Auke Bay

Corridor Study

Reconnaissance Study

Volume I of II

Prepared by USKH, Inc. for
The Alaska Department of Transportation & Public Facilities

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INTRODUCTION

The Alaska Department of Transportation and Public Facilities (Department) is studying alternatives that address the existing and anticipated capacity and safety deficiencies in the Auke Bay Area. This Engineering Reconnaissance Report contains the results of the Department's preliminary traffic and engineering studies, identifies environmental issues, presents alternatives, and comments a preferred engineering solution for project development.

This document represents the thinking and design decisions as of the date of this report. Changes frequently occur during the environmental and design process. Persons who may rely on information contained in this document should check with the Department for the most current design. For this information contact the Preliminary Design Group Chief, (907) 465-1851 or contact the Engineering Manager, (907) 465-4493.

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APPENDICES

ACRONYMS

AADT .....Average Annual Daily Traffic
AASHTO .....American Association of State Highway and Transportation Officials
ABCor ..... Auke Bay Corridor Study
AMHS .....Alaska Marine Highway System
BOP .....Beginning of Project
CAC .....Citizen's Advisory Committee
CBJ .....City and Borough of Juneau
CTWLTL ..... center-two-way-left-turn-lane
DOT&PF .....Alaska Department of Transportation and Public Facilities
EOP .....End of Project
GB..... AASHTO Green Book
HCM ..... Highway Capacity Manual
ITE .....Institute of Transportation Engineers
LOS ..... Level of Service
MOE..... Measure of Effectiveness
NMFS ..... National Marine Fisheries Service
NOAA ..... National Oceanic and Atmospheric Administration
O-D..... Origin Destination
PCM ..... ADOT&PF Highway Preconstruction Manual
PSC ..... Project Steering Committee
PSA ..... Public Service Announcement
PTR.....Permanent Traffic Recorder
ROW .....Right of Way
TRB ..... Transportation Research Board
v/c ..... Volume Over Capacity
UAS ..... University of Alaska Southeast
WB-50 .....semi trailer with 50-foot wheelbase

1. EXECUTIVE SUMMARY

Glacier Highway connects Egan Drive and the center of Juneau with destinations on the western side of the Mendenhall Valley, including the Auke Bay Ferry Terminal of the Alaska Marine Highway System (AMHS), the University of Southeast (UAS) campus, the Auke Bay harbor and "out-the-road" residential and recreational areas. The corridor also comprises part of the primary route between the Juneau downtown core and the alternative transportation hubs consisting of the Juneau International Airport and the Ferry Terminal.

This report documents the activities of the Auke Bay Corridor (ABCOR) Study initiated by the Alaska Department of Transportation and Public Facilities (DOT&PF). The purpose of the project was to identify current and possible future transportation problems along and across Glacier Highway, between the Fritz Cove Road intersection and the Ferry Terminal and evaluate solutions that safely and efficiently accommodate existing and future travel demands. The recommended improvements balance competing demands of local trips within the Auke Bay area with through trips to or from downtown Juneau. Each has been the subject of extensive public scrutiny and is designed to provide safe and efficient access along and across Glacier Highway for all modes of transportation: pedestrians, bicycles, public transit, automobiles, trucks, and commercial vehicles. DOT&PF will use the results of this study as it undertakes further design and begins the environmental process consistent with the requirements of the National Environmental Policy Act (NEPA).

This report, prepared by USKH, Inc., documents the preliminary evaluation of the existing and future transportation system, environmental conditions, and socio-economic conditions that guided DOT&PF in developing the Engineering Preferred Alternative for the corridor. A comprehensive public involvement process helped educate the public about issues and possible solutions and informed the project team of key issues and concerns of the public. The functional layouts of alternative transportation systems created during the course of this study attempted to balance the potentially competing demands of local and through trips along and across Glacier Highway for all modes of transportation. The resulting Engineering Preferred Alternative and its associated phasing strategy allow improvements to be built over time as funding and transportation needs dictate.

1.1 Summary of Activities

The project began in September 2002. Concurrent with the technical scope of work was a public involvement plan aimed at involving and informing Juneau citizens in all phases of the project. Of initial importance was to work with a Citizen Advisory Committee (CAC) to develop a set of project goals.

The initial analyses focused on assessing existing conditions in the study area. These were transportation (traffic volumes, number of lanes on the roadways, safety history); natural environment (wetlands, bald eagles, fish streams); and the built environment (land use, employment, types of businesses). From these current conditions, a forecast of future traffic was analyzed.

Considering the assessment of existing transportation and environmental conditions, the project team prepared a Preliminary Draft Purpose and Need statement to identify why improvements are needed in the corridor. These items will be refined and analyzed further as DOT&PF carries recommendations from this planning level into the environmental stage (NEPA process).

The Preliminary Draft Purpose and Need statement led to the development and analysis of several transportation system concepts to address the needs previously identified and evaluated at a qualitative level. After consideration from DOT&PF, the CAC and the general public, some were eliminated and others modified as subjects for a more detailed evaluation.

Subsequent to the initial brainstorming and evaluation of concepts, the three most viable alternatives were studied. Out of this evaluation came the development of the Department's Engineering Preferred Alternative, a combination of Alternatives 1 and 3.

1.2 Project Goals and Objectives

Goals and objectives for the project were developed by the CAC and the Project Steering Committee (PSC) at the beginning of this study. These are presented in the table below. From these, measures of effectiveness were prepared. The measures of effectiveness were used to compare the alternatives.

Goals and Objectives

Goals				
	To create a safe corridor	To balance accessibility and mobility	To develop a project that is compatible with the human and natural environment	To develop a project that is feasible
Objectives	Meet current design standards for vehicles, bicycles, and pedestrians	Improve travel efficiency for local and through traffic	Minimize impacts to the natural environment	Develop a project that is financially feasible
	Reduce the number and severity of accidents	Increase pedestrian and bicycle connectivity and mobility	Minimize social and economic impacts	Develop a project that has community acceptance
	Accommodate future traffic volumes	Maintain or improve access for emergency response	Actively involve the public	
	Investigate and address roadside boat trailer parking	Maintain or improve access for elementary school and UAS	Be consistent with existing and future land use plans	
	Accommodate mixed-use activities (education, tourism, recreation)		Enhance the community of Auke Bay	

1.3 Existing Conditions

Glacier Highway, along with Egan Drive, comprises the major transportation corridor between the Juneau downtown core, the Mendenhall Valley residential and commercial areas, the UAS campus, the Auke Bay Harbor, and "out-the-road" residential areas. The corridor also comprises part of the primary route between the Juneau downtown core and the alternative transportation hubs consisting of the Juneau International Airport and the AMHS Auke Bay Ferry Terminal (Ferry Terminal). The DOT&PF classifies this corridor as an Urban Principal Arterial.

The project limits include the portion of the Glacier Highway between Fritz Cove Road and the Ferry Terminal. This portion of highway is essentially a two lane paved arterial with shoulders and, along some sections, adjoining sidewalks. There are three major intersections: Fritz Cove Road, the UAS south entrance, and Back Loop Road. None of the intersections are signalized. The route is further characterized by a sweeping spiral curve by the Auke Bay Lab that is substandard and a series of horizontal and vertical curves in the Auke Nu Creek area. Traffic volumes on Glacier Highway have remained fairly stable within the study area over the past several years.

Owners in the project area are private parties. City and Borough of Juneau (CBJ), UAS, State of Alaska Division of Mental Health, State of Alaska Department of Natural Resources, U.S. Forest Service, and NOAA.

There are nine anadromous fish streams in the project area. Wetlands and eagle trees are also located in the project area.

Speed, collisions, and geometry are also issues of concern in the project area. DOT&PF confirmed that drivers exceed speed limits throughout the project corridor. The collision severity in the Auke Bay Corridor is higher than the statewide average. Furthermore, statistical significance tests indicate that the minor injury collisions are much higher than average. Four horizontal curves on Glacier Highway have radii that are less than the minimum radii for both the posted and design speeds.

1.4 Preliminary Draft Purpose and Need

The issues outlined above led to development of a Preliminary Draft Purpose and Need Statement for the project. These concepts, reviewed and modified by the CAC, served as the principle guide developing the possible solution.

The purpose of the Auke Bay Corridor project is to improve surface transportation along the Glacier Highway corridor, between Fritz Cove Road and the Alaska Marine Highway System (AMHS) Ferry Terminal. The needed improvement should provide sufficient capacity to safely handle the traffic demands for a 20-year design life.

- Improve the safety of identified intersections and segments
- Improve the substandard geometric design deficiencies along the existing road alignment
- Provide more reliable, efficient, convenient, and cost effective movement throughout the corridor
- Enhance non-motorized access on, off and across the corridor

1.5 Alternatives Considered

- Alternative 1 - This alternative follows the existing corridor with widening, realignments and intersection improvements.
- Alternative 2 - Under this alternative, a bypass is developed to the north of Glacier Highway between the new Guard facility and the Ferry Terminal. All through traffic would continue through

part of the corridor (Fritz Cove Road to DeHart's), but would have an option of using the bypass instead of the existing Glacier Highway between DeHart's and the Ferry Terminal.

- Alternative 3 - This alternative develops a complete bypass that would allow outbound Glacier Highway traffic, Back Loop Road traffic to avoid the current corridor. It would provide efficient access for UAS traffic and provide alternative access for traffic generated in the DeHart's to Auk Nu Drive area.

No Build Alternative – The no build alternative would consist of maintaining the roadways and the current configuration of the intersections. All intersections would be stop sign controlled on minor approaches

1.6 Preferred Engineering Alternative

The DOT&PF recommends combining Alternatives 1 and 3 into out Engineering Preferred Alternative. Alternative 1 consists of immediate, near-term improvements, and Alternative 3 provides future, long-term improvements. The Engineering Preferred Alternative would be constructed in phases.

Near-Term

- Construct a roundabout at the Fritz Cove Road, University of Alaska Southeast (UAS) south entrance, Glacier Highway intersection.
- Use a two-lane section through Auke Bay but add a left turn lane for Auke Bay Lab.
- Construct sidewalks on both sides of Glacier Highway from Fritz Cove Road to the Spaulding Meadows Trail parking lot.
- Construct a roundabout at the Glacier Highway and Mendenhall (Back) Loop Road intersection.
- Correct curves near Auke Bay Post Office and Stabler's Point.
- Add sidewalks to both sides of Back Loop Road from Glacier Highway to the North UAS Access intersection.

Long-Term

- Plan a complete bypass of the Auke Bay community that starts at Industrial Blvd., follows the east side of Hill 560, crosses Back Loop Road at Goat Hill and continues behind the community of Auke Bay and connects to Glacier Highway near Auke Nu Creek.
- Add a connection from the bypass to Back Loop Road at the north UAS access.
- Use a roundabout at the Back Loop Road, north UAS access and bypass intersection.
- Add sidewalks to both sides of the bypass connector from Back Loop Road to the UAS/National Guard Joint Use facility.

DOT&PF intends to move ahead on the near-term improvements as funding becomes available. Assuming that the near-term improvements are constructed by 2009, the traffic and operations analysis indicates that the long-term improvements may be needed by 2019. The long-term improvements would

also be phased. The bypass segment between Industrial Boulevard and Goat Hill on Back Loop Road would be constructed as the first phase.

The second long-term phase would construct the bypass from Goat Hill to Stabler's Point. Included in this phase would be the connection between the bypass alignment and the North UAS Access. This connection would replace the UAS/National Guard Joint Use facility access road now under construction. The second phase would also include the seawalk/multi-use path between the Spaulding Meadows trailhead and the Ferry Terminal. The seawalk could be advanced to the first long term phase, added to the near-term improvements, or constructed as a separate project.

2. INTRODUCTION

2.1 Reconnaissance Report

This report is a summary of work completed as part of the Auke Bay Corridor Reconnaissance Study. This report contains the results of preliminary traffic and engineering studies, identifies environmental issues, presents alternatives, and recommends an Engineering Preferred Alternative solution for project development. It also has references to the appendices of this report for those readers wishing more detailed data and analysis.

2.2 Project Description

Glacier Highway connects Egan Drive and the center of Juneau with destinations on the western side of the Mendenhall Valley, including the Auke Bay Ferry Terminal of the Alaska Marine Highway System (AMHS), the University of Southeast (UAS) campus, the Auke Bay harbor and "out-the-road" residential and recreational areas. The corridor also comprises part of the primary route between the Juneau downtown core and the alternative transportation hubs consisting of the Juneau International Airport and the Ferry Terminal. The Alaska Department of Transportation and Public Facilities (DOT&PF or Department) classifies this corridor as an Urban Principal Arterial. Glacier Highway north of Auke Bay was named Veterans Memorial Highway in 1989 to honor Juneau veterans; however, for simplicity, the highway will be called Glacier Highway in this report.

The project limits are Glacier Highway, from Fritz Cove Road to the Auke Bay Ferry Terminal. It also includes a portion of Mendenhall (Back) Loop Road, from the UAS entrance to the Wye. This portion of highway is essentially a two lane paved arterial with shoulders and, along some sections, adjoining sidewalks. There are major intersections: Fritz Cove Road, the UAS north entrance, and Back Loop Road. None of the intersections are signalized. The route is further characterized by a sweeping spiral

curve by the National Oceanic and Atmospheric Administration (NOAA) research facility that is substandard and a series of horizontal and vertical curves in the Auke Nu Creek area. Traffic volumes on Glacier Highway have remained fairly stable within the study area over the past several years.

The project study area will be referred to in this report as the Auke Bay Corridor – abbreviated as ABCor.

