APPENDIX U

INDIRECT AND CUMULATIVE EFFECTS ANALYSIS REPORT

JUNEAU ACCESS IMPROVEMENTS
SUPPLEMENTAL DRAFT
ENVIRONMENTAL IMPACT STATEMENT

STATE PROJECT NUMBER: 71100
FEDERAL PROJECT NUMBER: STP-000S (131)

Prepared for

Alaska Department of Transportation and Public Facilities
6860 Glacier Highway
Juneau, Alaska 99801-7999

Prepared by

URS Corporation
8411 Airport Boulevard
Juneau, Alaska 99801

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
A	
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AIDEA	Alaska Industrial Development and Export Authority
AMHS	Alaska Marine Highway System
APE	Area of Potential Effect
AS	Alaska Statute
AWQS	Alaska Water Quality Standards
B	
BMP	best management practice
C	
CBJ	City and Borough of Juneau
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNIPM	Committee for Noxious and Invasive Plants Management
CO	carbon monoxide
Coeur	Coeur Alaska, Inc.
D	
dBA	A-weighted decibels
DEIS	Draft Environmental Impact Statement
DOT&PF	(Alaska) Department of Transportation and Public Facilities
E	
EFH	essential fish habitat
EIS	Environmental Impact Statement
F	
FC	fecal coliform
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FHWA	(U.S. Department of Transportation) Federal Highway Administration
FR	Federal Register
FSEIS	Final Supplemental Environmental Impact Statement
FVF	fast vehicle ferry
G	
GIS	Geographic Information System
Goldbelt	Goldbelt, Inc.
GMU	Game Management Unit
H	
HCI	habitat capability index

ACRONYMS AND ABBREVIATIONS (continued)

L

$L_{(eq)}$	equivalent noise level

M

µg/L	migrograms per liter
MOA	Municipality of Anchorage

N

NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System

P

PAH	polynuclear aromatic hydrocarbon
PSD	Prevention of Significant Deterioration

R

ROD	Record of Decision
ROW	right-of-way
RV	recreational vehicle

S

SDEIS	Supplemental Draft Environmental Impact Statement

T

TPH	total petroleum hydrocarbon
TSS	total suspended solids

U

UCS	Union of Concerned Scientists
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 INTRODUCTION

Environmental effects of an action can be categorized as direct, indirect, or cumulative. The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) defines direct effects as those caused by the action and that occur at the same time and in the same place as the action (Title 40, Code of Federal Regulations [CFR], 1508.8). Indirect effects are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8).

Cumulative effects on the environment can result from the direct and indirect effects of an action in combination with other actions over time. CEQ regulations for implementing NEPA define cumulative effects in 40 CFR 1508.7 as:

> "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."

A cumulative effects analysis was included in the Alaska Department of Transportation & Public Facilities (DOT&PF) 1997 Juneau Access Improvements Draft Environmental Impact Statement (DEIS) (DOT&PF, 1997). DOT&PF has since modified the alternatives evaluated in the 1997 DEIS. Comments received on the 1997 DEIS and 2003 scoping comments indicated that additional data should be included in the indirect and cumulative effects analysis. This report presents a new indirect and cumulative effects analysis of the No Action Alternative and nine build alternatives identified in the Supplemental Draft Environmental Impact Statement (SDEIS).

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2.0 PROJECT DESCRIPTION

2.1 Project Purpose and Need

The purpose of and need for the Juneau Access Improvements Project is to provide improved surface transportation to and from Juneau within the Lynn Canal corridor that will:

- Provide the capacity to meet the transportation demand in the corridor
- Provide flexibility and improve opportunity for travel
- Reduce travel time between Lynn Canal communities
- Reduce state costs for transportation in the corridor
- Reduce user costs for transportation in the corridor

2.2 Project Description

Lynn Canal, located approximately 25 miles north of Juneau, is the waterway that connects Juneau with the cities of Haines and Skagway via the Alaska Marine Highway System (AMHS). At present there is no roadway connecting these three cities. The Glacier Highway originates in Juneau and ends at Echo Cove, approximately 40.5 miles to the northwest.

As required by the NEPA, the SDEIS for the Juneau Access Improvements Project considers the following reasonable alternatives:

Alternative 1 – No Action Alternative – The No Action Alternative includes a continuation of mainline AMHS service in Lynn Canal as well as the operation of the fast vehicle ferry (FVF) *M/V Fairweather* between Auke Bay and Haines and Auke Bay and Skagway. The *M/V Aurora* would provide shuttle service between Haines and Skagway, beginning as early as 2005.

Alternative 2 (Preferred) – East Lynn Canal Highway with Katzehin Ferry Terminal – This alternative would construct a 68.5-mile-long highway from the end of Glacier Highway at the Echo Cove boat launch area around Berners Bay to Skagway. A ferry terminal would be constructed north of the Katzehin River delta, and operation of the *M/V Aurora* would change to shuttle service between Katzehin and the Lutak Ferry Terminal in Haines. Mainline ferry service would end at Auke Bay, and the existing Haines/Skagway shuttle service would be discontinued. The *M/V Fairweather* would be redeployed on other AMHS routes.

Alternative 2A – East Lynn Canal Highway with Berners Bay Shuttles – This alternative would construct a 5.2-mile highway from the end of Glacier Highway at Echo Cove to Sawmill Cove in Berners Bay. Ferry terminals would be constructed at both Sawmill Cove and Slate Cove, and shuttle ferries would operate between the two terminals. A 52.9-mile highway would be constructed between Slate Cove and Skagway. A ferry terminal would be constructed north of the Katzehin River delta, and the *M/V Aurora* would operate between the Katzehin and the Lutak Ferry Terminals. Mainline ferry service would end at Auke Bay, and the existing Haines/Skagway shuttle service would be discontinued. The *M/V Fairweather* would be redeployed on other AMHS routes.

Alternative 2B – East Lynn Canal Highway to Katzehin with Shuttles to Haines and Skagway – This alternative would construct a 50.5-mile highway from the end of Glacier Highway at Echo Cove around Berners Bay to Katzehin, construct a ferry terminal at the end of the new highway, and run shuttle ferries to both Skagway and Haines from the Katzehin Ferry Terminal. The Haines to Skagway shuttle service would continue to operate, two new shuttle ferries would be constructed, and the *M/V Aurora* would be part of the three-vessel system.

Mainline AMHS service would end at Auke Bay. The *M/V Fairweather* would be redeployed on other AMHS routes.

Alternative 2C – East Lynn Canal Highway with Haines/Skagway Shuttle – This alternative would construct a 68.5-mile highway from the end of Glacier Highway at Echo Cove around Berners Bay to Skagway with the same design features as Alternative 2. The *M/V Aurora* would continue to provide service to Haines. No ferry terminal would be constructed at Katzehin. Mainline ferry service would end at Auke Bay, and the *M/V Fairweather* would be redeployed on other AMHS routes.

Alternative 3 – West Lynn Canal Highway – This alternative would extend the Glacier Highway 5.2 miles from Echo Cove to Sawmill Cove in Berners Bay. Ferry terminals would be constructed at Sawmill Cove and William Henry Bay on the west shore of Lynn Canal, and shuttle ferries would operate between the two terminals. A 38.9-mile highway would be constructed between William Henry Bay and Haines with a bridge across the Chilkat River/Inlet connecting to Mud Bay Road. The *M/V Aurora* would continue to operate as a shuttle between Haines and Skagway. Mainline ferry service would end at Auke Bay, and the *M/V Fairweather* would be redeployed on other AMHS routes.

Alternatives 4A through 4D – Marine Options – The four marine alternatives would construct new shuttle ferries to operate in addition to continued mainline service in Lynn Canal. All of the alternatives would include a minimum of two mainline vessel round trips per week, year-round, and continuation of the Haines/Skagway shuttle service provided by the *M/V Aurora*. The *M/V Fairweather* would no longer operate in Lynn Canal. All of these alternatives would require construction of a new double stern berth at Auke Bay.

Alternative 4A – FVF Shuttle Service from Auke Bay – This alternative would construct two FVFs to provide daily summer service from Auke Bay to Haines/Skagway.

Alternative 4B – FVF Shuttle Service from Berners Bay – This alternative would extend the Glacier Highway 5.2 miles from Echo Cove to Sawmill Cove in Berners Bay, where a new ferry terminal would be constructed. Two FVFs would be constructed to provide daily service from Sawmill Cove to Haines/Skagway in the summer and from Auke Bay to Haines/Skagway in the winter.

Alternative 4C – Conventional Monohull Shuttle Service from Auke Bay – This alternative would construct two conventional monohull vessels to provide daily summer service from Auke Bay to Haines/Skagway. In winter, shuttle service to Haines and Skagway would be provided on alternate days.

Alternative 4D – Conventional Monohull Shuttle Service from Berners Bay – This alternative would extend the Glacier Highway 5.2 miles from Echo Cove to Sawmill Cove in Berners Bay, where a ferry terminal would be constructed. Two conventional monohull vessels would be constructed to provide daily service from Sawmill Cove to Haines/Skagway in the summer and alternating day service from Auke Bay to Haines/Skagway in the winter.

3.0 METHODS

The indirect and cumulative effects analyses for the proposed project alternatives include the following:

- Definition of the spatial (geographic) and temporal (time frame) framework of the analysis.
- Identification of past, present, and reasonable foreseeable future actions that could have additive or synergistic environmental effects.
- Identification and description of potential indirect effects of project alternatives.
- Identification and description of potential cumulative effects of project alternatives.
- Summary matrix of direct, indirect, and cumulative effects.

3.1 Geographic Area

The indirect and cumulative effects assessments are encompassed within the following geographic areas:

- Auke Bay Ferry Terminal and Echo Cove within the City and Borough of Juneau (CBJ) for all resources, and the Glacier Highway in Juneau for noise impacts;
- From Echo Cove around Berners Bay and continuing north along the east side of Lynn Canal and Taiya Inlet to Skagway;
- The City of Skagway; and
- The Haines Borough and from William Henry Bay to Mud Bay Road in Haines on the west side of Lynn Canal.

3.2 Time Frame

Baseline conditions and current actions within the project area were evaluated in 2003. The time frame for past actions ranges from the 19th century, when the earliest area mining operations began, to 2003 for the indirect and cumulative effects analysis. The time frame for reasonably foreseeable future actions ranges from 2003 to 2038. Potential impacts of the project alternatives are projected to 2038 based on predicted traffic demand. Foreseeable future projects considered in this analysis include projects that are in the environmental review process, have applied for one or more permits from regulatory agencies, and/or have been included in government land use plans.

3.3 Identification of Direct and Indirect Effects

3.3.1 Direct Effects

Technical reports analyzed the potential for direct effects on resources from the Juneau Access Improvements Project alternatives. The direct effects of past, present, and reasonably foreseeable future actions were identified using agency documentation, NEPA documentation, other written documentation, personal communication with resource experts, and best professional judgment.

3.3.2 Indirect Effects

The potential indirect effects to be analyzed for project alternatives were identified using the 1997 DEIS comment letters (agency and the public), 1997 public testimony, and 2003 scoping letters. In addition, potential indirect effects were identified through literature searches, NEPA documentation, land use and development plans, other written documentation, personal communication with resource experts, current events reported in local and regional news, and best professional judgment.

3.4 Identification of Past, Present, and Reasonably Foreseeable Future Actions

Potential past, present, and reasonably foreseeable future actions were identified using the Juneau Access Improvements Project comment database to find external actions referred to in 1997 DEIS comment letters (agency and the public), 1997 public testimony, and 2003 scoping letters. In addition, external actions were identified through personal communication with resource experts, NEPA documentation, current events reported in local and regional news, and best professional judgment.

The following actions were determined not to be reasonably foreseeable future actions or pertinent present actions and, therefore, were not evaluated in the cumulative effects analyses.

- **Timber Sales –** There are no timber sales currently planned by any of the major landholders in the project area in the next 10 years.
- **Alaska Interstate Gas Company Natural Gas Service –** Alaska Interstate Gas Company proposes to provide natural gas service for Juneau and 16 other communities in southeast and southcentral Alaska. The project is currently in the marketing and feasibility stage; project development timelines are uncertain at this time.
- **Lace River Hydroelectric Project –** The Lace River Hydroelectric Project was granted a preliminary permit on December 11, 1995, for a hydroelectric project to be located on a tributary of the Lace River. On November 5, 1997, the company requested to terminate their permit since they had no market for their power. The permit officially expired on November 30, 1998 (Federal Register [FR] volume 63, number 58, 1998). It is unlikely that this project would be developed in the reasonably foreseeable future.
- **Cape Fox Land Entitlement Adjustment Act of 2003 –** This bill would give approximately 2,700 acres of U.S. Forest Service (USFS) lands in the Johnson and Slate creek drainages to Cape Fox Corporation and 9,300 acres of land in the Johnson, Sherman, and Sweeny creek drainages to Sealaska Native Corporation. In exchange, the USFS would get 3,000 acres of private lands near Ketchikan. If the land exchange is executed, it is expected that Cape Fox Corporation would use its new land to develop support services for the Kensington Mine (Alaska Legislature, 2002). This land exchange was not used in the analysis because the exchange is not completed and there is no management plan in place; therefore, there is insufficient information on future development plans to analyze potential impacts.

There are Alaska Mental Health Trust lands, Native allotments, and other private lands on both the east and west sides of Lynn Canal. A highway would increase the likelihood of development of these lands, but there are no specific, reasonably foreseeable future actions related to the lands. Therefore, these lands are not discussed in the cumulative analysis. DOT&PF controls access to any state highway. The location and configuration of driveways off of a state highway would need to be approved by DOT&PF.

The following sections present the past, present, and reaonably foreseeable future actions that were included in the cumulative effects analyses.

3.4.1 Mining

On the east side of Lynn Canal, the proposed project area lies within a large mineral region known as the Juneau Mining District, which has produced large quantities of gold, silver, and lead since 1869. The larger-scale mining activities have occurred primarily outside the project corridor, to the southeast of the project, near Juneau. However, the proposed alignment for an East Lynn Canal highway runs through areas of prospects, claims, and historic and current mines. Mining and prospecting within the project corridor has been primarily for copper, gold, silver, and zinc, with the primary area of historic mining activity along the Berners Bay area at the Jualin and Kensington mines (DOT&PF, 1995).

Presently, no mining is occurring along the east side of Lynn Canal in the project area. Coeur Alaska, Inc. (Coeur) acquired the Kensington and Julian mines in the 1990's and received all permits required to begin construction and operations following publication of the 1997 *Kensington Gold Project Final Supplemental Environmental impact Statement* and issuance of a USFS Record of Decision (ROD) (USFS, 1997). Construction of the new mine has not started. In an effort to increase efficiency and reduce disturbance in the area, Coeur submitted an amended Plan of Operations, which became the basis of the current 2004 *Kensington Gold Project Draft Supplemental Environmental Impact Statement* (USFS, 2002a; USFS, 2004). For the purpose of the Juneau Access Improvements Project cumulative impact assessment, it was assumed that mine development would take place before 2010, for which construction would start as early as 2005. The 2004 proposed mine has an expected life of 10 years following an 18-month construction period, although additional ore discovery could extend its operating life.

Mining has been minimal along the west side of Lynn Canal with the exception of the Alaska Endicott Mine near William Henry Bay, and the Dream Prospect on the mainland across from Sullivan Island. The former Alaska Endicott Mine is approximately one mile southwest of the beginning of the proposed Alternative 3 alignment at William Henry Bay. It was mined from the early 1900s to 1924 for copper and incidental amounts of gold and silver. The Dream Prospect was extensively explored for zinc and copper with no significant mineral recovery. Ten other mineral occurrences, prospects, and mines are in the project area on the west side of Lynn Canal (DOT&PF, 1995). No mining is currently taking place or planned on the west side of Lynn Canal in the project area.

3.4.2 Timber Harvests

In 1997, Goldbelt conducted a timber harvest in the Cascade Point/Echo Cove area, and that land is now being used as a rock quarry. Because there are no plans for timber harvests in the project area, it was assumed that none would occur within the time frame of the proposed project, with the exception of logging within the clearing limits as part of construction of one of the alternatives for the Juneau Access Improvements Project.

3.4.3 Development

State Development – Major projects developed by the state within the project area include construction of the State of Alaska Auke Bay, Haines, and Skagway ferry terminals, and the Echo Cove boat ramp. The Echo Cove boat ramp and access road were designed in 1996 and built by DOT&PF. The ramp consists of a 16-foot by 192-foot concrete ramp and a parking area. The CBJ maintains the facility.

Alaska Glacier Seafoods Company – Alaska Glacier Seafoods has obtained a permit to construct 12,000 square feet of office space and a processing plant next to the Auke Bay Ferry Terminal at Mile 12 of the Glacier Highway. In addition, the company has a permit modification to construct a timber dock and saltwater intake system associated with the processing facility.

Goldbelt, Inc. – Goldbelt, Inc. (Goldbelt), a local Native corporation organized under the Alaska Native Claims Settlement Act, has prepared a management plan for its Echo Cove landholdings, and has indicated that industrial or commercial uses related to transportation and recreation would be more likely future uses than residential development (Goldbelt, 1996). The long-range plan includes development on 10 percent of Goldbelt land at Echo Cove, including a 40-acre commercial development site at Cascade Point (road, dock development, service station), an 80-acre cultural center in Echo Cove, a camping area adjacent to the CBJ boat launch ramp in Echo Cove, and a low impact recreational and cultural development. Their USFS access easement allows for the construction, maintenance, and operation of a 2.5-mile-long, 26-foot-wide gravel road from the end of the existing Glacier Highway to the company's lands at Cascade Point. The Cascade Point Road project was the only Goldbelt project included in the cumulative impact analysis for the Juneau Access Improvements Project because it has a NEPA analysis that provides details of potential impacts and is permitted (Goldbelt, 1998; Goldbelt, 2003). The other Goldbelt projects are in the conceptual stage of development and are dealt with in general terms in this analysis.

The State of Alaska is investigating the possibility of constructing the proposed Cascade Point Road as part of the Industrial Roads Program. Also known as the Roads to Resources program, these state funds are used to foster industrial development. In this case, the goal would be to assist Goldbelt to develop its land at Cascade Point.

Coeur Alaska, Inc. – West of the Lace River, the highway for Alternatives 2, 2B, and 2C would intersect an existing unpaved road that runs from the dock at Slate Cove to the Jualin mine. This road is a public road that may be upgraded as part of Coeur's proposal to build a deepwater floating dock at Slate Cove with funds from the Alaska Industrial Development and Export Authority (AIDEA). Use of these funds would ensure state access to the dock. If Coeur develops the Slate Cove dock with AIDA funds, DOT&PF could use the dock in two ways: to provide interim ferry shuttle service during construction of a highway north of Slate Cove, and to provide temporary winter ferry service during extended road closures for avalanche control.

3.4.4 Recreation

Personal Recreation – Recreation in Lynn Canal includes pleasure boating, sailboating, kayaking, canoeing, camping, hiking, sportfishing, hunting, and shellfish harvesting. In 2001, the U.S. Coast Guard reported 4,472 boat registrations in Juneau, 436 in Haines, and 101 in Skagway. Developed tent and recreational vehicle (RV) campgrounds are found near the communities of Juneau, Skagway, and Haines. Hiking primarily occurs on trails maintained by the state, local government, or private non-profit organizations.

Commercial Recreation – Several flight-seeing companies provide scenic tours in the Lynn Canal area using small aircraft and helicopters for optimal viewing opportunities. Primary flight-seeing destinations include the Juneau Icefield, Chilkat Glacier system, Mendenhall Glacier, Glacier Bay National Park, and Wrangell-St. Elias National Park. Wilderness guiding is a growing industry in southeast Alaska, and guided tours in Berners Bay, the Katzehin River Valley, the Endicott River Wilderness, and the Chilkat Bald Eagle Preserve are popular. Guides operate Glacier River float trips and marine animal viewing tour boats in the Davidson Glacier area. Sportfishing is one of the most popular recreational activities in Lynn Canal. In 2003, the

Alaska Department of Fish and Game (ADF&G) Charter Vessel Registration List reported 1,127 charter boats registered in Juneau, 81 in Haines, and 13 in Skagway (ADF&G, 2003a).

3.4.5 Private Industry

Non-AMHS Vessel Operations – The Chilkat Express Ferry includes two 150-passenger, high-speed jet catamarans operated seasonally in northern Lynn Canal between Haines and Skagway. Fjord Express operates a 48-passenger vessel between Haines and Juneau. Large cruise ships (overnight capacity $\geq$ 250 passengers), small cruise ships (overnight capacity of $<$ 250 passengers), fishing boats, and other commercial boats also operate within Lynn Canal between Skagway, Haines, and Juneau.

Commercial Fishery – The Lynn Canal commercial fisheries (District 15) are segmented into three regulatory areas: 15A – Upper Lynn Canal; 15B – Berners Bay; and 15C – Lower Lynn Canal. The drift gillnet fishery targets sockeye, summer chum, coho, and fall chum salmon, with some king and pink salmon taken incidentally. A limited power and hand troll fishery for king and coho salmon exists in Lynn Canal, as well as a limited crab and shrimp pot fishery in Haines and Juneau.

There were 286 commercial fishing permit holders active in Juneau in 2002, with a combined harvest of 18.4 million pounds for a gross value of $14.35 million. In Haines, 81 commercial fishing permit holders harvested 5.3 million pounds with a gross value of $2 million. Skagway had three active permit holders, but only two fished commercially in 2002 (values unavailable).

Pacific Seaflight Ferry – Pacific Seaflight is planning to begin operating wing-in-ground-effect ships between Juneau and Haines and Juneau and Hoonah (Romey, L., Personal Communication, 2004). The vessels operate much like a hydrofoil, but instead of using fans to lift the vessel, the air cushion is created by the forward motion of the ship. The ferry service will be based in downtown Juneau.

