5.7 Comparison of Alternatives

The objectives of the Chehalis Basin Strategy, as described in Section 5.1, are used as the basis for evaluating the alternatives and their ability to meet the dual purpose and need of reducing flood damage and restoring aquatic species habitat. Sections 5.2 through 5.6 include information regarding the extent to which the No Action Alternative and action alternatives meet the objectives. This section provides a comparison between all of the alternatives.

5.7.1 Reduction in Flood Damage

In preparation of the EIS, a number of modeling studies were completed to understand which alternative would result in the greatest reduction in flood extents and depths, as well as the greatest reduction in flood damage. This section compares the following quantitative and qualitative differences among the alternatives: change in extent and depth of flood damage reduction, effects to agricultural land use, reduction in structure damage, and effects to transportation systems. Based on available data, Alternative 1 would reduce the areal extent and depth of 100-year floods to a greater extent than the No Action Alternative, as well as the other action alternatives. Alternative 4 would increase the areal extent and depth of 100-year floods upstream of Newaukum River confluence. Downstream of the Newaukum River confluence, including in the Chehalis-Centralia area, Alternative 4 would reduce flood extents and depths but to a lesser degree than Alternative 1. However, because Alternative 4 would relocate 16,000 acres of land uses, including 8,500 acres of agriculture, upstream of the Newaukum confluence, it would result in greater flood damage reduction compared to the No Action Alternative and other action alternatives (see Appendix C).

During 100-year floods, Alternative 1 would result in the greatest reduction in flood extents as compared to the No Action Alternative and other action alternatives. The No Action Alternative and Alternative 3 would not reduce flood extents. Alternative 1 would reduce flooding on approximately 4,481 acres throughout Lewis, Thurston, and Grays Harbor counties, with the most benefits realized in the Chehalis-Centralia area (see Figure 5.3-1). Alternative 2 would primarily reduce flooding in the Chehalis-Centralia area near the airport and I-5. However, raising the airport levee and constructing the I-5 Projects as part of Alternative 2 have the potential to increase flood extent and depth on approximately 14 acres of agricultural/forestland to the west (and upstream and downstream) of these actions (see Figure 5.4-1). While Alternative 4 would increase flooding by 4,590 acres in many valley bottom areas upstream of the Chehalis River confluence with the Newaukum River, it would result in a reduction of approximately 815 acres of flooded area downstream of the Newaukum River confluence (see Figure 5.6-1).

The increase or decrease in flood extents and depths would have an impact on land use. Alternative 1 would reduce flooding to a greater extent than the No Action Alternative and other action alternatives due to the reduction in flooding to 1,956 acres of agricultural/forestland (see Table 5.3-1). Alternative 4 would have the greatest impact on agriculture because implementation of the Restorative Flood

Protection action element could result in new or increased flooding to an area potentially reaching 21,000 acres in size in the future 100-year floodplain, including approximately 12,100 acres of active farmland, and would require relocation of 8,500 acres of farmland. The location, magnitude, and concentration of this potential impact from Alternative 4 has not been identified at this time.

Table 5.7-1 provides a comparison of the total number of structures flooded, relocated, or floodproofed during a 100-year flood by alternative. The Aberdeen/Hoquiam North Shore Levee action element is included in Alternatives 1 and 2, and would result in the additional protection of 2,715 structures. Alternative 4 would result in the greatest reduction in flood damage to high-value structures, primarily due to relocating up to 462 structures out of the proposed greenway to upland areas. Because of the land use impacts associated with construction and operation of the Restorative Flood Protection action element, Alternative 4 includes landowner compensation, relocation, or adaptation assistance for landowners willing to participate. Alternative 1 would result in the greatest reduction in remaining structures flooded after the actions have been implemented.

Table 5.7-1
Reduction in Flood Damage to High-value Structures Under Different Alternatives

	CHANGE FROM BASELINE 100-YEAR FLOOD				
ACTION	NO ACTION ALTERNATIVE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
Structures that would no longer be flooded	0	559	88	0	136
Structures relocated	0	0	0	0	462
Structures floodproofed	0	500	812	802	645
Total damages reduced to structures	**0**	**1,059**	**900**	**802**	**1,243**
Remaining structures flooded	1,379	320	479	577	598[1]

Notes:
1. Structures relocated are not included in this total because it is currently unknown whether property owners would be willing to relocate.

The alternatives were also evaluated to determine their effectiveness in reducing disruption in transportation systems, including closures of I-5 and local and regional transportation systems. Under the No Action Alternative, I-5 would continue to be closed up to 4 days during a 100-year flood, requiring use of WSDOT's detour route. Closures of SR 6, US 101, and US 12, and flooding of local roadways would continue. Flooding of rail lines, including BNSF, Union Pacific, and the Curtis Industrial Park line, would also continue under the No Action Alternative. All of the action alternatives would reduce disruptions to transportation systems compared to the No Action Alternative.

Of the action alternatives, Alternative 1 would result in the least disruption to transportation systems, while Alternative 4 would result in the most disruption (see Table 5.7-2). Under Alternative 1, flooding

of roadways would be reduced in the upper Chehalis Basin near the Chehalis River due to implementation of the Flood Retention Facility and Airport Levee Improvements. Alternative 4 would increase flooding impacts on transportation systems in the Chehalis Basin upstream of the Newaukum confluence with the Chehalis River.