2.3 Previous Study Activity

Originally, the scope of this project included the entire Auke Bay Corridor. However, in 1998, two separate projects were created. The rationale for the split was due to the difference in scope of the improvements required in the Fritz Cove Road to Seaview Avenue and the Seaview Avenue to Ferry Terminal segments. The first segment, (Fritz Cove Road to Seaview Avenue) it was thought, may require major realignment and therefore will need a full reconnaissance investigation with the development of several alternative improvements. Further it was thought the scope of required improvements in the Seaview Avenue to Ferry Terminal section of the Glacier Highway would not require a complete reconnaissance study.

During these two studies, DOT&PF did preliminary traffic and engineering studies but not to the level of a reconnaissance report. Also, no formal investigations for previously proposed alternative alignments had been completed.

2.4 Recent Work in the Study Area

The Fritz Cove Road and Glacier Highway intersection was rebuilt in 1995. Pavement was removed to improve the approach of turning vehicles from Fritz Cove Road.

An asphalt overlay was constructed during the summer and fall of 1998 from Seaview Avenue to the Ferry Terminal as part of the Auke Nu Curve Reconstruction project (AKSAS No. 67613). That project originated as a Highway Safety Improvement Program project in order to correct a subgrade and pavement failure at the “Auke Nu” curve. The project scope was expanded to include the pavement overlay by using National Highway System Pavement and Bridge Refurbishment funds.

2.5 Study Area

The eastern limit of the study area is along the western side of Montana Creek from Back Loop Road to Glacier Highway. The eastern limit includes the intersection of Glacier Highway and Industrial Boulevard. The western limit is along Glacier Highway just past the Ferry Terminal. The northern boundary includes all of Auke Lake and UAS campus. The southern boundary includes a portion of Auke Bay. The study area is shown below.

For the purposes of this report we used the following terminology to refer to locations and directions.

- Mendenhall Back Loop Road as Back Loop Road,
- The Glacier Highway and Back Loop Road (aka the DeHart's/Glacier) intersection as the Wye
- The AMHS Auke Bay ferry terminal as the Ferry Terminal,
- Toward downtown Juneau as inbound, and
- Toward the end of the road as outbound.
- NOAA Research Facility as the Auke Bay Lab

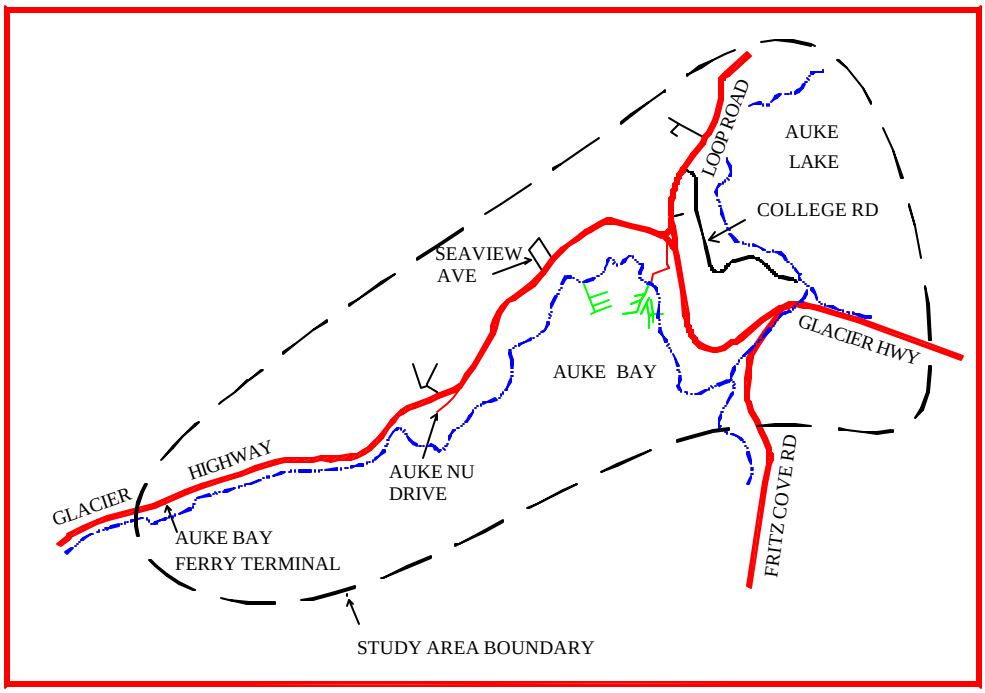


Figure 1

3. PRELIMINARY DRAFT PURPOSE AND NEED

3.1 Purpose

The purpose of the Auke Bay Corridor project is to improve surface transportation along the Glacier Highway corridor, between Fritz Cove Road and the Ferry Terminal. The improvement should provide sufficient capacity to safely handle the traffic demands for a 20-year design life.

3.2 Need for the Action

The following statements highlight the needs for the project. A more detailed discussion of each statement follows.

- Improve the safety of identified intersections and segments
- Improve the substandard geometric design deficiencies along the existing road alignment
- Provide more reliable, efficient, convenient, and cost effective movement throughout the corridor
- Enhance non-motorized access on, off and across the corridor

3.2.1 Improve Safety

The collision severity in the Auke Bay Corridor is higher than the statewide average. Furthermore, statistical significance tests indicate that the minor injury collisions are much higher than average. The following trends were identified and warrant attention.

- The Back Loop Road and Glacier Highway intersection system has a high collision rate, with a significant rear-end collision frequency. Figure 2 shows areas of conflicts between turning traffic and through traffic in the Wye intersection area.
- The Auke Nu Drive to Ferry Terminal segment on Glacier Highway has a high collision rate associated with its alignment. Contributing factors include road surface conditions and speed.
- Back Loop Road, between University Drive and the UAS entrance, has a high collision rate. Of particular concern at this location were two pedestrian collisions – one of which resulted in a fatality. Figure 3 presents the view approaching the intersection of the UAS entrance and Back Loop Road.

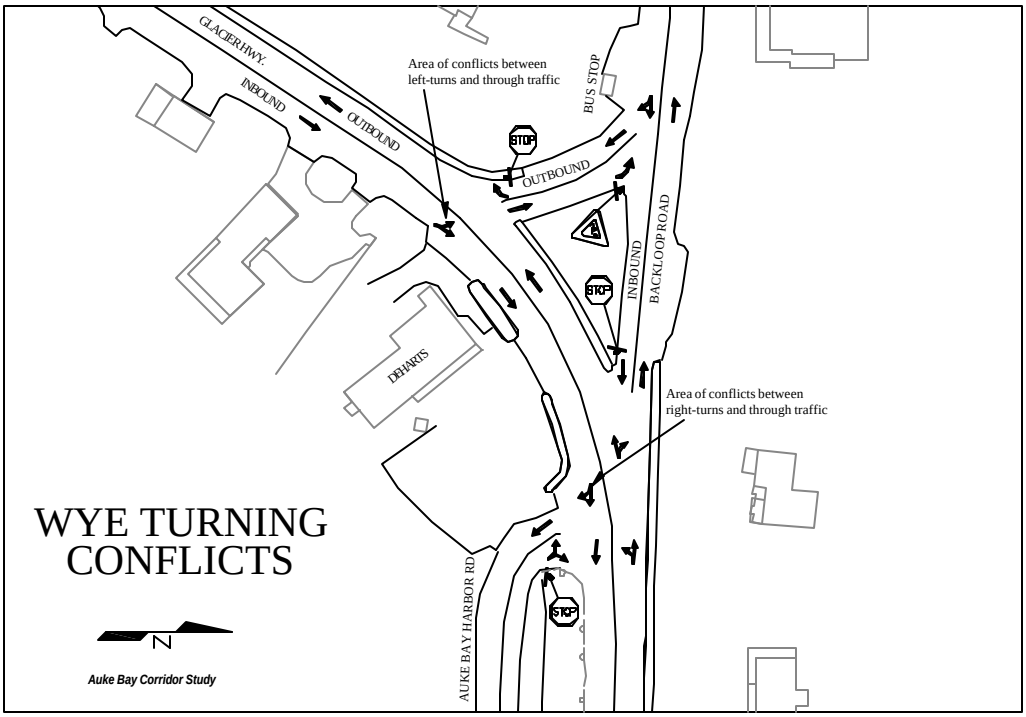


Figure 2

- A conflict analysis conducted at Fritz Cove Road and Glacier Highway shows a high number of conflicts between outbound right-turns into UAS and through vehicles. Figure 4 demonstrates these areas of conflicts.

Figure 3

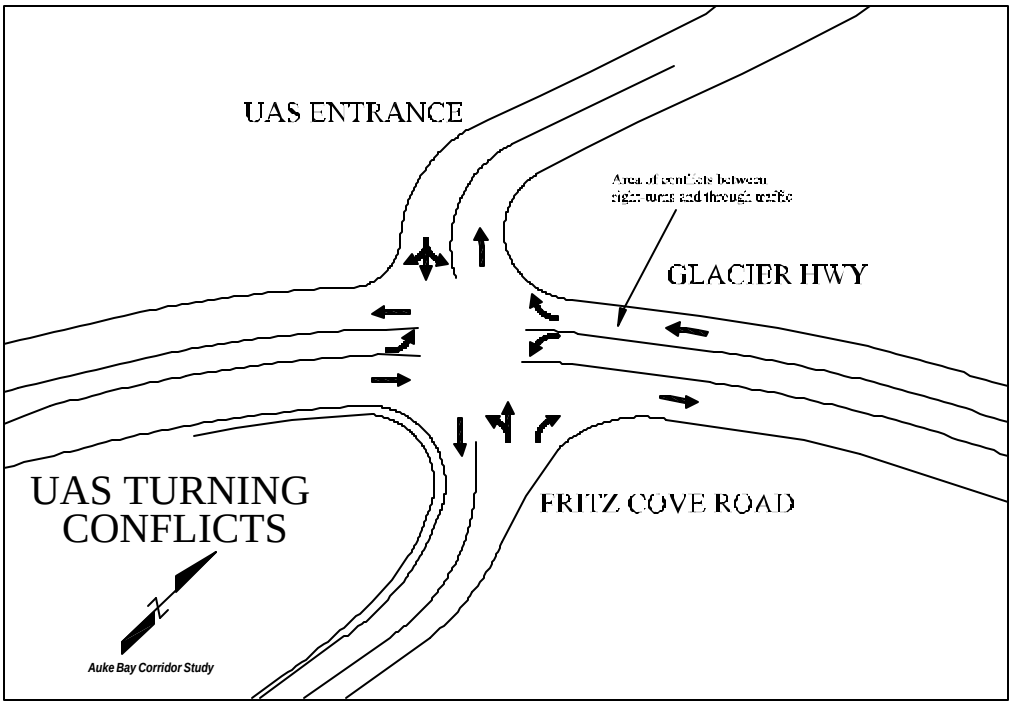


Figure 4

3.2.2 Improve Geometric Deficiencies

- Four horizontal curves on Glacier Highway have radii that are less than the minimum radii for both the posted and design speeds.

- The existing alignment employs spiral transition curves, reverse curves and compound curves – all features that may be unexpected by drivers. Figure 5 demonstrates the dangerous features of the curve near the Auke Bay Lab.

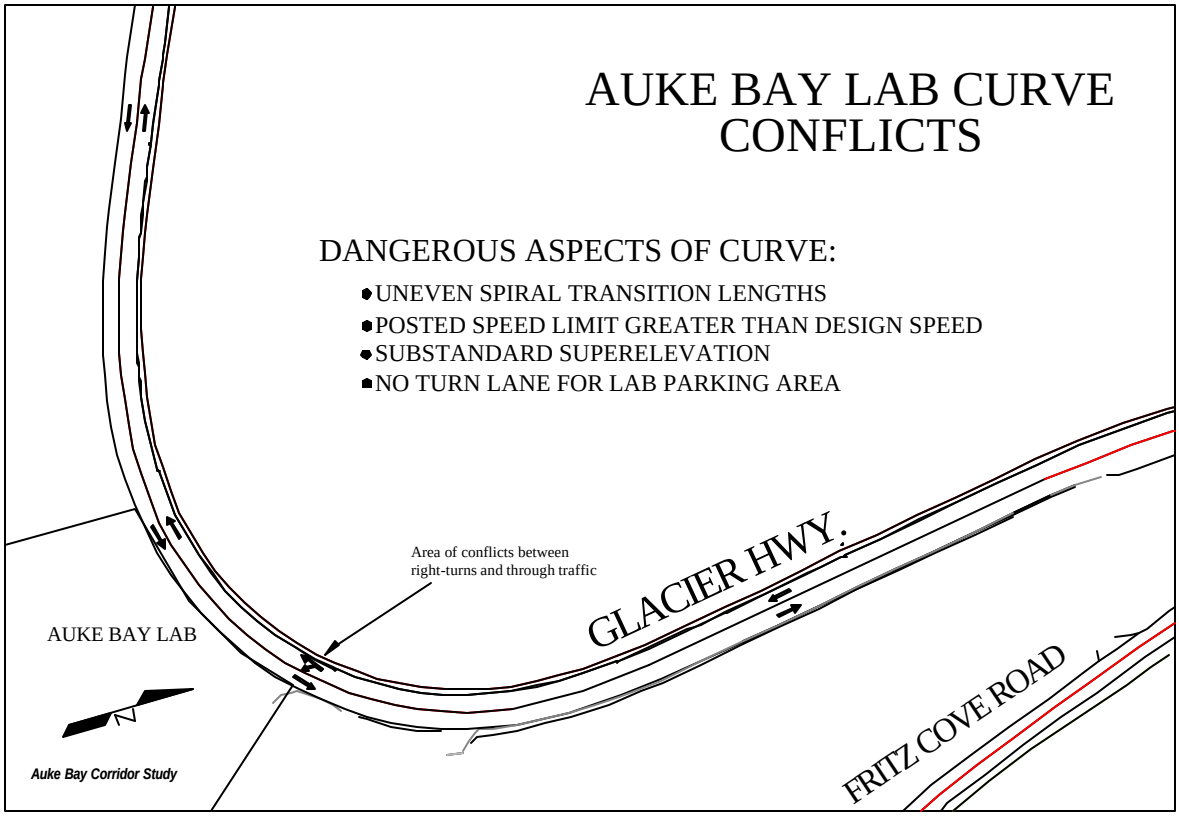


Figure 5

- All intersections meet the minimum standards for sight distance, but several intersections are less than desirable sight distance lengths. Figure 6 demonstrates the view looking inbound towards Juneau from the Auke Bay Lab. Figure 7 demonstrates the view looking inbound toward Juneau from Auke Bay Harbor Road.