3.4.6 Utilities

Alaska Power and Telephone Company has a Federal Energy Regulatory Commission (FERC) permit for a 6-acre, 3-megawatt hydroelectric project and electrical transmission line, called the Otter Creek Hydroelectric Project, situated primarily on USFS land at Kasidaya Creek near Taiya Inlet, three miles south of Skagway (FERC, 2002). Major infrastructure for the project includes an impoundment structure; a 3,700-foot-long, 40-inch-diameter penstock; a metal powerhouse with an adjacent staging area and transformer pad; a 75-foot-long tailrace; three helicopter pads; and a jetty. Construction is scheduled to begin in 2004.

Both the Haines and the Skagway sewage treatment facilities are primary treatment plants that operate under U.S. Environmental Protection Agency (USEPA) Section 301(h) waivers from secondary treatment for ocean discharges. Primary treatment includes screening, settling, grit removal, and skimming. The Haines outfall extends 1,800 feet into Lynn Canal and discharges effluent at 70 feet below mean lower low water (Bradford, 2003). Skagway's outfall extends 85 feet into Taiya Inlet and discharges effluent at 60 feet below mean lower low water (Gladden, 2003).

The CBJ operates three wastewater treatment plants (Juneau-Douglas, Mendenhall, and Auke Bay), all of which have National Pollutant Discharge Elimination System (NPDES) permits. The Auke Bay Wastewater Treatment Plant discharges effluent to Auke Bay at 30 feet below mean lower low water after secondary treatment (Jeffers, 2004). The other outfalls are not near the project area. The Auke Bay Ferry Terminal also discharges effluent to Auke Bay at 20 feet below mean lower low water after tertiary treatment.

3.4.7 Subsistence and Personal Use

Subsistence harvests are conducted by residents of Klukwan, Haines, and Skagway. These residents fish for salmon and other finfish, and hunt black bear, brown bear, moose, Sitka black-tailed deer, and mountain goat. The Native Alaskans residing in Haines and Skagway also harvest marine invertebrates, including crabs, shrimp, clams, and cockles. Harbor seals have been harvested by Skagway residents in the past, and continue to be harvested by Native Alaskans residing in Haines.

Juneau is not recognized as a subsistence community under the Alaska National Interest Lands Conservation Act. Some residents of Juneau use Berners Bay and Lynn Canal for personal use harvests of fish and shellfish.

3.5 Resources Not Evaluated for Cumulative Impact Assessment

Alternatives were analyzed to determine if they would have either direct or indirect effects on area resources. Resources that would not be directly or indirectly impacted by project alternatives were not evaluated for cumulative impacts. Resources that could potentially have direct or indirect impacts from project alternatives, but were not impacted by any past, present, or reasonable foreseeable future actions, were not evaluated for cumulative impacts. This section provides a brief description of why specific resource areas were not included in the cumulative impact analysis and identifies potential indirect impacts associated with the Juneau Access Improvements Project if they are predicted to occur.

3.5.1 Subsistence

Alternatives 2 through 2C and Alternative 3 would indirectly impact subsistence uses in Lynn Canal. A highway along the east side of Lynn Canal proposed under Alternatives 2 through 2C would allow for easier access to subsistence use areas for residents of Haines and Skagway in the Katzehin River area for harvest of marine invertebrates and marine mammals. A highway along the west side of Lynn Canal proposed under Alternative 3 would improve access to the Sullivan River area which could indirectly affect the intensity of subsistence harvest of marine invertebrates and marine mammals by Haines and Klukwan residents. A highway on either the east or west sides of Lynn Canal would increase access to other areas for subsistence harvest activities that previously were accessible only by boat or aircraft. Improved access would also increase non-subsistence recreational hunting and fishing, which would increase pressure on game animals and fish that are used for subsistence. No past, present or reasonably foreseeable future projects in the region would affect subsistence activities; therefore, there would be no cumulative impacts to subsistence uses of regional resources.

3.5.2 Environmental Justice

No highway segments of any project alternative would pass through the minority and low-income neighborhoods in the CBJ that lie along Glacier Highway between Jordan Creek and Vanderbilt Hill and Auke Bay and Lena Cove; therefore, there would be no direct effects on these minority and low-income communities. All alternatives except Alternatives 4A and 4C would add some additional traffic to Glacier Highway in these areas; however, that traffic would not substantially affect the level of service of the highway or substantially increase noise at adjacent residences.

The community of Klukwan is a minority and low-income community when compared to state and national data. Implementation of a build alternative, particularly a West Lynn Canal or East Lynn Canal Highway, would create local employment and business opportunities for local

residents, including Alaska Natives, which is a beneficial effect of the proposed project. Some of the property required for the Alternative 3 right-of-way is owned by Native Alaskans. These owners, as well as all other private property owners, would be compensated for their land at fair market value in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. None of the proposed alternatives would affect any property in the immediate vicinity of Klukwan; therefore, there would be no disproportionate adverse effect. Under proposed project alternatives, more visitor traffic would travel the highway adjacent to Klukwan. However, this community would not be impacted any more than Juneau, Haines, or Skagway. Increased traffic near Klukwan could result in increased tourism and economic development, which are beneficial effects.

Within the study area, an upgraded transportation system, either a highway or an improved ferry system, would improve access to regional medical care, which would be a beneficial effect. Upgrading the transportation system may increase economic development activities and provide economic opportunities for minority and low-income residents, which are beneficial effects.

The current surface transportation system in Lynn Canal is essentially an expensive toll road. The high cost of travel in Lynn Canal has an impact on low-income travelers, in some cases precluding their ability to travel outside their home town. Alternatives 2 through 2C, 3, and 4B and 4D would reduce the cost of travel in this area, benefiting all travelers.

Based on the traditional measures of environmental justice, FHWA has determined that none of the alternatives would have a disproportionate effect on low-income or minority communities. Because project alternatives would not have direct or indirect environmental justice impacts, environmental justice was not considered in the cumulative impact analysis.

3.5.3 Hydrology

All of the project alternatives except Alternatives 4A and 4C would cross the floodplains of streams and major rivers on the east or west side of Lynn Canal. Smaller, non-anadromous streams would be crossed by culverts. These culverts would be designed for the 50-year rainfall event, and end sections or rock dissipaters would be used to disperse high-volume/high-velocity outfall to protect soils and vegetation below culvert outfalls from erosion. All anadromous fish streams would be spanned by bridges. Single-span bridges and their piers would be located outside the predicted 100-year flood elevation. Multi-span bridges crossing large rivers would extend beyond the outer most channels at each river delta to protect their natural, meandering flow. The bridges would require placement of piers in the river floodplain. These supports would be spaced and designed to accommodate the predicted 100-year flood volume with no more than a one-foot rise in backwater. While culverts and bridges crossing streams would result in some alteration of surface water hydrology, they would not result in a substantial impact to this resource.

Because project alternatives would not have direct or indirect hydrologic impacts, these resource areas were not considered in the cumulative impact analysis.

3.5.4 Floodplains

The 1994 reconnaissance engineering study included a hydrology study and hydraulic analysis at major river and stream crossings on both the east and west side of Lynn Canal. U.S. Geological Survey (USGS) regression equations were used to predict runoff rates for watersheds crossed by highway alignments. Floodplains at 50-year and 100-year occurrences were calculated at each major river and stream crossing. Verification of the results was accomplished by comparing results with available gage-site data within the study area. This process confirmed both the magnitude and timing of the design flood flows.

Changes to the highway alignments since the 1997 DEIS are not of sufficient magnitude to necessitate a change in the hydraulic and engineering analyses. The major river and stream floodplains of concern remain unchanged. Structures (as described in Section 3.5.3) have been identified that have sufficient hydraulic capacity to pass the design flows. The centerline elevation of highway alternatives would be above the predicted 100-year flood elevation. Bridges would be designed to accommodate the 100-year flood volume with no more than one-foot rise in backwater. Culvert crossings would be designed to accommodate flows from a 50-year rainfall event. Any physical encroachment into a floodplain would not increase the risk of flooding. For these reasons, project alternatives would not have direct or indirect floodplain impacts; therefore, floodplains were not considered in the cumulative impact analysis.

3.5.5 Geology

The only geologic resource present in the region that could be affected by a project alternative and other actions is karst. Karst is located on the west side or Lynn Canal. Within the Alternative 3 West Lynn Canal Highway right-of-way (ROW), 10 percent of the ROW contains moderate vulnerability karst resources and less than 2 percent of the ROW contains high vulnerability karst resources. The accessibility created by a highway on the west side of Lynn Canal could result in increased recreational use and indirect impacts to caves and other karst features. To date, there are no identified impacts to karst resources from recreational uses.

No documented evidence exists to confirm that past external actions such as mining or selective logging efforts have affected karst features in the project area. Currently, neither mining nor logging occurs along the west side of Lynn Canal. There are currently no active mine claims and no timber sales are planned by any of the major landholders in the project area in the reasonable foreseeable future. Although direct and indirect effects would occur to karst due to Alternative 3, no past, present or reasonably foreseeable future actions were identified that would impact karst resources. Therefore, no cumulative effects would occur to karst resources on the west side of Lynn Canal.

Geologic hazards (e.g., avalanches and landslides) that could potentially affect project alternatives would not be impacted by other foreseeable future projects the region; therefore, there would be no cumulative impacts associated with geologic hazards.

3.5.6 Wild and Scenic Rivers

There are no designated Wild and Scenic Rivers in the project study area. Two rivers in the study area have been recommended for designation: the Gilkey River and the Katzehin River, both located on the east side of Lynn Canal. The Gilkey joins the Antler River upstream of where the Antler is crossed by the proposed alignment for Alternatives 2, 2B, and 2C. Therefore, the proposed project would not affect the status of the Gilkey River. The Katzehin River is crossed by the proposed alignment for Alternatives 2 through 2C near its mouth. The lower two miles of the river have been excluded from recommendation as Wild and Scenic because that reach was reserved for a possible transportation corridor crossing. Therefore, no alternative would affect the Wild and Scenic status of the Katzehin River. For this reason, Wild and Scenic Rivers were not considered in the cumulative impact analysis.

3.5.7 Farmland

There are no prime or unique farmlands in the State of Alaska, and the project study area does not appear on the U.S. Department of Agriculture Natural Resources Conservation Service list of farmlands of state or local importance. None of the proposed project alternatives or other

past, present, or future actions would impact farmland. Therefore, farmland was not considered in the cumulative impact analysis.

3.5.8 Coastal Barriers

Federal legislation requires that any federal action that could potentially affect Coastal Barrier Resources Systems must be consistent with the Federal Coastal Barriers Resource Act of 1982 and the Coastal Barrier Improvement Act of 1990. Coastal Barrier Resources Systems consist of undeveloped coastal barriers on the Atlantic and Gulf Coasts. No coastal barriers have been identified on the West Coast of the United States. Therefore, none of the proposed project alternatives or other past, present, or future actions would have any effect on coastal barriers. For this reason, coastal barriers were not considered in the cumulative impact analysis.

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4.0 INDIRECT AND CUMULATIVE EFFECTS ANALYSIS

This section discusses the indirect and cumulative impacts of project alternatives. Direct impacts of project alternatives are described in the following technical reports included as appendices to the Juneau Access Improvements SDEIS:

- Air Quality Modeling Memorandum
- Anadromous and Resident Fish Streams Technical Report
- Bald Eagle Technical Report
- Cultural Resources Technical Report
- Essential Fish Habitat (EFH) Assessment
- Hydrology and Water Quality Technical Report
- Karst Technical Report
- Land Use and Coastal Zone Technical Report
- Noise Analysis Technical Report
- Socioeconomic Effects Technical Report
- Steller Sea Lion Technical Report
- Visual Resources Technical Report
- Wetlands Technical Report
- Wild and Scenic Rivers Technical Memorandum
- Wildlife Technical Report

The following resource areas were evaluated for the cumulative impact analysis:

- Land use
- Cultural resources
- Socioeconomics
- Water quality
- Air quality
- Noise
- Wetlands
- EFH
- Terrestrial habitat
- Wildlife

These resource areas were included in the cumulative analysis based on comments received from the public and agencies on the 1997 EIS, scoping comments received on the SDEIS, and evaluation of past, present, and reasonably foreseeable future actions in the project study area.

4.1 Land Use

4.1.1 Alternative 1 – No Action

4.1.1.1 Indirect Effects

The No Action Alternative would continue existing and future AMHS service in Lynn Canal. Because this alternative would not alter transportation facilities in the Lynn Canal, it would not result in indirect impacts to land ownership, management, or resource uses.

4.1.1.2 Cumulative Effects

Because the No Action Alternative has no direct or indirect land use impacts, there would be no cumulative effects for land ownership, management, or resource uses.

4.1.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.1.2.1 Indirect Effects

DOT&PF and the USFS have identified 12 locations along the east side of Lynn Canal for pullouts and scenic overlooks along the highway. A handicapped-accessible pullout and trailhead would be located on the highway adjacent to the USFS cabin in Berners Bay, and DOT&PF would construct a trail to the cabin. The USFS may develop trails at some of the pullouts in the future. A separate environmental assessment would be completed by the USFS for these trails. Whether other trails are built at turnouts along the highway or not, Alternatives 2 through 2C would substantially improve access to the east Lynn Canal coastline for recreational activities such as hunting, fishing, hiking, kayaking/canoeing, and camping.

4.1.2.2 Cumulative Effects

Outdoor recreation is a major leisure time activity in Lynn Canal. The improved access provided by Alternatives 2 through 2C and the increase in visitors to the region expected with these highway alternatives, combined with the population increases that would be associated with the development of the Kensington Gold Project, would increase the use of the recreational resources along the coastline of the east side of Lynn Canal, particularly Berners Bay. It is also likely to increase commercial ventures related to outdoor activities.

The cumulative effect of increased recreational use of Lynn Canal, particularly Berners Bay, associated with any of these alternatives would likely be perceived as a negative impact by those who enjoy the existing primitive nature of the region, including some outfitters who currently provide wilderness trips there. It is possible that this may displace some existing commercial guiding services, such as overnight kayaking trips, and may result in more day trips.

4.1.3 Alternative 3 – West Lynn Canal Highway

4.1.3.1 Indirect Effects

DOT&PF and the USFS have identified seven locations along the west side of Lynn Canal for pullouts and scenic overlooks along the highway. The USFS may develop trails at some of the pullouts in the future. A separate environmental assessment would be completed by the USFS for these trails. Whether other trails are built at turnouts along the highway or not, Alternative 3 would substantially improve access to the west Lynn Canal coastline for recreational activities such as hunting, fishing, hiking, kayaking/canoeing, and camping.

4.1.3.2 Cumulative Effects

Outdoor recreation is a major leisure time activity in Lynn Canal. The improved access provided by Alternative 3 and the increase in visitors to the region expected with this highway alternative, combined with the population increases that would be associated with the development of the Kensington Gold Project, would increase the use of the recreational resources along the coastline of the west side of Lynn Canal. It is also likely to increase commercial ventures related to outdoor activities.

The cumulative effect of increased recreational use of Lynn Canal associated with Alternative 3 would likely be perceived as a negative impact by those who enjoy the existing primitive nature of the region, including some outfitters who currently provide wilderness trips there. It is possible that this may displace some existing commercial guiding services, such as overnight kayaking trips, and may result in more day trips.

4.1.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.1.4.1 Indirect Effects

By increasing ferry service in Lynn Canal, Alternatives 4A and 4C would increase opportunities for recreation in the vicinity of Haines and Skagway, but would not improve recreational access to those areas of Lynn Canal that are not currently served by roads.

4.1.4.2 Cumulative Effects

Alternatives 4A and 4C would not improve mobility in Lynn Canal outside of existing communities; therefore, these alternatives would have no cumulative effects on land ownership, management, or resource uses.

4.1.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.1.5.1 Indirect Effects

Alternatives 4B and 4D would increase access to lands adjacent to the proposed new road to Sawmill Cove. This could result in increased use of these lands for recreation, sport hunting and fishing, and personal use harvest of fish and wildlife. Alternatives 4B and 4D would also increase opportunities for recreation in the vicinity of Haines and Skagway.

4.1.5.2 Cumulative Effects

Alternatives 4B and 4D would improve opportunities for recreation in the vicinity of Haines, Skagway, and the lands between Echo Cove and Sawmill Cove, but would not improve recreational access to any other areas of Lynn Canal not currently served by roads. The proposed Goldbelt developments from Echo Cove to Cascade Point would provide additional recreational opportunities. The cumulative effect of improved recreational opportunities associated with either of these alternatives would likely be most noticeable in the Berners Bay area due to the proposed Goldbelt tour operations and easier access for personal kayakers and kayak guides in Berners Bay. This would likely be perceived as a negative impact by those who enjoy the existing nature of the area.

The road alignment proposed by Goldbelt from the end of Glacier Highway to the company's lands at Cascade Point is similar to the alignment of the highway for Alternatives 4B and 4D from Echo Cove to Sawmill Cove. If Goldbelt's road is built first, DOT&PF would use that alignment and widen the road to meet the state's highway standards. If one of the Juneau Access Improvements Project alternatives that includes this highway segment is built first, Goldbelt could use the highway with the addition of a short access road to Cascade Point. This would avoid the cumulative impact of two roads in the same area.

4.2 Visual Resources

4.2.1 Alternative 1 – No Action

4.2.1.1 Indirect Effects

The No Action Alternative would use existing transportation facilities in Lynn Canal; therefore, it would have no indirect visual impacts.

4.2.1.2 Cumulative Effects

The No Action Alternative would have no direct or indirect visual impacts. Therefore, this alternative would have no cumulative visual impacts.

4.2.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.2.2.1 Indirect Effects

Over 90 percent of the land crossed by Alternatives 2 through 2C is managed by the USFS or other federal agencies. None of these agencies have plans for development of these lands. Goldbelt has prepared plans for its lands north of Echo Cove and that development would proceed with or without the Juneau Access Improvements Project. Alternatives 2, 2A, and 2C would remove the access constraint to development of Skagway and Mental Health Trust lands in the vicinity of Skagway but there are no plans for such development. For these reasons, Alternatives 2 through 2C have no predicted indirect impacts on visual resources.

4.2.2.2 Cumulative Effects

Foreseeable future projects are planned along the east side of Lynn Canal in Berners Bay and Taiya Inlet. These future projects in combination with Alternatives 2, 2A, and 2C would result in cumulative visual impacts in these two areas. Because Alternative 2B would end north of the Katzehin River, cumulative visual impacts for this alternative would be limited to Berners Bay.

A highway under Alternatives 2, 2B, and 2C would be intermittently visible from boats in Berners Bay along the coastline of that bay, adding a linear man-made facility to the existing natural landscape. This addition of man-made elements to the natural landscape of Berners Bay would be further reinforced by the Goldbelt Cascade Point marine facility and the Kensington Mine Slate Cove marine facility.

Under Alternative 2A, the East Lynn Canal Highway would not extend around the eastern shore of Berners Bay. Instead, shuttle ferry service would be provided between two new terminals, one at Sawmill Cove and one at Slate Cove. These new terminals would be visible from boats in the bay and would add man-made forms to the existing natural landscape. If Alternative 2A were selected for the proposed project and a marine facility at Cascade Point was eminent,

DOT&PF would negotiate with Goldbelt to combine marine facilities at Cascade Point. This would reduce the cumulative visual impact of marine facilities in Berners Bay.

Alternatives 2, 2A, and 2C would be visible from Taiya Inlet, adding a man-made linear feature to the natural landscape. In the vicinity of Kasidaya Creek, these alternatives would have a cumulative visual effect in combination with the proposed Otter Creek Hydroelectric Plant.

4.2.3 Alternative 3 – West Lynn Canal Highway

4.2.3.1 Indirect Effects

Approximately 88 percent of the land crossed by Alternative 3 is managed by the USFS or owned by the State of Alaska. There are no plans for development of these lands. Goldbelt has prepared plans for its lands north of Echo Cove, and that development would proceed with or without the Juneau Access Improvements Project. Alternative 3 would remove the access constraint to development of private lands along the alignment on the west side of Lynn Canal; however, there are no plans for such development. For these reasons, Alternative 3 has no predicted indirect impacts on visual resources.

4.2.3.2 Cumulative Effects

There are no past, present, or reasonably foreseeable future projects on the west side of Lynn Canal other than Alternative 3 that would impact visual resources. Therefore, the project would have no cumulative visual impacts on that side of the Canal.

On the east side of Lynn Canal, the highway from Echo Cove to Sawmill Cove would be intermittently visible from boats at the southern end of Berners Bay, adding a linear man-made facility to the existing natural landscape. The new ferry terminal at Sawmill Cove would also be visible from boats in Berners Bay, adding a distinct man-made form to the natural landscape. This addition of man-made elements to Berners Bay would be further reinforced by the Goldbelt Cascade Point marine facility and the Kensington Mine Slate Cove marine facility. If Alternative 3 were selected for the proposed project and a marine facility at Cascade Point was eminent, DOT&PF would negotiate with Goldbelt to combine marine facilities at Cascade Point. This would reduce the cumulative visual impact of marine facilities in Berners Bay.

4.2.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.2.4.1 Indirect Effects

Alternatives 4A and 4C would not result in indirect impacts to visual resources because the only transportation facilities to be built in Lynn Canal under these alternatives would be modification of the existing Auke Bay ferry terminal.

4.2.4.2 Cumulative Effects

Alternatives 4A and 4C would have no direct or indirect visual impacts; therefore, they would have no cumulative visual impacts.

4.2.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.2.5.1 Indirect Effects

All of the land crossed by a highway between Echo Cove and Sawmill Cove for Alternatives 4B and 4D are either owned by the USFS or Goldbelt. There are no development plans for USFS lands. Goldbelt has prepared plans for its lands, and that development would proceed with or without the Juneau Access Improvements Project. Therefore, Alternatives 4B and 4D would not stimulate development that would result in indirect visual impacts.

