SR 3 Freight Corridor - New Alignment

previous project name:

SR 3 Belfair Bypass

Geology and Soils Discipline Report Update

Original Report:

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September 19, 2011

Updated:

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and

SCJ Alliance

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Prepared for:

U.S. Department of Transportation Federal Highway Administration

Washington State Department of Transportation

Purpose of this Document

In September 2011, the Washington State Department of Transportation (WSDOT) prepared the SR 3 - Belfair Bypass *Geology and Soils Environmental Discipline Report* in support of the project's National Environmental Policy Act (NEPA) *Environmental Assessment*.

Following preparation of the Revised EA in 2013, funding for the Freight Corridor was no longer available. However, in June 2019, the Legislature provided $66.9 million to design and construct the SR 3 Freight Corridor – New Alignment (formerly SR 3 – Belfair Bypass). Due to the time lapse between project activities (over six years), WSDOT initiated a series of activities to revisit the project's design and alignment, as well as potential environmental impacts.

In 2020, a new proposed alternative route was identified, which launched the need to update the 2011 discipline reports for the project. As such, this document provides updates to the 2011 Geology and Soils Discipline Report based on changes in project design, study area, and new regulations/guidance since the report was written.

Original page numbers (in the 2011 document) are referenced and text below each chapter title indicates which sentences/paragraphs are replaced.

The following chapters did not require any updates:

- Chapter 1, Executive Summary
- Chapter 3, Studies and Coordination

Chapter 2: Introduction

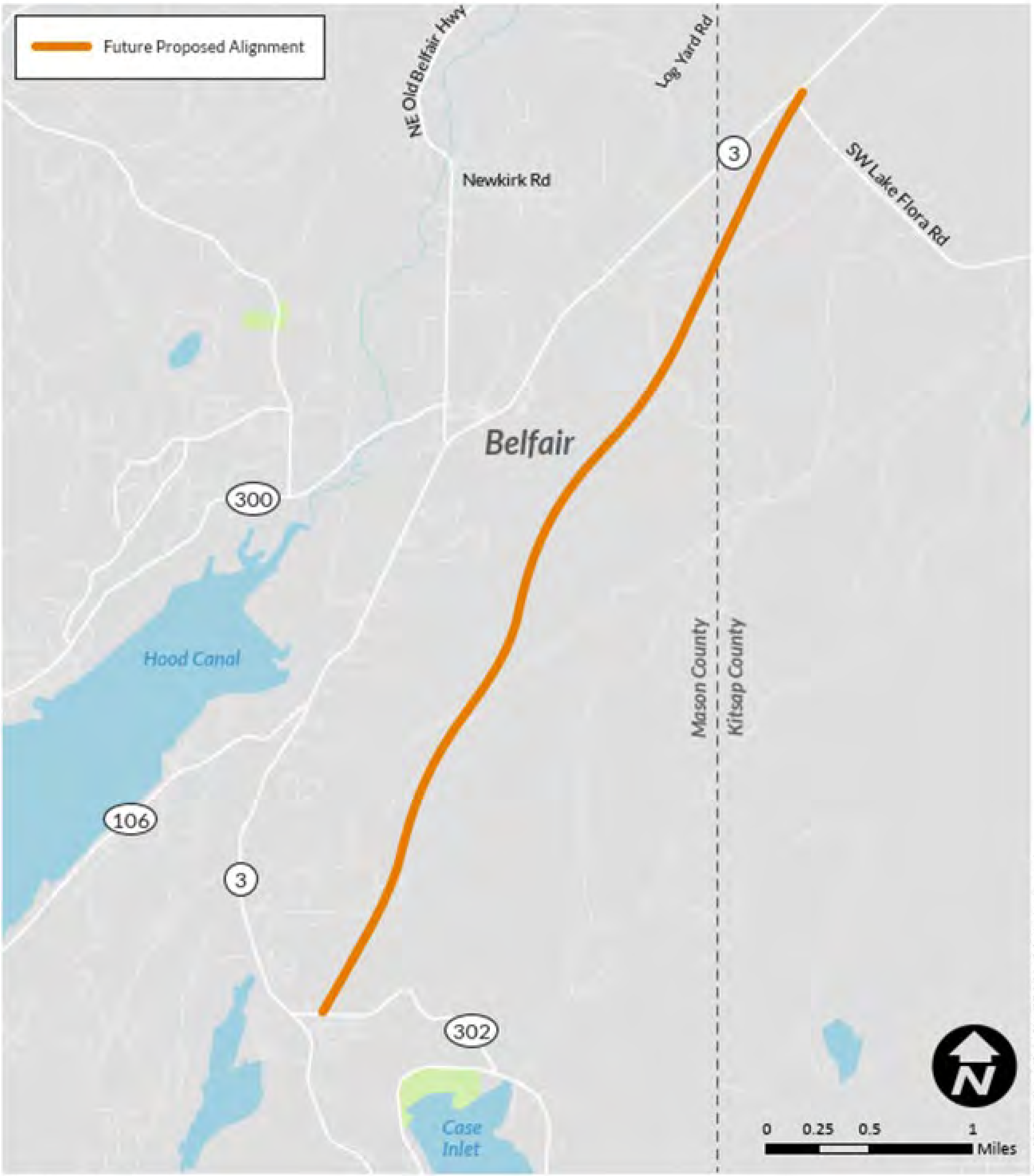
Replace the entire chapter with the following text and graphics:

