AMATS: Minnesota Drive Study- Westchester Lagoon to Seward Highway

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RECONNAISSANCE ENGINEERING STUDY

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Abbreviations

AADT	Average Annual Daily Traffic (vehicles per day)
AASHTO	American Association of State Highway and Transportation Officials
AMATS	Anchorage Metropolitan Area Transportation Solutions
DOT&PF	Alaska Department of Transportation and Public Facilities
CMF	Crash modification factor
CRF	Crash reduction factor
CMFC	Crash modification factor clearinghouse
HCS	Highway Capacity Software
HSIP	Highway Safety Improvement Program
ITE	Institute of Transportation Engineers
KE	Kinney Engineering, LLC
LOS	level of service
MOA	Municipality of Anchorage
MTP	Interim 2035 Metropolitan Transportation Plan
NCHRP	National Cooperative Highway Research Program
PHF	Peak hour factor
ROW	Right of way
UCL	Upper Control Limit (for statistical crash rate analysis)
v/c	volume-to-capacity ratio
vphpl	vehicles per hour per lane

Definitions

Average Annual Daily Traffic (AADT). A measurement of the number of vehicles traveling on a segment of highway each day, averaged over the year.

Controlled Access Freeway. Divided multi-lane highway without direct access to adjacent land uses. Users must utilize ramps to reach adjacent highway facilities with access to the adjacent land uses.

Crash Modification Factor (CMF). CMF is a factor associated with a safety treatment. It is the ratio that is formed by dividing before-treatment crashes (denominator) into after-treatment crashes (numerator) Crashes for the condition without the safety treatment are multiplied by the crash modification factor to determine the number of crashes expected to occur if the treatment is applied. CMFs are determined using a statistical analysis of sites with and without the treatment. CMF are typically expressed as a decimal number.

Crash Reduction Factor (CRF). CRF is another factor associated with a safety treatment, and is the percent reduction that can be expected after a treatment. Crashes that would be eliminated are the product of the before condition crashes by the CRF. CRF is equal to 1-CMF, and is usually expressed in terms of percentage (percent of the original crashes that will be eliminated).

Highway Safety Improvement Program (HSIP). Program of the Federal Highway Administration that provides Federal money for state and local projects that directly address safety.

Interchange. Set of ramps and intersections used to allow traffic to travel to and from a controlled access freeway facility.

Level of Service (LOS). Performance measure concept used to quantify the operational performance of a facility and present the information to users and operating agencies. The actual performance measure used varies by the type of facility; however, all use a scale of A (best conditions for individual users) to F (worst conditions). Often, LOS C or D in the most congested hours of the day will provide the optimal societal benefits for the required construction and maintenance costs.

Peak Hour Factor (PHF). Measure of traffic variability over an hour period calculated by dividing the hourly flowrate by the peak 15-minute flowrate. PHF values can vary from 0.25 (all traffic for the hour arrives in the same 15-minute period) to 1.00 (traffic is spread evenly throughout the hour).

Upper Control Limit (UCL). Statistical measure used in crash rate analysis to determine statistical significance. If the crash rate of the location in question is above the upper control limit for that location, the crash rate is above the average crash rate for similar facilities to a statistically significant level.

Volume to Capacity Ratio (v/c). Measure of how much of the available capacity of a facility is being used, calculated by dividing the demand volume by the capacity of a facility. Values of 0.85 or less indicate adequate capacity to serve the demand volume. When v/c is greater than 0.85, drivers begin to feel uncomfortably crowded.

Overview

Alaska Department of Transportation and Public Facilities (DOT&PF) has retained Kinney Engineering, LLC (KE) to complete a Reconnaissance Engineering Study of the Minnesota Drive corridor from Westchester Lagoon to the Seward Highway interchange with O'Malley Road. Figure 1 shows the study area.

Part of the National Highway System (NHS), Minnesota Drive is a vital north-south route connecting southwest Anchorage and downtown Anchorage. Throughout the length of the corridor, the route is functionally classified as principal arterial other, meaning that the focus of the corridor is to provide mobility (carrying longer distance traffic quickly and efficiently). The overall goal is to improve safety and consistency of the NHS route while also considering safety and operational improvements for other users of the system, motorized and non-motorized alike. Many locations on this corridor have been studied previously and interim improvements have been made. This study is intended to take a fresh look at the corridor: reviewing past improvements, reconsidering previous recommendations in light of system and population changes, and researching recent innovations in intersection and interchange design.

The Minnesota Drive/O'Malley Road corridor can be divided into three main segments: Midtown, Controlled Access Freeway, and the South Anchorage Terminus.

The **Midtown** portion of the study area begins at the southbound off-ramp to Hillcrest Drive and includes five signalized intersections (26th Avenue, Northern Lights Boulevard, Benson Boulevard, Spenard Road, and Tudor Road) and the road segments in between. Here, Minnesota Drive is a 6-lane divided arterial with sidewalks. Land uses in midtown are a mix of residential and commercial uses, resulting in higher pedestrian and bicycle volumes than other parts of the Minnesota corridor, with frequent mid-block pedestrian crossings. The land use density in the midtown area is high, adding to the cost of alternatives that require right-of-way acquisition. The main objective for the midtown segment is to identify balanced improvements that maintain mobility for through traffic in keeping with the NHS designation, reduce overall congestion, and increase safety for all users, including pedestrians and bicyclists.

The alternatives presented in this study do not add enough capacity to fully meet the peak period through traffic demands in this segment of the Minnesota Drive corridor. Alternatives that have enough capacity to meet the existing and future demands are likely to involve grade separation of key intersections. One such option would be a "cut and cover" where through lanes on Minnesota Drive are carried in a tunnel under the surface streets. These types of improvements are very expensive and the cost to implement them for Minnesota Drive in midtown is likely as high as or greater than the cost to implement similar treatments for the Seward Highway corridor in midtown.

Between Tudor Road and the Old Seward Highway, Minnesota Drive is a **Controlled Access Freeway** with full access control and five interchanges (International Airport Road, Raspberry Road, Dimond Boulevard, 100th Avenue, and C Street). There are no frontage roads except a short segment between 100th Avenue and Dimond Boulevard and there are no parallel bicycle or pedestrian facilities except an attached multi-use path from International Airport Road north to Tudor Road. The project objectives for this segment are to correct weaving conflicts between adjacent ramps at several interchanges and to improve safety and capacity at the cross-street ramp intersections for motorized and non-motorized users.

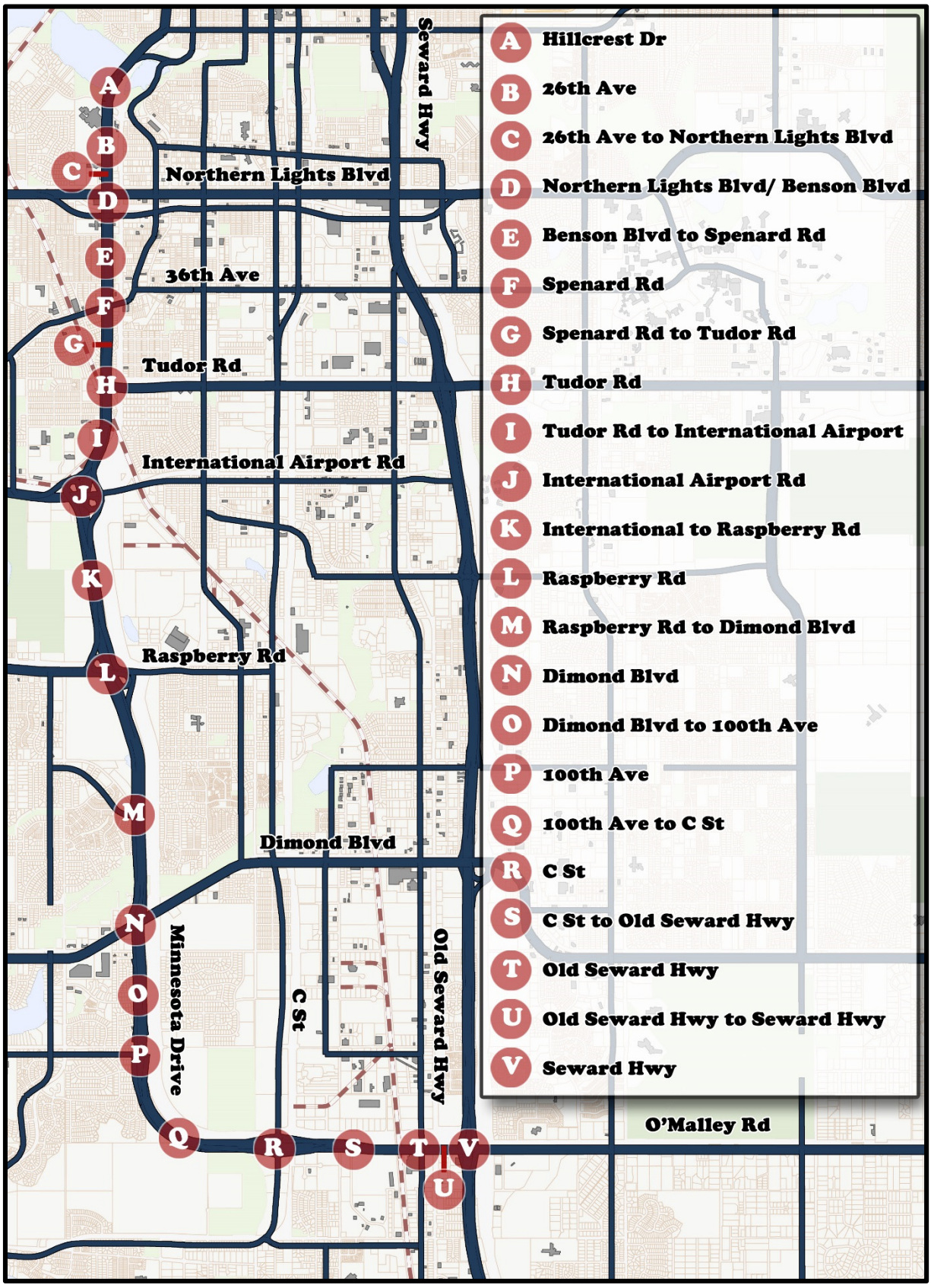


Figure 1 – Minnesota Drive Reconnaissance Study Area

The **South Anchorage Terminus** segment includes the Old Seward Highway signalized intersection and the Seward Highway interchange. In this segment, O'Malley Road is a 4-lane divided arterial with pathways or sidewalks on both sides of the road and three at-grade signalized intersections with pedestrian signals. The project objectives for this segment are to facilitate traffic movements between the Seward Highway and Minnesota Drive, improve safety at the interchange ramps, and decrease congestion at the Old Seward Highway and at the Seward Highway ramp intersections.

Part I of this study resulted in the Qualitative Study (found in Appendix B), which took a qualitative look at the entire corridor – identifying operational and safety concerns at each intersection, interchange, or segment and presenting a range of alternatives for addressing those concerns. Using the information presented in that study, DOT&PF identified a set of alternatives for further evaluation. KE has prepared this Reconnaissance Engineering Study with a more quantitative analysis of alternatives that have been advanced by the Department.

The Reconnaissance Engineering Study will be used by DOT&PF to plan future projects, providing guidance on the magnitude of the projects so funding can be secured.

Operational Analysis

In general, the analyses of traffic operations that were performed for this study are conceptual in nature, using data that were already available or could be easily collected. Analysis tools used include:

- Highway Capacity Software 2010 (HCS 2010) was used to examine level of service and queue characteristics for vehicles at unsignalized intersections, including roundabouts. HCS 2010 was also used to determine density and level of service for weaving, merge, and diverge influence areas in the freeway segments.
- Synchro (with signal timing provided by the Municipality of Anchorage) was used to examine level of service and queue characteristics for vehicles at signalized intersections.
- HCS 2000 was used for pedestrian LOS at unsignalized and signalized intersections.
- The Federal Highway Administration publication "Capacity Analysis Techniques for Design and Operation of Freeway Facilities" was used to estimate level of service for freeway ramps, depending on volume and ramp curvature.
- Vissim software was used to prepare a microsimulation of the interaction of roundabouts at the Seward Highway ramp terminals with the signalized intersection at the Old Seward Highway.
- The Manual on Uniform Traffic Control Devices 2009 was used to evaluate freeway guide signing.
- A Policy on Geometric Design of Highways and Streets was used to evaluate intersection and stopping sight distance, appropriate level of service objectives for specific facilities, and design of ramp features.

Default values representative of the general characteristic of the area were frequently used throughout the analysis. Values collected specifically for this analysis to be used instead of default values include:

- Peak Hour Factor (PHF), a measure of how traffic volumes vary throughout the hour being studied. For most locations, the analysis used the intersection PHF. Near schools, the PHF associated with traffic turning away from or towards a school during school

arrival or dismissal was used for those movements, as school traffic tends to exhibit more variability.

- Lane utilization, a measure of how traffic is shared between two or more lanes carrying the same movement. Lane utilization data were collected for the Northern Lights and Benson Boulevard alternative (manual observation) and for the Tudor Road alternatives (Bluetooth origin-destination study).

Existing Crash Patterns and Safety

DOT&PF provided a crash database detailing all crashes that occurred throughout the entire corridor for the period from 2003 through 2012. As part of the Qualitative Study, these crashes were coded to segments, intersections, and interchanges. Volumes for these years were collected from the DOT&PF Volume Reports or estimated and then used to calculate crash rates, which were compared to statewide crash rates for similar segments or intersections. (Note: in the case of interchange ramps, no state-wide rate is available; therefore, the average crash rate of the Minnesota Drive ramps was used in place of a state-wide rate.)

For each alternative selected for further analysis in the Reconnaissance Engineering Study, the expected crash benefit was estimated using crash modification factors taken from the Highway Safety Improvement Program (HSIP) Handbook, the Highway Safety Manual, or the Crash Modification Factors Clearinghouse online.

Public Involvement

Comments regarding the study were solicited using the following methods:

- Project website (www.minnesotadrivestudy.com) and interactive map
- Open House held on January 13, 2016 at Romig Middle School
- Anchorage Transportation Fair in February 2016.

Approximately 287 comments were received by email, phone, written comment, or online comment map. The comments have been entered into a spreadsheet where they can be sorted by location (see Appendix C). In some instances, further analysis was conducted in response to public comments.

Comparison of Alternatives

In cases where more than one alternative was considered to mitigate a concern at a specific site, a comparison was made of the relative merits of one alternative over another. The comparisons apply only to the range of alternatives selected at that site. The data analysis is not intended to facilitate comparison of projects that address different concerns.

Cost Estimates

Planning level cost estimates for each alternative were developed using values from Bid Tab reflecting recent bid results, with a simplified spreadsheet using quantities estimated from the conceptual drawings. In some cases, similar pay items are grouped together. Although these values were not adjusted for inflation, a contingency factor of 20% was included.

Midtown: Westchester Lagoon to Tudor Road

This segment is characterized as an urban commercial area with West High School and Romig Middle School on the north end and various businesses and high and medium density housing along the length extending south to Tudor Road. Major intersections are controlled with signals at:

- 26th Avenue
- Northern Lights Boulevard
- Benson Boulevard
- Spenard Road
- Tudor Road.

Corridor Pedestrian Connectivity

Between Benson Boulevard and Tudor Road, signalized intersections are spaced at approximately ½-mile intervals. The only designated pedestrian crossing locations are at the signalized intersections, which means that pedestrians walk up to 1 mile out-of-direction to cross Minnesota Drive at a signal in order to access midblock destinations. With pedestrian trip generators and attractions on both sides of Minnesota Drive, pedestrians are regularly observed to cross Minnesota Drive mid-block.

The number of pedestrians crossing mid-block was counted during the evening on Minnesota Drive between Tudor Road and Benson Boulevard. The evening time period was chosen based on the peak hour for pedestrians at the Northern Lights Boulevard and Benson Boulevard intersections. A summary of the counts is shown in Table 1. Counts include both pedestrians and bicyclists crossing Minnesota Drive. Pedestrians and bicyclists traveling within 300 feet of the nearest signalized crosswalk were not included in the counts.

Segment	Date	Time	Pedestrian or Bicyclist Count
31st Avenue to 33rd Avenue	4/13/2016	4:15-5:15 PM	1
33rd Avenue to 36th Avenue	4/12/2016	4:15-6:15 PM	4
300 feet south of Spenard to 40th Avenue	4/06/2016	4:00-6:00 PM	8
40th Avenue to 43rd Avenue	4/06/2016	4:00-6:00 PM	0

Table 1 Summary of Pedestrian Counts Crossing Minnesota Drive

During the evening peak period, vehicles experience significant congestion. Queues are long at the signalized intersections, and pedestrians walk between vehicles that are stopped to read the medians. In segments where vehicles are not fully stopped, vehicles travel at very slow speeds and with very small gaps, making it very difficult for pedestrians to cross Minnesota Drive in these areas.

On Minnesota Drive between Benson Boulevard and Spenard Road, there were 3 pedestrian and 12 bicycle crashes out of 154 total crashes for the segment from 2003 through 2012 (10% pedestrian or bicycle crashes). These crashes resulted in 1 major injury and 7 minor injuries, with 7 crashes resulting in property damage only. Children under 18 years of age were involved as either the bicyclist or the pedestrian in 6 of the 15 crashes. Most of the crashes appear to be

related to bicyclists or pedestrians traveling along Minnesota Drive, rather than crossing Minnesota Drive, with 4 crashes specifying that the pedestrian or bicyclist was traveling north- or southbound, 11 crashes specifying that the vehicle was traveling west- or eastbound, and 2 crashes specifying that the vehicle was traveling north- or southbound and turning right.

Between Spenard Road and Tudor Road on Minnesota Drive, there were 4 pedestrian and 3 bicycle crashes out of a total of 74 crashes from 2003 through 2012 (9.5% pedestrian or bicycle crashes). Children under 18 years of age were involved as either the bicyclist or the pedestrian in 2 of the 7 crashes. Although it is difficult to tell what movement pedestrians or bicyclists were making before the crash, it appears that most of these crashes involved pedestrians or bicyclists traveling along Minnesota Drive, rather than crossing Minnesota Drive. Three of the crashes (including the only fatality) involved vehicles turning right from a side street and two of the crashes involved a vehicle backing up. Only two crashes involved passenger cars traveling north- or southbound; however, the pedestrian movements weren't recorded, so it is uncertain whether or not the pedestrians were crossing Minnesota Drive.

Two addendums to the Alaska Traffic Manual (Section 3B.18 and Section 4A.03) provide guidance for determining whether or not a pedestrian crossing treatments should be considered at any location. Criteria include the number of crossing pedestrians, traffic volume, traffic speed, number of lanes, and presence of a median or refuge.

Through midtown, Minnesota Drive has a speed limit of 45 mph, 3 lanes in both directions, an AADT of over 35,000 vehicles per day, and a median varying in width from about 4 feet to about 15 feet. Based on these characteristics, Table 4A-101 in the ATM specifies two general crossing treatments depending on pedestrian volume. For sites with fewer than 20 pedestrian crossings per hour, non-electrical device treatments are suggested. For example, median islands (already installed) allow pedestrians to cross one direction of travel at a time, which reduces pedestrian delay and may increase safety. For sites with 20 or more pedestrian crossings per hour, a pedestrian hybrid beacon can be considered as part of an engineering analysis. As shown in Table 1, pedestrian volumes did not exceed 20 people per hour in the evening peak period.

Based on the observed pedestrian volumes, the existing treatment (median refuge islands) is appropriate. The crash history does not suggest that additional treatment (such as installation of high visibility warning devices) is necessary.

Public comments indicate that there is latent demand for pedestrians to cross Minnesota Drive at locations in between the traffic signals. If this latent demand exceeds the 20 pedestrians per hour threshold, it may be appropriate to consider an electrical regulatory device, such as a pedestrian hybrid beacon. The pedestrian hybrid beacon would stop traffic traveling along Minnesota Drive to allow pedestrians to cross the roadway. This treatment requires an engineering study to determine if it is an appropriate treatment, based on safety and operational considerations for both pedestrians and vehicle drivers.

A. Southbound Ramp from Minnesota Drive to Hillcrest Drive

The Minnesota Drive southbound exit ramp to Hillcrest Drive, shown in Figure 2, is approximately 1,600 feet in length from the fully developed lane to the stop bar at Hillcrest Drive. The ramp intersection at Hillcrest Drive is a stop-controlled T-intersection (with stop control on the ramp) and the ramp approach has a single shared left-and-right turn lane. The ramp flares at the intersection, allowing for a right turning vehicle to sit side by side with a left turning vehicle, but there is only width for a single queue of traffic.



Figure 2 – Southbound Minnesota Drive Ramp to Hillcrest Drive

The main concerns identified at this location are:

- Capacity at ramp intersection for vehicles on ramp
- Queuing on ramp during peak school periods

Alternatives to address these concerns that DOT&PF selected for further study in this report include:

- Alt A.1 – Lengthen Minnesota Drive Off-Ramp
- Alt A.2 – Add Additional Approach Lane at Hillcrest Drive
- Alt A.3 – Install Roundabout at Hillcrest Drive

An additional analysis was completed in response to public comments:

- Alt A.4 – Install All-way Stop at Hillcrest Drive

Existing Conditions

Operations

KE performed turning movement counts for the Minnesota Drive southbound off-ramp intersection with Hillcrest Drive on August 28, 2015 and August 31, 2015 at the start of the day for West High School (7:30 AM), at school dismissal time (2 PM), and during the PM peak. Figure 3 shows a summary of the turning movement counts during the three time periods. Pedestrians were also counted during these time periods, as shown in Figure 4.

In addition to school traffic, People Mover operates two bus routes (Route 3 and Route 7) that exit on the southbound Minnesota Drive ramp and turn left onto Hillcrest Drive. Both routes operate on 30-minute headways, so that 4 buses turn left from the exit ramp onto Hillcrest Drive every hour throughout the day.

Intersection control at the ramp terminus is stop control for traffic on the ramp and no control on Hillcrest Drive. As such, traffic traveling on Hillcrest Drive is not delayed by the ramp intersection, though queues from upstream intersections were observed to extend up to or past the exit ramp for short periods during the morning and school dismissal time periods. Table 2 presents the delay and level of service (LOS) for the southbound ramp traffic during each of the study time periods, using the Highway Capacity Manual methodology.

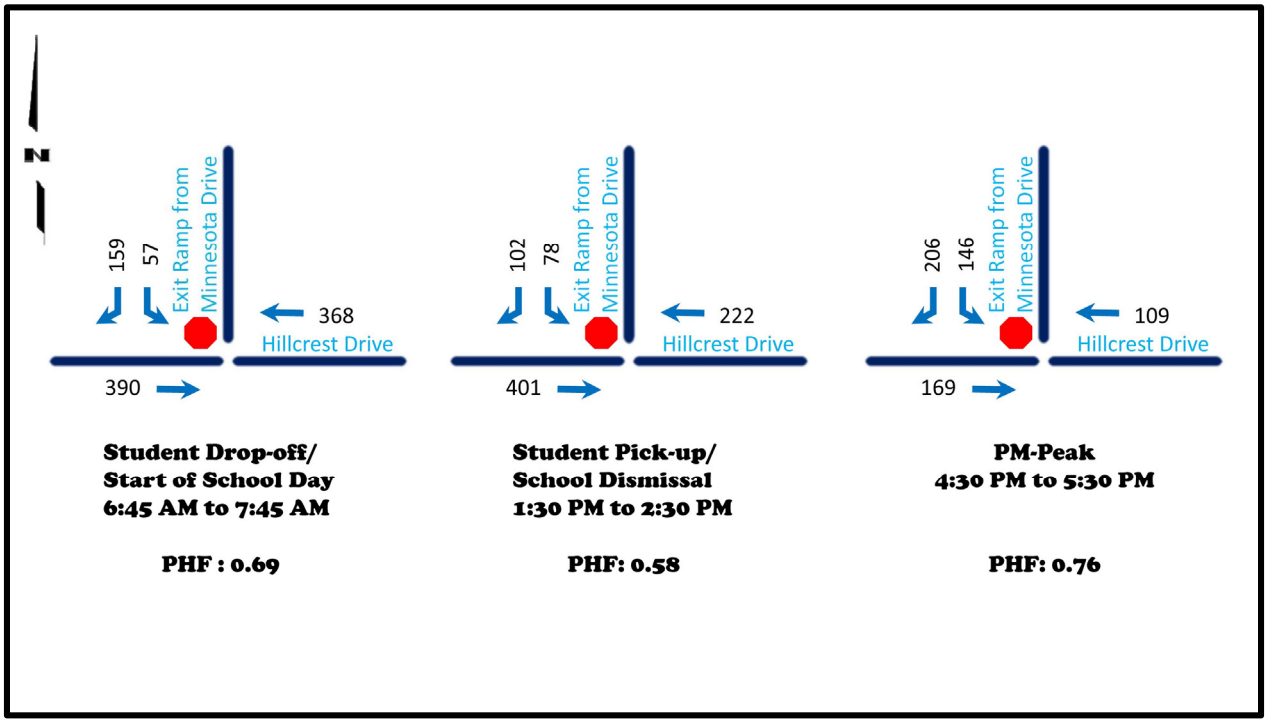


Figure 3 – Existing Turning Moving Counts at Hillcrest Drive and Exit Ramp Intersection

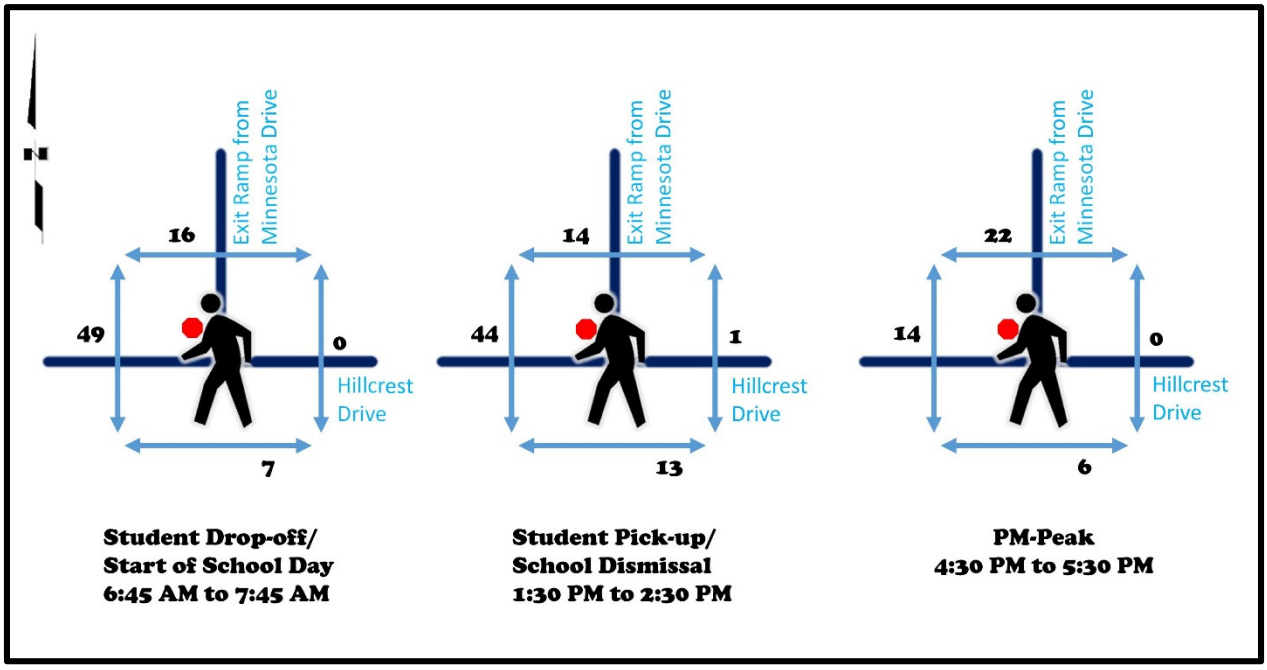


Figure 4 – Existing Pedestrian Counts at Hillcrest Drive and Exit Ramp Intersection

Southbound Approach	AM Peak	School Dismissal	PM Peak
Approach LOS	F	F	C
95th Percentile Queue (veh)	9	8	5
Volume to Capacity Ratio	0.90	0.88	0.64
Approach Delay (sec)	62	57	19

Table 2 – Existing Operational Conditions at Hillcrest Drive – Exit Ramp Intersection

Existing Crash Patterns

The 2003-2012 crash experience for this intersection is summarized below.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average?	Above Critical?
Southbound Minnesota Ramp-Hillcrest Drive Intersection	11	0.524	5750	0.336	0.568	yes	no
Southbound Minnesota to Hillcrest Ramp	3	1.508	1950	1.127	2.616	yes	no

Table 3 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Location	Crash Type	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Southbound Minnesota Ramp-Hillcrest Drive Intersection	Curb/Wall		1	1
	Sign		2	2
	Right Angle	2	2	4
	Rear End	1	3	4
	Total	3	8	11
Southbound Minnesota to Hillcrest Ramp	Guardrail Face		3	3
	Total		3	3

Table 4 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction			Total
		EAST	SOUTH	WEST	
No Vehicle #2	Curb/Wall	1			1
	Sign	2			2
Eastbound	Head-On Sideswipe			1	1
	Rear End	2			2
Westbound	Rear End			2	2
	Right Angle		3		3
Total		**5**	**3**	**3**	**11**

Table 5 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction – Southbound Minnesota Ramp at Hillcrest Drive

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction	
		SOUTH	Total
No Vehicle #2	Guardrail	3	3
Total		**3**	**3**

Table 6 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction – Southbound Minnesota to Hillcrest Ramp

The crash rate for this intersection and ramp segment are statistically similar to average crash rates. There were no fatal or major injury crashes from 2003 to 2012.

Planning Background

Plans for West High School and Romig Middle School consider some of the traffic congestion issues along Hillcrest Drive. DOT&PF Central Region has recommended that the Municipality of Anchorage pursue direct access from the school site to Northern Lights Boulevard to reduce congestion caused by circuitous routes to the school.

The Anchorage Pedestrian Plan identified a crossing project for the Minnesota Southbound Ramp-Hillcrest Drive. The project, listed as Priority Project 109, would make pedestrian crossing improvements at the Minnesota Southbound Ramp-Hillcrest Drive intersection and two other intersections on Hillcrest Drive.

Alt A.1 – Lengthen Minnesota Drive Off-Ramp

Operations

The existing ramp length is approximately 1,600 feet from the fully developed lane to the stop bar at Hillcrest Drive. The maximum queue observed on the southbound Minnesota Drive exit ramp at Hillcrest Drive was 9 vehicles during the AM peak when student arrive at West High School. Given an average vehicle length of 25 feet, this is equivalent to a 225-foot queue.

The American Association of State Highway and Transportation Officials (AASHTO) publication *A Policy on Geometric Design of Highways and Streets* recommends that a declaration lane of 425 feet be provided on a roadway with a speed limit of 50 mph and a declaration lane of 275 feet be provided on a roadway with a speed limit of 40 mph. Using interpolation, on a roadway with a speed limit of 45 mph such as the off-ramp from Minnesota Drive to Hillcrest Drive, a deceleration lane of 345 feet should be provided.

Taking into consideration the maximum observed queue and recommended deceleration lane length, only 570 feet of the 1,600-foot ramp is being utilized. This leaves storage room for an additional 41 passenger vehicles.

Safety

Targeted Crashes

This treatment would target be rear end crashes associated with queues on the off ramp; however, there were no rear end crashes associated with the off ramp. All 3 crashes that occurred on the off ramp were run off road crashes involving guardrail.

Potential Safety Benefit

Little safety benefit is anticipated with lengthening the off-ramp as there are no specific crashes associated with queueing vehicles on the ramp.

Conclusions

Since the existing ramp provides for deceleration and queues for far more vehicles than needed, extensions to the ramp length are not recommended.

Alt A.2 – Add Additional Approach Lane at Hillcrest Drive

To relieve congestion at the intersection of the Minnesota Drive southbound exit ramp with Hillcrest Drive, this alternative (shown in Figure 5) proposes to install an auxiliary turn lane to help improve the flow of southbound traffic.

Operations

Table 7 shows the operational characteristics of the southbound approach under this alternative. With the installation of an auxiliary lane, LOS for right turning vehicles is significantly improved; however, LOS for left turn vehicles is not improved in the morning peak period.



Figure 5 – A.2 Add Additional Approach Lane at Hillcrest Drive

Southbound Approach	AM Peak		School Dismissal		PM Peak	
	Left	Right	Left	Right	Left	Right
LOS	F	C	D	B	C	B
95th Percentile Queue (veh)	3	3	3	1	2	1
Volume to Capacity Ratio	0.57	0.52	0.49	0.32	0.40	0.27
Control Delay (sec)	60	21	31	15	18	11
Approach LOS	D		C		B	
Approach Delay (sec)	31		22		14	

Table 7 – Operational Conditions for Alt A.2 (Additional Southbound Approach Lane)

Based on a queue of 3 vehicles (about 75 feet), the auxiliary lane should be 150 feet in length.

Safety

Targeted Crashes

Targeted crashes would be southbound off-ramp crashes occurring at the Hillcrest Drive stop-controlled intersection. Of the 11 crashes occurring at this intersection, only 3 involve the southbound movement. They were all right angle crashes involving southbound vehicles on the stop-controlled movement leaving the stop bar and being struck by westbound vehicles on Hillcrest Drive.

Potential Safety Benefit

An additional approach lane might not offer significant crash reduction for the southbound movement since the existing crashes are right angle types. An additional lane could increase right angle crashes if left turning traffic in the left lane blocks the sight line of vehicles making a right turn onto Hillcrest Drive. The 2016 HSIP Handbook does not specify a crash reduction for adding a right turn lane on the minor stop controlled leg of an intersection.

Alt A.3 Roundabout at Hillcrest Drive

This alternative would remove the stop sign and place a single-lane roundabout with single-lane approaches at the intersection of the Minnesota Drive southbound exit ramp with Hillcrest Drive (see Figure 6).

Operations

Table 8 through Table 10 show the operational conditions for this alternative. Installing a roundabout introduces some delay to the eastbound and westbound traffic, but significantly reduces delay for southbound traffic. The longest queues extending from the roundabout would be for eastbound traffic at school dismissal time, as students are exiting the parking area. Based on the 95th percentile queues, eastbound queues would extend up to, but not through the upstream school driveway.

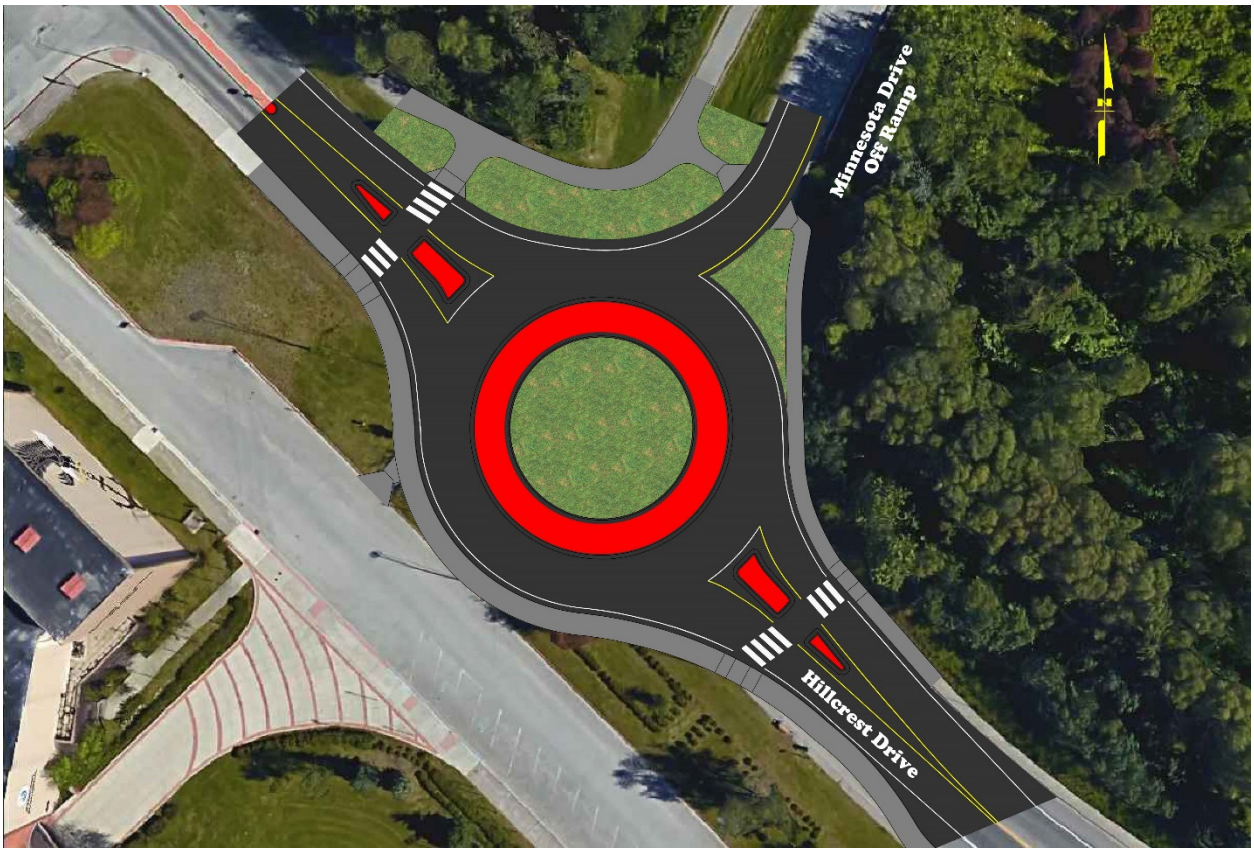


Figure 6 – A.3 Roundabout at Hillcrest Drive

	Westbound	Eastbound	Southbound	Overall
LOS	A	B	B	B
95th Percentile Queue (veh)	4	3	3	-
Volume to Capacity Ratio	0.57	0.49	0.52	-
Approach Delay (sec)	11	9	15	10

Table 8 – AM Peak Operational Conditions for Alt A.3 (Roundabout)

	Westbound	Eastbound	Southbound	Overall
LOS	A	C	B	B
95th Percentile Queue (veh)	2	7	2	-
Volume to Capacity Ratio	0.35	0.73	0.45	-
Approach Delay (sec)	7	7	12	12

Table 9 – School Dismissal Operational Conditions for Alt A.3 (Roundabout)

	Westbound	Eastbound	Southbound	Overall
LOS	A	A	A	A
95th Percentile Queue (veh)	<1	1	3	-
Volume to Capacity Ratio	0.13	0.25	0.48	-
Approach Delay (sec)	4	7	10	7

Table 10 – PM Peak Operational Conditions for Alt A.3 (Roundabout)

Of greater concern are the queues extending from upstream intersections (Hillcrest Drive at Spenard Road to the east and the school left turn entrance driveway 600 feet to the west). If queues from these intersections extend through the roundabout, the roundabout may become clogged and drivers may exhibit undesirable yielding behavior. As a result, a roundabout may be more appropriate as part of other improvements that decrease congestion throughout the corridor, such as providing direct access to the school site from Northern Lights Boulevard.

Safety

Targeted Crashes

There were 11 crashes at this intersection from 2003-2012. Crash types include 4 rear end, 3 right angle, 1 sideswipe, and 3 single vehicle fixed object crashes. There were no fatalities or major injuries.

Potential Safety Benefit

The 2016 HSIP Handbook suggests a 30% crash reduction for all crashes at a location with three legs (one leg stop controlled). Therefore, a single lane roundabout might be expected to reduce the crash experience at this intersection by three crashes in a 10-year period.

Alt A.4 All-Way Stop Control at Hillcrest Drive

This alternative would install stop signs for every approach on Hillcrest Drive. All-way stop control may reduce delay during busy time periods, but could increase delay during off-peak periods, resulting in drivers ignoring the traffic control device. The MUTCD contains guidance for determining whether or not all-way stop control is appropriate. The MUTCD presents three conditions under which all-way stop may be appropriate. The three conditions include:

- As a short term solution when a signal is warranted, but has not yet been built.
- To address a crash pattern that can be mitigated by installation of an all-way stop
- When volume and delay exceed a given threshold

In terms of safety, all-way stop control may be considered for installation when 5 or more crashes correctable by an all-way stop occur within a 12-month period. Correctable crashes include right turn, left turn, and right angle crashes. From 2003 to 2012 there were only 3 crashes correctable by all-way stop control. Thus, this condition is not met.

The volume and delay warrant consists of three criteria, all of which must be met:

- An average of 300 cars or more entering the intersection per hour from the major roadway over any 8 hours of the day
- An average of 200 (combined) vehicles, pedestrians, and bicycles or more entering the intersection from the minor street (both approaches) during the same 8-hour period
- Average vehicle delay for the minor street during the highest hour of 30 seconds per vehicle or more

While the vehicle delay from the Minnesota southbound ramp is greater than 30 seconds per vehicle during both the school arrival and school dismissal periods, the volume thresholds are not met for 8 hours of the day. Therefore, all-way stop control is not recommended for this intersection and is not evaluated further.

Cost Estimates

Phase	Alternative A.2	Alternative A.3
Design	$262,000	$471,000
Right-of-Way	$0	$0
Utilities	$10,000	$68,000
Construction	$435,000	$1,647,000
Contract Administration (20% of construction costs)	$87,000	$330,000
Contingency (20%)	$159,000	$503,000
Total	**$953,000**	**$3,019,000**

Comparison of Alternatives

Lengthening the Minnesota Drive off-ramp to Hillcrest Drive (Alternative A.1) is not recommended, as it could have significant environmental impacts and was not shown to provide much benefit.

Adding an additional approach lane to the southbound approach to the ramp intersection on Hillcrest Drive would decrease delay for southbound right turn vehicles, but would not significantly reduce delay for southbound left turn vehicles. Although the southbound left turn volumes are relatively small, they do include People Mover buses. The delay at this intersection is likely to have a significant impact on route timing. Any safety benefit to this alternative is expected to be very small. There would be no operational impact to east- and westbound traffic.

Installing a roundabout at the ramp terminal intersection would introduce delay for east- and westbound traffic; however, the delay would be minimal (less than 10 seconds per vehicle). Delay for both southbound right-turn and southbound left-turn vehicles would be reduced significantly. Crashes at this intersection would be reduced by about one third (3 fewer crashes out of 11).

None of the alternatives would address congestion at other nearby intersections. Table 11 summarizes the points of comparison.

	A.2 Add Approach Lane	**A.3 Roundabout**
Southbound Right Turn	LOS B/C	LOS A/B
Southbound Left Turn	LOS D to F	LOS A/B
Eastbound and Westbound	No delay	LOS A to C
Crash Reduction	0 out of 11	3 out of 11
Cost	$953,000	$3,019,000

Table 11 – Comparison of Alternatives for Hillcrest Drive

B. 26th Avenue at Minnesota Drive Intersection

At 26th Avenue, a signal serves traffic from Romig Middle school on the west and the residential area on the east, as well as providing protection for pedestrian crossings between the residential area and Romig Middle and West High Schools, as shown in Figure 7. A school speed zone extends about 400 feet along Minnesota Drive to either side of the 26th Avenue intersection, reducing the speed limit from 45 mph to 20 mph during school arrival, lunch, and dismissal periods. The flashers are active from 7:00 to 8:25 AM during the arrival period. During normal days, the lunch period flashers are active 10:15 to 11:10 AM. During parent-teacher conferences, they are active 10:50 AM to 12:15. The dismissal period flashers are active 1:50 to 3:15 PM during normal days and 1:50 to 2:30 PM during parent-teacher conferences.

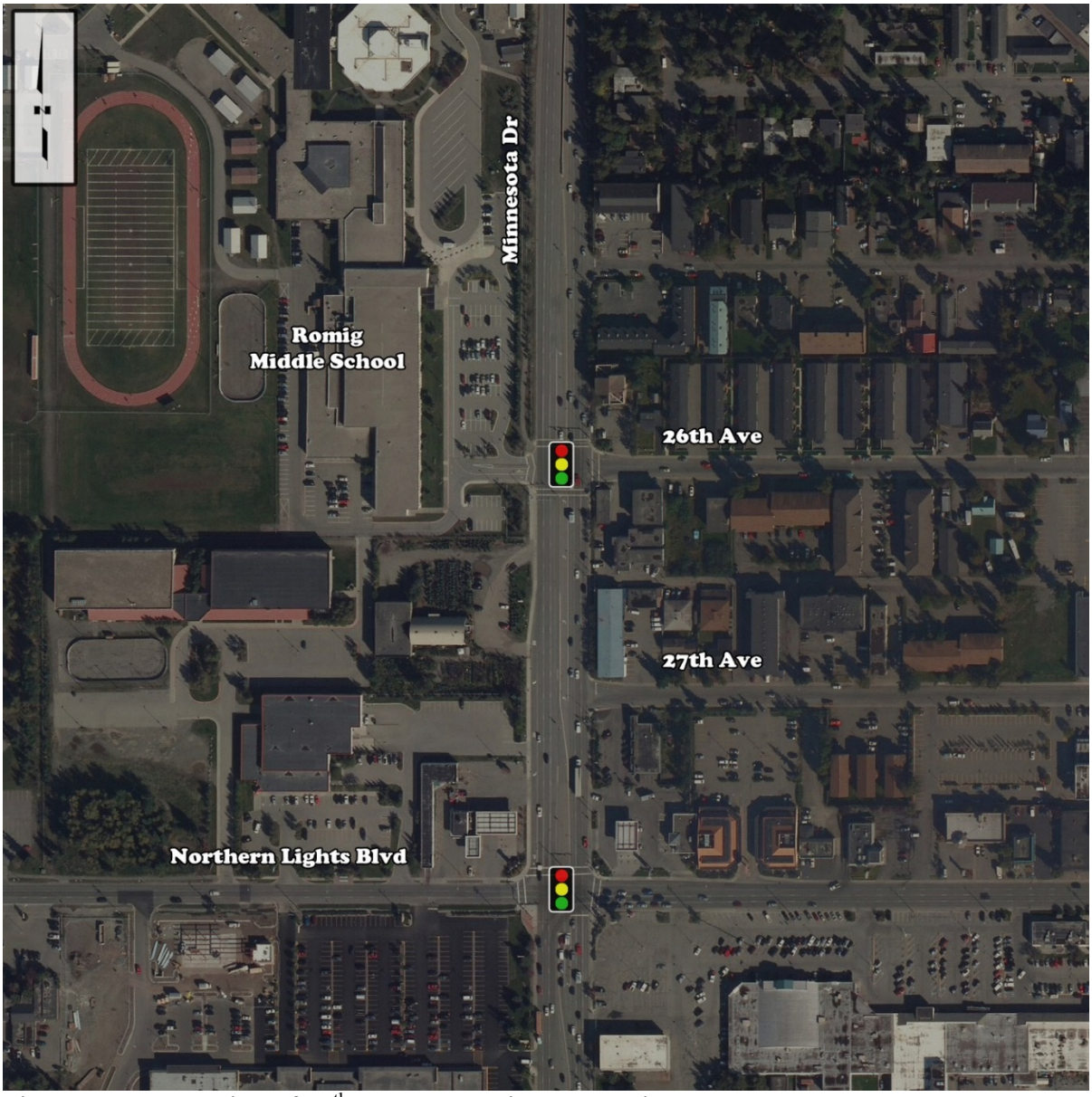


Figure 7 – Intersection of 26th Avenue at Minnesota Drive

The main concerns identified at this location are:

- Northbound and southbound capacity (a concern from 26th Avenue to Tudor Road)
- School speed zone exacerbates capacity delay in morning peak
- Queuing in northbound left turn lane

DOT&PF selected one alternative at this location for further study in this report:

- Alt B.2 – Lengthen Northbound Left-Turn Lane

See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

Operations

This is a four-way intersection with a protected northbound left turn phase. Counts were taken on January 15, 2015 by DOT&PF and April 20 and 21, 2015 by KE, as shown in Figure 8.

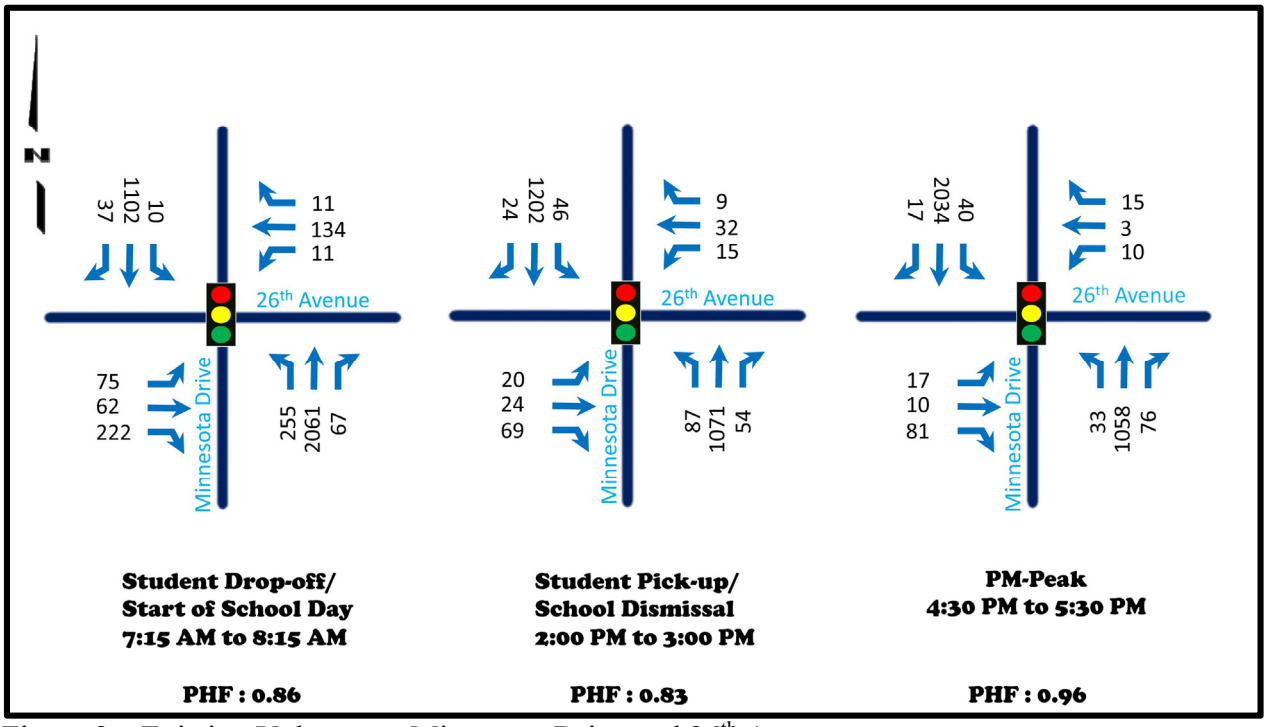


Figure 8 – Existing Volumes at Minnesota Drive and 26th Avenue

Northbound Left Turn	AM Peak	School Dismissal	PM Peak
Movement LOS	D	B	C
95th Percentile Queue (veh)	8	3	1
Volume to Capacity Ratio	0.75	0.40	0.25
Movement Delay (sec)	39	20	26

Table 12 – Existing Operational Conditions for Northbound Left Turn at Minnesota Drive and 26th Avenue

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized in Table 13.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average?	Above Critical?
Minnesota Drive at West 26th Avenue	48	0.366	35,930	1.415	1.590	no	no

Table 13 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Crash Type	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Left Turn		4	2	6
Other	1		1	2
Overtaking Sideswipe		1	6	7
Pedestrian/Bicycle	1	2	1	4
Rear End		9	13	22
Right Angle		3	3	6
U Turns	1			1
Total	**3**	**19**	**26**	**48**

Table 14 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Other			1	1		2
Eastbound	Overtaking Sideswipe	1					1
	Rear End	1					1
Northbound	Left Turn			4			4
	Overtaking Sideswipe		1				1
	Pedestrian/Bicycle					1	1
	Rear End		2				2
	Right Angle	3				2	5
	U Turns		1				1
Southbound	Left Turn		2				2
	Overtaking Sideswipe			3	1		4
	Rear End		1	16	1		18
Unknown Direction	Overtaking Sideswipe	1					1
	Pedestrian/Bicycle		1	1	1		3
	Rear End				1		1
	Right Angle		1				1
Total		**6**	**9**	**25**	**5**	**3**	**48**

Table 15 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction

The crash rate for this intersection is below the average crash rate for similar locations. There were no fatal crashes, but there were 3 major injury crashes from 2005 to 2008, indicating that crash severity may be a concern. One of the major injury crashes involved a southbound vehicle making a u-turn and striking a northbound vehicle, one involved a southbound vehicle striking the median, and one involved a pedestrian (see the following paragraph).

Four pedestrian or bicycle crashes occurred at the 26th Avenue intersection during the study period. On Wednesday, June 16, 2004 at 4:45 PM, a fourteen-year-old bicyclist received minor injuries in a crash. It is unknown what direction the bicyclist was traveling and there is no information about the other vehicle that was involved. On Sunday, June 25, 2006 at 4:16 AM, a southbound vehicle struck a pedestrian in the roadway, resulting in minor injuries to the pedestrian. It is unknown what direction the pedestrian was traveling. The pedestrian was ticketed for being intoxicated. On Sunday, October 5, 2008 at 12:51 AM, a 21-year-old man received major injuries when he was struck by a northbound vehicle. On Wednesday, January 5, 2011 at 6:57 AM, a westbound pedestrian was involved in a property-damage only crash. The crash report gives no information regarding the age of the pedestrian or regarding the vehicle that was involved in the crash. Only the 2011 crash occurred on a school day. It is unknown whether or not this crash involved a middle or high-school student.

Planning Background

This intersection may play a role in Projects 506 and 545 from the Anchorage Metropolitan Area Transportation Solutions (AMATS) Interim 2035 Metropolitan Transportation Plan (MTP) that will consider construction of a bicycle boulevard along 27th Avenue and make pedestrian improvements as well. Additionally, the intersection appears in the West Anchorage District Plan, which recommends adding a new pedestrian facility from Romig Middle School to Spenard Road. DOT&PF Central Region has recommended that the Municipality of Anchorage pursue direct access from the school site to Northern Lights Boulevard to reduce congestion caused by circuitous routes to the school.

Alt B.2 – Lengthen Northbound Left-Turn Lane

This alternative would extend the Minnesota Drive northbound left-turn lane from its current length of 350 feet to 400 feet, which is the desired length based on a combination of deceleration in the lane and 95th percentile queue. The additional length would provide extra storage for vehicles in the left-turn queue as well as additional deceleration area outside of the through lanes on Minnesota Drive (see Figure 9).

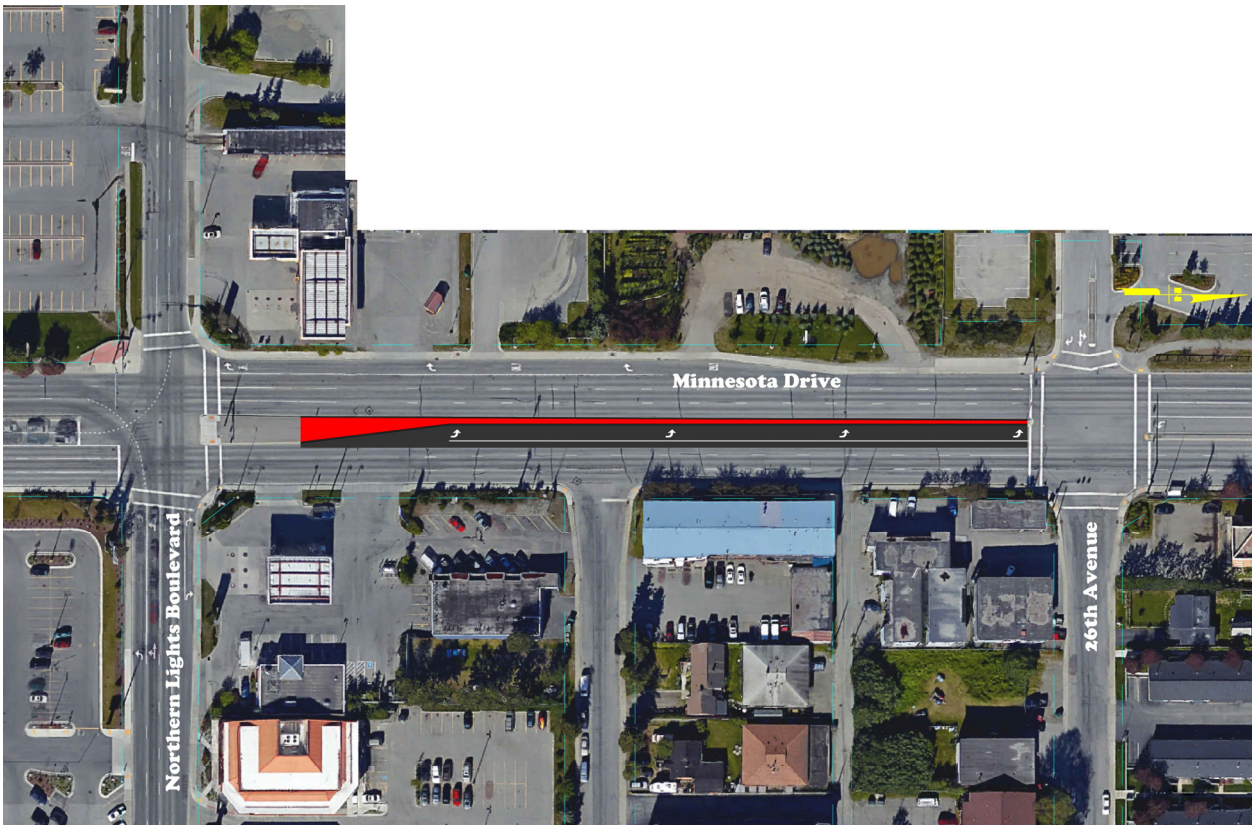


Figure 9 – B.2 Lengthen Northbound Left Turn Lane

Operations

The northbound left turn lane experiences a large volume of traffic during school arrival time in the morning. Left turns are made under protected-permitted phasing.

National Cooperative Highway Research Program (NCHRP) Report 279 sets forth guidelines for finding minimum turn lane lengths and desired turning lane lengths. A minimum turning lane length takes into account that a driver slows down 10 mph before entering the turning lane while a desired turning lane length accounts for drivers decelerating only in the turning lane. Turning lane length is dependent on through traffic speed, turning volumes, and adjacent queue lengths.

Where speeds are 35 mph or lower, the turn lane only needs to accommodate the queue. Because of the 20 mph school zone, at school arrival and dismissal, the turn lanes only need to accommodate the queue length at these times, whereas the speed limit is 45 mph during the PM peak and therefore the turn lane needs to also include deceleration length. The Alaska Highway Preconstruction Manual states that a left turn auxiliary lane should be at a minimum 100 feet and provide space for both decelerating and storage for roads with a 40-45 mph speed limit. Roads with a speed limit of 30-35 mph and lower need to provide only storage. Thus, during time periods when the school speed zone is active, only vehicle storage is necessary. The end result is that even though queues are longer during school arrival and dismissal times, the maximum need for left turn lane length occurs in the PM peak when the lane must also accommodate deceleration. As shown in Table 16, the desired lane length to accommodate queue and deceleration in the PM Peak is 400 feet.

	School Arrival	School Dismissal	PM Peak
Turning Volume	255	87	33
Left Turn Lane Queue	200 Feet	75 Feet	72 Feet
Minimum Lane Length	200 Feet	100 Feet	225 Feet
Desired Lane Length	200 Feet	100 Feet	400 Feet

Table 16- Northbound Left Turn Queue and Turn Lane Length Analysis

Safety

Targeted Crashes

There were 48 crashes at this intersection from 2003-2012. Only one of the 22 rear end crashes was attributable to northbound traffic. An additional 3 northbound-related rear end crashes occurred in the segment of Minnesota Drive between Northern Lights Boulevard and 26th Avenue.

Potential Safety Benefit

The 2016 HSIP Handbook specifies a rear end crash reduction of 15% for lengthening an existing left turn lane. Since there were only 4 crashes involving northbound versus northbound vehicles approaching 26th Avenue, the safety benefit of extending the left turn lane is negligible.

Cost Estimates

Phase	Alternative B.2
Design	$131,000
Right-of-Way	$0
Utilities	$10,000
Construction	$149,000
Contract Administration (20% of construction costs)	$29,000
Contingency (20%)	$39,000
Total	**$358,000**

C. Minnesota Drive from 26th Avenue to Northern Lights Boulevard

Minnesota Drive between 26th Avenue and Northern Lights Boulevard is a six lane arterial with a raised median. The segment has two driveways on the west side of Minnesota Drive and three on the east (including 27th Avenue).

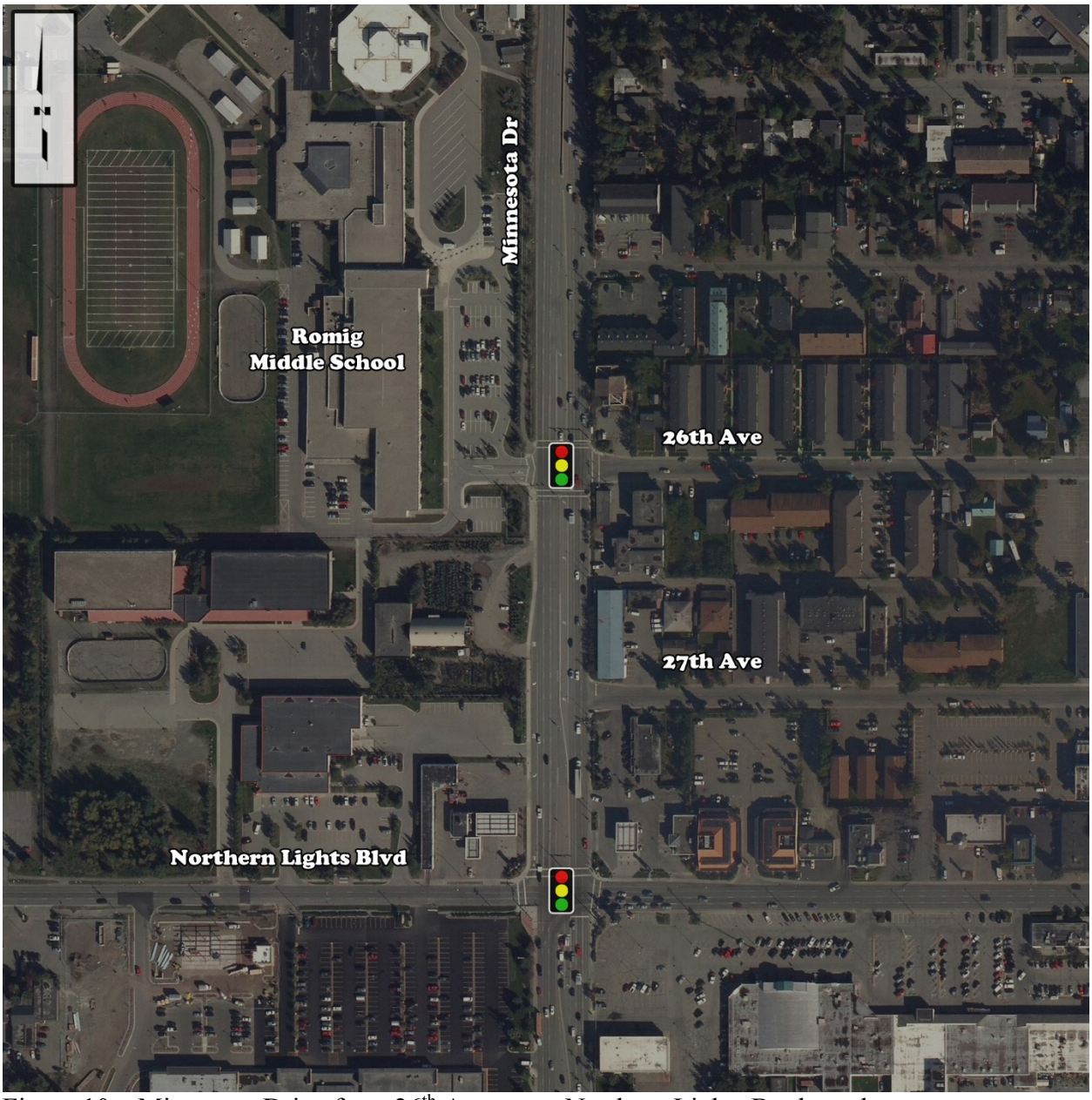


Figure 10 – Minnesota Drive from 26th Avenue to Northern Lights Boulevard

The main concerns identified at this location are:

- Pedestrian/bicycle connections from existing pathways to improvements proposed for 27th Avenue. DOT&PF has requested that the 27th Avenue project address these.

DOT&PF did not select any alternatives from this segment for further analysis. See Appendix B for a qualitative analysis of all alternatives.

D. Northern Lights Boulevard/Benson Boulevard Couplet

Northern Lights Boulevard and Benson Boulevard form a one-way couplet with traffic traveling eastbound on Benson Boulevard and westbound on Northern Lights Boulevard. Between the two roadways, Minnesota Drive is a four-lane road with dual left turn lanes at both intersections, divided by a 4-foot raised median. Pedestrians are prohibited from crossing the south leg at the Northern Lights Boulevard intersection and the north leg at the Benson Boulevard intersection due to conflicting left turn movements operating in shared through-and-left turn lanes.



Figure 11 – Northern Lights Boulevard/Benson Boulevard Couplet

The main concerns identified at this location are:

- Pedestrian movements are prohibited in an area with observed pedestrian demand
- Pedestrian and bicycle crashes
- Lack of storage for northbound and southbound left turns

Three alternatives were combined into one for further study as part of this report:

- Alt D.2, D.3, and D.4 – Complete Pedestrian Crosswalks at Signals, Widen Minnesota to Create Parallel Left-Turn Lanes, and Redistribute Storage for Northbound and Southbound Left-Turn Lanes

See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

Operations

The intersection of Minnesota Drive and Northern Lights Boulevard is signalized, with traffic approaching from three directions (no eastbound traffic). Westbound traffic utilizes five lanes: a left turn lane, a left turn/through lane, two exclusive through lanes and a right turn lane. There are three through lanes for both north and southbound traffic. In addition, there is one right turn lane for southbound traffic and two left turn lanes for northbound traffic. Figure 12 shows the existing turning movement counts.

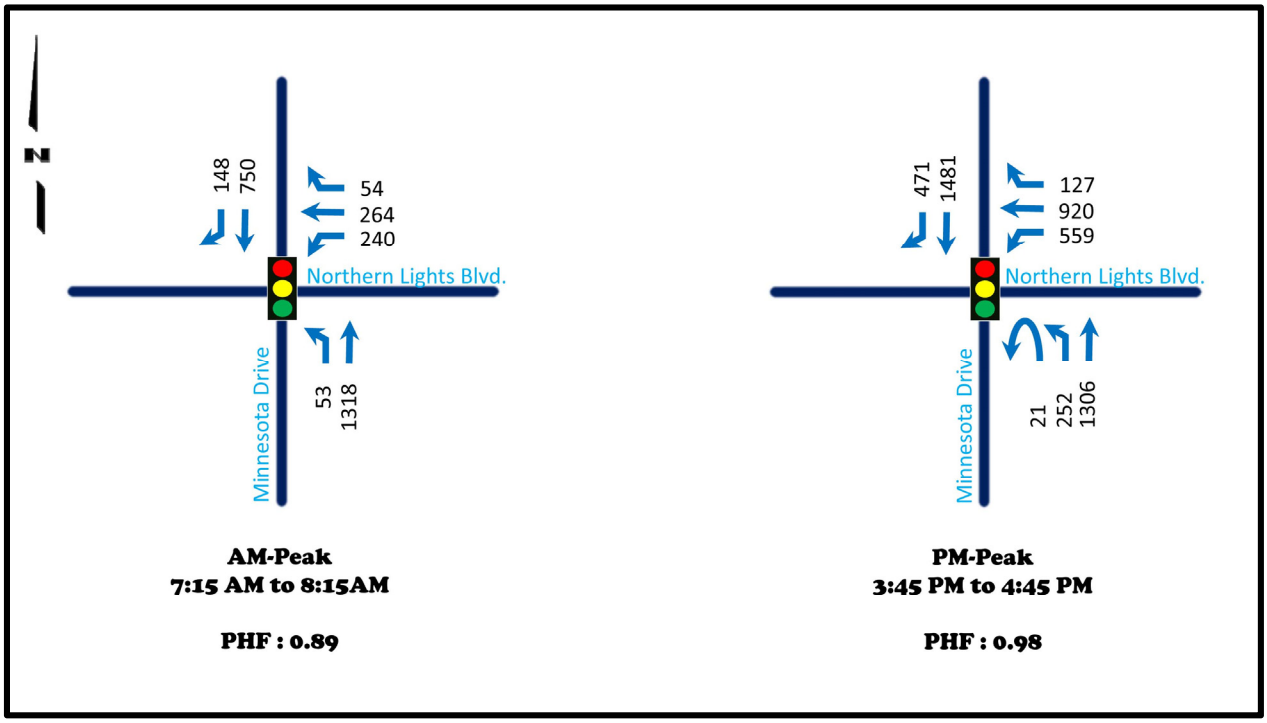


Figure 12 – Existing Volumes at Northern Lights Boulevard and Minnesota Drive

The Benson Boulevard intersection is also signalized with traffic approaching from three directions (no westbound traffic). Eastbound traffic utilizes four lanes (a left turn lane, a left turn/through lane, an exclusive through lane, and a shared through/right turn lane. Northbound traffic on Minnesota Drive has two designated through lanes and one shared through/right turn lane. Southbound traffic uses three through lanes and two left turn lanes. Figure 13 shows the existing turning movements.

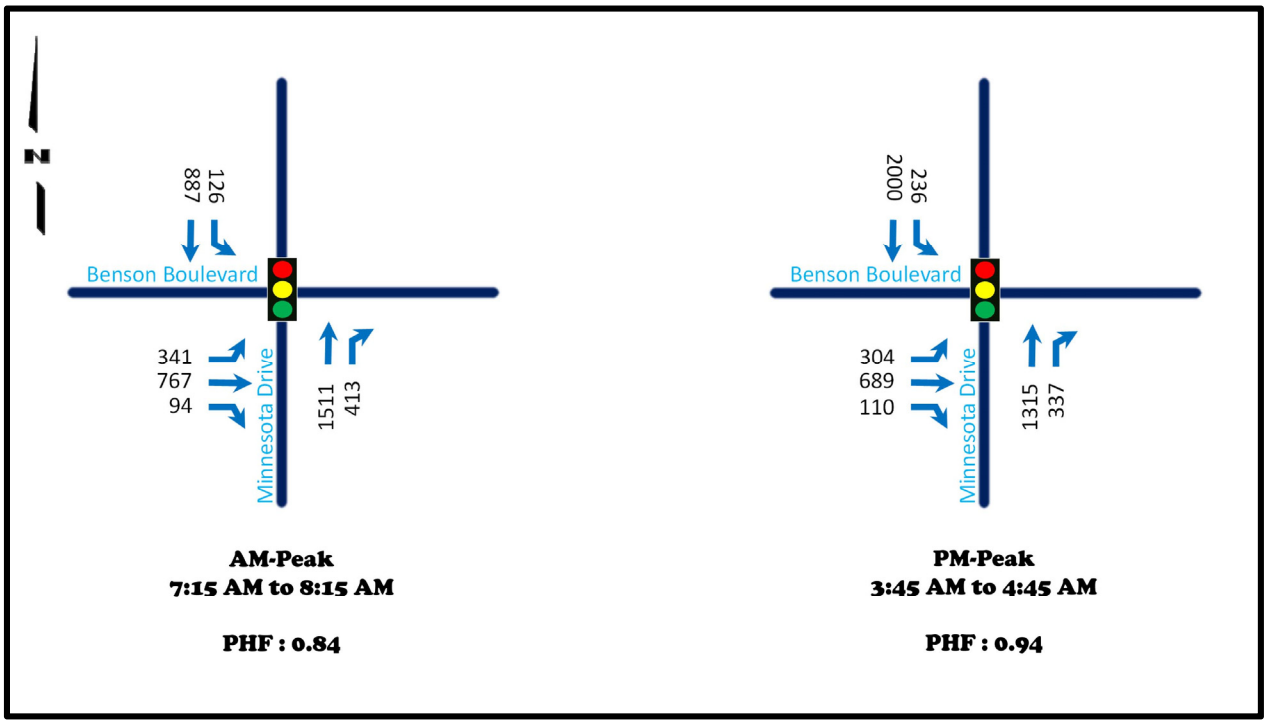


Figure 13 – Existing Volumes at Benson Boulevard and Minnesota Drive

The segment between Northern Lights and Benson Boulevards has one driveway on the west side of Minnesota Drive and one driveway on the east.

Figure 14 shows the existing lane configuration, morning and evening signal phasing, and lane distribution at the Northern Lights Boulevard intersection with Minnesota Drive. Figure 15 shows the same information for the Benson Boulevard intersection with Minnesota Drive. Pedestrians are prohibited from crossing the south leg at the Northern Lights Boulevard intersection and the north leg at the Benson Boulevard intersection due to conflicting left turn movements operating in shared through-and-left turn lanes. Pedestrian counts collected in July 2013 as part of the AMATS: Northern Lights/Benson Boulevard Pedestrian Safety Study observed 13 pedestrians crossing the prohibited approach at Northern Lights Boulevard and 12 pedestrians crossing the prohibited approach at Benson Boulevard during the 12 count hours (7 hours on a Tuesday and 5 hours on a Saturday). In addition, 106 pedestrians were observed crossing midblock between Northern Lights and Benson Boulevards during the 12-hour count.

KE made observations of existing traffic operations at both intersections in August 2015. Lane distribution was observed for the eastbound approach at Benson Boulevard in the morning peak period and for the westbound approach at Northern Lights Boulevard in the evening peak period. These observations were made during the peak hour for these approaches. In addition, the northbound and southbound left turns between the two intersections were observed during the evening peak period. The lane distribution observations, shown in Figure 14 and Figure 15, were used to calculate lane utilization, shown in Table 17 and Table 18.

The measured lane utilizations are lower than Synchro defaults. At the Northern Lights Boulevard intersection, the outer westbound through lane carries half the traffic of the other through lanes. This is probably related to through traffic avoiding turning traffic at the frequent driveways upstream of the intersection as well as the lane drop condition one mile downstream. Lanes carrying left turns are fairly well balanced. At the Benson Boulevard intersection, the

overall lane distribution is fairly balanced, but because of the shared condition, 50% of through vehicles travel in the exclusive through lane.

In the evening peak hour, northbound left turn traffic at Northern Lights Boulevard was observed spilling out of the left turn bay and impacting through traffic during multiple cycles. Although southbound left turn traffic at Benson Boulevard was not observed to spill out of the turn bay, the southbound left turn traffic was heavy and frequently filled up the available storage.

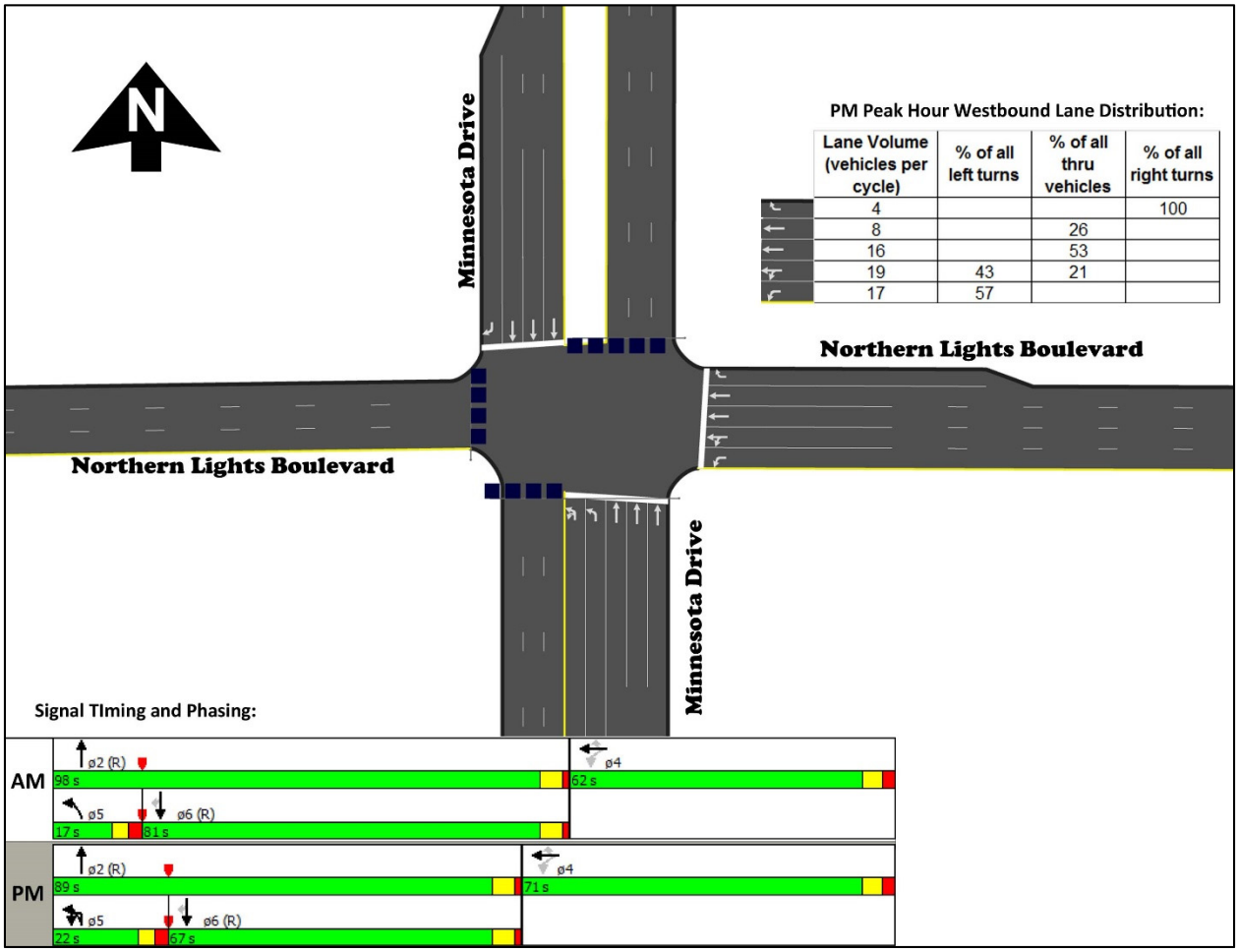


Figure 14 – Existing Lane Configuration, Signal Timing, and Lane Distribution at Northern Lights Intersection

	Lane Utilization
Westbound left	0.88
Westbound through	0.63
Northbound left	0.90

Table 17 – Lane Utilization at Northern Lights Boulevard Intersection during PM Peak

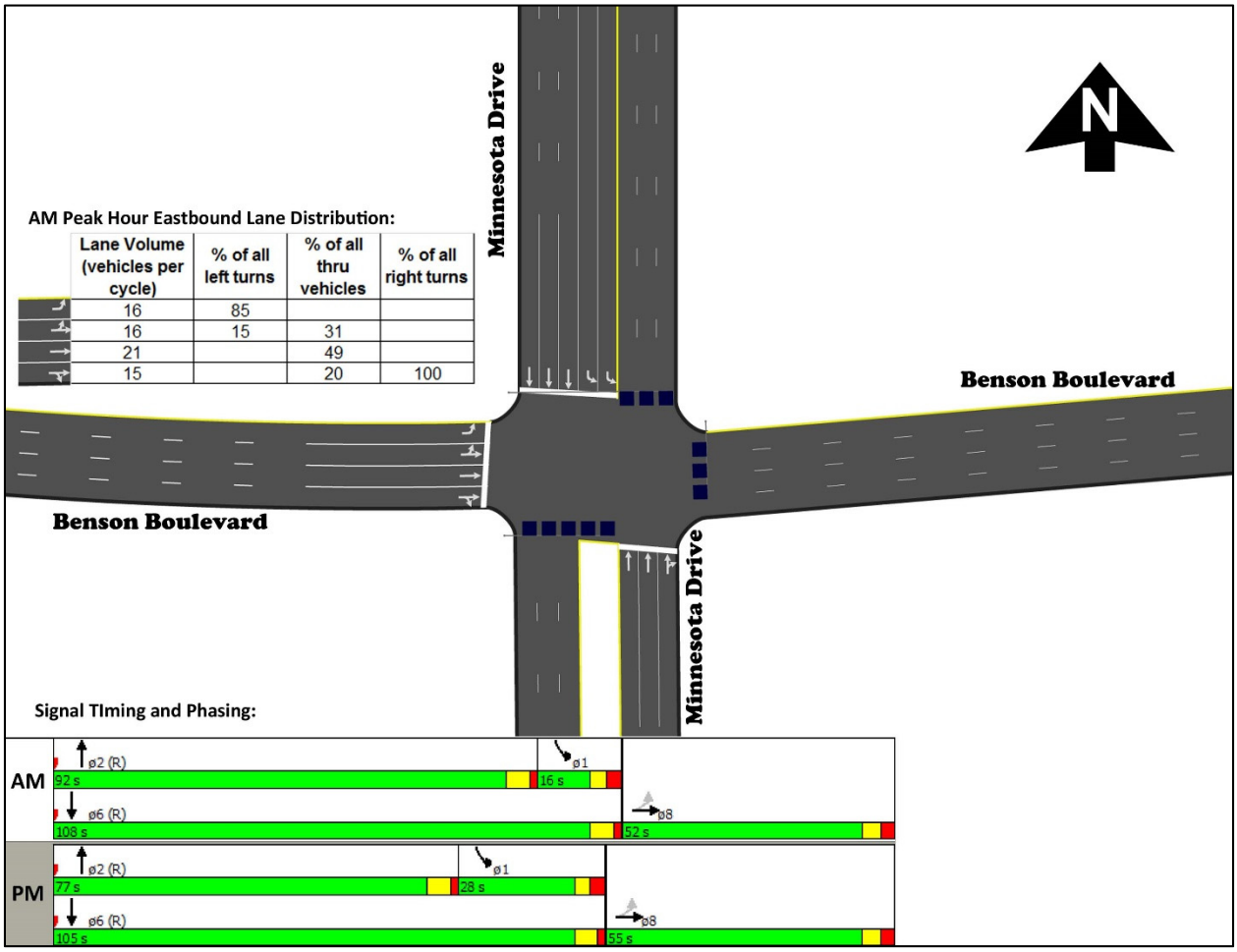


Figure 15 – Existing Lane Configuration, Signal Timing, and Lane Distribution at Benson Intersection

	Lane Utilization
Eastbound left	0.59
Eastbound through	0.69
Southbound left	0.96

Table 18 – Lane Utilization at Benson Boulevard Intersection during AM Peak

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized in the following tables. The segment in between the two intersections had a statistically higher than average crash rate. Additionally, crash severity is a concern, with 3 fatal crashes and 12 major injury crashes from 2003 to 2012. Right angle crashes and pedestrian crashes are the most common type of severe crash in this segment. The State's HSIP program has identified this segment of Minnesota Drive as a top area of concern for pedestrian crashes in the State, especially during hours of darkness and when visibility is poor due to adverse weather.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
Northern Lights Blvd-Minnesota Dr Intersection	187	0.930	55,120	1.221	1.352	no	no
Minnesota Dr Segment from Northern Lights to Benson Blvds	37	25.058	40,450	25.058	1.513	yes	yes
Benson Blvd-Minnesota Dr Intersection	203	1.008	55,180	1.221	1.352	no	no

Table 19 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Location	Crash Type	Fatality	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Northern Lights Blvd & Minnesota Dr Intersection	Double Left Sideswipe				1	1
	Left Turn			1		1
	Other				1	1
	Overtaking Sideswipe			6	9	15
	Pedestrian/Bicycle		1	6	5	12
	Rear End	1	1	25	78	105
	Right Angle	1	3	12	34	50
	Right Left Turn Sideswipe			1	1	2
	Total	**2**	**5**	**51**	**129**	**187**
Segment of Minnesota Dr from Northern Lights Blvd. to Benson Blvd.	Overtaking Sideswipe				6	6
	Pedestrian/Bicycle		3	4	5	12
	Rear End			3	5	8
	Right Angle			2	9	11
	Total		**3**	**9**	**25**	**37**
Benson Blvd & Minnesota Dr Intersection	Head On			1		1
	Left Turn			2	2	4
	Other			1	1	2
	Overtaking Sideswipe			5	16	21
	Pedestrian/Bicycle		2	8	3	13
	Rear End			29	78	107
	Right Angle	1	2	12	38	53
	U Turns			1		1
	Double Right Sideswipe				1	1
	Total	**1**	**4**	**59**	**139**	**203**

Table 20 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Other			1			1
	Pedestrian/Bicycle			1	1		2
EAST	Pedestrian/Bicycle			**1**	1		2
NORTH	Overtaking Sideswipe		**6**				6
	Pedestrian/Bicycle	**2**				**1**	3
	Rear End		**22**				22
	Right Angle	2			1	17	20
SOUTH	Left Turn		1				1
	Overtaking Sideswipe			1			1
	Rear End			27			27
	Right Angle	1				7	8
UNKNOWN	Pedestrian/Bicycle	**1**		1	1		3
	Rear End		1		1	2	4
	Right Angle				1	1	2
	Right Left Turn Sideswipe				1		1
WEST	Double Left Sideswipe					1	1
	Overtaking Sideswipe					8	8
	Pedestrian/Bicycle			**1**	1		2
	Rear End				1	51	52
	Right Angle		14	5	1		20
	Right Left Turn Sideswipe			1			1
Total		**6**	**44**	**39**	**10**	**88**	**187**

Table 21 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction – Minnesota Drive at Northern Lights Boulevard

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Pedestrian/Bicycle		1				1
EAST	Pedestrian/Bicycle		**2**				2
NORTH	Overtaking Sideswipe		**1**				1
	Pedestrian/Bicycle	**2**					2
	Rear End		**1**	**1**			2
SOUTH	Overtaking Sideswipe			**4**	1		5
	Pedestrian/Bicycle					**1**	1
	Rear End			**4**			4
	Right Angle	11					11
UNKNOWN	Pedestrian/Bicycle		2	1		**3**	6
	Rear End			1	1		2
Total		**13**	**7**	**11**	**2**	**4**	**37**

Table 22 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction – Minnesota Drive segment between Northern Lights Boulevard and Benson Boulevard

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Other			1	1		2
EAST	Left Turn		1			1	2
	Overtaking Sideswipe	4					4
	Pedestrian/Bicycle			2			2
	Rear End	30			1		31
	Right Angle		12	12	2		26
NORTH	Overtaking Sideswipe		11				11
	Pedestrian/Bicycle	1			1	1	3
	Rear End		36		2		38
	Right Angle	7			1		8
	Double Right Sideswipe		1				1
SOUTH	Head On		1				1
	Left Turn		1				1
	Overtaking Sideswipe			5			5
	Pedestrian/Bicycle		1				1
	Rear End			29	2		31
	Right Angle	12			1		13
	U Turns		1				1
UNKNOWN	Left Turn		1				1
	Overtaking Sideswipe			1			1
	Pedestrian/Bicycle	2	1		3		6
	Rear End	2	1	2			5
	Right Angle	2		2		1	5
WEST	Pedestrian/Bicycle			1			1
	Rear End					2	2
	Right Angle			1			1
Total		**60**	**68**	**56**	**14**	**5**	**203**

Table 23 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction – Minnesota Drive at Benson Boulevard

Planning Background

These intersections appear in Projects 13 and 57 in the Anchorage Pedestrian Plan. Project 13 assesses possible crossing improvements for the Benson Boulevard-Minnesota Drive intersection, while Project 57 focuses on crossing improvements for the Northern Lights Boulevard-Minnesota Drive intersection.

