

Chapter 3 Affected Environment, Consequences, and Mitigation

This chapter presents the environmental consequences of each option for nine disciplines, mitigation for adverse impacts, as well as cumulative effects and other environmental considerations. Other disciplines were studied briefly and found to be unchanged and sufficiently described in the 2008 Final EIS and ROD.

3.1 Disciplines Evaluated

This Draft Supplemental EIS is limited in scope, focusing on potential differences in construction and operational effects of the Selected Snowshed compared to those of the Proposed Bridges.

What disciplines were evaluated for this Supplemental EIS?

To identify affected disciplines, WSDOT reviewed the 2005 Draft EIS, the 2008 Final EIS, and supporting documentation such as public comments, discipline reports, and technical memoranda. Relevant regulations, agency guidance, and management plans were also reviewed for changes that may affect the previous analyses. Because the limited area and type of impacts associated with the Proposed Bridges would affect only certain disciplines, the original disciplines analyzed in the 2008 Final EIS were divided into two categories: no further study needed and further study conducted.

No Further Study Needed

WSDOT determined that no further study was needed for disciplines that would not be affected by the Proposed Bridges, or for which no resources are located within the design modification area. The analysis conducted for the 2008 Final EIS remains valid for these disciplines, and no further supplement or amendment is required in this Draft Supplemental EIS (Exhibit 3-1). Letters to file document these conclusions (Appendix B).

No further study is needed for:

- Air quality
- Noise
- Historic, cultural, and archaeological resources
- Recreation resources
- Hazardous materials and waste
- Energy
- Social and economic resources (utilities and environmental justice)

Further study was conducted for:

- Geology, soils, avalanche, and rock fall
- Water resources
- Wetlands and other jurisdictional waters
- Fish, aquatic species, and habitats
- Terrestrial species
- Transportation
- Land use
- Visual quality
- Social and economic resources (socioeconomics and public services)

Further Study Conducted

Further study was conducted for disciplines that required more in-depth analysis to determine the potential impacts of the Proposed Bridges (Exhibit 3-1). The study area for each discipline is the design modification area, except visual quality and social and economic resources, which are defined in those sections. Permanent and temporary impacts to these disciplines and associated mitigation were evaluated in technical updates (see appendices) and are summarized in this chapter.

Exhibit 3-1 Disciplines Considered for this Draft Supplemental EIS

Discipline	Justification
Letters To File – No Further Study Needed	
Air Quality	The Proposed Bridges would not change traffic volumes or associated vehicle emissions. Construction emissions would not change.
Noise	The Proposed Bridges would not change construction noise levels or traffic volumes and associated operational noise levels. There are no noise-sensitive receivers within the design modification area.
Historic, Cultural, and Archaeological Resources	The design modification area is within the original Area of Potential Effect. Removal of the Existing Snowshed is addressed in the ROD. Both options occupy the same footprint along the shoreline of Keechelus Lake, in a location with minimal potential to encounter archaeological resources.
Recreation Resources	There are no recreation resources within the design modification area.
Social and Economic Resources ¹	The Proposed Bridges would not change impacts to utilities or minority or low-income populations.
Hazardous Materials and Waste	There are no known hazardous material sites located within the design modification area.
Energy	Construction of the Proposed Bridges would require approximately the same amount of energy as the Selected Snowshed. Operation of the Proposed Bridges would require less energy.
Technical Updates – Further Study Conducted	
Geology, Soils, Avalanche, and Rock Fall ²	The Proposed Bridges would change or address these issues differently than the Selected Snowshed: cut and fill volumes and potential erosion, rock fall, landslide, and avalanche hazards.
Water Resources	The Proposed Bridges would change design and/or mitigation methods for water quality and lake storage capacity.
Wetlands and Other Jurisdictional Waters	The Proposed Bridges would change impact quantities to waters of the US.

**Exhibit 3-1
Disciplines Considered for this Draft Supplemental EIS**

Discipline	Justification
Fish, Aquatic Species, and Habitats	Blasting, work below the OHWM, and stormwater runoff associated with the Proposed Bridges would change impacts and/or mitigation to aquatic resources.
Terrestrial Species	The additional excavation for the Proposed Bridges would increase impacts to terrestrial habitat.
Transportation	The Proposed Bridges would change road closures, maintenance requirements, and maintenance of traffic during construction.
Land Use	The footprint of the Proposed Bridges extends up the hillside outside of the existing right-of-way, potentially adding to USFS easement requirements.
Visual Quality	The Proposed Bridges would change views from and of the highway.
Social and Economic Resources ¹	The Proposed Bridges would change the opportunity cost of I-90 road closures and affect emergency response.

¹ Social and economic resources are evaluated in the Socioeconomics Technical Update, Public Services Technical Update, Environmental Justice Letter to File, and Utilities Letter to File.

² Geology, soils, avalanche, and rock fall are evaluated in the Geology and Soils, Unstable Slope Hazard Areas, and Avalanche Risk and Mitigation Technical Updates.

OHWM – Ordinary High Water Mark

ROD – Record of Decision

Were impacts to Section 4(f) and Section 6(f) resources evaluated?

The 2005 Draft EIS and 2008 Final EIS evaluated the effects of the project on Section 4(f) and Section 6(f) resources. The Proposed Bridges evaluated in this Draft Supplemental EIS would not change the conclusions of the previous Section 4(f) and Section 6(f) evaluations. As documented in the 2008 Final EIS, the only Section 6(f) resource located in the I-90 project area is Crystal Springs Sno-Park. This resource is located outside the design modification area and, therefore, is outside the limited scope of this Draft Supplemental EIS.

The Existing Snowshed is the only Section 4(f) resource within the design modification area. It meets the criteria for a Section 4(f) resource because it was listed on the NRHP in 1995. Chapter 5 of the 2008 Final EIS, *Programmatic Section 4(f) Evaluation*, applies FHWA guidelines from the *Programmatic Section 4(f) Evaluation and Approval of FHWA Projects that Necessitate the Use of Historic*

A **Section 4(f) property** is a publicly-owned park, recreation area, wildlife and waterfowl refuge, or a historic site of national, state, or local significance, as regulated under Section 4(f) of the Department of Transportation Act of 1966. (23 CFR 774)

A **Section 6(f) property** is any property that is acquired or developed with financial assistance under Section 6(f) of the federal Land and Water Conservation Fund Act. (36 CFR 59)

Bridges (FHWA 1983) to the alternatives considered in the 2005 Draft EIS and 2008 Final EIS. That evaluation resulted in the finding that there are no feasible and prudent alternatives to the use (demolition) of the Existing Snowshed.

The design options that address the I-90 project purpose and need and have the least overall harm are those that maintain the current highway alignment. Steep unstable slopes on one side of the highway, and Keechelus Lake on the other, constrain viable alignments to this one location. Alternatives that diverged from the current alignment, thereby avoiding the Existing Snowshed, were fully evaluated and found to result in environmental, geotechnical, and economic impacts of extraordinary magnitude.

The Proposed Bridges would maintain virtually the same footprint and alignment as the Selected Snowshed, meet the I-90 project purpose and need, and result in comparable impacts. Therefore, the Programmatic Section 4(f) Evaluation presented in the 2008 Final EIS is also applicable to the Proposed Bridges.

FHWA, WSDOT, and DAHP developed a Memorandum of Agreement that documents mitigation measures for removal of the Existing Snowshed (see Appendix C to Chapter 5 of the 2008 Final EIS). These measures were completed in September 2009 before construction began on Phase 1A. Mitigation would not change regardless of which option FHWA and WSDOT choose to construct.

3.2 Geology, Soils, Avalanche, and Rock Fall

This section discusses the potential impacts of each option on geology and soils, including geologic hazards associated with erosion, unstable slopes, and avalanches.

The location of unstable slopes and avalanche hazard areas for the I-90 project are shown in Exhibit 2-11 of the 2008 Final EIS. More information on regional geology is provided in the *Geology and Soils Technical Update* and the *Unstable Slope Hazard Areas Technical Update* (Appendices C and D). Additional information on avalanches is provided in the *Avalanche Risk and Mitigation Technical Update* (Appendix E).

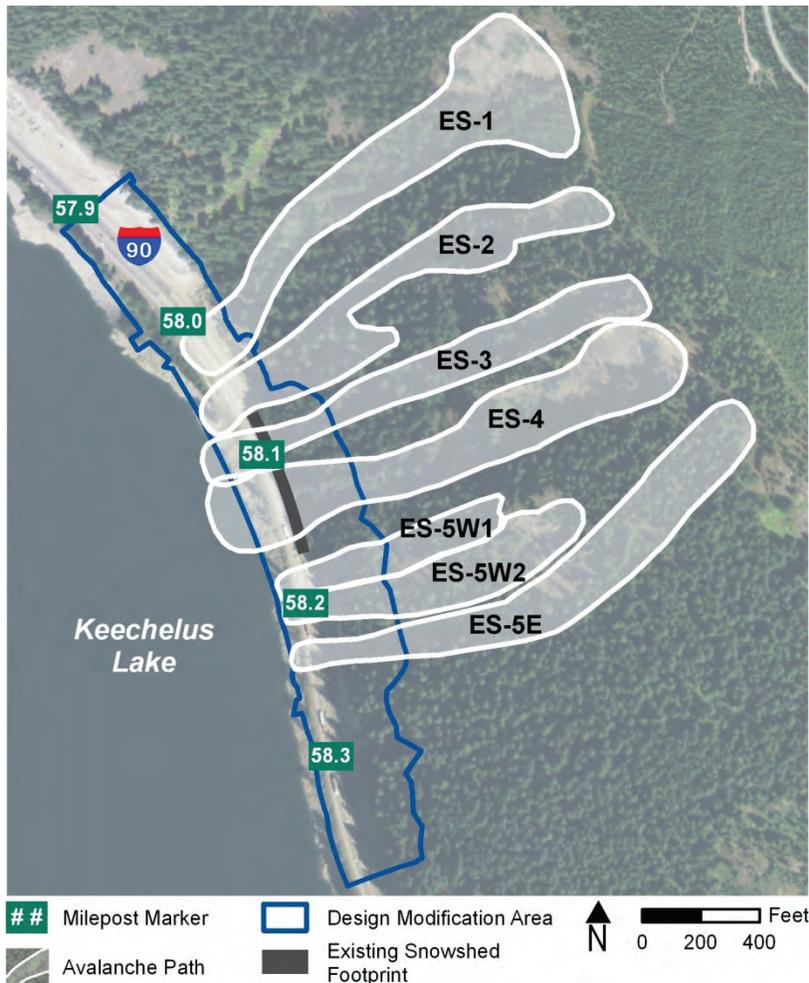


The Existing Snowshed, a Section 4(f) resource, will be removed to construct either option.

What has changed since the Record of Decision was issued?

The affected environment for geology, soils, avalanche, and rock fall as described in Section 3.1 of the 2008 Final EIS is relatively unchanged. However, WSDOT conducted geologic and geotechnical investigations to further assess subsurface soil and rock conditions in Phase 1C of the I-90 project (URS 2011, Wyllie & Norrish 2009). WSDOT also conducted additional analysis for avalanches within the design modification area. This analysis included additional avalanche modeling and revisions to avalanche paths within the design modification area, as illustrated in Exhibit 3-2. Formal avalanche design criteria for the Selected Snowshed were not established during preparation of the 2008 Final EIS and 2008 ROD. Design criteria for the Proposed Bridges were prepared after the design modification was proposed, and are described in Section 2.3.

Exhibit 3-2
Avalanche Paths in the Design Modification Area



The most persistent avalanche zone through Snoqualmie Pass is east of the summit along Keechelus Lake. This area is known as the **East Shed (ES)** and is responsible for approximately 70% of avalanche-related road closures within the Snoqualmie Pass area.

Avalanche paths within the ES are shown in Exhibit 3-2. There is one avalanche path each for ES 1, 2, 3, and 4. There are three avalanche paths for ES 5, which are designated 5 West 1 (5W1), 5 West 2 (5W2), and 5 East (5E).