Description of Proposed Action

The proposed SR 3 Freight Corridor – New Alignment project would construct a two-lane 6.5-mile limited access highway, with a design and posted speed of 50 miles per hour (mph), on a new alignment approximately 3,000 feet to the east of existing State Route (SR) 3. The major portion of the highway would run through Mason County, while the northern end would be located in Kitsap County. The proposed alignment would begin at MP 22.81 on SR 3 and connect back to the existing SR 3 alignment at MP 29.49 (see Figure 1). The south end connection to existing SR 3 is proposed just south of the intersection with SR 302, and the north connection is just north of SW Lake Flora Road. The proposed bypass highway would carry regional through traffic from Shelton to Bremerton and would be the mainline for SR 3. The existing SR 3 would become a "Business Loop" serving downtown Belfair with connections to SR 106, SR 300, and the Old Belfair Highway.

A typical cross-section of the proposed improvements is shown in Figure 2 and the construction elements would include the following:

- Two 12-foot travel lanes with 8-foot shoulders.
- Stormwater treatment facilities – natural dispersion and infiltration, compost-amended vegetated filter strips, and treatment wetlands.
- Acquiring right-of-way and implementing managed access.
- A roundabout at the north end of the alignment to connect the existing SR 3 corridor to the new corridor at Lake Flora Road.
- Two roundabouts to connect the south end of the new corridor to the existing SR 3 corridor at SR 302.
    - The western roundabout would provide access to the existing SR 3 corridor
    - The eastern roundabout would provide access to SR 302 and the proposed SR 3 Freight Corridor
- Right-in-right-out access to North Mason High School and Belwood Lane.