Another pedestrian project is proposed for the segment of Northern Lights Boulevard from Minnesota Drive to the Seward Highway. The project, Project 526 in the MTP (unfunded, illustrative) and Project 19 in the Anchorage Pedestrian Plan, is to upgrade the existing sidewalk along the segment and separate the sidewalk from the roadway.

Project 537 in the MTP is a short-term bicycle project for the Northern Lights/Benson Boulevard couplet proposing to add bicycle lanes to the couplet from Arlington Drive to LaTouche Street.

The Anchorage Bicycle Plan has a bicycle network project to add striping, markings, and signage to this proposed bicycle lane. The couplet also appears in the West Anchorage District Plan as a bicycle improvement plan to add a separated pathway on the couplet. The 2014 DOT&PF Non-Motorized Reconnaissance Engineering Study considered pedestrian and bicycle improvements for Northern Lights and Benson Boulevards between Minnesota Drive and Arctic Boulevard. The study did not recommend installing bicycle lanes due to the lack of adequate width on the segments. The study did recommend internal public connections between 27th Avenue and Northern Lights Boulevard to benefit nonmotorized circulation.

An HSIP project to install pedestrian scale lighting to aid motorists in seeing pedestrians on the sidewalks has been recommended.

Alt D.2, D.3, and D.4 – Complete Pedestrian Crosswalks at Signals, Widen Minnesota to Create Parallel Left-Turn Lanes, and Redistribute Storage for Northbound and Southbound Left-Turn Lanes

All three alternatives selected by DOT&PF for further study were combined into one since the alternatives complement each other. The main characteristics of this combined alternative include:

- Separate eastbound and westbound through and left turning traffic so that pedestrians can be accommodated on all approaches at the signalized intersections.
    - At Northern Lights Boulevard, this can be done by converting the through-left lane to a left turn only lane.
    - At Benson Boulevard, this can be done by converting the through-left lane to an exclusive through lane and building a second left turn lane.
    - Alter signal phasing to include pedestrian phases as well as eastbound or westbound left turn phases.
- Widen Minnesota Drive so that one left turn lane runs the full length of the segment in each direction (northbound and southbound).
- Rebuild the second left turn lane in each direction (northbound and southbound) as back-to-back lanes and redistribute the storage for those lanes.
- Lengthen the southbound right turn lane.

Figure 16 shows the proposed alternative. The signal phase changes, maintaining the existing 160-second cycle length, are illustrated in Figure 17 and Figure 18. At the Northern Lights Boulevard intersection, it was assumed that the westbound left turn lanes carry traffic with the default lane utilization and that the outer westbound through lane continues to carry less traffic compared to the other through lane, but the distribution is more even than existing due to decreased westbound through capacity. Table 24 shows the lane utilization that was used in analyzing the alternative at Northern Lights Boulevard. Similarly, Table 25 shows the lane utilization that was used in the analysis at Benson Boulevard. The analysis assumed that the eastbound left turn lanes carry traffic with the default lane utilization and that there is a preference for through traffic to travel in the through-only lanes over the through-right turn lane.



Figure 16 – D.2, D.3, and D.4 Complete Pedestrian Crosswalks at Signals, Widen Minnesota to Create Parallel Left-Turn Lanes, and Redistribute Storage for Northbound and Southbound Left-Turn Lanes

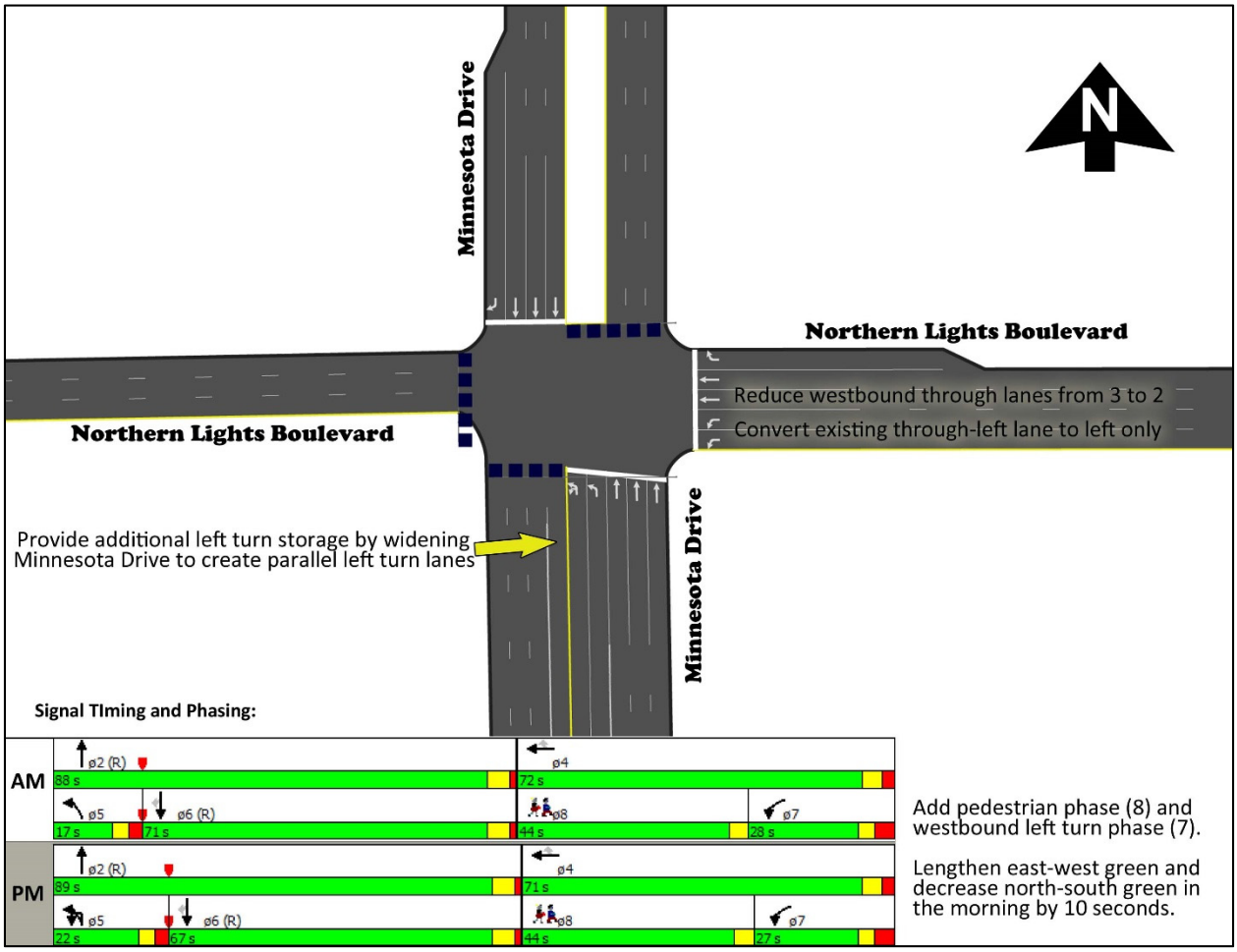


Figure 17 – Proposed Lane Configuration and Signal Timing at Northern Lights Boulevard Intersection

	Assumed Lane Utilization
Westbound left	0.97 (default)
Westbound through	0.79
Northbound left	0.90

Table 24 – Assumed Lane Utilization for Northern Lights Boulevard under Alternative

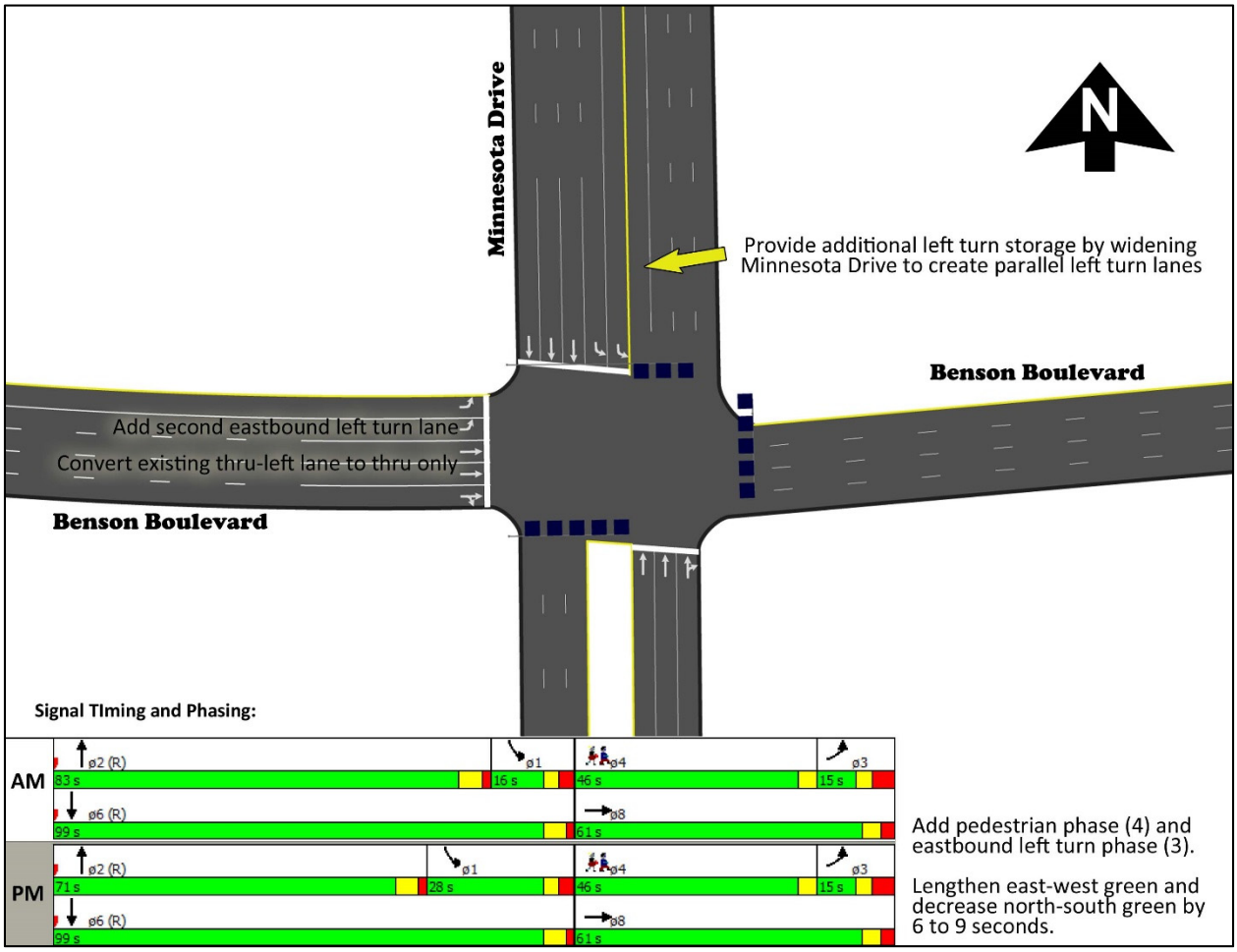


Figure 18 – Proposed Lane Configuration and Signal Timing at Northern Lights Boulevard Intersection

	Assumed Lane Utilization
Eastbound left	0.97 (default)
Eastbound through	0.83
Southbound left	0.97

Table 25 – Assumed Lane Utilization for Benson Boulevard under Alternative

Operations

Vehicular Traffic

The proposed changes at the Northern Lights and Benson Boulevard intersections were modeled in Synchro. Assumptions of the model include that the pedestrian phase only operates when the pedestrian button is activated and that there are 10 pedestrian calls per hour in the morning and 15 pedestrian calls per hour in the evening.

Table 26 through Table 29 compare the existing conditions at the two intersections during the morning and evening peak periods with the conditions under the proposed changes. The results show that the proposed changes would accommodate pedestrian movements that are currently prohibited without significant negative effects on the major movements. Where capacity would be added by the improvements, there would be improvements to LOS).

	AM Existing			AM Proposed		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
WBL	0.45	52	D	0.55	63	E
WBT	0.65	55	E	0.40	46	D
WBR	0.05	49	D	0.05	57	E
NBL	0.40	86	F	0.40	83	F
NBT	0.45	1	A	0.45	2	A
SBT	0.30	12	B	0.30	13	B
SBR	0.10	11	B	0.15	8	A
Overall	**0.50**	**17**	**B**	**0.50**	**17**	**B**

Table 26 – Northern Lights Boulevard: Comparison of Operations for Existing and Proposed Conditions during Morning Peak Period

	PM Existing			PM Proposed		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
WBL	0.75	44	D	0.85	55	D
WBT	1.05	78	E	0.95	47	D
WBR	0.25	30	C	0.20	24	C
NBL	0.90	97	F	0.90	90	F
NBT	0.55	8	A	0.55	8	A
SBT	0.90	42	D	0.90	41	D
SBR	0.95	61	E	0.90	52	D
Overall	**1.00**	**47**	**D**	**0.95**	**39**	**D**

Table 27 – Northern Lights Boulevard: Comparison of Operations for Existing and Proposed Conditions during Evening Peak Period

	AM Existing	AM Proposed

	Volume-to-Capacity Ratio	Average Delay (sec/veh)	LOS	Volume-to-Capacity Ratio	Average Delay (sec/veh)	LOS
EBL	1.25	203	F	0.60	58	E
EBT & EBR	1.10	110	F	0.75	48	D
NBT & NBR	0.95	42	D	1.00	52	D
SBL	0.65	81	F	0.60	71	E
SBT	0.35	14	B	0.35	13	B
Overall	**1.00**	**65**	**E**	**0.90**	**44**	**D**

Table 28 – Benson Boulevard: Comparison of Operations for Existing and Proposed Conditions during Morning Peak Period

	PM Existing			PM Proposed		
	Volume-to-Capacity Ratio	Average Delay (sec/veh)	LOS	Volume-to-Capacity Ratio	Average Delay (sec/veh)	LOS
EBL	0.95	90	F	0.65	70	E
EBT & EBR	0.80	56	E	0.60	45	D
NBT & NBR	0.85	26	C	0.85	26	C
SBL	0.55	48	D	0.55	42	D
SBT	0.75	12	B	0.75	10	A
Overall	**0.85**	**29**	**C**	**0.80**	**26**	**C**

Table 29 – Benson Boulevard: Comparison of Operations for Existing and Proposed Conditions during Evening Peak Period

Proposed turn lane lengths were determined by looking at queue lengths with the proposed changes. The minimum lane length assumes that vehicles begin to decelerate prior to entering the turn lane and then are able to fully decelerate behind the 95th percentile queue, while desired lane length would allow the vehicle to enter the turn lane at speed and fully decelerate in the turn lane before stopping behind the 95th percentile queue. The lane lengths were determined using morning peak traffic at Benson Boulevard and using evening peak traffic at Northern Lights Boulevard.

	WBL	WBT	WBR	NBL	NBT	SBT	SBR
95th Percentile Queue (ft.)	325	450	100	200	100	525	550
Minimum Lane Length (ft.)	325		150	275			725
Desired Auxiliary Lane Length (ft.)	450		450	525			875

Table 30 – Northern Lights Boulevard: Proposed Turn Lane Lengths

	EBL	EBT	NBT	SBL	SBT
95th Percentile Queue (ft.)	375	400	725	125	125
Minimum Lane Length (ft.)	375			200	
Desired Auxiliary Lane Length (ft.)	400			450	

Table 31 – Benson Boulevard: Proposed Turn Lane Lengths

Based on these values and on geometric constraints, the proposed alternative would extend the southbound right turn lane at Northern Lights Boulevard to 550 feet in length, build the new

eastbound left turn lane at Benson Boulevard 400 feet in length, and reapportion the northbound and southbound left turn lanes between the two intersections to give more length to northbound vehicles than to southbound vehicles.

Sensitivity Analysis (pedestrian calls per hour). Because the above analysis assumes that the pedestrian phase only comes up when a pedestrian activates the pedestrian detector, the results will be dependent on the assumption of the number of pedestrian calls per hour. Thus, a sensitivity analysis was performed to determine how the eastbound and westbound left turns would perform under different assumptions of pedestrian demand. Because the cycle lengths are 160 seconds long, there are 22.5 cycles per hour. This is the largest number of possible pedestrian calls each hour. The sensitivity analysis looked at changes to operations of the eastbound and westbound lefts with changes to the number of pedestrian calls per hour, varying from 0 to 20 calls per hour.

Table 32 through Table 35 show that the proposed changes can accommodate significant levels of pedestrian usage, even in the peak hours. For the westbound left turns at Northern Lights Boulevard, delay is increased in the morning by 2 to 15 sec/vehicle depending upon the number of pedestrian calls. In the evening, the westbound left turn delay at Northern Lights Boulevard is reduced when there are fewer pedestrian calls and increased by up to 3 sec/vehicle when pedestrian calls are more frequent. Left turn delay under the proposed condition is less than existing left turn delay for the eastbound left turns at Benson Boulevard, where the proposed changes would add capacity. Note that there is little difference between the results for 15 and 20 calls per hour.

	Pedestrian calls per hour				
	0	**5**	**10**	**15**	**20**
Actuated Green (sec)	23.7	21.8	20.6	19.4	19.4
Volume-to-Capacity Ratio	0.50	0.55	0.60	0.60	0.60
Average Delay (sec/veh)	54	60	64	67	67
LOS	E	E	E	E	E

Table 32 – Northern Lights Boulevard Westbound Left: Change in Operations with Change in Pedestrian Calls, Morning Peak

	Pedestrian calls per hour				
	0	**5**	**10**	**15**	**20**
Actuated Green (sec)	63.9	55.2	46.5	37.7	37.7
Volume-to-Capacity Ratio	0.50	0.60	0.70	0.85	0.85
Average Delay (sec/veh)	30	36	43	55	55
LOS	C	D	D	D	D

Table 33 – Northern Lights Boulevard Westbound Left: Change in Operations with Change in Pedestrian Calls, Evening Peak

	Pedestrian calls per hour				
	0	**5**	**10**	**15**	**20**
Actuated Green (sec)	49.8	40.6	32.2	24.4	24.4
Volume-to-Capacity Ratio	0.40	0.50	0.60	0.80	0.80
Average Delay (sec/veh)	42	50	58	72	72
LOS	D	D	E	E	E

Table 34 – Benson Boulevard Eastbound Left: Change in Operations with Change in Pedestrian Calls, Morning Peak

	Pedestrian calls per hour				
	0	**5**	**10**	**15**	**20**
Actuated Green (sec)	40.2	33.1	26.6	21.0	21.0
Volume-to-Capacity Ratio	0.35	0.45	0.55	0.65	0.65
Average Delay (sec/veh)	48	55	62	70	70
LOS	D	E	E	E	E

Table 35 – Benson Boulevard Eastbound Left: Change in Operations with Change in Pedestrian Calls, Evening Peak

Pedestrian Traffic

Pedestrian delay at signalized intersections depends only on signal timing parameters, not on pedestrian volume. Under the existing conditions, a pedestrian desiring to cross the south approach at Northern Lights Boulevard or the north approach at Benson Boulevard must instead cross three other approaches. Under the proposed changes, a pedestrian would be able to cross the desired approach. Table 36 shows pedestrian delay will be reduced by about half under the proposed changes.

	Average Pedestrian Delay (sec)			
	Northern Lights Boulevard		**Benson Boulevard**	
	Existing – Travel Southeast Corner to Southwest Corner	**Proposed – Cross South Approach**	**Existing – Travel Northeast Corner to Northwest Corner**	**Proposed – Cross North Approach**
AM	140	70	130	70
PM	140	70	130	70

Table 36 – Average Pedestrian Delay: Existing Compared to Proposed

Safety

Targeted Crashes

Crash reductions for these combined improvements are anticipated for the following crash types:

- Pedestrian and bicycle related crashes involving east-west movements across Minnesota Drive within the couplet area.
- Rear end and same direction sideswipe crashes involving northbound and southbound vehicles on Minnesota Drive between Northern Lights Boulevard and Benson Boulevard.

Pedestrian and bicycle related crashes involving east-west movements across Minnesota Drive within the couplet area. In many cases, it is not possible to determine the direction of the pedestrian or bicyclist as that information was not included in the crash report or the officer did not know the direction of the non-motorized participant in the crash. Of the 39 recorded pedestrian or bicycle related crashes occurring within the couplet area, 18 did not specify a direction for the non-motorized participant. The following table summarizes pedestrian and bicycle related crashes by pedestrian or bicycle travel direction:

Type of Crash	Direction of Pedestrian/Bicycle					Total
	Eastbound	Westbound	Southbound	Northbound	Unknown	
Pedestrian	3	3		1	7	14
Bicycle	5	2		7	11	25
Total	**8**	**5**	**0**	**8**	**18**	**39**

Table 37 – Pedestrian and Bicycle Crashes in Couplet Area by Pedestrian or Bicycle Travel Direction

In order to assign a specific direction to unknown direction pedestrian and bicycle crashes, the percentage of known crashes was calculated for each direction. These percentages were then applied to the unknown direction crashes. The following table summarizes this analysis:

Known Direction Pedestrian/Bicycle Crashes				Total Known Direction Pedestrian or Bicycle Crashes	Unknown Crash Assignment	Revised Total for Pedestrian/Bicycle Crashes by Direction
Direction	Pedestrian	Bicycle	Total			
% NB	4.8%	33.3%	38.1%	8	7	15
%SB	0.0%	0.0%	0.0%	0	0	0
%EB	14.3%	23.8%	38.1%	8	7	15
%WB	14.3%	9.5%	23.8%	5	4	9
Sum of Direction-Known Crashes				**21**		**39**
Sum of Unknown Direction Crashes					**18**	

Table 38 –Assignment of Unknown Direction Pedestrians/Bicycles

Using the preceding assumptions, we estimate that as many as 24 pedestrian and bicycle crashes would be included in those targeted for mitigation as a result of the installation of additional crosswalks and phases on Minnesota Drive. This is the combined total of eastbound and westbound crashes.

Rear end and same direction sideswipe crashes involving northbound and southbound vehicles on Minnesota Drive between Northern Lights Boulevard and Benson Boulevard.

- 22 rear end and 6 same direction sideswipe crashes on the northbound approach to Northern Lights Boulevard.
- 29 rear end and 5 same direction sideswipe crashes on the southbound approach to Benson Boulevard.
- An additional 7 crashes involving northbound or southbound rear end or same direction sideswipe vehicles were recorded in the segment of Minnesota Drive between Northern Lights Boulevard and Benson Boulevard.

There are also 34 eastbound rear end or same direction sideswipe crashes that may be subject to mitigation through the installation of an additional eastbound left turn lane on Benson Boulevard.

Potential Safety Benefit

Rear end and same direction sideswipe crashes

The 2016 HSIP Handbook specifies a rear end crash reduction of 15% for lengthening an existing left turn lane. Adding an additional turn lane is a similar improvement as it is intended for locations where the existing turn pocket is lengthened to accommodate the turning lane demand, eliminating turning traffic which backs up into the through lanes.

Rear end and same-direction sideswipe crashes were assumed to be distributed evenly among the five approach lanes for both the northbound and southbound directions. Of the 62 northbound and southbound rear end or same direction sideswipe crashes, 25 crashes were assumed to be associated with the left turn lanes and susceptible to correction through the installation of additional left turn storage. With a 15% crash reduction for these types of crashes, approximately 4 crashes would be mitigated during the 10-year study period.

In the case of the additional lane on eastbound Benson Boulevard, approximately 15% or 9 rear end or same direction sideswipe crashes are susceptible to mitigation with this lane addition.

Pedestrian and bicycle related crashes

Neither the Crash Modification Factors Clearinghouse (CMFC) nor the 2016 HSIP Handbook specifies a crash reduction factor for adding controlled pedestrian crossings at existing signalized intersections. A crash reduction factor of 39% in the CMFC for split phases for pedestrians may be an appropriate factor as it is intended for situations where pedestrians receive a "walk" display while the parallel traffic that would normally turn left or right through the crosswalk is held with a left or right red arrow signal and the through movement proceeds on a green signal. The phase is terminated following completion of the pedestrian crossing.

Using this crash reduction factor (CRF), approximately ½ of the 24east-west pedestrian and bicycle crashes could be reduced by 39% with the addition of the two east-west signalized pedestrian crossings, amounting to approximately 5 crashes during the 10-year study period.

Cost Estimates

Phase	**Alternative D.2, D.3 and D.4**
Design	$471,000
Right-of-Way	$523,000
Utilities	$340,000
Construction	$3,606,000
Contract Administration (20% of construction costs)	$721,000
Contingency (20%)	$1,132,000
Total	**$6,793,000**

E. Segment of Minnesota Drive from Benson Boulevard to Spenard Road

Minnesota Drive from Benson Boulevard to Spenard Road is a 6-lane road with a raised median. There is a 300-foot left-turn lane northbound onto 32nd Avenue and a 200-foot U-turn lane southbound just before 36th Avenue. The median between 35th and 32nd Avenues was installed as part of an HSIP project to mitigate right angle and left turn crashes at 33rd Avenue.



Figure 19 – Minnesota Drive from Benson Boulevard to Spenard Road

The main concern for this segment is:

- Auxiliary turn lanes at 32nd Avenue may not hold full queue during school dismissal at Aquarian Charter School.

The alternative selected by DOT&PF for further analysis is:

- Alt E.1 – Extend Auxiliary Turn Lanes

Existing Conditions

Operations

The intersection at 32nd Avenue and Minnesota Drive is controlled by a single stop sign controlling eastbound traffic on 32nd Avenue. A median prevents traffic from 32nd Avenue from going straight or left. In the northbound direction, Minnesota Drive is 3 through lanes and a 325-foot left turn lane. Southbound traffic is carried on 3 through lanes with the outside lane being a shared right turn lane. There is only one approach lane in the eastbound direction on 32nd Avenue.

Aquarian Charter School, one of the Anchorage School District's alternative schools, is located west of the intersection. The school does not have zone boundaries and transportation is not provided by the school district; therefore, students from any part of the city may attend and parents must arrange transportation. There is concern that during school arrival and dismissal time, queued northbound left-turning traffic at 32nd Avenue may back up into the through lanes on Minnesota Drive.

Traffic counts were performed by DOT&PF from August 10th to August 12th, 2015. Since the Anchorage School District school year began August 19, 2015, school traffic was estimated using the Institute of Transportation Engineers (ITE) Trip Generation Informational Report and added to the manual counts. The Trip Generation Informational Report provides traffic generation for a variety of land uses related to schools. The two most suitable land uses for this location are: 520 Elementary School and 528 Private School (K-8). Although there are more study sites for the Elementary School category (35 or more, depending on the variable), the data points are inconsistent because they include schools with a wide variety of bussing characteristics (both private and public schools). For the Private School (K-8) land use, there are fewer than 20 sites, but the data is less variable. Figure 20 shows the trip generation for the two land uses.

Because Aquarian Charter School is situated somewhat centrally in Anchorage, half of the generated trips were assumed to come from the north and half from the south. All of the traffic was assumed to travel along Minnesota Drive and reach Aquarian Charter School using 32nd Avenue. The actual counted volumes with school trips added on (given as a range) are shown in Figure 21.

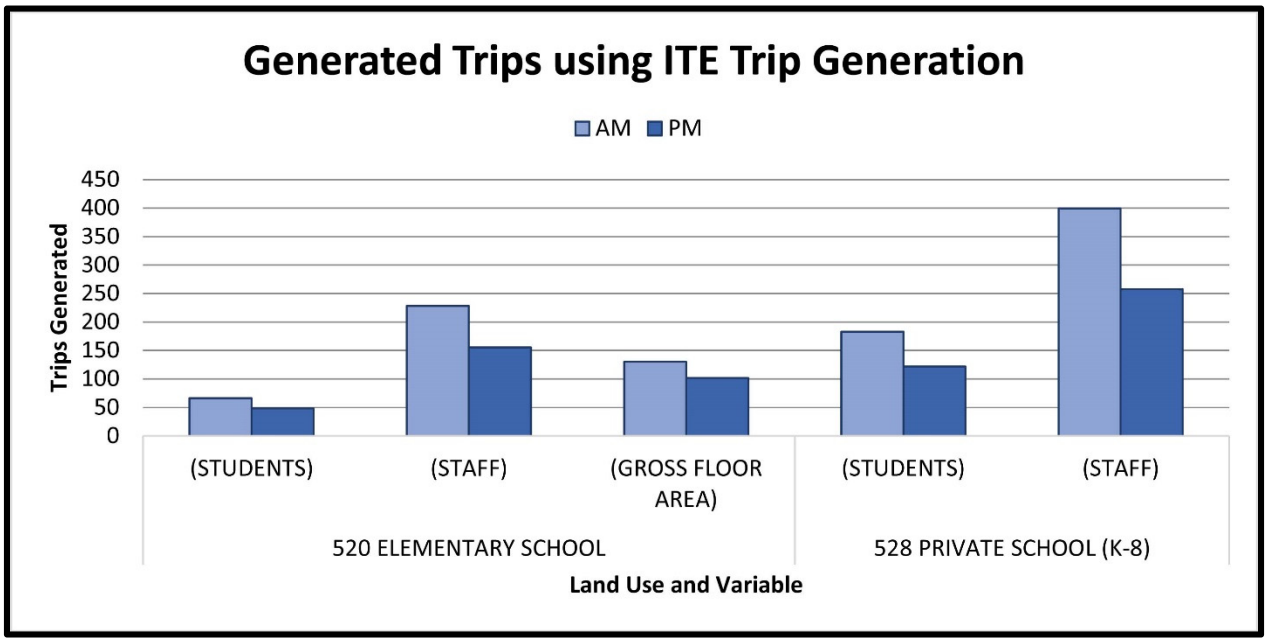


Figure 20 – Range of Trip Generation for Aquarian Charter School

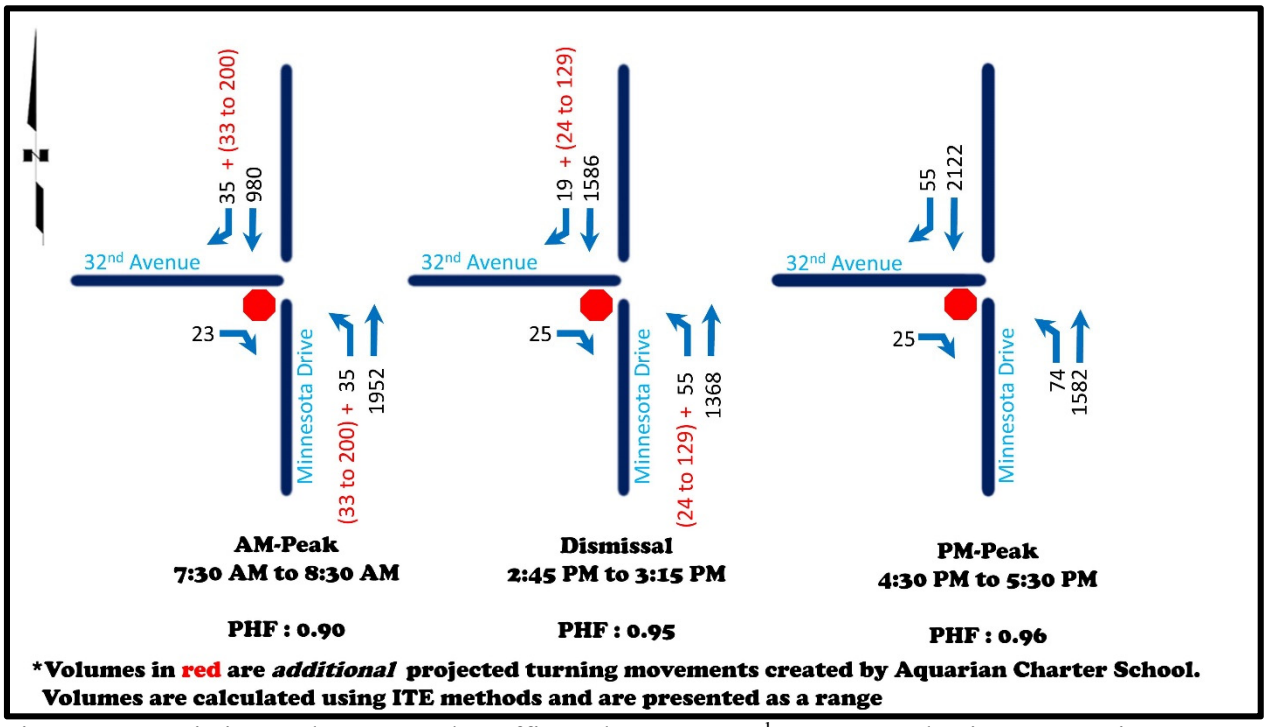


Figure 21 – Existing and Generated Traffic Volumes at 32nd Avenue and Minnesota Drive

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized below.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average?	Above Critical?
Minnesota Drive: Benson Blvd. to Spenard Rd.	155	2.836	39,400	1.513	1.796	yes	yes

Table 39 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Crash Type	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Head-On Sideswipe			1	1
Left Turn	1	1	2	4
Other		2	4	6
Overtaking Sideswipe		3	22	25
Parked			3	3
Pedestrian/Bicycle	1	7	7	15
Rear End	1	32	51	84
Right Angle	1	7	7	15
Right Left Turn Sideswipe		1		1
U Turns			1	1
Total	**4**	**53**	**98**	**155**

Table 40 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Other		1	5			6
	Pedestrian/Bicycle	1				1	2
EAST	Pedestrian/Bicycle				2		2
	Right Angle		1	1	1		3
NORTH	Left Turn			1			1
	Overtaking Sideswipe		9				9
	Pedestrian/Bicycle				2		2
	Rear End		24		1		25
	Right Angle					5	5
	U Turns		1				1
SOUTH	Head-On Sideswipe		1				1
	Left Turn		1	1		1	3
	Overtaking Sideswipe			15			15
	Parked			1			1
	Pedestrian/Bicycle	1				1	2
	Rear End			52	1		53
	Right Angle	5			1	1	7
	Right Left Turn Sideswipe					1	1
UNKNOWN	Overtaking Sideswipe		1				1
	Parked				1	1	2
	Pedestrian/Bicycle	2		1	1	1	5
	Rear End		3	2			5
WEST	Pedestrian/Bicycle			1	1		2
	Rear End					1	1
Total		**9**	**42**	**80**	**11**	**13**	**155**

Table 41 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction: Benson Boulevard to Spenard Road

This segment has a crash rate that is statistically higher than average for similar locations. In addition, there were 4 major injury crashes on the segment from 2003 to 2012. These included: a pedestrian crash and a right-angle crash on the segment between Benson Boulevard and 31st Avenue, a left turn crash at 32nd Avenue, and a right angle crash at 36th Avenue.

In order to better evaluate the extended turn lane alternative, crashes associated with the 32nd Avenue through 35th Avenue intersections were isolated and evaluated separately to remove those crashes associated with either Benson Boulevard or Spenard Road. 2003-2012 crashes for these intersections by crash type and vehicle #1 direction are summarized in Table 42.

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Other			2			2
EAST	Pedestrian/Bicycle				1		1
	Right Angle				1		1
NORTH	Left Turn			1			1
	Overtaking Sideswipe		1				1
	Rear End		8				8
	Right Angle					2	2
SOUTH	Head-On Sideswipe		1				1
	Left Turn		1	1		1	3
	Overtaking Sideswipe			2			2
	Parked			1			1
	Rear End			8			8
	Right Angle	1			1	1	3
	Right Left Turn Sideswipe					1	1
UNKNOWN	Pedestrian/Bicycle	1					1
Total		**2**	**11**	**15**	**3**	**5**	**36**

Table 42 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction: 32nd Avenue to 35th Avenue

Planning Background

Pedestrian plans for the segment include Project 83 in the Anchorage Pedestrian Plan to evaluate possible pedestrian crossing improvements beyond the existing median refuge and lighting.

Alt E.1 – Extend Auxiliary Turn Lanes

Figure 22 shows the proposed alternative.

Operations

The minimum generated trips and the maximum generated trips were combined with the DOT&PF counts to calculate northbound left turning queues using HCS 2010. Then, desired and minimum left turn lane lengths were found using the queue length and the NCHRP 279: Design Guidance for Intersection Auxiliary Lanes methodology. The minimum lane length takes into account a vehicle slowing down 10 mph before entering the turn lane. The desired lane length allows for a vehicle to decelerate completely in the turn lane.

Table 43 summarizes the findings. The data supports extending the turn lane to 400 feet.

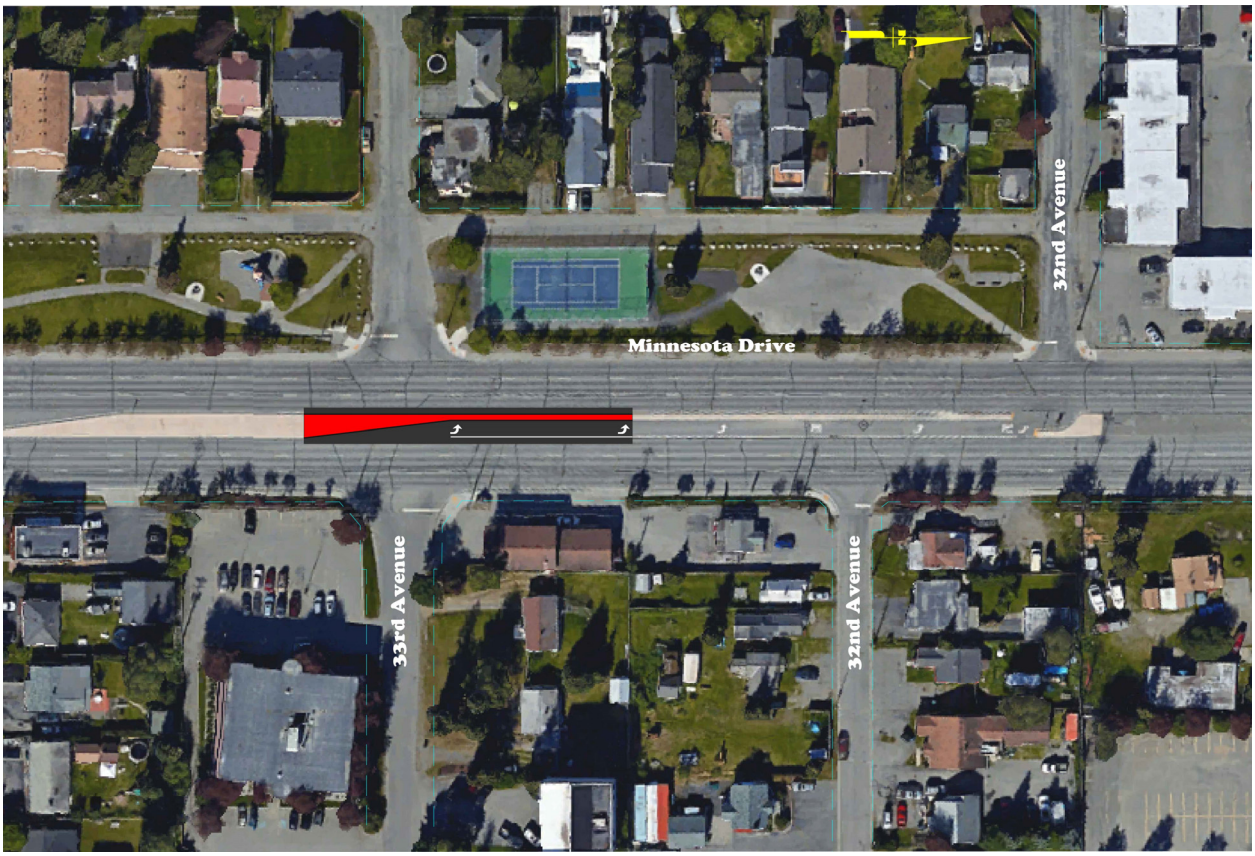


Figure 22 – E.1 Extend Auxiliary Turn Lanes

	Left Turn Vehicles		Queue (vehicles)		Minimum Left Turn Lane (feet)		Desired Left Turn Lane (feet)	
	Low	High	Low	High	Low	High	Low	High
AM	68	235	1	9	200	425	350	575
Dismissal	79	184	3	12	225	475	400	625
PM	74		4		250		425	

Table 43 – Range of Northbound Left Turn Lane Lengths

Safety

Targeted Crashes

There were 36 crashes recorded on Minnesota Drive between 32nd Avenue and 35th Avenue. Of those, 11 involved a rear end, same direction sideswipe, or left turn crashes with northbound vehicles and 12 involved a rear end, same direction sideswipe, or left turn crashes with southbound vehicles. These are the crashes subject to mitigation by the extension of the northbound left turn lane storage at 32nd Avenue or the southbound left turn lane storage at 35th Avenue.

Potential Safety Benefit

The 2016 HSIP Handbook specifies a rear end crash reduction of 15% for lengthening an existing left turn lane. Of the 36 crashes identified as potentially correctable through the lengthening of northbound and southbound left turn lanes, approximately 6 crashes could be mitigated during the 10-year study period.

Cost Estimates

Phase	**Alternative E.1**
Design	$131,000
Right-of-Way	$0
Utilities	$10,000
Construction	$87,000
Contract Administration (20% of construction costs)	$18,000
Contingency (20%)	$29,000
Total	**$275,000**

F. Spenard Road at Minnesota Drive Intersection

The Spenard Road signal is split phased with separate phases for the eastbound and westbound approaches. Spenard Road is skewed approximately 10 degrees.

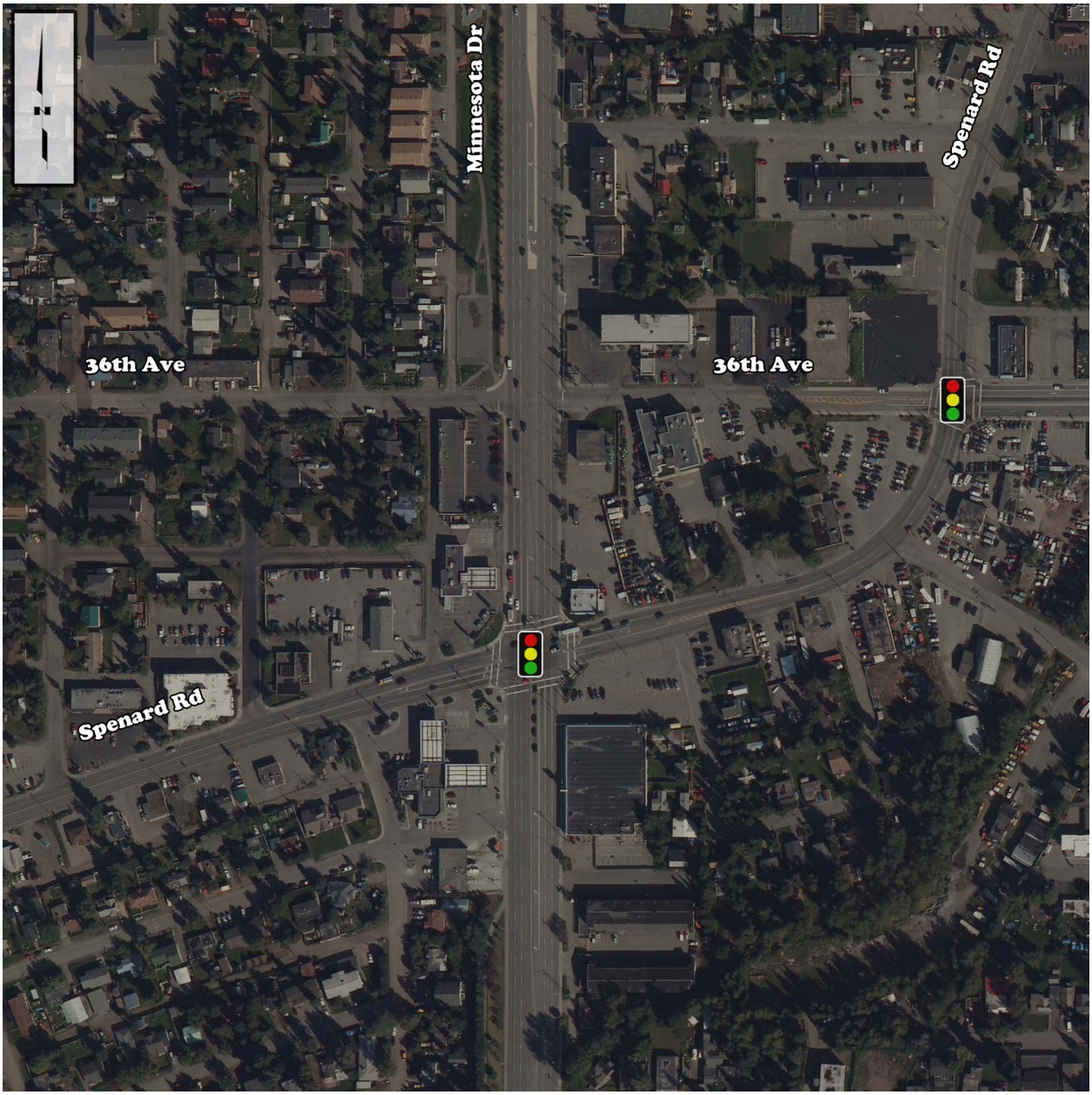


Figure 23 – Intersection of Spenard Road at Minnesota Drive

The main concern identified at this location is:

- The split operation at the signal for east-west traffic and high volumes in all directions lead to intersection capacity constraints.

DOT&PF recommended four alternatives, combined into three for this analysis, for further study:

- F.1 – One Way Couplet with 36th Avenue (East of Minnesota Drive only)
- F.4 – Reconfigure Spenard Road Approaches to Remove Split Phasing
- F.2/F.5 – Extend Northbound and Southbound Left Turn Lanes and Install Southbound Right Turn Lane

See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

Operations

At Minnesota Drive, Spenard Road is a minor arterial serving east- and westbound traffic. At the intersection, Spenard Road is divided by a raised median. Both the east and west approaches have three lanes with a left turn lane, a combined left turn-through lane, and a through-right turn lane. At the intersection, Minnesota Drive is also divided by a raised median. The approach in each direction has two through lanes, a shared through-right turn lane, and a left turn lane. Both geometric constraints and the shared left turn-through lanes necessitate that the east and westbound left turning traffic operate with split phasing (meaning that one approach operates with a green signal at a separate time from the other approach). Northbound and southbound left turns are protected. Pedestrians and bicycles are able to cross the intersection across any approach.

West of Minnesota Drive, Spenard Road heads southwest toward Ted Stevens Anchorage International Airport. To the east of Minnesota Drive, Spenard Road bends north and continues towards downtown Anchorage.

DOT&PF performed turning movement counts at Spenard Road and Minnesota Drive from September 28, 2015 through September 30, 2015, as shown in Figure 24. Signal timing was provided by the Municipality of Anchorage.

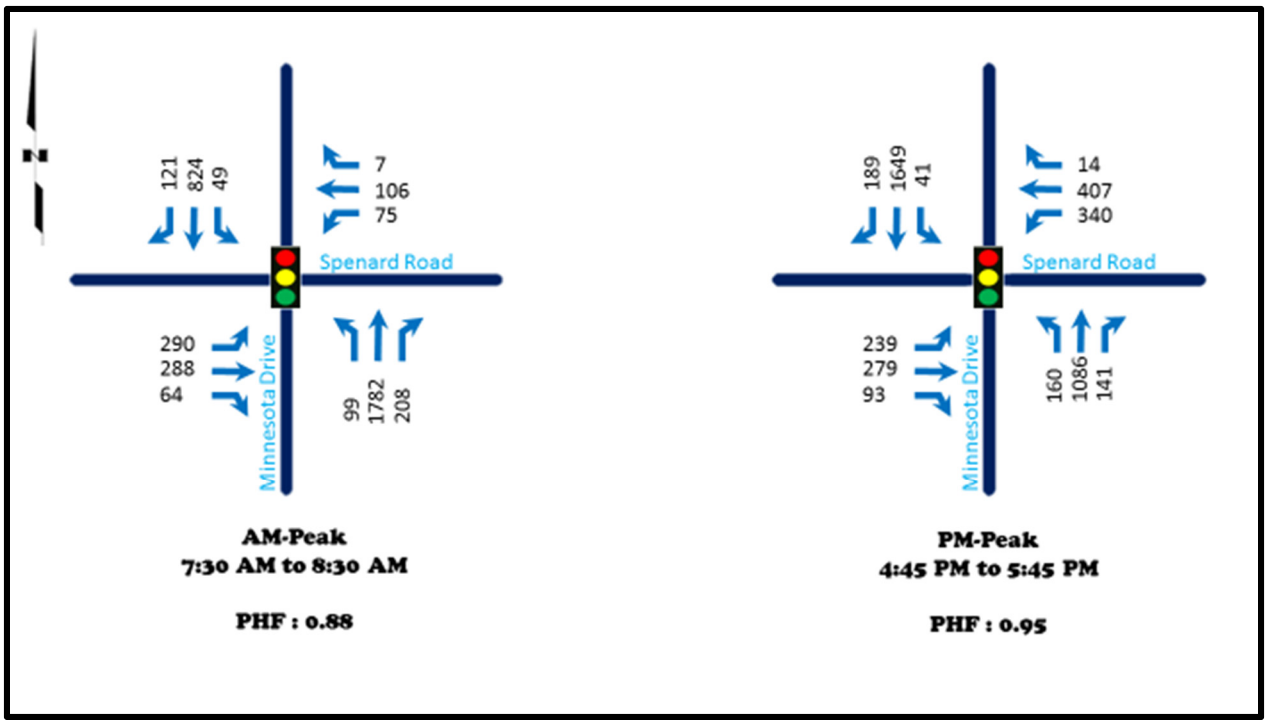


Figure 24 – Existing Turning Movement Volumes at Minnesota Drive and Spenard Road

As shown in Figure 24, traffic volumes peak in the northbound direction in the morning and in the southbound and westbound directions in the evening. Eastbound traffic is approximately the same during both peaks.

Capacity analysis was performed using Synchro. Table 44 shows the results for both the morning and evening peaks. The intersection operates with a volume-to-capacity ratio (v/c) of 0.79 during the AM-peak and 0.95 during the PM-peak. Northbound through traffic operates at LOS C during both peaks. Southbound through movements operate at a LOS C during the AM peak, but the southbound LOS degrades to LOS E during the PM peak (with average control delays of about a minute per vehicle and a v/c greater than 1). Traffic approaching on Spenard Road performs poorly during both periods, with LOS E or F.

	AM			PM		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
NBL	0.60	70	E	0.90	88	F
NBT & NBR	0.85	32	C	0.60	29	C
SBL	0.80	105	F	0.45	69	E
SBT & SBR	0.45	31	C	1.05	69	E
EBL	0.80	77	E	0.80	73	E
EBT & EBR	0.80	68	E	0.83	65	E
WBL	0.50	69	E	0.83	79	E
WBT & WBR	0.50	68	E	0.82	69	E
Overall	**0.80**	**42**	**D**	**0.95**	**60**	**E**

Table 44 – Existing Level of Service at Minnesota Drive and Spenard Road

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized below.

Location	**Crash Frequency (2003 to 2012)**	**Crash Rate**	**Average Segment or Entering Volume (AADT)**	**State Crash Rate**	**UCL @ 95% Confidence**	**Above Average?**	**Above Critical?**
Minnesota Drive at Spenard Road	245	1.162	57,750	1.415	1.552	no	no

Table 45 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Crash Type	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Double Left Sideswipe			1	1
Head On		1		1
Left Turn		3		3
Light Support		1	2	3
Other		3	2	5
Sign			7	7
Traffic Signal Pole		1	1	2
Utility Pole			2	2
Overtaking Sideswipe	1	2	34	37
Overturn		1		1
Parked		1		1
Pedestrian/Bicycle		4	6	10
Rear End	3	40	89	132
Right Angle	1	14	23	38
U Turns			2	2
Total	**5**	**71**	**169**	**245**

Table 46 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Cross Median/Centerline	1					1
	Curb/Wall		1				1
	Light Support	1			2		3
	Moose	1					1
	Other					1	1
	Other Fixed Object	1					1
	Sign	5	2				7
	Traffic Signal Pole		2				2
	Utility Pole	1	1				2
	Overturn			1			1
	Pedestrian/Bicycle	1	1	1			3
EAST	Head On					1	1
	Overtaking Sideswipe	7					7
	Pedestrian/Bicycle		1			1	2
	Rear End	31					31
	Right Angle		7	3			10
	U Turns	2					2
NORTH	Left Turn			2			2
	Overtaking Sideswipe		15				15
	Parked		1				1
	Pedestrian/Bicycle	1					1
	Rear End		46		1		47
	Right Angle	6				4	10
SOUTH	Left Turn		1				1
	Overtaking Sideswipe			9			9
	Pedestrian/Bicycle	1					1
	Rear End			29			29
	Right Angle	4				3	7
UNKNOWN	Overtaking Sideswipe		2			1	3
	Pedestrian/Bicycle			2	1		3
	Rear End	2			1		3
	Right Angle		2		1		3
WEST	Double Left Sideswipe					1	1
	Overtaking Sideswipe					3	3
	Rear End					22	22
	Right Angle		4	3	1		8
Total		**65**	**86**	**50**	**7**	**37**	**245**

Table 47 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction

This intersection has a crash rate that is below the average rate for similar locations. However, there were 5 major injury crashes at this intersection between 2003 and 2012. These included 3 rear end crashes, one sideswipe crash, and one right angle crash.

Planning Background

Project 121 in the MTP is a short-term project to rehabilitate and add pedestrian and bicycle facilities to Spenard Road from Minnesota Drive to Benson Boulevard, including a feasibility and impact analysis on the proposed Spenard Road/36th Avenue couplet.

Alt F.1 – One Way Couplet with 36th Avenue (East of Minnesota Drive Only)

This alternative would convert Spenard Road and 36th Avenue east of Minnesota Drive into a one-way couplet with traffic on 36th Avenue traveling exclusively westbound between Spenard Road and Minnesota Drive and traffic on Spenard Road traveling exclusively eastbound between 36th Avenue and Minnesota Drive (see Figure 25). Installing the couplet would allow for the westbound left turn phase to be eliminated from the Minnesota Drive and Spenard Road intersection, reallocating signal time to better serve other directions of travel.

A new signal would be installed at 36th Avenue to accommodate the redirected traffic. A right turn lane southbound at Minnesota Drive and Spenard Road would be installed to complete the rerouted travel paths. The distance between the existing signal at Minnesota Drive and Spenard Road and the new signal at Minnesota Drive and 36th Avenue would be approximately 400 feet.

As part of the couplet, all westbound traffic will be directed to 36th Avenue: existing westbound through traffic on Spenard Road will turn left onto Minnesota Drive at 36th Avenue and then turn right onto Spenard Road. Existing westbound left turn traffic from Spenard Road onto Minnesota Drive will also be turning left at the intersection of 36th Avenue with Minnesota Drive, creating a heavy westbound left turn movement at 36th Avenue.

Figure 26 shows existing traffic volumes at 36th Avenue and Minnesota Drive. Figure 27 shows current volumes at Spenard Road and 36th Avenue. Figure 28 and Figure 29 show approximately how traffic will be redistributed with the installation of a couplet. Installing a traffic signal at 36th Avenue could allow for northbound traffic on Minnesota Drive and westbound traffic at 36th Avenue to access the west portion of 36th Avenue from the signal.

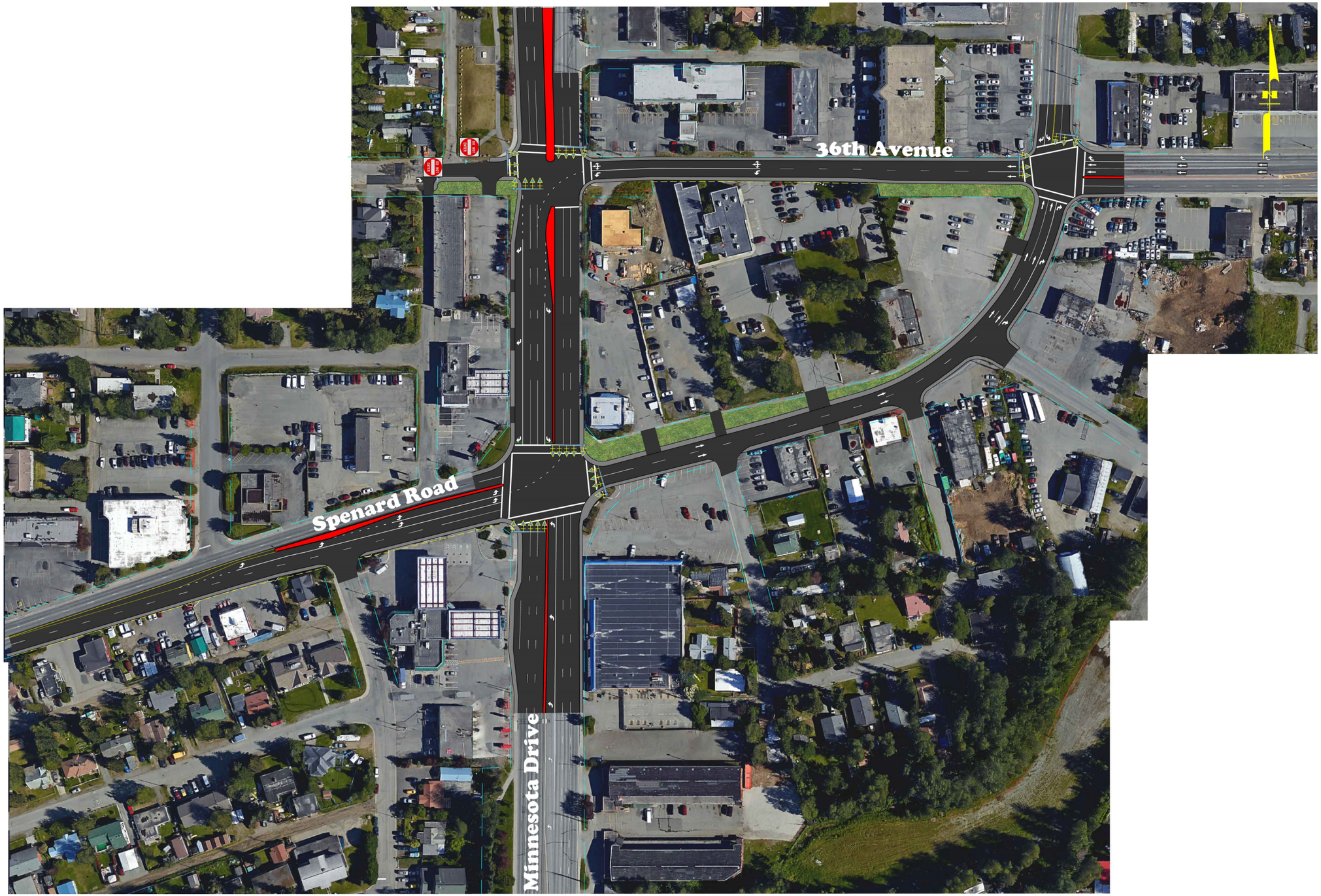


Figure 25 – F.1 One Way Couplet with 36th Avenue

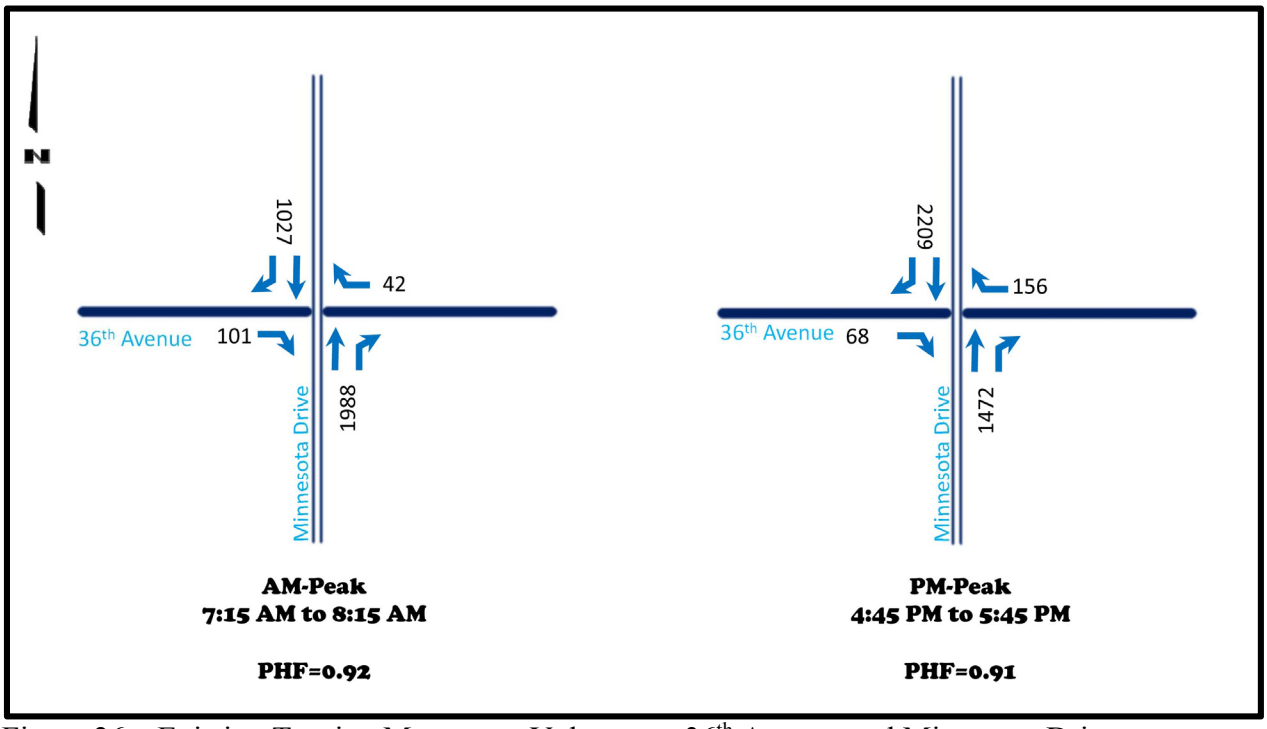


Figure 26 – Existing Turning Movement Volumes at 36th Avenue and Minnesota Drive

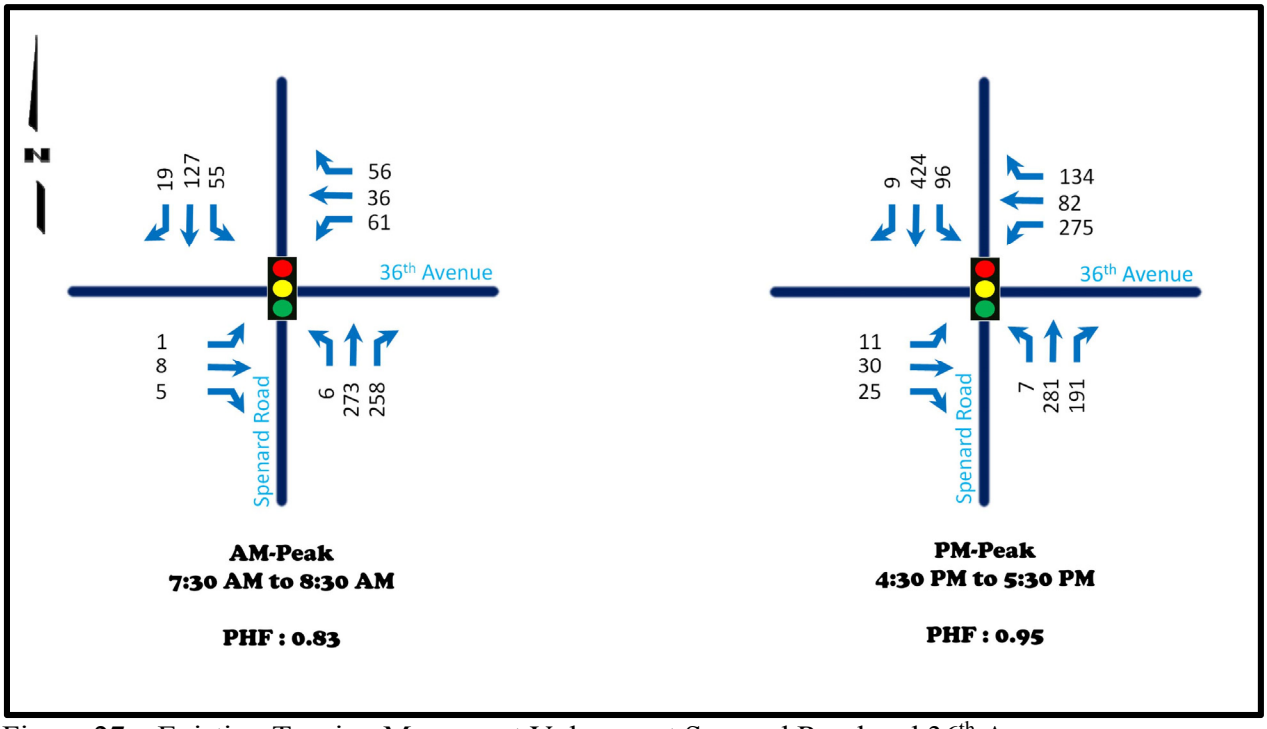


Figure 27 – Existing Turning Movement Volumes at Spenard Road and 36th Avenue

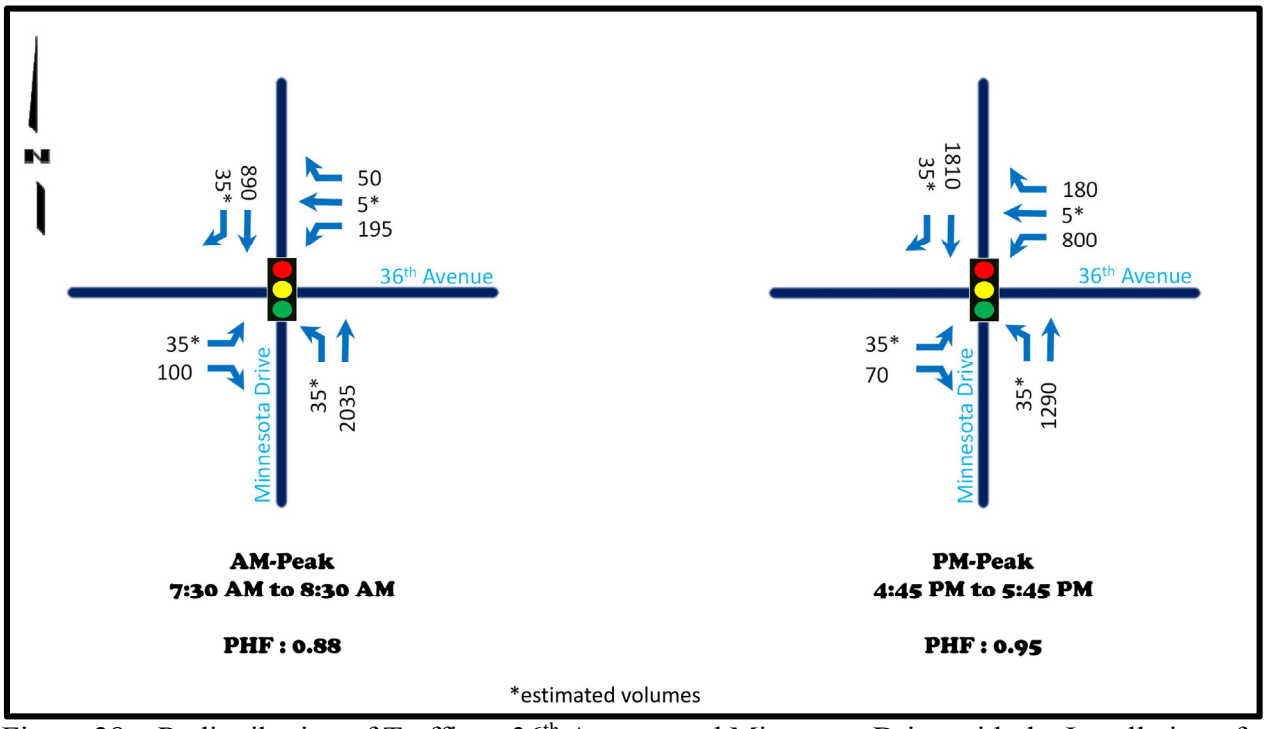


Figure 28 – Redistribution of Traffic at 36th Avenue and Minnesota Drive with the Installation of a Couplet

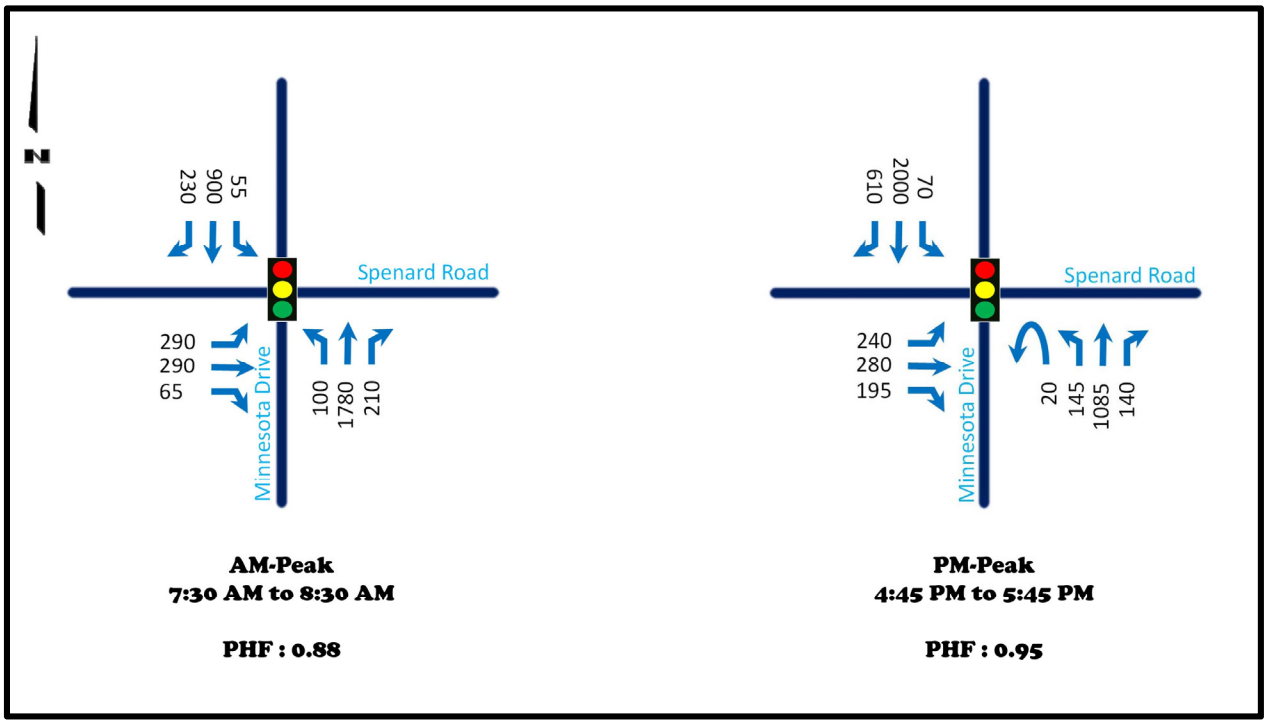


Figure 29 – Redistribution of Traffic at Spenard Road and Minnesota Drive with the Installation of a Couplet

The westbound approach of 36th Avenue at Minnesota Drive will need dual left turn lanes due to the heavy westbound left turn volume in the PM peak (see Figure 28). Since the right-of-way on this segment of 36th Avenue is very narrow and will only accommodate two lanes, the westbound approach is limited to one exclusive left turn lane and one shared left-through-right lane unless

more right-of-way is purchased. With a combined left-through lane on the westbound approach, it will be necessary either to operate the 36th Avenue signal at Minnesota Drive with split eastbound and westbound phasing or to eliminate movements exiting eastbound on 36th Avenue.

At Spenard Road, it will be necessary to separate the eastbound left turns from the through lanes so that the left turns can be separated from the pedestrian movement for the north approach. Figure 25 shows the preferred alternative for the two intersections.

Operations

Three options for the 36th Avenue intersection with Minnesota Drive were evaluated:

- Split phasing for east- and westbound movements – poor operational performance
- Expand westbound auxiliary lanes – requires right-of-way purchase – no pedestrian crossing for south approach
- Eliminate eastbound movements on east approach of 36th Avenue intersection – no pedestrian crossing for south approach

At the Spenard Road intersection with Minnesota Drive, two options were evaluated:

- Eastbound approach with one left turn lane, a through lane, and a shared through-right turn lane
- Eastbound approach with two left turn lanes, a through lane, and a shared through-right turn lane

The following tables compare operations for the three options at the 36th Avenue intersection. With the split phasing (Table 48), the 36th Avenue intersection operates as poorly or worse than the existing Spenard Road intersection, so there is no benefit to the couplet. Either of the other two options improve operations over existing; however, one requires acquisition of right-of-way and the other requires limiting access to not allow eastbound vehicles to enter the intersection.

	AM			PM		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
NBL	0.55	96	F	0.60	92	F
NBT & NBR	0.70	10	A	0.65	50	D
SBT& SBR	0.35	17	B	1.10	108	F
EB	0.40	70	E	0.10	67	E
WBL	0.70	80	F	0.85	57	E
WBT & WBR	0.60	74	E	0.85	55	E
Overall	**0.70**	**20**	**C**	**0.90**	**78**	**E**

Table 48 – East-West Split Phasing: 36th Avenue and Minnesota Drive

	AM			PM		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
NBL	0.55	100	F	0.65	126	F
NBT & NBR	0.70	5	A	0.53	12	B
SBT& SBR	0.35	14	B	0.85	58	E
EBL	0.55	82	F	0.50	80	E
EBT & EBR	0.05	68	E	0.05	70	E
WBL	0.70	70	E	0.90	64	E
WBT & WBR	0.10	69	E	0.25	37	D
Overall	**0.65**	**16**	**B**	**0.85**	**45**	**D**

Table 49 – Expand Westbound Approach, No Pedestrian Crossing on South Approach: 36th Avenue and Minnesota Drive

	AM			PM		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
NBL	0.50	82	F	0.60	100	F
NBT & NBR	0.65	14	B	0.45	11	B
SBT& SBR	0.35	7	A	0.80	51	D
WBL	0.45	62	E	0.90	64	E
WBT & WBR	0.40	62	E	0.90	61	E
Overall	**0.65**	**17**	**B**	**0.85**	**42**	**D**

Table 50 – Eliminate Eastbound Movements, No Pedestrian Crossing on South Approach: 36th Avenue and Minnesota Drive

The operational results for the Spenard Road intersection under the two options that were analyzed are shown in Table 51 and Table 52. Adding a second eastbound left turn lane reduces delay for that movement significantly.

	AM			PM		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
NBL	0.60	69	E	1.00	84	F
NBT & NBR	0.75	23	C	0.45	5	A
SBL	0.75	100	F	0.50	78	E
SBT	0.40	11	B	0.70	8	A
SBR	0.20	8	A	0.35	7	A
EBL	1.00	115	F	0.90	79	E
EBT & EBR	0.50	52	D	0.60	42	D
Overall	**0.80**	**31**	**C**	**0.80**	**18**	**B**

Table 51 – One Eastbound Left Turn Lane: Spenard Road and Minnesota Drive

	AM			PM		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
NBL	0.65	77	E	0.95	83	F
NBT & NBR	0.70	18	B	0.45	5	A
SBL	0.70	74	E	0.50	81	F
SBT	0.35	5	A	0.70	16	B
SBR	0.65	9	A	0.35	16	B
EBL	0.70	68	E	0.50	47	D
EBT & EBR	0.60	60	E	0.65	42	D
Overall	**0.70**	**24**	**C**	**0.75**	**21**	**C**

Table 52 – Double Eastbound Left Turn Lane: Spenard Road and Minnesota Drive

The distance between 36th Avenue and Spenard Road on Minnesota drive is about 400 feet. When analyzing the couplet, attention must be paid to the southbound through movement queue at Spenard Road and the northbound through movement queue at 36th Avenue. If either of these queues exceed 400 feet they will extend into upstream intersections, hindering operations of the couplet and Minnesota Drive. Table 53 and Table 54 show the queue lengths for each of the couplet options. Based on these results, none of the through queues are expected to extend into the upstream intersection.

	Northbound Through Queue (ft.)	
	AM	**PM**
East-West Split Phasing	350	375
Expand Westbound Approach	150	125
Eliminate Eastbound Movements	50	125

Table 53 – Northbound Through Queues at 36th Avenue Intersection for All Options

	Southbound Through Queue (ft.)	
	AM	**PM**
One Eastbound Left Turn Lane	175	275
Double Eastbound Left Turn Lanes	250	250

Table 54 – Southbound Through Queues at Spenard Road Intersection for All Options

Safety

Targeted Crashes

Crashes involving through vehicles and opposite direction left turn vehicles would ordinarily be mitigated by converting a two-way road to a one-way road as part of the couplet proposal. However, Spenard Road is already split-phased at Minnesota Drive, so this conflict has already been mitigated.

Crossover crashes involving vehicles traveling in opposite directions can expect to be mitigated by converting a formerly two-way roadway to one-way. This would apply to the portion of Spenard Road between Minnesota Drive and 36th Avenue and the portion of 36th Avenue

between Spenard Road and Minnesota Drive. Table 55 summarizes crashes on this portion of Spenard Road from 2003-2012.

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	SIGN		2				2
EAST	Head On					1	1
	Overtaking Sideswipe	2					2
	U Turns	1					1
UNKNOWN	Pedestrian/Bicycle			1	1		2
Total		**3**	**2**	**1**	**1**	**1**	**8**

Table 55 – 2003 to 2012 Crashes on Spenard Road Segment: Minnesota Drive to 36th Avenue

Right angle crashes can be reduced by the installation of a new traffic signal where these crash types are more frequent. The proposed couplet would result in the installation of a new traffic signal at the Minnesota Drive/36th Avenue intersection to accommodate the westbound leg of the couplet. However, the present intersection of 36th Avenue at Minnesota Drive is a right-in, right-out only configuration which has only experienced one right angle crash involving a right turn movement.

There were 162 rear end and same direction sideswipe crashes accounting for 66% of all crashes occurring at this intersection. These crashes can be reduced through improved intersection operations (capacity improvements) and improved signal timing, particularly during peak traffic periods, that can be achieved with a couplet configuration. However, the addition of a second traffic signal at 36th Avenue to facilitate the couplet can cause rear end crashes to increase.

Based on the discussion above, targeted crashes will most likely be limited to a percentage of rear end and same direction sideswipe crashes resulting from capacity and signal timing improvements.

Potential Safety Benefit

Neither the 2016 HSIP Handbook nor the CMF Clearinghouse contains a reduction factor for overall traffic signal timing improvements or a conversion of an intersection into a couplet. It is assumed that a percentage of rear end crashes and same direction sideswipe crashes could be reduced on all approaches as a result of the couplet conversion. However, as pointed out earlier, rear end crashes at the new 36th Avenue/Minnesota Drive traffic signal location could increase as there are currently only two rear end crashes were recorded here from 2003-2012.