4.2.5.2 Cumulative Effects

The highway from Echo Cove to Sawmill Cove would be intermittently visible from boats at the southern end of Berners Bay, adding a linear man-made facility to the existing natural landscape. The new ferry terminal at Sawmill Cove would also be visible from boats in Berners Bay, adding a distinct man-made form to the natural landscape. This addition of man-made elements to Berners Bay would be further reinforced by the Goldbelt Cascade Point marine facility and the Kensington Mine Slate Cove marine facility. If either Alternative 4B or Alternative 4D was selected for the proposed project and a marine facility at Cascade Point was eminent, DOT&PF would negotiate with Goldbelt to combine marine facilities at Cascade Point. This would reduce the cumulative visual impact of marine facilities in Berners Bay.

4.3 Historical and Archaeological Resources

4.3.1 Alternative 1 – No Action

4.3.1.1 Indirect Effects

The No Action Alternative would not change access in Lynn Canal from existing conditions; therefore, it would not stimulate development in the region. Therefore, the No Action Alternative would not result in indirect impacts to historical and archaeological resources.

4.3.1.2 Cumulative Effects

The No Action Alternative would not result in direct or indirect effects to historical or archeological resources; therefore, this alternative would not have cumulative impacts on these resources.

4.3.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.3.2.1 Indirect Effects

Implementation of Alternatives 2 through 2C would increase human access in East Lynn Canal. Increased access could result in indirect impacts because of disturbance to historic and prehistoric cultural sites by hikers, hunters, and other recreational users. Increased human access could result in the discovery of previously unknown cultural sites.

4.3.2.2 Cumulative Effects

Alternatives 2 through 2C would not have a direct adverse effect on the historical mining districts in the region. The Kensington Gold Project would have direct adverse effects on elements of the Berners Bay Historic Mining District. The cumulative effects to elements of the

District would be limited to potential adverse impacts of increased access in the Historic Mining District in combination with the development of the Kensington Gold Project.

4.3.3 Alternative 3 – West Lynn Canal Highway

4.3.3.1 Indirect Effects

Implementation of Alternative 3 would increase human access to the west side of Lynn Canal and between Auke Bay and Sawmill Cove on the east side of Lynn Canal. Increased access could result in indirect impacts because of disturbance to historic and prehistoric cultural sites outside of the project area by hikers, hunters, and other recreational users. Increased human access could result in the discovery of previously unknown cultural sites.

4.3.3.2 Cumulative Effects

There are no past, present, or reasonably foreseeable future projects on the west side of Lynn Canal other than Alternative 3 that would impact cultural resources. On the east side of Lynn Canal, no historic or prehistoric sites have been identified within the area of potential effect (APE) of the highway between Echo Cove and Sawmill Cove or the development areas of the Goldbelt property. Therefore, Alternative 3 would have no cumulative effects on historical or archaeological resources.

4.3.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.3.4.1 Indirect Effects

Alternatives 4A and 4C would have no indirect effects on cultural resources because the only construction that would take place with these alternatives would be modification of the existing Auke Bay ferry terminal. These alternatives would not improve access in Lynn Canal beyond the existing communities of Juneau, Haines, and Skagway.

4.3.4.2 Cumulative Effects

Alternatives 4A and 4C would have no direct or indirect impacts to cultural resources; therefore, these alternatives would not result in cumulative impacts to cultural resources.

4.3.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.3.5.1 Indirect Effects

The highway between Echo Cove and Sawmill Cove proposed for Alternatives 4B and 4D would provide increased access in that area. This could result in disturbance to historic and prehistoric sites outside of the project area by hikers, hunters, and other recreational users. Increased human access could result in the discovery of previously unknown cultural sites.

4.3.5.2 Cumulative Effects

No historic or prehistoric sites have been identified within the APE of the highway between Echo Cove and Sawmill Cove or the development areas of the Goldbelt property. Therefore, Alternatives 4B and 4D would have no cumulative effects on historical or archaeological resources.

4.4 Socioeconomic Resources

4.4.1 Alternative 1 – No Action

4.4.1.1 Indirect Effects

Traffic demand in Lynn Canal is projected to increase through 2038. This demand would not be met based on current AMHS vessel deployment and operation. While the projected demand would not be met, traffic in Lynn Canal is projected to grow under current AMHS operations, bringing more money into the economies of Juneau, Haines, and Skagway from the traveling public. However, the increased economic activity associated with this traffic increase would not noticeably change economic conditions or alter the quality of life for residents in these communities. Therefore, the No Action Alternative would have no indirect socioeconomic impacts.

4.4.1.2 Cumulative Effects

The No Action Alternative would have no direct or indirect socioeconomic impacts in Lynn Canal; therefore, the alternative would have no cumulative socioeconomic impacts.

4.4.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.4.2.1 Indirect Effects

East Lynn Canal Highway alternatives are projected to increase annual non-resident visitors to Lynn Canal communities in 2038 as follows:

- Juneau – 93,600 (Alternatives 2A and 2B) to 140,400 (Alternative 2)
- Haines – 21,600 (Alternative 2C) to 86,400 (Alternative 2)
- Skagway – 154,800 (Alternative 2B) to 482,400 (Alternative 2C)

Visitor spending would stimulate jobs in these communities that would indirectly lead to population growth. The projected population increases in Lynn Canal communities in 2038 resulting from an East Lynn Canal highway are:

- Juneau – 300 (Alternatives 2A and 2B) to 430 (Alternative 2)
- Haines – 0 (Alternative 2C) to 100 (Alternative 2)
- Skagway – 70 (Alternative 2B) to 160 (Alternative 2C)

For further information on economic projections for proposed project alternatives, see the *Socioeconomic Effects Technical Report*.

4.4.2.2 Cumulative Effects

Foreseeable future projects in the region are not projected to substantially affect Haines and Skagway; therefore, Alternatives 2 through 2C would not have a cumulative socioeconomic impact on these communities. The Kensington Gold Project (225 permanent jobs), Glacier Seafood Auke Bay facility (10-15 seasonal and 2 permanent jobs), and the Pacific Seaflight ferry (5-7 seasonal and 9 permanent jobs) are projected to increase employment in Juneau. The Kensington Gold Project is the only one of these projects that would have large enough employment to cause substantial population growth. According to the USFS *2004 Kensington*

Gold Project Draft Supplemental Environmental Impact Statement, the mine would increase the population of Juneau by approximately 1,164 people. Combined with the population growth projected for an East Lynn Canal highway, this would represent a maximum overall increase of approximately 4.5 percent in the Juneau population (Juneau's 2003 population estimate is 31,000 people).

Sales tax revenues for Juneau would increase due to the predicted increase in visitor spending associated with Alternatives 2 through 2C. It is estimated that these alternatives would generate approximately $520,000 to $775,000 additional sales tax dollars in 2038. The CBJ would receive approximately $1.4 million dollars from the Kensington Mine property taxes.

The new jobs and corresponding increase in Juneau population associated with Alternatives 2 through 2C and the Kensington Gold Project would likely increase housing demand and, correspondingly, property values in Juneau. This population growth is projected to place an increased demand on public services, the CBJ school system, and health care services. Due to a stagnant economy in Juneau over the last five years, most public services are not operating at full capacity and could accommodate increased demand, considering the additional tax revenues that would be generated through sales taxes and the Kensington Gold Project.

The maximum population increase associated with Alternatives 2 through 2C and the Kensington Gold Project would increase school enrollment in Juneau by about 100 students, spread through all grades. This increase in enrollment may require additional teachers and could cause overcrowding at the high school in Juneau.

4.4.3 Alternative 3 – West Lynn Canal Highway

4.4.3.1 Indirect Effects

The West Lynn Canal Highway is projected to increase annual non-resident visitors to Lynn Canal communities in 2038 as follows:

- Juneau – 28,900
- Haines – 158,100
- Skagway – 5,100

Visitor spending would stimulate jobs in these communities that would indirectly lead to population growth. The West Lynn Canal Highway is projected to increase the Juneau population by 100 people and the Haines population by 230 people in 2038. This alternative is projected to have no population effect on Skagway.

Haines' water supply and wastewater treatment system is adequate to accommodate 10 percent population growth. Population growth associated with Alternative 3, which is projected to be about 10 percent by 2038, would result in the need for expansion of these facilities if any other population growth occurs in Haines.

Increased traffic through and to Haines would place additional demands on the community's fire and emergency response services. If fire and emergency response personnel respond to incidents outside current service areas, such as currently inaccessible parts of the borough south of Haines, it would substantially reduce their capacity to deliver normal services while those personnel and equipment are occupied.

4.4.3.2 Cumulative Effects

Foreseeable future projects in the region are not projected to substantially affect Haines; therefore, Alternative 3 would not have a cumulative socioeconomic impact on that community. As stated previously in Section 4.4.2.2, the Kensington Gold Project, Glacier Seafood Auke Bay facility, and Pacific Seaflight are projected to increase employment in Juneau. Of these foreseeable future projects, the Kensington Gold Project is projected to increase the population of Juneau (1,164 people). Alternative 3 in combination with that project would result in an overall increase in Juneau's population of approximately 3.9 percent.

It is estimated that increased visitor spending associated with Alternative 3 would generate approximately $430,000 additional sales tax dollars in Juneau in 2038. CBJ would receive approximately $1.4 million dollars from the Kensington Mine property taxes.

The cumulative effect of the new jobs and corresponding increase in Juneau population associated with the project alternatives would likely cause an increased housing demand and a corresponding increase in property values in Juneau. This population growth is projected to place an increased demand on public services, the CBJ school system, and health care services. Due to a stagnant economy in Juneau over the last five years, most public services are not operating at full capacity and could accommodate increased demand, considering the additional tax revenues that would be generated by sales taxes and the Kensington Mine.

The maximum population increase with Alternative 3 and the Kensington Gold Project would increase school enrollment in Juneau by about 80 students, spread through all grades. This increase in enrollment may require additional teachers and could cause overcrowding at the high school in Juneau.

4.4.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.4.4.1 Indirect Effects

Alternative 4C is projected to result in no economic changes to Lynn Canal communities relative to the No Action Alternative. Therefore, this alternative would have no indirect effects on those communities.

Alternative 4A is projected to result in a maximum increase in annual non-resident visitors in Lynn Canal communities in 2038 as follows:

- Juneau – 19,200
- Haines – 19,200
- Skagway – 4,800

Visitor spending would stimulate jobs in Juneau, Haines, and Skagway that would indirectly lead to population growth. The projected maximum population increases in these communities in 2038 resulting from Alternative 4A are:

- Juneau – 70
- Haines – 25
- Skagway – 10

For further information on economic projections for proposed project alternatives, see the *Socioeconomic Effects Technical Report*.

4.4.4.2 Cumulative Effects

Alternative 4C would have no direct or indirect economic impacts to Lynn Canal communities; therefore, this alternative would have no cumulative economic impacts.

Alternative 4A is projected to increase the Juneau population by a maximum of 70 people in 2038. Together with the Kensington Gold Project projected population increase (1,164 people) this would represent a maximum overall increase of approximately 4 percent in Juneau.

It is estimated that increased visitor spending associated with Alternative 4A would generate approximately $128,000 additional sales tax dollars in Juneau. CBJ would receive approximately $1.4 million dollars from the Kensington Mine property taxes.

The cumulative effect of the new jobs and corresponding increase in Juneau population would likely cause an increased housing demand and a corresponding increase in property values in Juneau. This population growth is projected to place an increased demand on public services, the CBJ school system, and health care services. Due to a stagnant economy in Juneau over the last five years, most public services are not operating at full capacity and could accommodate increased demand, considering the additional tax revenues that would be generated through sales taxes and the Kensington Mine.

The maximum population increase associated with Alternative 4A and the Kensington Gold Project would increase school enrollment in Juneau by about 80 students, spread through all grades. This increase in enrollment may require additional teachers and could cause overcrowding at the high school in Juneau.

4.4.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.4.5.1 Indirect Effects

Alternatives 4B and 4D are projected to increase annual non-resident visitors in Juneau and Haines. Alternative 4B would also increase annual non-resident visitors in Skagway. The maximum increase in annual non-resident visitors in these Lynn Canal communities in 2038 is projected as follows:

- Juneau – 36,800 (Alternative 4B) to 11,200 (Alternative 4D)
- Haines – 28,800 (Alternative 4B) to 14,400 (Alternative 4D)
- Skagway – 11,200 (Alternative 4B)

Visitor spending would stimulate jobs in Juneau, Haines, and Skagway that would indirectly lead to population growth. The projected maximum population increase in these communities in 2038 resulting from Alternatives 4B and 4D are:

- Juneau – 140 (Alternative 4B) to 45 (Alternative 4D)
- Haines – 45 (Alternative 4B) to 20 (Alternative 4D)
- Skagway – 13 (Alternative 4B)

For further information on economic projections for proposed project alternatives, see the *Socioeconomic Effects Technical Report*.

4.4.5.2 Cumulative Effects

Alternatives 4B and 4D are projected to increase the Juneau population by a maximum of 140 and 45 people, respectively, in 2038. Together with the Kensington Gold Project projected population increase (1,164 people), this would represent a maximum overall increase of approximately 4 percent in Juneau.

It is estimated that increased visitor spending associated with Alternatives 4B and 4D would generate maximum additional sales tax dollars in Juneau of approximately $240,000 and $80,000, respectively. CBJ would receive approximately $1.4 million dollars from the Kensington Mine property taxes.

The cumulative effect of the new jobs and corresponding increase in Juneau population would likely cause an increased housing demand and a corresponding increase in property values in Juneau. This population growth is projected to place an increased demand on public services, the CBJ school system, and health care services. Due to a stagnant economy in Juneau over the last five years, most public services are not operating at full capacity and could accommodate increased demand, considering the additional tax revenues that would be generated through sales taxes and the Kensington Mine.

The maximum population increase associated with Alternatives 4B and 4D and the Kensington Gold Project would increase school enrollment in Juneau by about 80 students spread through all grades. This increase in enrollment may require additional teachers and could cause overcrowding at the high school in Juneau.

4.5 Water Quality

4.5.1 Alternative 1 – No Action

4.5.1.1 Indirect Effects

The No Action Alternative would have no indirect effects to water quality.

4.5.1.2 Cumulative Effects

Mainline AMHS ferries discharge treated wastewater that may contain fecal coliform (FC) bacteria and total suspended solids (TSS) above Alaska Water Quality Standards (AWQS). New compliance regulations effective beginning in 2004 require wastewater discharges to meet AWQS; therefore, the No Action Alternative would not result in direct water quality impacts in the future. Because the No Action Alternative has no direct or indirect water quality impacts in the future years of this analysis, it would have no cumulative impacts.

4.5.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.5.2.1 Indirect Effects

Increased access for recreational use and subsistence hunting and fishing resulting from Alternatives 2 through 2C could result in increased erosion along trails. This could result in some increases in sediment loads in streams adjacent to those trails. The sediment loads could alter stream profiles and degrade stream water quality by causing increased turbidity. Sediment accumulation from highway sanding and highway traffic could also alter stream profiles and

degrade water quality by increasing turbidity or introducing other potential contaminants. Sediment accumulation, however, would be limited by the projected high volume of rainfall and the projected low volume of peak week traffic (between 2,350 vehicles per day for Alternative 2B and 3,250 for Alternative 2 in 2038). In addition, re-vegetated slopes, shot rock slopes, and highway drainage ditches would filter out accumulated sediment during normal precipitation events. Storm events, however, could have the reverse effect of contributing sediment loads by dislodging this filtered sediment.

4.5.2.2 Cumulative Effects

Runoff from a highway, as well as runoff from foreseeable future projects in the study area, would contribute turbidity and pollutant loads to local drainages flowing to Lynn Canal. Results from stormwater research by the Federal Highway Administration (FHWA) indicate that stormwater runoff from low to medium traffic volumes (30,000 vehicles per day) on rural highways has minimal to no impact on aquatic organisms in receiving waters (U.S. Department of Transportation [USDOT] &FHWA, 1987). Studies conducted in Anchorage, Alaska, under the Municipality of Anchorage (MOA) Watershed Management Program similarly concluded that street runoff with average daily traffic volumes ranging from less than 2,000 to over 20,000 vehicles has minimal impacts to the water quality of receiving waters (MOA, 2000). Because of the rural setting of Alternatives 2 through 2C and the predicted low annual average daily traffic, runoff from the highway proposed for these alternatives is not likely to approach AWQS for any pollutant. Foreseeable future projects would be required to meet NPDES regulations for non-point source discharges. Therefore, the cumulative discharges from these sources are not likely to impact the water quality of Lynn Canal.

Wastewater treatment facilities associated with the proposed ferry terminals and foreseeable future projects such as the Otter Creek Hydroelectric Project would contribute small volumes of treated wastewater to Lynn Canal. All of these projects would be required to meet NPDES discharge limits to protect the water quality of Lynn Canal. Therefore, the cumulative discharges from these sources combined with stormwater runoff are not likely to impact the water quality of Lynn Canal.

The AMHS mainline ferry wastewater discharges in Lynn Canal would be eliminated with Alternatives 2 through 2C. Shuttle ferries associated with these alternatives would be equipped with sanitary waste holding tanks, or would discharge treated wastewater meeting AWQS. Holding tanks would be pumped out and the waste treated onshore for disposal. For these reasons, shuttle ferry operations would not contribute to a cumulative impact on water quality in Lynn Canal.

4.5.3 Alternative 3 – West Lynn Canal Highway

4.5.3.1 Indirect Effects

Increased access for recreational use and subsistence hunting and fishing could result in increased erosion along trails. This could result in some increases in sediment loads in streams adjacent to those trails. The sediment loads could alter stream profiles and degrade stream water quality by causing increased turbidity. Sediment accumulation from highway sanding and highway traffic could also alter stream profiles and degrade water quality by increasing turbidity or introducing other potential contaminants. Sediment accumulation, however, would be limited by the projected high volume of rainfall and the estimated low volume of peak week traffic (1,860 vehicles per day in 2038). In addition, re-vegetated slopes, shot rock slopes, and highway drainage ditches would filter out accumulated sediment during normal precipitation events. Storm events, however, could have the reverse effect of contributing sediment loads by dislodging this filtered sediment.

4.5.3.2 Cumulative Effects

Runoff from a highway, as well as runoff from foreseeable future projects in the study area, would contribute turbidity and pollutant loads to local drainages flowing to Lynn Canal. As discussed previously in Section 4.5.2.2, results from stormwater research by the FHWA and MOA indicate that stormwater runoff from the West Lynn Canal Highway is not likely to approach AWQS for any pollutant. Foreseeable future projects would be required to meet NPDES regulations for non-point source discharges. Therefore, the cumulative discharges from these sources are not likely to impact the water quality of Lynn Canal.

Wastewater treatment facilities associated with the proposed ferry terminals and foreseeable future projects such as the Kensington Gold Project and Otter Creek Hydroelectric Project would contribute small volumes of treated wastewater to Lynn Canal. All of these projects would be required to meet NPDES discharge limits to protect the water quality of Lynn Canal. Therefore, the cumulative discharges from these sources combined with stormwater runoff are not likely to impact the water quality of Lynn Canal.

The AMHS mainline ferry wastewater discharges in Lynn Canal would be eliminated with Alternative 3. Shuttle ferries associated with this alternative would be equipped with sanitary waste holding tanks, or would discharge treated wastewater meeting AWQS. Holding tanks would be pumped out and the waste treated onshore for disposal. For these reasons, shuttle ferry operations would not contribute to a cumulative impact on water quality in Lynn Canal.

4.5.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.5.4.1 Indirect Effects

Alternatives 4A and 4C would not alter access in Lynn Canal. Therefore, they would not result in any indirect impacts to water quality.

4.5.4.2 Cumulative Effects

As indicated previously in Section 4.5.1.2, new compliance regulations effective beginning in 2004 require wastewater discharges from the AMHS ferries that would operate in Lynn Canal under Alternatives 4A and 4C to meet AWQS. Shuttle ferries associated with these alternatives would be equipped with sanitary waste holding tanks, or would discharge treated wastewater meeting AWQS. Holding tanks would be pumped out and the waste treated onshore for disposal. For these reasons, ferry operations would not contribute to a cumulative impact on water quality in Lynn Canal.

4.5.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.5.5.1 Indirect Effects

Alternatives 4B and 4D would improve access between Echo Cove and Sawmill Cove in the summer. Increased access for recreational use could result in increased erosion along trails. This could result in some increases in sediment loads in streams adjacent to those trails. The sediment loads could alter stream profiles and degrade stream water quality by causing increased turbidity. Sediment accumulation from highway sanding and highway traffic could also alter stream profiles and degrade water quality by increasing turbidity or introducing other potential contaminants. Sediment accumulation, however, would be limited by the projected

high volume of rainfall and the estimated low volume of peak week traffic (1,860 vehicles per day). In addition, re-vegetated slopes and highway drainage ditches would filter out accumulated sediment during normal precipitation events. Storm events, however, could have the reverse effect of contributing sediment loads by dislodging this filtered sediment.

4.5.5.2 Cumulative Effects

Runoff from a highway between Echo Cove and Sawmill Cove under Alternatives 4B and 4D, as well as runoff from foreseeable future projects in the study area, would contribute turbidity and pollutant loads to local drainages flowing to Lynn Canal. As discussed previously in Section 4.5.2.2, results from stormwater research by the FHWA and MOA indicate that stormwater runoff from this highway is not likely to approach AWQS for any pollutant. Foreseeable future projects would be required to meet NPDES regulations for non-point source discharges. Therefore, the cumulative discharges from these sources are not likely to impact the water quality of Lynn Canal.

Wastewater treatment facilities associated with the proposed ferry terminal at Sawmill Cove and foreseeable future projects such as the Otter Creek Hydroelectric Project would contribute small volumes of treated wastewater to Lynn Canal. All of these projects would be required to meet NPDES discharge limits to protect the water quality of Lynn Canal. Therefore, the cumulative discharges from these sources combined with stormwater runoff are not likely to impact the water quality of Lynn Canal.

