.27449	-119.98265	42.5

MAGNITUDE	LOCATION	DATE	DEPTH	LATITUDE	LONGITUDE	MILES FROM PROJECT BOUNDARY
M 2.5	14 km SW of Basin City, Washington	4/3/1989	14 km	46.48683	-119.26099	46.4
M 3.1	8 km NNW of Roosevelt, Washington	3/27/1989	8 km	45.81583	-120.26149	31.0
M 2.6	13 km E of Arlington, Oregon	2/21/1989	13 km	45.73883	-120.03082	20.9
M 2.6	11 km S of Mabton, Washington	2/10/1989	11 km	46.11383	-120.02449	27.4
M 2.8	2 km W of Touchet, Washington	1/27/1989	2 km	46.04033	-118.70015	36.3
M 2.5	19 km ENE of Condon, Oregon	11/21/1988	19 km	45.26966	-119.94415	42.0
M 2.6	16 km W of Ukiah, Oregon	10/19/1988	16 km	45.13966	-119.13865	47.2
M 3.5	12 km NNW of Roosevelt, Washington	9/29/1988	12 km	45.84983	-120.25965	30.9
M 2.8	8 km WNW of Touchet, Washington	8/26/1988	8 km	46.07049	-118.76899	34.4
M 2.7	6 km E of Condon, Oregon	8/18/1988	6 km	45.22399	-120.09949	48.1
M 2.5	8 km SSW of Ione, Oregon	8/6/1988	8 km	45.43499	-119.88232	30.4
M 2.6	5 km NE of Condon, Oregon	7/23/1988	5 km	45.26016	-120.13282	46.8
M 2.9	3 km ENE of Condon, Oregon	7/11/1988	3 km	45.24466	-120.14215	48.0
M 2.5	7 km N of Richland, Washington	3/18/1988	7 km	46.35049	-119.26815	37.1
M 2.6	7 km NNE of Richland, Washington	3/18/1988	7 km	46.35016	-119.26582	37.1
M 2.6	8 km S of Prosser, Washington	3/17/1988	8 km	46.13233	-119.78299	21.9
M 2.6	9 km NNW of Ione, Oregon	2/28/1988	9 km	45.57116	-119.88465	22.2
M 2.7	6 km ESE of Condon, Oregon	2/20/1988	6 km	45.21633	-120.10565	48.8
M 2.5	16 km SSE of Arlington, Oregon	2/14/1988	16 km	45.57699	-120.14932	31.2
M 2.5	5 km W of Heppner, Oregon	2/7/1988	5 km	45.35599	-119.62165	32.2
M 2.5	3 km ENE of Prosser, Washington	2/3/1988	3 km	46.22299	-119.73399	27.3
M 3.1	10 km ESE of Condon, Oregon	9/8/1987	10 km	45.19116	-120.07199	49.5
M 2.6	Oregon	12/8/1986	19 km	45.97666	-118.95299	23.5
M 2.5	15 km NW of Lonerock, Oregon	11/10/1986	15 km	45.19966	-119.99715	47.5
M 2.8	11 km NE of Grandview, Washington	3/2/1986	11 km	46.31149	-119.78382	33.8
M 2.8	9 km W of Benton City, Washington	2/5/1986	9 km	46.25366	-119.61632	28.8
M 3.2	8 km ESE of Wallula, Washington	2/4/1986	8 km	46.04399	-118.80999	31.8
M 2.6	13 km S of Mesa, Washington	2/1/1986	13 km	46.45233	-118.99699	48.2
M 2.9	9 km W of Benton City, Washington	1/29/1986	9 km	46.25399	-119.61549	28.8
M 2.6	12 km S of Mesa, Washington	1/22/1986	12 km	46.45949	-118.99765	48.6
M 3.0	10 km W of Benton City, Washington	1/16/1986	10 km	46.25149	-119.61799	28.6

MAGNITUDE	LOCATION	DATE	DEPTH	LATITUDE	LONGITUDE	MILES FROM PROJECT BOUNDARY
M 2.6	5 km ENE of Umapine, Oregon	12/26/1985	5 km	45.98849	-118.42715	47.4
M 2.8	9 km W of Benton City, Washington	12/19/1985	9 km	46.24999	-119.61349	28.5
M 2.6	9 km NNE of Granger, Washington	12/6/1985	9 km	46.41816	-120.14549	47.5
M 2.9	13 km ESE of Prosser, Washington	12/3/1985	13 km	46.16549	-119.60332	22.7
M 2.9	10 km W of Benton City, Washington	11/18/1985	10 km	46.25183	-119.61832	28.7
M 2.8	14 km NNE of Richland, Washington	10/27/1985	14 km	46.39883	-119.19232	41.3
