4.6 BIOLOGICAL RESOURCES

This section describes the existing conditions of biological resources along the I-90 corridor and the vicinity that could be affected by the Project. The section also assesses the impacts to biological resources that would be attributable to the various alternatives. The impact assessment process included contacts with federal and state agencies, literature review, and field surveys. Subjects addressed in this section include habitat types, threatened and endangered species, other wildlife species, and noxious weeds. A technical report was prepared that contains detailed descriptions of the affected environment and the life histories of threatened and endangered species. A Biological Assessment was performed on Alternative R-8A, the Preferred Alternative, and the conclusions were that the project was determined to "may affect, not likely to adversely affect" Chinook Salmon, Coho Salmon, and Bull Trout. The project was determined to have no effect on Bald Eagles. NOAA Fisheries concurred in these determinations on January 20, 2004 and the United States Fish and Wildlife Service concurred on February 24, 2004. Copies of both concurrence letters are included in Appendix F.

4.6.1 Affected Environment

The Project study area for biological resources within the right-of-way corridor of I-90 and extends from 4th Avenue S in Seattle, through the City of Mercer Island, to the I-405 interchange in Bellevue along the I-90 corridor in Washington state. In addition, the study area for the analysis of impacts to fish includes the stormwater discharge points.

4.6.1.1 Habitats

Three major habitat types occur in the study area. These habitat types are urban landscaped, open water, and stream. However, the open water and stream habitats are the only special habitats in the study area. Each of the habitat types present in the study area is described below.

Urban Landscaped

The urban landscaped habitat occurs along most of the study area including the Corwin Curves, Mercer Island Central Business District, and Shorewood area. This habitat type includes freeway planting strips on fill material. Common vegetation in these habitats includes nonnative ornamental trees and shrubs, such as maple (*Acer* spp.), rockrose (*Cistus* sp.), and weed species such as Himalayan blackberry (*Rubus discolor*). Native trees such as Douglas fir (*Pseudotsuga menziesii*) and pines (*Pinus* spp.) have also been planted. English ivy (*Hedera helix*) is the most common groundcover in this habitat type and can be seen trailing over the concrete walls of the medians and sound barriers.

Open Water

The open water habitat is adjacent to the portions of the corridor (bridges) that cross Lake Washington. Lake Washington is a large freshwater lake with two major inlets: the Cedar River and the Sammamish Slough. Lake Washington's only outlet is the Montlake Cut, which leads to Lake Union. Lake Washington is the second largest natural lake in the state, with about

80 miles of shoreline (including about 30 miles along the shore of Mercer Island) and a surface area of about 35.6 square miles.

Stream

The stream habitat is the portion of the Mercer Slough adjacent to the drain that discharges stormwater from the Bellevue Way SE ramp. The stormwater drain is located on the west bank of Mercer Slough, approximately 400 feet upstream from the mouth of the slough where it enters Lake Washington and between the overpasses for the east and west bound lanes of I-90. The drainpipe discharge point is at least 30 feet from the bank at low water. Mercer Slough was at one time a part of Lake Washington, but when the lake level was lowered by the construction of the Chittenden Locks and the Montlake Cut, the lake bottom was transformed into a marshy peat bog. Mercer and Kelsey Creeks supply the water for Mercer Slough. The reaction of Kelsey Creek to storms is fast and dramatic because of the large impervious land area and piped storm drain system, with flows varying between a low flow of 5.12 to 670 cubic feet per second (cfs) and a mean stream flow of 22 cfs (USGS 2002). However, Mercer Slough is a highly backwatered extension of Lake Washington and the backwater and storage effect of the slough would tend to dampen increases in peak flow generated by upstream impervious surface area.

Wetlands are present along the shores of Mercer Slough including the drainpipe discharge point (WSDOT 2002c). The Mercer Slough wetland complex contains forested, scrub-shrub, and emergent communities. An emergent wetland community is present in the vicinity of the drainpipe discharge point, documented by non-native plants such as field bindweed (*Convulvulus arvensis*) and purple loosestrife (*Lythrum salicaria*).

Mercer Slough provides a migratory pathway and rearing habitat for salmonids that spawn in the upstream tributaries (Mercer, Kelsey, Richards, and Sturtevant Creeks). Coho salmon (*Oncorhyncus kisutch*) and coastal cutthroat trout (*Oncorhynchus clarki clarki*) are the dominant salmonid species, with Chinook salmon (*Oncorhynchus tshawytscha*) stocks increasing in recent years (Foley 2000). The majority of the coastal cutthroat trout in Lake Washington and its spawning tributaries have a lacustrine life history, spawning in the tributaries and rearing to maturity in the lake (Nowak 2000; Sabo 1995).

4.6.1.2 Threatened and Endangered Species

As part of agency consultation, the National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), Washington Department of Natural Resources (WDNR), and Washington Department of Fish and Wildlife (WDFW) were contacted to obtain records of state and federal protected species in the study area (Appendix C). (Since the biological analysis was conducted NMFS has now become NOAA Fisheries.)

Plants

The WDNR has no record of any T&E plant species occurring within the study area (Table 4.6-1). There is also no suitable habitat for T&E plant species along the I-90 corridor.

Wildlife

As part of agency consultation, the USFWS and WDFW identified one federal and state threatened wildlife species, the bald eagle (*Haliaeetus leucocephalus*), as likely to occur in the vicinity of the study area. Two federal species of concern have specific occurrences within a 1-mile radius of the study area: the peregrine falcon (*Falco peregrinus*) and the western pond turtle (*Clemmys marmorata marmorata*). Each of the species and their habitat requirements are described below.

Table 4.6-1
List of Threatened and Endangered Species

Common Name	Scientific Name	Status	
		Federal	State
Plants			
None			
Wildlife			
Bald eagle	*Haliaeetus leucocephalus*	T	T
Peregrine falcon	*Falco peregrinus*	SOC	S
Western pond turtle	*Clemmys marmorata*	SOC	E
Fish			
Puget Sound/Georgia Strait Coho salmon	*Oncorhyncus kisutch*	C	None
Puget Sound Chinook salmon	*O. tshawytscha*	T	C
Bull trout	*Salvelinus confluentus*	T	C

Explanation of Status Codes:
E - Endangered
T - Threatened
C - Candidate for Listing as Threatened or Endangered
SOC - Species of Concern
S - Sensitive

Source: NMFS, USFWS, WDNR, WDFW

Bald Eagle

The bald eagle is listed as a federal threatened and a state threatened species in Washington. The bald eagle population has been steadily increasing since the species received federal protection in 1978 (USFWS 1978). The USFWS is expected to delist the species in the near future (Stinson et al. 2001; USFWS 1999c).

Bald eagle foraging and wintering habitat occurs along the shores of Mercer Slough, Lake Washington, and various wooded tracts in the project vicinity (WDFW 2002a). There are several known bald eagle nests on Mercer Island, Bellevue, and Seward Park. Two nests are located close to the study area, both on the northern portion of Mercer Island and both approximately 0.6 mile from the I-90 corridor. These two nests are adjacent to each other on the same hillside. Urban/residential development exists between the study area and the nests. All bald eagle nests identified by WDFW have a mapped nesting territory associated with their location. The territories are the approximate biological use area, identified by WDFW, for the pair using the nest (Stofil 2002). The study area intersects two mapped territories. Most of the territories include the shoreline of Lake Washington, the primary foraging area for bald eagles.

No bald eagles were observed during field investigations.

Peregrine Falcon

The peregrine falcon is listed as a federal species of concern and a state sensitive species in Washington. Originally listed as endangered in 1970 (USFWS 1970), the peregrine falcon was delisted as a federal endangered species on August 25, 1999 (USFWS 1999b) and classified as a federal species of concern. The Washington State Fish and Wildlife Commission reclassified the peregrine falcon on April 13, 2002, from state endangered status to "sensitive" based on an increase in the Washington state breeding population from 5 known nesting pairs in 1980 to at least 73 pairs in 2002 (WDFW 2002b; Hays and Buchanan 2002).

Federal and state wildlife agencies identified two known peregrine falcon nests in the vicinity of the study area. Both are on manmade structures and over 2 miles from the study area, at the closest point. One of the nests is on a skyscraper building in downtown Seattle, where peregrines have been nesting since 1994.

No peregrine falcons were observed during field investigations.

Western Pond Turtle

The western pond turtle is listed as a federal species of concern and a state endangered species in Washington. Populations of this reptile are declining in Washington due to both natural and human-related impacts (Nordstrom and Milner 1997). Western pond turtles need shallow bodies of water with sufficient basking surfaces and vegetative cover to provide refuge.

The WDFW noted an individual occurrence of western pond turtle in the vicinity of the study area. The record is dated 1988 and the individual had originally been found in Burien in poor condition. The last reliable sight record of a western pond turtle in Lake Washington was under State Route (SR) 520 in 1992 (Hays et al. 1999). Competition with introduced turtles; predation by introduced species; the frequent disturbance of basking and foraging behavior by recreationalists; and an overall reduction of suitable wetlands and basking and nesting areas combine to make Lake Washington's habitat currently unsuitable for supporting a viable population of western pond turtles. As a result, Lake Washington was not included among the 21 water bodies surveyed in 1995 as possible reintroduction sites (Hays et al. 1999).

No western pond turtles were observed during field investigations.

4.6.1.3 Fish

Lake Washington is part of the Cedar/Sammamish watershed, which contains two major river systems, the Cedar and the Sammamish Rivers, and two other large lakes, Lake Union and Lake Sammamish. Despite heavy alteration, several species of salmonids still migrate through the lake and use it for various parts of their life cycle.

The NMFS and USFWS identified two T&E and one candidate fish species that occur in the study area. The species identified by the NMFS that use Lake Washington include Puget Sound/Strait of Georgia coho salmon and Puget Sound chinook salmon as likely to occur in the study area. The USFWS identified bull trout (*Salvelinus confluentus*) as likely to occur in Lake Washington near the study area. Discussions of the species are given below.

Chinook Salmon

Chinook salmon in the Lake Washington basin are considered part of the Puget Sound Evolutionary Significant Unit (ESU), which was federally listed as threatened in 1999 (NMFS 1999). The general life history of anadromous chinook salmon includes both freshwater and saltwater phases of development. Incubation, hatching, and emergence occur in freshwater, followed by migration to the ocean at which time smoltification occurs. After several years, maturation begins and adults return to freshwater habitats to spawn in their natal streams.

A unique attribute of Cedar/Sammamish chinook salmon is that they must migrate through Lake Washington. No other chinook stocks in Puget Sound, and only a few in Washington, utilize a large lake for adult migration and juvenile rearing (Kahler 2000; Kerwin 2001; City of Seattle 2000). Nearshore areas of the lake (usually less than 10 feet in depth) with fine substrates of sand and gravel are important areas that may be used as rearing grounds where juvenile chinook may grow prior to smolt out-migration and thus improve their chances of survival (Kerwin 2001). Juvenile chinook are rarely found in the limnetic (over about 30 feet in depth) habitats until after early May, when the smolt migration begins (Kerwin 2001). Smolts travel through the limnetic and littoral (under about 30 feet in depth) zones from mid May through at least late July (Kahler 2000, Kerwin 2001).

Lake Washington chinook stocks are summer/fall stocks that spawn primarily from mid-September through October (WDF et al. 1993). There are two native chinook salmon stocks in the Lake Washington basin (WDF et al. 1993). A native stock of chinook spawns in northern Lake Washington tributaries, including Thornton Creek, McAleer Creek, and the Sammamish River and its tributaries below Lake Sammamish. A second native stock of chinook salmon spawns in the Cedar River, the main tributary to south Lake Washington. In addition, an introduced run of chinook salmon occurs in Issaquah Creek at the head of Lake Sammamish, and several runs of chinook salmon have been introduced into tributaries on the east shore of Lake Washington, including Kelsey Creek, a tributary of Mercer Slough (Kahler 2000; Kerwin 2001).

Coho Salmon

Coho salmon in the Lake Washington basin are considered part of the Puget Sound/Strait of Georgia ESU and were determined to be candidates for listing under the ESA in 1995 (NMFS 1995).

Coho salmon utilize, to some degree, almost all accessible tributaries draining into Lake Washington (Kahler 2000; Kerwin 2001). Coho returning to these tributaries enter freshwater from mid-September to mid-November and spawn from late October to late February (WDF et al. 1993). Juvenile coho generally begin migrating to sea as smolts during their second spring.

Bull Trout

Bull trout in the Lake Washington basin are considered part of the Coastal-Puget Sound Distinct Population Segment (DPS), which was federally listed as threatened in 1999 along with all bull trout populations in the coterminous United States (USFWS 1999a). Dolly Varden (*Salvelinus malma*) in Washington state were proposed for listing as threatened under the similarity of appearance rule in 2001 (USFWS 2001). Because it is extremely difficult to separate these

species during field identification, the Washington State Department of Fish and Game manages these species together as "native char."

Bull trout exhibit resident and migratory life history strategies through much of the current range. Bull trout are found primarily in colder streams, although individual fish are found in larger river systems through the Columbia River basin (Federal Register Vol. 63 No. 111 1998). Strict cold water temperature requirements make bull trout vulnerable to activities that warm spawning and rearing waters.

Information on the presence, abundance, distribution, utilization, and life history of bull trout in the Cedar/Sammamish Watershed is either unavailable or extremely limited and reproducing populations of char in the lower Cedar River, Lake Washington, or Lake Sammamish or their tributaries have not been confirmed (Kerwin 2001; Kahler 2000). During the last two decades one "native char" was captured in Lake Sammamish and five in Lake Washington. One was captured between the SR 520 and I-90 bridges in about 200 feet of water. The others were found in less than 30 feet of water. It is possible that none of the streams in the Lake Washington basin, outside of the Cedar River and its tributaries above Chester Morse Reservoir, have a low enough temperature regime to allow successful reproduction of a viable population (Kerwin 2001; Kahler 2000; WDFW 1998; USFWS 1998; Berge and Mavros 2001; KCDNR 2000).

4.6.1.4 Other Wildlife Species

Several other wildlife species were observed in the study area occurring in the habitats previously described. Table 4.6-2 includes species observed during field investigations.

Table 4.6-2
Wildlife Species Observed During Site Investigations

Common Name	Scientific Name
Canada goose	*Branta canadensis*
Gadwall	*Anas strepera*
Mallard	*Anas platyrhynchos*
American coot	*Fulica americana*
Rock dove	*Columba livia*
American crow	*Corvus brachyrhynchos*
Black-capped chickadee	*Poecile atricapilla*
European Starling	*Sturnus vulgaris*
American robin	*Turdus migratorius*
Spotted Towhee	*Pipilo maculatus*
House finch	*Carpodacus mexicanus*

Source: RS Corporation

The great blue heron (*Ardea herodias*), a state monitor species, was also identified by the WDFW as occurring in the vicinity. State monitor species do not receive additional protection under state laws, but are considered "watch species" by biologists, and managed by WDFW to prevent them from becoming endangered, threatened, or sensitive. A great blue heron rookery is located approximately 1 mile north of the study area near the I-405 freeway. The rookery has been intermittently active since the 1940s, ranging from 10 to 20 nests. Its proximity to I-405 indicates that the birds are tolerant of continuous noise and disturbance at close range.

4.6.1.5 Noxious Weeds

Noxious weeds are nonnative, invasive species that threaten agriculture, rangelands, waterways, parks, wildlife, property values, public health and safety, and general ecological health and diversity of native ecosystems. Noxious weed infestations are the second leading cause of wildlife habitat loss (WNWCB 2001). All state agencies are required to control noxious weeds on lands they own, lease, or otherwise control through integrated pest management practices (RCW 17.10.145). King County classifies weeds under one of five categories: Class A, Class B, Class C, Weeds of Concern, and Obnoxious Weeds. No Class A or C weeds were observed during site investigation.

Habitat for noxious weeds in the study area is limited because most of the study area is paved. However, noxious weeds were observed growing along the shoulders and in landscaped areas within the I-90 corridor. English ivy is abundant in the landscaped areas along Mercer Island. In addition, Eurasian watermilfoil is present in Lake Washington and is likely adjacent to the bridges, especially near the shorelines. Scot's broom was observed adjacent to the Bellevue Way SE on-ramp. Numerous noxious weeds are present in the Mercer Slough area including reed canarygrass, herb Robert, bitter nightshade, and purple loosestrife. Noxious weeds observed during the site investigation are listed in Table 4.6-3.

Table 4.6-3
Noxious Weeds Present in the Study Area

Common Name	Scientific Name	King County Status
Scot's broom	*Cytisus scoparius*	Class B
Herb Robert	*Geranium robertianum*	Weed of Concern
English ivy	*Hedera helix*	Weed of Concern
Purple loosestrife	*Lythrum salicaria*	Class B
Eurasian watermilfoil[1]	*Myriophyllum spicatum*	Weed of Concern
Reed canarygrass	*Phalaris arundinacea*	Weed of Concern
Tansy ragwort[1]	*Senecio jacobaea*	Class B
Bitter nightshade	*Solanum dulcamara*	Weed of Concern
Himalayan Blackberry	*Rubus Discolor*	Obnoxious Weed

[1]Not observed during site investigation. Listed by King County Noxious Weed Control Board as present in study area.

Source: URS Corporation

Class B requires "control" by law. For Weeds of Concern, control is strongly encouraged by King County and new plantings are discouraged.

4.6.2 Impacts

4.6.2.1 Construction

Habitats

Alternative R-1: Existing/No Build

No construction or other alteration of the transportation corridor would occur with the No Build Alternative. Therefore, no Project-related impacts to habitats would be expected to occur with Alternative R-1. Effects of existing land uses would still continue.

Alternative R-2B Modified

Construction would be within the existing I-90 rights-of-way and therefore not require the removal of any high quality or special habitats. Location of staging areas is unknown at this time, but they would also likely be within the I-90 rights-of-way. If modifications to the drainpipe located in Mercer Slough were required, minor impacts to wetlands in the immediate area could occur. Issues would be addressed during the shoreline and water quality permitting process and mitigation provided if required.

Alternative R-5 Restripe

No impacts to habitats would occur as a result of the restriping activities.

Alternatives R-5 Modified and R-8A – Preferred Alternative

With Alternatives R-5 Modified and R-8A, some landscaped areas in the First Hill lid, CBD and Shorewood areas of Mercer Island, and adjacent to Bellevue Way SE ramp would be lost due to road widening. These habitats are disturbed and/or ornamental and offer little value to T&E species or other wildlife. If modifications to the drainpipe located in Mercer Slough were required (see Section 4.7 for a description of the proposed construction method), minor impacts to wetlands in the immediate area could occur. Issues would be addressed during the shoreline and water quality permitting process and mitigation provided if required.

Threatened and Endangered Species

Alternative R-1: Existing/No Build

No construction or other alteration of the transportation corridor would occur with the No Build Alternative. Therefore, no Project-related impacts to threatened and endangered species would be expected to occur with Alternative R-1. Effects of existing land uses would still continue.

Alternatives R-2B Modified, R-5 Modified and R-8A – Preferred Alternative

Wildlife. With Alternatives R-2B Modified, R-5 Modified and R-8A, construction would take place in the I-90 corridor, where any foraging bald eagles are likely to be habituated to noise and vehicle traffic. The closest bald eagle nest is 0.6 mile from the study area, but bald eagles do forage along the shorelines of Lake Washington and the Mercer Slough. None of the construction activity would occur near suitable perch trees for foraging eagles. There are no suitable perch trees near the Mercer Slough in the vicinity of the study area, and the slough (and Lake Washington) does not support a run of chum salmon, which is the salmonid species that supports most foraging concentrations of wintering bald eagles (due to the timing of spawning and presence of large numbers of carcasses on gravel bars of large mainstem rivers that support chum runs) (Stinson et al. 2001). This work would not likely require in-water work or construction access, although an existing drainage outfall to Mercer Slough might be replaced. Due to the developed nature and lack of suitable perch trees within the study area, construction impacts to bald eagles would be expected to be low.

No construction impacts to peregrine falcons would be expected since the nearest known nesting site is over 2 miles away from the study area. As discussed in subsection 4.6.1.2, Lake Washington is currently unsuitable to support a viable population of western pond turtles and therefore, no construction impacts to western pond turtles would be expected.

Fish. Chinook (threatened) and coho (candidate) salmon spawning in tributaries of Mercer Slough migrate through the Mercer Slough during both their upstream and downstream migrations. Bull trout are not known to reproduce in the Lake Washington watershed except for an isolated population native to the upper Cedar River watershed above an impassable barrier falls. A total of five bull trout have been documented in Lake Washington in the last two decades. Although rare in Lake Washington, bull trout may occasionally enter Mercer Slough to forage on small fish, smolts, and salmon eggs. It is unlikely that bull trout would remain in Mercer Slough or its tributaries during the summer and early fall months, when temperatures exceed 16°C. In-water construction in Mercer Slough would likely cause disturbance to the nearshore areas of the slough during construction. A temporary erosion and sediment control plan as well as a spill prevention plan would be implemented during construction to minimize impacts to the area. In-water work would occur during the appropriate construction window for Mercer Slough to further minimize potential impacts to migrating listed T&E fish species in Mercer Slough.

With Alternatives R-5 Modified and R-8A, impacts to Mercer Slough would be similar to those in Alternative R-2B Modified.

Other Wildlife Species

Alternative R-1: Existing/No Build

No construction or other alteration of the transportation corridor would occur with the No Build Alternative. Therefore, no Project-related impacts to other wildlife species would be expected to occur with Alternative R-1. Effects of existing land uses would still continue.

Alternatives R-2B Modified, R-5 Modified and R-8A – Preferred Alternative

Habitats that would be affected during construction are disturbed and/or ornamental and offer little value to wildlife species. In addition, wildlife species that use the I-90 corridor as foraging or nesting habitat are tolerant of continuous noise and disturbance at close range. Therefore, construction impacts to other wildlife species would be low.

Alternative R-5 Restripe

No impacts to other wildlife species would occur as a result of the restriping activities.

Noxious Weeds

Alternative R-1: Existing/No Build

No construction or other alteration of the transportation corridor would occur with the No Build Alternative. Therefore, no noxious weeds impacts on the environment would be expected to occur with Alternative R-1. Effects of existing land uses would still continue.

Alternatives R-2B Modified, R-5 Modified and R-8A – Preferred Alternative

Construction activity and staging would most likely be limited to landscaped areas in the study area that already contain noxious weeds. No new noxious weed plantings would occur and removal of existing weeds would occur in construction areas. The project will not result in noxious weed impacts on the environment.

Alternative R-5 Restripe

No new noxious weed plantings would occur and removal of existing weeds would occur in construction areas. The project will not result in noxious weed impacts on the environment.

4.6.2.2 Operation

Habitats

Alternative R-1: Existing/No Build

No alteration of the transportation corridor would occur with Alternative R-1. Therefore, no project-related impacts to T&E species, other wildlife, or their habitats would be expected to occur with Alternative R-1. Effects of existing land uses would still continue.

Alternative R-2B Modified

Alternative R-2B Modified would not disturb any high quality or special habitat. Some landscaped areas in the Mercer Island CBD and the Shorewood area and adjacent to Bellevue Way SE ramp would be lost due to road widening. However, these habitats are disturbed and/or ornamental. Therefore, there would be no operation impacts from this alternative to special habitats.

Alternative R-5 Restripe

Alternative R-5 Restripe would not add any new pavement or impervious surface to the study area. Modifications to the existing roadway would consist of painting new lane configurations. Therefore, there would be no operation impacts from this alternative to special habitats.

Alternative R-5 Modified

With Alternative R-5 Modified, some landscaped areas in the First Hill lid, CBD and Shorewood areas of Mercer Island, and adjacent to Bellevue Way SE ramp would be lost due to road widening. However, these habitats are disturbed and/or ornamental and offer little value to T&E species or other wildlife.

Alternative R-8A – Preferred Alternative

With Alternative R-8A, some landscaped areas in the Corwin Curves and the First Hill lid, CBD, and Shorewood areas of Mercer Island, and adjacent to the Bellevue Way SE ramp would be lost due to road widening. However, these habitats are disturbed and/or ornamental and offer little value to T&E species or other wildlife.

Threatened and Endangered Species

Alternative R-1: Existing/No Build

No alteration of the transportation corridor would occur with Alternative R-1. Therefore, no Project-related impacts to T&E species, other wildlife, or their habitats would be expected to occur with Alternative R-1. Effects of existing land uses would still continue.

Alternative R-2B Modified

Wildlife. Some habitats within the study area would be removed. However, these habitats are disturbed and/or ornamental and offer little value to T&E wildlife species. In addition, species using the study area for foraging or nesting are already tolerant of the continuous noise and traffic. Therefore, no operation impacts from this alternative to T&E wildlife species would be expected.

Fish. Alternative R-2B Modified would increase the impervious surface area by 2.61 acres. An increase in stormwater discharge into the lower Mercer Slough would occur. The discharge point in the lower Mercer Slough is at the broad bay-like mouth of the slough between the east and west-bound lanes of I-90, where the depth of the slough is regulated by the surface elevation of Lake Washington and little flow occurs. No changes in the stream channel morphology or water temperature of this segment of the slough is likely to occur due to the slight increase in discharge. The additional 2.61 impervious surface area has the potential, via unmitigated stormwater discharge, to increase fine sediments and vehicle pollutants such as oil or gas, as well as metal and tire fragments into Lake Washington. These pollutants are an avoidable impact if proper stormwater controls and filtration are implemented at all discharge locations. Impacts to listed fish species may occur in the nearshore areas where slackwater allows accumulation of pollutants to occur. These nearshore areas are important for T&E fish species for rearing and migration. Pollutants occurring in the open water areas of the lake are less likely to impact the listed T&E fish species because the deep open water is used less by the fish and the wind and waves would tend to disperse and dilute any pollutants present.

Alternative R-5 Restripe

Alternative R-5 Restripe would not add any new pavement or impervious surface to the study area. Modifications to the existing roadway would consist of painting new lane configurations. Therefore, there would be no operation impacts from this alternative to T&E wildlife species.

Alternative R-5 Modified

Wildlife. Impacts to T&E wildlife species would be similar to those in Alternative R-2B Modified.

Fish. Alternative R-5 Modified would increase the impervious surface area by 3.90 acres. The stormwater discharge locations are not anticipated to change. With the exception of additional impervious surface and therefore stormwater discharge on the west side of Mercer Island, stormwater impacts to T&E fish species would be similar to Alternative R-2B Modified.

Alternative R-8A – Preferred Alternative

Wildlife. Impacts to T&E wildlife species would be similar to those in Alternative R-2B Modified.

Fish. Alternative R-8A would increase the impervious surface area by 5.76 acres. The stormwater discharge locations are not anticipated to change. Stormwater impacts to T&E fish species would be similar to Alternative R-5 Modified, with the exception that stormwater discharge could be greater from increased impervious surface created from widening the Seattle I-5 to Mount Baker Ridge roadways.

Other Wildlife

Alternative R-1: Existing/No Build

No alteration of the transportation corridor would occur with Alternative R-1. Therefore, no project-related impacts to T&E species, other wildlife, or their habitats would be expected to occur with Alternative R-1. Effects of existing land uses would still continue.

Alternatives R-2B Modified, R-5 Modified and R-8A – Preferred Alternative

Some habitats within the study area would be removed. However, these habitats are disturbed and/or ornamental and offer little value to wildlife species. In addition, species using the study area for foraging or nesting are already tolerant of the continuous noise and traffic. Therefore, no operation impacts from this alternative to wildlife species would be expected.

Alternative R-5 Restripe

Alternative R-5 Restripe would not add any new pavement or impervious surface to the study area. Modifications to the existing roadway would consist of painting new lane configurations. Therefore, there would be no operation impacts from this alternative to fish species.

Noxious Weeds

Alternative R-1: Existing/No Build

No alteration of the transportation corridor would occur with Alternative R-1. Therefore, no noxious weed impacts would be expected to occur with Alternative R-1. Existing plants and weeds could remain.

Alternatives R-2B Modified, R-5 Restripe, R-5 Modified and R-8A – Preferred Alternative

Linear projects, such as roads, often create a pathway for noxious weeds to spread. Noxious weeds could become established in disturbed areas unless measures are taken to prevent the weeds from colonizing these areas. Therefore, with mitigation proposed in Section 4.6.3, no noxious weed impacts due to operation of the project would be expected.

4.6.3 Mitigation Measures

4.6.3.1 Construction

BIO-1. Replacement of the outfall in Mercer Slough, if required, would be conducted during the appropriate in-water work window for the Mercer Slough. All work would be completed over one construction season. The work window for the Mercer Slough is generally between July 16 and September 1, and would be established by WDFW.

BIO-1a. Construction staging for the replacement of the Mercer Slough outfall would occur from dry upland locations. A temporary access road would be placed through the wetlands adjacent to Mercer Slough in the vicinity of the outfall. The access roads would be removed and the shoreline and adjacent wetlands would be restored to preexisting conditions or better.

BIO-1b. New piles for the Mercer Slough outfall replacement would be installed using an impact pile driver. The work area would be isolated by a cofferdam, effectively reducing pressure vibrations. The cofferdam would be removed and the shoreline and adjacent wetlands would be restored to preexisting conditions or better.

BIO-1c. Appropriate in-water work BMPs would be followed to minimize the effects to fish and fish habitat.

4.6.3.2 Operation

BIO-2. Revegetation and landscaping efforts for the I-90 corridor would not use noxious weed species in either seed or plant mixes. In areas disturbed by construction, measures would be taken to prevent noxious weeds from colonizing.

The amounts of increased surface area described in Section 4.7 Water Resources for Alternatives R-2B (2.61 acres), R-5 Modified (3.90 acres) and R-8A (5.76 acres) are total amounts for the entire 8 mile corridor. Stormwater is collected along the way, rather than all collected in one area, and discharged as follows:

- **I-5 to Mount Baker Ridge Tunnel –** Stormwater is treated by 2 oil/sediment chambers to remove oil, sediment and floatable materials prior to being discharged into the City of Seattle storm drain system – widening in this area would occur with Alternative R-8A

- **HMH and LVM Bridges –** Surface water runoff discharges into a lagoon between the two bridges.

- **WSDOT I-90 Drainage System on Mercer Island –** There are three basins, each with a different outfall location, that collect stormwater from I-90 on Mercer Island. A portion of the City's stormwater from Luther Burbank Park is also diverted into this drainage system within the Island Crest Way ramp area. Stormwater from each of the three basins, is treated by oil/sediment chambers to remove oil, sediment and floatable materials prior to discharge. Roadways and ramps would be added in the central and eastern portion of Mercer Island with Alternatives R-2B, R-5 Modified and R-8A. Alternative R-2B would not have widening in the western portion of the island.

- **East Channel Bridge –** Stormwater runoff east of the high point on the East Channel bridge flows toward the I-90 drainage system at the Bellevue Way SE Interchange. Stormwater runoff discharges into an existing oil/sediment chamber prior to discharge into the Mercer Slough. None of the alternatives would increase impervious surface on the East Channel bridge.

- **Bellevue Way Reversible HOV Ramp –** Stormwater from a portion of the ramp discharges directly into Mercer Slough without being routed through the existing oil/sediment chamber. Runoff would increase with Alternatives R-2B, R-5 Modified and R-8A however treatment is being proposed.

For any one of the stormwater collection points, the increase would be minor regardless of the alternative. If treatment (oil/sediment chamber) is installed for the collected stormwater on the reversible HOV ramp area, that would be an improvement over existing conditions. Because the stormwater collection points are spread out along the 8 miles, and the use of oil/sediment chambers for all locations except for the bridge, the impacts on T&E fish species were found to be "similar" even with the difference in the total acreage of increased impervious surfaces.

