West Juneau/Douglas Highway Access Study

Draft

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Prepared For:

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SUMMARY

Existing traffic volumes on Douglas Island south of the Juneau-Douglas Bridge are causing traffic to operate at failing levels during the AM peak hour at the North Douglas Highway/Douglas Highway roundabout. The congestion is hindering the development of new housing stock in this conveniently located area of Juneau. This study was commissioned to estimate the traffic generating potential of the study area and to analyze traffic network improvement options that would enable traffic operations at acceptable levels. The study area is bounded by Douglas Highway, Kowee Creek, Tongass National Forest, and Belleview Subdivision on Douglas Island.

A number of potential improvement options were developed in consultation with City and Borough of Juneau staff and analyzed under the projected traffic loading to determine what impact each alternative would have on traffic operations. Total estimated costs and a general description of the different options are listed in the table below.

Option Breakdown

Option	Description	Total Cost
North Douglas Highway/Douglas Highway Roundabout	Restripe Roundabout for two westbound left turn lanes, add northbound right turn merge lane	$651,000
Cordova Street/Douglas Highway Channelization	Construct northbound left turn lane, southbound right turn lane, and two-way left turn lane north on Douglas Highway of Cordova Street	$1,032,000
Cordova Street/Douglas Highway Roundabout	Construct roundabout with single lane eastbound and southbound approaches, and a two lane northbound approach	$4,978,000
Middle Access	Construct 1,300 feet of new road between Foster Avenue and Douglas Highway	$2,035,000
Pioneer Avenue to North Douglas Highway	Construct 2,300 feet extension of Pioneer Avenue from Cordova Street to North Douglas Highway, including bridge over Kowee Creek	$6,597,000
Pioneer Avenue to New Development	Construct 1,000 feet extension of Pioneer Avenue from Cordova Street to existing road in new development north of Kowee Creek. Includes bridge over Kowee Creek	$5,101,000

Improving the North Douglas Highway/Douglas Highway roundabout is the only option that would enable that intersection to operate at acceptable levels throughout the 20-year study period. For the Cordova Street/Douglas Highway intersection, the intersection channelization option or the roundabout option are the only options for maintaining acceptable levels of service.

Even though the alternative access options would not provide congestion relief at the study area intersections, City and Borough of Juneau should consider these improvements as the area develops. There is value in the emergency access and traffic circulation benefits these options would provide, particularly the middle access option.

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ACRONYMS

ADT .....average daily traffic
CBJ .....City and Borough of Juneau
DOT&PF.....Alaska Department of Transportation and Public Facilities
GIS.....geographical information system
HCM .....Highway Capacity Manual
ITE .....Institute of Transportation Engineers
LOS.....levels-of-Service
mph.....miles per hour
MUTCD.....Manual on Uniform Traffic Control Devices
NCHRP.....National Cooperative Highway Research Program
NDH.....North Douglas Highway
RES .....Reconnaissance Engineering Study
ROW.....right of way
TWLTL .....two-way left turn lane
USKH .....USKH Inc.
v/c.....volume to capacity ratio

1 INTRODUCTION

The City and Borough of Juneau (CBJ) has retained USKH Inc. (USKH) to perform a Reconnaissance Engineering Study (RES) for the vicinity of the Douglas Highway/Cordova Street intersection. This report describes the study effort and describes alternative options that could be implemented to accommodate current and future traffic volumes in the area.

1.1 Project Description

Concerns have been raised that the Cordova Street/Douglas Highway intersection is nearing or is at capacity, and that increasing levels of traffic at this bottleneck will hamper future development in the area. CBJ has requested that USKH use existing traffic data to analyze traffic conditions and identify locations where capacity improvements may relieve the congestion issues. This traffic analysis includes existing traffic and traffic expected to be generated if the entire study area is developed to its full potential. After we identified the magnitude of the traffic issues, we examined a variety of options that could be implemented to provide acceptable levels of service (LOS) on the road network.

1.2 Scope

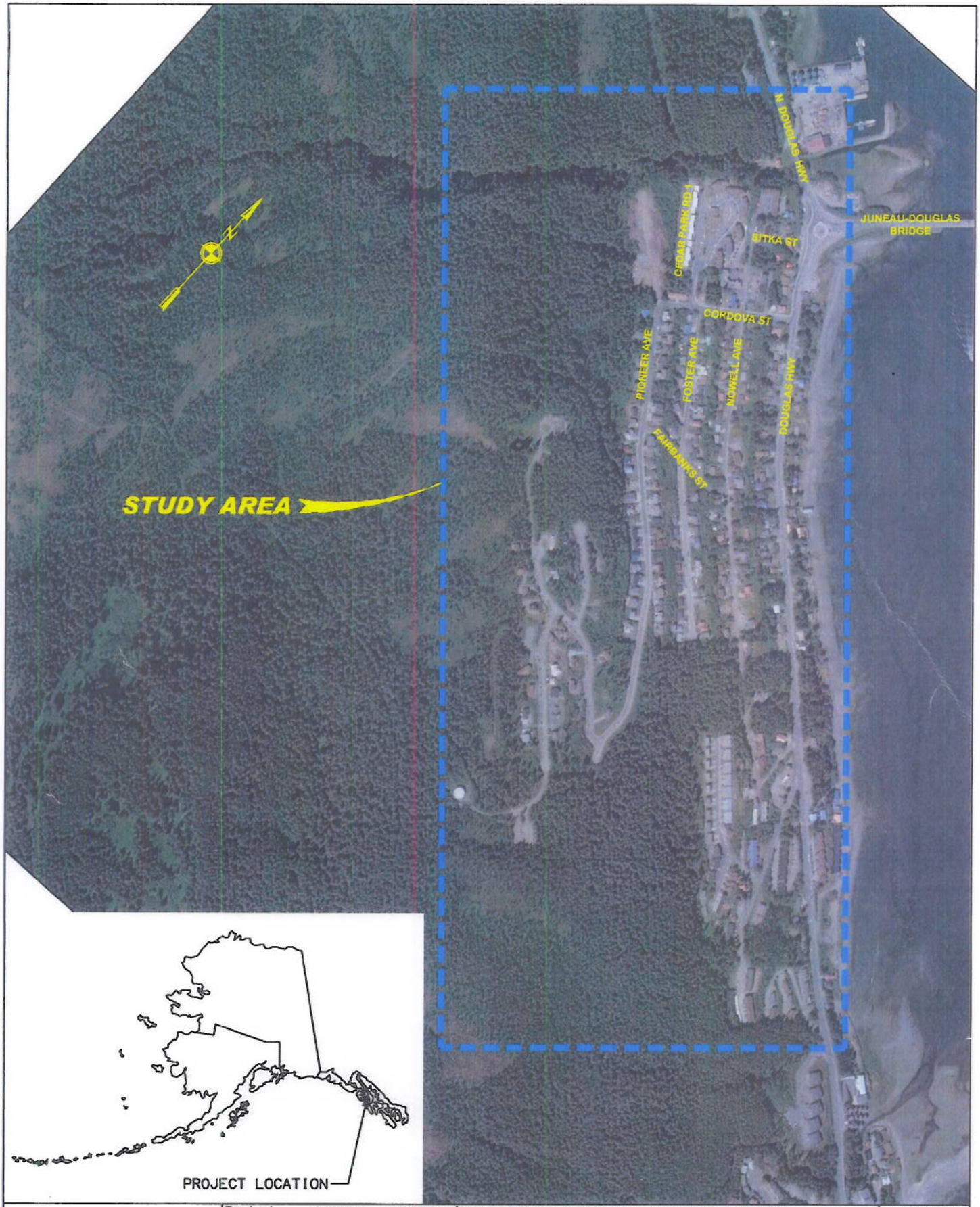
The project area extends from Douglas Highway to the Tongass National Forest boundary and from the Belleview Subdivision to Kowee Creek. The project area is shown on Figure 1.