Figure 6

Figure 7

- We observed potential sight distance problems at the DeHart's exit due to parked vehicles. Figure 8 shows a delivery truck at DeHart's temporarily blocking the view from the parking lot exit. Figure 9 shows parking areas available that would obstruct the view of traffic inbound to Juneau from exiting cars.

Figure 8

Figure 9

- The Back Loop Road intersection with Glacier Highway has a less than desirable layout. Skew angles on both right and left turn lanes impact the driver's ability to take full advantage of the available sight distance. Figure 10 is the view from Back Loop Road approaching the intersection with Glacier Highway.

Figure 10

- Oxford Street, which provides access to a small subdivision, has a steep approach and no landing before it intersects Glacier Highway.

- Auke Nu Drive also has an undesirable skew angle.

3.2.3 Provide Movement throughout the Corridor

- By 2009 Fritz Cove Road and UAS South Entrance will decline to an evening peak hour Level of Service (LOS) F. LOS is a measurement of how well an intersection accommodates vehicles within an acceptable range of delay. LOS A represents the best service and F is the worst.

- By 2019 the inbound approach of Back Loop Road to Glacier Highway will decline to an evening peak hour LOS F.

- By 2029 the Auke Bay Harbor Road approach will decline to an evening peak hour LOS F.

- By 2019 Glacier Highway will begin to experience unacceptable delays and long queues.

- By 2029 long queues develop behind turning cars and inbound traffic has an average speed of 17 to 19 mph in the peak evening travel time.

3.2.4 Enhance Non-motorized Access

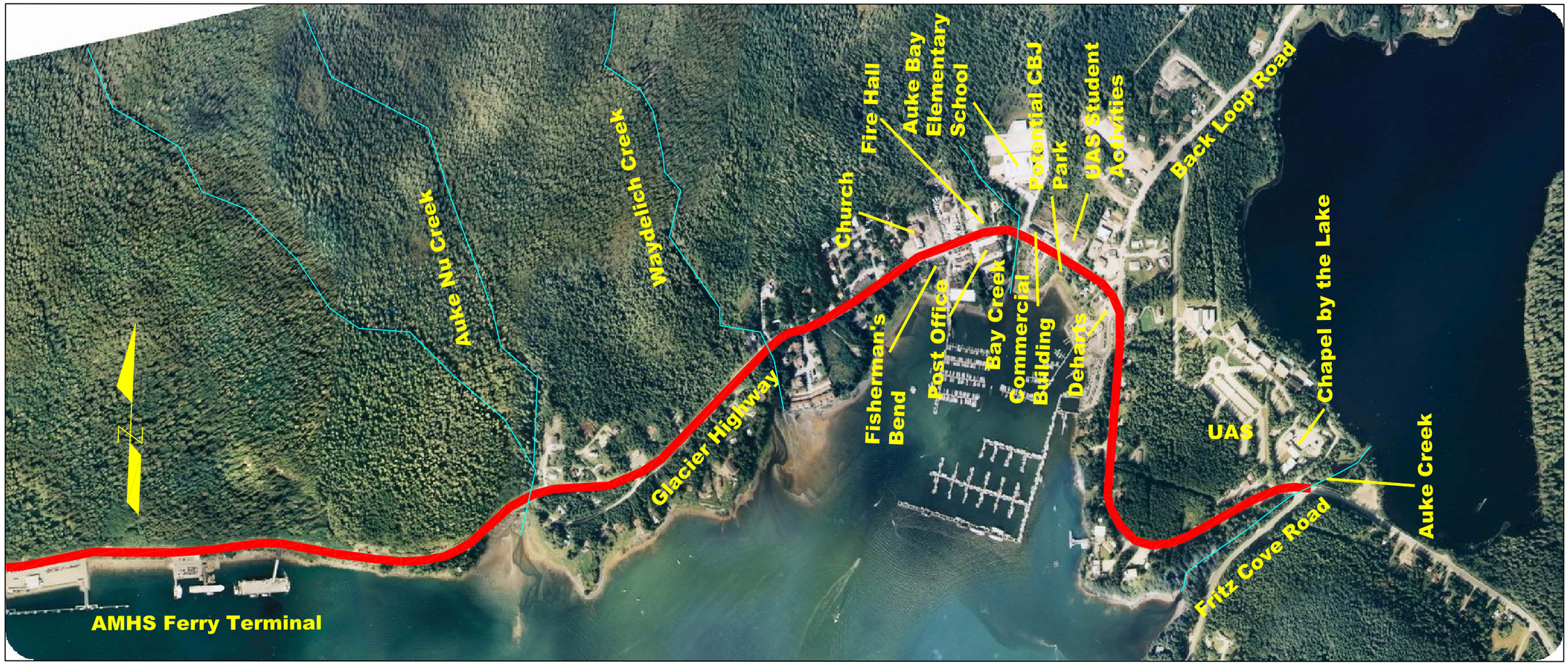
- Two schools (Auke Bay Elementary School and UAS) are located in the project corridor. Elementary students walk and ride their bicycles to school. University students walk to and from campus housing, classes and work. Parents, students and school officials have contacted the Department to express their concerns about the difficulty crossing Glacier Highway. Figure 11 shows the locations of schools and places of social and economic importance in the Auke Bay area.

The corridor is a popular boating and recreation center. Bicyclists and pedestrians commute to school and work, and many others walk and bike for recreation. Many other pedestrians in the area are marina users who walk from remote parking areas to the harbor. Figure 12 presents the locations of existing sidewalk and areas of heavy pedestrian traffic.

FIGURE 11

Auke Bay Corridor Study

Locations of Social and Economic Importance



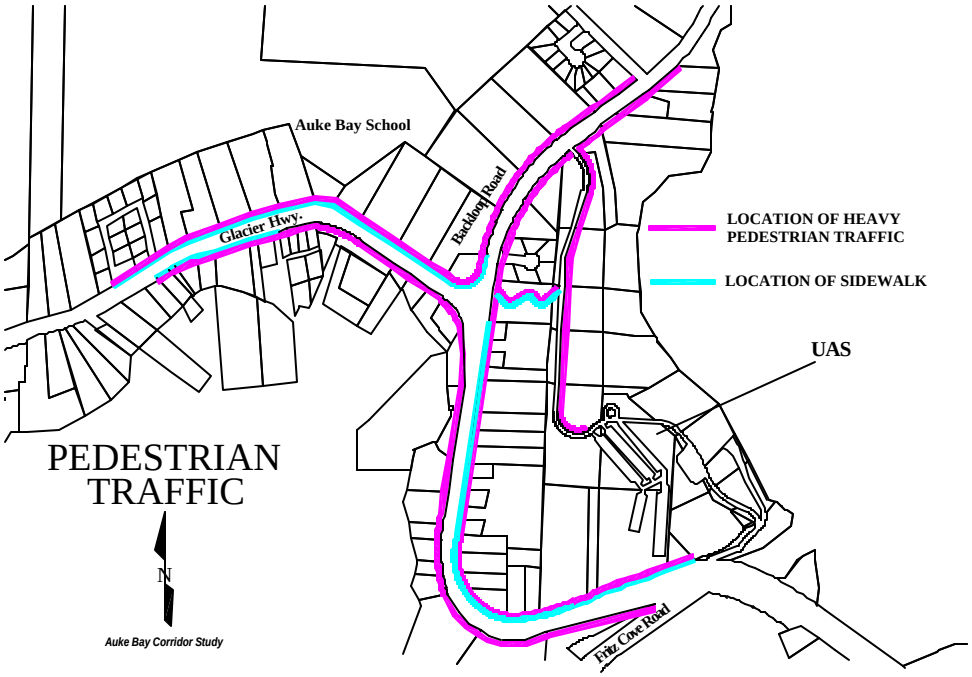


Figure 12

3.3 Compatibility with Existing Plans

According to the City and Borough of Juneau (CBJ) Areawide Transportation Plan of July, 2001 the forecast transportation deficiencies relating to Auke Bay stem from the fact that Glacier Highway is the only arterial through the area as well as the “main street” of the sub-area. Within a relatively congested area, there is a significant difference in travel speeds between motorized vehicles making local or through trips and pedestrians and bicyclists traveling along or across the highway. The plan suggests that this area be designed to adequately serve pedestrians, bicyclists, and local vehicle trips and through vehicle trips.

Further, the plan suggests that improvements for Auke Bay could include traffic calming measures and the construction of a roundabout or traffic signal at the Back Loop Road intersection. This would integrate the intersection with main street/traffic calming treatments through Auke Bay. Traffic calming treatments used may include landscaping, sidewalks on both sides of the street, access management, pedestrian level lighting, bus pullouts/shelters, curb extensions and bicycle lanes. A roundabout could serve as a

gateway treatment and a traffic-calming device in the school area. The plan also suggests including pedestrian crossing amenities between UAS campus facilities that are separated by the highway.

The CBJ 1995 Update to Comprehensive Plan suggests undertaking transportation improvements within Auke Bay to accommodate additional demand resulting from the construction of the Ferry Terminal, boat marina, and other facilities, as well as the expansion of UAS. The plan suggests that the proposed corridor should follow the division between low and medium density residential uses where possible.

The plan also suggests evaluating a corridor realignment of Glacier Highway from its intersection with UAS to Auke Bay and encouraging a new driveway for UAS that avoids the Auke Lake Wayside and minimizes adverse traffic impacts.

Finally, the plan suggests requiring sidewalks and bicycle paths or lanes along existing or newly constructed arterial and collector streets, where appropriate, to provide safe and efficient access and recreation and to reduce pedestrian/automobile conflicts.

The UAS Final Draft Executive Summary Campus Facilities Master Plan, February 2002 presents three site concept options. The recommended plan would establish the north entrance off Back Loop Road as the only public entrance to the core area of the campus. The existing entrance from Glacier Highway would be used for access to Chapel by the Lake property and emergency/service access for the campus.

According to the December 1993 Department of Natural Resources, Juneau State Land Plan, Auke Lake will continue to be managed to support the high public values of the lake including research, water quality, habitat restoration, fisheries management, summer and winter recreation, and landings by aircraft. According to the July 1996, CBJ, Juneau Parks and Recreation Comprehensive Plan, a master plan should be developed for the area around Auke Lake. This report also recommends a trail corridor between UAS student housing and Auke Bay Elementary School to be considered for bicycle and skiing use. Furthermore, the report recommends the reservation of a trail corridor between the Auke Bay Elementary School and the Spaulding Meadows trail so that the Auke Bay school parking lot could provide the necessary overflow parking for the trailhead.

According to Steve Gilbertson, CBJ Lands and Resources Manager, there is a proposed subdivision in the Pederson Hill area. The proposal calls for the development of 350 lots. There are also an additional 330 lots on the Mendenhall Peninsula that could be developed.

4. EXISTING CONDITIONS

4.1 Zoning Information

We obtained zoning information for the project area CBJ. In general the zoning is a mixture of residential, commercial, waterfront commercial and rural reserve. An exhibit depicting the zoning can be found in Appendix A of this report.

4.2 Property Records

We also obtained property ownership information from the CBJ. Owners in the project area are private parties, CBJ, UAS, State of Alaska Division of Mental Health, State of Alaska Department of Natural Resources, U.S. Forest Service, and NOAA. We prepared a map depicting ownership in the project area. An exhibit depicting the property ownership in the project corridor can be found in Appendix B of this report.

4.3 Preliminary Analysis of the Affected Environment

We wrote a report addressing all natural and man made environmental resources and socioeconomic issues. The complete report can be found in Appendix C of this report. Below is a summary of important findings.

4.3.1 Fish Streams

4.3.1.1 Auke Creek

Anadromous Stream Catalog Number: 111-50-10420

Auke Creek flows about 0.3 miles from Auke Lake to salt water in Auke Bay. Auke Creek has runs of coho, pink, chum and sockeye salmon, Dolly Varden, and cutthroat and rainbow trout. Auke Creek provides the primary spawning habitat in the Auke Lake drainage. Most salmon spawning is known to occur in the lower 2000 feet of the stream. Dolly Varden and cutthroat trout use habitat further upstream.

The creek flows under Glacier Highway through three, 6 foot by 6 foot, concrete box culverts 36 feet in length. Gravel, cobbles and riffle boards are present on the bottom of the westernmost box culvert. During the field visits cracks and patched cracks were visible in the concrete of the box culverts. DOT&PF's Bridge Design Section has regularly inspected these culverts and has reported concerns about their structural condition. These culverts are listed as deficient in the nation's bridge inventory.

4.3.1.2 Bay Creek

Anadromous Stream Catalog Number: 111-50-10390

Bay Creek supports both pink and Coho salmon and Dolly Varden. The creek provides spawning habitat for pink salmon in the lower 50 yards of the stream and in the intertidal area. The stream has numerous pools, overhanging banks, logs and dense overhead cover that provide excellent habitat for rearing for Coho salmon.

