BIOLOGICAL ASSESSMENT
SOUTH MEDFORD INTERCHANGE IMPROVEMENT PROJECT
&
BEAR CREEK / HIGHWAY 1 NORTHBOUND AND SOUTHBOUND BRIDGES REPLACEMENT PROJECT

City of Medford
Jackson County

Coho Salmon

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1.0 INTRODUCTION

1.1 BACKGROUND

The purpose of this Biological Assessment (BA) is to address the effects of the South Medford Interchange (SMI) project and the Bear Creek/Highway 1 Northbound (NB) and Southbound (SB) Bridges Replacement project (Bear Creek Highway 1 Bridges) on fish species listed as threatened under the federal Endangered Species Act (ESA) and "Essential Fish Habitat" (EFH) as defined by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Federal Highway Administration (FHWA) funds will partially finance both projects, which constitutes the Federal nexus. The Oregon Department of Transportation (ODOT) will be responsible for administering the funds and the construction activities associated with both projects.

This BA assesses compliance of both projects with Section 7(c) of the ESA of 1973, as amended. Section 7 of the ESA assures that, through consultation (or conferencing for proposed species) with either the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NOAA Fisheries), Federal actions do not jeopardize the continued existence of any threatened, endangered or proposed species, or result in the destruction or adverse modification of designated or proposed critical habitat.

This document is a batched BA that addresses the combined impacts of both the SMI and Bear Creek Highway 1 Bridges projects on listed salmonids. The SMI and the Bear Creek Highway 1 Bridges projects were developed at different times. Planning for the SMI project started over 4 years ago to address the need for a new interchange in the South Medford area. More recently, in 2002, inspections of the existing I-5 bridges over Bear Creek near Milepost 27.09 identified significant cracking and an urgent need to replace the bridges. Recognizing that the two project areas overlap along one segment of Bear Creek, and due to the urgent need to replace the I-5 bridges, ODOT has elected to prepare one BA for both projects. ODOT recognizes that the projects are related in a spatial sense due to their close proximity to one another, and it was determined that preparing a combined BA for both projects is the most efficient and cost effective way of addressing the impacts of both projects. Both projects are at different levels of design; the SMI project is slightly more advanced than the Bear Creek Highway 1 Bridges project.

The species addressed in this document is the Southern Oregon/Northern California Coasts Coho (SONCC) Evolutionarily Significant Unit (ESU). Coho are under the jurisdiction of NOAA Fisheries. Consultation is accomplished, in part, through this BA, which evaluates the potential effects of the proposed transportation projects on fish species that are federally listed under the ESA. Conservation measures are identified in this BA to avoid or minimize any adverse effects of the proposed projects on listed species or critical habitat.

Photographs documenting existing site conditions for the SMI and Bear Creek Highway 1 project areas are presented in Appendix A1 and A2, respectively. Preliminary project site

plans for the respective projects are presented in Appendices B1 and B2. Preliminary bridge plan and profiles for the SMI and Bear Creek Highway 1 Bridges projects are presented in Appendix C1 and C2, respectively.

1.1.1 South Medford Interchange

The existing South Medford Interchange is located at the Barnett Road Interchange at Exit 27 on Interstate 5 (I-5) in the City of Medford, Oregon and serves as one of two points of access between the City and the highway. The facility serves as the south gateway to the City, and it is a key link to future expansion of the City's economic base. Its importance has led to increased use, which has resulted in unacceptable levels of congestion. I-5 is one of two highways in western Oregon providing north-south connections between California and Washington states.

The proposed project will involve the construction of a new interchange approximately 0.58 km (0.36 mi) south of the existing Barnett Road Interchange. The existing Barnett Road Bridge over I-5 will be retained, although the existing interchange will be decommissioned and its ramps removed. The new interchange will involve a Single Point Urban Interchange (SPUI) bridging of I-5. Installation of the new interchange will require street relocations and modifications. The project will also require the construction of 3 new bridges over Bear Creek, the construction of a new bridge over Larson Creek and the replacement of an existing culvert on Lazy Creek. Because work will occur within and adjacent to Bear, Larson and Lazy Creeks, the project has the potential to impact coho salmon (*Oncorhynchus kisutch*) and their designated critical habitat.

Environmental impacts associated with the SMI project are currently being evaluated through the National Environmental Policy Act (NEPA) process. A Draft Environmental Impact Statement (DEIS) was completed and distributed for comment in December 2001. The Final Environmental Impact Statement is presently being refined. The Record of Decision will not be delivered prior to approval of the project by NOAA Fisheries in the form of a Letter of Concurrence or a Biological Opinion.

1.1.2 Bear Creek Highway 1 Bridges

The Bear Creek Highway 1 NB and SB Bridge Replacement project (Bear Creek Highway 1 Bridges) calls for the demolition and reconstruction of the existing Highway 1 (Interstate 5 [I-5]) bridges located over Bear Creek in Medford, Oregon. These bridges are located near MP 27.09 on I-5 approximately 680 meters (2,203 ft) south of the existing Barnett Road Interchange. These bridges are located within the southern portion of the SMI project area. Although the SMI project is considered by ODOT to be a separate project from the replacement of the existing I-5 bridges, the proposed southbound (SB) on-ramp and northbound (NB) off-ramp bridges for the SMI project will be constructed immediately adjacent to the existing I-5 bridges to be replaced.

Recent inspections conducted by ODOT in 2002 for both the NB and SB I-5 bridges identified cracking and other structural deficiencies significant enough to warrant the replacement of the bridges. Interstate 5 is one of two highways in western Oregon providing north-south connections between California and Washington states. The highway carries

significant volumes of commercial and passenger vehicle traffic and the safe operation of the bridges over Bear Creek is critical to maintaining traffic flow through the region. Without the pending replacement of the bridges, the structural problems will force ODOT to limit loads on the bridges, requiring a substantial amount of heavy-truck traffic to detour around the bridges. Detour routes are not defined, and given the nature of the trucks traveling the highway (e.g., triple-trailers and heavy loads) and the constraints of potential alternative roadway systems, it will be very problematic for trucks to find safe routes through the City of Medford and the surrounding Rogue Valley.

1.2 LOCATION

1.2.1 South Medford Interchange

The proposed SMI project area is located in the vicinity of the Barnett Road Interchange at Exit 27 (near milepost 27) on I-5, approximately 42 kilometers (27 miles) north of the border between Oregon and California. The existing interchange is located in the southeastern portion of the City of Medford, Jackson County, Oregon (Figure 1). The proposed new interchange will be located approximately 0.58 km (0.36 mi) southeast of the existing interchange (Figure 2A). Various elements of the project are located in Township 37S, Range 1W, Sections 31, 32 and 50.

1.2.2 Bear Creek Highway 1 Bridges

The existing I-5 bridges over Bear Creek are located at MP 27.09, approximately 680 meters (2,203 ft) south of the existing Barnett Road Interchange at Exit 27 in the southeastern portion of the City of Medford, Oregon (Figure 1). These bridges are located within the southern portion of the SMI project area in Township 37S, Range 1W, Section 32 (Figure 2B). The proposed bridges will be constructed at the same locations and along the same alignments as the existing bridges.

1.3 PURPOSE AND NEED

1.3.1 South Medford Interchange

The purpose of the proposed SMI is to provide a safe, efficient, long-term solution to the increasing traffic congestion within the SMI project area, which is focused on the I-5/Barnett Road Interchange. The proposed action is consistent with the City of Medford's 1999 Vision process, and the project is being designed to reduce existing traffic and future traffic congestion and operational problems within the project area. The project seeks to minimize adverse impacts to the environment, residential neighborhoods and businesses (ODOT 2001). The project is necessary to ease congestion, improve road safety and maintain the integrity of the Medford transportation system. The current transportation system within South Medford cannot support the future traffic that will be generated by the projected growth patterns presented in the City of Medford's Comprehensive Plan (ODOT 2001). Within Medford, I-5 carries a substantial amount of local traffic due to the low number of local cross-town connector routes. Barnett Road is one the few east-west connections serving not only traffic

Figure 1. Project Vicinity Map

Figure 2A. Project Location – South Medford Interchange

Figure 2B. Project Location – Bear Creek Highway 1 Bridges

accessing I-5, but also a substantial amount of east-west intra-city trips. Barnett Road experiences unacceptable levels of traffic during peak periods. Existing and projected Levels of Service (LOS) for key intersections along Barnett Road consistently show failing conditions (ODOT 2001). Without improvements to the interchange, unsafe vehicle queuing and particularly long queues at the interchange and its off-ramps will continue. Long off-ramp vehicle queues backing up onto I-5 serve to degrade the capacity of the freeway and increase the risk of accidents. Future operations of the interchange and I-5 need to be protected from traffic congestion and related safety problems in order to maintain their primary function of safe and efficient inter-regional and regional travel (ODOT 2001).

1.3.2 Bear Creek Highway 1 Bridges

In June 2002, ODOT conducted a detailed inspection of both the existing NB and SB I-5 bridges over Bear Creek. This inspection identified significant cracking in the bridge superstructure, advanced rutting on the bridge decks and signs of distress in the bridge soffits. Holes are beginning to form in the bridge decks and there is evidence of bent movement on the NB bridge (ODOT 2002a).

As previously stated, I-5 is one of two highways in western Oregon providing north-south connections between California and Washington states. The highway carries significant volumes of commercial and passenger vehicle traffic, and the safe operation of the bridges over Bear Creek is critical to maintaining traffic flow through the region. Due to the advancing structural wear on the bridges, their immediate replacement is warranted to protect the traveling public on I-5 and other local routes, and to maintain one of Oregon's primary interstate highways.

In addition to public safety, replacing the existing bridges provides several benefits to the hydrologic conditions along Bear Creek. New bridge structures will improve seismic and structural performance, improve hydraulics, and minimize long-term disturbance and obstructions within the Bear Creek channel.

2.0 EVALUATION METHODS

2.1 SOUTH MEDFORD INTERCHANGE

Evaluation methods used in the development of this BA employed detailed site analysis of both project sites coupled with regulatory agency site visits and conversations with agency biologists. A series of site visits were conducted for the SMI project in May and July 2000 and July 2001 for the purposes of evaluating and documenting biological resources within the project area for the development of the DEIS. Biological resources evaluated for the DEIS included vegetation communities, wildlife, threatened and endangered species, wetlands, and invasive species. The riparian forest communities along Bear and Larson Creeks were assessed during these site visits, and the DEIS addressed potential impacts to fisheries resources within the Bear Creek Watershed. Additional site visits for the purposes of evaluating potential impacts relative to the preparation of this BA were conducted in July 2002, and June and July 2003.

As part of the SMI project development and DEIS processes, a regulatory agency meeting, including a tour of the project site, was held on June 7, 2000. The purpose of this meeting was to provide a clear understanding of the SMI project, introduce the project team, identify regulatory agency concerns, and visit both the existing and proposed interchange sites to review existing environmental conditions. Present at the meeting were Nancy Munn (NOAA Fisheries), Nick Testa (ODOT Environmental Services), Jim Collins (ODOT Environmental Services), Yvonne Vallette (U.S. Environmental Protection Agency), Greg Holthoff (ODOT Environmental Services), Gordon Dunkeld (Oregon Division of State Lands [DSL]), Elton Chang (Federal Highways Administration), Bill Ryan (ODOT Environmental Services), Frank Stevens (ODOT), William Fletcher (ODOT Environmental Services), Chris Thoms (U.S. Army Corps of Engineers [COE]), Randy Reeve (Oregon Department of Fish and Wildlife [ODFW]), Robert Burns (United States Fish and Wildlife Service [USFWS]), Jim Hanks (JRH Engineering), Gary Shaff (JRH Engineering), Mark Hynson (Mason, Bruce & Girard [MB&G]), and Bob Carson (MB&G).

A second regulatory agency meeting was held on July 30, 2002. Topics discussed during the meeting included a project update, a discussion on the DEIS process and selection of the preferred alternative, and a review of the preliminary project design. This meeting also included a tour of the project site to review existing site conditions. Prior to conducting the site visit, ODOT surveyors had field staked the locations of proposed bridge piers, retaining walls and the centerlines of proposed interchange ramps to assist in visualizing potential impacts in the vicinity of all affected streams including Bear, Larson and Lazy Creeks. Present at this meeting were Jim Collins (NOAA Fisheries), Randy Reeve (ODFW), Greg Holthoff (ODOT Environmental Services), William Fletcher (ODOT Environmental Services), Bill Ryan (ODOT Environmental Services), Ken Cannon (ODOT Environmental Services), Jerry Marmon (ODOT Environmental Services), Mike Arneson (ODOT Bridge Design Team), Bruce Carmichael (ODOT Hydraulics), Eric Bonn (ODOT Bridge Design Team), Jerry Lane (OBEC, Inc.), Mike Gallagher (URS Corporation), Karen Smith (Jackson County Roads, Parks, and Planning Services), Mark Hynson (MB&G), and Stuart Myers (MB&G).

In October 2002, ODOT submitted a Biological Assessment to NOAA Fisheries based upon conceptual drawings and information for both the SMI and Bear Creek Highway 1 Bridges projects. NOAA Fisheries responded in a November 18, 2002 letter that the agency had not received all the necessary information to complete the consultation process on the SMI project. However, NOAA Fisheries did note that the agency had been involved in the associated NEPA process and has provided input on the various design alternatives for the SMI project. It was the opinion of NOAA Fisheries that ODOT's design process for both projects was working to avoid and minimize impacts to SONCC coho salmon (NOAA Fisheries 2002a).

Additional project planning continued through early 2003, and a third interagency meeting/ site visit was held on June 19, 2003. The purpose of this meeting was to provide attendees with an update of the EIS process, a summary of the main elements of both projects and a tour of both project sites to review existing site conditions. Present at this meeting were Jim Collins (NOAA Fisheries), Greg Holthoff (ODOT Environmental Services), William

Fletcher (ODOT Environmental Services), Bill Ryan (ODOT Environmental Services), Ken Cannon (ODOT Environmental Services), Jerry Marmon (ODOT Environmental Services), Mike Arneson (ODOT Bridge Design Team), Eric Bonn (ODOT Bridge Design Team), Debbie Timms (ODOT Project Manager), Frank Stevens (ODOT Project Manager), Tim Murphy (ODOT), Dave Peterson (USFWS Biologist), Dominic Yballe (COE), Tom Murtagh (ODFW), Gail Shaloum (URS Corporation), Mark Hynson (MB&G), and Doug Corkran (MB&G).

The overall purpose of these meetings was to solicit comments from agency representatives on conceptual design issues for the SMI project. Many of the design elements presented in this BA are in direct response to agency comments at these meetings. In addition, information pertinent to construction of the project and project impacts was obtained through other conversations and communications with NOAA Fisheries, ODFW, and ODOT staff.

Factors considered in evaluating project impacts included the coho salmon's dependence on specific habitat components that will be removed or modified, the abundance and distribution of habitat, habitat components in the project vicinity, distribution and population levels of the species (if known), the possibility of direct impact to fish, the degree of impact to habitat, and the potential to mitigate the adverse effects. The methods outlined in *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NOAA Fisheries 1996) were used to analyze the potential for project impacts on water quality and in-stream and riparian habitat quality. The analysis approach used in this document is to determine the environmental baseline for the watershed, discuss how the proposed action would affect the environmental baseline, and then use that information in a dichotomous key to arrive at a determination of effect.

2.2 BEAR CREEK HIGHWAY 1 BRIDGES

Due to the overlap of the SMI project area with the Bear Creek Highway 1 Bridges project site, all of the natural resource studies conducted for the SMI DEIS included the Bear Creek Highway 1 Bridges project site. Field studies performed for the SMI project area included site visits, data gathering, and analysis of the Bear Creek corridor.

During the June 7, 2000 SMI interagency field meeting, agency representatives and the ODOT project team conducted a walking tour of the area under and around the existing I-5 bridges that comprise the Bear Creek Highway 1 Bridges project site. The walking tour allowed the meeting participants to view existing site conditions around the bridges and to assess how certain elements of the SMI project will be located in proximity to the existing bridges. A second SMI interagency meeting on July 30, 2002 and a third interagency meeting on June 19, 2003 were held that also allowed participants to view and assess site conditions around the Bear Creek Highway 1 Bridges project area. Additional site visits of the Bear Creek Highway 1 Bridges project site for the purposes of evaluating impacts relative to the preparation of this BA were conducted in June and July 2003.

Similar to the SMI project, the interagency meetings of 2002 and 2003 were conducted for the purpose of obtaining comments from agency representatives on conceptual design issues for the Bear Creek Highway 1 Bridges project. Many of the design elements presented in

this BA are in direct response to agency comments that were derived from these meetings. In addition, information pertinent to the construction of the Bear Creek Highway 1 Bridges project and project impacts was also obtained through other conversations and communications with NOAA Fisheries, ODFW, and ODOT staff. The methods outlined in *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NOAA Fisheries 1996) were also used for the Bear Creek Highway 1 Bridges project to analyze potential project impacts. The analysis approach to arrive at a determination of effect was identical to that used for the SMI project.

3.0 PROJECT DESCRIPTIONS

The following section presents a description of both the SMI and the Bear Creek Highway 1 Bridges projects. The information presented is based on a review of concept plans for each project available at the time this document was prepared. Additional relevant project information was obtained through conversations and meetings with ODOT engineering staff who are working on various elements of the project design. ODOT project managers and technical staff understand that the project information presented in this document is preliminary.

3.1 SOUTH MEDFORD INTERCHANGE

3.1.1 General

The proposed SMI project will involve the construction of a new interchange approximately 580 m (1,903 ft) south of the existing Barnett Road interchange. The existing Barnett Road overpass of I-5 will be retained, although the existing interchange will be de-commissioned and its ramps to I-5 removed. The new interchange will involve a Single Point Urban Interchange (SPUI) bridging of I-5. This type of interchange concentrates all of the turning movements associated with the facility on the structure rather than distributing them at separate intersections associated with off-ramps and on-ramps, or at merging lanes as are commonly seen along the highway. The major components of the new interchange are presented in Figure 2A.

To access the interchange, Garfield Street will be extended from the existing intersection of Highway 99 (Hwy 99) and Belknap Road northwest approximately 740 m (2,430 ft) to the proposed interchange overpass of I-5. Referred to as the Garfield Street Extension, this new roadway will include four lanes with a raised median and exclusive turn lanes at intersections. From Hwy 99, the Garfield Street Extension will extend approximately 0.75 km (0.46 mi) northeast to the proposed interchange. From the proposed interchange structure, Highland Drive will be extended approximately 0.42 km (0.26 mi) to Barnett Road. The Highland Drive Extension will require new bridge crossings of Bear Creek and Larson Creek. A 1.8-m (6-ft) sidewalk and 1.8-m (6-ft) bike lane/shoulder are proposed for both sides of the Garfield Street and Highland Extensions. The sidewalks across all bridges will be 2.1 m (7 ft) wide.

In addition to the Garfield Street and Highland Drive Extensions, the existing alignment for Center Drive in the southern portion of the project area will be relocated to provide safe and functional spacing between intersections along Garfield Street. The current alignment of Center Drive is too close to the existing Hwy 99 and Belknap Avenue intersection to provide adequate vehicle function. Portions of Center Drive will be modified to provide access to existing development. Credit Union Drive will be modified to reconnect to either Center Drive or an internal access road. A road stub out is proposed at the realigned intersection of Center Drive and Garfield Avenue. The road stub out would provide for a future southerly extension of Center Drive to allow access to properties lying to the south. The road stub out is proposed only for property access and is not related to other development projects that may be planned for other properties to the south. Other planned and permitted development projects in the area are not dependent on the development of the SMI project.

Improvements to Hwy 99 are proposed from the existing Hwy 99/Stewart Avenue intersection south to Charlotte Anne Road, which is approximately 375 m (1,230 ft) south of the existing Hwy 99/Belknap Road intersection. These improvements include an additional NB left turn lane on the south leg of the Stewart/Hwy 99 intersection and an additional SB left turn lane on the north leg of the Belknap/Hwy 99 intersection. The turn lane improvements will widen the highway on both sides and will encroach upon existing commercial development on the east side.

New off-ramps and on-ramps will be constructed to connect with the interchange overpass. A new SB on-ramp to I-5 and a new NB off-ramp from I-5 will be constructed over Bear Creek.

3.1.2 Bridge and Overpass Construction

Construction of the proposed project will require the installation or replacement of 8 bridges within the project area, including 4 new crossings of Bear Creek or its tributaries. In the vicinity of the new interchange, new bridge construction will include the main Garfield Street/Highland Avenue Extension overpass of I-5, a new SB on-ramp to I-5 bridging Bear Creek, a new NB off-ramp from I-5 bridging Bear Creek and a new NB on-ramp to I-5. The new SB off-ramp from I-5 will be constructed on raised fill. Other new bridges include a new bridge over Bear Creek and Larson Creek in the northern portion of the project area for the Highland Drive Extension. The existing Barnett Road Bridge over Bear Creek and the existing Highland Drive box culvert on Lazy Creek will also be replaced.

With the exception of the Lazy Creek crossing, all of the bridges will be constructed with precast concrete beams and cast-in-place concrete decks. The new bridge over Lazy Creek will be a single-span cast-in-place concrete slab. Foundations for the bridges are all expected to be constructed using drilled shafts and/or steel piles (Bonn 2003). No concrete spread footings are proposed except possibly at Lazy Creek. Bridge bents will be located outside of Ordinary High Water Mark (OHWM) where possible. Three of the 26 new permanent bents will be constructed below the OHWM, while two existing bents and one box culvert will be removed from below the OHWM (Table 3.1). In addition, 18 temporary bridge bents will be constructed below the OHWM. Some riprap will be required for scour protection on several of the bridge structures. Each component of the SMI Project is summarized in Tables 3.2 and 3.3 and in the following sections.

Table 3.1 Bent and Culvert Structures Removal and Installation (South Medford Interchange)

Structures	Total Number of Structures	Number Above 100-Year Flood Elevation	Number Below 100-Year Flood Elevation	Number Below OHWM	In-water Work Area Containments
Bents Removed	4	0	2	2	2
Temporary Bents	32	2	12	18	18
Permanent Bents	26	2	21	3	3
Culverts Removed	1	0	0	1	1
Total Structures	**63**	**4**	**35**	**24**	**24**

3.1.2.1 New Garfield Street Bridge over Interstate 5 (Bridge No. 19108)

The proposed bridge carrying Garfield Street over I-5 will form the center of the new interchange. All of the new interchange ramps will be aligned to meet at the top of this bridge. The proposed Garfield Street Bridge will be a single-span precast prestressed bridge structure approximately 41.5 m (136 ft) long and 80 m (263 ft) wide. The top of the proposed bridge structure will be 7.6 m (25 ft) above the existing travel lanes of I-5. Retaining walls will be constructed on both the north and south approaches of the bridge to allow the ramps to remain as close as possible to I-5, thereby minimizing the overall project footprint, reducing the span length, eliminating the need for a mid-span support, and to facilitate this specific type of interchange geometry. The bridge bents and retaining walls will be installed approximately 100 m (328 ft) from the OHWM of Bear Creek. All these structures are located within the 100-year floodplain.

3.1.2.2 New Interchange Ramps

The new interchange will be constructed approximately 120 m (400 ft) northwest of where Bear Creek passes under I-5 and in an area where the Bear Creek channel meanders between a northerly and northwesterly flow. Construction of the new interchange will require the construction of two off-ramps and two on-ramps to provide full access to I-5. Due to the proposed height of the interchange and the proximity to Bear Creek, three of the four proposed ramps will be supported by bridge structures. Two of the ramps, the SB on-ramp to I-5 and the NB off-ramp from I-5, will require new bridge crossings of Bear Creek.

The proposed SB on-ramp to I-5 and the proposed NB off-ramp from I-5 will extend southeast from the proposed interchange along the I-5 alignment, crossing over Bear Creek at a point where the creek channel begins to change to a northwesterly flow. The proposed ramp bridges will be constructed outside (north and south) of the existing bridges that carry I-5 over Bear Creek. The following discussion presents additional details on the interchange ramp bridges:

Garfield Street Ramp to Highway 1 SB over Bear Creek (Bridge No. 19114)

The proposed Garfield Street Ramp to Highway 1 SB over Bear Creek (SB on-ramp to I-5 Bridge No. 19114) will be a four-span precast prestressed bridge structure approximately 127 m (417 ft) in length. The width of the ramp will taper from 11.6 m (38 ft) at its northern end to 10.2 m (33.5 ft) at its southern end. The bottom of the bridge will be a minimum of approximately 4 m (13 ft) above the OHWM. The proposed ramp will have five bents. One

Table 3.2 Summary of Bridge Impacts (SMI Project Permanent Bridges)

Permanent Bridges	Existing Conditions	Proposed Bridge	Net Changes
Bridge 19108 **Garfield/ Highland Street over Hwy. 1** **(Permanent)**	• Bridge does not currently exist	• Bridge length is 41.5 m • Bridge width is 80 m	• +41.5 m bridge length • +80 m bridge width
	• No bents below 100-year or OHWM	• 2 bents total • 2 bents below 100-year • 0 bents below OHWM • 0 in-water work area containments	• +2 bents total • +2 bents below 100-year • +0 bents below OHWM • +0 in-water work area containments
	• I-5 stormwater not currently treated	• Stormwater conveyed to north and south detention facilities	• Increased stormwater from impervious surfaces (treated)
Bridge 19109 **Hwy. 1 NB Ramp to Highland Dr.** **(Permanent)**	• Bridge does not currently exist	• Bridge length is 110 m • Bridge width is 8.4-12.4 m	• +110 m bridge length • +8.4-12.4 m bridge width
	• No bents below 100-year or OHWM	• 4 bents total • 2 bents below 100-year • 2 bents(6 drilled shafts) below OHWM • 2 in-water work area containments	• +4 bents total • +2 bents below 100-year • +2 bents (6 drilled shafts) below OHWM • +2 in-water work area containments (400 m^2) • +3.84 m^2 total stream bed disturbed below OHWM
	• No impervious surfaces present	• Stormwater conveyed to north detention facility	• Increased stormwater from impervious surfaces (treated)
Bridge 19110 **Highland Dr. over Bear Cr.** **(Permanent)**	• Bridge does not currently exist	• Bridge length is 128 m • Bridge width is 44m	• +128 m bridge length • +44 m bridge width
	• No bents below 100-year or OHWM	• 4 bents total • 4 bents below 100-year • 0 bents below OHWM • 0 in-water work area containments	• +4 bents total • +4 bents below 100-year • +0 bents below OHMW • +0 in-water work area containments
	• No impervious surfaces present	• Stormwater conveyed to north detention facility	• Increased stormwater from impervious surfaces (treated)
Bridge 19111 **Highland Dr. over Larson Cr.** **(Permanent)**	• Bridge does not currently exist	• Bridge length is 31 m • Bridge width is 44 m	• +31 m bridge length • +44 m bridge width
	• No bents below 100-year or OHWM	• 2 bents total • 2 bents below 100-year • 0 bents below OHWM • 0 in-water work area containments	• +2 bents total • +2 bents below 100-year • +0 bents below OHWM • +0 in-water work area containments
	• No impervious surfaces present	• Stormwater conveyed to north detention facility	• Increased stormwater from impervious surfaces (treated)

Table 3.2 Summary of Bridge Impacts (SMI Project Permanent Bridges) continued:

Permanent Bridges	Existing Conditions	Proposed Bridge	Net Changes
Bridge 19114 **Garfield Street Ramp to Hwy. 1 SB** **(Permanent)**	• Bridge does not currently exist	• Bridge length is 127 m • Bridge width is 10.2-11.6 m	• +127 m bridge length • +10.2-11.6 m bridge width
	• No bents below 100-year or OHWM	• 5 bents total • 4 bents below 100-year • 1 bent (3 drilled shafts) below OHWM • 1 in-water work area containment	• +5 bents total • +4 bents below 100-year • +1 bent (3 drilled shafts) below OHWM • +1 in-water work area containment (200 m^2) • +1.92 m^2 total stream bed disturbed below OHWM
	• No impervious surfaces present	• Stormwater conveyed to north detention facility	• Increased stormwater from impervious surfaces (treated)
Bridge 19284 **Highland Dr. Ramp to Hwy 1 NB** **(Permanent)**	• Bridge does not currently exist	• Bridge length is 184 m • Bridge width is 8.2-11.4 m	• +184 m bridge length • +8.2-11.4 m bridge width
	• No bents below 100-year or OHWM	• 5 bents total • 5 bents below 100-year • 0 bents below OHWM • 0 in-water work area containments	• +5 bents total • +5 bents below 100-year • +0 bents below OHWM • +0 in-water work area containments
	• No impervious surfaces present	• Stormwater conveyed to north detention facility	• Increased stormwater from impervious surfaces (treated)
Bridge 19285 **Barnett Rd. over Bear Cr.** **(Permanent)**	• Bridge length 50.6 m • Bridge width 18.6 m	• Bridge length is 52 m • Bridge width is 30 m	• +1.4 m bridge length • +11.4 m bridge width
	• 4 bents total • 2 bents below 100-year • 2 bents below OHWM • 2 in-water work area containments	• 2 bents total • 2 bents below 100-year • 0 bents below OHWM • 0 in-water work area containments	• -4 bents, +2 bents total • -2 bents, +2 bents below 100-year • -2 bents, +0 bents below OHWM • +2 in-water work area containments (400 m^2)
	• Barnett stormwater not currently treated	• Stormwater conveyed to north detention facility	• Existing untreated stormwater will be treated
Bridge 19286 **Highland Dr. over Lazy Cr.** **(Permanent)**	• Box culvert width 4.6 m • Box culvert length 23.5 m	• Bridge length is 10 m • Bridge width is 24 m	• +5.4 m structure length • +0.5 m structure width
	• Culvert is within OHWM • 1 in-water work area containment/diversion (for culvert removal)	• 2 bents total • 2 bents below 100-year • 0 bents below OHWM • 0 in-water work area containments	• -1 box culvert below OHWM • +2 bents total • +2 bents below 100-year • +0 bents below OHWM • +1 in-water work area containment/diversion (150 m^2) • +600 m^3 concrete removed below OHWM • Improved hydraulic capacity and fish passage
	• Highland stormwater not now treated	• Stormwater conveyed to north detention facility	• Existing untreated stormwater will be treated

Table 3.2 Summary of Bridge Impacts (SMI Project Permanent Bridges) continued:

Permanent Bridges	Existing Conditions	Proposed Bridge	Net Changes
Summary Total			
			Removals • -4 bents total • -2 bents below 100-year • -2 bents below OHWM • -1 box culvert below OHWM • -108 m^2 culvert area footprint below OHWM
			• **Additions** • +26 bents total • +23 bents below 100-year • +3 bents/9 drilled shafts below OHWM • +6 in-water work area containments (1150 m^2) • -600 m^3 concrete removed below OHWM • +5.76 m^2 stream bed disturbed (piers) below OHWM

Note: All dimensions, bent numbers, and stormwater conveyance information based on ODOT project plans of January 28, 2003 and discussion with ODOT engineers.