The traffic analysis portion of the RES focuses on existing and forecast traffic conditions at the un-signalized intersections of Cordova Street/Douglas Highway and the roundabout at Douglas Highway/North Douglas Highway (NDH). The highest level of hourly traffic in this area typically occurs during the AM and PM peak hours (also known as the commute rush hours); therefore, they are the focus of this traffic analysis. An analysis of these time periods ensures that capacity issues are being evaluated when congestion is at a peak during the typical weekday. A year 2030 horizon was selected as a reasonable estimate for the full development of the study area.

1.3 Traffic Analysis Methodologies

Standard local and regional traffic study practices gauge the function and capacity of road networks by analyzing traffic conditions at intersections. While traffic conditions can be measured and quantified along road segments as well as at intersections, traffic conditions at intersections are typically more sensitive to traffic volume changes than traffic conditions along road segments. This is due to the effect of conflicting turning movements on traffic conditions at intersections. In most cases, if the intersections have acceptable traffic conditions, the road segments also operate at acceptable levels.

Intersection traffic conditions were evaluated for this study based on the LOS methodologies of the Highway Capacity Manual (Transportation Research Board, 2000). The Highway Capacity Manual (HCM) provides a nationally recognized and locally accepted method of gauging traffic flow and congestion at intersections. Criteria range from LOS A, indicating free-flow conditions with minimal vehicle delays, to LOS F, indicating congested conditions with significant vehicle delays.



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Project	WEST JUNEAU/DOUGLAS HIGHWAY ACCESS STUDY	FIGURE NO.
Title	VICINITY MAP	1
Client	CITY & BOROUGH OF JUNEAU	Project No. 1139301

LOS is based on the anticipated delay for an average vehicle at the study intersection. For a signalized intersection, the delay for all of the vehicles approaching that intersection is considered. For unsignalized and roundabout intersections, LOS is calculated for each approach. Typically, only the approach with the lowest LOS is reported. Table 1 outlines the LOS criteria as defined in the HCM.

Table 1 – Intersection LOS Criteria

LOS	Unsignalized/ Roundabout Average Delay (sec/veh)	Signalized Average Delay (sec/veh)	General Description
A	≤10	≤10	Free Flow
B	>10 - 15	>10 - 20	Stable Flow (slight delays)
C	>15 - 25	>20 - 35	Stable flow (acceptable delays)
D	>25 - 35	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>35 - 50	>55 - 80	Unstable flow (intolerable delay)
F	>50	>80	Forced flow (jammed)

Source: Highway Capacity Manual (TRB, 2000)

For this study, LOS calculations for stop controlled intersections were performed using Synchro Version 7, (Trafficware, 2007). This software tool is based on the methodologies of HCM 2000. For roundabouts, LOS calculations were based on the methods presented in the National Cooperative Highway Research Program (NCHRP) Report 572 *Roundabouts in the United States* (NCHRP, 2007). These methods are expected to be incorporated into the 2010 update of the HCM. In addition to LOS, volume to capacity (v/c) ratios for roundabout improvements have been reported. This is useful since roundabout operations tend to become unpredictable when v/c exceeds 0.85.

Chapter 49.40 of the CBJ Code of Ordinances lists LOS D as the lowest acceptable threshold for area intersections. Alaska Department of Transportation and Public Facilities (DOT&PF) regulations state that the minimum acceptable LOS is C, or D if the intersection is already at D (17 AAC 10.070). This is relevant since Douglas Highway and NDH are DOT&PF roads. This study will evaluate options to improve traffic conditions at intersections that are projected to operate below these thresholds.

2 PROJECT OVERVIEW

This section describes the existing conditions in the project analysis area, including discussion of the roadway network, traffic volumes, and traffic operations.

2.1 Roadway Network

The primary roads in the study area are described as follows:

- Douglas Highway is a two-lane arterial with paved shoulders that runs south of the Juneau-Douglas Bridge and connects the community of Douglas with the Juneau-Douglas Bridge. Douglas Highway lies on a generally northwest/southeast alignment. The speed limit is 30 miles per hour (mph) through the study area. Street lighting is present at major street intersections, and storm water is conveyed via roadside ditches. Douglas Highway is operated and maintained by DOT&PF.
- Cordova Street is a two-lane collector with curb and gutter within the project limits. Separate left- and right-turn lanes exist at the intersection with Douglas Highway. Cordova Street runs on a northeast/ southwest alignment and has a posted speed of 20 mph. Cordova Street is operated and maintained by CBJ.
- NDH is the northern extension of Douglas Highway, extending north from the roundabout at the Juneau-Douglas Bridge. It has a two-lane section with paved shoulders, and a posted speed of 45 mph. NDH is operated and maintained by DOT&PF.