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

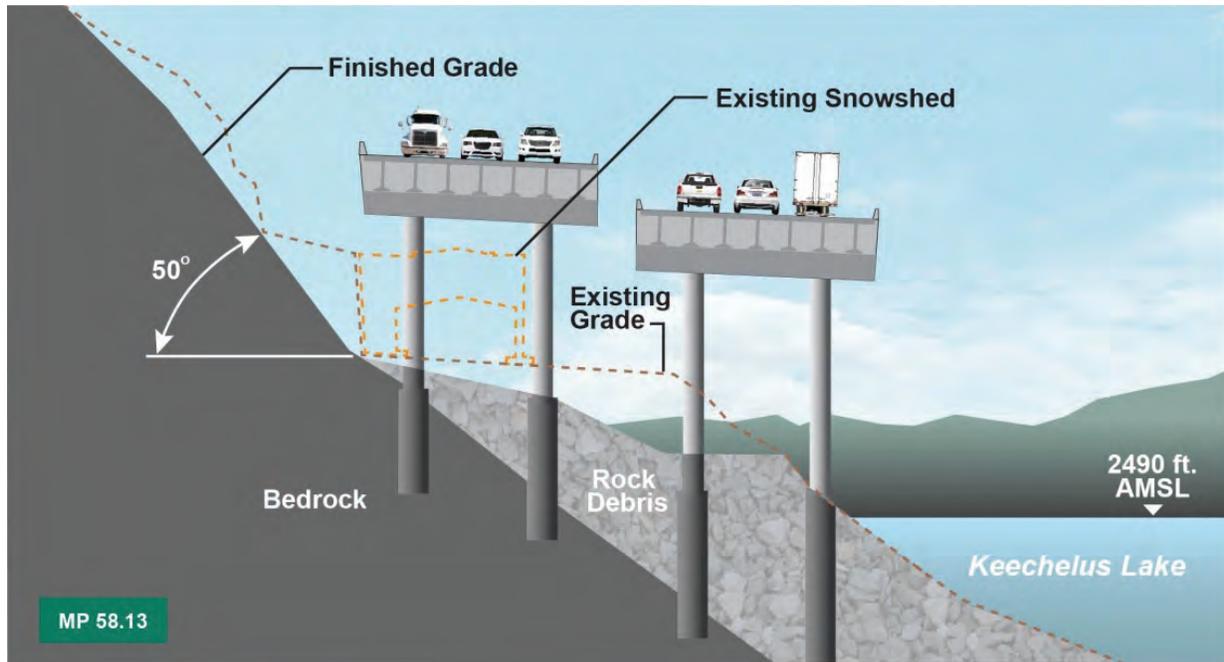
Excavation

The Selected Snowshed would require excavation of approximately 122,100 cubic yards of material (Exhibit 3-3). Excavation for the Proposed Bridges would remove more material from a larger area than the Selected Snowshed. An estimated 95,900 cubic yards of additional rock material would be excavated upslope of, under, and around the bridge structures, for a total of 218,000 cubic yards (see existing and finished grades in Exhibit 3-4). However, approximately 120,000 cubic yards of material would be directly hauled from the excavation site and placed as common borrow fill for the Proposed Bridge approaches. The remainder of the material would be processed at sites identified in the *Materials and Staging Report* (WSDOT 2008b), which would reduce the amount of imported fill needed for the I-90 project.

Exhibit 3-3
Estimated Cut and Fill Volumes (cubic yards)

Material Type	Selected Snowshed	Proposed Bridges	Difference
Total Cut	122,100	218,000	95,900
Total Fill	35,850	165,900	130,050
Net Cut/Fill	86,250 (net cut)	52,100 (net cut)	-34,150

Exhibit 3-4
Excavation and Bridge Foundation



Erosion Hazards

The design modification area is located on a steeply sloping hillside, in an area highly susceptible to erosion. As documented in the 2008 Final EIS, construction of the I-90 project has the potential to increase erosion and deliver sediment to receiving waters. WSDOT committed to the use of best management practices (BMPs) to minimize erosion for the I-90 project, and construction of the Proposed Bridges instead of the Selected Snowshed would not change this commitment. Potential BMPs may include revegetating exposed soil areas, reducing the length and steepness of slopes with exposed soils, and covering stockpiled soils with plastic sheeting.

Furthermore, the presence of erodible soils would not impact foundation stability because the deep foundations planned to support the Proposed Bridges are well below the top soils susceptible to erosion. Both options would be supported on deep foundations anchored in bedrock (Exhibit 3-4).

Avalanche Hazards

Construction of either option would take place over several summer construction seasons, when avalanches are not a potential hazard to

Best management practices, commonly referred to as BMPs, are methods used to avoid or minimize environmental impacts. These practices represent the most practical methods available and are continually being improved. BMPs are most commonly applied to minimize erosion during construction.

The effectiveness of construction BMPs will be monitored by WSDOT as part of the construction compliance program for the I-90 project. This allows WSDOT to adjust or replace BMPs to assure compliance with performance standards.

the traveling public. Between construction seasons, traffic would be routed through the design modification area in a predetermined, winter configuration similar to existing conditions. Construction of either option would include one winter without structural avalanche protection, following demolition of the Existing Snowshed (P. Larson, pers. comm., June 7, 2012). Without structural avalanche protection, there will be an increased risk from avalanches. WSDOT will increase avalanche control for either option accordingly. As a result, road closures and delays are expected to be more frequent for both options during this one winter. Therefore, risks associated with avalanche hazards during construction of either option are not substantially different.

Unstable Slope Hazards

There are three unstable slopes located within the design modification area with the potential for falling rock (rock fall). Activities such as blasting, excavation, and temporary drainage may increase localized rock fall and landslide hazards during construction. The Proposed Bridges would require more extensive rock cut than the Selected Snowshed to create space for snow and debris to pass beneath the bridge structures (Exhibit 3-4). The additional rock cuts increase the potential for rock fall for this option during construction. To mitigate the potential for rock fall, both options would use the same types of BMPs to stabilize slopes during construction, such as temporary containment fences for rock fall, blasting in lifts rather than large blasts, and slope monitoring to track slope movement or settlement.

Rock cut refers to the removal of rock material from the hillside using blasting or other means.

Permanent Impacts

Erosion Hazards

Once construction is complete, erodible soils would be stabilized using industry-standard BMPs such as soil preparation and integrated vegetation planting and management. Neither option would result in permanent impacts.

Avalanche Hazards

One of the greatest benefits of either option is the reduction of avalanche hazards within the design modification area. Reducing avalanche hazards increases public safety and reduces highway closures and travel delays. Natural avalanches and active avalanche control currently require an average of 42 hours of annual highway

closures in the design modification area, where approximately 70 percent of avalanche-related road closures occur on I-90 Snoqualmie Pass.

Design Winter Conditions

By designing the structures to meet the criteria described in Section 2.3, powder avalanches and dense flow avalanches would not affect the traveling public under winter conditions up to a 100-year event/accumulation. Both options are designed to eliminate the need for active avalanche control and associated road closures within the design modification area. As described in Section 2.2, the Selected Snowshed and the Proposed Bridges are also designed to withstand the potential impact forces of 100-year avalanches.

Powder Avalanches. Powder avalanches were raised as a concern for the previously rejected viaduct bridges (see Section 2.4). Powder avalanches can affect the traveling public in two ways: 1) obscured driver visibility from whiteout conditions; and 2) effects of strong crosswinds on vehicles. Avalanche design criteria were established to address these concerns. Therefore, powder avalanches would not impact traffic under design winter conditions.

Traffic within the Selected Snowshed would not be affected by crosswinds, but there is the potential for obscured visibility through the lake side openings. WSDOT would evaluate and address this issue during construction.

Traffic on the Proposed Bridges would not be affected by powder avalanches because the design includes elevation of the bridge structures, excavation of avalanche chutes underneath the bridges, and laying back the hillside to provide adequate clearance.

Extreme Winter Conditions

Extreme winter conditions occur during years of exceptionally high snowfall and severe storms. Conditions that exceed the design criteria are extremely rare and have never been recorded in this area.

In the rare event that conditions approach or exceed the design criteria, WSDOT would take appropriate action to protect the traveling public. These actions could include any or all of the following: 1) temporary highway closures; 2) active avalanche control; and 3) systematic removal of built up snow, rock, and debris. By actively removing accumulated snow from on top of the Selected Snowshed, the structure can be protected from the weight of

Active avalanche control is a process of intentionally triggering early avalanches, usually with explosives, before snow build-up becomes very deep.



Both options greatly reduce the need for active avalanche control and associated road closures.



Avalanches regularly block I-90 at the Existing Snowshed.

extreme snow accumulation and avalanches. Similarly, by removing snow from below the Proposed Bridges, the structure's ability to pass avalanches is renewed and structural risk to the bridge deck or risk to drivers from powder avalanches is reduced.

WSDOT is conducting additional analysis to determine the threshold at which an extreme avalanche event could affect each structure or impact traffic. The results of the analysis will help determine how often the above actions may be required for each option.

Unstable Slope Hazards

WSDOT designed both options to correct unstable slopes, which would be beneficial to highway safety. Slope stabilization would increase public safety and reduce delays due to rock fall and landslides.

The Selected Snowshed would reduce rock fall by removing loose rock, rock bolting, shotcrete treatments, installing wire mesh over rock faces, and cutting back slopes to reduce steepness. The Selected Snowshed is also designed to support the abutting rock slope and protect traffic lanes from falling rocks.

The Proposed Bridges would reduce risks from falling rock and debris through removal and stabilization of loose materials located upslope from the highway and by elevating and separating the highway from the hillside. The Proposed Bridges would require more extensive rock cuts to create space for passing avalanches beneath the bridge structures and to serve as a snow storage area. The rock cuts would align with existing avalanche paths to channel avalanches, falling rock, and debris between the bridge piers, which would be elevated on raised benches. The snow storage area beneath the Proposed Bridges, designed to act as a series of avalanche chutes, would direct smaller scale falling rock away from the bridge piers. Small rocks that hit the bridge piers are not anticipated to damage the concrete structure. Larger-scale rock fall would be mitigated using BMPs that have been successfully used by WSDOT elsewhere along the I-90 corridor such as scaling of loose rock debris, reinforcement with rock anchors (dowels and bolts), and wire mesh or cable net slope drapery. In the unlikely scenario that large rocks do hit the bridge piers, any resulting damage to the concrete structure would be addressed through WSDOT's ongoing bridge maintenance program.



The Proposed Bridges would require more extensive rock cuts than the Selected Snowshed.

Avalanche chutes are the excavated and contoured paths underneath the Proposed Bridges that direct avalanches between the bridge piers.

An **avalanche path** is the natural route that snow takes as it travels down a slope.

Although each option differs in its approach to addressing unstable slopes, both options reduce risks from rock fall and landslides, providing a long-term, beneficial effect to the traveling public.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

Disturbing only those areas necessary for construction would reduce temporary construction impacts to geology and soils associated with excavation. Sequencing the work strategically, such as limiting work during wet weather, would further minimize impacts.

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. Both options have been designed to minimize impacts to geology and soils and avoid and minimize rock fall and avalanche hazards. WSDOT conducted extensive geotechnical and geologic investigations and designed both avalanche structures based on the findings of those investigations. Both options are designed to stabilize areas of unstable soil and rock where necessary.

Geotechnical investigations are ongoing and will be incorporated into the final design of either option prior to construction. Both structures are also designed to meet equivalent criteria for 100-year snowfall accumulation and 100-year avalanches. However, WSDOT is undertaking an additional analysis to determine the threshold at which an extreme avalanche event could affect each structure or impact traffic. The results will help determine how often active avalanche control or snow removal may need to occur.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). If the Proposed Bridges are identified as the Preferred Alternative in the Final Supplemental EIS, the commitment to these BMPs would not change. However, WSDOT will modify existing permits and reinitiate consultation with the US Fish and Wildlife Service (USFWS) on several issues. Additional commitments may be identified during these processes.



Engineers work from a barge in Keechelus Lake to assess the subsurface soil and rock conditions near the Existing Snowshed.

Compensatory Mitigation

As a result of WSDOT's strategy of avoidance, minimization, and implementation of BMPs, neither option results in substantial adverse impacts associated with geology and soils, avalanche, and rock fall. No compensatory mitigation is required.

3.3 Water Resources

This section discusses the potential impacts of each option on water resources. Additional information is provided in the *Water Resources Technical Update* (Appendix G).