4.7 WATER RESOURCES

In response to comments received from NOAA Fisheries on the Biological Assessment, additional information was developed on the potential construction methodology to be used if the existing outfall in Mercer Slough is required to be replaced as part of this project. This information is included in the discussion of stormwater from the East Channel bridge in Section 4.7.1.2. This Section also reflects a reduction in the amount of new impervious surface area shown in the DEIS; the reduction is due to the elimination of widening of the Homer M Hadley (HMH) floating bridge.

4.7.1 Affected Environment

4.7.1.1 Hydrological Systems and Water Use

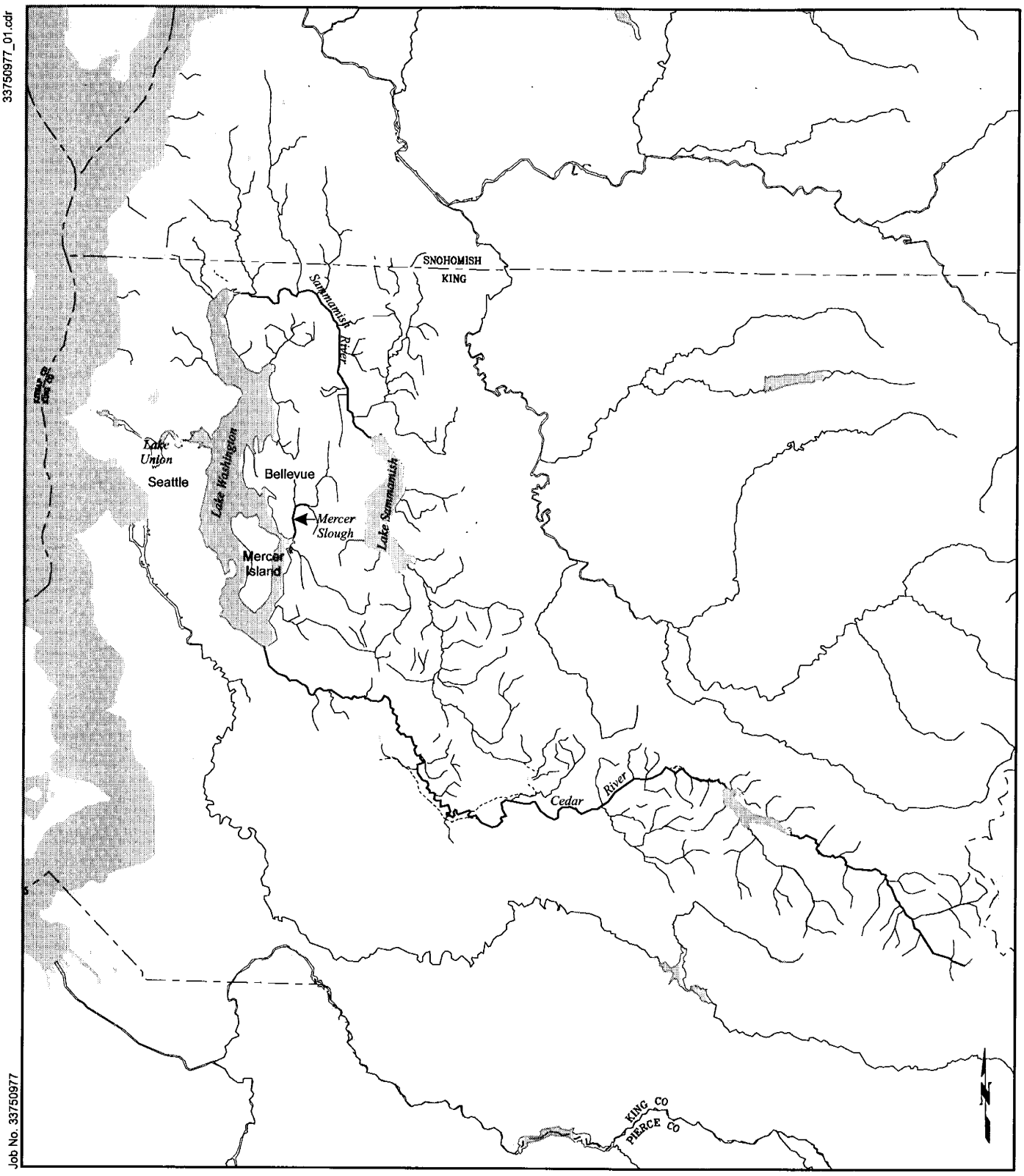
The Lake Washington vicinity is part of a larger water basin called the Cedar/Sammamish River Basin (Figure 4.7-1). The Cedar/Sammamish River Basin makes up Water Resource Inventory Area (WRIA) 08. Lake Washington, with 22,138 surface acres, is the largest lake in the basin. Lake Washington is also the second largest natural body of water in the state.

The Cedar/Sammamish River Basin consists of two major drainage courses. The Cedar River has its confluence at the southern end of Lake Washington near the City of Renton. The Cedar River originates high in the Cascade Mountains. After draining into Lake Washington, the river waters flow north to the Lake Washington Ship Canal and empty into Puget Sound. Lake Washington also receives drainage from Lake Sammamish via the Sammamish River at the north end of the lake. The Mercer Slough area (Figure 4.7-1) was at one time a part of Lake Washington. When the lake level was lowered in 1916 by construction of the Chittenden Locks and the Montlake Cut, the lake bottom in this area was transformed into a marshy peat bog. Mercer and Kelsey Creeks supply the water for Mercer Slough. The slough water flows slowly through the marshland, passing beneath the Bellevue Way SE interchange as it enters Lake Washington. Mercer Slough currently receives surface runoff from the surrounding area of Bellevue.

Surface runoff waters in the Puget Sound area are also collected in major streams and creeks, and some of these ultimately discharge into Lake Washington. Lake Washington also receives runoff from local storm sewer outfalls from developed areas in the vicinity of the lake.

Although the lake's water level fluctuates with the season, being higher in the spring and summer and lower in the fall and winter, the levels are actually regulated by the manipulation of the dam and locks on the Lake Washington Ship Canal. The elevation of the lake averages 14.5 feet above sea level, according to City of Seattle data.

The lake and its tributary rivers provide habitat for several varieties of commercial and game fish (see Section 4.6 Biological Resources, of this FEIS), which makes this hydrological resource valuable to fishermen both as a recreation area and as a fish-breeding area.



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Federal Transit Administration

SOUNDTRANSIT

Washington State Department of Transportation

Figure 4.7-1
Cedar/Sammamish River Watershed
Hydrogeologic Features Map

The waters of the lake are also used as a minor source of water supply for local industry, according to the Washington State Department of Ecology (Ecology). Lake Washington is classified by Ecology as a "Lake Class" water source. Although quantitative standards for this classification are not explicitly defined by the state, "water quality of this class exceeds or meets the requirements for all or substantially all uses," including domestic water supply (Chapter 173-210A WAC) (Ecology 1997). However, although water from some of the rivers feeding the lake is used for public consumption and agriculture, the lake water itself is not.

4.7.1.2 Water Quality

Ecology is required by Section 303d of the Clean Water Act to identify threatened and impaired surface water bodies every 2 years and to determine what action is needed to address the identified water quality problems. The final 1998 Section 303d list (the most recent) for WRIA 08 identifies Lake Washington (multiple locations) for exceedances of fecal coliform (Ecology 2000). Mercer Slough is also identified as an impaired surface water body in the Project vicinity. These sections are listed based on exceedances of fecal coliform, dissolved oxygen, and pH. The suspected source of fecal coliform was not noted in the listing. The dissolved oxygen and pH exceedance are attributed to a natural condition associated with decomposition of the organic materials in existing bogs associated with the slough.

The estimated annual pollutant loading to road surface of the two I-90 floating bridges in pounds/year is 29,000 pounds of total suspended solids (TSS), 356.3 pounds of totals Kjeldahl Nitrogen (TKN), 77.9 pounds of Phosphorous (PO_4P), 10.5 pounds of Copper (Cu), and 64.1 pounds of Zinc (Zn).

Groundwater in the Project area is confined to those areas and aquifers that are recharged by the infiltration of precipitation or the water from Lake Washington. Because the amount of recharge by precipitation is directly related to the available surface exposure, groundwater as a source of public supply has been substantially reduced as a result of commercial and residential development. The potential use of local groundwater as a public water supply on a major scale has been further curtailed because of the unpredictability of permeable zones in the older unconsolidated deposits and the generally inferior quality of the water (hardness, high mineral content, and poor chemical quality). The lack of substantial usage of groundwater is made evident by the fact that cities within the Project area rely on water piped in from the Cedar and Tolt River basins in the Cascade Mountains for their domestic water supplies.

The soils of and around Mercer Slough are predominantly peat, and the recharge of substrata aquifers results from infiltration of storm runoff and water from Lake Washington. The use of these waters is subject to constraints similar to those mentioned above in the case of the older unconsolidated deposits. Further, the perennial presence of peat tends to make groundwater in the area exceptionally acidic, increasing its potential for affinity to iron-related minerals and thus rendering it objectionable for human consumption (USGS 1963).

Although the groundwater in the Project area is generally considered unacceptable as drinking water, it is suitable for certain irrigational and industrial uses. However, the land use patterns in the vicinity of the existing facility preclude substantial use of this resource for these purposes.

Facilities

The section of I-90 between Seattle and Bellevue that is proposed to be improved passes through a number of drainage sub-basins. A description of existing drainage and water quality treatment within each of the sub-basins is provided below:

- **I-5 to Mount Baker Ridge Tunnel** – Stormwater is treated by two oil/sediment chambers to remove oil, sediment and floatable materials prior to being discharged into the City of Seattle storm drain system. The City drainage system that receives stormwater from the I-90/I-5 area discharges into the King County combined sewer system, which discharges either to the West Point treatment facility or overflows into the Duwamish River. The City drainage system that receives stormwater from the I-90/Mount Baker Ridge tunnel area discharges into Lake Washington. The I-90/Mount Baker Ridge tunnel and lid drainage systems discharge into one of the oil/water separators.

- **Homer M Hadley (HMH) and Lacey V Murrow (LVM) Floating Bridges** – Surface water runoff from the two I-90 floating bridges discharges into a lagoon between the two bridges. The purpose of the lagoon is to provide spill control. The lagoon has been constructed by the installation of a flexible, floating boom, which serves as a non-absorbant barrier between the two floating bridges at each end. Surface water on the LVM floating bridge is currently directed via the deck slope to the north or inside shoulder, where it discharges through barrier scuppers into the lagoon between the bridges. On the LVM floating bridge, the scuppers are typically rectangular openings in the bottom of the concrete barrier, approximately 12-inches wide and 4-inches high. Surface water on the HMH floating bridge is directed via the deck slope to the center of the bridge, where it flows into existing grate inlets located adjacent to the median barrier that separates the westbound and center roadways. Vaults located within the bridge pontoons at the grate inlets provide a degree of catchment, discharging stormwater from the roadways into the lagoon between the HMH and LVM floating bridges. Surface water from the shared-use pathway on the north side of the HMH floating bridge discharges directly into Lake Washington via downspouts adjacent to and on the north side of the barrier.

- **WSDOT I-90 Drainage System on Mercer Island** – There is an existing storm trunk system that is located under the approximate centerline of I-90 within the Mercer Island CBD. The system has three distinct basins, each with different outfall locations. In addition to receiving flows from the I-90 corridor, the central trunk line also receives a portion of stormwater diverted from Luther Burbank Park. The trunk line under the Island Crest Way ramp tunnels has been designed for a 50-year storm event and discharges into Lake Washington. The outfall for this trunk line is located approximately 300 feet from shore and approximately 40 feet below the ordinary high water line. Stormwater from each of the basins on Mercer Island is treated by oil/sediment chambers to remove oil, sediment and floatable materials prior to discharge.

- **Mercer Island – Concrete Flume Outfall** – Stormwater from the City of Mercer Island is conveyed under I-90 through a 1500 mm (60-inch) storm drain in the vicinity of 77th Avenue SE. Stormwater is discharged from the pipe into a watercourse located north of I-90 and west of 77th Avenue SE. After flowing through the watercourse, stormwater enters a concrete flume on the north side of SE 22nd Street. The concrete flume discharges into Lake Washington.

- **Mercer Island – Luther Burbank Park** – Stormwater from the City of Mercer Island is conveyed under Island Crest Way through a 450 mm (18-inch) storm drain in the vicinity of SE 28th Street. The storm drain system crosses under I-90 through a 610 mm (36-inch) storm drain east of Island Crest Way and eventually discharges into a watercourse within Luther Burbank Park and into Lake Washington. As mentioned previously, there is a flow control structure within the City system that diverts a portion of stormwater into the WSDOT I-90 drainage system within the Island Crest Way ramp area. Stormwater runoff west of the high point on the East Channel bridge flows toward the I-90 drainage system on Mercer Island.

- **East Channel Bridge to Bellevue Way SE** – Stormwater runoff east of the high point on the East Channel bridge flows toward the I-90 drainage system at the Bellevue Way SE Interchange. Stormwater runoff from a portion of I-90 within this area discharges into an existing oil/sediment chamber for water quality treatment prior to discharge into Mercer Slough. Stormwater from a portion of the existing reversible HOV ramp discharges directly into Mercer Slough without being routed through the existing oil/sediment chamber.

  The existing outfall in Mercer Slough was constructed approximately 40 years ago. According to the original plans for the outfall, the steel pipe from the last invert and manhole to the shoreline was approximately 170 feet long. At that time, the mouth of the pipe was located right at the main channel.

  The pipe was originally installed on a series of creosote treated timber piles driven into the slough bed. Concrete collars were then placed on top of the piles. The collars were designed to cradle the pipe and hold it in line with the low water level in Lake Washington. After the pipe was set on the concrete collars, it was backfilled to provide a minimum of two feet of cover in the upland areas.

  Since initial installation, the shoreline of the slough has eroded to the extent that approximately 40 feet of the outfall pipe is exposed and floating in the waters of the slough. The pipe is able to float because the original design for the outfall anticipated that the backfilled soil on top of the pipe would weight it down on the collar beneath it. The pipe was not anchored to the collar.

  Because the pipe is not anchored, it can float subject to the water surface elevation in the lake. The forty feet of exposed pipe is currently on a reverse slope back to the manhole reducing the efficiency of the outfall. The steel pipe is also corroding faster than it would if it were buried because the protective coatings are exposed to air and light.

Approximately 50 feet of the existing outfall has been previously removed. The discharge point is no longer at the main channel.

4.7.2 Impacts

4.7.2.1 Construction

Alternative R-1: Existing/No Build and Alternative R-5 Restripe

Construction associated with Alternative R-1 and Alternative R-5 Restripe would not have an impact on the hydrologic environment, because no additional impervious surface or roadway widening would occur. No impacts are anticipated with stripe removal and replacement with Alternative R-5 Restripe.

Alternatives R-2B Modified, R-5 Modified and R-8A – *Preferred Alternative*

These Build Alternatives would impact the surface water hydrology of any of the surface water bodies in the study area during construction. However, temporary materials stockpiles or grading patterns could result in temporary blockages of surface drainage pathways that could result in localized flooding during intense precipitation.

Potential water quality impacts from construction would be similar for these Build Alternatives. Potential impacts include increased sediment delivery to storm drains and to the nearby surface water bodies, and increased pollutant loads from activities associated with construction, particularly operation of construction equipment. Typical water pollutants associated with road construction are sediments and petroleum hydrocarbons.

The I-90 corridor crosses the shoreland area of Lake Washington (defined as within 200 feet of the ordinary high water mark). Failure to control erosion in the shoreland area could result in a higher potential of increased sediment loads to the lake. Construction mitigation measures would be designed to minimize these impacts.

Pending further study, the outfall in Mercer Slough may be replaced as part of the I-90 project. Although the proposed I-90 project would add only a small amount of additional water to the outfall (0.35 cfs for the 25-year, 24-hour design storm event), continued exposure and fluctuations in slope may cause the outfall to fail. If the outfall is replaced, it would be sized the same as the existing outfall. It would also be designed essentially the same as the existing outfall, with improvements to reduce environmental impacts and to improve its long-term performance.

Construction staging for the replacement of the outfall would occur from dry upland locations. A temporary access road would be placed through the wetlands adjacent to Mercer Slough in the vicinity of the outfall. In order to access the existing pipe, collars, and piles, it would be necessary to place a cofferdam along the entire length of the existing pipe. The total area enclosed in the cofferdam would be minimized to the greatest extent possible. All in-water work would be limited to the open fish window. All work would be completed over one construction

season. Appropriate in-water work BMPs would be followed to minimize the effects to fish and fish habitat.

Prior to the removal of the existing pipe, a temporary by-pass system would be installed to divert existing pipe flows around the established work areas.

New piles would be placed using an impact pile driver. The work area would be isolated by a cofferdam, effectively reducing pressure vibrations. Riprap would be placed around the water end of the outfall to dissipate the energy of the water leaving the outfall and to prevent shoreline erosion.

The cofferdam and access roads would be removed and the shoreline and adjacent wetlands would be restored to preexisting conditions or better.

If replacement of the outfall in Mercer Slough is required, in-stream work would need to occur generally between July 16 and September 1 and would be established by WDFW. BMPs would be needed to reduce or eliminate the potential for the release sediments and water pollutants associated with road construction to the slough and lake.

4.7.2.2 Operation

Water quality impacts from road operation are already occurring in the study area. The impacts of road operation on water quality would essentially be due to the build-up of pollutants from road traffic between storms and the subsequent run off of pollutants during storm events.

The quality of stormwater runoff is determined by a complex process that is dependent on a large number of variables, some of which are listed below:

- Storm duration and intensity
- Traffic characteristics (density)
- Number of dry days preceding a stormwater runoff event
- Maintenance policies (including sweeping, mowing, pesticides, de-icing)
- Surrounding land use
- Ambient air quality
- Regulations concerning vehicle emissions
- Vegetation types on highway right-of-way
- Spill risk from vehicular accidents

A partial list of typical pollutants found in highway stormwater runoff include particulates and solids, nutrients (nitrogen and phosphorus), metals (e.g., lead, zinc, iron, copper, cadmium, chromium, mercury, nickel, and manganese), salts (sodium, calcium, and chloride used in de-icing), petroleum hydrocarbons, polynuclear aromatic hydrocarbons (PAHs), pesticides and herbicides (from right-of-way maintenance), and asbestos.

Increased traffic volume with any of the alternatives would be expected to incrementally increase water quality impacts. None of these incremental increases would be expected to cause degradation of water quality in local surface water bodies after mitigation is implemented. The

new stormwater treatment facilities proposed for the Build Alternatives would greatly reduce the potential impact on surface water quality.

Water quality impacts from operation of the Project road systems would be similar for all of the Build Alternatives. The differences would be due to the size of additional impervious surfaces. None of the factors listed above would be substantially different for any of the Build Alternatives.

Alternative R-1: Existing/No Build and Alternative R-5 Restripe

Operations associated with Alternative R-1 and Alternative R-5 Restripe would have no additional impacts from highway runoff on the hydrologic environment, because no additional impervious surface or roadway widening would occur.

Alternative R-2B Modified

Alternative R-2B Modified would increase the impervious surface area by 2.61 acres. This alternative would have the least amount of new impervious surface as compared with Alternative R-5 Modified and R-8A. The difference is because the Seattle I-5 to Mount Baker Ridge roadways and the roadways in the western drainage basin of Mercer Island would not be widened. Roadways and ramps would be modified or added in the central and eastern Mercer Island and/or Bellevue sections of the I-90 roadway in Alternative R-2B Modified.

An increase in stormwater discharge into the lower Mercer Slough would occur. The discharge point in the lower Mercer Slough is at the broad bay-like mouth of the slough between the east and west-bound lanes of I-90, where the depth of the slough is regulated by the surface elevation of Lake Washington and little flow occurs, and this location would not change. No changes in the stream channel morphology or water temperature of this section of the slough is likely to occur due to the slight increase in discharge. Stormwater from all other stormwater basins where increases in impervious surfaces occur would be discharged directly into Lake Washington (a large Class 1 body of water under the Shorelines Management Act) after treatment, with no impacts to stream habitat.

The additional impervious surface area has the potential, via unmitigated stormwater discharge, to increase fine sediments and vehicle pollutants such as oil or gas, as well as metal and tire fragments into Lake Washington. These pollutants are an avoidable impact if proper stormwater controls and filtration are implemented at all discharge locations.

All stormwater runoff from new impervious surfaces will be treated according to WSDOT 1995 *Highway Runoff Manual* and the Endangered Species Act (ESA) Stormwater Effects Guidance Instructional Letter 4020.02 (WSDOT, 2002) and will discharge into new stormwater treatment facilities for water quality treatment prior to discharge at existing outfall locations. The new stormwater treatment facilities will provide water quality treatment for up to 140 percent of the new impervious area.

Alternative R-5 Modified

Alternative R-5 Modified would increase the impervious surface area by 3.90 acres and would create less new impervious surface than Alternative R-8A because the Seattle I-5 to Mount Baker Ridge roadways would not be widened in that area. The stormwater discharge locations are not anticipated to change.

Under existing and proposed conditions, there are no water quality treatment facilities on the LVM floating bridge (see Section 4.7.1.2). Because of structural considerations for the existing floating bridges and because of on-going changes in position of the bridges crossing Lake Washington, installation of additional permanent stormwater treatment BMPs is not currently proposed. Currently, floatable materials are periodically skimmed from the lagoon between the two bridges and the HMH floating bridge is swept on a regular basis with current sweeping technology. Although the primary purpose of the lagoon is to capture spills of floating liquids from accidents, most of the floating material skimmed from the lagoon is floating solids such as Styrofoam and oil sheens rarely are seen.

All stormwater runoff from new impervious surfaces will be treated according to WSDOT 1995 *Highway Runoff Manual* and the Endangered Species Act (ESA) Stormwater Effects Guidance Instructional Letter 4020.02 (WSDOT, 2002) and will discharge into new stormwater treatment facilities for water quality treatment prior to discharge at existing outfall locations. The new stormwater treatment facilities would provide water quality treatment for up to 140 percent of the new impervious area.

Alternative R-8A – *Preferred Alternative*

Alternative R-8A would increase the impervious surface area by 5.76 acres and would involve the construction of new impervious surfaces in all of the corridor's existing drainage basins. The stormwater discharge locations are not anticipated to change. Stormwater would be treated by two oil/sediment chambers to remove oil, sediment and floatable materials prior to being discharged into the City of Seattle storm drain system. The city drainage system that receives stormwater from the I-90/I-5 area discharges into the King County combined sewer system with discharges either to the West Point treatment facility or overflows into the Duwamish River just south of Harbor Island. The additional stormwater discharged into the City of Seattle's stormwater system would constitute only a slight percentage of the total stormwater discharge and the discharge point would be into a channelized portion of the Duwamish River (a Class 1 body of water under the Shorelines Management Act), where no change in channel morphology, hydrograph, or stream temperature would be expected to occur. The city drainage system that receives stormwater from the I-90/Mount Baker tunnel area discharges into one of the two oil/sediment chambers referred to above and into Lake Washington after detention and treatment.

All stormwater runoff from new impervious surfaces will be treated according to WSDOT 1995 *Highway Runoff Manual* and the Endangered Species Act (ESA) Stormwater Effects Guidance Instructional Letter 4020.02 (WSDOT, 2002) and will discharge into new stormwater treatment facilities for water quality treatment prior to discharge at existing outfall locations. The new stormwater treatment facilities would provide water quality treatment for up to 140 percent of the new impervious area.

Additional impervious surface would be built on the west side of Mercer Island in Alternatives R-5 Modified and Alternative R-8A. Alternative R-8A would also require widening roadways on I-90 between Seattle/I-5 and the Mount Baker Ridge tunnel. Where impervious area and projected runoff is expected to increase, new stormwater treatment facilities would be added to provide additional water quality treatment prior to discharge at existing outfall locations.

4.7.3 Mitigation Measures

4.7.3.1 Construction

The following general measures would be used during the Project construction phase to mitigate potential impacts on surface water quantity and quality:

WAT-1. The Project would be designed to minimize erosion and to prevent sediment from leaving the construction area. BMPs would be employed to control erosion and sediment. These BMPs are outlined in detail in the WSDOT 1995 *Highway Runoff Manual* (Section 4-3). In addition, the WSDOT Endangered Species Act Stormwater Effects Guidance Instructional Letter (IL #4020.02) shall be used as guidelines. A temporary erosion and sediment control (TESC) plan would provide for the prevention, interception, and treatment of all potential silt-laden runoff that may occur during Project construction. The TESC Plan would consist of a set of plans and narrative, as outlined in the 1995 *Highway Runoff Manual* (Section 5-3.4). The TESC Plan would show design and location of all BMPs, clearing limits, drainage contours, and all other major hydraulic features. The TESC Plan would also address construction schedule issues to ensure BMPs are in place and functional prior to grading operations, and that exposed soils are stabilized in a timely manner. The TESC Plan would also include a maintenance and operations schedule explaining how each BMP would be maintained. WSDOT would prepare a stormwater pollution prevention plan (including erosion and sediment control) in accordance with guidance in the 1995 *Highway Runoff Manual.*

WAT-2. The best available design practices would be used to maintain existing hydrologic function and drainage patterns based on site geology, hydrology, topography, and practicability.

WAT-3. The Project would provide a Spill Prevention, Control, and Countermeasures (SPCC) Plan for control of construction-related pollutants (such as petroleum products, lubricants, fuel, and oils). BMPs for the SPCC Plan are detailed in the WSDOT 1995 *Highway Runoff Manual.* WSDOT would prepare stormwater pollution prevention, including erosion and sediment control, plans in accordance with guidance in the 1995 *Highway Runoff Manual.*

WAT-4. Construction equipment would be maintained during the Project construction phase in order to prevent spill events, or chronic impacts, such as oil or lubricant drips from vehicles.

WAT-5. Temporary erosion and sediment control plans would be implemented to minimize impacts to Lake Washington during construction. These may include silt fences, straw bales, and any other means of controlling and filtering stormwater prior to discharge into Lake Washington.

WAT-6. Spill prevention plans would be implemented to minimize impacts to Lake Washington during construction. These could include booms in the water surrounding vessels/barges or other related construction to minimize and/or prevent spills of petroleum products or other pollutants.

WAT-7. If in-water work is required, BMPs would be implemented to reduce or eliminate the potential for the release of sediments and water pollutants associated with road construction to the slough and lake.

If the outfall into Mercer Slough is determined to require replacement as a part of the I-90 project, these additional measures would be implemented (WAT-7a through 7e).

WAT-7a. Construction staging for the replacement of the Mercer Slough outfall would occur from dry upland locations.

WAT-7b. During construction for the Mercer Slough outfall, a cofferdam would be installed along the entire length of the existing pipe. The total area enclosed in the cofferdam would be minimized to the greatest extent possible.

WAT-7c. Prior to the removal of the existing Mercer Slough outfall pipe, a temporary by-pass system would be installed to divert existing pipe flows around the established work areas.

WAT-7d. Once the new Mercer Slough outfall pipe is in place, soil would be placed back on top of the new Mercer Slough outfall pipe in the upland areas to the original ground contour.

WAT-7e. Riprap would be placed around the water end of the Mercer Slough outfall to dissipate the energy of the water leaving the outfall and to prevent shoreline erosion.

4.7.3.2 Operation

The following mitigation measures will be implemented in all applicable situations:

WAT-8. All stormwater runoff from new impervious surfaces would be treated according to WSDOT 1995 *Highway Runoff Manual* and the Endangered Species Act (ESA) Stormwater Effects Guidance Instructional Letter 4020.02 (WSDOT, 2002) and would discharge into new stormwater treatment facilities for water quality treatment prior to discharge at existing outfall locations. The new stormwater treatment facilities would provide water quality treatment for up to 140 percent of the new impervious area.

WAT-9. Road maintenance practices should conform to guidance in Section 7 of the WSDOT 1995 *Highway Runoff Manual.* Practices should address disposal of highway-generated waste (street sweepings, catch basin cleanings), maintenance of stormwater facilities (e.g., channel conveyance capacity), and snow and ice control operations.

WAT-10. Any hazardous materials spills that occur on the roadway would be cleaned up according to the SPCC.

WAT-11. Drainage structures (culverts, ditches) built or replaced for the Project would be designed per WSDOT 1997 *Hydraulic Manual* design guidance.

4.8 ENERGY

This section addresses the energy that is consumed during construction and operation of transportation facilities. During construction, energy is used to manufacture materials and transit vehicles, transport materials, and operate construction machinery. Operational energy consumption includes fuel and electricity consumed by public and private-operated vehicles using the facility, a negligible amount of electricity for signals and lighting, and the inevitable losses of energy during transmission. Energy consumption impacts associated with the Project are evaluated in this section by comparing vehicle energy consumption and construction energy consumption among alternatives.

For the purpose of this analysis, the study area is defined as the Puget Sound region and, more specifically, areas in the cities of Seattle, Mercer Island, and Bellevue that would be more directly affected by the Project. Energy consumption estimates for roadway traffic within the study area are based on the traffic impact analysis prepared for the Project. The alternatives are compared based on daily differences in energy consumed by traveling vehicles.

The energy consumption costs included in Table 4.8-1 have been updated from the information shown in the DEIS to reflect the revised construction cost information provided in Chapter 2.

4.8.1 Affected Environment

4.8.1.1 Washington Energy Use

Washington relies on six primary sources of energy: petroleum, hydroelectricity, natural gas, biofuels, coal, and uranium. Approximately 45 percent of the State's primary energy needs are met by petroleum, of which more than three quarters is imported from Alaska (OTED 2001). Petroleum has been the primary energy source in Washington since the 1970s. The importance of hydroelectricity as an energy source has declined since the mid 1980s, as reliance on consumption of fossil fuels has increased. Natural gas consumption doubled between 1983 and 1995, regaining the market share it lost during the 1970s, and now accounts for almost 15 percent of Washington's primary energy consumption. Biofuels, mainly wood and wood waste products, represent 8 percent of primary energy consumption. Coal is consumed almost exclusively at the Centralia Steam Plant in Centralia, while uranium is used at Energy Northwest's Columbia Generating Station plant in Richland. Together, coal and nuclear generation accounted for 9 percent of Washington's primary energy supply in 1997 (OTED 2001).

Total end-use energy consumption for Washington grew at a rate of 1.3 percent per year between 1993 and 1997, reaching an all-time high of 1.4 quadrillion British thermal units (Btu) (1,400 terajoules) in 1997 (OTED 2001). The transportation sector accounts for the largest share of the State's growth in energy consumption, increasing at an annual rate of 3.7 percent since 1985. The increase in end-use energy consumption for the State is attributable to population growth because per capita energy consumption has stayed relatively constant since the 1970s, with approximately 250 million Btu (0.00025 terajoules) per person being consumed per year.

4.8.1.2 Proposed Project

The Project corridor includes I-90 between 4th Avenue S in Seattle and I-405 in Bellevue. I-90 extends from Seattle to the East Coast of the United States and is one of two cross-lake connections between Seattle and the Eastside in the Puget Sound Region. The present-day facility comprises three independent freeway alignments: two three-lane outer roadways (eastbound and westbound) and a reversible two-lane barrier-separated center roadway. The center roadway is commonly referred to as the I-90 express lanes and forms a portion of the region's high-occupancy vehicle (HOV) system. Also included in the Project corridor are freeway interchanges (on and off ramps), surface streets, transit facilities, and the I-90 shared-use pathway.

