

Section 6: Natural and Built Environment

This section covers the natural and human-made aspects of the corridor that will have significant impact on future roadway improvements. While there are many naturally occurring conditions and human-made development within the corridor, this study focused only on those that could be significantly impacted by, or will have significant impact on, the improvement options considered.

What Natural Conditions Did the Study Focus on?

The Green River Valley is a river valley with generally wet and unstable soils. It is inhabited by a large variety of flora and fauna. These are conditions that will have direct impact on the costs and design of any proposed improvements.

This corridor study does not provide any National Environmental Policy Act (NEPA) or State Environmental Policy Act (SEPA) analysis, but rather focuses on the major environmental elements that will pose significant issues on future development of the corridor including soils, wetlands, floodplains, liquefaction, wildlife and fish habitat, and aquifer recharge areas.

For details on environmental constraints see **SR 167 Corridor Technical Memorandum No. 3: Existing Conditions**

What is the Geology in the Corridor?

Geological events that have occurred during millions of years have significant impacts on today's development in the Green River Valley. To better understand the environmental challenges we currently face, it is useful to have an understanding of the geological history of the Green River Valley.

The Green River Valley is part of the Puget Lowland, which is a broad, low-lying region located between the Cascade Mountain Range to the east and the Olympic Mountains to the west. The Puget Lowland was formed through millions of years

of glacial and volcanic activity. Approximately 18,000 years ago, an ice sheet one-mile thick covered the region from British Columbia to just south of Olympia. By 14,000 years ago, the ice had retreated to Seattle. At about the same time, thinning ice allowed marine waters to return to the Puget Lowland and the seawater lifted the ice and caused it to break up into icebergs which covered the entire region. Approximately 10,000 years ago, the glaciers disappeared and ended the Ice Age in this region. The Green River Valley was historically a fjord called Lake Russell.

What is Hydrology?

Hydrology is the study of the movement, distribution and quality of water throughout the Earth. Hydrological research provides insight for environmental engineering, policy development and planning.

As a result, the Green River Valley has a considerable number of wetlands, streams, and floodplains. Because the Valley is very wet and flat with a high underground water table, water does not drain (absorb into the ground) very well and the area floods easily. This presents significant challenges for any development in the Valley to avoid impacts to wetlands and streams. Current regulations require large tracts or substantial amounts of land to collect, treat, and drain stormwater runoff.

In addition, approximately 5,600 years ago, a massive mudflow (Lahar) occurred on Mt. Rainier and flowed into the Green River Valley. As a result, the ground in the Green River Valley provides very fertile soil for agricultural products such as hops, peas, and lettuce. However, these soils could become unstable during an earthquake.

There are two major soil issues that any roadway improvement on SR 167 will have to address: hydrology and liquefaction. Hydrology issues include mitigation for stormwater treatment (stormwater quality and stormwater detention) and wetland impacts. Liquefaction issues primarily impact bridges and other large structures. Existing structures may require expensive retrofitting or replacement to meet current seismic (earthquake) standards.

Liquefaction

Liquefaction occurs when water-saturated sandy or silty soil loses strength during earthquake shaking (similar to quicksand). It can cause major structural failure if not properly accounted for. Liquefaction only occurs in water-saturated soil. It has an impact on bridges and other large structures, which may require expensive retrofitting or replacement to meet current seismic (earthquake) standards.

The Washington State Department of Natural Resources (DNR) has developed liquefaction susceptibility maps which outline areas where liquefaction is most likely to happen (See Exhibit 6-1). State and local governments develop hazard mitigation plans and delineate geologically hazardous areas as required by the Growth Management Act.

The current DNR maps indicate that the majority of SR 167 is located within a moderate to high liquefaction susceptibility area. The portion of SR 167 west of SR 410 is an area of high liquefaction susceptibility. The soils in the Green River Valley are mostly a silt loam or a silty clay loam and include layers of sand and clay with very few pebbles. These soils are excellent for growing hops, peas, and lettuce but are problematic for structure foundations.

In addition, some of the bridge structures along SR 167 do not meet current design standards for earthquake or liquefaction. The design of structures and roadbeds will have to take this into consideration during development of any improvement project. Soils that are susceptible to liquefaction may require retrofit measures such as ground stabilization, selection of deeper foundations, different types of foundations, and/or selection of appropriate structural systems to accommodate anticipated displacements.