© Mapbox, © OpenStreetMap

Figure 1. SR 3 Freight Corridor Project Vicinity

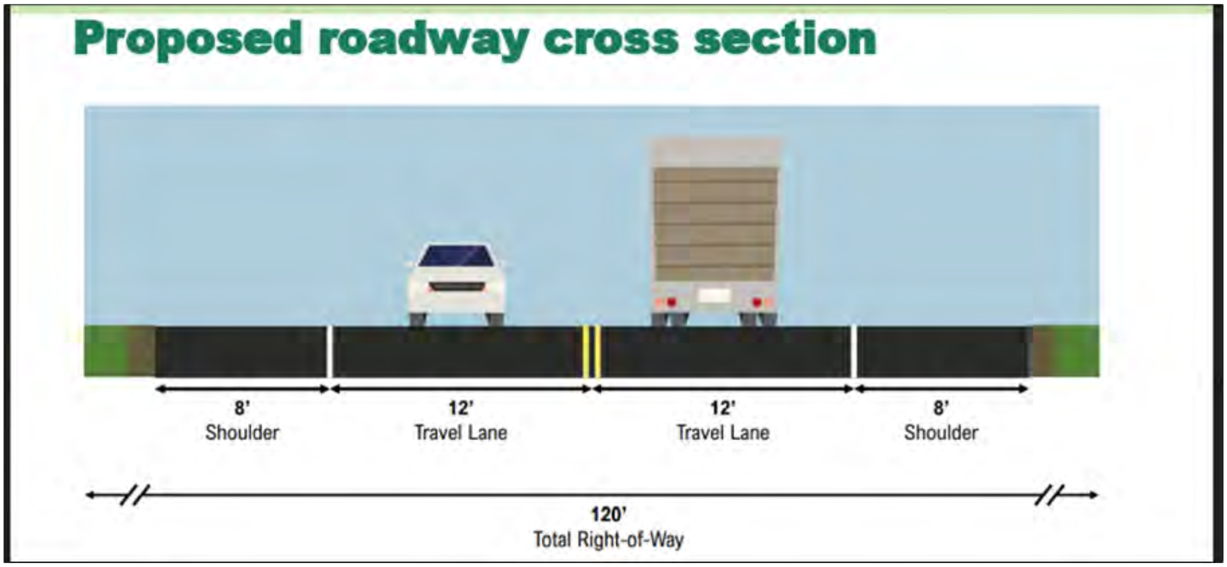


Figure 2. SR 3 Proposed Highway Cross-section

Purpose and Need

Why Do We Need the SR 3 Freight Corridor Project?

A new Freight Corridor around Belfair is needed to improve regional mobility for freight, passenger vehicles and transit. The improvements will increase mobility, reduce congestion through Belfair, and improve safety.

Regional Mobility

SR 3 in the Belfair urban area experiences chronic traffic congestion and declining operational Levels of Service (LOS) for traffic. Because SR 3 is the major north-south link between Mason and Kitsap counties, Belfair is a choke point on this regional highway and serves as the only freight route through southwest Kitsap and northeast Mason Counties. SR 3 is designated as a critical rural freight corridor and is part of the National Highway Freight Network (NHFN). SR 3 is also identified as a National Highway System (NHS) route and as a Highway of Statewide Significance (HSS). The National Highway System route designation extends from the Hood Canal Bridge in the north to Shelton in the south, passing through the Belfair urban area, the City of Bremerton, the Puget Sound Industrial Center - Bremerton (PSIC - B), and connecting with SR 16.

SR 3 carries most of the daily commute trips from SR 106, SR 300 and populated coastal areas in Mason County north to Bremerton and via SR 16 to points in Pierce and King Counties. Regional traffic using SR 3 must pass through the commercial area of Belfair, which has numerous access points with high turning volumes. Southbound traffic destined for Shelton, Grays Harbor, and Olympia must also pass through Belfair.

Traffic Operations

A combination of freight, commute, and recreational traffic volumes cause severe commute hour congestion through the Belfair urban area. Congestion is occurring during peak commute hours, weekends, holidays, and during the tourist season. SR 3 had up to 19,000 annual average daily vehicles per day in 2018 south of Lake Flora Road.

Highway LOS analysis shows the one-mile segment of the SR 3 mainline segment north of Lake Flora Road (MP 28.78 to MP 29.78) is LOS D. The signalized intersection at NE Clifton Lane operates at LOS D and E during the AM and PM peak periods, respectively, failing to meet LOS standards. The unsignalized intersection at Old Belfair Highway is operating at failing conditions of LOS E and F during the AM and PM peak periods, respectively.