On an annual basis, approximately 145,000 vehicles per day (vpd) travel across Lake Washington on I-90. At the East Channel bridge (between Mercer Island and Bellevue), the annual average daily traffic (AADT) is about 155,000 vpd. Total vehicle miles traveled on the roadway by trucks, buses, and automobile traffic are approximately 1,136,200 per day.

Average speeds on the outer roadways in the morning peak hour range from 30 to 35 mph westbound and 26 to 31 mph eastbound. In the afternoon peak hour, speeds vary from 28 to 32 mph in the eastbound direction and 26 to 30 mph in the westbound direction. In both cases, speeds in the reverse-peak direction are slower than in the peak direction.

There are typically 1.5 to 2.5 hours each weekday when speeds are reduced below the 60-mph free-flow speed, although these periods can extend to 3 or 4 hours when special events, accidents, or inclement weather occur. In the center roadway, travel speeds range from 55 to 63 mph westbound in the morning and 59 to 63 mph eastbound in the afternoon.

The traffic model indicates that existing energy consumption (2001) along the Project corridor due to traffic is 7.4 billion Btu (0.00743 terajoules).

4.8.2 Impacts

Common units of energy measurement are joules and Btu. One joule is the equivalent of 0.95 Btu, and one terajoule equals 1 trillion joules. Energy is reported in terajoules for this analysis because joules and Btu are relatively small units.

Energy consumption rates for vehicles operating on the roadway can be estimated by comparing changes in traffic operations due to the Project in terms of vehicle miles traveled (VMT). VMT by type is multiplied by the appropriate consumption factor (for automobiles, trucks, and buses) to obtain consumption of energy in terms of terajoules. Estimates of operation energy consumption for vehicles operating on the roadway are based on the operation traffic impact analysis prepared for this FEIS.

The estimated amount of energy consumed during construction of the Project is proportional to and therefore based on the Project's construction cost. An approximate construction energy consumption factor, adjusted to year 2000 dollars for urban freeway expansion, is approximately 10 terajoules per $1 million of construction cost (Caltrans 1983).

4.8.2.1 Construction

Each of the Build Alternatives would result in the expenditure of energy to manufacture and transport materials, as well as operate equipment during construction of the transit and roadway improvements. As shown in Table 4.8-1, the relative amount of construction energy required would increase substantially with each of the Build Alternatives proportional to the magnitude of the improvements (represented by the cost of the improvements rounded to the nearest $5 million). Overall, these values are a very small fraction of the energy consumed annually for transportation in Washington state, and would not put substantial additional demand on energy sources or fuel availability in the region.

Table 4.8-1
Energy Consumption Due to Construction

Alternative	Construction Cost Rounded to nearest $5M ($ million - 2002 dollars)	Energy Consumed During Construction (terajoules)
Alt R1	0	0
Alt R-2B Modified	50	500
Alt R-5 Restripe	20	200
Alt R-5 Modified	95	950
Alt R-8A – *Preferred*	130	1300

Note: The energy per dollar figure was drawn from Caltrans (1983)

4.8.2.2 Operation

Traffic is predicted to increase in future years, independent of the Project. Vehicle fuel consumption dominates the total energy use for each alternative, and is determined by daily VMT as discussed above. Energy consumption for each alternative is shown in Tables 4.8-2 and 4.8-3. As shown, energy consumption with Alternatives R-1, R-5 Restripe and R-5 Modified would be the lowest, followed closely by Alternative R-2B Modified. Alternative R-8A would consume the most energy of the Build Alternatives, due to R-8A's ability to accommodate a higher VMT.

Table 4.8-2
Operational Energy Consumption – 2005

Alternative	Daily Vehicle Miles Traveled on Roadway	Energy Consumed, Passenger Vehicles (Btu) (based on 6,233,000 Btu/vehicle mile)	Energy Consumed, Heavy Trucks (Btu) (based on 22,046,000 Btu/vehicle mile)	Energy Consumed, Transit Bus (Btu) (based on 41,655,000 Btu/vehicle mile)	Total Energy Consumption (terajoules)
Existing (2001)	1,136,200	6,834,066,889	751,459,956	236,642,055	0.00743
Alt. R-1 No Build	1,157,000	6,959,175,665	765,216,660	240,974,175	0.00757
Alt. R-2B Modified	1,156,800	6,957,972,696	765,084,384	240,932,520	0.00757
Alt. R-5 Restripe	1,157,000	6,959,175,665	765,216,660	240,974,175	0.00757
Alt. R-5 Modified	1,157,000	6,959,175,665	765,216,660	240,974,175	0.00757
Alt. R-8A – *Preferred*	1,205,500	7,250,895,648	797,293,590	251,075,513	0.00788

Table 4.8-3
Operational Energy Consumption – 2025

Alternative	Daily Vehicle Miles Traveled on Roadway	Energy Consumed, Passenger Vehicles (Btu) (based on 6,233,000 Btu/vehicle mile)	Energy Consumed, Heavy Trucks (Btu) (based on 22,046,000 Btu/vehicle mile)	Energy Consumed, Transit Bus (Btu) (based on 41,655,000 Btu/vehicle mile)	Total Energy Consumption (terajoules)
Existing (2001)	1,136,200	6,834,066,889	751,459,956	236,642,055	0.00743
Alt. R-1 No Build	1,190,900	7,163,078,911	787,637,442	248,034,698	0.00779
Alt. R-2B Modified	1,195,500	7,190,747,198	790,679,790	248,992,763	0.00782
Alt. R-5 Restripe	1,190,900	7,163,078,911	787,637,442	248,034,698	0.00779
Alt. R-5 Modified	1,190,900	7,163,078,911	787,637,442	248,034,698	0.00779
Alt. R-8A – *Preferred*	1,327,400	7,984,105,253	877,915,812	276,464,235	0.00868

4.8.3 Mitigation Measures

4.8.3.1 Construction

The following mitigation measures are recommended to reduce energy consumption:

EN-1. Limit the idling of construction equipment and employee vehicles.

EN-2. Plan to minimize double handling of fill and construction materials.

EN-3. Maintain equipment in good condition.

EN-4. Recycle materials generated during construction and use recycled materials.

EN-5. Consult with gasoline stations in the area to ensure that adequate gasoline supplies are available during and near the most intensive construction activities.

EN-6. Encourage carpooling or vanpooling among construction workers.

EN-7. Locate construction staging areas as close as possible to work sites.

4.8.3.2 Operation

No mitigation measures are required for operation. However, during operation, transportation control measures designed to reduce traffic volumes and congestion would also decrease energy consumption.

4.9 GEOLOGY AND SOILS

4.9.1 Affected Environment

4.9.1.1 Regional Geology

In general, the geology of the Project area is typical of the glaciated areas found throughout the Puget Lowland. A lobe of the continental ice sheet originating in southwest British Columbia during the late Pleistocene epoch repeatedly occupied the Puget Sound region. Each stage of glaciation was followed by an interglacial period during which, time stream-laid sands and gravels were deposited by meltwater streams and silts and clays were deposited in lakes. During the last glacial advance, known as the Vashon, ice in the vicinity of the I-90 corridor covered the soils with as much as 3,000 feet of ice (Waldron 1962). It is this glaciation event, between about 17,000 and 13,500 years ago (Waldron et al. 1962; Booth 1987) that shaped the project area. Immediately following the melting of the ice, glacial rivers flowed to a sea level roughly 200 feet lower than present. The sea level rose to within a few tens of feet of its present level by approximately 7,000 years ago, and has continued to slowly rise since. During this time Lake Washington was isolated from the marine waters of Puget Sound on the south by the deposition of alluvium by the Cedar River. Continued deposition resulted in further increases in the elevation of the water in Lake Washington and Mercer Slough.

Four geologic units of glacial origin (Lawton Clay, Esperance Sand, Vashon Till, and Vashon Recessional Outwash) underlie most of the ridges and uplands in the Seattle area. Post-glacial deposits are present within the lowland areas as shown in Table 4.9-1.

Table 4.9-1
Geologic Units

Age	Units			
Holocene (Less than 10,000 years)	Alluvium, colluvium, marine deposits, lahars, volcanic ash			Lowlands
Pleistocene (10,000 – 1,600,000 years)	Vashon Drift	Recessional Outwash deposits		Uplands
		Vashon Till		
		Esperance Sand	Advance Outwash	
		Lawton Clay		

Source: Galster, R.W., Laprade, W.T. 1991

The Vashon glacial advance covered the Puget Lowland with a variable thickness of glacial ice over the existing glacial outwash, lakebed (lacustrine), and till deposits and densely compacted these soils. Except for low-lying areas of rather limited extent, which contain recent stream and organic deposits, Lawton Till is the most recent unit found within the project area. This till consists primarily of dense to very dense gravelly, silty, fine to coarse sand with scattered cobbles. In general the till is found only at higher elevations, having been eroded from the lower levels. The Lawton Till is underlain by various glacial and interglacial deposits consisting of hard and dense silty clays, clayey silts, sandy silts, and silty sands with widely varying quantities of gravel, cobbles, and boulders. Bedrock occurs at a depth of approximately 1,000 feet in the

project area (Yount et al. 1985), but occurs at shallower depths to the north and south outside the project area.

Mercer Slough is part of an abandoned meltwater channel that formed during the retreat of the continental glacier, Mercer Slough consist of accumulated lacustrine deposits of soft fine-grained sediments: silts, clays and peat overlying dense sands and glacially consolidated soils. Rigg (1958), and more recently in a thesis by Newman (1983), described the Mercer Island Slough peat. Subsurface information from those studies document at least 50 to 60 feet of peat that accumulated between 7,000 to 13,000 years ago in open waters and shallow waters at a rate of 14.5 years per inch. This is nearly three times the average rate of peat accumulation described by Rigg for other sites in King County.

4.9.1.2 Regional Seismicity

Seattle is located in an active seismic region of the Pacific Northwest, where the primary tectonic feature is the Cascadia Subduction zone (CSZ). In this zone, the Juan de Fuca oceanic plate is being pushed (subducted) under the North American continental plate. Deformation within the Juan de Fuca plate is responsible for the larger recent earthquakes including the 1949 Olympia (Magnitude M-7.1), the 1965 Seattle (Magnitude M-6.5), and the 2001 Nisqually (Magnitude M-6.8) earthquakes.

The CSZ is capable of generating a great earthquake of magnitude M-8 or greater. This type of event apparently occurs every several hundred to 1,000 years and results in major earthquakes at depths of approximately 6 to 25 miles (10 to 40 km) beneath coastal and offshore Washington. Geologic studies during the last 10 to 15 years have suggested that multiple great earthquakes have occurred on the CSZ during 11,000 years (the Holocene epoch) (e.g., Atwater 1996; Peterson and Darienzo 1996). Geologic evidence for the most recent event (approximately 300 years before present) has been found at many coastal locations in Washington, Oregon, and Vancouver Island, B.C.

It is uncertain whether a single earthquake or several separate earthquakes closely spaced in time, caused the geologic effects at these locations. However, there is a general consensus that the CSZ has generated multiple earthquakes of M-8 or larger in the past few thousand years (Atwater et al. 1995; Nelson and Personius 1996; and Weaver and Shedlock 1996). Analysis of historical records of tsunamis in Japan, and tree ring dating in western Washington and Oregon support the interpretation that the most recent great earthquake on the CSZ may have ruptured most or the entire length of the CSZ about 300 years ago and was about M-9 (Satake and Tanioka 1996).

The Seattle fault is approximately parallel to I-90 study alignment and offsets bedrock from depths of 300 feet on the south side to depths of 1,000 to 3,000 feet on the north side of the fault. The Seattle fault is capable of generating earthquakes of M-7.0 or larger. Geologic evidence of prehistoric major earthquakes (paleoseismic) on the Seattle fault zone indicate the last large earthquake occurred approximately 900 AD. The reoccurrence interval for major earthquakes is estimated to be 500 years (Nelson et al. 1996). Large (M-6 to 7) earthquakes may occur more frequently. A north-trending fault zone in Puget Sound as well as other faults in western Washington are potential seismic sources of earthquakes of up to M-6.5 (Johnson et al. 1999).

The site geology and soils are characterized below based on published reports and the results of a literature research of existing subsurface soils explorations and geologic information. A list of relevant information is presented in Chapter 7 - References this FEIS and generally includes:

- Soil Survey of King County (USDA 1952) for surficial soil types and distributions;
- United States Geological Survey Maps;
- WSDOT geotechnical reports with borings;
- State of Washington Department of Natural Resources (DNR) reports on the geology of the project area; and
- King County GIS data (geology and geologic structures).

Figure 4.9-1 shows the alignment of I-90 together with the surficial geology of the area.

4.9.1.3 Project Area

Site Geology

Geologic mapping (Waldron et al. 1962, DNR 2000) in the study area (between Seattle and Bellevue) indicates that it is underlain by Vashon lacustrine sediments, generally silt of the Lawton Clay. The Lawton silts and clays are typically very stiff to hard in consistency, but their fractured nature has created stability problems throughout the history of development of the Puget Sound area. Existing maps also note that parts of the Project area is "modified land," where the native soils have been greatly disturbed by construction activities. Figure 4.9-1 shows the project area and the surficial geology.

Several large geotechnical investigations have been conducted in the Project area. In 1965 a geotechnical report (Shannon & Wilson [S&W] 1965) studied soil conditions for proposed freeway tunnels though Mount Baker Ridge that is confirmed in another geotechnical study for the I-90 Corwin Detour in 1985 (WSDOT 1985). In 1978 a design report (WSDOT 1978) studied the proposed Mercer Island I-90 alignment and details the subsurface geology. A more recent geotechnical investigation (Dames & Moore 2000) was also carried out on Mercer Island where I-90 intercepts 80th Avenue SE.

The findings of these geotechnical investigations, carried out prior to and after construction of I-90, give an accurate account of the geology and soil within the project area and were used to complete this report section.

Seattle, I-5 to Mount Baker Ridge

Near-surface soils are described in the soil survey of King County Area, Washington (USDA 1952) as "unclassified city land." Prior to 1930, there was massive re-grading, which lowered the elevation. Localized soil filling has also occurred as part of construction activities. Because of this re-grading and filling, existing geologic maps (Waldron et al. 1962, DNR 2000) classify these soils as "modified" and these have been mapped on Figure 4.9-1 as artificial fill.

Based on subsurface explorations specific to I-90 in this area (Hart Crowser & Associates 1985), Lawton Till deposits have been encountered over most of the Beacon Hill project area and are underlain by Lawton Clay deposits. These deposits are laterally persistent from Seattle I-5 east to Mount Baker Ridge.

Specific explorations for the Mount Baker tunnel (S&W 1965), indicate that the ridge is composed predominately of stiff to hard silty clay and clayey silt (Lawton Clay deposits) with a 35 foot thick layer of medium dense, silty fine sand (Lawton Till) capping the ridge. From Lake Washington Boulevard east to the edge of Lake Washington, explorations show that the Lawton Till cap has been eroded leaving the Lawton Clay exposed at the surface.

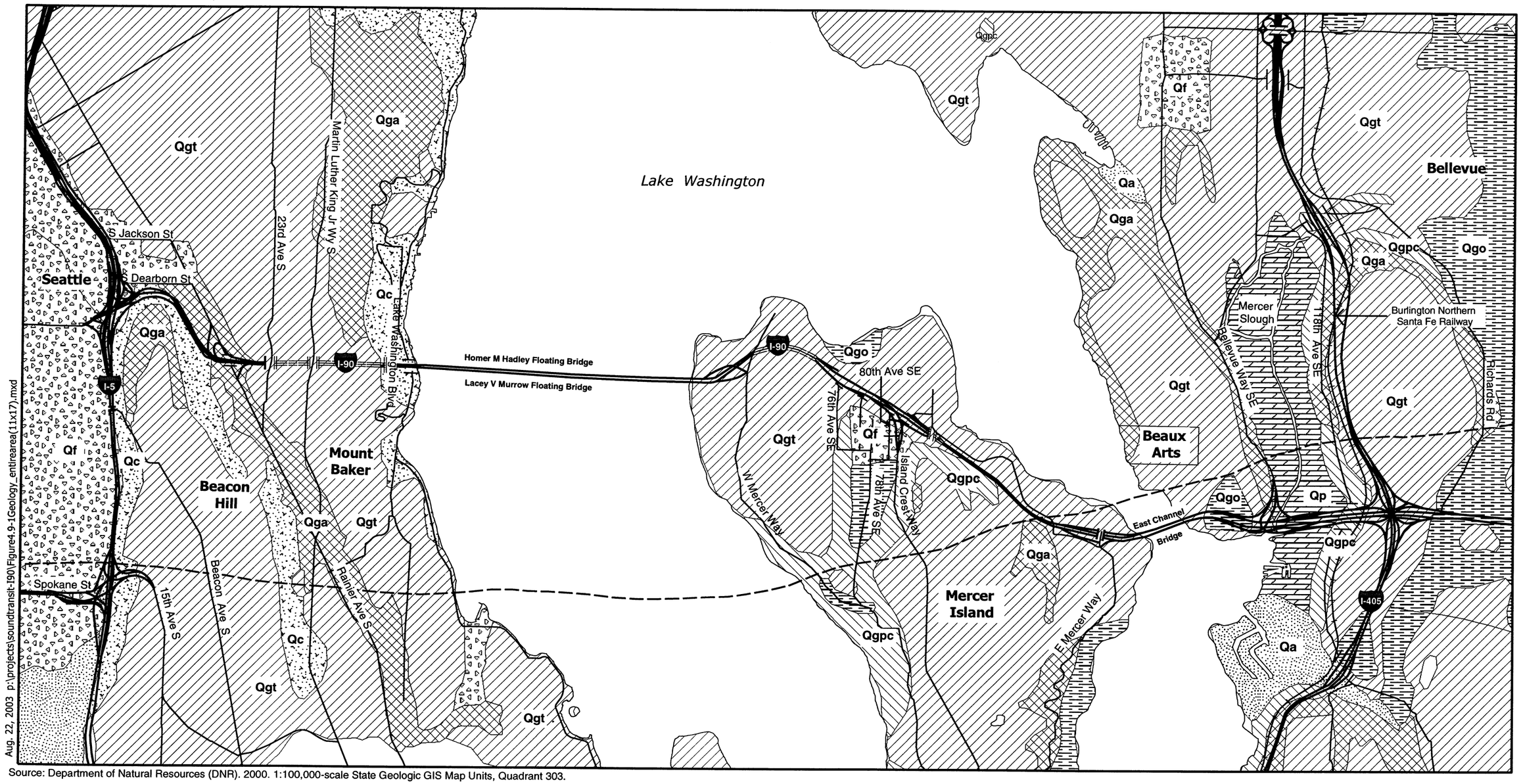
Mercer Island

Near-surface soils are described in the soil survey of King County Area, Washington (USDA 1952) as "Kitsap-silt loam" with a zone of "Bellingham-silty clay" between 76th and 77th Avenues SE. The Kitsap taxonomic soil unit is identified as being moderate to well draining whereas the Bellingham unit is described poorly draining. The Bellingham taxonomic unit coincides with a nearly impermeable geologic clay unit at the ground surface. This information is consistent with geologic mapping (Waldron et al. 1962, DNR 2000) that indicates the island is primarily Lawton Till underlain by Vashon lacustrine sediments as shown on Figure 4.9-1.

The design report for the I-90 Mercer Island route (WSDOT 1978) included an exploration program that consisted of 37 borings drilled near the current centerline of I-90. These test borings indicate that the soils are principally Vashon lacustrine deposits. These deposits are generally massively bedded with occasional layers and pockets of water bearing sand and gravel. The clays and silts of the lacustrine deposits are usually stiff and the sands dense. A thin Lawton Till unit covers most of Mercer Island.

The 1978 report notes that throughout most of the Burbank-Shorewood section, from Island Crest Way to Fortuna Drive, a 20- to 40-foot thick deposit of dense silty sand mantles the underlying stiff to hard clays. In general, the soils are competent with only small, local areas containing soft organic sediments. Prior to construction of I-90, slope stability problems occurred within this area along the south side of existing slopes uphill of U.S. 10. These slopes exhibited evidence of sliding, slumping and slow but steady seepage. In the summary of the 1978 report it is noted that design and construction techniques would mitigate the soils and foundation problems. It was noted however that groundwater would be a continuous but relatively minor problem throughout the corridor.

A geotechnical investigation (D&M 2000) was recently completed on Mercer Island where I-90 intercepts 80th Avenue SE. The investigation involved drilling and analyzing three borings and accompanying testing and analysis. All three borings encountered native silt/sandy silt (Lawton Till) to the maximum depth of 33 feet that was explored. The borings indicated that the soil is very stiff to hard in consistency. Fill material was also encountered in some borings.



Source: Department of Natural Resources (DNR). 2000. 1:100,000-scale State Geologic GIS Map Units, Quadrant 303.

0 0.25 0.5 1 Miles

U.S. Department of Transportation
Federal Highway Administration
Federal Transit Administration

SoundTransit

Washington State Department of Transportation

Legend

NONGLACIAL DEPOSITS

- Qa — Alluvium - silt, sand, and gravel deposited in streambeds and fans
- Qc — Continental Sediments - stratified clay, silt, sand, gravel, and peat of lacustrine, estuarine and fluvial origin
- Qp — Peat Deposits - peat, muck, and lacustrine silt and clay rich in organic matter, deposited mostly in closed depressions

GLACIAL DEPOSITS

- Qf — Artificial Fill - includes modified land
- Qgo — Fraser-Age Undifferentiated Outwash Deposits - recessional and proglacial stratified sand and gravel; locally contains silt and clay
- Qgt — Till - unsorted, unstratified, highly compacted mixture of clay, silt, sand, gravel and boulders
- Qga — Advance Outwash - outwash sand, gravel and lacustrine clay, silt and sand
- Qgpc — Pre-Fraser Age Undifferentiated - interbedded oxidized brown, red-grown, and gray gravel, sand, silt and clay
- ------ Inferred Surface Trace of Seattle Fault (Johnson et al., 1999)

Figure 4.9-1
Geology

East Channel Bridge/Bellevue/Bellevue Way SE/I-405

Near-surface soils are described in the soil survey of King County Area, Washington (USDA 1952) as "Alderwood-gravelly sandy loam." This taxonomic soil unit is identified as having sufficient surface drainage however, water movement internally is greatly retarded due to the cemented nature of the substratum. Waterlogging frequently occurs at the surface in winter and early spring. Geologic mapping (Waldron et al. 1962, DNR 2000) indicates that the area is generally underlain by Vashon lacustrine sediments and Lawton Till deposits, similar to Mercer Island. East of Bellevue Way SE, peat deposits of the Mercer Slough occur as a 2,000-foot wide band that extend north toward Bellevue. Figure 4.9-1 shows the location of these deposits.

According to specific I-90 subsurface explorations in this area (GeoEngineers 1989), five distinctive soil layers were identified. The top layer was described as a "significant thickness of fill overlying the area as a result highway construction." Generally underneath this layer, peat and organic material was encountered, with a maximum thickness of up to 65 feet. Below the peat layer is a silty clay layer with discontinuous 10-foot thick lenses of sand. Underneath all these layers are glacial deposits (advance outwash) composed of dense sand deposits.

This information indicates the Bellevue Way SE/I-405 area contains no "undisturbed" areas due to the fill layer that is currently there.

4.9.2 Impacts

Impacts to the geologic environment were assessed by considering the nature of the soils together with the effect that the extent and duration of construction activities will have on them. In addition, the potential for geologic hazards to impact the proposed project was assessed.

4.9.2.1 Geologic Hazards

Geologically hazardous areas are lands susceptible to landslides, erosion, or seismic movement due to the underlying soils and geology. The areas surrounding the proposed Project limits are considered geologically hazardous areas due to steep slopes, and areas where erosion and landslides have occurred in the past.

One of the primary sources of landslides has been the contact area between Vashon advance outwash deposits of sand and gravel and underlying transitional beds of fine-grained clayey silt deposited in lowland or proglacial lakes created from glacial meltwater (Tubbs 1974). Within the Seattle city limits, this area is known as the Esperance sand/Lawton Clay contact. Landslides have also occurred within glacial and non-glacial deposits above and below this contact area, as well as within post-glacial colluvium (material which has been transported down a slope by the force of gravity after a glacial event).

According the King County sensitive areas map folio (King County 1990) and the City of Seattle landslide database (S&W 2000) no large areas of landslides, erosion, or seismic movement exist along the Project route.

Seattle lies within Seismic Risk Zone 3, as classified by the Uniform Building Code (ICBO 1997) which is described as a zone of major seismic risk. The Seattle amendments to the Uniform Building Code require that new construction meet structural standards designed to withstand potential earthquakes as specified in the code. The projected surface trace of the Seattle fault crosses the eastern portion of the Project (Figure 4.9-1). Consequently there is a potential surface fault rupture to impact the Project in the event of a M-6 plus earthquake on the Seattle fault. However, it should be noted that direct evidence of the surface trace has not been identified in the Project area and it is possible that the fault does not reach the ground surface.

Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. This can occur in loose saturated soils, that is, soils in which the space between individual particles is completely filled with water. According to published liquefaction susceptibility maps (USGS 1992, Palmer 1999) the I-90 study alignment is generally a low liquefaction hazard area. The one exception is the Mercer Slough area east of Bellevue Way SE, which is mapped as a low to moderate liquefaction hazard area.

4.9.2.2 Construction

All Build Alternatives

The construction activities associated with each of the proposed Build Alternatives have the potential to cause erosion as a consequence of removing some existing road pavement and landscaping, moving of heavy equipment, grading to create a level surface, importing fill and road base, temporarily stockpiling materials, incremental roadway widening, adding/moving/removing of median barriers, constructing new ramps, and adding to existing ramps.

This impact would be small with the implementation of mitigation measures.

4.9.2.3 Operation

All Build Alternatives

After completion of construction and implementation of mitigation measures, it is expected that there will be negligible impacts on the geology and soils during operation.

4.9.3 Mitigation Measures

Best management practices (BMPs) would be adopted during construction in all applicable situations to mitigate impacts on the geology and soils.

General erosion impacts would be minimized using control measures being applied to all exposed areas during and after construction. Exposed areas would be protected at the beginning of the rainy season and at the completion of construction. Where feasible, on-site barriers (straw bales or similar devices) would be placed to trap sediments before runoff leaves the construction site. Appropriate construction equipment and techniques would be selected to minimize potential impacts together with construction sequencing, and a pre-construction condition survey.

Seismic impacts of the alternatives would be mitigated through standard design and construction practices common to the industry. If the Seattle fault does not reach the ground surface as inferred, the existing I-90 crosses the fault and it is not possible to avoid crossing it. Engineering design measures can be implemented to minimize the effects of surface rupture if the actual fault trace is known, but damage in the event of a surface rupturing earthquake cannot be fully mitigated.

4.9.3.1 Construction

The geotechnical issues would be primarily related to the potential for erosion during construction. Erosion would be limited through the implementation of the following BMPs.

GEO-1. The duff layer (loose leaf matter, needles, bark, and other easily identified plant parts), native topsoil, and natural vegetation would be retained in an undisturbed state to the maximum extent practicable.

GEO-2. The control or prevention of pollutant release would be the first line of defense by selecting source control BMPs. Erosion prevention would be prioritized over the treatment of turbid runoff.

GEO-3. BMPs would be specific to onsite characteristics (topography, drainage, soil type, ground cover, and critical areas) and the construction plan.

GEO-4. Runoff would be diverted away from exposed areas wherever possible. Clean water will be kept clean.

GEO-5. The extent of clearing operations and phase construction operations would be minimized.

GEO-6. Before reseeding a disturbed soil area, all soils would be amended with compost wherever topsoil has been removed.

GEO-7. Natural drainage features would be incorporated whenever possible, using adequate buffers and protecting areas where flow enters the drainage system.

GEO-8. Slope length and steepness would be minimized wherever possible.

GEO-9. Runoff velocities would be reduced to prevent channel erosion wherever possible.

GEO-10. Tracking of sediment offsite would be prevented wherever possible. During construction the wheels and undercarriage of trucks, and other vehicles leaving the site would be washed and managed using best management practices for construction projects. Erosion and run-on/runoff control methods and structures should be specified as engineering controls and practices in plans and specifications.

4.9.3.2 Operation

The following mitigation measures would be implemented in all applicable situations:

GEO-11. Erosion would be minimized using best management practices. Exposed areas would be re-vegetated or protected from water and wind erosion using erosion control blankets or similar devices.

GEO-12. Permanent and adequate drainage for surface water would be installed as specified by engineering controls and practices in the plans and specifications.

4.10 HAZARDOUS MATERIALS

This section describes the locations of known and potentially contaminated properties within one mile of I-90 between 4th Avenue S in Seattle and Bellevue Way SE/I-405 (the study area) and assesses the impacts of the Project on hazardous materials, as well as the impacts of hazardous materials on the project. The methodology for this section included a review of various current federal and state databases that list known contaminated sites; sites where hazardous materials are stored, used, and sold; and hazardous waste generators; and a risk analysis (see Section 4.10.2.2) to evaluate the potential increase in crashes resulting from implementing Alternative R-8A on I-90 or rerouting trucks carrying flammable cargoes to other area roadways. Historical maps and records were researched to trace the history of land use in the study area. Tables listing the identified sites are included in Appendix D of this EIS.

Key changes to this section from the DEIS include an expanded discussion in Section 4.10.1.3 of the potential for rerouting of trucks carrying flammable cargo and potential impacts of the rerouting in Section 4.10.2.2. The local, state and federal codes that govern the handling and routing of hazardous materials have also been included in Section 4.10.1.3. The summary of the risk analysis included in Section 4.10.2.2 is newly added, along with the complete risk analysis added as Appendix J.

4.10.1 Affected Environment

4.10.1.1 Hazardous Materials Databases

A number of federal and state regulations cover the use, transport, storage, and disposal of known and potentially hazardous materials and the remediation of sites contaminated by hazardous materials. Databases generated under the auspices of these regulations that were searched are listed below:

- EPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), which lists sites under review by the U.S. Environmental Protection Agency (EPA)
- EPA National Priority List (NPL), which lists sites designated for Superfund cleanup by EPA
- EPA Resource Conservation and Recovery Act (RCRA) Notifiers Lists, which cites businesses that report the use of hazardous and/or toxic materials
- EPA RCRA Corrective Action Report (CORRACTS), which lists sites that have or are currently undergoing some form of mitigation for hazardous materials
- EPA Response Notification System (ERNS), which lists sites where previous spills of hazardous waste or materials have occurred

- EPA Treatment, Storage, and Disposal (TSD) facilities listing, which includes sites that treat, store, or dispose of potentially hazardous materials

- Facility Index System (FINDS), which is a compilation of the following 12 lists: RCRA Listings (RCRIS), CERCLIS listings, the Permit Compliance System (PCS), Dun and Bradstreet (DUNS), AIRS Facility System (AFS), Section Seven Tracking System (SSTS), National Compliance Database, Enforcement Docket System (DOCKET), Federal Facility Information System (FFIS), Chemicals in Commerce Information System (CICIS), PCB Handler Activity Data System (PADS), and Toxic Chemical Release Inventory System (TRIS)

- Washington State Department of Ecology (Ecology) listing of underground storage tanks (UST)

- Ecology Leaking Underground Storage Tank (LUST) listing for Ecology-documented leaking USTs

- Ecology Confirmed and Suspected Contaminated Sites (CSCS), which is a list of potentially contaminated sites that have been subject to hazardous waste investigation and/or cleanup as mandated by the Washington Model Toxics Control Act (MTCA) Chapter 173-340 WAC

- Seattle-King County Department of Health listing of closed and abandoned landfills

4.10.1.2 Identified Sites

Seattle

A total of 660 sites were identified within the Seattle portion of the study area. Sites identified were cited in the state UST, LUST, and CSCS lists and the EPA FINDS and ERNS lists. Additional sites were identified during the review of historical maps. No sites within the study area appeared in the federal CERCLIS, NPL, CORRACTS, or the Seattle-King County Department of Health landfill publication.