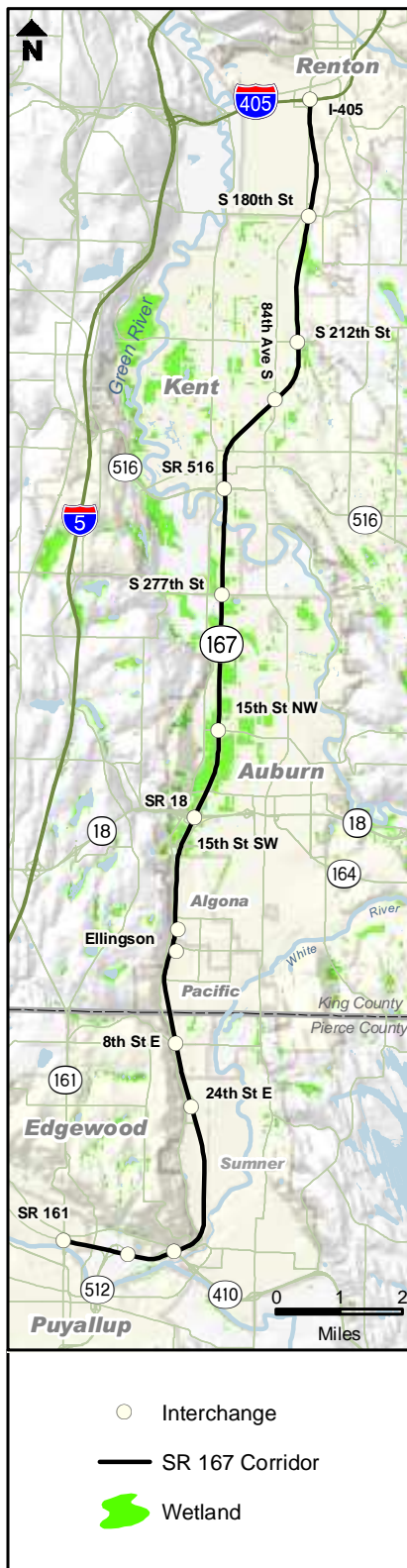
The SR 167 Corridor has 54 bridge structures that must be assessed to determine the appropriate level of retrofit (if any) or if replacement is necessary.

Exhibit 6-1
Liquefaction Susceptibility in the SR 167 Corridor



Source: DNR & Perteet GIS 2006

Exhibit 6-2
Wetlands in the SR 167 Corridor



Source: Perteet GIS

Wetlands

Wetlands are areas that are regularly or seasonally saturated by surface water or groundwater and are characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions. Examples of wetlands include what are commonly referred to as swamps, bogs, fens, marshes, and estuaries. Wetlands provide water quality functions, act as flood storage areas, and are a valuable natural resource to our environment. They can help moderate stormwater flows by slowing down and retaining flood waters during periods of heavy rain. They can help reduce flooding downstream and clean the water of materials such as dirt and oil. Wetlands may also provide vital habitat for many plants and animals.

In May 2005, WSDOT conducted a study on the SR 167 Corridor watershed. The “Enhancing Transportation Project Delivery Through Watershed Characterization, SR 167 Study – Report to UCO” used GIS data, to identify the potential of 105 wetlands and 27 wetland ditches within 300 feet of the existing SR 167 highway. Exhibit 6-2 illustrates the potential range of wetlands in the corridor and study area. Many of these wetlands within 300 feet of SR 167 are considered “riparian” because of their association with Mill Creek, the Green River, Garrison Creek, and Panther Creek. However, wetlands that are not directly connected with these stream systems are also located throughout the corridor.

Expanding SR 167 will likely affect wetlands. To address these impacts, proper design techniques, including the use of retaining walls and near vertical road side slopes (protected with guardrail), can help avoid and/or greatly minimize the potential adverse impacts to wetlands.

WSDOT’s Best Management Practices (BMP) policy on impacts to sensitive areas, in priority, is:

- Avoid impacts (use retaining walls, steep slopes, etc.)
- Minimize impacts
- Mitigate for the impacts

Culverts for Fish Passage

When SR 167 was first constructed in the 1970's there were many culverts placed to allow streams, creeks, and ditches to flow from one side of the highway to the other. The culvert structures are in two primary forms: round culvert pipes and box culverts. Many of these streams and creeks contain fish, however back then the technology did not exist to understand culvert design for environmentally appropriate fish passage. Today, all culverts are being identified and evaluated for fish-presence, as well as if the culvert represents a barrier to fish passage. This effort is being coordinated through WSDOT, the Washington Department of Fish & Wildlife, and the local tribal nations.