Several studies conducted over the last decade have demonstrated that traffic congestion and safety concerns will eventually overwhelm SR 3 in the approaching years. Traffic projections show that without the Freight Corridor, operational performance for freight and regional through traffic on the portion of existing SR 3 through Belfair will continue to decline to the point of chronic failure. It is expected that the corridor will operate at LOS E in 2045 and that, if no action is taken, travel times in the project area will continue to worsen as future traffic volumes increase.

The current highway does not support regional transportation needs. This route experiences seasonal fluctuations from tourist traffic and recreational users and is the most direct and expedient alternate land route for traffic from Bremerton to Interstate 5 if SR 16 or the Tacoma Narrows Bridge becomes blocked. Southbound traffic destined for Shelton, Grays Harbor, and Olympia must pass through Belfair. As land located in the corridor continues to be developed, and regional trips continue to increase, traffic congestion through Belfair will be exacerbated. The Bremerton Economic Development (BED) Study for US 101, SR 3 and SR 16 in Mason and Kitsap Counties (WSDOT 2012a) showed the Freight Corridor project was the top priority project for the local communities and stakeholders.

If the Freight Corridor project is not built, the SR 3 would be an important regional facility that will fail to provide efficient regional and local traffic mobility. A bypass would improve the roadway system around Belfair and would reduce travel time.

Improve Safety

Crash records in the study area indicate that the type and severity of crashes appear to be consistent with congested urban conditions. Rear-end and property damage only (PDO) or non-injury crashes account for the greatest number of crashes. The number of crashes tends to increase under congested conditions, but the severity of those crashes is generally lower, due to lower speeds. In the study area, between January 2018 and December 2022, 402 crashes were reported. Two were fatal crashes and eight were serious injury crashes. One serious injury crash was at the Lake Flora Rd intersection (MP 28.78). The remaining two fatal crashes and seven serious injury crashes were non-intersection crashes. During this time, 330 crashes occurred between the study intersections with the majority occurring between Lake Flora Road to NE Clifton Lane (42%) and between NE Clifton Lane to SR 106 (40%).

Support of Local Plans

The area is developing based on local agency comprehensive plans and zoning. However, the area lacks a completed transportation network appropriate for the community. The Bremerton Economic Development (BED) Study showed the SR 3 Freight Corridor is the top priority project for the local communities and stakeholders. The Freight Corridor has been included in the transportation elements of the Mason County and the City of Bremerton comprehensive plans.

What is the purpose of the SR 3 Freight Corridor Project?

The purpose of constructing a Freight Corridor is to provide a reliable high-speed regional route between Kitsap and Mason Counties, moving freight and regional traffic between Shelton and Bremerton, bypassing the urban center of Belfair. This project would reduce congestion and improve safety through Belfair and provide an alternate route during recurring highway closures resulting from vehicular crashes and other incidents. Implementation of this project would provide safe and reliable regional access to jobs, goods, and services, improve efficiencies for all public service providers, and lower the current crash rate on SR 3 through Belfair.

Project Alternatives

After conducting preliminary studies, WSDOT narrowed the number of potential alternatives to the build and the no-build alternatives.

Alternative 1: No Build Alternative

Under the No Build Alternative, the project would not be built. Only routine maintenance, repair, and minor safety improvements would take place on SR 3 in the study area over the next 20 years. The No Build Alternative would not improve travel times on SR 3.

WSDOT is evaluating the No Build Alternative to provide a reference point for comparing the effects, both positive and negative, associated with the proposed Build Alternative.
After conducting preliminary studies, WSDOT narrowed the number of potential alternatives to the Build and the No Build Alternatives.

Alternative 2: Build Alternative (Proposed Action)

The proposed SR 3 Freight Corridor – New Alignment project Build Alternative would construct a two-lane 6.5-mile limited access highway, with a design and posted speed of 50 miles per hour (mph), on a new alignment approximately 3,000 feet to the east of existing SR 3. The major portion of the highway would run through Mason County, while the northern end would be located in Kitsap County. The proposed alignment would begin at MP 22.81 on SR 3 and connect back to the existing SR 3 alignment at MP 29.49 (see Figure 1). The north end connection to existing SR 3 is proposed just north of SW Lake Flora Road, and the south connection is just south of the intersection with SR 302. The proposed bypass highway would carry regional through traffic from Shelton to Bremerton and would be the mainline for SR 3. The existing SR 3 would become a "Business Loop", serving downtown Belfair with connections to SR 106, SR 300, and the Old Belfair Highway.