Table 3.3 Summary of Bridge Impacts (SMI Project Temporary Bridges)

Temporary Bridges	Existing Conditions	Proposed Project	Net Changes
Bridges 19109-19110 Work Bridge (Temporary)	• Bridge does not currently exist	• 18 bents/72 piles total • 8 bents/32 piles below 100-year • 10 bents/40 piles below OHWM • 10 in-water work area containments	• +18 bents/72 piles total • +8 bents/32 piles below 100-year • +10 bents/40 piles below OHWM • +10 in-water work area containments (1,500 m^2)
Bridge 19111 Work Bridge (Temporary)	• Bridge does not currently exist	• 2 bents/8 piles total • 0 bents/0 piles below 100-year • 0 bents/0 piles below OHWM • 0 in-water work area containments	• +2 bents/8 piles total • +0 bents/0 piles below 100-year • +0 bents/0 piles below OHWM • +0 in-water work area containments
Bridge 19114 Work Bridge (Temporary)	• Bridge does not currently exist	• 10 bents/40 piles total • 4 bents/16 piles below 100-year • 6 bents/24 piles below OHWM • 6 in-water work area containments	• +10 bents/40 piles total • +4 bents/16 piles below 100-year • +6 bents/24 piles below OHWM • +6 in-water work area containments (900 m^2)
Bridge 19285 Work Bridge (Temporary)	• Bridge does not currently exist	• 2 bents/40 piles total • 0 bents/0 piles below 100-year • 2 bents/40 piles below OHWM • 2 in-water work area containments	• +2 bents/40 piles total • +0 bents/0 piles below 100-year • +2 bents/40 piles below OHWM • +2 in-water work area containments (300 m^2)
Summary Totals			**Net Change** Additions • +32 bents/160 piles total • +2 bents/8 piles above 100-year • +12 bents/48 piles below 100-year • +18 bents/104 piles below OHWM • +18 in-water work area containments (2,700 m^2)

Note: All dimensions, bent numbers, and stormwater conveyance information based on ODOT project plans of January 28, 2003 and discussion with ODOT engineers.

bent consisting of three drilled shafts will be constructed below the OHWM of Bear Creek (ODOT 2002b) for a total stream bottom disturbance area of approximately 1.92 m^2 (21 ft^2). The other four bents for the ramp will be located below the 100-year flood elevation of Bear Creek. Two of these bents will be located within 2 m (6.5 ft) of the OHWM.

Highway 1 NB Ramp to Highland Drive over Bear Creek (Bridge No. 19109)

The proposed Highway 1 NB Ramp to Highland Drive over Bear Creek (NB off-ramp from I-5 Bridge - No. 19109) will be a three-span precast prestressed bridge structure approximately 110 m (361 ft) in length. The width of the ramp will vary from 8.4 m (27.6 ft) at its southern end as it exits I-5 to 12.4 m (40.7 ft) at its northern end on the interchange pedestal. The bottom of the bridge will be a minimum of approximately 5 m (16 ft) above the OHWM. The proposed ramp will have four bents. Two bridge bents will be constructed below the OHWM of Bear Creek, consisting of three drilled shaft piers each, for a total stream bottom disturbance area of 3.84 m^2 (41 ft^2). The other two bents will be located below the 100-year flood elevation of Bear Creek approximately 13 and 19 m (43 and 62 ft) away from the OHWM.

Highland Drive Ramp to Highway 1 NB (Bridge No. 19284)

The proposed Highland Drive Ramp to Highway 1 NB (NB on-ramp to I-5 - Bridge No. 19284) will be a four-span precast prestressed bridge structure approximately 184 m (604 ft) in length. From the interchange pedestal, the width of the ramp bridge will taper from 11.4 m (37 ft) to approximately 8.2 m (27 ft) at its northern end as it meets the grade for I-5. The proposed ramp will have five bents. None of the bents will be constructed within the OHWM of Bear Creek, although all five bents for the ramp will be located below the 100-year flood elevation of Bear Creek. However, the two bents on either side of Bear Creek will be located approximately 3 to 4 m (10 to 13 feet) from the OHWM.

3.1.2.3 Highland Drive Extension Bridge over Bear Creek (No. 19110)

The proposed Highland Drive Extension will cross over Bear Creek approximately 70 m (230 ft) north of the proposed interchange pedestal over I-5. The proposed Highland Drive Extension Bridge over Bear Creek (Bridge No. 19110) will be a three-span precast prestressed bridge structure approximately 128 m (420 ft) long and approximately 44 m (144 ft) wide. The bottom of the bridge will be a minimum of approximately 8 m (26 ft) above the OHWM.

The proposed bridge will have a slight curve to the northwest and will consist of four bents. No bents are proposed below the OHWM of Bear Creek. Bent No. 3 will be located at the top of the east bank of Bear Creek and Bent No. 4 will be located halfway between the channel of Bear Creek and the main interchange pedestal (Highland Street Extension Bridge) over I-5 (both within 2 m [7 ft] of the OHWM). All four bents of the bridge will be located below the 100-year flood elevation of Bear Creek.

3.1.2.4 Highland Drive Extension Bridge over Larson Creek (Bridge No. 19111)

The proposed Highland Drive Extension Bridge over Larson Creek (Bridge No. 19111) will be a single-span precast prestressed bridge structure approximately 31 m (102 ft) long and approximately 44 m (144 ft) wide. The bottom of the bridge will be a minimum of

approximately 3 m (10 ft) above the OHWM. The proposed bridge will consist of two concrete bents and it will have a straight alignment over Larson Creek. Neither bent will be constructed below the OHWM of Larson Creek, but both will be located below the 100-year flood elevation of Larson Creek. Both bents will be located approximately 7 m (23 ft) from the OHWM.

The proposed bridge will be located at a point where Larson Creek flows through a deeply incised channel approximately 4.6 m (15 ft) deep. In addition, the alignment of the channel exhibits a sharp meander flowing northwest to southwest and then sharply northwest again within a stream length of approximately 24.4 m (80 ft). Due to the sharp meander, the entire south bank of Larson Creek appears to be eroding to the south. The proposed bent on the south side of Larson Creek will be located approximately 4.3 m (14 ft) from the top of the south bank of Larson Creek.

3.1.2.5 Replacement of Lazy Creek Box Culvert on Highland Drive (Bridge No. 19286)

In the northeastern portion of the project, Lazy Creek currently flows under Highland Drive through a large concrete box culvert approximately 23.5 m (77 ft) long and 4.6 m (15 ft) wide. The box culvert was constructed in 1962 and presently constricts the flow in Lazy Creek. The concrete sides and bottom of the culvert extend approximately 1.5 m (5 ft) downstream from the culvert. The bottom of the culvert ends with a 0.5-m (1.5-ft) vertical drop to the localized scour hole at the outlet to the culvert. The vertical drop at the discharge end of the culvert is considered a partial barrier to juvenile salmonids (ODFW 2002).

During construction of the proposed project, the existing box culvert will be removed and replaced with a new single-span bridge (Highland Drive Bridge over Lazy Creek – Bridge No. 19286). The proposed bridge will be approximately 24 m (79 ft) wide and 10 m (33 ft) long. The bottom of the bridge will be a minimum of approximately 1 m (3 ft) above the OHWM. The end bents would be located approximately 2 m (7 ft) outside of the OHWM of Lazy Creek. The replacement of the box culvert with a bridge is expected to improve streamflow through the crossing and eliminate the partial barrier for juvenile salmonids. Removal of the box culvert would remove approximately 600 m^3 (785 yd^3) of existing concrete from an area of approximately 108 m^2 (1,163 ft^2) below the OHWM of Lazy Creek. The bridge would provide 2.78 times the hydraulic capacity of the box culvert, eliminate channel constriction and would have no scour potential (Reisdorf 2003).

During bridge construction, streamflow in Lazy Creek will be diverted from the active work area by either temporary piping or sandbag diversions. All bridge construction activities will be constructed from the adjacent roadways. The existing box culvert will likely remain in place during construction of the new bridge piers, allowing the stream to pass through the active work area undisturbed. Once the bridge piers are completed, the stream will be diverted through piping or sandbags to one side of the culvert and the box culvert will be removed. The removal of the box culvert will be accomplished within one or two days. Once the box culvert is removed and the disturbed section of the stream channel has been graded and restored, the diversion pipe or sandbags will be removed and streamflow will be re-introduced into the new channel.

Following the removal of the box culvert, the disturbed portion of the stream channel under the new bridge will be restored to a natural gradient and condition that matches adjacent undisturbed sections of the creek. The bottom elevation of the creek will graded to transition the channel between the existing inlet and outlet stream bottom elevations. The bottom grade of the stream will be similar to the existing bottom grade of the culvert (less than 1 percent) and will match the slope of the natural channel. The sides of the stream channel will be graded to a stable sideslope along the entire length under the bridge. The bottom of the restored stream channel will consist of natural materials including small cobbles and gravel. Natural bedload sediment transport within Lazy Creek will likely supply additional gravel, silt and sand to the channel bottom within a few years of culvert removal.

The installation of the bridge over Lazy Creek will eliminate channel constriction imposed by the existing culvert, and the water velocity at the design flood event (36-year) will be relatively slow at 1.59 m/sec (5.2 ft/sec). Due to the low flood velocity, no riprap is proposed at this bridge location for scour protection. The disturbed stream channel will be graded to match the slope of the natural channel to minimize the potential for headcutting along the channel. It is anticipated that Lazy Creek will reach a stable equilibrium within a few years of removing the culvert (Reisdorf 2003). The generally slow flow within the creek has a reduced risk of headcutting and no adverse alterations in stream hydrology or stream morphology are expected from the removal of the culvert.

3.1.2.6 Replacement of Barnett Road Bridge Over Bear Creek (Bridge No. 19285)

The existing Barnett Road Bridge over Bear Creek (Bridge No. 19285) is a three-span reinforced concrete deck girder bridge with cantilevered ends. The bridge was constructed in 1948 and widened in 1967. The existing bridge structure is approximately 50.6 m (166 ft) long and 18.6 m (61 ft) wide. The bridge has two concrete bents that are located below the OHWM of Bear Creek. The middle two bent foundations are spread footings set upon sandstone bedrock. The end bents of the bridge are located outside the OHWM, but below the 100-year flood elevation of Bear Creek.

The original concept plan for the project proposed that the Barnett Road Bridge be widened to accommodate future traffic demands. However, recent bridge inspections have found significant shear and flexural cracking within the bridge structure. In addition, hydraulic analysis also showed that the existing bridge structure constrains the streamflow in Bear Creek during high flow events. Due to the deteriorating condition of the bridge and the hydraulic constraints that it presents, replacement of the bridge with a single-span structure is currently proposed (ODOT 2002b, 2003). A new single-span structure will improve seismic and structural performance, improve hydraulics, and minimize long-term disturbance and streamflow obstructions within the Bear Creek channel.

The proposed replacement bridge will be a single-span structure approximately 52 m (170.6 ft) long and 30 m (98.4 ft) wide. The bridge will have two drilled shaft end bents, both of which will be constructed near the top of the existing banks approximately 8 m (26 ft) outside of the OHWM of Bear Creek, but within the 100-year flood elevation. The bottom of the bridge will be a minimum of approximately 2.5 m (8 ft) above the OHWM. The proposed bridge surface will be elevated approximately 2.0 m (6.6 ft) above the existing bridge, and a

retaining wall would be constructed from the northeast corner of the bridge along the north side of Barnett Road to prevent fill material from encroaching into the adjacent Bear Creek Park as a result of the raised grade of the roadway. The retaining wall will be approximately 2.0 m (6.6 ft) in height and will be located approximately 24 m (79 ft) from the OHWM of Bear Creek along Barnett Road to the east of the new bridge. A second retaining wall will be constructed from the northwestern corner of the bridge north along the east side of Alba Drive approximately 12 m (39 ft) from the OHWM of Bear Creek. Both retaining walls will be used to retain the limit of fill onto the adjacent properties and are not expected to affect the hydraulics of Bear Creek (ODOT 2003).

Demolition of Existing Bridge

The replacement of the Barnett Road Bridge will be one of the last elements of the proposed SMI project to be constructed. In order to maintain traffic flow in the project area, the majority of the new interchange will be constructed and operational before the Barnett Road Bridge is replaced. During bridge replacement, the bridge will be closed and traffic will be re-routed to the new interchange.

After the bridge is closed, the demolition work on the existing bridge will begin. Appropriate containment measures will be installed to prevent demolition debris or associated waste from entering Bear Creek. The Contractor will be required to submit a Bridge Demolition Plan to ODOT and NOAA Fisheries for approval prior to construction. The Bridge Demolition Plan will specify the type of containment proposed by the Contractor. Bridge removal will not proceed until all concerns are addressed and ODOT and NOAA Fisheries have agreed that the containment measures are adequate and will perform properly.

The Contractor will begin demolition by removing the bridge deck and beams and the bridge bents. The bents will either be cut flush to bedrock, or if located in an area of alluvial material, cut 0.6 m (2 ft) below the stream bottom and backfilled with substrate similar to that which exists around the bent.

Given their location in the Bear Creek channel, the work area for each bent to be removed will require in-water work isolation and disturbance to the channel bottom. The in-water work area for each bent will be completely isolated from streamflow through the use of sandbags or some other form of diversion structure. The potential disturbance to the creek channel will be limited to the existing footing and surrounding work area of each bent. The Contractor will be required to submit a Work Area Isolation Plan to ODOT and NOAA Fisheries for approval prior to construction. Work area isolation and containment will not proceed until all concerns are addressed and ODOT and NOAA Fisheries have agreed that the work area isolation measures will perform adequately.

During the isolation of the in-water work areas, appropriate fish preservation and salvage methods will be employed. As needed, fish salvage operations to include seining or electro-shocking the isolated work area will be conducted by qualified fisheries biologists to remove and re-locate trapped fish. All intake structures for de-watering pumps will be installed with appropriate fish screens in accordance with NOAA Fisheries fish screen criteria (NOAA Fisheries, 1995 and 1996). All fish salvage and dewatering efforts will be completed

according to the Capture and Release guidelines described in the SLOPES document. Electrofishing operations will comply with NOAA Fisheries Backpack Electrofishing Guidelines (NOAA Fisheries, 1998).

Construct New Bridge

The first step in constructing the new bridge (Bridge No. 19285) will be to excavate the area for the new end bents and wingwalls. This excavation area will be protected with appropriate erosion control measures. Drilled shafts or steel piles will be installed to bedrock and the concrete for the pile caps will be poured on top of the piles. The wingwalls will then be constructed and the area behind the wingwalls will be back-filled. Containment measures will be implemented to ensure all "green" concrete is contained within the work area and does not come into contact with any flowing water.

Due to the length of the proposed single-span structure, temporary bents will be installed in the channel of Bear Creek to support the bridge beams until the structure has cured and stabilized. The temporary bent structures will be installed in close proximity to the existing bent locations and the work area for each temporary bent will be isolated from streamflow by an appropriate temporary containment or diversion structure. It is expected that two temporary bents will be installed below the OHWM of Bear Creek. The temporary bents will consist of a maximum of 40 steel pipe piles approximately 40 to 60 cm (16 to 24 in) in diameter supporting a lattice of steel cross beams and longitudinal beams. No treated wood piles will be used. Depending on the substrate, the steel pipe piles would either be drilled into place, or placed on spread footings.

If the substrate is soft enough, the temporary steel pipe piles for the temporary Barnett Road bridge bents may be drilled into place. Drilling shafts would require that either each shaft location be isolated from flowing water or the entire bent area be isolated. Once in-water work area isolation and fish salvage are complete, the drilling rig would drill the piles into place.

If the spread footing method of temporary bent construction is chosen, the spread footings would be constructed individually around each pile. Either the entire in-water work area would be isolated from flowing water or each individual pile location would be isolated. A section of corrugated pipe or other material would be place vertically on the stream bottom, the steel pipe pile placed vertically into the section of pipe, and concrete would be poured into the pipe and allowed to cure. When the concrete is cured, the in-water work area containment could be removed if needed.

The steel pipe piles would be removed by pulling them out with a crane that may be equipped with a vibratory device to remove piles that have been drilled into place. In-water work area containment would either be left in place while the temporary piles are in place or would be re-installed at the time of pile removal.

Once the temporary bents are in place, the precast beams will be placed onto the pile caps at the end bents and onto the temporary bents and tied together. Falsework to support the deck and mid-span diaphragm will be constructed and supported on the pre-cast beams. The bridge

deck will then be constructed and poured. As needed, new utilities will be mounted or relocated onto the bridge deck. A new stormwater pipe will be placed underneath the bridge deck (between the beams) to carry stormwater to a proposed water quality treatment facility/detention basin (Section 3.4) to be located just southeast of the bridge.

The construction activity will then move back to the bridge ends. The end panels will be constructed and finally the bridge rails will be constructed and poured. Roadway paving at each end of the bridge will be flared to match the existing roadway width to the new bridge width.

Once the completed bridge has been allowed to cure to specifications, the temporary bents will be completely removed. Any shallow excavations in the areas of the temporary bents will be backfilled with native gravel material from the Bear Creek channel stockpiled from previous excavations. All disturbed soils will be graded and stabilized with native seed and plantings. Any remaining blackberry thickets will be removed and the disturbed areas will be stabilized with a native seed mix.

During construction, approximately 10 trees with diameters at breast height (DBH) ranging from 10 to 46 cm (4 to 18 in) will be removed from the north (downstream) side of the bridge. No tree removal is proposed for the south (upstream) side of the bridge. The trees to be removed include red alder (*Alnus rubra*), cottonwood (*Populus balsamifera*) and Pacific willow (*Salix lasiandra*). ODOT will develop a restoration plan for restoring or enhancing the disturbed riparian area on the north side of the bridge. The goal of restoration at this location will be to replace existing riparian tree and shrub cover and provide for permanent slope stability. Trees removed during construction will be replaced at a 2:1 ratio with similar species. The trees will be monitored and maintained to ensure an 80 percent survival rate at the end of 5 years. Although no trees are proposed for removal on the south side of the Barnett Road Bridge, restoration of the bridge site will also consider removal of invasive species such as Himalayan blackberry (*Rubus discolor*) and planting with native tree and shrub species.

3.1.3 New Impervious Surfaces

The project will result in a net increase of approximately 66,000 m^2 (699,654 ft^2 or 16.3 ac) of impervious surface. A total of approximately 142,000 m^2 (1,528,475 sq ft or 35 ac) of impervious surface will be treated by the project, while also removing approximately 20,000 m^2 (215,278 ft^2 or 4.9 ac) of previously existing impervious surface. The majority of the impervious surfaces that will be created during the project will result from the construction of the Garfield Street Extension from Highway 99 to the I-5 interchange and the construction of the Highland Drive Extension from the interchange north to the Barnett Road intersection. Construction of the interchange ramps and the widening of Highland Drive will also add net new impervious surfaces. The removal of existing impervious surfaces will largely occur as the result of abandoning the existing Barnett Road interchange. All of the existing on- and off-ramps to I-5 at this interchange will be decommissioned, removed, and restored to more natural conditions, although a proposed water quality treatment/detention facility will be located in the southeast quadrant of the existing interchange (see discussion below). A small

portion at the southern end of Center Drive will also be removed when Center Drive is realigned to meet the Garfield Street Extension.

3.1.4 Stormwater Management

Stormwater from the project area will be treated by two proposed water quality treatment/detention facilities and one water quality swale. These facilities will be constructed to offset potential impacts to water quality and watershed hydrology as a result of the project. The water quality treatment/detention facilities and the water quality swale will treat the majority of stormwater runoff generated by the new impervious surfaces of the project. The detention basins and the water quality swale will also improve local water quality conditions by treating runoff from approximately half of the existing impervious surfaces within the project area (approximately 76,000 m^2 [818,057 ft^2 or 18.8 ac]). Stormwater leaving these existing impervious surfaces is currently being discharged into Bear Creek without prior treatment.

Stormwater from the portion of Hwy 99 north of the Garfield Street will not be directed to the proposed southern detention basin for treatment. Instead, stormwater will continue to drain along existing contours and topography to an unnamed tributary of Bear Creek that is piped northeast under existing commercial development and Barnett Road to Bear Creek. Existing topography and the developed nature of the project area does not allow for stormwater on this portion of the project to be directed to the southern detention basin. The amount of new impervious surfaces in this section of the project is relatively minor (less than 20% of the total impervious surface for this section of Hwy 99). The small amount of untreated stormwater generated by this section of the project is minor in relation to the extra treatment afforded by the proposed detention basins and water quality swale. The proposed stormwater management system will detain and treat more stormwater than is generated by the project and the resultant effect of the undetained stormwater from Hwy 99 will be negligible.

3.1.4.1 Stormwater Service Areas

The proposed service or collection area for each of the stormwater detention basins and the water quality swale is shown on Figure 3. A brief summary of the collection areas for both the northern and southern water quality treatment/detention facilities is presented below.

Stormwater from the following areas within the project site will be sent to the northern treatment/detention facility:

- The new Highland Road Extension from the center of I-5 to Barnett Road.
- The existing and widened Barnett Road from I-5 to Ellendale Road including businesses along the roadway. This area currently goes into Bear Creek untreated.
- Alba Drive, between Barnett Road and Bear Creek Park, including some parking lots, that currently goes into Bear Creek untreated
- Highland Drive from Barnett to Lazy Creek that currently goes into Bear Creek and Lazy Creek without treatment

Figure 3. Stormwater Service Areas

Stormwater from the following areas within the project site will be conveyed to the southern treatment/detention facility:

- Highway 99 and adjacent business parking lots between Charlotte Anne and the Garfield/Belknap intersection that currently goes into Bear Creek untreated.
- The new Center Drive.
- The Garfield Street Extension, from Hwy 99 to the center of I-5.
- The portions of both I-5 bridges north of Bear Creek.
- The portions of the NB off-ramp and SB on-ramp north of Bear Creek.

The total proposed service area, including impervious and pervious surfaces, for the proposed detention facilities and water quality swale is 181,000 m^2 (1,948,268 ft^2 or 44.7 ac) (ODOT 2001b). Both detention facilities will collect and treat runoff from a majority of the impervious surfaces within the project site, totaling approximately 142,000 m^2 (1,528,475 ft^2 or 35.1 ac) (ODOT 2001b). This area includes approximately 77,000 m^2 (828,821 ft^2 or 19.0 ac) of existing impervious surface that currently drains untreated directly into Bear Creek.

3.1.4.2 Water Quality Treatment/Detention Facilities

The water quality treatment/detention facilities will be constructed in two general areas that allow for the efficient treatment and eventual discharge of treated stormwater into Bear Creek. One facility (referred to as the southern stormwater detention pond) will be located near the southeastern corner of the existing bridge carrying I-5 over Bear Creek. The second facility (referred to as the northern stormwater detention pond) will be located in the northern portion of project in the southeast quadrant of the existing intersection of I-5 and Barnett Road. This facility will be located west of Bear Creek in the area where the existing NB off-ramp and on-ramp to I-5 will be abandoned. These water quality treatment/detention facilities will collect and treat runoff from a majority of the impervious surfaces within the project site, including runoff from existing impervious surfaces that currently drain untreated directly to Bear Creek.

In addition to the two water quality treatment/detention facilities, ODOT is proposing the construction of a grassed water quality swale along the east side of the NB lanes of I-5 on the south side of Bear Creek. This water quality swale will collect and treat stormwater originating from the proposed NB off-ramp and SB on-ramp south of Bear Creek and portions of existing I-5 south of the existing I-5 bridges.

Preliminary data on the treatment capabilities for both of the proposed water quality treatment/detention facilities are presented in Table 3.4.

Table 3.4 Preliminary Design Data for Southern and Northern Water Quality Treatment/Detention Facilities

Pond Location	Surface Footprint (m^2/sq ft)	Service Area (m^2/ac)	Treated Impervious Area (m^2/ac)	Net New Impervious Area (m^2/ac)
South Facility	2,500/26,909	51,000/12.6	51,000/12.6	34,000/8.4
North Facility	3,900/41,979	130,000/32.1	91,000/22.5	32,000/7.9
Totals	**6,400/68,889**	**181,000/44.7**	**142,000/35.1**	**66,000/16.3**

Source: ODOT 2001b.

The preliminary data show that the stormwater treatment detention facilities will provide treatment and detention for a minimum of 140% of the net new impervious surfaces. This level of treatment is considered the "no-effect" level and means that at least 1.4 times the amount of existing impervious surfaces will be treated compared to the net impervious surfaces being created by the project (Carmichael pers. comm., 2003). In this case, large areas of open vacant land are available for the construction of the stormwater treatment/detention facilities, and this offers an opportunity to provide treatment and detention to currently undetained flows that are discharging to Bear Creek, mostly from existing roadways. ODOT staff believe that this project allows for a high level of treatment and provides a good opportunity to improve upon the existing water quality conditions of Bear Creek.

The proposed treatment/detention facilities will be designed to achieve at least a 70% removal of total suspended solids (TSS) from both existing and net new impervious surfaces. The facilities will be designed to provide peak flow control based upon comparison of the pre-construction and post-construction peak flows that will be generated for the 2-year, 10-year and 50-year rainfall events. Upon construction of the proposed project, the stormwater treatment afforded by the treatment/detention facilities will ensure that peak post-development stormwater flows from the project will not exceed peak pre-construction flow rates for the 2-, 10- and 50-year storm events, consistent with NOAA fisheries guidance in their July 2003 SLOPES Biological Opinion (NOAA Fisheries 2003 and ODOT 2001b).

Each of the two water treatment/detention facilities will be an extended dry detention pond that consists of a depressed basin that temporarily detains the stormwater runoff following a storm event. This detention allows pollutants and sediments to drop out of the water column and slows the flow of stormwater entering Bear Creek. A portion of the bottom of each facility will have a driveable surface likely constructed of permeable pavers to allow access by maintenance vehicles and to provide a hard surface to easily remove accumulated sediments during future maintenance activities.

The permeability of the extended dry detention ponds will be maximized to the greatest extent possible. Approximately 15-20% of the total bottom of each basin will have a permeable surface to allow for stormwater infiltration. The sides of the basins will also be permeable to allow for infiltration. Although infiltration has not been factored into the stormwater treatment and discharge calculations, it is anticipated that a portion of the stormwater will infiltrate through the bottom and sides of the facilities. Soils in the general

area of the proposed detention ponds are Medford silty clay loams that have an anticipated permeability of 0.2 to 0.6 inches per hour (Johnson 1994). Providing stormwater infiltration will be an added benefit of the stormwater facilities, which will increase overall water quality treatment and reduce discharge volumes. The sides of the ponds will be planted with native grass and possibly some small shrubs in the upper part of the basin above the pond maximum water surface design elevation. The bottom and sides of the ponds will be maintained as needed (estimated to be approximately every 5 years). Long-term maintenance would generally only be required to remove accumulated sediment and maintain continued infiltration capacity. More regular maintenance may be required to reduce the growth of weeds, maintain the stormwater outlets and other routine maintenance.

The outfalls for the proposed water quality treatment/detention facilities will be located along the banks of Bear Creek. The southern detention facility outfall will be located on the west bank of Bear Creek approximately 45 m (150 ft) south (upstream) of the existing I-5 bridges over Bear Creek. The northern detention facility outfall will be located on the west bank of Bear Creek approximately 33 m (100 ft) south (upstream) of the Barnett Road Bridge. Each facility will have an outlet control structure and an underground pipe that will convey treated stormwater to a point of surface discharge located approximately at the 10-year flood elevation of Bear Creek (Carmichael, pers comm. October 7, 2003). Each point of surface discharge will be about 100 m^2 (1,076 ft^2) and will have a flow spreader to dissipate flows and to reduce the discharge velocity of stormwater to the point where no erosion would occur (approximately 1.2 m/sec [4 ft/sec] as required by SLOPES) (Appendix C1).

The water quality treatment/detention ponds will be designed to start discharging stormwater at the water quality event, which is one-third of the 2-year 24-hr precipitation amount (one-third of 6.35 cm/hr [2.5 in/hr] which equals 2.11 cm/hr [0.83 in/hour]). Storm volumes exceeding the water quality storm volume will be released through the facility detention control structure. A portion of the stormwater entering the ponds will infiltrate, but the majority of water will pass through each detention pond outlet structure to discharge into Bear Creek. The water quality event will be released over approximately 48 hours. The discharge velocities for the ponds will be less than or equal to 1.2 m/sec [4 ft/sec] before reaching the end of the flow spreaders (Carmichael per. comm., 2003).

The SLOPES Biological Opinion requires that stormwater be conveyed through manufactured elements that extend to the OHWM of Bear Creek (NOAA Fisheries 2003). The area between the stormwater discharge point and the OHWM will be protected from erosion by the use of a flow spreader, which will meet the SLOPES criteria for outfall protection. Each flow spreader will consist of a stone embankment (or riprap) pad comprised of uniformly-sized rock material. The rock material will be approximately Class 50 in size. Stormwater from the outfall pipe will discharge over the pad and spread out as a result of the irregular shapes of the rock material comprising the pad. The proposed outfall locations are currently armored by large riprap, which will be removed as part of the project. The large riprap will be replaced with much smaller (and localized) Class 50 riprap to prevent erosion by the stormwater discharge flows. The amount of riprap used for the flow spreaders represents a very small amount of riprap left along the banks of Bear Creek when compared to the amount and size of riprap that will be removed. The outfall and flow spreader pad

areas will be planted with woody native riparian vegetation such as willows to provide stream shading, additional discharge velocity control and stream corridor habitat.

The proposed treatment/detention facilities are designed achieve at least a 70 percent removal of total suspended solids (TSS) from the net new impervious surfaces. The extended detention time of the stormwater in the treatment/detention facilities provides an opportunity for pollutants and sediment carried by the water to settle out. These types of facilities typically remove 80-90% of the TSS in the stormwater (ODOT 2001b). The facilities are designed based upon the "first flush" concept which holds that the first 12.7 mm (0.5 in) of any given storm event contains 95% of the pollutants. The first 12.7 mm (0.5 in) from all storm events will be routed through the proposed treatment/detention facilities (ODOT 2001b). For rainfall events exceeding the water quality event (one-third of the 2-year 24-hr precipitation amount [2.11 cm/hr or 0.83 in/hr]), the initial volume of runoff will be treated; however, the volume of runoff greater than the water quality event will pass through the facility untreated. The highest concentration of pollutants is normally carried in the initial flush of a rainfall event. Therefore, the pollutant concentrations in the untreated portion of the runoff will be very dilute. Runoff from the existing impervious surfaces in the project area currently drains to Bear Creek untreated. Thus, following the construction of the project, including construction of the extended dry detention ponds, runoff to Bear Creek will transport fewer pollutants than are now carried to the stream.

In addition to the two water quality treatment/detention facilities, ODOT is proposing the construction of a grassed water quality swale along the east side of the NB lanes of I-5 on the south side of Bear Creek. This water quality swale will extend along the toe-of-fill for the NB shoulder of I-5 and discharge into Bear Creek approximately 53 m (175 ft) northeast (downstream) of the existing I-5 bridges. The water quality swale will collect and treat stormwater originating from the proposed NB off-ramp and SB on-ramp south of Bear Creek and portions of existing I-5 just south of the existing I-5 bridges (Figure 3).

The proposed water quality swale will have a slope of approximately 0.5%. The water quality swale will be vegetated and will be designed to detain stormwater flows. Shallow flow depths and slow velocities through the grassed area will provide the primary mechanism for pollutant removal. The grassed swale will include a flat bottom that is 100% pervious. Similar to the proposed water quality treatment/detention ponds, the water quality swale will be designed to start discharging stormwater at the water quality event (which is one-third of the 2-year 24-hr precipitation amount [2.11 cm/hr or 0.83 in/hour]. A portion of the stormwater is expected to infiltrate the bottom of the swale and storm volumes exceeding the water quality storm volume will be discharged through an outfall and level spreader located at the 10-year flood elevation of Bear Creek. The proposed outfall and level spreader for the water quality swale will have the same general design as those proposed for the water quality treatment/detention ponds (see previous discussion). The discharge velocity of stormwater at the end of the level spreaders will be approximately 1.2 m/sec (4 ft/sec), as required by SLOPES. The outfall and flow spreader pad area will also be planted with woody native riparian vegetation such as red alder, cottonwood or willows to provide stream shading, additional discharge velocity control and stream corridor habitat (Arneson per. comm. 2003 and Carmichael per. comm. 2003).