UST Sites

Of the identified sites, 214 sites are included in the Ecology UST list for the Seattle portion of the study area. A list of UST sites, including address and tank information (where available), is found in Table 1, WA Department of Ecology UST List Citations, in Appendix D. State records regarding USTs date back only to 1964. Therefore, some former potential UST sites do not appear in the current Ecology UST list. The possible existence and locations of potential historical UST sites were identified through historical research using Kroll maps dating back to 1920. These sites are included in Table 2, Historic Usage of Concern List Citations—Seattle, in Appendix D. It should be noted that the former presence of USTs is only a possibility suggested by historical use of the property. No UST sites are within the Seattle portion of the I-90 right-of-way.

The presence of an UST does not necessarily indicate that soil or groundwater on the property has been contaminated with tank contents, which usually include waste oil and fuels such as gasoline and diesel. Citation in the UST list indicates only the potential for contamination in the event of vessel failure. Sites on which USTs are known to have leaked are cited in the LUST list and described in the following section.

LUST Sites

A total of 228 LUST sites (with a total of 259 reported leak incidents) were identified within the Seattle portion of the study area. LUST sites are also considered UST sites and are on the UST list in Table 1. A list of LUST sites is found in Table 3, WA Department of Ecology LUST List Citations, in Appendix D. An individual site may be cited several times in the LUST listings. Multiple citations indicate a site's USTs have had several leaks because each leak will result in an individual LUST citation.

Two LUST sites within the I-90 right-of-way were identified as a result of the LUST database search: the WSDOT Day Street Open Space site, referred to as Day Street Park, and the WSDOT Bradner Place Apartment site. Each site is briefly discussed below.

- The Day Street Park Site (Figure 4.10-1) is located at the intersection of Day Street and Lakeside Avenue, beneath the western high-rise of the Homer M Hadley (HMH) floating bridge. While excavating the area for development of the Park, workers identified an improperly abandoned residential heating oil UST and contaminated soil in the area that is now the northern driveway to the parking lot east of Lakeside Avenue S. Documents on file at Ecology indicate that site remediation efforts included removal of the UST and 63 cubic meters of petroleum-contaminated soils in May and June of 1996. Confirmation soil sampling indicated that remaining soils conformed to MTCA cleanup criteria.

- The now vacant WSDOT Bradner Place Apartment site (Figure 4.10-1) is located at 1366 31st Avenue S, on top of the ridge above the I-90 Mount Baker Ridge tunnel. The property was the site of a Texaco gas station from the late 1940s through the 1970s. The site had four 4,000-gallon gasoline storage USTs, one 1,000-gallon heating oil storage UST, and one 500-gallon waste oil UST. The property was the subject of four Phase II environmental site assessments. The studies revealed that soil and groundwater on the property were contaminated with petroleum hydrocarbons and benzene, toluene, ethylbenzene, and xylenes (BTEX) in concentrations greater than MTCA cleanup levels. The site has been monitored on a quarterly basis since 1996. The most recent monitoring report by SECOR, Inc. (December 2001) revealed that groundwater on the site, which occurs at depths ranging from 5 to 8 feet below ground surface (bgs), still contains petroleum hydrocarbons and BTEX in concentrations greater than MTCA cleanup levels.

FINDS Sites

A total of 87 facilities within the Seattle portion of the study area are listed in EPA's FINDS list. A list of FINDS sites is found in Table 4, EPA FINDS List Citations, in Appendix D. As with

UST sites, the appearance of a site in the FINDS list is not an indication of the release of hazardous or toxic substances into the environment. The facilities listed in Table 4 are monitored by EPA and Ecology for the use or generation of small quantities of hazardous substances as a normal part of their business activities. When stored, used, and disposed of according to regulation, these materials pose little if any threat of contamination.

ERNS Sites

A total of 51 ERNS sites within the Seattle portion of the study area are included in the EPA ERNS list. A list of ERNS sites is found in Table 5, EPA ERNS List Citations, in Appendix D. The appearance of a site on the ERNS list indicates that there has been a spill of hazardous or toxic substances whose use, storage and disposal are regulated. Furthermore, the listing indicates that the spill has been properly reported and the appropriate regulatory authorities are aware of the event. An ERNS listing does not necessarily suggest that the site has been contaminated. As with the LUST listings, it is possible for an individual site to have multiple listings.

CSCS

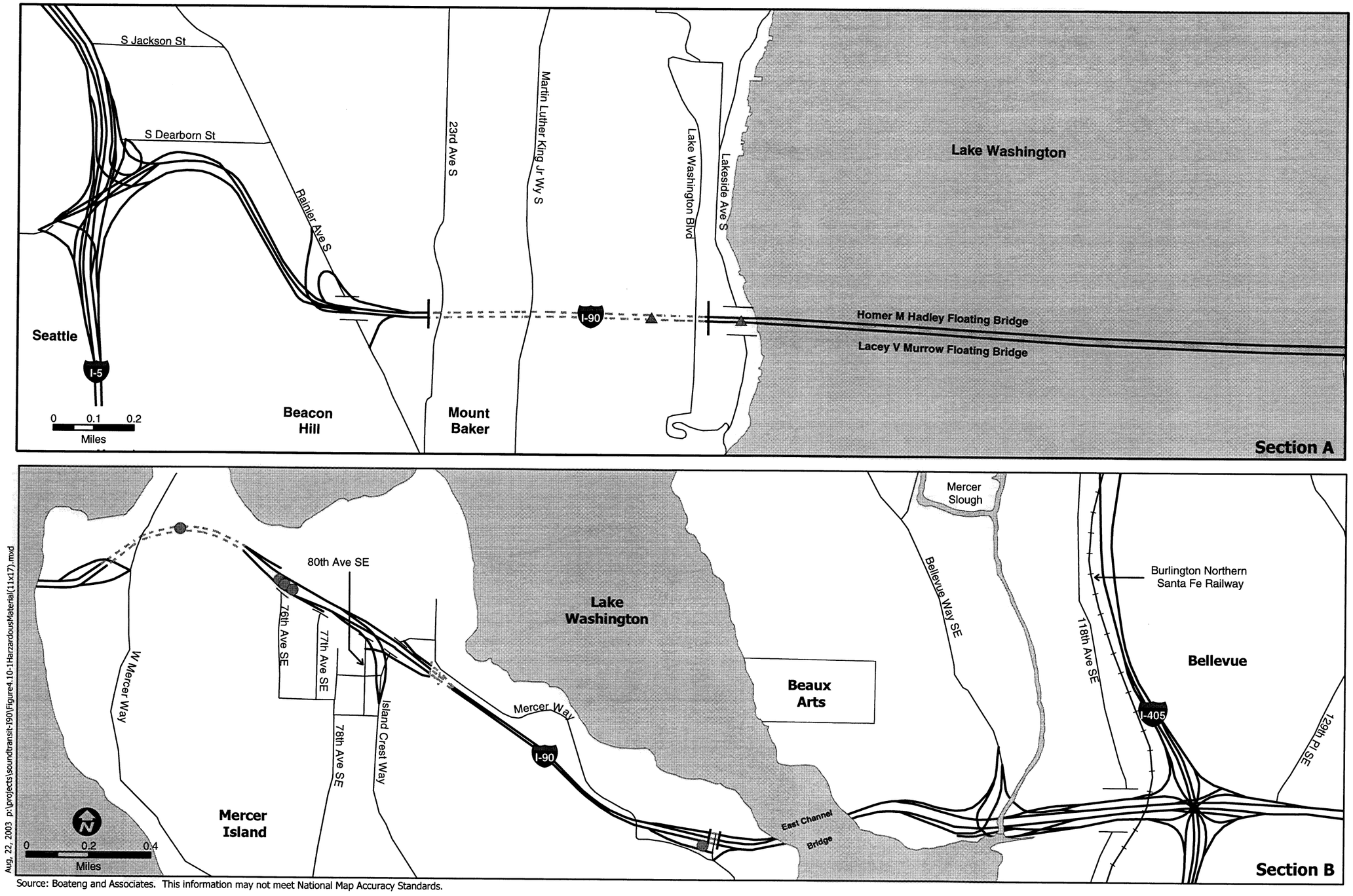
A total of 24 sites within the Seattle portion of the study area are listed in Ecology's CSCS list. A list of CSCSs is found in Table 6, WA Department of Ecology CSCS List, in Appendix D. The appearance of a site on the CSCS list indicates that Ecology is concerned that the site is potentially contaminated and that Ecology is either investigating or has mandated a cleanup. A site listed on the CSCS list does not necessarily indicate that the property has been contaminated with hazardous substances.

Other Potentially Contaminated Sites

Kroll maps dating to 1920 were reviewed for the Seattle portion of the study area. The object of the review was to trace the area's historical land use patterns to ascertain whether past activities might have environmentally impacted properties in the study area. Review of the Kroll maps revealed a total of 25 Historic Usage of Concern (HUC) sites. As discussed earlier, the list of HUC sites is found in Table 2 in Appendix D. Use of these sites ranged from industrial facilities such as iron foundries and a flour mill to a gasoline station.

Mercer Island

A total of 54 sites were identified within the Mercer Island portion of the study area as a result of this study. Sites identified were cited in the state UST and LUST lists, EPA FINDS list, and Mercer Island city directories. No sites within the study area appeared in the federal CERCLIS, NPL, CORRACTS, or ERNS lists; the Washington State CSCS list; or the Seattle-King County landfill publication.



Source: Boateng and Associates. This information may not meet National Map Accuracy Standards.

U.S. Department of Transportation
Federal Highway Administration
Federal Transit Administration

SoundTransit

Washington State Department of Transportation

Legend

UST Sites LUST Sites

Figure 4.10-1
Hazardous Materials

UST Sites

A total of 42 UST sites were identified in the Ecology UST list and historical Mercer Island directories dating back to 1940 within the Mercer Island portion of the study area. Information regarding UST sites, including address and (where available) tank specifications, is summarized in Table 1 in Appendix D. Because available state records concerning USTs date back only to 1964, some former potential UST sites, such as fuel dealers, do not appear in the UST list. Therefore, the possible existence and locations of historical UST sites were identified from old Mercer Island telephone directories dating back to 1940 and King County Assessor's Office records. These sites are also included in Table 1. Detailed information such as the presence of tanks, tank size, and age was not available.

Five of the UST sites are within or immediately adjacent to the I-90 right-of-way:

- 2101 72nd SE
- Blanchard's Union Service, corner of 76th Avenue SE and SE 24th Street
- Bestfire Oil Company, 7624 SE 24th Street
- Mercer Island Auto Rebuild, 7644 SE 24th Street
- Mercer Garage, E Mercer Way and Sunset Highway

LUST Sites

A total of 13 LUST sites were identified within the Mercer Island portion of the study area. These sites are included on the LUST list in Table 3 of Appendix D. No LUST sites are within the I-90 right-of-way. The LUST sites closest to the Project include:

- The BP station, which was a Unocal Station until 1998, at 2411 76th Street SE. Soil and groundwater were reported affected in a January 1991 release and cleanup was reported started in 1995. A review of archived Ecology project files revealed no additional information concerning the cleanup status of the site.
- The Texaco station, which was formerly a Shell station, at 7655 Sunset Highway. A release was reported on the site in 1989, and contaminated soil was reported cleaned up in June 1995. A total of approximately 3,000 cubic yards of contaminated soil was hauled offsite for disposal.
- The Chevron station at 7725 Sunset Highway. Soil on the property was reported contaminated in February 1995, and cleanup was reported complete in September 1995.
- The Tully's coffee store, which was formerly I&M Associates (Fuji Motors) and prior to that an ARCO station, at 7810 SE 27th Avenue. Four USTs were removed from the site in the 1980s, and a vapor extraction system (VES) was installed to remove

volatile hydrocarbons from the soils. Free product was noted on at least one occasion in one of several monitoring wells. The cleanup status of this property is unclear at this time, although file records suggest it is incomplete.

FINDS Sites

Twenty-four facilities within the Mercer Island portion of the study area were listed in the EPA FINDS list. Information about these sites is summarized in Table 4 in Appendix D. None of these sites is within the I-90 right-of-way.

Other Potentially Contaminated Sites

The names, addresses, and nature of businesses not otherwise identified in the UST, LUST, and FINDS lists are presented in Table 7 in Appendix D. In most cases, these 24 sites were identified from historical documents on file at the offices of the Mercer Island Historical Society. Documents reviewed included old maps, Mercer Island directories, and newspaper clippings and advertisements. Businesses consist primarily of dry cleaners, car sales and service sites, and dry goods vendors. Other than their former locations and the basic nature of business, little else is known. None of these sites is within the I-90 right-of-way.

Bellevue

A total of 20 discrete sites were identified within the Bellevue portion of the study area. Sites identified were cited in the UST, LUST, FINDS, ERNS, and CSCS lists.

UST Sites

A total of 8 UST sites were identified from Ecology's UST list within the Bellevue portion of the study area. Information about UST sites, including address and (where available) tank information, is summarized in Table 1 in Appendix D. None of the sites is within the I-90 right-of-way.

LUST Sites

A total of 9 LUST sites were identified within the Bellevue portion of the study area. LUST sites are also considered UST sites and are listed on the UST list in Table 1. LUST sites are shown on Table 3 in Appendix D. None of the sites is within the I-90 right-of-way.

FINDS Sites

A total of 7 facilities within the Bellevue portion of the study area were listed in the EPA's FINDS list. FINDS sites are identified in Table 4 in Appendix D. None of the sites is within the I-90 right-of-way.

ERNS Sites

There was 1 site included on the ERNS list for the Bellevue portion of the study area. This site is included on the ERNS list in Table 5 in Appendix D. This site is not within the I-90 right-of-way.

CSCS

Four sites within the Bellevue portion of the study area are included on Ecology's CSCS list. These sites are included in the list of citations in Table 6 in Appendix D. None of the sites is within the I-90 right-of-way.

Other Potentially Contaminated Sites

No other potentially contaminated sites within the Bellevue portion of the study area have been identified.

4.10.1.3 Routing of Trucks Carrying Flammable Cargo

Approximately 180 trucks per day carrying flammable cargo currently cross I-90 between I-5 and I-405, based on 2002 and 2003 counts. These trucks are predominately tanker trucks hauling gasoline, diesel fuel, and other Class 3 Flammable Liquids. There are approximately 10 trucks per day carrying flammable liquid cargo crossing SR 520 and 50 trucks per day on I-405 between I-5 and I-90 when I-90 is open to trucks carrying flammable cargo. Approximately 14 percent of the time, the I-90 tunnels are currently closed to trucks carrying flammable cargo due to maintenance on tunnel systems, resulting in approximately two-thirds of the 180 trucks (approximately 120 trucks) rerouting to the north along I-5 and SR 520, and approximately one-third of the 180 trucks (approximately 60 trucks) rerouting to the south along I-405.

Based on the 2002 and 2003 counts, approximately 60 additional trucks per day carry other hazardous cargo not classified as flammable. These other trucks carrying non-flammable hazardous cargo are currently allowed to use I-90 when flammable cargo is prohibited in the tunnels. In an action separate from this project, WSDOT is studying an extension of the current operating policy that prohibits flammable cargo in the I-90 tunnels and lids while the fire suppression systems are undergoing routine maintenance to include all hazardous cargo.

The following local and state codes apply to the cleanup of hazardous/flammable material spills. A summary of how each code applies to this project is included after each code listing.

Seattle Municipal Code

SMC 3.16.200 Incident Command Agency Designated. Summary: The Seattle Fire Department is the Hazardous Materials Incident Command Agency for all hazardous materials incidents within the corporate limits of The City of Seattle.

State Codes

RCW Title 4 – Civil Procedure, RCW 4.24 - Special Rights of Action and Special Immunities, RCW 4.24.314 - Person causing hazardous materials incident - Responsibility for incident clean-up – Liability. Summary: The person transporting hazardous materials shall clean up any hazardous materials incident that occurs during transportation, and will follow up to comply with all applicable federal and state laws and regulations.

RCW 70 – Public Health and Safety, RCW 70.136 - Hazardous Materials Incidents
Summaries of RCW 70.136.010, RCW 70.136.020, RCW 70.136.030, RCW 70.136.035, RCW 70.136.040, RCW 70.136.050, RCW 70.136.055, RCW 70.136.060, RCW 70.136.070: It is the intent of the legislature to promote and encourage advance planning, cooperation, and mutual assistance between applicable political subdivisions of the state and persons with equipment, personnel, and expertise in the handling of hazardous materials incidents, by establishing limitations on liability for those persons responding.

Summary of selected definitions:

- Hazardous materials: Materials which, if not contained may cause unacceptable risks to human life, unusual risks to the general public and to emergency response personnel responding at the scene; require unusual storage or transportation or require unusual treatment, packaging, or vehicles during transportation.

- Hazardous materials incident: an incident creating a danger to persons, property, or the environment as a result of spillage, seepage, fire, explosion, or release of hazardous materials, or the possibility thereof.

- Incident command agency: the predesignated or appointed agency charged with coordinating all activities and resources at the incident scene.

The governing body of each applicable political subdivision of this state shall designate a hazardous materials incident command agency within its boundaries. Along state and interstate highway corridors, the Washington state patrol shall be the designated incident command agency unless by mutual agreement that role has been assumed by another designated incident command agency.

In political subdivisions where an incident command agency has been designated, the Washington state patrol shall continue to respond with a supervisor to provide assistance to the incident command agency.

Hazardous materials incident command agencies are authorized and encouraged to enter into written hazardous materials emergency assistance agreements with any person whose expertise is deemed potentially useful.

An incident command agency is not liable for civil damages resulting from any act or omission in the performance of its duties, other than acts or omissions constituting gross negligence or willful or wanton misconduct.

RCW 70.136.060 lists terms and conditions that should be included in hazardous materials emergency assistance agreements that are executed prior to a hazardous materials incident.

Verbal hazardous materials emergency assistance agreements may be entered into at the scene of an incident where execution of a written agreement prior to the incident is not possible. The notification required by subsection (1) of this section shall be in substantially the form of the Notification of "Good Samaritan" Law, as fully cited in this RCW.

RCW Title 81 – Transportation, RCW 81.80 - Motor Freight Carriers, Rules and regulations. Summary: The commission shall have power and authority to prescribe rules and regulations in conformity with this chapter to carry out the purposes thereof, applicable to any and all "motor carriers," or to any persons transporting property by motor vehicle for compensation even though they do not come within the term "motor carrier" as herein defined.

4.10.2 Impacts

4.10.2.1 Construction

Seattle—All Alternatives

Because the Project would occur within the existing I-90 right-of-way, few of the hazardous materials sites identified in this study would pose any risk to the Project during construction. This is primarily due to such conditions as the substantial distances of most identified sites from the I-90 right-of-way, the lack of releases at many of the sites, and/or the cleanup status of nearby sites on which releases have been reported.

The 2 LUST sites identified within the Seattle portion of the I-90 right-of-way, the Day Street Park and Bradner Place Apartments, would not be affected by, or have any impact on, the Project. Ground disturbance or construction would not occur at either site.

Mercer Island

Alternatives R-1, R-5 Restripe and R-5 Modified

Construction would be minimal with these alternatives. No impacts related to hazardous waste sites are expected to occur.

Alternatives R-2B Modified and R-8A - Preferred Alternative

The construction of roadway ramps at 77th Avenue SE and 80th Avenue SE would offer some potential for an adverse impact from contaminated property, particularly if site preparation includes the removal of concrete abutments, pavement, and other soil-encapsulating materials present on the proposed ramp site. Potential impacts include encountering contaminated soils that may have resulted from the former operation of the three service stations within the I-90 right-of-way. However, any contaminated soils resulting from the past operation of those facilities may have been removed when underlying surficial soils were excavated and removed during previous I-90 construction, when the grade was lowered at least 15 feet. There is also potential to encounter contaminants that may have migrated into the proposed ramp areas from the LUST sites identified above.

Bellevue—All Alternatives

None of the potentially hazardous sites is located within the I-90 right-of-way in Bellevue portion of the study area; therefore, no impacts related to hazardous sites would occur.

4.10.2.2 Operation

No adverse impacts are expected to occur during operation of the Project with Alternatives R-1, R-2B Modified, R-5 Restripe or R-5 Modified. With Alternative R-8A, trucks carrying flammable cargo may be prohibited in the I-90 tunnels that are located between Rainier Avenue and Island Crest Way. If prohibited, flammable cargo would be re-routed to the north across Lake Washington via I-5, SR 520, and I-405; or to the south around Lake Washington via I-5 and I-405. This re-routing could affect approximately 180 trucks per day in the year of project opening and 220 trucks per day in year 2025 for the project based on current truck counts.

The I-90 tunnels are currently closed to trucks carrying flammable cargo due to maintenance approximately 14 percent of the time. A review by WSDOT of highway video tapes has shown that during these closures, approximately two-thirds of the re-routed trucks carrying flammable liquid cargo use the northern route over SR 520, and one-third use the southern route on I-405. For the purposes of the analysis included in this FEIS, it is assumed that a similar percentage of trucks would use the SR 520 or I-405 routes if a permanent prohibition on I-90 tunnel use were to be put in place.

The increase in mileage and vehicle-miles-traveled for the alternate flammable cargo routes over the current I-90 route is shown in Table 3.5-4 of the FEIS. For trucks traveling between Harbor Island and I-90 to the point of the I-90 intersection with I-405, the route is 9.1 miles. If these trucks were to instead use a route from Harbor Island going north on I-5, east on SR 520, and then south on I-405, the route would be approximately 16 miles, an increase of approximately seven miles. A south alternate route from Harbor Island consisting of south on I-5 to I-405 and then north on I-405, would be approximately 19.5 miles, an increase of approximately 10.5 miles.

Before any final policy determination is made, an evaluation is being made as to the change in risk of a crash on I-90 involving trucks carrying flammable cargo. The estimated frequency of crashes involving trucks carrying flammable cargo on I-90 would be statistically similar for the No Build Alternative and Alternative R-8A.

The local and state regulations listed in Section 4.10.1.3 would continue to be followed when the Proposed Project is constructed.

Crash Prediction Methodology

To assess the risk posed by the movement of flammable liquids, a number of steps were taken using nationally recognized methods. The first step was to identify alternate routes that could be used should I-90 be closed partially or entirely to flammable cargo.

If flammable cargo were prohibited from using the I-90 corridor, trucks carrying flammable liquid cargo would have to use I-5, I-405, SR 520, SR 522 or some combination of these roadways as part of their alternate route. The regional sources of flammable liquid cargoes being hauled over I-90 are concentrated at the fuel terminals in the industrial area near Spokane Street and I-5. These fuel terminals are located south of I-90. Based on studies conducted by WSDOT,

most trucks appear to use SR 520 or the I-5/I-405 route to the south of Lake Washington when I-90 is closed to trucks carrying flammable cargoes.

Potential alternate routes for trucks carrying flammable liquid cargo were divided into logical units for the assessment of crashes rates throughout these corridors. By first comparing crash rates, a relative assessment of safety performance of current conditions was made between the possible routes. Crash rates are also be used to determine the number of crashes for a given section of highway.

For any given section of highway the Institute of Transportation Engineers defines the crash rate as:

$$AccidentRate = \frac{(NumberofAccidents) * (1{,}000{,}000)}{(SectionLength) * (AADT) * (365\_days)} \qquad \text{Equation 1}$$

Crash rates were developed using the Washington State Patrol's crash data. The data was reviewed to determine the number of crashes for each section for medium and heavy trucks combined and for all vehicles. Light trucks were considered as automobiles in the development of truck crash rates.

Section lengths were reported in miles by determining the distance between the beginning and ending point of each segment. Average Annual Daily Traffic was accessed from the WSDOT traffic database. The denominator in Equation 1 represents the annual vehicle-miles of travel (VMT) in each corridor. Crash rates from Equation 1 are typically expressed as crashes per million vehicle-miles (MVM) of travel.

Summary of Risk Analysis

Appendix K includes a risk analysis for the potential change in occurrence of crashes involving trucks carrying flammable liquid cargo. The data used in the crash rate estimates are presented in Tables 1 and 2 of the Appendix. A truck involvement rate was computed to represent the percent of crashes involving trucks. These rates were used as the basis for the analysis of future conditions.

The probabilities for crashes involving trucks carrying flammable liquids in the Puget Sound range from 0.0111 to 0.0638 crashes per year (see Table 3 of Appendix K). Currently, the lowest probability is on I-405 between SR 520 and I-90, and the highest probability is on I-405 between I-5 and I-90. The current probability for I-90 between I-5 and I-405 is 0.0153 crashes per year which is among the lower probabilities for a roadway segment.

Based on the national database, about 65 percent of the collisions involving trucks carrying flammable liquids do not result in the release of flammable liquids. Without a release, there would not be a fire or explosion as a consequence of the crash. If a release of flammable liquid were to occur, there is about a 15 percent probability that the release would result in fire. If a release were to result in a fire, there is about a 30 percent probability that the fire would include an explosion. The overall probability of a fire or explosion from any crash involving trucks

carrying flammable cargo is the product of the included probabilities, or about 5 percent of all crashes involving trucks carrying flammable liquid cargo.

As shown on Table 4 of Appendix K, the probability of a crash resulting in a flammable liquid spill (35 percent of all crashes involving flammable liquid cargo) ranges from 0.0047 to 0.0226 occurrences per year. The probability of a spill resulting in fire (14.7 percent of all crashes resulting in a spill) ranges from 0.0006 to 0.0030 occurrences per year. The probability of a fire resulting in explosion (30.6 percent of all crashes resulting in a fire) ranges from 0.0002 to 0.0010 occurrences per year. The predicted outcomes for crashes involving trucks carrying flammable liquid cargo on I-90 are in the lower portions of the predicted ranges.

The estimated occurrences of crashes of various types are shown in Tables 4.10-1 and 2. Table 4.10-1 compares the No Build Alternative with Alternative R-8A for trucks carrying flammable liquid cargo continuing to be routed on I-90. Table 4.10-2 compares the Alternative R-8A rates on I-90 with the rates that could be expected with rerouted trucks on SR 520 or I-405. Given the infrequency of vehicles carrying flammable liquids being involved in a collision, spill, fire or explosion, the sample size of the analysis is not large enough to predict crash location along a given corridor with a statistically significant degree of certainty.

Table 4.10-1
Likelihood of Release Occurrence
Comparison Between No Build Alternative and Alternative R-8A for I-90 Between I-5 and I-405 for Years 2005 and 2025

Year	Roadway Alternative	Length (in miles)	Total Predicted Bi-directional Crashes (truck crashes/year)	Predicted Crashes with Spills (truck crashes/year)	Predicted Crashes Resulting in Fires (truck crashes/year)
2005	No Build Alternative	6.72	0.0153	0.0054	0.0008
	Alternative R-8A		0.0169	0.0060	0.0009
2025	No Build Alternative	6.72	0.0188	0.0067	0.0010
	Alternative R-8A		0.0225	0.0080	0.0012

Source: Flammable Liquids Risk Analysis, WSDOT 2003

The analysis used a rate-based approach to develop crash projections for trucks carrying flammable liquid cargo. As shown in Table 4.10-1, with year 2025 volumes the likelihood of truck crashes resulting in fires is predicted to be 0.0010 crashes/year on I-90 for the No Build Alternative, as compared to 0.0012 crashes/year on I-90 for Alternative R-8A without flammable cargo prohibitions, an increase of approximately 20 percent with Alternative R-8A.

Table 4.10-2
Likelihood of Release Occurrence
Comparison Between Alternative R-8A Routing of Trucks Carrying Flammable Liquid Cargo on I-90 and Reroutes Using SR 520 or I-405 For Years 2005 and 2025

Year	Route for Trucks Carrying Flammable Liquid Cargo	Length (in miles)	Total Predicted Bi-directional Crashes (truck crashes/year)	Predicted Crashes with Spills (truck crashes/year)	Predicted Crashes Resulting in Fires (truck crashes/year)
2005	I-90	6.72	0.0169	0.0060	0.0009
	North and South Alternate Route	34.5	0.0325	0.0115	0.0017
2025	I-90	6.72	0.0225	0.0080	0.0012
	North and South Alternate Route	34.5	0.0397	0.0141	0.0021

Source: Flammable Liquids Risk Analysis, WSDOT 2003

Results indicate that the rerouting of trucks carrying flammable liquid cargo on I-90 would increase the likelihood of crashes involving these trucks. This increase would be due to the combined effects of the increase in vehicle miles of travel on the alternate routes, and higher predicted crash rates on the South Alternate Route. The predicted likelihood of crashes of these trucks that would result in fires is 0.0021 crashes/year with year 2025 volumes on the North and South Alternate Routes (Table 4.10-2). This would represent an increase of approximately 75 percent over the predicted likelihood of crashes resulting in a fire if these trucks remained on I-90 with Alternative R-8A, or an increase of approximately 110 percent relative to the No Build Alternative. In all cases, the likelihood of a crash involving trucks carrying flammable cargo is small, and the likelihood of a crash resulting in a fire or explosion is remote.

The prohibition of flammable cargoes in the I-90 tunnels and lids requires consideration of both the frequency of recurrence and the consequences of crashes resulting in fires. WSDOT, in an attempt to allow the continued use of the I-90 tunnels and lids by trucks carrying flammable cargo, is committed to further study of the issues associated with the movement of flammable cargo and the means of managing risks associated with the movement of these cargoes in the I-90 tunnels and lids.

If this effort results in a policy decision to prohibit trucks carrying flammable cargo in the I-90 tunnels and lids, WSDOT is committed to further studying the means of managing risks associated with the movement of these cargoes on alternate routes. An operational decision will be made in consultation with FHWA and other project stakeholders, including local fire departments.

WSDOT is also studying an extension of the current operating policy that prohibits flammable cargo to also include all hazardous cargo in the I-90 tunnels and lids while the fire suppression systems is undergoing routine maintenance.

Before a policy decision is made to prohibit flammable and/or hazardous cargo on I-90, a public participation process would be implemented as outlined in the Code of Federal Regulations, *Title 49 -- Transportation, part 397 -- Transportation of Hazardous Materials; Driving and Parking Rules, Subpart C -- Routing of Non-Radioactive Hazardous Materials, Section 71 Federal Standards (49CFR397.71),* which states that prior to the establishment of a change in flammable or hazardous route designation, WSDOT shall provide public notification and a 30-day period in which to comment. If a public hearing is determined to be necessary the public shall be notified 30 days in advance of the hearing date.

If a policy decision is made to allow the continued use of the I-90 tunnels and lids by trucks carrying flammable cargo, public notification will be provided by WSDOT.

4.10.3 Mitigation Measures

4.10.3.1 Construction

Alternatives R-1 and R-5 Restripe

No mitigation measures are required.