Chapter 4 Affected Environment

Page 6, last paragraph, Climate, replace with:

The subject corridor is within the Puget Sound Lowlands climatic zone, which has a temperate maritime climate. Winters are typically cool and wet, while summers are generally mild and dry. Winter average temperatures are typically in the 30s to 50s and average summer temperatures are generally in the 60s to 70s. Average annual precipitation is approximately 52 inches and average annual snowfall is approximately 4 inches (Western Regional Climate Center, 2021).

Page 10, 2nd full paragraph, 3rd sentence, replace with:

Additional planning and resource studies have been conducted by (and coordinated with) the Washington State Department of Ecology, Kitsap and Mason Counties and other stakeholders within WRIAs 14 and 15, culminating in a draft watershed plan for WRIA 14 in January 2021 and for WRIA 15 in January 2021. As of this writing, neither draft plan has been approved by all stakeholders, according to DOE personnel involved in composing the draft reports.

Page 12, last paragraph, replace with:

Although not mapped at the surface along the proposed alignment, the following unit has been mapped and may be encountered locally at depth beneath Vashon Advance Outwash.

Page 15, first two paragraphs, 4.7 Corridor Engineering Geology and Groundwater, replace with:

The SR 3 Freight Corridor project (Build Alterative) is approximately 6.5 miles long. Based on the current project description, the proposed project would involve new cuts and fills, retaining structures, new intersections and intersection modifications, ditches, storm sewer systems, stormwater treatment facilities, culverts, and possible culvert extensions/replacements along the existing SR 3/SR302 segments. It is our understanding that structure site data and earthwork quantities for the proposed alignment are not available at this time. The following is a general outline of the engineering geologic/geotechnical issues relevant to the proposed corridor.

Among the engineering geologic/geotechnical issues that are relevant to the project will be the preparation of cuts and fills, extension and/or replacement of culverts, new and revised intersections (including a grade separation crossing at MP 23.43 and roundabout intersections at about MP 23.79), possible soft soil issues in upland wetland/ponded areas and depressions, creek/drainage crossings, possible landslide/slope stability issues in ravine(s) and near the southern end of the project, as well as the possible need for special investigation of mapped fault scarps and/or lineaments within the project corridor.

Page 16, third full paragraph, replace with:

From approximately the existing intersection of SR3 and SR302, the new route trends northeast across primarily upland prairie, mapped as being underlain by glacial till.

Page 16, last paragraph, replace with:

From the Alta neighborhood, northward, the alignment continues to traverse upland prairie areas, dotted locally by wetlands. Based on preliminary cross sections provided by the region, cuts and fills up to about 25 feet high are anticipated locally in this northern section of the project.

Page 17, first paragraph replace with:

The alignment crosses the trend of several mapped fault scarps (known as the "Sunset Beach scarps") that are possibly associated with Holocene-age (last 10,000 years) seismic ground deformation (Haugerud, 2009; Polenz et al., 2009; Nelson et al., 2008; Haugerud et al., 2003). The approximate locations of these scarps are shown in Figure 7. If significant structures (other than roadway grading) are anticipated in this area, detailed subsurface fault investigation(s) may be warranted during the PS&E-level geotechnical investigation.