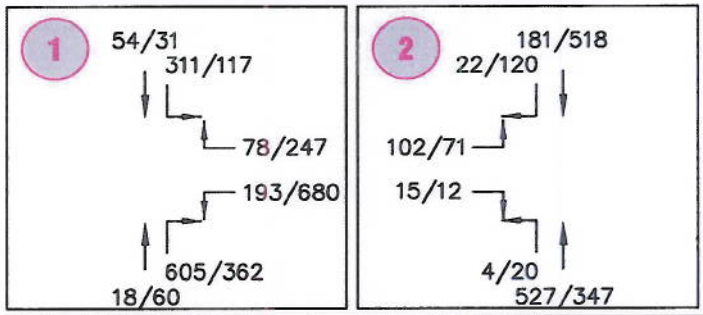
The intersections that were analyzed include the Cordova /Douglas Highway and the Douglas Roundabout, described as follows:

- The Douglas Highway/Cordova Street intersection is an unsignalized "T" intersection with stop control on the Cordova Street approach. The Cordova Street approach is striped with 150-foot long left- and right-turn lanes. Douglas Highway serves as the northwest and southeast legs of the intersection, Cordova Street as the southwest leg. This intersection is identified as intersection 2 in Figure 2.
- The Douglas Highway/Juneau-Douglas Bridge intersection is a three-legged roundabout, with the Juneau-Douglas Bridge serving as the base of the T approaching from the northeast. The Douglas Highway approaches are single lane approaches and the Juneau-Douglas Bridge approach has a separate right-turn lane. This intersection is identified as intersection 1 in Figure 2.

2.2 Traffic Volumes

DOT&PF provided 2004 turning movements for the Douglas Highway/Cordova Street intersection and 2008 turning movements for the NDH/Juneau-Douglas Bridge roundabout. Some growth has occurred in the Juneau area since these data were collected, so we have used historical traffic growth rates to project what these counts would be in 2010, assuming the past growth continued. A growth rate of 0.5 percent per year was used for the traffic volumes. This is used by for DOT&PF planning efforts in the area, and generally correlates to average daily traffic (ADT) changes reported in the DOT&PF ADT Maps. Interestingly, the ADT has continued to grow even though the population of Juneau declined by 0.2 percent between 200 and 2008. This indicates that background traffic growth is due to people driving more, not due to increased development. The 2010 existing conditions traffic volumes for the AM and PM peak hours are shown on Figure 2.

Traffic forecasts for 2030 were projected so we could analyze what the traffic conditions would be if no improvements are made to the road network over the 20-year study period, and if no development occurs within the study area. These projections were created by applying the previously mentioned growth rates to the 2010 traffic estimates over a 20-year growth period. This growth rate accounts for a continued trend of people driving more and/or development not directly considered by this study. The resulting 2030 traffic volume projections for the AM and PM peak hours are shown on Figure 3. Traffic generated by new development within the study area will be addressed later in the report.



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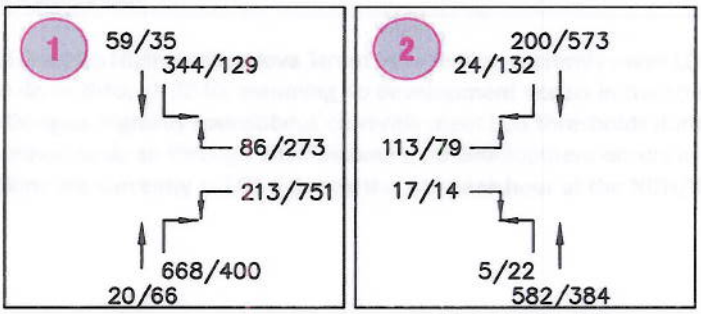
Project	WEST JUNEAU/DOUGLAS HIGHWAY ACCESS STUDY	FIGURE NO.
Title	2010 EXISTING CONDITIONS VOLUMES AM/PM PEAK HOUR	2
Client	CITY & BOROUGH OF JUNEAU	Project No. 1139301



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Project	WEST JUNEAU/DOUGLAS HIGHWAY ACCESS STUDY	FIGURE NO.
Title	2030 EXISTING CONDITIONS VOLUMES AM/PM PEAK HOUR	3
Client	CITY & BOROUGH OF JUNEAU	Project No. 1139301

2.3 Traffic Operations

The existing traffic conditions were analyzed to develop a baseline LOS, which provides a means of gauging future traffic impacts. Evaluations were performed based on the geometrics (number of lanes, auxiliary lane lengths, etc.), control data, and traffic volumes discussed in Sections 2.1 and 2.2. The existing conditions LOS summaries are shown in Table 2 and Table 3, and were calculated assuming no roadway improvements and no new development in the project area.

Table 2 – AM Existing Conditions LOS Summary

Location	Year 2010			Year 2030		
	LOS	Delay (sec/veh)	V/C WA[1]	LOS	Delay (sec/veh)	V/C WA[1]
Unsignalized Intersections						
Douglas Hwy/Cordova St	C	18.2	0.31 EB[2]	C	21.4	0.44 EB[2]
Roundabouts						
N. Douglas Hwy/Juneau-Douglas Bridge	F	68.2	1.06 NB[3]	F	127	1.22 NB[3]

1. Volume to Capacity ratio and Worse Approach for unsignalized intersections
2. EB = eastbound
3. NB = northbound

Table 3 – PM Existing Conditions LOS Summary

Location	Year 2010			Year 2030		
	LOS	Delay (sec/veh)	V/C WA1	LOS	Delay (sec/veh)	V/C WA1
Unsignalized Intersections						
Douglas Hwy/Cordova St	C	24.2	0.31 EB[2]	D	30.5	0.41 EB[2]
Roundabouts						
N. Douglas Hwy/Juneau-Douglas Bridge	B	11.1	0.70 WB[3]	C	14.5	0.78 WB[3]

1. Volume to Capacity ratio and Worse Approach for unsignalized intersections
2. EB = eastbound
3. WB = westbound

Traffic operations at the Douglas Highway/Cordova Street intersection currently meet LOS thresholds, and are expected to continue to do so through 2030, assuming no development occurs in the study area. Traffic operations at the NDH/Douglas Highway roundabout currently meet LOS thresholds during the PM peak hour and are expected to continue to do so through 2030 assuming no development occurs in the study area. However, traffic operations are currently at LOS F during the AM peak hour at the NDH/Douglas Highway roundabout.