The design modification area is located partially within the USFS Riparian Reserves buffer area, which extends 150 feet from the OHWM of Keechelus Lake. The USFS Aquatic Conservation Strategy (ACS) objectives apply to this buffer area (see Section 3.5 for more information about the ACS objectives and Riparian Reserves requirements).

What has changed since the Record of Decision was issued?

No substantial changes related to water resources have occurred since the ROD was issued. The affected environment for water resources as described in Section 3.3 of the 2008 Final EIS has not changed. However, there have been updates to water resource guidance and waterbody classifications since the ROD was issued. The *Highway Runoff Manual*, which guides the design of stormwater treatment systems for highway projects, was updated (WSDOT 2011b). Both options follow the 2011 update of the manual. Additionally, Washington State Department of Ecology periodically updates the state's 303(d) list. The active list at the time the ROD was issued was the 2004 303(d) list. The US Environmental Protection Agency approved the current 303(d) list in 2009. Keechelus Lake was previously listed as an impaired waterbody in 2004 and continues to be impaired for the same reasons.

The federal **Clean Water Act**, adopted in 1972, requires states to restore their waters to be "fishable and swimmable." Every two years, all states are required to prepare a list of waterbodies that do not meet water quality standards. This list is called the **303(d) list** because the process is described in Section 303(d) of the Clean Water Act.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Surface Water Runoff

Construction activities can result in temporary impacts to surface water from soil disturbance and concrete and chemical use onsite. The Selected Snowshed and the Proposed Bridges have the same requirements for stormwater control during construction. Both options would apply industry-standard BMPs to control contaminated stormwater runoff from active construction areas.

Water Use for Construction

The 2008 Final EIS estimates that approximately 152 million gallons of water from Keechelus Lake would be used during construction of Phase 1 for processing of materials, concrete production, dust suppression, and highway fill compaction. WSDOT obtained temporary water rights for this purpose through agreements with the Washington State Department of Ecology and the USBR. The Phase 1C construction contract indicates that construction of Phase 1C with the Selected Snowshed would use approximately 108 million gallons of water. This quantity is controlled by monthly withdrawal limits which vary by month. The Proposed Bridges would not use additional water.

Permanent Impacts

Water Quality

Off-Site Stormwater. Construction of the Selected Snowshed would require collection of off-site stormwater and conveyance across I-90 through a series of cross culverts. This is how off-site stormwater is conveyed across the highway under existing conditions. Shallow groundwater is not expected to cross the highway underneath the Selected Snowshed because of the presence of bedrock and the collection and piping of the off-site stormwater.

Construction of the Proposed Bridges would remove the existing highway fill from the area under the bridge structures, expose the bedrock, and allow stormwater from off-site to pass as surface flow under the structure. By doing this, the Proposed Bridges would allow flow to be unrestricted by pipes and, therefore, more natural. In

Surface water includes lakes, streams, ponds, and wetlands.

Groundwater is water found beneath the earth's surface in saturated soil and rock.

Highway stormwater is precipitation that runs off impervious surfaces and enters drainage features to convey and/or treat it.

Off-site stormwater is natural runoff from the adjacent hillside.

doing so, WSDOT meets a commitment to the USFS under the ACS objectives. This water would not flow across the highway to accumulate pollutants and, therefore, would not result in adverse water quality impacts.

Highway Stormwater. WSDOT committed to treating stormwater runoff for the equivalent of all new and existing impervious surfaces in the I-90 project area. WSDOT also committed to providing on-site treatment systems and off-site mitigation when on-site treatment is not possible because of physical constraints. Portions of I-90 in the design modification area are untreatable due to site constraints, but compensatory mitigation will be provided by treating equivalently-sized areas at other sites within the overall I-90 project limits. The commitment to treat equivalently-sized areas at other sites meets the requirements of WSDOT’s *Highway Runoff Manual*. The stormwater treatment area for both options is shown in Exhibit 3-5.

An **impervious surface** is a hard surface area that either prevents or limits the entry of water into the soil and from which water runs off at an increased rate of flow or volume (for example, rooftops, concrete paving).

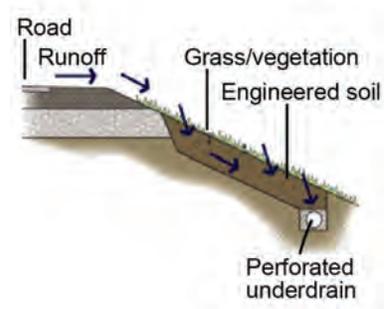
A **pollution-generating impervious surface** is an impervious surface that is considered a significant source of pollutants in surface and stormwater runoff (for example, metal roofs, roads).

**Exhibit 3-5
Selected Snowshed and Proposed Bridges Stormwater Treatment Area (acres)**

	Selected Snowshed	Proposed Bridges	Difference
Treated Impervious Surface	5.11	8.18	3.07
Untreated Impervious Surface	2.69	2.62	-0.07
Non-Pollution-Generating Impervious Surface (Selected Snowshed Structure)	2.94	0.00	-2.94
Total	10.74	10.80	0.06

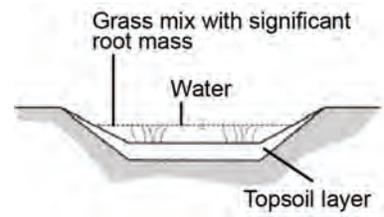
Treatment for the Selected Snowshed would include linear, roadside BMPs, such as media filter drains to treat as much pavement area as practicable. The pavement inside the Selected Snowshed would not receive treatment because precipitation would not fall on the roadway to “wash off” roadway pollutants. Therefore, it is considered a non-pollution-generating impervious surface.

The Proposed Bridges provide more space for additional on-site stormwater treatment facilities between the highway and the rock slope. This space is utilized in the design using two methods of treatment—media filter drains and bioinfiltration ponds. The result is a 3.07-acre increase in the total treated area (Exhibit 3-5).



A media filter drain, shown here, is a linear stormwater treatment and conveyance feature that infiltrates and filters stormwater from highway surfaces.

Not all pollution-generating impervious surface is treatable and treatment is not 100 percent efficient. Remaining pollutants that are discharged from the highway are known as pollutant loads. The 2008 Final EIS concluded that the I-90 project would improve water quality compared to existing conditions because improved treatment of roadway runoff would result in reduced loading (see rows A and B, Exhibit 3-6). The Proposed Bridges would result in higher calculated pollutant-loading than the Selected Snowshed because more pollution-generating impervious surface would be exposed to rainfall (see rows B and C, Exhibit 3-6). The small difference in loading between the Proposed Bridges and the Selected Snowshed is considered negligible (see rows D and E, Exhibit 3-6). Therefore, the conclusions of the 2008 Final EIS that the I-90 project would improve water quality are unchanged.



Cross section of a bioinfiltration pond. Polluted water infiltrates through vegetation and soils into the ground.

Exhibit 3-6
Pre- and Post-Project Pollutant Loading for the I-90 Project with Selected Snowshed or Proposed Bridges (pounds)

Annual Effluent Load ^{1, 2}	Total Suspended Solids	Total Zinc	Dissolved Zinc	Total Copper	Dissolved Copper
A. Load from existing impervious surface, pre I-90 project	82,603	160.82	58.48	29.24	7.75
B. Load from new and existing impervious surface, post I-90 project with Selected Snowshed	24,112	59.93	28.42	11.85	4.34
C. Load from new and existing impervious surface, post I-90 project with Proposed Bridges	24,280	60.83	29.04	12.06	4.45
D. Difference (I-90 project with Proposed Bridges minus I-90 project with Selected Snowshed)	168	0.90	0.62	0.21	0.11
E. Percent Increase (I-90 project with Proposed Bridges relative to I-90 project with Selected Snowshed)	0.07%	2%	2%	2%	3%

¹ Post-project pollutant loadings do not include additional treatment that will be provided in other off-site locations in or near the I-90 project corridor, consistent with the “equivalent area” approach.

² Pollutant loading is the product of pollutant concentration in the average annual runoff and the volume of runoff. The pollutant concentrations for both options would be similarly reduced because there is a direct relationship between pollutant concentration and pollutant loading from untreated impervious surface and treated stormwater.

Winter Maintenance. Both options would increase the area where traction sand and de-icer are used because both options include one additional lane in each direction that would have to be treated for snow and ice. It is anticipated that the Proposed Bridges would use more de-icer than the Selected Snowshed. In general, de-icer is applied to bridges more frequently than other roadway sections because bridges are prone to icing. In addition, the Selected Snowshed would protect 1,100 feet (0.2 mile) of highway from direct snowfall and therefore may receive less treatment with de-icer.

Washington State Section 303(d) Listings. Keechelus Lake is on the state's 303(d) list for excess quantities of dioxin and polychlorinated biphenyls found in fish tissue. Neither of these manufactured compounds originates from highway construction or runoff. The 2008 Final EIS concluded that construction and operation of the I-90 project with the Selected Snowshed would not impact the 303(d) listing. The Proposed Bridges would not change this conclusion.

Keechelus Lake Reservoir Storage

WSDOT committed to a policy of no net loss to Keechelus Lake's storage capacity because of the I-90 project. To achieve this, approximately 341,000 cubic yards of material were removed from the lake during Phase 1A, an amount that would more than compensate for any fill placed along the lakeshore. The Selected Snowshed would reduce the storage capacity of Keechelus Lake by adding approximately 4,400 cubic yards of fill. In contrast, the Proposed Bridges would increase the storage capacity of the lake by excavating approximately 41,000 cubic yards of rock, resulting in a total difference of 45,400 cubic yards (28 acre feet) compared to the Selected Snowshed. Although each option differs in its impact on lake storage, both options uphold WSDOT's commitment to no net loss and would, therefore, have no adverse impact to the lake.



Water levels in Keechelus Lake fluctuate with its use as an artificial reservoir.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. This is evident in ongoing revisions to the design of the proposed stormwater treatment systems.

WSDOT's approach to using de-icer primarily involves source control by following application guidelines in the *Statewide Snow and Ice Plan*, which minimizes the use of de-icer (WSDOT 2007a). However, WSDOT cannot entirely eliminate the use of either traction sand or chemical de-icers because both are essential to winter highway safety. The highway design under either option would install grit chambers in the stormwater collection system in an effort to collect and ultimately reduce the amount of traction sand entering waterbodies.

Grit chambers are modified catch basins with enlarged sumps that allow sand to settle out of the stormwater before it is discharged.

Direct construction impacts on Keechelus Lake are minimized under either option by only allowing work near the lake when the water level is low enough to gain access to the site when the work area is dry.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). The BMPs used for construction of Phase 1C were updated to 2011 standards. If the Proposed Bridges are identified as the Preferred Alternative in the Final Supplemental EIS, the commitment to these BMPs would not change. No additional BMPs are required for the Proposed Bridges.

Compensatory Mitigation

Both options have been designed to meet temporary and long-term stormwater standards consistent with the 2008 Final EIS and 2011 *Highway Runoff Manual*. Consequently, neither option would result in permanent adverse impacts to water resources and no compensatory mitigation is required.

3.4 Wetlands and Other Jurisdictional Waters

This section discusses the potential impacts of each option on wetlands and other jurisdictional waters. Additional information is provided in the *Wetlands Technical Update* (Appendix H).

The design modification area is located partially within the USFS Riparian Reserves buffer area, which extends 150 feet from the OHWM of Keechelus Lake. The USFS regulates or prohibits

Jurisdictional waters are aquatic and wetland features that are regulated by federal, state, and local agencies. Jurisdictional waters include both "waters of Washington State" and "waters of the US"

activities that may prevent attainment of the ACS objectives within this area (see Section 3.5), which differs from the regulation of jurisdictional wetland buffers by local agencies.

What has changed since the Record of Decision was issued?

There have been no major changes to wetland regulations since the ROD was issued. However, existing conditions within the design modification area have changed due to clearing activities associated with ongoing construction of Phase 1C. Therefore, the permanent wetland impacts identified in this section have already occurred as previously permitted for the Selected Alternative. Mitigation for impacts to wetland resources for the I-90 project was finalized in the *Final Wetland and Aquatic Resources Mitigation Plan* (WSDOT 2011c).