3.1.5 Retaining Walls

Due to the size and location of the proposed interchange, a series of seven retaining walls will be required around the main interchange, along the new ramp structures and adjacent to the north side of the new Barnett Road Bridge. The main purpose of these retaining walls will be to limit the extent of new fill within the riparian area along Bear Creek. The proposed locations of the retaining walls are shown on the project plans included in Appendix B1. The combined length of all seven retaining walls will be approximately 1,099 m (3,606 ft) and the walls will range in height from 3.3 m (10.8 ft) to 12.3 m (40.3 ft). One of the longest and tallest retaining walls will be the retaining wall that is installed along the east side of the interchange pedestal adjacent to Bear Creek. This retaining wall will be located approximately 1 to 2 m (3 to 7 ft) from the OHWM of Bear Creek, will be approximately 343.5 m (1,127 ft) in length and will reach a maximum height of 12.3 m (40.3 ft). The retaining wall on the west side of I-5 will extend north and south from the interchange pedestal along the main lanes of I-5 for approximately 349 m (1,145 ft) and will reach a maximum height of 9.1 m (30 ft). A retaining wall along the west side of the SB I-5 on-ramp will be approximately 170 m (560 ft) long. This retaining wall will be located within approximately 9 m (30 ft) of the OHWM.

All of the retaining walls will be constructed as Mechanically Stabilized Earth (MSE) retaining walls. Construction of the MSE retaining walls will likely start by grading along the proposed wall alignment and preparing the foundation of the MSE wall. As construction of the MSE wall progresses, fill will be simultaneously added behind the wall and compacted. Once the wall has reached the design elevation of a roadway or ramp, the top of the wall will be rounded or capped. A decorative finish will be applied to the retaining walls, and the finish will likely be similar to the retaining walls proposed for the North Medford Interchange (ODOT 2002b).

All of the proposed retaining walls will be constructed outside of the OHWM of Bear Creek (although the retaining wall along the NB I-5 on-ramp will be within 1 to 2 m [3 to 7 ft]) and will not have an adverse impact on stream hydraulics of Bear Creek. One advantage to the MSE retaining walls is that they require very little room in front of the wall for construction. This limits the amount of clearing and ground disturbance along the face of the wall, particularly those retaining wall sections that face towards the Bear Creek channel. Water surface elevations for the 100-year storm event in the SMI project area will not be significantly changed by the project. Within the project limits, minor variations in water surface elevations will occur due primarily to the new bridge supports (Bonn 2002).

3.1.6 Temporary Work Bridges and Access Roads

Three temporary work bridges will be constructed across Bear Creek to facilitate construction of the proposed interchange. The longest temporary work bridge will cross Bear Creek at two locations within the southeastern quadrant of the proposed interchange. This temporary structure will be constructed across Bear Creek along the north side of the proposed NB Ramp to Highland Drive (Bridge No. 19109) crossing over Bear Creek to the northeastern corner of the interchange pedestal. The temporary bridge will then angle east along the south side of the proposed Highland Drive Extension Bridge (No. 19110) crossing over Bear Creek terminating on the east side of Bear Creek. The northern terminus of the

bridge will potentially (pending right-of-way negotiations) connect with Dyer Road and the southeastern terminus will connect with the roadway embankment along the NB lanes of I-5. A second temporary work bridge over Bear Creek will be constructed along the south side of the proposed Garfield Street Ramp to Highway 1 SB (Bridge No. 19114) (SB on-ramp to I-5). This bridge will be accessed from the open fields on the west side of Bear Creek. A third temporary work bridge will be constructed over Larson Creek on the west side of the proposed Highland Drive Bridge over Larson Creek (Bridge No. 19111) (Appendix B1).

Construction of the temporary work bridges will likely occur before construction on the more significant components of the various bridges and ramps for the interchange begins. The proposed temporary work bridges will be constructed of steel pipe piles supporting a lattice of steel cross beams and longitudinal beams that are topped with a sealed wood deck. The Contractor will likely use pre-constructed work bridge panels or spans a minimum of approximately 12.2 m (40 ft) in length. These panels will be arranged so as to minimize the number of bents (and piles) within the OHWM. Assuming a minimum size of 12.2-m (40-ft) temporary bridge panel will be used, it is estimated that a total of 160 steel pipe piles will have to be installed, with 48 of those piles within the 100-year flood elevation of Bear Creek and 104 of those piles installed below the OHWM (see Tables 3.1 and 3.3). In those areas of the channel where bedrock is exposed (or nearly so), the steel piles will need to be anchored on small concrete spread footings, but in other areas they may be drilled into the stream bottom. The width of the temporary work bridges will vary from 6 to 10 m (20 to 33 ft), depending on location and the type of construction equipment that will be supported (ODOT 2002b). Construction of the temporary work bridges will occur during the ODFW defined in-water work period (June 15 to September 15) for Bear Creek (ODFW 2000).

It is anticipated that 18 in-water work isolation areas will have to be constructed to facilitate the installation of the temporary pipe piles used to construct the temporary bridges. This corresponds to the number of proposed temporary bents within the OHWM listed in Table 3.3. In-water work area isolation and fish capture and release will follow recent SLOPES guidance (NOAA Fisheries 2003).

Debris containment measures will be installed along the proposed temporary work bridges to prevent construction materials or associated waste from entering Bear Creek. The Contractor will be required to submit a Bridge Construction and Removal Plan to ODOT and NOAA Fisheries for approval prior to construction. The Bridge Construction and Removal Plan will specify the type of containment proposed by the Contractor for the temporary work bridges. Work from the temporary bridges will not begin until all concerns are addressed and ODOT and NOAA Fisheries have agreed that the containment measures are adequate and will perform properly for each temporary work bridge.

In addition to the temporary work bridges, temporary access roads will likely be required to gain access to main points of construction. At this time, the location of the access roads has yet to be determined, although they will be located within the proposed project clearing limits. It is not expected that access roads will be required below the OHWM of Bear or Larson Creeks. These temporary access roads will be constructed and stabilized in accordance with ODOT standards and specifications. This generally includes rough grading the access road alignment, installing some type of geotextile fabric for support, and applying

clean aggregate over the fabric as a driving surface. Upon completion of construction, the access roads will be decommissioned by removing the clean aggregate and geotextile fabric. The alignment will be graded back to original contours and grades and permanently stabilized with native vegetation in accordance with the project's approved landscaping and restoration plans. Depending on the specific location of the access road, the introduction of native vegetation will either include plantings of trees or shrubs to restore riparian forest conditions or herbaceous groundcover to restore urban lots or fields. The overall goal of the restoration plans will be to restore the functions and values of the impacted habitat. ODOT will prepare restoration plans that include a summary of performance and success criteria, details on plant arrangements and densities, a discussion of site preparation, and a discussion of the monitoring program to measure performance against success criteria.

3.1.7 Staging Areas

Staging areas for equipment and materials will be placed in five locations around the proposed project area and will be used for both the South Medford Interchange Project and the Bear Creek Highway 1 Replacement Bridges project (Figure 4). Staging areas will generally be located along existing roads closed for construction or in areas within the ODOT ROW for the proposed project. Staging areas will be used to store and maintain equipment, provide crew parking, provide a location for temporary construction offices, and to temporarily store materials for the construction of the project and from the demolition of existing bridges and roads. All staging areas will be located in previously disturbed areas and within the project area footprint. No staging areas will be located within riparian areas or within 45 m (148 ft) of a stream. The staging areas will total approximately 4.7 ha (11.6 ac), and are described below:

- The largest staging area (Area 1) will be located along the proposed footprint of the Garfield Street Extension to the southwest of the South Medford Interchange and will be approximately 2.4 ha (5.9 ac) in size. This staging area will generally be used for the construction of the I-5 on- and off-ramps, the Garfield Street Extension Bridge over I-5 and the Highland Avenue Extension Bridge over Bear Creek. This staging area will also be used for the removal and construction of the Bear Creek Highway 1 Replacement Bridges.
- A small staging area approximately 0.2 ha (0.5 ac) in size (Area 2) located between the NB and SB lanes of I-5 southeast of Bear Creek will be used to replace the existing I-5 Bear Creek Bridges.
- A staging area approximately 0.4 ha (1.0ac) in size (Area 3) will be located between Larson Creek and Barnett Road which will be used for the construction of the Highland Drive Extension Bridge over Larson Creek and the Lazy Creek box culvert replacement.
- Two large staging areas (Area 4 and Area 5) will be located in the Barnett Road intersection off- and on-ramp loops once they are removed. The south staging area (Area 4) will be approximately 0.7 ha (1.7 ac). The north staging area (Area 5) will be approximately 1.0 ha (2.5 ac). These staging areas will be used for the removal of the existing Barnett Road interchange and the replacement of the Barnett Road Bridge.

Figure 4. Proposed Staging Areas

3.1.8 Vegetation Removal

Construction of the proposed interchange will result in the temporary and permanent removal of approximately 12.0 ha (29.7 ac) of vegetation from various upland and riparian vegetation communities within the project area (Figure 5). This amount includes both temporary and permanent vegetation impacts below the OHWM and 100-year floodplain elevations of Bear and Larson Creeks (Table 3.5). As indicated in the table, a total of 6.63 ha (16.38 ac) of vegetation will be removed from the 100-year floodplain of Bear and Larson Creeks. Included within the 6.63-ha (16.38-ac) area is approximately 0.4 ha (0.9 ac) of riparian forest community vegetation that will be removed along Bear and Larson Creeks. This figure also includes a portion of the 6.5 ha (16.2 ac) of vegetation that will also be removed from the vacant fields to the west of I-5 and from the disturbed fields to the south and north of Larson Creek.

Table 3.5 Area of Vegetation Removal below OHWM and 100-year Floodplain Elevations.

Location of Clearing	Temporary Vegetation Removal (hectares/acres)	Permanent Vegetation Removal (hectares/acres)
Below OHWM	0.18 /0.44	0.43/1.063
Below 100-year Floodplain Elevation	0.39/0.98	6.63/16.38

The temporary impacts to vegetation will be the result of clearing for construction access and to provide clearance for the temporary work bridges. The vegetation that is temporarily disturbed in these areas will be restored following construction. Vegetation will be permanently removed from those sections of the project where permanent roads and bridge structures will be constructed.

The greatest loss of riparian forest vegetation (approximately 0.28 ha [0.7 ac]) will occur along the east side of the proposed interchange to accommodate construction of the Highland Drive Extension Bridge over Bear Creek (see Figure 5). This bridge will be approximately 44 m (144 ft) wide and will likely require a cleared corridor width of approximately 48.8 m (160 ft). Other clearing in the vicinity of this bridge will also be required to accommodate construction of the NB on-ramp to I-5. The majority of this ramp will be located within the existing cleared right-of-way for I-5, but portions of the ramp bridge will traverse the edge of the riparian forest community. Approximately 150 to 175 mature trees are expected to be removed in this area. The majority of trees to be removed range between 7.5 to 18 m (25 to 60 ft) tall and have diameters at breast height (DBH) ranging from 25 to 46 cm (10 to 18 in). Several of the larger trees that would be removed have a DBH ranging from 46 to 66 cm (18-26 in).

At the proposed locations of the NB off-ramp from I-5 and the SB on-ramp to I-5, the removal of large overstory trees will be limited. The proposed ramp bridges will be located within the existing cleared right-of-way of I-5 and vegetation removal will generally be small shrubs and blackberry thickets.

Figure 5. Proposed Clearing Limits

On the west side of the SB on-ramp to I-5, approximately 0.04 ha (0.1 ac) of riparian forest vegetation will be temporarily removed to accommodate construction of the temporary work bridge, including approximately 26 mature trees. The majority of trees to be removed range between 7.5 to 18 m (25 to 60 ft) tall and have a DBH ranging from 25 to 46 cm (10 to 18 in).

Additional tree removal is proposed along the alignment of the Highland Drive Extension Bridge over Larson Creek. Approximately 0.04 ha (0.1 ac) of riparian forest vegetation will be removed primarily from the north bank of the creek. Approximately 20 mature trees 6.0 to 12.2 m (20 to 40 ft) tall and with a DBH ranging from 20 to 41 cm (8 to 16 in) will be removed at this location.

In order to minimize soil loss and erosion during clearing and construction, the ODFW and NOAA Fisheries have requested that the stumps and root wads from removed trees be retained in the ground wherever possible (ODOT 2002c). Retaining the stumps and root wads in the ground will provide retention of sediment and minimize soil loss during the active construction period. With the exception of the Highland Drive Extension Bridge over Larson Creek where access is limited by vertical stream banks, those stumps or root wads that are located under the new bridges will be removed once construction is completed. Stumps or roots wads that are not located under a new bridge will be retained for restoration purposes. The majority of the trees to be removed will be black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra*) and willow (*Salix* spp.). All of these species will easily sprout new growth from the stumps that are retained in the ground. This new coppice growth from retained stumps will help re-establish some of the vegetation removed from the project corridors.

The riparian forest community along Bear Creek also provides shade to the creek and other riparian functions, including organic inputs to the stream and potential sources of habitat structure (large woody material [LWM]). ODOT will work with ODFW and NOAA Fisheries in retaining fallen trees and removed root wads for use in other in-stream restoration projects in the Bear Creek or Rogue Valley watersheds under consideration by conservation groups and public agencies.

ODOT will develop mitigation plans for restoring or enhancing riparian areas along Bear Creek as compensation for the 0.4 ha (0.9 ac) loss of riparian forest vegetation anticipated by this project. Preliminary surveys conducted by the ODOT project team have identified several existing disturbed areas along Bear Creek as potential sites for establishing new riparian forests. These areas amount to more than 0.5 ha (1.0 ac) and include disturbed areas along Bear Creek in the vicinity of the existing I-5 NB off-ramp to Barnett Road, the area surrounding the existing I-5 bridges over Bear Creek and portions of the Larson Creek stream corridor. Additional mitigation sites are located south of the project area along Bear Creek on property owned by ODOT and at McAndrews Park which is owned by the City of Medford. In each of these potential mitigation sites, natural riparian forest cover is currently lacking. These sites are generally dominated by invasive species and dense thickets of Himalayan blackberry.

Anticipated mitigation for the SMI project will include restoration of areas disturbed by construction that are located adjacent to the footprint of the project (i.e. along permanent and temporary bridge alignments). In addition, mechanical removal of invasive species and blackberry will be employed to approximately 0.5 ha (1.0 ac) of the previously disturbed areas along Bear and Larson Creeks followed by new plantings of native trees and shrubs. ODOT is also considering planting and restoring the area around the abandoned NB off-ramp from I-5 to expand the existing riparian forest corridor and to provide a continuous forested corridor from the proposed interchange to the Barnett Road Bridge. The overall goal of mitigation for the project will be to re-establish riparian forests that match the species composition and tree density of undisturbed riparian forests along Bear Creek. Trees removed during construction will be replaced at a 2:1 ratio with similar species and numbers to those removed. Native woody shrub species and herbaceous vegetation will also be planted to provide a diverse assemblage of species. Other performance standards for mitigation will include control of invasive species following planting, and monitoring and maintaining the restored areas for a period up to five years to ensure a high percentage of survival for planted tree species.

During the development of the mitigation plans, ODOT will consider the recommendations for mitigation presented in the Bear Creek Mitigation Implementation Plan (MB&G 2000). Regulatory agencies including NOAA Fisheries and ODFW will be given the opportunity to review and comment on these plans prior to their approval.

3.1.9 Construction Sequence

This section provides a rough estimate of the construction schedule and the sequence of construction for the various elements of the project. Anticipated start of construction is sometime in late 2005 or early 2006 and is subject to change pending receipt of various approvals and permits. Once construction has started, the entire project is expected to take about four to six full construction seasons to complete. The ODFW defined in-water work period for the Bear Creek watershed is June 15 to September 15 (ODFW 2000). All in-water construction operations will be scheduled to occur within the approved in-water work period for each construction season. As previously stated, the proposed interchange will be constructed and fully operational before the Barnett Road Bridge is replaced. The general anticipated sequence of construction is as follows:

1. Initiate construction of the main interchange pedestal over I-5.
2. Construct Highway 1 NB Ramp to Highland Drive over Bear Creek (NB off-ramp from I-5), retaining wall and temporary work bridge. The construction of the NB off-ramp and temporary work bridge will require in-water work within Bear Creek.
3. Construct Highland Drive Extension north to Barnett Road including bridges over Bear and Larson Creeks. Install retaining walls. Concurrently, build Garfield Street Ramp to Highway 1 SB over Bear Creek (SB on-ramp to I-5) along with retaining walls and temporary work bridge. Construction of the SB on-ramp and temporary work bridge will require in-water work within Bear Creek.
4. Construct southern section of Garfield Street Extension to Highway 99.

5. Construct Highland Drive Ramp to Highway 1 NB Bridge (NB on-ramp to I-5) and SB off-ramp from I-5.
6. Improve Highland Drive and replace existing Lazy Creek box culvert with new bridge. Replacement of the Lazy Creek box culvert will require in-water work within the Lazy Creek.
7. Complete main interchange pedestal over I-5 (Garfield Street Bridge over Highway 1). Open to traffic. Decommission existing Barnett Road interchange ramps.
8. Close Barnett Road Bridge. Route all traffic to new interchange.
9. Replace Barnett Road Bridge over Bear Creek. Replacement of the bridge will require in-water work within Bear Creek.

3.2 BEAR CREEK HIGHWAY 1 BRIDGES

3.2.1 General

Based upon a June 2002 inspection by ODOT, it has been determined that the existing I-5 bridges over Bear Creek have significant cracking and other structural problems, and that they are no longer able to support heavy truck loadings (ODOT 2002a). As such, the replacement of both the NB and SB I-5 bridge structures is required to maintain public safety. The existing bridges will be replaced at the same locations and along similar alignments as the existing bridge structures (see Figure 2B).

The Bear Creek bridges will be constructed with precast concrete beams and cast-in-place concrete decks. Foundations for the bridges are all expected to be constructed using drilled shafts (Bonn 2003). No concrete spread footings are proposed. Two of the nine new permanent bents will be constructed below the OHWM, while two existing bents will be removed (Table 3.6). In addition, 11 temporary bridge bents will be constructed below the OHWM. A total of 15 in-water work area containments will be required for bridge removal and construction.

Table 3.6 Bent and Culvert Structures Removal and Installation (Bear Creek Bridges)

Structures	Total Number of Structures	Number Above 100-Year Flood Elevation	Number Below 100-Year Flood Elevation	Number Below OHWM	In-water Work Area Containments
Bents Removed	13	0	11	2	2
Temporary Bents	20	0	9	11	11
Permanent Bents	9	0	7	2	2
Culverts Removed	0	0	0	0	0
Total Structures	**42**	**0**	**27**	**15**	**15**

3.2.2 Description of Existing Bridges

Tables 3.7 and 3.8 and the following sections present a description of the existing NB and SB I-5 bridges over Bear Creek.

Table 3.7 Summary of Bridge Impacts (Bear Cr. Bridges Project Bridges)

Permanent Bridges	Existing Conditions	Proposed Bridge	Net Changes
Bridge 19282 **Hwy 1 NB over Bear Cr.** **(Permanent)**	• Bridge length is 100 m • Bridge width is 11 m	• Bridge length is 107 m • Bridge width is 17 m	• +7 m bridge length • +6 m bridge width
	• 7 bents total • 6 bents below 100-year • 1 bent below OHWM • 1 in-water work area containment (for removal)	• 5 bents total • 3 bents below 100-year • 2 bents below OHWM • 2 in-water work area containments	• -7 bents +5 bents total • -6 bents, +5 bents below 100-year • -1 bent, +0 bents below OHWM • +1 in-water work area containments (200 m^2 total)
	• I-5 stormwater not currently treated	• Stormwater conveyed to south detention facility and swale	• Existing untreated stormwater will be treated
Bridge 19283 **Hwy. 1 SB over Bear Cr.** **(Permanent)**	• Bridge length is 95 m • Bridge width is 11 m	• Bridge length is 96 m • Bridge width is 14 m	• +1 m bridge length • +3 m bridge width
	• 6 bents total • 5 bents below 100-year • 1 bent below OHWM • 1 in-water work area containment (for removal)	• 4 bents total • 2 bents below 100-year • 2 bent below OHWM • 2 in-water work area containments	• -6 bents, +4 bents total • -5 bents, +2 bents below 100-year • -1 bent, +2 bents below OHWM • +3 in-water work area containments (600 m^2 total) • +8.54 m^2 stream bed disturbed below OHWM (piers)
	• I-5 stormwater not now treated	• Stormwater conveyed to south detention facility and swale	• Existing untreated stormwater will be treated
Summary Total			**Net Changes**
			<u>Removals</u> • -13 bents total • -11 bents below 100-year • -2 bents below OHWM
			• **<u>Additions</u>** • +9 bents total • +5 bents below 100-year • +2 bents below OHWM • +4 in-water work area containments (800 m^2 total) • +8.54 m^2 stream bed disturbed below OHWM (piers)

Note: All dimensions, bent numbers, and stormwater conveyance information based on ODOT project plans of January 28, 2003 and discussion with ODOT engineers.

Table 3.8 Summary of Temporary Bridge Impacts (Bear Cr. Bridges Project Temporary Bridges)

Temporary Bridges	Existing Conditions	Proposed Project	Net Changes
Bridges 19282-19283 Work Bridge (Temporary)	• Bridge does not currently exist	• 10 bents/40 piles total • 5 bents/20 piles below 100-year • 5 bents/20 piles below OHWM • 5 in-water work area containments	• +10 bents/40 piles total • +5 bents/20 piles below 100-year • +5 bents/20 piles below OHWM • +5 in-water work area containments (150 m^2 each = 750 m^2)
Bridges 19282-19283 Detour Bridge (Temporary)	• Bridge does not currently exist	• 10 bents/40 piles total • 4 bents/16 piles below 100-year • 6 bents/24 piles below OHWM • 6 in-water work area containments	• +10 bents/40 piles total • +4 bents/16 piles below 100-year • +6 bents/24 piles below OHWM • +6 in-water work area containments (150 m^2 each = 900 m^2)
Summary Total			**Net Changes** **<u>Additions</u>** • +20 bents/80 piles total • +9 bents/36 piles below 100-year • +11 bents/44 piles below OHWM • +11 in-water work area containments (150 m^2 each = 1,650 m^2 total)

Note: All dimensions, bent numbers, and stormwater conveyance information based on ODOT project plans of January 28, 2003 and discussion with ODOT engineers.

3.2.2.1 Existing Bear Creek Highway 1 NB Bridge

The existing NB I-5 bridge over Bear Creek is a six-span structure with one cantilever approximately 100 m (327 ft) long and approximately 11 m (35.2 ft) wide. The bridge consists of a cast-in-place reinforced concrete deck that provides two lanes of vehicle travel. Stormwater runoff from the bridge is discharged directly into Bear Creek and its adjacent floodplain by a series of curbside downspouts. No detention or treatment of stormwater originating from the bridge deck or roadway approaches is currently provided. The bridge has one bent (Bent No. 2) located at the edge of the creek channel within the OHWM of Bear Creek and is usually within flowing water during most of the year. The other six bents are within the 100-year flood elevation. A profile drawing of the existing NB I-5 bridge structure is provided in Appendix B2.

Both the north and south end bents for the bridge are protected by large volumes of riprap that are keyed into a toe trench. The riprap is comprised of large rocks, many in excess of 1 m (3.3 ft) in diameter. Along the north bank of Bear Creek, the riprap extends from the end bent (Bent No. 1) down to the Bear Creek channel near Bent No. 2 and extends approximately 10 m (30 ft) downstream of the bridge. The riprap also extends along the north bank of Bear Creek to the SB I-5 bridge structure.

3.2.2.2 Existing Bear Creek Highway 1 SB Bridge

The existing SB I-5 bridge over Bear Creek is a five-span structure approximately 95 m (312 ft) long and approximately 11 m (35.2 ft) wide. The bridge contains one cantilever at each end of the bridge. The design of the SB I-5 bridge is similar to the NB I-5 bridge, consisting of a cast-in-place reinforced concrete deck girder that also provides for two lanes of vehicle travel. One bent (Bent No. 2) is located below the OHWM of Bear Creek and is generally within the level of streamflow for Bear Creek during most of the year. The other five bents are within the 100-year flood elevation of Bear Creek. Similar to the NB I-5 bridge, stormwater runoff from the bridge currently drains directly to Bear Creek and its riparian area without prior detention or treatment through a series of curbside downspouts.

The north bank of Bear Creek under the bridge is also armored with large riprap that extends from the top of bank to the bottom of the Bear Creek channel. The riprap under and adjacent to the bridge is also large, with many individual rocks greater than 1 m (3.3 ft) in diameter. The riprap on the north bank of Bear Creek extends up to 37 m (120 ft) west or upstream of the bridge. The south bank of Bear Creek is approximately 30 m (100 ft) from the active flowing channel. The south bank is also armored with a large volume of large-sized riprap. The riprap on both banks is anchored into a toe trench below the point of active scour along Bear Creek. A profile drawing of the existing SB bridge structure is provided in Appendix C2.

3.2.3 Proposed Replacement Bridges

Both of the proposed NB and SB replacement bridges will consist of precast concrete beams with cast-in-place decks. Both replacement bridges will be constructed in the same locations and along the same alignments as the existing bridge structures. A comparison of the major

design elements between the existing and proposed bridge replacement structures is presented in Table 3.9.

Table 3.9 Comparison of Existing and Proposed Bear Creek Highway 1 Bridges

Bridge	Length meters (ft)	Width meters (ft)	Area m^2 (ft^2)	Number of Spans
Existing NB	100 (327)	11(35.2)	1,100 (11,510)	6
Proposed NB (19282)	107 (351)	17 (55)	1,778 (19,305)	4
Existing SB	95 (312)	11 (35.2)	1,045 (10,982)	5
Proposed SB (19283)	96 (315)	14 (47)	1,363 (14,670)	3

3.2.3.1 Bear Creek Highway 1 NB Replacement Bridge (Bridge No. 19282)

The proposed Bear Creek Highway 1 NB replacement bridge (Bridge No. 19282) will be a four-span bridge approximately 107 m (351 ft) long and approximately 17 m (55 ft) wide. The bottom of the bridge will be a minimum of approximately 3.5 m (11 ft) above the OHWM. The bridge will consist of 3 multi-column interior drilled shaft bents to support the bridge deck, all of which will be located above the OHWM for Bear Creek, but below the 100-year flood elevation. One bent will be located approximately 3 m (10 ft) from the OHWM. The proposed NB bridge will be wider than the proposed SB bridge to accommodate the existing condition of two NB travel lanes with standard shoulder widths, and to allow for the potential future re-alignment of the NB I-5 travel lanes. The re-alignment of the NB travel lanes would be necessary should there ever be the need for an additional travel lane. It is anticipated that all the bridge bents will be drilled shafts.

Approximately 31 m^3 (46 yd^3) of riprap will be removed from the end bents of the existing bridge. Approximately 40 m^3 (52 yd^3) of riprap will be required at both end bents of the new bridge to protect the bridge bents and adjacent fill slope from scour, a net increase of 9 m^3 (12 yd^3). However, this small increase in riprap will be offset by the removal of approximately 1,250 m^3 (1,635 yd^3) of riprap from a 416-m^2 (4,478-ft^2) area below the OHWM surrounding the existing I-5 bridges and an additional 5,313 m^3 (6,949 yd^3) removed from a 1,771-m^2 (19,063 ft^2) area above the OHWM at the top of the bank.

3.2.3.2 Bear Creek Highway 1 SB Replacement Bridge (Bridge No. 19283)

The proposed Bear Creek Highway 1 SB replacement bridge (Bridge No. 19283) will be a three-span structure approximately 96 m (315 ft) long and approximately 14 m (47 ft) wide. The bottom of the bridge will be a minimum of approximately 2.5 m (8 ft) above the OHWM. Two of the proposed multi-column bents will be located below the OHWM for a total stream bottom disturbance area of approximately 8.54 m^2 (92 ft^2). The remaining two bents will be located below the 100-year flood elevation approximately 9 and 12 m (30 and 39 ft) from the edge of the OHWM.

Similar to the NB bridge, all of the bridge bents will be constructed on drilled shafts. Riprap will be required at both end bents to protect the bridge bents and adjacent fill slope from scour. Approximately 29 m^3 (38 yd^3) of riprap will be removed from the end bents of the

existing bridge. Approximately 40 m^3 (52 yd^3) of riprap will be required at both end bents of the new bridge to protect the bridge bents and adjacent fill slope from scour, a net increase of 11 m^3 (14 yd^3). However, this small increase in riprap will be offset by the removal of approximately 1,250 m^3 (1,635 yd^3) of riprap from a 416-m^2 (4,478-ft^2) area below the OHWM surrounding the existing I-5 bridges and an additional 5,313 m^3 (6,949 yd^3) removed from a 1,771-m^2 (19,063 ft^2) area above the OHWM at the top of the bank.

3.2.4 Demolition of Existing Bridges

The replacement of the existing I-5 bridges will be one of the first construction activities needed to prepare for the SMI project. It is anticipated that the NB I-5 bridge will be replaced first followed by the SB bridge structure. Sequencing of the proposed I-5 bridge replacement process will be initiated by the construction of a temporary detour structure west of the existing SB I-5 bridge. Construction of the temporary detour structure will require the placement of temporary bridge bents within the Bear Creek channel. Next, a temporary work bridge will be constructed between the existing NB and SB I-5 bridges. This action will also require temporary bridge bents and in-water work within Bear Creek. Between the detour and temporary work bridges, approximately 11 bents supported by 44 steel pipes will be installed below the OHWM of Bear Creek (Table 3.7). After these two temporary bridges are in place, traffic will be shifted so that SB vehicles use the detour structure and NB vehicles use the existing SB bridge. Construction of the temporary work bridges will occur during the ODFW defined in-water work period (June 15 to September 15) for Bear Creek (ODFW 2000). It is anticipated that 20 in-water work isolation areas will have to be constructed for the installation of the temporary bridges. This corresponds to the number of proposed temporary bents below the OHWM listed in Table 3.8.

After construction of the detour route and work access bridges, the existing NB bridge and bent footings will be removed. The Contractor will likely remove the existing bridge in pieces that are as large as possible to remove. A crane will be attached to a section of the deck and that section will be cut free from the structure and then lifted to a staging area to be located in the median at the south end of the bridge. The bridge section may be cut with a concrete saw or by hoe ram. If a hoe ram is used to break up the concrete, then the internal rebar will be cut afterwards with a torch or by another method.

The Contractor will employ a containment method that prevents demolition debris from inadvertently falling into Bear Creek. The Contractor will be required to submit a Bridge Construction and Removal Plan to ODOT and NOAA Fisheries that will describe the containment measures to be used. The Contractor will remove the bridge deck, beams and the bridge bents. The bents will either be cut flush to bedrock, or if located in an area of alluvial material, cut 0.6 m (2 ft) below the stream bottom and backfilled with substrate similar to that which exists around the bent.