Alternatives R-2B Modified, R-5 Modified, and R-8A – *Preferred Alternative*

In the event of discovery of a hazardous site, health and safety monitoring will be conducted on work sites with potential hazardous materials. If applicable, air will be monitored for combustible organic compounds such as gasoline, explosive atmospheres, oxygen concentration, and carbon monoxide, and water will be tested for the presence of hazardous or toxic materials. Proper clothing, breathing equipment and other measures will be used to provide a safer environment for construction workers. Measures would be implemented to address public health, worker health and safety, and to prevent the spread of any existing contamination encountered during construction.

4.10.3.2 Operation

No mitigation measures are required beyond the standard spill response plans already in place with WSDOT.

4.11 PUBLIC SERVICES

This section describes the existing public services in the study area and assesses the impacts of the Project on public services. The study area for this section extends between 1 to 3 miles either side of the I-90 corridor between I-5 to the west and several miles to the east of I-405.

4.11.1 Affected Environment

4.11.1.1 Regional Emergency Services

Washington State Patrol

There are two Washington State Patrol stations that are responsible for traffic law enforcement in and immediately surrounding the study area. The District Headquarters are located in Bellevue just north of I-90 near 156th Avenue SE, and the Roanoke Detachment Office is located in downtown Seattle. Each station is staffed by 3 sergeants and 25 troopers (McCulley 2002).

The District Headquarters responds to calls for service and carries out traffic law enforcement on I-90 from Highpoint (east of Issaquah) to the Rainier Avenue S exit located west of the Mount Baker Ridge tunnel. Officers at the District Headquarters also respond to calls and conduct traffic law enforcement on the section of I-405 between Coal Creek Parkway and the King County/Snohomish County line. The Roanoke Detachment Office responds to calls for service and carries out traffic law enforcement on I-90 from I-5 to the West Mercer Way exit, and on I-5 from the Michigan Street exit to the King County/Snohomish County line. The response time of the Washington State Patrol to emergencies on I-90, I-405, and I-5 typically ranges between 5 to 10 minutes (McCulley 2002).

Washington State Patrol has advised that congestion on I-90 and associated ramps can increase response times. During times when congestion is bad, the department uses emergency lights, sirens, and airhorns to warn motorists to clear a path for emergency vehicles, or they drive on the shoulder (McCulley 2002).

King County Sheriff's Office

Precinct 3 of the King County Sheriff's Office is located at 22300 SE 231st Street in Maple Valley. The precinct has approximately 150 officers that serve areas such as Maple Valley, Newcastle, Renton, and Kent. The only area in the study area that the officers at Precinct 3 serve is Beaux Arts, where an officer from the Sheriff's department is required to be present for the first half an hour of each shift (Webster 2002).

Medical Services

American Medical Response operates an ambulance service that serves King County. The main ambulance station is located in Tukwila and is staffed by approximately 200 people, including staff who work in the communications center and vehicle maintenance workshop. There are about 60 ambulances and support vehicles at the Tukwila ambulance station. Outlying

ambulance stations are located in Auburn, Bothell, Des Moines, Enumclaw, Federal Way, Issaquah, Kent, Kirkland, Maple Valley, Renton, and Shoreline, and are staffed by 8 to 24 people (Butte 2002).

The average response time to emergencies in the areas surrounding the I-90 roadway between I-5 and I-405 is 10 minutes. The main routes used to respond to emergencies in these areas are I-5, I-405, I-90, Rainier Avenue S, and Martin Luther King Junior Way S. American Medical Response has advised that traffic congestion on I-90 has a substantial adverse effect on response times, and that SR-520 and other arterials or surface streets are used as alternative routes when traffic congestion on I-90 is severe (Butte 2002).

If people need to be hospitalized or need additional care, American Medical Response transports them to the nearest hospital or medical center in King County that is equipped to treat the patient's injury. Harborview Medical Center is located at 325 9th Avenue and is a regional health care facility for the Pacific Northwest and Alaska. As well as providing standard health care services, the medical center is a referral center that houses several centers of emphasis in trauma care, burns, HIV/AIDS, and neurosciences. It is also a teaching and research facility. The medical center (in conjunction with other organizations) operates Airlift Northwest, which has helicopters and fixed-wing jets for providing rapid transport and in-flight care.

4.11.1.2 Local Emergency Services

Seattle

Fire Protection

The Seattle Fire Department provides fire suppression along with emergency medical services to the population of Seattle. The Seattle Fire Department has a total of 33 fire stations strategically located throughout Seattle (Nelson 2002). Two of these stations are in the immediate vicinity of the Beacon Hill/Mount Baker/Judkins Park area. A description of these fire stations is provided below:

- **Fire Station 6.** This fire station is located at 101 23rd Avenue near E Yesler Way, which is north of I-90. The station is staffed by 7 firefighters. Fire fighting apparatus at the station is composed of one ladder truck and a fire engine.

- **Fire Station 30.** This fire station is located at 2931 Mount Baker Boulevard S near Rainier Avenue S, which is south of I-90. The station is staffed by 4 firefighters. Fire fighting apparatus at the station consists of one fire engine.

In the event of a major fire or rescue incident in the Beacon Hill/Mount Baker/Judkins Park area, additional fire companies from the following stations typically respond:

- **Fire Station 13.** This fire station is located at 3601 Beacon Ave S, which is south of I-90. Four firefighters and a Battalion Chief staff the station. Fire fighting apparatus at the station consists of one fire engine and a vehicle that is used by the chief (Nelson 2002).

- **Fire Station 10 – Seattle Fire Department Headquarters.** This fire station is located at 301 S Main Street, north of I-90 and west of I-5. Eleven firefighters and a Deputy Chief staff the station. Fire fighting apparatus at the station consists of one ladder truck, one fire engine, one aid unit, one hazardous materials unit, and two command vehicles (Nelson 2002).

- **Fire Station 25.** This fire station is located at 1300 E Pine Street to the north of I-90. The station is operated by 10 firefighters and a Battalion Chief. Fire fighting apparatus at the station is composed of one ladder truck, one fire engine, an aid unit, a command vehicle, a mobile generator/carbon dioxide unit, and a hose tender (Nelson 2002).

In the event of a major medical emergency, any one of the seven available Seattle Fire Department Medic Units may be dispatched, but the closest units are at the Medic One Headquarters. The Medic One Headquarters is located at Harborview Medical center at 325 9th Avenue, to the north of I-90 and east of I-5. Four paramedics, one Medical Services Officer, and one Medical Services Administrator staff the headquarters. The Paramedics and Medical Services Officer are firefighters who have been trained in cooperation with Harborview Medical Center and the University of Washington. The two medic one units (Medic One and Medic Ten) are fitted with the necessary equipment for carrying out advanced life support activities. The units at the Medic One Headquarters respond to basic and advanced life support alarms, as well as fires, emergencies involving hazardous materials, and rescue operations (Nelson 2002).

A Technical Rescue Team is housed at Fire Station 14, which is located at 3224 4th Avenue S. Six firefighters staff the station. Fire fighting apparatus at the station consists of one ladder truck, one rescue unit, and an aid unit. The firefighters assigned to Fire Station 14 are also trained in high-angle rescue, dive rescue, confined space rescue, structural collapse shoring, and heavy machinery/vehicle extrication (Nelson 2002).

The average response times of the Seattle Fire Department is 3.5 minutes for medical calls and 4.5 minutes for fire responses from companies that are stationed in the area where the emergency is located. Traditionally, fire responses tend to take slightly longer because the firefighters must put on protective clothing prior to responding (Nelson 2002). The ability of the Seattle Fire Department to respond to emergencies on I-90 between I-5 and I-405 is at times adversely affected by traffic congestion. During these times, the department uses emergency lights, sirens, and airhorns to warn motorists to clear a path for emergency vehicles.

Law Enforcement

The Seattle Police Department's South Precinct is located at 3001 S Myrtle Street to the south of I-90 and east of I-5. The South Precinct is staffed by approximately 200 police officers and administrative personnel. Equipment at the precinct includes a mobile precinct, a detached portable office, several gas pumps, and approximately 55 police cars.

The main north/south routes that are used to respond to dispatched calls from the precinct are 15th Avenue S, Beacon Avenue S, Martin Luther King Junior Way S, and Rainier Avenue S. The main east/west routes are S McClellan Street, S Columbian Way, S Orcas Street, and S Graham Street. The main north/south routes used to respond to emergencies in the Mount Baker

and Judkins Park neighborhoods are Rainier Avenue S, Martin Luther King Junior Way S, and Lake Washington Boulevard. The main east/west routes are S Massachusetts Street, S McLellan Street, and S Genessee Street (Santo Domingo 2002).

The Seattle Police Department has advised that congestion on I-90 (and associated ramps) typically has little or no effect on police response times in the South Precinct jurisdiction (Santo Domingo 2002).

Mercer Island

Fire Protection

Mercer Island Fire Department has two fire stations, which are described below:

- **Fire Station 91.** This fire station is the larger of the two stations and is located at 3030 78th Avenue SE, south of I-90 near Island Crest Way. The fire station is staffed by a battalion chief (or acting battalion chief), a company officer (or acting company officer), and two firefighters 24 hours a day, 7 days a week. Fire fighting apparatus at the station consists of three maxi pumper fire trucks, one midi pumper fire fighting truck, one aerial ladder truck, one medium-sized rescue truck, one command vehicle, two medical aid units, one trench rescue trailer with equipment, one salvage and overhaul trailer with equipment, and one potable water trailer (Tubbs 2002).

- **Fire Station 92.** This fire station is located at 8473 SE 68th Street on the southern end of Mercer Island. The fire station is staffed by a lieutenant (or acting lieutenant) and two firefighters 24 hours a day, 7 days a week. Fire fighting apparatus at the station consists of one maxi pumper fire engine, a midi pumper fire fighting truck, a medical aid unit, one emergency generator trailer with a 20 kilowatt (kW) generator, and two 5-kW portable generators (Tubbs 2002).

The Mercer Island Fire Department is required to have a minimum of seven fulltime firefighters on duty at all times (Tubbs 2002).

A number of firefighters from the Mercer Island Fire Department are part of the Mercer Island Department of Public Safety, which provides water rescue, recovery, and investigation services to and adjacent to the City of Mercer Island. These firefighters are certified rescue divers who are capable of deep and shallow water operations (City of Mercer Island 2002). The divers are equipped with a dive team trailer with the necessary water rescue equipment.

The Mercer Island Fire Department's primary response area is the geographic boundaries of Mercer Island, which includes the Lake Washington boundaries (midpoint between the shorelines). They are also responsible for responding to incidents on westbound I-90 to the Rainier Avenue S exits and on eastbound I-90 to the Richards Road exit. The Mercer Island Fire Department also has mutual aid agreements with surrounding communities and has provided fire protection, rescue/medical, and water-based services as far east as Lake Sammamish and as far west as Seattle (Tubbs 2002).

Fire Station 91's current average response time for all incidents is 4 minutes and 25 seconds. The current average response time for Fire Station 92 for all incidents is 5 minutes and 50 seconds. I-90 is often used as a response route when appropriate. The decision on whether to use I-90 is based on several factors, including the time of day, traffic conditions, weather conditions, and the nature of the incident. If the incident is on I-90 itself, there are only a few on and off ramps and only two emergency access roadways to I-90. The Mercer Island Fire Department's biggest challenge in responding to incidents is receiving accurate information on the location of the incident. With limited staff and limited access to I-90, a lack of accurate information is a concern because it can adversely affect the department's ability to respond to emergencies in a timely manner. This is exacerbated during times when traffic congestion is a problem (Tubbs 2002).

Law Enforcement

The Mercer Island Police Department is part of the Mercer Island Department of Public Safety. The Police Department is located at 9611 SE 36th Street immediately to the south of I-90 on the northeastern portion of Mercer Island. The Police Department is divided into the Police Operations unit and the Administrative Services unit. Police Operations includes the Marine Patrol and Patrol Section. Administrative Services includes the Criminal Investigations Section (detectives), the Services Section (dispatch, records, and evidence room), and a training and personnel sergeant (City of Mercer Island 2002). The Police Department is staffed by 30 police officers (Lacy 2002). Some of the services provided by the Police Department include the following:

- Routine patrol, including enforcement of criminal and traffic laws. There are four patrol sergeants and 15 police officers who perform routine patrol. During each shift there are typically 3 to 4 police officers on duty (Lacy 2002).
- Answering calls for service and taking appropriate police action.
- Follow-up investigations of criminal cases.
- Bicycle patrol of the City's CBD, parks, school grounds, bicycle/pedestrian paths, and the I-90 right-of-way. The bicycle patrol is staffed by one supervisor and eight officers.
- Marine patrol in the waters of Mercer Island, Medina, Renton, and Hunts Point.
- Community-oriented policing and emergency management programs.

The average response time for emergency calls on Mercer Island is between 5 and 6 minutes. During the morning and evening peak hour, traffic congestion on I-90 is a problem; however, the Police Department is able to use other streets on Mercer Island to bypass congested areas. 77th and 80th Avenues SE are the main roads used to travel to the northern end of Mercer Island, and 76th Avenue SE and Island Crest Way are also sometimes used (Lacy 2002).

Bellevue

Fire Protection

The Bellevue Fire Department provides fire suppression along with emergency medical services to the areas of Bellevue, Beaux Arts, Clyde Hill, Hunts Point, Medina, Yarrow Point, Newcastle, and King County Fire District Number 14. The Bellevue Fire Department has three fire stations in the study area, which are described below:

- **Station 1 (Headquarters).** This fire station is located at 766 Bellevue Way SE to the north of I-90. The station is normally staffed by 6 personnel. Fire fighting apparatus at the station consists of one fire engine, a battalion truck, and a medical aid unit.

- **Station 2.** This fire station is located at 2802 148 Avenue SE to the north of I-90. The station is staffed by 3 firefighters, 2 firefighters who are trained paramedics, and a firefighter/paramedic supervisor. Fire fighting apparatus at the station consists of one fire engine, a medical aid unit, and a medic one unit.

- **Station 4.** This fire station is located at 4216 128 Avenue SE to the south of I-90. The station is typically staffed by 3 personnel. Fire fighting apparatus at the station consists of one fire engine and a medical aid unit.

Law Enforcement

The Bellevue Police Department has two police stations in the study area. The Bellevue Police Headquarters are located at City Hall at 11511 Main Street, to the north of I-90. The police headquarters are staffed by police officers and administration personnel. The services available at the headquarters include patrol, investigations, fingerprinting, firearms licensing, and domestic violence and harassment-related court orders. The other police station in the study area is the Factoria substation, which is located inside Factoria Square Mall south of I-90. The police station is staffed by one full-time officer and a number of volunteers who work the daytime shift Monday through Friday. Services provided by the Factoria substation include business watch and community watch patrol.

The Bellevue Police Department primarily serves Bellevue and its surrounding areas, but the department also provides assistance to other police departments in the area including the Mercer Island Police Department. The main routes used to respond to emergencies in the area are 148th Avenue SE, I-405, and I-90. During the morning and evening peak hour, traffic congestion on I-90 and surrounding streets has an adverse impact on the ability of the Bellevue Police Department to respond to emergencies, with police vehicles often having to use the shoulders on I-90 to pass congested areas (Hershi 2002).

4.11.1.3 Other Public Services

Other public services in the Beacon Hill, Mount Baker, Judkins Park, Mercer Island, and Bellevue areas include waste collection and mail collection and delivery. Waste collection vehicles and US Postal Service vehicles use the I-90 roadway and other streets in the study area.

4.11.2 Impacts

Information from Chapter 3 – Transportation, Internet web sites for the various emergency service providers, and from the public service providers in the study area were reviewed in order to assess the impacts of the Project on public services. An impact on public services is considered if the response times of emergency service providers is regularly delayed for several minutes or more and if the Project results in substantial increases in demand for public services.

4.11.2.1 Construction

Alternative R-1: Existing/No Build

The small-scale roadway modifications or construction activities that would be required to preserve and maintain the corridor would not have any major impacts on public services. The small-scale construction activities such as pavement and bridge deck rehabilitation may result in some traffic congestion and could potentially delay emergency vehicles for a short period of time.

Alternative R-2B Modified

The construction activities associated with Alternative R-2B Modified, such as adding median barriers to the center roadway, conducting road widening, and constructing the two center roadway off-ramps at 77th and 80th Avenues SE, would necessitate temporary and intermittent lane changes on the I-90 roadway so as to direct traffic around the construction areas. There are likely to be some traffic delays as a result, and the delays would occur for the duration of construction.

The ability of some public service providers to serve the community would be affected by the construction activities and the associated lane changes and traffic delays. The public service providers most likely to be affected are the emergency services, such as the Washington State Patrol, American Medical Response, Seattle Fire Department, Mercer Island Fire Department, Mercer Island Police Department, and the Bellevue Police Department, who have all indicated that they use I-90 to respond to emergencies and/or respond to emergencies on the I-90 roadway itself. Several of the emergency service providers in the area, such as the Seattle Fire Department and Bellevue Police Department, have reported that traffic congestion on I-90 currently has an adverse impact on their ability to respond to emergencies. The Seattle Police Department has indicated that I-90 is not one of their main routes used to respond to emergencies. The King County Sheriff's Department have indicated that they only use I-90 to travel from their precinct in Maple Valley to Beaux Arts, where they are required to be present for the first half an hour of each shift; therefore, they are only likely to experience traffic delays during this commute and not when they are responding to an emergency.

During construction, it would be necessary to install detours on local streets near the I-90 ramps. It is also possible that short-term closures of 77th and 80th Avenues SE may be required during construction of the off-ramps and that partial road closures would be required on the Bellevue Way SE ramp during the construction activities to modify it for two-way operation. These detours and road closures would impact some public service providers such as the Mercer Island

Police Department, who have indicated that 77th and 80th Avenues SE are two of the main routes used to access the northern portion of Mercer Island.

The construction activities on the HMH floating bridge would not have an impact on the ability of emergency service providers, such as the Mercer Island Police and Fire Departments, to perform water-based rescues in Lake Washington near the bridge. However, depending on the construction activities being carried out on the I-90 roadway at the time, delays may occur when rescue personnel are traveling from their stations to the rescue boats.

The construction activities would not have any impact on the ability of the Harborview Medical Center to treat patients who have been transported to the center.

The traffic delays that would occur as a consequence of the construction activities may have some adverse impacts on waste collection services and mail collection and delivery services.

Alternative R-5 Restripe

Alternative R-5 Restripe would have similar impacts on public services as described for Alternative R2-B Modified; however, impacts would be to a lesser degree because the construction activities associated with Alternative R-5 Restripe would be less involved and would likely result in less traffic delays on the I-90 roadway.

Alternatives R-5 Modified and R-8A – *Preferred Alternative*

Alternatives R-5 Modified and R-8A would have similar impacts on public services as described for Alternative R2-B Modified.

4.11.2.2 Operation

Implementation of any of the alternatives will result in continued access to and from I-90, not unlike today. The estimated travel times may be the only differentiating aspect between alternatives for public services. (Refer to Chapter 3 – Transportation for travel time details.) No adverse impacts are anticipated.

4.11.3 Mitigation Measures

4.11.3.1 Construction

The following mitigation measures would be used during the Project construction phase to mitigate potential impacts.

PUB-1. To the extent it would be feasible, shoulders would be provided on the I-90 roadways during construction to facilitate passage of emergency vehicles during congested periods.

PUB-2. Personnel controlling the movement of vehicles in areas where construction works are being carried out would give priority to emergency vehicles over other vehicles. Emergency vehicles would only be allowed to proceed when it is safe to do so.

PUB-3. Emergency vehicles would not be restricted from responding to emergencies on streets where detours are in effect, provided it is not unsafe for them to proceed.

PUB-4. Signs would be erected to inform users of detours.

PUB-5. Development of construction staging plans would include consideration of limiting closures of 77th Avenue SE and 80th Avenue SE to avoid closing them at the same time.

PUB-6. Emergency service providers would be provided with regular updates on the progress of the construction activities and adequate notice of any proposed road closures or lengthy traffic delays.

PUB-7. Construction equipment would not be parked in front of fire hydrants.

4.11.3.2 Operation

No mitigation measures are required.

4.12 UTILITIES

This section describes the existing utilities in the study area and assesses the impacts of the Project on the utilities. The study area for this section extends 1 to 3 miles on either side of the I-90 corridor between I-5 to the west and several miles to the east of I-405.

4.12.1 Affected Environment

Potentially affected utilities in the study area include gas and power lines, water, sanitary sewer, storm sewer, communications, cable TV, and streetlights and traffic signals. Information regarding the location of these utilities was compiled by reviewing utility maps on file at the offices of US West, Puget Sound Energy, and the City of Mercer Island. In addition, the utility franchise and permit database maintained by the WSDOT's Northwest Region utility section was reviewed; this database identifies utilities that are located within WSDOT's right-of-way. Utility maps compiled by Infrastructure Consulting Corporation of Tukwila, Washington, were reviewed, and the study area was physically inspected. The methodology adopted for this analysis included review of the WSDOT *Design Manual* (May 2001) and *Utilities Manual* (September 1998), which cover both temporary and permanent basic utility removal, relocation requirements, and standards.

Power and Gas

According to records Seattle City Light and Puget Sound Energy have electrical power transmission lines and natural gas facilities located within the I-90 right-of-way to the west of Rainier Avenue S. King County has trolley bus power lines that cross under I-90 at Rainier Avenue S. Puget Sound Energy natural power and natural gas lines are also located within the I-90 right-of-way in the cities of Mercer Island and Bellevue.

Water

Three potable water transmission lines owned by Seattle Public Utilities are located within the I-90 right-of-way, south of I-90 in the vicinity of the Bellevue Way SE interchange. These water lines cross Lake Washington between Bellevue and Mercer Island, two under the lake and one on the East Channel bridge, the latter serving Mercer Island and providing fire protection on the bridge. Elsewhere in the corridor, municipally-owned potable water lines cross the I-90 right-of-way and run along surface streets adjacent to I-90. WSDOT-owned fire protection and landscape irrigation water supply systems are found throughout the I-90 corridor.

Sanitary Sewer

Records indicate that King County (Metro), the City of Seattle, the Mercer Island Sewer District, and the City of Bellevue have sanitary sewer facilities within the I-90 corridor. These are predominantly within surface streets that cross I-90 at various points in the corridor. Sanitary sewer facilities that are within WSDOT right-of-way are located on Mercer Island east of Shorewood Drive to the East Channel bridge, and in Bellevue near Bellevue Way SE.

Storm Sewer

Within the City of Seattle, storm water from the I-90 right-of-way is discharged into City of Seattle and King County (Metro) systems; the latter is a combined sewer system. On Mercer Island, two city storm sewer trunk lines cross under I-90 in the vicinity of 77th Avenue SE and Island Crest Way. WSDOT stormwater systems on Mercer Island discharge directly into Lake Washington. Similarly, WSDOT stormwater systems in the vicinity of Bellevue Way SE discharge directly into Mercer Slough. Refer to Section 4.7 Water Resources of this FEIS for more detail on existing storm sewer systems, water quality treatment facilities, and outfall locations.

Communications

WSDOT-owned fiber optic and twisted pair communication lines occur throughout the I-90 corridor. These connect the WSDOT Traffic Management Center in north Seattle to the control centers for the Mount Baker Ridge tunnels and lid and the First Hill lid, and to monitoring systems for the two I-90 floating bridges. They also provide for communications to and from the various Intelligent Transportation Systems (ITS) used to monitor and control traffic flow in the corridor, including closed-circuit TV cameras, ramp meters, changeable message signs, traffic data stations, and weather stations.

Qwest (formerly U.S. West Communications) has fiber optic and telephone communication lines within the I-90 right-of-way on Mercer Island and in Bellevue. VoiceStream has installed wireless communication (cell phone) antennas along the south side of eastbound I-90 at the West Mercer Way exit. Qwest and Nextel have installed a joint use wireless communication antenna and service cabinets at the base of the abutment along the east side of 60th Avenue SE and within the I-90 right-of-way.

Cable TV

Comcast (formerly AT&T Broadband and prior to that Viacom Cable) has fiber cable installations in conduits located intermittently in WSDOT right-of-way throughout the corridor. This includes lines on the East Channel bridge.

Illumination and Traffic Signals

The cities of Seattle, Mercer Island, and Bellevue own and operate roadway illumination and traffic signal systems for surface streets that cross or are adjacent to the I-90 right-of-way. WSDOT has numerous luminaires and associated power systems located within the I-90 right-of-way. WSDOT ramp meter traffic signals are located at each entrance ramp fed by surface streets.

4.12.2 Impacts

4.12.2.1 Construction

Potential temporary impacts may result from the Project. Specific potential impacts to the integrity and operation of utilities in the study area are discussed in the following sections.

Alternative R-1: Existing/No Build

The small-scale roadway modifications or construction activities that would be required to preserve and maintain the corridor would not have any major impacts on existing utilities. These small-scale construction activities, such as pavement and bridge deck rehabilitation, may result in some temporary utility outages or rerouting of utilities along the corridor.

Alternative R-2B Modified

The construction activities associated with Alternative R-2B Modified, such as adding a concrete median barrier to the center roadway, widening the center roadway on Mercer Island, constructing center roadway exit ramps at 77th and 80th Avenues SE, and converting the Bellevue Way SE ramp to two-way operation, would necessitate temporary and intermittent rerouting of WSDOT-owned utilities (specifically communication lines, fire and irrigation water supply systems, and illumination systems) around construction areas. There would likely be some modifications to existing utilities; these would include modifications to existing and construction of new illumination and traffic signal installations in the vicinity of the center roadway ramps on Mercer Island and at Bellevue Way SE, and restoration or replacement of existing fire and irrigation systems along the I-90 center roadway. These impacts would be temporary, affect only the corridor, and occur for approximately 6 months to one year during construction.

Existing storm sewer systems that would be affected with the widening of the I-90 center roadway and the addition of new ramps would be replaced adjacent to the existing locations along the widened section. These impacts would be minimal and would occur periodically during construction.

Alternative R-5 Restripe

Alternative R-5 Restripe would have a minimal impact on utilities within the I-90 corridor. Construction activity would be largely limited to restriping existing I-90 roadways, and erection of additional signing adjacent to the outer roadway shoulders.

Alternative R-5 Modified

The construction activities associated with Alternative R-5 Modified, including widening the outer roadways, constructing an exit ramp at 80th Avenue SE, and modifications to the Bellevue Way SE ramp to provide access to the westbound HOV lane, would necessitate temporary and intermittent rerouting of WSDOT-owned utilities (specifically communication lines, fire and irrigation water supply systems, and illumination systems) around construction areas. There

would likely be some modifications to existing utilities; these would include modifications to existing and construction of new illumination and traffic signal installations in the vicinity of the new and modified ramps, and restoration or replacement of existing fire and irrigation systems along the I-90 outer roadways. These impacts would be temporary, affect only the corridor, and occur for approximately 6 months to one year during construction.

Existing storm sewer systems that would be affected with the widening of the I-90 outer roadways and the addition of new ramps would be replaced adjacent to the existing locations along the widened section. These impacts would be minimal and would occur periodically during construction.

Alternative R-8A – *Preferred Alternative*

The construction activities associated with Alternative R-8A, widening the outer roadways, constructing new HOV exit ramps at 77th and 80th Avenues SE, and modifications to the Bellevue Way SE ramp to provide access to the westbound HOV lane, would necessitate temporary and intermittent rerouting of WSDOT-owned utilities (specifically communication lines, fire and irrigation water supply systems, and illumination systems) around construction areas. There would likely be some modifications to existing utilities; these modifications would include modifications to existing and construction of new illumination and traffic signal installations in the vicinity of the new HOV ramps, and restoration or replacement of existing fire and irrigation systems along the I-90 outer roadways. These impacts would be temporary, affect only the corridor, and occur for approximately 6 months to one year during construction.

Existing storm sewer systems that would be affected with the widening of the I-90 outer roadways would be replaced adjacent to the existing location along the widened section. These impacts are minimal and would occur periodically with the construction widening.

Table 4.12-1 shows the affected utilities and their impacts for each of the proposed alternatives.

Table 4.12-1
Summary of Utility Impacts

Utility	R-1 Existing and No Build	R-2B Modified Two-Way Center Roadway	R-5 Restripe Outer Roadway Transit Shoulders	R-5 Modified Outer Roadway Transit Shoulders w/Widening	R-8A HOV Lanes in Outer Roadways
Power & Gas	No impact	Minor adjustments as required	No impact	Minor adjustments as required	Minor adjustments as required
Water	No impact	Minor adjustments as required	Minor adjustments as required	Minor adjustments as required	Minor adjustments as required
Sanitary Sewer	No impact	No impact	No impact	No impact	No impact
Storm Sewer	No impact	Minor adjustments as required	No impact	Minor adjustments as required	Minor adjustments as required
Communications	No impact	Minor adjustments as required	Minor adjustments as required	Minor adjustments as required	Minor adjustments as required
Cable TV	No impact	Minor adjustments as required	No impact	Minor adjustments as required	Minor adjustments as required
Illumination and Traffic Signals	No impact	Minor adjustments as required	Minor adjustments as required	Minor adjustments as required	Minor adjustments as required

Note:
HOV = high-occupancy vehicle

Source: URS Corporation and ICON

4.12.2.2 Operation

Implementation of any of the alternatives would result in continued utility placement along the I-90 corridor, not unlike today. The primary impacts would occur to WSDOT-owned utilities that are within the existing I-90 roadway envelopes, including water supply lines for fire protection and irrigation systems, communication lines associated with ITS devices, and illumination and traffic signal systems. As noted in Table 4.12-1, some minor adjustments to the location of public utilities, including power and gas, water, sanitary and storm sewer, communications, cable TV, and illumination and traffic signal systems that are located within WSDOT rights-of-way could be required in the vicinity of ramp terminals on Mercer Island and in Bellevue. Specific numbers are not available due to the level of design engineering completed for the Project at this time. No long-term adverse impacts are anticipated with any alternative.

4.12.3 Mitigation Measures

4.12.3.1 Construction

The following mitigation measures would be used during the Project construction phase to mitigate potential impacts:

UTI-1. Prior to any construction activities or pre-construction excavation, utilities would be located using a locator service. Representatives of each utility would be contacted and involved in the process to ensure that utility infrastructure is not damaged and that services are not interrupted.

UTI-2. Existing utilities would be protected and kept in operation. If necessary, temporary luminaires and traffic signals would be established to maintain safety and traffic flow along the corridor. Temporary services would be constructed prior to shut off and/or relocation of existing utility services, where necessary.

4.12.3.2 Operation

No mitigation measures would be required.

4.13 HISTORIC AND ARCHAEOLOGICAL RESOURCES

This section addresses the historic and archaeological resources potentially present in the study areas (defined below). This study of historic and archaeological resources is consistent with the requirements of the National Historic Preservation Act of 1966 (NHPA), as amended; U.S. Department of Transportation (DOT) Section 4(f) regulations, and other relevant federal, state, and local legislation and regulations. The methodology included literature and records research and field visits.

4.13.1 Affected Environment

Section 106 of the NHPA requires federal agencies to take into account the effects that a project would have on properties included in or eligible for the National Register of Historic Places (NRHP). Prior to approving a project, the federal agency must give a reasonable opportunity for comment to the Advisory Council on Historic Preservation. Consultation with Native American tribes and the Washington Office of Archeology and Historic Preservation (OAHP) was initiated for the project in October 2002. Correspondence can be found in Appendix E and includes the listing of tribes with jurisdiction or interest: Duwamish, Kikiallus, Muckleshoot, Snoqualmie, Suquamish, Tulalip and Yakama.