As indicated previously in Section 4.5.1.2, new compliance regulations effective beginning in 2004 require wastewater discharges from the AMHS ferries that would operate in Lynn Canal under Alternatives 4B and 4D to meet AWQS. Shuttle ferries associated with these alternatives would be equipped with sanitary waste holding tanks, or would discharge treated wastewater meeting AWQS. Holding tanks would be pumped out and the waste treated onshore for disposal. For these reasons, ferry operations would not contribute to a cumulative impact on water quality in Lynn Canal.

4.6 Air Quality

4.6.1 Alternative 1 – No Action

4.6.1.1 Indirect Effects

The No Action Alternative would not increase access to Lynn Canal or increase vessel traffic in the Canal. Therefore, the No Action Alternative would have no indirect air quality impacts.

4.6.1.2 Cumulative Effects

The No Action Alternative would have no direct or indirect air quality impacts; therefore, this alternative would have no cumulative impacts on air quality.

4.6.2 Alternatives 2, 2A, 2B, and C – East Lynn Canal Highway Alternatives

4.6.2.1 Indirect Effects

As discussed in Section 4.4.2, economic impacts associated with Alternatives 2 through 2C would result in population growth in Juneau, Haines, and Skagway. This would result in an increased demand for housing, which would lead to an increased use of home heaters, stoves, and fireplaces. Emissions from these sources would contain pollutants such as carbon monoxide, nitrogen oxides, sulfur oxides, and particulates. Because of the small existing and

projected population in these communities, this increase in emissions is not likely to impact air quality.

There is a non-attainment area for particulates in the Mendenhall Valley. National and Alaska Ambient Air Quality Standards for particulates were exceeded in this area primarily as a result of dust emissions from the Mendenhall Glacier and from wood burning stoves. While the air quality status has not been modified, particulate emissions have been reduced below the standards as a result of emission control measures. Some of the population growth associated with Alternatives 2 through 2C is likely to occur in this non-attainment area. It is likely that air quality standards would be maintained in the area because of continued enforcement of the successful emission control measures implemented there.

4.6.2.2 Cumulative Effects

Vehicle traffic on the highway for Alternatives 2 through 2C and shuttle ferries associated with these alternatives would result in increased emissions of carbon monoxide, nitrogen oxides, sulfur oxides, and particulates. Foreseeable future actions, including the Kensington Gold Project, Goldbelt developments, non-AMHS vessels, and urban emissions, would also result in emissions of these pollutants. The primary emission sources from the Kensington Gold Project include combustion emissions (i.e., carbon monoxide, nitrogen oxides, sulfur oxides, and particulates) from power plant generators (four 3.3-megawatt units), smaller generator units at various facilities, and haul road vehicles, and particulate emissions from the tailings facility, borrow pits, rock crushing, and mine haul roads. These emissions were modeled as part of the Kensington Gold Project Supplemental EIS; the resulting pollutant concentrations were found to be below federal and state air quality standards and Prevention of Significant Deterioration (PSD) requirements for the build alternatives (USFS, 1997). PSD requirements take into account the cumulative emissions from a proposed project in combination with emissions from other major point sources in the region. Proposed Goldbelt land development would cause localized, short-term increases in air emissions in the area. Potential development in Juneau, Haines, and Skagway would also increase air pollutant emissions from sources such as combustion from heating of buildings, aircraft and watercraft use, and wood burning.

The foreseeable future projects in the Lynn Canal region are located several miles apart and, therefore, would not have a cumulative impact for non-reactive pollutants such as most particulates, carbon monoxide, and sulfur oxides. Cumulative concentrations of particulates and carbon monoxide could increase where the highway associated with Alternatives 2 through 2C passes by the Kensington Gold Project or Goldbelt development. Concentrations of particulate matter less than 10 microns in diameter (PM_{10}) and carbon monoxide resulting from the highest traffic volumes on an East Lynn Canal Highway (Alternative 2) in combination with background concentrations of these pollutants are estimated to be less than 1/3 of the National and Alaska Ambient Air Quality Standards in 2038 (see Section 4.3.10 of the Supplemental Draft EIS). The additional traffic associated with the Kensington and Goldbelt projects would be substantially smaller than traffic on the highway. Therefore, the cumulative concentrations of PM_{10} and carbon monoxide would not approach national and Alaska air quality standards for these pollutants. The volume of reactive pollutants such as nitrogen oxides and reactive organic gases from the proposed project and foreseeable future projects in combination with background concentrations would be too small to result in the formation of substantial concentrations of ozone.

4.6.3 Alternative 3 – West Lynn Canal Highway

4.6.3.1 Indirect Effects

As discussed in Section 4.4.3, economic impacts associated with Alternative 3 would result in population growth in Juneau and Haines. This would result in an increased demand for housing, which would lead to an increased use of home heaters, stoves, and fireplaces. Emissions from these sources would contain pollutants such as carbon monoxide, nitrogen oxides, sulfur oxides, and particulates. Because of the small existing and projected populations in these communities, this increase in emissions is not likely to impact air quality.

There is a non-attainment area for particulates in the Mendenhall Valley. National and Alaska Ambient Air Quality Standards for particulates were exceeded in this area primarily as a result of dust emissions from the Mendenhall Glacier and from wood burning stoves. While the air quality status has not been modified, particulate emissions have been reduced below the standards as a result of emission control measures. Some of the population growth associated with Alternative 3 is likely to occur in this non-attainment area. It is likely that air quality standards would be maintained in the area because of continued enforcement of the successful emission control measures implemented there.

4.6.3.2 Cumulative Effects

Vehicle traffic on the highway for Alternative 3 and shuttle ferries associated with these alternatives would result in increased emissions of carbon monoxide, nitrogen oxides, sulfur oxides, and particulates. Foreseeable future actions, including the Kensington Gold Project, Goldbelt developments, non-AMHS vessels, and urban emissions, would also result in emissions of these pollutants.

The foreseeable future projects in the Lynn Canal region are located several miles apart and therefore would not have a cumulative impact for non-reactive pollutants such as most particulates, carbon monoxide, and sulfur oxides. Cumulative concentrations of PM_{10} and carbon monoxide could increase where the highway associated with Alternative 3 passes by the Goldbelt property. Concentrations of PM_{10} and carbon monoxide resulting from traffic on an West Lynn Canal Highway in combination with background concentrations of these pollutants are estimated to be less than 1/3 of the National and Alaska Ambient Air Quality Standards in 2038 (see Section 4.4.10 of the Supplemental Draft EIS). The additional traffic associated with Goldbelt development would be substantially smaller than traffic on the highway. Therefore, the cumulative concentrations of PM_{10} and carbon monoxide would not approach national and Alaska air quality standards for these pollutants. The volume of reactive pollutants such as nitrogen oxides and reactive organic gases from the proposed project and foreseeable future projects in combination with background concentrations would be too small to result in the formation of substantial concentrations of ozone.

4.6.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.6.4.1 Indirect Effects

Alternative 4C would not substantially change access in Lynn Canal and would not result in substantial economic growth in any of the Lynn Canal communities. For these reasons, Alternative 4C would not result in indirect air quality impacts.

As discussed in Section 4.4.4, economic benefits associated with Alternative 4A would result in population growth in Juneau, Haines, and Skagway. This would result in an increased demand for housing, which would lead to an increased use of home heaters, stoves, and fireplaces. Emissions from these sources would contain pollutants such as carbon monoxide, nitrogen oxides, sulfur oxides, and particulates. Because of the small existing and projected population in these communities, this increase in emissions is not likely to impact air quality.

There is a non-attainment area for particulates in the Mendenhall Valley. National and Alaska Ambient Air Quality Standards for particulates were exceeded in this area primarily as a result of dust emissions from the Mendenhall Glacier and from wood burning stoves. While the air quality status has not been modified, particulate emissions have been reduced below the standards as a result of emission control measures. Some of the population growth associated with Alternative 4A is likely to occur in this non-attainment area. It is likely that air quality standards would be maintained in the area because of continued enforcement of the successful emission control measures implemented there.

4.6.4.2 Cumulative Effects

Increased ferry traffic associated with Alternatives 4A and 4C would result in increased emissions of carbon monoxide, nitrogen oxides, sulfur oxides, and particulates. Foreseeable future actions, including the Kensington Gold Project, Goldbelt developments, non-AMHS vessels, and urban emissions, would also result in emissions of these pollutants.

The foreseeable future projects in the Lynn Canal region are located several miles apart and therefore would not have a cumulative impact for non-reactive pollutants such as most particulates, carbon monoxide, and sulfur oxides. The volume of reactive pollutants such as nitrogen oxides and reactive organic gases from the proposed project and foreseeable future projects in combination with background concentrations would be too small to result in the formation of substantial concentrations of ozone.

4.6.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.6.5.1 Indirect Effects

As discussed in Section 4.4.5, economic impacts associated with Alternative 4B would result in population growth in Juneau, Haines, and Skagway, while the economic impacts of Alternative 4D would result in population growth in Juneau and Haines. This would result in an increased demand for housing, which would lead to an increased use of home heaters, stoves, and fireplaces. Emissions from these sources would contain pollutants such as carbon monoxide, nitrogen oxides, sulfur oxides, and particulates. Because of the small existing and projected population in these communities, this increase in emissions is not likely to impact air quality.

There is a non-attainment area for particulates in the Mendenhall Valley. National and Alaska Ambient Air Quality Standards for particulates were exceeded in this area primarily as a result of dust emissions from the Mendenhall Glacier and from wood burning stoves. While the air quality status has not been modified, particulate emissions have been reduced below the standards as a result of emission control measures. Some of the population growth associated with Alternatives 4B and 4D is likely to occur in this non-attainment area. It is likely that air quality standards would be maintained in the area because of continued enforcement of the successful emission control measures implemented there.

4.6.5.2 Cumulative Effects

Vehicle traffic on the highway from Echo Cove to Sawmill Cove for Alternatives 4B and 4D, and the increased ferry traffic associated with these alternatives, would result in increased emissions of carbon monoxide, nitrogen oxides, sulfur oxides, and particulates. Foreseeable future actions, including the Kensington Gold Project, Goldbelt developments, non-AMHS vessels, and urban emissions, would also result in emissions of these pollutants.

The foreseeable future projects in the Lynn Canal region are located several miles apart and therefore would not have a cumulative impact for non-reactive pollutants such as most particulates, carbon monoxide, and sulfur oxides. Cumulative concentrations of PM_{10} and carbon monoxide could increase where the highway associated with Alternatives 4B and 4D passes by the Goldbelt property. Concentrations of PM_{10} and carbon monoxide resulting from traffic on an West Lynn Canal Highway in combination with background concentrations of these pollutants are estimated to be less than 1/3 of the National and Alaska Ambient Air Quality Standards in 2038. The additional traffic associated with Goldbelt development would be substantially smaller than traffic on the highway. Therefore, the cumulative concentrations of PM_{10} and carbon monoxide would not approach national and Alaska air quality standards for these pollutants. The volume of reactive pollutants such as nitrogen oxides and reactive organic gases from the proposed project and foreseeable future projects in combination with background concentrations would be too small to result in the formation of substantial concentrations of ozone.

4.7 Noise

4.7.1 Alternative 1 – No Action

4.7.1.1 Indirect Effects

The No Action Alternative uses existing transportation facilities in Lynn Canal; therefore, this alternative would have no indirect noise impacts.

4.7.1.2 Cumulative Effects

The No Action Alternative would have no direct or indirect noise impacts; therefore, this alternative would have no cumulative noise impacts.

4.7.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.7.2.1 Indirect Effects

There are small areas of private and City of Skagway land in the vicinity of the alignment for Alternatives 2 through 2C. A highway on any of these alternatives would remove a constraint for development. There are currently no plans to develop these lands and there are no sensitive receptors near the alignment for Alternatives 2 through 2C in these areas. The nature and magnitude of any potential indirect noise impact associated with Alternatives 2 through 2C would depend on the specific characteristics of the development that may take place on these lands and only affect those new developments.

4.7.2.2 Cumulative Effects

Alternatives 2 through 2C would introduce a new noise source in an area that is principally undeveloped, adding traffic noise to existing intermittent man-made noises from helicopters, airplanes, jet boats, and other vessels in Lynn Canal and Berners Bay. Ambient noise

measurements along the shoreline of Lynn Canal range from about 35 to 52 A-weighted decibels (dBA) depending on weather conditions, proximity to other noise sources such as boats and airplanes, and proximity of streams. Based on noise modeling of projected traffic volumes on a highway for Alternatives 2 through 2C, the 65 dBA equivalent noise level (L_{eq}) noise contour generated by that traffic would be contained within the highway right-of-way (see *Noise Technical Report*). Simple noise attenuation theory indicates that noise decreases by approximately 6 dBA with every doubling of distance away from the source. Taking the average ambient noise level along the shoreline of Lynn Canal of about 40 dBA and using attenuation theory, traffic noise associated with Alternatives 2 through 2C is estimated to be at background levels at approximately 200 to 250 feet from the highway centerline. Alternative 2A would introduce the same noise source in Lynn Canal but not around the shoreline of Berners Bay.

The Kensington Gold Project Slate Cove access road and the Goldbelt Cascade Point Road and other potential Goldbelt developments would generate vehicular traffic noise. A cumulative effect of increased noise over ambient levels would occur from Echo Cove to the Cascade Point Road turnoff and at Slate Cove where the Kensington Gold Project access road would be in close proximity to the highway alignment for Alternatives 2 through 2C. No sensitive noise receptors (e.g., residences, parks, and hospitals) would be impacted by this cumulative noise. Terrestrial wildlife would not be impacted by this cumulative noise because of the predicted small volume of traffic[1]. The locations where there would be a cumulative noise impact are located at least a mile from identified haulouts for marine mammals; therefore, cumulative noise would not impact these species.

4.7.3 Alternative 3 – West Lynn Canal Highway

4.7.3.1 Indirect Effects

There is more private land on the west side of Lynn Canal near the proposed highway alignment than on the east side of the Canal. A West Lynn Canal Highway would remove a constraint for development. There are currently no plans to develop these lands and there are no sensitive receptors near the alignment for Alternative 3 in these areas. The nature and magnitude of any potential indirect noise impact associated with Alternative 3 would depend on the specific characteristics of the development that may take place on these lands and only affect those new developments.

4.7.3.2 Cumulative Effects

There are no foreseeable future projects on the west side of Lynn Canal. Therefore, there would be no cumulative impacts for Alternative 3 on the west side of the Canal.

On the east side of Lynn Canal, the Alternative 3 highway would extend from Echo Cove to Sawmill Cove, and a cumulative noise effect would occur from Echo Cove to the Goldbelt Cascade Point Road turnoff because of additional traffic associated with Goldbelt development. Vehicular traffic associated with the Alternative 3 highway and Goldbelt traffic would have a small cumulative increase in noise. No sensitive noise receptors (e.g., residences, parks, and hospitals) would be impacted by this cumulative noise. Terrestrial wildlife would not be impacted by this cumulative noise because of the predicted small volume of traffic. The locations where there would be a cumulative noise impact are located at least a mile from

[1] The Kensington Gold Project would have permanent employment of about 225. Assuming everyone lived in the Juneau area and drove to the project site and an average of 1.5 people per car, this project would add a maximum of 150 vehicles to the highway at every shift change.

identified haulouts for marine mammals; therefore, cumulative noise would not impact these species.

4.7.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.7.4.1 Indirect Effects

Alternatives 4A and 4C use the existing AMHS ferry terminals and would not result in the construction of any new transportation facilities; therefore, these alternatives would not cause indirect noise impacts.

4.7.4.2 Cumulative Effects

Ferry operations under Alternatives 4A and 4C would not be in close proximity to any of the foreseeable future projects in Lynn Canal. Therefore, there would be no cumulative noise impacts associated with these project alternatives.

4.7.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.7.5.1 Indirect Effects

The only private land in the vicinity of the highway for Alternatives 4B and 4D are parcels of Goldbelt land. Indirect noise impacts would be caused by traffic generated by development on those parcels or the developments themselves. The only foreseeable develop is the marine terminal proposed by Goldbelt at Cascade Point, which would be approximately ¼ mile from the highway for Alternatives 4B and 4D. This develop could occur with or without the Juneau Access Improvements Project because Goldbelt has a permit to construct an access road to Cascade Point.

4.7.5.2 Cumulative Effects

Alternatives 4B and 4D would include a highway from Echo Cove to Sawmill Cove. A cumulative noise effect would occur with traffic on this highway and traffic associated with Goldbelt development from Echo Cove to Cascade Point. Vehicular traffic associated with Alternatives 4B and 4D in combination with Goldbelt traffic would have a small cumulative increase in noise. No sensitive noise receptors (e.g., residences, parks, and hospitals) would be impacted by this cumulative noise. Terrestrial wildlife would not be impacted by this cumulative noise because of the predicted small volume of traffic. The locations where there would be a cumulative noise impact are located at least a mile from identified haulouts for marine mammals; therefore, cumulative noise would not impact these species.

4.8 Wetlands

4.8.1 Alternative 1 – No Action

4.8.1.1 Indirect Effects

The No Action Alternative would not alter access in Lynn Canal and would not include construction of new transportation facilities. Therefore, there would be no indirect wetland impacts associated with this alternative.

4.8.1.2 Cumulative Effects

Past projects on the east side of Lynn Canal have resulted in the loss of about four acres of palustrine emergent wetlands and an unknown acreage of forested wetlands. The preferred alternative for the Kensington Gold Project would result in the loss of 92 acres of wetlands, primarily forested wetlands. Development of the Cascade Point Road by Goldbelt would result in the loss of 2.5 acres of forested wetlands and 0.2 acre of palustrine emergent wetlands.

4.8.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.8.2.1 Indirect Effects

Increased access of humans, their pets, and their vehicles under Alternatives 2 through 2C could cause the indirect of introducing invasive plant species that could reduce the diversity of wetland communities and/or normal wetland functions. Non-native, invasive plant species that have the ability to spread into wetlands in Alaska include Canada thistle (*Cirsium arvense*), Eurasian watermilfoil (*Myriophyllum spicatum*), and purple loosestrife (*Lythrum salicaria*) (Committee for Noxious and Invasive Plants Management [CNIPM], 2004).

4.8.2.2 Cumulative Effects

Cumulative impacts to wetlands associated with Alternatives 2 through 2C would occur in the Berners Bay area from Echo Cove to Slate Cove and north of Berners Bay from Slate Cove to Comet Landing. In this area, Alternatives 2, 2B, and 2C would result in the loss of about 78 acres of forested wetlands, 1 acre of scrub-shrub wetlands, and 6 acres of palustrine emergent wetlands. Because Alternative 2A would not have a highway between Sawmill Cove and Echo Cove, it would result in the loss of fewer acres of wetlands in this area: 60 acres of forested wetlands, 1 acre of scrub-shrub, and 3 acres of palustrine emergent wetlands. Most of the wetlands loss resulting from these alternatives are located between Slate Cove and Comet Landing where the alignment for Alternatives 2 through 2C passes through a long strip of forested wetlands on the peninsula between Berners Bay and Lynn Canal and on the Lynn Canal coast north to Comet Landing. Alternatives 2, 2B, and 2C would remove 59 acres of forested wetlands and 3 acres of palustrine emergent wetlands, and Alternative 2A would remove 50 acres of forested wetlands and 3 acres of palustrine emergent wetlands in this area. Disturbance of wetlands at the mouths of the Antler, Lace, and Berners rivers in Berners Bay by Alternatives 2, 2B, and 2C have been largely avoided by adjustment of the proposed alignment for these alternatives since publication of the 1977 Draft EIS for the project. North of Sawmill Cove through the estuary area of these three rivers, Alternatives 2, 2B, and 2C would require the removal of about 3 acres of palustrine emergent wetlands and 9 acres of forested wetlands.

Both the Kensington Gold Project and Goldbelt development would contribute cumulatively to the loss of wetlands in the vicinity of Berners Bay, and, in the case of the Kensington Gold Project, wetlands loss in the vicinity of Comet Landing. The loss of wetlands associated with Goldbelt's proposed Cascade Point Road (2.5 acres of forested wetlands and 0.2 acre of scrub-shrub wetlands) would not be cumulative. The alignment of the road and the highway segment for Alternatives 2 through 2C between Echo Cove and Sawmill Cove would be the same. If the Cascade Point Road is built first, DOT&PF would use that alignment and widen the road to meet the state's highway standards. This small additional impact in wetland area would not result in a greater wetland impact than quantified for Alternatives 2 through 2C above. If one of these alternatives is built first, Goldbelt could use the highway after constructing a short access road to Cascade Point through non-wetland areas. If Goldbelt completes all of the development contained within its Master Plan, there would be an additional loss of 5 acres of forested wetlands (Goldbelt, 2003).

The applicant's proposed action for the Kensington Gold Project would result in the loss of about 71 acres of wetlands, as well as impacts to 20 acres of open water in Lower Slate Lake. These wetland losses would include approximately 39 acres of currently disturbed upland areas mixed with wetlands, 19 acres of forested wetlands, 10 acres of palustrine emergent wetlands, 3 acres of upland forest mixed with wetlands, and less than 1 acre each of scrub-shrub wetlands and palustrine aquatic beds. All but about an acre of these wetlands are located in the Berners Bay region. The loss of all of these wetlands would take place at a higher elevation than the Alternative 2 through 2C road alignments.

Alternatives 2 through 2C in combination with the Kensington Gold Project and Goldbelt development would result in the loss of about 140 (Alternative 2A) to 160 (Alternatives 2, 2B, and 2C) acres of wetlands in the Berners Bay area and the coast of Lynn Canal from that bay to Comet Landing. No open freshwater fill would occur under Alternatives 2 through 2C. The loss of functions associated with these wetlands would include groundwater recharge, discharge, and lateral flow and wildlife habitat. The cumulative loss of any of the wetland types would not have a noticeable effect on a watershed or regional basis because of the large amount of wetland habitat in this area. There are approximately 6,200 acres of forested wetlands, 1,800 acres of scrub-shrub wetlands, and 1,800 acres of palustrine emergent wetlands in the project study area between Echo Cove and Comet Landing.