Two bents will be removed from below the OHWM of Bear Creek during the demolition of the NB and SB bridges. This action will remove approximately 104 m^3 (136 yd^3) of existing concrete and rip-rap from the Bear Creek channel (approximately 52 m^3 [68 yd^3 per bridge bent). Given their location in or adjacent to the Bear Creek channel, the work area for each bent to be removed from the OHWM will require in-water work isolation and disturbance to

the channel bottom. The in-water work area for each bent will be completely isolated from streamflow through the use of sheet piles, sandbags or some other form of diversion structure. The potential disturbance to the creek channel will be limited to the existing footing of each bent. The Contractor will be required to submit a Work Area Isolation Plan to ODOT and NOAA Fisheries for approval prior to construction. Work area isolation and containment will not proceed until all concerns are addressed and ODOT and NOAA Fisheries have agreed that the work area isolation measures will perform adequately.

During the isolation of the in-water work areas, appropriate fish preservation and salvage methods will be employed. Fish salvage operations, including seining or electro-shocking the isolated work area, will be conducted by qualified fisheries biologists to remove and re-locate trapped fish. All intake structures for de-watering pumps will be installed with appropriate fish screens in accordance with NOAA Fisheries fish screen criteria (NOAA Fisheries 1995 and 1996). All fish salvage and dewatering efforts will be completed according to the Capture and Release guidelines described in the SLOPES document. Electrofishing operations will comply with NOAA Fisheries Backpack Electrofishing Guidelines (NOAA Fisheries 1998).

Once the NB I-5 bridge is removed and the new NB I-5 bridge is constructed, NB traffic will be diverted to the new NB bridge and a similar process will occur for removing the existing SB bridge. No additional temporary work bridges will be built for the construction of the SB bridge.

3.2.5 Construction of Proposed Bridges

The first step in constructing the new Bear Creek Highway 1 Bridges (Bridges Nos. 19282 [NB] and 19283 [SB]) will be to excavate the area for the new end bents and wingwalls. This excavation area will be protected with appropriate erosion control measures. Support piles will be driven or drilled to bedrock and the concrete for the pile caps will be poured on top of the piles. The end panel supports and wingwalls will then be constructed and the area behind the wingwalls will be back-filled. Containment measures will be implemented to ensure all uncured concrete is contained within the work area and does not come into contact with any flowing water (See Section 3.2.9 Vegetation Removal).

On the SB I-5 Bridge, interior bent drilled shaft foundations, columns, and web walls within the OHWM will be built with the work area isolated from flowing water. After construction of the crossbeams, the precast beams will be placed, deck formed and cast, and rails constructed.

The construction activity will then focus on building the bridge ends. The end panels will be constructed and finally the deck rails will be constructed and poured. Roadway paving at each end of the bridges will be flared to match the existing roadway width to the new bridge width. Guardrail flares will be constructed on all four of the bridge corners.

Upon completion of construction, all disturbed soils will be stabilized and landscaped in accordance with the approved plans. Appropriate riparian mitigation plantings will also be installed at this time (See Section 3.2.9-Vegetation Removal).

3.2.6 New Impervious Surfaces

Replacement of the existing I-5 bridges will result in a net increase of approximately 1,000 m^2 (10,763 ft^2 or 0.25 ac) of impervious surfaces. The proposed replacement bridge structures for both the NB and SB bridges will be longer and wider than the existing bridge structures. The NB bridge will be lengthened approximately 7 m (24 ft) and the SB bridge will be lengthened approximately 1 m (3 ft). The NB and SB bridges will be widened approximately 6 m (19.5 ft) and 3.6 m (11 ft), respectively.

3.2.7 Water Quality Treatment/Detention Facilities

As described in the SMI water quality treatment section (Section 3.1.4), stormwater originating from the new replacement bridges will be collected by curbside inlets and conveyed either to the southern water quality treatment/detention facility for the SMI project or to the water quality swale to be constructed for the SMI project along the east side of the new NB off-ramp. In general, stormwater originating from the bridges over the north half of Bear Creek will be conveyed to the southern water quality treatment/detention facility, while stormwater from the southern half of the bridges will go to the water quality swale. Unlike existing bridge conditions, no stormwater will be discharged directly into Bear Creek without prior treatment.

3.2.8 Temporary Work Bridges

A temporary work bridge will be constructed within the maintained I-5 right-of-way between the existing NB and SB I-5 bridges to facilitate construction of the replacement bridges. The temporary work bridge will be approximately 105 m (345 ft) long. This bridge will be accessed from the median of I-5 (Appendix B2).

Construction of the temporary work bridge will occur concurrent with or following the construction of the temporary SB detour bridge. The proposed temporary work bridge will be constructed of steel pipe piles supporting a lattice of steel cross beams and longitudinal beams that are topped with a sealed wood deck. The width of the temporary work bridge will vary from 6 to 10 m (20 to 33 ft), depending on location and the type of construction equipment that will be supported (ODOT 2002b). The Contractor will likely use pre-constructed work bridge panels or spans a minimum of approximately 12.2 m (40 ft) in length. These panels will be arranged so as to minimize the number of bents (and piles) within the OHWM. Assuming that a minimum size of 12.2-m (40-ft) temporary bridge panel will be used, it is estimated that approximately 80 steel pipe piles will have to be installed, with 36 of those piles within the 100-year flood elevation of Bear Creek and 44 of those piles installed below the OHWM (summarized previously in Tables 3.6 through 3.8).

Appropriate containment measures will be installed along the entire length of the temporary work bridge to prevent removed materials or associated waste from entering Bear Creek. The Contractor will be required to submit a Bridge Construction and Removal Plan to ODOT and NOAA Fisheries for approval prior to construction. The Bridge Construction and Removal Plan will specify the type of containment proposed by the Contractor for the temporary work bridges. Work from the temporary bridges will not begin until all concerns are addressed and ODOT and NOAA Fisheries have agreed agrees that the containment measures are adequate and will perform properly for each temporary work bridge.

3.2.9 Vegetation Removal

Replacement of the existing I-5 bridges will result in the removal or disturbance of approximately 0.7 ha (1.8 ac) of disturbed upland and riparian vegetation within the maintained right-of-way for I-5. This amount includes both temporary and permanent vegetation impacts below the OHWM and 100-year floodplain elevations of Bear Creek (Table 3.10). As indicated in the table, a combined total of 0.06 ha (0.17ac) of vegetation will be removed from the 100-year floodplain of Bear Creek.

Table 3.10 Area of Vegetation Removal below the OHWM and 100-year Floodplain Elevations for NB and SB Bear Creek Highway 1 Bridges

Location of Clearing	Temporary Vegetation Removal (hectares/acres)	Permanent Vegetation Removal (hectares/acres)
Below OHWM	0.067 /0.17	0.03/0.085
Below 100-year Floodplain Elevation	0.067/0.17	0.03/0.085

Due to the on-going vegetation maintenance activities along the I-5 corridor, the I-5 median and right-of-way surrounding the existing bridges has been cleared of trees and tall shrubs. The majority of the vegetation presently consists of dense thickets of Himalayan blackberry, scattered small saplings of red alder and willow, and dense herbaceous vegetation. Approximately 16 small trees or saplings will be removed during the replacement of the bridges, and the majority of trees to be removed range between 4.5 to 7.6 m (15 to 25 ft) tall and have diameters at breast height (DBH) ranging from 10 to 20 cm (4 to 8 in). No large riparian trees will be removed during the replacement of the bridge structures. The majority of the blackberry thickets presently cover the riprap that is located along both banks of Bear Creek.

Similar to the SMI project, stumps and root wads from removed small trees or shrubs will be retained in the ground wherever possible to provide retention of sediment and minimize soil loss during the active construction period (ODOT 2002c). The majority of the trees to be removed at the Bear Creek Highway 1 Bridge replacement sites will be red alder and willow. Both of these species will easily sprout new growth from stumps that are retained in the ground. This new coppice growth from retained stumps will help re-establish some of the vegetation removed from the project corridor.

As with the SMI project, ODOT will develop mitigation plans for restoring or enhancing riparian areas along Bear Creek as compensation for the minor loss of riparian vegetation associated with the replacement of the I-5 bridges. During the development of the mitigation plans, ODOT will consider the recommendations for mitigation presented in the Bear Creek Mitigation Implementation Plan (MB&G 2000). Regulatory agencies including NOAA Fisheries and ODFW will be given the opportunity to review and comment on these plans prior to their approval. Mechanical removal of invasive species and blackberry will be employed within the disturbed right-of-way of I-5 followed by new plantings of native trees and shrubs. The overall goal of mitigation for the Bear Creek Highways 1 project will be to

replace lost trees and shrubs within the vicinity of the new bridges. Trees removed during construction will be replaced at a 2:1 ratio with similar species and numbers to those removed. Native woody shrub species and herbaceous vegetation will also be planted to provide a diverse assemblage of species. Other performance standards for mitigation will include control of invasive species following planting, and monitoring and maintaining the restored areas for a period up to five years to ensure a high percentage of survival for planted trees.

3.2.10 Bear Creek Highway 1 Bridges Construction Sequence

This section provides a rough estimate of the construction schedule and sequencing for the various elements of the project. No firm construction date has been established, although the replacement of I-5 bridges is favored by ODOT prior to constructing major elements of the SMI project. Once construction has started, replacement of the existing bridge structures is expected to take about two full construction seasons to complete. The ODFW defined in-water work period for the Bear Creek is June 15 to September 15 (ODFW 2000). All in-water construction operations will be scheduled to occur within the approved in-water work period. The general anticipated sequence of construction is as follows:

1. Construct temporary detour bridge structure to the west of existing SB I-5 bridge. This phase of the project will require in-water work within Bear Creek.

2. Construct temporary work bridge between existing NB and SB I-5 bridges. This will require in-water work within Bear Creek.

3. Divert traffic flow so that SB vehicles use the temporary detour structure and NB vehicles use the existing SB I-5 bridge.

4. Remove existing NB I-5 bridge. Removal of bridge piers on this bridge will require in-water work within Bear Creek.

5. Construct new NB I-5 bridge structure.

6. Divert NB traffic onto new NB I-5 bridge.

7. Remove existing SB I-5 bridge. Removal of bridge piers on this bridge will require in-water work within Bear Creek.

8. Construct new SB I-5 bridge.

9. Divert SB traffic onto new SB I-5 bridge.

10. Remove temporary detour and temporary work bridge. Removal of the temporary bridges will require in-water work.

4.0 SPECIES OCCURRENCE AND STATUS

Both the SMI and the Bear Creek Highway 1 Bridge Replacement projects are located within the Bear Creek watershed. Perennial streams within the SMI project area include Bear Creek, Larson Creek and Lazy Creek (Figure 6A). The largest stream is Bear Creek and both Larson and Lazy Creeks are tributaries to Bear Creek. Perennial streams within the Bear Creek Highway 1 project area include Bear Creek (Figure 6B).

The Bear Creek watershed supports runs of chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), steelhead trout (*O. mykiss*) and Pacific lamprey (*Lampetra tridentata*) (Streamnet 2002 and ORIS 1994). Resident fish species in the watershed include reticulate sculpin (*Cottus perplexus*), rainbow trout, cutthroat trout (*O. clarki*) and Klamath smallscale sucker (*Catostomus rimiculus*). Introduced warm water adapted species include black crappie (*Pomoxis nigromaculatus*), largemouth bass (*Micropterus salmoides*), mosquitofish (*Gambusia affinis*), pumpkinseed (*Lepomis gibbosus*), and native redside shiner (*Richardsonius balteaus*) (Streamnet 2002 and ORIS 1994).

The NMFS announced on March 30, 2001 that listing of steelhead trout of the Klamath Mountains Province ESU is not warranted under the federal ESA (NMFS 2001). This decision was published in the Federal Register on April 4, 2001 (66 FR 17845). Therefore, steelhead trout in the Bear Creek watershed are not addressed in this BA.

Chinook salmon of the Southern Oregon and Northern California Coastal ESU are not currently listed under the federal ESA (64 FR 50394). Therefore, chinook salmon in the Bear Creek watershed are not addressed in this BA.

Only coho salmon are listed under the Federal ESA. The following section presents a discussion of the listing status of coho salmon and the occurrence of this species within Bear, Larson and Lazy Creeks.

4.1 COHO SALMON

Species: Coho Salmon (*Oncorhynchus kisutch*)
ESU: Southern Oregon/Northern California Coasts
Federal Status: Listed Threatened
Critical Habitat: Designated

Coho salmon in the proposed project area are part of the Southern Oregon/Northern California Coasts ESU that was listed as threatened under the federal ESA on May 6, 1997 (62 FR 24588). The ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California. Most streams within the South Medford area were once inhabited by coho salmon. Today, Bear Creek is the only stream within the South Medford area that is documented to contain coho salmon.

Critical habitat for this ESU was designated on May 5, 1999 and includes all river reaches accessible to listed coho salmon between Cape Blanco and Punta Gorda. Critical habitat includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally

Figure 6A. Fish Bearing Streams- South Medford Interchange

Figure 6B. Fish Bearing Streams- Bear Creek Highway 1 Bridges

impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) of accessible estuarine and riverine reaches. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 46,850 square kilometers (18,090 square miles) in California and Oregon. The following counties lie partially or wholly within watersheds inhabited by this ESU: California – Del Norte, Glenn, Humboldt, Lake, Mendocino, Siskiyou, and Trinity; Oregon – Coos, Curry, Douglas, Jackson, Josephine, and Klamath (64 FR 24049).

For general information on the habitat requirements and life history of Southern Oregon/Northern California Coast coho salmon ESU see the Federal Register published on May 6, 1997 (62 FR 24588).

4.2 COHO PRESENCE IN BEAR CREEK

Anadromous fish species known to be present in Bear Creek include coho salmon (federally listed as threatened), fall chinook salmon, summer steelhead, and winter steelhead. Fall chinook are recorded as occurring as far upstream as River Kilometer (RK) 37 (River Mile [RM] 23); the other anadromous species (coho salmon and summer and winter steelhead) have been recorded as far upstream as RK 43.4 (RM 27). Resident fish species include cutthroat trout, rainbow trout, Klamath smallscale sucker, redside shiner, reticulate sculpin, black crappie, largemouth bass, mosquitofish, and pumpkinseed (Streamnet 2002 and ORIS 1994).

Coho enter Bear Creek in November and December and spawn in available habitat from the mouth, upstream to Emigrant Creek (Fustish pers. comm., 1999a and Evenson pers. comm., 2003). The first 16 km (10 mi) of Bear Creek functions primarily as a migration corridor, providing passage to spawning and rearing areas. Prior to 1998, the Jackson Street Dam in Medford was a major obstacle for migrating fish. This dam was located approximately 2.4 km (1.5 mi) downstream from the project area and was removed in 1998. Presently, spawning occurs primarily in Ashland Creek (Evenson pers. comm., 1999b and 2003). Coho have been known to occur up to RK 43 (RM 27) of Bear Creek although abundance is low (Evenson pers. comm., 2003). ODFW's Salmon and Trout Enhancement Program (STEP) released approximately 8,000 coho from hatch boxes in upper Bear Creek for seven years and discontinued the practice four years ago. It is believed that approximately 25 percent of Bear Creek's returning adult coho originated from the STEP program during this period. The ODFW has operated a smolt trap since 2001, located 0.6 mile upstream from the confluence with the Rogue River on Bear Creek (Jerry Vogt, per. Comm., 2003). Biologists reported that 27 coho smolts were captured between March 1st to June 24th, 2001. Trapping efficiency was estimated to be approximately 27 percent. A summery report estimated 3.7 coho per mile of habitat. During 2002, from March 1st to June 15th, 68 coho smolts were captured. However, trapping efficiency was estimated to be approximately 3 percent. From the study, the coho population in Bear Creek was estimated to be approximately 2194 smolts in 2002. Angling is prohibited in Bear Creek and all associated tributaries (Evenson pers. comm., 2003).

4.3 COHO PRESENCE IN LARSON CREEK

Coho salmon are not documented in most reaches of Larson Creek (Evenson pers. comm., 2003). Coho may utilize the very lower reaches of Larson Creek from the mouth to RK 0.5 (RM 0.3) (Streamnet 2002). During ODFW surveys, salmonids were observed in Larson Creek above North Phoenix Road, which lies upstream of known fish passage barriers, of which the most downstream barrier is located at Ellendale Drive. The presence of salmonids in this area is unexplained. ODFW biologists speculate that salmonids may be able to travel through the extensive canal network, which traverses many stream systems in the Bear Creek watershed. Salmonids observed above passage barriers may have originated from Agate Lake, Emigrant Lake or other local streams (Evenson pers. comm., 2001).

ODFW observation surveys confirm summer steelhead presence up to RK 6.3 (RM 3.9) (Evenson pers. comm., 2003). Electroshocking surveys of the creek conducted by ODFW in March 1999 found fish inhabiting a much greater area than previously identified. Juvenile fish (steelhead or rainbow trout) were found to be present in Larson Creek up to 0.5 km (0.3 mi) downstream of where the East Lateral Canal crosses the creek, approximately 5.2 km (3.2 mi) upstream (east) of Ellendale Drive. Observation surveys also documented fall chinook presence upstream to RK 6.4 (RM 4) (Evenson pers. comm., 2003). ODFW found limited occurrences of adult rainbow trout/steelhead and chinook salmon in the lower reaches of Larson Creek; however, no coho occurrences were recorded.

Although the overall condition of Larson Creek is degraded, Mike Evenson, the ODFW District Fish Biologist, indicates that Larson Creek represents better fish habitat than most other Bear Creek tributaries (Evenson pers. comm. 2001). The reason for this is primarily due to the lack of hardened structures (i.e. concrete or gunnite-lined channels). ODFW has also hypothesized that coho and other anadromous salmonids may reside in the lower portions of Larson Creek to wait out flashy, high flows in Bear Creek. Some moderate quality habitat exists in a short section of the lowest reach of Larson Creek, just upstream of the Bear Creek confluence. Additionally, a section of Larson Creek in the vicinity of North Phoenix Road has undergone recent restoration efforts and is showing signs of improving habitat condition.

4.4 COHO PRESENCE IN LAZY CREEK

According to ODFW biologists, coho are not documented in Lazy Creek. Limited occurrences of steelhead and cutthroat trout have been recorded in the lower reach of Lazy Creek (Fustish pers. comm. 2002). The Lazy Creek watershed is heavily impacted by extensive impervious surfaces; a condition that is believed to be largely responsible for the ephemeral nature of streamflows in the creek. In the fall of 2000, several fall chinook salmon were stranded in Lazy Creek after streamflow increased following a rain event, then quickly dropped, stranding the fish in upper reaches of the stream (Vogt pers. comm. 2000).

According to an ODFW survey conducted in 1999, steelhead and cutthroat trout inhabit the lowest reaches of Lazy Creek up to a 305 m (1,000 ft) long culvert located approximately 1.6 kilometer (1 mile) upstream of the confluence with Bear Creek. The culvert is considered a fish passage barrier (Fustish pers. comm. 2002). Within the SMI project area, streamflow in

Lazy Creek is to the west and passes through developed urban residential areas and city parkland. The ODFW has no habitat data for the stream; however, the presence of juvenile steelhead and cutthroat trout suggests that some spawning habitat exists in Lazy Creek.

5.0 BASELINE CONDITIONS

Both the SMI and the Bear Creek Highway 1 Bridge Replacement projects are located within the Bear Creek watershed. Perennial streams within the SMI project area include Bear Creek, Larson Creek and Lazy Creek (see Figure 6A). The Bear Creek Highway 1 Bridge Replacement project will only encroach upon Bear Creek (see Figure 6B). Larson and Lazy Creeks will not be affected by this bridge replacement project.

The following section presents the environmental baseline conditions for Bear, Larson and Lazy Creeks. This is followed by a summary discussion of the other physical and environmental conditions within both the SMI and Bear Creek Highway 1 Bridge Replacement project sites.

5.1 STREAMS

5.1.1 Bear Creek

Both the SMI and the Bear Creek Highway 1 Bridge Replacement Projects are located within the Bear Creek sub-basin of the Rogue River Valley in central Jackson County, Oregon. Bear Creek flows northwest 82.2 kilometers (51.1 miles) from its headwaters through the cities of Ashland and Medford, to its mouth at the Rogue River approximately 9.7 kilometers (6 miles) west of White City. Both project sites are located approximately 14 kilometers (8.5 miles) upstream from the mouth, in the City of Medford.

The Bear Creek sub-basin drains approximately 994 square kilometers (384 square miles) (RVCOG 1995). Bear Creek is located in a wide valley constructed by alluvial deposition. Due to its proximity to Interstate 5 and other urban features, the stream is generally confined to a narrow meander zone. Elevations within the watershed range from 354 m (1,160 ft) above sea level at its confluence with the Rogue River to 2,296 m (7,533 ft) at the summit of Mt. Ashland.

The Bear Creek sub-basin is water deficient, primarily due to the seasonality of rainfall patterns, and demand for surface water supplies for irrigation and urban uses. Based upon a 79-year period of record (1921 through 2000), annual mean stream flow in Bear Creek ranges from 0.26 cms (9.03 cfs) to 7.90 cms (279 cfs) at United States Geological Survey (USGS) gauging station No. 14357500 in Medford. A maximum instantaneous stream discharge of record of 310 cms (approximately 10,900 cfs) occurred in January 1997 (USGS 2002). Log Pearson III analysis indicates that this event has a 54-year recurrence interval. A 100-year maximum flow event approximates 410 cms (approximately 14,500 cfs) in Bear Creek at Medford (MB&G 1998).

The Oregon Department of Environmental Quality (ODEQ) lists Bear Creek as a 303(d) stream (designation as a water quality limited water body) due to flow modification, habitat modification, summer temperatures, and year-round fecal coliform levels (ODEQ 2002). The Environmental Protection Agency (EPA) has approved Total Maximum Daily Load (TMDL) limits for Water quality inhibited parameters including total phosphorus, dissolved oxygen (DO), ammonia nitrogen, chlorophyll-a, aquatic weeds or algae, and pH. Sources of pollutants include, but are not limited to, road runoff, agricultural chemicals, algal growth and sewage treatment discharges. Temperatures in Bear Creek and many of its tributaries approach and often exceed lethal levels for coho salmon (25ºC [77ºF]) during the summer months (Dambacher et al. 1992).

There are 83 identified tributaries of Bear Creek, 13 of which are considered fish bearing. Within the South Medford area, principal perennial tributaries include Lazy Creek and Larson Creek. Other surface waters include an irrigation canal and seasonal or ephemeral drainages.

Within the SMI and Bear Creek Highway 1 Bridge Replacement project areas, sedimentation and a lack of appropriately sized spawning gravel are two of the most significant factors limiting the use of Bear Creek by fish. Local agricultural operations, urban runoff, road and creek maintenance, and gravel removal operations contribute sediment to Bear Creek. Within the proposed project areas, the fish habitat of Bear Creek is generally characterized by a confined stream channel bordered on both sides by commercial and residential development and otherwise disturbed habitats. Artificial rock levees have been constructed along portions of the west bank of Bear Creek to further confine flow and to limit flooding. Both banks of Bear Creek are lined with large riprap for scour protection near the I-5 bridges and the Barnett Road Bridge.

The streambed has limited habitat components, such as woody debris, pools, and proper gravel for anadromous fish spawning. Riffles account for approximately 20 percent of the stream reach; the remainder is dominated by glide habitat. The stream channel is composed primarily of bedrock, cobble and gravel substrates with local concentrations of small boulders or rocks that create limited refuge habitat for fish. Spawning gravels are mostly restricted to the downstream side of larger boulders.

No off-channel refugia exists along Bear Creek within the South Medford area due to the roadway fills for I-5 and installation of rock levees along portions of the west bank of the creek. The channel gradient in Bear Creek is less than 2 percent. Streambank conditions include rock levees and natural banks with high erosion and subsequent high sedimentation in the stream. Shade from adjacent riparian vegetation is estimated to be between 60 percent and 80 percent. The primary land use associated with this stream reach in the South Medford area is urban and historically disturbed fields.

5.1.2 Larson Creek

Larson Creek is a small tributary to Bear Creek near RK 18 (RM 11.2). Its drainage area includes the developed area on the northeast side of Barneburg Hill and south side of the Rogue Valley Memorial Hospital**.** The Medford Irrigation District (MID) Canal crosses

Larson Creek, and two additional tributaries of Larson Creek downstream of the East Lateral Canal crossing. An irrigation flow control gate is situated at the Larson Creek/MID Canal junction, which appears to regulate flow into Larson Creek from the canal and upper Larson Creek.

The ODFW Fish Passage Program (ODFW 1998) has identified four problem culverts on Larson Creek. Culverts located at Ellendale Drive and Black Oak Drive are owned by the City of Medford and are considered juvenile barriers and potential adult barriers as well. The remaining two listed culverts are owned by Jackson County and are located upstream of Ellendale Drive outside of the study area. These culverts are rated by ODFW as a medium priority for repair. During more recent years, the culvert at Ellendale Drive was been improved to pass juvenile fish and adults except during extreme low flows. Currently, improvement projects have not been implemented on the other three problem culverts (Evenson pers. comm., 2003).

The ODEQ lists Larson Creek as a 303(d) water quality limited stream for DO and pH during the months between October 1 and May 31, pH during the months between June 1 and September 30, summer temperatures, and year around fecal coliform levels (ODEQ 2002). Dambacher (1992) conducted a stream temperature and habitat study in Bear Creek and several of its tributaries, including Larson Creek. Stream temperature was monitored during the summer months (July through October) of 1991. Larson Creek exhibited average maximum temperatures during the monitoring period ranging from 17.2^{o}C (63°F) to 27.2^{o}C (81°F).

Project biologists have conducted several field surveys of Larson Creek during August 2000, July 2002 and July 2003, in the vicinity of Ellendale Drive and the proposed Highland Street Extension crossing for the SMI project. The surveys revealed a largely simplified, deeply-incised stream channel with active streambank erosion, although some stream sections with braided channels were observed. The streambed is generally composed of soft sediment, silt, or a mixture of small cobble, gravel and silt. Streambanks are nearly vertical in most locations observed, with estimated bank heights ranging from 2.5 to 4.5 m (8 to15 ft). The banks show signs of active erosion, and are composed primarily of bare soil. Some woody material is present in the stream channel, probably as a result of relatively common bank failures. Riparian vegetation consists of mainly non-native vegetation including blackberry, various grasses and some small trees, including willow and cottonwood.

During the field surveys, the water in Larson Creek was observed to be turbid with poor clarity. No recreational and angling opportunities were noted on this stream.

5.1.3 Lazy Creek

Lazy Creek is a small tributary to Bear Creek that bisects the northeastern portion of the SMI project area. Lazy Creek enters Bear Creek at approximately RK 17.4 (RM 10.8), approximately 500 m (1600 ft) north (downstream) of Larson Creek. The Oregon Department of Forestry classifies it as a medium-size, fish-bearing stream. According to an ODFW survey conducted in 1999, only steelhead and cutthroat trout inhabit Lazy Creek up

to an impassible culvert located at approximately RK 1.6 (RM 1) on Lazy Creek (Marcu pers. comm., 2000 and Evenson pers comm., 2003).

Within the SMI project area, streamflow in Lazy Creek is to the west and passes through developed urban residential areas and City parkland. Lazy Creek is used as an irrigation conduit during the irrigation season and often goes dry in early fall after the irrigation season has ended. The ODFW has no habitat data for the stream; however, the presence of juvenile steelhead and cutthroat trout suggests that some spawning habitat exists in Lazy Creek.

The ODEQ lists Lazy Creek as a 303(d) water quality limited stream for year-round fecal coliform levels, summer temperatures and for the monthly period between October 1 and May 31, and for pH between the monthly periods from June 1 to September 30 and October 1 to May 31 (ODEQ 2002). There is no documented stream temperature data on Lazy Creek. However, given its location within an urban setting, it is reasonable to assume that the stream has increased temperatures similar in some degree to those documented for Bear Creek and Larson Creek. No fish count or angling data are available for Lazy Creek.

Based upon field surveys conducted by project biologists in August 2000, July 2002, and June 2003 of the existing Lazy Creek culvert on Highland Drive, it was noted that Lazy Creek is confined to a narrow incised stream channel approximately 2 m (6.6 ft) wide. The stream exhibits a straight alignment with no meander. The streambed is generally composed of soft silt and sand with small cobbles. No rock or gravel is present in this section of the creek. During both field surveys, the water in Lazy Creek was observed to be turbid with poor clarity.

5.2 PHYSICAL CONDITIONS

5.2.1 South Medford Interchange

5.2.1.1 Topography

The SMI project area encompasses approximately 208 ha (514 ac). The project area is bisected by I-5. Bear Creek flows in a northwesterly direction through the project area, roughly paralleling the alignment for I-5. Larson Creek flows in a westerly direction through the project area and discharges into Bear Creek approximately 183 m (600 ft) south (upstream) of the Barnett Road Bridge over Bear Creek. Lazy Creek also flows in a westerly direction through the project area and discharges into Bear Creek approximately 305 m (1000 ft) north (downstream) of the Barnett Road Bridge over Bear Creek.

The majority of the project area is located on broad nearly-level alluvial terraces that dominate the Bear Creek valley. Elevations within the project area range from 415 m (1360 ft) above mean sea level along Bear Creek in the vicinity of Barnett Road to 433 m (1420 ft) along I-5 and the southwestern portion of the project area. Barneburg Hill is located just southeast of the project area with an elevation of approximately 512 m (1680 ft) (USGS 1983). General surface drainage is east and west toward Bear Creek, which conveys all surface runoff to the northwest. Gentle slopes of less than 5 percent characterize much of the

project area. In the vicinity of Bear Creek and I-5, slopes ranging from 25 to 35 percent are common along the fill embankments for the highway and the creek (USGS 1983).

5.2.1.2 Soils

The dominant soil types within the SMI project area include Medford silty clay loam, Brader-Debenger loam, Agate-Winlo complex, Coker clay, and the Camas-Newberg-Evans Complex. The Carney clay, Cove clay and Central Point sandy loam are also present to a substantial extent (Johnson 1994). The Camas-Newberg-Evans Complex soil type is mapped along both sides of Bear Creek. This soil complex is very deep and is comprised of well to excessively well-drained soils. Permeability is moderate to moderately rapid. Runoff is slow and the soils have a slight hazard of erosion by water. Other soils mapped in close proximity to Bear and Larson Creeks include the Medford silty clay loam and Agate-Winlo soil complex. Both of these soils are moderately well-drained to well-drained and have a slight hazard of erosion by water. This is largely due to the level terrain and good permeability of these soils. The majority of the remaining soils in the project area also exhibit similar characteristics relative to permeability and the slight hazard of erosion by water (Johnson 1994).

5.2.1.3 Wetlands

Wetland delineations have been conducted within the SMI project area, resulting in the identification of approximately 4.3 ha (10.5 ac) of wetlands within the vicinity of the proposed project. Wetland community types confirmed within the vicinity of the proposed footprint of the project include riverine, palustrine open water, palustrine emergent, palustrine scrub-shrub, palustrine forested, and linear wetlands (Figure 7A). Several ornamental ponds are located in the southeastern portion of the project area. These ponds are associated with the recreational area for the Rogue Valley Manor residential community located just east of I-5. These ponds have no direct connection to Bear Creek or any other surface drainage in the project area. Other surface waters include small wetland communities associated with poorly-drained depressions in the landscape or alluvial benches along Bear Creek. A stormwater detention pond is also located on the west side of I-5.