There is currently no development in the tideland area. On the adjacent uplands to the west of Bay Creek are an 18-unit condominium and the Auke Bay Wastewater Treatment Plant. On adjacent tidelands to the east is undeveloped fill on state-leased tidelands. The 1993 Juneau Fish Habitat Assessment recommended an opportunity to improve spawning habitat below Glacier Highway. The enhancement could consist of excavating a pool at the downstream end of the existing highway culvert along with the importation and stabilization of high quality spawning gravel downstream of the pool for approximately 100 feet.

Bay Creek flows under Glacier Highway through a 4-foot diameter corrugated metal pipe. There was no gravel in the bottom of the pipe. The culvert has a minor amount of rust on the surface. A 2-foot culvert drains directly from an inlet on Glacier Highway into the Bay Creek Culvert.

4.3.1.3 Waydelich Creek

Anadromous Stream Catalog Number: 111-50-10370

Waydelich Creek runs in a southerly direction for about two miles before entering salt water on the west side of Auke Bay. The creek supports pink and chum salmon and Dolly Varden trout. It provides spawning habitat for both species of salmon. This stream has a partial barrier to fish migration at the head of tidewater.

In 1983 a water reservoir for a streamside condominium complex was constructed near the site of a barrier falls. As mitigation for constructing the dams, the developers were required to enhance the spawning area downstream from the dam. The enhanced area has been scoured by heavy stream flows. The Juneau Fish Habitat Assessment recommends re-establishing the spawning area by replacing the spawning substrate that has been washed out.

Waydelich Creek flows under Glacier Highway in a 10-foot diameter corrugated metal pipe culvert. There was no gravel observed in the bottom of the culvert. The inside of the pipe has a minimal amount of surface rust. The culvert is perched.

4.3.1.4 Auke Nu Creek

Anadromous Stream Catalog Number: 111-50-10350

This stream has provides spawning habitat for pink salmon. Only the east fork of the stream is a catalogued fish stream. There is good intertidal spawning area below Glacier Highway.

4.3.1.5 UAJ and MB Creeks

Anadromous Stream Catalog Number: (111-50-10420-2012) and (111-50-10420-2015)

These two streams are small tributaries that enter the northwest corner of Auke Lake. These small streams occasionally dry up during hot weather but provide seasonally important rearing areas for small salmonids. MB Creek also provides some spawning habitat.

4.3.1.6 Lake Creek

Anadromous Stream Catalog Number: (111-50-10420-20210)

Lake Creek is the largest tributary feeding Auke Lake and is a major spawning area for Auke Lake stocks. Most salmon spawning is known to occur in the lower 2000 feet of the stream. Dolly Varden and cutthroat trout use habitat further upstream. The stream provides rearing habitat in pools and has excellent woody cover. The streams rearing potential, however, is compromised by it's steep gradient in the upper reaches. A falls located about one mile upstream from the stream mouth presents a barrier to upstream fish movement.

4.3.1.7 Lake Two Creek

Anadromous Stream Catalog Number: (111-50-10420-2008)

This creek, also known as Little Lake Creek, drains an area of about one square mile directly east of the Lake Creek watershed. This small stream is about one mile long and with a low gradient provides good

spawning and rearing habitat throughout its length. Salmon are known to spawn in the lower half of the stream and trout and char are known to also utilize the upper reaches.

4.3.1.8 Hanna Creek

Anadromous Stream Catalog Number: (111-50-10420-2006)

Hanna Creek is a small drainage that enters the northeast corner of Auke Lake. It is believed that sedimentation from construction of Back Loop Road degraded fish habitat in lower Hanna Creek. This small stream drains a large wetland-beaver marsh area located on the north side of Back Loop Road, which provides good rearing habitat for juvenile salmonids.

4.3.2 Wetlands

The Juneau Wetlands Management Plan was updated in May 1994. A map from the plan has been reproduced and can be found in Appendix C of this report (on page 6 of the Preliminary Analysis of the Affected Environment Report). It presents locations of wetlands, wetland categories and stream locations. It does not present Cowardin classification.

4.3.3 Eagle Trees

A graphic depicting the approximate location of known eagle trees can be found in Appendix C of this report (on page 14 of the Preliminary Analysis of the Affected Environment Report). There are at least four known eagle trees located along Glacier Highway.

4.4 Preliminary Traffic and Engineering

In addition to collecting information about zoning, property ownership and the natural environment, we collected and analyzed data about speed, collisions, geometry of the existing facilities and non-motorized use. A summary of our conclusions follows.

4.4.1 Travel Speeds

Anecdotally we heard that drivers exceed speed limits throughout the project corridor. DOT&PF provided the study team with speed data that confirmed these reports. The table below summarizes the data we used during the study.

Segment	Posted	Average of Mean Speeds	Average of 85th Percentile Speeds
BOP to NOAA Labs	45 MPH	45 MPH	49 MPH
NOAA to Waydelich Creek	35 MPH	37 MPH	42 MPH
Waydelich to Ferry Terminal	45 MPH	51 MPH	56 MPH
Ferry Terminal to EOP	50 MPH	51 MPH	56 MPH

4.4.2 Collision History

We obtained the collision record summaries for collisions that occurred between 1996 and 2000 in the project area. There were 67 collisions recorded during the 5-year study period. Many collisions, especially non-injury accidents, do not get reported. The reported number of collisions may be low by as much as 50 percent.

There are four classifications of collision severity: fatality, major injury, minor injury, and property damage only. We classify a collision based on the most severe injury that occurred. For example, a collision that had two major injuries, one minor injury, and three people with no injuries is classified as major injury.

The study area had one fatality collision (1.5% of total), four major injury collisions (6.0% of total), 25 minor injury collisions (37.3%), and 37 property damage only collisions (55.2%). For readers interested in more detail, please refer to Appendix D for the complete collision and conflict overview study.

4.4.3 Geometric Analysis

Below is a summary of findings from the Geometric Analysis. The complete report is located in Appendix E of this report. We analyzed the following geometric elements:

- Horizontal Curve Radii
- Vertical Grades and Curves
- Cross Section/Clear Zone
- Intersection Sight Distance/Layout

4.4.3.1 Horizontal Curve Radii

Four horizontal curves on Glacier Highway have radii that are less than the minimum radii for both the posted and design speeds – (1) near the Auke Bay Lab, (2) at the intersection with Back Loop Road, (3) near the Auke Bay post office, and (4) at Stabler's Point.

Figure 13 – Auke Bay lab curve looking toward Auke Bay

Figure 14 – NMFS Auke Bay lab curve looking toward Juneau

The curve near the Auke Bay Lab has a tight radius with lead-in transition, or spiral, curves. Transition curves were often used to introduce a circular curve in a natural manner. A spiral curve has a constantly changing radius and approximates the path of a vehicle entering a circular curve, gradually introducing the lateral acceleration associated with changes in the highway alignment. DOT&PF does not use spiral curves in the design of new highway construction and current practice is to replace spiral curves on reconstruction projects.

A few characteristics of this particular curve make it unusual. The entrance and exit spiral curve length are unequal and are longer than typically used at the time the roadway was originally designed. At current design standards the circular curve radius yields an operating speed of 33 mph in an area where the 85th percentile speed is about 49 mph. Also, during a past reconstruction project, the superelevation was flattened to 4 percent. The original design likely called for 8 to 10 percent superelevation and current standards for this type of road recommend 6 percent. These characteristics contribute to the discomfort experienced by drivers on this curve.

The curve at Back Loop Road is also a spiral curve, but is part of a compound curve that drivers do not usually expect. It appears that a reconstruction project flattened a portion of this curve. The substandard curve near the post office includes spirals. Two curves just before Waydelich Creek have more than adequate radii, but are reversing curves. This is a condition that drivers do not expect. These curves are in an area of slower traffic speeds.

The last substandard curve, at Stabler's Point, is part of a series of three curves that are located in a speed zone change area. All three curves have spiral transitions, and although the curves are not reversing, tangent lengths between the curves are shorter than drivers may expect.

4.4.3.2 Vertical Grades and Curves

Vertical grades and curves throughout the project area meet or exceed standards.

4.4.3.3 Cross Section/Clear Zone

The pavement width throughout the corridor is typically 40.5 feet wide. The pavement widens to 52 feet near the Ferry Terminal to allow for a center turn lane. Glacier Highway and Back Loop Road have 8-foot shoulders on both sides of the road. The operating width on the shoulders meets standards for bicyclists. A 5.5-foot sidewalk runs on the right side of the road (facing outbound) from the UAS south entrance to Seaview Avenue. There is a short stretch of sidewalk on the left side in front of the DeHart's parking lot.

Clear zones appear to be generally adequate, with guardrail in areas of steeper side slopes. The guardrail is damaged in many areas and guardrail end treatments do not meet current standards between Fritz Cove Road and Waydelich Creek. The height of guardrail above the roadway appears to be substandard in many areas along this same segment.

Figure 15 - Pedestrians on one side, sidewalk on other

4.4.3.4 Intersection Sight Distance/Layout

All intersections with Glacier Highway are stop-controlled on the side street. Except the Glacier Highway intersection, all intersections with Back Loop Road are stop-controlled on the side street. We measured sight distance at all public street and commercial driveway intersections. All intersections meet the minimum standards for sight distance, but several intersections provide less than desirable sight distance lengths.

Residents report Fritz Cove Road as an intersection with sight distance concerns, especially the inbound traffic on Glacier Highway. The guardrail, or seasonal brush growth, may contribute to feelings of discomfort at this location. We also observed potential sight distance problems at the DeHart's exit. Vehicles parking next to the DeHart's building and in parking spaces along the road can severely restrict sight distance in the direction of inbound traffic.

The Back Loop Road intersection with Glacier Highway has a less than desirable layout. Skew angles on both right and left turn lanes impact the driver's ability to take full advantage of the available sight distance. Auke Nu Drive also has an undesirable skew angle. The ideal intersection layout is to have the minor streets intersect at 90-degree angles.

A former driveway now provides subdivision access to ten lots on the uphill side of Glacier Highway. This private road, now called Oxford Street, was not developed to CBJ standards and is not maintained by CBJ crews. It has a steep approach and no landing where it intersects Glacier Highway. Oxford Street is a gravel road that washes down road debris after rainstorms and contributes to glaciation during the winter months.

4.4.4 Bicycles and Pedestrians

Glacier Highway has a sidewalk on the uphill side from Fritz Cove Road to Seaview Avenue. According to the Institute of Transportation Engineers (ITE) Technical Council Committee 5A-5 Design and Safety of Pedestrian Facilities (1994), all commercial and industrial streets and residential areas along major arterials should have sidewalks on both sides of the street. Further, the guide states that children walking to school should not cross major arterials without some intersection controls in place.
Glacier Highway and Back Loop Road have 8-foot shoulders on both sides of the road. The operating width on the shoulders is more than sufficient for bicyclists. The American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities (1999) recommends a four-foot minimum width with a five-foot width being desirable. The typical riders are children and young adults riding to school and adult recreational riders.

5. SYSTEM ASSESSMENT

This section contains a summary of how we predict the existing system will perform in the next 20 years. These conclusions are based on a forecast study, turning movement counts, peak hour movement study and an origin destination study we conducted at the beginning of this study. The complete forecast report can be found in Appendix F, the turning movement counts can be found in Appendix G, the peak hour movement study in Appendix H and the origin destination study in Appendix I.

5.1 Traffic Forecasts for No-Build Alternative

Future traffic forecasts were developed for the corridor using a combination of methods. Demographic and economic variables were evaluated with a step-wise regression EXCEL add-in routine to determine which ones are meaningful factors in determining Average Annual Daily Traffic (AADT) for each roadway segment. We found that CBJ population and CBJ employment were meaningful independent variables for AADT, and linear equations were developed for individual project roadway segments. Since there are good population and employment forecasts for CBJ, we are able use this in the derived equations to forecast base AADT in the future.

There are several potential developments, anticipated facilities, or transportation improvements, which are well outside of the model equations and are significant traffic generators or would change circulation. These include:

- Juneau Access Road
- Regional and Community Ferry Service as described for Zone 2 of the Southeast Area Transportation Plan (SATP);
- Mendenhall Peninsula Development (330 lots potential development);
- Pedersen Hill Development (350 lots potential development);
- Lena Point Development (NOAA Facility Relocation, 100 lots); and
- University of Alaska Southeast Expansion (UAS Master Plan).

The volumes generated by these developments would overlay the base traffic forecast. The base volume, along with the development traffic constitutes AADT for the No-Build Alternative (Existing Conditions).

Future AADT and peak hour intersection turning movement volumes (see Appendix N) for the no-build alternatives and Engineering Preferred Alternative were derived from the No-Build AADT (see Appendix F) and the Origin-Destination (O-D) Study (see Appendix I) conducted in September 2002. The O-D percentages were assumed unchanged for all future years. The O-D Study was conducted over two days. The resulting trip percentages were different for each day, and we averaged the two percentages for each

O-D pair. We assigned each averaged O-D percentage to a route in each alternative, based on segment travel times in each alternative.

For peak hour turning movements, we estimated the percentage of traffic occurring during morning and evening peaks (also known as "K" for morning or evening, expresses as a percentage) at area Permanent Traffic Recorders (PTR). We then forecasted future peak hour using the product of PTR "K" values and future AADT. Both AADT and turning movements were adjusted using O-D percentages to obtain turning movement counts that were assigned to the same routes as the O-D pairs. We routed UAS traffic to the north entrance to reflect the University's desire to change their main campus entrance.

We balanced all volumes between intersections, and added traffic to account for activity at the new Guard facility north of UAS on Back Loop Road.

5.2 Capacity Analyses of Existing Conditions

The following table presents forecasted AADT by segment at three different stages throughout the planning horizon: the anticipated construction year (2009); the mid-design life year (2019); and, the design year (2029). Choosing a construction year of 2009 allows time for continued project development, including the environmental documentation, right of way acquisition and final design. This insures that the forecasts are projected far enough ahead so that the project meets anticipated needs, not just existing needs, at construction completion.