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Ground disturbance and vegetation clearing during construction of either option would result in temporary impacts to wetland buffers and other jurisdictional waters (Exhibit 3-7). The Selected Snowshed includes temporary impact to 0.25 acre of vegetated wetland buffer. The Proposed Bridges would increase these impacts by 0.06 acre to 0.31 acre. This disturbed buffer is a remnant fringe of riparian vegetation between the high-pool elevation of Keechelus Lake and I-90. Excavation to construct the fill wall for the Selected Snowshed includes temporary impact to 0.43 acre below the OHWM of Keechelus Lake. Excavation of avalanche chutes beneath the Proposed Bridges would increase these excavation impacts by 0.59 acre to 1.02 acres.

The **high-pool elevation** of Keechelus Lake is 2,517 feet AMSL.

The **ordinary high water mark** refers to the highest level reached by a body of water that has been maintained for a sufficient period of time to leave evidence on the landscape. The ordinary high water mark of Keechelus Lake is 2,510 feet AMSL.

Exhibit 3-7
Selected Snowshed and Proposed Bridges Temporary Wetland Impacts (acres)

Resource	Selected Snowshed	Proposed Bridges	Difference
Wetlands	0	0	0
Wetland (Lakeshore) Buffers	0.25	0.31	0.06
Ditches	0	0	0
Keechelus Lake ¹	0.43	1.02	0.59

¹ This category includes impacts below the OHWM of the lake.

Permanent Impacts

Excavation and wetland fill from either option would result in permanent impacts to wetlands, wetland buffers, ditches, and other jurisdictional waters (Exhibit 3-8). Both options include the permanent fill of two small wetlands and two ditches within the design modification area.

Exhibit 3-8
Selected Snowshed and Proposed Bridges Permanent Wetland Impacts (acres)

Resource	Selected Snowshed	Proposed Bridges	Difference
Wetlands ¹	0.06	0.06	0
Wetland (Lakeshore) Buffers	1.25	1.19	-0.06
Ditches (acres/linear feet)	0.03/200	0.03/200	0
Keechelus Lake ²	0.40	0.05	-0.35

¹ Includes impacts which have already occurred due to ongoing Phase 1C construction activities.

² This category includes impacts below the OHWM of the lake.

The Selected Snowshed includes permanent impacts to 1.25 acres of disturbed wetland buffer adjacent to Keechelus Lake. The Proposed Bridges reduce these impacts by 0.06 acre to 1.19 acres.

The Selected Snowshed includes permanent impacts to 0.40 acre below the OHWM of Keechelus Lake. The Proposed Bridges would reduce these impacts by 0.35 acre due to the use of support piers instead of a fill wall along the shoreline. Permanent impacts below the OHWM are limited to 0.05 acre of fill associated with the central four piers in the outside row under the eastbound bridge (Exhibit 3-9). The excavation of avalanche chutes for the Proposed Bridges would result in a 1.28-acre increase in the nearshore habitat of the reservoir below the OHWM (Exhibit 3-9), which would provide beneficial effects for aquatic species (see Section 3.5). In doing so, WSDOT meets a commitment to the USFS under the ACS objectives.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. This is evident in the design of the Proposed Bridges, which would reduce impacts to Keechelus Lake when compared to the Selected Snowshed through the use of piers instead of a fill wall.

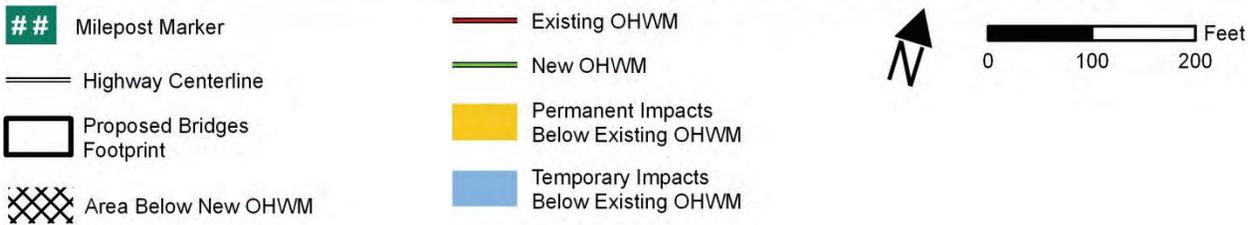
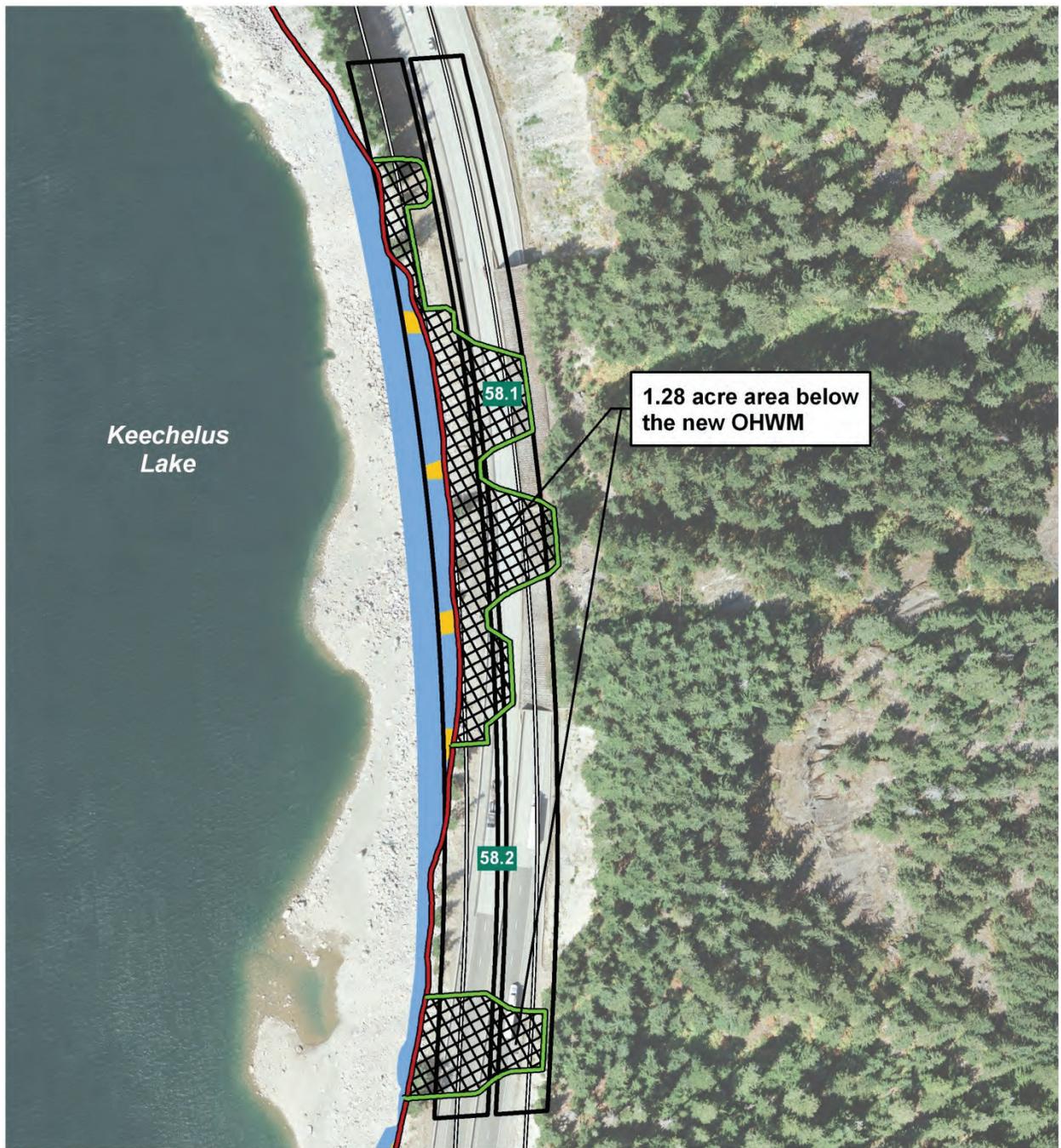
Because the difference between the Proposed Bridges and the Selected Snowshed is negligible and the Proposed Bridges have less permanent impacts to jurisdictional waters, an additional 404(b)(1) analysis is not warranted.

Best Management Practices

The Proposed Bridges would require modification and re-issuance of aquatic resource permits (for example, Sections 401 and 404 of the Clean Water Act and Hydraulic Project Approval) if deemed appropriate by regulatory agencies. These resource permits would stipulate conditions to further avoid and minimize temporary impacts to wetlands and other jurisdictional waters during construction.

WSDOT would adhere to all of the stipulated conditions in addition to those BMPs identified in the 2008 Final EIS, which address the impacts of the Selected Snowshed (Appendix F).

Exhibit 3-9
Proposed Bridges Impacts to Keechelus Lake



Compensatory Mitigation

Compensatory mitigation to address the impacts of the I-90 project with the Selected Snowshed is provided in Appendix F, including preparation of a *Final Wetland and Aquatic Resources Mitigation Plan* (WSDOT 2011c). The Proposed Bridges would reduce permanent impacts to jurisdictional waters compared to the Selected Snowshed. Therefore, no additional measures to mitigate for impacts to wetland resources or other jurisdictional water are required.

3.5 Fish, Aquatic Species, and Habitats

This section discusses the potential impacts of each option on aquatic species and habitat. Wetlands and other waters were previously discussed in Section 3.4. Additional information on aquatic species and habitat is provided in the *Aquatic Species Technical Update* (Appendix I).

The existing aquatic habitat and species within the design modification area are described in detail in the 2005 Draft EIS and 2008 Final EIS and supporting documentation, including the *Aquatic Species Discipline Report* (WSDOT 2002) and the *Biological Assessment* (WSDOT 2008c).

In addition to discussing impacts to fish and aquatic habitats, this section also includes impacts to Riparian Reserves, as identified in the ACS. The ACS is the element of the Northwest Forest Plan that was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. One intent of the strategy is to protect salmonid fish habitat on federal lands. Riparian Reserves are the portions of watersheds where ACS objectives receive primary emphasis. These are areas critical to maintaining hydrological, geomorphic, and ecological processes.

Most Riparian Reserves are associated with streams, but they also include wetlands, lakes, and reservoirs. The design modification area is located partially within a USFS Riparian Reserves buffer area, which extends 150 feet from the OHWM of Keechelus Lake. The USFS regulates or prohibits activities that may prevent attainment of ACS objectives within this area.

Riparian Reserves are administrative buffer areas established around springs, streams, wetlands, ponds, lakes, and potentially unstable areas.

What has changed since the Record of Decision was issued?

On November 17, 2010, the USFWS officially designated and modified bull trout critical habitat throughout the range of the species under Section 7 of the Endangered Species Act (ESA). This designation included Keechelus Lake. FHWA and WSDOT are in formal consultation with USFWS regarding this designation for the entire I-90 project. This consultation is anticipated to be completed in late 2012.

The affected environment for aquatic species as described in Section 3.5 of the 2008 Final EIS has not changed.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Temporary impacts to aquatic habitat may include construction stormwater runoff from excavation, work below the high-pool elevation of Keechelus Lake (2,517 feet AMSL), and blasting. Construction stormwater runoff, including hillside drainage, is addressed by appropriate implementation of BMPs as described in the 2008 Final EIS and *Conceptual and Final Wetland and Aquatic Resource Mitigation Plans* (WSDOT 2008d and 2011c). These BMPs include high-visibility construction exclusion fencing and erosion and sedimentation control measures. Impacts to aquatic species from construction stormwater runoff are the same for both options. Potential impacts associated with temporary work below high-pool elevation and blasting are described in more detail below.

Work below the High-Pool Elevation

Construction of the Selected Snowshed would result in temporary impacts to 0.57 acre below the high-pool elevation of Keechelus Lake (Exhibit 3-10). The Proposed Bridges would require more extensive temporary impacts (1.43 acres) below the high-pool elevation of Keechelus Lake, primarily due to the excavation of the avalanche chutes. Because excavation of the engineered avalanche chutes would occur when the lake is drawn down and the work area is dry, temporary impacts to aquatic life are limited to minor, temporary turbidity that would be produced following the first contact of the excavation area by precipitation or wave action

Section 7 of the Endangered Species Act requires federal agencies to consult with the USFWS if they determine that any actions they authorize, fund, and/or conduct may affect any federally proposed or listed species, or result in destruction or adverse modification of their critical habitat.