In general, the identified wetland communities are small and widely scattered throughout the landscape. They typically occupy poorly-drained depressions or flats and have been degraded by past land use activities. Several wetlands are isolated and have no direct connection to Bear Creek or other streams. Given their small size and degraded condition, the wetlands in the project area provide limited functions and values related to water quality, sediment and nutrient retention and floodwater storage. A summary description of the principal wetland characteristics for each primary wetland community type identified in the SMI project area is presented below:

- *Riverine Wetlands* – The riverine wetlands are the dominant wetland type within the project area, accounting for more than 60 percent of the total wetlands identified. The riverine wetlands consist of the open flowing water within the Bear, Larson, and Lazy Creek stream channels. Bear Creek has the largest riverine wetlands simply because it has the largest stream channel. The wetland vegetation within this wetland community type is generally limited to the edges of the flowing water.

Figure 7A. Wetland Resources- South Medford Interchange

- *Palustrine Open Water Wetlands (Deepwater Aquatic Habitats)* – These wetlands are associated with a man-made storm water retention pond on the west side of I-5 and two ornamental ponds within the Rogue Valley Manor property (Quail Crest Golf Course). These features are not true wetlands and would be appropriately characterized as deepwater aquatic habitats. Deepwater aquatic habitats are defined by the COE 1987 Wetland Delineation Manual as areas that are permanently inundated at mean annual water depths greater than 2.2 m (6.6 ft) or permanently inundated areas less than 2.2 m (6.6 ft) in depth that do not support rooted-emergent or woody plant species (Environmental Laboratory 1987). These features are considered "waters of the United States" for regulatory purposes. Maintained lawns and shrubs generally border these man-made open water wetlands (deepwater aquatic habitats).

- *Palustrine Emergent Wetlands* – These wetlands are primarily associated with stream floodplains and seasonally wet depressions or meadows. Several of these wetlands are associated with poorly-drained excavations or flooded borrow areas. The vegetation includes creeping spikerush (*Eleocharis palustris*), cattail (*Typha latifolia*), soft rush (Juncus effusus), reed canarygrass, and small-flowered bulrush (*Scirpus microcarpus*). Tree and shrub species are generally absent from this type of wetlands. Standing surface water is common throughout the identified emergent areas during the fall, winter and early spring.

- *Palustrine Forested Wetlands* – Forested wetlands are limited to a large poorly-drained depression in the northern portion of the project along the west side of Highland Avenue and to a small overflow channel along Bear Creek in the southwestern portion of the project area. This community consists of a canopy locally dominated by Oregon ash (*Fraxinus latifolia*), red alder, black cottonwood and Pacific willow (*Salix lucida* ssp. *lasiandra*). The edges of this community contain a locally dense shrub layer of Himalayan blackberry. The dense herbaceous groundcover consists of slough sedge (*Carex obnupta*), tall fescue (*Festuca arundinacea*), reed canarygrass and teasel (*Dipsacus fullonum* ssp. *sylvestris*).

- *Palustrine Scrub-Shrub Emergent Wetlands* – Primarily associated with isolated, poorly-drained, linear depressions or compacted soil areas within the SMI project area. The dominant shrubs in these areas are Himalayan blackberries and several species of willow (*Salix* spp.). The herbaceous groundcover consists of several wetland plants such as reed canarygrass, soft rush, teasel, and meadow foxtail (*Alopecurus geniculatus*).

- *Linear Wetlands* – These wetlands represent the smallest wetland type within the project area and include man-made features such as roadside ditches and swales that contain sufficient hydrology to support wetland conditions. The borders of these wetlands typically include a dense band of Himalayan blackberry. Within the ditches or swales, the vegetation is comprised of various wetland species such as cattail, smartweed (*Polygonum* spp.), soft rush and reed canarygrass.

5.2.1.4 Vegetation Communities

Given the local topography, climatic conditions and past land use practices, several distinct vegetation communities have developed within the SMI project area. These vegetation communities include developed urban areas, abandoned fields, riparian forests along Bear and Larson Creeks, woodlands and wetlands (Figure 8A). Historical land disturbance activities associated with agriculture, utility and highway construction, commercial and residential development, and industry have heavily influenced vegetative patterns across the landscape, and many of the vegetation communities are highly fragmented. The largest communities within the project area are the developed urban areas, abandoned fields and riparian forests. The woodlands and wetland vegetation communities comprise only a small part (less than 5 percent of the project area). A more detailed description of the developed urban area, abandoned field and riparian forest vegetation communities is provided below.

- *Developed Urban Areas* – This is the dominant land use type within the SMI project area consisting of residential, commercial, recreational and industrial land uses where native vegetation has been removed and often replaced with landscaped vegetation, broad expanses of lawn, ballfields and impervious surfaces. The developed urban area community land type accounts for approximately 50 percent of the study area. Approximately 75 to 80 percent of this cover type consists of impervious surfaces in the form of roadways, parking lots, sidewalks and structures. Considering just roadway surfaces, approximately 17.6 ha (43.6 ac) of this land type includes the paved surfaces from I-5 and other major divided roadways in the project area.

- *Abandoned Fields* – This vegetation community includes large fallow fields that were formerly pasture, cropland or rock quarry operations in the southern and western portions of the SMI project area. This community also includes the broad roadside embankments along I-5 and large vacant urban lots. The abandoned field vegetation community comprises about 20 percent of the project area.

  Historical land use practices for agriculture and industry removed much of the native vegetation and have heavily influenced the vegetative patterns visible today. The abandonment of agricultural activities in many of the fields of the project area has allowed natural successional processes to start. Many areas within the abandoned fields have substantial amounts of fill, which are now covered with herbaceous vegetation. Evidence of past filling is apparent in the large fields on the west side of Bear Creek. The majority of the fields now have dense herbaceous growth exceeding 1 m (3.3 ft) in height. Herbaceous species common to these fields consist of mostly non-natives, including tall fescue, yellow star thistle (*Centaurea solstitialis*), hairy vetch (*Vicia villosa*), teasel, Queen Anne's lace (*Daucus carota*), knapweed (*Centaurea diffusa*), cheat grass (*Bromus tectorum*), ripgut brome (*Bromus rigidius*), medusa head (*Taeniatherum caput-medusae*), orchard grass (*Dactylis glomerata*), and purple salsify (*Tragopogon porrifolius*).

  The broad roadway embankments along I-5 consist of common vetch, tall fescue, ripgut brome, and Queen Anne's lace. Himalayan blackberry is common along the bottom edge of the roadside embankments in the vicinity of the I-5 bridges over Bear Creek.

Figure 8A. Vegetation Communities- South Medford Interchange

Vegetation introduced into the landscaping of the I-5 median consists of Austrian pine (*Pinus nigra*), Oregon white oak (*Quercus garryana*) and Oregon grape (*Mahonia nervosa*).

- *Riparian Forests* – Riparian forests comprise approximately 6.3 ha (15.5 ac) or 3 percent of the project area. The riparian forest community generally exists within the floodplains of both Bear and Larson Creeks, and to a lesser extent along Lazy Creek. The riparian forest along Bear Creek is generally wider and less fragmented than the riparian vegetation along Larson Creek. With the exception of the right-of-way for I-5 and Barnett Road, the riparian forest community along Bear Creek is continuous.

  Along Bear Creek, mature black cottonwood, red alder, and Oregon ash locally dominate the overstory of the riparian forest community. The majority of the trees range between 12 to 18 m (40 to 60 ft) tall and have diameters ranging from 41 to 56 cm (16 to 22 in) DBH. Several trees in this community are slightly larger having a DBH ranging from 46 to 66 cm (18 to 26 in). Canopy coverage and density along Bear Creek is fair with approximately 30 to 40 percent of the creek being shaded by the adjacent riparian vegetation. The understory is comprised of saplings of the overstory species along with Scouler's willow (*Salix scouleriana*) and Sitka willow (*Salix sitchensis*). The shrub layer consists of very dense thickets of Himalayan blackberry. In many areas of this community, the Himalayan blackberry covers 70 to 90 percent of the shrub layer and grows in thickets up to 3 m (10 ft) high.

  Adjacent to the existing I-5 bridges over Bear Creek, the coverage of Himalayan blackberry ranges from 90 to 95 percent and is growing amongst the riprap and fill embankments supporting the bridge structures. The blackberry is also dominant on several rocky berms that parallel the west bank of Bear Creek. The herbaceous groundcover consists of reed canarygrass, poison hemlock (*Conium maculatum*), tall fescue, chicory, knotweed (*Polygonum* spp.), field mustard, and bedstraw (*Galium trifidium*). Narrow bands of purple loosestrife, sedge (*Carex* spp.) or rush (*Juncus* spp.) occur in scattered locations on the edges of the creek. Sand and gravel bars are also common along the edges of Bear Creek.

  The riparian forest community along Larson Creek is narrow and fragmented by development. The overstory is generally comprised of black cottonwood with a locally dense understory of Pacific willow. In comparison to Bear Creek, the overstory trees along Larson Creek are slightly smaller, ranging from 10 to 14 m (33 to 46 ft) tall with diameters ranging from 25 to 46 cm (10 to 18 in) DBH. Canopy coverage is sparse in several areas, ranging from 30 to 50 percent. The shrub layer also consists of dense thickets of Himalayan blackberry. Herbaceous groundcover is comprised of trailing blackberry (*Rubus urbinus*) and reed canarygrass.

5.2.1.5 Land Use

The South Medford Interchange Project is located entirely within the City of Medford's Urban Growth Boundary. The City's Comprehensive Plan is the controlling land use planning document within the project area (ODOT and FHWA 2001). Existing land uses within the project area are shown in Figure 9A.

The majority of the land in the project area is either vacant, developed commercial land or urban residential development. Much of the existing land base is privately owned. Vacant or re-developable lands dominates the west side of I-5 along the alignment for the proposed Garfield Street Extension. On the east side of I-5, the predominate land use is comprised of residential developments, including traditional single-family dwellings, low-income apartments, senior apartments, and a mobile home park. The proposed Bear Creek Greenway follows the riparian corridor along Bear Creek (ODOT and FHWA 2001). The Rogue Valley Manor, a retirement community, is located just southeast of the project area. Existing commercial development is located along Highway 99 and in the northwestern portion of the project area along Center Drive. The South Gateway Center, constructed in the mid-1990s, is located in the southeast quadrant of the existing interchange along Barnett Road. South Gateway Center houses a variety of retail and service businesses, and the surrounding area includes restaurants, hotels, gas and convenience stations, banks and other businesses (ODOT and FHWA 2001).

5.2.2 Bear Creek Highway 1 Bridges

5.2.2.1 Topography

The Bear Creek Highway 1 Bridges Replacement project area encompasses both the existing NB and SB I-5 bridges over Bear Creek. The majority of the project site is located on the broad nearly-level alluvial floodplain of Bear Creek that flows in a northerly direction through the project site. Elevations within the project area range from 421 m (1380 ft) above mean sea level along the Bear Creek channel to 428 m (1405 ft) at the top of the highway fill (USGS 1983). Slopes within the floodplain are less than 5 percent. Slopes ranging from 25 to 35 percent are common along the fill embankments for the highway and the west bank of Bear Creek.

5.2.2.2 Soils

The dominant soil types within the Bear Creek Highway 1 Bridge Replacement project area are the Medford silty clay loam and the Camas-Newberg-Evans Complex (Johnson 1994). The Medford silty clay loam is a well-drained soil with a slight hazard of erosion by water. This is largely due to the level terrain and the good permeability of these soils. The Camas-Newberg-Evans Complex soil type is mapped along both sides of the Bear Creek. This soil complex is very deep and is comprised of well to excessively well-drained soils. Permeability is moderate to moderately rapid. Runoff is slow and the soils have a slight hazard of erosion by water (Johnson 1994).

Figure 9A. Existing Land Use – South Medford Interchange

5.2.2.3 Wetlands

Wetland delineations conducted in the project area have only identified riverine wetlands in association with the Bear Creek channel (Figure 7B). The wetland vegetation within this wetland community type is generally limited to the edges of the flowing water and is generally comprised of reed canarygrass. The floodplain soils along Bear Creek are generally well-drained and do not support wetland systems.

5.2.2.4 Vegetation Communities

The vegetation around the Bear Creek Highway 1 Bridges project site has been heavily disturbed by past highway construction and maintenance activities. The vegetation within the highway right-of-way is best described as abandoned field vegetation with small sections of riparian forest vegetation at the edges of the right-of-way (Figure 8B). Within the project site, the majority of vegetation along the broad roadway embankments for I-5 consists of common vetch, tall fescue, ripgut brome, and Queen Anne's lace. Himalayan blackberry is common along the roadside embankments in the vicinity of the I-5 bridge supports over Bear Creek. Vegetation introduced into the landscaping of the I-5 median consists of Austrian pine, Oregon white oak and Oregon grape.

5.2.2.5 Land Use

Like the SMI project, the Bear Creek Highway 1 Bridges Replacement project is located entirely within the City of Medford's Urban Growth Boundary. Specifically, the proposed project is located entirely within the right-of-way for I-5. Existing land uses adjacent to the project site are shown in Figure 9B and discussed in Section 5.2.1.5 of this report.

6.0 ANALYSIS OF EFFECT

This section addresses only the potential impacts resulting from the proposed SMI and Bear Creek Highway 1 Bridges Replacement projects. Actions unrelated to these projects have not been taken into account.

6.1 SITE SPECIFIC IMPACTS

This subsection addresses site specific impacts that may result from the two projects given the conservation measures proposed. These potential impacts include reductions in water quality, degradation of habitat elements, changes in channel conditions and dynamics, alteration of basin hydrology, shifts in watershed condition, and direct harm to fish.

6.1.1 Water Quality

Water quality is a major component of salmonid habitat. The condition and quality of the water that the fish encounter during their life cycle is extremely important, and can determine such things as feeding and breeding success rates, disease levels, growth rates, and predation rates. Major elements of water quality critical to salmon are turbidity/sediment levels, chemical contamination, and temperature. Turbidity and fine-sediments can reduce prey detection, alter trophic levels, reduce oxygen along the substrate, smother redds, and damage

Figure 7B. Wetland Resources- Bear Creek Highway 1 Bridges Project

Figure 8B. Vegetation Communities- Bear Creek Highway 1 Bridges Project

Figure 9B. Existing Land Use- Bear Creek Highway 1 Bridges Project

gills, as well as cause other deleterious effects. Chemical contamination can alter fecundity and fertility levels, increase disease, shift biotic communities, and reduce the overall health of migrating salmon. Temperature affects metabolic rates, resistance to disease, oxygen levels in the water, and other vital factors.

Possible impacts to water quality common to both projects could occur from chemical contamination, increased turbidity levels, and changes in stream temperature. In addition to the Erosion and Sediment Control Plan a Pollution Control Plan will be prepared for each project that describes containment measures that will be employed to reduce the probability of negative impacts to current water quality conditions.

6.1.1.1 Construction-related Debris

Because of the extensive over-water work proposed for both projects during the construction of the various permanent and temporary work bridges, construction-related debris could potentially enter Bear, Larson or Lazy Creeks. Appropriate containment of all over-water work areas will be required to minimize the potential for debris entering surface waters.

6.1.1.2 Chemical Contamination

Possible chemical contamination of Bear, Larson, and Lazy Creeks could occur when activities involving hazardous materials occur in areas that have direct or indirect hydrologic connections to the creeks. These activities include asphalt-concrete application, lane painting and striping, and vehicle fluid leaks. An additional source of chemical contamination is increased stormwater runoff associated with an increase in impervious surfaces. Although increases in impervious surfaces can result in additional pollutant loadings and higher runoff volumes, the water quality treatment/detention facilities proposed for both projects have been designed to reduce or minimize these effects.

6.1.1.3 Turbidity

Increases in turbidity will be limited to activities associated with culvert work, road bank cut and fill, installation of temporary work bridge piers and channel modification. The greatest opportunity for measurable increases in turbidity is from bridge construction and other road construction activities that occur within or near water bodies. On both projects, the greatest risk for turbidity will occur during the removal of existing bridge bents and the installation of temporary work bridge pilings within the channel of Bear Creek. On the SMI project, an additional risk for turbidity will occur during the removal of existing bents and the installation of temporary bridge bents on the Barnett Road Bridge. All of these activities will be conducted only after approved sediment containment measures are in place to effectively control erosion impacts.

6.1.1.4 Stream Temperature

Removal of riparian vegetation can cause elevated stream temperatures. Solar radiation is the principal energy source that causes stream heating. Shading reduces direct solar radiation loading and stream heating. Between the two projects, the greatest potential for removing riparian vegetation is associated with the SMI project. The Bear Creek Highway 1 Bridges Replacement project will have little or no impact on existing riparian forest cover.

During construction of the proposed SMI project, the removal of approximately 0.4 ha (0.9 ac) of riparian vegetation within the Bear Creek and Larson Creek stream corridors will be necessary for permanent bridge construction, temporary work bridge construction, access road construction, and retaining wall construction (see Figure 5). Vegetation proposed for removal is predominately native and non-native riparian tree species located along the Bear Creek corridor. Approximately 150 to 175 mature trees that provide beneficial shade, as well as other functions, will be removed along Bear Creek. Approximately 20 mature trees will be removed along Larson Creek. Following construction, new riparian vegetation will be planted along the Bear Creek corridor to mitigate for the removal of existing riparian vegetation. Section 6.3 discusses the potential temperature effects of vegetation removal.

6.1.2 Channel Conditions and Flow Dynamics

Channel conditions and dynamics are influenced by a number of processes. Changes in impervious surface area, the addition of new bridge bents within existing stream channels, and the placement of riprap are the principal agents typical to transportation projects that can be responsible for channel condition and flow dynamics alterations. Additional impervious surfaces can alter the water quality, hydrology, and habitat complexity of a system. The installation of retaining walls can channel or divert streamflow. Increased roadway area provides additional opportunities to collect and store chemicals released from automobiles. The reduction in infiltration capacity can increase the rising limb of a storm hydrograph, resulting in a flashy system, increased erosion, and reduced groundwater storage. The increase in erosion can lead to simplification and channelization of a stream, while the reduced groundwater storage can alter the peak and base flows of the drainage.

6.1.2.1 Impervious Surface Area

- *South Medford Interchange:* The construction of the new interchange will result in a net increase of 66,000 m^2 (699,654 ft^2 or 16 ac) of impervious surfaces. The majority of stormwater originating from the new impervious surfaces will be collected and conveyed to either a water quality swale or one of two water quality treatment/detention facilities proposed for the project.
- *Bear Creek Highway 1 Bridges:* Replacement of the Bear Creek Highway 1 Bridges will result in a net increase of 1,000 m^2 (10,763 ft^2 or 0.25 ac) of impervious surfaces. This increase is largely due to the fact that the replacement bridges will be longer and wider than the existing bridges. Unlike the existing conditions, no stormwater from the replacement bridges will be discharged directly into Bear Creek without prior treatment. Stormwater originating from the new replacement bridges will be collected by curbside inlets and conveyed to either the water quality swale or the southern water quality treatment/detention facilities proposed for the SMI project. These facilities have sufficient capacity to receive and treat the stormwater originating from the proposed replacement bridge structures. Since the replacement of the I-5 bridges will occur prior to the construction of the detention facilities for the SMI project, ODOT is considering the use of other water quality treatment techniques (i.e. early construction of the water quality swale) on an interim basis until the SMI facilities are constructed.

6.1.2.2 Bridge Bents and Culverts

- *South Medford Interchange:* No new permanent bridge bents will be located within the existing channel of Bear or Larson Creek. The two existing bridge bents within the Bear Creek channel that support the existing Barnett Road Bridge will be removed during the replacement of this structure and the Lazy Creek box culvert under Highland Drive. For all bridges within the SMI project, a total of 22 bents will be installed below the 100-year flood elevation of Bear Creek and 2 bents each below the 100-year flood elevation of Larson and Lazy Creeks. Of the 22 bents below the 100-year flood elevation of Bear Creek, only three new bridge bents will be installed below the OHWM. The construction of temporary work bridges will require the placement of approximately 152 steel pipe piles below the 100-year flood elevation of Bear Creek, 104 of which would be below the OHWM. No temporary piles will be placed below the 100-year flood elevation of Larson or Lazy Creeks. These piles will be temporary and will be removed at the completion of the project. In addition to the temporary bridge bents, a small area (approximately 120 m^2 (1,292 ft^2) below the OHWM will be disturbed by the placement of temporary falsework associated with the construction of the Highland Drive/Bear Creek Bridge. The falsework will be supported either with lightweight scaffolding or approximately 6 or less steel pipe piles.
- *Bear Creek Highway 1 Bridges:* For this project, 13 existing bents (7 for the NB and 6 for the SB bridges) will be removed from below the 100-year flood elevation of the Bear Creek channel, 2 of which will be removed from below the OHWM (1 each from the NB and SB bridges). The replacement bridges will require a total of nine bents (5 for the NB bridge and 4 for the SB bridge). Seven of these bents (5 for the NB bridge and 2 for the SB bridge) will be constructed below the 100-year flood elevation of Bear Creek. Two bents will be constructed below the OHWM for the SB bridge. The construction of a temporary work bridge and a temporary detour bridge will require the placement of approximately 80 steel piles below the 100-year flood elevation of Bear Creek (40 for each bridge). Forty-four of these piles (20 for the temporary work bridge and 24 for the temporary detour bridge) will be placed below the OHWM. These steel pipe pile bents will be temporary and will be removed at the completion of the project.

6.1.2.3 Riprap

- *South Medford Interchange:* Based upon the preliminary project design, no riprap is currently proposed for the project. Should final design determine a need for riprap, use of riprap will be minimized and will only be used to provide scour protection for new bridge bents. No new riprap will be placed within the channel of Bear Creek. Within the proposed project area, the banks of the existing Bear Creek channel are currently armored with significant amounts of riprap. In many places, the riprap extends well below the existing OHWM of Bear Creek. The potential exists that some of the existing riprap may be removed during the construction of various project elements, resulting in an overall net decrease of riprap along the Bear Creek channel. No riprap is proposed along the Larson or Lazy Creek channels.
- *Bear Creek Highway 1 Bridges:* The streambanks surrounding the existing I-5 bridges are presently protected by large amounts of riprap. Approximately 1,250 m^3(1,635 yd^3) of

this riprap would be removed from a 416-m^2 (4,478-ft^2) area below the OHWM. An additional 5,313 m^3 (6,949 yd^3) of this riprap would be removed from a 1,771-m^2 (19,063 ft^2) area above the OHWM at the top of the bank.

6.1.2.4 Retaining Walls

- *South Medford Interchange:* The MSE retaining walls proposed for the SMI project will be located outside the OHWM of Bear Creek. No changes to water surface elevations will occur. The proposed retaining walls will be largely aligned parallel with the Bear Creek channel and will not block or alter streamflow. The new retaining walls will have no effect on the stream hydraulics of Bear Creek (Bonn 2003). Appendix C1 shows a typical retaining wall cross section.
- *Bear Creek Highway 1 Bridges:* No retaining walls are proposed for this project.

6.1.3 Degradation of Riparian Areas

Wetlands and riparian areas directly influence critical salmonid habitat structure and function, as well as indirectly affect a multitude of hydrologic and biochemical processes. Intact riparian areas are responsible for water quality treatment, storm event infiltration, groundwater storage, and other biochemical and hydrologic processes vital to properly functioning habitat conditions. Riparian vegetation influences shading, organic inputs, streambank stabilization, insect production as food sources, channel complexity, and soil properties.

South Medford Interchange: The proposed project is expected to result in the loss of approximately 0.04 ha (0.1 ac) of palustrine emergent wetlands. The majority of these wetlands are associated with poorly-drained depressions in the landscape that have no direct hydrological connection to any surface water. The loss of these wetlands is not expected to have an adverse effect on salmonid habitat structure and function. Further, a compensatory mitigation plan will be prepared and implemented for the project to compensate for the loss of the limited functions and values that these wetlands provide. The wetland mitigation plan will be prepared in accordance with COE and DSL regulations.

The project will also result in the loss of approximately 0.4 ha (0.9 ac) of riparian forest vegetation along Bear and Larson Creeks. It is estimated that 150 to 175 mature trees will be removed along Bear Creek and 20 mature trees will be removed along Larson Creek.

Bear Creek Highway 1 Bridges: The Bear Creek Highway 1 Bridges project will not result in the loss of wetlands or riparian forest habitat. The project is located within the maintained right-of-way for I-5, and the existing vegetation is limited to dense blackberry thickets and scattered small saplings of red alder and willow, and dense herbaceous vegetation. Approximately 16 small trees or saplings will be removed during the replacement of the bridges, and the majority of the trees to be removed range from 4.5 to 7.6 m (15 to 25 ft) tall and have diameter at breast height (DBH) ranging from 10 to 20 cm (4 to 8 in). No mature riparian trees will be removed for this project.

6.2 MINIMIZATION AND AVOIDANCE MEASURES

Conservation measures have been incorporated into the design of both the SMI and Bear Creek Highway 1 Bridges project (Section 7.0) to minimize and avoid impacts to coho salmon and their designated critical habitat. These measures address water quality, erosion and sediment control, containment of construction materials, handling of hazardous materials, and disturbance of riparian vegetation. In addition, the project designs have already gone through several reviews and revisions to minimize impacts associated with water crossings. Additional reviews and revisions to both projects are forthcoming as the project designs move forward and as the ODOT project and technical staff obtain input and comment from various natural resource management and regulatory agencies. Further, planning for both projects is being conducted concurrently and ODOT is exploring ways to construct major elements of both projects simultaneously, such as the temporary work bridges, to reduce or minimize impacts. The following is a summary listing of the various design elements for each project that will serve to avoid and minimize potential impacts to coho salmon. These measures include:

6.2.1 South Medford Interchange

- Minimizing project footprint by incorporating the use of MSE retaining walls.
- Designing proposed bridge structures to fully span the OHWMs of all project area creeks to the greatest extent possible.
- Designing the replacement of Barnett Road Bridge as a single-span structure. This would remove the existing three-span structure with its two existing bridge bents from the channel of Bear Creek.
- Replacing the existing Highland Drive box culvert crossing of Lazy Creek with a new single-span bridge. This will eliminate a partial barrier to juvenile salmonids.
- Designing the proposed bridges such that they will require either no riprap or a minimal amount for scour protection.
- Designing the proposed water quality treatment/detention facilities (two detention basins and one water quality swale) to collect and treat the majority of stormwater originating from existing and proposed impervious surfaces within the project area. The stormwater treatment system will provide treatment for previously undetained flows originating from existing impervious surfaces within the project area. The proposed stormwater treatment system will exceed local requirements and provide treatment and detention for a minimum of 140% of the net new impervious surfaces.
- Retaining stumps and root wads within the ground during clearing for the temporary work bridges will minimize sedimentation and soil loss during construction. Following the removal of the temporary work bridges, the retained stumps will likely sprout new growth to help re-establish some of the vegetation removed from the riparian areas.
- Designing mitigation and landscaping plans to compensate for the loss of riparian forest vegetation and wetlands. The mitigation plans will meet COE, DSL and SLOPES requirements.

- Decommissioning the existing Barnett Road interchange and removal of existing impervious surfaces associated with the interchange ramp system.
- Staging equipment to avoid impacting natural resources via additional clearing, grubbing, paving, and access roads.
- Employing various containment measures such as netting or false-work to prevent construction debris from entering surface waters.
- Scheduling the construction activities to ensure that over-water activities will be conducted during time periods that minimize potential impacts to fish species.

6.2.2 Bear Creek Highway 1 Bridges

- Designing the replacement bridges to match the alignments of the existing bridges. All construction activities will occur within the maintained right-of-way for I-5. No clearing or disturbance for new bridge alignments will be required.
- Designing the replacement bridges to remove existing bridge bents from the active channel of Bear Creek.
- Employing the use of temporary work bridges to minimize equipment use within the riparian area of Bear Creek.
- Directing all stormwater from the replacement bridges to the southern water quality treatment/detention facility and water quality swale for the SMI project for treatment prior to discharge. This will be an improvement over existing conditions since stormwater from the existing bridges is presently discharged into Bear Creek without prior treatment.
- Retaining stumps and root wads within the ground during clearing for the temporary work bridges will minimize sedimentation and soil loss during construction. Following the removal of the temporary work bridges, the retained stumps will likely sprout new growth to help re-establish some of the vegetation removed from the riparian areas.
- Designing the replacement bridges to use less riprap than currently existing within the project site.
- Designing mitigation and landscaping plans to compensate for the loss of riparian shrub and herbaceous vegetation. The mitigation plans will meet COE, DSL and SLOPES requirements.
- Staging equipment to avoid impacting natural resources via additional clearing, grubbing, paving, and access roads.
- Employing various containment measures such as netting or falsework to prevent construction debris from entering surface waters.
- Scheduling the construction activities to ensure that over-water activities will be conducted during time periods that minimize potential impacts to fish species.
- Removing approximately 1,250 m^3 (1,635 yd^3) of riprap from below the OHWM and 5,313 m^3 (6,949 yd^3) of riprap from above the OHWM at the top of the bank along both sides of Bear Creek.

6.3 IMPACTS TO ENVIRONMENTAL BASELINE

Evaluation of potential impacts from both the SMI and the Bear Creek Highway 1 Bridges projects on the Bear Creek watershed was conducted according to *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NOAA Fisheries 1996). The effect of the proposed projects on the Bear Creek environmental baseline is limited to temporary localized impacts that will result in no net change to watershed baseline values. Impacts to riparian vegetation will be mitigated by new plantings of riparian vegetation along the Bear Creek corridor. Opportunities for replacing or enhancing riparian areas exist within the project area along Bear and Larson Creeks. Specific details on the arrangement and locations of the new riparian plantings have yet to be determined. Baseline conditions in the Bear Creek watershed are summarized in Table 6.1.

Table 6.1 Checklist for Documenting Environmental Baseline and Effects of the South Medford Interchange and Bear Creek Highway 1 NB and SB Bridges Replacement Projects on Relevant Indicators (NOAA Fisheries 1996) for the Southern Oregon/Northern California Coasts Coho Salmon ESU.

	ENVIRONMENTAL BASELINE			EFFECTS OF THE ACTION(S)		
PATHWAYS:	Properly		Not Properly			
Water Quality:						
Temperature			X		X-	
Sediment/Turbidity			X		X+	
Chemical Contam.			X		X+	
Habitat Access:						
Physical Barriers			X		X+	
Habitat Elements:						
Substrate			X		X	
Large Woody Debris			X		X-	
Pool Frequency			X		X	
Pool Quality		X			X	
Off-Channel Habitat			X		X	
Refugia			X		X	
Channel Condition and Dynamics:						
Width/Depth Ratio		X			X	
Streambank Cond.			X		X-	
Floodplain			X		X	
Flow/Hydrology:						
Peak/Base Flows			X		X	
Drainage Net. Incr.		X			X+	
Watershed Conditions:						
Road Dens. & Loc.			X		X-	
Disturbance History		X			X	
Riparian Reserves			X		X	

Watershed: Bear Creek – Includes Larson and Lazy Creeks

Maintain(+) = localized benefit; no system-wide effect.
Maintain(-) = localized, temporary impact; no system-wide effect.
Maintain = no localized, temporary, or system-wide effect.
Note: Findings reflect combined worst-case effects of both projects.

6.3.1 Water Quality

6.3.1.1 Temperature

All three principal creeks in the SMI and Bear Creek Highway 1 Bridges project areas, Bear, Larson and Lazy Creeks, are currently listed on the ODEQ 303(d) List of Water Quality Limited Water Bodies for violations of temperature criteria (ODEQ 1998). The U.S. Forest Service (USFS), Bureau of Land Management (BLM), and ODFW data consistently show temperatures over 17.8°C (64°F) (ODEQ 1998), and approaching and often exceeding lethal levels (25.0°C [77.0°F]) for salmonids in Bear Creek and many of its tributaries during the summer months (Dambacher et al. 1992). All of these creeks pass through agricultural land and urban areas that have degraded or removed riparian cover along the waterways. In urban areas, much of the stormwater originates from impervious surfaces which pre-heats runoff during the summer months. As such, the Bear Creek Watershed is considered **not properly functioning** for this parameter.