3 PROJECT AREA DEVELOPMENT

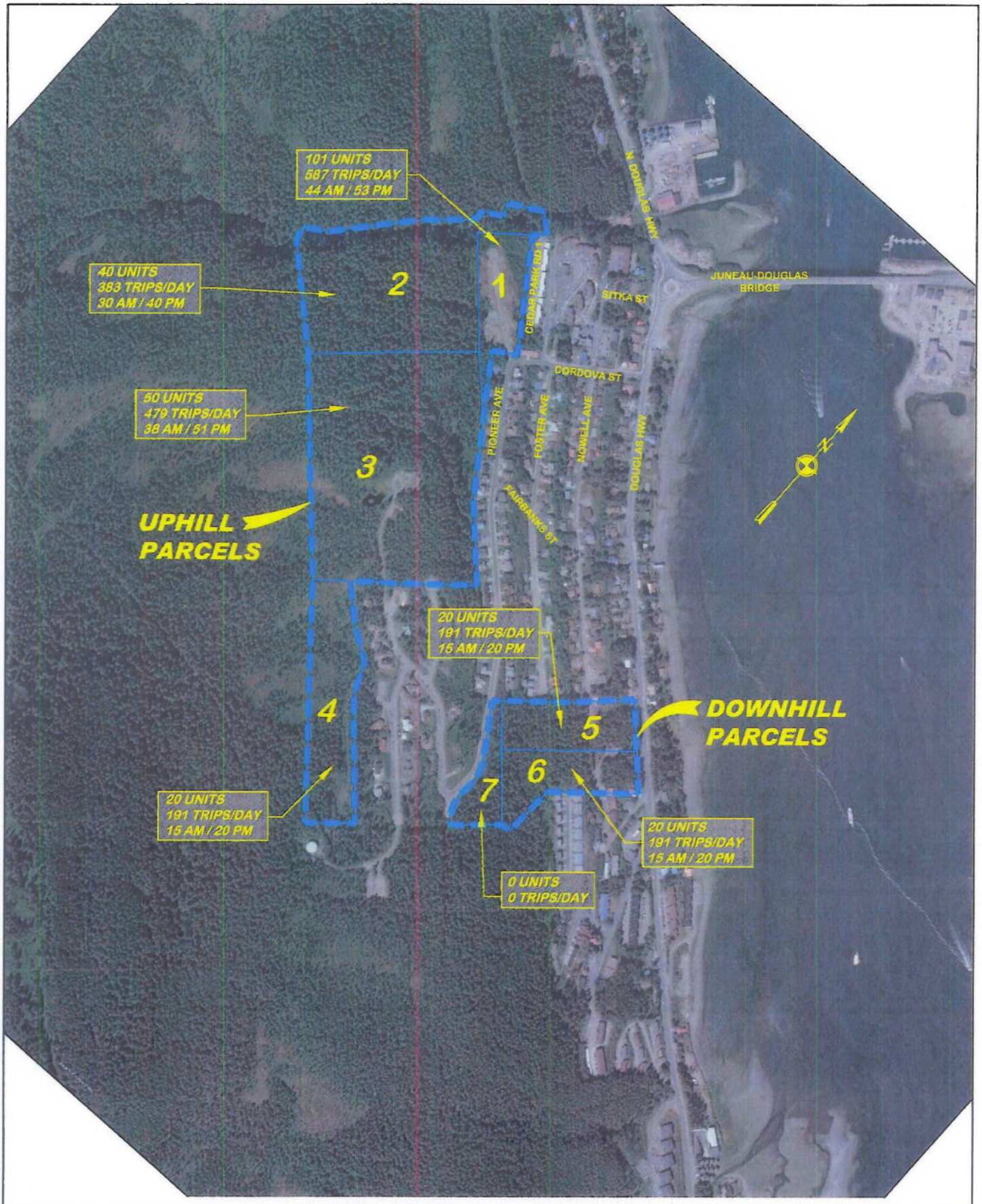
This section describes the development potential of the vacant lands within the study area. The impact of the new traffic from this development on the existing area road system is also discussed.

3.1 Development Potential

USKH contracted with Walsh Planning and Development Services (Walsh) to provide a build-out analysis of the undeveloped parcels between Kowee Creek and the Belleview Subdivision. This analysis is attached as Appendix C. Walsh analyzed the area as seven different parcels, the first four of which are uphill of the existing developments, and the last three occupy the area between the existing Belleview Subdivision and the Channel Heights Subdivision as shown on Figure 4.

One of the uphill parcels (parcel 1) already has a development plan for 101 condominium units. The remaining uphill parcels (parcels 2, 3, and 4) are currently zoned D-5, although Parcel 2 has the potential to be rezoned to D-18 if certain requirements are met. Full development of these four parcels could result in more than 400 dwelling units. However, due to topographic and access restraints, Walsh does not expect this to occur. Aside from the planned condominium development, all of the uphill parcels are expected to eventually develop in a similar fashion to the existing Blueberry Hills Subdivision, with single family residential lots in the 15,000 to 20,000 square foot range. The likely development potential of all these uphill parcels is 119 single family homes over the 20-year planning horizon of this project. Note that this total includes 9 additional units in the Blueberry Hills subdivision that have not been built.

The three downhill parcels (parcels 5, 6, and 7) are also zoned D-5. Access to developments on these parcels can be provided by extending the existing streets from the Channel Hills and Belleview Subdivisions across the parcels. These sites have the potential to add 75 dwelling units to the area, but market realities and site access requirements lower the likely estimate to 40 single family homes over the 20-year planning horizon of this project.



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Project	WEST JUNEAU/DOUGLAS HIGHWAY ACCESS STUDY	FIGURE NO.
Title	PROJECT AREA DEVELOPMENT POTENTIAL	4
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3.2 Development Traffic

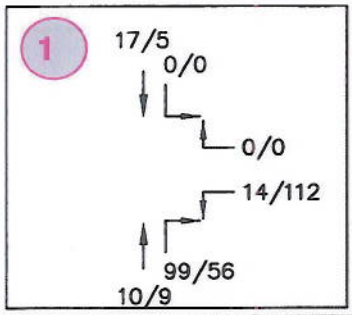
New traffic produced by the projected residential development can be estimated by applying trip generation factors listed in the eighth edition of the Institute of Transportation Engineer's (ITE) *Trip Generation Manual* (ITE, 2008). ITE has collected traffic data from different types of developments around the country over the last 40 years. They have used this data to correlate traffic generation with various development variables such as dwelling units, employees, etc. We have applied ITE's trip generation factors to Walsh's development projections to estimate new traffic generation. Two ITE development types apply to the expected area developments: Single-Family Detached Housing and Residential Condominium. Characteristics of these development types are listed in Table 4.

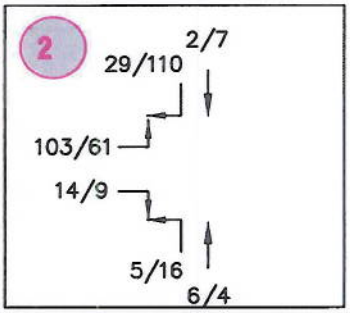
Table 4 – ITE Trip Generation Rates

Land Use	Daily Trips/ Dwelling Unit	AM Trips/ Dwelling Unit	PM Trips/ Dwelling Unit
Single-Family Detached Housing (ITE 210)	9.57	0.75	1.01
Residential Condominium/Townhouse (ITE 230)	5.81	0.44	0.52

Traffic expected to be generated by each parcel is shown on Figure 4. The total new traffic volume is 2,108 trips per day, 164 during the AM peak hour and 213 during the PM peak hour.