Critical habitat is defined as specific area(s) essential to the conservation of the species.

following construction. However, as most of the substrate in this location is rock, the risk of temporary turbidity impacts is considered negligible.

Exhibit 3-10
Temporary Impacts Below High-Pool Elevation of Keechelus Lake (acres)

Area	Selected Snowshed	Proposed Bridges	Difference
Area below high-pool elevation (2,517 feet AMSL)	0.57	1.43	0.86

Blasting

Blasting is harmful to fish life when it occurs close to fish-bearing waters. The acoustic shock associated with blasting is transferred to aquatic habitat through air and ground vibration. Post-detonation compressive shock waves can injure or kill fish through rupture and hemorrhage of vital organs. Blasting can also disturb aquatic life without causing physical injury. The closer blasting occurs to the water, the greater the risk to fish. The extent of blasting upslope of I-90 is similar for both options and would not impact fish life.

All shoreline blasting would occur on dry land while the lake is drawn down to lower levels. Blasting associated with rock excavation for the Proposed Bridges has the potential to occur closer to the lake (within 100 feet of the water) than the blasting associated with the Selected Snowshed, increasing risks to aquatic life. Juvenile and adult fish using nearshore areas at the time of blasting could leave the immediate area due to noise and vibration, but would return shortly after the blast event.

It is important to note that neither option would use blasting to install pier columns. Both options would install pier columns using drilled shafts, which would not impact fish life. This analysis may be updated based upon the results of ongoing consultation with USFWS. Any updated results will be included in the Final Supplemental EIS.



Blasting of rock would be required to construct either option.

Permanent Impacts

Work below the High-Pool Elevation

The Proposed Bridges would result in substantially less permanent impact below the existing high-pool elevation of Keechelus Lake due to the installation of piers to support the Proposed Bridges instead of a continuous wall to support the outer edge of the Selected Snowshed. Excavation of the avalanche chutes for the Proposed Bridges would increase the area of aquatic habitat below the high-pool elevation by 2.22 acres (Exhibit 3-11). This area would likely provide additional foraging and daily movement opportunities for any fish, amphibians, insects, and other aquatic species that may use the nearshore areas of the lake during high-pool in the spring and early summer, when the lake is not frozen. Fish species could include bull trout (*Salvelinus confluentus*), cutthroat trout (*Oncorhynchus clarkii*), rainbow trout (*Oncorhynchus mykiss*), mountain whitefish (*Prosopium williamsoni*), burbot (*Lota lota*), and northern pikeminnow (*Ptychocheilus oregonensis*). The creation of additional aquatic habitat meets a commitment to the USFS under the ACS objectives.

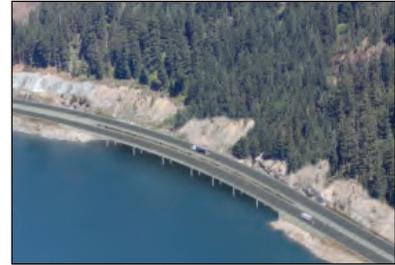
Exhibit 3-11
New Aquatic Habitat in Keechelus Lake (acres)

Area	Selected Snowshed	Proposed Bridges	Difference
Area at high-pool elevation (2,517 feet AMSL)	0	2.22	2.22

In addition to the beneficial effect of additional nearshore habitat for general aquatic species, excavation of the avalanche chutes underneath the Proposed Bridges would create an additional 2.22 acres of habitat for the threatened bull trout population that lives in Keechelus Lake (Exhibit 3-11). During the late spring and early summer months when the lake is at high pool, this area would provide additional foraging habitat for bull trout.

Removal of Riparian Vegetation

The Proposed Bridges would remove almost the same amount of riparian vegetation as the Selected Snowshed (see Section 3.4). Therefore, impacts to aquatic species due to the removal of riparian vegetation are similar for both options. Creation of new aquatic area



The Proposed Bridges would create nearshore aquatic habitat in the lake at high-pool elevation (design visualization).



The Selected Snowshed would remove aquatic habitat in the lake at high-pool elevation (design visualization).



An isolated population of bull trout lives in Keechelus Lake.

along the shoreline of Keechelus Lake with the Proposed Bridges would provide an opportunity for both passive and active establishment of riparian vegetation in areas that would not exist under the Selected Snowshed. These new riparian vegetation areas would provide new foraging areas for aquatic species during high-pool levels in the spring and early summer.

Stormwater Runoff

As discussed in Section 3.3, the Proposed Bridges would generate a small increase in pollutant loading from the increased amounts of pollution-generating impervious surfaces. This additional stormwater runoff may result in minor behavioral impacts to fish in close proximity to outfalls in the design modification area. However, implementation of enhanced stormwater treatment in previously untreated areas for the I-90 project would make these impacts negligible. Impacts to aquatic species from stormwater runoff are not substantially different for either option.

As discussed in Section 3.3, both options increase the area where traction sand and de-icers are used and it is anticipated that the Proposed Bridges would require more de-icer than the Selected Snowshed. Based upon the small concentrations of constituent contaminants in de-icer, both options would result in negligible impacts to aquatic species.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. This is evident in the design of the Proposed Bridges, which would reduce impacts to Keechelus Lake through the use of piers instead of a fill wall.

Construction of the Proposed Bridges would adhere to previous commitments made during preparation of the 2008 Final EIS to avoid impacts from blasting and in-water work. These include, but are not limited to, the following:

- Limit the size of blast charges such that acoustic shock in Keechelus Lake fish habitat will be less than the threshold

recommended in the literature (100 kilopascal) (Wright and Hopky 1998).

- No work, including work bench excavation, drilling for pier column shafts, or rock excavation, will be conducted in the lake, but will occur when the lake level is drawn down to an elevation below that of the work area (WSDOT 2008c).

Best Management Practices

WSDOT committed to using a wide range of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). The BMPs used for construction of Phase 1C were updated to 2011 standards. Construction of the Proposed Bridges would not change the commitment to these BMPs and no additional BMPs are currently required. However, the Proposed Bridges would require modification and re-issuance of aquatic resource permits (for example, Sections 401 and 404 of the Clean Water Act and Hydraulic Project Approval). These resource permits would stipulate conditions to be used during construction to avoid and minimize impacts to aquatic species and habitat, including Washington State Department of Ecology mixing zone requirements. These permits may also include stipulations associated with vegetation establishment in new aquatic habitat along the shoreline, which would meet a commitment to the USFS ACS objectives. Additional commitments that affect aquatic habitats and species could also result from ongoing consultation with USFWS regarding bull trout in Keechelus Lake. WSDOT would adhere to all stipulated conditions and commitments.

Compensatory Mitigation

Neither option is expected to result in permanent adverse impacts to fish, aquatic species, and habitat. Therefore, no compensatory mitigation is required.

3.6 Terrestrial Species

This section discusses the potential impacts of each option on terrestrial species. Additional information is provided in the *Terrestrial Resources Technical Update* (Appendix J).

What has changed since the Record of Decision was issued?

Gray wolves (*Canis lupus*) have extended their range in Washington State since the ROD was issued. Gray wolves in the eastern one-third of the state were delisted from protection under the ESA, but they are still listed in the vicinity of the I-90 project. Breeding gray wolves are now within approximately 15 miles east of the I-90 project, which increases the likelihood that gray wolves may be encountered within the design modification area during construction.

On March 8, 2012, the USFWS proposed revisions related to critical habitat for the northern spotted owl (*Strix occidentalis caurina*). This proposal could designate critical habitat for the owl within the entire I-90 project area. A final decision by the USFWS on this designation is anticipated in November of 2012. The ESA consultation re-initiation for the Proposed Bridges will evaluate this proposed designation in greater detail.

Construction of Phase 1C is ongoing as previously permitted, including some clearing activities for the Selected Alternative within the design modification area. Therefore, some impacts identified in this section associated with the Selected Snowshed may have already occurred.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Temporary impacts to terrestrial species and habitat are identified in Exhibit 3-12. Noise during construction and removal of habitat for staging, stockpiling, and equipment access would result in temporary impacts to wildlife habitat under both options. The Selected Snowshed includes temporary impacts to 2.32 acres of terrestrial habitat, while the Proposed Bridges would impact 0.22 acre more habitat, for a total of 2.54 acres. Temporary impact areas include areas that would be revegetated following completion of construction.



Gray wolves are not common in the I-90 project area, but their presence cannot be ruled out.

Exhibit 3-12
Selected Snowshed and Proposed Bridges Temporary Terrestrial Habitat Impacts (acres)

Habitat Type	Selected Snowshed	Proposed Bridges	Difference
Early Successional Forest	0.22	0.03	-0.19
Mid Successional Forest	0.13	0.11	-0.02
Mature Forest	1.38	1.78	0.40
Rock	0.59	0.62	0.03
Total	2.32	2.54	0.22

Includes impacts associated with the Selected Alternative which may have already occurred due to ongoing Phase 1C construction activities.

Temporary impacts to mature forest would require an extended length of time (80 years) for regrowth. In the meantime, these areas would still provide wildlife habitat function but would not exhibit mature forest characteristics such as multiple canopy layers and high vegetative structure.

Noise from construction of either option, particularly from blasting, has the potential to disrupt normal wildlife behavior, including foraging and breeding activities. These impacts are similar in duration and type for both options.

Permanent Impacts

The Selected Snowshed includes permanent impacts to 4.45 acres of terrestrial habitat, including 1.97 acres of mature forest (Exhibit 3-13). The Proposed Bridges would impact up to an additional 3.26 acres of total terrestrial habitat, including an additional 2.28 acres of mature forest located upslope of the Existing Snowshed, for a total of 7.71 acres. These habitat impacts could affect both listed and other terrestrial species, which are described in more detail below.

Exhibit 3-13**Selected Snowshed and Proposed Bridges Permanent Terrestrial Habitat Impacts (acres)**

Habitat Type	Selected Snowshed	Proposed Bridges	Difference
Early Successional Forest	0.35	0.78	0.43
Mid Successional Forest	0.02	0.43	0.41
Mature Forest	1.97	4.25	2.28
Rock	2.11	2.25	0.14
Total	4.45	7.71	3.26

Includes impacts associated with the Selected Alternative which may have already occurred due to ongoing Phase 1C construction activities.

Listed Species

Wolves, grizzly bear (*Ursus arctos*), and Canada lynx (*Lynx canadensis*) are listed under the ESA and may occur in the vicinity of the I-90 project on a transient basis, but no active reproducing populations are known to occur near the design modification area. These large carnivores are much more likely to use areas such as Gold Creek near the north end and Price/Noble Creek near the south end of Keechelus Lake as movement corridors. No suitable habitat for other listed species, including Ute ladies'-tresses (*Spiranthes diluvialis*) and marbled murrelet (*Brachyramphus marmoratus*), exists in the design modification area. For these reasons, no adverse impacts to these listed species are anticipated.

The mature forest habitat within the design modification area provides potential dispersal habitat for northern spotted owl. However, the potential for spotted owl use of this habitat is unlikely due to ongoing human disturbance. No spotted owl nesting is documented in the vicinity of the I-90 project. Although both options could impact individual owls foraging or moving through the area, substantial adverse impacts on the local population of northern spotted owls are not anticipated.

Other Species

Terrestrial species closely associated with mature upland forest are the most likely affected because the Proposed Bridges would impact their primary habitat. These include species such as pine marten (*Martes martes*), fisher (*Martes pennanti*), pileated woodpecker

(*Dryocopus pileatus*), Vaux’s swift (*Chaetura vauxi*), and northern goshawk (*Accipiter gentilis*).

Most of these species are not expected to occur in proximity to I-90 due to the high level of habitat fragmentation and human disturbance. Also steep rocky slopes and noise from I-90 make the design modification area unlikely habitat for most of these species. USFS staff conducted a site visit on July 23, 2012, and determined that there is a low likelihood of rare species occurrence within the design modification area. The USFS also determined that surveys for mollusk, vascular plant, lichen, bryophyte, and fungi cannot be completed safely within the design modification area due to the steep rocky terrain (P. Garvey-Darda, pers. comm., July 23, 2012). Construction of the Proposed Bridges would reduce the amount of available potential habitat for these species in the short-term compared to the Selected Snowshed.