Page 20, last paragraph and Page 21, first paragraph replace with:

"The Seattle fault zone is a 4- to 7-km-wide east-trending fault zone that extends from the Cascade Range foothills on the east across the Puget Lowland to Hood Canal, crossing Lake Sammamish, Lake Washington, Puget Sound, Bainbridge Island, and the Kitsap Peninsula. Various strands of the fault zone lie largely concealed beneath the major population centers of Seattle, Bellevue, and Bremerton. It forms the northern boundary of a belt of bedrock exposures that cross much of the Puget Lowland. The depth to bedrock north of the fault zone is as much as 1 km (Yount and others, 1985 #4746; Johnson and others, 1999 #4729). The fault zone has been imaged on seismic-reflection profiles collected in Puget Sound and adjacent waterways (Yount and Gower, 1991 #4744; Johnson and others, 1994 #4730; Pratt and others, 1997 #4737; Johnson and others, 1999 #4729), correlates with large gravity and magnetic anomalies (Danes and nine others, 1965 #4723; Blakely and others, 2002 #4716), and is represented by a prominent velocity anomaly on tomographic models (Brocher and others, 2001 #4718; Calvert and others, 2001 #4722). These data indicate the zone consists of three or more south-dipping thrust faults that form the structural boundary between the Seattle uplift on the south and the Seattle basin on the north. Blakely and others (2002 #4716) have named three of these structures the frontal fault, the Blakely Harbor fault, and the Orchard Point fault. Nelson and others (2003 #5868) termed the "frontal fault" the "Seattle fault." The Seattle fault zone also includes north-dipping reverse or thrust faults, such as the Toe Jam Hill fault (Nelson and others, 2000 #4733; 2002 #4736; 2003 #5868), which forms a complex scarp in densely forested terrain on Bainbridge Island. Slip on both south- and north-dipping faults within the zone probably is associated with offset on a south-dipping master fault (e.g., Pratt and others, 1997 #4737) at depth. Surface-deforming earthquakes have occurred on the Seattle fault zone in the latest Holocene, most recently about 1040–910 cal yr BP, (A.D. 900–930) as summarized by Nelson and others (2014 #7675)." (USGS 2021)

Page 21, last paragraph and Page 22, first paragraph replace with:

"The Saddle Mountain deformation zone (Blakely and others, 2009 #7646) consists of numerous mapped faults, including Saddle Mountain East and West faults described and discussed by Wilson (1975 #5721) and Wilson and others (1979 #5663), Canyon River fault of Walsh and Logan (1997 #6225, 2007 #7630), and the Frigid Creek fault of Blakely and others (2009 #7646). According to Blakely and others (2009 #7646), aeromagnetic data suggests the zone of deformation extends at least 35 km, from 6 km southwest of Lake Cushman northward to the latitude of the Seattle, but the total length of the deformation zone may be 45 km. The zone accommodates shortening of Puget Lowland and might possibly be kinematically linked to the Seattle fault [570]. Detailed study of the Saddle Mountain faults, which included trenching and isotopic dating, indicates that the most recent coseismic surface deformation occurred in the Holocene (Wilson, 1975 #5721; Wilson and others, 1979 #5663; Barnett and others, 2015 #7646), and LiDAR reveals fault scarps offsetting Holocene alluvium (Haugerud and others, 2003 #6211)." (USGS, 2021)

Page 23, first paragraph, first sentence, replace with:

Soil liquefaction occurs in loose, saturated, non-cohesive and often sandy or silty soils and low plasticity silts and clays when the water pressure in the pore spaces increases to a level that is sufficient to separate the soil grains from each other.

Page 23, last paragraph and Page 24, first paragraph (Seismic Ground Shaking) replace with:

Based on the United States Geologic Survey (USGS) Uniform Hazard Tool that references the latest update of the 2014 Update to the National Seismic Hazard Maps, (accessed March 16, 2021), deep-focus earthquakes within the subducting Juan de Fuca Plate pose the highest risk probability to the subject project area, followed by subduction zone earthquakes at the offshore plate boundary (Cascadia Subduction Zone or fault), and shallow crustal earthquakes within the North America Plate. The Seattle Fault zone is identified as a potentially significant local crustal source of earthquake shaking. Potential Richter magnitudes from deep-focus and shallow crustal earthquakes in the area are estimated to be in the 6.5 to 7.5 range. Subduction zone earthquakes are estimated to be capable of Richter magnitudes in the 8 to 9.5 range. From the seismic risk mapping by the USGS, the peak horizontal acceleration (%g) for an event with a 7% probability of exceedance in 75 years for Site Class B in the project vicinity is approximately 0.53 g, based on the USGS Uniform Hazard Tool (https://earthquake.usgs.gov/hazards/interactive/) using the U.S. Dynamic: Conterminous edition for 2014 v4.2.0).