Section 110 of the NHPA establishes the broad historic preservation responsibilities of federal agencies and is intended to ensure that historic preservation is integrated into all federal agency programs. This intent was first set forth in the preamble to the NHPA in 1966. When the NHPA was amended in 1980, Section 110 was added to expand and make more explicit federal agency responsibility for identifying and protecting historic properties. Section 110 also requires each federal agency to consider projects and programs that further the purposes of the NHPA (National Park Service 2002).

Section 4(f) refers to the original section within the DOT Act of 1966, which requires that park and recreational lands, wildlife and waterfowl refuges, and historic sites be considered during the development of transportation projects and applies to properties included on or eligible for the NRHP. Section 4(f) applies to all projects that receive funding from, or require approval by, an agency of DOT, including FHWA. Refer to Section 4.14 Parklands, of this FEIS for more information about Section 4(f).

Historic structures or districts identified in this section are listed on the Washington Heritage Register administered by the State Historic Preservation Officer of the Washington State Office of Archaeology and Historic Preservation (OAHP), the NRHP maintained by the National Park Service, and/or as local historic landmarks. Additional historic structures listed have been identified in previous studies (Stump 1999, Stratton and Lindeman 1977) and confirmed to be still standing during field trips in July and August 2002.

Considering the magnitude and nature of the Project in accordance with 36 CFR 800.4, the Area of Potential Effect (APE) has been defined to be limited to only those historic resources directly above, within or abutting the roadway, or located at a close enough distance to the roadway to

potentially be affected by proximity impacts such as noise or dust. Construction limited to the existing right-of-way, combined with the current existence of the interstate along this corridor, contribute to the fact that the undertaking would have no potential to affect properties outside the defined APE. The proposed alternatives would entail ground-disturbing activities only in areas where such activities have already and recently occurred, and therefore the undertaking would have no potential to affect archaeological resources.

4.13.1.1 Study Area History

Interstate 90 is a major east-west highway through the United States, beginning in Seattle and terminating in Boston. Soon after pioneer settlement began in Seattle in the 1850s, settlers promoted the development of a road over Snoqualmie Pass to serve as a connection between the east and west sides of the Cascade Mountains (Stratton and Lindeman 1977). Native Americans, fur traders, and gold miners had previously pioneered a route. Local fund-raisers earned enough money to build a rough wagon road, which was crossed by a train of six wagons coming through the pass in October 1865.

Various efforts to improve and maintain the wagon road were largely unsuccessful, and interest waned with the construction of the Northern Pacific Railroad line to Tacoma in 1887. But the automobile's significance as a mode of transportation at the turn of the 20th century brought a new focus to the need for the road. The Alaska-Yukon-Pacific Exposition of 1909 helped to spawn an effort to provide the highway. In 1915, the "Sunset Highway" opened, made possible by adequate funding and new engineering techniques. In 1924, a wooden bridge was built across the east channel of Lake Washington to Mercer Island (Stratton and Lindeman 1977).

A pontoon bridge of old ship hulls was proposed to span the lake between Seattle and Mercer Island as early as 1920. The Lake Washington Floating Bridge, now called the Lacey V Murrow floating bridge, was constructed between 1938 and 1940, was considered an engineering marvel at the time (Gellataly 1977; WSDOT 1988, 1989, 1992).

Planning for the construction of I-90 across Mercer Island began in the mid 1950s. During the 1960s, a design was developed that called for 14 lanes of concrete, plus up to 4 lanes for convenience and access roads, with much of the roadway to be built on 50-foot piers. Island residents protested, resulting in substantial redesign and delay. The final design approved by Mercer Island residents in 1971 called for four lanes each way plus two transit lanes (4-2T-4), with the two outside lanes dedicated for Mercer Island destinations only. In 1976, a compromise design changed the roadway to the current 3-2T-3 configuration, eliminating the fourth lane between Mercer Island and Seattle. Most of the roadway is entrenched and partially lidded (Gellataly 1977; WSDOT 1988, 1989, 1992). The highway was completed in 1993.

The following subsections describe the historic resources in individual portions of the I-90 corridor. These sections are followed by section 4.13.1.7 which describes the historic resources considered to be within the Area of Potential Effect (APE) from the construction or operation of the I-90 Alternatives.

4.13.1.2 Seattle, I-5 to Mount Baker Ridge

Neighborhoods within the I-90 corridor from I-5 to Mount Baker Ridge include the Central Area, Beacon Hill, and Mount Baker. The Central Area and Beacon Hill in the vicinity of I-90 include single family and multi-family housing, with commercial and retail uses, particularly along Rainier Avenue S. The Mount Baker neighborhood is largely an older established single family housing residential area.

Structures on the local, state, or national historic registers in the vicinity of this section of the Project area are listed below.

- WSDOT has identified a housing area that is eligible for listing as a historic district on the NRHP. The potential 6th Avenue S historic district was identified in consultation with OAHP for the SR 519 Intermodal Access Project in 1997. The boundary of the eligible district includes addresses from 1020 to 1507 on 6th Avenue S, running north and south of Royal Brougham Way. Two buildings at 1229 and 1217 6th Avenue S were determined by OAHP not to be eligible for the National Register, although they were determined to be contributing properties within the potential historic district.
- 12th Avenue South Bridge over Dearborn Street (Dr. Jose Rizal Bridge)
- Thompson-Laturner House (Will H. Thompson House), 3119 Day Street (on top of the tunnel portion of I-90)
- U.S. Immigration Station and Assay Office, 815 Airport Way South
- Pacific Medical Center, Former U.S. Marine Hospital, 1200 – 12th Avenue South
- Seattle Chinatown Historic District (International Special Review District)
- Lacey V Murrow floating bridge
- East Portals of the Mount Baker Ridge tunnel
- Mount Baker Ridge tunnel
- Ellsworth, Storey Historic Cottages, 1706-1816 S Lake Washington Boulevard and 1725-1729 S 36th Avenue
- Black Property, 1319 12th Ave S
- Victorian Row Apartment Building, 1236-38 S King Street
- Black Manufacturing Building, 1130 Rainier Avenue S
- Brill Trolley #798, Metro Trolley Barn

4.13.1.3 Mercer Island/First Hill Lid

Single family residential is the predominant land use in the area of the I-90 corridor from Lake Washington east to Mercer Island's central business district (CBD). The Park on the Lid is located on top of the First Hill lid and extends from W Mercer Way to 74th Avenue SE. The Mercer Island Historical Society has designated the following sites in the vicinity of I-90 as historic landmarks. Neither are within the APE.

- Roanoke Inn Tavern, 1825 72nd Avenue SE
- Veterans of Foreign Wars, Post #5760 (Keewaydin Clubhouse, Mercer Island Community Clubhouse), 1836 72nd Avenue SE

4.13.1.4 Mercer Island CBD

Mercer Island's CBD is located south of I-90. A King County/Metro Transit park-and-ride is located north of I-90 in this portion of the highway corridor, and single family and multi-family residences are also in the area. Luther Burbank Park, designated a historical landmark by the Mercer Island Historical Society, is located north and south of I-90 at 84th Avenue SE. No sites in this area are listed on the Washington Heritage Register or the NRHP.

4.13.1.5 Mercer Island/Shorewood

The Shorewood area is residential. No sites in this area are have been designated historic by the Mercer Island Historical Society, nor are any sites listed on the Washington Heritage Register or the NRHP. Stratton and Lindeman (1977) list the old Fortuna Park Pavilion near the Lake Washington shoreline at the end of Fortuna Drive as a historic site that should be accorded consideration. The pavilion is now a part of the Covenant Shores retirement community. The Herzl-Ner Tamid Conservative Congregation Synagogue and Jewish Community Center, both on East Mercer Way and south of I-90, are noted as "outstanding modern architectural and cultural facilities" by Stratton and Lindeman (1977). No resources were identified within the APE.

4.13.1.6 East Channel Bridge/Bellevue Way SE/I-405

After crossing the East Channel of Lake Washington, I-90 passes south of the Enatai residential neighborhood in Bellevue and through the Mercer Slough Park. No sites in this area have been designated historic by the Bellevue Historical Society, nor are any sites listed on the Washington Heritage Register or the NRHP. No resources were identified within the APE.

4.13.1.7 Historic Structures Within the Area of Potential Effect

Structures on the local, state or national historic registers within the Area of Potential Effects (APE) are shown in Table 4.13-1. All are located within the City of Seattle. None of the historic structures on Mercer Island or in Bellevue listed above were considered to be located with the APE.

Table 4.13-1
Historic Structures Within the APE

Structure and address	Designated Seattle Historic Landmark	On Washington Heritage Register	On National Register of Historic Places
6th Avenue S. Housing Area, 1020 to 1507 6th Avenue S., running north and south on Royal Brougham Way.	No	No	Not on Register, but has been determined by WSDOT to be eligible for listing as a historic district
12th Avenue South Bridge over Dearborn Street (Dr. Jose Rizal Bridge)	No	Yes	Yes
Thompson-Laturner House (Will H. Thompson House), 3119 Day Street (on top of the tunnel portion of I-90)	Yes	Yes	Yes
Lacey V Murrow Floating Bridge	Yes	No	Not on Register; preliminary determination of non-eligibility by WSDOT and OAHP (see text below)
East Portals of the Mount Baker Ridge Tunnel	Yes	Not separately from Mount Baker Ridge Tunnel	Not separately from Mount Baker Ridge Tunnel
Mount Baker Ridge Tunnel	Yes	Yes	Yes

Sources: (City of Seattle 2002), (State of Washington 2002), (U.S. National Park Service 2002)

The 6th Avenue housing area is not on the National Register of Historic Places, although WSDOT has determined that the area is eligible for listing as a historic district. OAHP has made a determination that the Lacey V Murrow floating bridge is not eligible for listing on the National Register of Historic Places (phone communication of Craig Holstine, WSDOT, with Greg Griffith, OAHP, February, 2003). This was confirmed by OAHP in a letter dated January 12, 2004 and can be found in Appendix F.

4.13.2 Impacts

Impacts to historic resources were assessed by determining whether any portion of the identified historic sites would 1) be acquired for the Project, 2) be damaged or disrupted by the Project, 3) be altered by the Project, or 4) receive measurable proximity effects from the Project such as noise or dust. The project would not require the acquisition of any historic properties.

4.13.2.1 Construction and Operation

6th Avenue S Housing Area

No changes are proposed that would alter the characteristics that make the 6th Avenue S housing area eligible for the NRHP. The alternatives all entail changes to the existing roadway within the right-of-way, largely achieved through restriping and relocation of moveable barriers. No measurable proximity impacts due to air quality are anticipated for any of the listed or eligible properties. The difference in sound levels between the No Build and Build Alternatives are 1 to

2 dBA, which is imperceptible. No measurable proximity impacts due to noise are anticipated for any of the listed or eligible properties.

12th Avenue South Bridge over Dearborn Street (Dr. Jose Rizal Bridge)

The 12th Avenue South Bridge is located approximately 35-60 feet above I-90, and carries 12th Avenue South across the cut made for South Dearborn Street from the south end of First Hill to the north end of Beacon Hill in Seattle. The bridge is owned by the state of Washington. The bridge would not be damaged, disrupted or altered due to any of the alternatives. The distance separation between the bridge and the roadway would limit any proximity effects of construction noise or dust to minimal levels.

Thompson-Laturner House (Will H. Thompson House), 3119 Day Street (on top of the tunnel portion of I-90)

This property is located on Mount Baker Ridge approximately 110 feet above the top of the Mount Baker Ridge tunnel of I-90. The house sits approximately 110 feet south of the tunnel center line and 78 feet south of the southern edge of the tunnel. Construction would be confined to within the tunnel area in this section and would not cause damage, disruption or alteration of the historic house. No proximity impacts from noise or dust would occur due to the tunnel acting as a barrier.

Lacey V Murrow Floating Bridge

As noted previously, OAHP has made the determination of non-eligibility for listing on the National Register of Historic Places for the Lacey V Murrow floating bridge. Construction activities on the Lacey V Murrow floating bridge, under any of the Alternatives, would consist of routine maintenance or restriping. None of these activities would damage, disrupt or alter the bridge structure or its appearance.

East Portals of the Mount Baker Ridge Tunnel

The east portals of the Mount Baker Ridge tunnel have been separately designated as a Seattle Historic Landmark, in addition to designation for the Mount Baker Ridge tunnel. The Washington Heritage Register and the National Register of Historic Places do not list them separately from the designation for the Mount Baker Ridge tunnel. None of the alternatives would damage, disrupt or alter the east portals of the Mount Baker Ridge tunnel.

Mount Baker Ridge Tunnel

None of the alternatives would affect the historic characteristics of the Mount Baker Ridge tunnel, including the east portals, that made it eligible for listing on the National Register of Historic Places. This was confirmed in a letter from OAHP dated December 26, 2003 and can be found in Appendix F.

4.13.3 Mitigation Measures

No adverse impacts to historic or archaeological resources are anticipated. No mitigation measures are required.

Should any archaeological materials be encountered during construction activities, all work in the vicinity of the find shall stop until a determination of significance is made. Impacts to any sites that are determined to be important resources (i.e., eligible for nomination to the NRHP) would require mitigation such as avoidance or data recovery. In this instance, the Washington Office of Archeology and Historic Preservation and tribes with jurisdiction or an interest in the resource would be contacted as necessary.

4.14 PARKLANDS

This section describes the existing parklands in the study area and assesses the impacts of the Project on these areas, and Section 4(f) and 6(f) resources. The study area for this section extends approximately 0.5 mile either side of the I-90 corridor between I-5 to the west and just beyond I-405 to the east.

4.14.1 Affected Environment

4.14.1.1 Study Area

Existing Parklands

A description of existing parklands in the study area is provided below:

- **Dr. Jose Rizal Park.** This 9.6-acre park is located in the neighborhood of Beacon Hill near the intersection of I-90 and I-5, at the corner of S Judkins Street and 12th Avenue S. Facilities at the park include children's play equipment, picnic areas, walking paths, grassed areas, sculptures, and restrooms. From the park there are views of downtown Seattle and Elliot Bay (Seattle Parks and Recreation 2002). The park is owned by the City of Seattle and managed by Seattle Parks and Recreation.

- **Taejon Park.** This 2-acre park is located in the neighborhood of Beacon Hill between I-90 and Sturgus Avenue S (Seattle Parks and Recreation 2002). The park overlooks I-90 and has a picnic area, benches, walking paths, and sculptures. The park consists predominantly of grassed areas. The park is owned by the City of Seattle and managed by Seattle Parks and Recreation.

- **Sturgus Park.** This 2-acre park is located in the neighborhood of Beacon Hill between I-90 and Sturgus Avenue S, to the west of Taejon Park (Seattle Parks and Recreation 2002). The park overlooks I-90 and has grassed areas and walking paths. The park is owned by the City of Seattle and managed by Seattle Parks and Recreation.

- **Judkins Park and Playfield.** This 6.2-acre park is located in the neighborhood of Judkins Park north of I-90 near the intersection of S Norman Street and 23rd Avenue SE. Facilities at the park include children's play equipment, a basketball court, a tennis court, wading pool, walking paths, picnic area with barbecues, and restrooms (Seattle Parks and Recreation 2002). The park is owned by the City of Seattle and managed by Seattle Parks and Recreation.

- **Colman Playfield.** This park is located in the neighborhood of Beacon Hill south of I-90 near the intersection of 21st Avenue S and S Massachusetts Street. The park has children's play equipment and a small grassed area. The park is owned by the City of Seattle and managed by Seattle Parks and Recreation.

- **Sam Smith Park.** This 15.2-acre park is located on top of the Mount Baker Ridge tunnels and lid at 23rd Avenue S and S Atlantic Street. The park has children's play equipment and soccer fields (Seattle Parks and Recreation 2002). Funding has been set aside for improving the landscape connections between the park and the nearby Colman School parking lot (Counts 2002). The park is owned by the City of Seattle and managed by Seattle Parks and Recreation.

- **East Portal Viewpoint.** This viewpoint is located in the Mount Baker neighborhood along Lake Washington Boulevard. The viewpoint is part of Sam Smith Park and was created specifically for viewing the I-90 floating bridges and has a plaque dedicated to Homer Hadley for designing the world's first concrete floating bridge in 1920. From the viewpoint there are also views of Lake Washington, Bellevue, Seward Park, and the Cascade Mountains in the distance. The viewpoint has a bench and landscaping, and access to the I-90 shared-use pathway. The park is owned by the City of Seattle and managed by Seattle Parks and Recreation.

- **Colman Park.** This 24.3-acre park is located in the Mount Baker neighborhood south of I-90 along Lake Washington Boulevard. The park consists predominantly of natural forested areas with trails, a terrace garden, and a habitat restoration area. There are some small grassed areas, and Lake Washington is accessible from the park. The park is owned by the City of Seattle and managed by Seattle Parks and Recreation.

- **Day Street Park.** This park is located in the Mount Baker area beneath the I-90 overpass that connects the roadway to the HMH floating bridge. The park is on the Lake Washington waterfront and has a boat dock and fishing dock. It also has a small grassed area. The park is owned by the City of Seattle and managed by Seattle Parks and Recreation.

- **Park on the Lid.** The park is located on Mercer Island on top of the First Hill lid and extends from W Mercer Way to 74th Avenue SE. The park was created around the exhaust ventilation shafts for I-90 and consists of grassed areas and small trees/shrubs intermingled with the ventilation shafts. Facilities at the park include softball fields, tennis courts, basketball courts, a picnic shelter, playground areas, public restrooms, and open space. There are views of downtown Seattle and Lake Washington from the park. The park is owned by the City of Mercer Island and managed by the City's Parks and Recreation Department. A proposal has been put forward to construct a new restroom near the west lid parking lot and to construct a boat launch area under the East Channel bridge (Brown 2002).

- **Mercer Island I-90 Outdoor Sculpture Gallery.** The gallery is located on Mercer Island to the south of I-90 between 77th Avenue SE and 80th Avenue SE. It is approximately 1.5 acres in size and consists of grassed areas planted with small trees and shrubs. Throughout the grassed areas are a number of sculptures that are available for purchase, and paths and benches for viewing the sculptures. Each of the sculptures are displayed for at least one year before they are sold. The park is owned

by WSDOT and managed by the City of Mercer Island's Parks and Recreation Department.

- **Luther Burbank Park.** This 77-acre park is located on Mercer Island along 84th Avenue SE. The majority of park is located to the north of I-90; however, a small portion of the park is located to the south. A large portion of the park has been left undeveloped to provide habitat for a variety of wildlife such as waterfowl and beaver. Approximately 3 miles of trails meander through these natural areas, providing opportunities for bird watching and viewing other wildlife. In the more developed areas of the park there are tennis courts, a basketball court, chess tables, an amphitheater for watching concerts and plays during the summer, and grassed areas for activities such as frisbee. Amenities at the park include a large children's play area with swings and play structures, group picnic areas with barbecues and picnic tables, washrooms, and a dog off-leash area. The park also has facilities for water-based activities such as boat docks, a public fishing pier, and a swimming beach (King County Department of Parks and Recreation 2002). In the vicinity of Luther Burbank Park, I-90 is located in a "trench" approximately 30 feet below the surface of the park. A portion of the park was constructed as a lid over I-90 as mitigation for the original construction of I-90, and contains a pedestrian trail and connection to the south portion of the park. The area of the park directly adjacent to the north side of I-90 contains landscaping and a parking lot. Recreational amenities are located farther to the north of the south parking lot and farther away from I-90. The park is currently owned by King County; however, a proposal has been put forward to transfer ownership to the City of Mercer Island.

- **Mercer Island Boat Launch.** This boat launch is located south of I-90 near the western end of the East Channel bridge. The boat launch is owned by and managed by the City of Mercer Island.

- **Open Space.** There is an area of open space located south of I-90 near Gallagher Hill Road that has not been developed as a formal recreation area but may be used for recreational purposes from time to time.

- **Mercer Slough Park.** This 367-acre park is located in Bellevue along 118th Avenue SE. The majority of the park is located to the north of I-90; however, a small portion of the park is located to the south. Mercer Slough Park is one of the most diverse ecosystems in the urban Puget Sound region and offers a range of recreational activities for people to enjoy nature. The park offers 3-hour guided canoe trips, 5 miles of trails, and bird watching (The Trust for Public Land 2002). A proposal has been put forward for development of the Mercer Slough Environmental Education Center (including trails and interpretive displays), which would be located adjacent to Bellevue Way SE (Kost 2002).

- **Enatai Beach Park.** This park is located on the shore of Lake Washington under the eastern end of the East Channel bridge. The park currently has a beach, boat dock, and picnic area; however, the park is proposed to be expanded in the future with additional parking, playground equipment, improved picnic facilities, and a boat

launch area and associated access road (Kost 2002). Enatai Beach Park is owned by the City of Bellevue and managed by the City's Department of Parks and Community Services.

The locations of these parklands are shown on Figure 4.14-1.

Lake Washington is a navigatable waterway and is used for a variety of purposes including the recreational activities such as swimming, fishing, sailing, kayaking, and waterskiing. The 22,138-acre lake is publicly owned. None of the alternatives would change its use for recreational purposes.

4.14.1.2 Section 4(f) and 6(f) Lands

Section 4(f) Lands

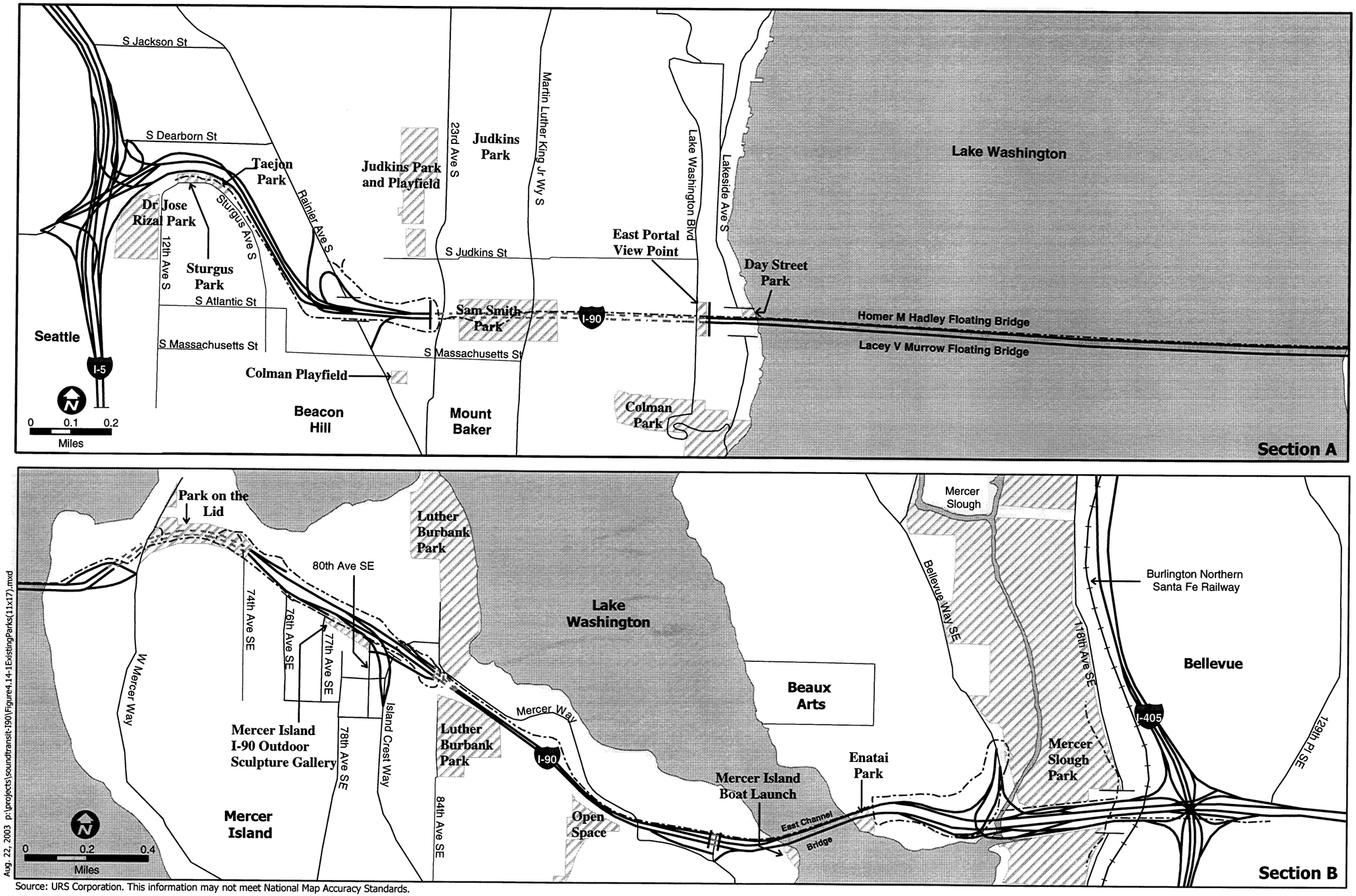
Section 4(f) refers to the original section within the U.S. Department of Transportation (DOT) Act of 1966 that set out the requirement for consideration of park and recreational lands, wildlife and waterfowl refuges, and historic sites during the development of transportation projects. The law, now codified in two places (49 USC 303 and 23 USC 138), is implemented by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) through regulations found at 23 CFR 771.135. Section 4(f) applies to all projects that receive funding from or require approval by an agency of the DOT, including FHWA. Section 771.135 states:

> *(a)(1) The Administration may not approve the use of land from a significant publicly owned public park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that:*
> *(i) There is no feasible and prudent alternative to the use of land from the property; and*
> *(ii) The action includes all possible planning to minimize harm to the property resulting from such use.*

In addition, before approving use of these lands for a transportation project, supporting information must demonstrate that there are unique problems or unusual factors involved in the use of alternatives that avoid these properties or that the cost, social, economic, and environmental impacts or community disruption resulting from such alternatives reach extraordinary magnitude (WSDOT 2001 and 23 CFR Section 771.135).

In addition to mandating protection of certain land uses, FHWA rules require that when the project's impacts in the proximity of the protected area are so severe that the resource's activities, features, or attributes are substantially impaired, then Section 4(f) is also called into effect even if the project does not actually intrude into the protected use (WSDOT 2001 and 23 CFR Section 771.135). Impacts may include:

- Resources affected by noise levels
- Aesthetic features of the resource compromised by the transportation facility
- Access restricted, thus substantially diminishing the use of the resources
- Vibrations impair use of the resource and diminish the value of wildlife habitat



Aug. 22, 2003 p:\projects\soundtransit-I90\Figure4.14-1ExistingParks(11x17).mxd

Source: URS Corporation. This information may not meet National Map Accuracy Standards.

U.S. Department of Transportation
Federal Highway Administration
Federal Transit Administration

SoundTransit

Washington State Department of Transportation

Legend

Roadway Tunnel — Shared-use Pathway — Existing Parklands

Figure 4.14-1
Existing Parklands

Section 4(f) applies to the protection of resources listed below:

- Dr. Jose Rizal Park
- Taejon Park
- Sturgus Park
- Judkins Park and Playfield
- Colman Playfield
- Sam Smith Park and East Portal Viewpoint
- Colman Park
- Day Street Park
- Park on the Lid
- Mercer Island I-90 Outdoor Sculpture Gallery
- Luther Burbank Park
- Mercer Island Boat Launch
- Enatai Beach Park
- Mercer Slough Park

The I-90 shared-use pathway, which is located on the HMH floating bridge and also extends across the length (east/west) of the study area (and along 118th Avenue SE and Bellevue Way SE), is used by bicyclists commuting to and from work and was provided primarily for transportation purposes. It is also used for recreational purposes including bicycling, walking, rollerblading, and jogging. The portion of the shared-use pathway located along I-90 is owned by WSDOT. Based on FTA and FHWA criteria, the shared-use pathway is not a Section 4(f) resource. (See the letter from FTA and FHWA to WSDOT, dated November 25, 2002 in Appendix F. See also Section 3.4 Pedestrian/Bicycle Access for more discussion of the shared-use pathway.)

Section 6(f) Lands

Section 6(f) of the Land and Water Conservation Fund Act of 1965 (16 USC 460L 4-11) provides that:

> *No property acquired or developed with assistance under this section shall, without the approval of the Secretary (of the Interior), be converted to other than public recreation uses. The secretary shall approve any such conversions only if he finds it to be in accord with the then existing comprehensive state outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of the recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.*

The 1978 Final EIS/Section 4(f) Statement (for the improvement of interstate standards of I-90 between the junction with I-5 and the vicinity of the junction with I-405) was evaluated, as well as the background file on this work. This evaluation indicated that land in the study area was not purchased with Land and Water Conservation funds or designated for conversion under

Section 6(f) (Sound Transit 2001). Therefore, Section 6(f) of the Land and Water Conservation Fund Act does not apply to this project.

4.14.2 Impacts

Impacts to parklands were assessed by reviewing documents that were available on City of Seattle, City of Mercer Island, City of Bellevue, and King County websites; reviewing existing environmental documentation relating to the Project; consulting with FHWA to determine which parklands are Section 4(f) resources; and inspecting parklands within the study area. According to the regulations associated with Section 4(f) resources (23 CFR Part 771.135 and Section 4(f) Policy Paper [FHWA 1987]), there is "use" if there is an acquisition or an adverse occupancy of Section 4(f) lands or in the case of a "constructive use", the proximity impacts (air quality, noise, visual quality, etc.) of the project constitute a substantial impairment of the site's vital functions.

4.14.2.1 Construction

Alternative R-1: Existing/No Build

The small-scale roadway modifications or construction activities that would be required to preserve and maintain the corridor would not have an impact on parklands or Section 4(f) resources.

Alternatives R-2B Modified, R-5 Modified and R-8A – *Preferred Alternative*

Taejon Park and Sturgus Park

Construction of Alternative R-2B Modified or Alternative R-8A would not have direct adverse impacts on parklands or Section 4(f) resources in the study area; however, there are anticipated to be some temporary noise and visual impacts on Taejon Park and Sturgus Park due to their proximity to I-90. The impacts would be caused by the addition of a median barrier to the center roadway in the Seattle I-5 to Mount Baker Ridge section of the corridor for Alternative R-2B Modified, or the provision of a fifth travel lane on the outer roadways in the Seattle I-5 to Mount Baker Ridge for Alternative R-8A. The impacts would be similar.

Construction activities for Alternative R-5 Modified in the Seattle I-5 to Mount Baker Ridge section of the corridor will be limited to restriping in the Mount Baker Ridge tunnel and lid; therefore, it is not anticipated that there would be an impact on Taejon Park or Sturgus Park.

Dr. Jose Rizal Park, Judkins Park and Playfield, Colman Playfield, Sam Smith Park, and Colman Park

None of the alternatives would have an impact on parks located further away from I-90 such as Judkins Park and Playfield, Colman Park and Playfield, Dr. Jose Rizal Park, and Sam Smith Park.

East Portal Viewpoint and Day Street Park

Construction activities for Alternatives R-2B Modified, R-5 Modified or R-8A on the HMH floating bridge would be visible from the East Portal Viewpoint but would not have an impact on the recreational or scenic value of the viewpoint. The construction activities on the HMH

floating bridge may have some temporary noise impacts on Day Street Park. The impacts for the three alternatives would be similar.