Alt F.4 – Reconfigure Spenard Road Approaches to Eliminate Split Phasing

One alternative to improve the operations of the intersection at Spenard Road and Minnesota Drive is to modify the geometry of the intersection to allow west- and eastbound traffic to run left turn phases simultaneously. To eliminate the split phasing, the lane geometry would be changed to add a second left turn lane so that the lane configuration for the east- and westbound approaches would become: two left turn lanes, a through lane, and a shared through-right turn lane, as shown in Figure 30.

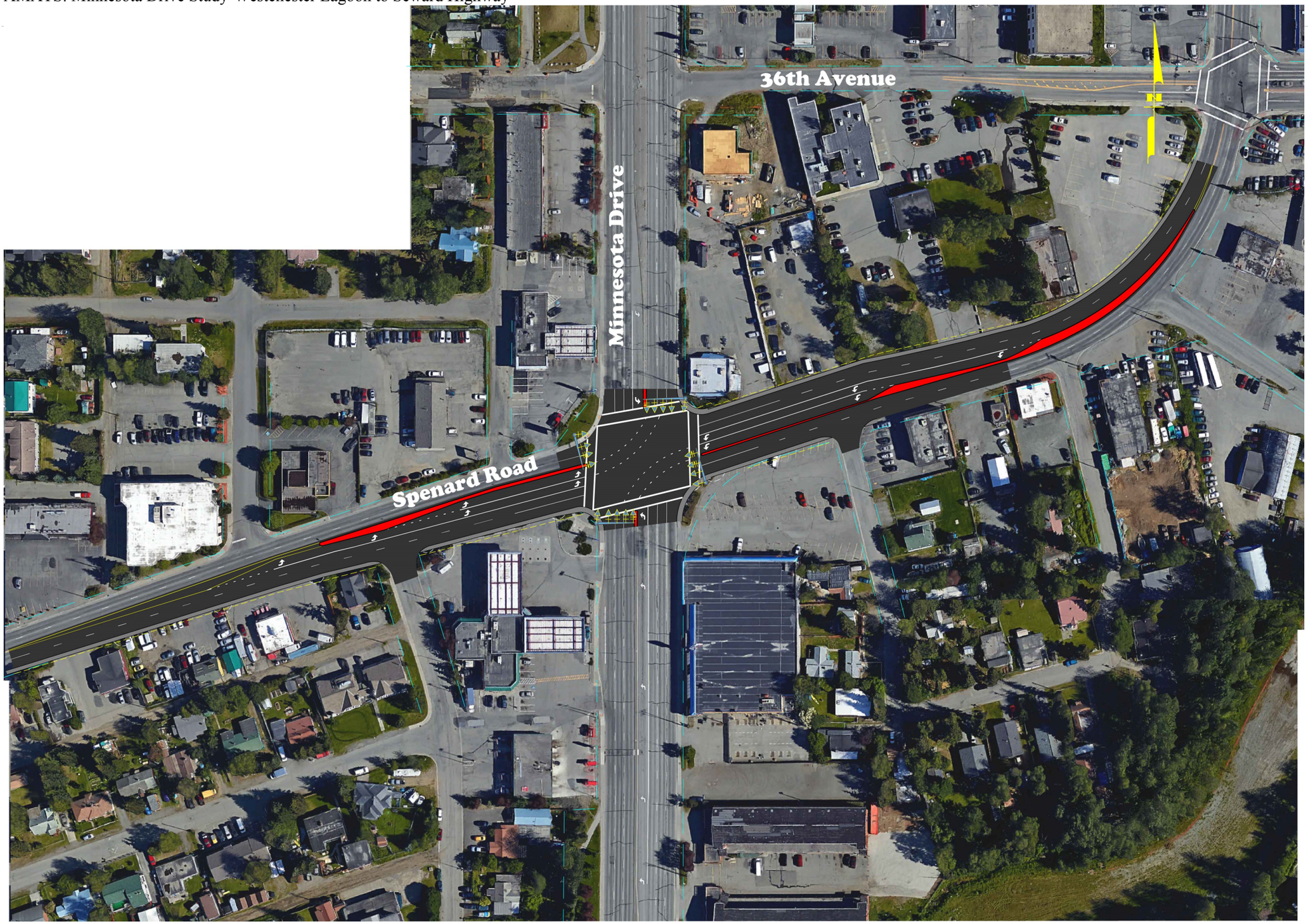


Figure 30 – F.4 Reconfigure Spenard Road Approaches to Eliminate Split Phasing

Operations

Table 56 shows intersection operations for this alternative. The intersection experiences a small improvement during the AM peak with a decrease in control delay of 6 seconds per vehicle for northbound through traffic and 13 seconds per vehicle for southbound through traffic. The intersection v/c ratio is reduced and the LOS is improved to a C.

During the PM peak, control delay is decreased by over 20 seconds per vehicle in the northbound through direction and 30 seconds per vehicle for southbound through traffic. The v/c ratio decreases from 0.95 to 0.83 meaning the intersection will operate under capacity. The intersection LOS improves to D from an E with 37.0 seconds per vehicle of control delay. The recommended LOS of C has an upper boundary of 35 seconds per vehicle, indicating the intersection runs just outside of the recommended LOS.

	AM			PM		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
NBL	0.67	88.0	E	0.76	48.9	D
NBT & NBR	0.77	25.5	C	0.46	7.7	A
SBL	0.62	90.6	F	0.43	83.3	E
SBT & SBR	0.41	18.1	B	0.82	30.3	C
WBL	0.33	67.3	E	0.83	83.9	F
WBT & WBR	0.48	67.3	E	0.77	67.2	E
EBL	0.64	68.1	E	0.70	79.9	E
EBT & EBR	0.75	70.5	E	0.71	65.8	E
Overall	**0.74**	**34.1**	**C**	**0.83**	**37.0**	**D**

Table 56 – Operations for Spenard Road Intersection: Eliminate Split Phasing (Dual East- and Westbound Through Lanes)

One option under this alternative would be to convert the existing eastbound and westbound through-left lanes to left turn only, reducing the through lanes to one through-right lane in both the eastbound and westbound directions. This would reduce the footprint of the east and west approaches, and possibly require less purchase of right-of-way. As expected, this configuration does not operate as well as the configuration with two eastbound and westbound through lanes. Under the single through lane configuration, green time is taken away from the north- and southbound movements and is given to the eastbound and westbound approaches. Nevertheless, eastbound and westbound traffic must sit through several cycles of the light before passing through the intersection and queues extend back to the Spenard/36th Avenue signal. Table 57 presents the resulting operations.

As shown in the table, the intersection operates very close to capacity with this configuration and many movements experience LOS F in the PM peak hour. Overall, the benefit is very marginal when compared with the existing condition.

	AM			PM		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
NBL	**0.67**	**77.5**	**E**	**0.83**	**54.9**	**D**
NBT & NBR	0.91	40.5	D	0.53	13.7	B
SBL	0.79	105.2	F	0.51	74.9	E
SBT & SBR	0.48	26.1	C	0.94	40.8	D
WBL	0.45	53.5	D	0.92	107.3	F
WBT & WBR	0.92	81.7	F	0.94	89.7	F
EBL	0.33	64.3	E	0.87	83.9	F
EBT & EBR	0.69	69.1	E	0.94	79.7	E
Overall	**0.89**	**44.7**	**D**	**0.94**	**48.5**	**D**

Table 57 – Operations for Spenard Road Intersection: Eliminate Split Phasing (Single East- and Westbound Through Lanes)

Safety

Targeted Crashes

There were 162 rear end and same direction sideswipe crashes accounting for 66% of all crashes occurring at this intersection. The east-west approaches experienced 63 crashes or 39% of the 162 rear end and same direction sideswipe crashes at this intersection. These crashes can be reduced through the elimination of the east-west split phase and increased left turn storage on the Spenard Road approaches providing sufficient storage space can be provided to accommodate all left turning vehicles, particularly during peak traffic periods. North-south rear end and same direction sideswipe crashes are less likely to be affected by the split phase elimination other than a slight reduction that could occur as a result of improved traffic signal operation and timing.

Potential Safety Benefit

The 2016 HSIP Handbook specifies a rear end crash reduction of 15% for lengthening an existing left turn lane. Adding an additional turn lane and increasing the storage on the existing turn lane is a similar improvement as it is intended for locations where the existing turn pocket is lengthened to accommodate the turning lane demand, eliminating turning traffic which backs up into the lanes.

Rear end and same-direction sideswipe crashes were assumed to be distributed evenly among the three approach lanes for both the east- and westbound directions. 63 eastbound and westbound rear end or same direction sideswipe crashes, 42 crashes were assumed to be associated with the left turn lanes and susceptible to correction through the installation of additional left turn storage. With a 15% crash reduction for these types of crashes, approximately 7 crashes would be mitigated during the 10-year study period.

Alt F.3/F.5 – Lengthen Minnesota Drive Left Turn Lanes/Add Southbound Right-Turn Lane

This alternative would lengthen the northbound and southbound turn lanes and add a separate southbound right-turn lane on Minnesota Drive at Spenard Road, as shown in Figure 31. The main benefit of lengthening the left turn lanes is to better accommodate queues in the peak hour, which could reduce impacts to the through lanes if left turn queues extend out of the turn lanes. Figure 24 presented the turning movement volumes at the Spenard Road intersection with Minnesota Drive. The southbound right turn volumes are not heavy enough to suggest a need for a right turn lane; however, the southbound through demand is over capacity. Therefore, building a right turn lane may improve operations for the southbound through traffic.

Operations

Table 58 shows intersection operations for this alternative. Adding the southbound right turn lane would increase capacity for the southbound through movements, resulting in better LOS in the PM peak.

The northbound and southbound auxiliary lane queue lengths and proposed lane lengths for estimating the cost of lengthening the turn lanes are shown in Table 59. Based on the values in Table 59 and physical constraints, the proposed lane lengths are 300 feet for the southbound right turn lane, 400 feet for the southbound left turn lane, and 575 feet for the northbound left turn lane.



Figure 31 – F.3/F.5 Lengthen Minnesota Drive Left Turn Lanes/Add Southbound Right-Turn Lane

	AM			PM		
	Volume-to-Capacity Ratio	**Average Delay (sec/veh)**	**LOS**	**Volume-to-Capacity Ratio**	**Average Delay (sec/veh)**	**LOS**
NBL	0.60	70	E	0.90	88	F
NBT & NBR	0.85	36	D	0.60	29	C
SBL	0.80	105	F	0.45	69	E
SBT	0.40	32	C	0.95	41	D
SBR	0.10	63	E	0.10	24	C
EBL	0.80	77	E	0.80	73	E
EBT & EBR	0.80	68	E	0.80	70	E
WBL	0.40	68	E	0.85	74	E
WBT & WBR	0.40	67	E	0.80	67	E
Overall	**0.80**	**45**	**D**	**0.90**	**48**	**D**

Table 58 – Operations for Spenard Road Intersection: Add Southbound Right Turn Lane

	Northbound Left Turn		**Southbound Left Turn**		**Southbound Right Turn**	
	AM Peak	**PM Peak**	**AM Peak**	**PM Peak**	**AM Peak**	**PM Peak**
Turning Volume	99	147	49	41	121	189
Left Turn Lane Queue	175	225	125	50	50	100
Minimum Lane Length	350	400	275	200	225	275
Desired Lane Length	525	575	450	400	375	400

Table 59 – Northbound and Southbound Auxiliary Queue and Turn Lane Length Analysis

Safety

Targeted Crashes

This improvement targets northbound and southbound rear end crashes by increasing the capacity and/or left turn lane storage on these approaches.

As stated earlier, there were 162 rear end and same direction sideswipe crashes accounting for 66% of all crashes occurring at this intersection. The north-south approaches experienced 99 crashes, or 61% of the 162 rear end and same direction sideswipe crashes at this intersection. These crashes can be reduced through the installation of a southbound right turn lane on Minnesota Drive and by increased left turn storage on the Minnesota Drive approaches to Spenard Road.

Potential Safety Benefit

The 2016 HSIP Handbook specifies a rear end crash reduction of 15% for lengthening an existing left turn lane and a crash reduction of 10% for adding a right turn lane at an urban signalized intersection. Increasing the storage on the existing turn lane is intended for locations where the existing turn pocket is lengthened to accommodate the turning lane demand, eliminating turning traffic which backs up into the through lanes.

Since it is not known from the crash data what lane vehicles involved in these types of crashes were in, our approach was to distribute these crashes evenly among the approach lanes for both the northbound and southbound directions.

Lengthen Left Turn Lanes

Of the 99 northbound and southbound rear end or same direction sideswipe crashes, it was assumed that approximately 25 crashes occurred in the vicinity of the left turn lanes and were susceptible to correction through the installation of additional left turn storage. With a 15% crash reduction for these crashes, approximately 4 crashes would be mitigated during the 10-year study period.

Install Southbound Right Turn Lane

There were 38 rear end or same direction sideswipe crashes on the southbound approach to Spenard Road. Dividing these crashes on the three lane approach results in approximately 13 crashes per lane. Using a 10% crash reduction for the installation of the southbound right turn lane, a reduction of 1 to 2 crashes can be expected during the 10-year study period.

Cost Estimates

Phase	**Alternative F.1**	**Alternative F.4**	**Alternative F.3, F.5**
Design	$1,047,000	$471,000	$366,000
Right-of-Way	$1,674,000	$1,465,000	$419,000
Utilities	$1,005,000	$848,000	$188,000
Construction	$5,259,000	$2,410,000	$2,062,000
Contract Administration (20% of construction costs)	$1,052,000	$482,000	$412,000
Contingency (20%)	$2,007,000	$1,135,000	$690,000
Total	**$12,044,000**	**$6,811,000**	**$4,137,000**

Comparison of Alternatives

Only one of the three alternatives considered for this study would be constructed. Table 60 provides a comparison of the operational and safety benefits of the three alternatives. Note that this is a planning-level analysis and a more detailed analysis would be needed to understand how sensitive the intersection operations are to capacity changes at other locations along the corridor.

	Existing			F.1 Couplet			F.4 Eliminate Split Phasing			F.3 & F.5 Lengthen Left Turn Lanes & Install SB Right Turn Lane		
	v/C	**Delay (s)**	**LOS**	**v/C**	**Delay (s)**	**LOS**	**v/C**	**Delay (s)**	**LOS**	**v/C**	**Delay (s)**	**LOS**
Southbound Movements (PM Peak)	1.05	69	E	0.80	51	D	0.82	30	C	0.95	41	D
East- & Westbound Movements (PM Peak)	0.83	65	E	0.90	61	E	0.77	67	E	0.80	70	E
Crash Reduction				Minimal			7 fewer east- or westbound rear end crashes (out of 63)			5 to 6 fewer north- or southbound rear end crashes (out of 99)		
Cost				$12,044,000			$6,811,000			$4,137,000		

Table 60 – Comparison of Alternatives at Spenard Road

G. Segment of Minnesota Drive from Spenard Road to Tudor Road

Minnesota Drive between Spenard Road and Tudor is a six-lane road separated by a raised median.

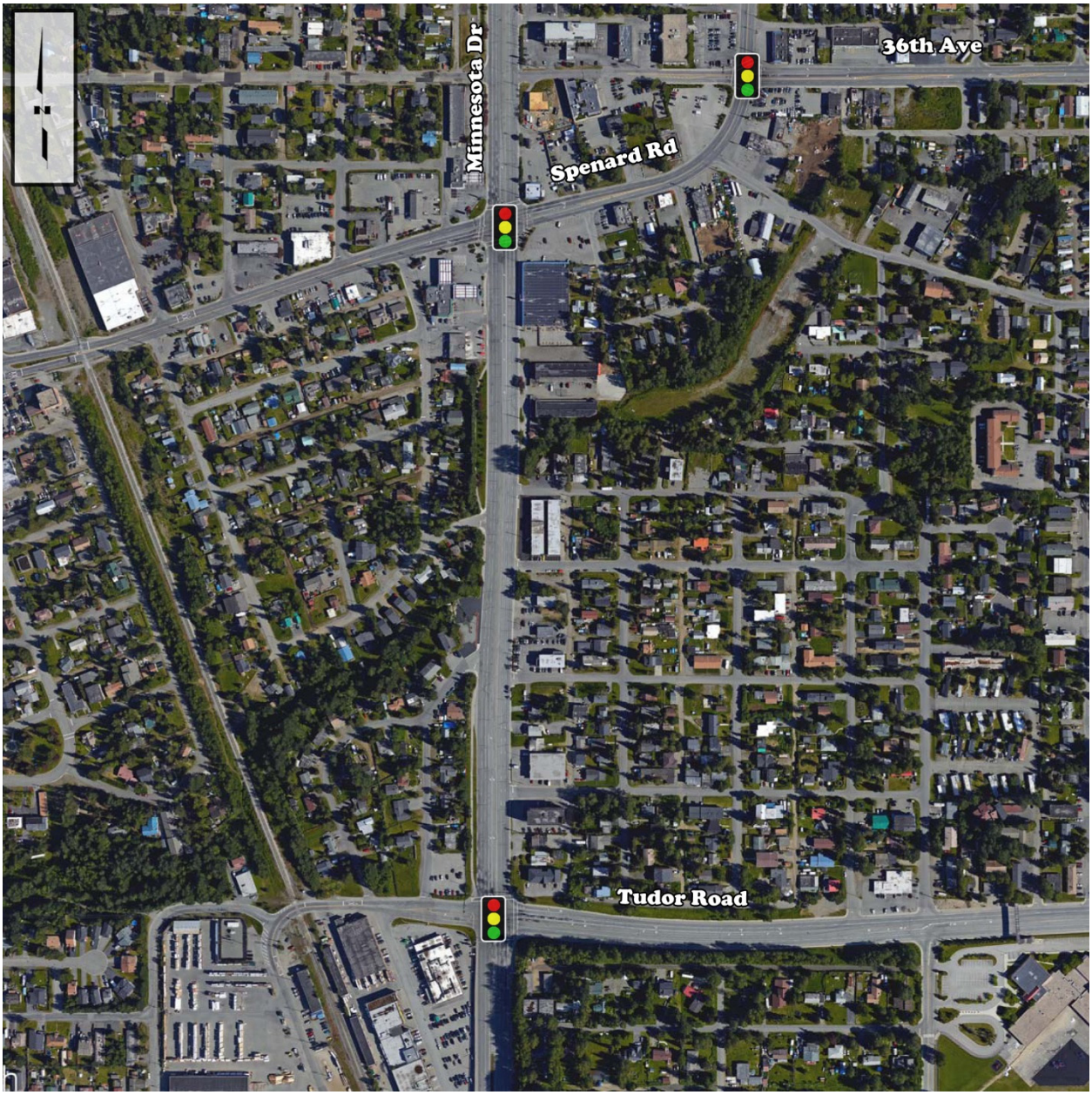


Figure 32 – Segment of Minnesota Drive from Spenard Road to Tudor Road

The main concerns identified at this location are:

- Segment capacity

DOT&PF did not select any alternatives from this segment for further analysis. See Appendix B for a qualitative analysis of all alternatives.

H. Tudor Road at Minnesota Drive Intersection

Minnesota Drive at Tudor Road is a signalized intersection. The northbound and westbound legs are at a downhill grade. Northbound traffic transitions here from freeway conditions to signalized at-grade intersections.

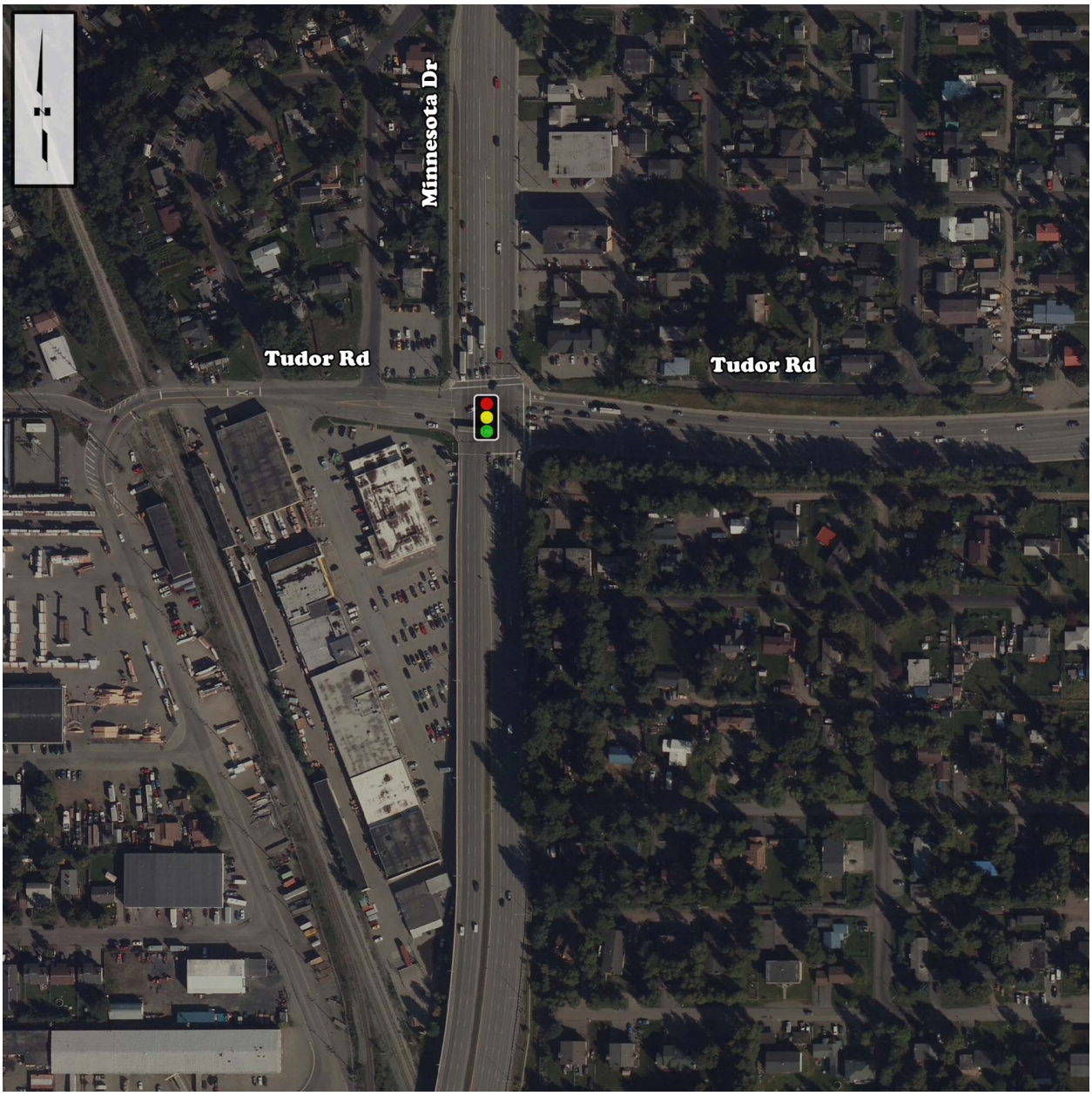


Figure 33 – Intersection of Tudor Road at Minnesota Drive

The main concern identified at this location is:

- Intersection capacity

DOT&PF recommended three alternatives for further study:

- H.2 – Triple Westbound Left-Turn Lanes

- H.3 – Reconfigure Approaches and Eliminate Split Phasing
- H.4 – Add Southbound Right Turn Lane
- H.5 – Add Active Warning Flashers on Northbound Minnesota Drive

See Appendix B for a qualitative analysis of all alternatives.

Existing and Forecasted Conditions

Operations

Southbound traffic has dual left turn lanes, two through lanes, and a thorough/right lane. Northbound traffic has a single left turn lane, three through lanes, and a right turn lane. Eastbound traffic has a left turn lane, a through lane, and a through/right lane. Westbound traffic has a left turn lane, a shared through/left lane, a through lane, and a right turn lane. Eastbound and westbound traffic operates with a split phase. Based on the counts taken at Tudor Road and Minnesota Drive on January 15, 2015 by DOT&PF, the northbound lanes are at or above capacity during the AM peak. The south and westbound lanes are at or above capacity during the PM peak.

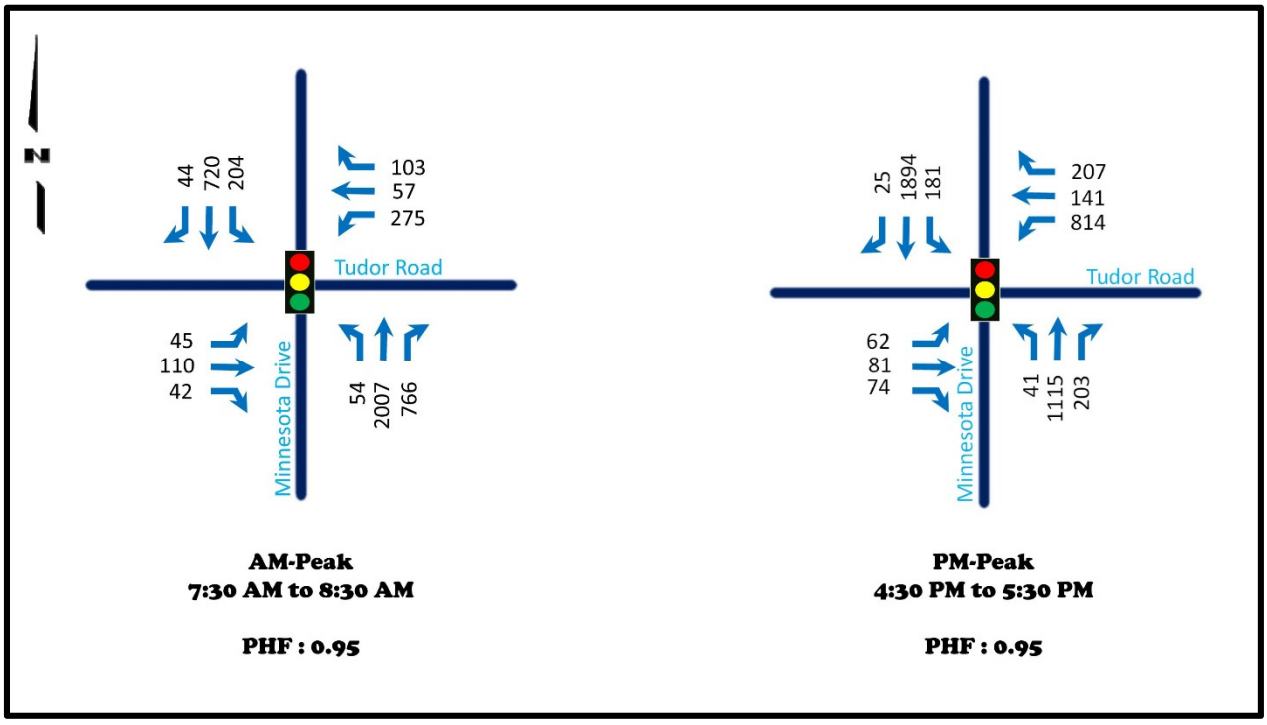


Figure 34 – Existing Volumes at Tudor Road and Minnesota Drive

Projected 2035 turning movement volumes were developed for two different volume scenarios which provide an upper and lower bound to the delay calculations. The two scenarios represent a range of possible volume changes on Tudor Road due to the opening of the Dowling Road extension, shown in Figure 35. A range of volumes were developed because the AMATS Travel Demand Models do not consider intersection capacity when assigning traffic. Therefore, it is likely that Minnesota Drive would appear less attractive if intersection capacity were included in the model and the traffic growth would not be as high as the model suggests.

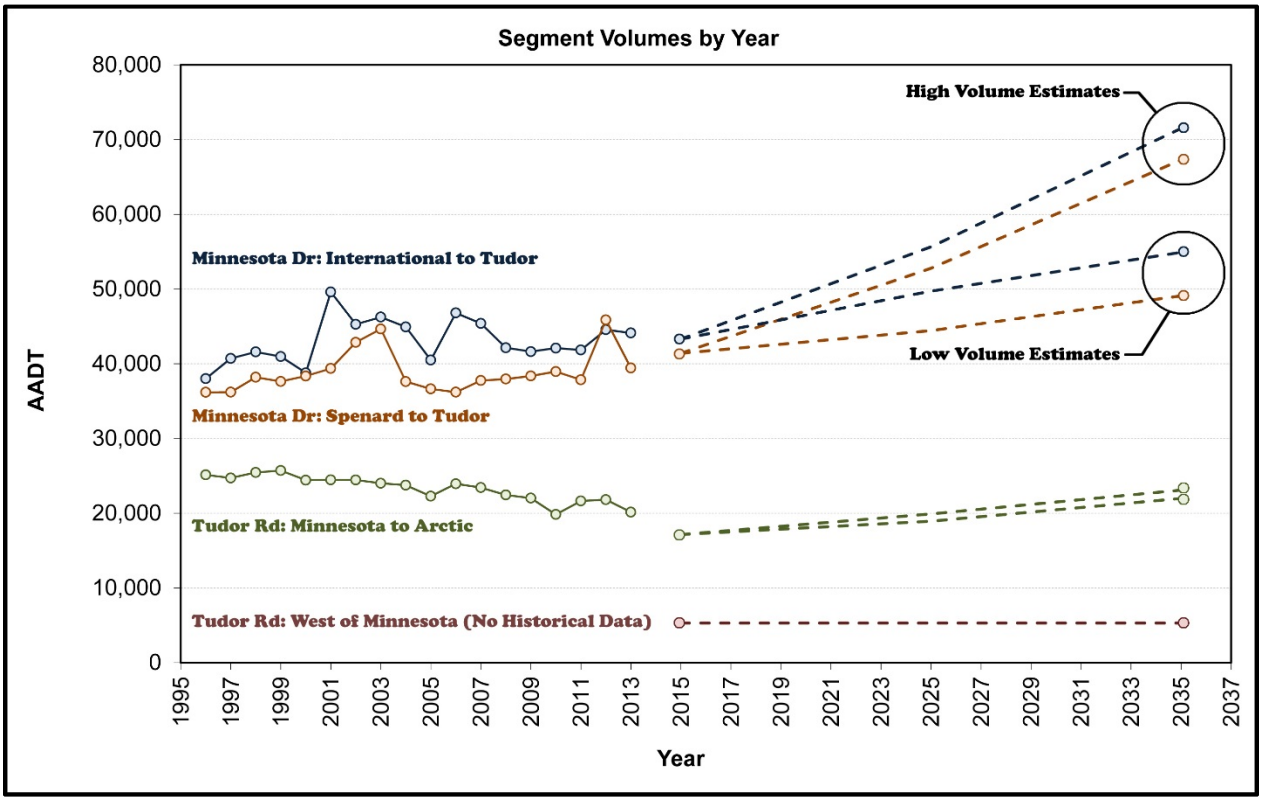


Figure 35 – Segment Volumes at Minnesota and Tudor for Operations Analysis

Turning movements were derived from the AADTs using NCHRP 255 methodology and 2015 observed turning movement proportions. The Minnesota Drive PTR north of Dimond Boulevard indicated approximately 8% of the daily traffic occurs during the PM peak period. Figure 36 presents forecasted 2035 PM Peak hour turning movement volumes.

Lane utilization for the westbound Tudor Road left turn traffic was estimated using Bluetooth detectors to gather origin-destination information. The Bluetooth detectors identify a unique code emitted by individual Bluetooth devices and record the time and date in which the code was detected. Three Bluetooth detectors were used for the analysis: one was set up on Tudor Road, one on International Airport Road, and one on Minnesota Drive south of the International Airport Road interchange. The Bluetooth detector software is able to match recordings of the same Bluetooth device at the different detectors. Since the Bluetooth detectors do not detect every vehicle, the origin-destination information provided by the detectors is not volume information, but can be used to estimate the percent of vehicles traveling between different origin-destination pairs. Based on this analysis, 35% of vehicles who turn left from Tudor Road onto Minnesota Drive proceed to take the International Airport Road exit, while 65% continue south on Minnesota Drive. Assuming that all of the vehicles who desire to exit at International Airport Road use the right-most westbound left turn lane, the lane utilization for the westbound left turn movement is 0.74 in the current year and will be 0.71 given projected 2035 volumes.

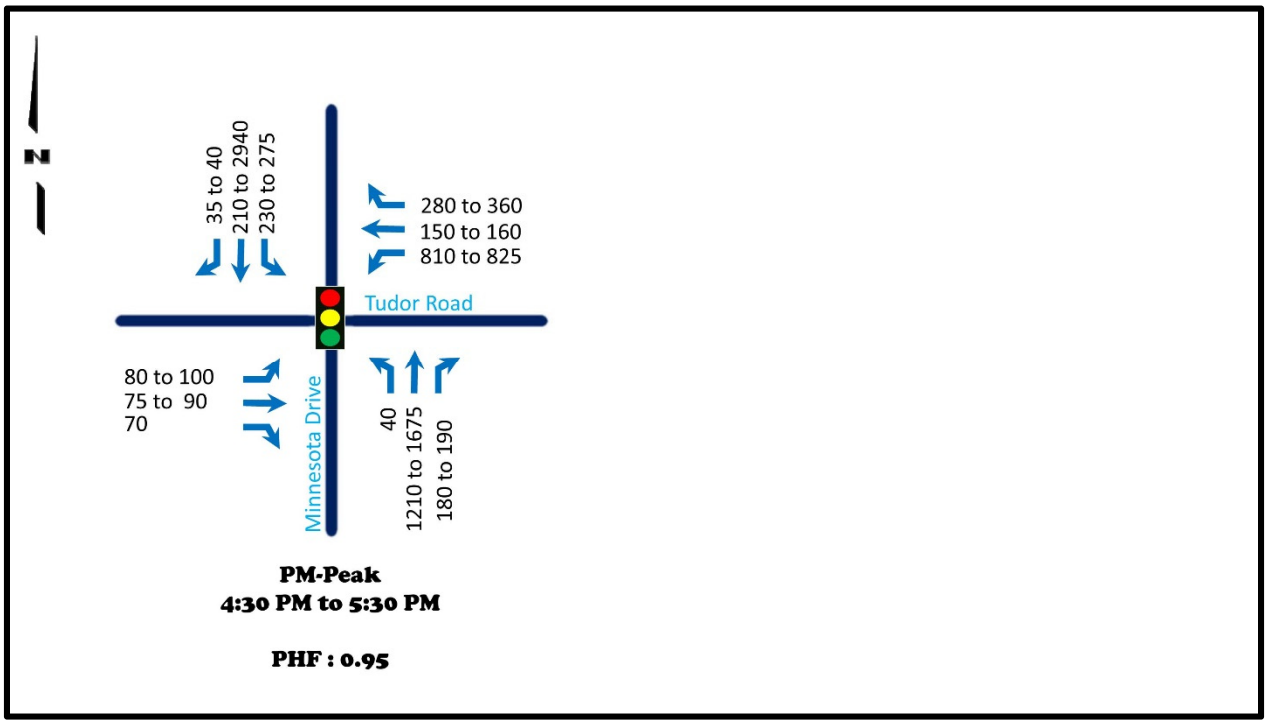


Figure 36 – Turning Movement Volumes at Tudor Road and Minnesota Drive (2035, PM Peak)

Table 61 and Table 62 present the Synchro analysis results for the existing configuration of the intersection using design turning movement volumes in both the high and low volume scenarios.

		Eastbound		Westbound			Northbound			Southbound	
		Left	**Thru/RT**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru/RT**
2015 PM	Control Delay (s/veh)	81	75	125	51	40	76	38	30	71	49
	Volume to Capacity Ratio	0.6	0.5	1.1	1.1	0.2	0.5	0.6	0.2	0.6	0.9
	Movement Level of Service	F	E	F	D	D	E	D	C	E	D
	Intersection Delay (s/veh)	54									
2025 PM	Control Delay (s/veh)	111	74	114	54	45	75	40	29	68	77
	Volume to Capacity Ratio	0.8	0.5	1.0	1.0	0.4	0.4	0.7	0.1	0.6	1.1
	Movement Level of Service	F	E	F	D	D	E	D	C	E	E
	Intersection Delay (s/veh)	65									
2035 PM	Control Delay (s/veh)	114	73	166	57	47	75	53	31	80	242
	Volume to Capacity Ratio	0.8	0.5	1.2	1.2	0.5	0.3	0.9	0.2	0.8	1.4
	Movement Level of Service	F	E	F	E	D	E	D	C	E	F
	Intersection Delay (s/veh)	146									

Table 61 – Delay Results Summary – No Build: High Volume Scenario

		Eastbound		Westbound			Northbound			Southbound	
		Left	**Thru/RT**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru/RT**
2025 PM	Control Delay (s/veh)	96	74	86	48	40	75	40	30	70	54
	Volume to Capacity Ratio	0.7	0.5	1.0	1.0	0.2	0.4	0.6	0.1	0.6	1.0
	Movement Level of Service	F	E	F	D	D	E	D	C	E	D
	Intersection Delay (s/veh)	53									
2035 PM	Control Delay (s/veh)	109	76	123	51	41	75	44	33	69	81
	Volume to Capacity Ratio	0.8	0.6	1.1	1.1	0.3	0.5	0.7	0.2	0.6	1.1
	Movement Level of Service	F	E	F	D	D	E	D	C	E	F
	Intersection Delay (s/veh)	68									

Table 62 – Delay Results Summary – No Build: Low Volume Scenario

Figure 37 shows the intersection delay for each of the volume scenarios and design years. The intersection currently is operating at LOS D/E in the PM. The reduced traffic on Tudor due to the Dowling extension will possibly allow the intersection to continue to perform at the level it does today for another 10 years, but within 20 years the increase of traffic on Minnesota Drive in conjunction with the heavy left turns off of westbound Tudor Road, will push the intersection operation into the critical regions of LOS E/F.

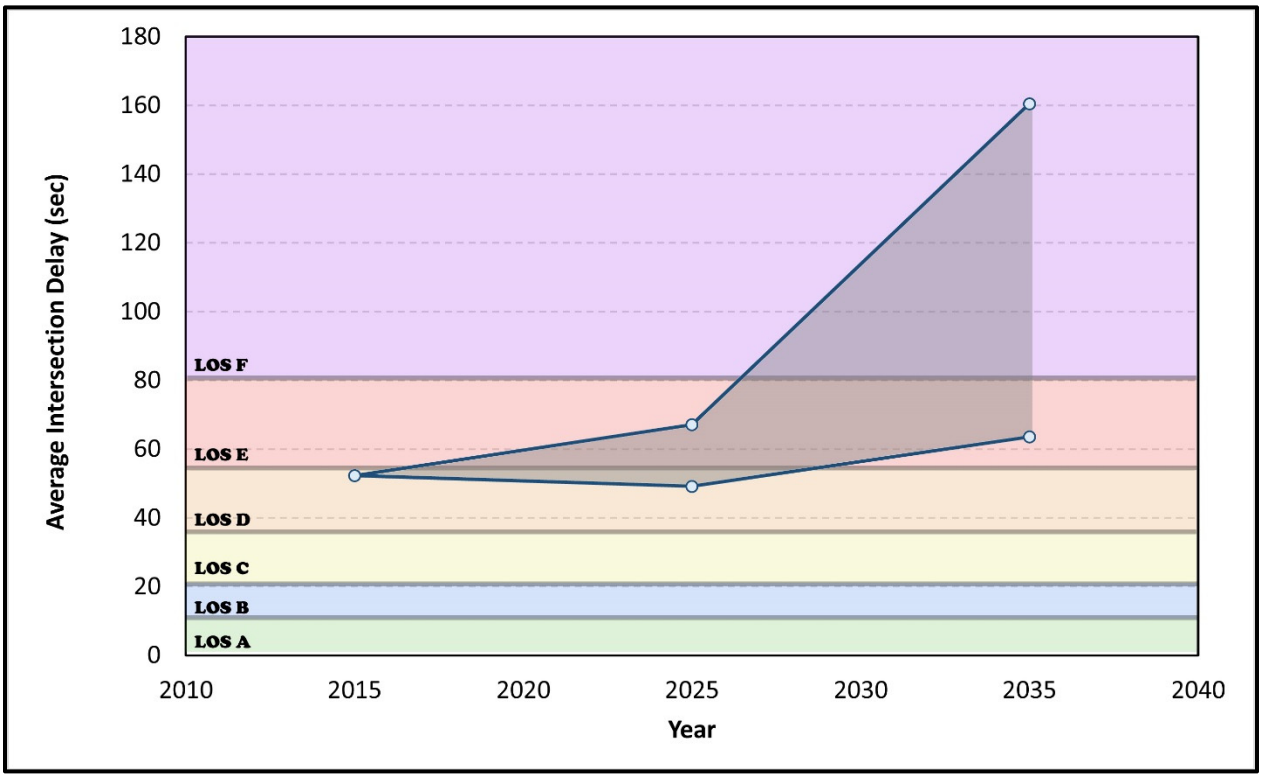


Figure 37 – Delay Results Summary – No Build

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized below.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average?	Above Critical?
Minnesota Drive at Tudor Road	227	1.181	52,660	1.559	1.552	no	no

Table 63 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Crash Type	Fatality	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Double Left Sideswipe			1	2	3
Head On			1	2	3
Left Turn	1		2	1	4
Crash Cushion				1	1
Curb/Wall			1	4	5
Moose			1		1
Other				1	1
Other Fixed Object				1	1
Sign			1		1
Traffic Signal Pole				1	1
Overtaking Sideswipe		1	3	26	30
Overturn				1	1
Parked			1		1
Pedestrian/Bicycle		1	2		3
Rear End		3	45	94	142
Right Angle	1	4	12	24	41
Right Left Turn Sideswipe			1	2	3
Right Turn Sideswipe			1		1
Total	**2**	**9**	**72**	**160**	**243**

Table 64 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Crash Cushion				1		1
	Curb/Wall	1		2	1	1	5
	Moose	1					1
	Other				1		1
	Other Fixed Object	1					1
	Sign					1	1
	Traffic Signal Pole		1				1
	Overturn			1			1
EAST	Overtaking Sideswipe	6					6
	Rear End	7					7
	Right Angle		2	2			4
NORTH	Left Turn			1		1	2
	Overtaking Sideswipe		5				5
	Rear End		49				49
	Right Angle	4				4	8
	Right Left Turn Sideswipe		2				2
	Right Turn Sideswipe		1				1
SOUTH	Double Left Sideswipe			1			1
	Head On		1				1
	Left Turn		2				2
	Overtaking Sideswipe			11			11
	Parked			1			1
	Rear End			35	3		38
	Right Angle	2			1	2	5
UNKNOWN	Overtaking Sideswipe			2	1		3
	Pedestrian/Bicycle		1	1			2
	Rear End			1	2	1	4
	Right Angle	2	1		1		4
	Right Left Turn Sideswipe					1	1
WEST	Double Left Sideswipe					2	2
	Head On	2					2
	Overtaking Sideswipe					5	5
	Pedestrian/Bicycle					1	1
	Rear End					44	44
	Right Angle		16	4			20
Total		**26**	**81**	**62**	**11**	**63**	**243**

Table 65 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction

The crash rate for this intersection is below the average crash rate for similar locations. However, there were 2 fatal crashes and 9 major injury crashes from 2003 to 2012. One fatal crash occurred in the late evening on a Friday on January 1, 2003. A southbound vehicle struck a northbound left-turning vehicle. Two persons died and three persons received minor injuries. The second fatal crash occurred during evening rush hour on a Thursday on September 17, 2009. An eastbound vehicle turning left struck two southbound vehicles. One person died and one received minor injuries. The 9 major injury crashes included 1 pedestrian crash, 1 sideswipe crash, 3 rear end crashes, and 4 right angle crashes.

Planning Background

The intersection is included in Project 309, an unfunded illustrative project, in the MTP to turn the Tudor Road-Minnesota Drive intersection into a grade-separated interchange to continue the unimpeded traffic flow from International Airport Road and to widen Minnesota Drive between Tudor Road and Northern Lights Boulevard to 8 lanes.

Alt H.2 – Triple Westbound Left-Turn Lanes

This alternative would reconfigure the intersection to eliminate the east-west split phase timing by isolating the left turns from the through and right turn movements. The alternative would also add a third left turn lane to the westbound approach (see Figure 38).

Operations

The cycle length is held at 160 seconds in each scenario, and the timing is optimized for the new volumes for each year.

The Bluetooth origin-destination data was again used to determine likely lane utilization under this scenario. Once again, assuming that all vehicles exiting at International Airport Road will use the right-most westbound left turn lane, the lane utilization for the triple left turn will be 0.85.

Table 66 and Table 67 present the Synchro analysis results for the triple left turn configuration of the intersection using design turning movement volumes in both the high and low volume scenarios.



Figure 38 – H.2 Triple Westbound Left-Turn Lanes

		Eastbound		Westbound			Northbound			Southbound	
		Left	**Thru/RT**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru/RT**
2015 PM	Control Delay (s/veh)	74	71	63	48	46	76	30	24	71	35
	Volume to Capacity Ratio	0.4	0.4	0.8	0.3	0.2	0.5	0.5	0.2	0.6	0.8
	Movement Level of Service	E	E	E	D	D	E	C	C	E	C
	Intersection Delay (s/veh)	42									
2025 PM	Control Delay (s/veh)	73	73	66	56	57	75	30	22	67	35
	Volume to Capacity Ratio	0.5	0.4	0.8	0.4	0.5	0.4	0.6	0.1	0.6	0.9
	Movement Level of Service	E	E	E	E	E	E	C	C	E	C
	Intersection Delay (s/veh)	42									
2035 PM	Control Delay (s/veh)	74	73	76	55	60	75	38	24	68	124
	Volume to Capacity Ratio	0.5	0.5	0.9	0.4	0.6	0.5	0.8	0.2	0.7	1.2
	Movement Level of Service	E	E	E	D	E	E	D	C	E	F
	Intersection Delay (s/veh)	85									

Table 66 – Delay Results Summary – Triple Left Turn: High Volume Scenario

		Eastbound		Westbound			Northbound			Southbound	
		Left	**Thru/RT**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru/RT**
2025 PM	Control Delay (s/veh)	73	72	65	54	52	75	27	21	68	29
	Volume to Capacity Ratio	0.4	0.4	0.8	0.4	0.3	0.4	0.5	0.1	0.6	0.8
	Movement Level of Service	E	E	E	D	D	E	C	C	E	C
	Intersection Delay (s/veh)	39									
2035 PM	Control Delay (s/veh)	73	74	66	53	52	75	31	24	68	35
	Volume to Capacity Ratio	0.4	0.5	0.9	0.4	0.4	0.5	0.6	0.1	0.6	0.9
	Movement Level of Service	E	E	E	D	D	E	C	C	E	D
	Intersection Delay (s/veh)	44									

Table 67 – Delay Results Summary – Triple Left Turn: Low Volume Scenario

Figure 39 below, shows the intersection delay for each of the volume scenarios and design years. The current 2015 condition shows how the triple left turn would operate with today's traffic levels. Compared to the existing configuration, the triple left would reduce the overall delay by approximately 10 seconds per vehicle in the PM peak hour. The ten-year estimate is that regardless of the growth scenario, the triple left would allow the intersection to remain LOS D. If volumes on Tudor and Minnesota remain steady at historical growth rates, the delay in 20 years may be similar to what is being experienced today. However, higher estimates would put the intersection at LOS E/F.

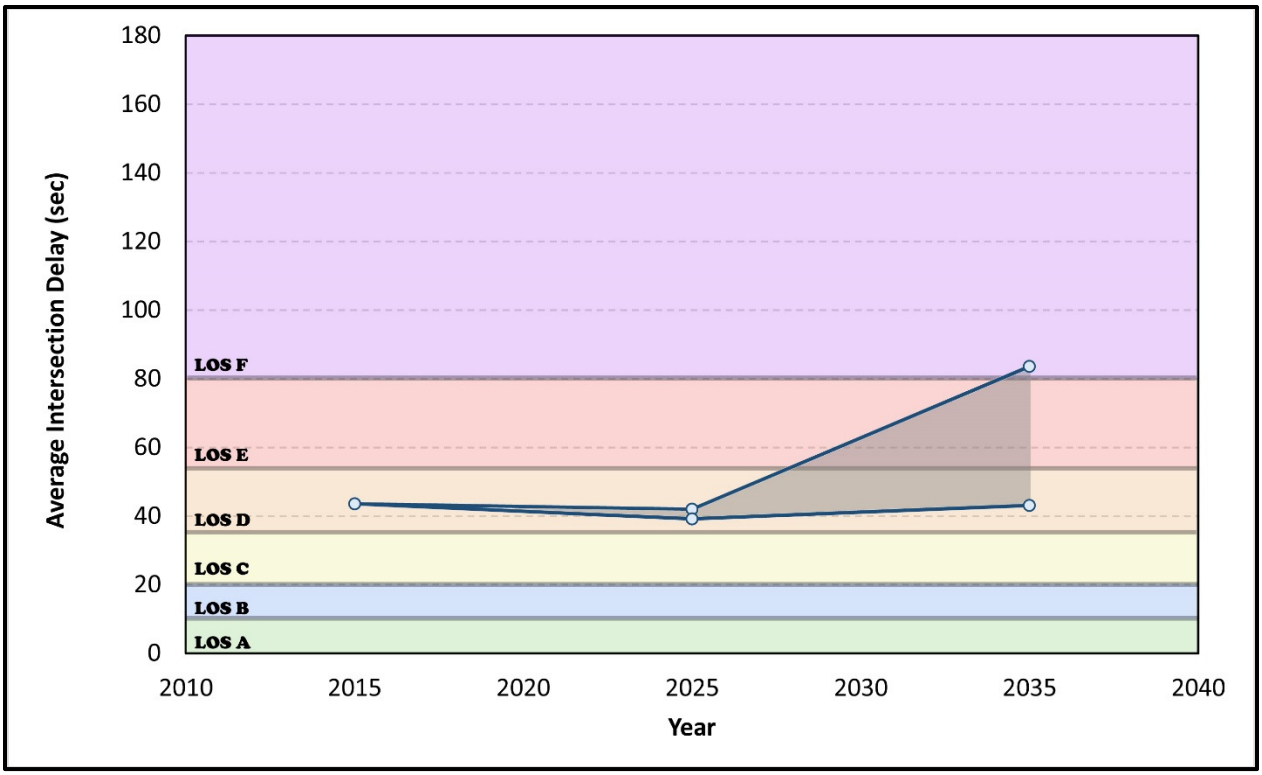


Figure 39 – Delay Results Summary – Triple Left Turn

Safety

Targeted Crashes

Westbound approach crashes. Presently there are 44 westbound crashes coded as Rear End and 7 westbound crashes coded as either double left or overtaking sideswipes. A small percentage of rear end crashes on the other intersection approaches may occur as a result of westbound capacity and traffic signal timing improvements.

Potential Safety Benefit

Rear end and same direction sideswipe crashes on the Westbound Tudor Road Approach. The 2016 HSIP Handbook specifies a rear end crash reduction of 15% for lengthening an existing left turn lane. Adding an additional turn lane is a similar improvement as it is intended for locations where the existing turn pocket is lengthened to accommodate the turning lane demand, eliminating turning traffic which backs up into the thru lanes.

Rear end and same-direction sideswipe crashes were assumed to be distributed evenly among the four westbound approach lanes. Of the 51 westbound rear end or same direction sideswipe crashes, 25 crashes were assumed to be associated with the left turn lanes and susceptible to correction through the installation of a third left-turn lane. With a 15% crash reduction for these types of crashes, approximately 4 crashes would be mitigated during the 10-year study period.

The existing westbound left/left-thru lane approach experienced 7 same direction sideswipe crashes, possibly associated with the dual left turn movement. We can expect that the number of these types of crashes will increase with a triple left turn lane. This is largely dependent on the amount of traffic making the westbound left turn from Tudor Road to Minnesota Drive that wishes to take the westbound International Airport exit ramp to access the Anchorage International Airport (AIA) 1900 feet south of Tudor Road. The introduction of a triple left turn lane for westbound Tudor Road could result in a considerable weaving potential depending on which westbound left turn lane AIA traffic has selected. An analysis of crashes on southbound Minnesota Drive between Tudor Road and the westbound International off-ramp was initiated to determine the extent of the existing weaving situation and to assess what the potential increase in crashes might be downstream resulting from the triple left turn lane. The following table summarizes these crashes:

Vehicle #2 Direction	**Crash Type**	**Vehicle #1 (Presumed at-fault) Direction**	**Total**
		SOUTH	
No Vehicle #2	Bridge/Overpass	2	2
	Curb/Wall	4	4
	Ditch	1	1
	Guardrail Face	1	1
	Light Support	2	2
	Median Barrier	1	1
	Other Fixed Object	3	3
	Snoberm	3	3
	Overturn	4	4
	Other	1	1
SOUTH	Overtaking Sideswipe	10	10
	Rear End	10	10
Total		**42**	**42**

Table 68 -Minnesota Drive: Tudor to International Airport Road Off-Ramp Southbound Only by Crash Type and At-Fault Vehicle

There were 10 crashes that were coded either as a rear end or overtaking sideswipe crashes. In addition, another 22 were single vehicle run off the road or fixed object crashes. Assuming that a percentage of these crashes is related to the present weaving situation on southbound Minnesota Drive south of Tudor Road, a triple left turn lane option could be expected to increase these types of crashes related to the weaving segment by at least 1/3.

Alt H.3 – Reconfigure Approaches and Eliminate Split Phasing

This alternative reconfigures the intersection to eliminate the east-west split phase timing by isolating the left turns from the through and right turn movements, as shown in Figure 40.

Operations

The cycle length is held at 160 seconds in each scenario, and the timing is optimized for the new volumes for each year.

Table 69 and Table 70 present the Synchro analysis results for this configuration of the intersection using design turning movement volumes in both the high and low volume scenarios.



Figure 40 – H.3 Reconfigure Approaches and Eliminate Split Phasing

		Eastbound		Westbound			Northbound			Southbound	
		Left	**Thru/RT**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru/RT**
2015 PM	Control Delay (s/veh)	74	72	140	41	40	76	36	29	71	46
	Volume to Capacity Ratio	0.4	0.4	1.2	0.3	0.2	0.5	0.6	0.2	0.6	0.9
	Movement Level of Service	E	E	F	D	D	E	D	C	E	D
	Intersection Delay (s/veh)	61									
2025 PM	Control Delay (s/veh)	73	73	177	52	53	75	33	24	67	43
	Volume to Capacity Ratio	0.5	0.4	1.2	0.4	0.4	0.4	0.6	0.1	0.6	1.0
	Movement Level of Service	E	E	F	D	D	E	C	C	E	D
	Intersection Delay (s/veh)	61									
2035 PM	Control Delay (s/veh)	74	73	302	53	58	75	39	24	70	137
	Volume to Capacity Ratio	0.5	0.5	1.5	0.4	0.6	0.5	0.8	0.2	0.7	1.2
	Movement Level of Service	E	E	F	D	E	E	D	C	E	F
	Intersection Delay (s/veh)	118									

Table 69 – Delay Results Summary – No Split: High Volume Scenario

		Eastbound		Westbound			Northbound			Southbound	
		Left	**Thru/RT**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru/RT**
2025 PM	Control Delay (s/veh)	73	73	117	47	45	75	34	26	68	39
	Volume to Capacity Ratio	0.4	0.5	1.1	0.3	0.2	0.4	0.6	0.1	0.6	0.9
	Movement Level of Service	E	E	F	D	D	E	C	C	E	D
	Intersection Delay (s/veh)	52									
2035 PM	Control Delay (s/veh)	73	74	171	46	46	75	37	28	68	48
	Volume to Capacity Ratio	0.4	0.5	1.2	0.4	0.3	0.5	0.6	0.2	0.6	1.0
	Movement Level of Service	E	E	F	D	D	E	D	C	E	D
	Intersection Delay (s/veh)	66									

Table 70 – Delay Results Summary – No Split: Low Volume Scenario

Figure 41 shows the intersection delay for each of the volume scenarios and design years. The current 2015 condition shows how the intersection would hypothetically be operating under this alternative. The ten-year estimate is that regardless of the growth scenario, removing the split phased operation would allow the intersection to remain LOS D as it is currently. The twenty-year estimate indicates that the design would be less likely to be able to operate at a LOS D than the Triple Left configuration.

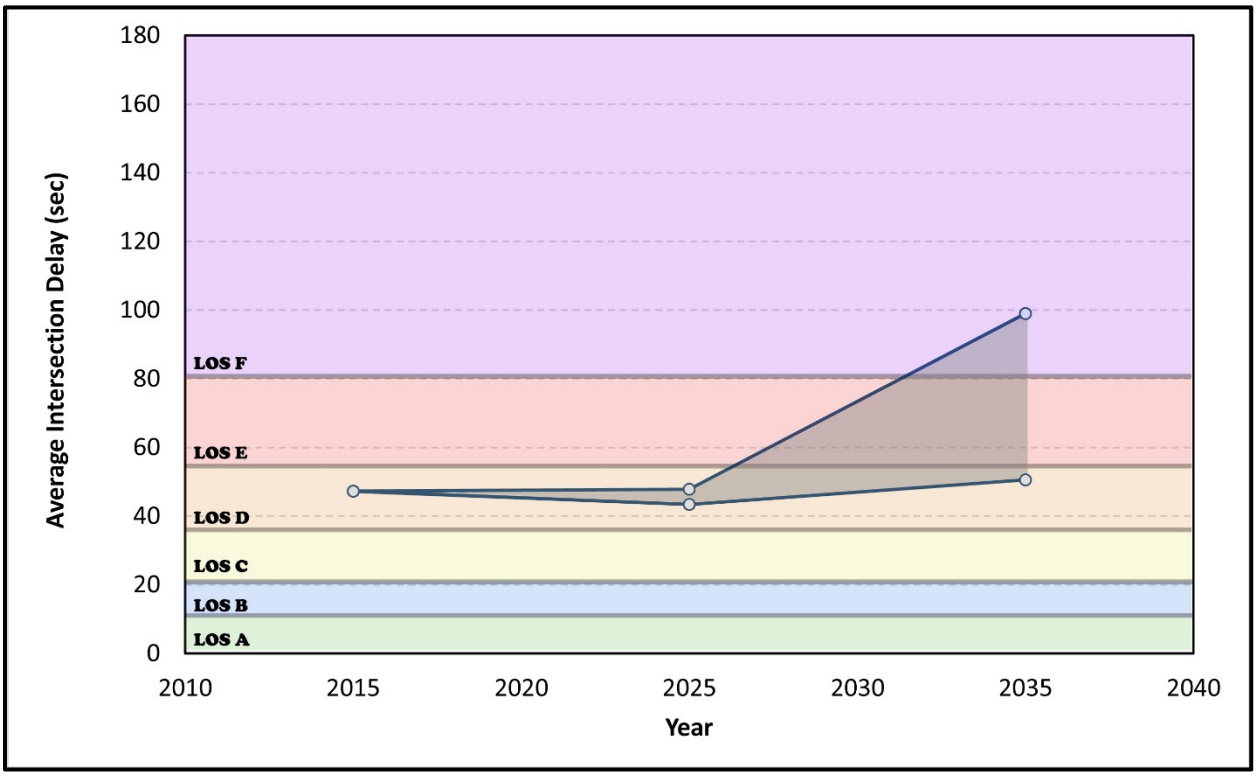


Figure 41 – Delay Results Summary – No Split

Safety

Targeted Crashes

There were 164 rear end and same direction sideswipe crashes accounting for nearly 68% of all crashes occurring at this intersection. The east-west approaches experienced 64 crashes or 39% of the 164 rear end and same direction sideswipe crashes at this intersection. These crashes can be reduced through the elimination of the east-west split phase and increased left turn storage on the Tudor Road approaches providing sufficient storage space can be provided to accommodate all left turning vehicles, particularly during peak traffic periods. North-south rear end and same direction sideswipe crashes are less likely to be affected by the split phase elimination other than a slight reduction that could occur as a result of improved traffic signal operation and timing.

Potential Safety Benefit

The 2016 HSIP Handbook specifies a rear end crash reduction of 15% for lengthening an existing left turn lane. Adding an additional turn lane and increasing the storage space on the existing turn lane is a similar improvement as it is intended for locations where the existing turn pocket is lengthened to accommodate the turning lane demand, eliminating turning traffic which backs up into the thru lanes.

Since it is not known from the crash data what lane vehicles involved in these types of crashes were in, our approach was to distribute these crashes evenly among the four westbound (two left turn lanes) and three eastbound (two left turn lanes) approach lanes. Of the 64 eastbound and westbound rear end or same direction sideswipe crashes, this would result in a 15% crash reduction for the approximately 32 crashes occurring in the vicinity of the left turn lanes which would be susceptible to correction through the installation of additional left turn storage, amounting to approximately 5 crashes during the 10-year study period.

Alt H.4 – Add Southbound Right-Turn Lane

This alternative would separate out the southbound right turns into their own exclusive turn lane, as shown in Figure 42.

Operations

The signal timing was kept the same as the existing condition after confirming that the pedestrian crossing times still met current MUTCD standards with the additional crossing distance.

Table 71 and Table 72 present the Synchro analysis results for the "Southbound Right Turn" configuration of the intersection using design turning movement volumes in both the high and low volume scenarios.

Figure 43 shows the Intersection delay for each of the volume scenarios and design years. The current 2015 condition shows how the intersection would hypothetically operate with the right turn lane in 2015. The impact of this additional lane would not greatly impact the intersection performance overall, but it would possibly improve the merge segment south of the intersection as it would allow traffic traveling to the airport to stay in the right lane, rather than move to middle lane to bypass the heavy truck traffic turning right at Tudor Road.



Figure 42 – H.4 Add Southbound Right-Turn Lane

		Eastbound		Westbound			Northbound			Southbound		
		Left	**Thru/RT**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
2015 PM	Control Delay (s/veh)	81	74	105	47	37	76	42	33	71	61	27.6
	Volume to Capacity Ratio	0.6	0.5	1.0	1.0	0.2	0.5	0.7	0.2	0.6	1.0	0.0
	Movement Level of Service	F	E	F	D	D	E	D	C	E	E	C
	Intersection Delay (s/veh)	57										
2025 PM	Control Delay (s/veh)	111	74	121	55	46	75	39	29	68	36	22.2
	Volume to Capacity Ratio	0.8	0.5	1.1	1.1	0.4	0.4	0.7	0.1	0.6	1.0	0.0
	Movement Level of Service	F	E	F	E	D	E	D	C	E	E	C
	Intersection Delay (s/veh)	61										
2035 PM	Control Delay (s/veh)	114	73	176	59	48	75	50	30	86	224	24.2
	Volume to Capacity Ratio	0.8	0.5	1.2	1.2	0.5	0.4	0.9	0.2	0.8	1.4	0.0
	Movement Level of Service	F	E	F	E	D	E	D	C	F	F	C
	Intersection Delay (s/veh)	137										

Table 71 – Delay Results Summary – Southbound Right Turn Lane: High Volume Scenario

		Eastbound		Westbound			Northbound			Southbound		
		Left	**Thru/RT**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
2025 PM	Control Delay (s/veh)	96	74	86	49	40	75	40	30	70	51	25.5
	Volume to Capacity Ratio	0.7	0.5	1.0	1.0	0.2	0.4	0.6	0.1	0.6	0.9	0.0
	Movement Level of Service	F	E	F	D	D	E	D	C	E	D	C
	Intersection Delay (s/veh)	52										
2035 PM	Control Delay (s/veh)	109	76	123	51	41	75	45	34	68	75	26.0
	Volume to Capacity Ratio	0.8	0.6	1.1	1.1	0.3	0.5	0.7	0.2	0.6	1.0	0.0
	Movement Level of Service	F	E	F	D	D	E	D	C	E	E	C
	Intersection Delay (s/veh)	66										

Table 72 – Delay Results Summary – Southbound Right Turn Lane: Low Volume Scenario

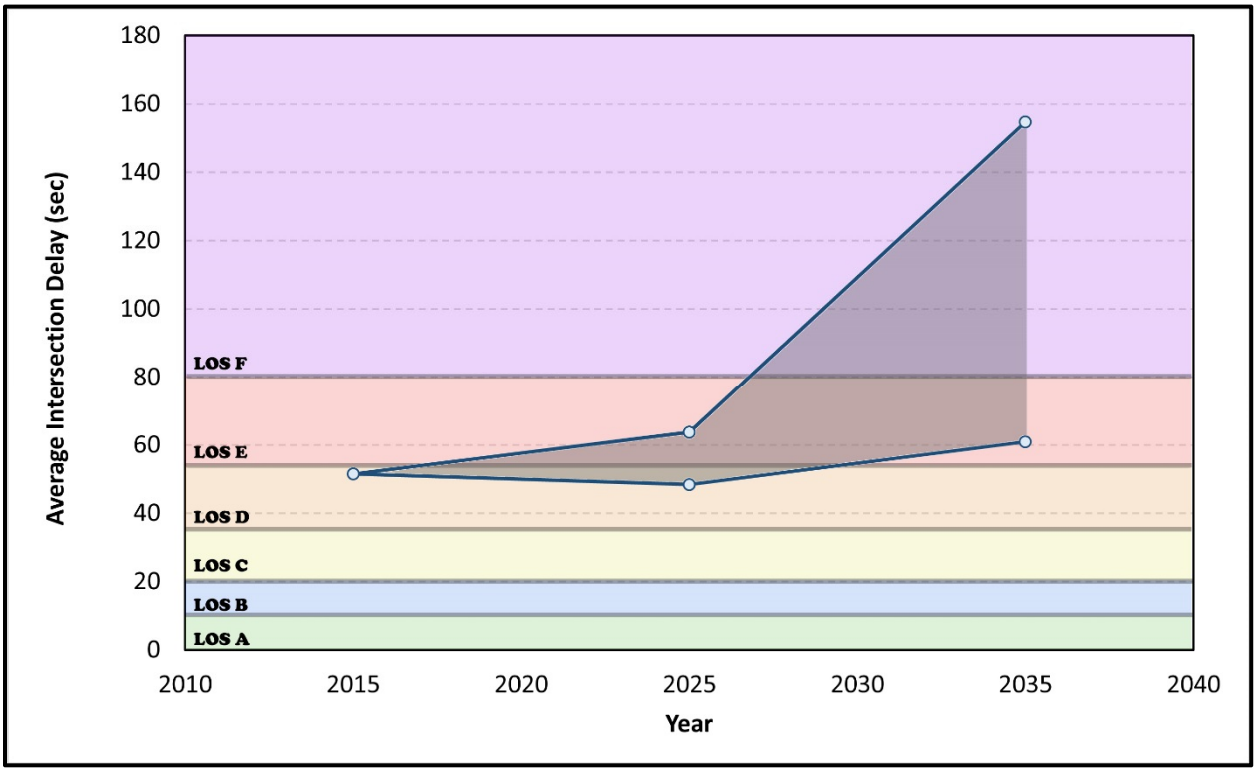


Figure 43 – Delay Results Summary – Southbound Right Turn

Safety

Targeted Crashes

This improvement targets southbound rear end crashes by increasing the capacity on this approach through the addition of a southbound right turn lane.

There were 46 rear end and same direction sideswipe crashes on the southbound approach to Tudor Road accounting for 19% of all crashes occurring at this intersection. These crashes can be reduced through the installation of a southbound right turn lane on Minnesota Drive at Tudor Road.

Potential Safety Benefit

The 2016 HSIP Handbook specifies a rear end crash reduction of 10% for adding a right turn lane at an urban signalized intersection. There were 46 rear end or same direction sideswipe crashes on the southbound approach to Tudor Road. Dividing these crashes on the five lane approach results in approximately 10 crashes per lane. Using a 10% crash reduction for the installation of the southbound right turn lane, a reduction of 1 crash can be expected during the 10-year study period.

Alt H.5 – Add Active Advance Warning Flashers on Northbound Minnesota Drive

The segment of Minnesota Drive between Tudor Road and Old Seward Highway is about 5 miles of access-controlled freeway with a posted speed limit of 60 mph. There are no signalized intersections on this segment of Minnesota Drive. Starting with Tudor Road, the speed

limit drops to 50 mph and there are signals at the major crossroads. Figure 44 shows the signs placed along northbound Minnesota Drive to inform drivers of the change in speed limit and to alert them to the signal ahead. As drivers on northbound Minnesota Drive approach Tudor Road, a Speed Zone Ahead sign informs them the speed limit will drop. The posted speed limit then proceeds to drop to 50 mph. Soon after, a Signal Ahead sign with passive warning beacons informs drivers they are approaching a signalized intersection. Shortly after the Signal Ahead sign there is a second 50 mph sign.

According to the MUTCD, Signal Ahead signs are installed when the primary traffic signal heads are not visible for a sufficient distance or to give added emphasis to the upcoming traffic control. Active advance warning flashers (AAWF) are a type of Signal Ahead sign placed in advance of signalized intersections. They flash yellow just before the traffic signal changes from green to red and continue to flash while the signal is red, turning off when the signal is green. In this way, they alert drivers of the onset of a yellow light so that drivers may make a better choice in preparing to stop or continue through the intersection.

The Alaska Traffic Manual (ATM) specifies conditions under which AAWFs may be considered for installation. The first criterion is:

A) *Where sight distance to the conventional traffic signal indications meets or exceeds standards.*

The minimum sight distance is 540 feet for a roadway with an 85th percentile speed of 50 mph and 715 feet for a roadway with an 85th percentile speed of 60 mph. The stopping sight distance at Tudor Road and Minnesota Drive appears to be adequate.

In addition, one of the following criteria must be met:

A) *High-speed (55 mph or higher) approaches to an intersection placed at least one mile from another signalized intersection, or*
B) *At the first signalized intersection after 10 or more miles of uninterrupted highway.*

The distance between Tudor Road and Old Seward Highway along Minnesota Drive is 5 miles; therefore, criterion C is not met.

Criterion B defines a high-speed approach as 55 mph or higher. The speed limit on Minnesota Drive is 60 mph south of Tudor Road; however, on the intersection approach, the speed limit is reduced to 50 mph. To gain a better understanding of actual speeds on the intersection approach of northbound Minnesota Drive and Tudor Road, KE performed spot speed study on March 29, 2013.

The speeds of free-flowing passenger vehicles were measured only when the traffic signal was green and queues had dissipated. Data collectors were positioned so that they could observe the signal phase to make sure through traffic was not braking while passing through the intersection. Sixty-one observations were taken during the afternoon from 1:45 PM to 2:30 PM. Table 73 shows the range of observed speeds and the 85th percentile speed. Because the 85th percentile speed is above 55 mph, the northbound approach to the Tudor Road intersection can be considered "high speed" for the purpose of evaluating whether or not an AAWF can be considered. Thus, criterion B is met.

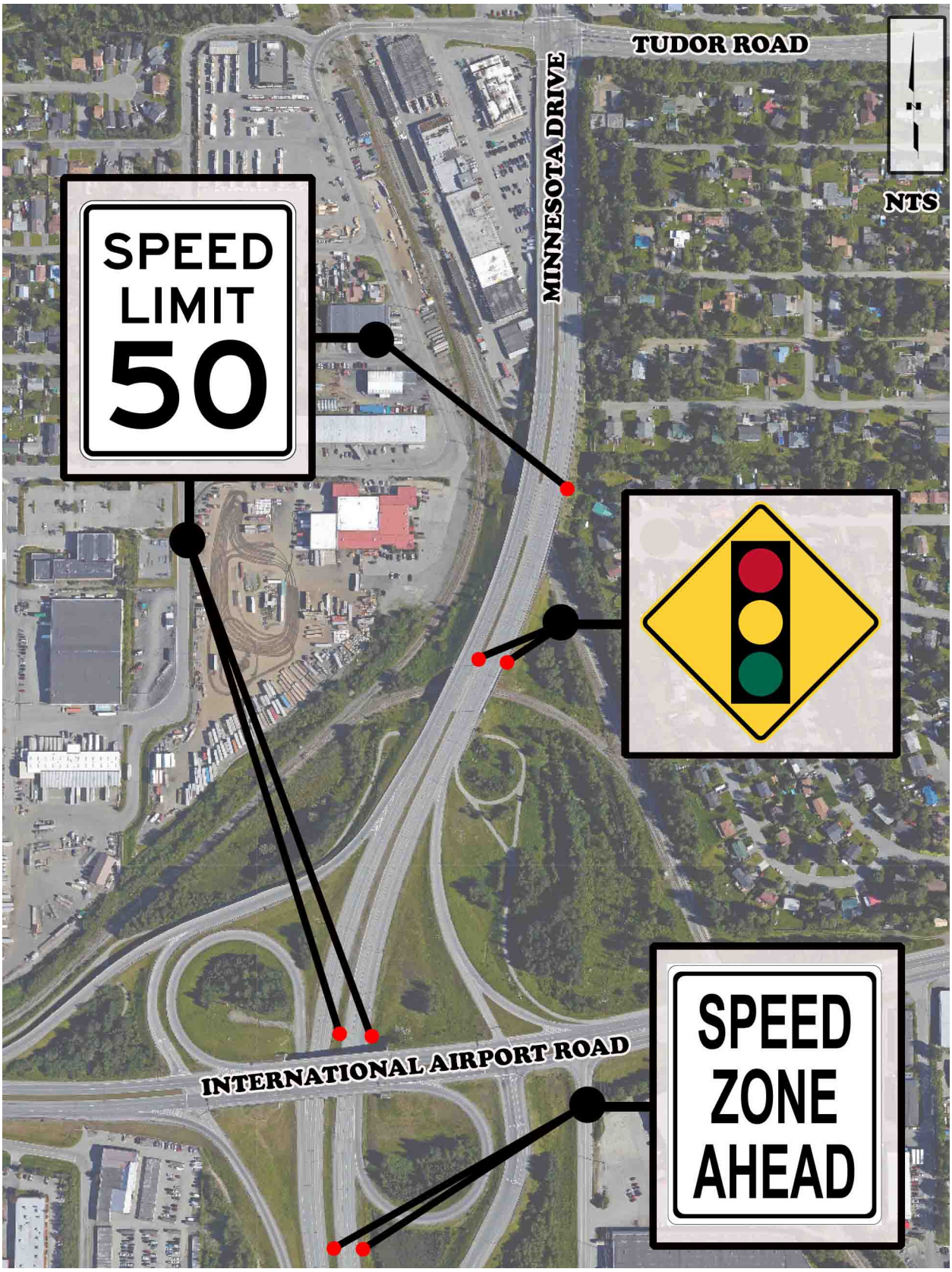


Figure 44 – Existing Speed Limit and Signal Ahead Signage on Northbound Minnesota Drive Approaching Tudor Road

Intersection with Minnesota Drive	Lowest Speed (mph)	Mean Speed (mph)	85th Percentile Speed (mph)	Highest Speed (mph)
Tudor Road	45	53	59	66

Table 73 – Results of Spot Speed Study on Northbound Approach at Minnesota Drive and Tudor Road

If the criteria are met, an engineering analysis should be completed to determine whether or not AAWF should be installed. The benefit of installing an AAWF would be to reduce rear end and right-angle crashes by alerting drivers to the onset of a yellow signal.

Table 74 gives a summary of rear end, right-angle, and all other crashes by approach and severity at Minnesota Drive and Tudor Road. On the northbound approach, 49 out of 81, or 60 percent of the crashes are rear end crashes. Rear end crashes on the south-, east-, and westbound approaches are 56, 35, and 70 percent of all crashes, respectively. Right angle crashes compose between 3 and 8 percent of total approach crashes in each direction, with the northbound approach having the second lowest occurrence at 5 percent.

Because the percentage of rear end and right angle crashes on northbound Minnesota Drive at Tudor Road is comparable to the percentage of rear end and right angle crashes on the other three approaches at the intersection, the existing signage appears to adequately alert drivers to the traffic signal, and an AAWF is not suggested for installation on northbound Minnesota Drive before Tudor Road.

	Total	Crash Type	PDO	Minor Injury	Major Injury	Fatality
Northbound	81	Rear End	31 (38%)	18 (22%)	-	-
		Right-Angle	3 (4%)	1 (1%)	-	-
		All Other	18 (64%)	6 (31%)	4 (5%)	-
Southbound	62	Rear End	25 (40%)	9 (15%)	1 (2%)	-
		Right-Angle	1 (2%)	-	-	1 (2%)
		All Other	16 (68%)	8 (27%)	1 (3%)	0 (2%)
Eastbound	26	Rear End	7 (27%)	1 (4%)	1 (4%)	-
		Right-Angle	2 (8%)	-	-	-
		All Other	10 (73%)	3 (15%)	1 (8%)	1 (4%)
Westbound	63	Rear End	26 (41%)	17 (27%)	1 (2%)	-
		Right-Angle	1 (2%)	3 (5%)	-	-
		All Other	10 (59%)	5 (40%)	0 (2%)	-

PDO = Property Damage Only
Table 74 – Summary of Right-Angle and Rear End Crashes at Tudor Road and Minnesota Drive

Cost Estimates

Phase	Alternative H.2	Alternative H.3	Alternative H.4
Design	$471,000	$314,000	$314,000
Right-of-Way	$654,000	$105,000	$105,000
Utilities	$42,000	$42,000	$136,000
Construction	$2,908,000	$1,300,000	$706,000
Contract Administration (20% of construction costs)	$582,000	$260,000	$141,000
Contingency (20%)	$931,000	$404,000	$280,000
Total	**$5,588,000**	**$2,425,000**	**$1,682,000**

Comparison of Alternatives

Three alternatives were considered to improve efficiency of the signal during the PM Peak.

The first would install triple westbound left turn lanes and eliminate split phasing for the east- and westbound phases at the intersection. This alternative increases capacity of the intersection the most; however, same direction sideswipes may increase.

The second alternative would eliminate the split phasing for the east- and westbound phases at the intersection by converting the through-left lane to a left-only lane. This has little effect on intersection capacity, since the through-left lane already acts as a de facto left turn lane. There would be a small reduction in the number of rear end crashes for the westbound left turn movement.

The third alternative adds a southbound right turn lane. This gives a small amount of additional capacity to the intersection, removing right turning traffic from the through lanes. There may be some additional benefit to reduce weaving south of the intersection for drivers accessing the International Airport Road ramp directly to the south; however, this benefit could not be quantified.

Table 75 compares these three alternatives.

	No Build			H.2 Triple WB Lefts			H.3 Eliminate Split Phasing			H.4 SB Right Turn		
	v/C	**Delay (s)**	**LOS**	**v/C**	**Delay (s)**	**LOS**	**v/C**	**Delay (s)**	**LOS**	**v/C**	**Delay (s)**	**LOS**
High Volume Scenario												
Southbound Thru	1.4	242	F	1.2	124	F	1.2	137	F	1.4	224	F
Westbound Left	1.2	166	F	0.9	76	E	1.5	302	F	1.2	176	F
Intersection	1.3	146	F	1.1	85	F	1.2	118	F	1.3	137	F
Low Volume Scenario												
Southbound Thru	1.1	81	F	0.9	35	D	1.0	48	D	1.0	75	E
Westbound Left	1.1	123	F	0.9	66	E	1.2	171	F	1.1	123	F
Intersection	1.0	68	E	0.8	44	D	1.0	66	E	1.0	66	E
Crash Reduction				Possible Increase			5 out of 32 westbound rear ends			1 out of 46 southbound rear ends		
Cost				$5,588,000			$2,425,000			$1,682,000		

Table 75 – Comparison of Alternatives for Tudor Road Capacity Improvements (PM Peak – 2035)

Controlled Access Freeway: Tudor Road to C Street

This segment is characterized as an urban freeway beginning just south of the Tudor Road signal and continuing south through the 90-degree turn. All intersections in this segment are interchanges. The interchanges are:

- International Airport Road
- Raspberry Road
- Dimond Boulevard
- 100th Avenue
- C Street

Corridor Operations

This freeway segment of Minnesota Drive was divided into diverge, merge, weaving, ramp overlap, and basic segments by direction. Each segment was analyzed to determine the current LOS during the peak traffic volume period for that segment and direction, based on the 2013 AADTs on Minnesota Drive and 2015 ramp volumes provided by DOT&PF. Directional LOS of the freeway facility overall was also analyzed.

Northbound Minnesota Drive was analyzed for the morning peak period with a directional distribution of 73% and a design hourly volume of 7% of AADT. The roadway was divided into 18 segments: 3 diverge, 6 merge, 1 weaving, and 8 basic segments. Table 76 shows the 18 segments and the LOS for each. The LOS for all segments varies between LOS A and B. The freeway facility has an overall LOS of B in the northbound direction.

Segment of Minnesota Drive (Northbound Direction)	LOS
Old Seward Hwy to C St Off-Ramp	A
C St Off-Ramp Diverge	B
C St Off-Ramp to C St On-Ramp	A
C St On-Ramp Merge	B
100th Ave Off-Ramp Diverge	A
100th Ave Off-Ramp to 100th Ave On-Ramp	A
100th Ave On-Ramp Merge	B
100th Ave On-Ramp to Dimond Blvd On-Ramp	B
Dimond Blvd On-Ramp Merge	B
Dimond Blvd On-Ramp to Raspberry Rd Off-Ramp	B
Raspberry Rd Off-Ramp Diverge	B
Raspberry Rd Off-Ramp to Raspberry Rd Loop On-Ramp	B
Raspberry Rd Loop On-Ramp Merge Segment	B
Raspberry Rd On-Ramp to International Off-Ramp Weaving	B
International Airport Rd Off-Ramp to International Airport Rd Loop On-Ramp	B
International Airport Rd Loop On-Ramp Merge	B
International Airport Rd On-Ramp Merge	B
International Airport Rd On-Ramp to Tudor	A
Northbound Minnesota Drive Overall	B

Table 76 – Existing Level of Service for Northbound Segments on Minnesota Drive

Southbound Minnesota Drive was analyzed during the evening peak with a directional distribution of 67% and a design hourly volume of 11%. The roadway was divided into 23 segments: 5 diverge, 7 merge, 2 ramp overlap, 1 weaving, and 8 basic segments. Table 77 shows the LOS for each segment; the LOS varies between LOS B and C. Overall, in the southbound direction the freeway facility operates at LOS B.

LOS for both directions of the freeway were estimated in the year 2035 using generalized guidelines for freeways from the Florida QLOS tables. As shown in Table 78, two segments of northbound Minnesota Drive will operate at LOS C in the morning peak: the segment traveling through the Dimond Boulevard interchange and the segment traveling through the International Airport Road interchange. The remaining segments will operate at LOS B.

Table 79 shows the results for the southbound direction. Four segments of Minnesota Drive will operate at LOS E in 2035 in the evening peak: the three segments from Tudor Road to the Raspberry Road interchange and the segment traveling through the Dimond Boulevard Interchange. The remaining segments will operate at LOS B or C.