The mid-design life forecast provides a checkpoint for highway planners. Actual traffic volumes far lower or far higher than the forecast are an indication that earlier studies did not accurately anticipate need. If volumes are lower, planners can delay subsequent improvements. If higher, future improvements may need to be advanced. Design year forecasts represent the traffic volumes for which the improvements are designed to carry.

Year	ADT Element	→ Between →	Auke Bay Terminal	Auke Nu Drive	Auke Bay Harbor Drive	Fritz Cove Road
			Auke Nu Drive	Auke Bay Harbor Road	Fritz Cove Road	Engineers Cut-Off Road
2009	Base		4,300	4,400	8,900	13,400
	Juneau Access		700	700	700	700
	Ferry		350	350	350	350
	Development		370	370	60	100
	UAS		100	100	500	500
	2009 Total AADT		5,820	5,920	10,510	15,050
2019	Base		4,400	4,900	10,100	15,300
	Juneau Access		850	850	850	850

	Ferry		350	350	350	350
	Development		480	480	310	590
	UAS		100	100	800	800
	2019 Total AADT		6,180	6,680	12,410	17,890
2029	Base		4,800	6,100	13,000	19,800
	Juneau Access		1,000	1,000	1,000	1,000
	Ferry		350	350	350	350
	Development		590	590	560	1,060
	UAS		100	100	800	800
	2029 Total AADT		6,840	8,140	15,710	23,010

Morning average and evening 30th highest peak hours were evaluated at the project intersections for the years 2002, 2009, 2019, and 2029.

The southbound, inbound approach of Back Loop Road intersection with Glacier Highway will have an evening peak hour level of service “F” by the year 2019. The Auke Bay Harbor Road approach of its intersection with Glacier Highway will have an evening level of service “F” by 2029. The Fritz Cove and UAS South Entrance approaches to their intersection with Glacier Highway currently have evening peak hour levels of service of “E/F”, and will decline to “F” by 2009. The levels of service of all the intersection fro the years 2002, 2009, 2019 and 2029 can be found in Appendix J. These locations will experience long delays and long queues.

Deterministic Highway Capacity Manual (HCM) methods show that Glacier Highway (evaluated as a two-lane highway) will begin to have operational problems by 2019. Within the Fritz Cove Road to Auke Nu Drive segment, these operational issues will be exacerbated by mid-block and intersection turning vehicles. Microscopic simulation shows that in 2029, long queues develop behind turning vehicles along Glacier Highway from Fritz Cove Road to Auke Nu Creek, and the inbound traffic has an average travel speed of 17 to 18 mph in the evening travel time.

The performance and function of Glacier Highway may be degraded further once steps are taken to solve the intersection issues. Since the roadway is already at a high volume over capacity (v/c) ratio, it is likely any improvements to intersections will decrease the capacity of the Glacier Highway approaches, which then become the controlling factor in the segment capacity. As such, improvements must be considered on a system basis rather than individual spot locations.

5.3 Safety Analyses

5.3.1 Collisions

The collision severity in Auke Bay Corridor is higher than the statewide average. Furthermore, statistical significance tests indicate that the minor injury collisions are much higher than average. The following trends were identified and warrant attention.

- The Back Loop Road and Glacier Highway intersection has a high collision rate, with a significant rear-end collision frequency.
- The Auke Nu Drive to Ferry Terminal segment on Glacier Highway has a high collision rate associated with its alignment. Contributing factors include road surface conditions and speed.
- Back Loop Road, between University Drive and the UAS entrance, has a high collision rate. Of particular concern at this location were two pedestrian collisions – one of which resulted in a fatality.

5.3.2 Conflicts

The conflict analysis at Fritz Cove Road and Glacier Highway shows a high number of conflicts between outbound right-turns into UAS and the through vehicles, but these are expected with large turning volumes. Nonetheless, a right-turn lane would improve the intersection because of the restricted sight-distance and higher approach speeds.

6. DESIGN STANDARDS

6.1 Functional Roadway Classification

Road design criteria are based on the roadway classification. Glacier Highway is considered an Urban Principal Arterial for the entire length of the project.

6.2 Reference Standards

The following reference standards were used in the analysis of existing conditions and alternative improvement.

- AASHTO "A Policy on Geometric Design of Highways and Streets," 4th Edition, 2001.
- ADOT&PF Highway Preconstruction Manual (PCM), Chapters 4, 5, and 11, 2003.
- Transportation Research Board (TRB) "Highway Capacity Manual," 2000.

6.3 Design Criteria

The design criteria established for this project conforms to the current reference standards listed above. DOT&PF identifies this project as a new construction/reconstruction project with 40 to 50 miles per hour (mph) design speeds. Design criteria were developed using pertinent guidelines from the PCM and AASHTO and are presented in the following table.

Criteria Description	Fritz Cove Rd. to Waydelich Creek	Waydelich Creek to Ferry Terminal
Design Year	2029	2026
Design Vehicle	AASHTO WB-50	AASHTO WB-50
Design Speed	40 mph	50 mph
Stopping Sight Distance	275 ft (PCM 1120-5) 305 ft (GB)	400 ft (PCM 1120-5) 425 ft (GB)
Passing Sight Distance	1500 ft (PCM 1120-5) 1470 ft (GB)	1800 ft (PCM 1120-5) 1835 ft (GB)
Maximum Allowable Grade	5% Rolling (PCM 1120-5) 8% Rolling (GB)	5% Rolling (PCM 1120-5) 8% Rolling (GB)
Minimum Allowable Grade	0.30%	0.30%
Minimum Allowable Degree of Curvature	R=535 ft (PCM 1120-5) e=6% R=510 ft (GB)	R=840 ft (PCM 1120-5) e=6% R=835 ft (GB)
Minimum K-value for Vertical Curves: Sag/Crest	64 / 44	96 / 84
Number of Roadways	1	1
Width of Traveled Way	10-12 ft lane in each direction	10-12 ft lane in each direction
Width of Shoulders: Outside/Inside	0 ft w/o ROW (GB) 8 ft w/ ROW (GB) / n/a	0 ft w/o ROW (GB) 8 ft w/ ROW (GB) / n/a
Surface Treatment: Traveled Way/Shoulders	Asphalt Concrete / Asphalt Concrete	Asphalt Concrete / Asphalt Concrete
Side Slope Ratios: Foreslopes/Backslopes	4:1 to 6:1 w/in Clear Zone (PCM Table 1130-8) / 6:1 w/in CZ, 1.5:1 o/s CZ	4:1 to 6:1 w/in Clear Zone (PCM Table 1130-8) / 6:1 w/in CZ, 1.5:1 o/s CZ
Degree of Access Control	Partial	Partial
Bicycle Provisions	4 ft - 8 ft shoulder	Pathway and 4 ft - 8 ft shoulder
Pedestrian Provisions	Sidewalks and shoulders	Pathway and shoulder

7. ALTERNATIVES CONSIDERED

We started the process of developing alternatives by identifying problem areas and brainstorming potential solutions. We then selected the most promising solutions and presented them to the Project Steering Committee (PSC), the Citizen's Advisory Committee (CAC) and the public. These solutions involved stand-alone improvements like traffic calming treatments, intersection improvements and roadway typical sections.

After considering the input we received from the PSC, CAC and the public, we incorporated the potential solutions into seven different concepts that addressed transportation system improvements throughout the entire corridor. A Conceptual Analysis Report was prepared in May 2003 to compare the seven concepts. This report and drawings of the concepts can be found in Appendix K. We developed Measure of Effectiveness (MOE), in conjunction with goals and objectives at the beginning of the study, for use in comparing and analyzing the concepts. The complete list of MOE can be found in Appendix L. We presented these seven concepts to the CAC and PSC to solicit their input with regard to short-listing the three most promising concepts. DOT&PF considered the input from the CAC and PSC and selected three concepts for further study. These selected concepts were developed into the three alternatives presented below.

Forecast traffic volumes are an important consideration when evaluating the alternatives. Our forecast methodology is described in Section 5.1. The following table summarizes AADT for the alternatives.

	Glacier Highway				Back Loop Road		Bypass Alignment		
	Ferry Terminal to Auke Nu Drive	*Auke Nu Drive to Auke Bay Harbor Drive*	*Auke Bay Harbor Drive to Fritz Cove Road*	*Fritz Cove Road to Engineers Cut-Off Road*	*Glacier Hwy to UAS North Access*	*UAS Outbound (Alt 1&2) or to By Pass (Alt 3)*	*UAS Access to West Glacier Hwy*	*Back Loop Road to UAS Access*	*Glacier Hwy (Industrial Blvd) to Back Lop Rd*
Current (2001)	4,117	5,668	7,977	12,013	2532				
2029 No-build and Alternative 1	6,840	8,140	15,710	23,010	4800				
2029 Alternative 2	6,000	7,300	15,710	23,010	7,000	5,900	800		
2029 Alternative 3	6,000	3,600	10,300	12,700	3,000	4,600	3,600	4,800	9,200

Appendix N has diagrams that show intersection turning movements for morning and evening peak hours.

7.1 Alternative 1

This alternative follows the existing corridor with widening, realignments and intersection improvements. Please refer to Figure 16 below.

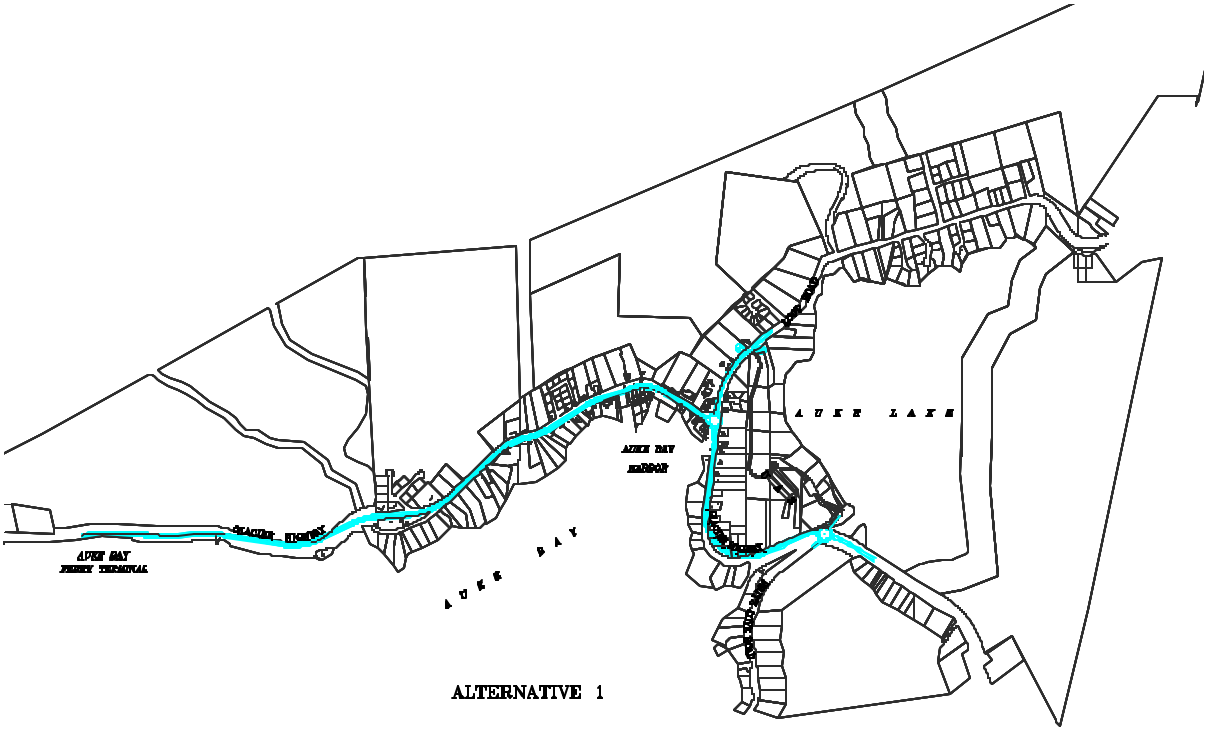


Figure 16

This alternative would widen Glacier Highway between Fritz Cove Road and Waydelich Creek to provide a 3-lane section, with curb and gutter and sidewalks. This "urban" section was crafted to address current and future development, as well as to increase pedestrian and bicycle safety and mobility.

There would be one lane in each direction (inbound and outbound) with a center-two-way-left-turn-lane (CTWLTL). The CTWLTL would provide refuge for left-turning vehicles into driveways and cross-streets, and would be an effective accident prevention measure. Shoulders would serve as breakdown or emergency parking lanes, as well as a bicycle lane.

The curve between Fritz Cove Road and the Auke Bay lab would be realigned to accommodate anticipated design and posted speeds of 35 mph.

Between Waydelich Creek and the Ferry Terminal, the section will have two lanes and shoulders. There would be horizontal curve realignment west of Auk Nu Drive so that safe operating speeds of 45 to 50 mph would be possible. No improvements would be required for Back Loop Road typical section.

Under this alternative, 180-foot diameter, double lane, modern roundabouts would be constructed at the Fritz Cove Road/UAS south entrance intersection, and to replace the Wye intersection with Back Loop Road. The intersection of Back Loop Road with the UAS north entrance and Guard access facility would be unsignalized with stop signs on the UAS and Guard approaches.

7.1.1 Operational Performance

Appendix M should be referenced for signalization warrants and other development details for this alternative. In case of conflicts, the following material in this Alternative 1 discussion supercedes information in the interim document.