South Medford Interchange: Implementation of the SMI project will result in the loss of approximately 0.4 ha (0.9 ac) of riparian forest vegetation along Bear and Larson Creeks. The loss of this vegetation will be localized to the proposed alignment of the Highland Street Extension bridges over Bear and Larson Creeks and the Barnett Road Bridge. It is estimated that approximately 150 to 175 mature trees will be removed along Bear Creek and 20 mature trees will be removed along Larson Creek. Several of these trees overhang the creeks and provide beneficial shade. Removal of these trees could locally influence stream temperatures. However, the proposed project will implement a riparian mitigation program to replace lost trees and enhance other sections of the riparian corridor along both Bear and Larson Creeks. It is anticipated that lost trees will be replaced at a 2:1 ratio and existing disturbed areas up to 0.4 ha (0.9 ac) along Bear and Larson Creeks will be restored or enhanced. Trees will be replaced in the same densities and species composition as the trees in undisturbed portions of the Bear Creek corridor. The overall goal of the riparian mitigation program will be to replace the lost functions and values provided by the existing riparian vegetation. Until the mitigation areas are fully established, the benefit of the new riparian plantings will not be fully realized. Once fully established, the new riparian plantings will likely provide the same level of benefit for stream temperature as the existing riparian vegetation that will be removed.

In addition, two water quality treatment/detention facilities and a water quality swale will be constructed to provide water quality treatment and detention for the majority of the runoff originating from the impervious surfaces generated by the project. The proposed water quality treatment/detention facilities and the water quality swale will also treat approximately 6.5 ha (19.0 ac) of existing impervious surfaces in the project area that presently flows to Bear Creek untreated. Although a percentage of the stormwater entering these facilities would infiltrate to groundwater and not influence stream temperatures, the temporary detention of stormwater afforded by the stormwater detention facilities has the potential to elevate water temperature. ODOT will likely plant trees and shrubs around the margin of the proposed stormwater detention basins to provide partial shading of the detention basins, but the benefit of this action will likely be minimal until the trees are fully established (**maintain-)**.

Bear Creek Highway 1 Bridges: Replacement of the existing I-5 bridges is not expected to result in the loss of mature riparian forest vegetation along Bear Creek. The project is located within the maintained right-of-way for I-5 and the potential loss of vegetation will be limited to dense thickets of Himalayan blackberry and approximately 16 small trees or saplings of willow and red alder between 4.5 and 7.6 m (15 to 25 ft) tall. Like the SMI project, this project will also implement a riparian mitigation program to replace lost trees and to enhance riparian vegetation in the vicinity of the existing bridges. It is anticipated that the lost trees will be replaced at a 2:1 ratio and will be planted within the disturbed areas surrounding the new bridges. Removal of the dense thickets of Himalayan blackberry would also occur followed by planting of native shrubs and herbaceous groundcover. Until the mitigation areas are fully established, the benefit of the new riparian plantings will not be fully realized. Once fully established, the new riparian plantings will likely provide the same level of benefit for stream temperature as the existing riparian vegetation that will be removed.

Stormwater originating from the replacement bridges will be collected and conveyed to southern water quality treatment/detention basin and the water quality swale for the SMI project. This will be an improvement over existing conditions since stormwater from the existing bridges is presently discharged directly into Bear Creek without prior treatment. Although a percentage of the stormwater entering the water quality swale and the southern detention basin would infiltrate to groundwater and not influence stream temperatures, the temporary detention of stormwater afforded by the southern stormwater detention facility has the potential to elevate water temperature. ODOT will likely plant trees and shrubs along the margin of the southern stormwater detention basin for partial shade, but the benefit of these plantings will be minimal until the trees are fully established (**maintain-)**.

6.3.1.2 Sediment/Turbidity

The upper reaches of the Bear Creek watershed consists of highly erodable soils resulting in high natural suspended sediment loads (RVCOG 1995). The highly erodable nature of the soils is largely due to the steep slopes in the headwaters area. Extensive agricultural and urban development in the watershed has also contributed additional sediment. Locally, the project area has also experienced rock and gravel quarry operations that further add to sediment loadings. The result of these land use practices and processes is poor water quality due to elevated turbidity and embedded substrates that generally become unsuitable for spawning salmonids and incubating eggs. As such, the Bear Creek watershed is considered **not properly functioning** for this parameter.

South Medford Interchange: During SMI project construction, an Erosion and Sediment Control Plan (ESCP) prepared according to ODOT's standards will be implemented. This ESCP will likely employ a number of techniques to control sediment and erosion such as the installation of silt filter fences or staked haybales along the limits of grading, stabilized points of construction access, and the temporary and permanent stabilization of disturbed soils with seed and mulch.

In addition, the project will include the construction of two large water quality treatment/detention facilities and a water quality swale that will treat not only runoff originating from a majority of the impervious surfaces generated by the project, but also

stormwater from impervious surfaces along I-5 and Barnett Road, which is currently discharged to Bear Creek untreated. The preliminary design data for these facilities show that they will provide stormwater treatment and detention for a minimum of 140% of the net new impervious surfaces. This level of treatment is considered the "no-effect" level and means that at least 1.4 times the amount of existing impervious surfaces will be treated compared to the net impervious surfaces being created by the project (Carmichael pers. comm., 2003). This level of treatment is consistent with NOAA Fisheries recent guidance on storm management (NOAA Fisheries 2003). These types of facilities typically remove 80-90% of the TSS in the stormwater (ODOT 2001b). The facilities are designed based upon the "first flush" concept which holds that the first 12.7 mm (0.5 in) of any given storm event contains 95% of the pollutants. The first 12.7 mm (0.5 in) from all storm events will be routed through the proposed treatment/detention facilities (ODOT 2001b). For rainfall events exceeding the water quality event (which is one-third of the 2-year 24-hr precipitation amount [2.11 cm/hr or 0.83 in/hour]), the initial volume of runoff will be treated; however, the volume of runoff greater than the water quality event will pass through the facility untreated. The highest concentration of pollutants is normally carried in the initial flush of a rainfall event. Therefore, the pollutant concentrations in the untreated portion of the runoff will be very dilute. The extra treatment afforded by these water quality treatment/detention facilities will maintain this parameter.

Turbidity will be monitored in the project area streams during periods of in-water work. Elements of the project that could result in short-term turbidity include the installation of steel pile bents for temporary work bridges, the removal of existing bridge bents at the Barnett Road Bridge, the installation and removal of temporary work bents at the Barnett Road Bridge and the removal of the existing Lazy Creek box culvert under Highland Drive. Turbidity monitoring will be employed during the construction period for each of these project elements. The existing streamflow in all the creeks of the project area consistently exhibit turbid conditions and the proposed construction activities are not expected to have a significant impact on existing conditions. Development and implementation of an ESCP will minimize short-term localized impacts from turbidity. In addition, ODOT is considering the construction of the water quality treatment/detention basins during the early stages of the project to function as sediment settling basins **(maintain+)**.

Bear Creek Highway 1 Bridges: Similar to the SMI project, replacement of the existing I-5 bridges will require the development and implementation of an ESCP. This ESCP will likely employ similar sediment control techniques such as the installation of silt filter fences along the limits of grading and the temporary and permanent stabilization of disturbed soils with seed and mulch. Stormwater runoff from the proposed replacement bridges will be conveyed to the southern water quality treatment/detention basin and the water quality swale for the SMI project. As stated above, these facilities will be designed to provide treatment and detention for a minimum of 140% of the net new impervious surfaces. This level of treatment is considered the "no-effect" level and is consistent with NOAA Fisheries recent guidance on storm management (NOAA Fisheries 2003). The proposed stormwater facilities will typically remove 80-90% of the TSS in the stormwater (ODOT 2001b). The facilities are designed based upon the "first flush" concept which holds that the first 12.7 mm (0.5 in) of any given storm event contains 95% of the pollutants. Overall, directing stormwater from the

new bridges to the proposed stormwater treatment facilities will be an improvement over existing conditions, since stormwater from the existing bridges is presently discharged into Bear Creek without prior treatment. The treatment afforded by the southern detention basin and water quality swale will maintain this parameter.

Turbidity will be monitored in Bear Creek during periods of in-water work. Elements of the project that could result in short-term turbidity include the installation of steel pile bents for the temporary detour and work bridges, and the removal of the existing bridge bents within Bear Creek. Turbidity monitoring will be employed during the construction period for each of these project elements. Development and implementation of an ESCP will minimize short-term localized impacts from turbidity **(maintain+)**.

6.3.1.3 Chemicals/Nutrients

Dissolved oxygen, total phosphorus, ammonia as nitrogen, and pH exceed established water quality standards in the Bear Creek watershed (RVCOG 1995). This is primarily due to the large volumes of agricultural runoff the watershed receives. In addition, Larson Creek and Lazy Creek exceed water quality standards for bacteria. The Bear Creek watershed is **not properly functioning** for this parameter.

South Medford Interchange: Two water quality treatment/detention basins and a water quality swale will be constructed as a part of the SMI project to control and treat a majority of the stormwater originating from the impervious surfaces generated by the project. These facilities will also collect and treat stormwater that currently originates from existing surfaces that drain untreated into Bear and Larson Creeks (such as the existing I-5 bridges). Each of the two water treatment/detention basins will be an extended dry detention pond that allows sediments to drop out of the water column and slows the flow of stormwater entering Bear Creek. These types of facilities typically remove 80-90% of the TSS in the stormwater. Pollutants and chemicals that adhere to such sediments will also drop out and be retained in the basins. For rainfall events exceeding the water quality event (which is one-third of the 2-year 24-hr precipitation amount [2.11 cm/hr or 0.83 in/hour]), the initial volume of runoff will be treated; however, the volume of runoff greater than the water quality event will pass through the detention basins untreated. The highest concentration of pollutants is normally carried in the initial flush of a rainfall event. Therefore, the pollutant concentrations in the untreated portion of the runoff will be very dilute. As such, following the construction of the project, including construction of the two water quality treatment/detention basins, runoff to Bear Creek will transport fewer pollutants than are now being carried to the stream. Reduced traffic congestion resulting from the project may also reduce the amount of pollutants deposited on roadways and subsequently delivered to Bear Creek (**maintain+**).

Bear Creek Highway 1 Bridges: Stormwater runoff from the proposed replacement bridges will be conveyed to the southern water quality treatment/detention basin and the water quality swale for the SMI project for detention and treatment. This will be an improvement over existing conditions where stormwater is presently discharged to Bear Creek untreated. Routing the stormwater to these facilities prior to discharge will facilitate removal of sediments and the pollutants that adhere to them. The treatment afforded by the southern

water quality treatment/detention basin and the water quality swale will reduce the amount of pollutants subsequently delivered to Bear Creek and **maintain(+)** this parameter.

6.3.2 Habitat Access

6.3.2.1 Physical Barriers

Upstream passage of anadromous fish in the Bear Creek system is possible throughout the mainstem of Bear Creek. The Jackson Street Dam (a former fish passage barrier) was removed and replaced with a fish-friendly structure. The Rogue River Valley Irrigation District (RRVID) now operates an irrigation diversion a short distance upstream, but fish passage is maintained with a fish ladder. There are several structures identified by ODFW and ODOT as barriers to upstream migration of anadromous fish in Bear, Larson, and Lazy Creeks. One of these barriers is the existing Highland Drive box culvert on Lazy Creek. This culvert has a vertical drop of about 0.5 m (1.5 ft) at the downstream end and is considered a partial barrier to juvenile salmonids.

Various other irrigation diversions, including those operated by the Medford Irrigation District and Talent Irrigation District may not totally block fish passage on Bear Creek, but probably hinder fish passage. Emigrant Dam totally blocks anadromous fish passage on Bear Creek, cutting off approximately 10 percent of the useable habitat to salmon. Juvenile rearing habitat may be reduced by similar amounts (RVCOG 1995). The Fish Passage parameter is considered **not properly functioning** for the Bear Creek watershed.

South Medford Interchange: Construction of the SMI project will not result in the installation of any new bridge piers or obstructions within the channels of Bear or Larson Creeks. One of the principal elements of the SMI project will be the replacement of the existing Highland Drive box culvert on Lazy Creek. This culvert will be replaced with a new single-span bridge, which will eliminate the partial barrier for juvenile salmonids. In addition, the project proposes to remove the existing bridge bents for the Barnett Road Bridge when the bridge is replaced with a single-span structure. These two actions combined will serve to further improve fish passage within the Bear Creek watershed **(maintain+)**.

Bear Creek Highway 1 Bridges: Replacement of the existing I-5 bridges will result in the removal of two existing bridge bents from the Bear Creek channel. The proposed spans of the replacement bridges will be longer than the existing bridge spans, which will result in new crossings of Bear Creek without the need for bridge bents within the active channel. The existing end bents for the I-5 bridges are presently protected by large amounts of riprap. The replacement of the bridges will also remove approximately 1,250 m^3 (1,635 yd^3) of this riprap from a 416-m^2 (4,478-ft^2) area below the OHWM. The majority of this riprap is presently within the active flowing channel (see photographs in Appendix A2). The permanent removal of the existing bents and a large portion of the existing riprap will improve fish passage conditions within Bear Creek **(maintain+)**.

6.3.3 Habitat Elements

6.3.3.1 Substrate

Within the vicinity of both the SMI and Bear Creek Highway 1 Bridges project, the channels of Bear Creek and Larson Creek are composed primarily of sandstone bedrock, cobble, and gravel substrates with local concentrations of small boulders or rocks that create limited refuge habitat for fish. These complexes are generally embedded in a concretion of fine sediments. These accumulations of fine sediments reduce the available spawning habitat in Bear Creek.

Larson and Lazy Creeks are channelized streams that contain limited habitat. Some suitable habitat exists for spawning and rearing in these streams, but the habitat is fragmented due to passage barriers and channel modification. Spawning gravels or beds are infrequent. On Lazy Creek, the channel substrate is composed primarily of fine sediments such as silt or sand. In addition, portions of Larson Creek are actively eroding which is adding to the accumulations of fine sediments. This parameter is **not properly functioning** for the Bear Creek watershed.

South Medford Interchange: The substrate of the creeks within the SMI project area will not be permanently affected by the project. No new permanent bridge bents will be installed within the channels of Bear Creek or Larson Creek. The existing bridge bents for the Barnett Road Bridge will be permanently removed from Bear Creek and the channel area under the bents will be restored to natural conditions with small cobble and gravel. Two new bridge bents will be installed within the OHWM of Bear Creek, but not within the OHWM of the channel. The existing concrete bottom of the Highland Drive box culvert on Lazy Creek will be removed and replaced with a natural channel substrate comprised of small cobbles and gravel. Temporary steel pile bents will be installed during the construction and operation of the temporary work bridges. These bents will be removed after construction, and the substrate below each pile will be restored with small cobble and gravel. As such, the proposed project would not affect this parameter (**maintain**).

Bear Creek Highway 1 Bridges: The proposed replacement of the I-5 bridges will not significantly change the current substrate conditions of the Bear Creek channel. Two of the existing bridge bents below the OHWM of Bear Creek will be permanently removed and the channel area under the bents will be restored to natural conditions with small cobble and gravel. The existing end bents for the I-5 bridges are presently protected by large amounts of riprap and the project will remove approximately 1,250 m^3(1,635 yd^3) of this riprap from a 416 m^2 (4,478 ft^2) area below the OHWM. The majority of this riprap is presently within the active flowing channel and would be replaced with small cobble and gravel wherever possible. The proposed replacement bridges will require two new bridge bents to be installed within the OHWM of Bear Creek, which will create conditions similar to those that currently exist. Temporary steel pile bents will be installed during the construction and operation of the detour and temporary work bridges. These bents will be removed after construction, and the substrate below each pile will be restored with small cobble and gravel. Overall, there will be no long-term impact on this parameter (**maintain**).

6.3.3.2 Large Woody Debris

Large woody debris (LWD) is currently lacking in quantity sufficient to provide stream channel complexity and adequate refugia for juvenile salmonids in Larson, Lazy, and Bear Creeks. The riparian zones of all of these creeks have also been depleted to the extent that they do not provide the potential for significant LWD recruitment into the streams. This parameter is **not properly functioning**.

South Medford Interchange: Implementation of the SMI project will result in the loss of approximately 0.4 ha (0.9 ac) of mature riparian forest vegetation along Bear and Larson Creeks. It is estimated that 150 to 175 100 mature trees will be removed along Bear Creek and 20 mature trees will be removed along Larson Creek. The loss of this vegetation will further reduce the available recruitment material for LWD in the watershed. However, the ODFW has requested that any large trees or root wads removed during project construction be retained for use in other riparian improvement projects in the Bear Creek watershed. ODOT will comply with this request. It is anticipated that lost trees will be replaced at a 2:1 ratio and existing disturbed areas up to 0.4 ha (0.9 ac) along Bear and Larson Creeks will be restored or enhanced. One of the goals of the riparian mitigation program will be to establish trees to provide future LWD recruitment. Until the mitigation areas are fully established, the benefit of the new riparian plantings will not be fully realized **(maintain-)**. Once fully established, the new riparian plantings will likely provide the same level of benefit for LWD recruitment as the existing riparian vegetation that will be removed. In the long-term, the proposed project will not significantly affect this parameter (**maintain-**).

Bear Creek Highway 1 Bridges: Replacement of the existing I-5 bridges will not result in a substantial loss of mature riparian forest vegetation. The project will be located within the maintained right-of-way for I-5 and the removal of vegetation will largely be limited to thickets of Himalayan blackberry and approximately 16 small trees or saplings of willow and red alder between 4.5 and 7.6 m (15 to 25 ft) tall. Such trees or saplings are not considered to be good recruitment material for LWD. However, as with the SMI project, ODOT will retain the larger trees or root wads (if available) for use in other riparian improvement projects in the Bear Creek watershed. In addition, it is anticipated that the lost trees will be replaced at a 2:1 ratio and will be planted within the disturbed areas surrounding the new bridges. Given the small size of the existing vegetation proposed for removal and the anticipated new tree plantings, this project will have a minimal impact on the LWD parameter **(maintain-)**.

6.3.3.3 Pool Frequency

The frequency of pool occurrence in the Bear Creek watershed, including Larson and Lazy Creeks, is not documented. Many sections of Bear Creek have been altered by the addition of riprap to convey flow quickly through the project area and there are few natural structures in the channel to produce pools. During summer months, the flow in all of the creeks in the project area is low and sandstone bedrock is often exposed in many sections of Bear and Larson Creeks. Small pools are usually only present immediately downstream of large rocks or other obstructions. Such pools are often limited to small sections of the creek channel. The approximate percentage of the wetted area in Bear Creek that is comprised of pools is approximately 15 percent. Between such pools, much of Bear Creek is glide habitat.

For Larson Creek, the frequency and quality of pools is limited by its incised and narrow stream channel. Like Bear Creek, this stream system lacks large natural obstructions to produce and maintain pools. Within the SMI project area, the largest pool in Larson Creek is the plunge pool located just below the Ellendale Drive culvert over Larson Creek. The majority of Larson Creek is glide habitat.

Within Lazy Creek, much of the stream channel is channelized throughout the SMI project area. Nearly all of the stream system is either glide habitat or choked with herbaceous vegetation such as reed canarygrass or bullrush. One of the few pools on the Lazy Creek system is the result of the artificial plunge pool located below the outlet to the Highland Drive box culvert on Lazy Creek. Natural obstructions to form or maintain pools are also absent from this system.

Overall, LWD is not present in sufficient quantity to create or maintain pools over time in Larson, Lazy, or Bear Creeks. Coupled with the extensive glide habitat that is dominant throughout both project areas, the Bear Creek watershed is **not properly functioning** for this parameter.

South Medford Interchange: The proposed SMI project will not affect this parameter (**maintain**). The project does not propose any permanent alterations to existing stream channels that will affect pool frequency. During the replacement of the Barnett Road Bridge, the existing bridge bents will be removed from Bear Creek and the stream channel restored to natural conditions with cobble and gravel. This action is not expected to increase pool frequency since the action will occur in an area of exposed sandstone bedrock and glide habitat along Bear Creek. Existing riparian trees removed during construction will be salvaged to the extent possible for use by ODFW and other conservation groups in other LWD and stream restoration projects along Bear Creek.

Bear Creek Highway 1 Bridges: Replacement of the existing I-5 bridges will not result in any permanent alterations to the existing Bear Creek stream channel that will affect pool frequency **(maintain)**. Two existing bridge bents below OHWM will be removed and replaced with two new bridge bents; however, these bents are located in glide habitat along Bear Creek.

6.3.3.4 Pool Quality

Due to sedimentation and exposed sandstone bedrock, pools are of marginal quality in the section of Bear Creek that passes through the two project sites. Pool quality improves in the upstream reaches of Bear and Larson Creeks, beyond the limits of either the SMI or the Bear Creek Highway 1 Bridges projects. This element is considered **at risk** due to continued development in the watershed and the poor pool quality of lower stream reaches.

South Medford Interchange: The proposed SMI project will not affect this parameter (**maintain**). As previously described, the project does not propose any alterations to existing stream channels in the project area. Replacement of the existing Highland Drive box culvert on Lazy Creek will restore a small section of the creek to a more natural condition, eliminating the artificial plunge pool below the culvert. Existing riparian trees removed

during construction will be salvaged for use by ODFW and other conservation groups in creating pools in other sections of the Bear Creek watershed.

Bear Creek Highway 1 Bridges: Replacement of the existing I-5 bridges will not result in any permanent alterations to the existing Bear Creek stream channel that will affect pool quality **(maintain)**. Two existing bridge bents below OHWM will be removed and replaced with two new bridge bents; however, these bents are located in glide habitat along Bear Creek. Similar to the SMI project, any existing riparian trees removed during construction will be salvaged to the extent possible for use by ODFW and other conservation groups in other stream restoration projects to improve pool frequency and quality along Bear Creek.

6.3.3.5 Off-Channel Habitat

Due to the historical land use practices employed within the Bear Creek watershed, this type of habitat is non-existent in Bear, Larson, and Lazy Creeks. Developments for commercial and residential purposes have filled or removed backwaters, side channels, wetlands, seeps or other habitat complexities along all of the streams in the SMI and SMI Bear Creek Highway 1 project areas. Much of the immediate Bear Creek channel has been armored with riprap or rock levees to stabilize banks and to channel floodwaters. This is particularly true in the vicinity of the existing I-5 bridges. The extensive armoring with riprap or rock levees has removed any connectivity to remaining off-channel habitat. Along Larson and Lazy Creeks, multi-family and single-family residences have been constructed in close proximity to the stream channels. Large sections of Lazy Creek have been channelized or culverted, and off-channel habitat has been filled for development. In short, there are no backwaters, side channels, seeps, or other habitat complexities within either project area. This parameter is **not properly functioning**.

South Medford Interchange: Implementation of the SMI project will not impact or affect any off-channel habitat adjacent to the creeks of the project area. All of the principal elements of the project (i.e. bridges, retaining walls) will be located along a section of Bear or Larson Creek that is either armored with riprap and rock levees or deeply incised. The construction of these project elements will not create or eliminate off-channel habitat due to the confined nature of these waterways. Mitigation will be required for the project to replace the loss of riparian forest functions and values as a result of construction. Depending on the location and type of mitigation to be developed for this project, ODOT project and technical staff will consider the creation or restoration of off-channel habitat as a possible element of the overall mitigation plan for the project. Mitigation options being considered include the creation of small wetlands or backwater areas at proposed stormwater outfalls. Existing rock levels and restrictive riprap may be removed during mitigation to allow a more natural flow of water during flood events (**maintain**). The removal of riprap will improve off-channel habitat forming processes.

Bear Creek Highway 1 Bridges: Replacement of the existing I-5 bridges will not impact or affect any off-channel habitat adjacent to Bear Creek. The existing end bents for both bridges are presently armored by large amounts of riprap that restrict the channel and eliminate any off-channel habitat. The project would remove approximately 1,250 m^3 (1,635 yd^3) of this riprap from a 416-m^2 (4,478-ft^2) area along the banks; however, the removal of this riprap

would not provide an opportunity to create off-channel habitat. Mitigation will be required for this project to replace the loss of 16 small trees or saplings a result of construction. Depending on the location and type of mitigation to be developed for this project, ODOT project and technical staff will consider the creation or restoration of off-channel habitat as a possible element of the overall mitigation plan for the project (**maintain**).

6.3.3.6 Refugia

Refugia are remnant habitat such as undercut banks, large boulders, root wads and debris jams. Such habitats are important for sensitive aquatic organisms because they provide protection and cover from predators, high-energy stream flow, temperature extremes and other potential threats to survival.

The riparian areas along Bear, Larson or Lazy Creeks do not provide suitable refugia for salmonids (**not properly functioning**). Again, this is largely due to the extensive channelization and armoring with riprap or rock levees along many sections of the creeks. These actions have eliminated much of the refugia in this section of the Bear Creek watershed. In short, there are no root wads, debris jams, undercut banks or large natural boulders within the stream systems surrounding the SMI and Bear Creek Highway 1 Bridges project areas.

South Medford Interchange: The proposed SMI project will not result in the loss of refugia **(maintain)**. All of the proposed actions for this project will be located in creek segments where refugia are absent. Mitigation options for the project will include consideration of creating refugia along the project area streams. These mitigation options will include the placement of root wads along stream banks or the repositioning of large rocks within the existing riprap to create refugia.

Bear Creek Highway 1 Bridges: Similar to the SMI project, the replacement of the existing I-5 bridges will not result in the loss of refugia **(maintain)**. All of the proposed actions for this project will be located along a segment of Bear Creek that is extensively armored with riprap and where refugia are absent. The project would remove approximately 1,250 m^3 (1,635 yd^3) of this riprap from a 416-m^2 (4,478-ft^2) area along the banks and may provide an opportunity to create some refugia along Bear Creek. Mitigation options that are being considered by ODOT include the placement of root wads along stream banks or the repositioning of large rocks within the reduced area of riprap to create refugia.

6.3.4 Channel Conditions and Dynamics

6.3.4.1 Width/Depth Ratio

The width/depth ratio in the Bear Creek watershed is undocumented. In accordance with NOAA Fisheries (1996) directive, this element is considered **at risk** due to insufficient data.

South Medford Interchange: The proposed SMI project will not result in any significant adverse modifications to the stream channels of Bear, Larson or Lazy Creeks. Three new bridge bents will be installed within the OHWM of Bear Creek, but not within the wetted perimeter of the channel. No new permanent bridge bents will be installed within the

channels of Bear Creek or Larson Creek. The existing bridge bents for the Barnett Road Bridge will be permanently removed and the channel area under the bents will be restored to natural conditions with small cobble and gravel. The existing concrete bottom of the Highland Drive box culvert on Lazy Creek will be removed and replaced with a wider single-span bridge structure. At the culvert location, the stream channel will be restored to natural conditions with native streambed material, and the width of the channel will likely be wider than the current box culvert width. Overall, the proposed project will not affect this parameter (**maintain**).

Bear Creek Highway 1 Bridges: This project will not result in an adverse modification to the Bear Creek stream channel. Two of the existing bridge bents for the bridges will be permanently removed from below the OHWM, and two new bridge bents will be constructed below OHWM. The stream channel area in the vicinity of the removed bents will be restored to match adjacent stream bottom conditions with small cobble and gravel. No deep excavations from the removed bents will be allowed to remain. The existing end bents for both bridges are presently armored by large amounts of riprap that restrict the channel and minimize the width of the existing channel, particularly along the west bank of the Bear Creek under the existing bridges (see photographs in Appendix A2). The project would remove approximately 1,250 m^3 (1,635 yd^3) of this riprap from a 416-m^2 (4,478-ft^2) area below the OHWM and a portion of this riprap would be within the wetted channel of Bear Creek. The removal of this riprap would provide some limited widening of the channel within the immediate vicinity of the existing bridge. The temporary channel alterations will be offset by the removal of large amounts of riprap from the streambanks. Overall, there will be no long-term impacts to this parameter (**maintain**).

6.3.4.2 Streambank Condition

Streambank conditions within the Bear Creek watershed include high erosion, bank failure and subsequent high rates of sedimentation. In addition, several segments on Bear Creek within the SMI and Bear Creek Highway 1 Bridges project areas have armored levees constructed to contain high flows and limit floodwaters. This parameter is **not properly functioning**.

South Medford Interchange: The proposed project will require the removal of approximately 0.4 ha (0.9 ac) of mature riparian forest vegetation and the construction of retaining walls in proximity to the Bear Creek channel. These actions will be limited to the proposed alignments of the new bridge crossings of Bear and Larson Creek and elevate the risk of erosion and bank failure during construction. Retaining stumps and root wads in the ground during clearing operations and installing soil erosion and sediment control measures will minimize the risk of streambank failure.

The proposed outfalls for the water quality treatment/detention basins and water quality swale will be located at several locations along the banks of Bear Creek. Each facility will have an outlet control structure and an underground pipe that will convey treated stormwater to a point of surface discharge located approximately at the 10-year flood elevation of Bear Creek. Each point of surface discharge will be about 100 m^2 (1,076 ft^2) and will have a flow spreader to dissipate flows and to reduce the discharge velocity of stormwater to the point

where no erosion would occur (approximately 1.2 m/sec [4 ft/sec], as required by SLOPES. Each flow spreader will be constructed to provide a stable point of discharge for stormwater and to eliminate erosion or degradation of the streambank. Each flow spreader will consist of a stone embankment (or riprap) pad comprised of uniformly-sized rock material, approximately Class 50 in size. The proposed outfall locations are already armored by large riprap that will be removed as part of the project. The large riprap will be replaced with much smaller (and localized) Class 50 riprap to prevent erosion by the stormwater discharge flows. The amount of riprap used for the flow spreaders represents a very small amount of riprap left along the banks of Bear Creek when compared to the amount and size of riprap that will be removed. The outfall and flow spreader pad areas will be planted with woody native riparian vegetation such as willows to provide stream shading, additional discharge velocity control and stream habitat.

All of the proposed permanent and temporary bridge structures will fully span the creeks; however, several bridge bents will be constructed near the top of banks for Bear and Larson Creeks. The area surrounding each bent will be protected from erosion during construction and all disturbed areas will be permanently stabilized with native vegetation following construction. Effects of these actions are temporary, although proximity of the retaining wall will reduce habitat quality in Bear Creek and increase the probability of bank erosion downstream (**maintain-**).

Bear Creek Highway 1 Bridges: Replacement of the existing I-5 bridges will require modification of the existing riprap along the streambank of Bear Creek. In addition, the removals of at least two bridge bents near the western streambank of Bear Creek are proposed. These actions will cause temporary impacts to the current condition of the Bear Creek streambank within the project area. However, the removal of large riprap armoring the streambank (approximately 1,250 m^3 (1,635 yd^3) of this riprap from a 416-m^2 (4,478-ft^2) area below the OHWM from an area immediately below the existing bridges will improve local streambank functions in the long-term **(maintain+)**.

6.3.4.3 Floodplain Connectivity

Stream morphology prevents the formation of off-channel areas in the upper reaches of Bear Creek. Lower reaches of Bear Creek, including Larson and Lazy Creeks, are greatly restricted due to urban and agricultural development, including diking and levee construction. The streambed has been scoured down to bedrock in many locations. Many large wetlands have been eliminated with the use of drain tiles and ditches throughout the watershed. The current condition is considered **not properly functioning**.