Segment of Minnesota Drive (Southbound Direction)	LOS
Tudor Rd to International Airport Rd Off-Ramp	B
International Airport Rd Off-Ramp Diverge	B
International Airport Rd Off-Ramp to International Airport Rd Loop On-Ramp	B
International Airport Rd Loop On-Ramp Merge	B
International Airport Rd On-Ramp Merge	C
International Airport Rd On-Ramp to Raspberry Rd Off-Ramp	C
Raspberry Rd Off-Ramp Diverge	B
Raspberry Rd Off-Ramp to Raspberry Rd Loop On-Ramp	B
Raspberry Rd Loop On-Ramp Merge	B
Raspberry Rd On-Ramp Merge	B
Raspberry Rd On-Ramp to Strawberry Rd Off-Ramp	B
Strawberry Rd Off-Ramp Diverge	B
Strawberry Rd Off-Ramp to Dimond Blvd Off-Ramp	B
Dimond Blvd Off-Ramp Diverge	B
Dimond Blvd Off-Ramp to Dimond Blvd On-Ramp	B
Dimond Blvd On-Ramp to 100th Ave Off-Ramp Weaving	B
100th Ave Off-Ramp to 100th Ave On-Ramp	B
100th Ave On-Ramp Merge	B
100th Ave On-Ramp to C St Off-Ramp	B
C St Off-Ramp Diverge	B
C St Off-Ramp to C St On-Ramp	B
C On-Ramp Merge	B
C St Frontage Road Merge	B
Southbound Minnesota Drive Overall	B

Table 77 – Existing Level of Service for Southbound Segments on Minnesota Drive

Segment of Minnesota Drive (Northbound Direction)	LOS
Old Seward Hwy to C St	B
Through C St Interchange	B
C St to 100th Ave	B
Through 100th Ave Interchange	B
100th Ave to Dimond Blvd	B
Through Dimond Blvd Interchange	C
Dimond Blvd to Raspberry Rd	B
Through Raspberry Rd Interchange	B
Raspberry Rd to International Airport Rd	B
Through International Airport Rd Interchange	C
International Airport Rd to Tudor Rd	B

Table 78 –2035 Level of Service for Northbound Minnesota Drive

Segment of Minnesota Drive (Southbound Direction)	LOS
Tudor Rd to International Airport Rd	E
Through International Airport Rd Interchange	E
International Rd to Raspberry Rd	E
Through Raspberry Rd Interchange	C
Raspberry Rd to Dimond Blvd	C
Through Dimond Blvd Interchange	E
Dimond Blvd to 100th Ave	B
Through 100th Ave Interchange	C
100th Ave to C St	C
Through C St Interchange	C
C to Old Seward	C

Table 79 –2035 Level of Service for Southbound Minnesota Drive

Corridor Safety

Run off road crashes that occurred between 2003 and 2012 were examined along the freeway segments of Minnesota Drive. Crash clusters appear to occur near on- and off-ramps and on curves. Within the run off road crash clusters, over half of the run off road crashes occur when road conditions are icy or snowy.

At the International Airport Road interchange, Minnesota Drive curves horizontally under the cross street. Figure 45 shows crashes are occurring near the beginning and end of the horizontal curve. The southern group of northbound crashes occurs after the off-ramp to International Airport Road. Vehicles in this cluster run off the road before entering the horizontal curve.

North of International Airport Road, at the north end of the horizontal curve, run off road crashes form a cluster in both directions. In addition, the northbound on-ramp enters the freeway in this segment, and the southbound off-ramp exits the freeway in this segment. Of the eight total crashes, five occurred in snowy or icy conditions.

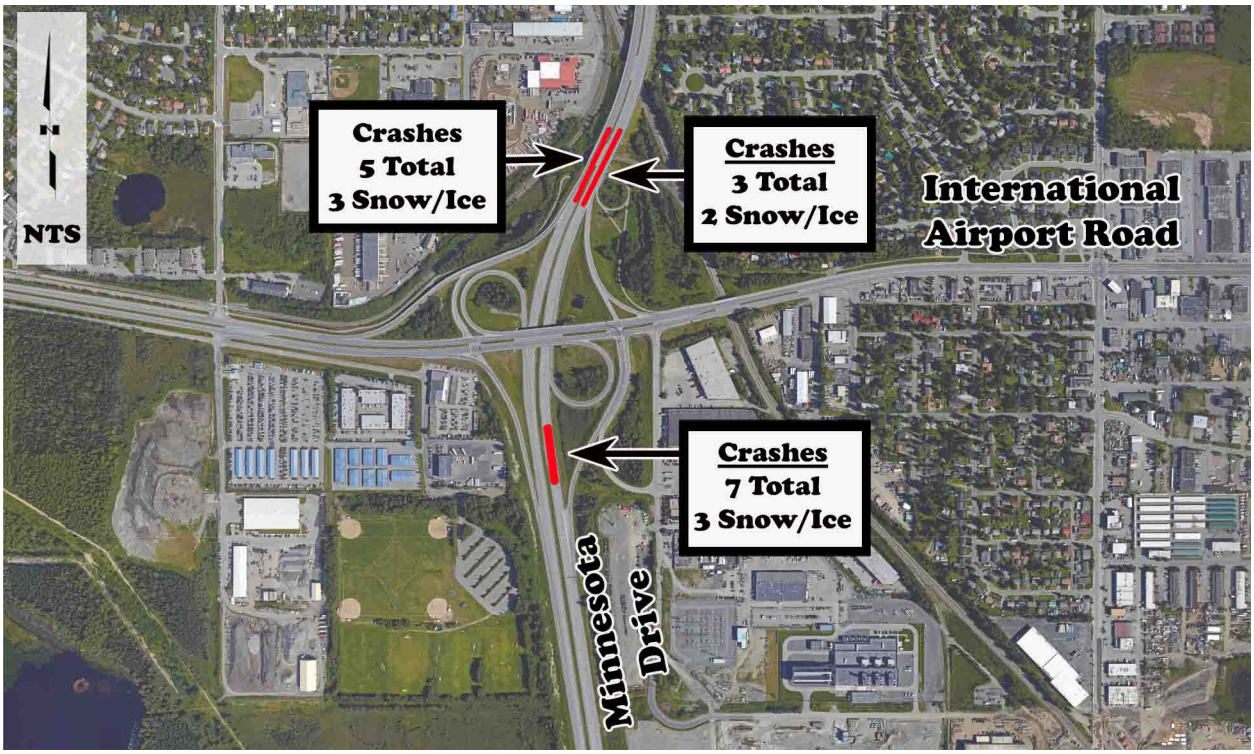


Figure 45 – Run Off Road Crash Clusters near International Airport Road

Both north- and southbound traffic on Minnesota Drive must navigate a horizontal curve before and after passing under the Raspberry Road interchange. Figure 46 shows crash clusters that occur north of the interchange in both directions: 13 southbound run off road crashes and 9 northbound run off road crashes. This segment is characterized by both a horizontal curve and the entrances or exits to on- and off-ramps in both directions. The majority of crashes are occurring under snowy and icy road conditions. Changes to the on- and off-ramps between International Airport Road and Raspberry Road that are discussed in Section K on page 121 may address this crash pattern.



Figure 46 – Run off Road Crash Clusters near the Raspberry Road Interchange

Figure 47 shows that between the Raspberry Road interchange and the Dimond Boulevard interchange, southbound Minnesota Drive run off road crashes are clustered primarily around two features: a horizontal curve north of the Strawberry Road off ramp and the southbound Dimond Boulevard off-ramp. Between 2003 and 2012, 22 run off road crashes were recorded on the curve before the Strawberry Road off ramp, and six crashes were recorded in the vicinity of the southbound Dimond Boulevard off-ramp. Half of the run off road crashes in both directions happened while road conditions were icy or snowy. Alternatives to address the crash pattern at the southbound Minnesota Drive off-ramp to Dimond Boulevard are addressed in Section M on page 139.

Under the Dimond Boulevard interchange, northbound Minnesota Drive undergoes a slight horizontal curve. In the past 10 years, 15 run off road crashes have been recorded. Many of these occurred when the road was snowy or icy. Most crashes occurred outside of the presence of any ramps.

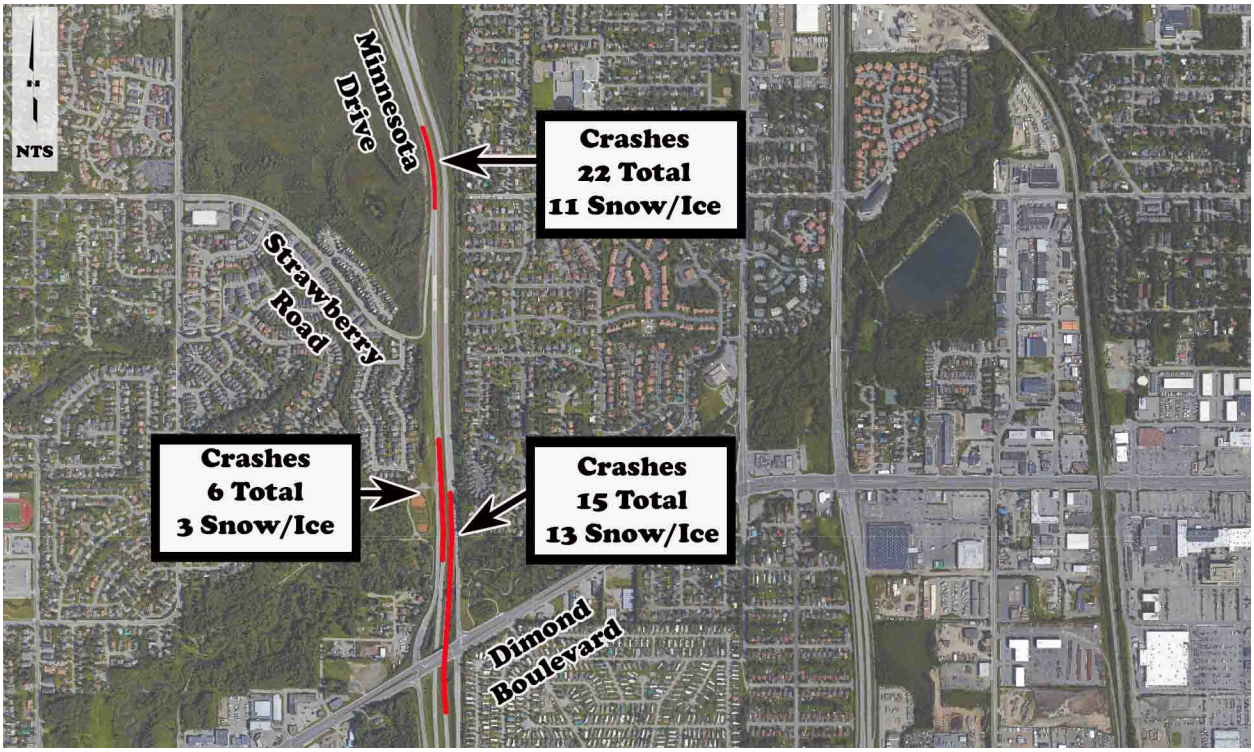


Figure 47 – Run off Road Crash Clusters between Raspberry Road Interchange and Dimond Boulevard Interchange

As shown in Figure 48, run off road crashes between 100th Avenue and C Street occur primarily on two segments: the 90-degree horizontal curve where O'Malley Road transitions into Minnesota Drive, and the Minnesota Drive overpass at 100th Avenue. At the 100th Avenue overpass, most of the crashes occurred on roadways with snow or icy conditions. Further south, there is a cluster of seven run off road crashes in the northbound direction and 2 run off road crashes in the southbound direction. The on- and off-ramps for 100th Avenue are located within the crash cluster segments. Over half of these crashes occurred in snowy and or icy conditions.

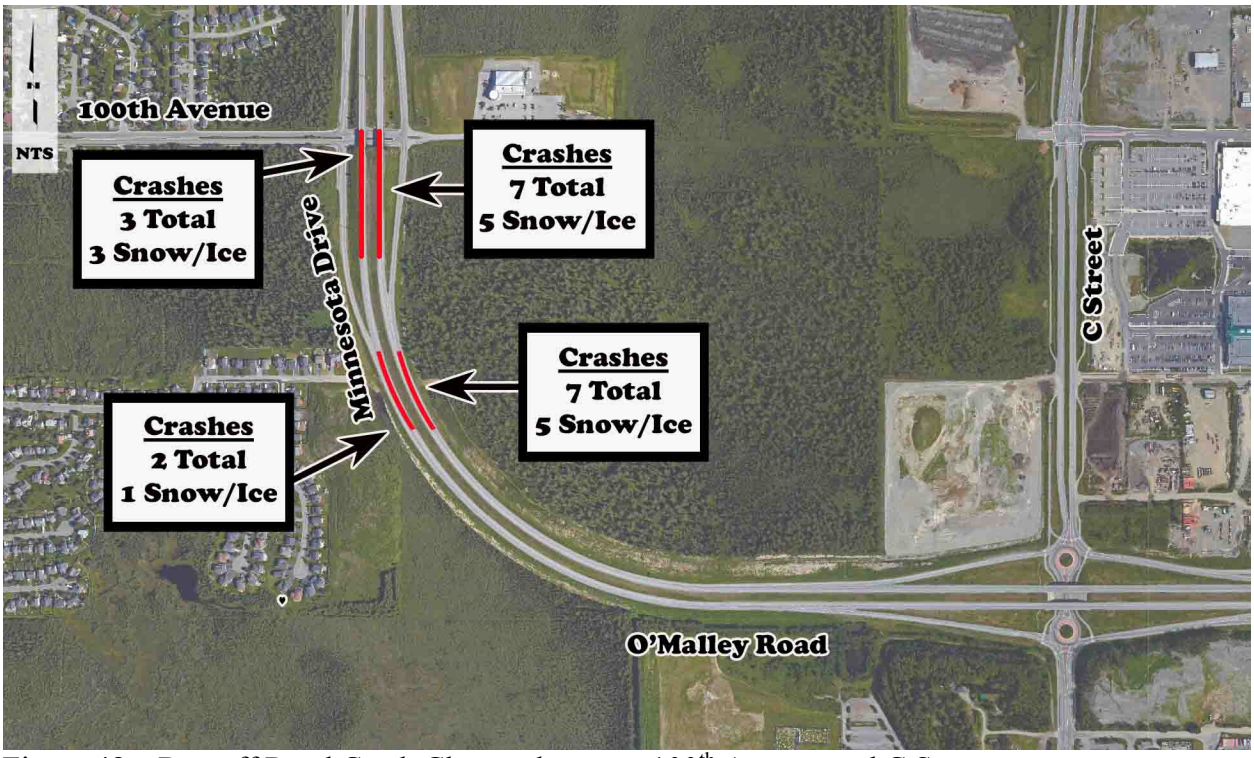


Figure 48 – Run off Road Crash Clusters between 100th Avenue and C Street

I. Segment of Minnesota Drive from Tudor Road to International Airport Road

Minnesota Drive from Tudor Road to International Airport Road is a divided freeway with 4 northbound lanes and 3 southbound lanes.

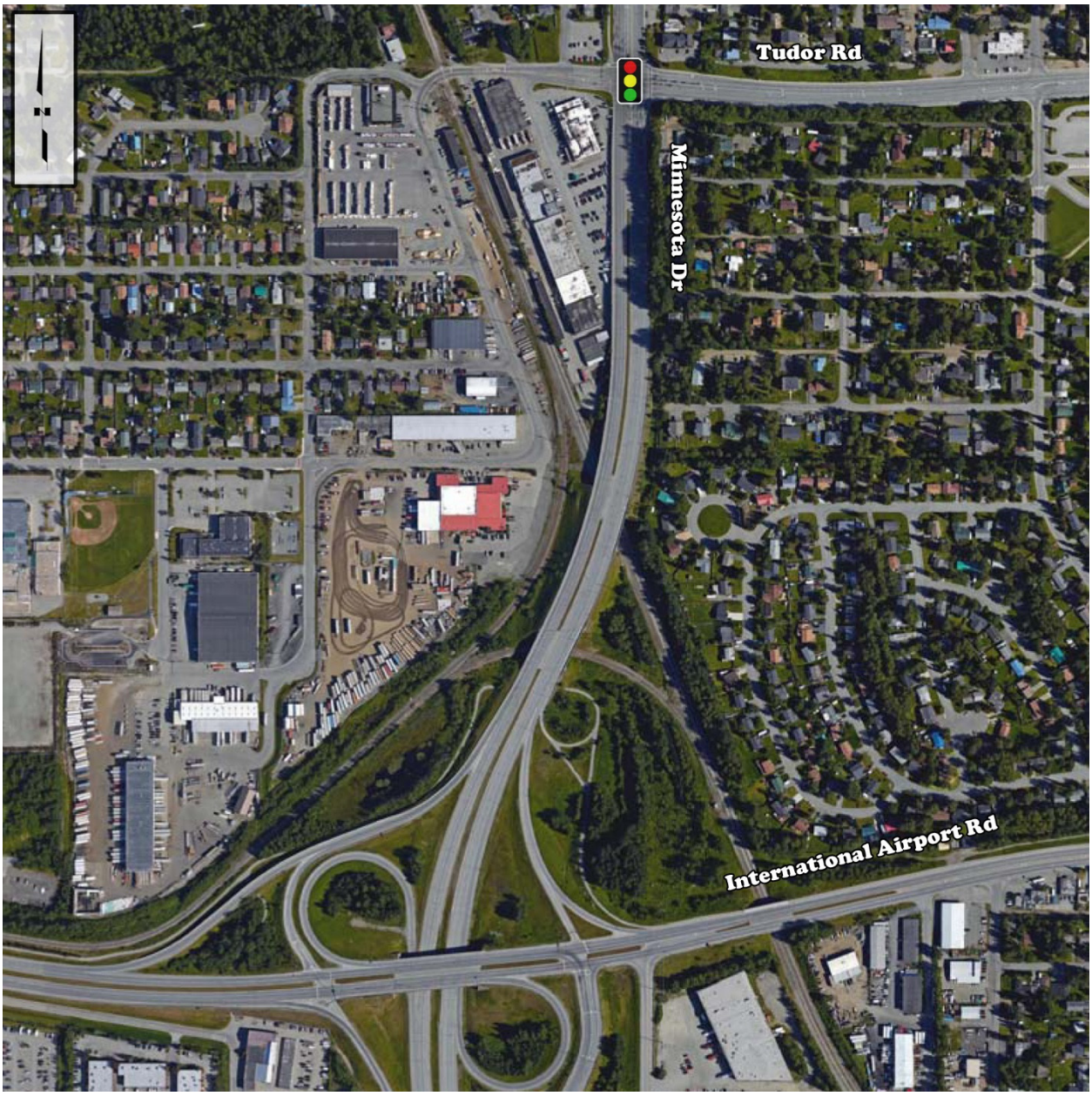


Figure 49 – Segment from Tudor Road to International Airport Road

The main concerns at this location are:

- Segment capacity

DOT&PF did not select any alternatives from this segment for further analysis.

See Appendix B for a qualitative analysis of all alternatives.

J. International Airport Road at Minnesota Drive Interchange

International Airport Road at Minnesota Drive is a partial cloverleaf interchange with signalized intersections at the ramp terminals. A circuitous pathway accommodates pedestrians and bicyclists through the interchange. Although there are no pedestrian or bicycle crashes within the interchange, there have been observations of pedestrians and bicyclists crossing at the interchange rather than using the separated path.



Figure 50 – Interchange of International Airport Road at Minnesota Drive

The main concerns at this interchange are:

- Access for pedestrians through the interchange
- Merge conflicts associated with the southbound Minnesota Drive off-ramp to westbound International Airport Road at Northwood Drive

DOT&PF recommended two alternatives for further study that have been combined into one analysis:

- J.1 – Reconfigure Interchange
- J.5 – Tighten Radii at Ramps to Better Accommodate Non-Motorized Traffic

See Appendix B for a qualitative analysis of all alternatives.

Existing and Forecasted Conditions

Operations

DOT&PF performed turning movement counts at the intersection of International Airport Road and the northbound Minnesota Drive ramps (east intersection) from August 6, 2015 through August 7, 2015 and again September 16, 2015 through September 18, 2015. Turning movement counts for the intersection with the southbound ramps (west intersection) were inferred using counts at the east intersection, volume counts for the ramps collected in June 2015, and the Bluetooth directional study. Figure 51 shows the resulting turning movements during the PM peak. Signal timing was provided by the Municipality of Anchorage.

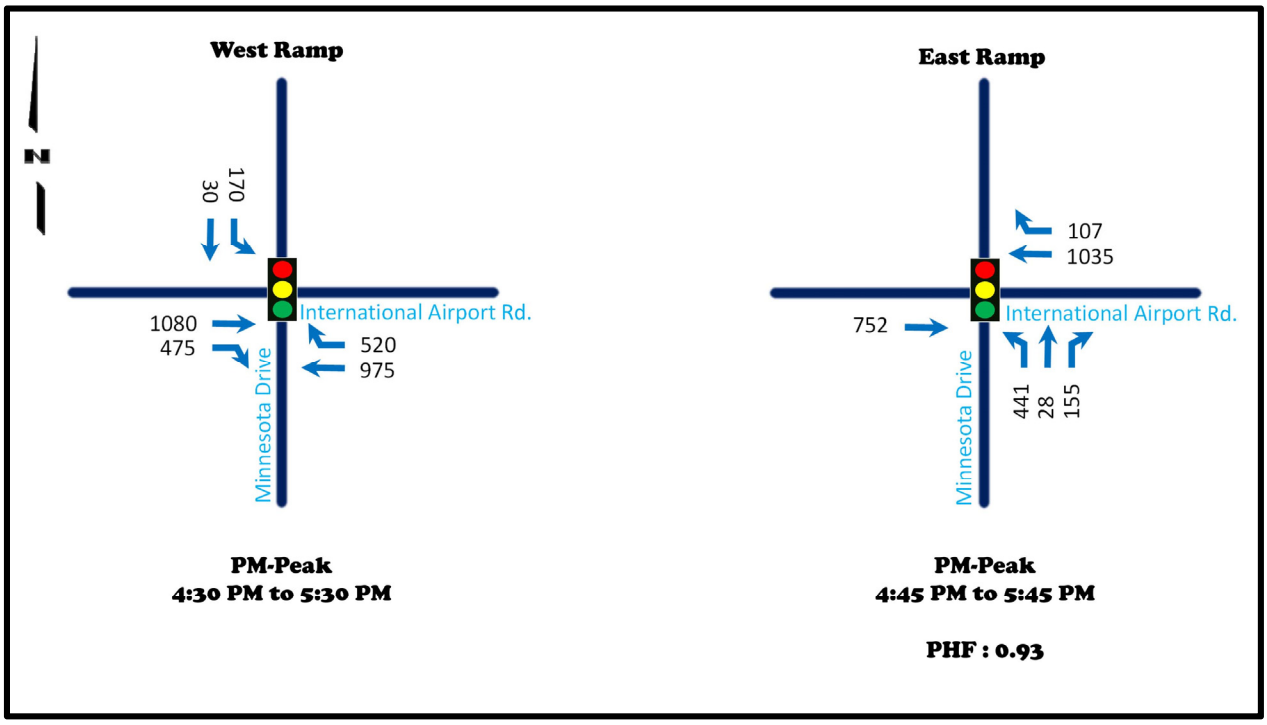


Figure 51 – Existing Volumes at International Airport Road Intersections with Minnesota Drive Ramps (PM Peak)

The level of service of an interchange is dependent upon the intersections within the interchange. For every origin-destination pair, the LOS is equivalent to the combined delay experienced by a vehicle traveling through each of the intersections needed to make that movement.

Table 80 shows the delay and LOS for all movements at each intersection individually. Table 81 gives delay and LOS for the different origin-destination combinations at the interchange on International Airport Road. The existing interchange is able to handle all traffic with LOS C or better.

West Intersection 2015-pm					East Intersection 2015-pm				
Movement	**v/c**	**Queue (ft.)**	**Control Delay (sec)**	**LOS**	**Movement**	**v/c**	**Queue (ft.)**	**Control Delay (sec)**	**LOS**
EB-T	0.40	75	5	A	EB-T	0.50	75	6	A
EB-R	0.40	25	2	A	WB-T	0.40	100	8	A
WB-T	0.50	125	5	A	NB-L	0.65	125	31	C
SB-L	0.35	50	31	C	NB-T	0.30	25	11	C
SB-T	0.50	75	35	C	NB-R	0.30	25	11	C
Overall	**0.50**	**N/A**	**7**	**A**	**Overall**	**0.55**	**N/A**	**12**	**B**

Table 80 – Movement LOS for International Airport Road Intersections at Minnesota Drive Interchange (2015)

Origin	Turn	Destination	Turn	Average Delay (sec)	LOS
MINN-NB	LT	INT'L- WB	T	35.8	C
MINN-NB	RT	INT'L-EB	-	10.7	A
MINN-SB	-	INT'L-WB	-	-	-
MINN-SB	LT	INT'L-EB	T	37.3	C
INT'L-EB	T	MINN-NB	-	5.4	A
INT'L-EB	RT	MINN-SB	-	1.7	A
INT'L-WB	-	MINN-NB	-	-	-
INT'L-WB	T	MINN-SB	-	7.7	A
INT'L-EB	T	INT'L-EB	T	11.8	A
INT'L-WB	T	INT'L-WB	T	13.0	A
MINN-NB	T	MINN-NB	-	11.3	A
MINN-SB	T	MINN-SB	-	35.1	C

Table 81 – Average Delay and LOS for Origin-Destination Combinations (2015)

Projected traffic volumes for 2035 are shown in Figure 52. Using these volumes and optimized traffic signal timings, southbound traffic turning left onto International Airport Road at the east intersection has LOS D (Table 83) all other lane groups have a LOS of C or better. Given these values, it appears that the existing ramp configuration works well for the major movements through the interchange and is expected to continue to do so in the future.

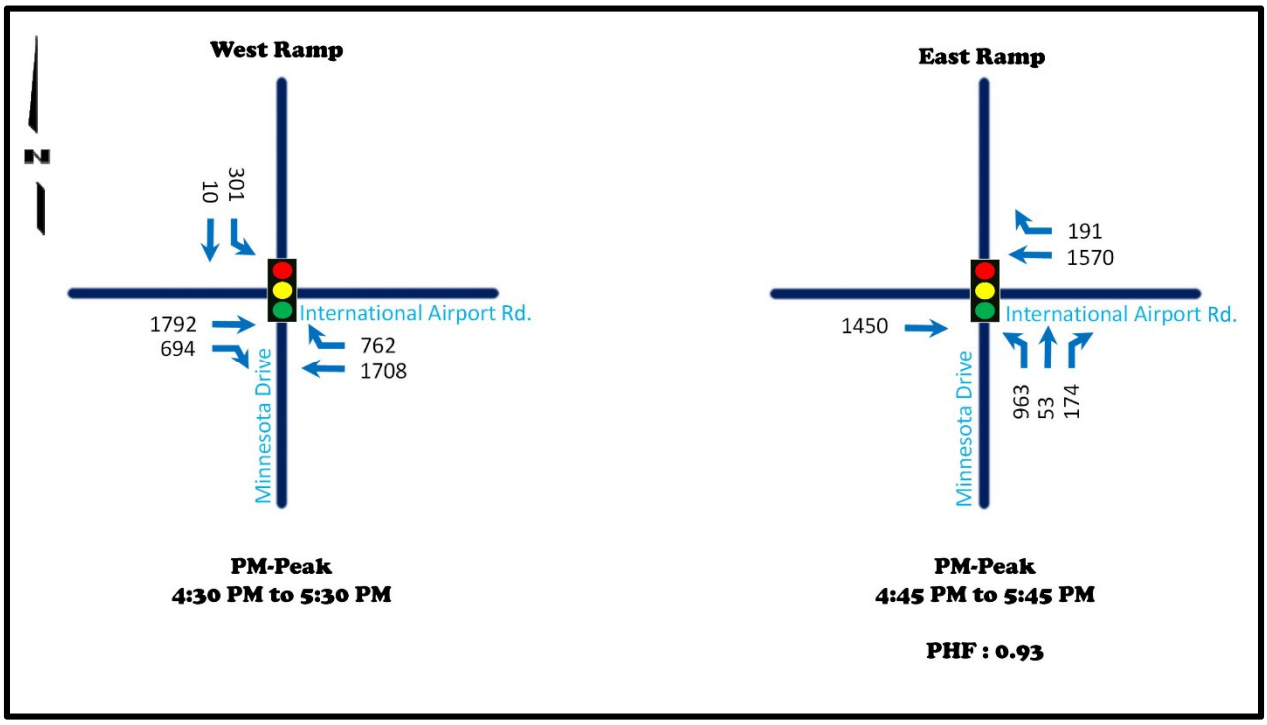


Figure 52 – Projected 2035 Volumes at International Airport Road Intersections with Minnesota Drive Ramps (PM Peak)

West Intersection 2035-pm					East Intersection 2035-pm				
Movement	**v/c**	**Queue (ft.)**	**Control Delay (sec)**	**LOS**	**Movement**	**v/c**	**Queue (ft.)**	**Control Delay (sec)**	**LOS**
EB-T	0.60	150	6	A	EB-T	0.90	400	23	C
EB-R	0.60	25	3	A	WB-T	0.70	200	14	B
WB-T	0.80	350	9	A	NB-L	0.90	300	38	D
SB-L	0.60	125	41	D	NB-T	0.25	75	16	B
SB-T	0.60	125	41	D	NB-R	0.20	50	13	B
Overall	**0.75**	**N/A**	**9**	**A**	**Overall**	**0.90**	**N/A**	**22**	**C**

Table 82 – Projected Movement LOS for International Airport Road Intersections at Minnesota Drive Interchange (2035)

Origin	Turn	Destination	Turn	Average Delay	LOS
MINN-NB	L	INT'L- WB	T	47.4	C
MINN-NB	RT	INT'L-EB	-	13.2	A
MINN-SB	-	INT'L-WB	-	-	-
MINN-SB	L	INT'L-EB	T	63.4	D
INT'L-EB	T	MINN-NB	-	6.1	A
INT'L-EB	RT	MINN-SB	-	2.6	A
INT'L-WB	-	MINN-NB	-	-	-
INT'L-WB	T	MINN-SB	-	14.4	A
INT'L-EB	T	INT'L-EB	T	28.6	B
INT'L-WB	T	INT'L-WB	T	23.4	B
MINN-NB	T	MINN-NB	-	16.3	B
MINN-SB	T	MINN-SB	-	40.5	C

Table 83 – Average Delay and LOS for Origin-Destination Combinations (2035)

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized in Table 84 and Table 85. Only one location is identified as having a crash rate that is statistically above the statewide average for similar facilities: the ramp from southbound Minnesota Drive to International Airport Road. Crash types were examined at this location and at the three locations with a higher frequency of crashes: the two signalized intersections and the segment of International Airport Road between Minnesota Drive and Northwood Street.

Crash types for each of the four locations are shown in Table 86. At the intersections, rear end and angle crashes predominate. On the segments, most of the crashes relate to running off the road. Comparing the distribution of crash types at the two signalized intersections to the distribution of all crashes by crash type in the Municipality of Anchorage from 2003 through 2013, both angle crashes and rear end crashes are over represented at the intersection of Minnesota northbound ramps with International Airport Road.

As shown in Table 87, the rear end crashes are distributed fairly evenly on all approaches, with 8 rear end crashes in the northbound direction, 6 rear end crashes in the eastbound direction, and 11 rear end crashes in the westbound direction. Rear end crashes were more likely to occur in ice and snow (56% of rear end crashes). Driver inattention and unsafe speed were the most frequently cited circumstances leading to the crashes.

Table 87 indicates that angle crashes were most likely to occur between eastbound and northbound vehicles (19 of 24 angle crashes, or almost 80%). About half of the angle crashes occurred on ice or snow. The attending police officer noted red light running as the cause of the crash for 10 of the crashes (the eastbound driver was at-fault for 9 of these crashes). Traffic control features were examined to determine if they could be contributing to the eastbound right angle crash pattern:

- Advanced detectors are placed correctly.
- Yellow change intervals appear to be set in accordance with current guidelines.
- Red clearance times also appear to be set in accordance with current guidelines.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
Northbound Minnesota Drive Ramp-International Airport Road Intersection	56	0.437	35,130	1.221	1.385	No	No
Southbound Minnesota Drive Ramp-International Airport Road Intersection	30	0.244	33,700	1.221	1.389	No	No
International Airport Road: Minnesota Drive to Northwood Street	19	0.291	33,520	1.513	1.866	No	No

Table 84 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes (Intersections and Segments)

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	Average Minnesota Ramp Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
Southbound Minnesota to International Airport Ramp	9	3.311	5,960	1.127	2.370	Yes	Yes
Northbound Minnesota to International Airport Ramp	6	0.591	7,380	1.127	1.724	No	No
Westbound International Airport to Northbound Minnesota Ramp	0	0.00	1,140	1.127	4.476	No	No
Eastbound International Airport to Northbound Minnesota Loop Ramp	6	2.175	2,750	1.127	2.360	Yes	No
Eastbound International Airport to Southbound Minnesota Ramp	4	0.745	4,500	1.127	1.974	No	No
Westbound International Airport to Southbound Minnesota Loop Ramp	3	1.179	2,550	1.127	2.418	Yes	No

Locations shown with grey shading above were not evaluated further.

Table 85 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes (Ramps)

Location	Crash Type	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
International Airport Road @ NB Ramp Signal	Head On			1	1
	Other		1		1
	Overtaking Sideswipe			4	4
	Rear End		5	20	25
	Right Angle	1	3	20	24
	U Turns			1	1
	Total	**1**	**9**	**46**	**56**
International Airport Road @ SB Ramp Signal	Left Turn			1	1
	Other			1	1
	Overtaking Sideswipe		1	1	2
	Overturn			1	1
	Rear End		3	9	12
	Right Angle	1	3	9	13
	Total	**1**	**7**	**22**	**30**
Segment of Int'l Airport Rd from Northwood Dr to Minnesota Dr	Bridge Rail		1		1
	Curb/Wall			1	1
	Guardrail End			1	1
	Light Support			1	1
	Utility Pole		1	1	2
	Overtaking Sideswipe		1	5	6
	Overturn			3	3
	Rear End			4	4
	Total		**3**	**16**	**19**
Segment of Minnesota Dr SB Ramp from Minnesota Dr to International Airport Rd	Curb/Wall			1	1
	Ditch		1		1
	Guardrail End			2	2
	Guardrail Face			1	1
	Other Fixed Object			1	1
	Overtaking Sideswipe		1	2	3
	Total		**2**	**7**	**9**

Table 86 – 2003 to 2012 Crashes by Crash Type and Severity

International Airport Road @ Northbound Ramp Signal

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction				Total
		EAST	NORTH	UNKNOWN	WEST	
No Vehicle #2	Other		1			1
EAST	Overtaking Sideswipe	1				1
	Rear End	8				8
	Right Angle		8			8
	U Turns				1	1
NORTH	Overtaking Sideswipe		1			1
	Rear End		6			6
	Right Angle	11		1	3	15
UNKNOWN	Overtaking Sideswipe		1			1
	Right Angle		1			1
WEST	Head On	1				1
	Overtaking Sideswipe				1	1
	Rear End				11	11
Total		**21**	**18**	**1**	**16**	**56**

International Airport Road @ Southbound Ramp Signal

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction			Total
		EAST	SOUTH	WEST	
No Vehicle #2	Other		1		1
	Overturn			1	1
EAST	Left Turn			1	1
	Overtaking Sideswipe	1			1
	Rear End	4			4
SOUTH	Rear End		2		2
	Right Angle	1		10	11
WEST	Overtaking Sideswipe			1	1
	Rear End			6	6
	Right Angle		2		2
Total		**6**	**5**	**19**	**30**

Segment of International Airport Road from Northwood Drive to Minnesota Drive

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction			Total
		EAST	UNKNOWN	WEST	
No Vehicle #2	Bridge Rail			1	1
	Curb/Wall			1	1
	Guardrail End	1			1
	Light Support			1	1
	Utility Pole		1	1	2
	Overturn			3	3
EAST	Overtaking Sideswipe	1			1
	Rear End	1			1
UNKNOWN	Overtaking Sideswipe		1	1	2
WEST	Overtaking Sideswipe		1	2	3
	Rear End			3	3
Total		**3**	**3**	**13**	**19**

Segment of Minnesota Southbound Ramp from Minnesota Drive to International Airport Road

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction			Total
		SOUTH	UNKNOWN	WEST	
No Vehicle #2	Curb/Wall	1			1
	Ditch			1	1
	Guardrail End	1	1		2
	Guardrail Face			1	1
	Other Fixed Object	1			1
NORTH	Overtaking Sideswipe	1			1
SOUTH	Overtaking Sideswipe	1			1
WEST	Overtaking Sideswipe			1	1
Total		**5**	**1**	**3**	**9**

Table 87 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction for Segments and Intersections Included in the International Airport Road Analysis

Planning Background

The interchange is part of the segment of Minnesota Drive from Strawberry Road to International Airport Road ranked 6th in 95th percentile highest moose crash areas from 2006 to 2010. A moose fence was built in 2014 along the Minnesota Drive corridor to mitigate these crashes.

Alt J.1/J.5 – Reconfigure Interchange and Tighten Radii at Ramps to Better Accommodate Non-Motorized Traffic

Based on the existing conditions analysis, no changes are needed to the interchange in order to accommodate the existing and projected future volumes; however, there is an existing crash pattern of run-off-road crashes and sideswipe crashes associated with the southbound Minnesota Drive off-ramp to westbound International Airport Road and with the weave condition between vehicles entering International Airport Road from Minnesota Drive and vehicles turning right at Northwood Street.

To mitigate this crash pattern, this alternative would bring the southbound right turn traffic to the traffic signal, similar to what is being constructed at the Raspberry Road intersection to the south. In addition, ramps along the north side of International Airport Road would be reconstructed to smaller radii, to improve pedestrian and bicycle accommodations through the interchange. The alternative is shown in Figure 53.

Operations

There have been recurring observations of pedestrians and bicyclists crossing at the International Airport Road-Minnesota Drive interchange rather than using the separated pathways provided. The large ramp radii allow vehicles to operate at high speeds on the on- and off-ramps. Tightening the curves by lowering the ramp radii would slow traffic and better accommodate pedestrians and bicycles at the interchange, developing a more pedestrian/bicycle-friendly interchange.

The five free-flow ramps in the interchange were analyzed using a capacity analysis method found in the 1974 Federal Highway Administration Report *Capacity Analysis Techniques for Design and Operation of Freeway Facilities*. The report was used to determine the existing ramp LOS and the new LOS if the ramps were tightened to 20 mph and 25 mph radii. Table 88 shows the LOS and v/c ratio for existing volumes as the ramp radius changes. Table 89 gives the same information for projected 2035 volumes. Based on the results of this analysis, all of the ramps will operate with LOS C or better with a 25 mph ramp radius through 2035. The only ramp with volumes high enough that a 20 mph radius will reduce the LOS to D is the southbound Minnesota Drive off-ramp to westbound International Airport Road.

Ramp	AADT	Design Volume (vph)	Existing radius		25 mph radius		20 mph radius	
			LOS	v/c	LOS	v/c	LOS	v/c
International Airport EB - Minnesota NB Loop Ramp	3192	342	A	0.21	A	0.23	A	0.29
International Airport WB - Minnesota SB Loop Ramp	1865	200	A	0.12	A	0.13	A	0.17
International WB - Minnesota NB Ramp	1083	160	A	0.10	A	0.11	A	0.13
International EB - Minnesota SB Ramp	4695	502	A	0.30	A	0.34	B	0.42
Minnesota SB - International WB Ramp	6067	661	B	0.40	B	0.45	B	0.56

Table 88 – Effect of Ramp Radius on Ramp LOS: International Airport Road (2013)

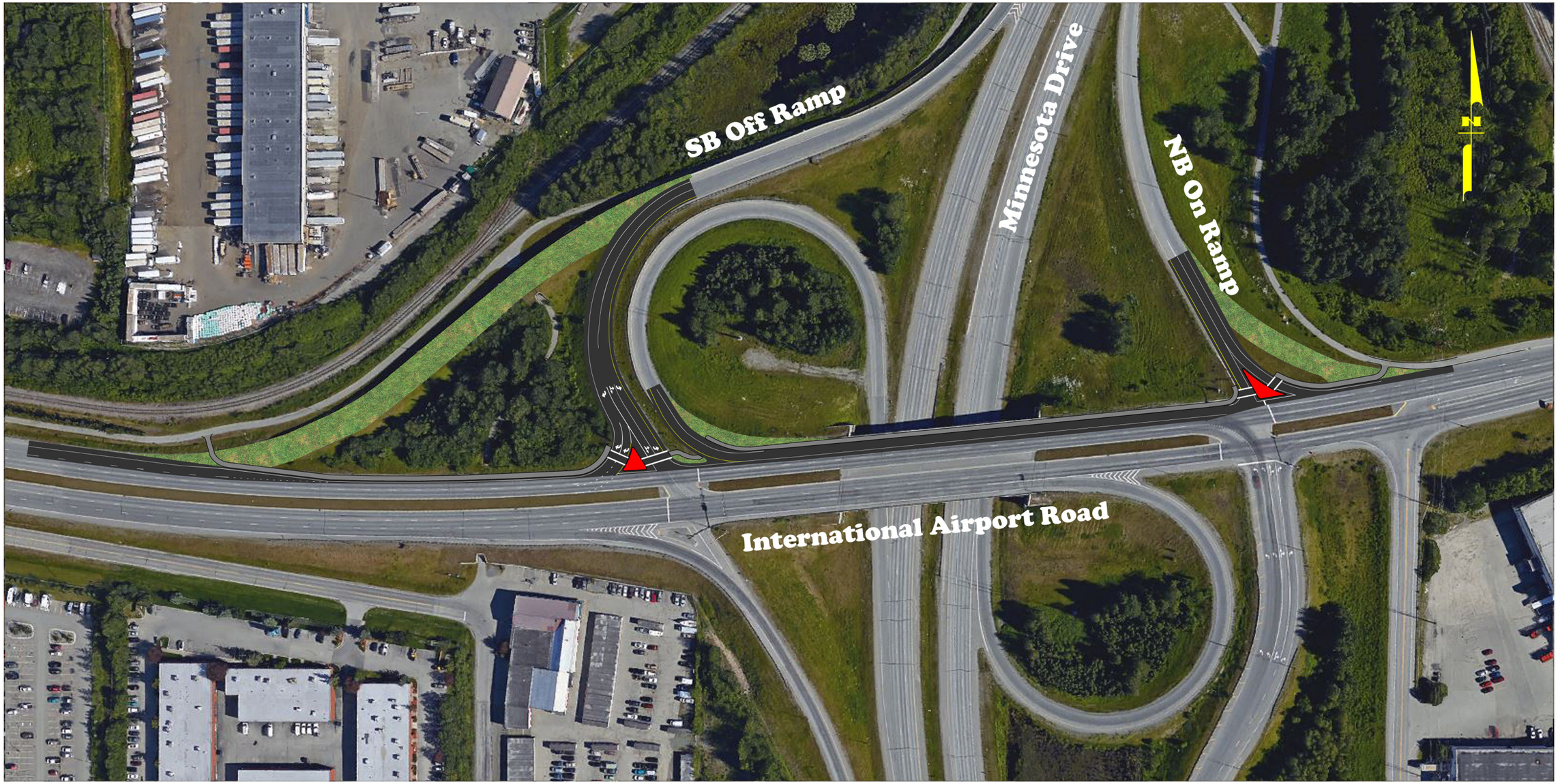


Figure 53 – J.1/J.5 Reconfigure Interchange and Tighten Radii at Ramps to Better Accommodate Non-Motorized Traffic

Ramp	AADT	Design Volume (vph)	Existing Radius		25 mph Radius		20 mph Radius	
			LOS	v/c	LOS	v/c	LOS	v/c
International Airport EB - Minnesota NB Loop Ramp	4924	527	A	0.32	A	0.35	A	0.44
International Airport WB - Minnesota SB Loop Ramp	2883	308	A	0.19	A	0.21	A	0.26
International WB - Minnesota NB Ramp	2314	248	A	0.15	A	0.17	A	0.21
International EB - Minnesota SB Ramp	7258	777	B	0.47	B	0.52	C	0.65
Minnesota SB - International WB Ramp	9379	1022	B	0.62	C	0.69	D	0.87

Table 89 – Effect of Ramp Radius on Ramp LOS: International Airport Road (2035)

If the southbound Minnesota Drive off-ramp to westbound International Airport Road is brought in to the signal, the expected volume of traffic will require double right turn lanes. Keeping the existing 80-second cycle length, the west intersection will still operate well (LOS B), as shown in Table 90.

West Intersection 2035-pm					East Intersection 2035-pm				
Movement	v/c	Queue (ft.)	Control Delay (sec)	LOS	Movement	v/c	Queue (ft.)	Control Delay (sec)	LOS
EB-T	0.65	200	10	B	EB-T	0.90	400	20	C
EB-R	0.50	25	10	A	WB-T	0.70	200	14	B
WB-T	0.90	450	17	B	NB-L	0.90	300	36	D
SB-L	0.40	75	25	C	NB-T	0.20	75	19	B
SB-T	0.40	75	25	C	NB-R	0.20	50	18	B
SB-R	0.95	150	44	D					
Overall	**0.90**	**N/A**	**17**	**B**	**Overall**	**0.90**	**N/A**	**21**	**C**

Table 90 – J.1/J.5 Movement LOS for International Airport Road Intersections at Minnesota Drive Interchange – Southbound Right Turns at Signal (2035)

Safety

Targeted Crashes

This alternative improves the interchange ramp intersections to better accommodate non-motorized transportation modes on International Airport Road and to bring the southbound right turns into the ramp traffic signal.

There is a separated pathway on the north side of International Airport Road between the Northbound Minnesota Drive off-ramp and Northwood Drive which routes non-motorized traffic in an underpass under Minnesota Drive and associated ramps. This routing is approximately 3,100 feet in length while using the shoulder of International Airport Road is approximately 1,200 feet shorter and is free of snow and ice for more of the year than the pathway. Because it is a more direct route for east-west non-motorized traffic, pedestrians and bicyclists have been

observed using International Airport Road instead of the pathway. There are currently no pedestrian or bicycle crashes in this area.

There are 8 crashes associated with the 700-foot weaving area on westbound International Airport Road between the southbound Minnesota Drive off-ramp and Northwood Drive. An additional 24 crashes have occurred at the International Airport Road/Northwood Drive intersection.

Potential Safety Benefit

Since there are no non-motorized crashes at the interchange ramp intersections, a reduction factor for these types of crashes associated with this option is not meaningful. However, there a is a potential for reducing the crashes in the westbound International Airport Road/Southbound Minnesota Drive off ramp weaving area by eliminating the weave. Although there is currently no reduction factor in the 2016 HSIP Handbook or the CMF Clearinghouse for this type of improvement, we can expect that the majority of 8 crashes involving the weave would be mitigated by this improvement.

Cost Estimates

Phase	**Alternative J.1/J.5**
Design	$471,000
Right-of-Way	$0
Utilities	$78,000
Construction	$4,696,000
Contract Administration (20% of construction costs)	$939,000
Contingency (20%)	$1,237,000
Total	**$7,421,000**

K. Segment of Minnesota Drive from International Airport Road to Raspberry Road

Minnesota Drive from International Airport Road to Raspberry Road is a 6 lane access-controlled highway with a grassy median.



Figure 54 – Minnesota Drive from International Airport Road to Raspberry Road

Main concerns with this segment include:

- Operational and safety concerns with merge at southbound on-ramp from International Airport Road to Minnesota Drive
- Operational concerns with exit at northbound off-ramp to International Airport Road from Minnesota Drive

DOT&PF recommended two alternatives for further study, one for each direction of travel:

- K.1 – Install a Fourth Lane from International Airport Road to Raspberry Road
- K.2 – Construct Dual Lane Off-Ramp for Northbound Minnesota Drive to International Airport Road

See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

Operations

In the southbound direction, Minnesota Drive is three lanes wide between International Airport Road and Raspberry Road. The on-ramp from eastbound International Airport Road to southbound Minnesota Drive is a tapered ramp, with about 150 feet of tapered acceleration lane. Similarly, the off-ramp from southbound Minnesota Drive to Raspberry Road is also a tapered ramp, with about 150 feet of tapered deceleration lane. There is concern that during periods of heavy traffic, there are insufficient gaps for vehicles entering Minnesota Drive using the on-ramp to merge with the mainline traffic. LOS for freeways is determined using the density of the portion of the freeway being studied. Density is measured in passenger cars per mile per lane (pc/mi/ln). The merge and diverge segments on the southbound Minnesota Drive segment both operate at LOS C under existing conditions. Under projected future volumes, the merge and diverge segments are forecasted to operate at LOS D.

Movement	Year	LOS	Density (pc/mi/ln)
Merge	2013	C	21.0
	2035	D	32.7
Diverge	2013	C	21.6
	2035	D	31.0

Table 91 – Density and LOS of Ramp Influence Areas

On the northbound side of Minnesota Drive, there are two northbound lanes prior to the Raspberry Road interchange. Two additional lanes are added as the lanes continue through the interchange, one from the eastbound Raspberry Road to northbound Minnesota Drive loop ramp and one from the westbound Raspberry Road to northbound Minnesota Drive on-ramp. The northbound direction continues as four lanes until the far right lane is dropped at the exit ramp to International Airport Road. There is an operational concern for traffic from further south (prior to the interchange at Raspberry Road) wanting to exit at International Airport Road. The added lanes require the vehicles to merge to the right twice.

Although ramp and mainline volumes are known for this segment, origin-destination volumes are unknown. For example, the volume of traffic entering at the Raspberry Road on-ramp and then immediately exiting at the International Airport Road off-ramp is unknown. As a result, a sensitivity analysis was done to consider the effect of different assumptions of ramp-to-ramp volumes on the freeway density in the weave influence area. Table 92 shows that the weaving segment between the on-ramp from Raspberry Road to the off-ramp at International Airport Road currently operates at LOS B and is forecasted to have LOS C in 2035.

Year	Percent of On-Ramp Traffic Exiting at Off-Ramp	LOS	Density (pc/mi/ln)
2015	0%	B	12.4
	20%	B	12.3
	40%	B	12.2
2035	0%	C	22.0
	20%	C	21.7
	40%	C	21.6

Table 92 – Density of Weave Influence Area

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized below.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average?	Above Critical?
Minnesota Drive: International Airport Road I/C to Raspberry Road I/C	150	0.970	48,700	1.012	1.148	no	no

Table 93 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Crash Type	Fatality	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Head-On Sideswipe				2	2
Animal				1	1
Bridge/Overpass			1		1
Cross Median / Centerline			1	1	2
Ditch	1		2	1	4
Embankment		1		1	2
Guardrail End			1	1	2
Guardrail Face		1		4	5
Light Support				1	1
Moose		1	1	15	17
Ran Off Road		1	1	2	4
Sign		1	1	2	4
Snoberm			3	2	5
Unknown		1		1	2
Utility Pole			1	1	2
Veh in Transit				1	1
Overtaking Sideswipe			5	35	40
Overturn	1	2	9	7	19
Parked		1	1	2	4
Rear End			14	18	32
Total	**2**	**9**	**41**	**98**	**150**

Table 94 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction			Total
		NORTH	SOUTH	UNKNOWN	
No Vehicle #2	Animal	1			1
	Bridge/Overpass	1			1
	Cross Median/Centerline		2		2
	Ditch	2	1	1	4
	Embankment	1		1	2
	Guardrail End		1	1	2
	Guardrail Face	3	1	1	5
	Light Support		1		1
	Moose	7	8	1	16
	Ran Off Road	2	2		4
	Sign	1	3		4
	Snoberm	1	4		5
	Unknown	1	1		2
	Utility Pole	1	1		2
	Veh in Transit		1		1
	Overturn	8	11		19
NORTH	Head-On Sideswipe		2		2
	Moose			1	1
	Overtaking Sideswipe	11	1	1	13
	Parked	1			1
	Rear End	10			10
SOUTH	Overtaking Sideswipe		26		26
	Rear End		20	1	21
UNKNOWN	Overtaking Sideswipe	1			1
	Parked		3		3
	Rear End			1	1
Total		**52**	**89**	**9**	**150**

Table 95 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction

The crash rate for this segment is below average crash rates for similar locations. There were 2 fatal crashes and 9 major injury crashes from 2003 to 2012. One fatal crash occurred in the evening on Friday, February 7, 2003 when a southbound vehicle overturned in the ditch. One occupant was killed and the other occupant received major injuries. The second fatal crash occurred in the evening on Friday, April 30, 2004 when a northbound vehicle ran off the road and into a ditch. Two occupants died and two received minor injuries. The major injury crashes all also involved vehicles running off of the road.

Planning Background

The segment is part of the Minnesota Drive from Strawberry Road to International Airport Road segment ranked 6th in 95th percentile highest moose crash areas from 2006 to 2010. A 2014 project installed moose fence along Minnesota Drive to address this concern.

Alt K.1 – Install Southbound Weaving Lane from International Airport Road to Raspberry Road

A fourth southbound lane that enters as the southbound on-ramp from International Airport Road and continues to the southbound off-ramp to Raspberry Road could address the operational concerns caused by the merge at the on-ramp. This would combine the merge-diverge segments into a single weave segment. Figure 55 presents this alternative.

Operations

Weaving movements were analyzed on the segment using the worst conditions. The worst case would be for all ramp traffic to either be ramp-to-freeway or freeway-to-ramp movements with no ramp-to-ramp movements, resulting in all ramp traffic needing to weave with the mainline traffic. The analysis yielded the weaving segment to operate at LOS C.

Although ramp and mainline volumes are known for this segment, origin-destination volumes are unknown. For example, the volume of traffic entering at the International Airport Road on-ramp and then immediately exiting at the Raspberry Road off-ramp is unknown. A sensitivity analysis was performed to see how the assumption of different ramp-to-ramp volumes changed the resulting freeway density. Three situations were analyzed: with all entering volume exiting at the off-ramp, half the entering volume exiting at the off-ramp, and none of the entering volume existing at the off-ramp.

Table 96 shows the LOS and density of the weave segment under the different scenarios. Under this alternative, operations would improve from LOS C to B immediately and from LOS D to C under projected future volumes.

Year	Percent of On-Ramp Traffic Exiting at Off-Ramp	LOS	Density (pc/mi/ln)
2015	0%	B	13.3
	34%	B	13.0
	70%	B	12.5
2035	0%	C	24.1
	34%	C	23.0
	70%	C	21.7

Table 96 – Density of Weave Influence Area

Safety

Targeted Crashes

This alternative would target southbound multiple vehicle same direction crashes in the weaving area between the southbound on-ramp from International Airport Road to the southbound off-ramp to Raspberry Road. Forty-six crashes recorded on this segment were southbound versus southbound involving multiple vehicles. They were either rear end or overtaking sideswipe crashes.

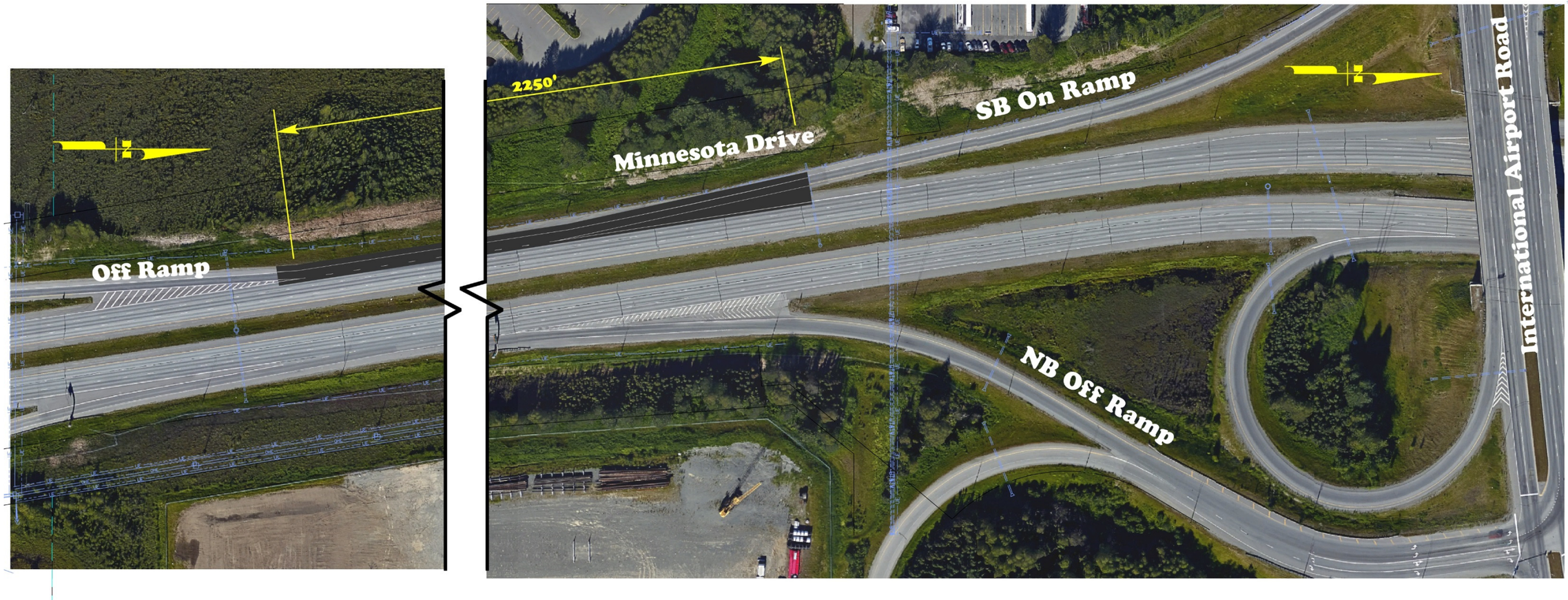


Figure 55 – K.1 Install Southbound Weaving Lane from International Airport Road to Raspberry Road

Potential Safety Benefit

The 2016 HSIP Handbook does not contain a reduction factor for an added auxiliary lane. However, the NCHRP 687 states that a reduction factor of 20% is expected for single vehicle crashes and multiple vehicle crashes when adding a continuous auxiliary lane for weaving between entrance and exit ramps. The 20% CRF applied to the 75 crashes; 46 southbound multiple vehicle crashes and 29 southbound single vehicle crashes (removing moose-vehicle collisions); would have eliminated 15 crashes during the 10-year study period.

Alt K.2 – Construct Dual Lane Off-Ramp for Northbound Minnesota Drive to International Airport Road

The double merge movements made by the traffic desiring to exit at International Airport Road could be addressed by adding another lane to the International Airport Road off-ramp. The additional lane would be added as on option lane – giving drivers the option to either continue north on Minnesota Drive or exit at International Airport Road. Under this arrangement, traffic approaching from south of Raspberry Road would only need to change lanes once to exit at International Airport Road. Constructing a parallel northbound frontage road from Raspberry Road to International Airport Road would also decrease the volume of traffic entering the highway and increase the available gaps for vehicles wanting to merge to the far right lane. This alternative is shown in Figure 56.

Operations

As shown in Table 97, the weaving influence area was evaluated under the same range of volumes that were considered for the existing traffic. The alternative marginally decreases density in the weave influence area.

Year	Percent of On-Ramp Traffic Exiting at Off-Ramp	LOS	Density (pc/mi/ln)
2015	0%	B	11.6
	20%	B	11.5
	40%	B	11.3
2035	0%	B	19.8
	20%	B	19.6
	40%	B	19.4

Table 97 – Density of Weave Influence Area

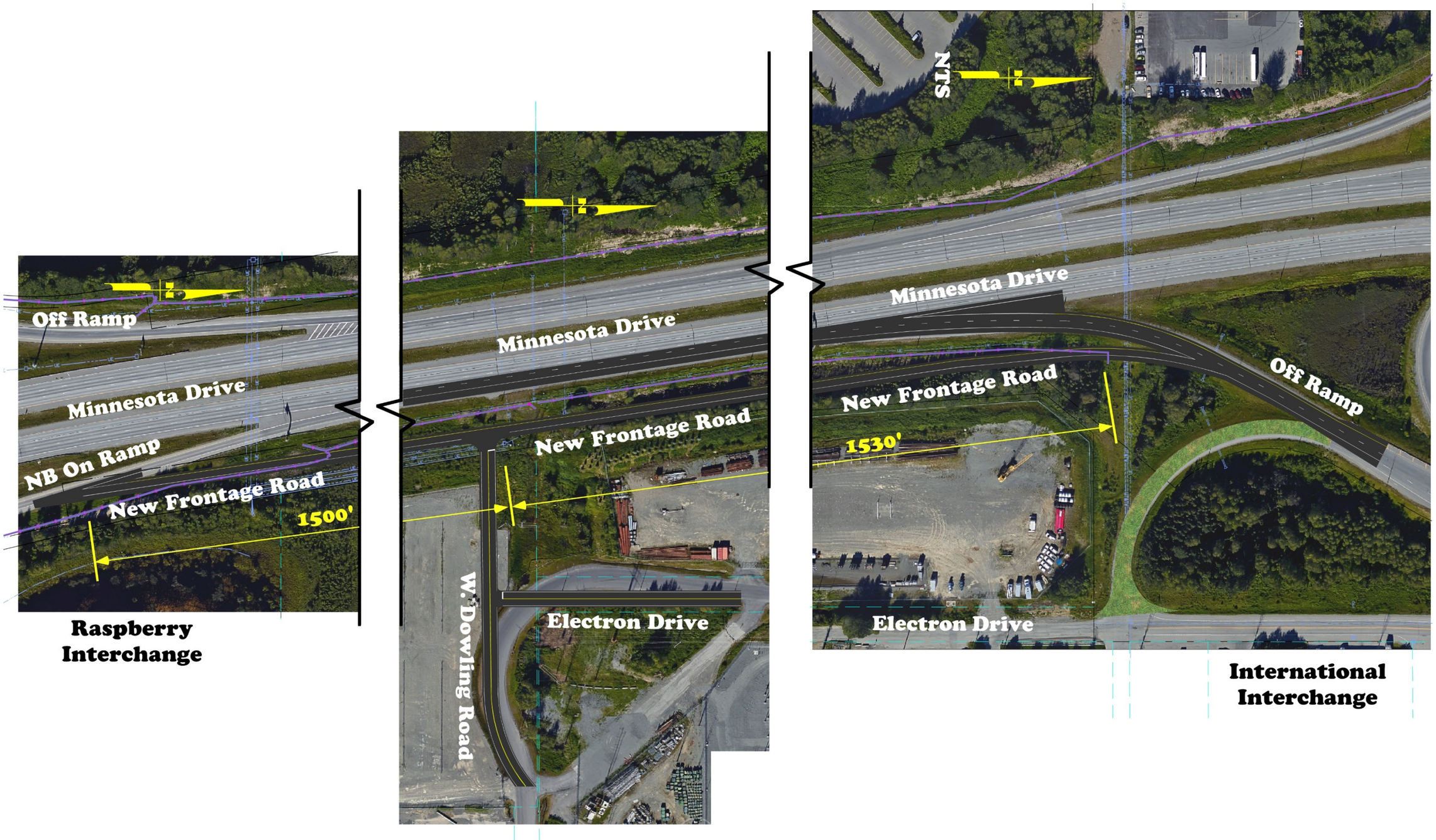


Figure 56 – K.2 Install Dual Lane Off-Ramp for Northbound Minnesota Drive to International Airport Road

Safety

Targeted Crashes

This alternative would target northbound multiple vehicle same direction crashes in the weaving area between the northbound on-ramp from Raspberry Road to the northbound off-ramp to International Airport Road. Twenty-one crashes recorded on this segment were northbound versus northbound involving multiple vehicles.

This alternative may also provide some crash mitigation for northbound single vehicle run off the road type crashes for vehicles changing lanes in the weaving area. Twenty-nine northbound single vehicle crashes occurred in this area, 7 of which were moose/vehicle crashes that should be mitigated with the recent moose fence project.

Potential Safety Benefit

The 2016 HSIP Handbook does not contain a reduction factor for an added auxiliary lane. However, NCHRP 687 lists a reduction factor of 20% for vehicle crashes after adding a continuous auxiliary lane for weaving between entrance and exit ramps. Applying a 20% CRF to the 21 northbound multiple vehicle crashes and 22 non-moose/vehicle crashes would have produced a reduction of 9 crashes during the 10-year study period.

Cost Estimates

Phase	**Alternative K.1**	**Alternative K.2**
Design	$419,000	$523,000
Right-of-Way	$0	$785,000
Utilities	$78,000	$759,000
Construction	$2,540,000	$4,726,000
Contract Administration (20% of construction costs)	$508,000	$945,000
Contingency (20%)	$708,000	$1,548,000
Total	**$4,253,000**	**$9,286,000**

L. Raspberry Road at Minnesota Drive Interchange

Raspberry Road at Minnesota Drive is a partial cloverleaf interchange. The southbound and northbound off-ramps are currently being reconstructed as part of the Dowling Road Phase II project. After construction is complete, there will be signals at both off-ramps. The design will include accommodations for pedestrians and bicyclists through the interchange in addition to the existing out-of-direction pathway that tunnels under Minnesota Drive to the south of the interchange.

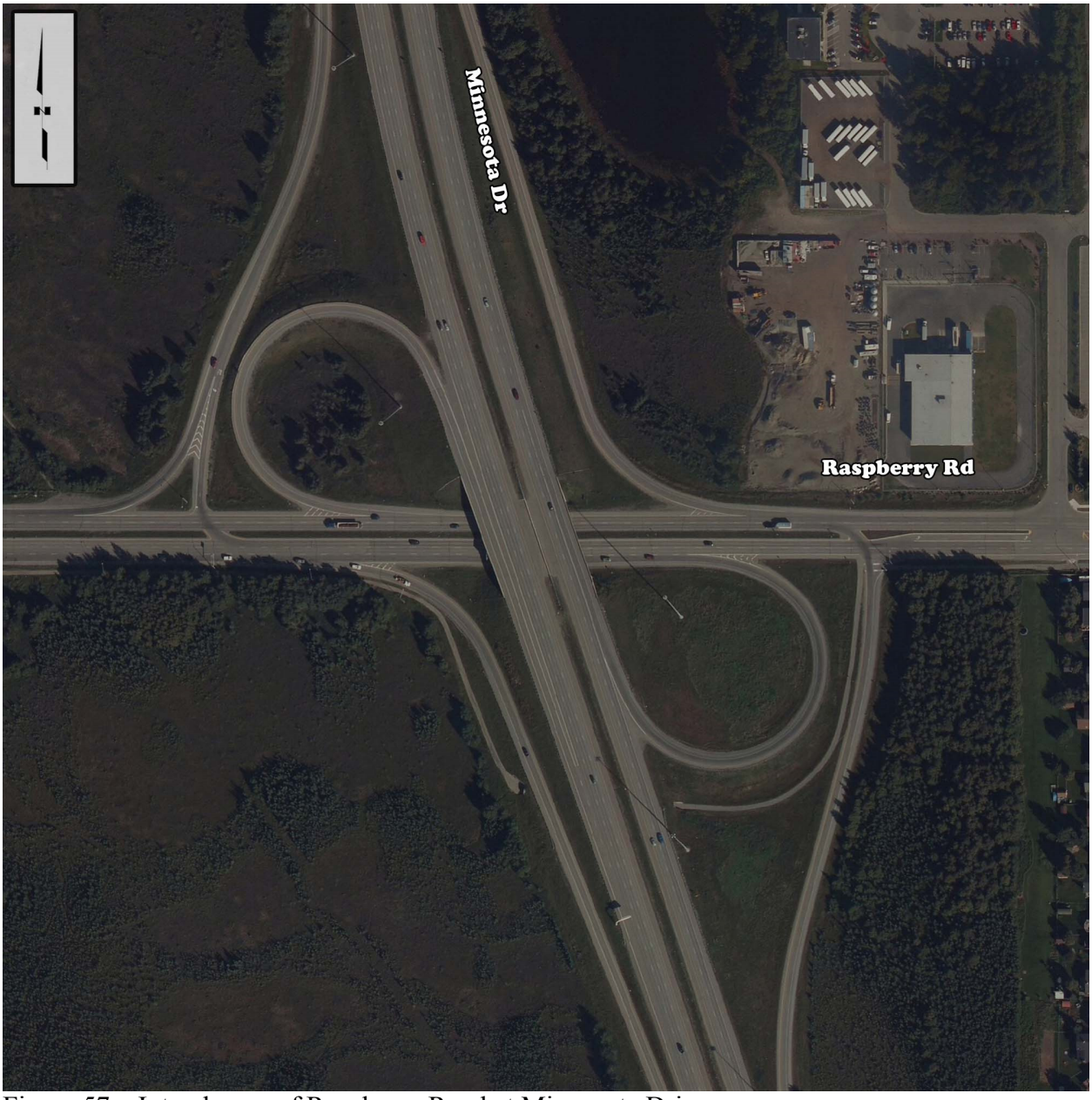


Figure 57 – Interchange of Raspberry Road at Minnesota Drive

The main concern at this interchange is:

- Large radii encourage high speeds for vehicles entering the on-ramps, which are inconsistent with pedestrian and bicycle pathways through the interchange.

DOT&PF selected one alternative for further study:

- L.1 – Tighten Radii at Ramps to Better Accommodate Non-Motorized Traffic

See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

Operations

Operations were not evaluated at this interchange, as conditions have been carefully studied as part of the Dowling Road Phase II project and there will be significant changes to operations as part of that project currently in construction.

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized in the following tables.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
Northbound Minnesota Drive Ramp-Raspberry Road Intersection	18	0.273	18,050	0.336	0.461	No	No
Southbound Minnesota Drive Ramp-Raspberry Road Intersection	15	0.183	22,480	0.336	0.447	No	No

Table 98 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes (Intersections)

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	Average Minnesota Ramp Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
Northbound Minnesota to Raspberry Ramp	2	0.689	3,310	1.127	2.325	No	No
Raspberry to Northbound Minnesota Ramp	1	1.084	2,900	1.127	3.487	No	No
Eastbound Raspberry to Northbound Minnesota Loop Ramp	3	0.522	8,750	1.127	1.943	No	No
Southbound Minnesota to Raspberry Ramp	4	0.524	7,740	1.127	1.825	No	No
Raspberry to Southbound Minnesota Ramp	4	0.998	4,010	1.127	2.124	No	No
Westbound Raspberry to Southbound Minnesota Loop Ramp	2	5.270	470	1.127	5.279	Yes	No

Locations shown with grey shading above were not evaluated further.

Table 99 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes (Ramps)

LOCATION	Crash Type	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Intersection Raspberry Rd & Minnesota Northbound Ramp	Other			1	1
	Overtaking Sideswipe		1	2	3
	Rear End		1	7	8
	Right Angle		4	2	6
	Total		**6**	**12**	**18**
Intersection Raspberry Rd & Minnesota Southbound Ramp	Ditch		2		2
	Other Fixed Object		1		1
	Ran Off Road			1	1
	Overtaking Sideswipe		1	3	4
	Rear End	1	1	3	5
	Right Angle		1	1	2
	Total	**1**	**6**	**8**	**15**

Table 100 – 2003 to 2012 Crashes by Crash Type and Severity

Intersection Raspberry Rd & Minnesota NB Ramp

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction			Total
		EAST	NORTH	WEST	
No Vehicle #2	Other		1		1
	EAST	3	5		8
	Rear End	3			3
	Right Angle		5		5
NORTH	Overtaking Sideswipe		1		1
	Rear End		3		3
	Right Angle	1			1
UNKNOWN	Rear End	1			1
WEST	Overtaking Sideswipe			2	2
	Rear End			1	1
Total		**5**	**10**	**3**	**18**

Table 101 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction

Intersection Raspberry Rd & Minnesota SB Ramp

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Ditch			2			2
	Other Fixed Object			1			1
	Ran Off Road			1			1
EAST	Overtaking Sideswipe	1					1
	Rear End	1					1
NORTH	Overtaking Sideswipe		1				1
SOUTH	Rear End			3			3
	Right Angle				1		1
UNKNOWN	Overtaking Sideswipe				1		1
	Rear End				1		1
WEST	Overtaking Sideswipe					1	1
	Right Angle			1			1
Total		**2**	**1**	**8**	**3**	**1**	**15**

Table 102 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction

The crash rate for the intersections and ramp segments at this intersection are statistically similar to average crash rates for similar locations. There were no fatal crashes and only 1 major injury crash from 2003 to 2012.

Planning Background

Project 564 is a short-term project in the MTP to add bicycle lanes to Raspberry Road from Minnesota Drive to Kincaid Park. The Anchorage Bicycle Plan recommends a project to add signage, striping, and markings to these bicycle lanes. The West Anchorage District Plan has a bicycle commuting improvement plan than would add bicycle lanes along the entire length of Raspberry Road. Some of these improvements are being made as part of the West Dowling Phase II and Raspberry Road projects in 2015 and 2016.

The segment is part of the segment of Minnesota Drive from Strawberry Road to International Airport Road ranked 6th in 95th percentile highest moose crash areas from 2006 to 2010. A recent project has added moose fence along Minnesota Drive to address this concern.

Alt L.1 – Tighten Radii at Ramps to Better Accommodate Non-Motorized Traffic

This alternative would tighten the radii at the ramp terminals along the south side of Minnesota Drive to develop a more pedestrian/bicycle-friendly interchange, as shown in Figure 58.

Operations

The large ramp radii on the Raspberry-Minnesota Interchange encourage high speeds for vehicles entering and exiting the ramps. The high speeds are inconsistent with the pedestrian and bicycle pathways through the interchange. Tightening the ramp radii would slow vehicles down and develop a more pedestrian/bicycle-friendly interchange.

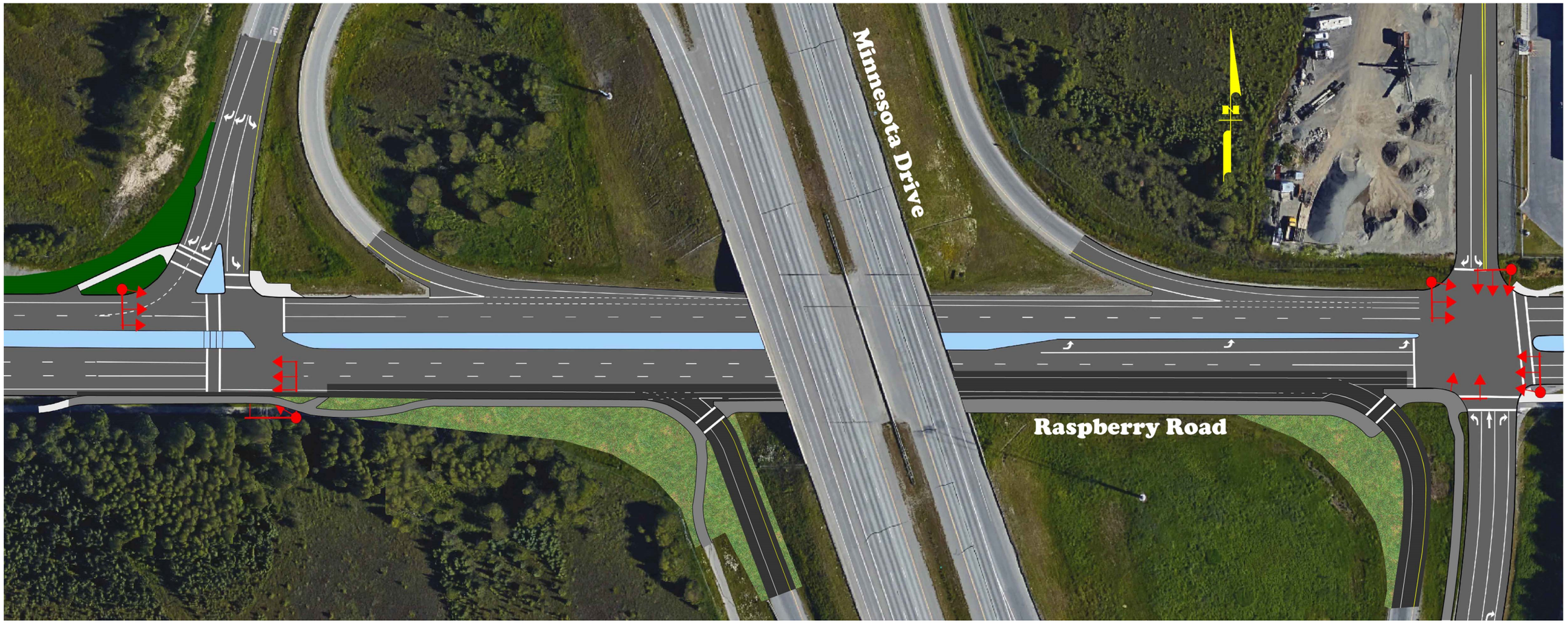


Figure 58 – L.1 Tighten Radii at Ramps to Better Accommodate Non-Motorized Traffic

The free flow ramps were analyzed to see the effects on LOS if the ramp radii were tightened from their existing radius to a 20 mph and a 25 mph ramp radius, using the capacity guide table in the *Capacity Analysis Techniques for Design and Operation of Freeway Facilities*. Table 103 shows the LOS and v/c ratio of the existing, 20 mph radius, and 25 mph radius ramps in 2013. Table 104 shows the values for 2035. Based on this analysis, only the loop on-ramp from eastbound Raspberry Road to northbound Minnesota Drive has enough volume to drop to LOS E in 2035 with the tightest curve (20 mph). With all other curve radius and volume combinations, the ramps are expected to operate at LOS C or better. In general, LOS C is preferred; however, it could be acceptable to design for LOS D or E if needed to balance the needs of all users.

Ramp	**AADT**	**Design Volume (vph)**	**Existing radius**		**25 mph radius**		**20 mph radius**	
			LOS	**v/c**	**LOS**	**v/c**	**LOS**	**v/c**
Raspberry EB – Minnesota NB Loop Ramp	8106	867	B	0.52	B	0.58	C	0.73
Raspberry WB – Minnesota SB Loop Ramp	597	64	A	0.04	A	0.04	A	0.05
Raspberry WB – Minnesota NB Ramp	1071	115	A	0.07	A	0.08	A	0.10
Raspberry EB – Minnesota SB Ramp	2994	320	A	0.19	A	0.22	A	0.27

Table 103 – Effect of Ramp Radius on Ramp LOS: Raspberry Road (2013)

Ramp	**AADT**	**Design Volume (vph)**	**Existing radius**		**25 mph radius**		**20 mph radius**	
			LOS	**v/c**	**LOS**	**v/c**	**LOS**	**v/c**
Raspberry EB – Minnesota NB Loop Ramp	10538	1128	B	0.68	C	0.76	E	0.95
Raspberry WB – Minnesota SB Loop Ramp	776	83	A	0.05	A	0.06	A	0.07
Raspberry WB – Minnesota NB Ramp	1392	149	A	0.09	A	0.10	A	0.13
Raspberry EB – Minnesota SB Ramp	3892	416	A	0.25	A	0.28	A	0.35

Table 104 – Effect of Ramp Radius on Ramp LOS: Raspberry Road (2035)

Safety

Targeted Crashes

This alternative improves the interchange ramp intersections to better accommodate non-motorized transportation modes on Raspberry Road.

There is a separated pathway on the south side of Raspberry Road which routes non-motorized traffic in a tube under Minnesota Drive and associated ramps. This routing is approximately 1,750 feet in length while using the north side of Raspberry Road and accounting for crossing at the new traffic signals is approximately 600 feet shorter. Because it is a more direct route for east-west non-motorized traffic, the occasional pedestrian or bicycle uses the shoulder of Raspberry Road instead of the pathway. There are currently no pedestrian or bicycle crashes in this area.

Potential Safety Benefit

Since there are no non-motorized crashes at the interchange ramp intersections, a reduction factor for these types of crashes associated with this option is not meaningful.

Traffic signals are currently either already installed or will be by the end of 2015 at both Raspberry Road Interchange ramp intersections. As part of these improvements, a bicycle lane is being installed on the north side of Raspberry Road. This work does not include significant redesign of interchange ramps to better accommodate non-motorized users.

Cost Estimates

Phase	**Alternative L.1**
Design	$262,000
Right-of-Way	$0
Utilities	$78,000
Construction	$1,012,000
Contract Administration (20% of construction costs)	$202,000
Contingency (20%)	$311,000
Total	**$1,865,000**

M. Segment of Minnesota Drive from Raspberry Road to Dimond Boulevard

Minnesota Drive from Raspberry Road to Dimond Boulevard is a divided highway with 2 northbound lanes and 3 southbound lanes. An exit ramp on the segment serves as an access point to Strawberry Road on the west side of Minnesota Drive. The third southbound lane exits at Dimond Boulevard.

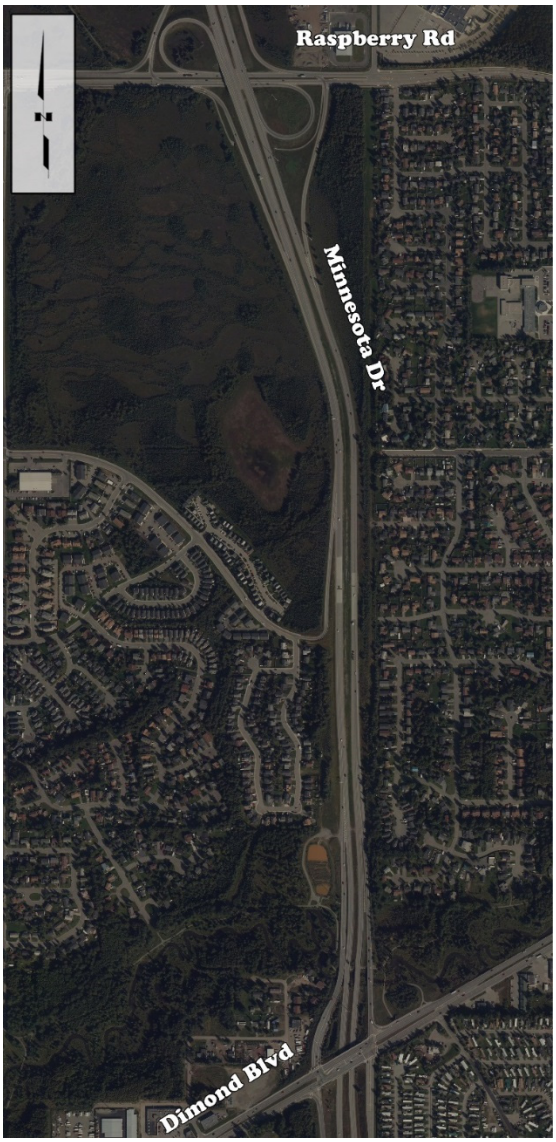


Figure 59 – Minnesota Drive from Raspberry Road to Dimond Boulevard

Main concerns for this segment include:

- A crash cluster of vehicles hitting the crash attenuator in the gore area at the southbound off-ramp
- Ran-off-road, rear end, and sideswipe crashes associated with the merge condition on the northbound on-ramp from Dimond Boulevard

DOT&PF selected two alternatives for further study in regards to the southbound direction:

- Alt M.1 – Extend Dimond Southbound Off-ramp to the North
- Alt M.2 – Diagrammatic Signs for Southbound Minnesota Drive Off-Ramp to Dimond Boulevard

DOT&PF selected one alternative for further study in regards to the northbound direction:

- Alt M.4 – Construct Dual-Lane On-Ramp to Northbound Minnesota Drive

See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

The southbound exit lane for Dimond Boulevard is a single drop lane exit. At the exit, southbound Minnesota is reduced to two lanes. It is located near a slight horizontal curve and a slight vertical curve. Because of roadside grades at the off-ramp, there is guardrail in the gore area and a crash attenuator is used as an end treatment.

The on-ramp for northbound Minnesota Drive from Dimond Boulevard initiates as two lanes. Eastbound traffic from Dimond Boulevard may turn left onto the on-ramp from signal controlled lanes. Westbound traffic from Dimond Boulevard turns right onto the ramp from a channelized yield controlled right turn lane. The two lanes merge together on the ramp and then a single lane merges with northbound Minnesota Drive. Where the on-ramp merges, Minnesota Drive is two lanes in both directions divided by a depressed median.

Operations

Southbound

Three overhead guide signs alert drivers to the upcoming exit. Because of the close proximity to the Strawberry Road exit, two of these signs are also alerting drivers to the location of the Strawberry Road exit.

The first Advanced Guide Sign shows is placed just downstream of the bridge over Raspberry Road. The sign is green with a white legend. The top half tells drivers that Strawberry Road is the next right, while the bottom half indicates that Dimond Boulevard is ¾ mile from the sign.