Mule deer (*Odocoileus hemionus*), black bear (*Ursus americanus*), cougar (*Puma concolor*), elk (*Cervus canadensis*), olive-sided flycatcher (*Contopus cooperi*), merlin (*Falco columbarius*), neotropical migratory birds, and many bat species have more general habitat requirements and may occur within the design modification area. However, habitat for these species is not limited in the vicinity of the I-90 project.

Wildlife Movement

Neither option would impact any designated connectivity emphasis areas or hydrologic connectivity zones. All of the existing crossing areas important to wildlife are at existing creek corridors located either east or west of the design modification area. Within the design modification area, the location of both options between the steep slopes to the east and Keechelus Lake to the west would minimize the use of this area by wildlife.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT’s strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable.

Hydrologic connectivity zones are geographic zones where connections between groundwater and surface water play an important role in maintaining natural flow paths which transmit water, sediment and nutrients in support of aquatic organisms and sustaining streamflow.

WSDOT committed to a wide range of avoidance and minimization measures for terrestrial species on the I-90 project, including adjustment of designs to avoid mature forest, riparian areas, and wetlands; acquisition of offsite properties for habitat preservation; construction of wildlife crossing structures; and implementation of a wildlife monitoring plan (see the *Wildlife Monitoring Plan* [WSDOT 2008e]). No additional avoidance and minimization measures specific to the Proposed Bridges are proposed for terrestrial species. However, WSDOT expects that as the design is completed, impacts to terrestrial habitat can be reduced further, and that the impacts presented herein represent the worst case.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). Construction of the Proposed Bridges would not change the commitment to these BMPs and no additional BMPs are currently required.

Compensatory Mitigation

Compensatory mitigation to address the impacts of the I-90 project with the Selected Snowshed is provided in Appendix F. The I-90 project mitigates for unavoidable impacts to terrestrial species through the beneficial effects of the Selected Alternative, which includes improved ecological connectivity, an increase in riparian habitat, and a decrease in wildlife mortality. Consequently, neither option would result in substantial adverse impacts to terrestrial species. No additional compensatory mitigation is required.

3.7 Transportation

This section discusses the potential impacts of each option on transportation. Additional information on transportation is provided in the *Transportation Technical Update* (Appendix K).

What has changed since the Record of Decision was issued?

No substantive changes have occurred to the I-90 project's transportation goals and requirements since the ROD was issued.

The affected environment for transportation as described in Section 3.7 of the 2008 Final EIS has not changed.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

WSDOT has committed to keeping two lanes of traffic open in both directions during peak travel times throughout construction of the I-90 project. Temporary closures and lane restrictions would typically be limited to low traffic periods (Monday through Thursday). This commitment applies to both options. Construction of the Selected Snowshed would require work over the highway. This would result in more temporary closures than would be required for the Proposed Bridges.

The Proposed Bridges require more excavation to construct than the Selected Snowshed. However, much of the extra material excavated from the adjacent hillside will be used on-site as fill material for the bridge approaches (J. Yamaura, pers. comm., August 20, 2012). This will limit the need for hauling to and from the site, resulting in minimal impacts to traffic.

As discussed in Section 3.2, construction of either option would include one winter without structural avalanche protection following removal of the Existing Snowshed. During this winter, WSDOT would increase preventative avalanche control, which may result in more frequent road closures. While the roadway alignment for each option may differ during construction, there is no substantial difference in the anticipated frequency or duration of road closures for avalanche control for either option.

Permanent Impacts

Road Closures

Minimizing road closures related to avalanches and rock fall is an important element of the I-90 project purpose and need. As discussed in Section 3.2, both options are designed to minimize avalanches from impacting the traveling public and eliminate the need for active avalanche control and road closures for typical avalanche events. During severe snow storms, WSDOT has the ability to close the

highway if safety warrants it, but such circumstances are extremely rare.

The two options use different approaches to address unstable slopes, as described in Section 3.2. Even though the options differ in their approach to slope stabilization, both would reduce highway closures due to rock fall.

Transportation Safety

The I-90 project was designed to increase transportation safety by increasing capacity, straightening highway sections, providing wider shoulders, and improving wildlife crossings. In some respects, the design of the Proposed Bridges improves transportation safety more than the Selected Snowshed, which shares some of the “operational difficulties” as the tunnel alternatives analyzed in the 2005 Draft EIS and 2008 Final EIS. Operational difficulties include the need for specialized emergency response equipment and requirements associated with hazardous and flammable materials (WSDOT 2008a).

As discussed in the 2008 Final EIS, Snoqualmie Pass averages nearly 450 inches of rain and snow each year, making the travel lanes slippery and limiting visibility. Other hazards created by heavy precipitation include ice, flooding, avalanches, and rock slides (WSDOT 2008a). WSDOT actively maintains the corridor to reduce the potential for accidents associated with these conditions. The Selected Snowshed and the Proposed Bridges both have the potential for icy conditions, similar to other structures within the I-90 project area. Ice could form at the entrance or exit of the Selected Snowshed where the pavement transitions from wet to dry conditions. Ice could also form on the bridge structures due to cold air above and below the bridge deck.

Neither option includes a sustained grade that presents a risk to the traveling public when conditions are icy. Exhibit 3-14 compares the design features of the Selected Snowshed and the Proposed Bridges to two other bridge structures within the I-90 project area, all of which are designed in compliance with American Association of State Highway and Transportation Officials and WSDOT design guidelines. The maximum vertical grade for the Proposed Bridges is 2.6 percent, which is less than the maximum vertical grade of 4.1 percent used elsewhere on the I-90 project (west of the Resort Creek Bridge). The most substantial curve associated with the Proposed



Unstable slopes cause damage to the highway, put motorists at risk, and can cause delays.



WSDOT actively maintains the I-90 corridor to ensure the safety of the traveling public.

The **vertical grade** is the amount of inclination of a roadway. A higher vertical grade indicates a steeper road.

The **cross slope** is the horizontal or lateral (cross) slope of a roadway.

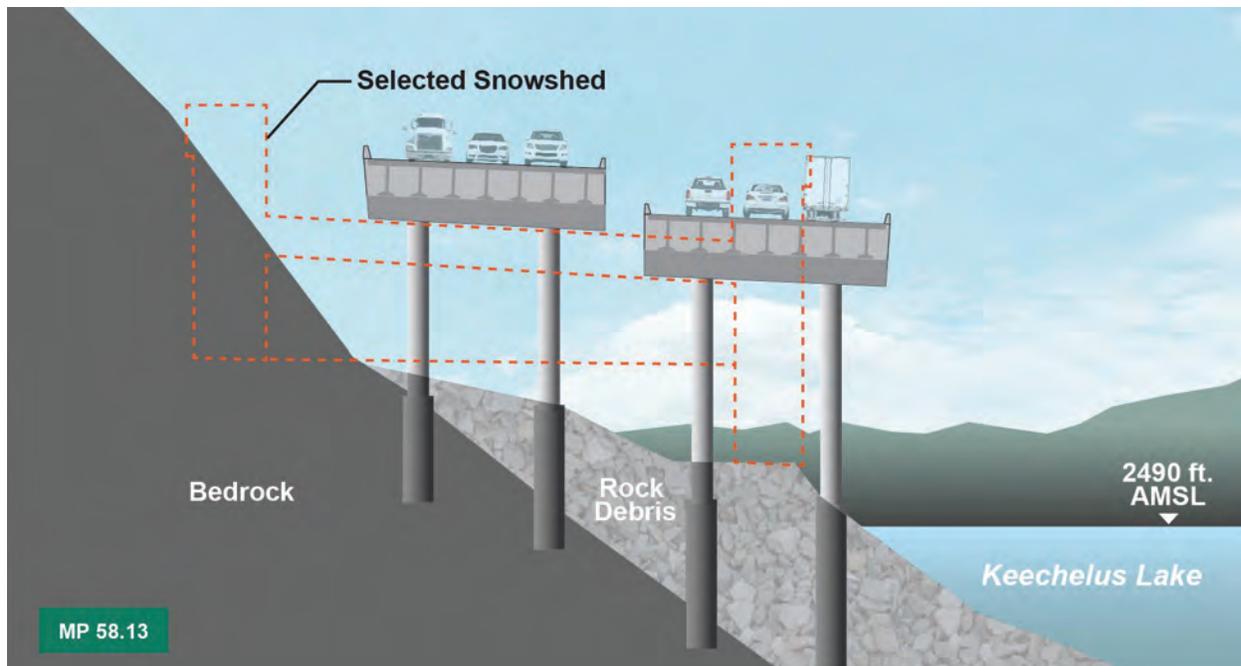
Bridges is a 5 percent cross-slope, which is flatter than the 6 percent cross-slope for the Selected Snowshed (Exhibit 3-15). Overall, the curves associated with both options are comparable to the curves of other structures throughout the I-90 corridor and do not present a safety risk to the traveling public.

Exhibit 3-14
Structural Design Comparison

Structure	Maximum Height ¹	Length	Maximum Vertical Grade	Maximum Cross-Slope
Selected Snowshed	n/a	1,100 ft	2.3%	6%
Proposed Bridges	75 ft	1,200 ft	2.6%	5%
Gold Creek Bridges	33 ft	930 ft/1,085 ft	0.7%	4%
Slide Curve Bridge	55 ft	1,152 ft	0.7%	5%

¹ Height is measured from the top of the bridge deck at the centerline of the bridge to the ground surface.

Exhibit 3-15
Cross Section Comparison of the Selected Snowshed and Proposed Bridges



For either structure, WSDOT would monitor road conditions, plow the road, and apply traction sand and de-icer when needed to minimize the potential hazards. These activities would be similar to the preventative maintenance WSDOT performs on many other structures throughout the corridor.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT committed to keeping two lanes of traffic open in both directions during peak travel times throughout construction in the 2008 Final EIS. WSDOT would uphold this commitment for either option.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). Construction of the Proposed Bridges would not change the commitment to these BMPs and no additional BMPs are currently required.

Compensatory Mitigation

Neither option would result in permanent adverse impacts to transportation. Therefore, no compensatory mitigation is required.

3.8 Land Use

This section discusses the potential impacts of each option on land use. Additional information on land use is provided in the *Land Use Technical Update* (Appendix L).

What has changed since the Record of Decision was issued?

Existing land use conditions have changed due to ongoing construction activities associated with Phase 1C of the I-90 project. There have also been updates to local plans and state environmental procedures. Kittitas County has updated its *Comprehensive Plan* (Kittitas County 2011) since the ROD was issued. The WSDOT *Environmental Procedures Manual* (EPM) is also updated on a

regular basis. The June 2011 update to the EPM merged six former EPM chapters into one, Chapter 450, Land Use (WSDOT 2011d).

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

In August 2009, the USFS approved a 36.52-acre right-of-way easement for the I-90 project with the Selected Snowshed. This easement included a 0.42-acre easement on Kittitas County Tax Parcel No. 918735. This parcel was privately owned at one time, but as a result of land exchange, is now part of the National Forest. Temporary and permanent land use impacts on that parcel are identified in Exhibit 3-16.

Exhibit 3-16
Selected Snowshed and Proposed Bridges Land Use Impacts (acres)

Impact	Kittitas County Tax Parcel Number	Ownership	Selected Snowshed	Proposed Bridges	Difference
Temporary ¹	918735	Public	0	1.12	1.12
Permanent ^{1,2}	918735	Public	0	1.07	1.07

¹ Temporary and permanent impacts include areas outside of current right-of-way easement areas.

² Permanent impacts for the Proposed Bridges include right-of-way easement areas, which are subject to change during final design. The USFS will determine the final easement area.

Temporary Impacts

Construction of the Selected Snowshed would occur entirely within the current right-of-way easement area. Construction-related activities for the Proposed Bridges would increase temporary land use impacts by 1.12 acres on Parcel No. 918735 (Exhibit 3-16). Section 7 of the Memorandum of Understanding (MOU) between WSDOT and the USFS indicates that use or occupancy of National Forest System lands for other highway-related uses outside easement areas will require a USFS-issued Special Use Permit. WSDOT would obtain a Special Use Permit or amend an existing permit prior to construction.

Permanent Impacts

Land Acquisitions for New Highway Right-of-Way

The Proposed Bridges would require additional right-of-way easement of approximately 1 acre on Parcel No. 918735 managed by USFS (Exhibits 3-16 and 3-17). The procedure for granting an easement modification would be the same for the Proposed Bridges as it was for the I-90 project with the Selected Snowshed.