South Medford Interchange: The proposed SMI project will not affect floodplain connectivity **(maintain)**. No substantial alteration or fragmentation of the floodplains along Bear, Larson or Lazy Creeks is proposed. The MSE retaining walls proposed for the project will be located outside the OHWM of Bear Creek and will be located roughly parallel to the creek channel. The locations of the proposed walls will not separate or block areas of floodplain and will not affect the hydraulics of Bear Creek. The existing continuity of the floodplains will be maintained.

Bear Creek Highway 1 Bridges: The proposed replacement of the existing I-5 bridges will not affect floodplain connectivity **(maintain)**. No substantial alteration or fragmentation of the existing floodplain along Bear Creek is proposed. The existing continuity of the floodplain will be maintained.

6.3.5 Flow/Hydrology

6.3.5.1 Peak/Base Flows

Historically, annual stream flows of Bear Creek (measured at Medford) have shown more variability than annual precipitation rates, which probably reflects the effects of storage and diversion actions (RVCOG 1995). High flows occur in summer in the upper watershed due to releases from Emigrant Reservoir. Then as flows are diverted for irrigation farther downstream, flows sometimes decrease to below normal levels. This has been referred to as an "inverted" flow regime. There are no flow data available for Larson and Lazy Creeks; however, both creeks are used as irrigation conduits and their flow can fluctuate drastically depending on irrigation demand. For this reason, the Bear Creek watershed is **not properly functioning** for this parameter.

South Medford Interchange: The SMI project will result in a net increase of approximately 6.6 ha (16.3 ac) of impervious surfaces for the South Medford area. This increase in impervious surfaces could alter annual stream flows in local streams. However, two water quality treatment/detention basins and a water quality swale are included in the project design to detain and treat stormwater originating from the majority of the impervious surfaces generated by the project. These water quality treatment/detention facilities are also designed to capture and treat stormwater originating from approximately 7.1 ha (19 ac) of existing developed areas within the project area that currently drains undetained directly into Bear, Larson and Lazy Creeks. The preliminary design data shows that the facilities will provide treatment and detention for a minimum of 140% of the net new impervious surfaces. This level of treatment is considered the "no-effect" level and means that at least 1.4 times the amount of existing impervious surfaces will be treated compared to the net impervious surfaces being created by the project (Carmichael pers. comm., 2003). This level of treatment is consistent with NOAA Fisheries recent guidance on storm management (NOAA Fisheries 2003).

The water quality treatment/detention facilities are designed to ensure that peak post-development flows from the project will not exceed peak pre-construction flow rates for the 2, 10 and 50-year storm events, despite the increases in impervious surfaces. The water quality treatment/detention ponds will be designed to start discharging stormwater at the water quality event, which is one-third of the 2-year 24-hr precipitation amount (one-third of 6.35 cm/hr [2.5 in/hr] which equals 2.11 cm/hr [0.83 in/hour]). Storm volumes exceeding the water quality storm volume will be released through the facility detention control structure. A small portion of the stormwater entering the ponds will infiltrate, but the majority of water will pass through each detention pond outlet structure to discharge into Bear Creek. The water quality event will be released over approximately 48 hours.

Overall, the stormwater treatment and detention system for the SMI project will not have an effect on peak/base flows of Bear Creek or its tributaries. The additional detention and treatment afforded by the proposed system on currently undetained flows will result in a local improvement to this parameter **(maintain)**.

Bear Creek Highway 1 Bridges: Reconstruction of the existing I-5 bridges will result in a slight increase in net impervious surfaces. Stormwater originating from the replacement bridges will be collected and conveyed to the southern water quality treatment/detention basin and water quality swale for the SMI project for detention and treatment. This is an improvement over existing conditions since stormwater from the existing bridges is presently discharged into Bear Creek undetained. The southern water quality treatment/detention basin and water quality swale for SMI have sufficient capacity to capture and effectively detain and treat flows from the replacement bridges. As presented above, the water quality treatment/detention facilities for the SMI project are designed to ensure that peak post-development flows from the project will not exceed peak pre-construction flow rates for the 2, 10 and 50-year storm events, despite the increases in impervious surfaces. The level of detention and treatment afforded by the southern detention basin and water quality swale will be at the "no effect" level and will be an improvement over existing conditions. Therefore, the project will improve this parameter **(maintain+)**.

6.3.5.2 Drainage Network Increase

The Bear Creek watershed contains developed areas with extensive drainage networks resulting from roads and urban development. The watershed is considered **at risk** for this parameter.

South Medford Interchange: This project will result in a net gain of approximately 7.1 ha (19 ac) of impervious surfaces within the project area. Given the extensive amount of impervious surfaces already existing within the project area, the increase of impervious surfaces is considered relatively small. However, the two water quality treatment/detention facilities and water quality swale included in the project design will detain and treat the majority of the stormwater originating from the proposed and existing impervious surfaces within the project area. As previously described, the level of detention and treatment afforded by the proposed stormwater collection system will be at the "no-effect" level (as a minimum) and is consistent with NOAA Fisheries recent guidance on storm management (NOAA Fisheries 2003). The most prominent benefit of the proposed stormwater system is the proposed collection, detention and treatment of currently undetained or untreated stormwater that is currently being discharged into Bear Creek. The project would improve the drainage network density in the Bear Creek watershed **(maintain+)**.

Bear Creek Highway 1 Bridges: Reconstruction of the existing I-5 bridges will result in a slight increase in net impervious surfaces. Given the extensive amount of impervious surfaces already existing within the project area, the relatively small 1,000 m^2 (10,763 ft^2 or 0.25 ac) increase of impervious surfaces is considered negligible for the project area. Stormwater originating from the replacement bridges will be collected and conveyed to the southern water quality treatment/detention basin and water quality swale for the SMI project for detention and treatment. This is an improvement over existing conditions since

stormwater from the existing bridges is presently discharged into Bear Creek undetained and untreated. The proposed water quality treatment/detention facilities for SMI are designed to capture and effectively detain the flows from the replacement bridges. As previously described, the level of detention and treatment afforded by the proposed SMI stormwater collection system will be at the "no-effect" level (as a minimum) and is consistent with NOAA Fisheries recent guidance on storm management (NOAA Fisheries 2003). The most prominent benefit of the proposed stormwater system is the proposed collection, detention and treatment of currently undetained or untreated stormwater that is currently being discharged into Bear Creek. The project will improve the drainage network density in the Bear Creek watershed **(maintain+)**.

6.3.6 Watershed Conditions

6.3.6.1 Road Density and Location

Due to the high density of roads and urban development adjacent to Bear, Larson, and Lazy Creeks, and the proximity of I-5 to Bear Creek throughout its valley, this parameter is **not properly functioning**.

South Medford Interchange: The proposed SMI project will create several new roads and will require the abandonment of several sections of existing roadway. Overall, the project will result in a small increase in the overall road density for South Medford **(maintain-**).

Bear Creek Highway 1 Bridges: The proposed replacement of the existing I-5 bridges will not result in a substantial increase in road density. The proposed replacement bridges will be located along the same alignment as the existing bridges and will result in a nominal increase of impervious surfaces (approximately 1,000 m^2 (10,763 ft^2 or 0.25 ac). No new permanent roads are required for this project **(maintain)**.

6.3.6.2 Disturbance History

Disturbances within the Bear Creek watershed are a combination of commercial, industrial, residential, and agricultural development. The Bear Creek watershed is considered **at risk** for this parameter.

South Medford Interchange: The environmental baseline for this parameter will not be changed as a result of the SMI project (**maintain**). All proposed construction activities will occur within lands that have been extensively disturbed in the past.

Bear Creek Highway 1 Bridges: Replacement of the existing I-5 bridges will not change the environmental baseline for this parameter **(maintain)**. All construction activities associated with the replacement of the bridges will occur within the existing maintained right-of-way for I-5. The right-of-way was previously disturbed during the original construction of the interstate.

6.3.6.3 Riparian Reserves

The Bear Creek Greenway was intended to provide an unbroken riparian corridor along 48 km (30 m) of Bear Creek. The riparian reserve system for the Bear Creek watershed is

largely intact, but has become fragmented in areas of urban development, including the project area. Lack of adequate shading, along with returns of warm irrigation water, have been cited as a cause of high summertime temperatures in the lower reaches of Bear Creek. Therefore, this parameter is **not properly functioning**.

South Medford Interchange: Implementation of the SMI project will require the removal of approximately 0.4 ha (0.9 ac) of mature riparian forest vegetation along Bear and Larson Creeks. The loss of this riparian vegetation will be limited to the proposed alignment of the Highland Avenue Extension Bridge over Bear and Larson Creeks and this action will further fragment the riparian reserves along both creeks. The SMI project will implement a riparian mitigation program to replace lost trees at a 2:1 ratio and existing disturbed areas up to 0.4 ha (0.9 ac) along Bear and Larson Creeks will be restored or enhanced. The overall goal of the riparian mitigation program will be to replace the lost functions and values provided by the existing riparian vegetation. Until the mitigation areas are fully established, the benefit of the new riparian plantings will not be fully realized. Once fully established, the new riparian plantings will likely provide some additional level of riparian reserve for the Bear Creek watershed (**maintain**).

Bear Creek Highway 1 Bridges: The replacement of the existing I-5 bridges will occur within the maintained right-of-way of I-5, which is largely void of mature forest riparian vegetation. Removal of riparian vegetation will be limited to thickets of Himalayan blackberry and approximately 16 small trees or saplings of willow and red alder between 4.5 and 7.6 m (15 to 25 ft) tall scattered throughout the interstate right-of-way. It is anticipated that the lost trees will be replaced at a 2:1 ratio and will be planted within the disturbed areas surrounding the new bridges. Given the small size of the existing vegetation proposed for removal and the anticipated new tree plantings, this project will not significantly affect this parameter **(maintain)**.

7.0 CONSERVATION MEASURES

Conservation measures are intended to minimize or avoid environmental impacts to proposed or listed species or critical habitat. Conservation measures common to both the SMI and the Bear Creek Highway 1 Bridges projects are presented in the following sections of this document. In general, many of the conservation measures that are common to both projects will follow the practices outlined in Section 00290 (Environmental Protection) of ODOT's *Standard Specifications for Highway Construction* (2002d). Standard Specifications presented in Section 7.1 are applicable to both projects and will be amended in the Special Provisions of each project to include additional conservation measures specifically designed for each project. As both projects are still in the early design stages, special provisions as they appear in Section 7.2 of this document are subject to change as each project design progresses.

Additional conservation measures may be agreed upon by various divisions and departments of the state and federal government. These agreements are not contractually binding, but may be made a condition of the resulting federal Letter of Concurrence or Biological Opinion.

Failure to meet these conditions may have repercussions to both the SMI and the Bear Creek Highway 1 Bridges projects. Since both projects are still in the early design stages, non-contractual obligations that appear in Section 7.3 of this document are subject to change as the project design progresses.

7.1 STANDARD SPECIFICATIONS

The following is a listing of ODOT Standard Specifications that will be applicable to both the SMI and Bear Creek Highway 1 Bridges projects:

7.1.1 Section 00170 - Legal Relations and Responsibilities

Directs the Contractor to comply with all laws, ordinances, codes, regulations, and rules that relate to the work or to those engaged in the work. This section addresses Permits, Licenses, and Taxes (00170.02); Protection of Navigable Waters (00170.32), and Safety, Health and Sanitation Provisions (00170.60); as well as other applicable human resources issues.

7.1.2 Section 00280 - Erosion and Sediment Control

Requires Contractor to implement ODOT's ESCP that was developed exclusively for the subject project. The ESCP is developed to comply with Federal, State, and local laws, rules and regulations, and the National Pollution Discharge Elimination System (NPDES) General Construction Permit regarding erosion prevention and sediment control for on-site construction activities. Typically included in this section are the soil and slope protection and stabilization measures, and Site Restoration specifications, including planting materials and methods.

The Contractor will also be required to obtain an Erosion Control Permit from the City of Medford for both the SMI and Bear Creek Highway 1 Bridges project. Separate permits will have to be obtained for each project.

7.1.3 Section 00320 - Clearing and Grubbing

Directs the Contractor on Clearing Operations (00320.40), including clearing, preserving, and trimming trees and other vegetation, as well as Grubbing Operations (00320.41), including providing limits on the Contractor's area of approved activity and scope of actions. This section provides protection to vegetation both within and outside of the work areas.

7.1.4 Section 01040 – Planting

Provides the Contractor with guidelines for furnishing, planting and establishing specified plant materials in planting areas shown or directed in the project plans. This section includes directions for specific planting seasons, layout and preparation of planting areas, in addition, preparation of planting materials and requirements for establishment to assure satisfactory growth and survival.

7.2 AMENDMENTS TO STANDARD SPECIFICATIONS

The following is a listing of proposed Amendments to ODOT Standard Specifications that are common to both the SMI and the Bear Creek Highway 1 Bridges projects. It is ODOT's intent to comply to the extent practical with the SLOPES Terms and Conditions during the

construction, operation and maintenance of both projects. The conservation measures presented in this section have been designed to be in compliance with Reasonable and Prudent Measure No. 2 (General Conditions for Construction, Operation and Maintenance) within the SLOPES Biological Opinion. This list illustrates some of the conservation measures that each construction Contractor for both the SMI and Bear Creek Highway Bridges projects will be required to follow to ensure the best possible compliance with the SLOPES Terms and Conditions.

7.2.1 Section 00170 – Legal Relations and Responsibilities

1. For the purposes of both projects, the restricted work area (also defined as the in-water work area, OHWM, active channel, jurisdictional waters, ordinary high water mark, and "beds and banks" of the State of Oregon) is here defined as top of bank for Bear, Larson or Lazy Creek, or any tributary channel, and shall be flagged by the Engineer prior to initiation of any project activities. The location of the restricted work area shall also be indicated on the project plans.

2. A Pollution Control Plan (PCP) will be developed for each project to prevent point-source pollution related to construction activities from entering restricted work areas. The PCP will describe the hazardous materials or products that will be used, including inventory, storage, handling and monitoring. The PCP will also include a spill containment and control plan with notification procedures, specific clean-up and disposal instructions for different products, response measures, methods for disposal of spilled materials and employee training for spill containment. (*In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO).*

3. Prior to the replacement of the existing I-5 bridges, the Barnett Road Bridge and the Lazy Creek culvert on Highland Drive, the Contractor shall submit a Bridge Demolition Plan for each bridge to ODOT and NOAA Fisheries for approval prior to construction. The Demolition Plan for each bridge or culvert will specify the type of in-water work isolation and debris containment proposed by the Contractor. Bridge or culvert removal will not proceed until all concerns are addressed and ODOT and NOAA Fisheries have agreed that the containment measures are adequate and will perform properly for each bridge/culvert replacement action. (*In compliance with Section 2.2.3.2q Isolation of In-water Work Area and Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO).*

4. All work within the restricted work area will be completed during the ODFW defined in-water work period (June 15 to September 15; [ODFW 2000]). Extensions of the in-water work period will require prior approval from NOAA Fisheries and ODFW. (*In compliance with Section 2.2.3.2.d Timing of In-Water Work of the SLOPES BO).*

5. Notify the Project Engineer (Engineer) ten days prior to initiating water diversion activities. This is to ensure adequate time for the Engineer to notify the appropriate agencies and ODOT staff for proper fish handling operations. All fish salvage operations shall be conducted by a qualified ODOT biologist or designee.

6. Prior to beginning work within the restricted work area, the Contractor shall prepare and submit to ODOT and NOAA Fisheries a sediment and debris containment plan. The sediment and debris containment plan shall outline specific containment measures necessary to keep all construction debris out of the active stream channel during construction activities at the site. A diagram shall be assembled to show the method and sequence of construction and removal and submitted as part of the sediment and debris containment plan. (*In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO).*

7. Do not leave construction vehicles or equipment unattended in the restricted work area.

8. Materials removed during excavation will only be placed in locations where they cannot enter streams or other water bodies. (*In compliance with Section 2.2.3.2.o Heavy Equipment of the SLOPES BO).*

9. Isolate all in-water work areas that occur within the channels of Bear, Larson or Lazy Creeks. In particular, isolate all in-water work areas proposed for the removal of the existing bridge piers on the Barnett Road Bridge and the I-5 bridges. Isolation of the work area or diversion of streamflow will also be required around the work area surrounding removal of the existing Highland Drive box culvert on Lazy Creek within the SMI project. Contractor shall completely isolate the work area from the active flowing creek channel using pipes, inflatable bags, sandbags, sheet pilings, or similar materials. (*In compliance with Section 2.2.3.2.q Isolation of In-Water Work Area of the SLOPES BO).*

10. Isolate all in-water work areas associated with the placement of temporary work bridges and temporary detour bridges. Contractor shall completely isolate the work area from the active flowing creek channel using inflatable bags, sandbags, sheet pilings, or similar materials. (*In compliance with Section 2.2.3.2.q Isolation of In-Water Work Area of the SLOPES BO).*

11. Do not reintroduce streamflow into the work area without approval from the Engineer.

12. Contaminated or sediment-laden water from the project (e.g. water contained within a dewatered or isolated work area) discharged directly into a restricted work area or any waters of the State (e.g. Bear, Larson or Lazy Creeks) shall meet the following water quality criteria: The turbidity of water discharged into the stream shall be less than 10% higher than the ambient turbidity of stream water measured upstream of the in-water work isolation area.

- No water exhibiting a visible sheen of hydrocarbon contamination shall be discharged into the stream.

- Water within the in-water work isolation area shall not be discharged directly to the stream without meeting these criteria. Water not meeting these criteria shall be treated,

transported offsite, or remain within the in-water work isolation area until meeting water quality criteria

- Water to be discharged into the stream shall be tested periodically to ensure it meets water quality parameters. The Pollution Control Plan (PCP) shall contain a component describing the testing procedure to be used.

- Do not discharge contaminated or sediment-laden water, or water contained within an in-water isolation area, directly into any waters of the State until it has been treated to the satisfaction of the Engineer (e.g., by bioswale, filter, settlement pond, pumping to vegetated upland location, bio-bag, dirt-bag or other approved method). (*In compliance with Section 2.2.3.2.f Construction Discharge Water of the SLOPES BO).*

13. The use of new rock or riprap will only be implemented when other practical measures that are less damaging to the natural environment are not available, and when necessary will be minimized. Any additions of new riprap for scour protection will be individually placed in such a way that produces an irregularly contoured face along the streambank to provide velocity disruption. To the extent practical, existing riprap will be reorganized to create an irregularly contoured face along the streambank. No end dumping of riprap will be permitted.

14. Install, operate, and maintain the fish screen on all water intake structures in accordance with NOAA Fisheries fish screen criteria as described in: *National Marine Fisheries Service, Juvenile Fish Screen Criteria* (revised February 16, 1995) *and Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996) (guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens [http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm]). When drawing or pumping water from any stream, protect fish by equipping intakes with screens having a minimum 27% open area and meeting the following requirements:

    - Perforated plate openings shall be 2.38 mm (3/32 inch) or smaller.
    - Mesh or woven wire screen openings shall be 2.38 mm (3/32 inch) or smaller in the narrowest direction.
    - Profile bar screen or wedge wire openings shall be 1.75 mm (1/16 inch) or smaller in the narrow direction.

Choose size and position of screens to meet the following criteria:

METRIC

	Approach Velocity [1] (m/s)	**Sweeping Velocity [2] (m/s)**	**Wetted Area of Screen (m^2)**	**Comments**
Ditch Screen	≤ 0.12	Shall exceed approach velocity	Divide max. water flow rate (m^3/s) by 0.12 m/s	If screen is longer than 1.2 m, angle 45° or less to stream flow
Screen with proven self-cleaning system	≤ 0.12	–	Divide max. water flow rate (m^3/s) by 0.12 m/s	–
Screen with no cleaning system other than manual	≤ 0.06	–	Divide max. water flow rate (m^3/s) by 0.06 m/s	Pump rate 0.0283 m^3/s or less

[1] Velocity perpendicular to screen face at a distance of approximately 75 mm
[2] Velocity parallel to screen

ENGLISH

	Approach Velocity [1] (ft/sec)	**Sweeping Velocity [2] (ft/sec)**	**Wetted Area of Screen (ft^2)**	**Comments**
Ditch Screen	≤ 0.4	Shall exceed approach velocity	Divide max. water flow rate (cfs) by 0.4 fps	If screen is longer than 4 feet, angle 45° or less to stream flow
Screen with proven self-cleaning system	≤ 0.4	–	Divide max. water flow rate (cfs) by 0.4 fps	–
Screen with no cleaning system other than manual	≤ 0.2	–	Divide max. water flow rate (cfs) by 0.2 fps	Pump rate 1 cfs or less

[1] Velocity perpendicular to screen face at a distance of approximately 3 inches
[2] Velocity parallel to screen

(*In compliance with Section 2.2.3.2.f Fish Screens of the SLOPES BO).*

15. While pumping water around all isolated work areas, maintain continuous operation of the pump. *(In compliance with Section 2.2.3.2.f Fish Screens of the SLOPES BO).*

16. While pumping water around all isolated work areas, make a second operational pump available for rapid deployment. *(In compliance with Section 2.2.3.2.f Fish Screens of the SLOPES BO).*

17. Pollutants (i.e., waste spoils, petroleum products, fresh concrete cured less than 24 hours, silt, welding slag and grindings, concrete saw cutting by-products, sandblasting abrasive, etc.) shall be contained and shall not come in contact with any wetland, waterway or restricted work area. Implement containment measures adequate to prevent pollutants from entering the restricted work area. (*In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan and Section 2.2.3.2.i Construction Discharge Water of the SLOPES BO).*

18. Do not stockpile any hazardous materials within 45 m (150 ft) of the bed or banks of any wetland, waterway or the restricted work area. (*In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan and Section 2.2.3.2.i Construction Discharge Water of the SLOPES BO).*

19. If contamination of any wetland, waterway or the restricted work area occurs, notify the Engineer and immediately attempt to contain and remove the material.

20. Containment measures adequate to prevent fuel and other hazardous materials from leaving the work area and entering any wetland, waterway or the restricted work area shall be implemented. Fuel containment measures and the location of areas used for vehicle, equipment, and fuel storage shall be designated in a Pollution Control Plan (PCP) and approved and monitored by the Engineer. (*In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan and Section 2.2.3.2.i Construction Discharge Water of the SLOPES BO).*

21. All equipment, fuel, and materials shall be removed from any area used for vehicle staging, maintenance, fuel storage or re-fueling before the water level rises to within 1 vertical meter (3 vertical feet) of the area.

22. Prior to transport to the project site, inspect and clean all construction equipment. All construction equipment will be examined for any dripping leaks. Any identified dripping leaks will be repaired prior to the equipment being transported to the project site. No equipment with identified dripping leaks will be permitted in the project site. (*In compliance with Section 2.2.3.2.o Heavy Equipment of the SLOPES BO).*

23. Prior to operating within 45 m (150 ft) of the restricted work area, inspect and clean all construction equipment. All construction equipment will be examined for any dripping leaks. Any identified dripping leaks will be repaired offsite prior to the equipment operating within the project area. Remove external oil, grease, dirt and caked mud. Do not discharge untreated wash and rinse water into the restricted work area(s). Establish temporary impoundment(s) to catch water from equipment cleansing. Establish

temporary impoundment(s) in a location that shall not contribute untreated wastewater to any wetland, waterway or the restricted work area. (*In compliance with Section 2.2.3.2.i Construction Discharge Water and Section 2.2.3.2.o Heavy Equipment of the SLOPES BO).*

24. Establish temporary impoundment(s) as concrete washout areas for concrete mixers and trucks. Collect and properly dispose of dried concrete waste material from washout areas. Locate concrete washout areas at least 45 m (150 ft) from any wetland, waterway or restricted work area. (*In compliance with Section 2.2.3.2.i Construction Discharge Water of the SLOPES BO).*

25. At the end of each work shift, all vehicles and equipment (except for cranes and pile drivers) shall be stored at least 45 m (150 ft) from the restricted work area, or in an area approved by the Engineer. Track-mounted equipment, large cranes, pile drivers and other equipment whose limited mobility makes it impractical to move may remain at the workstation if work at that location was not completed during the previous work shift. (*In compliance with Section 2.2.3.2.o Heavy Equipment of the SLOPES BO).*

26. To minimize the amount of fuel remaining in vehicles during non-work times, the Contractor will not be allowed to perform refueling on track-mounted equipment, cranes and pile drivers during the second half of the work shift without approval from the Engineer. During all refueling operations, implement spill prevention measures and provide fuel containment systems designed to completely contain a potential spill, as well as other pollution control devices and measures adequate to provide containment of hazardous material. Perform refueling operations to minimize the amount of fuel remaining in vehicles stored during non-work times. All refueling operations will be constantly attended and monitored by qualified personnel. (*In compliance with Section 2.2.3.2.o Heavy Equipment and Section 2.2.3.2h Pollution and Erosion Control Plan of the SLOPES BO).*

27. No refueling of non-track mounted vehicles, storage of hazardous materials, or vehicle maintenance shall be allowed within 45 m (150 ft) of any wetland, waterway or the restricted work area. (*In compliance with Section 2.2.3.2.o Heavy Equipment and Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO).*

28. Place "diapers" on all stationary power equipment (e.g. generators, cranes, compressors) operating within 45 m (150 feet) of the restricted work area. (*In compliance with Section 2.2.3.2.o Heavy Equipment of the SLOPES BO).*

29. Locate areas for storing fuels and other potentially hazardous materials and areas for refueling and servicing equipment and vehicles at least 45 m (150 feet) away from the any wetland, waters of the State or restricted work area. (*In compliance with Section 2.2.3.2.o Heavy Equipment of the SLOPES BO).*

30. Secondary containment measures will be employed during fueling of all track mounted equipment on all temporary bridges or work platforms. (*In compliance with Section*

2.2.3.2.o Heavy Equipment and Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO).

31. All equipment staging areas and material stockpile areas will be identified in the project plans and/or approved by ODOT. Staging areas will be located in previously improved or disturbed sites. These sites include the existing highway, other roads, and developed sites that have been cleared, compacted and/or graveled (i.e., poorly vegetated and previously disturbed areas). Equipment staging and material stockpile areas will be clearly identified in the field. (*In compliance with Section 2.2.3.2.o Heavy Equipment of the SLOPES BO).*

32. Implement spill prevention measures and provide fuel containment systems designed to completely contain a potential spill, as well as other pollution control devices and measures adequate to provide containment of hazardous material. (*In compliance with Section 2.2.3.2.j Heavy Equipment of the SLOPES BO).*

33. Maintain hazardous material containment booms and spill containment booms on-site to facilitate the cleanup of hazardous material spills. Install hazardous material containment booms in instances where there is a potential for release of petroleum or other toxicants. (*In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO).*

34. No treated timbers will be used for temporary or permanent bridge piling. No treated timbers will be allowed to enter any stream, wetland or restricted work area. (*In compliance with Section 2.2.3.2.l Treated Wood of the SLOPES BO).*

35. Install the minimum number and diameter of temporary pilings necessary to achieve structural integrity of all temporary work structures. Driving and proofing of piles will be conducted with techniques that minimize the use of force and resulting sound pressure. When using an impact hammer to drive or proof steel piles, use an appropriate sound attenuation device that will reduce sound pressure levels by 20 decibels such as wood or sound damping material between hammer and pile or a confined bubble curtain around the piling diameter for the full depth of the water column. (*In compliance with Section 2.2.3.2.j Piling Installation of the SLOPES BO).*

36. Temporary access roads will be installed within existing disturbed areas or along existing roadways to the greatest extent possible. No at-grade temporary access road will be constructed across any waterway, wetland or restricted work area. All temporary access roads not within the footprint of a new bridge or road will be removed, regraded to original contours, stabilized and revegetated. (*In compliance with Section 2.2.3.2.n Temporary Access Roads and Drilling Pads and Section 2.2.3.2.v Obliteration of the SLOPES BO).*

37. All temporary work bridge decks shall be sealed. Containment measures that minimize any potential for petrochemicals or hazardous materials to enter the waterway shall be installed. *(In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO.)*

7.2.2 Section 00280 – Erosion and Sediment Control

1. An Erosion and Sediment Control Plan (ESCP) will be developed and implemented for each project. The ESCP will be developed to address anticipated site conditions. The Contractor shall submit an ESCP for approval, which represents actual conditions for each project. The plan may be developed and submitted in stages for each type of work shown in the Contractor's schedule. When submitted in stages, each type of work will not begin until the Engineer approves the ESCP for that stage. (*In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO).*

2. Erosion and sediment control measures shall be implemented prior to any work within 90 m (300 ft) of any stream or restricted work area, and shall remain in place until the project area is stabilized, as determined by the Engineer. (*In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO).*

3. The ESCP shall include implementation of sediment barriers to protect water quality, with particular attention to safeguarding adjacent waterways. (*In compliance with Section 2.2.3.2.h Pollution and Erosion Control Plan of the SLOPES BO).*

7.2.3 Section 00320.40 – Clearing and Grubbing

1. Limit clearing to designated rights-of-way. Prior to construction, the limits of clearing shall be flagged or staked in the field. Sensitive features such as riparian vegetation and wetlands will also be identified in the field and their locations shown to all construction personnel. (*In compliance with Section 2.2.3.2.m Preconstruction Activity of the SLOPES BO).*
2. During initial clearing operations, all topsoil will be stripped and stockpiled for landscaping and other mitigation projects. Temporary sediment control measures will be employed for all topsoil stockpiles.

3. Vegetation located under the proposed alignments of permanent and temporary bridge structures shall be cut off at ground level and the stumps and roots left intact, excluding areas approved for grubbing by the Engineer. Stumps or root wads that are not located under a new bridge will be retained for restoration purposes and allowed to resprout. For areas under new bridge structures,, salvage and replant native tree and shrub plant material within the Bear Creek corridor. The main trunks of removed trees and root wads will be retained and stockpiled for potential use in other mitigation projects within the Bear Creek watershed. (*In compliance with Section 2.2.3.2.p Site Preparation of the SLOPES BO).*

4. Minor limbing of retained riparian trees may occur to allow passage of equipment as approved by the Engineer.

5. Temporary access shall minimize impact to riparian vegetation and shall be approved by the Engineer prior to construction.

7.2.4 Section 01040 – Planting

The scope of these planting requirements includes the furnishing and planting of the riparian plantings, as directed by a project Mitigation Plan.

1. A mitigation and restoration plan will be prepared for each project. This plan will provide baseline information on existing impacted resources, goals and objectives for site restoration and performance standards for assessing whether stated mitigation goals are achieved. A work plan and five-year monitoring and maintenance plan will be included within the mitigation and restoration plan. (*In compliance with Section 2.2.3.2.u ii Plan Contents of the SLOPES BO).*

2. Mitigation and site restoration will be conducted as necessary to ensure that all streambanks, soils and vegetation disturbed by the project stabilized and restored to natural conditions. Site mitigation and planting will be conducted to restore natural slopes, re-establish existing drainage patterns and allow for establishment of permanent native woody vegetation along stream corridors. (*In compliance with Section 2.2.3.2.u i Site Restoration of the SLOPES BO).*

3. It is preferred that native plant material from the project area or watershed be used for mitigation plantings. If the preferred native stock material is deemed unacceptable for the plantings, then specify in writing to the Engineer 90 calendar days prior to initiating any work defined in this Section (01040) that a source for the native plant materials specified in the contract has been identified. This includes permanent erosion control seed mix and mitigation shrubs/trees. The guarantee shall include the name(s) of the nursery and/or contract grower, confirmation of availability of sufficient quantities and species by the planting season, origin of plant material, date material was collected, and proper storage method. (*In compliance with Section 2.2.3.2.u i Site Restoration of the SLOPES BO).*

4. No fertilizer or pesticides shall be used with the riparian area plantings or within 45 m (150 ft) of any wetland, waterway or the restricted work area. (*In compliance with Section 2.2.3.2.u i Site Restoration of the SLOPES BO).*

5. Use cellulose fiber with tackifier applied with appropriate measures for native grass seed mix.

7.3 NON-CONTRACTUAL OBLIGATIONS AND AGREEMENTS

1. A copy of the Biological Assessment and Biological Opinion will be available at the Project Manager's office for review during bidding.