The second sign is placed 500 feet upstream of the theoretical gore for the Strawberry Road exit. It serves as an Exit Direction sign for Strawberry Road and a second Advanced Guide Sign for Dimond Boulevard. The sign is green with white legend. The top half of the sign indicates the Strawberry Road exit, with an arrow pointing up and to the right in the direction of the off ramp. The bottom half indicates that the Dimond Boulevard exit is in 1/2 mile.

At the theoretical gore for the Dimond Boulevard exit, there is an overhead Exit Direction sign. The top portion of the sign is green with a white legend, while the bottom portion is yellow with a black legend. The top half indicates the Dimond Boulevard exit, with a white arrow pointing up and to the right in the direction of the exit. The bottom half reads ‘exit only.’ A green exit gore sign with a white arrow pointing up and to the right is placed in the gore.

Decision sight distance is the distance a driver needs to select an appropriate speed and path. For drivers on Minnesota Drive, with a speed limit of 60 mph, the decision sight distance is 1,280 feet.

Northbound

The northbound on-ramp from Dimond Boulevard begins with two lanes (with two eastbound left turn lanes). Westbound right turn traffic merges in about 100 feet north of Dimond Boulevard. The two lanes merge together before entering Minnesota Drive, with the distance between the merge warning sign and the beginning of the taper about 350 feet. This advance warning distance is less than the distance recommended in the MUTCD for lane reduction merge markings (see Figure 3B-14 in the MUTCD). This seems to affect lane utilization.

Volume counts for the ramps and for the mainline were provided by DOT&PF. LOS for freeway facilities is measured using density. Under existing conditions, the merging segment has a density of about 20 passenger cars per mile per lane (pc/mi/ln), or LOS B. Using projected future volumes, the merge segment becomes more dense (about 35 pc/mi/ln), or LOS D, meaning there is projected to be some turbulence in the influence area of the merging area. Similarly, the diverging segment from northbound Minnesota Drive to Raspberry Road has LOS B under existing conditions, but will have LOS D under projected future volumes.

Movement	Year	LOS	Density (pc/mi/ln)
Merge (Dimond Blvd NB on-ramp)	2013	B	20
	2035	D	35
Diverge (Raspberry Rd NB off-ramp)	2013	B	18
	2035	D	29

Table 105 – Density of Ramp Influence Areas

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized below.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
Minnesota Drive: Raspberry Road I/C to Dimond Boulevard I/C	189	0.996	37,690	1.012	1.135	no	no
Southbound Minnesota Drive to Strawberry Off Ramp	3	1.916	1,790	1.127	2.842	Yes	No
Segment of Minnesota NB Ramp from Dimond Blvd to Minnesota Dr	21	4.614	7,440	1.127	2.048	Yes	Yes

Table 106 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Crash Type	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Animal			1	1
Bridge Rail		1		1
Bridge/Overpass			1	1
Crash Cushion		1		1
Curb/Wall		2	2	4
Ditch		4	4	8
Guardrail End	1	1	6	8
Guardrail Face	2	2	11	15
Light Support	1	1		2
Median Barrier	1	2	1	4
Moose		3	26	29
Other		1	1	2
Ran Off Road		4	8	12
Snoberm		1	1	2
Tree		1	2	3
Unknown		1	1	2
Utility Pole			1	1
Overtaking Sideswipe	2	16	20	38
Overturn	1	8	17	26
Parked		4	2	6
Rear End	2	10	14	26
Total	**10**	**63**	**119**	**192**

Table 107 – 2003 to 2012 Crashes by Crash Type and Severity – Minnesota Drive: Raspberry to Dimond Segment

Crash Type	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Guardrail Face		1	2	3
Moose			2	2
Ran Off Road		2		2
Overtaking Sideswipe			5	5
Overturn	1		3	4
Rear End		3	2	5
Total	**1**	**6**	**14**	**21**

Table 108 – 2003 to 2012 Crashes by Crash Type and Severity – Northbound Dimond to Minnesota On-Ramp

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction			Total
		NORTH	SOUTH	UNKNOWN	
No Vehicle #2	Animal		1		1
	Bridge Rail	1			1
	Bridge/Overpass	1			1
	Crash Cushion		1		1
	Curb/Wall		3		3
	Ditch	2	5	1	8
	Guardrail End	1	7		8
	Guardrail Face	9	5	1	15
	Light Support	1	1		2
	Median Barrier	1	3		4
	Moose	16	8	1	25
	Other	2			2
	Ran Off Road	9	3		12
	Snoberm		2		2
	Tree	1	2		3
	Unknown	2			2
	Utility Pole	1			1
	Overturn	11	14	1	26
NORTH	Moose	2			2
	Overtaking Sideswipe	17			17
	Parked	3			3
	Rear End	8			8
SOUTH	Moose		2		2
	Overtaking Sideswipe		19	2	21
	Parked		2		2
	Rear End		11	2	13
UNKNOWN	Parked	1			1
	Rear End	1	2		3
Total		**90**	**91**	**8**	**189**

Table 109 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction for Segment of Minnesota Dr. from Raspberry Rd to Dimond Blvd

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction			Total
		SOUTH	UNKNOWN	WEST	
No Vehicle #2	Curb/Wall	1			1
EAST	Rear End			1	1
SOUTH	Rear End		1		1
Total		**1**	**1**	**1**	**3**

Table 110 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction for Segment of Minnesota SB Ramp from Minnesota Dr. to Strawberry Rd

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction				Total
		EAST	NORTH	UNKNOWN	WEST	
No Vehicle #2	Guardrail Face		3			3
	Moose		2			2
	Ran Off Road		2			2
	Overturn		3	1		4
NORTH	Overtaking Sideswipe	1	2		1	4
	Rear End		5			5
SOUTH	Overtaking Sideswipe		1			1
Total		**1**	**18**	**1**	1	**21**

Table 111 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction for Segment of Minnesota Drive Northbound Ramp from Dimond Boulevard to Minnesota Drive

The crash rate for this segment is statistically similar to average crash rates for similar segments; however, there were 10 major injury crashes on this segment from 2003 to 2012. Six of these involved run-off-road crashes, two were sideswipe crashes, and two were rear end crashes.

The crash rate for the northbound ramp from Dimond Boulevard to Minnesota Drive is statistically higher than the average crash rate on ramps along Minnesota Drive; however, there was only 1 major injury crash on the ramp from 2003 to 2012.

The southbound exit for Dimond Boulevard is a drop lane. The exit is located in a combination of horizontal and vertical curvatures that, despite being signed, can be difficult for a driver to see. The limited sight distance for drivers wishing to exit at Dimond Boulevard contributes to delayed lane changing maneuvers that in turn result in collisions with a crash cushion located at the gore of the exit.

Planning Background

The segment appears in Project 317 (unfunded, illustrative) in the MTP to add a northbound frontage road parallel to Minnesota Drive from Dimond Boulevard to Raspberry Road.

The segment is also part of the segment of Minnesota Drive from Strawberry Road to International Airport Road ranked 6th in 95th percentile highest moose crash areas from 2006 to 2010. A recent project installed moose fence along Minnesota Drive to address this concern.

The University of Alaska Anchorage is currently performing a study of run off road crashes that includes this segment of highway.

Alt M.1 – Extend Dimond Southbound Off-Ramp to the North

One possible solution to reduce the number of crashes at the gore is to move the entrance of the exit further north on Minnesota Drive. This will provide better decision sight distance for the drivers and could also be built where guardrail would not be needed in the gore area, thus removing the obstacle that is being hit. Figure 60 presents this alternative.



Figure 60 – M.1 Extend Dimond Southbound Off-Ramp to the North

Operations

The Green Book recommends 1,000 feet at the minimum between exit-ramps. Placing the new off-ramp for the Dimond Boulevard exit 1,000 feet south of the Strawberry Road exit should create enough decision sight distance for drivers as they come around the curve preceding the Strawberry Road exit.

Under this alternative, the exit lane will remain a drop lane. The exit lane will run parallel to Minnesota Drive as a frontage road until in connects with the existing Dimond Boulevard exit off-ramp near the service access for the water filtration pond.

Safety

Targeted Crashes

This alternative would target southbound multiple vehicle same direction and single vehicle fixed object crashes in the area between the southbound off-ramp at Strawberry Road and the southbound off-ramp at Dimond Boulevard. Of the 89 crashes coded as southbound (either single or same direction multiple vehicle), 27 occurred between the Strawberry Road and Dimond Boulevard off ramps. These crashes are summarized below:

Vehicle #2 Direction	Crash Type	Vehicle #1 Direction		Total
		SOUTH	UNKNOWN	
No Vehicle #2	Crash Cushion	1		1
	Ditch	1		1
	Guardrail End	3		3
	Guardrail Face	4		4
	Moose	2		2
	Overturn	4		4
SOUTH	Overtaking Sideswipe	4	1	5
	Rear End	7		7
Total		**26**	**1**	**27**

Table 112- Southbound Minnesota Drive: Strawberry to Dimond Exit Only Crashes by Crash Type and Vehicle Direction

These are the crashes targeted by the relocation of the southbound Dimond Boulevard Off-Ramp.

Potential Safety Benefit

Neither the 2016 HSIP Handbook nor the CMF Clearinghouse contains a reduction factor for relocating an off-ramp. The present southbound Minnesota Drive at Dimond Boulevard off ramp is a right lane drop located on a downgrade. Since guardrail is present on both the right shoulder of the highway and the left shoulder of the off ramp due to an adverse slope, the guardrail ends terminate in a crash cushion located in the exit gore. This crash cushion is frequently struck by vehicles that either do not realize that the right lane ends at the exit ramp or who are not in the right lane but want to exit at Dimond Boulevard.

Although there is no specific crash reduction factor associated with the relocation of the off ramp exit away from the downgrade and guardrail terminal, this improvement is meant to allow vehicles to exit southbound Minnesota Drive in a tangent, flat segment of highway where the exit gore crash cushion is not needed. As a result, the 8 reported collisions with the crash cushion

and/or guardrail along with many of these types of collisions that go unreported should be significantly reduced. This ramp relocation could also result in a reduction in the number of southbound rear end and same direction sideswipe crashes for those crashes where driver confusion regarding the exit ramp contributed to the crash.

Alt M.2 – Enhance Guide Signs for Southbound Minnesota Drive Off-Ramp to Dimond Boulevard

Another option to reduce crashes at the gore of the Dimond Boulevard exit ramp is to install new signs on the segment of Minnesota Drive between the southbound on-ramp from Raspberry Road to the exit ramp at Dimond Boulevard.

Sign Design

Figure 61 illustrates the existing guide signs associated with the Dimond Boulevard exit and the proposed new guide signs.

There are currently three signs that alert drivers to the upcoming exit at Dimond Boulevard: an advance guide sign that alerts drivers that the Strawberry Road exit is next and that the Dimond Boulevard exit is in ¾ mile, an exit direction sign for Strawberry Road that also alerts drivers that the Dimond Boulevard exit is in ½ mile, and an exit direction sign for Dimond Boulevard. The last sign is the only one that warns drivers of the drop lane condition for Dimond Boulevard.

Direction on the use of guide signs for interchanges is found in the Manual of Uniform Traffic Control Devices (MUTCD 2009), Section 2E. In this document, four headings are used to indicate the status of each statement:

- Standard – usually accompanied by the word “shall”, indicates a required, mandatory, or specifically prohibitive practice.
- Guidance – usually accompanied by the word “should”, indicates a recommended, but not mandatory practice in typical situations. Deviations are allowed as engineering judgement or an engineering study deems appropriate.
- Option – usually companied by the word “may”, indicates a permitted practice with no recommendation.
- Support – a statement of information.

The proposed guide signs and guide sign spacing follows the example shown in Figure 2E-30 of the MUTCD.

Guidelines for interchanges with a lane drop and no option lanes are found in Section 2E.24 of the Manual of Uniform Traffic Control Devices (MUTCD 2009). This section indicates that major guide signs for all lane drops at interchanges shall be mounted overhead. The MUTCD indicates that the arrow and Exit Only wording shall match that shown in Figure 2E-16 of the MUTCD (the arrows are also described in Section 2E.19). Section 2E.30 of the MUTCD indicates that all interchanges shall have Advance Guide signs (described further in Section 2E.33) and Exit Direction Signs (described further in Section 2E.36).



Figure 61 – M.2 Enhance Guide Signs for Southbound Minnesota Drive Off-Ramp to Dimond Boulevard

The Strawberry Road exit can be considered a minor interchange because it serves "low volumes of local traffic." Section 2E.51 of the MUTCD indicates that this type of exit shall have at least one Advance Guide sign. This section indicates that an Exit Direction sign should also be used. Section 2E.33 indicates that at minor interchanges, only one Advance Guide sign should be used and it should be placed ½ to 1 mile from the exit gore.

The Dimond Boulevard exit is a major or intermediate interchange. Section 2E.33 of the MUTCD states that Advance Guide signs should be placed at ½ mile and 1 mile from the exit. Because the interchanges are closely spaced, a third Advance Guide sign is not used.

Because the recommended location for the Advance Guide signs for the Strawberry Road and Dimond Boulevard exits overlap, Interchange Sequence Signs displaying the distance to both exits at the same time may be used. The Guide Sign spacing proposed here follows the guidelines for closely-spaced interchanges found in the MUTCD (Section 2E.40). The first sign is an interchange sequence sign to alert drivers to the two exits coming up next (see Section 2E.40), as shown in Figure 62. This serves as the only Advance Guide Sign for the Strawberry Road exit and as the first Advance Guide Sign for the Dimond Boulevard exit.



Figure 62 – Interchange Sequence Sign for Strawberry Road and Dimond Boulevard Exits

The second sign is an Exit Direction sign for Strawberry Road, depicted in Figure 63. This sign would typically be placed at the theoretical gore and, because Strawberry Road is a minor exit, the sign could be placed in the roadside rather than overhead; however, because of the horizontal curve at this location and because there is an existing overhead structure, this sign could be placed over the right lane.



Figure 63 – Exit Direction Sign for Strawberry Road

The third sign is an Advanced Guide Sign for Dimond Boulevard, depicted in Figure 64. This sign would meet standards found in Section 2E.24 and in Section 2E.33. This is a new sign and would be placed on a new overhead structure. This sign alerts drivers to the upcoming exit and is the first sign that alerts drivers that the right-most lane will exit at Dimond Boulevard. This sign is needed to give drivers more time to position themselves to either exit at Dimond Boulevard or to continue on Minnesota Drive.



Figure 64 – Advanced Guide Sign with Exit Only Sign Panel

The final sign for the Dimond Boulevard exit is an Exit Direction sign with an Exit Only sign panel, depicted in Figure 65. This sign meets the standards found in Section 2E.24 and in Section 2E.36.



Figure 65 – Exit Direction Sign with Exit Only Sign Panel for Dimond Boulevard.

Safety

Targeted Crashes

This alternative would target the same crashes as Alternative M-1 by improving the advance southbound Dimond Boulevard exit ramp signing.

Potential Safety Benefit

Neither the 2016 HSIP Handbook nor the CMF Clearinghouse contains a reduction factor for improved guide signing. There is one countermeasure listed in the CMF Clearinghouse for installing improved advance freeway guidance signing in rural areas but that countermeasure has a very low quality rating and, in one case, results in an increase in crashes.

Although there is no specific reduction factor associated with this improvement, the installation of enhanced guide signing for the southbound Dimond Boulevard exit only lane may reduce confusion experienced by drivers unsure of the exit ramp location or that it is an exit only lane. This may in turn reduce collisions with the crash cushion and/or guardrail along with many of these type collisions that go unreported. This improved signing could also result in a reduction in the number of southbound rear end and same direction sideswipe crashes for those crashes where driver confusion regarding the exit ramp contributed to the crash.

Alt M.4 – Construct Dual-Lane On-Ramp from Dimond Blvd to Northbound Minnesota Drive

To reduce the number of crashes, a dual on-ramp could be installed. The existing outside lane would be extended and become a new lane on Minnesota Drive. The existing inside would merge with the existing outside lane on Minnesota Drive. FIGURE shows this alternative.

Operations

Installing a dual-lane on-ramp with one lane continuing and exiting at Raspberry Road would combine the merging and diverging segments into one weaving segment. The LOS of a weaving segment, like a merging segment, is measured by density.

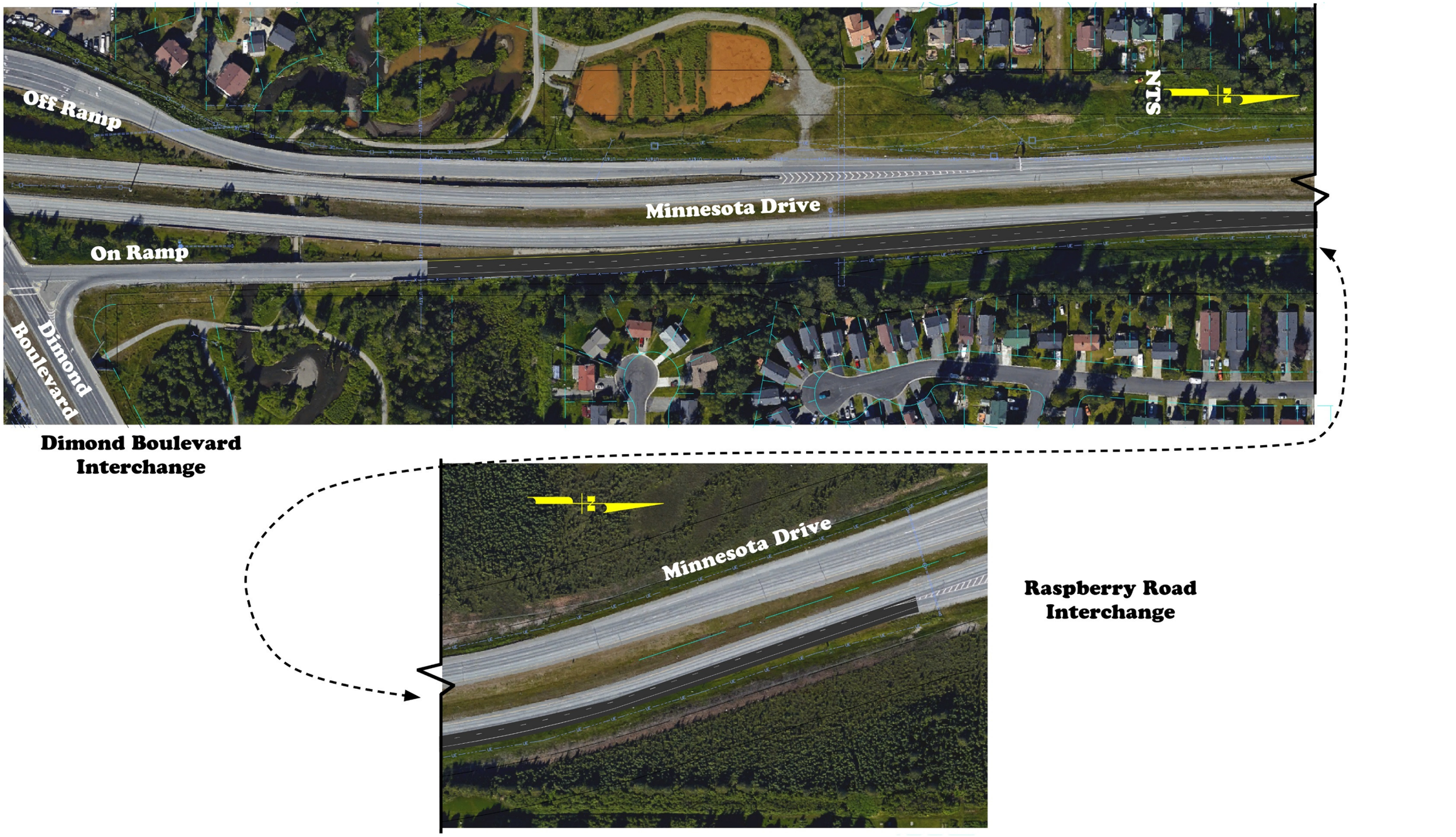


Figure 66 – M.4 Construct Dual-Lane On-Ramp from Dimond Boulevard to Northbound Minnesota Drive

Although ramp and mainline volumes are known for this segment, origin-destination volumes are unknown. For example, the volume of traffic entering at the Dimond Boulevard on-ramp and then immediately exiting at the Raspberry Road off-ramp is unknown. A sensitivity analysis was performed to see how the assumption of different ramp-to-ramp volumes changed the resulting freeway density. Three situations were analyzed: with all exiting volume coming from the ramp, half the exiting volume coming from the ramp, and none of the exiting volume coming from the ramp.

Table 113 shows the results of the weaving analysis. With current traffic volumes, the proposed weaving area will have a density of about 14 pc/mi/ln (LOS B). At future volumes, the highest density is about 27 to 30 pc/mi/ln (LOS C or D). This represents an overall improvement for this highway segment.

Year	Volume of Ramp-to-Ramp Movement	LOS	Density (pc/mi/ln)
2015	All exiting volume from ramp	B	13.9
	Half exiting volume from ramp	B	14.1
	No exiting volume from ramp	B	14.4
2035	All exiting volume from ramp	C	26.9
	Half exiting volume from ramp	C	27.6
	No exiting volume from ramp	D	29.5

Table 113 – Density of Weave Influence Area

Safety

Targeted Crashes

This alternative would target northbound Dimond Boulevard to Minnesota ramp crashes as well as other northbound crashes on Minnesota Drive between Dimond Boulevard and the northbound Raspberry Road off ramp by extending the existing two lane on ramp beyond the Campbell Creek Bridge to Minnesota Drive and extending a third through lane to form a northbound exit only lane at Raspberry Road. There were 90 northbound related crashes between the northbound Dimond On-ramp and the northbound Raspberry Off-ramp. An additional 21 crashes were coded to the northbound Dimond to Minnesota on ramp itself for a total of 111 crashes. Of those, 26 were same direction sideswipe crashes. Another 22 were single vehicle fixed object crashes including crashes with guardrail, bridge rail, etc. (Guardrail crashes are likely related to northbound Dimond to Minnesota on-ramp where guardrail is present on both sides of the ramp.) 32 additional crashes were classified as run-off-the-road crashes. Nearly 1/3 of these referenced a curving alignment possibly indicating that they occurred in the northbound curve to the left near Raspberry Road.

Potential Safety Benefit

The 2016 HSIP Handbook does not contain a reduction factor for an added auxiliary lane. However, NCHRP 687 lists a reduction factor of 20% for vehicle crashes after adding a continuous auxiliary lane for weaving between entrance and exit ramps. This crash reduction factor could also apply to the same direction sideswipe crashes on the northbound on ramp where the two lane ramp merges into a single lane.

The 20% CRF for the 28 northbound multiple vehicle Minnesota Drive crashes, 7 northbound multiple vehicle Dimond to Minnesota on ramp crashes , and the 47 northbound single vehicle crashes eliminates about 17 crashes during the 10-year study period.

Cost Estimates

Phase	Alternative M.1	Alternative M.2	Alternative M.4
Design	$366,000	$105,000	$471,000
Right-of-Way	$0	$0	$0
Utilities	$78,000	$10,000	$78,000
Construction	$2,553,000	$176,000	$4,676,000
Contract Administration (20% of construction costs)	$511,000	$36,000	$936,000
Contingency (20%)	$702,000	$65,000	$1,232,000
Total	**$4,210,000**	**$392,000**	**$7,393,000**

Comparison of Alternatives

There are two alternatives for reducing gore crashes at the southbound off-ramp to Dimond Boulevard. One would move the gore for the off-ramp to a location that will allow vehicles to exit southbound Minnesota Drive in a tangent, flat segment of highway where the exit gore crash cushion is not needed. This will eliminate or reduce severity for many of the crashes that occur in the gore.

The second alternative would add an additional advanced guide sign to warn drivers that the right lane exits at Dimond Boulevard in advance of the actual drop condition. Advanced notice of the drop lane condition may eliminate some crashes related to drivers suddenly changing lanes to either get out of the exiting lane or to get in it.

Table 114 provides a comparison of the two alternatives.

	M.1 Relocate SB Off-Ramp	M.2 Enhanced Guide Signs
Crash Reduction	Eliminates or reduces severity for 8 crashes with barrier in gore area	Eliminates some portion of 8 gore area crashes and 11 sideswipe and rear end crashes
Cost	$4,210,000	$392,000

Table 114 – Comparison of Alternatives for Southbound Minnesota Drive Off-Ramp to Dimond Boulevard

N. Dimond Boulevard at Minnesota Drive Interchange

Dimond Boulevard at Minnesota Drive is a diamond interchange with signals at the ramp terminals. Right turns to enter the Minnesota Drive on-ramps from Dimond Boulevard are channelized, with a yield condition. Shifting horizontal curves under the Dimond Boulevard Overpass were a factor in setting the Minnesota Drive freeway segment speed limit at 60 mph.



Figure 67 – Interchange of Dimond Boulevard at Minnesota Drive

Main concerns at this location include:

- Ran-off-road, rear end, and sideswipe crashes associated with the merge condition on the northbound and southbound on-ramps. (The northbound off-ramp was discussed in the previous section.)
- Sight distance may be limited for southbound vehicles turning right turn on red

DOT&PF selected one alternative for further study:

- N.1 – Improve Sight Distance for Double Southbound Right Turn

See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

Operations

Figure 68 shows the turning movement counts taken by DOT&PF on August 4, 2005 for the northbound Minnesota Drive ramp intersection and on May 4, 2011 for the southbound Minnesota Drive ramp intersection at Dimond Boulevard.

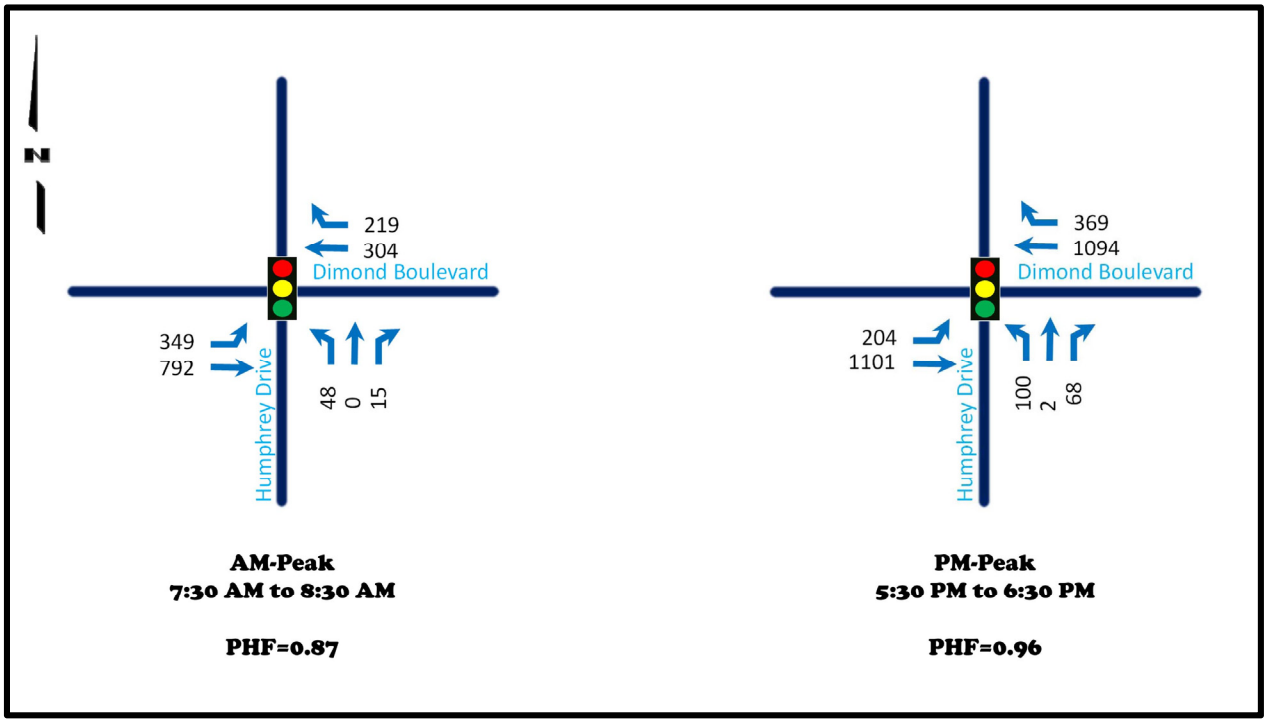


Figure 68 – Existing Volumes on Dimond Boulevard and Northbound Off-Ramp Intersection

The southbound Minnesota Drive exit to Dimond Boulevard is a single drop lane that widens to four lanes (an exclusive left turn lane, a shared through-left turn lane, and double right turn lanes) at the signalized intersection with Dimond Boulevard. Immediately to the east of the intersection, Dimond Boulevard is a bridge that traverses Minnesota Drive. As Dimond Boulevard is an urban road there are sidewalks on either side of the Dimond Boulevard, including the bridge over Minnesota Drive. There is a four-tube railing on the bridge which transitions into guardrail.

Traffic turning right onto Dimond Boulevard from the exit may do so when the signal is red. The bridge has a slight grade. The grade, guardrail, and railing may all impede the vision of drivers turning right onto Dimond Boulevard from the exit.

Sight Distance Measurement

Minimum required sight distance for the condition where vehicles are entering a roadway from a driveway or side street is stopping sight distance for vehicles on the main road to slow down or

stop if necessary when a vehicle enters from the side street. It is desirable to additionally provide intersection sight distance, which would allow a minor street vehicle stopped behind the stop bar or crosswalk to gauge whether they can enter the major street without forcing the major road traffic to brake.

Minimum stopping sight distance depends on speed and grade for vehicles on Dimond Boulevard. The calculated value is 360 feet.

Desirable intersection sight distance depends on the distance being crossed and acceleration characteristics of the vehicle entering the main road. Since the left-most right turn lane must cross a greater distance, the intersection sight distance is greater for vehicles using this lane. Table 115 shows calculated desirable intersection sight distances.

Type of Vehicle	Left-Most Right Turn Lane (ft.)	Right-Most Right Lane (ft.)
Passenger Car	496	430
Single-unit truck	628	562
Combination Truck	761	695

Table 115 – Desirable Intersection Sight Distance for Southbound Right Turn at Dimond Boulevard

KE measured the actual sight distance using a distance measuring instrument (DMI). A sight distance of 426 feet was observed. This meets minimum requirements for stopping sight distance, but is less than desired intersection sight distance. Figure 69 shows the measured departure sight triangle. Two obstacles reduce the available sight distance: guardrail and left-turning vehicles.

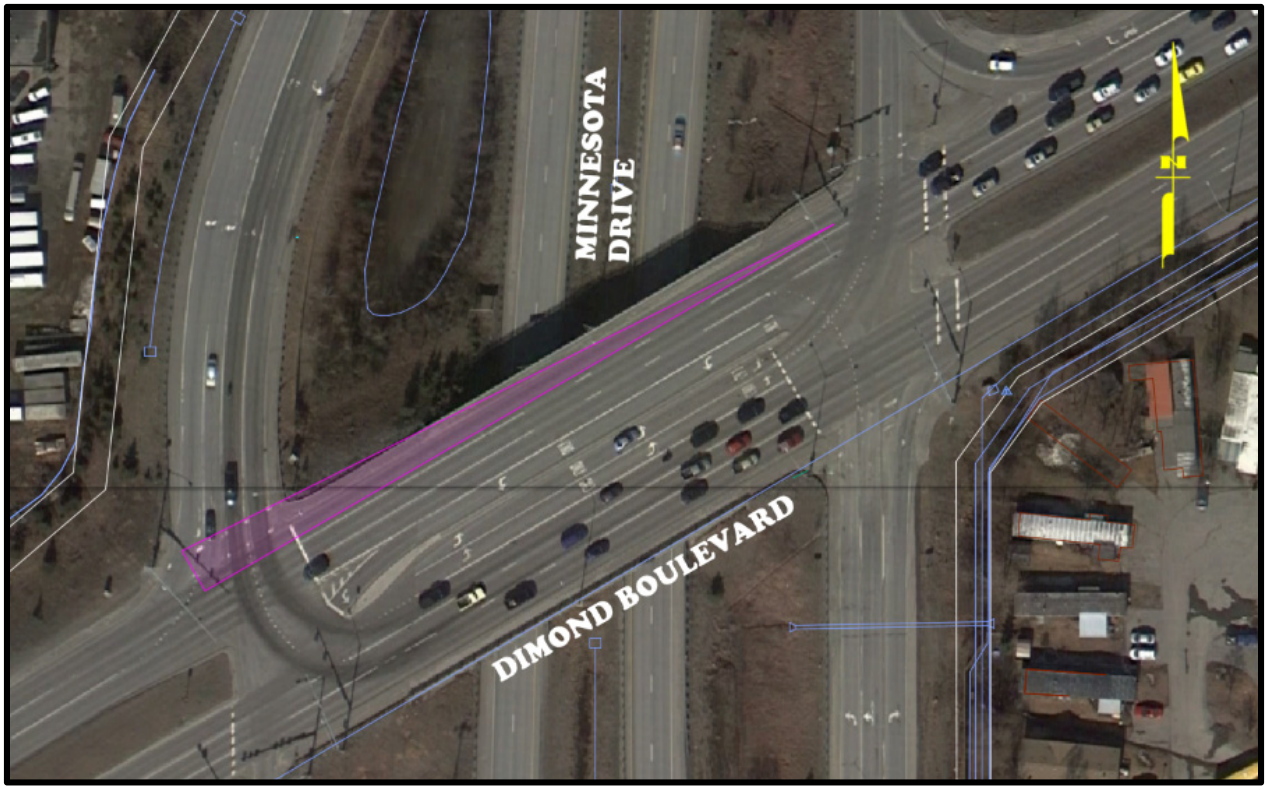


Figure 69 – Sight triangle on Dimond Boulevard

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized below.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
Northbound Minnesota Drive & Dimond Boulevard	102	0.818	34,160	1.221	1.388	No	No
Southbound Minnesota Drive & Dimond Boulevard	125	0.861	39,790	1.221	1.375	No	No

NOTE: Dimond at NB On-Ramp is included in previous Minnesota Drive: Raspberry to Dimond Segment.

Table 116 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes (Intersections)

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	Average Minnesota Ramp Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
Dimond to Southbound Minnesota Ramp	9	3.088	2,920	1.127	2.322	Yes	Yes

NOTE: Dimond at NB On-Ramp is included in previous Minnesota Drive: Raspberry to Dimond Segment.

Table 117 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes (Ramp)

Location	Crash Type	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Intersection Dimond Blvd & Minnesota SB Ramp	Left Turn	4	18	11	33
	Guardrail End			1	1
	Guardrail Face			1	1
	Other Fixed Object			1	1
	Sign		1	4	5
	Traffic Signal Pole			1	1
	Overtaking Sideswipe		1	4	5
	Parked		1		1
	Pedestrian/Bicycle		4	2	6
	Rear End		12	28	40
	Right Angle		11	18	29
	Right Turn Sideswipe			1	1
	U Turns			1	1
	Total	**4**	**48**	**73**	**125**
Intersection Dimond Blvd & Minnesota NB Ramp	Head On		1		1
	Left Turn	1	3	6	10
	Guardrail Face		1	2	3
	Median Barrier		1		1
	Moose			1	1
	Ran Off Road			1	1
	Sign			1	1
	Traffic Signal Pole			1	1
	Utility Pole			1	1
	Overtaking Sideswipe			10	10
	Pedestrian/Bicycle		1	1	2
	Rear End	1	13	34	48
	Right Angle	2	6	14	22
	Total	**4**	**26**	**72**	**102**
Segment of Minnesota SB Ramp from Dimond Blvd to Minnesota Dr	Guardrail Face		1	5	6
	Other Fixed Object			1	1
	Snoberm			1	1
	Overturn			1	1
	Total		**1**	**8**	**9**

Table 118 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle # 2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Guardrail End	1					1
	Guardrail Face			1			1
	Other Fixed Object			1			1
	Sign	2		2		1	5
	Traffic Signal Pole					1	1
	Pedestrian/Bicycle			2			2
EAST	Left Turn					32	32
	Overtaking Sideswipe					1	1
	Pedestrian/Bicycle			2			2
	Rear End	14			1		15
	Right Angle			2	1		3
	Right Turn Sideswipe			1			1
SOUTH	Overtaking Sideswipe			1			1
	Rear End			16			16
	Right Angle	5			2	17	24
UNKNOWN	Parked				1		1
	Pedestrian/Bicycle			2			2
	Rear End	1	1	1			3
	Right Angle	1					1
WEST	Left Turn	1					1
	Overtaking Sideswipe					3	3
	Rear End	1				5	6
	Right Angle			1			1
	U Turns	1					1
Total		**27**	**1**	**32**	**5**	**60**	**125**

Table 119 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction for the Dimond Blvd & Minnesota SB Ramp Intersection

Vehicle # 2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Guardrail Face		2			1	3
	Median Barrier		1				1
	Moose		1				1
	Ran Off Road	1					1
	Sign					1	1
	Traffic Signal Pole				1		1
	Utility Pole	1					1
EAST	Head On					1	1
	Left Turn					8	8
	Overtaking Sideswipe	5					5
	Rear End	17					17
	Right Angle		4		1		5
NORTH	Overtaking Sideswipe		2				2
	Rear End		5		3		8
	Right Angle	8			2	6	16
UNKNOWN	Overtaking Sideswipe	1				1	2
	Pedestrian/Bicycle		1	1			2
	Rear End		1		2		3
	Right Angle				1		1
WEST	Left Turn	2					2
	Overtaking Sideswipe					1	1
	Rear End					20	20
Total		**35**	**17**	**1**	**10**	**39**	**102**

Table 120 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction for the Dimond Blvd & Minnesota NB Ramp Intersection

Vehicle # 2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction	Total
		SOUTH	
No Vehicle #2	Guardrail Face	5	5
	Other Fixed Object	1	1
	Snoberm	1	1
	Overturn	1	1
UNKNOWN	Guardrail Face	1	1
Total		**9**	**9**

Table 121 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction for the Segment of Minnesota SB Ramp from Dimond Blvd to Minnesota Drive

The crash rates for the intersections associated with this interchange are below average crash rates for similar locations; however, there were 4 major injury crashes at each intersection

between 2003 and 2012. At the southbound ramp intersection, all of the major injury crashes were left turn crashes where westbound vehicles were turning left and struck eastbound vehicles. At the northbound ramp intersection, there were 2 right angle crashes, 1 rear end, and 1 left turn crash.

For the southbound ramp from Dimond Boulevard to Minnesota Drive, the crash rate was statistically higher than the average crash rate for ramps on Minnesota Drive; however, there were no fatal or major injury crashes from 2003 to 2012.

Planning Background

The segment of Dimond Boulevard from Jewel Lake Road to Old Seward Highway appears as Project Priority 175 of the Anchorage Pedestrian Plan. This plan proposes adding a walkway and lighting on this segment. The West Anchorage District Plan has a bicycle improvement plan to complete the road reconstruction with pedestrian facilities on Dimond Boulevard from Minnesota Drive to Kincaid Park. The Anchorage Bicycle Plan proposes to design and construct with the roadway a bicycle friendly solution for Dimond Boulevard signage from Minnesota Drive to Arctic Boulevard.

The interchange is part of the segment of Minnesota Drive from 100th Avenue to Tudor Road ranked 7th in 75th percentile areas of concern for moose crashes from 2006 to 2010. A recent project installed moose fence along Minnesota Drive to address this concern.

Alt N.1 – Improve Sight Distance for Double Southbound Right-Turn Lane

This alternative would improve sight distance for the southbound dual right turn lanes at the southbound Minnesota Drive ramp intersection.

Guardrail.

To prevent errant vehicles from going off of Dimond Boulevard and into freeway traffic below, guardrails have been placed seven feet from the curb on Dimond Boulevard. According to the Roadside Design Guide (AASHTO), the guardrail should begin to flare at the end of the bridge at a rate of 10 to 1 until it reaches a distance of 13 feet from the face of the curb. Realigning the guardrail to meet this guidance would also extend sight distance for southbound right turning drivers.

Left Turning Vehicles.

The stop bar is currently in the same position for all traffic turning onto Dimond Boulevard. This places left turning vehicles within in the desirable intersection sight distance triangle for right turning vehicles trying to turn right on red. To improve sight distance for the right turning vehicles, the stop bars for left turning traffic could be set back. To help reinforce the stopping point for left turning traffic, a “Stop Here on Red” sign could be installed.

Figure 70 shows the recommended modifications.

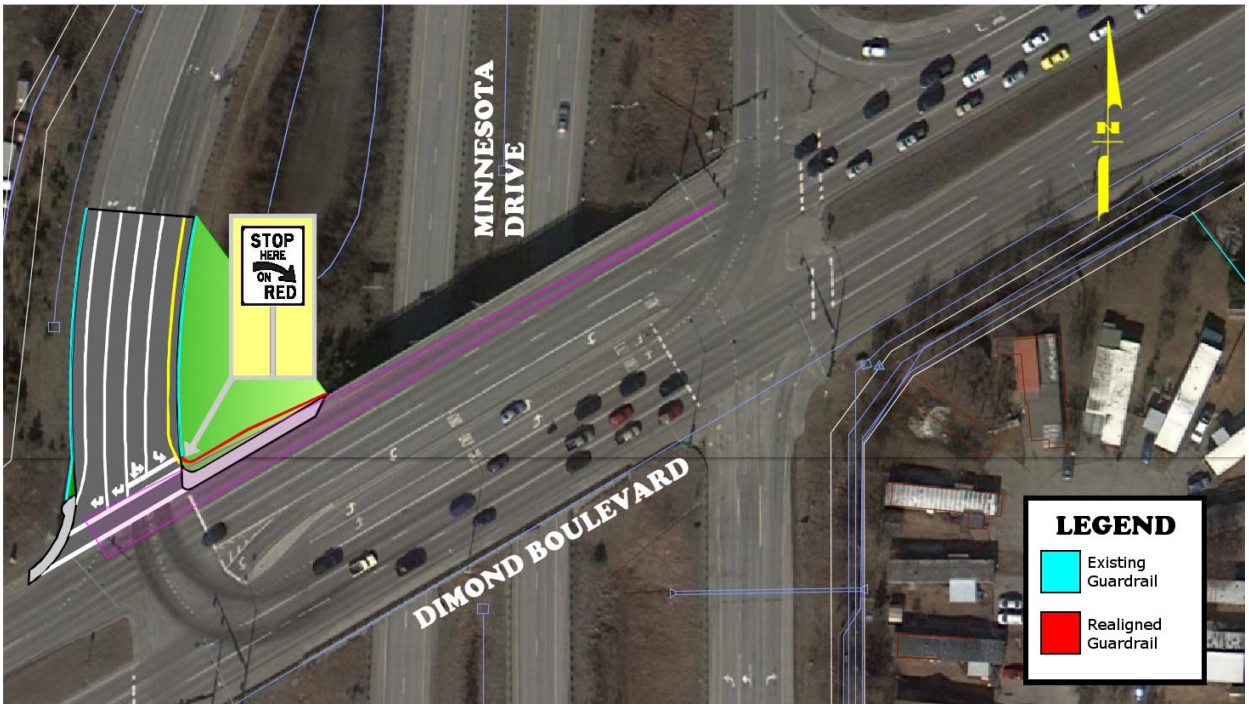


Figure 70 – Recommended Modifications Improve Desirable Sight Distance for Southbound Right Turns at Dimond Boulevard Off-ramp from Minnesota Drive

Safety

Targeted Crashes

While minimum stopping sight distance is met, this improvement targets crashes between southbound right turning vehicles on the southbound Dimond Boulevard off ramp and westbound vehicles on Dimond Boulevard by improving the intersection sight distance for southbound right turning traffic. There were 17 southbound versus westbound right angle crashes at this intersection. Another 17 were southbound rear end crashes (16 at the intersection and 1 on the ramp). Some of these crashes may be related to less than desirable sight distance. Guardrail and southbound left turning traffic could all block southbound right turning traffic from seeing westbound thru traffic on Dimond Boulevard.

Potential Safety Benefit

The 2016 HSIP Handbook specifies a crash reduction of 10% for multi-car crashes involving vehicles on the limited sight distance approach. There were 34 rear end or same direction sideswipe crashes on the southbound approach to Dimond Boulevard. Using a 10% crash reduction for improving the intersection sight distance, a reduction of 3-4 crashes can be expected during the 10-year study period.

Cost Estimates

Phase	**Alternative N.2**
Design	$105,000
Right-of-Way	$0
Utilities	$26,000
Construction	$340,000
Contract Administration (20% of construction costs)	$68,000
Contingency (20%)	$108,000
Total	**$647,000**

O. Segment of Minnesota Drive from Dimond Boulevard to 100th Avenue

Minnesota Drive from Dimond Boulevard to 100th Avenue is a 4 lane access-controlled freeway with a grassy median. There is a southbound auxiliary lane between the Dimond Boulevard off-ramp and the 100th Avenue on-ramp and a frontage road that serves residences with direct access to the frontage road.

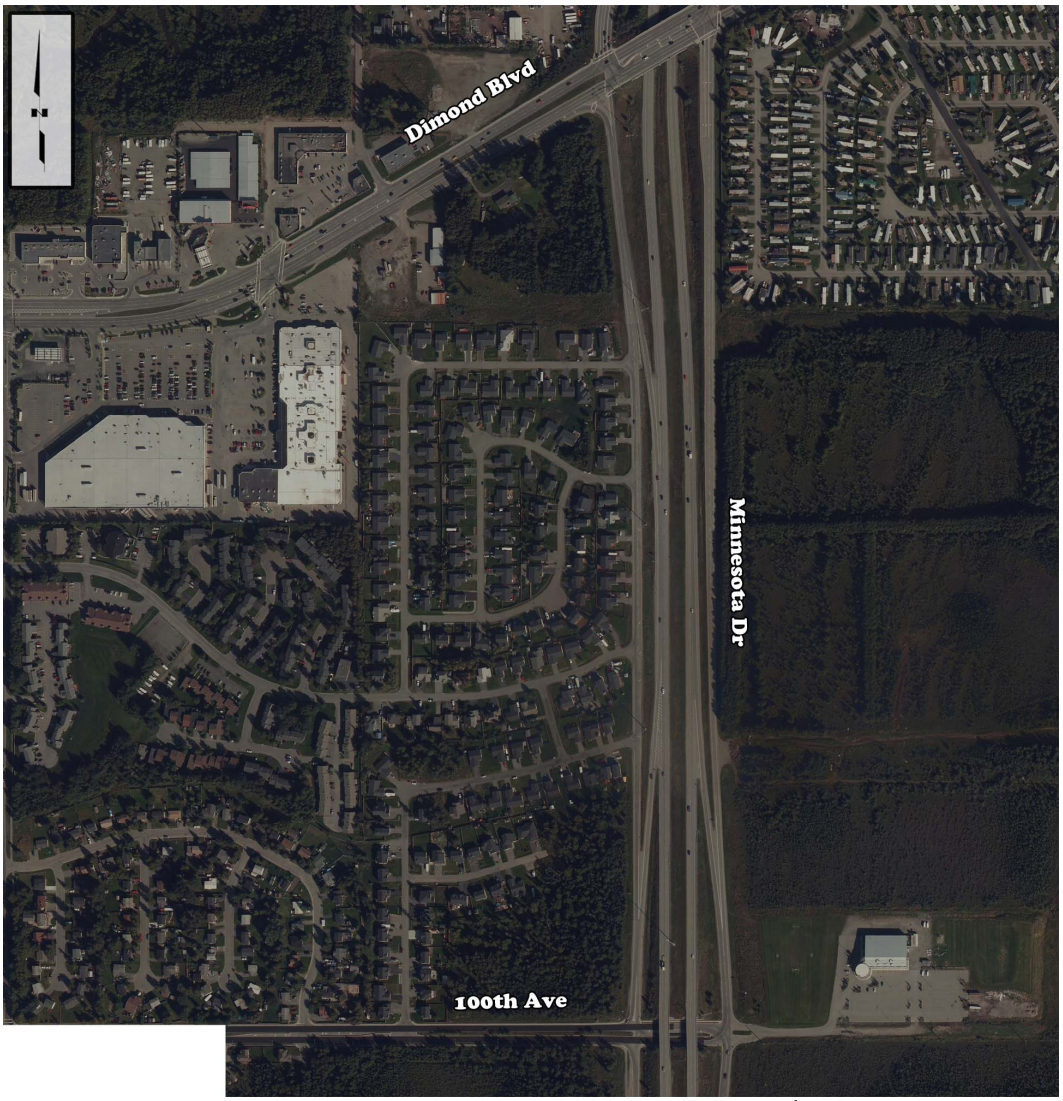


Figure 71 – Minnesota Drive from Dimond Boulevard to 100th Avenue

The main concern with this segment is:

- Future weaving conflicts if ramp volumes increase in the future.

DOT&PF did not select any alternatives from this segment for further analysis. A northbound exit directly to Dimond Boulevard is not recommended at this time because it would not serve very high volumes and there are safety concerns. See Appendix B for a qualitative analysis of all alternatives.

P. 100th Avenue at Minnesota Drive Interchange

100th Avenue at Minnesota Drive is a diamond interchange with stop control at the ramp terminal intersections.



Figure 72 – Interchange at 100th Avenue

Improvements to this interchange have been studied as part of the Municipality's project to extend 100th Avenue from C Street to Minnesota Drive. Solutions for this interchange are deferred to be built with this future project and would consider roundabouts or signals for the interchange intersection. No alternatives are presented in this report.

Q. Segment of Minnesota Drive from 100th Avenue to C Street

Minnesota Drive from 100th Avenue to C Street is an access-controlled 4 lane freeway with a grassy median.



Figure 73 – Minnesota Drive from 100th Avenue to C Street

In considering whether or not to raise the speed limit on Minnesota Drive, the Department conducted curve testing. The geometry of the 90-degree horizontal curve in this segment contributed to the decision to limit the speed limit to 60 mph. No other operational or safety concerns were identified for this segment.

R. C Street at Minnesota Drive Interchange

C Street at Minnesota Drive is a diamond interchange with roundabouts at the ramp terminals.



Figure 74 – Interchange of C Street at Minnesota Drive

No operational or safety concerns were identified for this interchange. It should be noted that land development along C Street may lead to a need for improvements to the interchange due to increased volumes. This will likely be addressed by Traffic Impact Analyses for the various land uses.

South Anchorage Terminus: C Street to Seward Highway

This segment is characterized as an urban commercial area which transitions between the freeway segment to the west and passes through the developments surrounding the Seward Highway. The segment provides both access to local businesses and serves traffic entering and exiting the Seward Highway corridor. Signalized intersections in this segment of the study area include:

- Old Seward Highway
- Seward Highway southbound ramp intersection
- Seward Highway northbound ramp intersection

S. Segment of Minnesota Drive from C Street to Old Seward Highway

Minnesota Drive from C Street to Old Seward Highway is a 4 lane divided highway that transitions from access-controlled freeway to at-grade signalized intersections. The frontage road south of Minnesota adds another lane in the eastbound direction for 700 feet before the additional lane turns into a right-turn-only lane at the Old Seward Highway.



Figure 75 – Minnesota Drive from C Street to Old Seward Highway

The frontage road on the south of Minnesota Drive mainly serves the Anchorage Sand and Gravel Company, Inc. (AS&G), allowing eastbound trucks access into and out of the gravel pit site. To travel westbound, however, the trucks must travel down to Klatt Road, over to C Street or Old Seward Highway, and back up to Minnesota Drive/O'Malley Road. Because this out-of-direction travel is costly, AS&G instead pays the owner of the property to the west for direct access to Peninsula Circle. This is also very costly. AS&G has proposed a solution that would

create a two-way frontage road from the AS&G driveway to C Street, adding a westbound approach to the south roundabout at the C Street interchange and reconfiguring the eastbound on ramps. This would require a Traffic Impact Analysis and private mitigation. DOT&PF's preference is to work with the Municipality to establish Peninsula Circle as a public right-of-way.

No other operational or safety concerns were identified for this segment; however, the MTP and the bicycle plan propose a multi-use pathway to connect the paths on C Street and on the Old Seward Highway. See Appendix B for a qualitative analysis of all alternatives.

T. Old Seward Highway at Minnesota Drive Intersection

Old Seward Highway at Minnesota Drive is a 4-leg signalized intersection.



Figure 76 – Intersection of Old Seward Highway at Minnesota Drive

The main concern at this intersection is:

- Intersection capacity

Most alternatives for further study for this location were included in analyses for alternatives at the Seward Highway. Because there are 5 miles between this signalized intersection and the previous signalized intersection at Tudor Road, an AAWF was analyzed for this intersection, similar to the analysis performed for Alternative H.5 starting on page 93.

- T.2 – Add Active Warning Flashers on Eastbound Minnesota Drive

See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

Operations

DOT&PF performed a turning movement count at Minnesota Drive and Old Seward Highway on January 20, 2015. The results of this count are shown in Figure 77. Existing signal timing for the PM peak period was provided by the Municipality of Anchorage.

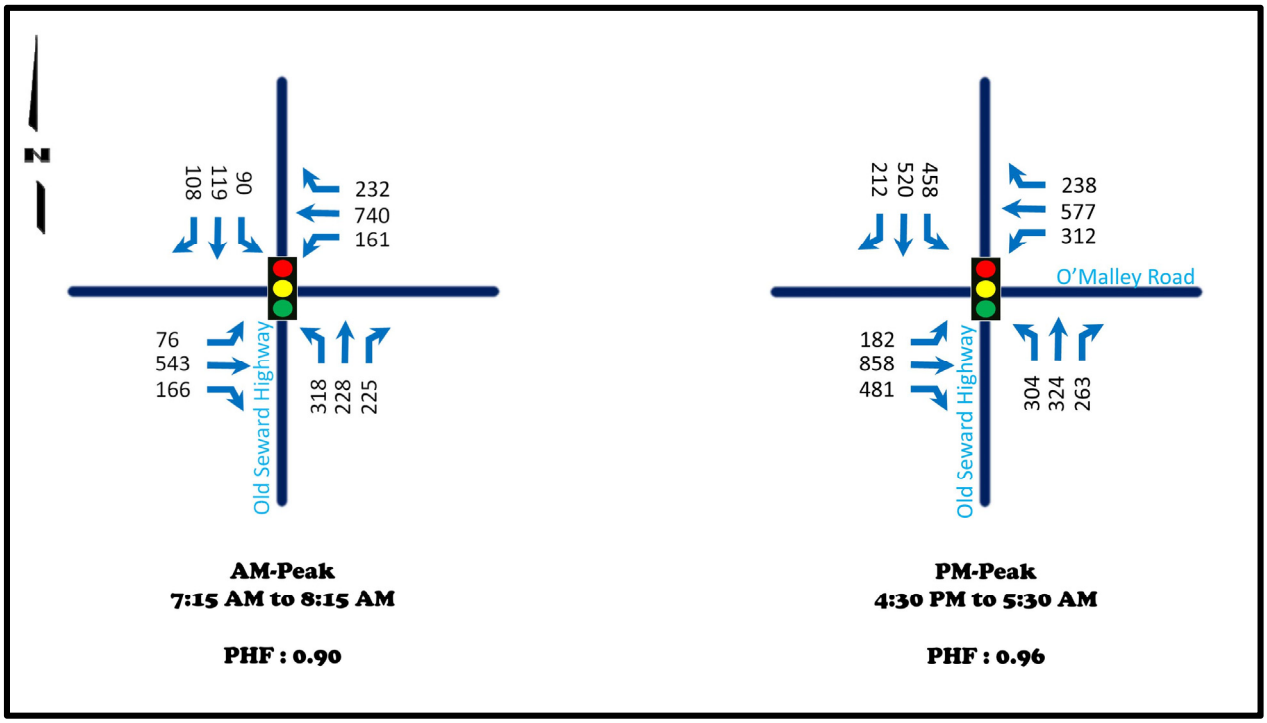


Figure 77 – Existing Turning Movement Volumes at Minnesota Drive/O'Malley Road and Old Seward Highway

As shown in Figure 77, traffic volumes are highest in the westbound direction in the AM peak, but larger for every other direction in the PM peak.

Capacity analysis was performed using Synchro. Table 122 shows the results for the evening peak hour based on the signal timing during the PM Peak hour. The intersection currently operates at LOS E with a volume-to-capacity ratio (v/c) of 0.93. All movements operate at LOS D or worse, with the eastbound and westbound left turn movements experiencing the highest delay, particularly in the eastbound direction where there is only a single turn lane.

Lane Group	Volume-to-Capacity Ratio	Average Delay (sec/veh)	LOS
NBL	0.79	68.0	E
NBT	0.65	57.6	E
NBR	0.22	51.7	D
SBL	0.85	62.5	E
SBT	0.80	56.1	E
SBR	0.16	40.8	D
EBL	1.01	124.8	F
EBT	0.94	62.1	E
EBR	0.72	49.2	D
WBL	0.98	93.7	F
WBT	0.64	44.5	D
WBR	0.19	80.1	F
Overall	**0.93**	**62.4**	**E**

Table 122 – Existing PM Peak Level of Service at Minnesota Drive/O'Malley Road and Old Seward Highway

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized below.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
Minnesota Drive/ O'Malley Road at Old Seward Highway	192	1.103	47,700	1.415	1.566	no	no

Table 123 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Crash Type	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Double Left Sideswipe		2	2
Left Turn	3	6	9
Other	1	5	6
Overtaking Sideswipe	1	4	5
Pedestrian/Bicycle		2	2
Rear End	37	101	138
Right Angle	12	13	25
Right Left Turn Sideswipe		4	4
U Turns		1	1
Total	**54**	**138**	**192**

Table 124 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Sign				1		1
	Traffic Signal Pole		1	1		2	4
	Utility Pole			1			1
EAST	Left Turn					2	2
	Overtaking Sideswipe	2					2
	Rear End	29			2	1	32
	Right Angle		4	3			7
	Right Left Turn Sideswipe				1		1
NORTH	Left Turn			1			1
	Rear End		24		1		25
	Right Angle	2				1	3
	Right Left Turn Sideswipe			1			1
SOUTH	Double Left Sideswipe			1			1
	Left Turn		4				4
	Overtaking Sideswipe			1			1
	Pedestrian/Bicycle	1					1
	Rear End			37	1		38
	Right Angle	1			1	3	5
	Right Left Turn Sideswipe		1				1
UNKNOWN	Pedestrian/Bicycle	1					1
	Rear End	1	3	2			6
	Right Angle				1		1
WEST	Double Left Sideswipe					1	1
	Left Turn	2					2
	Overtaking Sideswipe					2	2
	Rear End					37	37
	Right Angle		4	5			9
	Right Left Turn Sideswipe					1	1
	U Turns					1	1
Total		**39**	**41**	**53**	**8**	**51**	**192**

Table 125 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction

The crash rate for this intersection is below the average crash rate for similar locations. There were no fatal or major injury crashes from 2003 to 2012.

T.2 – Add Active Warning Flashers on Eastbound Minnesota Drive

Similar to the northbound approach of Minnesota Drive at Tudor Drive, eastbound Minnesota Drive has a reduction in the posted speed limit from 60 to 50 mph as it approaches Old Seward Highway. Figure 78 shows that before the posted speed limit is reduced there is a Speed Zone Ahead sign informing drivers of the change.

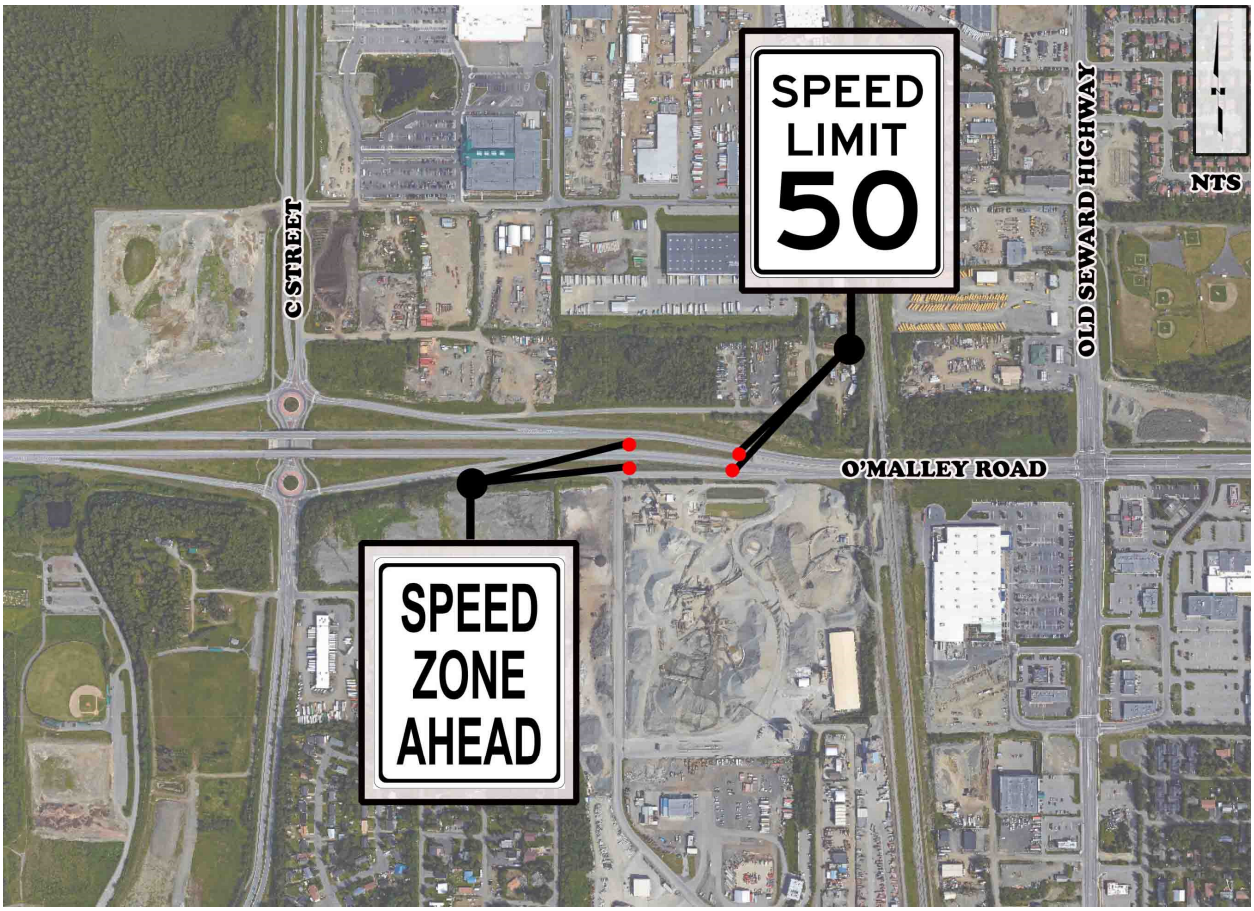


Figure 78 – Speed Limit and Signal Signage on Eastbound O'Malley Road Drive Approaching Old Seward Highway

As described in the analysis of Alternative H.5 starting on page 93, if an intersection approach is less than ten miles away from the previous signalized intersection, than installation of a AAWF is only considered if the approach is high speed (55 mph or more). On March 30, 2016, KE performed a spot speed study of free-flowing passenger vehicles on the eastbound approach and found the 85th percentile speed to be 49 mph. The eastbound approach of Minnesota Drive at Old Seward Highway is therefore not considered high speed and is not an appropriate candidate for an AAWF.

Intersection with Minnesota Drive	Lowest Speed (mph)	Mean Speed (mph)	85th Percentile Speed (mph)	Highest Speed (mph)
Old Seward Highway	33	38	49	57

Table 126 – Spot Speed Summary for Eastbound O'Malley Road at Old Seward Highway

Further analysis was conducted to determine if other treatments warning drivers of the change in condition from full access controlled freeway to arterial with at-grade signalized intersections are needed. Right angle crashes and rear end crashes were analyzed at the O'Malley Road and Old Seward Highway to determine if there is a crash pattern that could be mitigated by treatments such as a Signal Ahead sign.

Table 127 shows the total right angle crashes recorded at O'Malley Road and Old Seward Highway by travel direction of the at-fault vehicle. The eastbound approach has both the lowest

incidence and lowest percentage of right angle crashes. In 10 years, 3 eastbound vehicles were at fault in right angle crashes versus 8 at both the north- and southbound approaches.

	Eastbound	Westbound	Northbound	Southbound
Right Angle Crashes	3	4	8	8
Total Crashes	39	51	41	53
Percentage Right Angle Crashes	7.7%	7.8%	19.5%	15.1%

Table 127: Right Angle Crashes at O'Malley Road and Old Seward Highway

Table 128 shows the same comparison for rear end crashes. The eastbound approach has the highest percentage of rear end crashes; however, the westbound approach also has a high percentage, only about 2 percent smaller than the eastbound approach. In terms of frequency, the eastbound approach has the third lowest frequency of rear end crashes.

	Eastbound	Westbound	Northbound	Southbound
Rear End Crashes	29	37	24	37
Total Crashes	39	51	41	53
Percentage Rear End Crashes	74.3%	72.5%	58.5%	69.8%

Table 128: Rear End Crashes at O'Malley Road and Old Seward Highway

Because the right angle and rear end crash patterns for the eastbound and westbound approaches are very similar, Signal Ahead signs are not recommended.

U. Segment of O'Malley Road from Old Seward Highway to Seward Highway

O'Malley Road from Old Seward Highway to Seward Highway is a 4 lane road with a raised median. There is a 200 foot left-turn lane westbound onto O'Malley Center Drive.



Figure 79 – O'Malley Road from Old Seward Highway to Seward Highway

The main concern on this segment is:

- A pattern of rear end, sideswipe, and left turn crashes at O'Malley Center Drive

Alternatives for further study for this location were included in analyses for alternatives at the Seward Highway. See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

Operations

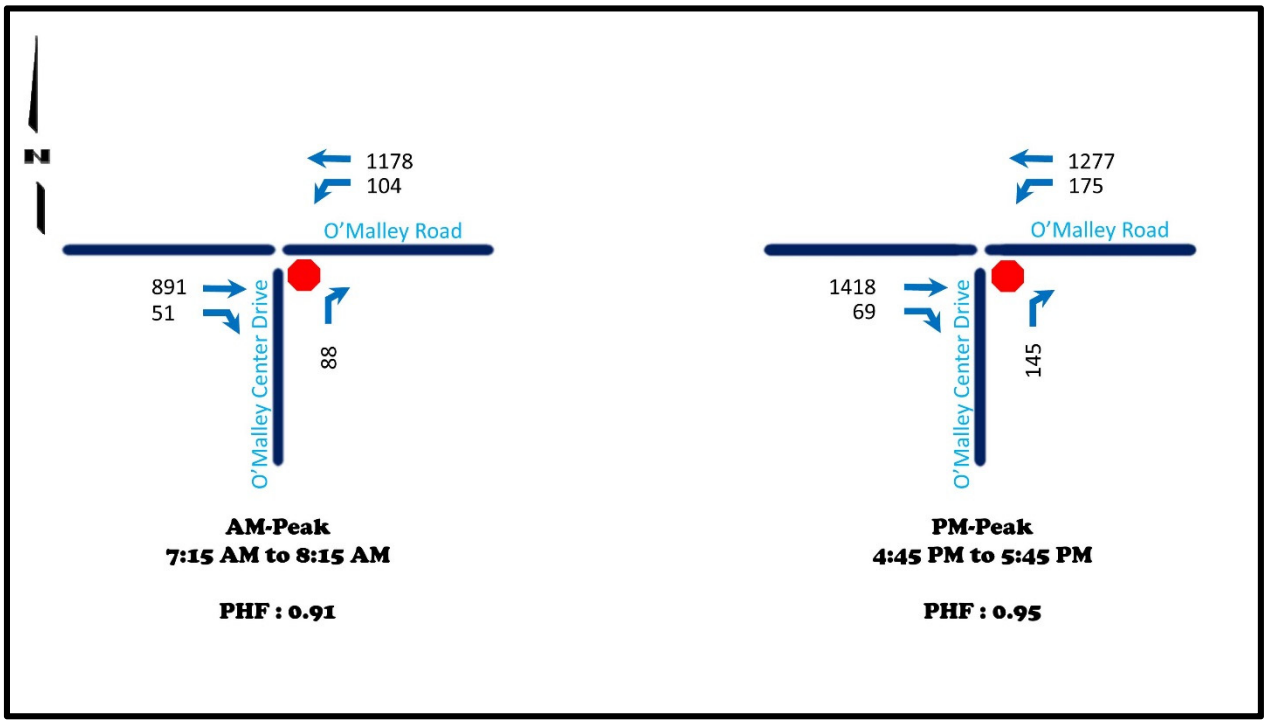


Figure 80 – Existing Turning Movement Volumes at O'Malley Road and O'Malley Center Drive

O'Malley Center Drive services a small commercial corridor. Where it exits at O'Malley Road, the driveway is controlled by a stop sign. Only right turns are permitted for traffic turning onto O'Malley Road from O'Malley Center Drive. Eastbound traffic on O'Malley Road can access O'Malley Center drive by turning right from a through-right turn lane. Westbound traffic on O'Malley Road may access O'Malley Center Drive by turning left from a designated left turn lane with 200 feet of storage.

Turning movement counts were observed at the intersection of O'Malley Center Drive in September of 2015 by Kinney Engineering, LLC. Analysis was completed to determine the queue length for westbound left turning traffic on O'Malley Road. Table 129 shows existing conditions at the intersection.

	AM		PM	
	NB-R	WB-L	NB-R	WB-L
Volume (veh/hr)	77	113	145	175
v/c	0.30	0.17	1.17	0.47
LOS	C	B	F	C
Queue (veh)	1	1	8	2
Queue (ft.)	25	25	200	50
Control Delay (sec)	23.0	11.5	195.0	21.7

Table 129 – Existing Conditions at O'Malley Center Drive

A volume study was conducted to determine the volume threshold of westbound left turns onto O'Malley Center Drive which would result in queues spilling back into the O'Malley Road through lanes. The analysis concluded that a 21% increase in the left turn volume would be required for the auxiliary lane to break down in this way. This increase is not anticipated to occur in the next 20 years.

However, as will be discussed in the following section, a closure of the westbound left turn auxiliary lane would be required if roundabouts were constructed at the ramp intersections of O'Malley Road and the Seward Highway since the lane would encroach upon the effective area of the roundabout and increase turbulence due to weaving maneuvers.

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized below.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
O'Malley Road: Old Seward Highway to Seward Highway Segment	34	1.661	29,200	1.513	1.578	no	no

Table 130 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Crash Type	Incapacitating Injury	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Left Turn		2	7	9
Embankment			1	1
Sign			3	3
Overtaking Sideswipe			2	2
Overturn			2	2
Pedestrian/Bicycle		1		1
Rear End	1	5	9	15
Right Angle			1	1
Total	**1**	**8**	**25**	**34**

Table 131 – 2003 to 2012 Crashes by Crash Type and Severity

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Embankment					1	1
	Sign				1	2	3
	Overturn	2					2
EAST	Left Turn					9	9
	Rear End	9					9
	Right Angle		1				1
NORTH	Rear End		1				1
SOUTH	Rear End			1			1
WEST	Overtaking Sideswipe					2	2
	Pedestrian/Bicycle		1				1
	Rear End				2	2	4
Total		**11**	**3**	**1**	**3**	**16**	**34**

Table 132 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction

The majority of the crashes in this segment occur at the O'Malley Road/O'Malley Centre intersection. Crash experience for this intersection is as follows:

Crash Type	Non-Incapacitating or Possible Injury	Property Damage Only	Total
Left Turn	2	7	9
Sign		2	2
Pedestrian/Bicycle	1		1
Rear End	3	6	9
Right Angle		1	1
Total	**6**	**16**	**22**

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Sign				1	1	2
EAST	Left Turn					9	9
	Rear End	5					5
	Right Angle		1				1
NORTH	Rear End		1				1
SOUTH	Rear End			1			1
WEST	Pedestrian/Bicycle		1				1
	Rear End					2	2
Total		**5**	**3**	**1**	**1**	**12**	**22**

Table 133 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction: O'Malley Road @ O'Malley Centre

The crash rate for this segment is below the average crash rate for similar locations. There was only one major injury crash from 2003 to 2012.

Alt U.1 – Close Left-Turn Access at O'Malley Center Drive

This alternative would close the left-turn access from O'Malley Road westbound to O'Malley Center Drive. The primary reason for closing the left turn access is to improve safety or to better accommodate changes to the connection between the Seward Highway and Minnesota Drive.

If O'Malley Center Drive becomes right-in-right-out only, westbound left-turning traffic at O'Malley Center Drive would be relocated to westbound u-turns at the Old Seward Highway. If the O'Malley Center Drive access were completely closed, westbound left-turning traffic at O'Malley Center Drive would be relocated to westbound left turns at the Old Seward Highway and then southbound left turns at the O'Malley Center Drive signal on the Old Seward Highway.

Safety

Targeted Crashes

Crashes involving the westbound left turn and opposing eastbound traffic are targeted with this improvement. There were 22 crashes at this median opening during the 2003-2012 study period. 9 involved westbound left turning vs eastbound traffic and another 5 involved eastbound rear ends, some of which may have been yielding to westbound left turning traffic.

Potential Safety Benefit

The 2016 HSIP Handbook specifies a crash reduction of 90% for crashes making the movement to be closed. It also indicates that new crashes can be caused by diverted traffic. Traffic which normally used this westbound left turn opening would likely divert to the Old Seward Highway intersection. Depending on the ultimate configuration of that intersection, the potential increase in crashes could vary depending on the option selected under Alternative T above.

Assuming that the at-grade intersection were to remain at the Old Seward Highway intersection, there were 8 crashes that specifically indicated the westbound left turn or U-turn movement. The left turn movement being closed is considerably smaller than the left turn movement at the Old Seward Highway and the Old Seward Highway left turn movement is a signalized dual left turn lane. Assuming the westbound left turn volume at the Old Seward Highway is roughly four times higher than the closed left turn movement, we could expect that 25% of the left turn crashes that occurred at the median opening to be closed would occur at the Old Seward Highway. That means that we might expect a total of 6 of the 9 crashes occurring at the median opening to be susceptible to correction its closing.

Using a 90% crash reduction for closing the median opening, a reduction of 5 crashes can be expected during the 10-year study period.

V. Seward Highway at O'Malley Road Interchange

Seward Highway at O'Malley Road is a diamond interchange with signalized intersections at the ramp terminals.



Figure 81 – Interchange of Seward Highway at O'Malley Road

The main concerns at this intersection include:

- Capacity of the ramp intersections
- Long term plans to link Minnesota Drive and the Seward Highway with directional ramps
- Pattern of eastbound left turn crashes at the northbound Seward Highway ramp

DOT&PF requested further analysis considering alternatives for this interchange, for the Old Seward Highway intersection, and for the roadway in between. Three alternatives were studied:

- TUV.1 – Roundabouts at Seward Highway Ramp Terminals

- TUV.2 – Partial Interchange (with Roundabouts at Seward Highway Ramp Terminals)
- TUV.3 – Diverging Dimond Interchange with Old Seward Highway (with Roundabouts at Seward Highway Ramp Terminals)

See Appendix B for a qualitative analysis of all alternatives.

Existing Conditions

Operations

DOT&PF provided PM turning movement volumes for the ramp intersections from observations conducted in May of 2013. The results of this count are shown in Figure 82. Existing signal timing for the PM peak period was provided by the Municipality of Anchorage.

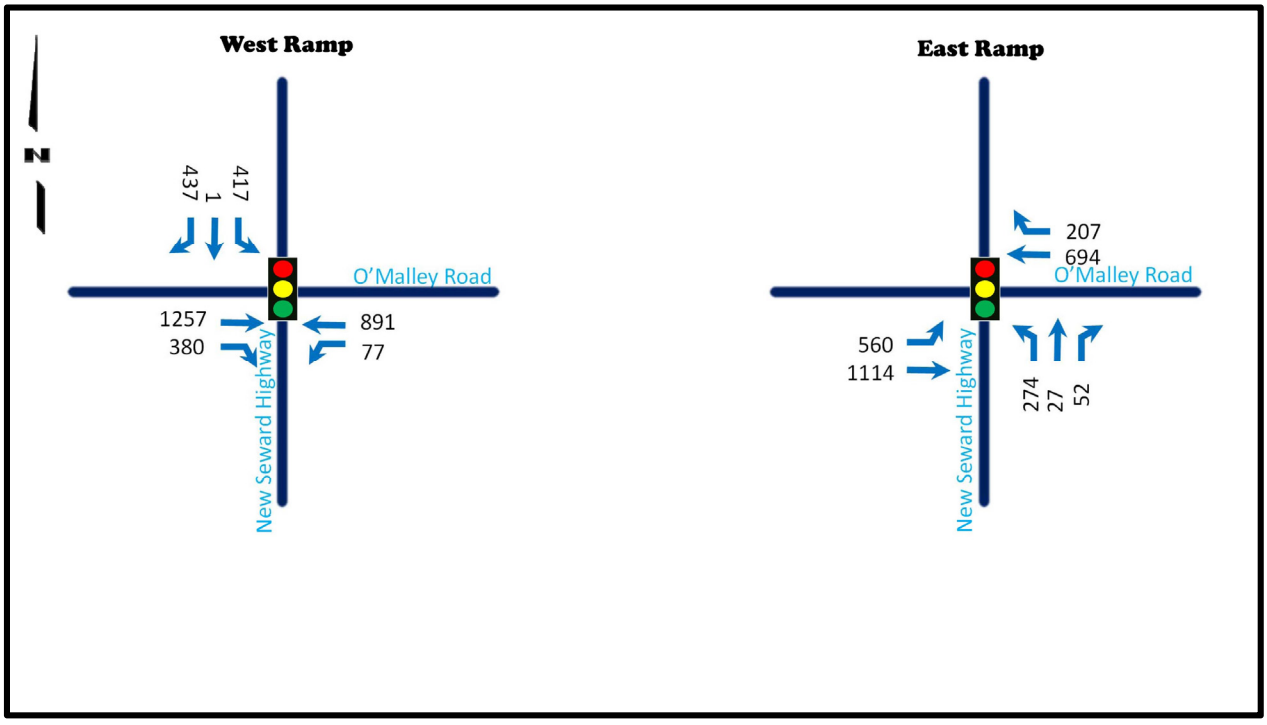


Figure 82 – Existing PM Peak Turning Movement Volumes at O'Malley Road and New Seward Highway

Capacity analysis was performed using Synchro. Table 134 shows the results for the existing PM peak hour analysis on the west side of the Seward Highway interchange, and Table 135 shows the performance on the east side. The west side intersection currently operates at LOS D with a volume-to-capacity ratio (v/c) of 0.98, and the east side operates at LOS C with a v/c of 0.86.

Lane Group	Volume-to-Capacity Ratio	Average Delay (sec/veh)	LOS
WBL	0.77	95.3	F
WBT	0.49	14.5	B
SBL	0.95	81.0	F
SBL-SBT-SBR	0.94	80.1	F
SBR	0.70	49.4	D
EBT-EBR	1.02	32.9	C
Overall	**0.98**	**40.0**	**D**

Table 134 – Existing PM Peak Level of Service at O'Malley Drive and West Seward Highway Ramps

Lane Group	Volume-to-Capacity Ratio	Average Delay (sec/veh)	LOS
WBT	0.81	52.3	D
WBR	0.16	35.4	D
EBL	0.85	37.1	D
EBT	0.52	3.0	A
NBL	0.73	65.6	E
NBL-NBT	0.72	65.5	E
NBR	0.06	49.1	D
Overall	**0.86**	**30.4**	**C**

Table 135 – Existing PM Peak Level of Service at O'Malley Drive and East Seward Highway Ramps

An analysis of the existing intersection with future volumes projected to 2035 suggests that the intersections will operate at LOS F and LOS E on the west and east sides, respectively.

Existing Crash Patterns

The 2003-2012 crash experience for this location is summarized in the following tables. Although the crash rate at both ramp intersections is not above average, there were 17 major injury crashes and 1 fatal crash at the two ramp intersections. The fatality occurred on Wednesday, December 24, 2008 in the early afternoon when a westbound driver turning left onto the southbound on ramp struck an eastbound driver. All four of the major injury crashes at the northbound ramp intersection were left turn crashes. At the southbound ramp intersection, there were 6 left turn crashes, 2 rear end crashes, 2 right angle crashes, 2 bicycle crashes, and 1 overturn crash that resulted in major injuries.

Because of the concern about the frequency of incapacitating injury crashes, an HSIP project has installed flashing yellow arrow for east- and westbound left turn movements at the two intersections. According to the HSIP manual, flashing yellow arrows is expected to reduce left turn crashes by 30 percent.

Location	Crash Frequency (2003 to 2012)	Crash Rate	Average Segment or Entering Volume (AADT)	State Crash Rate	UCL @ 95% Confidence	Above Average ?	Above Critical ?
O'Malley Road at Seward Highway West (southbound) Ramp	128	1.191	29,440	1.221	1.401	no	no
O'Malley Road at Seward Highway East (northbound) Ramp	99	0.988	27,450	1.221	1.408	no	no

Table 136 – 2003 to 2012 Crash Frequency, Crash Rates and Average Annual Traffic Volumes

Location	Crash Type	Fatality	Incapacitating Injury	Non-Incapacitating Or Possible Injury	Property Damage Only	Total
O'Malley Road at Seward Highway West (southbound) Ramp	Left Turn	1	6	11	17	35
	Other				1	1
	Overtaking Sideswipe				1	1
	Overturn		1			1
	Pedestrian/Bicycle		2			2
	Rear End		2	17	39	58
	Right Angle		2	9	17	28
	Right Turn Sideswipe				2	2
	Total	**1**	**13**	**37**	**77**	**128**
O'Malley Road at Seward Highway East (northbound) Ramp	Double Left Sideswipe				1	1
	Left Turn		4	18	30	52
	Overtaking Sideswipe			1	4	5
	Rear End			5	21	26
	Right Angle			6	9	15
	Total		**4**	**30**	**65**	**99**

Table 137 – 2003 to 2012 Crashes by Crash Type and Severity

O'Malley Road at Seward Highway West (southbound) Ramp

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction				Total
		EAST	SOUTH	UNKNOWN	WEST	
No Vehicle #2	Other		1			1
	Overturn	1				1
EAST	Left Turn				34	34
	Rear End	27		1		28
	Right Angle		2	1		3
SOUTH	Rear End		14			14
	Right Angle	5			7	12
	Right Turn Sideswipe		2			2
UNKNOWN	Overtaking Sideswipe	1				1
	Rear End	3				3
	Right Angle	2	3			5
WEST	Left Turn	1				1
	Pedestrian/Bicycle	1			1	2
	Rear End				13	13
	Right Angle		8			8
Total		**41**	**30**	**2**	**55**	**128**

O'Malley Road at Seward Highway East (northbound) Ramp

Vehicle #2 Direction	Crash Type	Vehicle #1 (Presumed at-fault) Direction					Total
		EAST	NORTH	SOUTH	UNKNOWN	WEST	
EAST	Left Turn				1		1
	Overtaking Sideswipe	4					4
	Rear End	9					9
	Right Angle		3				3
NORTH	Double Left Sideswipe		1				1
	Rear End		2				2
	Right Angle	7				3	10
SOUTH	Rear End			1			1
UNKNOWN	Left Turn	2					2
	Rear End	1					1
	Right Angle					1	1
WEST	Left Turn	48			1		49
	Overtaking Sideswipe				1		1
	Rear End					13	13
	Right Angle		1				1
Total		**71**	**7**	**1**	**3**	**17**	**99**

Table 138 – 2003 to 2012 Crashes by Crash Type and Vehicle Direction

Planning Background

There are several projects in the MTP dealing with the proposed interchanges at the Old Seward Highway and at the Seward Highway: Project 139 (a reconnaissance study), Project 211 (first phases of construction), and Project 322 (to complete construction – unfunded/illustrative).