The 2008 Final EIS concluded that the land acquisitions and easements needed for new highway right-of-way would not change the existing land use patterns or ownership outside of the right-of-way, nor would they be incompatible with adjacent land uses. The minor amount of additional right-of-way easement needed for the Proposed Bridges would not change this conclusion. Lastly, all easements would involve public land, and there are no impacts to privately-owned land.

Compatibility with Existing Land Use Regulations

The USFS issued a consistency determination on August 18, 2009, indicating that the I-90 project with the Selected Snowshed is consistent with USFS land management plans. The use of an additional acre of USFS land for the Proposed Bridges is minimal when compared to the 36.52 acres already transferred for the entire I-90 project. Based on discussions with USFS to date, it is anticipated that USFS would also determine that the Proposed Bridges are consistent with USFS management plans, contingent upon review and approval of final construction and design plans.

Kittitas County issued all requested permits to WSDOT for the I-90 project, indicating that it is consistent with its land use regulations. The Proposed Bridges would alter the land use on an additional acre of public land compared to the Selected Snowshed. Construction of either option would occur within the Keechelus Lake shoreline and critical areas regulated by Kittitas County. Given the minor change in impacted acreage with the Proposed Bridges and the location of this acreage, it is anticipated that Kittitas County would determine that the Proposed Bridges are also consistent with their land use regulations.

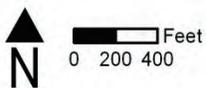
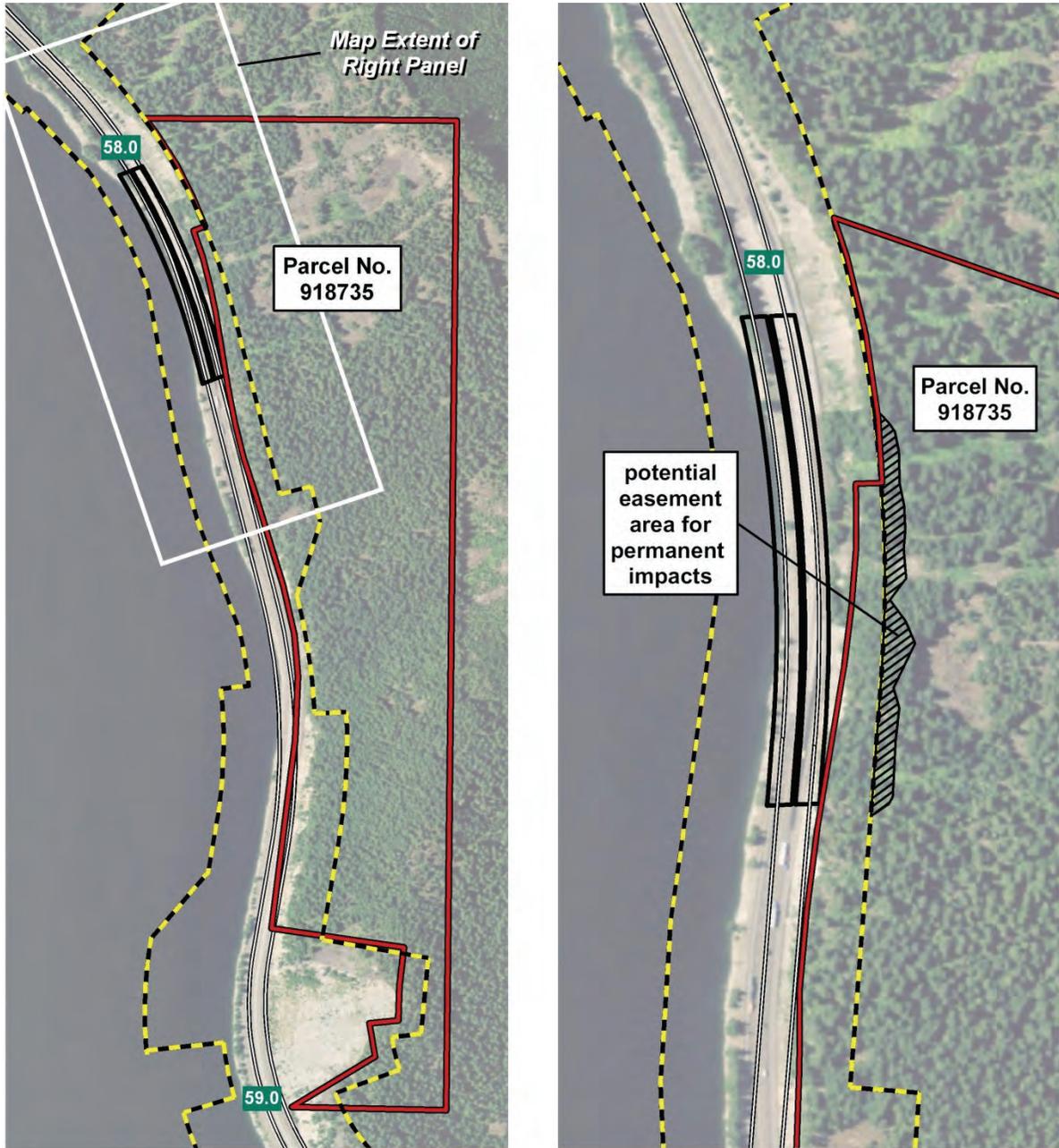
Acquisition of easements on USFS land is governed by two MOUs between the USFS, WSDOT, and FHWA. The MOUs, which outline the procedure for processing land transfers, are summarized in Section 1.13 of the 2008 Final EIS.

Kittitas County's Critical Areas Ordinance (1994)

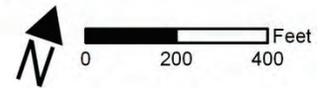
identified critical areas as:

- Wetlands
- Areas with a critical recharging effect on aquifers used for potable water
- Fish and wildlife conservation areas
- Frequently flooded areas
- Geologically hazardous areas

Exhibit 3-17
Proposed Bridges Additional Right-of-Way Easement



- ##** Milepost Marker
- Highway Centerline
- - - Current ROW
- ▭ Proposed Bridges Footprint
- ▭ Parcel Boundary



How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. This is evident in the design footprint of the Proposed Bridges, which has been reduced to minimize additional land acquisitions.

Best Management Practices

No BMP-related commitments were made in the 2008 Final EIS for the I-90 project with the Selected Snowshed, and none are proposed for the Proposed Bridges.

Compensatory Mitigation

Compensatory mitigation to address land use impacts of the I-90 project with the Selected Snowshed is summarized in Appendix F. However, the commitment is not relevant within the design modification area. No additional compensatory mitigation measures are expected for the Proposed Bridges.

3.9 Visual Quality

This section discusses the potential impacts of each option on visual quality. The study area for visual analysis extends beyond the design modification area to include key views both from and towards the highway. Additional information is provided in the *Visual Quality Technical Update* (Appendix M).

What has changed since the Record of Decision was issued?

There have been no major changes to visual regulations or guidance since the ROD was issued. However, existing visual conditions have changed due to construction activities associated with Phase 1B of the I-90 project immediately west of the study area and clearing activities associated with Phase 1C occurring to the west.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Construction of either option would result in similar temporary visual impacts.

Permanent Impacts

There are three key views within the study area (Exhibit 3-18). Complete descriptions of the visual analysis of existing conditions at these key views are provided in the *Visual Discipline Report Supplement* (WSDOT 2007b). The visual quality rating system considers three factors in determining visual quality: vividness, intactness, and unity. Each factor is rated on a scale of 1 to 7, with 7 representing the most desirable conditions. The total visual quality rating is a numerical average of the three ratings.

What do the Total Visual Quality Rating numbers mean?

7 – Dramatic, Pristine Natural Environment with water, mountains, and mature vegetation, or superb example of built environment in dramatic physical setting.

6 – Very High

5 – High

4 – Moderately High

3 – Average

2 – Moderately low

1 – Low

Exhibit 3-18
Visual Quality Key Views



The Selected Snowshed would increase visual ratings at the two key views on I-90 and decrease visual ratings at the key view from the John Wayne Pioneer Trail (Exhibit 3-19). The Proposed Bridges would increase the ratings for one key view on I-90, resulting in a minor beneficial effect. Ratings for two key views would decline with the Proposed Bridges, resulting in minor permanent adverse impacts.

**Exhibit 3-19
Visual Quality Ratings for the Selected Snowshed and Proposed Bridges**

Key View	Location	Existing	Selected Snowshed	Proposed Bridges	Difference ^{1, 2, 3}
2007-3	View from the John Wayne Pioneer Trail	5.5	5.3	5.2	-0.3
2007-4	View eastbound from MP 58.0	5.1	5.7	4.3	-0.8
2007-5	View westbound from MP 58.3	4.7	5.3	5.6	0.9
Average		5.1 (High)	5.4 (High)	5.0 (High)	-0.4

¹ Difference between the Proposed Bridges and existing conditions.

² A negative number is less desirable and represents a decrease in total visual quality; a positive number represents an increase in total visual quality.

³ Differences of less than 1.0 in visual quality ratings between existing and proposed are not considered a substantial visual impact.

The average existing visual quality for the three impacted key views is 5.1. The Selected Snowshed would increase average visual quality at these key views to 5.4, while the Proposed Bridges would slightly reduce visual quality to 5.0. The Proposed Bridges result in a minor overall reduction in visual quality compared to the Selected Snowshed because intactness and unity ratings would decline as a result of increased signs of development and removal of existing vegetation for the avalanche chutes. WSDOT does not consider a total visual quality rating change of less than 1.0 a substantial visual impact. Therefore, the Proposed Bridges would not result in any substantial adverse impacts to visual quality.

For consistency with analyses in the 2008 Final EIS, results for Key View 2007-3 are based on the 2007 photograph from the John Wayne Pioneer Trail. Exhibit 3-20 shows design simulations of the Selected Snowshed and Proposed Bridges on a more recent photo.

Exhibit 3-20

Visual Comparison of the Selected Snowshed and the Proposed Bridges from Key View 2007-3



The Selected Snowshed, as seen from the John Wayne Pioneer Trail (design visualization with lake elevation at 2,465 feet AMSL). The visual quality rating of the Selected Snowshed from this viewpoint is 5.3 (High).



The Proposed Bridges, as seen from the John Wayne Pioneer Trail (design visualization with lake elevation at 2,465 feet AMSL). The visual quality rating of the Proposed Bridges from this viewpoint is 5.2 (High).

The USFS manages changes in views for those traveling along this state and National Scenic Byway. The current Forest Plan assigns the corridor to a land use designation of Scenic Travel – Retention. The proposed Forest Plan Revision would maintain a similar management of scenic views. The USFS previously determined that the I-90 project with the Selected Snowshed is consistent with the Forest Plan. The Proposed Bridges differ from the Selected Snowshed in appearance and would require more alteration of the adjacent hillside forest. Adherence to the *Architectural Design Guidelines* (WSDOT 2008f) should ensure the Proposed Bridges are consistent with Forest Plan objectives.

Visual quality for travelers within the design modification area would improve. While in the Selected Snowshed, scenic views of mountains, lake and forest would be mostly blocked (WSDOT 2007b). For eastbound travelers on the Proposed Bridges, views of the adjacent hillside would be obscured by the higher westbound bridge, but westbound travelers would have unobstructed scenic views up and across the lake where none previously existed. For either option, the changes in traveler views are relatively brief (12.5 seconds) at the 65 mph design speed of the new roadway.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable.

The Proposed Bridges and the Selected Snowshed would use the Cascadian style design theme from the *Architectural Design Guidelines* (WSDOT 2008f), which WSDOT committed to using in the 2008 Final EIS. The Cascadian theme uses native rock, or the appearance of native stone texture, on walls, barriers, piers, and tunnel portals. The theme as applied by WSDOT may incorporate arches on the bridge piers and large tapered columns with rock texture and rock-patterned barriers. The consistent use of this design theme is intended to help unify the look of the I-90 corridor and improve the visual quality ratings from existing ratings.



Both options would use the Cascadian style design theme, which is being carried throughout the I-90 corridor.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). Construction of the Proposed Bridges would not change the commitment to these BMPs and no additional BMPs are currently required.