There are many culverts along the corridor, however only those that could potentially be affected by expansion of the freeway were identified for this report.

At this time only the sections of SR 167 between 24th Street E and S 277th Street and from S 180th Street to I-405 have been closely analyzed. Only two culverts have been identified as partial barriers to fish passage, both culverts are located just north of 8th Street E, in Pacific. These culverts carry fish species Coho, chum, and Steelhead and they lead to the White River.

Today's understanding of the needs of fish can help to engineer solutions to the barrier and partial barrier culverts. Each culvert retrofit (or replacement) must be custom designed for that particular location.

Wildlife and Fish Habitat

The WSDOT Watershed Characterization Study and the Corridor GIS screening identified the likely presence of several endangered/protected species along the SR 167 corridor. These species include Blue Heron, Chinook salmon, Chum salmon, Coho salmon, Pink salmon, Sockeye salmon, Steelhead trout, and Bull trout.

These species are likely found along the major watercourses, as illustrated in Exhibit 6-4, including:

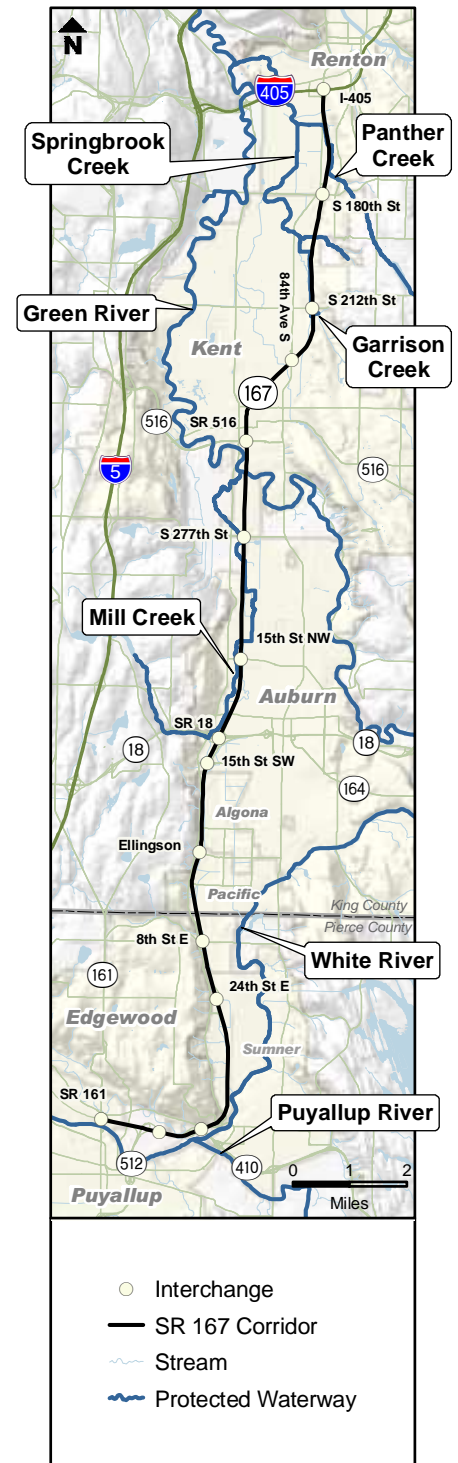
- Panther Creek in Renton
- Springbrook Creek in Renton
- Green River in Kent
- Garrison Creek in Kent
- Mill Creek in Kent and Auburn
- White River in Auburn
- Puyallup River in Puyallup

Construction permits will likely include added requirements so that these species are not harmed. This can increase the cost of project development and/or design significantly.

Various state, federal, and county wildlife regulations require special emphasis in identifying, locating, and protecting certain species. Protection sometimes requires construction activities be kept a certain distance away from an area or habitat, or that wildlife be buffered by a specified number of acres within the project limits for protection.

Similar to wetlands, the presence of protected species adds complexity to the design and permitting process for any future project.