7.1.1.1 Intersection Operational Performance

Signalized and unsignalized intersections were evaluated with Syncho/SimTraffic, a software package that uses HCM2000 methods. Roundabouts were evaluated with RODEL software, which uses the empirical methods of Britain. The following tables summarize the 2029 operational performance for the alternative's major intersections.

Alternative 1 2029 AM	**Measure of Effectiveness** (for unsignalized intersections, LOS and v/c are presented for stop controlled approaches)		
Intersection	**LOS**	**v/c**	**Delay (average of all entering vehicles)**
Glacier Hwy-Fritz Cove Road, 4-leg, 180-foot Diameter Roundabout	A	0.45 maximum (eastbound)	4.4 sec/veh
Glacier Hwy-Back Loop Road, 3-leg, 180-foot Diameter Roundabout	A	0.56 maximum (eastbound)	5.7 sec/veh
Back Loop Road-UAS North Entrance-Guard Access, 2-way Stop Controlled Intersection	B-northbound B-southbound	0.05 northbound 0.01 southbound	1.6 sec/veh

Alternative 1 2029 PM	Measure of Effectiveness (for unsignalized intersections, LOS and v/c are presented for stop controlled approaches)		
Intersection	**LOS**	**v/c**	**Delay (average of all entering vehicles)**
Glacier Hwy-Fritz Cove Road, 4-leg, 180-foot Diameter Roundabout	A	0.6 maximum (northbound)	5.7 sec/veh
Glacier Hwy-Back Loop Road, 3-leg 180-foot Diameter Roundabout	A	0.76 max (westbound)	8.9 sec/veh
Back Loop Road-UAS North Entrance-Guard Access, 2-way Stop Controlled Intersection. (Northbound and Southbound approaches should have right-only, shared through-left lanes in design year. Back Loop Road approaches should have left-turn lanes, primarily for safety)	E-northbound C-southbound	0.69 northbound 0.02 southbound	9 sec/veh

Upon construction, the roundabouts will function well with a single circulatory lane and single lane approaches. By 2019, both Roundabouts should have 2-circulatory lanes. Glacier Highway should have two-lane lanes in each direction for approach and departure by 2019.

Northbound and southbound approaches should have right-only, shared through-left lanes in design year at the Back Loop Road-UAS-Guard access stop controlled intersection. Back Loop Road approaches should have left-turn lanes, primarily for safety as a preventative measure to reduce rear-end accidents.

Detailed capacity and geometric reports are found in Appendix N. These intersections largely meet goals and objectives, except that northbound left-through movements will operate at LOS E.

7.1.1.2 Urban Arterial Operation

We evaluated average travel speeds on the proposed cross-sections for this Alternative. We used SimTraffic simulations (average of 30 runs) to estimate speeds.

Alternative 1 2029 Urban Segments	Posted Speed	No-Build, Existing Conditions	Alternative 1 Speeds	HCM Arterial LOS
Glacier Highway, Fritz Cove through Auke Bay Commercial Area	35 MPH (45 MPH to NOAA)	24 MPH	18 MPH	D
Back Loop Road	40-45 MPH	11 MPH	26 MPH	C

These models included driveways and minor street traffic, which impacted travel speeds. LOS D is acceptable for urban areas, especially since the average speeds also include intersection delay. Speeds in motion, therefore, would be higher.

7.1.1.3 Rural Highway Operation Performance Measures

The following table summarizes operations for the rural segment portion of this project. We used the HCM2000 two-lane highway methodology for this analysis.

2029 Operations – Glacier Highway	
ADT	6,840
DHV	750
PHF	0.90
Computed DHV Factor	11%
Directional Distribution (%)	70/30
Percent Recreational Vehicles	N/A
Percent Commercial Trucks	4%
Lane Width	12 feet
Paved Shoulder	8 feet
Terrain	Rolling
Estimated No-Passing Zones	50%
Free Flow (85th reading)	56 mph
Average of Mean Speed S_{FM}	51 mph
Percent Time Following	66%
Volume/Capacity Ratio	0.29
Average Travel Speed	46 mph
Levels of Service	C

7.1.2 Accident Reduction

Crash reductions were estimated for the elements of the proposed alternative. The following table presents the results, which include adjustments for increasing volumes over the life of the project.

Intersection	Proposed Improvements	1996- 2000		Predicted 2029 No Build	Alternative 1 2029 Predicted Accident Performance	
		Average Accidents per Year	Rate (Accidents per Million Entering Vehicles)	Average Accidents per Year	Average Accidents per Year	Rate (Accidents per Million Entering Vehicles)
Glacier Hwy-Ferry Terminal	As is existing, stop-sign controlled "Tee"	1.4	0.95	1.5	1.5	0.95
Glacier Hwy-Back Loop Rd-Auke Bay Harbor Rd	Roundabout	3.6	1.19	7.4	3.7	0.60
Glacier Hwy-Fritz Cove Road-UAS South Access	Roundabout	1.8	0.44	3.5	1.7	0.22
Back Loop Rd- UAS North Access	Channelization Left-turn lane	0.2	0.24	0.8	0.1	0.02
	Totals	7.0		**13.1**	**7.0**	

We conclude that this alternative is effective in addressing accident issues along the corridor.

7.2 Alternative 2

Under this alternative, a bypass is developed to the north of Glacier Highway between the new Guard facility and the Ferry Terminal. All through traffic would continue through part of the corridor (Fritz Cove Road to DeHart's), but would have an option of using the bypass instead of the existing Glacier Highway between DeHart's and the Ferry Terminal. Please refer to Figure 17.

Glacier Highway would be widened to three lanes (inbound and outbound through lanes with CTWLTL), with curb and gutter, sidewalks and shoulders, between Fritz Cove Road and the Wye. Glacier Highway typical section between the Wye and the connection with the Bypass would not be improved except at the intersections. Back Loop Road would not be improved.

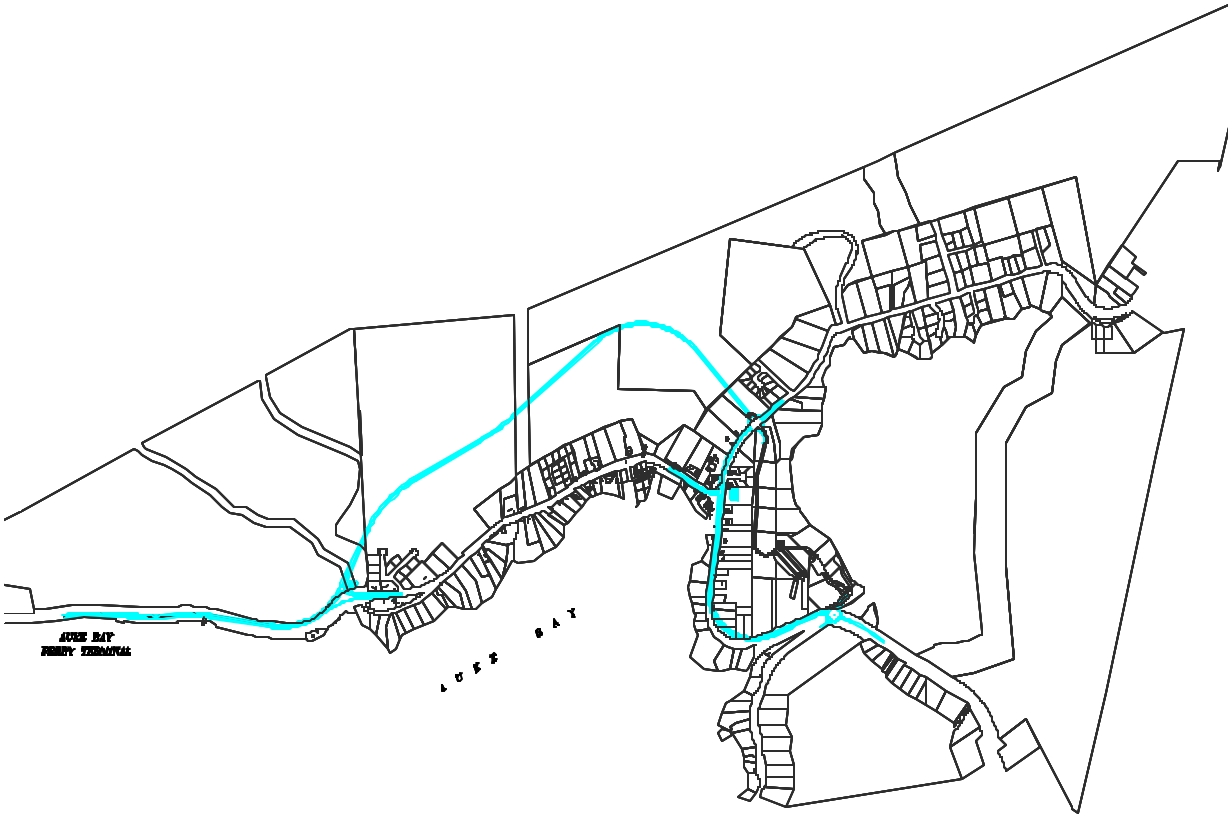


Figure 17

The curve between Fritz Cove Road and the Auke Bay lab would be realigned to meet the geometric design standards. The section of Glacier Highway between Fritz Cove Road and the Wye would continue to have operating speeds of around 35 mph. In addition, portions of Glacier Highway between the Ferry Terminal and the Bypass intersection would be realigned to increase safe operating speeds.

The proposed bypass would be designed to a 50 mph design speed. The typical section on this road would consist of two 12-foot lanes, with 8-foot shoulders.

Modern roundabouts (180-foot, double lane) are proposed for the Fritz Cove-UAS intersection with Glacier Highway and the bypass-UAS intersection with Back Loop Road. The Wye would be realigned and reconfigured into a "tee" intersection, and would have traffic signal control. Other intersections would operate well under stop sign control.

7.2.1 Operational Performance

Appendix M should be referenced for signalization warrants and other development details of this alternative. In case of conflicts, the following material in this Alternative 2 discussion supercedes information in the interim document.

7.2.1.1 Intersection Operational Performance

The following table summarizes intersection performance measures in 2029 for morning and evening peak hours. Appendix N has full capacity reports and geometric requirements.

Alternative 2 2029 AM	**Measure of Effectiveness** (for unsignalized intersections, LOS and v/c are presented for stop controlled approaches)		
Intersection	**LOS**	**v/c**	**Delay**
Glacier Hwy-Fritz Cove Road, 180-foot Diameter Roundabout	A	0.36 maximum (eastbound)	3.1 sec/veh
Glacier Hwy-Back Loop Road, Signal Control	C	0.51	21.3 sec/veh
Back Loop Road-UAS North Entrance-Guard Access, 140-foot Diameter Roundabout	A	0.24 maximum (both MLR approaches)	4.0 sec/veh
Glacier Hwy-Bypass West Terminus, Stop Sign Control	A-northbound	0.07-northbound	1.4 sec/veh

Alternative 2 2029 PM	**Measure of Effectiveness** (for unsignalized intersections, LOS and v/c are presented for stop controlled approaches)		
Intersection	**LOS**	**v/c**	**Delay**
Glacier Hwy-Fritz Cove Road, 180-foot Diameter Roundabout	A	0.76 maximum (westbound)	6.6 sec/veh
Glacier Hwy-Back Loop Road, Signal Control	C	0.82	27.2 sec/veh
Back Loop Road-UAS North Entrance-Guard Access, 140-foot Diameter Roundabout	A	0.43 maximum (northbound)	5.1 sec/veh
Glacier Hwy-Bypass West Terminus, Stop Sign Control	B-northbound	0.40-northbound	8.3 sec/veh

The Glacier Highway and Fritz Cove Road roundabout will function well as a single circulatory lane, with single lane approaches until 2019. After 2019, the roundabout should have two circulatory lanes, and the Glacier Highway approach lanes and departure lanes should be two lanes in each direction.

7.2.1.2 Urban Arterial Operation

We evaluated average travel speeds on the proposed cross-sections for this Alternative. We used SimTraffic simulations (average of 30 runs) to estimate speeds.

Alternative 2 Urban Segments	Posted Speed	No-Build, Existing Conditions	Alternative 2 Speeds	HCM Arterial LOS
Glacier Highway, Fritz Cove through Auke Bay Commercial Area	35 MPH (45 MPH to Auke Bay Lab)	24 MPH	16 MPH	E
Back Loop Road	40-45 MPH	11 MPH	25 MPH	C

The low travel speeds through the commercial area are due in part to the signal.

7.2.1.3 Rural Segments

Glacier Highway between Waydelich Creek and the Ferry Terminal, and the Bypass will function as rural two-lane highways.

2029 Operations – Glacier Highway	
ADT	6,000
DHV	650
PHF	0.90
Computed DHV Factor	11%
Directional Distribution (%)	70/30
Percent Recreational Vehicles	N/A
Percent Commercial Trucks	4%
Lane Width	12 feet
Paved Shoulder	8 feet
Terrain	Rolling
Estimated No-Passing Zones	50%
Free Flow (85th reading)	56 mph
Average of Mean Speed S_{FM}	51 mph
Percent Time Following	62%
Volume/Capacity Ratio	0.25
Average Travel Speed	47 mph
Levels of Service	C

2029 Operations – Bypass Alignment	
ADT	800
DHV	90
PHF	0.90
Computed DHV Factor	11%
Directional Distribution (%)	70/30
Percent Recreational Vehicles	N/A
Percent Commercial Trucks	4%
Lane Width	12 feet
Paved Shoulder	8 feet
Terrain	Rolling
Estimated No-Passing Zones	50%
Estimated Base Free Flow Speed	50 mph
Percent Time Following	30%
Volume/Capacity Ratio	0.25
Average Travel Speed	47 mph
Levels of Service	C (Speed Constrained)

7.2.2 Accident Reduction

Crash reductions were estimated for the elements of the proposed alternative. The following table presents the results, which include adjustments for increasing volumes over the life of the project.