2. Prior to the pre-construction conference, ODOT Environmental staff shall review the Contractor's ESCP, PCP, and, if appropriate, provide additional containment measures.

8.0 INTERRELATED AND INTERDEPENDENT EFFECTS

Interrelated actions include actions that are part of a larger action and depend on the larger action for justification. Interdependent actions are defined as actions with no independent utility apart from the proposed action.

Future development in the South Medford area is expected to continue until full buildout of available land is achieved. This development will occur regardless of the implementation of the South Medford Interchange and the Bear Creek Highway 1 Bridges project. Other planned and permitted development projects in the area are not dependent on either of these two projects. Both projects may very generally increase the attractiveness of developable land in the South Medford area for some types of development by improving safe and efficient vehicle movement. However, the proposed roadway improvements will not induce more development within the South Medford area than would otherwise occur. For example, the SMI project is proposing a road stub out at the realigned intersection of Center Drive and Garfield Street. The road stub out would provide for a future southerly extension of Center Drive to allow access to properties lying to the south. The road stub out is proposed only for property access and is not related to other development projects that may be planned for other properties to the south. Several other prominent development constraints and opportunities substantially influence the timing and location of development in the area.

The City of Medford has limited commercial and residential land remaining within its Urban Growth Boundary and the vacant land in South Medford comprises a good portion of the remaining land. Population and employment projections for the City of Medford show an increasing demand for commercial development in the South Medford area. Land that is presently zoned for residential use could be converted to commercial use within the next three decades. Future development is expected to occur without the SMI project or the replacement of the I-5 bridges. Other factors besides these two projects, such as a limited land base, would likely influence the South Medford area to develop, although other factors, such as other street system capacity, annexation procedures, and utility constraints may need to be overcome.

Development within the South Medford area is subject to municipal, county, state, and federal land use and environmental regulations. Oregon's 14 (non-Willamette Greenway and Coastal) Statewide Planning Goals and Guidelines set mandated standards for state, county, and municipal jurisdictions in guiding existing and future land use. Oregon's statewide goals are achieved through local comprehensive planning. State law requires each city and county to adopt a comprehensive plan and the zoning and land-division ordinances needed to put the plan into effect. The local comprehensive plans must be consistent with the statewide planning goals. The proposed SMI and Bear Creek Highway 1 Bridges projects would not affect or change current zoning and comprehensive plan designations of vacant land within the project area and therefore will not affect the type or level of future development that may occur. In addition, any future development within the project area will be subject to City of Medford environmental regulations that are intended to preserve sensitive areas such as wetlands, riparian corridors, fish and wildlife habitats, and archaeological sites and control stormwater generated from new impervious surfaces.

9.0 CUMULATIVE EFFECTS

Cumulative effects are defined as the effects of future state, local, or private activities that are reasonably certain to occur in the Bear Creek watershed. Additional projects within the watershed are anticipated as population growth continues in the region. Associated road and commercial development, as well as maintenance and upgrading of the existing infrastructure are therefore likely in the foreseeable future for this watershed.

The urban communities along Bear Creek anticipate accelerated population growth in the next 10 years. As of July 1999, the City of Medford's population was 59,990 (DeLorenzo pers. comm. 2000). By 2010, Medford's population is projected to be 71,110. Similar growth has been experienced in the City of Ashland. From 1980 to 1990, the City of Ashland saw a population increase of 1,291 (8.6 percent). From 1990 to 1998, the population grew by 2,986 (18 percent). Ashland's population is expected to grow by another 13 percent by the year 2018. It is estimated that by 2018, nearly 200 additional acres will be needed for residential development, and more than 100 acres of land will be needed to support the growing commercial base (City of Ashland 1999a).

Thus, it can be reasonably assumed that projected growth patterns similar to that of Medford and Ashland may be expected as well with the other municipalities occupying the Bear Creek corridor, such as Central Point, Phoenix, and Talent. The likely result of this growth and development will be increases in traffic volume, municipal water demands, and conversion of grasslands to hard surfaces for commercial and residential use. All of these factors ultimately amount to increased pressure on sustaining fish populations and the resources comprising the habitat upon which they rely.

Numerous transportation improvement projects are included in the local Transportation System Plan (TSP) and Capital Improvement Plans (CIP) for the various communities in the Bear Creek watershed and Jackson County. For example, ODOT just recently completed an Environmental Assessment (EA) for the proposed North Medford Interchange (NMI) which includes improvements to Highway 62 in the vicinity of its interchange with I-5 and Biddle Road. ODOT also just received a Biological Opinion (BO) from NOAA Fisheries for the Medford Viaduct. This project is a 0.96-km (0.5-mile) segment of I-5 within the City of Medford where the viaduct will undergo improvements to the bridge deck and retrofitting for seismic protection and upgraded scour protection (NOAA Fisheries 2002b).

Jackson County Roads, Parks and Planning Services is also working on a multipurpose path (Path) in the vicinity of the South Medford Interchange project area. Conceptually, the Path will be minimally serving as a temporary bicycle and pedestrian connection between the Greenway Trail and the Barnett Road area until Jackson County constructs the permanent segment of the Greenway Trail along Bear Creek; however, depending on several factors, the Path might become a permanent feature. The proposed Path will approach the new interchange area from the south, generally following Bear Creek on its east side. The Path will cross under the existing/future I-5 bridges and the proposed location of the SMI interchange ramps, until it intersects with the Highland Street Extension and then follows the extension up to Barnett Road. ODOT will likely grant Jackson County either a permit or an easement to construct an approximately 3.3-m (10-ft) wide Path within the SMI project area

that is otherwise required for normal slope, utility, maintenance or other right-of-way requirements. Jackson County will need to construct a slab bridge across Larson Creek. Jackson County will be responsible for constructing and maintaining the Path and bridge.

Further south, the City of Ashland's current TSP and CIP include approximately 40 street improvement projects scheduled for construction within 20 years (at various stages of funding certainty). The projects are intended to address a number of capacity and safety needs or upgrades to the existing streets. These types of projects generally involve road widening, addition of turn lanes, sidewalks, and bike paths, and the addition of storm drainage facilities (City of Ashland 1999a, City of Ashland 1999b).

Maintenance of existing transportation facilities and structures is ongoing in the Bear Creek watershed, as it is elsewhere. Some of the normal maintenance activities include deck overlay, repair of structures, striping and signing, and washing and painting of bridges. Any of these activities may present potential impacts to fisheries resources. While maintenance activities do not normally require mitigation, the cumulative effect of a number of seemingly minor or even negligible individual impacts may compound to result in lasting significant impacts.

10.0 COMPENSATORY MITIGATION

ODOT has proposed construction of two water quality treatment/detention facilities and a water quality swale to remove roadway pollutants from stormwater runoff and reduce the hydrologic impacts from net new impervious surfaces by providing temporary detention and treatment of runoff. A northern water quality treatment/detention facility will be located directly east of I-5, adjacent to Barnett Road and a southern water quality treatment/detention facility will be located west of I-5 and in the southwest quadrant of and adjacent to the proposed SPUI. The grassed water quality swale will be constructed along the east side of the NB lanes of I-5 on the south side of Bear Creek. As previously described in this document, these proposed water quality treatment/detention facilities and water quality swale were overdesigned by ODOT to accommodate currently undetained flows in the project area. This includes the currently undetained flows from the existing I-5 bridges, as well as from portions of the City's Barnett Road and Highland Drive.

ODOT project and technical staff understand that this level of treatment goes well beyond what is normally required to offset the impacts of the new impervious surfaces. In this case, the large area available for construction of these facilities offers the opportunity to provide treatment and detention above and beyond that which would normally be required and would partially be considered mitigation. It is not anticipated that this type of opportunity will present itself in all future ODOT projects; however, ODOT project and technical staff feel that since both projects will allow it, the opportunity to improve upon the existing condition of Bear Creek should be acted upon.

In addition to the proposed stormwater treatment afforded to both projects, extensive mitigation will be required to compensate for riparian vegetation removal and impacts to

wetlands. Selection of potential mitigation sites will first favor areas within the immediate area of both projects followed by sites along the Bear Creek corridor. Possible mitigation sites being considered include land being decommissioned at the existing Barnett Road interchange and/or on City-owned property along Bear Creek (ODOT 2001a). Where possible, mitigation for riparian and wetland impacts will be integrated with existing habitat. The *Bear Creek Mitigation Implementation Plan*, which was prepared under the direction of ODOT, shall be used to identify potential mitigation sites and programs (ODOT 2000). The following is a preliminary listing of some of the mitigation measures being considered for the loss of riparian vegetation and wetlands:

10.1 RIPARIAN MITIGATION

1. A riparian mitigation plan will be developed for both projects to compensate for the loss of riparian forest vegetation. This plan will include plantings of native species at densities and species diversity minimally matching the existing riparian vegetation communities along Bear Creek. Several potential mitigation sites are available along Bear Creek and these sites will be reviewed and approved by the regulatory agencies prior to construction.

2. All new plantings will occur within the Bear Creek riparian corridor using either salvaged native plant material or new plant material obtained from local growers with similar tolerances for heat and cold. New plantings will likely be installed at a ratio of 2:1 to lost vegetation. Planting and restoration plans will be prepared by a Landscape Architect or similar professional in coordination with a plant ecologist.

3. In addition to new riparian plantings, enhancement of existing riparian areas along Bear Creek in the vicinity of both projects will also be proposed. The enhancement of riparian areas will include the removal of blackberry thickets and/or reed canarygrass, and the introduction of native riparian trees and shrubs.

4. A vegetation monitoring and maintenance plan will be implemented upon completion of the new riparian plantings. The monitoring program will be implemented for a period of no less than 5 years. The monitoring program will seek to achieve an 80 percent coverage rate for the planted riparian vegetation.

5. Vegetation removed for the proposed project will be mitigated by replacement. A planting plan will be prepared to provide riparian functions lost by vegetation removal for the project.

10.2 WETLANDS

1. Secure the necessary COE and DSL permits to allow the necessary filling of wetlands. The ODOT project and technical staff for each project will coordinate with regulatory agencies to develop the appropriate wetland mitigation measures.

2. Restore wetlands that are temporarily disturbed. Construct replacement wetlands as required by regulating authorities.

3. Clearly identify all wetland crossings in the field. During construction, install project-limiting fencing to restrict equipment operations within wetlands to be preserved.

4. Design all wetland crossings in accordance with current wetland protection regulations. At proposed wetland crossings, limit disturbance to the minimum extent necessary. Specify that all disturbed areas should be protected from erosion within seven (7) calendar days of completion of the project using vegetation or other means. All disturbed wetland areas will be restored within one year with native wetland species. Introduced plant materials will be from local sources and exhibit the same species diversity and character as native vegetation within existing wetlands. Control re-establishment of reed canarygrass at proposed crossings.

5. Design and implement mitigation projects within the same general area and watershed. Wherever possible, wetland topsoil will be salvaged for use in developing new wetland areas.

11.0 FINDING OF EFFECT

11.1 SOUTH MEDFORD INTERCHANGE

After evaluating the potential effects (Table 6.1), ODOT concludes that the proposed action described as the South Medford Interchange project will result in more than a negligible probability of "take" for the Southern Oregon/Northern California Coasts Coho Salmon ESU. The proposed action may "hinder the attainment of relevant functioning indicators" as defined in *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NOAA Fisheries 1996) for this species. Therefore, we make a determination of **may affect**, **likely to adversely affect,** with regard to the Southern Oregon/Northern California Coasts Coho Salmon ESU.

The extent of proposed work within or adjacent to the Bear Creek corridor has the potential for short-term adverse impacts on coho salmon. Several bridge bents will be located adjacent to or within the Bear Creek and Larson Creek OHWMs; however, ODOT proposes to conduct all work within the restricted work zone during the ODFW approved in-water work window for Bear Creek (June 15th to September 15th). In addition, ODOT will incorporate turbidity curtains and silt booms within streams affected by the proposed project to contain eroded sediments during construction. Replacement of the Highland Drive box culvert on Lazy Creek will require impoundment and conveyance of flow around the dried work area. Fish salvage work may be necessary during dewatering of the culvert replacement work area; however, it is not anticipated that coho salmon will be present in large numbers during salvage work.

This proposed action **may affect, but is not likely to adversely modify** the designated critical habitat of the Southern Oregon/Northern California Coasts Coho Salmon ESU. The addition of new impervious surfaces increases surface runoff and the potential for upland erosion and stream channel degradation. Construction of the two water quality

treatment/detention basins and a water quality swale, and the proper implementation of project soil erosion and sediment control measures will help minimize the potential for adverse impacts. The installation of new roadways and bridges will require the removal of a number of mature cottonwoods and willows from the Bear Creek corridor. The loss of this vegetation will have short-term adverse impacts on riparian functions and values. However, mitigation of the vegetation removal in the form of new riparian plantings in the project area will not result in any long-term net change in function of the existing riparian habitat as a result of the proposed project.

Due to this finding of effect, ODOT and FHWA are requesting initiation **of formal consultation** and conferencing in accordance with Section 7 of the ESA.

11.2 Bear Creek Highway 1 Bridges

After evaluating the potential effects (Table 6.1), ODOT concludes that the proposed action described as the Bear Creek Highway 1 Bridges project will result in more than a negligible probability of "take" for the Southern Oregon/Northern California Coasts Coho Salmon ESU. The proposed action may "hinder the attainment of relevant functioning indicators" as defined in *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NOAA Fisheries 1996) for this species. Therefore, we make a determination of **may affect, likely to adversely affect,** with regard to the Southern Oregon/Northern California Coasts Coho Salmon ESU.

The extent of proposed work within or adjacent to the Bear Creek corridor has the potential for short-term adverse impacts on coho salmon. Several bridge bents will be located adjacent to or within the Bear Creek OHWM. However, ODOT proposes to conduct all work within the restricted work zone during the ODFW approved in-water work window for Bear Creek (June 15th to September 15th). In addition, ODOT will incorporate turbidity curtains and silt booms within streams affected by the proposed project to contain eroded sediments during construction.

This proposed action **may affect, but is not likely to adversely modify** the designated critical habitat of the Southern Oregon/Northern California Coasts Coho Salmon ESU. The replacement of the existing bridges is not expected to create a large amount of new impervious surfaces. Stormwater originating from the bridges will be directed to the southern detention basin and water quality swale for the SMI project and no long-term effects on water quality are expected. The implementation of sediment control measures and other conservation practices will limit any potential project-related effects to the project vicinity. Riparian vegetation impacts will be limited to blackberry thickets, small shrubs and saplings since the project will occur entirely within the maintained right-of-way for I-5. The right-of-way is largely void of mature riparian forest vegetation. Small saplings, shrubs and herbaceous vegetation removed during construction will be restored. Additional mitigation in the form of new riparian plantings will occur in the project area to ensure that the project will not result in a long-term net change in function of the existing riparian habitat.

Due to this finding of effect, ODOT and FHWA are requesting initiation **of formal consultation** and conferencing in accordance with Section 7 of the ESA for the Bear Creek Highway 1 Bridges project.

11.3 INCIDENTAL TAKE STATEMENT

Recent smolt trapping in Bear Creek has resulted in variable estimates of smolt density. In 2001, smolt density was estimated at 3.7 coho smolts per mile (2.3 smolts per kilometer), in 2002, it was estimated at 81 coho smolts per mile (50 smolts per kilometer) and in 2003 it was estimated at 7.3 coho smolts per mile (4.7 smolts per kilometer) (Vogt 2001, 2002, and 2003). Coho smolts generally out-migrate in the spring between March and June. Therefore, coho smolts may be present in the project area during the first part of the in-water work window (June 15-September 15). In addition, resident juvenile coho may be present within the project area. The project area generally does not have good coho spawning or rearing habitat, although other tributaries in Bear Creek upstream of the project area do. Therefore, the project area is most likely to be used by adult and juvenile/smolt coho as a migration corridor (Evenson pers. comm., 2003b). In addition, it is likely that water temperatures in the project area would be too warm during the in-water work period to support juvenile coho rearing. However, some evidence from other watersheds in the Medford area indicates that coho juveniles are able to survive in streams where water temperatures would be expected to be a limiting factor (Evenson pers. comm., 2003b). Therefore it should be assumed that juvenile coho or coho smolts may be present within the project area at any time.

The highest number of smolts estimated from the trapping studies was 50 smolts per stream kilometer. In estimating the incidental take, this figure will be used as a conservative maximum concentration of smolts within the project area (which will likely be less during in water work). Conservatively, doubling this figure to estimate coho smolt and juvenile density gives 100 coho smolts/juveniles per stream kilometer within the project area (or one smolt/juvenile for every 10 m (33 ft) of stream). With an average wetted channel width of 15 m (50 ft), the average coho density would be one smolt/juvenile every 150 m^2 (1,615 ft^2). The number of coho smolts/juveniles that are likely to require salvaging can now be calculated based on the total area of the in-water work area containments required.

Twenty four in-water work area containments are required for the South Medford Interchange Project, totaling 3,850 m^2 (41,440 ft^2). Using one coho smolt/juvenile per every 150 m^2 (1,615 ft^2) yields a total of 26 smolts/juveniles captured and handled during fish salvage efforts.

Fifteen in-water work area containments are required for the Bear Creek Highway 1 Bridges Replacement Project, totaling 2,450 m^2 (26,372 ft^2). Using one coho smolt/juvenile per every 150 m^2 (1,615 ft^2) yields a total of 16 smolts/juveniles captured and handled during fish salvage efforts.

It is anticipated that approximately 10 percent of the fish caught during salvage operations will likely result in lethal takings. This number will amount to 3 coho salmon for the SMI project and 2 coho for the Bear Creek Highway 1 Bridges project. However; because of generally low water levels and elevated water temperatures in this reach during fish salvage

operations, it is expected that mortality rates could be elevated during recovery. Therefore, we anticipate one additional lethal take of coho salmon for each project, for a final maximum take estimate of 4 coho salmon for the SMI project and 3 coho salmon for the Bear Creek Highway 1 Bridges project.

12.0 ESSENTIAL FISH HABITAT CONSULTATION

12.1 OVERVIEW OF ESSENTIAL FISH HABITAT

Public Law 104-267, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to establish new requirements for "Essential Fish Habitat" (EFH) descriptions in federal fishery management plans and to require federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH. EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Pacific Fisheries Management Council (PFMC) has recommended an EFH designation for the Pacific salmon fishery that will include those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery (i.e., properly functioning habitat conditions necessary for the long-term survival of the species through the full range of environmental variation).

The Magnuson-Stevens Act requires consultation for all actions that may adversely affect EFH, and it does not distinguish between actions in EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

The consultation requirements of section 305(b) of the Magnuson-Stevens Act (16 U.S.C. 1855(b)) provide that:

1. Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;

2. NOAA Fisheries shall provide conservation recommendations for any federal or state activity that may adversely affect EFH.

3. Federal agencies shall, within 30 days after receiving conservation recommendations from NOAA Fisheries, provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the

conservation recommendations of NOAA Fisheries, the federal agency shall explain its reasons for not following the recommendations.

12.2 IDENTIFICATION OF ESSENTIAL FISH HABITAT

Salmon fishery EFH includes all streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except above the impassable barriers identified by PFMC (PFMC 1999). Chief Joseph Dam, Dworshak Dam, and the Hells Canyon Complex (Hells Canyon, Oxbow, and Brownlee Dams) are among the listed man-made barriers that represent the upstream extent of the Pacific salmon fishery EFH. Salmon EFH excludes areas upstream of longstanding naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years). In the estuarine and marine areas, proposed salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 kilometers [230.2 miles]) offshore of Washington, Oregon, and California north of Point Conception (PFMC 1999).

12.3 CONCLUSION

12.3.1 South Medford Interchange

The SMI project will have construction activities that will require work within active stream channels (in-water work in Bear, Larson and Lazy Creeks) and may have temporary negative effects on water quality and hydrology. The conservation measures and special provisions described in this BA (Section 7.0) are considered adequate to prevent long-term adverse effects on EFH for Pacific salmon within either project area. However, ODOT believes that the proposed actions for the SMI project is **likely to adversely affect** Pacific salmon EFH due to the occurrence of in-water work and the possibility of temporary increases in sedimentation.

12.3.2 Bear Creek Highway 1 Bridges

The Bear Creek Highway 1 Bridges project will also have construction activities that will require in-water work within active stream channel of Bear Creek and may have temporary negative effects on water quality and hydrology. The conservation measures and special provisions described in this BA (Section 7.0) are considered adequate to prevent long-term adverse effects on EFH for Pacific salmon within either project area. However, ODOT believes that the proposed actions for Bear Creek Highway 1 Bridges Replacement project is **likely to adversely affect** Pacific salmon EFH due to the occurrence of in-water work and the possibility of temporary increases in sedimentation.

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Appendix A1

Photographs of the
South Medford Interchange Project Area

Photo 1. View to the southeast along the east side of Highway 99 from the vicinity of the Stewart Avenue intersection. Proposed road improvements within this section of the project will include the addition of turning lanes. Land use is commercial development and public park.

Photo 2. View to the southwest showing existing intersection of Center Drive and Belknap Road in photo background. The proposed Garfield Street Extension will extend from Highway 99 (in far background of photo) into foreground of photo. White stake in foreground indicates proposed centerline of Garfield Street Extension.

Photo 3. View to the northeast showing existing Babe Ruth ballfield along proposed alignment for the Garfield Street Extension. The proposed Garfield Street Extension will pass through the ballfield into the equipment parking area in far background of photo.

Photo 4. View to the northwest showing proposed location of southern stormwater treatment/detention facility. This area will also be used as an equipment staging area. Proposed route of Garfield Street Extension will extend through background of photograph. Interstate 5 (I-5) is just off the right hand side of the photo.

Photo 5. View to the northwest showing proposed location of southbound (SB) off-ramp from I-5. The existing SB lanes to I-5 are to the right of the roadway embankment on the right side of photo. Existing stormwater detention basin is located within the fenced enclosure in the far left background of photo.

Photo 6. Photo view to the southeast showing proposed location of Garfield Street Ramp to Hwy. 1 SB bridge over Bear Creek (Bridge No. 19114 – SB on-ramp bridge to I-5). The existing SB I-5 bridge over Bear Creek is at the left side of the photograph. Large rock in center of photograph is located at the top of bank for Bear Creek. This area is also the approximate location of the proposed outfall from the southern stormwater treatment/detention facility. Some of the riparian vegetation at right background of photo would be removed during construction of proposed southbound on-ramp bridge to I-5.

Photo 7. Photo view to the southwest showing existing riprap and bridge bent for the SB I-5 bridge over Bear Creek (Bridge No. 19283). The riprap extends into photo background along the west bank of Bear Creek and is covered by dense Himalayan blackberry. Proposed SB on-ramp bridge to I-5 would be constructed over the riprap and blackberry in photo background.

Photo 8. Alternate view to the southwest from under the existing SB I-5 bridge over Bear Creek. Note riprap on west bank of Bear Creek in photo background. Proposed SB on-ramp bridge to I-5 would be constructed over this bank.

Photo 9. View to the southeast along the SB lanes of I-5 showing existing disturbed right of way along the west side of highway. Photo taken from existing SB I-5 bridge over Bear Creek. Proposed SB I-5 on-ramp bridge (Bridge No 19114) would extend through center of photo into photo background to meet the existing roadway. Note dense growth of Himalayan blackberry throughout this section of the roadway. Riparian forest vegetation at far right side of photo would not be impacted by construction.

Photo 10. View to the northwest along the northbound (NB) lanes of I-5 showing proposed location of proposed Hwy. 1 NB ramp to Highland Drive Bridge over Bear Creek (Bridge No. 19109 – NB off-ramp from I-5). White stakes in photo center indicate proposed centerline of ramp. Proposed ramp bridge would extend into photo background to proposed interchange.

Photo 11. Photo view to the southeast along NB lanes of I-5 showing proposed location of Highland Drive ramp to Hwy. 1 NB (Bridge No. 19284 – NB on-ramp bridge for I-5). Proposed interchange would be constructed in photo background and ramp bridge would extend to photo foreground. Red stakes in photo indicate proposed bent locations for NB on-ramp bridge. Riparian forest vegetation along left side of photograph would be removed along bridge alignment.

Photo 12. Photo view to the southeast showing typical riparian forest vegetation along Bear Creek.

Photo 13. View to the northeast showing east bank of Bear Creek at the proposed location of Highland Drive Bridge over Bear Creek (Bridge No. 19110). The proposed location of the interchange is behind the photographer. The east bank of Bear Creek at this location is steep and composed of large riprap.

Photo 14. View to the southwest showing proposed location of Highland Drive Bridge over Bear Creek (Bridge No. 19110). Red stakes in photo background indicate proposed bridge bent locations. The proposed bridge will cross Bear Creek at the tree line in the center background of photo.

Photo 15. View to the northeast showing proposed location of the Highland Drive Extension through open vacant lot just south of Larson Creek. The proposed Highland Drive Bridge over Larson Creek (Bridge No. 19111) will be at the tree line in the photo background.

Photo 16. View to west showing existing channel of Larson Creek at location of Highland Drive Bridge over Larson Creek (Bridge No. 19111). Note incised nature of channel.

Photo 17. View to the south showing vacant lot just south of Barnett Road. Larson Creek at tree line in photo background. Proposed Highland Drive Extension will cross Larson Creek at photo background and extend to photo foreground to connect with Barnett Road.

Photo 18. Photo view to the south from Barnett Road showing proposed location of northern stormwater treatment/detention facility. The existing on-ramp to NB I-5 and the existing off-ramp in photo center will be decommissioned and removed to accommodate construction of the stormwater treatment/detention facility.

Photo 19. View to the southeast showing the north elevation of the existing Barnett Road Bridge over Bear Creek (Bridge No. 19285). Note cemented condition of stream channel at this location. The existing bridge bents in and adjacent to the creek channel will be removed when the bridge is replaced with a single-span structure.

Photo 20. Photo view to the west showing south elevation of the existing Barnett Road Bridge over Bear Creek (Bridge No. 19285). Both banks have riprap that is covered with Himalayan blackberry. The proposed outfall for the northern stormwater treatment/detention facility will be constructed on the west bank of Bear Creek in the center background of the photo.

Photo 21. Alternate view to the east showing south side of the existing Barnett Road Bridge over Bear Creek (Bridge No. 19285). Small palustrine emergent wetland is located on the east bank of Bear Creek at the right background of the photograph.

Photo 22. View to the east showing the existing box culvert that conveys Lazy Creek under Highland Drive. The vertical drop at the outlet for the culvert is approximately 0.5 m (1.5 ft). This culvert is considered to be a partial barrier to juvenile salmonids. This culvert will be replaced with a bridge during the proposed widening of Highland Drive. The proposed Highland Drive Bridge over Lazy Creek (Bridge No. 19286) will be a single-span structure.

Photo 23. View to the west showing existing channel for Lazy Creek downstream of box culvert in Photo 22. This section of Lazy Creek is extensively channelized and the herbaceous vegetation is dominated by reed canarygrass. Streamflow is towards photo background.

Photo 24. View to the southeast along Highland Drive toward Lazy Creek crossing. The red vehicle in the photo background is at the approximate location of Lazy Creek. Forested wetlands are located in wooded area just off the shoulder of the roadway on the right side of the photograph. These wetlands will not be impacted by the proposed improvements along Highland Drive.

Appendix A2

Photographs of
Bear Creek/Highway 1
Northbound and Southbound
Bridges Replacement Project Area

Photo 1. Photo view to the northeast showing southbound (SB) lanes and maintained right-of-way for Highway 1 (Interstate I-5). Existing I-5 bridges over Bear Creek (Bridge Nos. 19282 and 19283) in center background of photograph.

Photo 2. Photo view to the east showing existing I-5 bridge crossings over Bear Creek floodplain. Southbound bridge structure (Bridge No. 19283) in photo foreground and northbound (NB) bridge structure (Bridge No. 19282) in photo background. Majority of vegetation under the bridges is comprised of small shrubs and herbaceous vegetation. Bear Creek is located to the left off the photo.

Photo 3. Alternate view to the east showing the existing NB I-5 bridge structure over Bear Creek floodplain. Vegetation is largely comprised of shrubs and herbaceous vegetation. No mature riparian forest vegetation exists around the immediate bridge structures.

Photo 4. Photo view to the northeast showing existing NB I-5 bridge structure over Bear Creek. Temporary work bridge would be constructed over Bear Creek on this side of the bridge structure to facilitate replacement of the existing bridge. Note location of existing bridge piers either within or at the edge of the Bear Creek stream channel.

Photo 5. Photo view to the north showing the existing conditions along the north bank of Bear Creek between the existing I-5 bridge structures. Southbound I-5 bridge structure on left side of photograph and NB I-5 bridge structure on right side of photograph. Note large collection of riprap evident under the SB I-5 bridge structure. Note location of bridge piers in Bear Creek stream channel.

Photo 6. Photo view to the south showing the existing conditions along the south floodplain and bank of Bear Creek between the existing I-5 bridge structures. Northbound I-5 bridge structure on left side of photograph and SB I-5 bridge structure on right side of photograph. Vegetation in this area is dominated by Himalayan blackberry that covers large volumes of riprap between and under the bridge structures in the photo background.

Photo 7. Photo view to the southwest from under the existing SB I-5 bridge structure showing Bear Creek stream channel. Note riprap on west bank of Bear Creek in photo background. Note bridge pier location next to Bear Creek and absence of riprap at left margin of photo.

Photo 8. Photo view to the southwest showing existing riprap and bridge bent for the existing SB I-5 bridge structure over Bear Creek. The riprap extends into photo background along the north bank of Bear Creek and is covered by dense Himalayan blackberry. Riprap extends behind photographer along the north bank to NB I-5 bridge structure. Note location of bridge bent in channel of Bear Creek.

Photo 9. Photo view to the southeast showing existing riprap and bridge bent for the NB I-5 bridge structure over Bear Creek. East profile for SB I-5 bridge structure in photo background. Riprap shown in Photo 8 extends along the north bank of Bear Creek between the two bridges through photo 9's foreground to a point approximately 10 m (30 ft) behind the photographer. Note location of bridge bent in channel of Bear Creek.

Photo 10. View of existing vegetation on the median at the southern end of the I-5 bridges over Bear Creek. Vegetation consists of both native and non-native tree and shrub species.

Appendix B1

Preliminary Project Plan
for the
South Medford Interchange Project

Appendix B2

Preliminary Project Plan
for the
Bear Creek/Highway 1
Northbound and Southbound
Bridges Replacement Project

Appendix C1

Preliminary Bridge Plans
for the
South Medford Interchange Project

Appendix C2

Preliminary Bridge Plans for
Bear Creek/Highway 1
NB and SB
Bridges Replacement Project