Exhibit 6-4
Wildlife and Fish Habitat in the SR 167 Corridor



Source: Perteet GIS

Aquifer Recharge Areas

The SR 167 Corridor crosses a shallow aquifer that affects the river water levels in the Green, White, and Puyallup River Valleys. A deeper aquifer exists near Auburn. These aquifers are the primary water source for the City of Auburn. They are also tapped by wells operated by the Cities of Kent, Algona, Pacific, Sumner, and the Valley Water Association.

These aquifers are considered “Sole Source Aquifers”, which requires special measures during any improvement project to prevent groundwater contamination, both during construction and after the project is built. The federal EPA (Environmental Protection Agency) requires that stormwater runoff must be treated before it infiltrates into the aquifer. WSDOT storm drainage design standards for any road widening near these areas must take into account the Sole Source Aquifers and integrate special measures to avoid negative effects.

What are the Land Use Characteristics in the SR 167 Corridor?

Although there are still pockets of agricultural land throughout the corridor and adjacent to SR 167 farming in the Green River Valley is becoming less and less prevalent. Beginning with the construction of the freeway in the 1970’s, land use in the Green River Valley has been transformed from largely agricultural use to suburban use. It has developed into a mix of residential, industrial warehouse, commercial retail centers, and supporting office and manufacturing services. The residential land uses have primarily been in major subdivisions and apartment complexes, which have to a degree, established South King and North Pierce County as a relatively affordable place to live in the Central Puget Sound region.

The various cities in the Green River Valley have a mix of land use designations. Tukwila and Kent have specific areas designated as manufacturing/industrial centers. Renton, Tukwila, Kent, Auburn, and Puyallup have areas within each city designated as urban centers. The Green River Valley also has the highest concentration of warehouses in the region.

Exhibit 6-5 provides an example of how land use in the Green River Valley has changed over the last seventy years. During that period the Lake Meridian area of Kent was transformed from predominately agricultural uses to primarily dense residential housing.

The land uses on the west side of SR 167 north of SR 516 are primarily varied commercial uses including retail, office, and warehouse. On the east side, and north of SR 516, are predominantly residential land uses with the exception of areas with steep topography and the downtown Kent area. The downtown Kent area is a mixture of land uses including commercial retail and office, schools, and recreational park land.

One-third of the region's storage and distribution facilities are located along the corridor. SR 167 is considered a key link in the daily transport of goods and commodities. It is a connection to the major regional Port of Tacoma and close to the Port of Seattle with connections to regional distribution centers, and I-5, I-405, I-90, SR 18, SR 410, and SR 161. The SR 167/I-405 route is also a viable alternative to I-5 for north-south interstate truck traffic.

What Existing Stormwater and Drainage Facilities Exist Along the Corridor?

Stormwater in the northern six miles of the corridor is primarily managed through a series of underground pipes which cross the highway in various locations. Ditches carrying stormwater are also evident in some locations. Stormwater in the southern 14 miles of the project area is managed primarily with the use of ecology embankments and ecology ditches, with only a few underground stormwater culverts.

Exhibit 6-5 Changing Land Use Along the SR 167 Corridor



1936 – Agricultural land use is predominant



1970 – Residential development increasing



1996 – Residential land use is predominant

Photos of the Lake Meridian Area in Kent
Source: PSRC

For further information on the development of the corridor and applicable plans and policies see **SR 167 Corridor Technical Memorandum No. 3: Existing Conditions** and also **Technical Memorandum 3 – Appendix D – Review of Past Studies and Plan.**

From I-405 in Renton to SR 161 in Puyallup, there are numerous culvert crossings, some of which are carrying fish-bearing streams. Major drainage crossings along the SR 167 Corridor are located near the following roads:

- 39th Street in Renton
- Carr Road/SW 43rd Street in Renton
- SE 180th Street in Kent
- S 188th Street in Kent
- S 212th Street in Kent
- S 259th Street/Green River Crossing in Kent
- 44th Street NW in Auburn

There are fish-bearing culverts throughout the corridor, but currently accurate inventory of the exact locations of only some of these culverts has been prepared. A joint Washington State Department of Fish and Wildlife (WDFW) and WSDOT fish-passage barrier assessment was conducted in 2003, but it was done at a field reconnaissance level only. This assessment shows major crossings, but subsequent field work has demonstrated the study did not account for numerous smaller crossings.

A major element of any future project action is to conduct an official culvert inventory using the newly-adopted WSDOT Culvert Inventory Protocol (adopted in January 2007). This detailed field review will identify every single culvert crossing and any potential fish barrier issues.