The interchange is part of the segment of O'Malley Road from the Seward Highway to Hane Street ranked 10th in 95th percentile highest moose crash areas from 2006 to 2010.

Alt TUV.1 – Roundabouts at Ramp Terminals (Including shifting O'Malley Road to the North)

Operations

A Vissim microsimulation model was created to study the effect of interchange roundabouts at the Seward Highway in proximity to the signal at Minnesota Drive and Old Seward Highway. The roundabout was designed iteratively and the final analysis was based on a double lane turbo roundabout which contained spiral movements forcing traffic in the inner ring to move outward as they pass the various approaches. This design reduces the number of conflict points within the roundabout and allows for more efficient operation.

The simulation analysis showed satisfactory operation for both the roundabouts and the Old Seward Highway signal through 2034. The spacing between the signal and the west ramp roundabout were adequate in the simulation runs to contain the queues which were developing both eastbound and westbound along the segment. However, 2034 PM peak hour volumes resulted in several situations where the queues in either direction spilled back enough to effect the speed of vehicles passing through both the roundabouts and the Old Seward signal, indicating that the roundabout solution would likely not provide satisfactory operation beyond 2034 without other options installed to provide alternative routes to reduce the traffic within this study area.

The simulation model included conditions with and without O'Malley Center Drive. In each of the model runs eastbound queues were frequently observed to backup beyond the O'Malley Center Drive left turn lane blocking the lane's ability to clear before the auxiliary lane backed up into the roundabout. Additionally, the roundabout created a steady flow of westbound traffic which made it more difficult for traffic maneuvering from the southbound ramp across O'Malley Road to enter the left turn lane into O'Malley Center Drive. Therefore, if roundabouts are constructed at the ramp intersections the design should include the removal of the westbound left turn onto O'Malley Center Drive.

Figure 83 presents a sketch of the layout of this option.

Safety

Targeted Crashes

Both the 2016 HSIP Handbook and the CMF Clearinghouse contain crash reduction factors which include a percentage of all intersection crashes as subject to mitigation through the construction of a roundabout in place of a traffic signal. There were a total of 128 crashes at the southbound Seward Highway off-ramp and 99 crashes at the northbound Seward Highway off-ramp that are subject to mitigation through the conversion of the traffic signals to multi-lane roundabouts.



Figure 83 – TUV.1 Roundabouts at Ramp Terminals (Including Shifting O'Malley Road to the North)

Potential Safety Benefit

The 2016 HSIP Handbook contains a reduction factor of 30% of ALL crashes for conversion of a traffic signal to a single lane roundabout. However, it does not contain a reduction factor for conversion to a multi-lane roundabout. The CMF Clearinghouse contains a crash reduction factor of 19% for the conversion of a traffic signal to a multi-lane roundabout. Using the 19% crash reduction for replacing a traffic signal with a multi-lane roundabout, a reduction of approximately 43 crashes can be expected during the 10-year study period.

Alt TUV.2 – Partial Interchange (with Roundabouts at Seward Highway Ramp Terminals. Includes shifting O'Malley Road to the North)

This option builds off of Alt TUV.1, adding construction of directional ramps from Minnesota Drive/O'Malley Road to the Seward Highway for the following movements:

- Eastbound left turn movements from Minnesota Drive to the Seward Highway.
- Eastbound right turn movements from Minnesota Drive to the Seward Highway
- Southbound right turn movements from the Seward Highway to Minnesota Drive.
- Northbound left turn movements from the Seward Highway to Minnesota Drive.

The directional ramps will carry traffic directly between the Seward Highway and Minnesota Drive, traveling under the Old Seward Highway. In this way, traffic volumes will be reduced at both the Seward Highway ramp intersections and at the Old Seward Highway intersection.

Operations

The Vissim analysis of Alt TUV.1 indicated that the volumes in the 2034 PM peak hour would likely be too large to have satisfactory operation in the segment between the Seward Highway ramp roundabouts and the signal at Minnesota Drive and Old Seward Highway. One method of improving the operation of this segment and extending the life of the design would be to install a partial interchange at the Seward Highway which uses the ROW north of O'Malley and Minnesota Drive to provide routes for traffic traveling to or from the Seward Highway and Minnesota Drive west of the Old Seward Highway. This would remove a large portion of the through movement demand westbound at the Old Seward Highway. However, the east and westbound left turn movements at the Old Seward Highway would not be reduced, but the operation of these movements would be improved by the extra availability of green time for these movements.

Figure 84 presents a sketch of the layout of this option.



Figure 84 – TUV.2 Partial Interchange (with Roundabouts at Seward Highway Terminals, Including Shifting O'Malley Road to the North)

Safety

The potential safety benefits of a roundabout interchange are discussed under Alternative TUV.1. This section looks at safety benefits of an at-grade intersection at Old Seward Highway, with grade-separated ramps for traffic directly accessing Minnesota Drive from the Seward Highway and vice versa.

Targeted Crashes

Crashes targeted by this improvement would be those involving eastbound and westbound vehicles destined for the Seward Highway that can now bypass the Old Seward Highway intersection. Generally, this includes rear end crashes involving eastbound vehicles and right angle crashes involving eastbound versus either northbound or southbound vehicles. The number of these crashes subject to a crash reduction was determined by the percentage of eastbound traffic entering the Seward Highway and the percentage of westbound traffic coming from the Seward Highway that would use the new separated ramps. A total of 39 eastbound and 50 westbound crashes involving the targeted crashes have occurred. Approximately 44% of the eastbound (17) and 40% of the westbound (20) crashes for a total of 37 crashes are subject to reduction by this improvement.

Potential Safety Benefit

The 2016 HSIP Handbook contains a formula for determining the reduction factor for constructing an interchange using FHWA Interchange Safety Analysis Tool (ISAT). The CMF Clearinghouse does contain several reduction factors for converting an at-grade intersection to an interchange. However, each of these methods determines a percentage of total intersection crashes that could be reduced through construction of an interchange. Under Targeted Crashes, we determined that the installation of the eastbound and westbound connector ramps between the Seward Highway and Minnesota Drive could help mitigate up to 37 crashes involving vehicles making the eastbound or westbound Seward Highway to Minnesota Drive movement at the Old Seward Highway and can reasonably assume that nearly 100% of these crashes would be mitigated during the 10-year study period. All remaining crashes would still be expected to occur at the at-grade intersection.

Removing the eastbound to north/south Seward Highway and the southbound left and northbound right to westbound Minnesota Drive through the construction of directional ramps will remove approximately 73 crashes from the roundabouts, based on annual average daily traffic volumes on the ramps. We determined that the installation of the directional ramps between the Seward Highway and Minnesota Drive could help mitigate up to 90% of crashes involving vehicles making the eastbound left turn or northbound left turn movement along with some of the southbound versus eastbound/westbound and northbound versus eastbound/westbound right angle crashes. Using the 90% reduction factor, up to 66 of these crashes would be mitigated during the 10-year study period.

Alt TUV.3 – Diverging Dimond Interchange with Old Seward Highway (with Roundabouts at Seward Highway Ramp Terminals. Includes shifting O'Malley Road to the North)

This option builds off of Alt TUV.1, adding construction of an interchange at the Old Seward Highway, allowing east-west traffic to cross the Old Seward Highway with no delay; however, this option does nothing to reduce traffic volumes at the Seward Highway ramp intersections.

Operations

A full diverging diamond intersection at Minnesota Drive and the Old Seward Highway would provide efficient use of the ROW available in the study area and would separate the conflicting north-south traffic from the east-west traffic at Minnesota Drive and Old Seward Highway. A diverging diamond would provide free movements east and west, and separate the north and south bound traffic and all of the turns into two signalized intersections on the north and south side of the interchange. These signals would operate with only two phases with all left and right turns directed to unsignalized merge ramps. Due to this design, there would be a much more efficient flow of traffic.

The proximity of the roundabout at the Seward Highway ramp intersections may result in eastbound queues that block the ramp exit. Further study would be required to determine the most favorable location for the eastbound ramp exit terminal, and the possibility of mitigating these queues with additional bypass lanes or right turn slip lanes at the Seward Highway roundabouts.

Figure 85 presents a sketch of the layout of this option.

Safety

The potential safety benefits of a roundabout interchange are discussed under Alternatives TUV.1. The following safety discussion concerns only the diverging diamond at the Old Seward Highway intersection.

A diverging diamond interchange with the Old Seward Highway passing over Minnesota Drive/O'Malley Road and containing the diverging diamond. Ramps would connect the Old Seward Highway to Minnesota Drive.

Targeted Crashes

Both the 2016 HSIP Handbook and the CMF Clearinghouse contain crash reduction factors which include a percentage of ALL intersection crashes as subject to mitigation through the construction of a grade-separated interchange. Since both of these approaches assume a percentage of all fatal and injury crashes are subject to mitigation as a result of the installation of a grade-separated interchange, all of the fatal and injury crashes are assumed to be targeted by this improvement. There were a total of 54 fatal or injury crashes at this intersection during the study period.

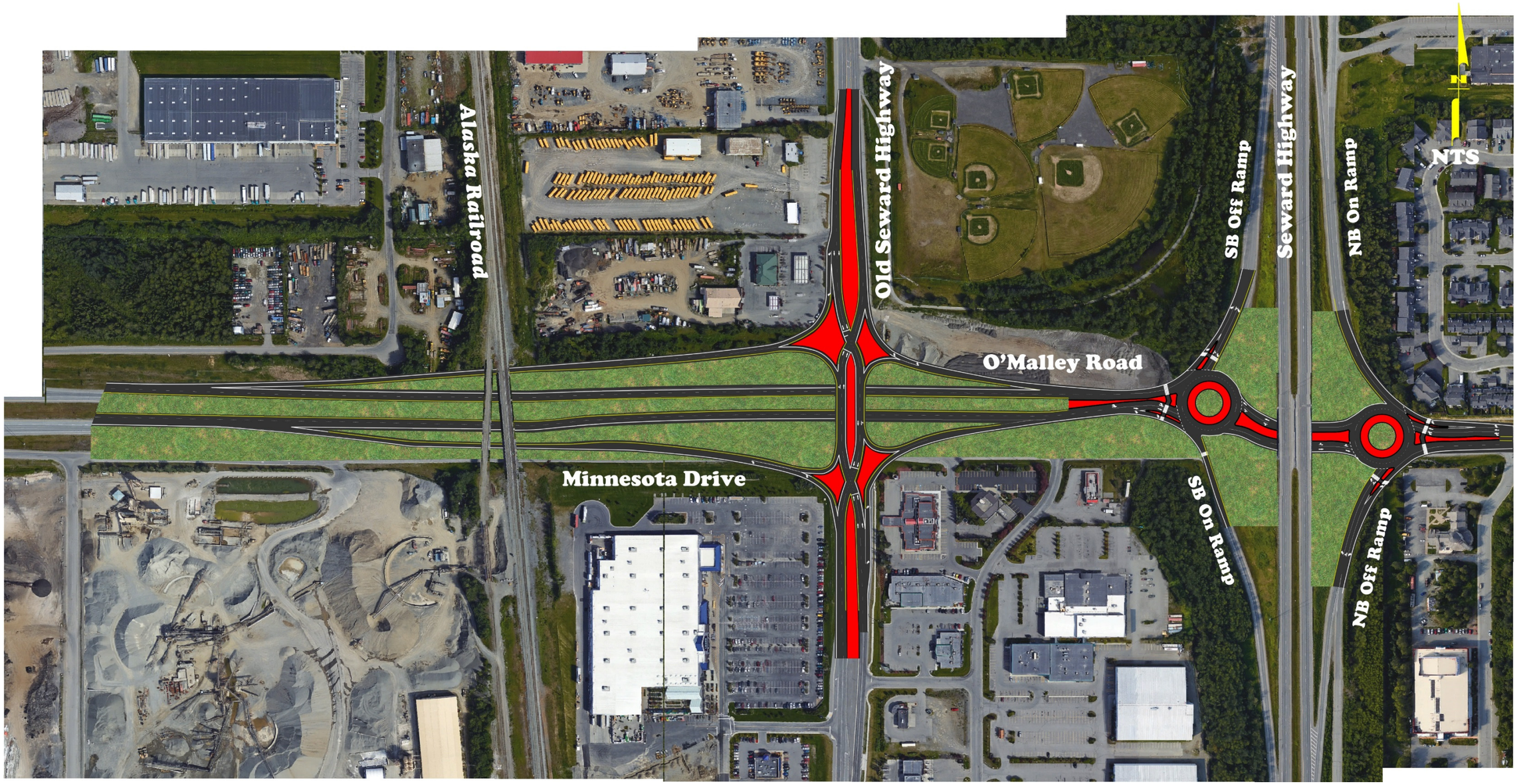


Figure 85 – TUV.3 Diverging Dimond Interchange with Old Seward Highway (with Roundabouts at Seward Highway Ramp Terminals, including Shifting O'Malley Road)

Potential Safety Benefit

The 2016 HSIP Handbook contains a formula for determining the reduction factor for constructing an interchange using FHWA Interchange Safety Analysis Tool (ISAT). The CMF Clearinghouse does contain several reduction factors for converting an at-grade intersection to an interchange. Using the CMF Clearinghouse, 57% for all fatal and injury crashes, a reduction of 31 crashes can be expected during the 10-year study period.

Cost Estimates

Phase	Alternative TUV.1	Alternative TUV.2	Alternative TUV.3
Design	$942,000	$2,302,000	$1,831,000
Right-of-Way	$0	$0	$0
Utilities	$105,000	$785,000	$706,000
Construction	$18,661,000	$84,645,000	$36,114,000
Contract Administration (20% of construction costs)	$3,732,000	$16,929,000	$7,223,000
Contingency (20%)	$4,688,000	$20,932,000	$9,175,000
Total	**$28,128,000**	**$125,593,000**	**$55,049,000**

Comparison of Alternatives

Because both the Seward Highway and Minnesota Drive have segments of high-capacity freeway, the projected traffic volume traveling between the roadways is very high, which will eventually overload the existing at-grade intersections. Three alternatives for improving the connection between the Seward Highway and Minnesota Drive were considered using a planning-level analysis. The first alternative, roundabouts at the Seward Highway interchange, is a short-term solution that would address the existing eastbound and westbound left turn crash pattern and improve vehicle flow. The other two alternatives would each build off of the first alternative to provide longer term solutions, but they are mutually exclusive (only one of them could be built). This is because of the close proximity of the Old Seward Highway to the Seward Highway (

While alternative TUV.3 (an interchange at the Old Seward Highway) costs much less than TUV.2 (directional ramps that bypass the Old Seward Highway), only the directional ramps will remove traffic from the Seward Highway ramp intersections. Thus, TUV.2 is the only one of these options that will fully accommodate the expected future demand.

Table 139 compares these alternatives.

	TUV.1 Roundabouts at Seward Hwy & Shift O'Malley Dr	**TUV.2 Roundabouts at Seward Hwy, Shift O'Malley Dr, & Directional Ramps**	**TUV.3 Roundabouts at Seward Hwy & Diverging Diamond at Old Seward**
Existing and Future Operations	Works well in short term, but begins to fail by 2035 as roundabouts and Old Seward Highway signal try to carry all traffic between interchanges	Works well long term, as heavy movements between interchanges are removed from surface streets	Old Seward Hwy interchange works well long term; however, roundabouts at Seward Hwy ramps still carry all traffic between interchanges and will likely fail
Crash Reductions	43 crashes out of 227 total at both ramp intersections	37 crashes out of 89 traveling east- and westbound at Old Seward Highway 66 crashes out of 73 left turn crashes at Seward Highway ramps	31 fatal and injury crashes due to interchange at Old Seward Highway, plus 43 crashes at roundabouts.
Cost	$28,128,000	$125,593,000	$55,049,000

Table 139 – Comparison of Alternatives for Connection between Seward Highway and Minnesota Drive

References

Interim 2035 Metropolitan Transportation Plan, Municipality of Anchorage, Anchorage Metropolitan Area Transportation Solutions, November 2015.

Official Streets and Highways Plan, Municipality of Anchorage, June 2014.

Anchorage Bicycle Plan, Anchorage Metropolitan Area Transportation Solutions, March 2010.

Anchorage Pedestrian Plan, Anchorage Metropolitan Area Transportation Solutions, October 2007.

Freight Mobility Study, Anchorage Metropolitan Area Transportation Solutions, June 2001.

West Anchorage District Plan, Municipality of Anchorage, July 2012.

Highway Capacity Software, McTrans.

Capacity Analysis Techniques for Design and Operation of Freeway Facilities, FHWA, 1974.

Vissim Software, PTV Vision.

NCHRP Report 687, Guidelines for Ramp and Interchange Spacing, Transportation Research Board, 2011.

Highway Safety Improvement Program Handbook, DOT&PF, 2016.

Highway Safety Manual, AASHTO, 2010.

Crash Modification Factors Clearinghouse, http://www.cmfclearinghouse.org/ FWHA.

Appendix A: Summary of Locations and Alternatives

This study identified existing safety and operational concerns for 22 segments, intersections, and interchanges on Minnesota Drive from Westchester Lagoon to the Seward Highway and examined potential alternatives to mitigate the identified concerns. The following list summarizes the alternatives that were considered at each location and briefly describes next steps.

A. Southbound Ramp from Minnesota Drive to Hillcrest Drive

Alternative Considered	**Proposed Action**
A.1 Lengthen Minnesota Drive Off-Ramp	Not recommended
A.2 Add Additional Approach Lane at Hillcrest Drive	No Action by DOT&PF. Municipality of Anchorage to determine whether or not to address school traffic congestion.
A.3 Roundabout at Hillcrest Drive	No Action by DOT&PF. Municipality of Anchorage to determine whether or not to address school traffic congestion.
A.4 All-Way Stop Control at Hillcrest Drive	Not recommended

B. 26th Avenue at Minnesota Drive Intersection

Alternative Considered	**Proposed Action**
B.1 Separated Grade Pedestrian Crossing	No immediate action
B.2 Lengthen Northbound Left-Turn Lane	Scope for possible inclusion in existing pavement rehabilitation project
B.3 Install Express Lanes Hillcrest Drive through Tudor Road	Costs for this alternative (sometimes known as Cut and Cover) are similar to costs for the Highway-to-Highway project connecting the Seward Highway and the Glenn Highway at about $900 million. Not considered further at this time.

C. Minnesota Drive from 26th Avenue to Northern Lights Boulevard

Alternative Considered	**Proposed Action**
C.1 Improve Pedestrian and Bicycle Facilities on East Side	Coordinate with Municipality's 27th Avenue study

D. Northern Lights Boulevard/Benson Boulevard Couplet

Alternative Considered	**Proposed Action**
D.1 Improve Lighting	HSIP project
D.2 Redistribute Storage for Northbound and Southbound Left Turn Lanes	Prepare cost estimate for inclusion in next TIP or NHS rankings
D.3 Widen Minnesota Drive to Create Parallel Left Turn Lanes	
D.4 Completing Pedestrian Crosswalks at Signals	
D.5 Relocation of One Leg of Couplet to Alternative Corridor	Not considered further

E. Segment of Minnesota Drive from Benson Boulevard to Spenard Road

Alternative Considered	**Proposed Action**
E.1 Extend Auxiliary Turn Lanes	Scope for possible inclusion in existing pavement rehabilitation project
E.2 Clarify Use of Southbound U-turn Lane	Not considered further

F. Spenard Road at Minnesota Drive Intersection

Alternative Considered	**Proposed Action**
F.1 One Way Couplet with 36th Avenue (East of Minnesota Drive Only)	Prepare more detailed cost estimate
F.2 One Way Couplet with 36th Avenue East and West of Minnesota Drive	Not considered further
F.3 Lengthen Minnesota Drive Left-Turn Lanes	Prepare more detailed cost estimate (with F.5)
F.4 Reconfigure Spenard Road Approaches to Eliminate Split Phasing	Prepare more detailed cost estimate
F.5 Add Southbound Right-Turn Lane	Prepare more detailed cost estimate (with F.3)
F.6 Develop Strategies to Encourage Airport Traffic to Use International Airport Road	Not considered further

G. Segment of Minnesota Drive from Spenard Road to Tudor Road

No alternatives considered at this location.

H. Tudor Road at Minnesota Drive Intersection

Alternative Considered	Proposed Action
H.1 Westbound Left-Turn Fly Over Ramp	No action. Costs are not balanced by possible benefits
H.2 Triple Westbound Left-Turn Lanes	
H.3 Reconfigure Approaches and Eliminate Split Phasing	
H.4 Add Southbound Right-Turn Lane	
H.5 Add Active Warning Flashers on Northbound Minnesota Drive	Not recommended

I. Segment of Minnesota Drive from Tudor Road to International Airport Road

No alternatives considered at this location.

J. International Airport Road at Minnesota Drive Interchange

Alternative Considered	Proposed Action
J.1 Reconfigure Interchange	Needs more analysis to find good balance between modes
J.2 Add Dilemma Zone Detection	Dilemma zone detection is already present
J.3 Improve Wayfinding for Existing Pedestrian/ Bicycle Pathway	Needs more analysis to find good balance between modes
J.4 Improve Exit Sign for Southbound Minnesota Drive Off-ramp	Part of HSIP Sign Inventory Upgrades project
J.5 Tighten Radii at Ramps to Better Accommodate Non-motorized Traffic	Needs more analysis to find good balance between modes
J.6 Extend 3 Lanes Westbound Past Northwood Drive to Spenard Road	Not considered further

K. Segment of Minnesota Drive from International Airport Road to Raspberry Road

Alternative Considered	Proposed Action
K.1 Install Southbound Weaving Lane from International Airport Road to Raspberry Road	
K.2 Construct Dual lane Off-Ramp for Northbound Minnesota Drive to International Airport Road	Prepare cost estimate for inclusion in next TIP or NHS rankings

L. Raspberry Road at Minnesota Drive Interchange

Alternative Considered	Proposed Action
L.1 Tighten Radii at Ramps to Better Accommodate Non-motorized Traffic	Reassess after completion of current construction project, which includes bike lane

M. Segment of Minnesota Drive form Raspberry Road to Dimond Boulevard

Alternative Considered	**Proposed Action**
M.1 Extend Dimond Southbound Off-Ramp to the North	
M.2 Enhance Guide Signs for Southbound Minnesota Drive Off-Ramp to Dimond Boulevard	Possible HSIP
M.3 Extend 3-Lanes on Southbound Minnesota Drive Beyond Dimond Boulevard	Not considered further
M.4 Construct Dual-Lane On-Ramp from Dimond Boulevard to Northbound Minnesota Drive	Prepare more detailed cost estimate

N. Dimond Boulevard at Minnesota Drive Interchange

Alternative Considered	**Proposed Action**
N.1 Improve Sight Distance for Double Southbound Right-Turn Lane	Scope with project to resurface ramps

O. Segment of Minnesota Drive from Dimond Boulevard to 100th Avenue

Alternative Considered	**Proposed Action**
O.1 Swap Dimond On-Ramp and 100th Avenue Off-Ramp Southbound	Not considered further due to impacts to residences along frontage road
O.2 Add Northbound Minnesota Drive Off-Ramp to Dimond Boulevard	Not considered further due to weaving impacts

P. 100th Avenue at Minnesota Drive Interchange

No alternatives considered at this location. Improvements to the interchange ramp intersections are expected with future improvements to 100th Avenue.

Q. Segment of Minnesota Drive from 100th Avenue to C Street

No alternatives considered at this location.

R. C Street at Minnesota Drive Interchange

No alternatives considered at this location.

S. Segment of Minnesota Drive from C Street to Old Seward Highway

Alternative Considered	**Proposed Action**
S.1 Extend Multi-Use Pathway between C Street and the Old Seward Highway	Not considered further
Reconfigure south frontage road to accommodate two-way traffic from AS&G	Work with Municipality to obtain right-of-way for Peninsula Circle

T. Old Seward Highway at Minnesota Drive Intersection

U. Segment of O'Malley Road from Old Seward Highway to Seward Highway

V. Seward Highway at O'Malley Road Interchange

Alternative Considered	**Proposed Action**
TUV.1 Roundabouts at Ramp Terminals	To be developed further by consultant selected for O'Malley/Seward Highway interchange
TUV.2 Partial Interchange	
TUV.3 Diverging Diamond Interchange with Old Seward Highway	

Appendix B: Qualitative Study

AMATS: Minnesota Drive Study-Westchester Lagoon to Seward Highway

PROJECT NUMBER: Z587580000/0421(097)

QUALITATIVE STUDY



August 2015

Prepared for the Alaska Department of Transportation and Public Facilities

Prepared by Kinney Engineering, LLC

KINNEY
ENGINEERING, LLC

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Abbreviations

AADT	Average Annual Daily Traffic (vehicles per day)
ADOT&PF	Alaska Department of Transportation and Public Facilities
HCS	Highway Capacity Software
HSIP	Highway Safety Improvement Program
KE	Kinney Engineering, LLC
LOS	level of service
MOA	Municipality of Anchorage
MTP	2035 Metropolitan Transportation Plan
ROW	Right of way
UCL	Upper Control Limit (for statistical crash rate analysis)
v/c	volume-to-capacity ratio
vphpl	vehicles per hour per lane

Overview

Alaska Department of Transportation and Public Facilities (ADOT&PF) has retained Kinney Engineering, LLC (KE) to complete a Reconnaissance Engineering Study of the Minnesota Drive corridor from Westchester Lagoon to the Seward Highway interchange with O'Malley Road. Figure 1 shows the study area. This report takes a qualitative look at the entire corridor – identifying locations with operational and safety concerns and presenting a range of alternatives for addressing those concerns. Using the information presented in this report, ADOT&PF will identify a set of alternatives for further study and KE will prepare a Reconnaissance Engineering Study with a more quantitative analysis of these advanced alternatives.

Operations

Sketch planning tools were used to estimate volume-to-capacity ratios (v/c) for intersections and segments. For signalized intersections, it was assumed that right turn capacity is about 300 vehicles per hour per lane (vphpl), left turning lane capacity is about 250 vphpl, and through lane capacity is about 600 vphpl. For segments, the generalized tables linking annual average daily traffic (AADT) with level of service (LOS) were used. At unsignalized intersections (including roundabouts), the most recent turning movement counts were loaded into the Highway Capacity Software (HCS).

Safety

Crashes on the Minnesota Drive corridor, on all of the interchange ramps, and on the side streets in the vicinity of Minnesota Drive were collected for the years 2003 through 2012. These crashes were coded to segments, intersections, and interchanges. Volumes for these years were collected from the ADOT&PF Volume Reports or estimated and then used to calculate crash rates, which were compared to statewide crash rates for similar segments or intersections. (Note: in the case of interchange ramps, no state-wide rate is available; therefore, the average crash rate of the Minnesota Drive ramps was used in place of a state-wide rate.)

Evaluation of Alternatives

The same sketch planning tools were used to estimate v/c for alternatives that have an effect on operations. Future year traffic volumes were developed with a simple 1% annual growth rate. To determine safety effects, crash modification factors (CMFs) were collected from the Highway Safety Improvement Program Handbook or from the CMF Clearinghouse webpage. Cost estimates were initially best guess and then were validated using a conceptual plan cost estimate spreadsheet that KE uses for estimating costs of conceptual designs. Operations and maintenance costs were estimated using the costs published in the HSIP Handbook.

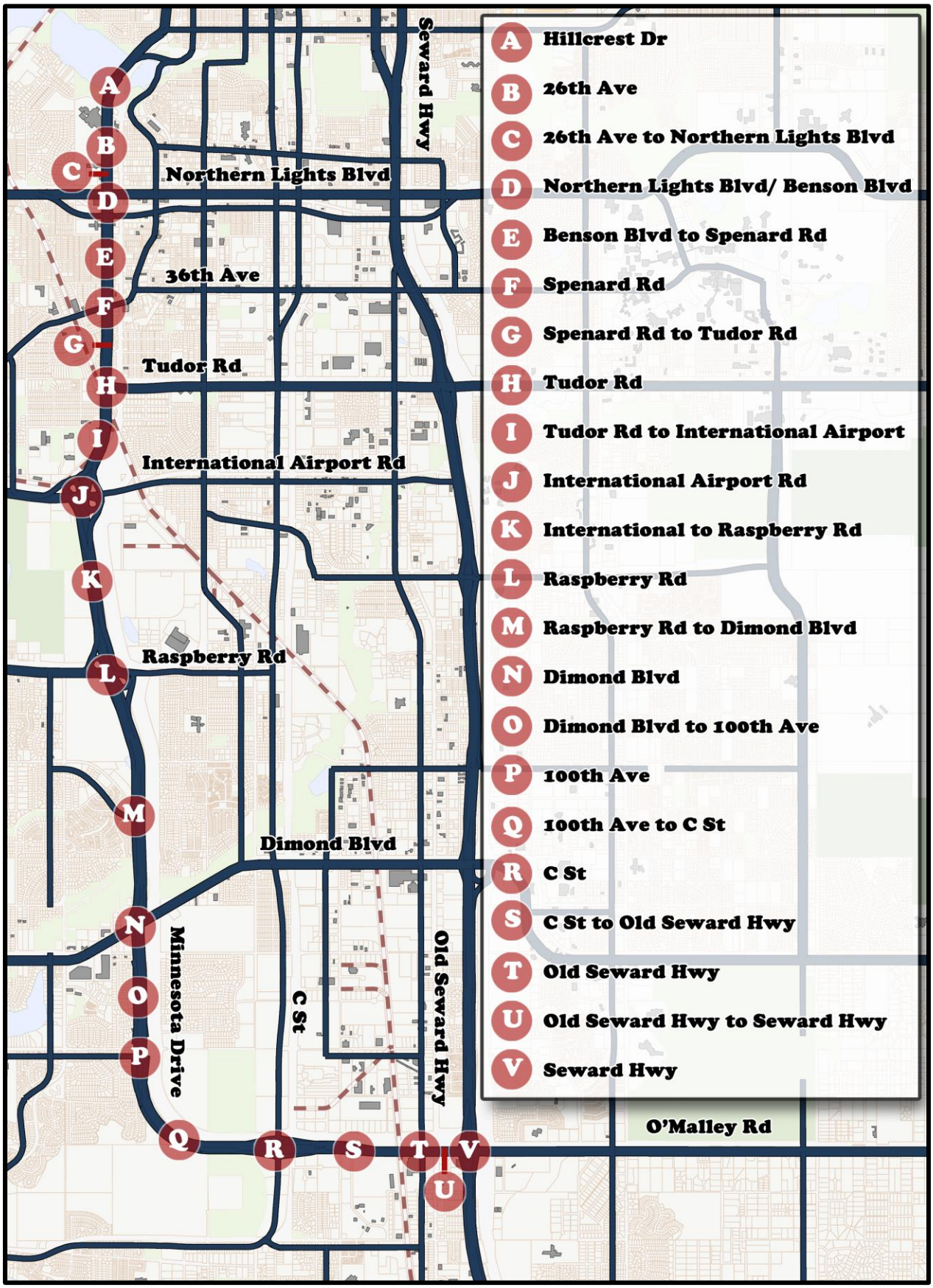


Figure 1 – Minnesota Drive Reconnaissance Study Area

A. Southbound Ramp from Minnesota Drive to Hillcrest Drive

The Minnesota Drive southbound exit ramp to Hillcrest Drive shown in Figure 2 is approximately 1,600 feet in length from the fully developed lane to the stop bar at Hillcrest Drive. The ramp intersection at Hillcrest Drive is a stop-controlled T-intersection (with stop control on the ramp) and the ramp approach has a single shared left-and-right turn lane. The ramp flares at the intersection, allowing for a right turning vehicle to sit side by side with a left turning vehicle, but there is only width for a single queue of traffic.

The main concerns identified at this location are:

- Capacity at ramp intersection for vehicles on ramp
- Queuing on ramp during peak school periods

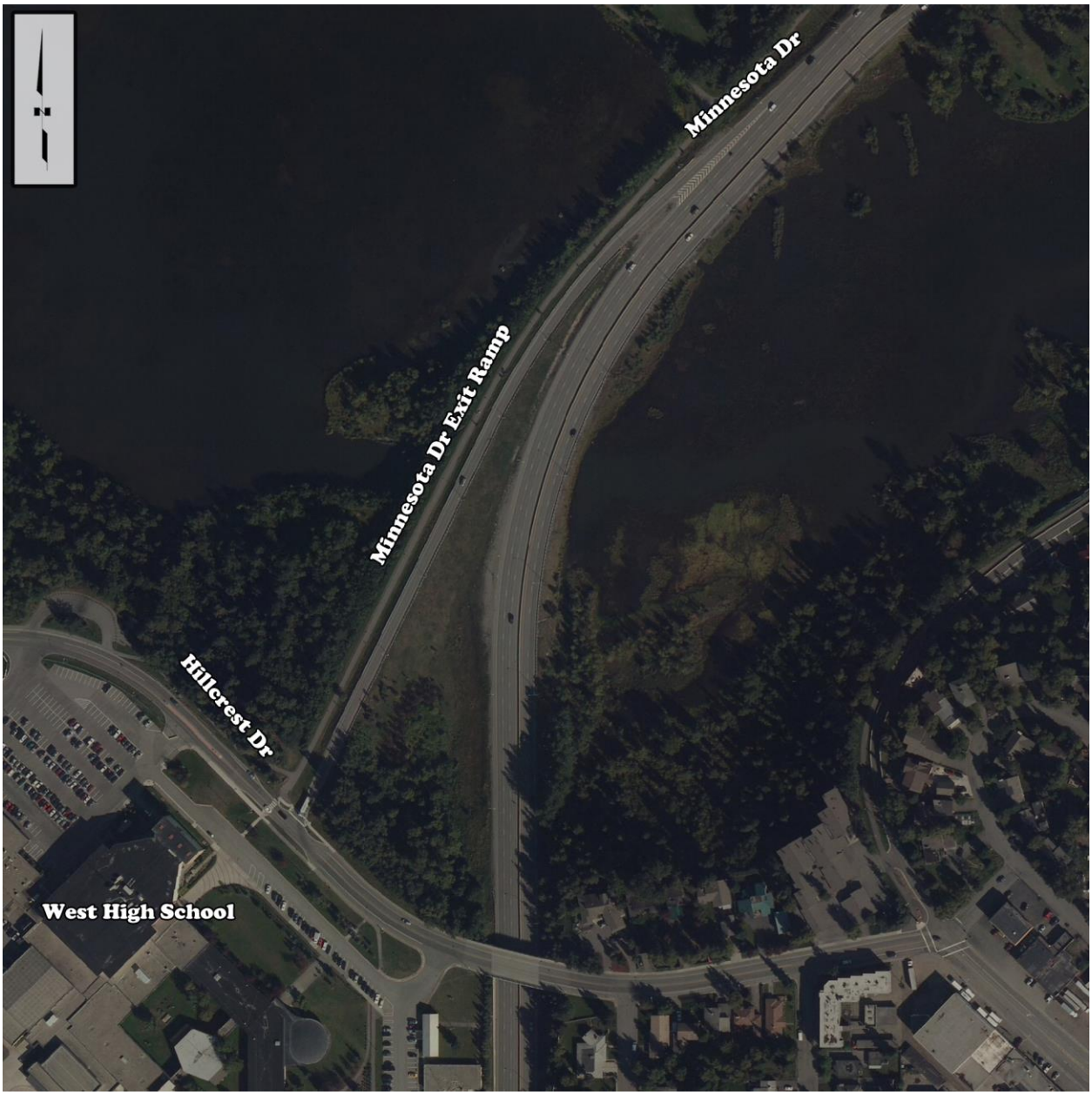


Figure 2 – Southbound Minnesota Drive Ramp to Hillcrest Drive

Operations

Traffic backs up on the ramp during peak periods (school arrival, evening peak), especially when the southbound left turn demand is higher, as right turn vehicles must queue behind left turning vehicles.

Safety

Both the southbound Minnesota Drive ramp to Hillcrest Drive and the ramp intersection at Hillcrest Drive have average total crash rates. The predominant crash types are ran-off-road and rear end crashes.

Location	Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
Southbound Minnesota Ramp-Hillcrest Drive Intersection	11	0.524	0.336	0.568
Southbound Minnesota to Hillcrest Ramp	3	1.508	1.127	2.616

Table 1 – Crash Rates for Southbound Minnesota Ramp to Hillcrest Drive

Crash Type	Crash Frequency
Ran-off-road	6
Rear End	4
Right Angle	3
Head On Sideswipe	1
Grand Total	*14*

Table 2 – Crash Types for Southbound Minnesota Ramp to Hillcrest Drive

Non-Incapacitating/Possible Injury	Property Damage Only
3	11

Table 3 – Crash Severity for Southbound Minnesota Ramp to Hillcrest Drive

Appearance in Metropolitan Transportation Plan or Area Plans

The 2010 West Romig Master Plan shows a school driveway entrance forming a fourth leg at the ramp intersection and signal control at the intersection.

Bike or Pedestrian Plan

The Anchorage Pedestrian Plan identified a crossing project for the location. The project, listed as Priority Project 109, would make pedestrian crossing improvements at the Minnesota Southbound Ramp-Hillcrest Drive intersection and two other intersections on Hillcrest Drive.

Moose Crash Ranking

The segment is not found in the Moose Crash Ranking sheet.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

Alt A.1 – Lengthen Minnesota Drive Off-Ramp

This alternative would extend the Minnesota Drive southbound off-ramp up to a maximum of 500 additional feet for a total of over 2,000 feet. The additional ramp length would reduce the risk of ramp queues spilling back from the Hillcrest Drive intersection, particularly during the heavy AM peak.

KE found very limited volume counts at the Hillcrest Drive ramp intersection. Further analysis of the need for this alternative would require acquisition of turning movement counts.

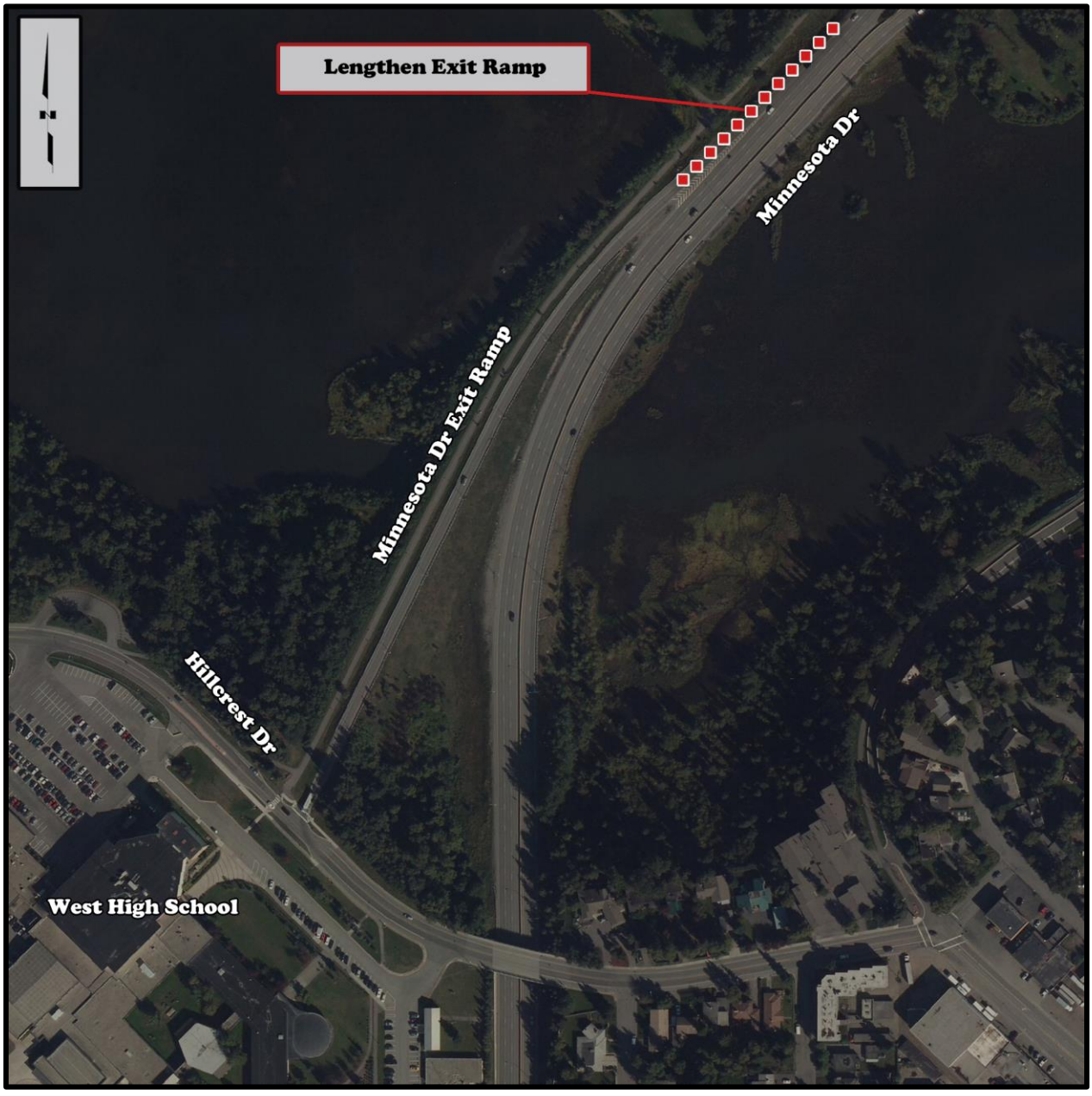


Figure 3 – Lengthen Minnesota Drive Off-Ramp at Hillcrest Drive

Concerns Addressed:	This solution would provide queue storage, but does not increase capacity at the Hillcrest Drive intersection.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Provides additional storage to prevent spill back of queued vehicles onto Minnesota Drive.
Disadvantages:	Requires construction and ROW acquisition in Westchester Lagoon wetlands area.
Delivery Timeframe:	Medium (5-10 years)
Year of breakdown:	Beyond 20 years
Cost Range:	$1,000,000 to $2,500,000
Operating and Maintenance Costs:	$30,000 over 15-year life span
ADOT&PF Staffing Needs:	No staffing increase

Alt A.2 – Add Additional Approach Lane at Hillcrest Drive

This alternative would widen the southbound approach to Hillcrest Drive and separate the left and right turning traffic. The auxiliary lane length would be approximately 400 feet or more, separating left turn traffic and right turn traffic, increasing the efficiency of the intersection and decreasing queue length.

KE found very limited volume counts at the Hillcrest Drive ramp intersection. Further analysis of the need for this alternative would require acquisition of turning movement counts.

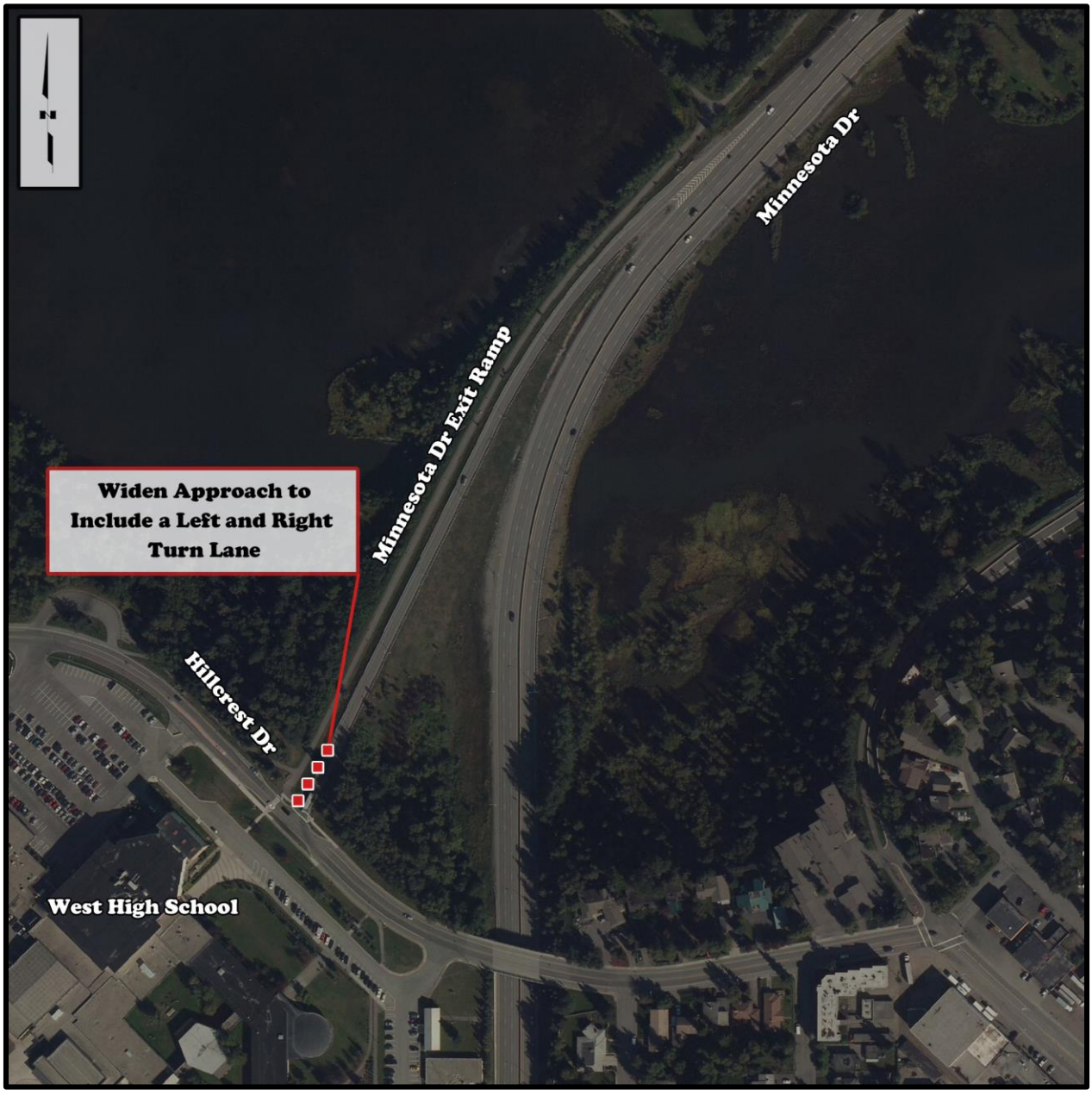


Figure 4 – Add Auxiliary Lane at Hillcrest Drive

Concerns Addressed:	This alternative decreases delay and decreases queue lengths.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Increases storage for queued vehicles. Decreases delay for ramp vehicles at the Hillcrest Intersection. No apparent ROW, Utility, or Environmental impacts.
Disadvantages:	Does not address congestion on Hillcrest Drive due to school traffic.
Delivery Timeframe:	Short (1-4 years)
Year of breakdown:	Beyond 20 years
Cost Range:	$1,000,000 to $2,500,000
Operating and Maintenance Costs:	$35,000 over 20-year life span
ADOT&PF Staffing Needs:	No staffing increase

B. 26th Avenue at Minnesota Drive Intersection

At 26th Avenue, a signal serves traffic from Romig Middle school on the west and the residential area on the east, as well as providing protection for pedestrian crossings between the residential area and Romig Middle and West High Schools, as shown in Figure 5. A school speed zone extends about 400 feet to either side of the 26th Avenue intersection, reducing the speed limit from 45 mph to 20 mph during school arrival, lunch, and dismissal periods. The flashers are active from 7:00 to 8:25AM during the arrival period. The lunch period flashers are active 10:15 to 11:10 during normal operations, 10:15AM to 12:15PM and 10:50AM to 12:15PM during parent-teacher conferences. The dismissal period flashers are active 1:50 to 3:15PM during normal operations and 1:50 to 2:30PM during parent-teacher conferences.

The main concerns identified at this location are:

- Northbound and southbound capacity (a concern from 26th Avenue to Tudor Road)
- School speed zone exacerbates capacity delay in morning peak
- Queuing in northbound left turn lane

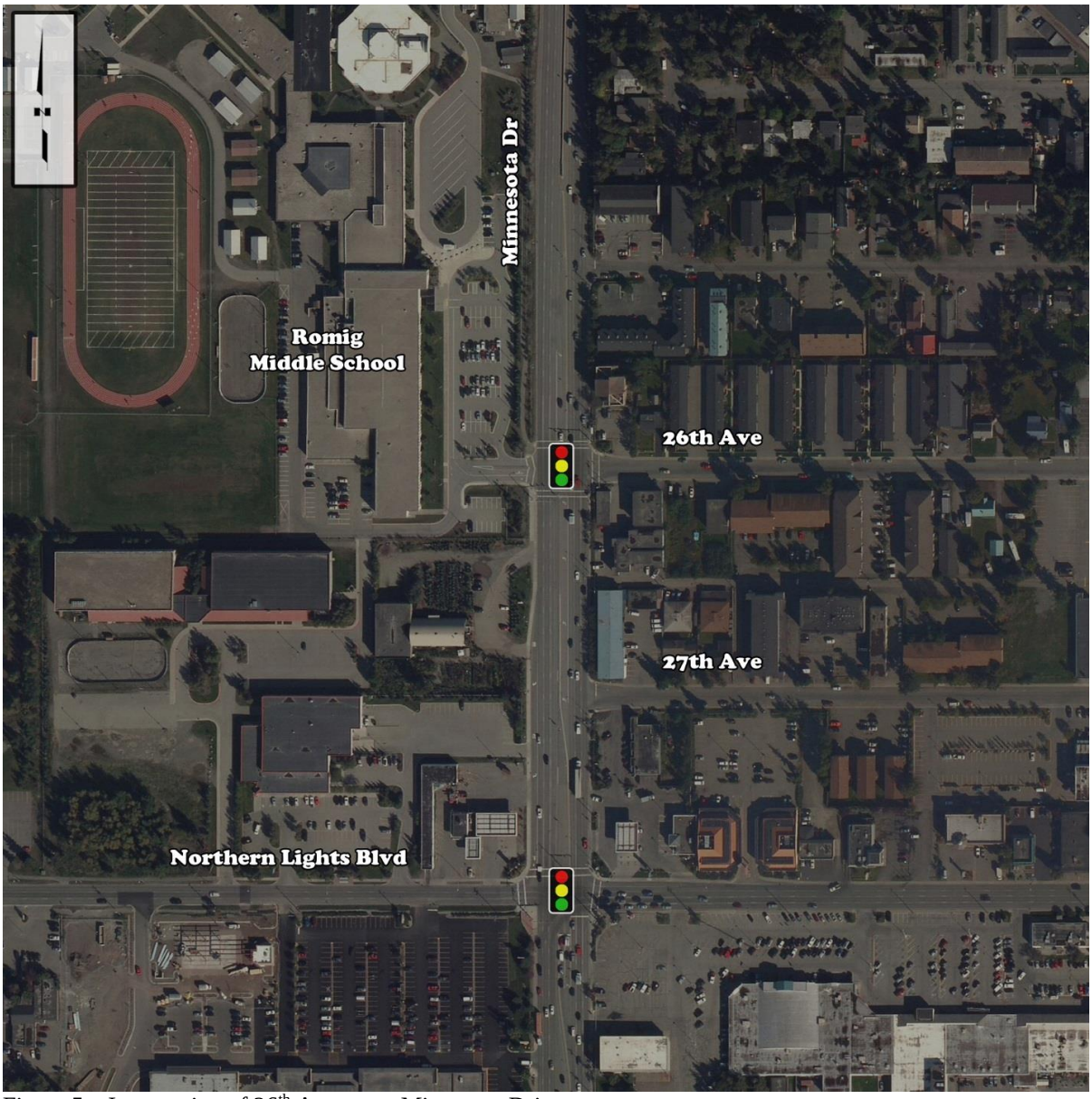


Figure 5 – Intersection of 26th Avenue at Minnesota Drive

Operations

The intersection is a four way intersection with a protected northbound left turn phase. Based on counts taken on January 15, 2015 by ADOT&PF, the northbound through and auxiliary lanes at this intersection are at or above capacity in the AM peak and the southbound through and right turn lanes are at or above capacity in the PM peak. During high demand periods at the middle school, left turn queues are sometimes longer than the northbound left turn lane.

Safety

This intersection has a below-average total crash rate. The predominant crash types are rear end/sideswipes.

There were 3 pedestrian crashes and at the intersection during the study period. 2 of these crashes were with pedestrians crossing the street. There was also 1 bicycle crash involving a 14 year old bicyclist. The crashes did not occur during school hours.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
48	0.366	1.415	1.590

Table 4 – Crash Rate for 26th Avenue at Minnesota Drive

Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	29
Left Turn / U Turns	7
Right Angle	6
Pedestrian / Bicycle	4
Ran-off-road	2
Parked	1
Grand Total	*49*

Table 5 – Crash Types for 26th Avenue at Minnesota Drive

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
3	19	27

Table 6 – Crash Severity for 26th Avenue at Minnesota Drive

Appearance in Metropolitan Transportation Plan or Area Plans

The intersection appears in Project 316 in the 2035 Metropolitan Transportation Plan (MTP) as an unfunded illustrative project to rehabilitate and add another lane to the northbound segment of Minnesota Drive from 26th Avenue to 15th Avenue. This intersection may also play a role in Projects 506 and 545 that will consider construction of a bicycle boulevard along 27th Avenue and make pedestrian improvements as well. The 2010 West Romig Master Plan would create alternative access to the school to help relieve peak period congestion at this intersection.

Bike or Pedestrian Plan

The intersection appears in the West Anchorage District Plan. The plan recommends adding a new pedestrian facility from Romig Middle School to Spenard Road.

Moose Crash Ranking

The intersection is not found in the Moose Crash Ranking sheet.

Pedestrian Crash Ranking

The intersection is not found in the Pedestrian Crash Ranking sheet.

Alt B.1 – Separated Grade Pedestrian Crossing

This alternative would install a separated grade crossing for pedestrians and fencing to funnel pedestrians and bicyclists to use the crossing. It was suggested as a means of removing the school speed zone.



Figure 6 – Construct Separated Pedestrian Crossing

Concerns Addressed:	This alternative would provide a protected pedestrian pathway to the school, but it would not necessarily eliminate the speed zone, as it would be difficult to prevent pedestrians from crossing at 26th Avenue.
Conformance to Plans:	This alternative would require coordination with the MOA study on 27th Avenue for pedestrian and bicycle improvements.
Advantages:	Provides a protected crossing for pedestrians (including school children) across Minnesota Drive.
Disadvantages:	Pedestrians come to the intersection from multiple directions, making it difficult to develop a design that funnels pedestrian and bicycle traffic to an overcrossing. High cost, significant ROW, utility, and environmental impacts
Delivery Timeframe:	Medium (5-10 years)
Year of breakdown:	Not applicable
Cost Range:	$2,500,000 to $5,000,000
Operating and Maintenance Costs:	$25,000 over 30-year life span
ADOT&PF Staffing Needs:	To be estimated by ADOT&PF

Alt B.2 – Lengthen Northbound Left-Turn Lane

This alternative would extend the Minnesota Drive northbound left-turn lane from its current length of 350 feet to a full 400 feet, which is the maximum recommended length for auxiliary lanes. The additional length would provide extra storage for vehicles in the left-turn queue as well as additional deceleration area outside of the through lanes on Minnesota.



Figure 7 – Lengthen Northbound Left Turn Lane

Concerns Addressed:	This would reduce the likelihood of vehicle queues extending out of the turn lane during peaks in traffic accessing the school, providing minor safety and operational improvements.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Increases queue storage for vehicles accessing the school during high demand periods
Disadvantages:	Does not address demand or capacity issues at the school that are the cause of the long queues. Reduces the median refuge for any 27th non-motorized traffic.
Delivery Timeframe:	Short (1 to 4 years)
Year of breakdown:	Not applicable. Left turn traffic due to school is not expected to increase over time.
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$15,000 over 20-year life span
ADOT&PF Staffing Needs:	To be estimated by ADOT&PF

Alt B.3 – Install Express Lanes Hillcrest Drive through Tudor Road

This alternative would expand Minnesota Drive to include express lanes that would carry non-stop traffic through the mid-town area from Hillcrest Drive through Tudor Road. To decrease impacts to existing land uses, the express lanes would likely be built under the existing roadway (sometimes known as a Cut and Cover).



Figure 8 – Install Express Lanes

Concerns Addressed:	Increases the through-vehicle capacity on Minnesota Drive to meet the existing capacity in the fully access-controlled segments to the south.
Conformance to Plans:	This alternative would address need identified in the unfunded illustrative Project 316 in the 2035 MTP.
Advantages:	Increases through-vehicle capacity on Minnesota Drive without negatively affecting cross streets motorized and non-motorized traffic.
Disadvantages:	Significant impacts to existing land uses in the corridor. Very high cost.
Delivery Timeframe:	Long (11 – 20 years)
Year of breakdown:	Beyond 20 years
Cost Range:	over $50,000,000
Operating and Maintenance Costs:	$1,000,000 over 20-year life
ADOT&PF Staffing Needs:	Significant maintenance increase

C. Minnesota Drive from 26th Avenue to Northern Lights Boulevard

Minnesota Drive between 26th Avenue and Northern Lights Boulevard is a six lane highway with a raised median. The segment has two driveways on the west side of Minnesota and three on the east (including 27th Avenue).

The main concerns identified at this location are:

- Pedestrian/bicycle connections to connect improvements proposed for 27th Avenue to existing pathways.



Figure 9 – Minnesota Drive from 26th Avenue to Northern Lights Boulevard

Operations

Based on AADT (shown in Table 7), Minnesota Drive from Hillcrest Drive to Northern Lights Boulevard has an approximate LOS of C.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	33230	33000	32210	32430	31010	30630	40906	36990	36857	36809

Table 7 – AADT from Northern Lights Boulevard to Hillcrest Overpass

Safety

The segment has a higher-than-average total crash rate, which is likely related to the shortness of the segment between two signalized intersections. The majority of crashes on this segment are rear ends or sideswipes – probably related to vehicles turning at the driveways and at 27th Avenue.

There was 1 bicycle crash that occurred at the 27th Avenue-Minnesota Drive intersection involving a bicyclist crossing 27th Avenue and a passenger car entering Minnesota Drive.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
30	6.074	1.513	2.525

Table 8 – Crash Rate for Minnesota Drive from 26th Avenue to Northern Lights Boulevard

Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	22
Parked	4
Right Angle	4
Ran-off-road	3
Pedestrian / Bicycle	1
Grand Total	*34*

Table 9 – Crash Types for Minnesota Drive from 26th Avenue to Northern Lights Boulevard

Non-Incapacitating/Possible Injury	Property Damage Only
8	26

Table 10 – Crash Severity for Minnesota Drive from 26th Avenue to Northern Lights Boulevard

Appearance in Metropolitan Transportation Plan or Area Plans

See discussion under Bike or Pedestrian Plan.

Bike or Pedestrian Plan

Projects 506 and 545 in the MTP are short-term projects to improve pedestrian and bicycle facilities on 27th Avenue. The MOA is currently conducting a study on 27th Avenue to look at bicycle and pedestrian improvements for the 27th Avenue route.

Moose Crash Ranking

The intersection is not found in the Moose Crash Ranking sheet.

Pedestrian Crash Ranking

The intersection is not found in the Pedestrian Crash Ranking sheet.

Alt C.1 – Improve Pedestrian and Bicycle Facilities on East Side

This alternative would connect the planned pedestrian and bicycle facilities on 27th Avenue to the signalized intersections at 26th Avenue and at Northern Lights Boulevard, connecting to the pathways on the west side of these intersections. Currently, there is a narrow 5-foot sidewalk on the east side of Minnesota Drive.



Figure 10 – Construct Multi-Use Trail on East Side of Minnesota Boulevard

Concerns Addressed:	Completes the connections between the proposed 27th Avenue pedestrian and bicycle improvements and the multi-use trails that connect on the west side of Minnesota at 26th Avenue and at Northern Lights Boulevard.
Conformance to Plans:	This alternative supports the pedestrian and bicycle improvements to 27th Avenue proposed in the MTP.
Advantages:	Supports pedestrian and bicycle connections in midtown area. Encourages use of the signalized intersections for crossing Minnesota Drive.
Disadvantages:	May require additional ROW
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Not applicable
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$2,000 over 20-year life span
ADOT&PF Staffing Needs:	No staffing increase

D. Northern Lights Boulevard/Benson Boulevard Couplet

Northern Lights Boulevard and Benson Boulevard form a one-way couplet with traffic traveling eastbound on Benson Boulevard and westbound on Northern Lights Boulevard. Between the two roadways, Minnesota Drive is a four-lane road with dual left turn lanes at both intersections, divided by a 4-foot raised median. The spacing between the two intersections is approximately 500 feet between the stop bars. The southbound dual left-turn lanes at Benson Boulevard are approximately 150 feet in length and the northbound dual left-turn lanes at Northern Lights Boulevard are approximately 100 feet in length.

The main concerns identified at this location are:

- Intersection capacity and queue storage
- Pedestrian and bicycle crashes



Figure 11 – Northern Lights Boulevard/Benson Boulevard Couplet

Operations

The intersection at Minnesota Drive and Northern Lights is signalized, with traffic approaching from three directions (no eastbound traffic). Westbound traffic utilizes five lanes: a left turn lane, a left turn/through lane, two through lanes and a right turn lane. There are three through lanes for both north and southbound traffic. In addition, there is one right turn lane for southbound traffic and two left turn lanes for northbound traffic. Based on counts taken at Minnesota Drive and Northern Lights Boulevard on January 15, 2015, by ADOT&PF, the northbound through lanes at this intersection are at or above capacity in the AM peak, and the southbound and westbound lanes are at or above capacity in the PM peak.

The segment between Northern Lights and Benson has one driveway on the west side of Minnesota and one driveway on the east. Based on the AADT and generalized guidelines, Minnesota Drive from Northern Lights Boulevard to Benson Boulevard has an approximate LOS of D.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	42,532	41,287	40,300	40,580	38,790	38,836	41,570	38,540	38,233	37,850

Table 11 – AADT from Benson Boulevard to Northern Lights Boulevard

The Benson Boulevard intersection is also signalized with traffic approaching from three directions (no westbound traffic). Eastbound traffic utilizes four lanes (a left turn lane, a left turn/through lane, an exclusive through lane, and a shared through/right turn lane. Northbound traffic on Minnesota Drive has two designated through lanes and one shared through/right turn lane. Southbound traffic uses three through lanes and two left turn lanes. Based on the counts by ADOT&PF on January 15, 2015, the northbound and eastbound lanes at the Benson Boulevard-Minnesota Drive intersection are at or over capacity in the AM peak. The northbound and southbound lanes are at or above capacity in the PM peak.

Safety

The intersections have average total crash rates, while the segment has a higher-than-average total crash rate, which is likely related to the shortness of the segment between two signalized intersections. Pedestrian or bicycle crashes are significant at both intersections and on the segment between them (13 pedestrian and 26 bicycle crashes). The predominant vehicular crash types are rear end/sideswipes and right angle crashes.

There were 3 fatal crashes at this location. The first fatal crash happened at the Benson Boulevard-Minnesota Drive intersection on Sunday, July 6, 2003. At 7:37 PM, a vehicle was turning left onto Benson Boulevard and failed to yield to a northbound vehicle traveling straight ahead. There were 2 occupants in vehicle 1; one sustained a minor injury, while the other received a fatal injury. The driver of vehicle 2 sustained a major injury.

The second fatal crash occurred on the Northern Lights Boulevard-Minnesota Drive intersection on Tuesday, August 3, 2004 at 9:18 AM. A southbound vehicle was traveling at an unsafe speed and rear-ended a southbound, stopped vehicle. The driver of vehicle 1 received a fatal injury, while all 3 occupants in the second vehicle received no injuries.

The third fatal crash happened on Friday, July 6, 2007 on the Northern Lights Boulevard-Minnesota Drive intersection at 10:55PM. A northbound vehicle ran a red light and struck a westbound vehicle starting to move in traffic. Consequently, a third vehicle involved in the crash ended up striking a traffic signal pole. The driver of vehicle 1 received the fatal injury,

while the driver of vehicle 2 sustained a major injury and driver of vehicle 3 had no injuries. Driver 1 was not using a seatbelt.

Location	Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
Northern Lights Boulevard-Minnesota Drive Intersection	187	0.93	1.221	1.352
Minnesota Drive Segment from Northern Lights to Benson	37	25.058	1.513	3.517
Benson Boulevard-Minnesota Drive Intersection	203	1.008	1.221	1.352

Table 12 – Crash Rates for the Northern Lights/Benson Boulevard Couplet at Minnesota Drive

Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	277
Right Angle	122
Pedestrian / Bicycle	39
Left Turn / U Turns	6
Ran-off-road	5
Right Left Turn Sideswipe	2
Double Left Sideswipe	1
Head On	1
Double Right Sideswipe	1
Grand Total	*454*

Table 13 – Crash Types for the Northern Lights/Benson Boulevard Couplet at Minnesota Drive

Fatality	Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
3	12	125	314

Table 14 – Crash Severity for the Northern Lights/Benson Boulevard Couplet at Minnesota Drive

Appearance in Metropolitan Transportation Plan or Area Plans

The couplet falls within Project 309, an unfunded illustrative project in the MTP to widen a segment of Minnesota Drive between Tudor Road and Northern Lights Boulevard to 8 lanes. The project would also turn the Tudor Road-Minnesota Drive intersection into a grade-separated interchange.

Bike or Pedestrian Plan

The location appears in Projects 13 and 57 in the Anchorage Pedestrian Plan. Project 13 assesses possible crossing improvements for the Benson Boulevard-Minnesota Drive intersection, while Project 57 focuses on crossing improvements for the Northern Lights Boulevard-Minnesota Drive intersection.

Another pedestrian project is proposed for the segment of Northern Lights Boulevard from Minnesota Drive to the Seward Highway. The project, Project 526 in the MTP (unfunded, illustrative) and Project 19 in the Anchorage Pedestrian Plan, is to upgrade the existing sidewalk along the segment and separate the sidewalk from the roadway.

Project 537 in the MTP is a short-term bicycle project for the Northern Lights/Benson Boulevard couplet proposing to add bicycle lanes to the couplet from Arlington Drive to LaTouche Street.

The Anchorage Bicycle Plan has a bicycle network project to add striping, markings, and signage to this proposed bicycle lane. The couplet also appears in the West Anchorage District Plan as a bicycle improvement plan to add a separated pathway on the couplet. The 2014 ADOT&PF Non-motorized Reconnaissance Engineering Study considered pedestrian and bicycle improvements for Northern Lights and Benson Boulevards between Minnesota Drive and Arctic Boulevard. The study did not recommend installing bicycle lanes due to the lack of adequate width on the segments to add them.

Moose Crash Ranking

The intersection is not found in the Moose Crash Ranking sheet.

Pedestrian Crash Ranking

Minnesota Drive from 31st Avenue to Northern Lights Boulevard is ranked 8th highest for segments with pedestrian crashes from 2002 to 2011.

Alt D.1 – Improve Lighting

This alternative would improve the lighting between the intersections, with the specific goal of highlighting pedestrians. This alternative has been nominated as an HSIP project and is moving forward through the nomination.



Figure 12 – Improve lighting between Northern Lights Boulevard and Benson Boulevard

Concerns Addressed:	ADOT&PF found a pattern of higher severity pedestrian and bicycle crashes during hours of darkness. This would illuminate pedestrians and bicyclists in the street and on the sidewalk to enable drivers to see them and slow down or maneuver around the pedestrian/bicycle.
Conformance to Plans:	This alternative complements pedestrian improvement projects in the MTP and Non-motorized plans.
Advantages:	Small reduction on all crashes. Decreases likelihood of highest severity crashes by providing a clearer indication of pedestrian movement and behavior on parallel walkways.
Disadvantages:	Does not reduce the likelihood of pedestrian mid-block crossings. Does not address vehicular operational issues.
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Not applicable
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$35,000 over 15-year life span
ADOT&PF Staffing Needs:	No staffing increase

Alt D.2 – Redistribute Storage for Northbound and Southbound Left Turn Lanes (no widening)

This alternative would redistribute the storage space for northbound and southbound left turns within the couplet to better match queuing throughout the day. The taper rate could also be adjusted to provide more storage.



Figure 13 – Redistribute storage between Northern Lights Boulevard and Benson Boulevard

Concerns Addressed:	This alternative may help reduce rear end crashes by accommodating more queues; however, it may not accommodate all queues.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Does not require ROW acquisition
Disadvantages:	Does not reduce heavy queueing between intersections.
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	A more detailed analysis is needed to determine the length of queue needed
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$15,000 over 20-year life span
ADOT&PF Staffing Needs:	No staffing increase

Alt D.3 – Widen Minnesota Drive to Create Parallel Left-Turn Lanes

This alternative would create parallel dual left turn lanes of approximately 400 feet in both directions between Northern Lights and Benson Boulevards. Minnesota Drive would need to be widened by approximately 24 feet. Additionally, the northbound approach at Benson Boulevard and the southbound approach at Northern Lights Boulevard would need to be widened to align the through lanes.



Figure 14 – Construct Parallel Left Turn Lanes

Concerns Addressed:	This alternative would significantly increase the amount of available queue storage for left turns, reducing rear end crashes.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Provides queue storage for the heavy peak hour left turn queues.
Disadvantages:	Does not address congestion that causes long queues. Does not address pedestrian access.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	A more detailed analysis is needed to determine the length of queue needed
Cost Range:	$5,000,000 to $10,000,000
Operating and Maintenance Costs:	$90,000 over 20-year life span
ADOT&PF Staffing Needs:	Increase plowing, additional quarter of an hour needed for each truck and driver

Alt D.4 – Completing Pedestrian Crosswalks at Signals and Installing Median Barrier to Prohibit Mid-block Crossings

Currently, pedestrian crossings are only allowed on the outside legs of both the Northern Lights Boulevard and Benson Boulevard intersections. This alternative would add a crossing on the north side of Benson Boulevard and on the south side of Northern Lights Boulevard, which would require alterations to the traffic signals and to the lane assignments on Northern Lights Boulevard and Benson Boulevard, including the construction of an additional left turn lane in either direction. A median barrier or fence would be installed on Minnesota Drive to eliminate pedestrian mid-block crossings.

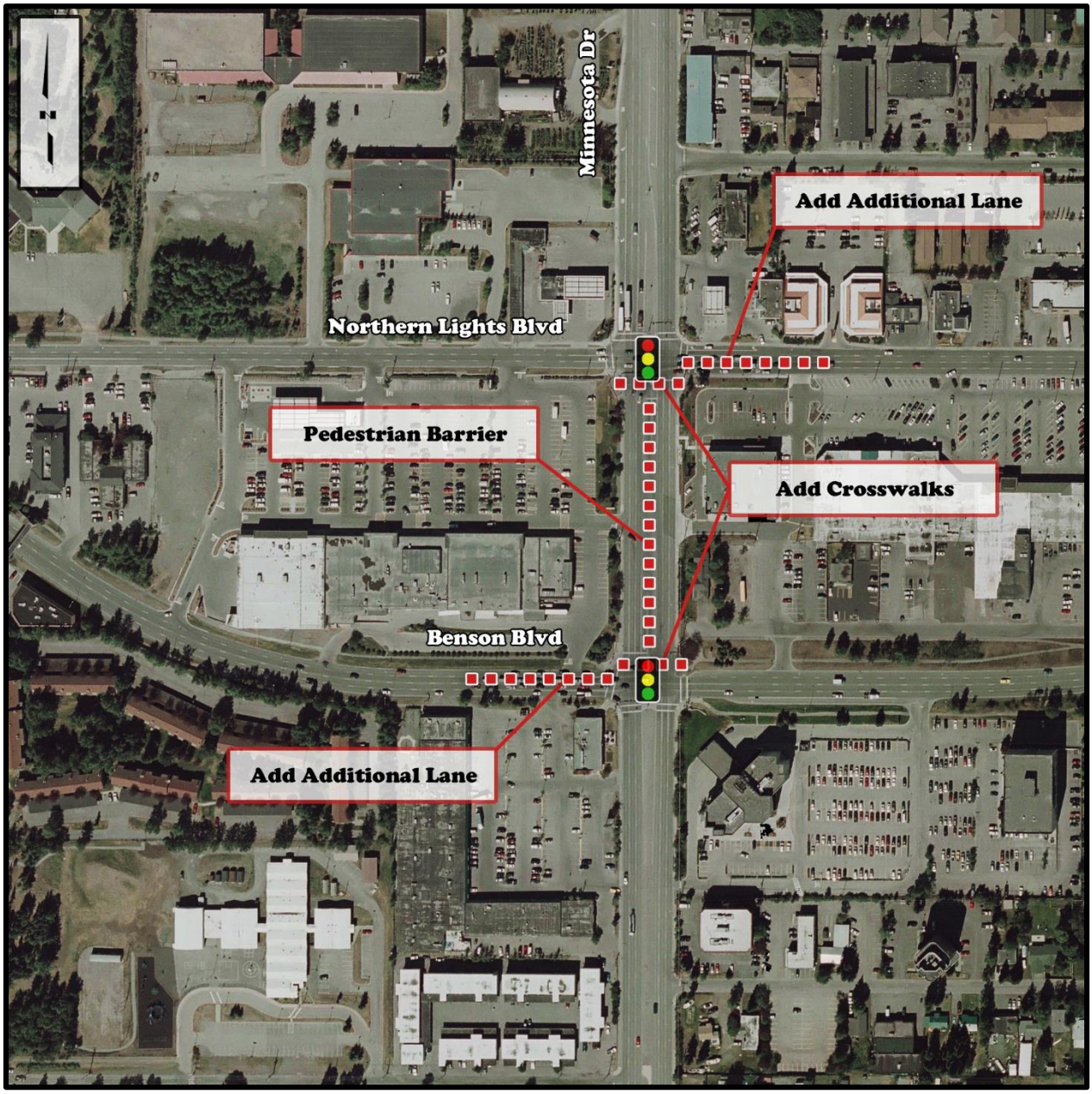


Figure 15 – Install Pedestrian Crosswalks at Signals and Barrier to Mid-Block Crossing

Concerns Addressed:	Significantly improves pedestrian access and decreases likelihood of pedestrian accidents.
Conformance to Plans:	Would directly address projects 13 and 57 in the Anchorage Pedestrian Plan
Advantages:	Provides signalized pedestrian crossings for inside legs of the intersections, improving safety at intersections. Eliminates mid-block crossings, improving safety mid-block.
Disadvantages:	May require ROW to alter auxiliary lane use on Northern Lights and Benson Boulevards. May reduce vehicle capacity at intersections. Effects to vehicle capacity need a detailed analysis in order to be understood.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Not applicable
Cost Range:	$2,500,000 to $5,000,000
Operating and Maintenance Costs:	$90,000 over 20-year life span
ADOT&PF Staffing Needs:	Increased visits each year to clean crash cushions and replace once per 5 years

Alt D.5 – Relocation of One Leg of Couplet to Alternative Corridor

This alternative would increase the separation between the signals at Northern Lights Boulevard and Benson Boulevard by moving Northern Lights Boulevard to the north or Benson Boulevard to the south. Figure 16 depicts an option of moving Northern Lights Boulevard to the north to align with the 27th Avenue corridor. This would increase the separation to approximately 800 feet, which would provide adequate length to increase the turn lanes to approximately 350 feet in both direction, not including a taper.

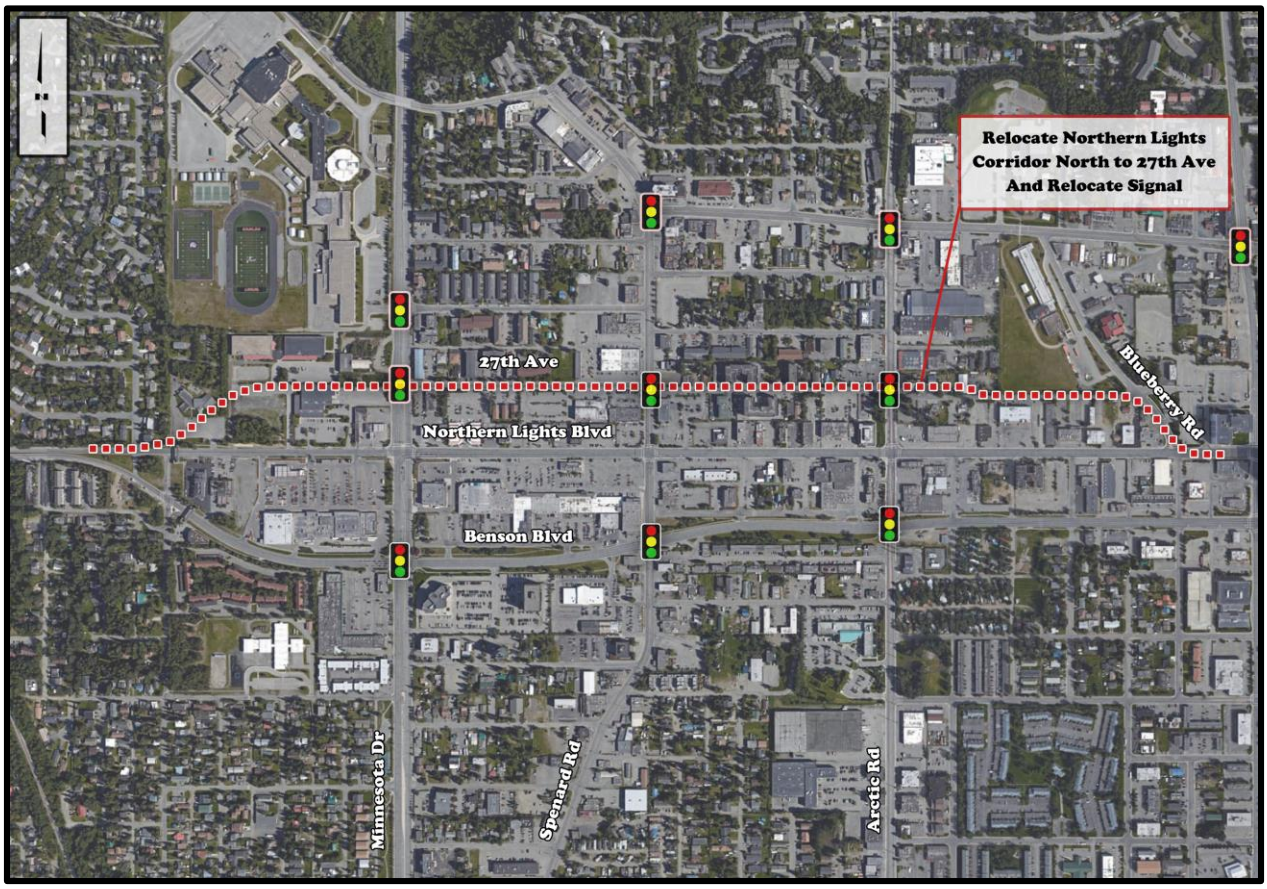


Figure 16 – Relocate Northern Lights Corridor to the North

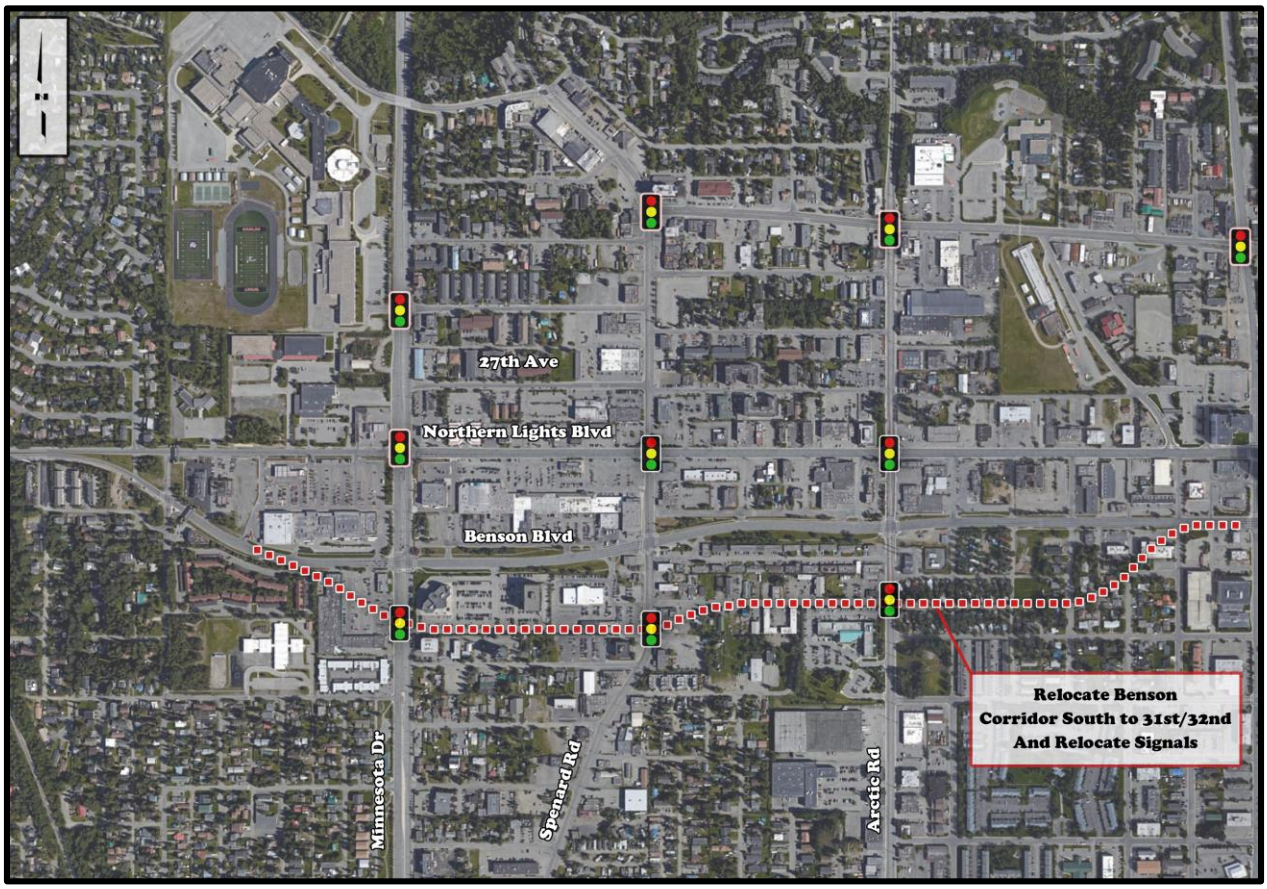


Figure 17 – Relocate Northern Lights Corridor to the South

Concerns Addressed:	Would provide more room for left turn storage, reducing rear end crashes.
Conformance to Plans:	This alternative would be inconsistent with the West Romig Master Plan and also with the plans for 27th Avenue in the bicycle and pedestrian plans.
Advantages:	Could increase left turn storage lengths
Disadvantages:	Will require significant ROW takes, utility relocation, and have significant environmental impacts, but will not solve capacity concerns for traffic traveling through the intersections
Delivery Timeframe:	Long (11 – 20 years)
Year of breakdown:	Beyond 20 years
Cost Range:	$25,000,000 to $50,000,000
Operating and Maintenance Costs:	$1,000,000 over 20-year life
ADOT&PF Staffing Needs:	To be estimated by ADOT&PF

E. Segment of Minnesota Drive from Benson Boulevard to Spenard Road

Minnesota Drive from Benson Boulevard to Spenard Road is a 6-lane road with a raised median. There is a 300-foot left-turn lane northbound onto 32nd Avenue and a 200-foot U-turn lane southbound just before 36th Avenue.