How this additional traffic reaches the existing road network depends on what kind of changes are made to the network. To provide a starting point, we are assuming that parcel 1 traffic will access the road network at the top of Cordova Street, and that the other uphill parcels will extend the existing Blueberry Hills Subdivision roads. The downhill parcels will access the road network from the Channel Heights Subdivision and from the Belleview Subdivision. Based on a travel time analysis, one third of the traffic from the downhill parcels will access Douglas Highway through the Belleview Subdivision. The rest of the downhill parcels and all of the uphill parcels will access Douglas Highway at the Cordova Street intersection. The resulting development traffic volumes are shown on Figure 5 and 2030 background traffic volumes with development traffic volumes are shown on Figure 6.





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Project WEST JUNEAU/DOUGLAS HIGHWAY ACCESS STUDY

Title DEVELOPMENT VOLUMES
AM/PM PEAK HOUR

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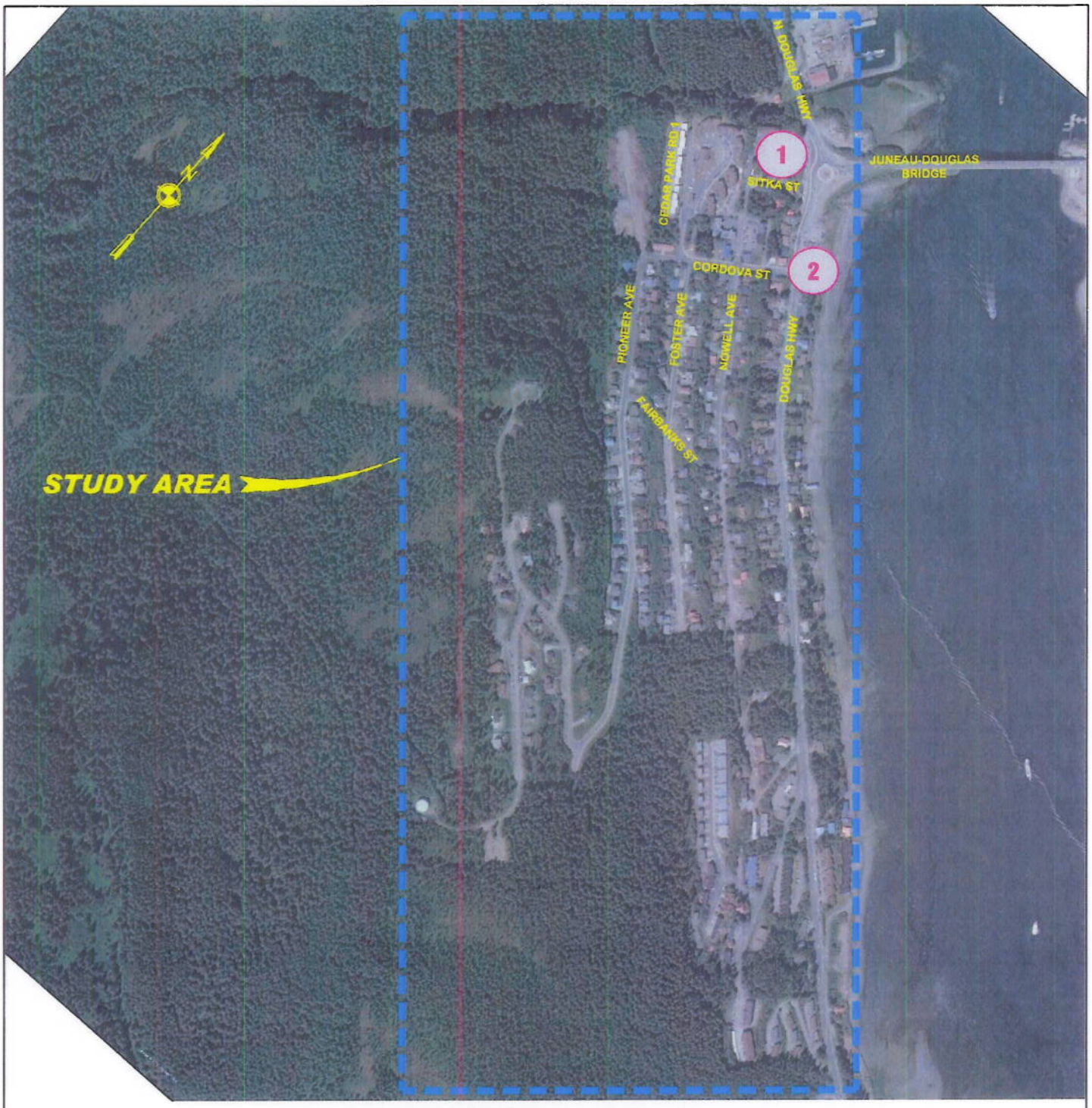
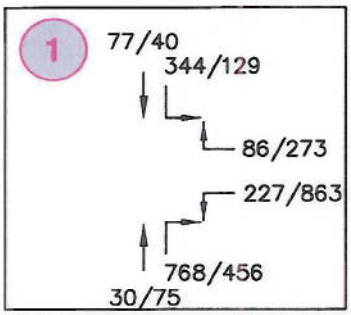
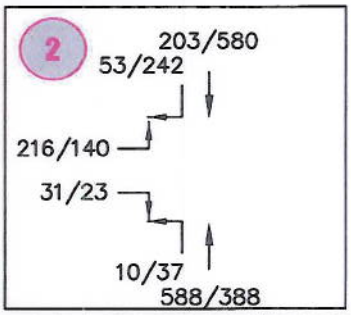
FIGURE NO. 5







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Project WEST JUNEAU/DOUGLAS HIGHWAY ACCESS STUDY

Title 2030 EXISTING PLUS DEVELOPMENT VOLUMES AM/PM PEAK HOUR

Client CITY & BOROUGH OF JUNEAU Project No. 1139301

FIGURE NO. 6

3.3 Traffic Operations

Traffic operations were evaluated using the 2030 estimated traffic volumes plus the development traffic volumes, and the resulting LOS and delay projections are shown in Table 5.