4.8.3 Alternative 3 – West Lynn Canal Highway

4.8.3.1 Indirect Effects

Increased access of humans, their pets, and their vehicles under Alternative 3 could cause the indirect effect of introducing invasive plant species that could reduce the diversity of wetland communities and/or normal wetland functions. Non-native, invasive plant species that have the ability to spread into wetlands in Alaska include Canada thistle (*Cirsium arvense*), Eurasian watermilfoil (*Myriophyllum spicatum*), and purple loosestrife (*Lythrum salicaria*) (CNIPM, 2004).

4.8.3.2 Cumulative Effects

There are no foreseeable future projects on the west side of Lynn Canal. Therefore, the highway from William Henry Bay to Haines proposed for Alternative 3 would have no predictable cumulative wetland impacts. The segment of the proposed Alternative 3 highway from Echo Cove to Sawmill Cove in combination with the Kensington Gold Project and Goldbelt development would have a cumulative wetland impact on the east side of Lynn Canal.

Alternative 3 would result in the loss of 10 acres of forested wetlands and 1 acre of scrub-shrub wetlands between Echo Cove and Sawmill Cove. Alternative 3 in combination with the Kensington Gold Project and Goldbelt development would result in the loss of about 86 acres of wetlands in the Berners Bay area. The loss of functions associated with these wetlands would include groundwater recharge, discharge, and lateral flow and wildlife habitat. The cumulative loss of any of the wetland types would not have a noticeable effect on a watershed or regional basis because of the impacts are primarily in different watersheds and the large amount of wetland habitat in project study area. There are approximately 1,200 acres of forested wetlands, 1,770 acres of scrub-shrub wetlands, and 1,060 acres of palustrine emergent wetlands in the Berners Bay area.

4.8.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.8.4.1 Indirect Effects

Alternatives 4A and 4C would not alter access in Lynn Canal and would not involve construction of new transportation facilities. Therefore, these alternatives would have no indirect effects on wetlands.

4.8.4.2 Cumulative Effects

Alternatives 4A and 4C would have no direct or indirect impacts on wetlands; therefore, they would have no cumulative effects on wetlands.

4.8.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.8.5.1 Indirect Effects

Alternatives 4B and 4D would provide vehicular access to the area between Echo Cove and Sawmill Cove. Increased access of humans, their pets, and their vehicles to this area could introduce invasive plant species that could reduce the diversity of wetland communities and/or normal wetland functions. Non-native, invasive species that have the ability to spread into wetlands in Alaska include Canada thistle (*Cirsium arvense*), Eurasian watermilfoil (*Myriophyllum spicatum*), and purple loosestrife (*Lythrum salicaria*) (CNIPM, 2004).

4.8.5.2 Cumulative Effects

Alternatives 4B and 4D would result in the loss of 10 acres of forested wetlands and 1 acre of scrub-shrub wetlands between Echo Cove and Sawmill Cove. These alternatives in combination with the Kensington Gold Project and Goldbelt development would result in the loss of about 86 acres of wetlands in the Berners Bay area. The loss of functions associated with these wetlands would include groundwater recharge, discharge, and lateral flow and wildlife habitat. The cumulative loss of any of the wetland types would not have a noticeable effect on a watershed or regional basis because of the large amount of wetland habitat in this area. There are approximately 1,200 acres of forested wetlands, 1,770 acres of scrub-shrub wetlands, and 1,060 acres of palustrine emergent wetlands in the Berners Bay area.

4.9 Marine and Anadromous Habitat and Species (Including Essential Fish Habitat)

4.9.1 Alternative 1 – No Action

4.9.1.1 Indirect Effects

The No Action Alternative would not alter access in Lynn Canal. Therefore, there would be no indirect impacts to marine and anadromous species and habitat.

4.9.1.2 Cumulative Effects

The following foreseeable future projects would cause loss of marine EFH due to the placement of fill in the intertidal and shallow subtidal zones:

- Alaska Glacier Seafoods Plant – 0.63 acres of fill for a pad extending into Auke Nu Cove, and an 80-foot by110-foot pile-supported dock (U.S. Army Corps of Engineers [USACE], 2003).
- Goldbelt Cascade Point Marine Terminal Facility – 1.2 acres of fill for a breakwater and 1.6 acres of dredge for a turning basin (U.S. Army Corps of Engineers, 2004a).
- Kensington Mine Slate Cove facilities – 3.6 acres of fill for a marine terminal (U.S. Army Corps of Engineers, 2004b).
- Otter Creek Hydroelectric Plant – 0.7 acres of fill in intertidal and subtidal habitat for a deep marine jetty and floating dock (USFS, 2002b).

The intertidal and shallow subtidal habitat that would be lost as a result of these projects is used by juvenile salmon, particularly pink salmon, during their early marine life stages, as well as by prey species for fish stocks in Lynn Canal. When they first enter marine waters, pink salmon spend most of their time in a few centimeters of water (Groot and Margolis, 1991). Other juvenile salmonids such as chum, coho, and sockeye salmon also use shallow nearshore habitat for rearing, but not to the same extent as pink salmon. Foreseeable future projects would result in impacts to approximately eight acres of nearshore habitat used by juvenile salmon. Because much of the Lynn Canal coastline provides suitable rearing habitat for juvenile salmon, this loss would not measurably affect salmon populations in Lynn Canal.

Construction of the dock facility at Slate Creek for the Kensington Gold Project could affect both adult eulachon returning to spawn and juvenile eulachon, depending on timing. Noise and increased boat traffic due to construction could disrupt the migration of some adult eulachon returning to spawn if these activities occur in the April to May spawning period. Avoiding construction during this period could mitigate this effect. Some juvenile eulachon feeding in Berners Bay could be affected by dock construction at Slate Creek; however, these fish are found mostly along the bottom in deeper water (Smith and Saalfeld, 1955). Because construction would impact a small area of eulachon foraging habitat and construction would last for a short period of time, it would not measurably affect the populations of eulachon in Lynn Canal (USFS, 2004).

Approximately 3 acres of potential spawning habitat for Pacific herring at Cascade Point would be lost due to construction of the dock and breakwater. If the filled and dredged area at Cascade Point was entirely lost for spawning, approximately 350 feet of shoreline would be affected (USFS, 2004). This is equivalent to about 2 percent of the along-shore herring spawning length (approximately three miles) observed in Berners Bay in 2003.

The Kensington Gold Project and Alaska Glacier Seafoods project would increase marine vessel traffic in Lynn Canal. Until recently, treatment of wastewater discharged from marine vessels did not need to meet water quality standards that were completely protective of aquatic life. New compliance regulations effective beginning in 2004 require wastewater discharges to meet AWQS. Therefore, even though marine vessel traffic and corresponding wastewater discharges may increase under the No Action Alternative, those discharges should not alter water quality in Lynn Canal because of improved wastewater treatment.

4.9.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.9.2.1 Indirect Effects

Alternatives 2 through 2C would result in improved access to the east side of Lynn Canal. This is likely to result in increased recreational fishing for anadromous fish along the eastern shoreline of Lynn Canal, as well as the anadromous streams crossed by the alignment. No boat

ramps would be constructed along the highway for any of these alternatives. Therefore, they would not increase the number of access points in the project study area for boats other than small, highly portable recreational craft such as kayaks and canoes.

As discussed in Section 4.4.2, Alternatives 2 through 2C are projected to result in an increase in non-resident visitors and a small population increase in Juneau, Haines, and Skagway. This would increase the volume of effluent discharged from the wastewater treatment facilities in these communities. This increase would not reduce water quality in the receiving waters because these facilities must meet NPDES discharge limitations protective of aquatic life.

4.9.2.2 Cumulative Effects

For Alternatives 2 through 2C, the highway would be on the shoreline at several locations between Sherman Point and the Katzehin River. This would result in filling approximately 22 acres of intertidal and shallow subtidal habitat. Alternatives 2 and 2B would fill 4.3 acres of intertidal and subtidal habitat for the proposed Katzehin ferry terminal, as well as dredge an additional 4.5 acres of subtidal habitat for a ferry mooring basin at the terminal site. Alternative 2A would include this fill and dredge area at Katzehin, as well as filling and dredging 4.3 acres of intertidal and subtidal habitat at Sawmill and Slate coves in Berners Bay. Therefore, Alternatives 2 and 2B would impact about 31 acres of intertidal and subtidal habitat, Alternative 2A would impact about 35 acres of these habitats, and Alternative 2C would impact 22 acres of these habitats.

As discussed in Section 4.9.1.2, nearshore intertidal and shallow subtidal habitat is used by juvenile salmon, particularly pink salmon, during their early marine life stages, as well as by prey species for fish stocks in Lynn Canal. Alternatives 2 through 2C in combination with foreseeable future projects would result in the loss of 30 (Alternative 2C) to 43 (Alternative 2A) acres of this habitat. Because much of the Lynn Canal coastline provides suitable rearing habitat for juvenile salmon, this loss would not measurably effect salmon populations in Lynn Canal.

The Slate Creek dock facilities for the Kensington Gold Project in combination with the Slate Cove ferry terminal for Alternative 2A may impact several acres of foraging habitat for juvenile eulachon. These fish are found mostly along the bottom in deeper water (Smith and Saalfeld, 1955) than would be impacted by these two facilities; therefore, this cumulative habitat loss would not be large enough to measurably affect eulachon populations in Lynn Canal. Eulachon also use the Katzehin River for spawning. Because Katzehin ferry terminal proposed for Alternatives 2, 2A, and 2B would be located north of the river delta, it would not impact spawning runs of this species.

The Pacific herring population in Lynn Canal has been substantially reduced over the past few decades to the point that it is no longer a viable commercial fishery. Various hypotheses have been put forth as to why the stocks have declined, though none have been substantiated by scientific analysis. These hypotheses include one or some combination of the following factors: overfishing, increased predator populations, disease, habitat alteration/degradation, water pollution, and environmental changes such as unfavorable oceanographic conditions.

In a quantitative assessment of the frequency with which explanations have been attributed to herring stock collapses worldwide, Pearson et al. (1999) found that overfishing was the most frequently cited cause (74 percent of the cases), followed by environmental change (50 percent of cases), changes in food supply (15 percent), predation (2 percent), disease (2 percent), and habitat modification (2 percent). In most cases, these factors were seen to have acted in

combination with each other; single-factor causes other than overfishing (37 percent) or environmental change alone (13 percent) were rare.

Overfishing may have played a role in the initial decline of Lynn Canal herring stocks. Stocks were harvested at a low rate (<1,000 tons) until stock declines led to a fishery closure in 1982. Harvest did occur in some seasons when minimum spawning biomass thresholds were not met, and Lynn Canal may have been especially susceptible to brief periods of overfishing due to poorly understood factors, such as its limited migratory range.

If both the Goldbelt Cascade Point marine facility and the Sawmill Cove ferry terminal proposed for Alternative 2A were constructed, they would have a cumulative impact on existing Pacific herring spawning habitat. The ferry terminal would require fill and dredge of 3.1 acres of intertidal and subtidal habitat in roughly the center of the area that Pacific herring are known to currently spawn in Berners Bay. Based on a site survey, the proposed Sawmill Cove terminal site is not high quality herring spawning habitat because it supports only a small amount of blade kelp and no eelgrass or stalked kelp. However, Pacific herring do spawn there. Alternative 2A in combination with foreseeable future projects would impact a total of approximately six acres of spawning habitat currently used by Pacific herring in Berners Bay. The footprint of the Sawmill Cove ferry terminal is approximately 300 feet of shoreline at mean lower low water, which is equivalent to less than 2 percent of the along-shore herring spawning length observed in Berners Bay in 2003. The footprint of the Cascade Point marine facility in combination with the Sawmill Cove terminal proposed for Alternative 2A would result in the cumulative loss of 4.4 percent of the known along-shore Pacific herring spawning habitat in Berners Bay.

Alternatives 2 through 2C in combination with other foreseeable future projects in the region were evaluated for the potential to impact EFH through changes in water quality. This evaluation considered discharges of sanitary wastewater from marine and ferry terminals as well as marine vessels, leakage of fuels and lubricants from marine vessels, highway stormwater runoff, and catastrophic spills from marine vessels and vehicles using a highway.

Alternatives 2, 2A, and 2B would have a new ferry terminal at Katzehin, and Alternative 2A would also have new ferry terminals at Sawmill Cove and Slate Cove. Sanitary wastewater would be discharged from the Katzehin terminal into Lynn Canal, and wastewater from the Sawmill Cove and Slate Cove terminals would be discharged into Berners Bay. These discharges would not substantially alter water quality. Wastewater would undergo tertiary treatment using ultraviolet light disinfection prior to discharge, and discharges would be at the appropriate distance from shore and depth of water to meet permit guidelines for mixing. Treated wastewater would meet AWQS protective of aquatic life. There are no plans for wastewater treatment and discharge at Coeur's proposed Slate Creek and Goldbelt's proposed Cascade Point marine facilities in Berners Bay. Because discharge of wastewater from ferry terminals proposed for Alternatives 2 through 2B would not result in substantial water quality changes in Berners Bay, and other foreseeable future marine facilities that would be located there would not include wastewater treatment and discharge facilities, there would be no cumulative water quality impacts from this source.

Alternatives 2 through 2C would end AMHS service at Auke Bay but would increase shuttle ferry traffic in Lynn Canal. Shuttle ferries would be equipped with sanitary waste holding tanks that would be pumped out, and the waste would be treated onshore at an appropriate treatment plant, or they would discharge treated wastewater meeting applicable standards. Therefore, wastewater from these ferries would not impact water quality in Lynn Canal and Berners Bay, and would not contribute to cumulative water quality impacts.

The increased marine vessel traffic in Berners Bay associated with Alternative 2A and foreseeable future projects at Slate Creek and Cascade Point could lead to an increase in total petroleum hydrocarbons (TPHs) in the bay from fuel and lubricant leaks. TPHs consist of a mixture of light and heavy hydrocarbons and include polynuclear aromatic hydrocarbons (PAHs). Lighter hydrocarbons, like those contained in diesel fuel, are generally more volatile and water-soluble and therefore are associated with potential acute hazards to aquatic life. The larger and heavier hydrocarbons are more persistent in the environment and have the potential for chronic toxicological effects (USFS, 2004).

In studies on Pacific herring, the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) found a direct relationship between PAH accumulation in muscle tissue and ovaries of exposed fish and PAH concentrations of oil in water. The study noted that PAH exposure resulted in a depression of immune function and expression of viral symptoms (USFS, 2004).

Herring eggs exposed to TPHs experienced shorter incubation times, and reduced egg survival, larval survival, and swimming ability as well as morphological abnormalities. At concentrations of 7.6 micrograms/liter (µg/L), significant larval abnormalities were observed in Pacific herring, and adverse effects from exposure to PAHs have been observed at concentrations of about 0.7 µg/L (USFS, 2004).

The highest concentrations of PAHs in the water of San Francisco Bay were reported at 0.5 µg/L. The marine vessel traffic in that bay is orders of magnitude larger than would occur in Berners Bay with Alternative 2A and foreseeable future projects, and San Francisco Bay receives large volumes of urban runoff containing TPHs. It should also be noted that San Francisco Bay has supported a viable Pacific herring fishery for many decades (USFS, 2004).

Although hydrocarbon levels near AMHS ferry terminals have not been monitored, NMFS believes normal levels in these areas would be very low (USFS, 2004). Hydrocarbon levels approaching those observed in San Francisco Bay may cause adverse effects on Pacific herring; however, it is likely that fuel leakage from the cumulative marine traffic that could occur in Berners Bay would produce hydrocarbon levels several orders of magnitude lower than those found in San Francisco Bay. Therefore, fuel leakage from the cumulative increase in ferry traffic associated with Alternative 2A and foreseeable future projects is not likely to impact EFH in Berners Bay.

The highway proposed for Alternatives 2, 2B, and 2C would be located along the eastern shore of Berners Bay, and at times it would be within 200 feet of the shore. Results of stormwater research by the FHWA indicate that stormwater runoff from low to medium traffic volumes (under 30,000 vehicles per day) on rural highways exerts minimal to no impact on the aquatic components of most receiving waters (USDOT & FHWA, 1987). Annual average daily traffic on the proposed highway is projected to range from 670 (Alternatives 2A and 2B) to 930 (Alternative 2) vehicles in 2038, which is about 3 percent of the maximum traffic volume considered in the FHWA research. The maximum peak week average daily traffic for any of the alternatives is projected to reach 3,250 (Alternative 2) vehicles in 2038, or about 10 percent of the maximum traffic volume considered in the FHWA research.

Studies conducted in Anchorage, Alaska, under the MOA Watershed Management Program similarly concluded that street runoff has minimal impacts to the water quality of receiving waters from most potential pollutants (MOA, 2000). These studies evaluated runoff from residental streets (<2,000 average daily traffic) to major arterials (>20,000 average daily traffic), including water quality impacts from snowmelt. The studies showed dissolved concentrations of calcium, chromium, magnesium, and zinc to be below AWQS and PAHs to be below EPA water

quality criteria. Only dissolved concentrations of copper and lead were noted to be above their AWQS; however, modest dilution would likely reduce these concentrations below their AWQS. Because of the rural setting of Alternatives 2, 2B, and 2C and the predicted low annual average daily traffic, lower concentrations of pollutants would be present in runoff from the highway proposed for these alternatives than were found in the Anchorage studies. Based on the results of those studies and FHWA research, runoff from Alternatives 2, 2B, and 2C would not cause water quality impacts in Berners Bay.

The potential for an accidental fuel spill in Berners Bay would increase with Alternative 2A in combination with Coeur's Slate Creek and Goldbelt's Cascade Point marine facilities. Depending on the timing and location of such a spill, it could substantially impact the spawning population of Pacific herring in the bay. It could also impact the spawning population of eulachon that use the Antler, Lace, and Berners rivers; however, this impact would be less since eulachon generally remain in deep water until they move up their spawning rivers.

4.9.3 Alternative 3 – West Lynn Canal Highway

4.9.3.1 Indirect Effects

Alternative 3 would result in improved access to Berners Bay north from Echo Cove to Sawmill Cove and the west side of Lynn Canal. This is likely to result in increased recreational fishing for anadromous fish along the western shoreline of Lynn Canal, as well as the anadromous streams crossed by the alignment. No boat ramps would be constructed along the highway for any of these alternatives. Therefore, they would not increase the number of access points in the project study area for boats other than small, highly portable recreational craft such as kayaks and canoes.

As discussed in Section 4.4.3, Alternative 3 is projected to result in an increase in non-resident visitors and a small population increase in Juneau and Haines. This would increase the volume of effluent discharged from the wastewater treatment facilities in these communities. This increase would not reduce water quality in the receiving waters because these facilities must meet NPDES discharge limitations protective of aquatic life.

4.9.3.2 Cumulative Effects

The Alternative 3 highway alignment would be on the shoreline at one location just north of the Endicott River, resulting in the fill of 0.09 acres of intertidal habitat. Construction of the proposed crossing of the Chilkat River/Inlet would also fill 4.8 acres of intertidal habitat. The proposed ferry terminals at Sawmill Cove and William Henry Bay would fill and dredge a total of about 8 acres of intertidal and shallow subtidal habitat.

As discussed in Section 4.9.1.2, nearshore intertidal and shallow subtidal habitat is used by juvenile salmon, particularly pink salmon, during their early marine life stages, as well as by prey species for fish stocks in Lynn Canal. Alternative 3 in combination with foreseeable future projects would result in the loss of about 21 acres of this habitat. Because much of the Lynn Canal coastline provides suitable rearing habitat for juvenile salmon, this loss would not measurably affect salmon populations in Lynn Canal.

If both the Goldbelt Cascade Point marine facility and the Sawmill Cove ferry terminal proposed for Alternative 3 were to be constructed, they would have a cumulative impact on existing Pacific herring spawning habitat. The ferry terminal would require fill and dredge of 3.1 acres of intertidal and subtidal habitat in roughly the center of the area that Pacific herring are known to currently spawn in Berners Bay. Based on a site survey, the proposed Sawmill Cove terminal site is not high quality herring spawning habitat because it supports only a small amount of

blade kelp and no eelgrass or stalked kelp. However, Pacific herring do spawn there. Alternative 3 in combination with foreseeable future projects would impact a total of approximately 6 acres of spawning habitat currently used by Pacific herring in Berners Bay. The footprint of the Sawmill Cove ferry terminal is approximately 300 feet of shoreline at mean lower low water, which is equivalent to less than 2 percent of the along-shore herring spawning length observed in Berners Bay in 2003. The footprint of the Cascade Point marine facility in combination with the Sawmill Cove terminal proposed for Alternative 3 would result in the cumulative loss of 4.4 percent of the known along-shore Pacific herring spawning habitat in Berners Bay.

Alternative 3 in combination with other foreseeable future projects in the region were evaluated for the potential to impact EFH through changes in water quality. This evaluation considered discharges of sanitary wastewater from marine and ferry terminals as well as marine vessels, leakage of fuels and lubricants from marine vessels, highway stormwater runoff, and catastrophic spills from marine vessels and vehicles using a highway.

Sanitary wastewater would be discharged from the Sawmill Cove terminal into Berners Bay and from the William Henry Bay terminal into William Henry Bay. These discharges would not substantially alter water quality. Wastewater would undergo tertiary treatment using ultraviolet light disinfection prior to discharge, and discharges would be at the appropriate distance from shore and depth of water to meet permit guidelines for mixing. Treated wastewater would meet AWQS protective of aquatic life. There are no plans for wastewater treatment and discharge at Coeur's proposed Slate Creek and Goldbelt's proposed Cascade Point marine facilities in Berners Bay. Because discharge of wastewater from ferry terminals proposed for Alternative 3 would not result in substantial water quality changes in Berners Bay and other foreseeable future marine facilities that would be located there would not include wastewater treatment and discharge facilities, there would be no cumulative water quality impacts from this source.