The main concerns identified at this location are:

- Estimated segment LOS D
- Rear end crashes
- Pedestrian and bicycle crashes



Figure 18 – Minnesota Drive from Benson Boulevard to Spenard Road

Operations

The segment has 8 access points on the west side of Minnesota Drive and 15 on the east side (including the minor side streets). Based on AADT and generalized guidelines, Minnesota Drive from 26th Avenue to Tudor Road has an approximate LOS of D.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	41,950	40,610	40,337	39,890	36,851	38,571	37,940	37,720	38,629	39,458

Table 15 – AADT from Benson Boulevard to Spenard Road

Safety

This segment of Minnesota Drive has a higher-than-average total crash rate. The majority of the crashes are rear ends or sideswipes. Also, 3 pedestrian crashes and 12 bicycle crashes occurred on this segment during the study period.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
150	2.745	1.513	1.796

Table 16 – Crash Rate for Minnesota Drive from Benson Boulevard to Spenard Road

Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	109
Pedestrian / Bicycle	15
Right Angle	15
Ran-off-road	6
Left Turn / U Turns	5
Parked	3
Head On Sideswipe	1
Right Left Turn Sideswipe	1
Grand Total	*155*

Table 17 – Crash Types for Minnesota Drive from Benson Boulevard to Spenard Road

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
4	53	98

Table 18 – Crash Severity for Minnesota Drive from Benson Boulevard to Spenard Road

Appearance in Metropolitan Transportation Plan or Area Plans

Project 309, an unfunded illustrative project in the MTP, would widen this segment of Minnesota Drive to 8 lanes.

Bike or Pedestrian Plan

Pedestrian plans for the segment include Project 83 in the Anchorage Pedestrian Plan to evaluate possible pedestrian crossing improvements.

Moose Crash Ranking

The segment is not found in the Moose Crash Ranking sheet.

Pedestrian Crash Ranking

Ranked 8th highest for pedestrian crashes from 2002 to 2011.

Alt E.1 – Extend Auxiliary Turn Lanes

Currently there is approximately 400 feet of separation between the beginning of the north and south auxiliary lanes. This alternative would increase either the northbound left-turn lane or the southbound U-turn lane to up to 400 feet.



Figure 19 – Extend Left Turn Lane Length

Concerns Addressed:	Would provide additional queue storage for left-turn/u-turn vehicles, possibly reducing some rear end crashes.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Could be beneficial for accommodating short term queues related to Aquarian Charter School on 32nd Avenue.
Disadvantages:	Does not address pedestrian crashes.
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Turning movement studies during periods when the Charter School is open are needed to determine this
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$7,000 over 10-year life span
ADOT&PF Staffing Needs:	Increase snow haul

Alt E.2 – Clarify Use of Southbound U-turn Lane

Currently the southbound auxiliary lane is signed as "U-turn Only". This alternative would replace this sign with a "U-turn or Left-turn". This would clarify that the lane could be used for left turn into the business driveways directly opposite the median opening.



Figure 20 – Replace U-Turn Only Sign

Concerns Addressed:	This alternative is not anticipated to affect operations or safety. It is intended only to clarify the use of the turn lane.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Clarifies that the southbound turn lane can be used for left turns as well as u-turns. May reduce calls from motorists getting tickets for turning left instead of u-turning
Disadvantages:	Drivers may use private driveway to complete u-turn
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Not applicable
Cost Range:	Less than $100,000
Operating and Maintenance Costs:	$0
ADOT&PF Staffing Needs:	To be estimated by ADOT&PF

F. Spenard Road at Minnesota Drive Intersection

The Spenard Road signal is split phased with separate phases for the eastbound and westbound approaches. Spenard Road is skewed approximately 10 degrees.

The main concerns identified at this location are:

- Intersection capacity

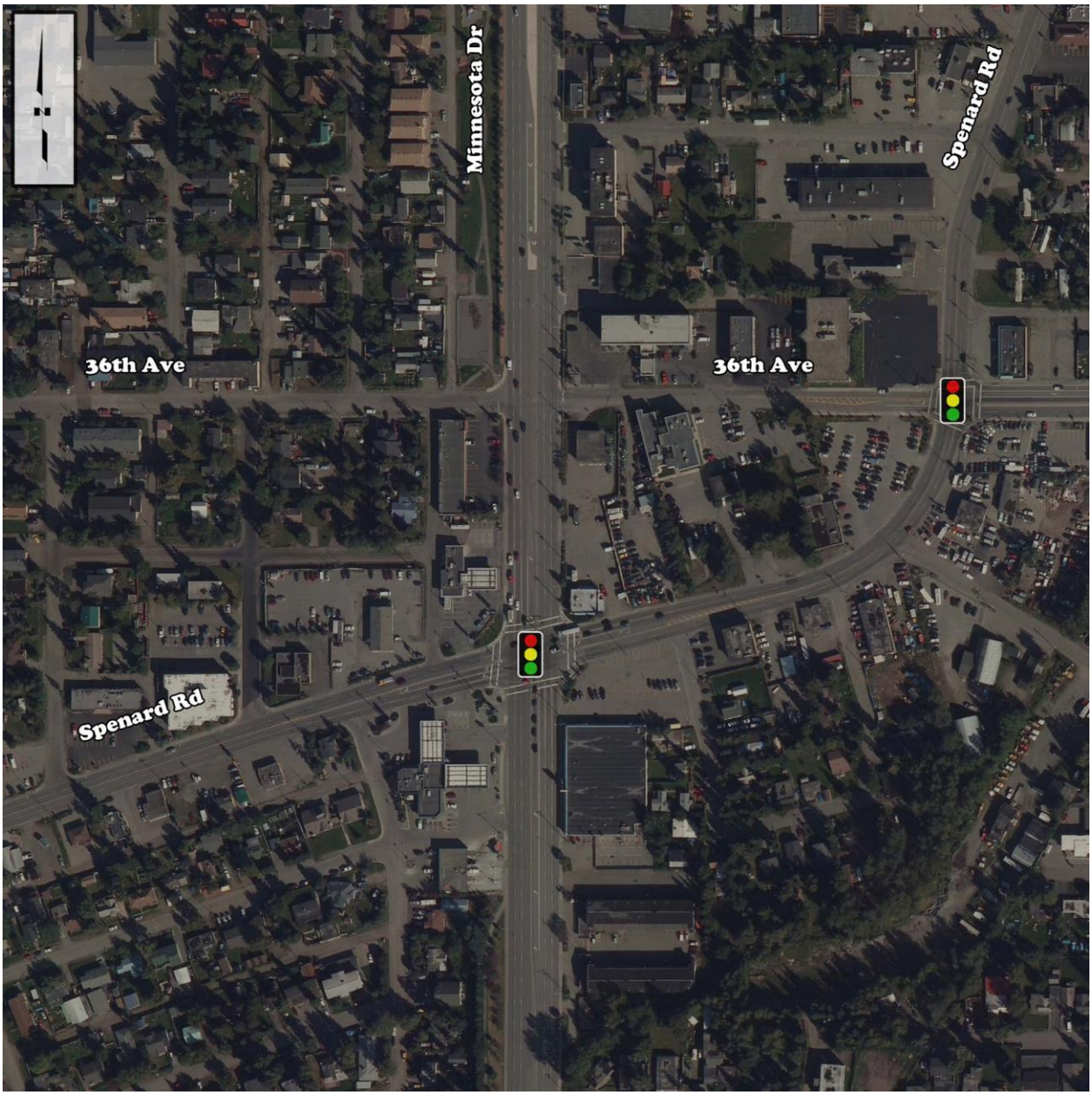


Figure 21 – Intersection of Spenard Road at Minnesota Drive

Operations

Eastbound and westbound traffic operate split-phased, with a left turn lane, a shared through/left turn lane, and a shared through/right turn lane in each direction. Northbound and southbound traffic each have a left turn lane, two through lanes and a through/right turn lane. Northbound

and southbound left turns are protected. Based on counts taken at Spenard Road and Minnesota Drive on January 14, 2010, the northbound lanes are at or above capacity in the AM peak, and the southbound lanes and the northbound left turn lane are at or above capacity in the PM peak.

Safety

This intersection has an average total crash rate. The predominant crash types are rear end/sideswipe and right angle crashes. There were 4 pedestrian crashes and 6 bicycle crashes at the intersection.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
208	0.987	1.415	1.552

Table 19 – Crash Rate for Spenard Road at Minnesota Drive

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	169	Double Left Sideswipe	1
Right Angle	38	Head On	1
Ran-off-road	11	Moose	1
Pedestrian / Bicycle	10	Overturn	1
Sign	7	Parked	1
Left Turn / U Turns	5		
Grand Total	*245*		

Table 20 – Crash Types for Spenard Road at Minnesota Drive

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
5	71	169

Table 21 – Crash Severity for Spenard Road at Minnesota Drive

Appearance in Metropolitan Transportation Plan or Area Plans

The intersection is included in Project 309, an unfunded illustrative project, in the MTP to widen Minnesota Drive between Tudor Road and Northern Lights Boulevard to 8 lanes. The project also turns the Tudor Road-Minnesota Drive intersection into a grade-separated interchange to continue the unimpeded traffic flow from International Airport Road.

Project 121 in the MTP is a short-term project to rehabilitate and add pedestrian and bicycle facilities to Spenard Road from Minnesota Drive to Benson Boulevard, including a feasibility and impact analysis on the proposed Spenard Road/36th Avenue couplet.

Bike or Pedestrian Plan

This segment of Minnesota Drive does not appear in the Pedestrian or Bicycle Plans.

Moose Crash Ranking

The intersection is not found in the Moose Crash Ranking sheet

Pedestrian Crash Ranking

The intersection is not found in the Pedestrian Crash Ranking sheet.

Alt F.1 – One Way Couplet with 36th Avenue (East of Minnesota Drive Only)

This alternative would convert Spenard Road and 36th Avenue east of Minnesota into a one-way couplet with 36th Avenue as exclusively westbound between Spenard Road and Minnesota Drive and Spenard Road as exclusively eastbound between 36th Avenue and Minnesota Drive. A new signal would be installed at 36th Avenue to accommodate the redirected traffic. A right turn lane southbound at Minnesota Drive and Spenard Road would be installed to complete the rerouted travel paths. The distance between the existing signal at Minnesota Drive and Spenard Road and the new signal at Minnesota Drive and 36th Avenue would be approximately 400 feet.

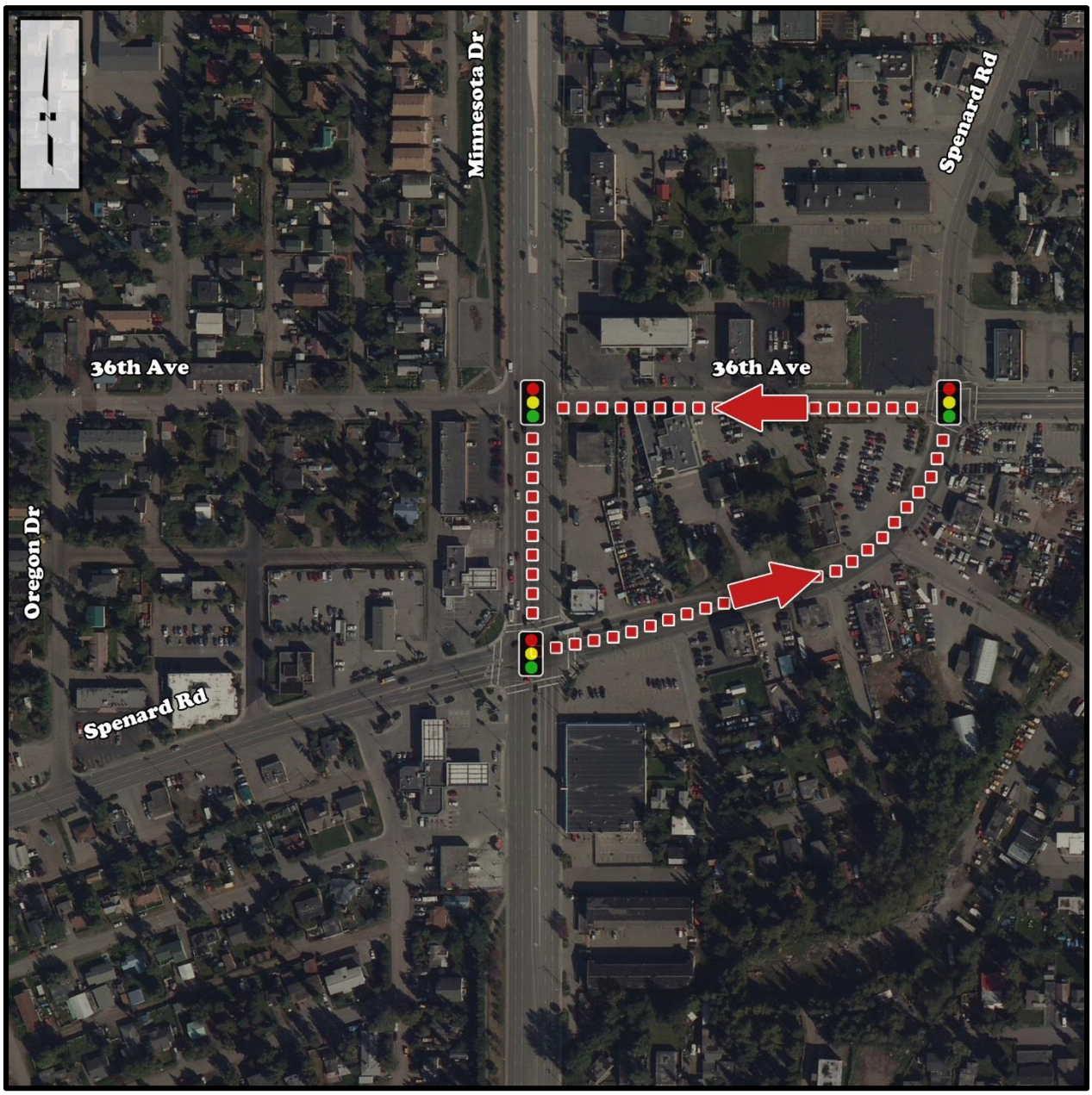


Figure 22 – One-Way Couplet with 36th Avenue (east of Minnesota)

Concerns Addressed:	May allow more phase time to the main line; however, the westbound left turn at 36th Avenue would be very heavy and the southbound right turn at Spenard would be very heavy
Conformance to Plans:	A feasibility study for this alternative is included in the MTP.
Advantages:	Allows eastbound and westbound traffic to be served simultaneously, which should give more green time to the main road.
Disadvantages:	Even with dual westbound lefts at 36th Avenue and a separate southbound right turn lane at Spenard Road, these movements would still be over capacity.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Intersections appear to be over capacity immediately after the project is completed – further analysis could clarify this
Cost Range:	$5,000,000 to $10,000,000
Operating and Maintenance Costs:	$410,000 over 20-year life
ADOT&PF Staffing Needs:	Increase plowing and staffing

Alt F.2 – One Way Couplet with 36th Avenue East and West of Minnesota Drive

This alternative would continue the one-way couplet described in Alternative F.1 for some distance across Minnesota Drive so that the westbound traffic is not added to southbound traffic on Minnesota.

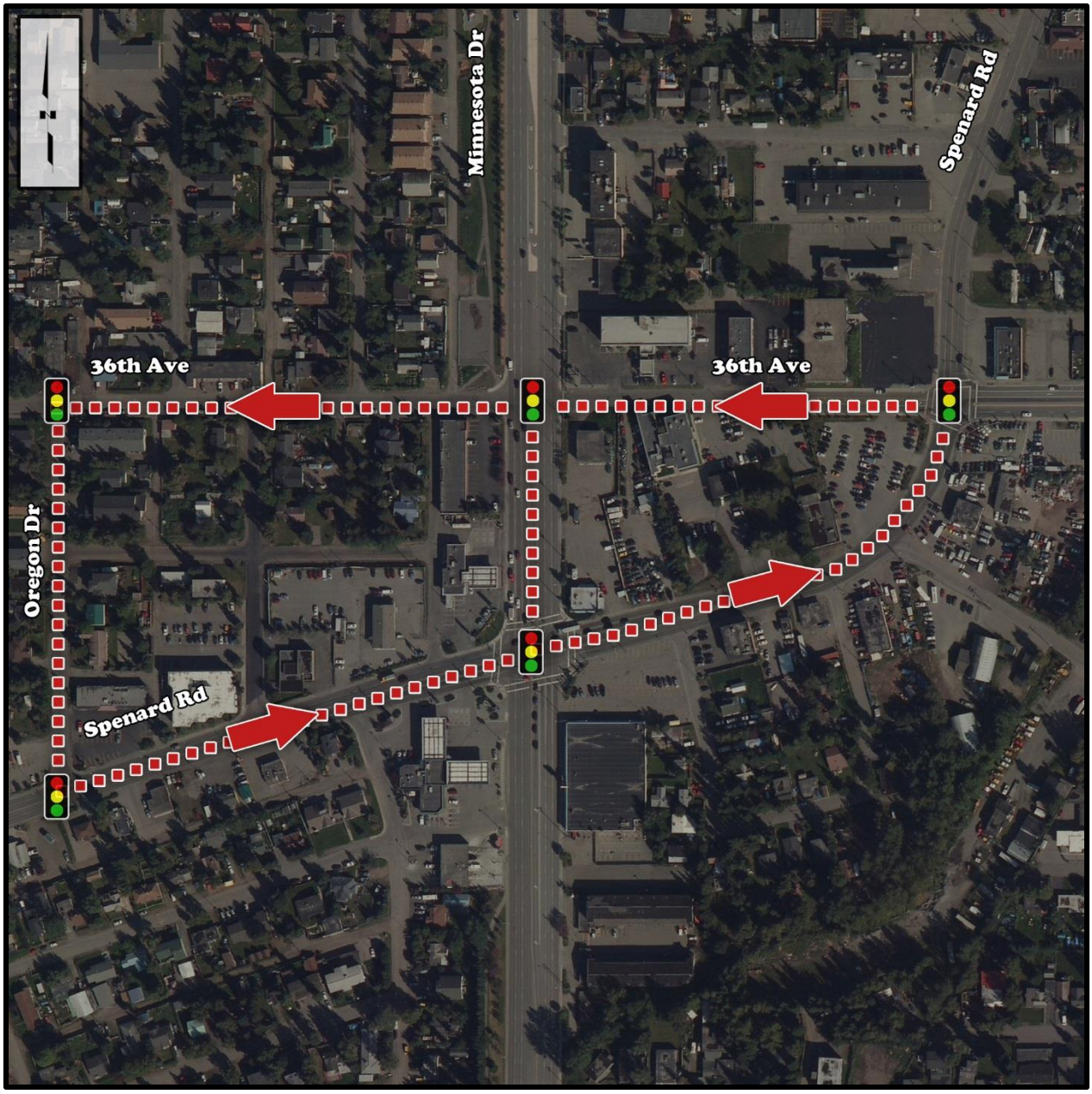


Figure 23 – One-Way Couplet with 36th Avenue (both sides of Minnesota)

Concerns Addressed:	Allows eastbound and westbound movements to proceed simultaneously, which will give additional green time to the mainline; however, northbound and southbound through traffic, as well as westbound and eastbound left turn traffic may still be operating over capacity.
Conformance to Plans:	A feasibility study of the couplet alternative is included in the MTP.
Advantages:	Allows eastbound and westbound traffic to be served simultaneously, which should give more green time to the main road. Works better than the couplet only on the east side of Minnesota Drive.
Disadvantages:	Turning local roads into arterial streets will result in significant impacts to the neighborhood to the west of Minnesota Drive.
Delivery Timeframe:	Long (11 to 20 years)
Year of breakdown:	Major movements may still operate over capacity immediately.
Cost Range:	$10,000,000 to $25,000,000
Operating and Maintenance Costs:	$710,000 over 20-year life
ADOT&PF Staffing Needs:	Increase plowing

Alt F.3 – Lengthen Minnesota Drive Left-Turn Lanes

This alternative would lengthen the north- and southbound left turn lanes on Minnesota Drive to accommodate longer queues.



Figure 24 – Lengthen Left-Turn Lanes on Minnesota Drive

Concerns Addressed:	Would provide additional queue storage for northbound and southbound left-turn vehicles, possibly reducing some rear end crashes.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	May reduce some rear end crashes
Disadvantages:	Would not address congestion at the intersection.
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Not applicable
Cost Range:	$500,000 to $1,000,000
Operating and Maintenance Costs:	$6,000 over 15-year life
ADOT&PF Staffing Needs:	Increase snow storage, hauling, and plowing

Alt F.4 – Reconfigure Spenard Road Approaches to Eliminate Split Phasing

This alternative would widen the east- and westbound approaches of Spenard Road to allow for exclusive left turns that could run simultaneously eastbound and westbound. This would eliminate the necessity of split phasing the intersection.



Figure 25 – Reconfigure Eastbound and Westbound Approaches to Eliminate Split Phasing

Concerns Addressed:	Would eliminate split phasing of the intersection, allowing more green time to the main street. Could also improve efficiency of eastbound left turn movement through longer left turn lanes
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Allows more traffic to use the intersection at the same time, reducing delay.
Disadvantages:	Has significant ROW, utility, and environmental impacts
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Sketch planning tools suggest northbound and southbound volumes are still over capacity.
Cost Range:	$1,000,000 to $2,500,000
Operating and Maintenance Costs:	$30,000 over 20-year life
ADOT&PF Staffing Needs:	No staffing increase

Alt F.5 – Add Southbound Right-Turn Lane

This alternative would add a separate southbound right-turn lane on Minnesota Drive. Costs for this alternative assume a full take of the Chevron Station in the northwest quadrant.



Figure 26 – Install Southbound Right Turn Lane

Concerns Addressed:	Would improve southbound capacity for through and right turn movements. May reduce rear end accidents.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Improves operations for southbound traffic.
Disadvantages:	Has significant ROW, Utility, and Environmental impacts. Does not improve capacity for other movements.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Sketch planning tools suggest northbound and southbound volumes are still over capacity.
Cost Range:	$2,500,000 to $5,000,000
Operating and Maintenance Costs:	$10,000 over 10-year life
ADOT&PF Staffing Needs:	Increase plowing, additional half an hour needed for each truck and driver

Alt F.6 – Develop Strategies to Encourage Airport Traffic to use International Airport Road

This alternative would install directional signs or educational indications that would direct airport traffic to use International Airport Road, instead of Spenard Road.

It is unknown to what extent drivers travel Spenard Road to reach International Airport Road rather than continue along Minnesota Drive to access International Airport Road directly. KE could estimate these percentages using our Bluetooth readers.



Figure 27 – Direct Through Traffic to International Airport Road

Concerns Addressed:	Further study is required to determine the magnitude of the problem caused by through traffic using Spenard Road.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	Could decrease traffic on Spenard Road, moving demand to the higher capacity road (International Airport Road). Would not have significant ROW, utility, or environmental impacts.
Disadvantages:	Is only effective if drivers can be convinced to alter their route.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Beyond 20 years
Cost Range:	Depends on strategy identified
Operating and Maintenance Costs:	Depends on strategy identified
ADOT&PF Staffing Needs:	No staffing increase

G. Segment of Minnesota Drive from Spenard Road to Tudor Road

Minnesota Drive between Spenard Road and Tudor is a six-lane road separated by a raised median.

The main concerns identified at this location are:

- Segment capacity

This could be mitigated by an option to build a cut-and-cover freeway – not discussed in this report.

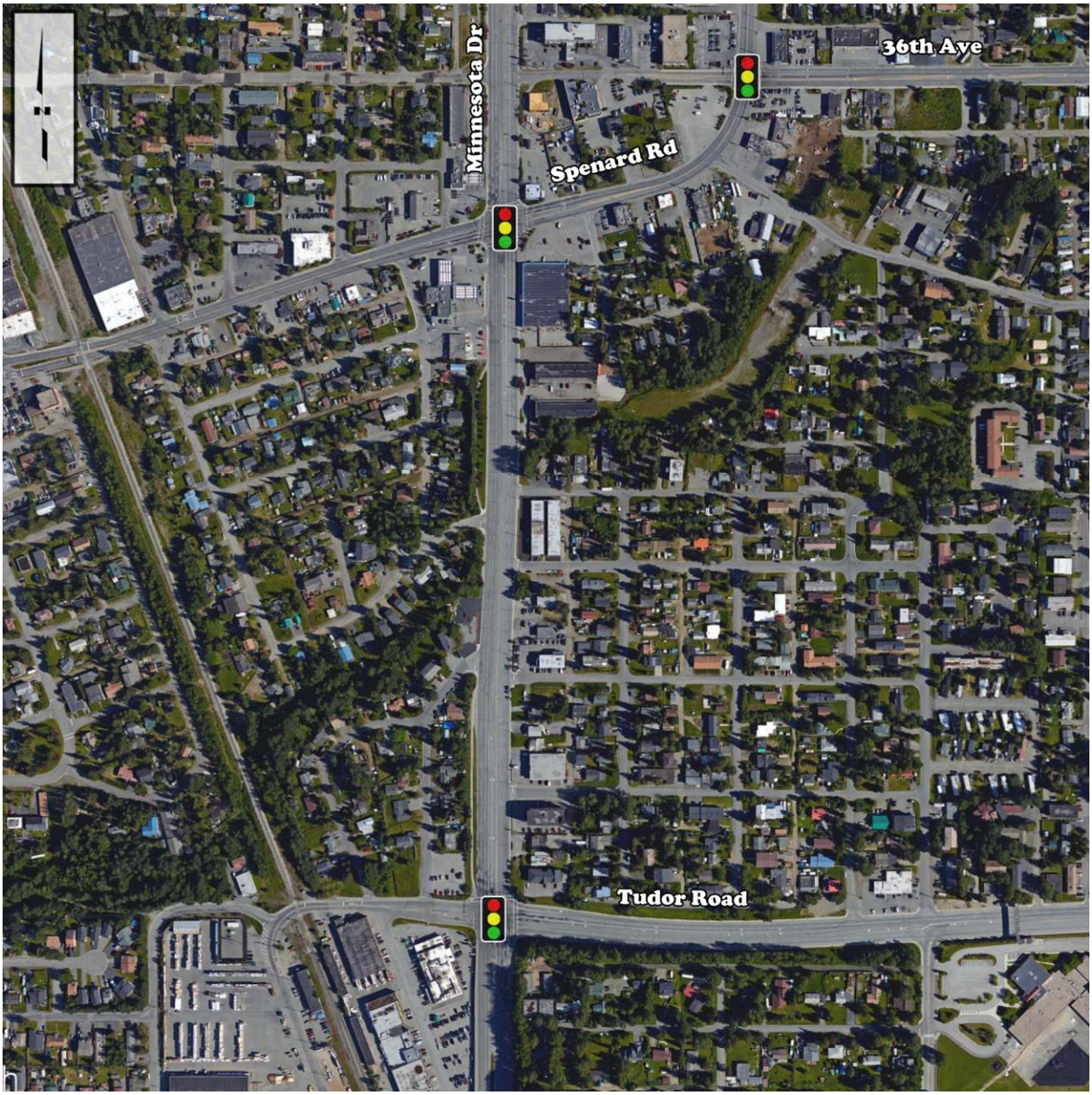


Figure 28 – Segment of Minnesota Drive from Spenard Road to Tudor Road

Operations

This segment has 6 access points on the west side of Minnesota Drive and 16 access points on the east side (including the minor side streets). Based on AADT and generalized guidelines, Minnesota Drive from Tudor Road to Spenard Road has an approximate LOS of D.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	37,617	36,640	36,200	37,759	37,954	38,371	38,955	37,858	45,874	39,440

Table 22 – AADT from Spenard Road to Tudor Road

Safety

This segment has an average total crash rate. The majority of the crashes were rear ends or sideswipes. Three pedestrian crashes and 4 bicycle crashes occurred at this segment.

A fatal crash happened on Tuesday, April 14, 2009 at 12:52PM. On a cloudy day, a vehicle leaving a driveway failed to yield to a pedestrian. The crash fatally injured the pedestrian.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
74	1.617	1.513	1.823

Table 23 – Crash Rate for Minnesota Drive from Spenard Road to Tudor Road

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	48	Ran-off-road	4
Pedestrian / Bicycle	7	Moose	3
Head On	5	Head On Sideswipe	1
Right Angle	5	Animal	1
Grand Total	*74*		

Table 24 – Crash Types for Minnesota Drive from Spenard Road to Tudor Road

Fatality	Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
1	3	20	50

Table 25 – Crash Severity for Minnesota Drive from Spenard Road to Tudor Road

Appearance in Metropolitan Transportation Plan or Area Plans

The segment is included in Project 309, an unfunded illustrative project, in the MTP. The project is to widen the segment of Minnesota Drive between Tudor Road and Northern Lights Boulevard to 8 lanes. The project would also turn the Tudor Road-Minnesota Drive intersection into a grade-separated interchange to continue the unimpeded traffic flow from International Airport Road.

Bike or Pedestrian Plan

There are no projects in the bicycle or pedestrian plans for this location.

Moose Crash Ranking

The segment is not found in the Moose Crash Ranking sheet.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

H. Tudor Road at Minnesota Drive Intersection

Minnesota Drive at Tudor Road is a signalized intersection. The northbound and westbound legs are at a downhill grade. Northbound traffic transitions here from freeway conditions to signalized at-grade intersections.

The main concerns identified at this location are:

- Segment capacity

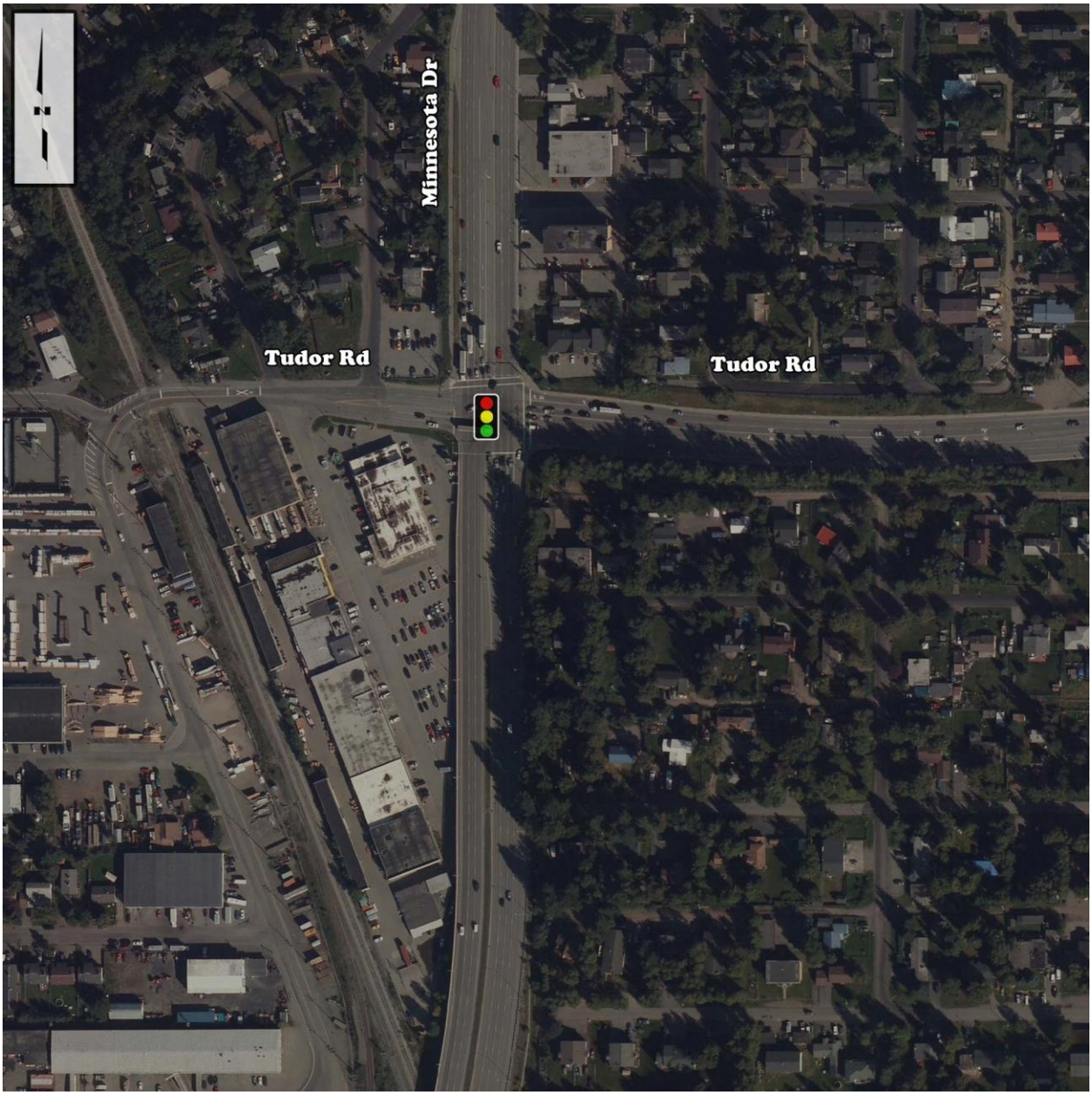


Figure 29 – Intersection of Tudor Road at Minnesota Drive

Operations

Southbound traffic has dual left turn lanes, two through lanes, and a through/right lane. Northbound traffic has a single left turn lane, three through lanes, and a right turn lane.

Eastbound traffic has a left turn lane, a through lane, and a through/right lane. Westbound traffic has a left turn lane, a shared through/left lane, a through lane, and a right turn lane. Eastbound and westbound traffic operates with a split phase. Based on the counts taken at Tudor Road and Minnesota Drive on January 15, 2015 by ADOT&PF, the northbound lanes are at or above capacity during the AM peak. The south and westbound lanes are at or above capacity during the PM peak.

Safety

This intersection has an average total crash rate. The predominant crash types are rear end/sideswipe and right angle crashes. Two pedestrian crashes and 2 bicycle crashes occurred at this intersection.

There were 2 fatal crashes at this intersection during the study period. One fatal crash happened on Friday, January 3, 2003 at 11:45PM. On an icy and dark but lighted roadway, a speeding southbound vehicle ran a red light and struck a northbound vehicle turning left. A total of 4 occupants were in vehicle 1. Of the 4 occupants, 2 sustained minor injuries and 2 received fatal injuries. The driver in vehicle 2 sustained minor injuries.

The other fatal crash occurred on Thursday, September 17, 2009 at 5:13PM. An eastbound vehicle turning left ran a red light and crashed into a southbound vehicle going straight ahead. Consequently, the crash caused a third vehicle to run into a guardrail face. The vehicle 1 driver endured a fatal injury, vehicle 2 driver received no injuries, and vehicle 3 driver sustained possible injuries.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
227	1.181	1.415	1.559

Table 26 – Crash Rate for Tudor Road at Minnesota Drive

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	172	Pedestrian / Bicycle	3
Right Angle	41	Right Left Turn Sideswipe	3
Ran-off-road	5	Moose	1
Curb / Wall	5	Overturn	1
Left Turn	4	Parked	1
Double Left Sideswipe	3	Right Turn Sideswipe	1
Head On	3		
Grand Total	*243*		

Table 27 – Crash Types for Tudor Road at Minnesota Drive

Fatality	Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
2	9	72	160

Table 28 – Crash Severity for Tudor Road at Minnesota Drive

Appearance in Metropolitan Transportation Plan or Area Plans

The intersection is included in Project 309, an unfunded illustrative project, in the MTP to turn the Tudor Road-Minnesota Drive intersection into a grade-separated interchange to continue the unimpeded traffic flow from International Airport Road and widen Minnesota Drive between Tudor Road and Northern Lights Boulevard to 8 lanes.

Bike or Pedestrian Plan

There are no pedestrian or bicycle improvements for this segment of Minnesota Drive in the Anchorage Pedestrian or Bicycle Plans.

Moose Crash Ranking

The intersection is not found in the Moose Crash Ranking sheet.

Pedestrian Crash Ranking

The intersection is not found in the Pedestrian Crash Ranking sheet.

Alt H.1 – Westbound Left-Turn Fly Over Ramp

This alternative would construct a single lane fly over ramp for westbound left turns to southbound Minnesota Drive. The lane would depart from Tudor Road at level during the westbound downgrade approaching Tudor Road beginning at a point far enough up the hill to clear Minnesota Drive at the intersection. The ramp would then gradually return to grade, merging into the Minnesota Drive southbound traffic from the west with the terminal of the merge just prior to the first railroad bridge. The cost estimate assumes that this design would require substantial right of way acquisition in the southwest quadrant of the intersection.



Figure 30 – Westbound Left-Turn Fly-Over Ramp

Concerns Addressed:	Improves operations by removing a major conflicting movement from signal control at the intersection.
Conformance to Plans:	This alternative could be a first step towards plans for an interchange at this intersection.
Advantages:	Could take advantage of existing grades at the intersection in building separation between westbound left turn lane and northbound/southbound through lanes.
Disadvantages:	Significant ROW, utility, and environmental impacts
Delivery Timeframe:	Long (11 – 20 years)
Year of breakdown:	Sketch planning tools suggest northbound and southbound volumes are still over capacity.
Cost Range:	$25,000,000 to $50,000,000
Operating and Maintenance Costs:	$250,000 over 30-year life
ADOT&PF Staffing Needs:	Bridge inspections, increase plowing and snow haul

Alt H.2 – Triple Westbound Left-Turn Lanes

This alternative would alter the westbound approach of Tudor Road at Minnesota Drive to expand the existing left turn lane and through/left lane to a triple left turn lane. To limit right-of-way impacts, there would be a single through lane westbound, and a single westbound receiving lane. Additional pavement markings, overhead signs, and/or lighting would be installed to assist in lane selection for left turn movements and to keep drivers in their own lane through the turn. Consideration could be given to closing one of the left turn lanes during winter months if delineation of the three turn lanes is not possible. The closed lane could be used as snow storage.

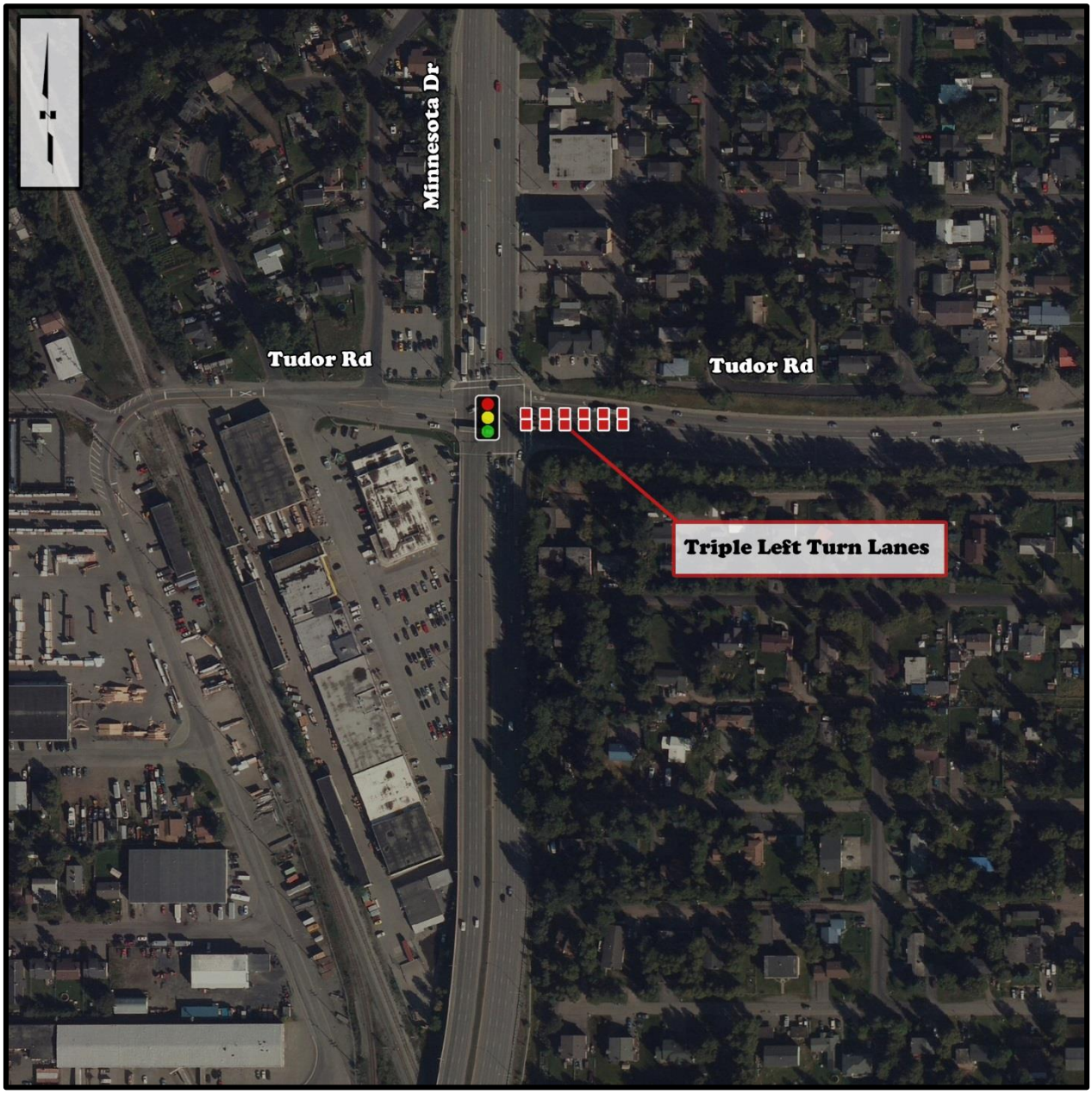


Figure 31 – Triple Left Turn Lanes

Concerns Addressed:	Would improve operations for heavy westbound left turn movement.
Conformance to Plans:	This alternative would not affect any of the area plans.
Advantages:	May be able to be constructed with minimal ROW and utility impacts.
Disadvantages:	Would be very difficult to delineate left turn paths through the intersection in winter months. May require overhead signage to help motorists choose proper lane. Could cause increase in sideswipe crashes for turning vehicles.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Sketch planning tools suggest northbound and southbound volumes are still over capacity.
Cost Range:	$5,000,000 to $10,000,000
Operating and Maintenance Costs:	$60,000 over 20-year life
ADOT&PF Staffing Needs:	No staffing increase

Alt H.3 – Reconfigure Approaches and Eliminate Split Phasing

This alternative would reconfigure the east- and westbound approaches so that they would no longer be required to operate separately under split phasing. The east- and westbound left turn lanes would be moved to their own separate lanes, as opposed to being shared with through movements as they are now. The eastbound approach would be converted to a dual through lane including a shared right and one left turn lane, and the westbound would be converted to a single through lane and a dual left with a separate right turn lane. It is possible that the westbound left turn lane may need to shift north to accommodate simultaneous east and west left turns, but the dropped westbound receiving lane could accommodate this change.



Figure 32 – Reconfigure Eastbound and Westbound Approaches to Eliminate Split Timing

Concerns Addressed:	Adds time to main street green.
Conformance to Plans:	This alternative would not affect any area plans.
Advantages:	Could be constructed with minimal ROW or environmental impacts
Disadvantages:	Turning movements will have to accommodate heavy vehicles accessing land uses on west approach.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Sketch planning tools suggest northbound and southbound volumes are still over capacity.
Cost Range:	$1,000,000 to $2,500,000
Operating and Maintenance Costs:	$35,000 over 20-year life
ADOT&PF Staffing Needs:	No staffing increase

Alt H.4 – Add Southbound Right-Turn Lane

This alternative would construct an additional 400-foot southbound right turn lane at Tudor Road. The primary purpose of this lane would be to remove turning heavy vehicle traffic from the through lane, allowing through vehicles desiring to exit Minnesota Drive at International Airport Road to remain in the right lane. The cost estimate assumes that the design of this lane would require both ROW acquisition and utility relocation.

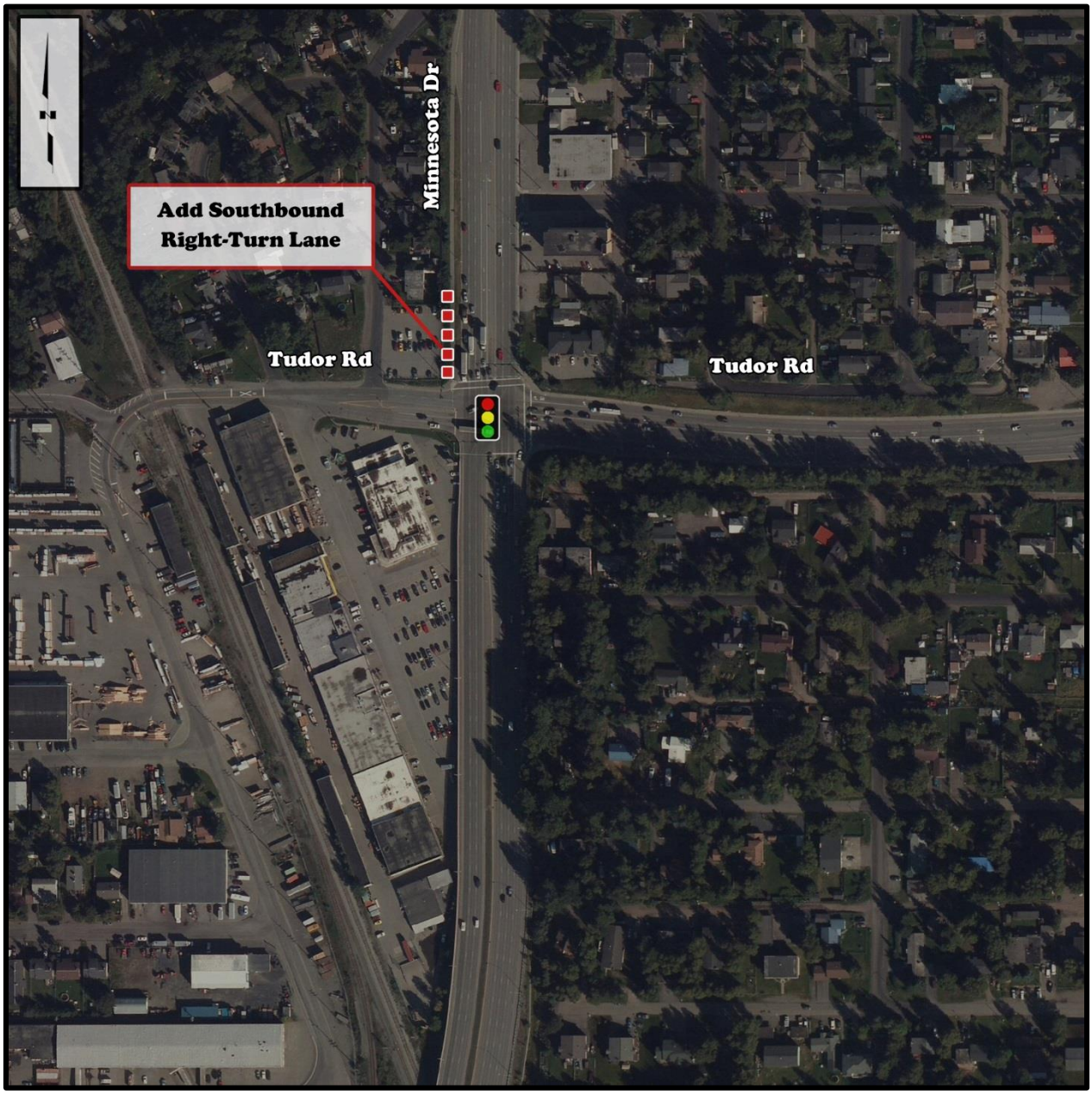


Figure 33 – Install Southbound Right Turn Lane

Concerns Addressed:	Removes heavy vehicles from southbound through lanes as they slow to make a right turn, allowing southbound through vehicles that desire to access International Airport Road to remain in the right lane. May reduce rear end/sideswipe crashes.
Conformance to Plans:	This alternative does not affect area plans.
Advantages:	Improves operations for southbound vehicles
Disadvantages:	ROW and utility costs may not be offset by benefits.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Sketch planning tools suggest northbound and southbound volumes are still over capacity.
Cost Range:	$1,000,000 to $2,500,000
Operating and Maintenance Costs:	$10,000 over 10-year life
ADOT&PF Staffing Needs:	No staffing increase

Alt H.5 – Add Active Advance Warning Flashers on Northbound Minnesota Drive

This alternative would install an active advance warning flasher on the Minnesota Drive northbound approach 500 feet prior to the intersection of Tudor Road. The Tudor Road intersection is the first signalized intersection that drivers encounter after more than 5 miles of freeway extending south to the Old Seward Highway. This sign would be similar to the signs that are now installed on the Seward Highway northbound in advance of 36th Avenue and on the Glenn Highway westbound in advance of the intersection with Airport Heights Drive, both of which have very similar road and volume conditions. This alternative is a minor option for safety.

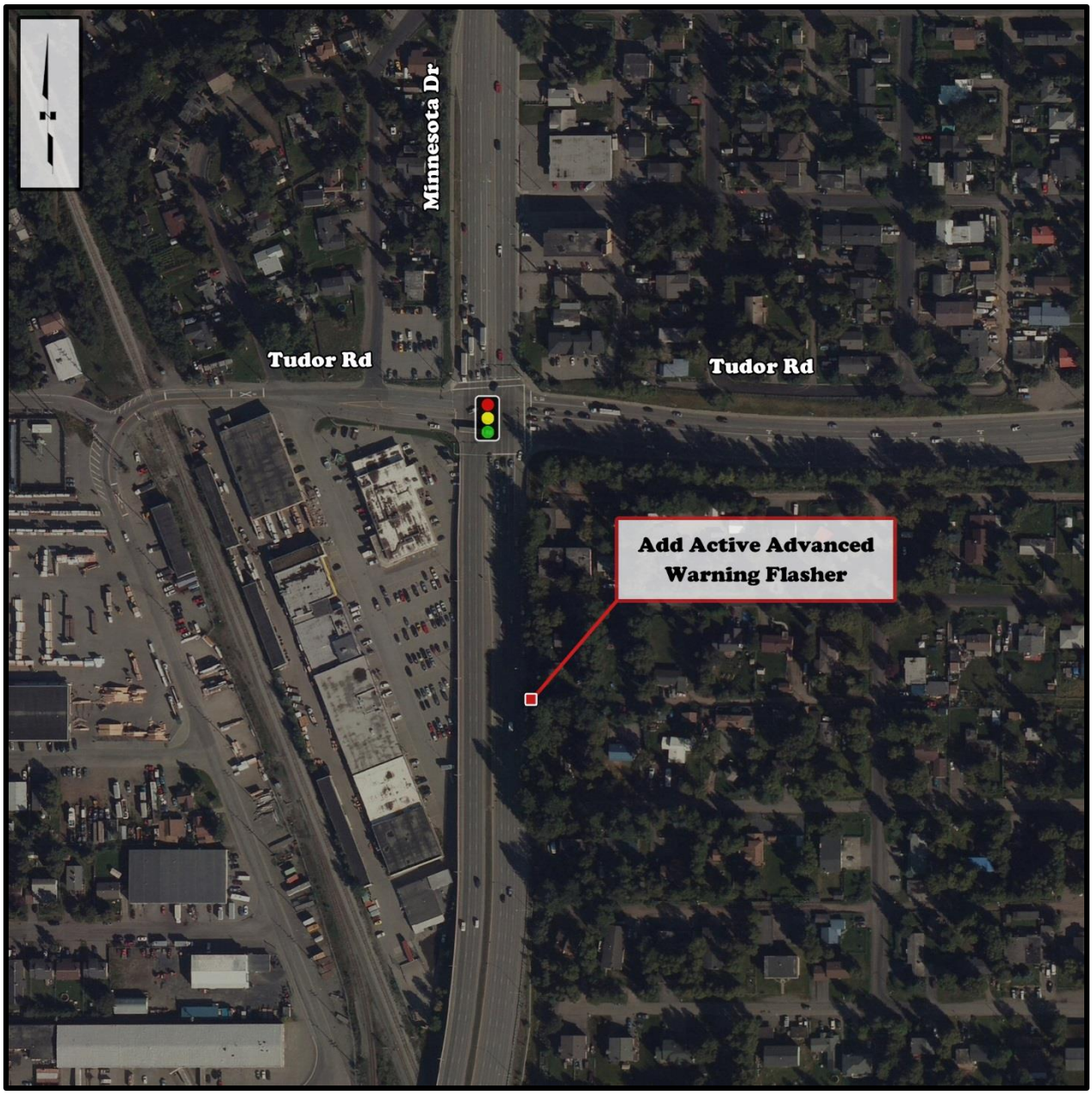


Figure 34 – Active Advanced Warning Flasher

Concerns Addressed:	Can help motorists recognize change from freeway facility to facility with at-grade signalized intersections.
Conformance to Plans:	This alternative does not affect area plans.
Advantages:	Does not have significant ROW or environmental impacts. This alternative has a minor safety benefit.
Disadvantages:	Does not address capacity concerns at the intersection.
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Not applicable
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$22,000 over 10-year life
ADOT&PF Staffing Needs:	Increased sign maintenance

I. Segment of Minnesota Drive from Tudor Road to International Airport Road

Minnesota Drive from Tudor Road to International Airport Road is a divided freeway with 4 northbound lanes and 3 southbound lanes.

The main concerns at this location are:

- Segment capacity

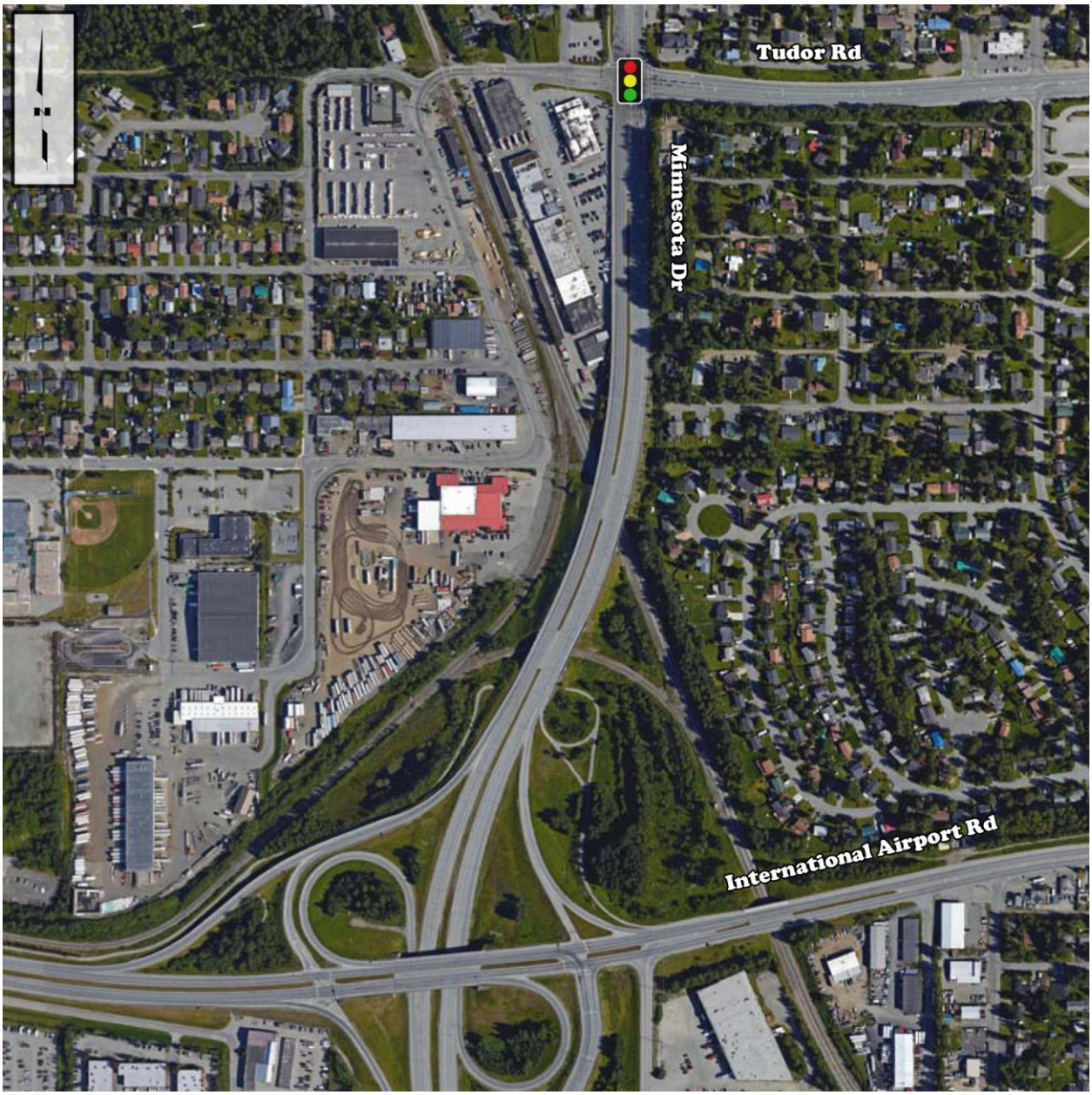


Figure 35 – Segment from Tudor Road to International Airport Road

Operations

Based on AADT and generalized guidelines, Minnesota Drive from International Airport Road to Tudor Road has an approximate LOS of B.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	44,929	40,491	46,805	45,404	42,142	41,620	42,091	41,840	44,557	44,120

Table 29 – AADT from Tudor Road to International Airport Road

Safety

This segment of Minnesota Drive has a below-average total crash rate. The predominant crash types are rear end/sideswipes and ran-off-road crashes.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
73	0.805	1.012	1.191

Table 30 – Crash Rate for Minnesota Drive from Tudor Road to International Airport Road

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	39	Snow Berm	5
Ran-off-road	15	Head On	2
Curb / Wall	5	Head On Sideswipe	1
Overturn	5	Moose	1
Grand Total	*73*		

Table 31 – Crash Types for Minnesota Drive from Tudor Road to International Airport Road

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
3	24	46

Table 32 – Crash Severity for Minnesota Drive from Tudor Road to International Airport Road

Appearance in Metropolitan Transportation Plan or Area Plans

There are no plans for this location.

Bike or Pedestrian Plan

There are no bicycle or pedestrian plans for this location.

Moose Crash Ranking

The segment is part of the segment of Minnesota Drive from 100th Avenue to Tudor Road ranked 7th in 75th percentile areas of concern for moose crashes from 2006 to 2010. A recent project constructed a moose fence to mitigate these crashes.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

J. International Airport Road at Minnesota Drive Interchange

International Airport Road at Minnesota Drive is a partial cloverleaf interchange with signalized intersections at the ramp terminals. A circuitous pathway accommodates pedestrians and bicyclists through the interchange. Although there are no pedestrian or bicycle crashes at the location, there have been observations of pedestrians and bicyclists crossing at the interchange rather than in the separated path.

The main concerns at this interchange are:

- Access for pedestrians through the interchange
- Eastbound/westbound rear end crashes
- Lane departure crashes on southbound Minnesota off-ramp
- Merge conflicts associated with Minnesota southbound to International Airport Road westbound traffic on International Airport Road at Northwood Drive



Figure 36 – Interchange of International Airport Road at Minnesota Drive

Operations

The ramp intersections at International Airport Road are under signal control. All traffic accessing Minnesota Drive from International Airport Road does so from uncontrolled ramps on the right side of the road. Based on counts taken at the International Airport Road and Minnesota Drive ramp intersections on August 31, 2011, all movements operate under capacity in the peak hours.

Safety

The ramp from southbound Minnesota Drive to International Airport Road has a higher-than-average total crash rate. All other intersections and ramps have average or below-average total crash rates. On the southbound Minnesota Drive to International Airport Road ramp, there were 6 ran-off-the road crashes (guardrail, wall, ditch, and other) and 3 sideswipe crashes. Although

there are no pedestrian and bicycle crashes, pedestrians and bicyclists have been observed traveling through the interchange rather than using the separated pathway.

Location	Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
Northbound Minnesota Drive Ramp-International Airport Road Intersection	56	0.437	1.221	1.385
Southbound Minnesota Drive Ramp-International Airport Road Intersection	30	0.244	1.221	1.389
Northbound Minnesota to International Airport Ramp	6	0.591	1.127	1.724
Westbound International Airport to Northbound Minnesota Ramp	0	0.00	1.127	4.476
Eastbound International Airport to Northbound Minnesota Loop Ramp	6	2.175	1.127	2.360
Southbound Minnesota to International Airport Ramp	**9**	**3.311**	**1.127**	**2.370**
Eastbound International Airport to Southbound Minnesota Ramp	4	0.745	1.127	1.974
Westbound International Airport to Southbound Minnesota Loop Ramp	3	1.179	1.127	2.418

Table 33 – Crash Rates for International Airport Road at the Minnesota Drive Interchange

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	73	Light Support	5
Right Angle	37	Left Turn / U Turns	2
Guardrail	13	Head On	1
Ran-off-road	12	Parked	1
Overturn	7		
Grand Total	*151*		

Table 34 – Crash Types for International Airport Road at the Minnesota Drive Interchange

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
4	31	116

Table 35 – Crash Severity for International Airport Road at the Minnesota Drive Interchange

Appearance in Metropolitan Transportation Plan or Area Plans

There are no plans for this location.

Bike or Pedestrian Plan

There are no bicycle or pedestrian plans for this location.

Moose Crash Ranking

The interchange is part of the segment of Minnesota Drive from Strawberry Road to International Airport Road ranked 6th in 95th percentile highest moose crash areas from 2006 to 2010. A moose fence was recently built along the Minnesota Drive corridor to mitigate these crashes.

Pedestrian Crash Ranking

The interchange is not found in the Pedestrian Crash Ranking sheet.

Alt J.1 – Reconfigure Interchange

This alternative would reconfigure the ramps to develop a more pedestrian/bicycle-friendly interchange. One possibility would be to construct a diamond interchange with roundabouts at the terminal intersections. Other interchange types could be considered, such as a diverging diamond.

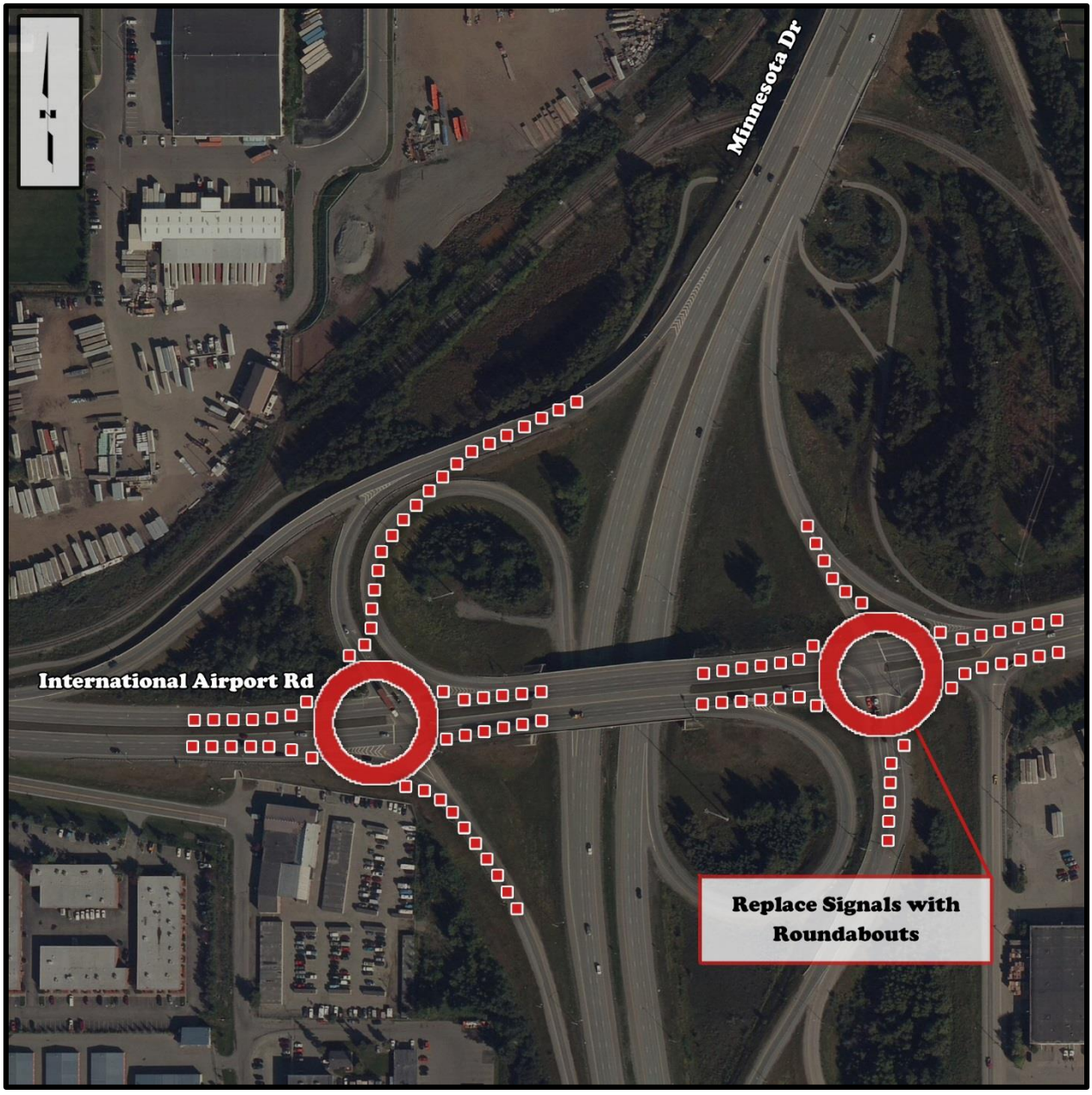


Figure 37 – Reconfigure Interchange

Concerns Addressed:	Improves pedestrian/bicycle east-west movement. Eliminates weaving concerns related to Northwood Drive west of the interchange. Could decrease right angle/left turn crashes at ramp intersections.
Conformance to Plans:	Does not affect any area plans.
Advantages:	Improvements to safety and to pedestrian/bicycle connectivity.
Disadvantages:	Significant design and construction costs
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Beyond 20 years
Cost Range:	$10,000,000 to $25,000,000
Operating and Maintenance Costs:	$45,000 over 10-year life
ADOT&PF Staffing Needs:	To be estimated by ADOT&PF

Alt J.2 – Add Dilemma Zone Detection

This alternative assumes dilemma zone detection loops have not been installed on the bridges. KE was unable to ascertain whether or not there is currently dilemma zone detection at these intersections. Dilemma zone detection would be possible on the bridges using a number of technologies, such as microwave detection.



Figure 38 – Install Dilemma Zone Detection

Concerns Addressed:	Would decrease eastbound and westbound rear end and sideswipe crashes related to the end of the signal phase.
Conformance to Plans:	This alternative would not affect any area plans.
Advantages:	Safety improvement at minimal impact/cost
Disadvantages:	None known
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Not applicable
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$0
ADOT&PF Staffing Needs:	No staffing increase

Alt J.3 – Improve Wayfinding for Existing Pedestrian/Bicycle Pathway

The existing multi-use pathway at this interchange routes pedestrian and bicycles to the north, under Minnesota Drive at a pedestrian undercrossing, and back to International Airport Road; however, there are no signs to inform pedestrians or bicyclists of the route. This alternative would install wayfinding signs to aid pedestrians and bicyclists in following the correct route through the interchange. NOTE: These signs will be added with a HSIP Sign Inventory Upgrades project.



Figure 39 – Install Pedestrian Wayfinding Signs

Concerns Addressed:	Would aid pedestrians and bicyclists in finding the pathway through the intersection
Conformance to Plans:	This alternative would not affect area plans.
Advantages:	Provides benefit with minimal cost or impacts.
Disadvantages:	Existing non-motorized pathway through the interchange is circuitous, so some pedestrians or bicyclists will continue to use the roadway shoulder to traverse the interchange.
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Not applicable.
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$2,000 over 6-year life span
ADOT&PF Staffing Needs:	No staffing increase

Alt J.4 – Improve Exit Sign for Southbound Minnesota Drive Off-Ramp

This alternative would improve exit signs to aid motorists in choosing the correct leg of the southbound ramp to reach their intended destination.



Figure 40 – Install Diagrammatic Exit Sign for Southbound Minnesota Drive Off-Ramp

Concerns Addressed:	May reduce rear end and sideswipe crashes at the diverge point on the ramp.
Conformance to Plans:	This alternative does not impact area plans.
Advantages:	Requires minimal cost and impact.
Disadvantages:	Does not address pedestrian east-west connectivity through the interchange
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Not applicable
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$4,500 over 6-year life span
ADOT&PF Staffing Needs:	No staffing changes

Alt J.5 – Tighten Radii at Ramps to Better Accommodate Non-motorized Traffic

This alternative would tighten the radii at the ramp terminals to slow traffic at the point where vehicles interact with non-motorized traffic to develop a more pedestrian/bicycle-friendly interchange. The southbound-to-westbound traffic to the signal, eliminating the free right turn movement. This could reduce weaving between southbound right-turn vehicles desiring to continue through on International Airport Road past Northwood Drive and westbound through vehicles desiring to turn right on Northwood Drive.

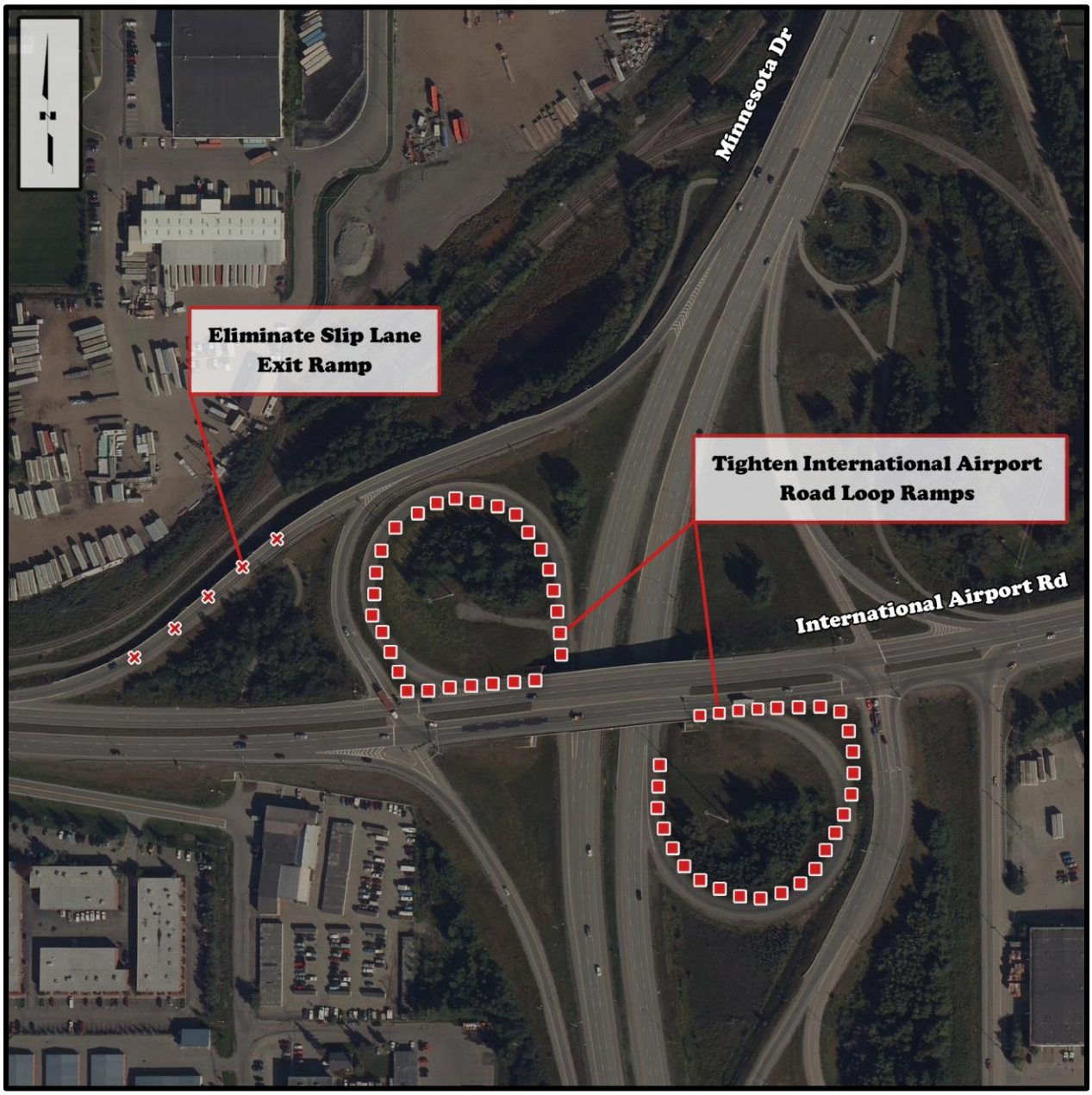


Figure 41 – Tighten Radii at Ramps and Eliminate Southbound Free Right Turn

Concerns Addressed:	Improves safety for pedestrians or bicyclists choosing to use the roadway shoulder to cross the interchange east-west. If southbound free right turn is removed, reduces weaving conflicts related to Northwood.
Conformance to Plans:	This alternative does not affect area plans.
Advantages:	Provides improved east-west connectivity for pedestrians/bicyclists through the interchange at lower cost and impact than completely reconstructing the interchange.
Disadvantages:	Does not address crash concerns
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Beyond 20 years
Cost Range:	$5,000,000 to $10,000,000
Operating and Maintenance Costs:	$0
ADOT&PF Staffing Needs:	No staffing increase

Alt J.6 – Extend 3 Lanes Westbound Past Northwood Drive to Spenard Road

This alternative would extend the third westbound lane on International Airport Road past the existing merge just west of Northwood Drive all the way to Spenard Road.



Figure 42 – Extend 3 Lanes Westbound to Spenard Road

Concerns Addressed:	Reduces weaving conflicts related to Northwood Drive.
Conformance to Plans:	This alternative does not affect area plans.
Advantages:	Reduces friction due to weaving on International Airport Road west of the interchange.
Disadvantages:	Does not affect pedestrian/bicycle connectivity or address other crash concerns.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Beyond 20 years
Cost Range:	$2,500,000 to $5,000,000
Operating and Maintenance Costs:	$30,000 over 20-year life span
ADOT&PF Staffing Needs:	Increased plowing

K. Segment of Minnesota Drive from International Airport Road to Raspberry Road

Minnesota Drive from International Airport Road to Raspberry Road is a 6 lane access-controlled highway with a grassy median.

Main concerns with this segment include:

- Operational and safety concerns with merge at southbound on-ramp.
- Operational concerns with exit at northbound off-ramp



Figure 43 – Minnesota Drive from International Airport Road to Raspberry Road

Operations

Based on AADT and generalized guidelines for a freeway, Minnesota Drive from International Airport Road to Raspberry Road has an approximate LOS of B.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	51,218	49,889	49,278	49,089	47,058	45,110	47,157	47,063	49,132	48,285

Table 36 – AADT from International Airport Road to Raspberry Road

The existing southbound on-ramp from International Airport Road to Minnesota Drive is a taper ramp, providing minimal distance for ramp traffic to merge in with the main line traffic. During periods when there is high demand to exit southbound Minnesota Drive at Raspberry Road, there are few gaps to enable ramp traffic to enter the mainline.

In the northbound direction, motorists desiring to exit at International Airport Road must merge to the right twice before exiting due to add lanes at Raspberry Road.

Safety

This segment has an average total crash rate. The predominant crash types are rear end/sideswipes and ran-off-road crashes.

There were 2 fatal crashes on this segment during the study period. The first fatal crash occurred on Friday, February 7, 2003 at 10:10PM. A southbound vehicle, traveling at an unsafe speed, was passing another vehicle and overturned into a ditch. Of the 2 occupants of the vehicle, one received a fatal injury, while the other sustained minor injuries.

The second fatal crash happened on Friday, April 30, 2004, at 9:36PM. A northbound vehicle was traveling at an unsafe speed and changing lanes before running off the road and into a ditch. There was a total of 4 occupants in the vehicle, 2 sustaining minor injuries and 2 receiving fatal injuries. Both fatal crashes occurred on a dry and dark but lighted roadway.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
150	0.97	1.012	1.148

Table 37 – Crash Rate for Minnesota Drive from International Airport Road to Raspberry Road

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	72	Snow Berm	5
Ran-off-road	25	Parked	4
Overturn	19	Head On Sideswipe	2
Moose	17	Animal	1
Guardrail	5		
Grand Total	*150*		

Table 38 – Crash Types for Minnesota Drive from International Airport Road to Raspberry Road

Fatality	Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
2	9	41	98

Table 39 – Crash Severity for Minnesota Drive from International Airport Road to Raspberry Road

Appearance in Metropolitan Transportation Plan or Area Plans

There are no plans for this location.

Bike or Pedestrian Plan

There are no bicycle or pedestrian plans for this location.

Moose Crash Ranking

The segment is part of the segment of Minnesota Drive from Strawberry Road to International Airport Road ranked 6th in 95th percentile highest moose crash areas from 2006 to 2010. A recent project installed moose fence along Minnesota Drive to address this concern.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

Alt K.1 – Install 4th Lane from International Airport Road to Raspberry Road

This alternative would construct a 4th lane for southbound traffic beginning at the International Airport Road on-ramp and either exiting at Raspberry Road or continuing just past the off-ramp.



Figure 44 – Install 4th lane from International Airport Road to Raspberry Road

Concerns Addressed:	Provides additional time for traffic to negotiate weaving between vehicles entering the main line from International Airport Road and vehicles exiting at Raspberry Road.
Conformance to Plans:	This alternative does not affect area plans.
Advantages:	Decreases friction due to weaving for this segment of Minnesota Drive
Disadvantages:	More detailed analysis needed to determine whether parallel ramps or added weaving lane is preferred
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Unknown. Weaving volumes have not been accurately estimated
Cost Range:	$1,000,000 to $5,000,000
Operating and Maintenance Costs:	$110,000 over 30-year life span
ADOT&PF Staffing Needs:	Increased plowing

Alt K.2 – Construct Dual Lane Off-Ramp for Northbound Minnesota Drive to International Airport Road

This alternative would construct a dual lane off-ramp from northbound Minnesota Drive to International Airport Road, where one lane is the existing exit-only lane and the second lane could be accessed from a through lane. This would eliminate the need for northbound traffic on Minnesota Drive to change lanes twice in order to exit at International Airport Road. The connection from Electron Drive to the off-ramp would be altered to improve weaving on the ramp.



Figure 45 – Install dual lane exit for Northbound Minnesota Drive at International Airport Road

Concerns Addressed:	Improves weaving on northbound Minnesota Drive, as it requires northbound drivers exiting at International Airport Road to change lanes only once, rather than twice.
Conformance to Plans:	This alternative does not affect any area plans
Advantages:	Simplifies weaving movements in this segment of Minnesota Drive
Disadvantages:	Crash experience may not justify expense.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Beyond 20 years
Cost Range:	$5,000,000 to $10,000,000
Operating and Maintenance Costs:	$75,000 over 30-year life span
ADOT&PF Staffing Needs:	No staffing increase

L. Raspberry Road at Minnesota Drive Interchange

Raspberry Road at Minnesota Drive is a partial cloverleaf interchange. The southbound and northbound off-ramps are currently being reconstructed as part of the Dowling Road Phase II project. After construction is complete, there will be signals at both off-ramps. The design will include accommodations for pedestrians and bicyclists through the interchange in addition to the existing out-of-direction pathway that tunnels under Minnesota Drive to the south of the interchange.

Main concerns at this interchange include:

- Large radii will encourage high speeds for vehicles entering the on-ramps, which are inconsistent with pedestrian and bicycle pathways through the interchange.

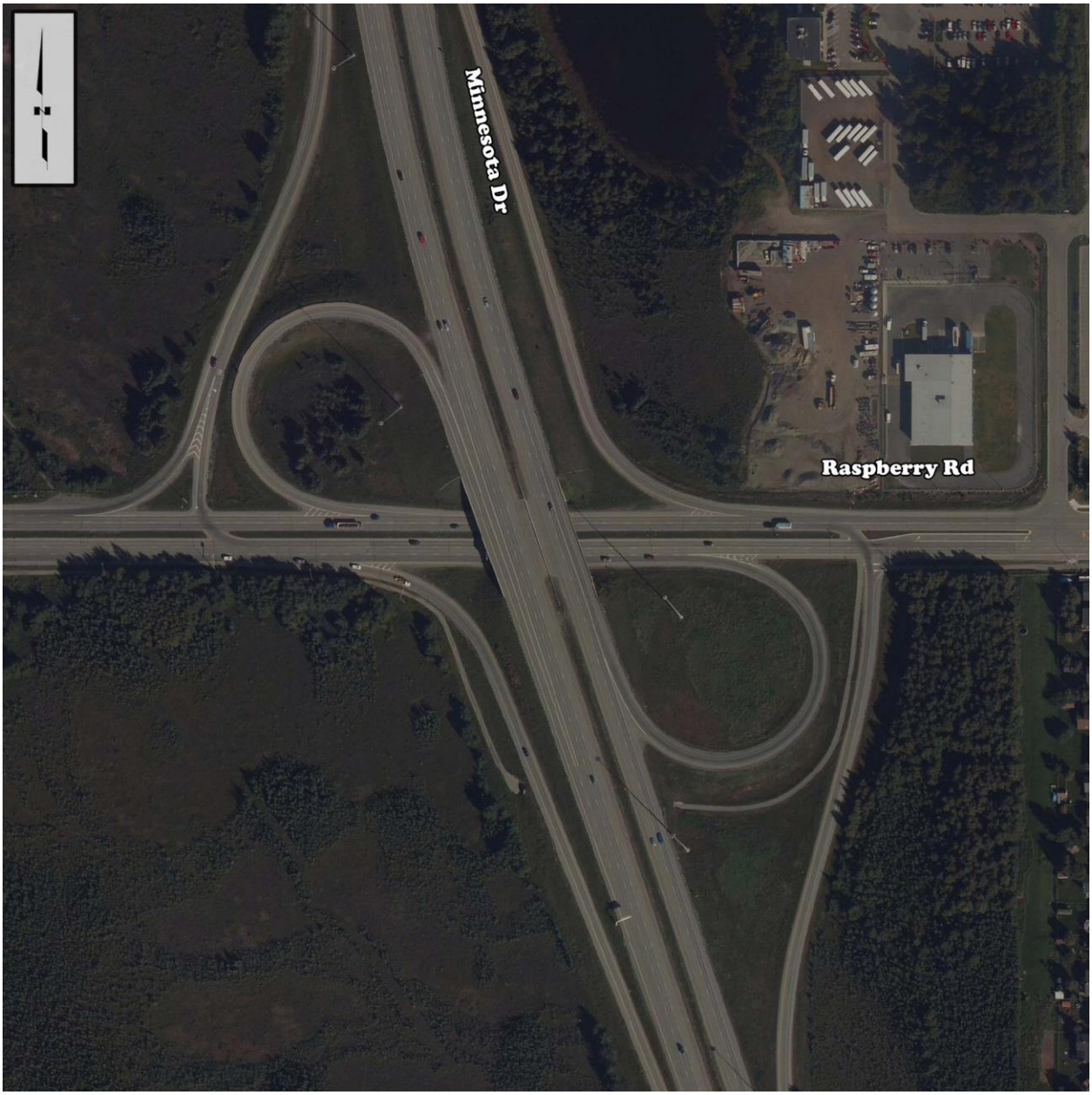


Figure 46 – Interchange of Raspberry Road at Minnesota Drive

Operations

Operations were not evaluated at this interchange, as conditions have been carefully studied as part of the Dowling Road Phase II project and there will be significant changes to operations as part of that project currently in construction.