Table 5 – AM and PM 2030 With-Development LOS Summary

Location	AM			PM		
	LOS	Delay	V/C WA[1]	LOS	Delay	V/C WA[1]
Unsignalized Intersections						
Douglas Hwy/Cordova St	E	43.6	0.78 EB[2]	F	77.4	0.86 EB[2]
Roundabouts						
N. Douglas Hwy/Juneau-Douglas Bridge	F	207	1.42 NB[3]	D	25.7	0.91 WB[4]

1. Volume to Capacity and Worse Approach for unsignalized intersections
2. EB = eastbound
3. NB = northbound
4. WB = westbound

Traffic operations at the Cordova Street/Douglas Highway intersection and the NDH/Douglas Highway intersection will not meet LOS thresholds in the future if the area is fully developed and no transportation network improvements are made. The next section discusses possible transportation network improvement options that will improve the LOS of these intersections.

4 IMPROVEMENT OPTIONS

There are three broad tactics that can be employed to alleviate the current and future traffic congestion at the NDH/Douglas Highway and Cordova Street/Douglas Highway intersections:

1. Improve the intersections to accommodate the traffic demand.
2. Provide convenient alternative routes to bypass the bottleneck area.
3. Reduce the demand for vehicle trips during peak times.

Reducing the demand for vehicle trips could involve efforts such as improved public transit, encouraging employers to adjust workday start and end times, and/or implementing congestion pricing schemes. There is some merit to all of these ideas, but their use is for community wide traffic concerns and is beyond the scope of this small area study. The remaining two tactics are investigated in the following sections. An overview of the options analyzed is shown on

Figure 7. Improvement options are shown in more detail in Appendix D.

4.1 Intersection Improvements

The overall volume of traffic at the NDH/Douglas Highway and Cordova Street/Douglas Highway intersections is not excessively large, but conflicts between certain movements are causing the operations to fail. It is possible that adding a lane or changing the method of control at the intersection may improve traffic operations to an acceptable level.

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FIGURE NO.
7

4.1.1 NDH/Douglas Highway Roundabout

Capacity at roundabout intersections is based on the complex interaction between circulating traffic and entering traffic at each entry leg. During the PM peak hour, the bottleneck is the westbound entry leg. Circulating flow at this point is low at 75 vehicles; however, 863 vehicles are trying to enter the roundabout. The gaps available in the circulating flow are not great enough to allow 863 vehicles to enter the roundabout without excessive delay. A possible solution would be to make the westbound leg a two-lane approach, and continue the second lane around to exit southbound on Douglas Highway. The roundabout appears to have been constructed with this change in mind, so it should simply be a matter of restriping the roundabout to change the existing westbound right turn to a shared right/left lane. The additional lane could then either terminate in a merge beyond the roundabout or terminate as a right turn lane at Cordova Street. This would improve the roundabout LOS to A in the PM peak hour.

During the AM peak hour, the critical conflict is between the northbound entering traffic and the circulating flows. The southbound left turn from NDH conflicts with the northbound right turn to such a degree that a yield or stop control would not work to adequately serve traffic. One option may be to create a northbound right turn bypass lane that merges into the eastbound through lane just before the bridge. According to NCHRP 572,

> *"The capacity of a merging bypass lane has not been assessed in the United States. Its capacity is expected to be relatively high due to a merging operation between two traffic streams at similar speeds."*

Adding this right turn bypass lane to the roundabout would result in LOS A during the AM peak hour. However, there is currently no means of calculating the LOS of the merge.

4.1.2 Cordova Street/Douglas Highway

Since the intersection of Cordova Street/Douglas Highway has stop control on one approach, there are essentially two movements that can cause operations to fail at this intersection: side street left turns and main street left turns. Both of these movements require gaps in the traffic to pass through the intersection. The side street left turn, from Cordova Street, must have gaps in both directions of traffic on the main street, Douglas Highway, while the main street left must have gaps in one direction of main street traffic. For the Cordova Street/Douglas Highway intersection, the main street left turn demand is relatively low, but the side street left turn demand is high. Coupled with a high volume of Douglas Highway traffic, it is difficult for Cordova Street left turning traffic to find adequate gaps in the traffic flow to make their turn.

There are several options available for improving the intersection that may alleviate the anticipated congestion. The Manual on Uniform Traffic Control Devices (MUTCD) recommends that channelization improvements be evaluated before considering more stringent control methods. To evaluate channelization improvements, we have turned to NCHRP 457 *Engineering Study Guide for Evaluating Intersection Improvements*, which provides guidelines on conditions that may benefit from the installation of certain intersection improvements.

Channelization: Evaluating the traffic patterns of the Cordova Street/Douglas Highway intersection under the recommendations given in NCHRP 457 shows that a northbound left turn and southbound right turn lane are justified. Unfortunately, even with additional turn lanes LOS will still be E or F under the projected traffic volumes.

Traffic operations at this intersection suffer because the eastbound left turn traffic will struggle to find adequate gaps to cross the southbound traffic and enter the northbound traffic. Providing a two-way left turn lane (TWLTL) on Douglas Highway would enable the left turning Cordova Street traffic to make two stage left turns, so a gap in both south and northbound traffic would not need to occur at the same time. Providing a northbound left turn lane and extending that through the intersection as a TWLTL would improve the LOS to C during the AM and PM peak hours.

Four-Way Stop: Changing the intersection to all-way stop control is not recommended. The MUTCD states that all-way stop control *"is used where the volume of traffic on the intersecting roads is approximately equal."* This is not the case at this intersection. All-way stop control would penalize traffic on Douglas Highway during all hours, even though Cordova Street will operate acceptably with two-way stop control except during the peak hours.

Traffic Signal: Changing the intersection to signal control is also not recommended. The close proximity to the roundabout at NDH/Douglas Highway could cause queues from the signal to back up into the roundabout. Additionally, vehicles leaving the signal and approaching the roundabout would be platooned, which would negatively impact the traffic operations at the roundabout. Roundabouts operate most efficiently when traffic arrives randomly dispersed. One way that a signal control at Cordova/Douglas may work, is if the existing NDH roundabout were removed and replaced with a traffic signal. However, since this is not likely to occur, this alternative was dropped from further consideration.

Roundabout: Changing the intersection to roundabout control was also analyzed. Based on NCHRP 457 guidelines, the intersection is a candidate for roundabout control. An operational analysis of traffic through a single-lane roundabout at this intersection reveals that AM traffic will experience LOS D, and PM traffic will experience LOS C. AM traffic congestion is due to the conflict between eastbound left turning traffic and northbound through traffic. Adding a second northbound through lane to the roundabout would provide LOS A during the AM peak hour, and have no effect on the PM peak hour operations.