Compensatory Mitigation

Compensatory mitigation to address the impacts of the I-90 project with the Selected Snowshed is provided in Appendix F. No additional compensatory mitigation measures are expected for the Proposed Bridges.

3.10 Social and Economic Resources

This section discusses the potential impacts of each option on the local and regional economy. Social and economic impacts are expected to extend well beyond the design modification area. Therefore, the study area for social and economic resources includes Kittitas, King, and Pierce counties. Additional information is provided in the *Socioeconomics Technical Update* and *Public Services Technical Update* (Appendices N and O).

What has changed since the Record of Decision was issued?

There are no substantial changes to the affected environment as described in Section 3.13 of the 2008 Final EIS. However, cost estimates to construct the I-90 project have been updated since the ROD was issued based on more detailed design information.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Employment Benefits

The I-90 project as a whole will create a substantial number of temporary construction-related jobs, including approximately 4,800

direct jobs and 7,300 indirect jobs (12,100 total jobs) over the life of the I-90 project.

Construction of the Proposed Bridges is anticipated to cost essentially the same as construction of the Selected Snowshed. Construction-related employment is directly proportional to cost. Therefore, the Proposed Bridges would not change the amount of direct labor income generated by the I-90 project. Employment benefits during construction are the same for either option.

Public Services

Highway closures and lane restrictions during construction have the potential to impact emergency services, but are necessary for construction of either option. The Proposed Bridges would require fewer highway closures than the Selected Snowshed, which would improve access for emergency services during construction.

Permanent Impacts

Employment Benefits

After construction is complete, operation and maintenance of the highway could have nominal effects on employment throughout the local region and Washington State. WSDOT maintenance staff for the existing I-90 corridor through Snoqualmie Pass consists of 25 full-time employees and an additional 45 seasonal employees during the winter months. WSDOT will need to hire additional maintenance staff for I-90 to accommodate the increased number of structures and to plow the additional lanes during the winter after construction of the I-90 project.

Both options would result in some maintenance benefits associated with reduced avalanches and rock fall. However, some additional maintenance is required to maintain both structures, as described in Section 2.5. The Selected Snowshed would require four additional staff to operate and maintain its electronic, lighting, and fire and life safety components, resulting in a slight increase in local employment. In contrast, the Proposed Bridges would not require additional maintenance personnel for the first 20 years. Additional staffing may be required once the bridge structures age and require repairs for potential bridge deck and joint problems.

Once built, the I-90 project with either option would have no impact on overall employment trends within the study area.



Construction of either option will create jobs in the I-90 project area.

Reliability Improvement Benefits

Closures of I-90 can result in costs to the regional economy because they interfere with commerce, disrupt travel, delay delivery of freight, and increase uncertainty for manufacturers and shippers. Closure-related impacts on commercial trucking operations may include violation of mandated curfew hours, increased overtime costs, and missed shipping connections. These are referred to as opportunity costs of road closure. The longer the closure, the faster opportunity costs accumulate.

Both options would require periodic lane closures for routine maintenance and inspection. Compared to the Selected Snowshed, the Proposed Bridges would require fewer lane closures for maintenance (see Section 2.5), resulting in lower opportunity costs.

Both options would reduce the frequency and duration of unexpected road closures due to typical avalanche events and rock fall, thereby lowering opportunity costs relative to existing conditions. Periodic lane closures may be required for active avalanche control and snow removal associated with extreme avalanches for either option (see Section 2.5).

Benefits to Public Services

The I-90 project with either option would improve traffic flow and transportation safety that would have a positive effect on emergency services response times. The Proposed Bridges would place fewer demands on emergency service providers than the Selected Snowshed because the Selected Snowshed requires specific training for a tunnel emergency response that would not be required for the Proposed Bridges.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

No avoidance or minimization measures have been proposed.

Best Management Practices

No BMP-related commitments were made in the 2008 Final EIS for the I-90 project with the Selected Snowshed, and none are proposed for the Proposed Bridges.

The **opportunity cost** of a weather-related closure of I-90 includes the value of passengers' and commercial drivers' time and costs to operate passenger vehicles or the loss of revenue for commercial trucks.



Freight trucks at a standstill on I-90 due to an avalanche control closure.

Compensatory Mitigation

Neither option would result in permanent adverse impacts to social and economic resources. Therefore, no compensatory mitigation is required.

3.11 Indirect Effects

Would the Proposed Bridges result in additional or different indirect effects?

The previous sections of this chapter evaluate the direct effects of the Proposed Bridges as compared to the direct effects of the Selected Snowshed. This section considers the potential indirect effects of constructing the Proposed Bridges. Additional detail is provided in the *Indirect Effects Technical Update* (Appendix P). The indirect effects of the I-90 project with the Selected Snowshed were identified in the 2008 Final EIS.

The 2008 Final EIS concluded that almost all of the adverse effects of the I-90 project are direct rather than indirect. This is based on (1) the location of the I-90 project being almost completely within the Okanogan-Wenatchee National Forest, which will prevent the I-90 project from leading to housing or traffic growth (development that may occur on sections of private land would adhere to zoning regulations and the Kittitas County Comprehensive Plan); and (2) the unavoidable adverse impacts of the I-90 project are limited to the area of construction and will not result in adverse impacts either away from the I-90 project area or later in time. Where indirect effects would occur, they would have a beneficial effect. The beneficial indirect effects of the I-90 project are described below.

- The increased level of safety and capacity from the new highway would have beneficial economic effects continuing for many years throughout the State of Washington.
- The I-90 project's ecological connectivity improvements would result in a gradual increase in wildlife gene flow from wildlife use of the new crossing structures between the North and South Cascades.
- Removal of barriers would allow for restoration of wetlands and aquatic habitat, more natural stream movement of fish and aquatic species, and more natural passage of groundwater.

Indirect effects are effects that are caused by the project and are later in time or farther removed in distance, but are still reasonably foreseeable.

- Increased hydrologic connectivity between groundwater and surface water at stream crossings would have a beneficial effect on water quality and habitat over many years.

None of these indirect effects are solely attributed to the Selected Snowshed. The Proposed Bridges would not result in any additional adverse indirect effects or modify the beneficial indirect effects anticipated from the I-90 project with the Selected Snowshed.

3.12 Cumulative Effects

Would the Proposed Bridges result in additional or different cumulative effects?

This section discusses the cumulative effects of the I-90 project with the Proposed Bridges compared to the Selected Snowshed. Cumulative effects are evaluated within the context of past, present, and reasonably foreseeable future actions. Additional detail is provided in the *Cumulative Effects Technical Update* (Appendix Q).

The 2008 Final EIS considered potential cumulative effects on greenhouse gas emissions, wetlands, terrestrial habitat, and land use. Construction of the Proposed Bridges would not change the I-90 project's effects on greenhouse gas emissions or wetlands. Therefore, the conclusion that there are no cumulative effects to these resources would not change. Land use and terrestrial habitat are analyzed for changes to cumulative effects that could result from the Proposed Bridges. The 2008 Final EIS identified 27 past, present, and reasonably foreseeable future actions at the time of publication. Two additional reasonably foreseeable projects have been identified since the ROD was issued: the Upper Yakima Restoration Project and the Keechelus to Kachess Pipeline.

Land Use

The 2008 Final EIS indicated that the greatest risk of a cumulative effect from land use comes from the possibility of re-zoning to higher development densities. However, it is assumed in the 2008 Final EIS that development on private land is consistent with current zoning. The I-90 project with either option would not change traffic demand or induce growth and is not expected to change land use.

Cumulative effects are the summation of impacts on a resource resulting from the proposed project, when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes these actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Both of the newly-identified reasonably-foreseeable future actions are consistent with current zoning and are not a driving factor for changes to zoning. The Upper Yakima Restoration Project would also protect forested areas from development.

The cumulative impacts of these actions on land use are, therefore, unchanged from those described in the 2008 Final EIS.

Terrestrial Resources

The overall I-90 project with either option would have beneficial effects to terrestrial species by providing crossing opportunities for animals to move north and south across the highway. This beneficial effect would occur by acquiring habitat preservation areas in the I-90 project area, by restoring wetland and riparian habitat in the I-90 project area, and by reducing wildlife mortality. One of the goals for the Upper Yakima Restoration Project is to improve terrestrial habitat. Therefore, it is assumed that only beneficial effects to habitat are expected from this restoration. An assessment of the effects to terrestrial habitat from the Keechelus to Kachess Pipeline is not available at this time. The pipeline would run through currently forested areas that are assumed to be impacted during construction and retained as an easement above the buried pipe. Evaluation of the I-90 project's impacts to terrestrial species and identification of potential mitigation would be required by the USFS.

While the I-90 project, the Proposed Bridges, and the Keechelus to Kachess Pipeline would contribute to a cumulative loss of forest habitat in the Snoqualmie Pass Adaptive Management Area, these additional adverse impacts are less than the overall beneficial effects of the I-90 project and the Upper Yakima Restoration Project, which include improved ecological connectivity, increased riparian habitat, increased preservation of mature forest in the area, and reduced wildlife mortality. Ongoing land management activities such as those promulgated in the *Snoqualmie Pass Adaptive Management Area Plan* (USFS and USFWS 1997) and the *Northwest Forest Plan* (USFS and Bureau of Land Management 1994) are also expected to increase the extent of late-successional forest available to terrestrial species.

3.13 Other Environmental Considerations

Irreversible and Irretrievable Commitment of Resources

NEPA regulations require environmental analyses to identify "...any irreversible and irretrievable commitments of resources, which would be involved in the proposed action should it be implemented." Section 3.17 of the 2008 Final EIS identified some resources impacted by the I-90 project that may involve a possible irreversible or irretrievable commitment. Potential changes to these commitments that would result from construction of the Proposed Bridges are described below.

- Widening and realigning the I-90 corridor would result in an irreversible commitment of land resources during the time period that the land is used for a highway. The Proposed Bridges would slightly increase the amount of land converted to a highway use (Appendix L).
- The energy consumed during construction of the I-90 project is an irreversible commitment of resources. The Proposed Bridges would not change the amount of energy consumed during construction as compared to the amount of energy consumed during construction of the Selected Snowshed (Appendix B [Letter to File for Energy Resources]).
- Road construction would use construction materials (cement, asphalt, etc.), which would require the irretrievable use of additional labor and natural resources. The 2008 Final EIS concluded that their use would not have any adverse impact upon continued availability of these resources, and the Proposed Bridges would not change this conclusion.
- The I-90 project would require a substantial one-time irretrievable expenditure of both state and federal funds. The Proposed Bridges would not require additional expenditures for design and construction, and would result in a long-term cost savings for operations and maintenance as compared to the Selected Snowshed.

Primary irreversible and irretrievable resource commitments may occur when: (1) resources are removed and cannot be replaced within a reasonable time frame (such as extinction of a threatened or endangered species), or (2) project completion will obstruct use of the resources (such as building over a cultural site).

Relationship Between Local Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

Pursuant to NEPA regulations, an EIS must consider "...the relationship between short-term uses of man's environment, and the maintenance and enhancement of long-term productivity." Section 3.17 of the 2008 Final EIS evaluated the short-term benefits of the I-90 project compared to long-term productivity derived from not pursuing the I-90 project. These effects are described below, followed by potential changes related to the Proposed Bridges.

- Short-term effects of the I-90 project include localized disruptions, higher noise levels, increased air pollution, and rerouting of traffic during the construction period. These impacts are relatively inconsequential in the long term and would not be changed by the Proposed Bridges.
- The I-90 project would reduce long-term productivity in areas where habitat is used for highway expansion, new alignments, or road widening. The Proposed Bridges would further reduce long-term productivity due to the increased land area needed to construct the Proposed Bridges compared to the Selected Snowshed.
- The I-90 project would enhance long-term productivity through the creation of additional wildlife habitat and the connection of habitat areas that are presently separated. The Proposed Bridges would not change the proposed wildlife connectivity or the creation of additional habitat by the I-90 project with the Selected Snowshed.

FHWA and WSDOT concluded in the 2008 Final EIS that the beneficial effects to long-term productivity are more considerable than the negative impacts. The slight reduction in long-term productivity that occurs because the Proposed Bridges would convert a small amount of additional land to a transportation use would not change this overall conclusion. The I-90 project with either option is consistent with the maintenance and enhancement of the long-term productivity for the I-90 project area and Washington State.