Alternative 2 adds a new intersection to the project. Future accidents at this location were estimated as the product of the average rate for unsignalized, “tee” intersections by the forecasted entering volume.

Intersection	Proposed Improvements	1996- 2000		Predicted 2029 No Build	Alternative 2 2029 Predicted Accident Performance	
		Average Accidents per Year	Rate (Accidents per Million Entering Vehicles)	Average Accidents per Year	Average Accidents per Year	Rate (Accidents per Million Entering Vehicles)
Glacier Hwy-Ferry Terminal	As is existing, stop-sign controlled "Tee"	1.4	0.95	1.5	1.5	0.95
Glacier Hwy-Back Loop Rd-Auke Bay Harbor Road	Realignment, Signal Channelization	3.6	1.19	7.4	4.4	0.72
Glacier Hwy-Fritz Cove Road-UAS South Access	Roundabout	1.8	0.44	3.5	1.7	0.22
Back Loop Road-UAS North Access	Roundabout	0.2	0.24	0.8	0.4	0.12
Total Accidents per Year		7.0		**13.1**	8.0	
New Intersections						
Glacier Hwy-West By Pass	Stop-sign controlled "Tee"			0.9	0.9	0.59
Total Alternative 2 Accidents per Year					**8.9**	

We conclude that this alternative is effective in addressing accident issues along the corridor.

7.3 Alternative 3

This alternative develops a complete bypass that would allow outbound Glacier Highway traffic, Back Loop Road traffic to avoid the current corridor. It would provide efficient access for UAS traffic and provide alternative access for traffic generated in the DeHart's to Auk Nu Drive area. Please refer to Figure 18.

This alternative would not provide any improvement to Glacier Highway or Back Loop Road except at intersections. The Bypass would have two 12-foot lanes and 8-foot shoulders. The alignments would be designed for 50 mph.

The Bypass intersections with Industrial Boulevard and Glacier Highway (east termini) and with Back Loop Road would be signalized. The Fritz Cove Road-UAS South Entrance Intersection would be signalized as well.

The Wye intersection would be realigned into a “tee” configuration, but would not be signalized. The Back Loop Road approach would be under stop sign control. All other intersections would be stop sign controlled.

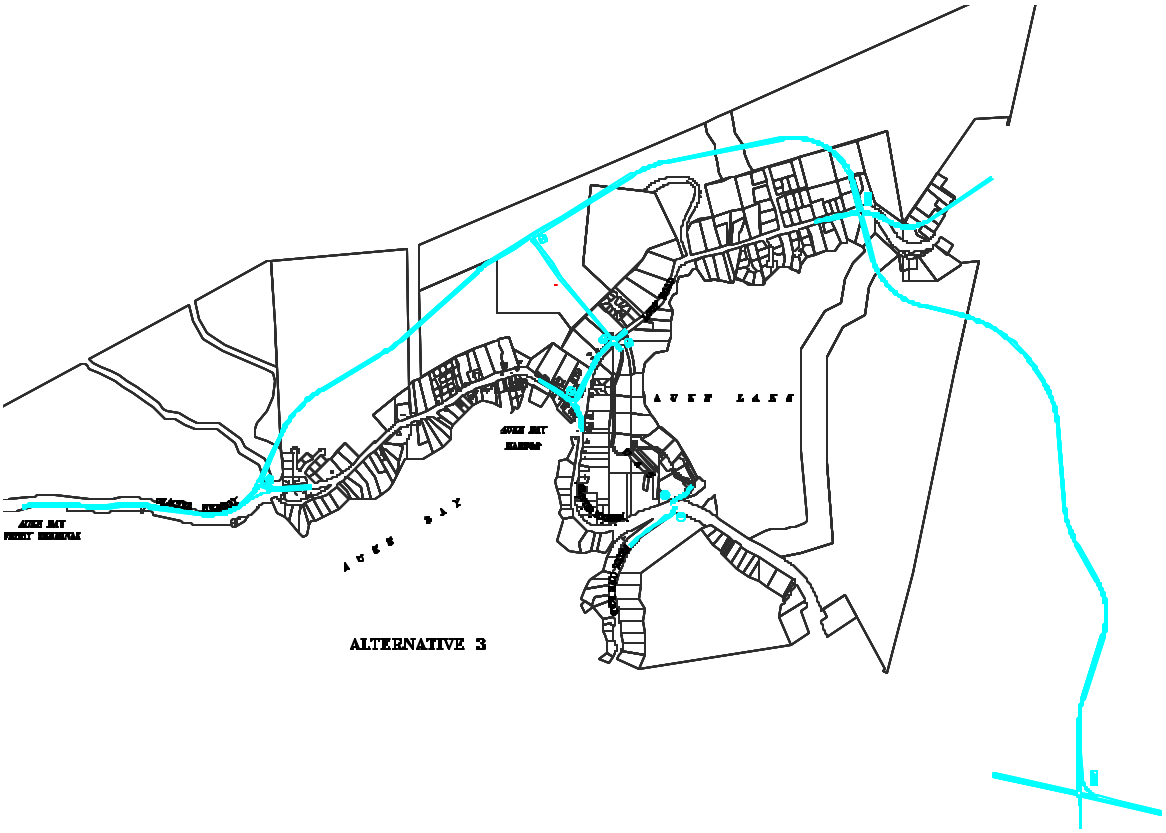


Figure 18

7.3.1 Operational Performance

Appendix M should be referenced for signalization warrants and other development details for this alternative. In case of conflicts, the following material in this Alternative 3 discussion supercedes information in the interim document.

7.3.1.1 Intersection Operational Performance

The following tables summarize 2029 morning and evening peak hour operations for Alternative 3. Full capacity reports and geometric recommendations are in Appendix N.

Alternative 3 2029 AM	Measure of Effectiveness (for unsignalized intersections, LOS and v/c are presented for stop controlled approaches)		
Intersection	**LOS**	**v/c**	**Delay**
Glacier Hwy-Fritz Cove Road, Stop Control	B-northbound B-southbound	0.14-northbound 0.05 southbound	2.9 sec/veh
Glacier Hwy-Back Loop Road, Stop Control	B-southbound	0.23-southbound	3.1 sec/veh
Back Loop Road-UAS North Entrance-Guard Access, Stop Control	B-northbound B-southbound	0.02-northbound 0.21 southbound	6.1 sec/veh
Glacier Hwy-Bypass West Terminus, Stop Control	B-northbound	0.04-northbound	0.7 sec/veh
Bypass-Back Loop Road, Signalized	B	0.36	18.5 sec/veh
Bypass-UAS Access, Stop Control	A-northbound	0.02-northbound	1.8 sec/veh
Glacier Hwy-East Bypass-Industrial Blvd., Signalized	C	0.61	22.7 sec/veh

Alternative 3 2029 PM	Measure of Effectiveness (for unsignalized intersections, LOS and v/c are presented for stop controlled approaches)		
Intersection	**LOS**	**v/c**	**Delay**
Glacier Hwy-Fritz Cove Road, Stop Control	E-northbound F-southbound	0.53-northbound 1.22 southbound	18.9 sec/veh
Glacier Hwy-Back Loop Road, Stop Control	D-southbound	0.52-southbound	4.3 sec/veh
Back Loop Road-UAS North Entrance-Guard Access, Stop Control	C-northbound C-southbound	0.46-northbound 0.32 southbound	9.8 sec/veh
Glacier Hwy-Bypass West Terminus, Stop Control	B-northbound	0.11-northbound	1.9 sec/veh
Bypass-Back Loop Road, Signalized	C	0.49	22.9 sec/veh
Bypass-UAS Access, Stop Control	B-northbound	0.15-northbound	3.1 sec/veh
Glacier Hwy-East Bypass-Industrial Blvd., Signalized	C	0.9	29.5 sec/veh

As shown above, the Fritz Cove Road and Glacier Highway intersection will have unacceptable operations.

7.3.1.2 Urban Arterial Operation

The following table shows arterial operations for this Alternative. In this, we assume that the segment of the Bypass between the Glacier Highway - Industrial Boulevard signal and the Back Loop Road signal is an urbanized road because of the interrupted flow constraints.

Alternative 3 Urban Segments	Posted Speed	No-Build, Existing Conditions	Alternative 3 Speeds	HCM Arterial LOS
Glacier Highway, Fritz Cove Road through Auke Bay Commercial Area	35 MPH (45 MPH to NOAA)	24 MPH	27 MPH	C
Glacier Highway, Outbound to Ferry Terminal	45 MPH	41 MPH	40 MPH	A
Back Loop Road	40-45 MPH	11 MPH	28 MPH	B
Bypass, Alternative 3, Glacier Highway to Back Loop Road	45 MPH (estimated)		37 MPH	A

7.3.1.3 Rural Segments

Glacier Highway between Waydelich Creek and the Ferry Terminal would not be improved. It would have a LOS of C for the design year with its existing configurations. The Bypass between Back Loop Road and the intersection with Glacier Highway (west terminus) will function as rural two-lane highway.

2029 Operations – Bypass Alignment	
End	**West Glacier Highway**
ADT	4800
DHV	530
PHF	0.90
Computed DHV Factor	11%
Directional Distribution (%)	70/30
Percent Recreational Vehicles	N/A
Percent Commercial Trucks	4%
Lane Width	12 feet
Paved Shoulder	8 feet
Terrain	Rolling
Estimated No-Passing Zones	50%
Estimated Base Free Flow Speed	50 mph
Percent Time Following	59%
Volume/Capacity Ratio	0.20
Average Travel Speed	42 mph
Levels of Service	D (speed constrained)

The LOS is reduced because of the 50 mph design speed. Otherwise, other performance measures, including a v/c ration of 0.20, indicate good operations.

7.3.2 Accident Reduction

Crash reductions were estimated for the elements of the proposed alternative. The following table presents the results, which include adjustments for increasing volumes over the life of the project.

Alternative 3 adds several new intersections to the project. Future accidents at these locations were estimated as the product of the average rate for similar intersections by the forecasted entering volume.

Intersection	Proposed Improvements	1996- 2000		Predicted 2029 No Build	Alternative 3 2029 Predicted Accident Performance	
		Average Accidents per Year	Rate (Accidents per Million Entering Vehicles)	Average Accidents per Year	Average Accidents per Year	Rate (Accidents per Million Entering Vehicles)
Glacier Hwy-Ferry Terminal	As is existing, stop-sign controlled "Tee"	1.4	0.95	1.5	1.5	0.95
Glacier Hwy-Back Loop Road-Auke Bay Harbor Rodd	Realignment and Channelization	3.6	1.19	7.4	4.8	0.77
Glacier Hwy-Fritz Cove Road-UAS South Access	Minor Channelization	1.8	0.44	3.5	3.5	0.44
Back Loop Rd-UAS North Access	Channelization, New LT Lane	0.2	0.24	0.8	0.1	0.02
Total Accidents per Year		7.0		**13.1**	9.8	
New Intersections						
Glacier Hwy-West By Pass	Stop-sign controlled "Tee"			0.9	0.9	0.59
Glacier Hwy-East By Pass-Industrial Blvd	Signal					
Back Loop Road and Bypass	Signal			6.6	6.6	1.60
By Pass- UAS-Guard Access	Stop-sign controlled "Tee"			1.1	1.1	0.59
Total Alternative 3 Accidents per Year					**18.5**	

The new intersections, especially the signal at the Back Loop Road and Bypass intersection increase accident potential. In addition, this alternative does not reduce accidents within the existing corridor as well as Alternatives 1 and 2, primarily because the roundabouts of Alternatives 1 and 2 are more effective accident reduction tools.

7.4 No-Build

The no build alternative would consist of maintaining the roadways and the current configuration of the intersections. All intersections would be stop sign controlled on minor approaches. Currently, PM LOS is unacceptable (LOS E/F) for north and south approaches at Fritz Cove intersection. The Wye intersection and Harbor Drive intersection will have a PM Peak Hour LOS of "F" by 2029.

The preliminary engineering, traffic analysis and cost estimates for the three build alternatives and the no-build alternative can be found in Appendix M. Drawings presenting the horizontal alignments and plan and profiles of the three alternatives can be found in Appendix N.

8. ENGINEERING PREFERRED ALTERNATIVE

DOT&PF gathered and considered the input from the CAC and the PSC regarding the three alternatives presented above. Instead of selecting one of the alternatives, they decided to combine parts of Alternatives 1 and 3 and phase the improvements to meet the needs of the project. The Engineering Preferred Alternative is made up of both near and long-term improvements. DOT&PF recognized that there are safety issues that need to be addressed quickly. They also recognized that there will be capacity issues that will need to be addressed in the future. Below is a narrative describing near term improvement and the long-term plan of this alternative. Figure 19 is a graphic depiction of this Engineering Preferred Alternative. Appendix O contains the plan and profile drawings.

8.1 Description of the Engineering Preferred Alternative

Near-Term

- Construct a roundabout at the Fritz Cove Road, UAS south entrance, Glacier Highway intersection.
- Use a two-lane section through Auke Bay but add a left turn lane for Auke Bay lab.
- Construct sidewalks on both sides of Glacier Highway from Fritz Cove Road to the Spaulding Meadows Trail parking lot.
- Construct a roundabout at the Glacier Highway and Back Loop Road intersection
- Correct curves near Auke Bay Post Office and Stabler's Point.
- Add sidewalks to both sides of Back Loop Road from Glacier Highway to the North UAS Access intersection.