4.2 Alternate Access Routes

4.2.1 South Access

The south access improvement alternative would extend Pioneer Avenue down to John Street. The elevation difference between the beginning and end points of this road would be about 225 feet, which means that a road with a 10 percent grade would have to be 2,250 long. To estimate the number of trips the route would siphon from the existing Cordova Street egress route, we used a travel time analysis that compared the travel time between the Pioneer Avenue/Blueberry Hills Road intersection and the Cordova Street/Douglas Highway intersection. The travel times were estimated based on route length and area speed limits. In the case of the south access option, the existing travel time is 125 seconds, and using the new route it would be 170 seconds. Ignoring potential intersection delays, the south route would be much less desirable than the current route and would probably get little use. In addition, the contours indicate terrain between Pioneer Avenue and John Street is very steep and does not provide a good road route. As such, we have dropped this route from further consideration.

4.2.2 Middle Access

The middle access option would create a new road between Pioneer Avenue and Douglas Highway between the existing Channel Heights and Belleview subdivisions. The overall elevation difference between the beginning and

end of the road is 229 feet and will present a challenge. Plan and profile of a potential alignment are shown in Appendix D. Using the same methods outlined under the south access discussion, the travel time from Pioneer Avenue to the Cordova Street/Douglas Highway intersection will be 123 seconds using the middle access route and 103 seconds using the existing route. Unlike the south access route, the middle access route would provide direct access to some of the potential developments in the project area. Even though traffic from the uphill parcels may not use this route, it is very likely that traffic from the downhill parcels will benefit.

Assuming that motorists are willing to travel 20 seconds out of their way to bypass the delay at Cordova Street/Douglas Highway, the middle access route would serve all of the traffic from the 40 potential dwellings on the downhill parcels, and from the 39 existing homes in the Channel Heights Subdivision. These traffic changes would not impact the operations at the NDH/Douglas Highway roundabout, but would improve operations at the Cordova Street/Douglas Highway intersection to LOS E (37 seconds/vehicle) in the AM and LOS F (65 seconds/vehicle) in the PM peak hours. Since this route would not benefit traffic from Pioneer Avenue, the right of way (ROW) and cost discussion on this route are based on providing a route from Foster Avenue down to Douglas Highway. A plan and profile view of a potential route is shown in Appendix D.

4.2.3 North Access

The north access option would extend a road from Cordova Street north across Kowee Creek and then turn east to connect with NDH. This alternative has significant terrain challenges, both with grade and with crossing Kowee Creek. However, it also has the potential to relieve some of the congestion issues at the NDH/Douglas Highway roundabout.

Nowell Avenue Extension: An extension of Nowell Avenue was considered as a way to provide a route for traffic to bypass Douglas Highway. Its close proximity to Douglas Highway increases the amount of traffic that could potentially use the route. However, terrain along the route would require deep cut sections. If the deep cuts do not make construction impossible, this route would be very expensive due to the tight ROW and adjacent buildings. This route was not considered further.

Foster Avenue Extension: An extension of Foster Avenue was briefly analyzed, but dropped from consideration due to terrain challenges, impacts to the Cedar Park Apartment complex, and the fact that it does not fit well with the existing road network.

Pioneer Avenue to NDH: The possibility of extending Pioneer Avenue and connecting it with NDH has the benefits of no directly adjacent buildings, and of meshing well with the existing road network. Elevation differences would require a road approximately 1,300 feet in length to connect the Pioneer Extension with NDH. Plan and profile of a potential alignment are shown in Appendix D. Unfortunately, the distance between the Pioneer Avenue/Cordova Street intersection and the NDH/Douglas Highway roundabout would be twice as long with the Pioneer Extension route as with the existing route. The 50 extra seconds of travel time means that few motorists would be likely to use the Pioneer Avenue extension, except those who would continue traveling north on NDH. Based on turning movement percentages, there may be 21 AM (8 exiting, 13 entering) and 31 PM (20 exiting, 11 entering) motorists who make that trip. These volume changes are too small to change the LOS at either intersection.

Pioneer Avenue to New Development: CBJ staff suggested the possibility of connecting Pioneer Avenue to a new road that has been constructed by a private land owner north of Kowee Creek, with no new connection to NDH. This connection would provide a good means of secondary access to residents on both sides of Kowee

Creek, and would provide a route for traffic between the neighborhoods to avoid the Douglas Highway arterial. The only foreseeable construction challenge would be the bridge across the creek. This alternative would have a similar impact to traffic as the Pioneer Avenue to NDH connection, except that a few motorists from the neighborhood north of Kowee Creek may travel south and use Cordova Street to access Douglas Highway. Overall, this alternative will not improve LOS at the Cordova Street/Douglas Highway intersection or the NDH/Douglas Highway intersection.

4.3 Impacts and Costs

Impacts anticipated by the various improvement options are based on aerial photography, geographical information system (GIS) data, and a site visit made in December 2009. It is likely that utilities will be impacted, and possible that there will be environmental considerations as well. We have attempted to account for utility impacts where they are visible, but not enough data is currently available to accurately quantify all of the utility and environmental impacts.

ROW costs are based on data from the City assessor's website. Property values have been increased by 50-percent to account for administrative costs related to acquisition. Construction costs are in 2010 dollars and include construction administration and a 30 percent contingency. Engineering costs include design engineering and CBJ project management, and are estimated to be 20 percent of the construction estimate.

4.3.1 NDH/Douglas Highway Roundabout

Since the Douglas Roundabout was designed to have two westbound left turn lanes, the costs and impacts for this improvement are much less than they otherwise would have been. Approximately 3,400 square feet of ROW will be needed for the northbound right turn lane from the Breeze In, for a cost of $82,000. New construction will include curb work on the southbound exit leg, and constructing the new northbound right turn lane and sidewalk. This lane may require widening the embankment for the bridge approach. Construction costs are estimated to be $475,000.

4.3.2 Cordova Street/Douglas Highway Channelization

The package of turn lanes at Cordova Street/Douglas Highway includes a northbound left turn lane, a TWLTL north of the intersection, and a southbound right turn lane. These improvements will require the entire available ROW at the intersection, and most likely strip frontage acquisition to accommodate utilities, retaining walls, and appurtenances. Approximately 2,500 square feet of ROW will be needed for these improvements. In addition, seven utility poles and underground communication utilities will have to be relocated. Utility relocations are estimated to cost $200,000. Construction will include modifications to the storm drain system and street lighting, as well as new lanes, sidewalks, curbs, and retaining walls. Construction costs, including utilities, are estimated to be $810,000

4.3.3 Cordova Street/Douglas Highway Roundabout

Due to the grades on Cordova Street, a roundabout at the Cordova Street/Douglas Highway intersection would have to be built to the shore side of Douglas Highway. This means that there will be no ROW impacts to the uphill corner parcels, but more shore side lots will be impacted due to the road relocation. Constructing a roundabout at the Cordova Street/Douglas Highway intersection will require acquiring four shore-side lots, including the Douglas Breeze In. ROW would cost approximately $2,500,000. Construction will also be

challenging due to the grades between Douglas Highway and the shoreline. Construction will include modifications to the storm drain system and street lighting, as well as new lanes, sidewalks, curbs, and retaining walls. Construction costs, including utilities, are estimated to be $2,065,000.