Mercer Island I-90 Outdoor Sculpture Gallery

The most intensive construction activities would occur in the vicinity of the Mercer Island CBD section of the corridor. With Alternatives R-2B, R-5 Modified and R-8A, construction could have temporary noise, visual, and dust impacts on the Mercer Island I-90 Outdoor Sculpture Gallery. While the impacts would be similar, the least impacts would be anticipated to be caused by the construction of Alternative R-5 Modified, and slightly greater impacts for the construction of Alternative R-8A, with impacts for the construction of Alternative R-2B Modified similar but slightly less than impacts from Alternative R-8A.

None of the alternatives would require the closure or restricting access to the Sculpture Gallery itself at anytime during construction.

Temporary impacts from the construction of Alternative R-2B Modified would be due to adding a median and widen the center roadway by 2 to 4 feet, or the widening of the outer roadway by up to 10 feet for the construction of Alternative R-8A. Both alternatives would include the construction of two center roadway off-ramps at 77th Avenue SE and 80th Avenue SE. It is possible that short-term closures of 77th and 80th Avenues SE may be required during construction of the off-ramps. These road closures are anticipated to have some temporary effect on access in that area to the Sculpture Gallery, but no impact is anticipated since access would be available from other locations.

With Alternative R-5 Modified, temporary noise, visual and dust impacts to the Sculpture Garden would be caused by the construction activities to widen the outer roadways and provide a westbound HOV lane to the 80th Avenue SE ramp. It is also possible that short-term closure of 80th Avenue SE may be required during construction of the HOV lane. Temporary closure of 80th Avenue SE is anticipated to have some temporary effect on access in that area to the Sculpture Gallery, but no impact is anticipated since access would be available from other locations.

Park on the Lid, Luther Burbank Park, and Mercer Island Boat Launch

It is not anticipated that the construction activities for Alternatives R-2B Modified, R-5 Modified and R-8A along the Mercer Island/First Hill lid section of I-90 would have an adverse impact on the Park on the Lid or Mercer Island Boat Launch. Impacts to Luther Burbank Park would be limited to the pedestrian overpass connecting the north and south parts of Luther Burbank Park. The pedestrian overpass is on a lid over the freeway and there would be temporary noise, dust and visual impacts from construction occurring approximately 30 feet below the lid on the roadway.

Enatai Beach Park and Mercer Slough Park

Less intensive construction activities would take place in the East Channel bridge/Bellevue Way SE/I-405 section of the corridor. With Alternative R-2B Modified, construction of the median barrier in the center roadway and modification of the Bellevue Way SE center roadway ramp in the East Channel bridge/Bellevue Way SE/I-405 section of the corridor would not have a direct impact on Mercer Slough Park or Enatai Beach. However, there could be some temporary

noise and visual impacts on Enatai Beach and the area of Mercer Slough Park adjacent to the corridor. These proximity impacts would have some temporary adverse impact on people's enjoyment of the parks in the area adjacent to the corridor.

There would be no impacts on Enatai Beach Park from Alternative R-5 Modified or Alternative R-8A.

Modification of the Bellevue Way SE ramp for Alternative R-5 Modified would not have any direct impact on Mercer Slough Park. However, there would be temporary noise, visual, and dust impacts on the area of the park adjacent to the corridor. These proximity impacts could have some temporary adverse impact on people's enjoyment of the park area adjacent to the corridor. The proximity impacts to the park would be less with this alternative compared to Alternative R-2B Modified.

The construction of the connection between the Bellevue Way SE ramp and the outer roadway HOV lane are anticipated to have the same temporary and proximity impacts on Mercer Slough Park as described for Alternative R-5 Modified.

Overall, the functions of or available activities at the parks would not be affected or substantially impaired by Alternatives R-2B Modified, R-5 Modified, or R-8A and none of these alternatives would cause an impact on surrounding land use that would adversely impact the parks.

Alternative R-5 Restripe

There would be no direct adverse impacts on parklands or Section 4(f) resources during construction of Alternative R-5 Restripe. The temporary restriping activities would be visible from some parklands such as the East Portal Viewpoint; however, these activities would not impact the recreational use of or available activities at any parklands in the study area, and the alternative would not have an impact on surrounding land use that would adversely impact the parks.

4.14.2.2 Operation

Alternative R-1: Existing/No Build

Operation of Alternative R-1 would not have adverse impacts (in terms of acquisition of land) on parklands or Section 4(f) resources in the study area.

All Build Alternatives

Implementation of the Build Alternatives would not require acquisition of parkland and is not anticipated to result in air quality or visual impacts to the study area or parklands. The difference in sound levels between the No Build and Build Alternatives are 1 to 2 dBA which is imperceptible. Operation of any of the proposed alternatives would not have adverse impacts on parklands or Section 4(f) resources in the study area.

4.14.3 Mitigation Measures

4.14.3.1 Construction

Construction proximity impacts to parklands are caused by visual, dust or noise changes. There would be no substantial impairment of any park or Section 4(f) resources, and no "use" under Section 4(f) regulations. As a result, no mitigation would be required as per Section 4(f) regulations. There are no additional recommended mitigation measures beyond those listed in Sections 4.3 Visual Resources, 4.4 Air Quality, and 4.5 Noise of this EIS.

4.14.3.2 Operation

No mitigation measures are required.

4.15 UNAVOIDABLE ADVERSE IMPACTS

4.15.1 Introduction

A summary of all impacts and mitigation measures is located in the Summary of this FEIS. This section describes the unavoidable adverse effects caused by the Project alternatives that would remain after applying the proposed mitigation measures (see summary of mitigation measures in Table S-2 and a listing of mitigation measures in Appendix J). Where feasible, suggested mitigation measures are proposed to be incorporated into the facility planning and design to substantially eliminate the adverse impacts. In other cases, adverse impacts can be reduced but not eliminated and are therefore determined to be unavoidable.

No direct unavoidable adverse impacts have been identified for land use, air quality, utilities, or historical and archeological resources.

The elements of the environment that would have unavoidable adverse impacts remaining after implementation of mitigation measures are discussed below. Unavoidable impacts have been added for hazardous materials for the approximately 180 total truck trips per day in year 2005 (projected to increased to a total of 220 truck trips per day in year 2025) that may be required to be rerouted if a decision is made to prohibit trucks carrying flammable cargo from the I-90 tunnels (see Section 4.15.9). The DEIS stated that the trucks would be prohibited from use of the tunnels, however WSDOT has committed to further studying the means of managing risks associated with the movement of these cargoes and no decision has yet been made to change existing policy.

4.15.2 Transportation

Construction

Transit and HOV Operations

During the construction of modifications to I-90 between Seattle and Bellevue, there would be impacts to transit operations caused by lane closures and incident-caused delays.

Pedestrian/Bicycle Alternative Access

During construction of R-5 Restripe, R-5 Modified, or the Preferred Alternative R-8A, there may be temporary closure of the shared-use pathway to allow for railing replacement, and work on the adjacent westbound lane and shoulder. These temporary closures would require pathway users to use alternative access routes or shuttle services which would be provided.

Operation

Regional Mobility

Due to increased population and development in the Puget Sound region, congestion would increase on I-90 with all alternatives, and truck traffic may shift to less congested hours of the day, i.e., evenings, nights, and midday periods, or divert to other corridors. Regional mobility

impacts are addressed as part of the Puget Sound Regional Council Transportation Plan. The Build Alternatives are consistent with that plan and are intended to improve regional mobility for transit and HOV.

Flammable cargoes may be prohibited from the I-90 tunnels with the operation of the Preferred Alternative R-8A, and would be required to use other regional routes. These routes would entail additional travel time and delay for trucks originating in or destined to the Port of Seattle and south Seattle industrial districts. These diversions would affect about 90 trucks daily in each direction of travel in year 2005, or about 4 percent of trucks currently using the I-90 corridor. By the year 2025, the number of trucks is projected to increase to approximately 110 trucks per day in each direction.

Transit and HOV Operations

With the operation of Alternative R-2B Modified, transit riders and carpoolers traveling in the peak directions would experience increases in delay in 2005.

Freeway Operations

With Alternative R-2B Modified, poor levels of service (LOS) would persist on the other roadways for traffic operations in the peak directions of travel both in 2005 and 2025. Congestion levels would increase relative to Alternative R-1. This congestion would also adversely affect the I-405 mainline, where speeds would decrease during the AM peak hour. With Alternatives R-1, R-5 Restripe and R-5 Modified, poor LOS would persist in the outer roadways in both directions of travel. With the Preferred Alternative R-8A, levels of service would improve in the outer roadways in both directions, lowering overall levels of congestion, but queues and delays at the system interchanges would increase.

With crash reduction measures, potential overall and injury crash rates with Alternatives R-2B Modified, R-5 Modified and R-8A would likely be within or overlapping the range of projected crash rates for those that would occur with Alternative R-1. Potential injury rates for Alternative R-5 Restripe would overlap the potential rates for Alternative R-1, however the potential overall crash rates would be higher than projected for Alternative R-1. Without crash reduction measures, potential crash rates with Alternatives R-5 Restripe, R-5 Modified, and R-8A could be higher than those projected to occur with Alternative R-1.

The number of outer roadway incidents blocking travel lanes would be greater with Alternative R-8A than for each of the other alternatives. The number of center roadway incidents blocking travel lanes would be greater with Alternative R-2B Modified than for each of the other alternatives. (See Table 3.2-17 in Chapter 3 for details on incidents by alternative.)

Surface Street Operations

In the PM peak hour with the Preferred Alternative R-8A, the intersection of Airport Way and 4th Avenue S would degrade from LOS D to LOS E, and the delay would increase from 43 seconds to 59 seconds compared with Alternative R-1. Due to physical constraints there would be no practical mitigation measure that could be done at this intersection.

On-ramp queues at Rainier Avenue S and Bellevue Way SE that would disrupt surface street operations will continue to worsen with all alternatives.

Pedestrian/Bicycle Access

With Alternatives R-5 Modified and R-8A, truck and motorized vehicle traffic would be closer to the pathway than it currently is. This would be partially mitigated through the addition of screening on the top of the barrier dividing pathway users from traffic.

Freight Movement

There is only one unavoidable impact that is specific to freight and not to other I-90 traffic. That impact could be caused by the potential redirection in year 2005 of 180 flammable cargo trips from I-90 to either the SR 520 North Alternate Route (120 trips) or the I-405/I-5 South Alternate Route (60 trips) with Alternative R-8A. By year 2025, the total number of trucks would be projected to increase to 220, with 150 trucks using the North Alternate Route and 70 trucks using the South Alternate Route. If a decision is made to redirect trucks carrying flammable cargo, the reroutes could increase vehicle miles traveled by approximately 650,000 miles per year and eastbound truck trips by up to one hour from fuel distribution points on Seattle's Harbor Island depending upon traffic conditions on SR 520 and I-405.

Maintenance

With Alternative R-2B Modified, there would need to be center lane closures to allow access to the HMH Floating Bridge pontoons for maintenance. This would limit access to the pontoons to off-peak hours and increase the cost of routine maintenance activities. Responses to alarms in the pontoons would require an emergency closure of the westbound center roadway. This would increase maintenance costs by requiring additional traffic control measures, and would decrease the reliability of the westbound center roadway for transit and HOV traffic, as responses to alarms cannot be deferred to off-peak period times.

With Alternative R-5 Modified and the Preferred Alternative R-8A, in the westbound Mount Baker Ridge Tunnel and the First Hill Lid, the outside shoulder would be reduced in width from the existing 10 feet to 4 feet. With this width reduction in the westbound direction, some routine maintenance operations such as sweeping shoulders and cleaning closed circuit television cameras would require closure of the adjacent travel lane.

4.15.3 Visual Resources

Short-term or temporary unavoidable adverse visual resource impacts would occur during construction due to the visibility of dust, construction vehicles and lights. These impacts would be reduced through mitigation measures such as dust control and shielding of construction lighting. No unavoidable adverse visual resource impacts for operation have been identified.

4.15.4 Noise

Construction

With the implementation of construction noise mitigation, unavoidable adverse impacts would not occur during daytime construction. The proposed Project could include nighttime construction activities, which would either meet lower noise limits required by the local noise ordinances or would require a nighttime construction noise variance from the appropriate local

jurisdictions. An unavoidable adverse impact could occur during potential times of nighttime construction activities near residential areas, if the impact could not be mitigated. These impacts would be temporary.

Operation

FHWA and WSDOT use a two-part test to assess traffic noise impacts. A noise impact is deemed to occur if design-year traffic noise levels either substantially exceed existing noise levels by 10 dBA or approach or exceed FHWA noise abatement criteria. Design-year L_{eq} noise levels with the alternatives would increase by a maximum of 1 to 2 dBA compared with the existing conditions. An increase of 2 dBA or less would be imperceptible to the human ear.

Noise impacts were found to occur at some locations because design-year noise levels would approach or exceed FHWA criterion of 67 dBA. These locations are affected by all alternatives, including the No Build Alternative, and include residences along South Judkins Street, the base of Beacon Hill, in Leschi, north of the Mercer cut, and north of I-90 in Bellevue (see Table 4.5-7 in Section 4.5 Noise). Noise mitigation was evaluated for each of the impacted locations and found not to be feasible (see Section 4.5.3). The traffic noise impacts at these locations would therefore be considered an unavoidable adverse impact.

4.15.5 Biological Resources

No unavoidable impacts adverse to biological resources are expected for Alternatives R-1, R-2B Modified, or R-5 Restripe. A potential exists for disturbances to wetlands during in-water construction in Alternatives R-5 Modified and R-8A if the Mercer Slough outfall requires replacement. If the work is required, impacts to wetlands would be addressed during the shoreline and water quality permitting process and mitigation provided if required. Work would be conducted during the appropriate in-water work window for Mercer Slough as established by Washington Department of Fish and Wildlife.

4.15.6 Water Resources

Impacts from the alternatives would be mitigated through standard design and construction practices common to the industry. A potential exists for short-term unavoidable adverse impacts to water quality after proper stormwater controls and filtration are implemented, from the release of water pollutants associated with potential in-water construction, such as sediment and petroleum hydrocarbons.

4.15.7 Energy

Although mitigation measures would be carried out to minimize energy consumption during construction and operation, the operation of Alternatives R-2B Modified, R-5 Restripe and R-5 Modified would consume approximately the same amount of energy as Alternative R-1. The Preferred Alternative R-8A would consume slightly more than the other alternatives due to Alternative R-8A's ability to accommodate a higher vehicle miles traveled (VMT).

4.15.8 Geology and Soils

With proposed and recommended mitigation measures there would be minimal unavoidable adverse impacts to the geologic environment caused by erosion during construction.

4.15.9 Hazardous Materials

If trucks carrying flammable cargo are prohibited from using the I-90 tunnels, approximately 120 trucks per day would be rerouted from Harbor Island north on I-5 to SR 520, east on SR 520 and then south on I-405 to I-90 (North Alternate Route), and approximately 60 trucks per day would be rerouted south on I-5 to I-405 and then north on I-405 to I-90 (South Alternate Route) in year 2005. These numbers are projected to increase to a total of 220 trucks per day in year 2025, with 150 trucks using the North Alternate Route and 70 trucks per day using the South Alternate Route. The likelihood of a crash involving a truck carrying flammable cargo would be higher on the combined North and South Alternate Routes than on I-90 (due to additional miles traveled and higher crash rates on the South Route). The number of these crashes resulting in a fire or explosion would also be higher on the alternate routes, however these numbers are extremely small.

The prohibition of flammable cargoes in the I-90 tunnels and lids requires consideration of both the frequency of recurrence and the consequences of crashes resulting in fires. WSDOT, in an attempt to allow the continued use of the I-90 tunnels and lids by trucks carrying flammable cargo, is committed to further study of the issues associated with the movement of flammable cargo and the means of managing risks associated with the movement of these cargoes in the I-90 tunnels and lids.

If this effort results in a policy decision to prohibit trucks carrying flammable cargo in the I-90 tunnels and lids, WSDOT is committed to further studying the means of managing risks associated with the movement of these cargoes on alternate routes. An operational decision will be made in consultation with FHWA and other project stakeholders, including local fire departments.

WSDOT is also studying an extension of the current operating policy that prohibits flammable cargo to also include all hazardous cargo in the I-90 tunnels and lids while the fire suppression systems is undergoing routine maintenance.

Before a policy decision is made to prohibit flammable and/or hazardous cargo on I-90, a public participation process would be implemented as outlined in the Code of Federal Regulations, *Title 49 -- Transportation, part 397 -- Transportation of Hazardous Materials; Driving and Parking Rules, Subpart C -- Routing of Non-Radioactive Hazardous Materials, Section 71 Federal Standards (49CFR397.71),* which states that prior to the establishment of a change in flammable or hazardous route designation, WSDOT shall provide public notification and a 30-day period in which to comment. If a public hearing is determined to be necessary the public shall be notified 30 days in advance of the hearing date.

If a policy decision is made to allow the continued use of the I-90 tunnels and lids by trucks carrying flammable cargo a public notification will be provided by WSDOT.

4.15.10 Public Services

Traffic delays, lane changes, and detours that would occur during construction would be unavoidable and could have some adverse impacts on public services, such as on the response times of the emergency service providers who use I-90 to respond to emergencies or respond to emergencies on the roadway itself. Mitigation measures such as staging plans and updates to service providers would reduce these impacts.

4.15.11 Parklands

Overall, the functions of or available activities at the parks adjacent to or in the vicinity of the I-90 corridor would not be affected by the Project; however, the appeal of the parks may be affected temporarily during construction due to additional visual, dust or noise changes. Mitigation measures such as dust control and noise controls would reduce these impacts.

4.16 SECONDARY AND CUMULATIVE EFFECTS

4.16.1 Introduction

Secondary and cumulative effects for each of the elements of the environment studied for this EIS are discussed below. The transportation analysis reviewed potential traffic projects in the area on adjacent highways. With the exception of improvements to SR 520 and I-405, no other roadway projects are anticipated in the area and therefore do not result in cumulative or secondary effects to most elements of the environment.

Secondary or indirect effects from the project are expected to be minor because of minor changes in traffic levels among all of the Alternatives. As a result of these minor changes, secondary or indirect effects would be limited to minor differences in the timing of changes in land use and the resultant minor effects on water quality and biological resources caused by new development.

This information in this section has been substantially reorganized from the information provided in the DEIS to respond to comments received on the DEIS. Since the DEIS, additional information has been included on the adaptability or flexibility of converting the corridor for future projects including light rail or high capacity transit. (See Section 4.16.3.5)

4.16.2 Secondary Effects

Secondary or indirect effects are those that are caused by the proposed project, but are later in time or farther removed in distance than direct impacts, but are still reasonably foreseeable.[1] Examples are changes in land use and economic vitality (including rate of new development, growth related to improved access and travel conditions, pressure to more intensely develop existing areas, and population changes), related effects on water quality and natural resources, and noise caused by rerouted traffic.

4.16.2.1 Land Use and Economic Vitality

No Build Alternative

For all alternatives, including the No Build Alternative, it is assumed that growth would occur according to existing comprehensive plans and zoning designations. Because the proposed Project is intended to improve HOV access and transit reliability between Bellevue and Seattle, development as envisioned in the local Comprehensive Plans may not proceed as fast with the No Build Alternative as with one or more of the Build Alternatives. However, development and buildout of the local Comprehensive Plans will continue as long as the economy is relatively strong and public facilities are made available.

[1] 40 CFR 1508.8

Build Alternatives

The following assumptions underlie conclusions regarding growth in the I-90 Corridor:

- There are no specific future development activities currently known that would be dependent on the project and would not proceed without the proposed project.
- Development would occur according to existing comprehensive plan and zoning designations, but growth may be more rapid with the proposed improvements;
- The rate of growth would be affected by other transportation improvements in the region, specifically improvements to I-405 and SR 520. Improvements to I-90 by itself are forecasted to cause little change in traffic levels. If improvements are not made to I-405 and SR 520, the improvements made to I-90 would have a small effect on the rate of either residential or commercial development on the east side of Lake Washington.

4.16.2.2 Water Quality and Biological Resources

With Alternative R-5 Modified and the Preferred Alternative R-8A, some landscaping would be removed for roadway widening. No vegetation would be removed outside of the existing roadway landscaped areas, so there is not expected to be a secondary loss of habitat, nor a change to the existing mix of plant species within the corridor.

As noted above in the land use discussion, improvements to I-90 alone are expected to result in minor changes to traffic levels, and would therefore have minor effects on growth in the east King County area. The effects on water quality and biological resources due to planned growth will happen eventually with or without this Project, but some of these effects could happen sooner because of the Project. New development would be subject to local comprehensive plans and zoning ordinances as well as regulations designed to protect both water quality and biological resources. Because of these changes in traffic levels and regulations governing development, development related to the Build Alternatives would have minor effects on downstream water quality impacts, reduced open space and remove existing plant communities.

4.16.2.3 Noise

The Preferred Alternative R-8A would likely shift a small volume of traffic (less than 1 percent) away from the existing SR-520 to I-90. Although a small amount of traffic would be shifted away, SR-520 would continue to operate at capacity during the peak hours. The operation of SR-520 at peak-hour capacity would result in similar peak-hour traffic noise levels along the existing SR-520 with or without this projected shift of traffic. This shift in traffic to I-90 from SR-520 under Alternative R-8A also would result in a very small net increase of traffic on I-405 (through downtown Bellevue) and on I-5 (through downtown Seattle), which would result in a negligible increase in traffic noise levels. In comparison, Alternatives R-1, R-2B, R-5 Restripe, and R-5 Modified would not measurably shift any traffic from SR-520 to I-90.

With the Preferred Alternative R-8A, trucks carrying flammable materials may be prohibited in the I-90 tunnels, which would result in some trucks being diverted to SR-520. Approximately

120 trucks per day in year 2005 would be diverted to SR-520, which carries approximately 3,000 trucks per day. This number would be projected to increase to 150 trucks per day by year 2025. The 4 percent additional truck volumes would increase traffic noise by less than 1 dBA on SR-520. Alternative R-8A also could divert approximately 60 trucks per day from I-90 to I-405 in year 2005 (increasing to 70 trucks per day by year 2025), which currently carries approximately 11,000 trucks per day. The shift of 60 trucks would increase the number of trucks on I-405 by less than 1 percent, which would result in a negligible increase on truck noise on I-405. The potential impacts of diverting trucks carrying flammable materials would not occur under Alternatives R-1, R-2B, R-5 Restripe, and R-5 Modified.

4.16.3 Cumulative Effects

Cumulative effects are impacts on the environment that result from the incremental consequences of a project when added to other past or reasonably foreseeable future actions (regardless of who would take that future action). The cumulative effects may be undetectable when viewed individually, but add to other disturbances and eventually lead to a measurable change.[2] Examples are changes in land use, the loss of wetland areas, the elimination of wildlife habitats caused by a combination of transportation projects, or increased noise levels.

The cumulative effects analyses includes:

- Geographic boundaries, or study area, for evaluating the potential effects
- Time frame for considering reasonably foreseeable future actions
- Relevant past, present and future actions that could cause a cumulative effect
- Critical resources that are likely to have potential cumulative effects
- Important cumulative effects issues

The critical resources affected by proposed I-90 improvements that are likely to have potential cumulative effects are traffic and transportation from roadway improvements, land use, air quality, noise, water quality and fish resources. Short-term cumulative construction impacts to public services may occur.

4.16.3.1 Geographic Boundary of Study Area

None of the project alternatives add general purpose traffic lanes. Lanes are added only for transit and high-occupancy vehicles (HOV). The traffic models show minimal increase in traffic levels (less than 1 percent annually) and most is attributed to HOV use. The lack of growth of traffic levels from the I-90 project is indicative that the project will not induce growth in residences or businesses on the east side of Lake Washington. Access to the I-90 corridor proposed for improvements is constrained by access ramps from or to I-5 on the west and I-405 on the east. Because of these growth indicators and system constraints, for the purposes of this cumulative impact analysis, the geographic boundary of the study area was considered to be the four regional freeways forming roughly a rectangle between Seattle and eastside communities: I-90 between I-5 and I-405, I-5 from I-90 to SR 520, SR 520 from I-5 to I-405, and I-405 from SR 520 to I-90.

[2] 40 CFR 1508.7

4.16.3.2 Time Frame

For the analyses of cumulative effects, year 2030 was selected as the future temporal boundary because it is the horizon year for *Destination 203*0, the 2001 update of the Metropolitan Transportation Plan, and it encompasses *VISION 202*0, the region's long-range growth management, economic development, and transportation strategy. The transportation analyses utilized forecasts prepared for years 2020 or 2025 to be consistent with other major corridor studies in the region. These forecasts included growth assumptions that are consistent with the regional plans prepared by the Puget Sound Regional Council (PSRC). A consistent study year (year 2025) was used for the analyses of direct effects of the No Build and Build Alternatives.

The cumulative effects of the No Build Alternative, which assumes implementation of *VISION 2020* and programmed and funded transportation improvements, were identified as the most meaningful baseline for comparing potential cumulative effects of the action alternatives on critical resources, ecosystems, and human communities of concern.

4.16.3.3 Relevant Past, Present and Future Actions

In the analysis of cumulative effects, it is necessary to consider past and present projects, as well as reasonably foreseeable future projects. Planning for the construction of I-90 across Mercer Island began in the mid 1950s. The final design approved by Mercer Island residents in 1971 called for four lanes each way plus two transit lanes (4-2T-4), with the two outside lanes dedicated for Mercer Island destinations only. In 1976, a compromise design changed the roadway to the current 3-2T-3 configuration, eliminating the fourth lane between Mercer Island and Seattle. Most of the roadway is entrenched and partially lidded (Gellataly 1977; WSDOT 1988, 1989, 1992). The highway was completed in 1993.

The notable, reasonably foreseeable federal, non-federal, and private actions identified during scoping that could be cumulative with the I-90 Two-Way Transit and HOV Operations Project Build Alternatives include the following, which are discussed in greater detail below:

- *VISION 2020* proposed long-term regional land use plan:
  Metropolitan Transportation Plan – *Destination 2030,* the transportation element of *Vision 2020* and two elements of Destination 2030, roadway improvement project and transit improvement projects:

  1. Relevant Roadway Improvement Projects
     - State Route (SR) 520 Bridge Replacement and HOV Project
     - I-405 Corridor Improvements

  2. Relevant Transit Improvement projects
     - Sound Transit *Sound Move* Phase I Investments

The Puget Sound Regional Council (PSRC) adopted the update of *VISION 2020* in 1995. *VISION 2020* serves as a long-range growth management, economic, and transportation strategy. It establishes a multiple-center approach to development that promotes a jobs/housing balance and plans for needed transportation improvements, specifying that improvements should occur at the same time as employment growth to implement the infrastructure concurrency requirements

of GMA. *VISION 2020* focuses growth into the Urban Growth Area (UGA) defined by each county. The Metropolitan Transportation Plan (MTP) was adopted in 1995 as the transportation element of *VISION 2020.*

Destination 2030 functions as the transportation element of *VISION 2020* and provides the regional transportation system to support the planned growth. *Destination 2030* is the Spring 2002 update of the 1995 Metropolitan Transportation Plan (MTP). The MTP serves as a planning tool used to identify regional transportation problems and analyze and develop regional solutions. *Destination 2030* supports a balanced multimodal transportation system that provides options to users, but the plan recognizes that capacity enhancements are needed to improve mobility on the region's roadways. With *Destination 2030,* vehicle miles traveled (VMT) is expected to increase by 45 percent and population by 50 percent over the next 30 years, increasing to 79 million miles per weekday by 2010, but then leveling off at 94 million miles per weekday by 2030. To address this growth, the plan calls for an aggressive program of transportation investments. With these investments, the growth in travel demand can be accommodated with relatively minor impacts on system performance, such as a 2 percent increase in congestion (PM peak) in 2030.

The transportation investments in *Destination 2030* include roadways, transit and non-motorized transportation systems as its major elements. The non-motorized transit component includes pedestrian improvement zones located in designated Urban Centers and regional transit station areas including bus, rail, and ferry facilities. For analysis of cumulative impacts with the proposed I-90 project, this discussion focuses on relevant roadway improvements and transit projects. No new non-motorized transportation components are being proposed in the study area.

4.16.3.4 Roadway Improvements

Destination 2030 includes improvements on principal arterials and arterial HOV lanes, and it adds general purpose and HOV lane miles to the interstate and state route system in the four-county region. There are two relevant roadway and HOV projects to be considered for cumulative impact analysis with the proposed I-90 project: (1) SR 520 Bridge Replacement and HOV Project; and (2) I-405 Corridor Program Improvements.

I-90 Alternatives

As I-90 becomes more congested in 2020, the forecasts show that cross-lake traffic will find other routes. With Alternative R-1, I-90's share of cross-lake traffic would decrease from the existing 67 percent to around 55 percent. The Preferred Alternative R-8A results in an increase of HOV capacity across I-90 that would attract some additional travel through the I-90 corridor. Daily volumes on I-90 would increase up to 2-3 percent compared to Alternative R-1. Most of the traffic increase would be due to added HOV volumes, with minimal changes in general traffic volume (see Appendix H).

Alternative R-8A would result in small shifts in traffic away from SR 520 (i.e., less than 1 percent), while net impacts to I-405 (through downtown Bellevue) and I-5 (through downtown Seattle) would also be very small. The net increase in travel across Lake Washington could be

attributable to shifts in regional travel patterns caused by improved east-west mobility. However, these travel pattern shifts would be quite small.

Alternative R-8A HOV 3+ scenario would show minimal changes in major freeway facility or regional vehicle miles of travel (Table 4.16-1). An R-8A HOV 2+ scenario would result in some increases in I-90 VMT, small decreases in SR 520 VMT, and minor variation in regional VMT.

A system analysis was performed to estimate the potential freeway system effects caused by roadway/transit improvements made in either the SR 520 or I-405 corridors. The reason for conducting this analysis was to provide additional insight into the impacts of other major freeway projects on I-90 and the surrounding freeway system. The travel forecasts conducted for the I-90 Project assumed no major improvements to capacity on SR 520 or I-405. This assumption provided a conservative assessment of I-90 impacts, since no improvements on SR 520 or I-405 have been funded. However, the proposals emerging in both corridors are consistent with current regional plans documented in *Destination 2030*. During the past two years, the SR 520 Project has been evaluating a wide range of SR 520 corridor improvements, several of which involve addition of capacity to the SR 520 floating bridge corridor. Similarly, the I-405 Corridor Program environmental document was completed in 2002, resulting in recommendations for capacity expansion and transit improvements along that freeway.

The system analysis utilized travel forecasts conducted for the SR 520 and I-405 projects to compare with I-90 results. All of these datasets were based upon the PSRC regional modeling suite and contained similar network and land use assumptions. The I-405 and SR 520 forecasts were for 2020 and were developed during 2001. These results were compared with updated travel forecasts for I-90 (2025 horizon year) that were prepared in 2002 and used in the transportation analysis in this document.

SR 520 Bridge Replacement and HOV Project

Improvements to SR 520 are included in *Destination 2030*. WSDOT, Sound Transit, and FHWA have moved into the environmental analysis, documentation, and review phase of the SR 520 project to study options for crossing Lake Washington in the SR 520 corridor. In this phase, the recommendations from the study committee, as well as alternatives suggested by other community members, agencies, and advocacy groups, will be evaluated to determine the recommendations' value in improving mobility, their impacts on the environment and affected communities, and the steps that may need to be taken to avoid or mitigate negative impacts or to add positive impacts. An EIS will be prepared as part of the review process. Environmental analysis for this project has been initiated but preparation and completion of the EIS is dependent upon securing further funding. This cumulative effects analysis considered two scenarios without tolls for SR 520 improvements: added HOV lanes across the SR 520 floating bridge (6 lanes total); and added HOV lanes plus general purpose lanes across the SR 520 floating bridge (8 lanes total).