Page 24, first two full paragraphs (Ground Motion Amplification) replace with:

Ground motion is caused by seismic waves propagating through the subsurface from the energy released during an earthquake. The presence of soil overlying bedrock can change the intensity of ground shaking felt at the ground surface from what would be felt on bedrock alone. Very soft or loose soils, shallow groundwater, and topographic conditions may cause the ground shaking to be amplified (greater than that felt on rock) or attenuated (less than that felt on rock). For small or distant earthquakes that cause low levels of shaking, liquefiable soils are likely to amplify the ground shaking. For large nearby earthquakes that cause higher levels of shaking, little amplification or even attenuation of higher-frequency ground motions are possible before liquefaction will occur (Kramer, 1996).

The soil conditions along the subject corridor primarily consist of glacial and alluvial deposits, local organic deposits and locally perched groundwater tables. It is likely that ground motion from a moderate to strong earthquake would impact the project corridor. To account for this amplification, the appropriate site class assigned to the soil profile should be determined in accordance with Table 3.10.3.1-1 of the AASTHO LRFD Bridge Design Specifications, and the site response factors selected following the recommendations in the WSDOT Bridge Design Manual.

Page 26, 4.9 Geologic Resources, 2nd sentence, replace with:

There are no currently WSDOT-approved/active sources of aggregate within the proposed corridor, based on a search of the WSDOT Aggregate Source Approval website and information obtained from Olympic Region Materials (January 2021).

Chapter 5 Potential Study Corridor Impacts

Page 27, Structural Foundation Excavation:

Remove entire section

Page 28, Landslides – Build Alternative: Proposed Action replace with:

Based on the literature review and site reconnaissance, risks associated with potential landslides appear to be primarily located on slopes adjacent to the unnamed tributary of Coulter Creek in the southern portion of the alignment and could impact design and construction of the embankment. In addition, potential landslide risks may be present at the southern terminus of the project (near the Allyn Landslide) and may impact the design of cut slopes in that area.

Page 28, Landslides – Seismic Hazards: Proposed Action replace with:

Potential seismic hazards that would require mitigation during design and construction are primarily related to critical structures (such as retaining walls and intersections) within the project. Potential impacts include seismic ground shaking and potential liquefaction effects in areas of soft and/or saturated ground.

Page 30, Use of Public and/or Private Aggregate Sources, first sentence, replace with:

No currently approved aggregate resource is available within the proposed highway corridor, so use of WSDOT sources and/or private local aggregate sources will be required to construct the structural pavement section.

Chapter 6 Proposed Study Corridor Mitigations

Page 34, first full paragraph, first sentence, replace with:

Currently potential landslide hazards are present mainly adjacent to the unnamed Tributary to Coulter Creek and possibly at the south end of the project, near the Allyn Landslide. During the design-phase engineering geologic/geotechnical investigation, these potential hazards will be investigated and mitigated if found to be present in the alignment corridor. Use of internal design guidelines and manuals for soil cuts and embankments, highway runoff, and temporary erosion and sediment control should avoid the creation of new landslides.

Chapter 7 References

Add the following references:

U.S. Geological Survey, 2021, "Quaternary Fault and Fold Database for the United States," accessed January 27, 2021 from USGS website: http://eruthguake.usgs.gov/hazards/gfaults/

Washington State Geological Survey, 2018, “Landslide Compilation Geodatabase,” interactive website search tool accessed on February 4, 2021 at: https://geologyportal.dnr.wa.gov/#natural_hazards