M 2.5	15 km NNE of Richland, Washington	10/27/1985	15 km	46.40949	-119.18132	42.2
M 2.6	11 km WSW of Ione, Oregon	8/2/1985	11 km	45.44299	-119.95332	31.5
M 2.5	8 km SSW of Toppenish, Washington	6/21/1985	8 km	46.30216	-120.33199	47.0
M 2.5	9 km SSW of Toppenish, Washington	6/19/1985	9 km	46.29799	-120.33815	47.0
M 2.5	4 km SSE of Umatilla, Oregon	4/30/1985	4 km	45.88166	-119.32049	5.8
M 2.6	4 km NNW of Hermiston, Oregon	4/17/1985	4 km	45.87899	-119.31532	5.8
M 2.6	15 km ENE of Echo, Oregon	3/1/1985	15 km	45.80499	-119.01599	17.3
M 2.6	20 km NW of Boardman, Oregon	2/27/1985	20 km	45.96133	-119.90632	16.3
M 3.9	15 km SSE of Boardman, Oregon	2/10/1985	15 km	45.70449	-119.63449	8.8
M 2.7	15 km SSE of Wallula, Washington	1/31/1985	15 km	45.95449	-118.83682	27.9
M 2.8	20 km NW of Boardman, Oregon	1/31/1985	20 km	45.96449	-119.90249	16.3
M 2.6	21 km NW of Boardman, Oregon	1/28/1985	21 km	45.96733	-119.91099	16.7
M 2.6	9 km ENE of Zillah, Washington	12/6/1984	9 km	46.42216	-120.14565	47.7
M 2.9	12 km S of Mabton, Washington	10/4/1984	12 km	46.10549	-120.02565	27.0
M 2.5	19 km SE of Prosser, Washington	9/7/1984	19 km	46.07416	-119.60699	16.4
M 2.5	9 km S of Prosser, Washington	8/10/1984	9 km	46.12516	-119.78782	21.5
M 2.7	4 km E of Umapine, Oregon	6/6/1984	4 km	45.97399	-118.43649	46.7
M 2.5	7 km W of Highland, Washington	5/14/1984	7 km	46.12349	-119.20465	23.4
M 2.8	20 km SSW of Prosser, Washington	4/30/1984	20 km	46.04049	-119.87815	18.8
M 3.3	9 km NNE of Umatilla, Oregon	3/23/1984	9 km	45.99599	-119.29215	13.7
M 2.5	8 km W of Heppner, Oregon	1/18/1984	8 km	45.35983	-119.66482	32.4
M 2.5	8 km ENE of Zillah, Washington	1/12/1984	8 km	46.42666	-120.15149	48.1
M 2.7	9 km W of Pendleton, Oregon	10/21/1983	9 km	45.65999	-118.91565	24.3
M 3.8	6 km S of College Place, Washington	3/22/1983	6 km	45.99199	-118.40299	48.5
M 3.2	9 km NNE of Umatilla, Oregon	11/23/1982	9 km	45.99733	-119.28865	13.8

MAGNITUDE	LOCATION	DATE	DEPTH	LATITUDE	LONGITUDE	MILES FROM PROJECT BOUNDARY
M 2.7	10 km NNE of Umatilla, Oregon	10/30/1982	10 km	45.99899	-119.28749	14.0
M 2.7	24 km NNW of Bickleton, Washington	10/19/1982	24 km	46.18549	-120.46415	47.3
M 2.8	9 km NNE of Umatilla, Oregon	10/12/1982	9 km	45.99599	-119.28815	13.8
M 2.6	19 km WNW of Bickleton, Washington	8/30/1982	19 km	46.07516	-120.52715	46.7
M 2.6	20 km NW of Bickleton, Washington	7/20/1982	20 km	46.12766	-120.48832	46.4
M 3.2	16 km WSW of Bickleton, Washington	6/14/1981	16 km	45.96166	-120.50699	43.6
M 2.8	19 km ENE of Roosevelt, Washington	12/18/1980	19 km	45.83299	-120.00732	18.7
M 2.6	3 km S of Finley, Washington	3/12/1980	3 km	46.12466	-119.02565	27.7
M 2.6	11 km NNE of Boardman, Oregon	3/4/1980	11 km	45.93999	-119.66399	7.5
M 2.5	27 km NNW of Benton City, Washington	9/8/1979	27 km	46.48966	-119.64699	45.1
M 4.3	6 km S of College Place, Washington	4/8/1979	6 km	45.99133	-118.39915	48.7
M 2.7	4 km S of Wallula, Washington	3/1/1979	4 km	46.04749	-118.90565	28.1