The SR 520 evaluation provided forecasts for two build scenarios across SR 520 and one build alternative across I-90. I-90 Alternatives R-1 and R-8A (HOV 3+) were evaluated for the system-wide impact analysis and are considered to have the greatest effect. Other I-90

Alternatives (R-2B Modified and the R-5 Alternatives) were found to have very small (i.e., less than 1 percent) effects on system freeway volumes and were not further evaluated in this effort.

The following two scenarios for SR 520 were considered in the evaluations:

- Added HOV lanes across the SR 520 floating bridge (6 lanes total)
- Added HOV lanes plus general purpose (GP) lanes across the SR 520 floating bridge (8 lanes total)

In addition, two combined scenarios were considered:

- Alternative R-8A (HOV 3+) plus SR 520 added HOV lanes (6 lanes)
- Alternative R-8A (HOV 3+) plus SR 520 added HOV and general purpose lanes (8 lanes)

Table 4.16-1 shows the forecasted changes in vehicle miles of travel (VMT) for the SR 520 scenarios in comparison with I-90 Alternatives R-1 and R-8A. These results were based upon the 2020 travel forecasts prepared in 2001, but are considered to reasonably reflect the relative differences among the scenarios. High levels of congestion in both the SR 520 and I-90 corridors result in rather dramatic traffic shifts between them; these shifts are dependent upon prevailing travel conditions (e.g., weather, incidents, special events). Specific findings related to the scenarios are summarized below.

Table 4.16-1
Comparisons of Daily Vehicle Miles of Travel (VMT) for I-90 and SR 520 Alternatives

	Regional VMT		Facility Vehicle Miles of Travel (VMT)							
Scenario	2020 Regional VMT	Growth vs. No Action (%)	I-405	Growth vs. No Action (%)	I-5	Growth vs. No Action (%)	I-90	Growth vs. No Action (%)	SR 520	Growth vs. No Action (%)
No Build I-90 or SR 520	100.6	n/a	0.7	n/a	1.0	n/a	1.2	n/a	0.7	n/a
R-8A	100.7	0.1%	0.7	1.4%	1.0	0.0%	1.2	1.7%	0.7	0.0%
SR 520 HOV Lane	100.6	0.0%	0.7	-0.8%	1.0	1.2%	1.2	-1.9%	0.8	1.2%
SR 520 HOV + GP Lane	101.0	0.4%	0.7	1.1%	1.1	2.2%	1.1	-3.3%	1.1	46.0%
R-8A* plus SR 520 HOV Lane	100.7	0.1%	0.7	0.0%	1.0	1.0%	1.2	0.0%	0.8	1.9%
R-8A* plus SR 520 HOV and GP Lane	101.1	0.5%	0.7	1.4%	1.1	2.0%	1.2	-1.1%	1.0	38.7%

Notes: Values are in millions.
Based upon 2020 forecasts conducted in 2001. Current 2025 forecasts of regional VMT show approximately 96 million daily VMT.
*Assumes HOV 3+ occupancy rule.
Source: Mirai Associates 2002

SR 520 Scenarios

The relative effects of improvements to the SR 520 corridor would be substantially higher than comparable improvements to I-90. The addition of an HOV lane across the SR 520 floating bridge would result in an 8 percent increase in total SR 520 travel, along with a 2 percent

reduction in I-90 volumes. This shift away from I-90 would be of similar magnitude to the increase in volume on I-90 caused by Alternative R-8A. (See Appendix H.)

If an HOV lane and a general purpose lane were added to SR 520, the results would be more pronounced, showing that the traffic demands on SR 520 could increase by almost 50 percent. The modeling showed that volumes on I-90 would fall by around 3 percent, resulting in a substantial net increase in total cross-lake travel. (Note: Trans-Lake/SR 520 forecasts conducted in 2002 indicate that the I-90 volume reductions could be more substantial, on the order of 10,000 to 15,000 vehicles per day, or a 7 percent reduction).

In the short term, the traffic reduction along I-90 would be expected to be substantially greater. In the longer term, this scenario would provide substantially better east-west mobility than currently exists. A situation that could cause a substantial shift in trip making could occur between the eastside (notably Bellevue) and the north and central portions of Seattle. Conversely, trips would be reduced between north Seattle and downtown Seattle.

The SR 520 capacity scenarios would result in some reductions along I-405 southbound through downtown Bellevue, while northbound I-405 trips would increase. This illustrates the fact that many people, otherwise using I-90, would prefer to use SR 520. Supporting this finding are studies in the City of Bellevue that show a considerable diversion of peak period traffic away from SR 520 to I-90 currently using city streets (e.g., 148th Ave) as well as I-405 through downtown Bellevue.

Impacts to I-5 traffic would be somewhat similar. Traffic volume shifts would be minimal in the south downtown area near I-90, while I-5 demands would increase by 2 to 5 percent in the northern downtown sections approaching SR 520.

The SR 520 HOV lane scenario would show small changes in facility or regional VMT (Table 4.16-1). The HOV plus general purpose lane scenario would show substantial increases in SR 520 vehicle miles of travel, minor reductions in I-90 VMT, and small increases in regional VMT.

Combined I-90 and SR 520 Scenarios

While I-90 volumes are expected to increase with Alternative R-8A, the two combined scenarios indicate that HOV and/or general purpose capacity improvements made to SR 520 would likely offset most of the traffic increases on I-90. Relative effects on I-405 and I-5 are influenced primarily by the SR 520 capacity additions rather than by the Alternative R-8A HOV lane project. A net increase in cross-lake travel would occur as a result of improvements in east-west mobility (see Appendix H).

The combined scenarios would result in increases in regional VMT of 0.5 to 1.0 percent, with freeway facility impacts on VMT of less than 2 percent (Table 4.16-1). The exception would be the large growth in SR 520 VMT under the scenario that adds both an HOV and general purpose lane to the SR 520 corridor.

While not directly analyzed, it is anticipated that a combination of the SR 520 scenarios with either I-90 Alternative R-2B Modified or R-5 Modified would show net increases in cross-lake

travel and reductions in volumes on I-90. The net results would likely be similar to the SR 520 scenario findings described previously.

I-405 Corridor Program Improvements

All of the core projects and strategies in the Final EIS developed for the I-405 Corridor Program are included in *Destination 2030*. In addition, the PSRC refined *Destination 2030* in Spring 2002 to fully reflect and incorporate the transportation improvements contained in the I-405 Corridor Program Preferred Alternative. These adopted transportation improvement projects and strategies are in response to the planned growth under the existing jurisdictional comprehensive plans, which in turn conform to the regional planned growth under *VISION 2020*. The I-405 Corridor Program alternatives do not include all the HCT facilities that are included in *Destination 2030*. Links completing the HCT network around the region, such as north to Everett by 2030, are not included. With some project elements, such as the bus rapid transit system, the I-405 Corridor Program improvements could actually serve as a transitional solution that could enhance implementation of a more intensive or higher-order HCT system in the corridor in the future. In addition, the MTP uses HOV 2+, while the I-405 Corridor Program study uses HOV 3+ in the alternatives. Analysis showed that the HOV use along I-405 does not vary much among the I-405 study alternatives since the number of HOV lanes remains constant across alternatives. HOV 3+use ranges from 3 to 4 percent of vehicles in the north end, and up to 10 percent in the south end of the corridor.

The I-405 forecasts assumed no improvements to either SR 520 or I-90. The results illustrate the potential effects of I-405 corridor expansion on travel patterns across Lake Washington. The I-405 Preferred Alternative proposes a new bus rapid transit (BRT) system, substantial expansion of local bus transit service, up to two added lanes in each direction on I-405, improvements to arterial capacity and connectivity within the study area, and the other general purpose and HOV roadway improvements. The BRT system would operate in improved-access HOV lanes on I-405, I-90, and SR 520.

The addition of freeway and transit capacity in the I-405 corridor would result in substantial increases in north-south travel along the freeway. In evaluating the regional cumulative effects of the I-405 Corridor Program, the forecasts for population, employment, and travel demand in the corridor were compared to forecasts for the four-county central Puget Sound region.

Table 4.16-2 compares VMT and VHT for the I-405 study area and region for the I-405 No Action Alternative and the Preferred Alternative. The I-405 study area comprises approximately a thirty-mile corridor extending from Tukwila and Kent on the south to Lynnwood in the north.

Table 4.16-2
I-405 Corridor Effects on Daily Vehicle Miles of Travel (VMT) and Vehicle Hours of Travel (VHT)

I-405 Alternative	VMT (Daily)		VHT (Daily)	
	Study Area (trips within)	Region-wide	Study Area (trips within)	Region-wide
2020 No Action Alternative	23,927,000	102,770,000	834,000	3,389,000
2020 Preferred Alternative (Mar 2002)*	26,208,000	104,459,000	853,000	3,3660,00
Change vs. No Action Alternative (%) *	9.5%	1.6 %	2.3%	0.7%

Source: I-405 Corridor Program Final EIS, Table 3.12-18, June 2002. Data developed from PSRC Model I-405 FEIS incorrectly shows the percentage of VMT change for the study area as "11.5%."

Within the study area, the I-405 Preferred Alternative showed approximately a 12 percent increase in VMT. Regional VMT increased by up to 2 percent for the Preferred Alternative.

Effects on Cross-Lake Travel

The travel forecasts (2020) show that the I-405 Preferred Alternative would have limited impacts on cross-lake travel patterns (WSDOT 2002b). This finding is consistent with the assumption in the study of minimal capacity increases in either the SR 520 or I-90 corridors. Daily traffic volumes on SR 520 and I-90 were estimated to decrease by around 1 percent. This trend may be partially due to improved accessibility in the I-405 corridor that would shift some work and non-work trips away from Seattle to the Eastside. The I-405 Preferred Alternative also forecasted that transit across Lake Washington (combined SR 520 and I-90) would average 35,000 to 40,000 daily persons in 2020 (WSDOT 2002a). These estimates were consistent with the transit assumptions and findings in the SR 520 study.

While not reflected in the travel forecasts or the detailed traffic analysis on I-90, the I-405 plan would improve traffic operations at the I-90 interchange by upgrading ramp connections to I-405. In particular, the I-405 project recommends extending an eastbound auxiliary lane on I-90 approaching I-405 to reduce the effects of queuing on I-90 operations.

4.16.3.5 Transit Improvements

The transit component is comprised of major regional transit services and facilities that provide public transportation access between major regional activities centers, connecting designated Urban Centers and major regional employment locations. Regional transit services can provide an alternate travel mode in congested corridors. In addition to the region's planned fixed-guideway HCT (light rail and commuter rail) and passenger-only ferry service, transit services are also represented by the transportation facilities they use – general purpose lanes, HOV lanes, and exclusive transit rights-of-way. Regional transit facilities include major park-and-ride lots, transit centers, and ferry terminals. For the purpose of this cumulative impact analysis, relevant Sound Transit *Sound Move* Investments were considered.

Sound Transit *Sound Move* Investments

Since 1996, Sound Transit has begun implementing *Sound Move*, which includes regional express bus service, HOV access improvements, park-and-ride lots, and commuter rail and light rail.

Specific projects in the I-90 corridor include improvements to bus routes that use I-90, and park-and-ride and transit centers that use these routes, including expansion of the existing Mercer Island transit station, located along N Mercer Way and adjacent to the existing Mercer Island park-and-ride. The transit station is anticipated to be expanded from the current two bus bays to a total of four bus bays. It will include new passenger shelters, sidewalk improvements, paving, lighting and signage. An additional 200 parking spaces would be added to the Mercer Island park-and-ride.

Analysis of Flexibility/Adaptability for Future Light Rail/HCT Operations

Light rail is discussed in this cumulative impacts analysis only as to whether any of the alternatives either preclude future light rail on I-90 or would facilitate future light rail. The Project is not a light rail or High Capacity Transit (HCT) project; it is intended to improve regional express bus transit and HOV operations. If there is a high capacity transit project proposed for I-90 in the future, it would have its own environmental analysis. Light rail is discussed in this FEIS only as to whether any of the alternatives either preclude future light rail on I-90 or would facilitate future light rail. The project alternatives have been reviewed to determine whether they would be adaptable for a future light rail project. This analysis was completed as part of WSDOT's SR 520 Trans-Lake Project which examined the implications of the implementation of light rail on the I-90 center roadway. A similar analysis has not been performed to consider future adaptability to other forms of high capacity transit.

Based on assumptions in the study, it was determined that the center roadway could only be used by LRT and maintenance vehicles—joint use of the LRT trackway by transit buses and/or other rubber-tired vehicles was found to be infeasible (CH2M Hill 2002).

As part of preparing the analysis for the EIS, each of the alternatives was reviewed to determine whether they could be adapted in the future for LRT. As discussed below, none of the alternatives would preclude LRT in the center roadway, however Alternative R-8A has been found to be the most adaptable alternative. The following summarizes the results of evaluating each of the alternatives for adaptability to LRT in the center roadway. Other forms of high capacity transit were not evaluated as part of this analysis.

Alternative R-1: Existing/No Build

With exclusive use of the I-90 center roadway for light rail, all other traffic (transit bus, HOV, and general-purpose) would be moved out of the center roadway. This traffic would have to be accommodated in the existing outer roadways. The displacement of this traffic to the outer roadways would be expected to increase the severity and duration of congestion on I-90 between Seattle and Bellevue.

Alternative R-2B Modified

Alternative R-2B Modified would displace general purpose traffic from the center roadway, leaving transit buses and other eligible HOV traffic in the center roadway. With exclusive use of the I-90 center roadway for light rail, HOV and bus traffic would be displaced to the outer roadways which would increase congestion levels in the outer roadways. The construction of Alternative R-2B Modified would not preclude a conversion of the center roadway to high-capacity transit in the future. The proposed concrete median barrier would need to be removed from the center roadway for this conversion. With rail-based high-capacity transit, center roadway ramps constructed on Mercer Island as a part of Alternative R-2B Modified would no longer be needed, except for maintenance access.

Alternatives R-5 Restripe and R-5 Modified

Traffic displacements would be similar to those described for Alternative R-1. Modifications to the I-90 outer roadways that would be made as a part of either Alternative R-5 Restripe or Alternative R-5 Modified would not likely conflict with conversion of the center roadway to light rail use, and could likely remain in operation.

Alternative R-8A – Preferred Alternative

Alternative R-8A would be the most adaptable alternative in terms of compatibility for conversion of the I-90 center roadway to light rail use. Alternative R-8A would reduce both the construction impacts and long-term impacts of light rail operations on I-90. Alternative R-8A would prepare the corridor for future light rail in the I-90 center roadway by providing HOV lanes and associated HOV direct access ramps on Mercer Island for both directions of travel in the outer roadways, providing a two-way link in the Core HOV lane system for the Puget Sound region. Modifications to the HMH floating bridge would not preclude converting the center roadway to light rail transit in the future.

4.16.3.6 Land Use

The traffic and transit numbers prepared for the I-90 analysis show that the benefits of the proposed improvements are largely to transit in the reverse-peak direction. Daily and peak period traffic volumes increase very slowly from 2000 to 2005 to 2025 (less than 1 percent annually). 2025 transit ridership is forecasted at almost double over 2005 due to increases in service and demographic changes. The Build alternatives are forecasted to have a relatively minimal effect on transit ridership based on model results. Due to the minimal forecasted traffic increases, the following qualitative analysis of the cumulative effects on land use was prepared. Transit reliability is anticipated to increase ridership, however the actual amount of increased is difficult to forecast.

Regional Growth History

The Puget Sound region has experienced tremendous growth in two large cycles, one in the 1960s and another in the 1980s and 1990s. The Puget Sound region was still growing in 2001, with annual growth rates projected at 1.1 to 2.0 percent out to 2030 (PSRC, 2001a). While the growth rate was substantial in the 1960s, the current predominant Eastside land uses did not emerge until the 1980s when the area transitioned from rural/suburban, to suburban/urban with identifiable Urban Centers.

The Eastside (communities east of Lake Washington) was a rural area prior to the completion of the first Lake Washington floating bridge across Mercer Island in 1940. The bridge dramatically decreased the time it took to travel between Seattle and the Eastside. During the next twenty years the previously rural Eastside was transformed into a major suburb of Seattle, with development focused in Bellevue and the other neighborhoods having easy access to U.S. 10 (now I-90). The second major phase in the contemporary development of the Eastside began when the second Lake Washington floating bridge was completed in 1963. The opening of SR 520 facilitated access and development in the 1970s and early 1980s of the northern and northeastern portions of the Eastside areas that had previously been difficult to access from Seattle. During the period the Eastside also became an important location for businesses and jobs, which increased 400 percent between 1960 and 1980.

It is important to note that unlike previous I-90 construction or improvement projects, none of the alternatives being considered for the proposed I-90 project would include new general purpose lanes. The improvements proposed are to add two-way transit and HOV lanes by restriping roadways and incremental roadway widening where feasible.

Growth Management Act

Through the late 1980s and 1990s, new regulatory policies at the state, regional, and local levels were enacted that defined the boundaries within which growth would be accommodated and the amount of density that each city will need to accommodate over a 20-year horizon. The Washington State Growth Management Act (GMA) defined urban and rural growth areas (UGAs), designated Urban Centers, established density targets in those Urban Centers, and established minimum levels of services on statewide infrastructure. Before the GMA was adopted in 1990, there was little statewide or regional direction on growth, and a growth pattern of continual sprawl into rural areas.

The Puget Sound Regional Council (PSRC) adopted the update of *VISION 2020* in 1995. *VISION 2020* describes a regional land use pattern consistent with and supportive of the state's Growth Management Act (GMA) policies. The local comprehensive plans for cities in the study area were developed within the framework of *VISION 2020*. The alternatives for the I-90 study are consistent with all local jurisdictions' adopted land use zoning. The I-90 Project Build Alternatives are consistent with GMA in that they support implementation of the envisioned regional land use pattern.

King County, working with the local cities, took the lead in developing and adopting County-Wide Planning Policies (CWPP), which integrated land use planning with transportation planning policies. Cities within King County, adopted the CWPP as one regional implementation tool of the GMA and *VISION 2020* policies. The CWPP establish the Urban Center concept, which is beginning to take form within the designated UGA.

All of the local jurisdictions in the study area have adopted comprehensive plans in accordance with requirements of the GMA, the CWPP, and the PSRC Multi-county Planning Policies. These comprehensive plans include transportation elements that are reviewed and certified by the PSRC as conforming to the transportation planning elements of the GMA, *VISION 2020*, and the MTP.

Qualitative Land Use Analysis

As noted above, the traffic and transit numbers show that the benefits of the proposed improvements are largely to transit in the reverse-peak direction. Daily and peak period traffic volumes increase very slowly from 2000 to 2005 to 2025 (less than 1 percent annually). 2025 transit ridership is forecasted at almost double over 2005 due to increases in service and demographic changes. The Build alternatives have relatively minimal effect on transit ridership based on model results and would therefore have minimal effects on changes in land use.

The Build Alternatives would contribute to an overall improvement in transit reliability, and Alternatives R-5 Modified and R-8A would contribute to an overall improvement in travel times for high-occupancy vehicles (HOV). For transit riders and HOV users, these alternatives would improve access between residential communities and commercial areas on either side of Lake Washington within the I-90 corridor, improving connections to jobs, education and shopping.

The combination of the I-90 Project with the SR 520 Project and I-405 Corridor Improvements would increase access and reduce congestion within the Urban Growth Area. These improvements would support planned development in designated Urban Centers and around the major transit facilities. These changes may, in turn, support increases in land values, encourage economic development and assist in the realization of local, King County and regional goals for growth and economic development.

4.16.3.7 Air Quality

Motor vehicles are dominant sources of regulated pollutants. Based on the 1998 emission levels obtained from Puget Sound Clean Air Agency (PSCAA), automobiles contribute about 57 percent of the CO and 60 percent of the NO_x released to the atmosphere in the Puget Sound region. Despite the population growth the region has experienced in recent years, ambient CO levels have been declining over the last two decades. Reduced emissions from mobile sources due to increasingly stringent state motor vehicle inspection and maintenance programs, cleaner burning fuels and technological/ engineering improvements to engine performance have been the key factors behind the decrease. Because of the reduction in ambient CO levels and because there has not been a measured exceedance of the NAAQS, CO is not currently considered a significant air quality problem in the Puget Sound region. By considering the effects of future projects and background growth with the proposed alternatives, the cumulative effects of traffic air emissions were evaluated. The cumulative effect of the transportation projects considered for this analysis is not expected to change this trend in improved regional air quality from vehicles. Other impacts to air quality come from the burning of hydrocarbons, such as natural gas for industrial uses and heating. These types of emissions which cause ozone formation are projected to increase in the central Puget Sound regional between 2010 and 2025.

4.16.3.8 Noise

Cumulative noise impacts would occur from the combined traffic volumes under the proposed project, growth in background traffic, and changed traffic patterns under other identified projects such as SR-520. General growth in the Puget Sound area would increase background traffic volumes on area roadways, which would thereby increase traffic noise levels without the

proposed project. By considering the effects of future projects and background growth with the proposed alternatives, the cumulative effects of traffic noise were evaluated. The increase in traffic noise from project-related traffic would cumulatively add to the background traffic noise levels along I-90, however the 1 to 2 decibel increase from Project Alternatives (including the No Build) would not be perceptible.

If SR-520 was expanded to six or eight lanes, traffic would be diverted from I-90 to SR-520. Traffic volumes on I-90 could be reduced by approximately 6 to 8 percent, which could reduce projected I-90 traffic sound levels by less than 1 dBA. Although a small amount of traffic would be shifted away from I-90, I-90 likely would continue to operate at capacity during the peak hours, which would result in similar peak-hour sound levels along I-90 with or without this projected shift of traffic under the cumulative development scenarios. The SR-520 Bridge Replacement and HOV Project would cumulatively increase overall traffic volumes on SR-520 and possibly increase associated traffic noise levels, although future noise levels along SR-520 would depend on new noise walls and other mitigation likely to be included as part of the SR-520 Bridge Replacement and HOV Project.

4.16.3.9 Water Quality

The rivers and major lakes in the study area have been extensively altered due to development during the past century. For instance, in 1916 Lake Washington was lowered by 16 feet as a result of construction of a ship canal and locks to allow ship passage between Puget Sound and the lake. To assure adequate water for the newly constructed ship locks, the Cedar River was diverted into the south end of Lake Washington.

Streams within the project area have also undergone considerable change. Most of the development within the stream basins has occurred in the past 50 years. There have been some declines in the quality of the streams. These include the typical pollutants associated with urban development—nitrogen, phosphorus, oil and grease, coliform, bacteria, and detectable levels of some herbicides and pesticides. However, the more serious and pervasive effects upon streams have been physical. Direct stream impacts resulting from past development include bank armoring and widening for flood control. In the past, it was common practice to route a stream into an underground culvert for hundreds or even thousands of feet to pass under a highway or developed property.

Streams now typically experience higher peak flows than they historically did. As a result, channel scouring and widening are common. Channel scour and bank erosion often lead to heavy sedimentation in low-gradient and downstream sections, particularly at stream mouths.

By the 1970s, there was recognition among the state and local agencies that some form of stormwater controls for new development was needed. Since then, several stormwater management plans, guidelines, and regulations have been issued, including the *Puget Sound Water Quality Management Plan*; the King County *Surface Water Design Manual*; and the Department of Ecology *Stormwater Management Manual for Western Washington,* which has recently been revised. Implementation of these stormwater regulations and policies assures that the rate of hydrologic and water quality degradation in developing areas will be greatly reduced from those that historically occurred.

Because stormwater regulations will continue to evolve, future water resource conditions in the project area are difficult to predict. Even with implementation of stormwater treatment and

detention measures for all new development, increases in pollutant loads and adverse changes in existing hydrology to streams within the Project area are likely to occur in streams within the project area. Planned household and employment growth is estimated to result in a 26 percent increase in impervious coverage in the next 20 years.[3] With the exception of Alternative R-5 Restripe which would add no new impervious surface, the I-90 Build Alternatives would add between 2.61 and 5.76 acres of new impervious surface spread linearly along the 8 mile corridor. For the I-90 project alone, this would represent a relatively small increase in impervious surface area. The proposed I-405 Corridor Program improvements would potentially contribute between 1 and 8 percent of the new impervious surface in the study area used for the I-405 project.[4] The cumulative effects of the I-405, SR 520 (adding 2 to 4 lanes), and the I-90 projects, when viewed collectively, could have the potential for adverse changes to water quality from additional runoff of pollutants from new impervious surfaces if not adequately mitigated through regulation or best management practices.

4.16.3.10 Fish Resources

Agencies including the NMFS (now NOAA Fisheries) and WDFW have tracked population trends for anadromous salmonids. Although fish populations naturally fluctuate in response to factors such as climate variations, nearly all native salmonid populations in the region have undergone a severe declining trend since the human population began rapidly increasing over the past century.

Within the project area, the high rate of population and employment growth has driven the recent trend in adverse impacts on fish and fish habitat, primarily through habitat degradation. Creating new impervious surfaces associated with development is a predictor of fish habitat degradation.

The GMA requires all cities and counties in the state to conduct planning for growth and protection of sensitive areas, and has more extensive requirements for the largest and fastest-growing cities and counties in the state. By requiring definition of Urban Growth Areas, the GMA relieves development pressure on urban areas that generally contain the most viable fish habitat. King County and the cities of Seattle, Bellevue, and Mercer Island have adopted sensitive areas ordinances that include the protection of wetlands and steams, with more stringent protection for streams that provide salmonid habitat. These ordinances establish restrictions on disturbance of aquatic habitat, including stream disturbance, wetland filling, and buffer encroachment.

The federal ESA established a legal framework to protect species considered to be in danger of extirpation. There are two classifications under which a species may be listed: Species determined to be in imminent danger of extinction throughout all of a substantial portion of their range are listed as "endangered." Species determined likely to become endangered in the foreseeable future are listed as "threatened."

Two fish species occurring within the project area have been listed under the ESA: Puget Sound chinook salmon was listed as threatened in March 1999, and the Coastal-Puget Sound DPS of bull trout was listed as threatened in October 1999.

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[3] *I-405 Corridor Program NEPA-SEPA Final Environmental Impact Statement and Final Preliminary Section 4(f) Evaluation.* June 2002 FHWA, FTA, King County Department of Transportation, WSDOT, Sound Transit.
[4] Ibid.

A year after the chinook salmon listing, Section 4D rules were published by the NMFS, which among other things, dictate control of stormwater and protection of streams and lakes that form habitat for wild chinook. This has had the short-term effect of expanding federal review over many types of development formerly subject only to local review. It is likely that over the long term, modifications to the 4D Rule and the development of habitat conservation plans will lead to a more streamlined approval process than is currently the case. It is clear that community land use plans and major development projects must specifically weigh potential impacts on streams and fish and be prepared to demonstrate adequate off-setting mitigation.

As noted above in Water Quality, the cumulative effects of the transportation projects would be an increase in impervious surface which will increase pollutants in the area's streams and lakes. This could degrade fish habitat if not adequately mitigated through regulation or best management practices.

4.16.3.11 Public Services

The cumulative effects to Public Services during construction caused by traffic delays, lane changes, and detours would occur only if construction of the Build Alternatives were to occur simultaneously with construction of improvements on either SR 520 or I-405. If this were to occur, there could be some overall slowing of the response times of the emergency service providers who use I-90 to respond to emergencies or respond to emergencies on the roadway itself. Given the status of funding for the SR 520 and I-405 improvement projects, simultaneous construction of two or all three of these roadway projects is unlikely.

4.16.3.12 Conclusion

The analysis of cumulative and secondary effects indicates that planned growth in population and employment, as expressed through *VISION 2020* and *Destination 2030*, and the development that will be associated with this growth are by far the most substantial actions affecting the magnitude and severity of cumulative effects in the central Puget Sound region and I-90 corridor. The *direct* effects of the I-90 Alternatives are expected to be minimal for all critical resources such as fish and aquatic habitat, and their incremental contribution to overall *cumulative* effects within the region would generally be very small when compared to the combined effects of other past, present, and reasonably foreseeable future actions.

The differences in cumulative effects among the alternatives would be minor relative to the overall level of cumulative effect anticipated due to other past, present, and reasonably foreseeable future actions. In addition, proposed mitigation for direct effects coupled with other federal, state, and local permitting and preservation activities will reduce any cumulative and secondary effects.

The review of potential cumulative and indirect effects also shows the following:

- The daily VMT in the central Puget Sound region is expected to increase to 79 million miles per weekday by 2010, but then level off to 94 million miles per weekday by 2030 under the *Destination 2030* plan (PSRC, 2001a). To address this growth, the plan calls for an aggressive program of transportation investments.

- Hydrocarbon emissions, which largely drive ozone formation in the central Puget Sound region, are projected to increase between 2010 and 2025.

- Cumulative and secondary effects on air pollutant emission levels from vehicles in 2025 are very similar under all of the alternatives, and are not expected to be substantial.

- Recent and anticipated regulatory programs assure that the rate of hydrologic and water quality degradation in developing areas will be greatly reduced from those that historically occurred.

- Planned household and employment growth is estimated to result in a 26 percent increase in impervious coverage in the I-405 study area over the next 20 years.

- Cumulative and secondary effects on surface water are similar under all I-90 Alternatives. While there would be small areas of additional impervious surface added with the I-90 Build Alternatives, the proposed I-405 Corridor Program improvements would potentially contribute between 1 and 8 percent of the new impervious surface in the study area over the next 20 years.

- Within the project area, the high rate of population and employment growth has driven the recent trend in adverse impacts on fish and fish habitat, primarily through habitat degradation.

- The project Alternatives would have minimal effect on population and employment growth and therefore minimal contribution to cumulative degradation of fish habitat.

4.17 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

All of the Build Alternatives examined in this FEIS would have similar local short-term (from commencement of construction for a period of one to two years) impacts and use of natural resources. For instance, each of the Build Alternatives (to varying degrees) would have short-term adverse impacts during construction such as dust generation, noise and temporary lane closures on I-90. However, the transportation improvements that each of the Build Alternatives would achieve are consistent with state (House Bill 1487), regional (PSRC *Destination 2030 and 2001-2004 Regional TIP*), and local *(Seattle, Mercer Island, and Bellevue Comprehensive Plans*) planning documents. These documents identify the need for transportation improvements in the context of future land use development that is expected to occur in King County and the region over the next 20 years or so. Traffic studies conducted as part of this Project have also demonstrated that I-90 would experience unacceptable delays in transit and HOV operations unless improvements are made to the corridor. The local short-term impacts, benefits and use of resources that would occur as a consequence of the Project would contribute to the maintenance and enhancement of the long-term productivity of the Puget Sound region.

4.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Implementation of the proposed Project involves a commitment of a range of natural, physical, human, and fiscal resources. Fossil fuels, labor, and roadway construction materials such as cement, asphalt, and aggregate would be expended. Labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. However, they are not in short supply and their use will not have an adverse effect upon continued availability of these resources. Should the land ever be converted to another use, some of these materials such as the road pavement would be able to be crushed and reused as fill. Construction of the Project would also require a one-time expenditure of both state and federal funds that are not retrievable.

The commitment of these resources is based on the concept that residents in the Puget Sound region and throughout the state would benefit by the improved quality of the transportation system. These benefits would consist of improved mobility and safety, savings in time, and greater availability of quality services that are anticipated to outweigh the commitment of these resources.