Alternative 3 would end AMHS service at Auke Bay but would increase shuttle ferry traffic in Lynn Canal and introduce shuttle ferry traffic in Berners Bay. Shuttle ferries would be equipped with sanitary waste holding tanks that would be pumped out, and the waste would be treated onshore at an appropriate treatment plant, or they would discharge treated wastewater meeting applicable standards. Therefore, wastewater from these ferries would not impact water quality in Lynn Canal and Berners Bay, and would not contribute to cumulative water quality impacts.

The increased marine vessel traffic in Berners Bay associated with Alternative 3 and foreseeable future projects at Slate Creek and Cascade Point could lead to an increase in TPHs in the bay from fuel and lubricant leaks. However, because of the small volume of vessel traffic that would result from Alternative 3 and foreseeable future projects, it is unlikely that the cumulative increase in hydrocarbons would be large enough to impact EFH in Berners Bay.

The highway proposed for Alternative 3 would be located along the eastern shore of Berners Bay to Sawmill Cove. Based on the results of stormwater runoff studies conducted by the MOA and FHWA, runoff from Alternative 3 would not cause water quality impacts in Berners Bay.

The potential for an accidental fuel spill in Berners Bay would increase with Alternative 3 in combination with Coeur's Slate Creek and Goldbelt's Cascade Point marine facilities. Depending on the timing and location of such a spill, it could substantially impact the Pacific herring spawning population in the bay. It could also impact the spawning population of eulachon that use the Antler, Lace, and Berners rivers; however, this impact would be less since eulachon generally remain in deep water until they move up their spawning rivers.

4.9.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.9.4.1 Indirect Effects

Alternatives 4A and 4C would not substantially change access in Lynn Canal. Therefore, these alternatives would result in no indirect impacts to marine and anadromous fish and their habitats.

4.9.4.2 Cumulative Effects

Nearshore intertidal and shallow subtidal habitat in Auke Bay is used by juvenile salmon, particularly pink salmon, during their early marine life stages, as well as by prey species for fish stocks in Lynn Canal. Limited herring spawning also occurs in Auke Bay. In addition to these fish species, crabs could be present in nearshore areas of the bay. In later winter, adult red king crab return to nearshore areas; young-of-the-year red and blue king crab require nearshore shallow habitat with protective cover. Early juvenile bairdi Tanner crab also occupy shallow waters and mud habitat.

Alternatives 4A and 4C in combination with the foreseeable future construction of the Alaska Glacier Seafoods Plant would result in the loss of about 1.5 acres of nearshore intertidal and shallow subtidal habitat in Auke Bay. Other marine facilities have been constructed in Auke Bay including the existing Auke Bay ferry terminal, a boat launch ramp, several marinas including fueling facilities, a harbor master's office, associated parking, and residential and commercial wastewater discharge facilities. Although the acreage of impacted intertidal and subtidal habitat has not been computed, development occurs all along the waterfront of Auke Bay. A larger portion of most of the facilities is on the surface of the water away from the nearshore habitat (such as the finger float system of a marina), and parts of the facilities occupy a smaller portion of intertidal or subtidal habitat (such as a staging dock and access ramp). In such instances, the amount of the nearshore habitat impacted is not commensurate with the size of the entire development. Because the remaining Auke Bay nearshore intertidal and subtidal habitat and most of the Lynn Canal coastline provides suitable rearing habitat for juvenile salmon, pre species, and crabs, this loss would not measurable affect fish and invertebrate populations in Auke Bay or Lynn Canal.

4.9.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.9.5.1 Indirect Effects

Alternatives 4B and 4D would result in improved access to Berners Bay north from Echo Cove to Sawmill Cove. This is likely to result in increased recreational fishing for anadromous fish along the Berners Bay shoreline to Sawmill Cove, as well as in Sawmill Creek. No boat ramps would be constructed along the highway for either alternative. Therefore, they would not increase the number of access points in the project study area for boats other than small, highly portable recreational craft such as kayaks and canoes.

As discussed in Section 4.4.5, economic impacts associated with Alternative 4B would result in population growth in Juneau, Haines, and Skagway while the economic impacts of Alternative 4D would result in population growth in Juneau and Haines. This would increase the volume of effluent discharged from the wastewater treatment facilities in these communities. This increase would not reduce water quality in the receiving waters because these facilities must meet NPDES discharge limitations protective of aquatic life.

4.9.5.2 Cumulative Effects

Nearshore intertidal and shallow subtidal habitat in Auke Bay is used by juvenile salmon, particularly pink salmon, during their early marine life stages, as well as by prey species for fish stocks in Lynn Canal. Limited herring spawning also occurs in Auke Bay. In addition to these fish species, crabs could be present in nearshore areas of the bay. In later winter, adult red king crab return to nearshore areas; young-of-the-year red and blue king crab require nearshore shallow habitat with protective cover. Early juvenile bairdi Tanner crab also occupy shallow waters and mud habitat.

Alternatives 4B and 4D in combination with the foreseeable future construction of the Alaska Glacier Seafoods Plant would result in the loss of about 1.5 acres of nearshore intertidal and shallow subtidal habitat in Auke Bay. Other marine facilities have been constructed in Auke Bay including the existing Auke Bay ferry terminal, a boat launch ramp, several marinas including fueling facilities, a harbor master's office, associated parking, and residential and commercial wastewater discharge facilities. Although the acreage of impacted intertidal and subtidal habitat has not been computed, development occurs all along the waterfront of Auke Bay. A larger portion of most of the facilities is on the surface of the water away from the nearshore habitat (such as the finger float system of a marina), and parts of the facilities occupy a smaller portion of intertidal or subtidal habitat (such as a staging dock and access ramp). In such instances, the amount of the nearshore habitat impacted is not commensurate with the size of the entire development. Because the remaining Auke Bay nearshore intertidal and subtidal habitat and most of the Lynn Canal coastline provides suitable rearing habitat for juvenile salmon, pre species, and crabs, this loss would not measurable affect fish and invertebrate populations in Auke Bay or Lynn Canal.

Alternatives 4B and 4D would result in the loss of 3.2 acres of intertidal and subtidal habitat from dredging and filling at the proposed Sawmill Cove ferry terminal site. Alternatives 4B and 4D in combination with foreseeable future projects would result in the loss of about 10 acres of intertidal and shallow subtidal habitat in Berners Bay used by juvenile salmon and prey species for fish stocks in Lynn Canal. Because much of the Lynn Canal coastline provides suitable rearing habitat for juvenile salmon, this loss would not measurably effect salmon populations in Lynn Canal.

If both the Goldbelt Cascade Point marine facility and the Sawmill Cove ferry terminal proposed for Alternatives 4B and 4D were constructed, they would have a cumulative impact on existing Pacific herring spawning habitat. Based on site surveys, the proposed Sawmill Cove terminal site provides herring spawning habitat because it supports sparse but persistent bladed kelp. Alternatives 4B and 4D in combination with foreseeable future projects would impact a total of approximately six acres of spawning habitat currently used by Pacific herring in Berners Bay. The footprint of the Sawmill Cove ferry terminal is approximately 300 feet of shoreline at mean lower low water, which is equivalent to less than 2 percent of the along-shore herring spawning length observed in Berners Bay in 2003. The footprint of the Cascade Point marine facility in combination with the Sawmill Cove terminal proposed for Alternatives 4B and 4D would result in the cumulative loss of 4.4 percent of the known along-shore Pacific herring spawning habitat in Berners Bay.

Alternatives 4B and 4D in combination with other foreseeable future projects in the region were evaluated for the potential to impact EFH through changes in water quality. This evaluation considered discharges of sanitary wastewater from marine and ferry terminals as well as marine vessels, leakage of fuels and lubricants from marine vessels, highway stormwater runoff, and catastrophic spills from marine vessels and vehicles using a highway.

Sanitary wastewater would be discharged from the Sawmill Cove terminal into Berners Bay. This discharge would not substantially alter water quality. Wastewater would undergo tertiary treatment using ultraviolet light disinfection prior to discharge, and discharges would be at the appropriate distance from shore and depth of water to meet permit guidelines for mixing. Treated wastewater would meet AWQS protective of aquatic life. There are no plans for wastewater treatment and discharge at the proposed Slate Creek and Cascade Point marine facilities in Berners Bay. Because discharge of wastewater from the ferry terminal proposed for Alternatives 4B and 4D would not result in substantial water quality changes in Berners Bay and other foreseeable future marine facilities that would be located there would not include wastewater treatment and discharge facilities, there would be no cumulative water quality impacts from this source.

Sanitary waste discharged from AMHS vessels in Lynn Canal must meet AWQS. Shuttle ferries would be equipped with sanitary waste holding tanks that would be pumped out, and the waste would be treated onshore at an appropriate treatment plant, or they would discharge treated wastewater meeting applicable standards. Therefore, wastewater from these ferries would not impact water quality in Lynn Canal and Berners Bay, and would not contribute to cumulative water quality impacts.

The increased marine vessel traffic in Berners Bay associated with Alternatives 4B and 4D and foreseeable future projects at Slate Creek and Cascade Point could lead to an increase in TPHs in the bay from fuel and lubricant leaks. However, because of the small volume of vessel traffic that would result from Alternatives 4B and 4D and foreseeable future projects, it is unlikely that the cumulative increase in hydrocarbons would be large enough to impact EFH in Berners Bay.

The highway proposed for Alternatives 4B and 4D would be located along the eastern shore of Echo Cove to Sawmill Cove. Based on the results of stormwater runoff studies conducted by the MOA and FHWA, runoff from Alternatives 4B and 4D would not cause water quality impacts in Berners Bay.

The potential for an accidental fuel spill in Berners Bay would increase with Alternatives 4B and 4D in combination with Coeur's Slate Creek and Goldbelt's Cascade Point marine facilities. Depending on the timing and location of such a spill, it could substantially impact the Pacific herring spawning population in the bay. It could also impact the spawning population of eulachon that use the Antler, Lace, and Berners rivers; however, this impact would be less since eulachon generally remain in deep water until they move up their spawning rivers.

4.10 Terrestrial Vegetation

4.10.1 Alternative 1 – No Action

4.10.1.1 Indirect Effects

The No Action Alternative would not alter access in Lynn Canal and would not require construction of new transportation facilities. Therefore, this alternative would not result in indirect effects to terrestrial vegetation.

4.10.1.2 Cumulative Effects

Terrestrial vegetation has been affected by past developments on both the east and west sides of Lynn Canal, including historical mining operations, state and local government developments, private developments, timber harvests, and developments on Tongass National Forest lands. The 1998 improvements to the Kensington Gold Mine facilities resulted in a loss of 9 acres of non-forest vegetation, including mixed needleleaf, muskeg, and forb/grass/sedge communities

(USFS, 1998). Terrestrial vegetation impacts from the Jualin Mine facilities and road access resulted in loss of 37.3 acres of forested vegetation, of which 28.7 acres was old-growth forest; and a loss of 5.5 acres of non-forest vegetation (USFS, 1988). Approximately 73 acres of second growth forest has been mapped on the east (~32 acres) and west (~41 acres) sides of Lynn Canal within the Tongass National Forest, indicating past timber harvests have occurred, mostly along the coast and rivers (USFS, 2003). Over 350 acres of timber harvests have occurred within Unit 6 of the Haines State Forest (Alaska Department of Natural Resources [ADNR], 2002). Past Goldbelt, state government, local government, and private timber harvests and developments have resulted in an unknown impact to terrestrial vegetation.

Reasonably foreseeable future actions including the Kensington Gold Project, Goldbelt Cascade Point Access Road, and the Otter Creek Hydroelectric Project would have impacts to terrestrial vegetation within the project study area. The proposed action for the Kensington Gold Project would result in the permanent loss of 106.5 acres of forested vegetation, which includes 92.6 acres of low, medium, and high volume old-growth forests. Eleven acres of non-forest vegetation would be affected, including alpine, mixed needleleaf, muskeg, and forb/grass/sedge communities. The proposed Cascade Point access road, staging area, and log and equipment transfer bulkhead would result in the filling of 2.5 acres of forested wetlands and 0.2 acres of palustrine scrub-shrub/emergent wetlands along the beach (USFS, 2002a). Non-wetland vegetation has not been analyzed as part of the Cascade EIS; however, aerial photographs indicate the remaining non-wetland vegetation is forested, implying approximately 14.2 to 23.3 acres of non-wetland forest removal related to the construction of the access road. The geographic information system (GIS) timber layer used to analyze the Juneau Access Alternative impacts indicates that the affected forested wetlands and non-wetland forests in this area are old-growth. The Otter Creek Hydroelectric Project is expected to result in inundation of approximately 6 acres of mostly forested terrestrial vegetation within the Otter Creek Valley, but the actual area of affected terrestrial vegetation is undetermined at this time (USFS, 2002b). Past, present, and reasonably foreseeable future projects on both the east and west sides of Lynn Canal would result in the cumulative loss of approximately 631 acres of terrestrial vegetation. This estimate does not account for regeneration of forested vegetation.

4.10.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.10.2.1 Indirect Effects

Construction and maintenance and operation of Alternatives 2 through 2C could result in the introduction of non-native plant species that could change the structure of vegetation communities. One invasive species that has been introduced in southeast Alaska that is presently subject to eradication efforts is the Japanese knotweed (*Polygonum cuspidatum*) (Union of Concerned Scientists, 2003). Other invasive species that can displace native plants include Canada thistle (*Circium arvense*) and foxtail barley (*Hordeum jubatum*) (Shepard *et al*., 2002). DOT&PF construction contracts would require contractors to use specific techniques and procedures to minimize the accidental introduction of foreign plant species carried on construction equipment and to use native or non-invasive plant species for hydro seeding of exposed embankments. Compliance with these best management practices (BMPs) would minimize the risk of introducing foreign plant species to the highway corridor.

Alternatives 2 through 2C would improve access to the west side of Lynn Canal. This could result in loss of terrestrial vegetation from recreation activities, mineral extraction, or development of private lands. Minor effects could also occur from firewood and personal use logging near Juneau.

4.10.2.2 Cumulative Effects

Alternatives 2 through 2C would result in the loss of 456 (Alternative 2B) to 629 (Alternatives 2 and 2C) acres of terrestrial habitat, including 62 (Alternative 2A) to 80 (Alternatives 2, 2B, and 2C) acres of forested wetlands. All but 9 (Alternative 2A) to 14 (Alternatives 2, 2B, and 2C) acres of this vegetation would be forest, 50 to 70 percent of which would be classified as old-growth forest. Alternatives 2 through 2C in combination with past, present, and foreseeable future projects would result in the maximum loss of approximately 1,240 acres of terrestrial vegetation, more than half of which would be old growth forest. Vegetation removed for the Cascade Point access road would not be a cumulative impact. The alignment of the Cascade Point Road is similar to the alignment of the highway for Alternatives 2 through 2C from Echo Cove to Sawmill Cove. If Goldbelt's road is built first, DOT&PF would use that alignment and widen the road to meet the state's highway standards. If one of the Juneau Access Improvements Project alternatives that includes this highway segment is built first, Goldbelt could use the highway with the addition of a short access road to Cascade Point.

The cumulative loss of terrestrial vegetation represents about one percent of the estimated 117,000 acres of terrestrial habitat in the Lynn Canal region. This loss would not represent a substantial loss of terrestrial habitat, and it would not adversely affect any rare or unique vegetation community types or any known rare or sensitive plant species.

4.10.3 Alternative 3 – West Lynn Canal Highway

4.10.3.1 Indirect Effects

Construction and maintenance and operation of Alternative 3 could result in the introduction of non-native plant species that could change the structure of vegetation communities. DOT&PF construction contracts would require contractors to use specific techniques and procedures to minimize the accidental introduction of foreign plant species carried on construction equipment and to use native or non-invasive plant species for hydro seeding of exposed embankments. Compliance with these BMPs would minimize the risk of introducing foreign plant species to the highway corridor.

Alternative 3 would improve access to the east side of Lynn Canal north to Sawmill Cove and the west side of Lynn Canal. This could result in loss of terrestrial vegetation from recreation activities, mineral extraction, or development of private lands. Minor effects could also occur from firewood and personal use logging near Juneau and Haines.

4.10.3.2 Cumulative Effects

Alternative 3 would result in the loss of 423 acres of terrestrial habitat, including 408 acres of forest and 14 acres of shrub and open meadow/muskeg. Alternative 3 in combination with past, present, and foreseeable future projects would result in the loss of about 1,030 acres of terrestrial vegetation, more than half of which would be old-growth forest. Vegetation removed for the Cascade Point access road would not be a cumulative impact. The alignment of the Cascade Point Road is similar to the alignment of the highway for Alternative 3 from Echo Cove to Sawmill Cove. If Goldbelt's road is built first, DOT&PF would use that alignment and widen the road to meet the state's highway standards. If one of the Juneau Access Improvements Project alternatives that includes this highway segment is built first, Goldbelt could use the highway with the addition of a short access road to Cascade Point.

The cumulative loss of terrestrial vegetation represents about 0.9 percent of the estimated 117,000 acres of terrestrial habitat in the Lynn Canal region. This loss would not represent a

substantial loss of terrestrial habitat, and it would not adversely affect any rare or unique vegetation community types or any known rare or sensitive plant species.

4.10.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.10.4.1 Indirect Effects

Alternatives 4A and 4C would not result in the construction of any new transportation facilities or alter access in Lynn Canal; therefore, they would have no indirect effects on terrestrial vegetation.

4.10.4.2 Cumulative Effects

Alternatives 4A and 4C would have no direct or indirect effects on terrestrial vegetation; therefore, they would have no cumulative impacts on terrestrial vegetaton.

4.10.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.10.5.1 Indirect Effects

Construction and maintenance and operation of Alternatives 4B and 4D could result in the introduction of non-native plant species from Echo Cove to Sawmill Cove that could change the structure of vegetation communities. DOT&PF construction contracts would require contractors to use specific techniques and procedures to minimize the accidental introduction of foreign plant species carried on construction equipment and to use native or non-invasive plant species for hydro seeding of exposed embankments. Compliance with these BMPs would minimize the risk of introducing foreign plant species to the highway corridor.

Alternatives 4B and 4D would improve access to the east side of Lynn Canal north to Sawmill Cove. This could result in loss of terrestrial vegetation from recreation activities. Minor effects could also occur from illegal firewood and personal use logging near Juneau.

4.10.5.2 Cumulative Effects

Alternatives 4B and 4D would result in the loss of 55 acres of terrestrial habitat, including 53 acres of old-growth forest and 2 acres of meadow/muskeg. Alternatives 4B and 4D in combination with past, present, and foreseeable future projects would result in the loss of about 670 acres of terrestrial vegetation, more than half of which would be old growth forest. Vegetation removed for the Cascade Point access road would not be a cumulative impact. The alignment of the Cascade Point Road is similar to the alignment of the highway for Alternatives 4B and 4D from Echo Cove to Sawmill Cove. If Goldbelt's road is built first, DOT&PF would use that alignment and widen the road to meet the state's highway standards. If one of the Juneau Access Improvements Project alternatives that includes this highway segment is built first, Goldbelt could use the highway with the addition of a short access road to Cascade Point.

The cumulative loss of terrestrial vegetation represents about 0.6 percent of the estimated 117,000 acres of terrestrial habitat in the Lynn Canal region. This loss would not represent a substantial loss of terrestrial habitat, and it would not adversely affect any rare or unique vegetation community types or any known rare or sensitive plant species.

4.11 Wildlife

This cumulative effects analysis discusses the same marine and terrestrial wildlife species and functional groups as the *Wildlife Technical Report* with one exception. Humpback whales are included in the marine mammal group in the *Wildlife Technical Report* but are discussed in conjunction with Steller sea lions in Section 4.13, Threatened and Endangered Species. In order to facilitate the analysis of potential effects and to minimize the repetition of information, the species are discussed within functional groupings. Species within these groups share similar types of conservation concerns or susceptibilities to impacts and represent many other species that would have similar types of impacts from project alternatives, although the intensity of the effects may vary substantially between species. Direct effects of the project alternatives are described in the *Wildlife Technical Report*. The functional groups are as follows:

- Marine mammals – harbor seal, harbor porpoise, Dall's propoise, minke whale, killer whale, and sea otter (Note: Steller sea lion and humpback whales are addressed under Threatened and Endangered Species, Section 4.13)
- Marine birds – marbled murrelet, Kittlitz's murrelet, harlequin duck, great blue heron, and trumpeter swan
- Terrestrial mammals – mountain goat, Sitka black-tailed deer, river otter, marten, brown bear, black bear, wolf, and moose
- Terrestrial birds – Queen Charlotte goshawk, American peregrine falcon, olive-sided flycatcher, gray-cheeked thrush, blackpoll warbler, and Townsend's warbler (Note: bald eagle is addressed in Section 4.12)
- Amphibians – wood frog

4.11.1 Alternative 1 – No Action

4.11.1.1 Indirect Effects

The No Action Alternative would not substantially change marine traffic in Lynn Canal, alter access in the Canal, or require the construction of new transportation facilities. Therefore, the No Action Alternative would not result in indirect effects to wildlife.

4.11.1.2 Cumulative Effects

The No Action Alternative would have no direct or indirect effects of wildlife; therefore, this alternative would have no cumulative wildlife impacts.

4.11.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.11.2.1 Indirect Effects

Marine Mammals – Alternatives 2 through 2C do not include any new boat launch facilities and therefore would not increase recreational or commercial use of motorized vessels in Lynn Canal. Some people would likely park at pull-outs along the highway as well as at the Katzehin ferry terminal proposed for Alternatives 2, 2A, and 2B, and the Sawmill Cove and Slate Cove ferry terminals proposed for Alternative 2A, to use nearby beaches for recreation (e.g., walking on the beach or launching lightweight vessels such as kayaks). This could cause a temporary disturbance to harbor seals hauled out on nearby beaches. This indirect impact is unlikely to have a population-level effect on harbor seals in Lynn Canal.