4.3.4 Middle Access

The middle access option would need new ROW for the entire corridor. Given that the corridor would have to wind through two parcels, the most likely scenario would be for the City to purchase both parcels and resubdivide the area to accommodate the road. Overall, assuming a 60-foot-wide corridor, 78,000 square feet of ROW would be required to build the road. Another 43,500 square feet of ROW would likely be required to connect the new road with the existing neighborhood streets. Total ROW costs would be approximately $675,000. Construction will include a new local road with pavement, storm drain, sidewalk, curb, and gutter and cost approximately $1,133,000.

4.3.5 Pioneer Avenue to NDH

This option would need new ROW for the entire corridor. Assuming a 60-foot-wide corridor, 138,000 square feet of ROW from three or four different parcels would be needed, at a cost of $483,000. If this option is selected, it will be important to move quickly to obtain the ROW between Kowee Creek and Cordova Street since the land owner is currently building condominiums on the parcel. Construction would include a new bridge and 2,300 feet of road with pavement, storm drain, sidewalk, curb and gutter. Construction would likely cost $5,095,000.

4.3.6 Pioneer Avenue to New Development

This option would build essentially the first 1,000 feet of the Pioneer Avenue to NDH connection, including the bridge over Kowee Creek. If this option is selected, it will be important to move quickly to obtain the ROW between Kowee Creek and Cordova Street since the land owner is currently building condominiums on the parcel. Approximately 60,000 square feet of ROW would need to be obtained at a cost of $210,000, and construction would cost about $4,076,000.

4.3.7 Summary

Estimated costs are listed in Table 6.

Table 6 – Cost Estimates

Option	Construction	ROW	Engineering/ Administrative	Total Cost
NDH/Douglas Highway Roundabout	$474,000	$82,000	$95,000	$651,000
Cordova Street/Douglas Highway Channelization	$810,000	$60,000	$162,000	$1,032,000
Cordova Street/Douglas Highway Roundabout	$2,065,000	$2,500,000	$413,000	$4,978,000
Middle Access	$1,133,000	$675,000	$227,000	$2,035,000
Pioneer Avenue to NDH	$5,095,000	$483,000	$1,019,000	$6,597,000
Pioneer Avenue to New Development	$4,076,000	$210,000	$815,000	$5,101,000

Table 7 provides a comparative summary of each of the option.

Table 7 – Option Comparison

Option	Pro	Con
NDH/Douglas Highway Roundabout	• Eliminates LOS deficiency at intersection • Combine with Cordova Street Channelization for lowest cost solution	• Does not provide secondary access
Cordova Street/Douglas Highway Channelization	• Eliminates LOS deficiency at intersection • Combine with NDH/Douglas Highway Roundabout improvements for lowest cost solution	• Does not provide secondary access
Cordova Street/Douglas Highway Roundabout	• Eliminates LOS deficiency at intersection	• Does not provide secondary access • High ROW impact • Adds delay to Douglas Highway traffic • High construction cost
Middle Access	• Provides secondary access • Provides access to new land	• Does not address LOS deficiencies • Complicated ROW issues
Pioneer Avenue to NDH	• Provides secondary access • Improves connectivity	• Does not address LOS deficiencies • Requires most new road construction • Highest overall cost • Expensive bridge
Pioneer Avenue to New Development	• Provides secondary access • Improves connectivity	• Does not address LOS deficiencies • Expensive bridge

5 SUMMARY AND CONCLUSIONS

Existing traffic volumes on Douglas Island south of the Juneau-Douglas Bridge are causing traffic to operate at failing LOS levels during the AM peak hour at the NDH/Douglas Highway roundabout. The congestion is hindering the development of new housing stock in this conveniently located area of Juneau. This study was commissioned to determine what improvements could be built to enable vacant residential areas to be developed while maintaining acceptable traffic operations at the area intersections.

A build out analysis was conducted in order to estimate potential future traffic volumes in the study area. Traffic projections were then applied to the road network changes to produce estimates of future LOS at the NDH/Douglas Highway intersection and the Cordova Street/Douglas Highway intersection. A number of potential improvement options were developed in consultation with CBJ staff and analyzed under the projected traffic loading to determine what impact each alternative would have on traffic operations.

Of all the options considered, the only option that would provide acceptable operations at the NDH/Douglas Highway roundabout would be to restripe the roundabout for two westbound left turn lanes and add a northbound right turn merge lane. To maintain acceptable traffic operations at the Cordova Street/Douglas Highway intersection, CBJ can either construct a roundabout or build a northbound left turn lane, southbound right turn lane, and a TWLTL north on Douglas Highway north of Cordova Street.

None of the alternate access routes would improve LOS to acceptable levels at the study area intersections. However, due to the value of secondary access and neighborhood circulation, they should still be considered as the study area develops. The Middle Access option in particular should be encouraged. This option provides access to the parcels through which it passes, and provides a convenient "back door" to Douglas Highway for both the Channel Heights and Belleview subdivisions.

The north access routes also appear attractive for traffic circulation. However, the high cost of a bridge across Kowee Creek makes it difficult to justify the expense, since there is little quantifiable benefit to traffic operations. There will need to be a route north across the creek at some point, but that may be better coordinated with a "bench road" collector route plan for the island.

6 REFERENCES

Bonneson, James A and Michael D. Fontaine. 2001. *NCHRP Report 457: Engineering Study Guide for Evaluating Intersection Improvements*. Washington, D.C. National Academy Press.

Rodegerdts, Lee, Et al. 2007. *NCRHP Report 572: Roundabouts in the United States*. Washington, D.C. Transportation Research Board.

US Department of Transportation, Federal Highway Administration. 2004. *Manual on Uniform Traffic Control Devices*. Washington, D.C.

Transportation Research Board. 2000. *Highway Capacity Manual*. Washington D.C.

Appendix D
Improvement Options

USKH
Engineering • Architecture
Land Surveying • Planning

WEST JUNEAU/DOUGLAS HIGHWAY ACCESS STUDY

Title NDH/DOUGLAS HIGHWAY ROUNDABOUT IMPROVEMENTS
CORDOVA STREET/DOUGLAS HIGHWAY CHANNELIZATION

Client CITY & BOROUGH OF JUNEAU Project No. 1139301

FIGURE NO.
D1