The information collected during the culvert inventory process is critical to determining which culverts may need to be replaced for improved fish passage, which is a major cost element for every project.

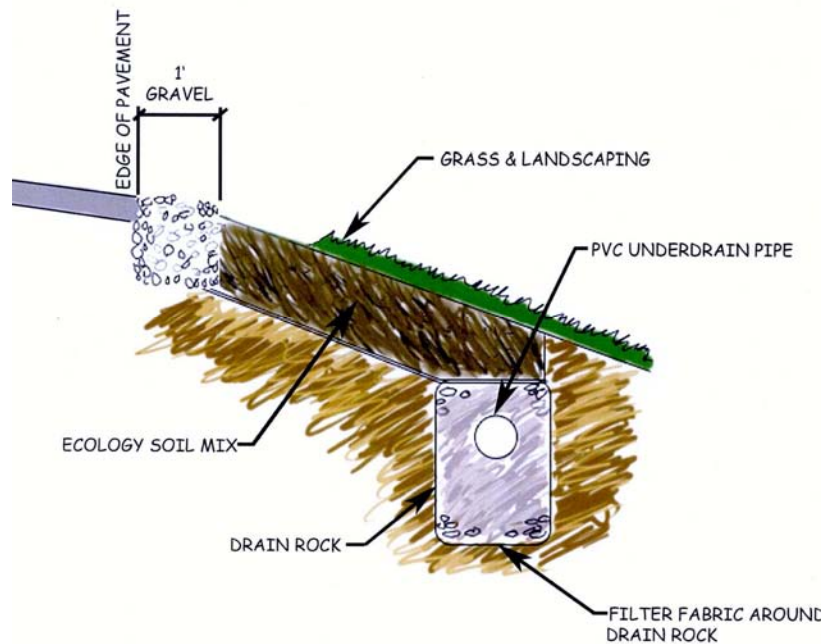
It is WSDOT policy that the state will identify and improve, where practicable, any fish barrier culverts that are affected by project construction. Although WSDOT policy strongly

supports replacing these types of culverts, there are many factors which play into this decision, including coordination with WDFW. As a result, culvert replacement decisions must be made on a case-by-case basis. It is important to note that this decision-making process involves multiple field studies and agencies, and can significantly affect project schedules and budgets during the assessment and the potential culvert redesign process. Therefore, it should be conducted as early in the design process as possible.

Existing ecology embankments (see Exhibit 6-6) are located:

- Along the sides of the highway and interchange ramps from near the bridge at the Green River in Kent to the SR 161 interchange in Puyallup.
- In the grassy median between the northbound and southbound lanes from approximately 208th Street S in Kent to 44th Street in Auburn as well as from near Broadway in Algonia to 5th Avenue SW in Pacific.
- In the grass median between the northbound and southbound lanes of the highway from near the crossing of 44th Street NW in Auburn to near Broadway in Algonia.
- In the median from near 5th Avenue SW in Pacific to SR 161 in Puyallup.

Exhibit 6-6
Example of an Ecology Embankment



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Existing stormwater detention ponds are located at the following interchanges:

- S 180th Street in Kent
- SR 516 in Kent
- S 277th Street in Kent
- SR 18 in Auburn
- South of 15th Street SW in Auburn
- Near 8th Street E in Pacific

Key Findings of This Section

Natural Resources

- The Green River Valley has significant wetlands, floodplain areas, stormwater facilities, and liquefaction issues that will likely impact the design and cost of improvements on SR 167.

Freight and Warehouse Hub

- The Green River Valley has developed into a major commercial and warehouse center for the region and the west coast of the United States.
- One-third of the region's storage and distribution facilities are located along the corridor. SR 167 is considered a key link in the daily transport of goods and commodities from the major regional Ports of Seattle and Tacoma.

Residential Growth

- The expansion of residential land use in the valley and upper plateaus has contributed to the traffic growth on the SR 167 Corridor. Under existing comprehensive plans, this residential growth pattern will continue.
- The Green River Valley still provides one of the last relatively affordable housing areas for South King County and North Pierce County.

Stormwater and Drainage Elements

- There are major drainage courses that pass under the SR 167 Corridor. Some of these are fish-bearing culverts and WSDOT is working with regulatory agencies to define which may need replacement or improvement.
- There are numerous existing ecology embankments and stormwater ponds throughout the SR 167 Corridor.

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