Marine Birds – As indicated above, Alternatives 2 through 2C would not increase use of motorized marine vessels in Lynn Canal. Some people would likely park at pull-outs along the highway as well as at the Katzehin ferry terminal proposed for Alternatives 2, 2A, and 2B, and the Sawmill Cove and Slate Cove ferry terminals proposed for Alternative 2A, to use nearby beaches for recreation (e.g., walking on the beach or launching lightweight vessels such as kayaks). This could disturb marine birds and waterfowl resting and foraging in near-shore areas. This type of disturbance could cause temporary displacement of birds, but would be unlikely to affect reproductive success or survival.

Terrestrial Mammals – Highway access to the east side of Lynn Canal is likely to increase hunting for black and brown bears, moose, and mountain goats, hunting and trapping for wolves, and trapping for marten and river otters. Black bear harvest in the project study area has historically accounted for only a small percentage of the total harvest in Game Management Unit (GMU) 1C and 1D, with about four bears per year taken around Berners Bay, and three bears per year taken between Sherman Point and Skagway (ADF&G, 2003b). GMU 1C covers southeast Alaska from Port Houghton and Cape Fanshaw north to Eldred Rock in Lynn Canal and encompasses areas accessible from Glacier Highway and the road system around Juneau. GMU 1D covers southeast Alaska from Eldred Rock north to the Canadian border and west past Glacier Bay, encompassing Haines, Skagway, and Klukwan. Most black bears in these GMUs are taken in areas accessible by highways and logging roads, although many hunters also use boats for access (Barten, 2002a; Hessing, 2002a). Highway access to the east side of Lynn Canal is likely to increase hunting pressure on black bears. The highway would also increase accessibility to the area for recreational activities and thus increase the presence of people along the highway corridor. This could increase human-bear interactions and could occasionally result in bear mortality in defense of life and property. Based on the Habitat Capability Index (HCI) modeling for the project in the 1997 Juneau Access DEIS, Alternatives 2 and 2C would have the greatest impact on habitat capability for black bear on the east side of Lynn Canal. These two alternatives would reduce black bear habitat capability by about 7 percent compared with current conditions. Most of this reduction would be a result of increased hunting pressure on this species.

In recent years, brown bear harvest has averaged about one bear per year on the east side of Lynn Canal, almost entirely from the Berners Bay watershed. Improved access to Berners Bay, the Katzehin River, and other anadromous stream valleys along the highway alignment could increase hunting pressure on brown bears, especially since hunting closures in other parts of southeast Alaska and Canada have increased hunting pressure in GMU 1 which extends from Portland Canal south of Ketchikan north to the Canadian Border above Skagway and Haines (Porter, 2001). Increased mortality from hunting in areas that were previously only accessible by boat, plus occasional defense of life and property mortality, could lead to more restrictive hunting regulations to protect the local population of brown bears. The HCI model results for the 1997 Draft EIS predicted that an East Lynn Canal Highway would decrease brown bear habitat capability by 29 percent compared to present conditions. Most of this decrease would be due to habitat fragmentation because a highway along the east side of Lynn Canal would separate higher elevation denning habitat from important low elevation foraging habitat.

Marten are the most frequently trapped furbearer in the project area and are easy to trap; therefore, they are susceptible to over harvest in easily accessible areas (Barten, 2001). Most of the marten presently trapped in the project study area come from the Berners Bay area. The introduction of highway access could increase the intensity of trapping pressure around Berners Bay and initiate new trapping efforts in areas north of Sherman Point, especially in their preferred low-elevation old-growth forest habitats (Suring *et al*., 1992). This could cause local depletions of marten in high-quality habitat areas that are easy to access from the highway,

such as the Katzehin River valley. The HCI modeling for the project in 1997 indicated that Alternatives 2 and 2C would have the greatest impact on habitat capability for marten on the east side of Lynn Canal. These two alternatives would reduce marten capability by about 38 percent compared with current conditions. Most of this reduction would be a result of increased trapping for this species.

River otters are difficult to trap and the skins are difficult to process, so trapping effort is generally dependent on high fur prices (Barten, 2001). The proposed highway would facilitate access for trappers and could contribute to increased trapping pressure on river otters along the east side of Lynn Canal, depending on the economics.

Wolves are managed as a furbearing species by ADF&G, with regular hunting and trapping seasons in the fall and winter. In the mid-1980s, trappers took four or five wolves every year from Berners Bay, but no wolves have been taken since 1993. Based on research experience, Dave Person (personal communication, 2004) has found that trapping and hunting are a major source of mortality for wolves. He has lost as many as half of his research animals to hunting in regions where there are roads. Increased trapping and hunting as a result of improved access could impact the wolf population on the east side of Lynn Canal.

Sitka black-tailed deer are primarily located south of Echo Cove on the east side of Lynn Canal. Improved access north of Echo Cove with Alternatives 2 through 2C is not likely to increase hunting pressure on this species because of low population numbers in this region.

The moose population in the Berners Bay watershed is subject to a permit-only hunt for eight to 18 animals per year (Barten, 2002b). Although highway access could change how hunters get to their hunting grounds, it is unlikely to improve hunting success. Potential for poaching would likely increase with increased access, especially in winter. Alternative 2A would essentially maintain the status quo conditions for moose, since it would not improve access to the head of Berners Bay where the moose population is found on the east side of Lynn Canal.

Mountain goat populations in the Lynn Canal area are subject to substantial hunting pressure by both resident and non-resident hunters in places where there is easy access either by road or by boat with safe anchorage nearby (Barten, 2002c; Hessing, 2002b). Hunting pressure, combined with severe winter weather and disease outbreaks, caused population levels to decline in the early 1980s to the point that the goat hunting season was closed for many years in the Juneau area. Road accessible areas continue to receive disproportionate hunting pressure and are thus the focus of ADF&G game management concerns. Alternatives 2 through 2C would provide access to a large area of high quality goat habitat that is presently hunted only lightly because access is difficult. The highway alignment traverses many avalanche paths and river valleys that would provide access points for hunters to hike up into mountain goat habitat. This could result in an increase in hunting pressure on these goats and have long-term population-level effects, leading to changes in game management efforts.

Terrestrial Birds – None of the terrestrial bird species considered in this analysis are subject to sport or subsistence hunting and do not rely on prey species that would be susceptible to increased hunting or trapping pressure. Some birds may be temporarily disturbed as a result of increased recreational use of the project study area with Alternatives 2 through 2C. This indirect effect would not have population-level effects on any of these species.

Amphibians – Indirect effects of Alternatives 2 through 2C on amphibians would be very small because potential recreational activities are not likely to take place to any great extent in their preferred wetland habitats.

4.11.2.2 Cumulative Effects

Marine Mammals – Alternative 2A in combination with the Kensington Gold Project would cumulatively increase ferry traffic in Berners Bay. This could increase disturbance to harbor seals. However, harbor seals use a variety of haulouts. There are alternative spots for them to rest if they are temporarily displaced from a particular location. Therefore, the cumulative increase in disturbance at haulouts is not likely to affect the survival or reproductive success of this species.

Increased marine traffic with the Kensington Gold Project and Alternatives 2 through 2C would increase the risk of vessel collisions with marine mammals. Because collisions between marine mammals and vessels, particularly ferries, are rare, this increased risk is not likely to affect populations of marine mammals in Lynn Canal or Berners Bay.

Marine Birds – Marine birds nest in old-growth forest along the coast of Lynn Canal. Traffic associated with Alternatives 2 through 2C is likely to inhibit marine birds from nesting, resting, or foraging near the highway. The Kensington Gold Project would have the potential to cause similar impacts. Nesting, resting, and foraging habitat is abundant in the project study area for marine birds. Therefore, the cumulative impact is not expected to have population-level effects on any marine bird species.

Terrestrial Mammals – As indicated in Section 4.10.2.2, Alternatives 2 through 2C in combination with foreseeable future projects would result in the loss of a maximum of 1,240 acres of terrestrial habitat. This represents about one percent of the 117,000 acres of terrestrial habitat in the project study area. This direct loss of habitat for terrestrial mammals would be small compared with the overall available habitat.

Alternatives 2 through 2C in combination with the Kensington Gold Project would have cumulative impacts to brown bears. Depending on the alternative selected for this project, the Kensington Gold Project would result in the loss of 118 to 268 acres of habitat, half of which is upland habitat. This loss was projected to result in an impact to brown bears in the Supplemental EIS prepared for the project (USFS, 2004), but the level of impact was not quantified. Because the Kensington Gold Project would result in the direct loss of a relatively small amount of habitat concentrated at higher elevations than Alternatives 2 through 2C and would not cause habitat fragmentation, the contribution of the Kensington Gold Project on cumulative effects to the brown bear population would be small in comparison to the impact of Alternatives 2 through 2C. The Kensington Gold Project would largely impact brown bear habitat in one contiguous area. Alternatives 2 through 2C would also remove habitat but more importantly create a long, linear barrier to brown bear movement. Because brown bears tend to avoid highways, some bears may abandon portions of their range instead of crossing the highway, effectively reducing the amount of habitat available to them. This is likely to have a greater impact on brown bear than the physical loss of habitat by the highway itself and Kensington Gold Project facilities.

Terrestrial Birds – Terrestrial birds nest in old-growth forest along the coast of Lynn Canal. Traffic associated with Alternatives 2 through 2C is likely to inhibit these birds from nesting, resting, or foraging near the highway. The Kensington Gold Project would have the potential to cause similar impacts. Nesting, resting, and foraging habitat is abundant in the project study area for marine birds. Therefore, the cumulative impact is not expected to have population-level effects on any terrestrial bird species.

Amphibians – As discussed in Section 4.8.2.2, Alternatives 2 through 2C in combination with foreseeable future projects would result in a cumulative loss of 160 to 180 acres of wetlands in the Berners Bay to Comet Landing area. This would represent about 2 percent of the total wetlands habitat available in this area (9,800 acres). Therefore, the cumulative loss of habitat would not have population-level effects on any amphibian species.

4.11.3 Alternative 3 – West Lynn Canal Highway

4.11.3.1 Indirect Effects

Marine Mammals – Alternative 3 does not include any new boat launch facilities and therefore would not increase recreational or commercial use of motorized vessels in Lynn Canal. Some people would likely park at pull-outs along the highway as well as at the Sawmill Cove and William Henry Bay ferry terminals proposed for Alternative 3 to use nearby beaches for recreation (e.g., walking on the beach or launching lightweight vessels such as kayaks). This could cause a temporary disturbance to harbor seals hauled out on nearby beaches. This indirect impact is unlikely to have a population-level effect on harbor seals in Lynn Canal.

Marine Birds – Alternative 3 would likely increase recreational use (i.e., walking along the beach or use of lightweight boats such as kayaks) of Berners Bay and William Henry Bay near the ferry terminals with the availability of parking at the terminals. Disturbance to marine birds from pedestrian traffic and lightweight vessels could cause temporary displacement of resting or foraging birds but this would not affect reproductive success or survival of any of these birds. None of the species considered in this group are normally hunted for sport or subsistence in southeast Alaska.

Terrestrial Mammals – Highway access to the west side of Lynn Canal is likely to increase hunting for black and brown bears, moose, and mountain goats, hunting and trapping for wolves, and trapping for marten and river otters. Black bear harvest in the project study area has been primarily in St. James Bay south of William Henry Bay and in the Haines State Forest south of Haines. Highway access to the west side of Lynn Canal is likely to increase hunting pressure on black bears. The highway would also increase accessibility to the area for recreational activities and thus increase the presence of people along the highway corridor. This could increase human-bear interactions and could occasionally result in bear mortality in defense of life and property. The HCI modeling for the project in the 1997 Juneau Access DEIS indicated that Alternative 3 would reduce black bear habitat capability by about 2 percent compared with current conditions. Most of this reduction would be a result of increased hunting pressure on this species.

Generally, one to two brown bears per year have been taken in the Haines State Forest south of Haines. Improved access to anadromous stream valleys along the highway alignment such as the Sullivan and Endicott river valleys could increase hunting pressure on brown bears. Increased mortality from hunting in areas that were previously only accessible by boat, plus occasional defense of life and property mortality, could lead to more restrictive hunting regulations to protect the local population of brown bears. The HCI modeling conducted for the project in 1997 indicated that Alternative 3 would reduce brown bear habitat capability by about 23 percent compared with current conditions. Most of this decrease would be due to habitat fragmentation because a highway along the west side of Lynn Canal would separate higher elevation denning habitat from important low elevation foraging habitat.

Marten are the most frequently trapped furbearer in the project area and are easy to trap; therefore, they are susceptible to over harvest in easily accessible areas (Barten, 2001). Most marten trapping on the west side of Lynn Canal has taken place between St. James Bay and William Henry Bay, in the Sullivan River valley, and in the Haines State Forest south of Haines.

The introduction of highway access would open new areas to trapping in this species preferred low-elevation old-growth forest habitats. This could cause local depletions of marten in high-quality habitat areas that are easiest to access from the highway, such as the Sullivan River valley. The HCI modeling for the project in 1997 indicated that Alternative 3 would reduce marten capability by about 30 percent compared with current conditions. Most of this reduction would be a result of increased trapping for this species.

River otters are difficult to trap and the skins are difficult to process, so trapping effort is generally dependent on high fur prices (Barten, 2001). The proposed highway would facilitate access for trappers and could contribute to increased trapping pressure on river otters along the west side of Lynn Canal, depending on the economics.

Based on research experience, Dave Person (personal communication, 2004) has found that trapping and hunting are a major source of mortality for wolves. He has lost as many as half of his research animals to hunting in regions where there are roads. Alternative 3 would open the west side of Lynn Canal to increased hunting and trapping pressure on this species. This could impact the wolf population on the west side of the Canal.

Sitka black-tailed deer are primarily located south of William Henry Bay on the west side of Lynn Canal. Improved access north of William Henry Bay with Alternative 3 is not likely to increase hunting pressure on this species because of low population numbers in this region.

Moose distribution is more widespread on the west side of Lynn Canal than on the east side. St. James Bay, William Henry Bay, the Endicott River Valley, and the southern part of the Chilkat River Valley all have populations that are connected with larger herds in Glacier Bay and the Chilkat River Valley (Hessing, 2002c). Alternative 3 crosses about six miles of moose winter habitat in the vicinity of the Sullivan and Endicott rivers and the Chilkat Valley area. Access to this area would increase hunting pressure on these herds, leading to changes in game management efforts.

Mountain goat populations on the west side of Lynn Canal have received little hunting pressure because of lack of access. Alternative 3 traverses a number of avalanche paths and river valleys that would provide access points for hunters to hike up into mountain goat habitat. This could result in an increase in hunting pressure on these goats, leading to changes in game management efforts.

Terrestrial Birds – None of the terrestrial bird species considered in this analysis are subject to sport or subsistence hunting and do not rely on prey species that would be susceptible to increased hunting or trapping pressure. Some birds may be temporarily disturbed as a result of increased recreational use of the project study area with Alternative 3. This indirect effect would not have population-level effects on any of these species.

Amphibians – Indirect effects of Alternative 3 on amphibians would be very small because potential recreational activities are not likely to take place to any great extent in their preferred wetland habitats.

4.11.3.2 Cumulative Effects

Marine Mammals – Alternative 3 in combination with the Kensington Gold Project would cumulatively increase ferry traffic in Berners Bay. This could increase disturbance to harbor seals. However, harbor seals use a variety of haulouts. There are alternative spots for them to rest if they are temporarily displaced from a particular location. Therefore, the cumulative

increase in disturbance at haulouts is not likely to affect the survival or reproductive success of this species.

Increased marine traffic with the Kensington Gold Project and Alternative 3 would increase the risk of vessel collisions with marine mammals. Because collisions between marine mammals and vessels, particularly ferries, are rare, this increased risk is not likely to affect populations of marine mammals in Lynn Canal or Berners Bay.

Marine Birds – Marine birds nest in old-growth forest along the coast of Lynn Canal. The Alternative 3 highway from Echo Cove to Sawmill Cove and the Kensington Gold Project would have a cumulative effect on these birds in the Berners Bay area. Marine birds are likely to avoid nesting, resting, or foraging in the vicinity of these projects. Nesting, resting, and foraging habitat is abundant in the project study area for marine birds. Therefore, the cumulative impact is not expected to have population-level effects on any marine bird species.

Terrestrial Mammals – As indicated in Section 4.10.2.3, Alternative 3 in combination with foreseeable future projects would result in the loss of about 1,030 acres of terrestrial habitat. This represents about 0.9 percent of the 117,000 acres of terrestrial habitat in the project study area. This direct loss of habitat for terrestrial mammals would be small compared with the overall available habitat.

Alternative 3 in combination with the Kensington Gold Project would have cumulative impacts to brown bears. Depending on the alternative selected for this project, the Kensington Gold Project would result in the loss of 118 to 268 acres of habitat, half of which is upland habitat. This loss was projected to result in an impact to brown bears in the Supplemental EIS prepared for the project (USFS, 2004), but the level of impact was not quantified. The 5-mile road segment from Echo Cove to Sawmill Cove may create a barrier to the movement of brown bear from higher elevation denning habitat to lower elevation foraging habitat near the coast. The HCI modeling done for the project in 1997 indicates that this road could reduce the habitat capability of brown bear by eight percent compared to current conditions. Most of this reduction would result from habitat fragmentation. These impacts would take place on opposite sides of Berners Bay, with the Kensington Gold Project impacting brown bears northwest of the bay and Alternative 3 impacting brown bear southeast of the bay.

Terrestrial Birds – Terrestrial birds nest in old-growth forest along the coast of Lynn Canal. The Alternative 3 highway from Echo Cove to Sawmill Cove and the Kensington Gold Project would have a cumulative effect on these birds in the Berners Bay area. Terrestrial birds are likely to avoid nesting, resting, or foraging in the vicinity of these projects. Nesting, resting, and foraging habitat is abundant in the project study area for marine birds. Therefore, the cumulative impact is not expected to have population-level effects on any marine bird species.

Amphibians – As discussed in Section 4.8.3.2, Alternative 3 in combination with foreseeable future projects would result in a cumulative loss of 106 acres of wetlands in the Berners Bay area. This would represent about 3 percent of the total wetlands habitat available in this area (4,030 acres). Therefore, the cumulative loss of habitat would not have population-level effects on any amphibian species.

4.11.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.11.4.1 Indirect Effects

Alternatives 4A and 4C would not alter access in Lynn Canal or result in the construction of new transportation facilities. Therefore, it would not have indirect impacts on wildlife.

4.11.4.2 Cumulative Effects

Alternatives 4A and 4C would not have direct or indirect effects on wildlife; therefore, these alternatives would not have cumulative effects on wildlife.

4.11.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.11.5.1 Indirect Effects

Marine Mammals – Alternatives 4B and 4D do not include any new boat launch facilities and therefore would not increase recreational or commercial use of motorized vessels in Lynn Canal. Some people would likely park at the Sawmill Cove ferry terminal proposed for these alternatives to use nearby beaches for recreation (e.g., walking on the beach or launching lightweight vessels such as kayaks). This could cause a temporary disturbance to harbor seals hauled out on nearby beaches. This indirect impact is unlikely to have a population-level effect on harbor seals in Lynn Canal.

Marine Birds – Some people would likely park at the Sawmill Cove ferry terminal proposed for Alternatives 4B and 4D to use nearby beaches for recreation (e.g., walking on the beach or launching lightweight vessels such as kayaks). This could disturb marine birds and waterfowl resting and foraging in near-shore areas. This type of disturbance could cause temporary displacement of birds, but would be unlikely to affect reproductive success or survival.

Terrestrial Mammals – Highway access from Echo Cove to Sawmill Cove is likely to increase hunting pressure on black bears in this area. The highway would also increase accessibility to the area for recreational activities and thus increase the presence of people along the highway corridor. This could increase human-bear interactions and could occasionally result in bear mortality in defense of life and property.

Marten are the most frequently trapped furbearer in the project area and are easy to trap; therefore, they are susceptible to over harvest in easily accessible areas (Barten, 2001). Most of the marten presently trapped in the project study area come from the Berners Bay area. The introduction of highway access to Sawmill Cove could increase the intensity of trapping trapping in the small portion of the bay that would be made accessible.

River otters are difficult to trap and the skins are difficult to process, so trapping effort is generally dependent on high fur prices (Barten, 2001). The proposed highway would facilitate access for trappers as far north as Sawmill Creek.

Terrestrial Birds – None of the terrestrial bird species considered in this analysis are subject to sport or subsistence hunting and do not rely on prey species that would be susceptible to increased hunting or trapping pressure. Some birds may be temporarily disturbed as a result of increased recreational use of the project study area with Alternatives 4B and 4D. This indirect effect would not have population-level effects on any of these species.

Amphibians – Indirect effects of Alternatives 4B and 4D on amphibians would be very small because potential recreational activities are not likely to take place to any great extent in their preferred wetland habitats.

4.11.5.2 Cumulative Effects

Marine Mammals – Alternatives 4B and 4D in combination with the Kensington Gold Project would cumulatively increase ferry traffic in Berners Bay. This could increase disturbance to harbor seals. However, harbor seals use a variety of haulouts. There are alternative spots for them to rest if they are temporarily displaced from a particular location. Therefore, the cumulative increase in disturbance at haulouts is not likely to affect the survival or reproductive success of this species.

Increased marine traffic with the Kensington Gold Project and Alternatives 4B and 4D would increase the risk of vessel collisions with marine mammals. Because collisions between marine mammals and vessels, particularly ferries, are rare, this increased risk is not likely to affect populations of marine mammals in Lynn Canal or Berners Bay.

Marine Birds – Marine birds nest in old-growth forest along the coast of Lynn Canal. The highway from Echo Cove to Sawmill Cove for Alternatives 4B and 4D and the Kensington Gold Project would have a cumulative effect on these birds in the Berners Bay area. Marine birds are likely to avoid nesting, resting, or foraging in the vicinity of these projects. Nesting, resting, and foraging habitat is abundant in the project study area for marine birds. Therefore, the cumulative impact is not expected to have population-level effects on any marine bird species.