Table 5.7-2
Reduction in Transportation Impacts During a 100-year Flood Under Different Alternatives

NO ACTION ALTERNATIVE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
I-5 CLOSURES (CLOSED 4 DAYS DURING 100-YEAR FLOOD)				
No reduction	Reduced by 3 days	Reduced up to 3 days	No reduction	No reduction
FLOODING OF SR 6, US 101, US 12, AND LOCAL ROADS				
No reduction	Reduced by 1 to 3 days	Reduced behind levee, increased on west side of I-5 (SR 6 and local roadways)	No reduction	Reduced in Chehalis-Centralia area by up to 1 day, could be increased on SR 6 (4 days), SR 506 (1 to 2 days), and SR 508 (2 days)

5.7.2 Restoration of Aquatic Species Habitat

Implementation of the Aquatic Species Habitat Actions low and high scenarios in all of the action alternatives would substantially increase riparian area and salmon abundance, resulting in a benefit to other aquatic species as well. With Aquatic Species Habitat Actions, riparian area would be increased between 21 river miles (1,150 acres) and 214 river miles (9,750 acres). Alternative 1 would decrease 241 acres of riparian area in the FRFA reservoir due to clear-cutting and permanent inundation. As a combined action alternative, Alternative 1 would result in a total of between 909 and 9,509 acres of increased riparian habitat. Alternative 4 would increase the riparian area by between 562 and 6,552 acres through adding large wood in the treatment areas, for a total of 1,712 to 16,302 acres of increased riparian habitat.

As shown in Table 5.7-3, Alternative 1 would result in the least increase in salmon abundance, while Alternative 4 would result in the greatest increase in salmon abundance. The increase in salmon abundance for Alternatives 2 and 3 would be very similar to the Aquatic Species Habitat Actions (see Section 4.8.4.2.1). Across all alternatives, climate change would reduce salmon abundance, and the low restoration scenario would generally maintain the status quo. Modeled results of salmon habitat potential include the maturation of riparian areas in managed forestlands and active restoration from the Aquatic Species Habitat Actions compared to current conditions.

A major difference between Alternative 1 and the other alternatives is the effect on salmon and other aquatic species that use the mainstem Chehalis River upstream and immediately downstream of the dams. The dams would have a significant adverse impact on the native species that use this area of the mainstem. Although, the FRO dam would allow passage of species, changes to habitat in the reservoir area would decrease the survival of salmon and other species. The FRFA dam would more severely reduce upstream and downstream passage of aquatic species resulting significant reductions of salmon, lamprey and other species in that portion of the Chehalis Basin.

The potential response of some specific species to Alternatives 1 and 4—accounting for climate change—are also compared in the previous sections (see Figures 5.3-4 and 5.3-5 [Alternative 1] and Figures 5.6-2 and 5.6-3 [Alternative 4]). The contribution of managed forestlands to salmon abundance would, on average, contribute 59% of restoration benefit for the low scenario and 27% for the high scenario[5].

Table 5.7-3
Potential Response in Salmon Abundance to Habitat Change in the Chehalis Basin Under Different Action Alternatives

ACTION	CHANGE IN ABUNDANCE FOR CHUM, SPRING-RUN AND FALL-RUN CHINOOK, COHO, AND WINTER-RUN STEELHEAD IN NUMBER OF FISH (%)			
	LOW RESTORATION 20% OF REACHES (CURRENT CONDITIONS)	LOW RESTORATION 20% OF REACHES (FUTURE CONDITIONS)	HIGH RESTORATION 60% OF REACHES (CURRENT CONDITIONS)	HIGH RESTORATION 60% OF REACHES (FUTURE CONDITIONS)
Aquatic Species Habitat Actions (Alternatives 2 and 3 would be similar)	48,843 **(18%)**	5,019 **(2%)**	194,383 **(73%)**	141,135 **(53%)**
Alternative 1 (FRFA and Aquatic Species Habitat Actions)	38,215 **(14%)**	4,707 **(2%)**	143,975 **(54%)**	123,564 **(46%)**
Alternative 1 (FRO 50 and Aquatic Species Habitat Actions)	46,756 **(18%)**	8,781 **(3%)**	192,986 **(73%)**	127,946 **(48%)**
Alternative 1 (FRO 100 Aquatic Species Habitat Actions)	46,602 **(18%)**	7,925 **(3%)**	192,560 **(72%)**	127,848 **(48%)**
Alternative 4 (Restorative Flood Protection and Aquatic Species Habitat Actions)	120,514 **(45%)**	40,017 **(15%)**	249,345 **(94%)**	179,847 **(68%)**

Based on the increased riparian area and salmon abundance, Alternative 4 would result in the greatest benefit to aquatic species compared to the No Action Alternative and other action alternatives. Alternative 1 would substantially restore habitat for aquatic species, but would result in the least benefit

[5] Refer to Draft EIS Addendum dated October 17, 2016.

as a result of permanent and large-scale changes to the Chehalis River and floodplain caused by a Flood Retention Facility.