Long-Term

- Plan a complete bypass of the Auke Bay community that starts at Industrial Blvd., follows the east side of Hill 560, crosses Back Loop Road at Goat Hill and continues behind the community of Auke Bay and connects to Glacier Highway near Auke Nu Creek.
- Add a connection from the bypass to Back Loop Road at the north UAS access.
- Use a roundabout at the Back Loop Road, north UAS access and bypass connector intersection.
- Add sidewalks to both sides of the bypass connector from Back Loop Road to the UAS/National Guard Joint Use facility.
- Add a seawalk/multi-use path on the waterside from the Spaulding Meadows Trailhead to the Ferry Terminal.

8.2 Phasing of the Engineering Preferred Alternative

DOT&PF intends to move ahead on the near-term improvements as funding becomes available. Assuming that the near-term improvements are constructed by 2009, the traffic and operations analysis

LONG TERM PLAN

8' SHOULDER
12' LANE
12' LANE
8' SHOULDER

SHORT TERM IMPROVEMENTS

8' SHOULDER
2 LANE
2 LANE
8' SHOULDER

LONG TERM PLAN

6' SIDEWALK
4' SHOULDER
11' LANE
11' LANE
4' SHOULDER
6' SIDEWALK

AUKE LAKE

LONG TERM PLAN

8' SHOULDER
12' LANE
12' LANE
8' SHOULDER

AUKE BAY FERRY TERMINAL

AUKE BAY

SHORT TERM IMPROVEMENTS

6' SIDEWALK
4' SHOULDER
11' LANE
11' LANE
4' SHOULDER
6' SIDEWALK

FRITZ COVE ROAD

TO VALLEY

KEY

SHORT TERM ROADWAY IMPROVEMENTS
SHORT TERM PEDESTRIAN ACCESS IMPROVEMENTS
LONG TERM ROADWAY PLAN
LONG TERM PEDESTRIAN ACCESS PLAN

0 500 1000 2000

SCALE: 1"=1000'

(see Section 8.3) indicates that the long-term improvements may be needed by 2019. The long-term improvements would also be phased. The bypass segment between Industrial Boulevard and Goat Hill on Back Loop Road would be constructed as the first phase. Based on the results of the O-D study, this phase would reduce the traffic volumes at the Wye significantly and should extend the design life of the near-term improvements.

The second long-term phase would construct the bypass from Goat Hill to Stabler's Point. Included in this phase would be an extension of the new road to the UAS/National Guard Joint Use facility, now under construction, with a connection between the bypass alignment and the North UAS Access. The second phase would also include the seawalk/multi-use path between the Spaulding Meadows trailhead and the Ferry Terminal. The seawalk could be advanced to the first long-term phase, added to the near-term improvements, or constructed as a separate standalone project.

8.3 Preliminary Traffic and Operations Analysis

We prepared a comparative analysis of delay per vehicle (total seconds within the cordoned study area), average travel speed, and cumulative time in the system (cordoned study area). The analysis was performed with SimTraffic, and the table below summarizes the averages found after 30 simulations of each alternative.

2029 PM Traffic			
Alternative	**Delay/Veh (sec)**	**Travel Time (hours)**	**Avg Speed (mph)**
Alternative 1	223	366	17
Alternative 2	187	339	18
Alternative 3	130	266	30
No-Build, Existing Conditions	346	441	18

Alternative 3 is superior in traffic movement efficiency because the Bypass provides an excellent route for Back Loop Road bound, UAS bound and portions of the Auke Bay businesses. It also greatly reduces traffic on Glacier Highway through Auke Bay, thus reducing congestion and delay. In addition, no signals or roundabouts on Glacier Highway are a part of Alternative 3. This penalizes side street traffic, but allows the large majority of traffic to proceed without delay.

All three alternatives have strength and weaknesses in meeting goals and objectives. As an example, we see Alternative 3 as the most efficient travel network with good speeds, least time in system and delay, yet it is the poorest in accident reduction when compared to 1 or 2. In recognition of this, an Engineering

Preferred Alternative was formed which pulled strong performing elements from the base alternatives. In summary, this alternative includes:

- Roundabouts at the Glacier-Fritz Cove and the Glacier-Back Loop Road intersections. Both of these locations under unsignalized operations will have less than desirable operations. Roundabouts have excellent capacity, and more importantly are good crash reduction countermeasures. They have a much less operational and maintenance commitment than signals in terms of cost (operating a signal costs $5,000 to $10,000 a year) and manpower.

- Future Bypass with signal at Back Loop Road. The Bypass will sweep north from the Glacier-Industrial Drive intersection, climb over Pederson Hill and behind the UAS student housing area, and re-connecting to Glacier Highway near Stabler's Point. The existing west portion of Glacier Highway, near Auke Bay area, will form a stop control tee intersection.

- Future roundabout at the Back Loop Road-UAS Access-Guard intersection. A roundabout will reduce the minor street delay that would be experienced under unsignalized operations.

This Engineering Preferred Alternative would be phased. The roundabouts at Fritz Cove Road and Back Loop Road would be constructed and these would function as single lane circulatory lane, single approach lane roundabouts. Single lane roundabouts require much less right-of-way (140-foot diameter vs. 180-foot diameter) than two-lane roundabouts, and are better for pedestrian crossings.

The Engineering Preferred Alternative traffic volumes would be similar to Alternative 1 volumes until the Bypass is constructed. As such, these volumes can be used to determine when the single-lane approach, single lane circulatory lanes will no longer function. At that point, the Bypass must be on-line to reduce volumes at these intersections. We have determined that by 2019, the approximate project mid-life would be the time frame when the Bypass would be required. The following table summarizes the 2019 operation performance of the Fritz Cove Road and Back Loop Road single lane roundabouts.

Traffic Operation during the PM peak (2019) of the Engineering Preferred Alternative

	Measure of Effectiveness		
Intersection	**LOS**	**v/c**	**Delay**
Glacier Hwy-Fritz Cove Road, 140-foot Diameter Roundabout, One Circulatory Lane	D	0.94 maximum (westbound)	29 sec/veh
Glacier Hwy-Back Loop Road, 140-foot Diameter Roundabout, One Circulatory Lane	A	0.57 maximum (northbound)	6.1 sec/veh

With the Bypass, these intersections will function at acceptable operation levels well beyond the design year.

The stop controlled approaches for the Back Loop Road-UAS-Guard Access intersection will begin to operate at undesirable levels by 2019. As such, the second phase of this project, which would construct the Bypass, should also include the 140-foot diameter, single lane roundabout at this location.

The proposed "tee" intersection that would connect Glacier Highway would function adequately, even though inbound (towards Juneau) left-turn movements would have long delays. However, this movement is rather light (forecasted as 20 vph in 2029), and these outbound vehicles would have an alternate outbound travel route (through Auke Bay to the Bypass), if delay becomes intolerable. The Bypass/Glacier Highway westbound/northbound approach should have a left-turn lane, and the Glacier Highway stopped approach should have a left-turn lane and a right-turn lane.

All other intersections in the Engineering Preferred Alternative will have operations similar to Alternative 3 in the design year.

8.4 Preliminary Cost of Engineering Preferred Alternative

The table below shows estimated costs for the Engineering Preferred Alternative. Costs are presented for the near-term improvements and the two phases of the long-term improvements. The seawalk costs are included in the second phase of the long-term improvements and are also shown separately.

Estimated Project Costs				
	Near-Term	**Long-Term Phase I**	**Long Term Phase II**	**Seawalk**
Construction	$7,390,000	$16,650,000	$11,610,000	$840,000
Engineering and Administration	$2,350,000	$5,290,000	$3,680,000	$270,000
Phase Totals	$9,740,000	$21,940,000	$15,290,000	$1,110,000
Project Total	$46,970,000			

Costs for right of way acquisition and relocation of utilities are not known at this time and are not included in the estimated costs shown above. Detailed cost estimates are included as Appendix Z.

8.5 Preliminary Analysis of the Environment Affected by the Engineering Preferred Alternative

The complete report discussing potential environmental effects of the Engineering Preferred Alternative can be found in Appendix Q. Following is a summary of some of the effects discussed in the complete report.

8.5.1 Preliminary Right of Way Impacts

The long-term phase 1 route from Glacier Highway to Back Loop Road would require acquisition of approximately 2.5 miles of right of way. The City and Borough of Juneau owns the majority of property along this route. The long term phase 2 would require acquisition of an additional 2.5 miles of right of way. This route would involve private, UAS, CBJ and State Mental Health properties. The majority of land which would be included in right of way for the Auke Bay Bypass is currently undeveloped and held by government entities. Private property would be involved where the new road intersects Glacier Highway and the Back Loop Road.

It is estimated that the construction of the Engineering Preferred Alternative would result in the removal of five house and two garages. This alternative is characterized by three substantial changes in access grade and would require the relocation of 13 power poles and the removal of 13 parking spaces.

8.5.2 Preliminary Social and Economic Impacts

Social impacts include adverse impacts to traffic patterns and accessibility, affects to school districts, recreational areas, churches, businesses and emergency services, and affects to special interest groups, minorities and economically disadvantaged.

The UAS and Auke Bay Elementary School are both located along the project corridor. Parking for the Spaulding Meadows trail is located just off Glacier Highway. Boating, bicycling, hiking and kayaking are popular recreational activities in Auke Bay. Chapel by the Lake and Auke Bay Bible Church are also located along the project corridor.

The roundabouts included in the Engineering Preferred Alternative would provide improved safety and access through and within the immediate Auke Bay area. Local drivers, bicyclists and pedestrians would need to learn how to navigate roundabouts. Minimal changes in traffic patterns within the immediate Auke Bay area would be expected.

The Auke Bay Bypass would provide an alternate route for drivers wishing to avoid the commercial Auke Bay area and would provide several miles of additional roadside for bicyclists. The long-term phase 2 seawalk, when connected to sidewalks that are part of the short term improvements would provide a new and safe access for pedestrians from the Ferry Terminal through the Auke Bay area.

The proposed Auke Bay Bypass would access CBJ lands which are zoned for residential development. This area could provide up to 350 new lots.

Proposed short-term improvements will provide a safer and more logical flow of traffic through and within the immediate Auke Bay area. The proposed roundabout at the Glacier Highway-Back Loop Road intersection would address safety and sight distance concerns. However the roundabout would eliminate direct access from Glacier Highway to DeHart's. The store's access to Auke Bay Harbor Road would remain.

Residential development in areas accessed by the Auke Bay Bypass would provide economic opportunity for local businesses and would add to the local tax base. The Bypass may negatively impact businesses in the Auke Bay area as it will provide an alternate route and could decrease traffic traveling past businesses and stopping to make spur of the moment purchases.

8.5.3 Preliminary Impacts to Wetlands

Wetlands delineation will be necessary to determine the exact impacts to wetlands and for permitting purposes. Delineation was not completed as part of this reconnaissance effort. Based on the Juneau Wetlands Management plan and field visits we estimate that over ten acres of various types and values of wetlands will be impacted as a result of constructing this alternative.

8.5.4 Preliminary Impacts to Fish Streams

The table below is a summary of potential impacts that could result from the Engineering Preferred Alternative. Note that the asterisk after the stream name indicates an area of anadromous fish habitat.

Reroute Stream or Replace Crossing Structure	Crossing Structure Extension	New Stream Crossing
Auke Creek *	Waydelich Creek	Auke Nu Creek *
	Auke Nu Creek *	Waydelich Creek
	Bay Creek *	Bay Creek
		Lake Creek *
		Lake Two Creek *
		Hanna Creek *
		Wild Meadow Drainage

** Fish present at this location*

8.5.5 Preliminary Impacts to Eagle Trees

There are four eagle trees located along Glacier Highway. According to Mike Jacobsen of the U.S. Fish and Wildlife Service (USFW), these eagle trees aren't being used currently by bald eagles. There are also eagle nest trees located near the mouth of Auke Creek and near Auke Nu Creek at the west end of the project area.

Eagle nest trees are not necessarily used every year. However, USFW stipulations surrounding eagle nest trees can be expected, especially during the nesting season. There isn't enough information to

determine the impacts to the bald eagle tree at this time. Impacts will be examined and quantified, in consultation with USFW, during the NEPA process.

9. PUBLIC INVOLVEMENT

Our public involvement efforts included the use of two committees (Project Steering Committee and Citizens Advisory Committee), two public meetings, two newsletters (each mailed to 4500 addresses in the study area), and a DOT&PF project web page. The public involvement plan can be found in Appendix R.

9.1 Public Meetings

We held two public meetings during the course of the study. We advertised the public meetings by faxing public service announcements (PSAs) to local radio stations and the local newspaper. We also posted flyers in public locations advertising the meeting. We placed a display advertisement that ran three times prior to each public meeting. Finally we highlighted the public meeting in two newsletters we sent out prior to each meeting. We sent out over 4500 newsletters. The newsletters can be found in Appendix S.

The first public meeting was held on Thursday, April 3, 2003. The second public meeting was held on Thursday, October 2, 2003. The sign in sheets can be found in Appendix T. Details of the public meetings can be found in Appendix U. The written comments can be found in Appendix V.

9.2 Citizen Advisory Committee

One committee was the CAC. This committee was made up of local residents, business owners, and users of facilities in the corridor. This committee met five times over the course of a year and provided valuable input as the project developed. The committee met on the following dates:

- November 13, 2002
- January 8, 2003
- April 1, 2003
- May 15, 2003
- August 7, 2003

The CAC member list can be found in Appendix W. The meeting minutes from the five meetings can be found in Appendix X. Finally the Power Point presentations given at CAC meetings #2, #4 and #5 can be found in Appendix Y.

9.3 Project Steering Committee

The other committee was the Project Steering Committee. This committee consisted of representatives from the Department, the UAS and the CBJ. This committee also met five times during the project development process, usually the day after the CAC meetings. They evaluated the needs and alternatives on more of a policy level than the CAC. DOT&PF led the PSC meetings.