Terrestrial Mammals – As indicated in Section 4.10.5.2, Alternatives 4B and 4D in combination with foreseeable future projects would result in the loss of about 670 acres of terrestrial habitat. This represents about 0.6 percent of the 117,000 acres of terrestrial habitat in the project study area. This direct loss of habitat for terrestrial mammals would be small compared with the overall available habitat.

Alternatives 4B and 4D in combination with the Kensington Gold Project would have cumulative impacts to brown bears. Depending on the alternative selected for this project, the Kensington Gold Project would result in the loss of 118 to 268 acres of habitat, half of which is upland habitat. This loss was projected to result in an impact to brown bears in the Supplemental EIS prepared for the project (USFS, 2004), but the level of impact was not quantified. The 5-mile road segment from Echo Cove to Sawmill Cove may create a barrier to the movement of brown bear from higher elevation denning habitat to lower elevation foraging habitat near the coast. The HCI modeling done for the project in 1997 indicates that this road could reduce the habitat capability of brown bear by eight percent compared to current conditions. Most of this reduction would result from habitat fragmentation. These impacts would take place on opposite sides of Berners Bay, with the Kensington Gold Project impacting brown bears northwest of the bay and Alternatives 4B and 4D impacting brown bear southeast of the bay.

Terrestrial Birds – Terrestrial birds nest in old-growth forest along the coast of Lynn Canal. The highway from Echo Cove to Sawmill Cove for Alternatives 4B and 4D and the Kensington Gold Project would have a cumulative effect on these birds in the Berners Bay area. Terrestrial birds are likely to avoid nesting, resting, or foraging in the vicinity of these projects. Nesting, resting, and foraging habitat is abundant in the project study area for marine birds. Therefore, the cumulative impact is not expected to have population-level effects on any marine bird species.

Amphibians – As discussed in Section 4.8.5.2, Alternatives 4B and 4D in combination with foreseeable future projects would result in a cumulative loss of 106 acres of wetlands in the Berners Bay area. This would represent about 3 percent of the total wetlands habitat available in this area (4,030 acres). Therefore, the cumulative loss of habitat would not have population-level effects on any amphibian species.

4.12 Bald Eagles

4.12.1 Indirect Effects

The No Action Alternative and Alternatives 4A and 4C would not alter access in Lynn Canal or result in the construction of new transportation facilities. Therefore, these alternatives would have no indirect effects on bald eagles.

4.12.2 Cumulative Effects

The No Action Alternative and Alternative 4A and 4C would have no direct or indirect effects on bald eagles; therefore, these alternatives would have no cumulative effects on bald eagles.

Past, present, and reasonably foreseeable future projects in combination with Alternatives 2 through 2C, 3, 4B, and 4D would result in the loss of a small amount of habitat, but no loss of known nest trees or food sources for bald eagles. In light of the ability for bald eagles to habituate to human presence, the cumulative impact of increased human presence in the region is not likely to have a population-level effect on bald eagles.

The build alternatives for the proposed project, Alternatives 2 through 2C, 3, 4B, and 4C, would include highways on either the east or west side of Lynn Canal. These highways would increase access for outdoor recreation. This could result in the disturbance of eagle nests by hikers and campers. Alternatives 2 and 2C would have the greatest potential for this indirect impact because these alternatives include the longest highway, extending from the end of Glacier Highway at Echo Cove north to Skagway. Alternatives 4B and 4D would have the least potential for this indirect impact because these alternative would include only a new five-mile long highway from Echo Cove to Sawmill Cove.

4.13 Threatened and Endangered Species

4.13.1 Alternative 1 – No Action

4.13.1.1 Indirect Effects

The No Action Alternative would not alter access in Lynn Canal or result in the construction of transportation facilities. Therefore, the No Action Alternative would have no indirect effect on threatened and endangered species.

4.13.1.2 Cumulative Effects

Humpback Whales – Humpback whales are only occasionally seen inside Berners Bay (Marston *et al*., 2002; U.S. Fish and Wildlife Service [USFWS], 2003), and are present there most frequently during the spring when they enter the bay to feed on spawning herring and eulachon. The Slate Creek and Cascade Point marine facilities proposed for the Kensington Gold Project would introduce regular commercial marine traffic to Berners Bay. This would increase the potential for marine vessel collisions with humpback whales in Berners Bay.

Steller Sea Lions – Steller sea lions are attracted to spring spawning aggregations of eulachon and Pacific herring in Berners Bay and occasionally use a haulout on the point of land that forms the southwestern corner of Slate Cove during this time of year. Construction and operation of the Kensington Mine marine facility in Slate Cove could disrupt Steller sea lions during the herring and eulachon spawning periods and would increase the potential for marine vessel collisions with Steller sea lions.

4.13.2 Alternatives 2, 2A, 2B, and 2C – East Lynn Canal Highway Alternatives

4.13.2.1 Indirect Effects

Humpback Whales – Alternatives 2 through 2C would not include any new boat launching facilities in Lynn Canal. Therefore, these alternatives would have no indirect effects on humpback whales.

Steller Sea Lions – In response to NMFS concerns about potential pedestrian access and disturbance at the Gran Point and Met Point haulouts, highway design elements have been incorporated into Alternatives 2 through 2C that are intended to prevent motorists from leaving the highway corridor and approaching these haulouts. The measures include steep embankments and 8- to 10-foot-high concrete barriers within 3,000 feet of either haulout. DOT&PF would monitor the effectiveness of these design elements after highway construction and make additional changes, if necessary, to keep people away from these haulouts. The ferry terminal at Slate Cove proposed for Alternative 2A would be approximately two miles from the sea lion haulout at Point St. Mary. Although this haulout is potentially accessible to pedestrians along the beach at low tide, the difficulty of traversing the rocky shoreline and adjacent forested area would deter most people from walking out to the area.

4.13.2.2 Cumulative Effects

Humpback Whales – Alternative 2A in combination with Coeur's proposed Slate Cove and Goldbelt's proposed Cascade Point marine facilities for the Kensington Gold Project would increase the potential risk for marine vessel collisions with humpback whales using Berners Bay in the spring. Because of the low incidence of vessel collisions and the infrequent use of Berners Bay by humpback whales, this cumulative effect is not likely to adversely affect this whale population.

Steller Sea Lions – Alternative 2A in combination with Coeur's proposed Slate Cove and Goldbelt's proposed Cascade Point marine facilities could disrupt Steller sea lions preying on euchalon and Pacific herring runs in Berners Bay and increase the potential for marine vessel collisions with sea lions. Ferries would travel across the bay about every 45 minutes. As ferries and other marine vessels come near, sea lions may move away from them. It is unlikely that these cumulative effects would adversely affect the Steller sea lion population because the marine vessels associated with Alternative 2A and the foreseeable future projects would be relatively slow and maintain a steady course, and the risk of collision is very small.

4.13.3 Alternative 3 – West Lynn Canal Highway

4.13.3.1 Indirect Effects

Alternative 3 does not include any new boat launch facilities and is thus unlikely to increase recreational or commercial use of motorized vessels in the area. Therefore, this alternative would not have indirect effects on threatened and endangered species in Lynn Canal.

4.13.3.2 Cumulative Effects

Humpback Whales – The Sawmill Cove ferry terminal for Alternative 3 in combination with Coeur's proposed Slate Cove and Goldbelt's proposed Cascade Point marine facilities would increase the potential risk for marine vessel collisions with humpback whales using Berners Bay in the spring. Because of the low incidence of vessel collisions and the infrequent use of Berners Bay by humpback whales, this cumulative effect is not likely to adversely affect this whale population.

Steller Sea Lions – The Sawmill Cove ferry terminal in combination with Coeur's proosed Slate Cove and Goldbelt's proposed Cascade Point marine facilities could disrupt Steller sea lions preying on euchalon and Pacific herring runs in Berners Bay and increase the potential for marine vessel collisions with sea lions. It is unlikely that these cumulative effects would adversely affect the Steller sea lion population.

4.13.4 Alternatives 4A and 4C – FVF from Auke Bay and Conventional Monohull Shuttle Service from Auke Bay

4.13.4.1 Indirect Effects

Since Alternatives 4A and 4C do not include any new facilities or access that would increase recreational or commercial use of marine areas important to humpback whales or Steller sea lions, these alternatives would have no indirect effects on threatened and endangered species.

4.13.4.2 Cumulative Effects

Alternatives 4A and 4C in combination with the Kensington Gold Project would increase marine vessel traffic in Lynn Canal. This would increase the risk of collisions with humpback whales. Because such collisions are rare, it is unlikely that this increased risk would adversely affect this humpback whale population.

4.13.5 Alternatives 4B and 4D – FVF from Berners Bay and Conventional Monohull Shuttle Service from Berners Bay

4.13.5.1 Indirect Effects

Alternatives 4B and 4D do not include any new boat launch facilities and would not increase recreational or commercial use of motorized vessels in Lynn Canal. Therefore, these alternatives would have no indirect effects on threatened and endangered species.

4.13.5.2 Cumulative Effects

Humpback Whales – The Sawmill Cove ferry terminal for Alternatives 4B and 4D in combination with Coeur's proposed Slate Cove and Goldbelt's proposed Cascade Point marine facilities for the Kensington Gold Project would increase the potential risk for marine vessel collisions with humpback whales using Berners Bay in the spring. Because of the low incidence of vessel collisions and the infrequent use of Berners Bay by humpback whales, this cumulative effect is not likely to adversely affect this whale population.

Steller Sea Lions – The Sawmill Cove ferry terminal in combination with Coeur's proposed Slate Cove and Goldbelt's proposed Cascade Point marine facilities could disrupt Steller sea lions preying on euchalon and Pacific herring runs in Berners Bay and increase the potential for marine vessel collisions with sea lions. It is unlikely that these cumulative effects would adversely affect the Steller sea lion population.

5.0 LIST OF PREPARERS

Name and Education	*Responsibility*	*Professional Experience*
Tom Baily MS Plant Ecology BS Plant Ecology	Cumulative Effects Technical Report	URS, Principle-in-Charge, 30 years experience
Barry Bergdoll BS Civil Engineering	Project Management	URS, Senior Transportation Engineer, 35 years experience
Joyce Payne MS Agricultural Biology and Entomology BS Agricultural Biology	Technical Review, and Coordination	URS, Senior Biologist, 7 years experience
Sue Ban MS Biological Oceanography BS Biology	Technical Lead for Anadromous Fish and EFH	URS, Senior Biologist, 18 years experience
Kim Busse BS Biology	Wetlands	URS, Biologist, 5 years experience
Dave Erikson MS Biology BS Wildlife Biology	Technical Lead for Wetlands, and Technical Review for Bald Eagle, Wildlife, and Steller Sea Lion	URS, Senior Biologist, 18 years experience
Jim Glaspell MS Wildlife Management BS Forest Technology	Technical Lead for Land Use	URS, Associate Biologist, 30 years experience
Tara Howell BA Environmental Science	Technical Review and Editing	URS, Environmental Scientist, 5 years experience
Richard Kleinleder MS Biology BS Biology and Environmental Studies	Technical Lead for Steller Sea Lion, Bald Eagle, and Wildlife	URS, Biologist/Ecologist, 20 years experience
Joan Kluwe PhD Natural Resources MS Forestry BS Forestry	Technical Lead for Socioeconomics	URS, Environmental Scientist, 13 years experience
Richard Knox BLA Landscape Architecture	Technical Lead for Visual Resources	URS, Environmental Planner, 8 years experience
Anne Maki MS Environmental Science BS Environmental Science	Technical Lead for Water Quality and Hydrology	URS, Environmental Scientist, 3 years experience

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6.0 REFERENCES

Alaska Department of Fish and Game (ADF&G). 2003a. Commercial Fisheries Entry Commission, Reports. ADF&G Charter Vessel Registration List. Accessed from Internet: http://www.cfec.state.ak.us/

ADF&G. 2003b. Southeast Alaska Black Bear Management. Federal Aid Survey and Inventory Performance Report. Unit 1D. ADF&G, Division of Wildlife Conservation, Juneau, Alaska.

Alaska Department of Natural Resources (ADNR), Division of Mining, Land, and Water, Resource Assessment and Development Section, Division of Forestry. 2002. *Haines State Forest Management Plan*. August

Alaska Department of Transportation and Public Facilities (DOT&PF). 1995. *Land Use and Coastal Zone Technical Report*. Juneau Access Improvements. Prepared by ADOT&PF, Southeast Region for Federal Highway Administration, Alaska Division. April.

DOT&PF. 1997. *Juneau Access Draft Environmental Impact Statement (DEIS)*. Report prepared, by ADOT&PF, Southeast Region for Federal Highway Administration, Alaska Division.

Alaska Legislature. 2002. *Bill to help open mine gets hearing*. Accessed from website: http://alaskalegislature.com/stories/061902/minebill.shtml.

Barten, N. 2001. Unit 1C and 1D furbearer management reports. Pages 23-34 *in* C. Healy, editor. Furbearer management report of survey and inventory activities 1 July 1997 - 30 June 2000. Alaska Department of Fish and Game. Project 7.0 Juneau Alaska. Available on-line: http://www.state.ak.us/adfg/wildlife/geninfo/pub/division_reports/fur01mt_se.pdf Accessed on October 26, 2003.

Barten, N. 2002a. Unit 1C black bear management report. Pages 35-52 *In* C. Healy, editor. Black bear management report and inventory activities 1 July 1998 - 30 June 2001. Alaska Department of Fish and Game. Project 17.0 Juneau Alaska. Available on-line at http://www.state.ak.us/adfg/wildlife/geninfo/pub/division_reports/mblb02.pdf. Accessed on October 26, 2003.

Barten, N. 2002b. Unit 1C moose management report. Pages 20-41 *in* C. Healy, editor. Moose management report of survey and inventory activities 1 July 1998 - 30 June 2000. Alaska Department of Fish and Game. Project 1.0 Juneau Alaska. Available on-line: http://www.wildlife.alaska.gov/pubs/techpubs/mgt.cfm Accessed on November 17, 2003.

Barten, N. 2002c. Unit 1C. Mountain goat management report. Pages 32-37 *in* C. Healy, editor. Mountain goat management report of survey and inventory activities 1 July 1999 - 30 June 2001. Alaska Department of Fish and Game. Project 12.0 Juneau Alaska. Available on-line: http://www.wildlife.alaska.gov/pubs/techpubs/mgt_rpts/goa02mt_se.pdf. Accessed on November 17, 2003.

Bradford, S. 2003. Haines Water and Sewer Department, personal communication. December 23.

Coeur Alaska, Inc. (Coeur). 2002. Kensington Gold Project. Alaska Slate Creek Cove Marine Terminal. Department of the Army Corps of Engineers Section 404 Permit Application. Prepared for Coeur Alaska, Inc., Juneau, AK. October.

Committee for Noxious and Invasive Plants Management (CNIPM). 2004. Invasive Plants. Alaska Committee for Noxious and Invasive Plant Management. Cooperative Extension Service. P.O. Box 75-8155, Fairbanks, Alaska, 99775-8155. Available on-line at http://www.cnipm.org/plants.html. Accessed February 19, 2004.

Federal Energy Regulatory Commission (FERC). 2002. Final Environmental Assessment for Hydropower License, Otter Creek Hydroelectric Project, FERC Project No. 11588-001, Alaska.

Gladden, T. 2003. City of Skagway Water and Wastewater, personal communication, December 23.

Goldbelt, Inc. (Goldbelt). 1996. *Echo Cove Master Plan*. March.

Goldbelt. 1998. *Cascade Point Access Highway Final Environmental Impact Statement (FEIS) and Record of Decision*. Prepared for USFS, Tongass National Forest, R10-MB-368.

Goldbelt. 2003. Echo Cove Master Plan Cascade Point Terminal Department of the Army Corps of Engineers Section 404 Permit Application. No. 2-1997-0245, Berners Bay 4. Prepared by Earthworks Technologies, Inc., Couer d'Alene, ID. May.

Groot, C. and L. Margolis. 1991. Pacific Salmon Life Histories. Univ. British Columbia Press, Vancouver, British Columbia, Canada. 564 pp.

Hessing, P. 2002a. Unit 1D black bear management report. Pages 53-68 *In* C. Healy, editor. Black bear management report and inventory activities 1 July 1998 - 30 June 2001. Alaska Department of Fish and Game. Project 17.0 Juneau Alaska. Available on-line at http://www.wildlife.alaska.gov/pubs/techpubs/mgt_rpts/blb02.pdf. Accessed on October 26, 2003.

Hessing, P. 2002b. Unit 1D Mountain goat management report. Pages 43-47 *in* C. Healy, editor. Mountain goat management report of survey and inventory activities 1 July 1999 - 30 June 2001. Alaska Department of Fish and Game. Project 12.0 Juneau Alaska. Available on-line: http://www.wildlife.alaska.gov/pubs/techpubs/mgt_rpts/goa02mt_se.pdf. Accessed on November 17, 2003.

Hessing, P. 2002c. Unit 1D Moose Management Report. Pages 45-54 *in* C. Healy, editor. Moose management report of survey and inventory activities 1 July 1998 – 30 June 2000. Alaska Department of Fish and Game. Project 1.0 Juneau, Alaska. Available on-line: http://www.wildlife.alaska.gov/pubs/techpubs/mgt.cfm. Accessed November 17,2003.

Jeffers, S. 2004. Juneau Douglas Wastewater Utility Division, personal communication, January 12.

Marston, B.H., M.F. Willson, and S.M. Gende. 2002. Predator aggregations during eulachon *Thaleichthys pacificus* spawning runs. Marine Ecology Progress Series 231: 229-236.

Municipality of Anchorage (MOA) Watershed Management Program. 2000. Receiving Water Chemistry at Select Streams in Anchorage, Alaska: 2000 Data Report. Prepared by CH2M Hill, Inc., Anchorage, Alaska.

Pearson, W.H., R.A. Elston, R.W. Bienert, *et al*. 1999. Why Did the Prince William Sound, Alaska, Pacific Herring (*Clupea Pallasi*) Fisheries collapse in 1993 and 1994? Review of Hypotheses: Canadian Journal of Fisheries and Aquatic Sciences, v. 56, no. 4, p. 711-737.

Person, D. 2004. Personal communication.

Porter, B. 2001. Unit 1 brown bear management report. Pages 1-17 *In* C. Healy, editor. Brown bear management report of survey-inventory activities, 1-July 1998-30 Jun 2000. Alaska Department of Fish and Game. Project 4.0 Juneau Alaska. Available on-line at http://www.wildlife.alaska.gov/pubs/techpubs/mgt_rpts/mbr01_R1_2.pdf. Accessed on October 26, 2003.

Romey, L. 2004. Pacific Seaflight, personal communication. Jan 13, 10:30 am.

Shepard et al. 2002. A Change to Catch the Problem Early. *State and Private Forestry*. USFS, Alaska Region.

Smith, W.E. and R.W. Saalfeld. 1955. Studies on Columbia River Smelt (*Thaleichthys pacificus*). Washington Department Fisheries, Fisheries Research Paper 1 (3): 3-26.

Suring, L., D.C. Crocker-Bedford, R.W. Flynn, C. Hale, G.C. Iverson, M.D. Kirchhoff, T.E Scheneck II, L.C. Shae, and K. Titus. 1992. A strategy for maintaining well-distributed viable populations of wildlife associated with old-growth forest in Southeast Alaska. Report by an interagency committee. Alaska Dept. of Fish and Game, Juneau Alaska.

Union of Concerned Scientists (UCS). 2003. Invasive Species in Alaska. Research report published on UCS website, Cambridge, MA. 16 pp. Available on-line: www.ucsusa.org. Accessed 15 December 2003.

United States Army Corps of Engineers (USACE). 2003. Public Notice of Application for Permit. Alaska Glacier Seafood Company, Juneau, AK. Reference No. M-1999-1426. December 31.

USACE. 2004a. Notice of Application for permit, Goldbelt, Inc. Cascade Point Mooring Facilities.

USACE. 2004b. Notice of application for permit, Coeur Alaska, Inc. Slate Cove Marine Terminal.

United States Department of Transportation (USDOT) and Federal Highway Administration (FHWA). 1987. Guidance for Preparing and Processing Environmental and Section 4(f) Documents, FHWA Technical Advisory T6640.8A. Octover 30.

U.S. Fish and Wildlife Service (USFWS). 2003. Wildlife and Human Use of the Shoreline and Near-shore Waters of Berners Bay, Southeast Alaska. Preliminary report. February. 25 pp.

United States Forest Service (USFS). 1992. Kensington Gold Project Final Environmental Impact Statement. Tongass National Forest. R10- MB-159. Vol I. February.

USFS. 1997. Kensington Gold Project Final Supplemental Environmental Impact Statement. Tongass National Forest. R10-MB-343. Vols. I & II. August.

USFS. 1998. Cascade Point Access Highway Final Environmental Impact Statement (FEIS) and Record of Decision. Prepared for USFS, Tongass National Forest, R10-MB-368.

USFS. 2002a. Kensington Gold Project. Amended Plan of Operations. Supplemental Environmental Impact Statement. Scoping Document. Juneau Ranger District. September.

USFS. 2002b. Final Environmental Assessment for Hydropower License. Otter Creek Hydroelectric Project. Prepared for Federal Energy Regulatory Commission (FERC), Office of Energy Projects. FERC Project #11588-001, Alaska.

USFS. 2003. Tongass Land Management Plan Revision Final Supplementary Environmental Impact Statement, Roadless Area Evaluation for Wilderness Recommendations. R-10-MB-481a. U.S. Department of Agriculture, U.S. Forest Service, Alaska Region. Available on-line: http://www.tongass-seis.net/seis/index.html. Accessed September 26, 2003.

USFS. 2004. Kensington Gold Project Draft Supplemental Environmental Impact Statement. Prepared by Tetra Tech, Inc., 143 Union Boulevard, Suite 1010, Lakewood, CO 80228.

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