M 3.6	7 km SE of Mabton, Washington	2/17/1979	7 km	46.16416	-119.93265	27.2
M 2.6	3 km SSE of Umatilla, Oregon	12/22/1978	3 km	45.89133	-119.32815	6.3
M 2.8	4 km SE of Wallula, Washington	3/4/1978	4 km	46.06033	-118.85549	30.5
M 3.2	7 km NNE of Boardman, Oregon	2/20/1978	7 km	45.89649	-119.64999	4.4
M 2.9	7 km NNE of Boardman, Oregon	3/31/1977	7 km	45.90183	-119.65415	4.8
M 3.1	7 km NNE of Boardman, Oregon	3/11/1977	7 km	45.89916	-119.66565	4.9
M 2.9	19 km ESE of Arlington, Oregon	7/26/1976	19 km	45.64683	-119.97382	21.5
M 3.1	7 km NW of Touchet, Washington	7/23/1976	7 km	46.08533	-118.74965	35.7
M 3.5	18 km ESE of Arlington, Oregon	7/1/1975	18 km	45.62799	-120.00199	23.4
M 3.6	18 km NW of Ione, Oregon	7/1/1975	18 km	45.60533	-120.01615	24.9
M 3.8	12 km SSE of Prosser, Washington	6/28/1975	12 km	46.09899	-119.70599	18.6
M 3.3	12 km SSE of Prosser, Washington	6/28/1975	12 km	46.10533	-119.70365	19.0
M 2.7	13 km SSE of Prosser, Washington	6/28/1975	13 km	46.09216	-119.72215	18.3
M 3.1	1 km WSW of Pasco, Washington	6/15/1975	1 km	46.23399	-119.11315	32.1
M 2.8	14 km NE of Richland, Washington	5/22/1975	14 km	46.39183	-119.17899	41.1
M 2.8	16 km NNE of West Richland, Washington	5/9/1975	16 km	46.43099	-119.25999	42.6
M 2.7	4 km S of Cayuse, Oregon	5/9/1975	4 km	45.63299	-118.55599	41.3
M 2.8	19 km SSE of Prosser, Washington	12/29/1973	19 km	46.04883	-119.65799	14.8
M 2.5	17 km S of Mesa, Washington	12/9/1972	17 km	46.41883	-119.03065	45.4

MAGNITUDE	LOCATION	DATE	DEPTH	LATITUDE	LONGITUDE	MILES FROM PROJECT BOUNDARY
M 2.6	17 km S of Mesa, Washington	12/9/1972	17 km	46.41883	-119.03049	45.4
M 2.5	15 km WNW of Ione, Oregon	8/27/1972	15 km	45.53283	-120.01615	28.3
M 2.6	15 km WNW of Ione, Oregon	8/21/1972	15 km	45.57516	-119.98899	25.3
M 3.1	8 km S of West Richland, Washington	1/4/1971	8 km	46.23083	-119.36315	28.1
M 2.8	4 km WNW of Grandview, Washington	12/9/1970	4 km	46.27016	-119.95115	34.0
M 3.0	5 km SSE of Satus, Washington	11/29/1970	5 km	46.22516	-120.11532	35.9
M 2.9	14 km NNE of West Richland, Washington	11/14/1970	14 km	46.42983	-119.29899	42.1
M 2.9	16 km NNE of West Richland, Washington	11/7/1970	16 km	46.44199	-119.29149	43.0
M 2.5	4 km ENE of Echo, Oregon	9/29/1970	4 km	45.76049	-119.14549	11.5
M 2.8	9 km ENE of Zillah, Washington	6/22/1970	9 km	46.42849	-120.15099	48.2
M 2.5	3 km NNE of Satus, Washington	4/29/1970	3 km	46.29966	-120.13782	40.6
M 2.6	3 km N of Satus, Washington	4/22/1970	3 km	46.29883	-120.15515	41.1
M 2.7	6 km WNW of Mabton, Washington	4/4/1970	6 km	46.22833	-120.07999	35.0
M 2.5	14 km NNE of West Richland, Washington	8/31/1969	14 km	46.42916	-119.29165	42.2
M 2.6	14 km NNE of West Richland, Washington	7/31/1969	14 km	46.41849	-119.28449	41.5
M 2.8	6 km N of Boardman, Oregon	4/19/1969	6 km	45.89749	-119.70349	5.9
M 6.0	3 km SW of Garrett, Washington	7/16/1936	3 km	46.03099	-118.42899	48.1
M 4.7	Near Umatilla, Oregon	3/7/1893	Unknown	45.89999	-119.29999	7.4