Safety

The northbound and southbound Minnesota ramp terminal intersections at Raspberry Road have average total crash rates. All of the ramps have average or below-average total crash rates. The predominant crash types are rear end/sideswipes and ran-off-road crashes.

Location	Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
Northbound Minnesota Drive Ramp-Raspberry Road Intersection	18	0.273	0.336	0.461
Southbound Minnesota Drive Ramp-Raspberry Road Intersection	15	0.183	0.336	0.447
Northbound Minnesota to Raspberry Ramp	2	0.689	1.127	2.325
Raspberry to Northbound Minnesota Ramp	1	1.084	1.127	3.487
Eastbound Raspberry to Northbound Minnesota Loop Ramp	3	0.522	1.127	1.943
Southbound Minnesota to Raspberry Ramp	4	0.524	1.127	1.825
Raspberry to Southbound Minnesota Ramp	4	0.998	1.127	2.124
Westbound Raspberry to Southbound Minnesota Loop Ramp	2	5.270	1.127	5.279

Table 40 – Crash Rates for Raspberry Road at the Minnesota Drive Interchange

Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	30
Ran-off-road	16
Right Angle	8
Overturn	6
Moose	4
Grand Total	*64*

Table 41 – Crash Types for Raspberry Road at the Minnesota Drive Interchange

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
2	19	43

Table 42 – Crash Severity for Raspberry Road at the Minnesota Drive Interchange

Appearance in Metropolitan Transportation Plan or Area Plans

There are no plans for this location.

Bike or Pedestrian Plan

Project 564 is a short-term project in the MTP to add bicycle lanes to Raspberry Road from Minnesota Drive to Kincaid Park. The Anchorage Bicycle Plan recommends a project to add signage, striping, and markings to these bicycle lanes. The West Anchorage District Plan has a

bicycle commuting improvement plan than would add bicycle lanes along the entire length of Raspberry Road. Some of these improvements are being made as part of the West Dowling Phase II and Raspberry Road projects this summer.

Moose Crash Ranking

The segment is part of the segment of Minnesota Drive from Strawberry Road to International Airport Road ranked 6th in 95th percentile highest moose crash areas from 2006 to 2010. A recent project has added moose fence along Minnesota Drive to address this concern.

Pedestrian Crash Ranking

The interchange is not found in the Pedestrian Crash Ranking sheet.

Alt L.1 – Tighten Radii at Ramps to Better Accommodate Non-motorized Traffic

This alternative would tighten the radii at the ramp terminals to develop a more pedestrian/bicycle-friendly interchange.

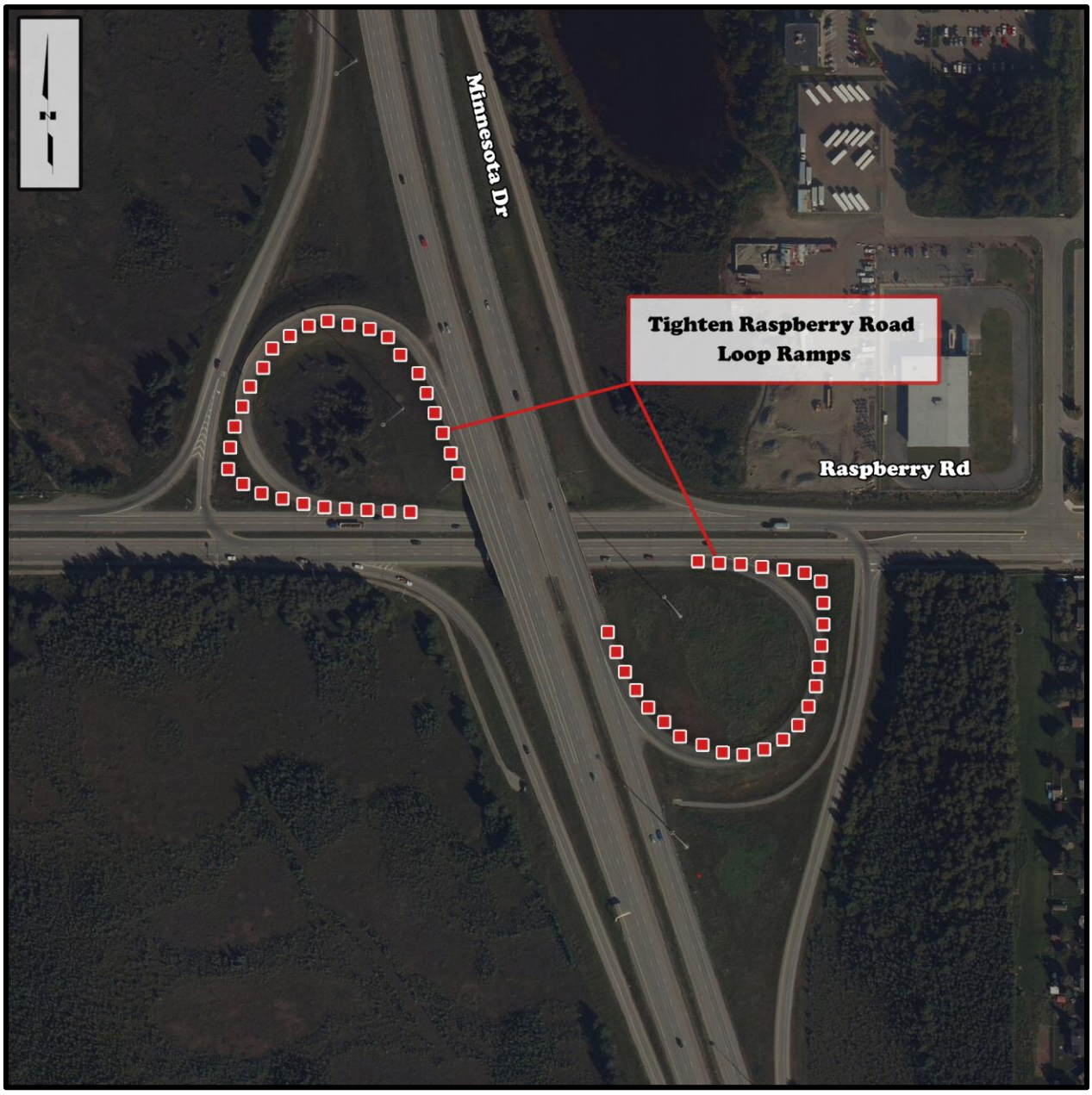


Figure 47 – Tighten Ramp Radii

Concerns Addressed:	Improves east-west connectivity for bicyclists and pedestrians through the interchange.
Conformance to Plans:	This alternative supports the MTP, the Anchorage Bicycle Plan, and the West Anchorage District Plan to add bicycle lanes to Raspberry Road.
Advantages:	Improves bicycle and pedestrian safety at high-speed on-ramps
Disadvantages:	Requires construction in area that is being reconstructed this summer.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Not applicable
Cost Range:	$500,000 to $1,000,000
Operating and Maintenance Costs:	$50,000 over 20-year life span
ADOT&PF Staffing Needs:	No staffing increase

M. Segment of Minnesota Drive from Raspberry Road to Dimond Boulevard

Minnesota Drive from Raspberry Road to Dimond Boulevard is a divided highway with 2 northbound lanes and 3 southbound lanes. An exit ramp on the segment serves as an access point to Strawberry Road on the west side of Minnesota Drive. The third southbound lane exits at Dimond Boulevard.

Main concerns for this segment include:

- A crash cluster of vehicles hitting the crash attenuator in the gore area at the southbound off-ramp

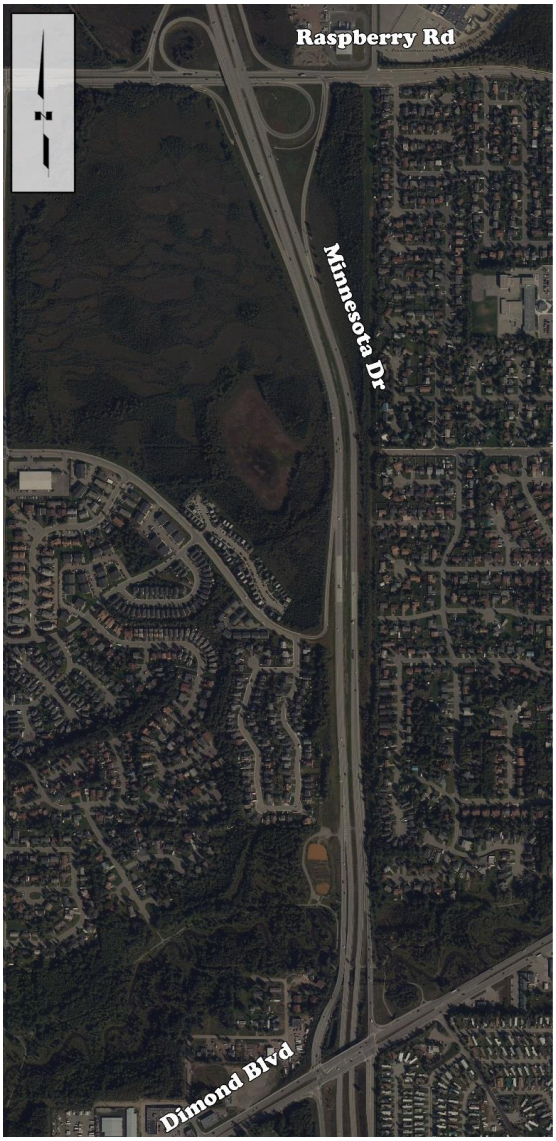


Figure 48 – Minnesota Drive from Raspberry Road to Dimond Boulevard

Operations

Based on AADT and generalized guidelines for freeways, Minnesota Drive from Raspberry Road to Dimond Boulevard has an approximate LOS of B.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	37,450	39,788	39,310	38,870	36,464	35,948	38,480	38,250	38,160	37,780

Table 43 – AADT from Raspberry Road to Strawberry Road On-Ramp

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	39,928	38,603	37,402	37,313	35,977	33,782	35,726	36,145	37,314	37,663

Table 44 – AADT from Strawberry Road On-Ramp to Dimond Boulevard

Safety

The Minnesota Drive segment and the southbound Minnesota Drive to Strawberry Road ramp have average total crash rates. The predominant crash types are rear end/sideswipes and ran-off-road crashes. There is a pattern of crashes at the southbound exit ramp from Minnesota Drive to Dimond Boulevard related to vehicles running into the crash attenuator in the gore area.

Location	Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
Minnesota Drive Segment from Raspberry Road to Dimond Boulevard	189	0.996	1.012	1.135
Southbound Minnesota to Strawberry Ramp	3	1.916	1.127	2.842

Table 45 – Crash Rates for Minnesota Drive from Raspberry Road to Dimond Boulevard

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	64	Guardrail	23
Ran-off-road	35	Ditch	8
Moose	29	Parked	6
Overturn	26	Animal	1
Grand Total	*192*		

Table 46 – Crash Types for Minnesota Drive from Raspberry Road to Dimond Boulevard

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
10	63	119

Table 47 – Crash Severity for Minnesota Drive from Raspberry Road to Dimond Boulevard

Appearance in Metropolitan Transportation Plan or Area Plans

The segment appears in Project 317 in the MTP to add a northbound frontage road parallel to Minnesota Drive from Dimond Boulevard to Raspberry Road.

Bike or Pedestrian Plan

There are no bicycle or pedestrian plans for this location.

Moose Crash Ranking

The segment is part of the segment of Minnesota Drive from Strawberry Road to International Airport Road ranked 6th in 95th percentile highest moose crash areas from 2006 to 2010. A recent project installed moose fence along Minnesota Drive to address this concern.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

Alt M.1 – Extend Dimond Southbound Off-Ramp to the North

This alternative would relocate the southbound Dimond Boulevard off-ramp further to the north.

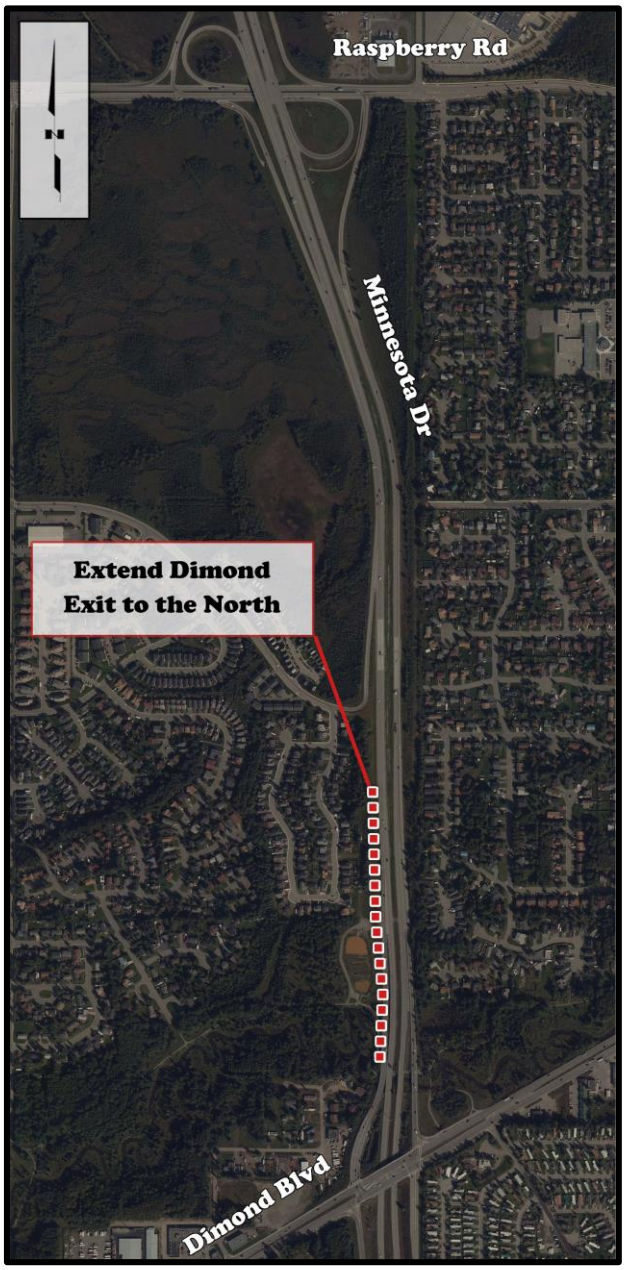


Figure 49 – Combine Strawberry Road and Dimond Boulevard Off-Ramps

Concerns Addressed:	This would eliminate crashes related to vehicles striking the crash attenuator in the gore area of the Dimond Boulevard southbound exit, as geometric conditions do not require median barrier in the gore area at the Strawberry Road exit.
Conformance to Plans:	This alternative does not affect area plans.
Advantages:	Eliminates crashes in the gore area at Dimond Boulevard
Disadvantages:	May be confusing to motorists to leave the highway at Strawberry Road in order to reach Dimond Boulevard. Good signage would be necessary.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Not applicable.
Cost Range:	$2,500,000 to $5,000,000
Operating and Maintenance Costs:	$150,000 over 20-year life span
ADOT&PF Staffing Needs:	No staffing increase.

Alt M.2 – Enhance Guide Signs for Southbound Minnesota Drive Off-Ramp to Dimond Boulevard

This alternative would improve the existing signs signaling the Dimond Boulevard southbound off-ramp.

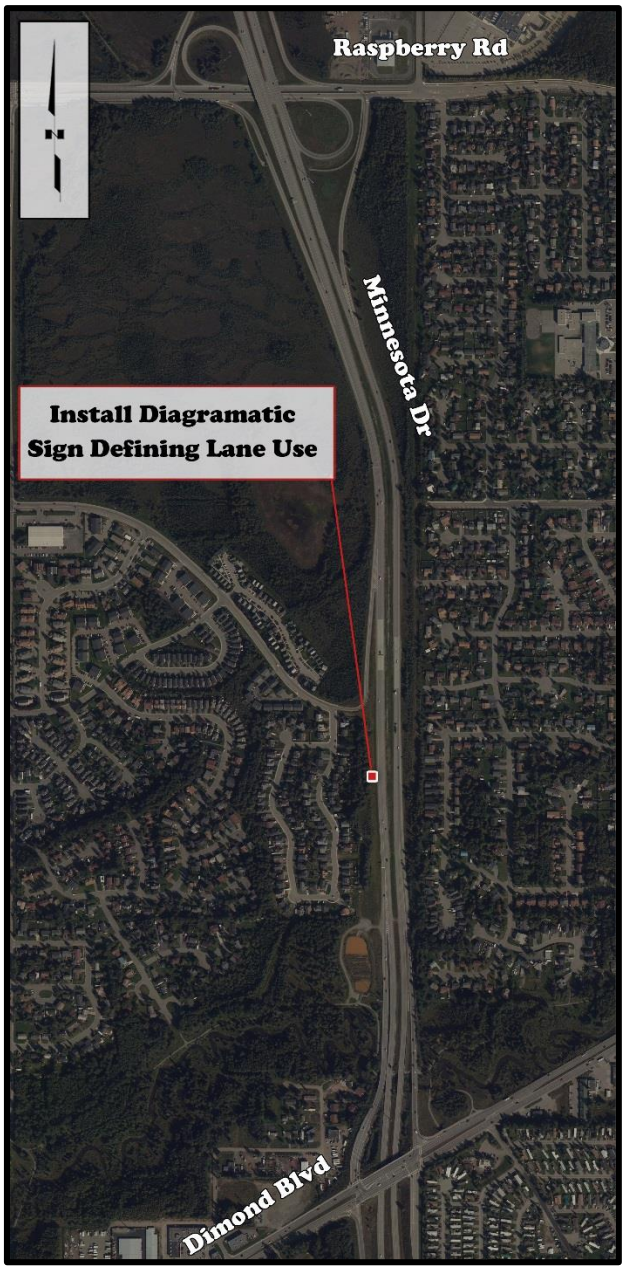


Figure 50 – Install Diagrammatic Signs for Southbound Minnesota Drive Off-Ramp to Dimond Boulevard

Concerns Addressed:	Provides improved guidance to motorists regarding the configuration of the southbound off-ramp to Dimond Boulevard to reduce crashes in the gore area.
Conformance to Plans:	This alternative does not affect any area plans.
Advantages:	Relatively inexpensive and quick application.
Disadvantages:	Does not eliminate all gore crashes, as the median barrier in the gore area remains.
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Not applicable
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$25,000 over 20-year life span
ADOT&PF Staffing Needs:	No staffing increase

Alt M.3 – Extend 3-Lanes on Southbound Minnesota Drive Beyond Dimond Boulevard

This alternative would extend the third southbound lane on Minnesota Drive beyond the Dimond Boulevard exit, so that the third lane no longer exits at Dimond Boulevard.

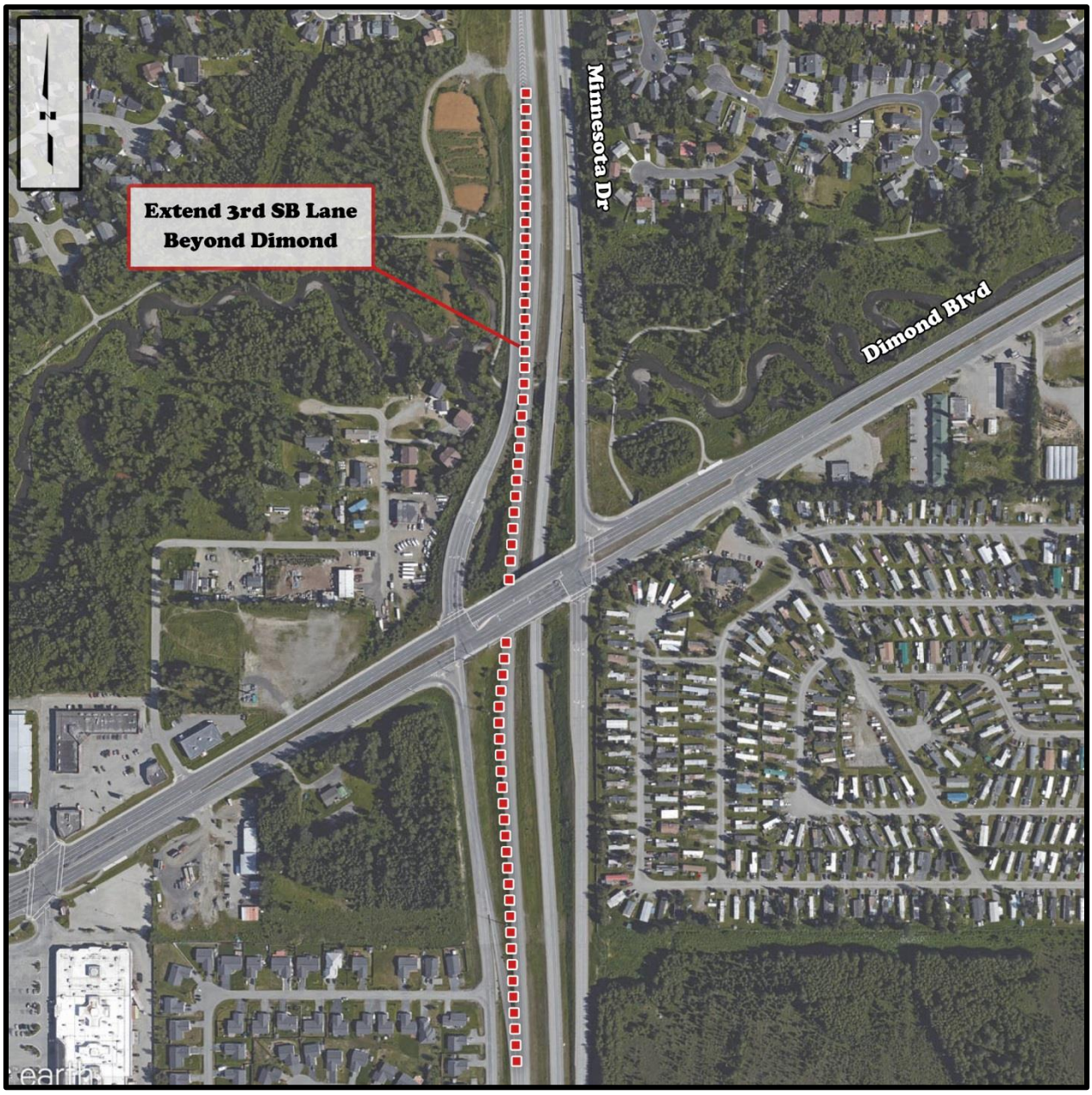


Figure 51 – Extend 3-Lane Southbound Minnesota Drive Beyond Dimond Boulevard

Concerns Addressed:	Removes possibly unexpected condition of third southbound lane exiting at Dimond Boulevard, which may reduce crashes related to the gore area.
Conformance to Plans:	This alternative does not affect area plans.
Advantages:	Motorists have become familiar with this treatment at the southbound Dowling Road exit on the New Seward Highway.
Disadvantages:	Will not eliminate all crashes related to the gore area.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Not applicable.
Cost Range:	$2,500,000 to $5,000,000
Operating and Maintenance Costs:	$100,000 over 10-year life span
ADOT&PF Staffing Needs:	Increase plowing by at least 10 passes per year

Alt M.4 – Construct Dual-Lane On-Ramp to Northbound Minnesota Drive

This alternative would construct a two-lane on-ramp from Dimond Boulevard to northbound Minnesota Drive. One option would be to develop an additional northbound lane between the on-ramp from Dimond Boulevard and the off-ramp to Raspberry Road.



Figure 52 – Construct Dual-Lane On-Ramp

Concerns Addressed:	Would reduce sideswipe and ran-off-road crashes related to merging on the on-ramp
Conformance to Plans:	This alternative does not affect area plans.
Advantages:	Improves safety by reducing conflicts on the on-ramp
Disadvantages:	Care should be taken in the design to ensure that merging conflicts are not just moved to another location.
Delivery Timeframe:	Medium (5 – 10 years)
Year of breakdown:	Not applicable.
Cost Range:	$5,000,000 to $10,000,000
Operating and Maintenance Costs:	$200,000 over 10-year life span
ADOT&PF Staffing Needs:	Additional plowing pass

N. Dimond Boulevard at Minnesota Drive Interchange

Dimond Boulevard at Minnesota Drive is a diamond interchange with signals at the ramp terminals. Right turns to enter Minnesota Drive are channelized, with a yield condition at the ramps.

Main concerns at this location include:

- Ran-off-road, rear end, and sideswipe crashes associated with the merge condition on the northbound and southbound on-ramps.
- Sight distance may be limited for southbound vehicles turning right turn on red (not evaluated)



Figure 53 – Interchange of Dimond Boulevard at Minnesota Drive

Operations

The southbound on-ramp on Minnesota Drive from Dimond Boulevard also accesses Bietinger Drive, the frontage road. At the signal, eastbound traffic has three through lanes and a right turn lane, westbound traffic has three through lanes and a left turn lane, and southbound traffic has a left turn lane, a through/left turn lane, and dual right turn lanes. Westbound left turns operate protected-permitted.

The northbound on-ramp for Minnesota Drive at Dimond Boulevard begins as two lanes that merge and then merge with traffic on Minnesota Drive. At the signal, eastbound traffic has two left turn lanes, and three through lanes. Westbound traffic has three through lanes and a right turn lane. Northbound traffic has a left turn lane, a through/left lane, and a right turn lane.

Based on counts taken by ADOT&PF on August 4, 2005 for the northbound Minnesota Drive ramp and on May 4, 2011 for the southbound Minnesota Drive ramp at Dimond Boulevard, the westbound left turn lane is close to capacity at the southbound Minnesota ramp intersection.

Safety

The northbound and southbound Minnesota Drive ramp terminal intersections at Dimond Boulevard have average total crash rates. The southbound Minnesota Drive to Dimond Boulevard ramp has a below-average total crash rate (crashes at the gore were coded to the segment). The ramps from Dimond Boulevard to both north- and southbound Minnesota Drive have higher-than-average crash rates.

One pedestrian crash and one bicycle crash occurred at Minnesota Drive northbound ramp intersection at Dimond Boulevard. One pedestrian crash and 5 bicycle crashes occurred at the Minnesota Drive southbound ramp intersection at Dimond Boulevard.

The predominant crash types are rear end/sideswipe, right angle, and left turn/U-turn crashes. At the merge area for the ramp from Dimond Boulevard to northbound Minnesota Drive, there were 8 sideswipe or rear end crashes. The remaining 13 crashes on this ramp were ran-off-road crashes (overturn, guardrail, etc.). Similarly, the 9 crashes on the ramp from Dimond Boulevard to southbound Minnesota Drive were all ran-off-road-type crashes.

Location	Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
Northbound Minnesota Drive Ramp-Dimond Boulevard Intersection	102	0.818	1.221	1.388
Southbound Minnesota Drive Ramp-Dimond Boulevard Intersection	125	0.861	1.221	1.375
Dimond Boulevard to Northbound Minnesota Ramp	**21**	**4.551**	**1.127**	**2.048**
Southbound Minnesota to Dimond Ramp	3	0.322	1.127	1.752
Dimond to Southbound Minnesota Ramp	**9**	**3.088**	**1.127**	**2.322**

Table 48 – Crash Rates for Dimond Boulevard at the Minnesota Drive Interchange

Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	143
Right Angle	51
Left Turn / U Turns	44
Guardrail	15
Ran-off-road	12
Pedestrian / Bicycle	8
Sign	6
Overturn	6
Moose	4
Parked	1
Right Turn Sideswipe	1
Head On	1
Grand Total	*292*

Table 49 – Crash Types for Dimond Boulevard at the Minnesota Drive Interchange

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
10	89	193

Table 50 – Crash Severity for Dimond Boulevard at the Minnesota Drive Interchange

Appearance in Metropolitan Transportation Plan or Area Plans

There are no plans for this location.

Bike or Pedestrian Plan

The segment of Dimond Boulevard from Jewel Lake Road to Old Seward Highway appears as Project Priority 175 of the Anchorage Pedestrian Plan. This plan proposes adding a walkway and lighting on this segment. The West Anchorage District Plan has a bicycle improvement plan to complete the road reconstruction with pedestrian facilities on Dimond Boulevard from Minnesota Drive to Kincaid Park. The Anchorage Bicycle Plan proposes to design and construct with the roadway a bicycle friendly solution for Dimond Boulevard signage from Minnesota Drive to Arctic Boulevard.

Moose Crash Ranking

The interchange is part of the segment of Minnesota Drive from 100th Avenue to Tudor Road ranked 7th in 75th percentile areas of concern for moose crashes from 2006 to 2010. A recent project installed moose fence along Minnesota Drive to address this concern.

Pedestrian Crash Ranking

The interchange is not found in the Pedestrian Crash Ranking sheet.

Alt N.1 – Improve Sight Distance for Double Southbound Right-Turn Lane

This alternative would improve sight distance for the southbound dual right turn lanes at the southbound Minnesota Drive ramp intersection.



Figure 54 – Improve sight distance for dual right-turn lanes at southbound ramp intersection

Concerns Addressed:	Improves sight distance for southbound right turn vehicles; however, there is not a pattern of right turn angle crashes at this intersection.
Conformance to Plans:	This alternative would not affect area plans.
Advantages:	Aids southbound right turning drivers in looking for gaps for right turn on red maneuvers
Disadvantages:	Would not improve safety for higher crash rate on-ramps.
Delivery Timeframe:	Short (1 – 4 years)
Year of breakdown:	Not applicable.
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$0
ADOT&PF Staffing Needs:	To be estimated by ADOT&PF

O. Segment of Minnesota Drive from Dimond Boulevard to 100th Avenue

Minnesota Drive from Dimond Boulevard to 100th Avenue is a 4 lane access-controlled freeway with a grassy median. There is a southbound auxiliary lane between the Dimond Boulevard off-ramp and the 100th Avenue on-ramp and a frontage road that serves residences with direct access to the frontage road.

Main concerns with this segment include:

- The southbound Dimond Boulevard on-ramp and the 100th Avenue off-ramp are closely spaced, which may result in weaving conflicts if ramp volumes increase in the future.
- Northbound traffic accessing Dimond Boulevard must exit at 100th Avenue and pass through the 100th Avenue ramp intersections.

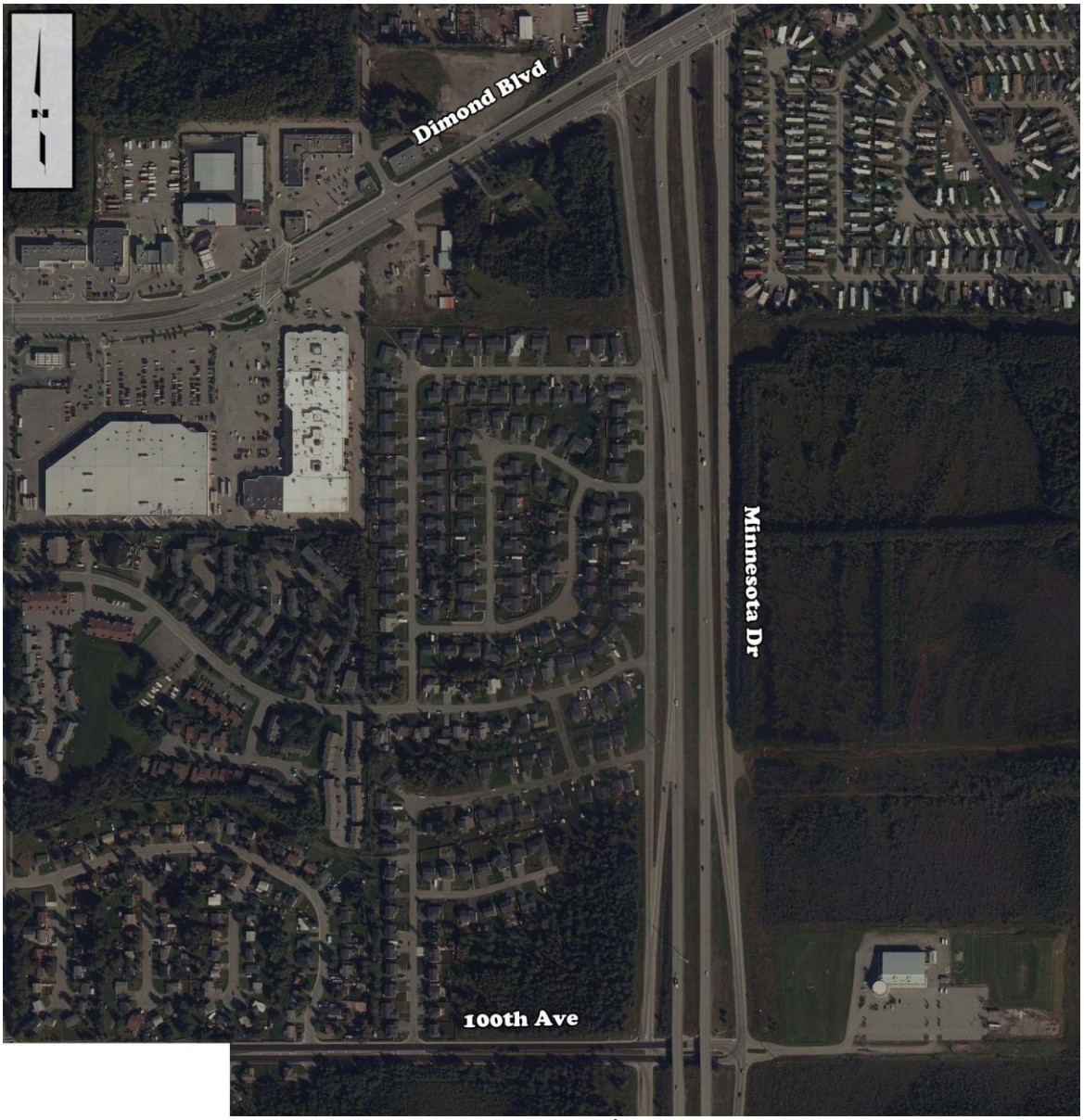


Figure 55 – Minnesota Drive from Dimond Boulevard to 100th Avenue

Operations

Based on AADT and generalized guidelines for freeways, Minnesota Drive from Dimond Boulevard to 100th Avenue has an approximate LOS of B.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	22,019	21,290	21,962	23,773	22,946	23,112	23,990	24,920	25,620	25,960

Table 51 – AADT from Dimond Boulevard to 100th Avenue

Safety

The segment has a below-average total crash rate. The predominant crash types are rear end or sideswipe crashes.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
42	0.690	1.012	1.232

Table 52 – Crash Rate for Minnesota Drive from Dimond Boulevard to 100th Avenue

Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	20
Ran-off-road	7
Guardrail	6
Moose	6
Overturn	3
Grand Total	*42*

Table 53 – Crash Types for Minnesota Drive from Dimond Boulevard to 100th Avenue

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
2	13	27

Table 54 – Crash Severity for Minnesota Drive from Dimond Boulevard to 100th Avenue

Appearance in Metropolitan Transportation Plan or Area Plans

There are no plans for this location.

Bike or Pedestrian Plan

There are no bicycle or pedestrian plans for this location.

Moose Crash Ranking

The segment is part of the segment of Minnesota Drive from 100th Avenue to Tudor Road ranked 7th in 75th percentile areas of concern for moose crashes from 2006 to 2010.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

Alt 0.1 – Swap Dimond On-Ramp and 100th Ave Off-Ramp Southbound

This alternative would move the southbound merge/weaving area for traffic entering the freeway from Dimond Boulevard and traffic exiting the freeway at 100th Avenue to the frontage road by moving the 100th Avenue off-ramp northwards and the Dimond Boulevard on-ramp southwards so that the ramps swap places.



Figure 56 – Swap Locations of Southbound Dimond Boulevard On-Ramp and 100th Avenue Off-Ramp

Concerns Addressed:	Would alleviate future weaving problems between the ramps as volumes increase. May reduce rear end and sideswipe crashes associated with the merge.
Conformance to Plans:	This alternative would support the extension of 100th Avenue from C Street to Minnesota Drive.
Advantages:	Could alleviate future weaving problems
Disadvantages:	Would increase traffic volumes passing residential driveways on frontage road significantly. Mitigating this situation would significantly increase costs.
Delivery Timeframe:	Medium (5 – 10 Years)
Year of breakdown:	Beyond 20 years
Cost Range:	Not estimated due to impacts to residential driveways
Operating and Maintenance Costs:	$130,000 over 10-year life span
DOT Staffing Needs:	To be estimated by DOT&PF

Alt 0.2 – Add Northbound Minnesota Drive Off-Ramp to Dimond Boulevard

This alternative would construct on off-ramp from Minnesota Drive to Dimond Boulevard, eliminating the need for traffic bound for Dimond Boulevard to exit at 100th Avenue. The on-ramp from 100th Avenue could be shortened/steepened to allow more weaving room between the on-and off-ramps.



Figure 57 – Construct Northbound Minnesota Drive Off-Ramp to Dimond Boulevard

Concerns Addressed:	Would improve operations at 100th Avenue northbound ramp intersection by eliminating need for traffic accessing Dimond Boulevard to travel through the intersection.
Conformance to Plans:	Would support extension of 100th Avenue between C Street and Minnesota Drive
Advantages:	Reduces confusion for drivers trying to access Dimond Boulevard, while improving operations at 100th Avenue ramp
Disadvantages:	Short distance between 100th Avenue on-ramp and proposed Dimond Boulevard off-ramp may create weaving concerns
Delivery Timeframe:	Medium (5 – 10 Years)
Year of breakdown:	Beyond 20 years
Cost Range:	$2,500,000 to $5,000,000
Operating and Maintenance Costs:	$60,000 over 10-year life span
DOT Staffing Needs:	Increase plowing

This alternative is not recommended for further study due to major changes on 100th Avenue with the MTP project to connect Minnesota Drive to C Street.

P. 100th Avenue at Minnesota Drive Interchange

100th Avenue at Minnesota Drive is a diamond interchange with stop control at the ramp terminal intersections.

Improvements to this interchange are planned as part of the Municipality's project to extend 100th Avenue from C Street to Minnesota Drive. As a result, no alternatives are presented in this report.



Figure 58 – Interchange at 100th Avenue

Operations

The Municipality has plans to replace the intersections at the Minnesota Drive and 100th Avenue interchange with roundabouts. The ramp intersections were studied in detail as part of the Municipality's project and were therefore not analyzed for this report.

Safety

All intersections and ramps at the 100th Avenue interchange have average or below-average total crash rates. The predominant crash types are right angle and rear end/sideswipe crashes.

Location	Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
Northbound Minnesota Drive Ramp-100th Avenue Intersection	12	0.241	0.702	0.907
Southbound Minnesota Drive Ramp-100th Avenue Intersection	32	0.825	0.702	0.936
Northbound Minnesota to 100th Avenue Ramp	2	0.834	1.127	2.463
100th Avenue to Northbound Minnesota Ramp	2	0.824	1.127	2.454
Southbound Minnesota to 100th Avenue Ramp	1	0.518	1.127	2.642
100th Avenue to Southbound Minnesota Ramp	1	1.192	1.127	3.630

Table 55 – Crash Rates for 100th Avenue at the Minnesota Drive Interchange

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Right Angle	25	Animal	1
Rear End / Overtaking Sideswipe	19	Right Turn Sideswipe	1
Overturn	4	U Turns	1
Ran-off-road	3		
Grand Total	*54*		

Table 56 – Crash Types for 100th Avenue at the Minnesota Drive Interchange

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
3	20	33

Table 57 – Crash Severity for 100th Avenue at the Minnesota Drive Interchange

Appearance in Metropolitan Transportation Plan or Area Plans

Project 103, a short-term project in the MTP, will extend 100th Avenue from Minnesota Drive to C Street and recommends adding bicycle lanes and a separated pathway to the segment.

Bike or Pedestrian Plan

The project to design and construct a separated path on 100th Avenue from Minnesota Drive to King Street along with the road construction appears in the Anchorage Bicycle Plan. Project Priority 312, in the Anchorage Pedestrian Plan, is a project to add the missing sidewalks on 100th Avenue between Minnesota Drive and C Street.

Moose Crash Ranking

The interchange is part of the segment of Minnesota Drive from 100th Avenue to Tudor Road ranked 7th in 75th percentile areas of concern for moose crashes from 2006 to 2010.

Pedestrian Crash Ranking

The interchange is not found in the Pedestrian Crash Ranking sheet.

Q. Segment of Minnesota Drive from 100th Avenue to C Street

Minnesota Drive from 100th Avenue to C Street is an access-controlled 4 lane freeway with a grassy median.

No operational or safety concerns were identified for this segment.



Figure 59 – Minnesota Drive from 100th Avenue to C Street

Operations

Based on generalized guidelines for freeways, Minnesota Drive from 100th Avenue to C Street has an approximate LOS of B.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	25,310	24,480	23,700	23,173	21,479	21,159	22,209	23,136	23,801	24,495

Table 58 – AADT from 100th Avenue to C Street

Safety

The segment has an average total crash rate. The predominant crash types are ran-off-the-road crashes and rear end/sideswipes.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
71	0.806	1.012	1.194

Table 59 – Crash Rate for Minnesota Drive from 100th Avenue to C Street

Crash Type	Crash Frequency
Ran-off-road	16
Overturn	15
Rear End / Overtaking Sideswipe	13
Moose	11
Guardrail	9
Ditch	5
Animal	2
Grand Total	*71*

Table 60 – Crash Types for Minnesota Drive from 100th Avenue to C Street

Non-Incapacitating/Possible Injury	Property Damage Only
20	51

Table 61 – Crash Severity for Minnesota Drive from 100th Avenue to C Street

Appearance in Metropolitan Transportation Plan or Area Plans

There are no plans for this location.

Bike or Pedestrian Plan

There are no bicycle or pedestrian plans for this location.

Moose Crash Ranking

The segment is part of the segment of Minnesota Drive from 100th Avenue to Tudor Road ranked 7th in 75th percentile areas of concern for moose crashes. A recent project installed moose fence along the Minnesota Drive corridor to address these concerns from 2006 to 2010.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

R. C Street at Minnesota Drive Interchange

C Street at Minnesota Drive is a diamond interchange with roundabouts at the ramp terminals.

No operational or safety concerns were identified for this interchange.



Figure 60 – Interchange of C Street at Minnesota Drive

Operations

Using counts taken by the AKDOT&PF on June 11, 2014, the roundabouts at C Street and Minnesota Drive were analyzed using McTrans Highway Capacity Software 2010. Both roundabouts operate at LOS C or better throughout the day.

Safety

All intersections and ramps at the C Street to westbound Minnesota Drive ramp and the westbound and eastbound Minnesota Drive to C Street ramps did not have any crashes during the study period. The predominant crash types are rear end/sideswipe and ran-off-road crashes.

Location	Crash Frequency (2007 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
Westbound C Street-Minnesota Drive Roundabout	12	0.245	0.813	1.035
Eastbound C Street-Minnesota Drive Roundabout	9	0.213	0.813	1.053
Minnesota Drive & C Street Roundabouts	17	0.425	0.813	1.06
C Street to Eastbound Minnesota Ramp	1	0.559	1.127	2.712

Table 62 – Crash Rates for C Street at the Minnesota Drive Interchange

Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	18
Ran-off-road	10
Sign	8
Right Angle	6
Overturn	1
Pedestrian / Bicycle	1
Grand Total	*44*

Table 63 – Crash Types for C Street at the Minnesota Drive Interchange

Non-Incapacitating/Possible Injury	Property Damage Only
10	34

Table 64 – Crash Severity for C Street at the Minnesota Drive Interchange

Appearance in Metropolitan Transportation Plan or Area Plans

There are no plans for this location.

Bike or Pedestrian Plan

There are no bicycle or pedestrian plans for this location.

Moose Crash Ranking

The segment is not found in the Moose Crash Ranking sheet.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

S. Segment of Minnesota Drive from C Street to Old Seward Highway

Minnesota Drive from C Street to Old Seward Highway is a 4 lane divided highway that transitions from access-controlled freeway to at-grade signalized intersections. The frontage road south of Minnesota adds another lane in the eastbound direction for 700 feet before the additional lane turns into a right-turn-only lane at the Old Seward Highway.

No operational or safety concerns were identified for this segment; however, the MTP and the bicycle plan propose a multi-use pathway to connect the paths on C Street and on the Old Seward Highway.



Figure 61 – Minnesota Drive from C Street to Old Seward Highway

Operations

Based on AADT and generalized guidelines for freeways, Minnesota Drive from C Street to Old Seward Highway has an approximate LOS of B.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	26,469	25,600	24,780	25,078	24,155	24,809	24,532	25,345	25,166	26,288

Table 65 – AADT from C Street to Old Seward Highway

Safety

This segment has a below-average total crash rate. The predominate crash types are ran-off-road, moose, and rear end/sideswipe crashes.

2 fatal crashes occurred at this segment. One crash occurred on Sunday, May 18, 2003, at 2:10PM. On a dry, curved roadway, an eastbound motorcycle crashed into a light support. The motorcyclist received a fatal injury. The other crash occurred on Sunday, March 9, 2008, at 8:30PM. In a dark but lighted roadway, a westbound vehicle was traveling the wrong way and collided head on with an eastbound vehicle. The driver of vehicle 1 was driving while intoxicated and received a fatal injury; the driver of vehicle 2 sustained a major injury. Neither drivers were using a seatbelt.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
15	0.226	1.012	1.223

Table 66 – Crash Rate of Minnesota Drive from C Streeet to Old Seward Highway

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Ran-off-road	5	Head On	1
Moose	4	Overturn	1
Rear End / Overtaking Sideswipe	3	Parked	1
Grand Total	*15*		

Table 67 – Crash Types of Minnesota Drive from C Streeet to Old Seward Highway

Fatality	Non-Incapacitating/Possible Injury	Property Damage Only
2	4	9

Table 68 – Crash Severity of Minnesota Drive from C Streeet to Old Seward Highway

Appearance in Metropolitan Transportation Plan or Area Plans

There are no plans for this location.

Bike or Pedestrian Plan

Project 543 is a short-term project in the MTP and the Bicycle Plan to design and construct a separated pathway on Minnesota Drive from Old Seward Highway to C Street.

Moose Crash Ranking

The segment is not found in the Moose Crash Ranking sheet.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

Alt S.1 – Extend Multi-Use Pathway between C Street and the Old Seward Highway

This alternative would construct a separated pathway connecting the non-motorized facilities on the Old Seward Highway with those on C Street along the Minnesota Drive corridor.



Figure 62 – Construct Pathway to Connect C Street and Old Seward Highway Pathways

Concerns Addressed:	Improves pedestrian and bicycle connectivity.
Conformance to Plans:	This alternative is found in the MTP and in the Anchorage Bicycle Plan.
Advantages:	Consistent with MTP and Bicycle Plan
Disadvantages:	If municipal roads were constructed to better develop the grid on either side of Minnesota Drive in this area, those local roads could serve this purpose. Bike pathway crossing Olive Lane needs a safer connection to get across
Delivery Timeframe:	Medium (5 – 10 Years)
Year of breakdown:	Not applicable.
Cost Range:	$1,000,000 to $2,500,000
Operating and Maintenance Costs:	$6,000 over 20-year life span
DOT Staffing Needs:	Pathway maintenance

T. Old Seward Highway at Minnesota Drive Intersection

Old Seward Highway at Minnesota Drive is a 4-leg signalized intersection.

The main concern at this intersection is:

- Intersection capacity



Figure 63 – Intersection of Old Seward Highway at Minnesota Drive

Operations

The intersection at Minnesota Drive/O'Malley Road and Old Seward Highway has two through lanes and a right turn lane in each of the four directions. There are dual left turn lanes for westbound, northbound, and southbound traffic, and one left turn lane for eastbound traffic. All left turns are protected. Based on counts taken at Old Seward Highway and Minnesota

Drive/O'Malley Road on January 20, 2015, by AKDOT&PF, the southbound and eastbound lanes operate at or above capacity in the PM peak.

Safety

This intersection has an average total crash rate. The majority of crashes are rear ends or sideswipes. 2 bicycle crashes occurred at the intersection.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
192	1.103	1.415	1.566

Table 69 – Crash Rate for Old Seward Highway at Minnesota Drive and O'Malley Road

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	155	Ran-off-road	2
Right Angle	29	Double Left Sideswipe	2
Left Turn / U Turns	10	Pedestrian / Bicycle	2
Traffic Signal Pole	4	Parked	1
Right Left Turn Sideswipe	4	Right Turn Sideswipe	1
Grand Total	*210*		

Table 70 – Crash Types for Old Seward Highway at Minnesota Drive and O'Malley Road

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
1	56	153

Table 71 – Crash Severity for Old Seward Highway at Minnesota Drive and O'Malley Road

Appearance in Metropolitan Transportation Plan or Area Plans

Project 139, a short-term project in the MTP, is a reconnaissance study to identify the operations, design, and signal phasing of the proposed Seward Highway-O'Malley Road interchange and the Old Seward Highway-Minnesota Drive interchange. Project 211, a long-term project in the MTP, is to construct the freeway-style interchange between the Seward Highway and Minnesota Drive. Project 322, an unfunded illustrative project, is to complete the Seward Highway-O'Malley Road interchange.

Bike or Pedestrian Plan

There are no plans for Minnesota Drive/O'Malley Road at this intersection in the non-motorized plans.

Moose Crash Ranking

The intersection is part of the segment of O'Malley Road from the Old Seward Highway to Elmore Road ranked 17th in 75th percentile areas of concern for moose crashes from 2006 to 2010.

Pedestrian Crash Ranking

The intersection is not found in the Pedestrian Crash Ranking sheet.

Alt T.1 – Interchange with Minnesota Drive/O'Malley Road and Old Seward Highway

This alternative would construct a grade-separated interchange between Minnesota Drive/O'Malley Road and the Old Seward Highway. Minnesota Drive/O'Malley Road would probably be taken under the Old Seward Highway and traffic control would be on Old Seward Highway.



Figure 64 – Develop Interchange at Minnesota Drive/O'Malley Road and Old Seward Highway

Concerns Addressed:	Would provide significant operational improvements for traffic on Minnesota Drive/O'Malley Road and would reduce crashes significantly.
Conformance to Plans:	This alternative is identified in the MTP.
Advantages:	Safety and operational benefits – found in the MTP.
Disadvantages:	High cost, long term project. Currently, entering volumes at this interchange are less than those at Tudor and at Spenard.
Delivery Timeframe:	Long (11 – 20 Years)
Year of breakdown:	Beyond 20 Years
Cost Range:	Over $50,000,000
Operating and Maintenance Costs:	$55,000 over 30-year life span
DOT Staffing Needs:	To be estimated by DOT&PF

This alternative is not recommended for further study due to the lower volumes compared to other locations along the corridor. It is recommended to look for at-grade solutions first.

U. Segment of O'Malley Road from Old Seward Highway to Seward Highway

O'Malley Road from Old Seward Highway to Seward Highway is a 4 lane road with a raised median. There is a 200 foot left-turn lane westbound onto O'Malley Center Drive.

The main concern on this segment is:

- A pattern of rear end, sideswipe, and left turn crashes at O'Malley Center Drive

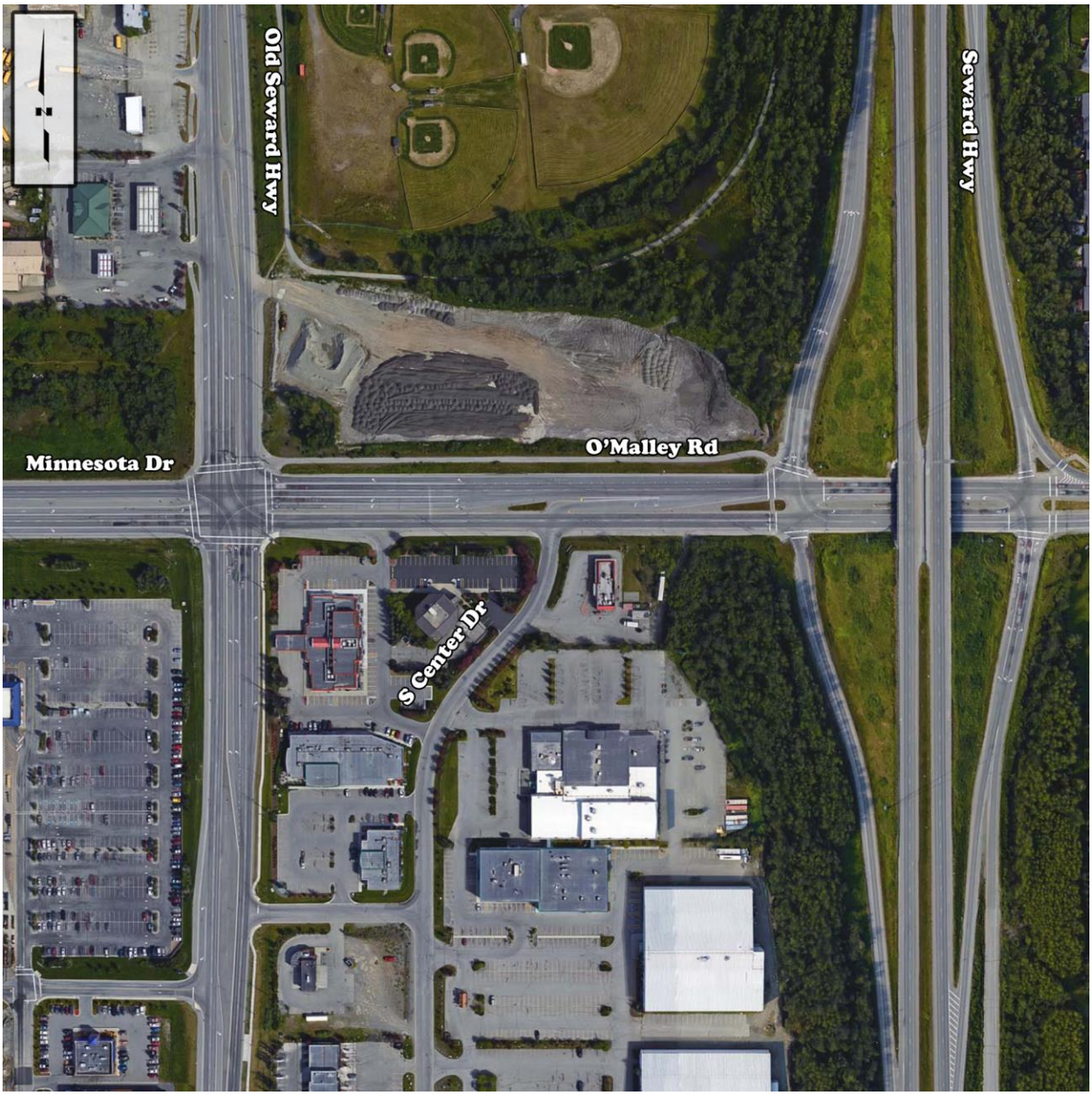


Figure 65 – O'Malley Road from Old Seward Highway to Seward Highway

Operations

Based on AADT and generalized guidelines, O'Malley Road from Old Seward Highway to the Seward Highway has an approximate LOS of C.

YEAR	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
AADT	32,384	28,075	27,232	27,632	29,078	29,480	29,320	28,650	27,774	30,982

Table 72 – AADT from Seward Highway to New Seward Highway

Safety

This segment of O'Malley Road has an average total crash rate. The predominant crashes are rear end/sideswipe and left turn crashes. Half of the rear end/sideswipe crashes and all of the left turn crashes occurred at the intersection with O'Malley Centre Drive. There was 1 bicycle crash at the O'Malley Road-O'Malley Centre Drive intersection.

Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
34	1.661	1.513	1.985

Table 73 – Crash Rate for O'Malley Road from Old Seward Highway to Seward Highway

Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	17
Left Turn	9
Sign	3
Overturn	2
Ran-off-road	1
Pedestrian / Bicycle	1
Right Angle	1
Grand Total	*34*

Table 74 – Crash Types for O'Malley Road from Old Seward Highway to Seward Highway

Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
1	8	25

Table 75 – Crash Severity for O'Malley Road from Old Seward Highway to Seward Highway

Appearance in Metropolitan Transportation Plan or Area Plans

There are several projects in the MTP dealing with the proposed interchanges at the Old Seward Highway and at the Seward Highway: Project 139 (a reconnaissance study), Project 211 (first phases of construction), and Project 322 (to complete construction).

Bike or Pedestrian Plan

There are no bicycle or pedestrian plans for this location.

Moose Crash Ranking

The segment is part of the segment of O'Malley Road from the Old Seward Highway to Elmore Road ranked 17th in 75th percentile areas of concern for moose crashes from 2006 to 2010.

Pedestrian Crash Ranking

The segment is not found in the Pedestrian Crash Ranking sheet.

Alt U.1 – Close Left-Turn Access at O'Malley Center Drive

This alternative would close the left-turn access from O'Malley Road westbound to O'Malley Center Drive.



Figure 66 – Close Access to O'Malley Center Drive

Concerns Addressed:	Would move left turns to signalized intersections where left turn crashes may be less likely. Rear end/sideswipe crashes may be decreased, but some would likely move to another location.
Conformance to Plans:	This alternative does not affect area plans.
Advantages:	Eliminates conflicts that result in crashes.
Disadvantages:	Reduces access to a busy activity center – may increase crashes and congestion at other locations.
Delivery Timeframe:	Short (1 – 4 Years)
Year of breakdown:	Not applicable.
Cost Range:	$100,000 to $500,000
Operating and Maintenance Costs:	$0
DOT Staffing Needs:	No staffing increase

V. Seward Highway at O'Malley Road Interchange

Seward Highway at O'Malley Road is a diamond interchange with signalized intersections at the ramp terminals.

The main concerns at this intersection include:

- Capacity of the ramp intersections
- Long term plans to link Minnesota Drive and the Seward Highway with directional ramps
- Pattern of eastbound left turn crashes at the northbound Seward Highway ramp



Figure 67 – Interchange of Seward Highway at O'Malley Road

Operations

Turning movement counts were not available during the AM peak. During the PM peak, the southbound and eastbound traffic operates at or over capacity.

Safety

The intersections at the ramp terminals have average total crash rates. The predominant crash types are rear end/sideswipe and eastbound or westbound left turn/U-turn crashes. 2 bicycle crashes occurred at the southbound Seward Highway ramp-O'Malley Road intersection.

1 fatal crash occurred at the southbound Seward Highway ramp-O'Malley Road intersection on Wednesday, December 24, 2008, at 1:51 PM. With ice on the roadway, a westbound vehicle turning left into the southbound on ramp to Seward Highway failed to yield and collided with an eastbound vehicle going straight. Of the 3 occupants in vehicle 1, one received possible injuries, one sustained minor injuries, and the other received a fatal injury. The driver of vehicle 2 had no injuries.

Location	Crash Frequency (2003 to 2012)	Crash Rate	State Crash Rate	UCL @ 95% Confidence
Northbound Seward Highway Ramp- O'Malley Road Intersection	99	0.988	1.221	1.408
Southbound Seward Highway Ramp- O'Malley Road Intersection	128	1.191	1.221	1.401

Table 76 – Crash Rates for O'Malley Road at the Seward Highway Interchange

Crash Type	Crash Frequency	Crash Type	Crash Frequency
Rear End / Overtaking Sideswipe	105	Overturn	2
Left Turn / U Turns	88	Pedestrian / Bicycle	2
Right Angle	44	Right Turn Sideswipe	2
Ran-off-road	8	Double Left Sideswipe	1
Grand Total	*252*		

Table 77 – Crash Types for O'Malley Road at the Seward Highway Interchange

Fatality	Incapacitating Injury	Non-Incapacitating/Possible Injury	Property Damage Only
1	17	77	157

Table 78 – Crash Severity for O'Malley Road at the Seward Highway Interchange

Appearance in Metropolitan Transportation Plan or Area Plans

There are several projects in the MTP dealing with the proposed interchanges at the Old Seward Highway and at the Seward Highway: Project 139 (a reconnaissance study), Project 211 (first phases of construction), and Project 322 (to complete construction).

Bike or Pedestrian Plan

There are no bicycle or pedestrian plans for this location.

Moose Crash Ranking

The interchange is part of the segment of O'Malley Road from the Seward Highway to Hane Street ranked 10th in 95th percentile highest moose crash areas from 2006 to 2010.

Pedestrian Crash Ranking

The interchange is not found in the Pedestrian Crash Ranking sheet.

Alt V.1 – Roundabouts at Ramp Terminals

This alternative would construct roundabouts to replace the existing signalized intersections at the ramp terminals.

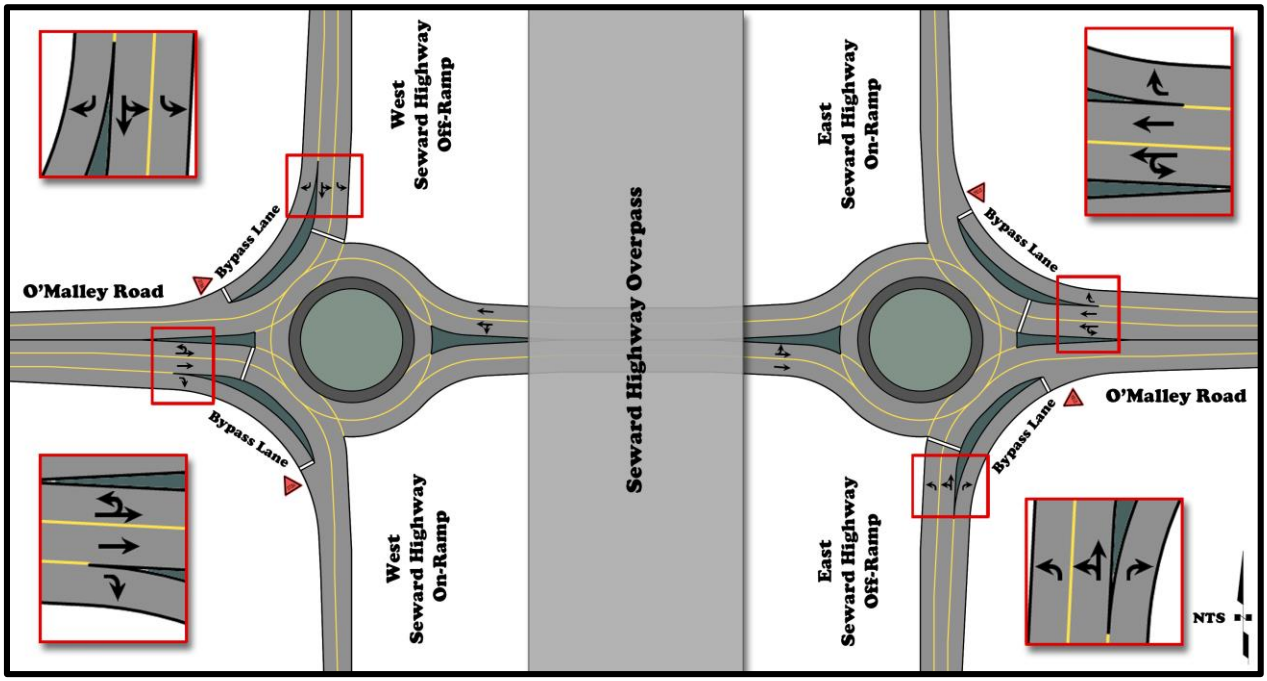


Figure 68 – Schematic of Roundabouts at Interchange Ramp Terminals

Concerns Addressed:	Eliminates left turn crashes at ramp intersections. Probably does not increase total intersection capacity enough to handle future traffic volumes without the addition of a full or partial interchange.
Conformance to Plans:	Could improve safety at ramp terminals even after full or partial interchange between Minnesota Drive and the Seward Highway is designed and built.
Advantages:	Can be implemented more quickly than a full or partial freeway-to-freeway interchange. Significant safety benefits.
Disadvantages:	Likely will have significant ROW, environmental, and utility impacts. Has short lifespan before volumes exceed capacity.
Delivery Timeframe:	Medium (5 – 10 Years)
Year of breakdown:	Approximately 10 years, according to analysis KE prepared for O'Malley Road Reconstruction project
Cost Range:	$5,000,000 to $10,000,000
Operating and Maintenance Costs:	$45,000 over 10-year life span
DOT Staffing Needs:	To be estimated by DOT&PF

Alt V.2 – Highway-to-Highway Partial Interchange

This alternative would construct ramps directly connecting eastbound Minnesota Drive with Northbound Seward Highway and both Southbound and Northbound Seward Highway with westbound Minnesota Drive.

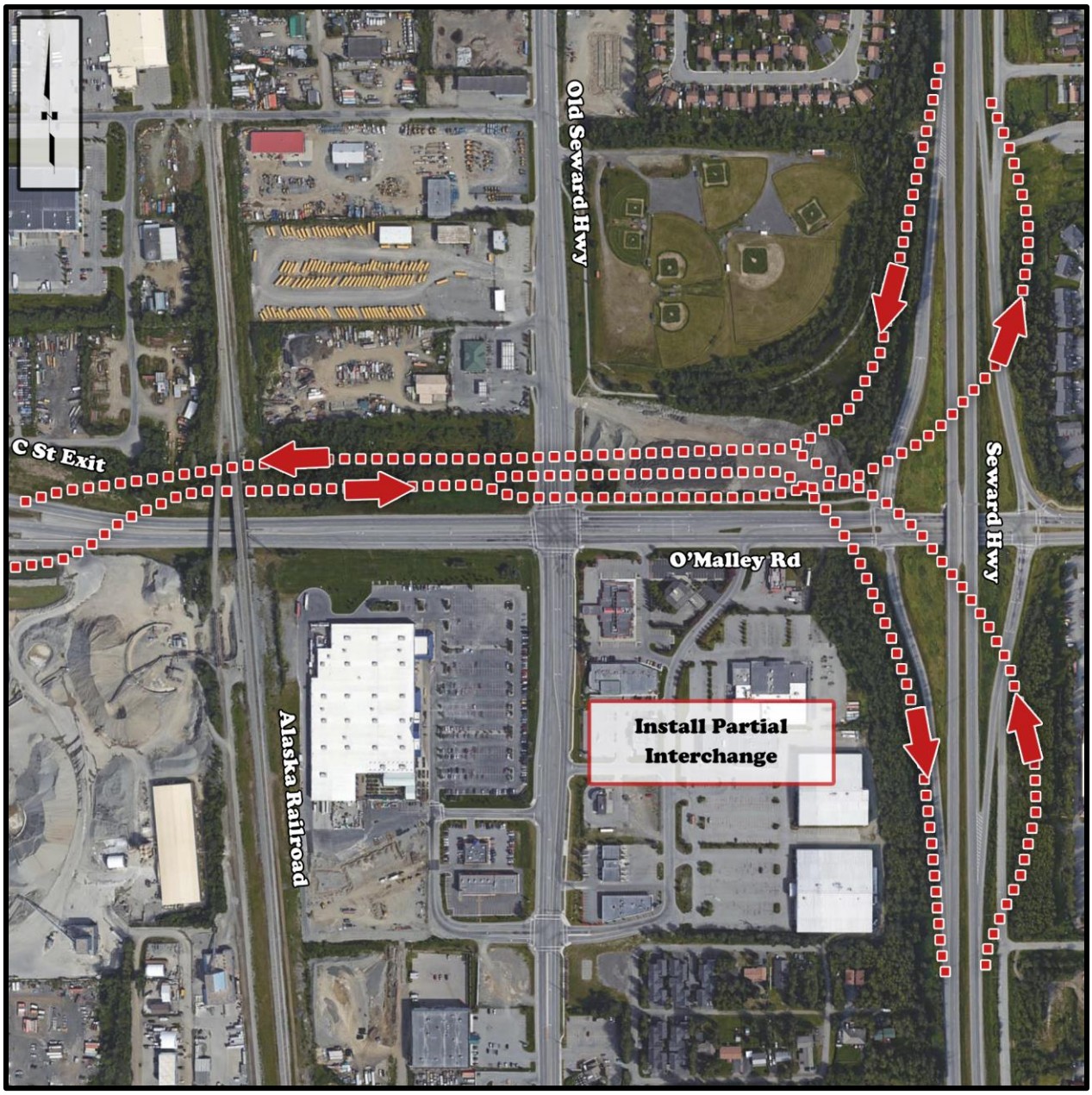


Figure 69 – Partial Interchange

Concerns Addressed:	Significantly improves operations for the movements that would become free. Decreases likelihood for left turn crashes and for rear end crashes.
Conformance to Plans:	This alternative is found in the MTP.
Advantages:	Free flow movements between the Seward Highway and Minnesota Drive are consistent with the freeway classification of these roadways. This alternative is less expensive than a full interchange.
Disadvantages:	High cost, long term project. Currently, entering volumes at this interchange are less than those at Tudor and at Spenard.
Delivery Timeframe:	Long (11 – 20 Years)
Year of breakdown:	Beyond 20 Years.
Cost Range:	$25,000,000 to $50,000,000
Operating and Maintenance Costs:	$120,000 over 30-year life span
DOT Staffing Needs:	Bridge inspections, maintain and operate new lanes, increase plowing

This alternative is not recommended for further study due to the low volumes at the intersection compared to higher volumes in other locations of the corridor. It is recommended to look for at-grade solutions first.

Alt V.3 – Full Freeway-to-Freeway Exchange

This alternative would build a full freeway-to-freeway exchange, making all turning movements between the Seward Highway and Minnesota Drive free movements.

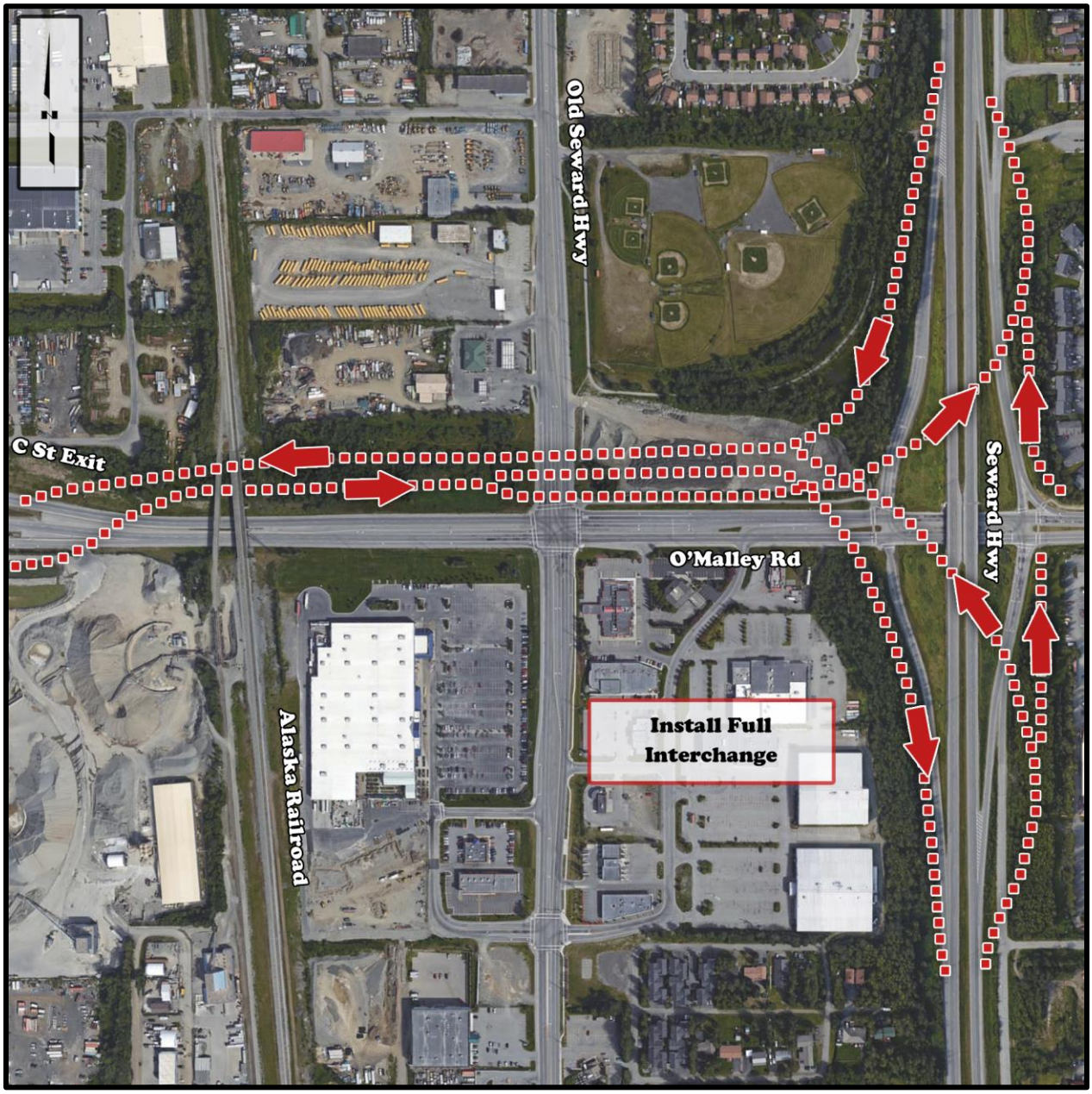


Figure 70 – Construct Full Freeway-to-Freeway Interchange

Concerns Addressed:	Would significantly improve operations/decrease delay for all movements. Would eliminate left turn and rear end crashes.
Conformance to Plans:	This alternative is included in the MTP.
Advantages:	Free flow movements between the Seward Highway and Minnesota Drive are consistent with the freeway classification of these roadways.
Disadvantages:	High cost, long term project. Currently, entering volumes at this interchange are less than those at Tudor and at Spenard.
Delivery Timeframe:	Long (11 – 20 Years)
Year of breakdown:	Beyond 20 Years.
Cost Range:	Over $50,000,000
Operating and Maintenance Costs:	$180,000 over 30-year life span
DOT Staffing Needs:	To be estimated by DOT&PF

References

2035 Metropolitan Transportation Plan, Municipality of Anchorage, Anchorage Metropolitan Area Transportation Solutions, May 2012.

Official Streets and Highways Plan, Municipality of Anchorage, June 2014.

Anchorage Bicycle Plan, Anchorage Metropolitan Area Transportation Solutions, March 2010.

Anchorage Pedestrian Plan, Anchorage Metropolitan Area Transportation Solutions, October 2007.

Freight Mobility Study, Anchorage Metropolitan Area Transportation Solutions, June 2001.

West Anchorage District Plan, Municipality of Anchorage, July 2012.

Highway Capacity Software, McTrans.

Appendix – Traffic Data

Turning Movements and Lane Capacity

1/15/2015	AKDOTPF													
AM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity		PM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity
NB	L	228	L	1	228	91%		NB	L	33	L	1	33	13%
	T	1647	T	2	561	94%			T	1058	T	2	378	63%
	R	37	T/R	1	561	100%			R	76	T/R	1	378	76%
SB	L	0	L	1	0	0%		SB	L	40	L	1	40	16%
	T	796	T	2	265	44%			T	2034	T	2	684	114%
	R	53	T/R	1	318	62%			R	17	T/R	1	667	114%
WB	L	2	L					WB	L	10	L			
	T	104	T	1	112	20%			T	3	T	1	28	10%
	R	6	R						R	15	R			
EB	L	66	L					EB	L	17	L			
	T	39	T	1	105	33%			T	10	T	1	27	8%
	R	220	R	1	220	73%			R	81	R	1	81	27%

26th Avenue and Minnesota Drive

1/15/2015	AKDOTPF													
AM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity		PM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity
NB	L	65	L	2	33	13%		NB	L	240	L	2	120	48%
	T	1771	T	3	590	98%			T	1105	T	3	368	61%
SB	T	803	T	3	268	45%		SB	T	1842	T	3	614	102%
	R	183	R	1	183	61%			R	481	R	1	481	160%
WB	L	269	L	1	135	54%		WB	L	537	L	1	179	72%
	-		L/T	1	224	69%			-		L/T	1	517.4	170%
	T	268	T	2	89	15%			T	797	T	2	319	53%
	R	83	R	1	83	28%			R	132	R	1	132	44%

Northern Lights Boulevard and Minnesota Drive

1/15/2015	AKDOTPF													
AM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity		PM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity
NB	T	1448	T	2	622	104%		NB	T	1060	T	2	465	78%
	R	418	T/R	1	622	173%			R	335	T/R	1	465	133%
SB	L	176	L	2	88	35%		SB	L	303	L	2	152	61%
	T	949	T	3	316	53%			T	1986	T	3	662	110%
EB	L	432	L	1	288	115%		EB	L	322	L	1	215	86%
	-	-	L/T	1	359	93%			L	-	L/T	1	258	68%
	T	860	T	1	430	72%			T	602	T	1	301	50%
	R	85	T/R	1	300	64%			R	106	T/R	1	257	60%

Benson Boulevard and Minnesota Drive

7/14/2010	MOA							7/14/2010	MOA					
AM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity		PM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity
NB	L	49	L	1	49	20%		NB	L	60	L	1	60	24%
	T	740	T	2	291	49%			T	1763	T	2	642	107%
	R	134	T/R	1	291	71%			R	162	T/R	1	642	134%
SB	L	127	L	1	127	51%		SB	L	211	L	1	211	84%
	T	1721	T	2	640	107%			T	1242	T	2	464	77%
	R	200	T/R	1	640	140%			R	149	T/R	1	464	102%
WB	L	314	L	1	157	63%		WB	L	332	L	1	166	66%
	T	319	L/T	1	317	53%			T	420	L/T	1	376	63%
	R	65	T/R	1	225	48%			R	102	T/R	1	312	69%
EB	L	91	L	1	46	18%		EB	L	393	L	1	131	52%
	T	136	L/T	1	114	30%			T	367	L/T	1	454	32%
	R	17	T/R	1	85	17%			R	16	T/R	1	192	37%

Spenard Road and Minnesota Drive

1/15/2015	AKDOTPF					
AM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity
NB	L	54	L	1	54	22%
	T	2007	T	3	669	112%
	R	766	R	1	766	255%
SB	L	204	L	2	102	41%
	T	720	T	2	240	40%
	R	44	T/R	1	284	55%
WB	L	275	L	1	138	55%
	T	57	L/T	1	166	60%
	R	103	T/R	1	132	39%
EB	L	45	L	1	45	18%
	T	110	T	1	110	9%
	R	42	T/R	1	42	23%

PM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity
NB	L	40	L	1	40	16%
	T	1115	T	3	372	62%
	R	203	R	1	203	68%
SB	L	170	L	2	85	34%
	T	1894	T	2	640	107%
	R	25	T/R	1	640	111%
WB	L	808	L	1	202	81%
	T	141	L/T	1	713	137%
	R	207	T/R	1	174	98%
EB	L	62	L	1	62	25%
	T	81	T	1	81	7%
	R	74	T/R	1	74	31%

Tudor Road and Minnesota Drive

North-AM	WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	13.2	7.5	0.0		15.3		5.2	5.4	
Lane LOS	B	A			C		A	A	
Lane 95% Queue	1.5	0.0			6.9		0.5	0.6	
Approach Delay, s/veh	5.12			15.32			5.33		
Approach LOS, s/veh	A			C			A		
Intersection Delay, s/veh	9.58								
Intersection LOS	A								

North-PM	WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	10.4	5.4	0.0		7.9		10.8	12.1	
Lane LOS	B	A			A		B	B	
Lane 95% Queue	1.7	0.0			2.2		3.0	3.8	
Approach Delay, s/veh	5.10			7.95			11.47		
Approach LOS, s/veh	A			A			B		
Intersection Delay, s/veh	9.82								
Intersection LOS	A								

South-AM	EB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	7.7	5.6	8.2	21.0	3.7	5.7	5.3	5.6	
Lane LOS	A	A		C	A		A	A	
Lane 95% Queue	0.7	0.0	0.8	8.9	0.0	0.8	0.8	1.0	
Approach Delay, s/veh	7.94			17.95			5.50		
Approach LOS, s/veh	A			C			A		
Intersection Delay, s/veh	12.20								
Intersection LOS	B								

South-PM	EB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	6.8	4.8	23.1	8.9	3.8	5.2	5.3	5.6	
Lane LOS	A	A		A	A		A	A	
Lane 95% Queue	0.6	0.0	6.4	2.3	0.0	0.5	0.8	1.0	
Approach Delay, s/veh	19.69			7.98			5.50		
Approach LOS, s/veh	C			A			A		
Intersection Delay, s/veh	13.65								
Intersection LOS	B								

C Street Roundabouts

1/20/2015	AKDOTPF					
AM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity
NB	L	318	L	2	159	64%
	T	228	T	2	114	19%
	R	225	R	1	225	75%
SB	L	90	L	2	45	18%
	T	119	T	2	60	10%
	R	108	R	1	108	36%
WB	L	161	L	2	81	32%
	T	740	T	2	370	62%
	R	232	R	1	232	77%
EB	L	76	L	1	76	30%
	T	543	T	2	272	45%
	R	166	R	1	166	55%

PM	Movements	TMV	Lanes	# Lanes	Lane Movement	Lane Capacity
NB	L	304	L	2	152	61%
	T	324	T	2	162	27%
	R	263	R	1	263	88%
SB	L	458	L	2	229	92%
	T	520	T	2	260	43%
	R	212	R	1	212	71%
WB	L	312	L	2	156	62%
	T	577	T	2	289	48%
	R	238	R	1	238	79%
EB	L	182	L	1	182	73%
	T	858	T	2	429	72%
	R	481	R	1	481	160%

Old Seward Highway and O'Malley Road

Appendix C: Public Comments

General Comments

Date	Comment
1/5/2016	You've identified a whole bunch of issues. I've traveled that route home from work hundreds (if not thousands) of times, though bicycling up A/C from the Conoco building was my usual path. I am now retired. I stayed on Minnesota to C when driving. Things I've noticed during the drive home, usually around 4PM ... The swoop thru the lagoon, NOBODY drives 45. 50 to 55 is what most traffic does. When I drove under 50, everyone passed me. I might suggest someway to "meter" out the traffic before hitting the swoop. The light where there is a school crossing, with the kids' safety in mind might be something to consider. I realize that from 9th on on during rush hour it all stacks up. I used to cross there on 10th on my bike to get to the coastal trail. I realize we are kinda stuck with just 2 4-lanes running south ... Minnesota and New Seward. When school there lets out, pedestrians should have all the consideration. After school is out, I'd suggest timing the lights if they are not already (headed south). An alternative, if it could be made attractive, would be C, but that is so good for bikes, I'd hate to increase auto traffic. Time getting home is irrelevant If you choose to drive, that is your consequence. We need better non-auto alternatives, not more "fixes" for the car-addicted. Traffic calming, for the many people not in cars (and to compact the traffic, often increasing flow), might be a better objective
1/8/2016	There is nothing wrong with Minnesota Drive. It flows well and is right sized. There is no need to improve it. The money should be spent elsewhere. Minnesota Drive is one of our crowning jewels in this town. Yes, it does get busy at times but it can be worked around. It is right-sized and should be able to handle future growth. The congestion on Minnesota is nothing like you see in large cities such as Seattle. We have nothing to complain about.
1/7/2016	I am the homeowner of 2240 Culver Place and the statement Minnesota Blues couldn't be more accurate. This is also the case for every neighbor that I have spoken to. The noise pollution that we receive is ridiculous. Once cars leave downtown, Minnesota is treated as a highway with persons going over of 65 miles per hour not to mention the semi traffic and J-braking. However there is no sound barrier. There is also no effort to slow people down, having six lanes and a mile without a light encourages people to go as fast as possible which they do. I have had my baby woken up inside my house by traffic noise. The only protection from Minnesota the city has provided is a chain link fence, it does nothing to stem the tide of dust, salt and noise. It is almost mind-boggling that the city has built a highway through the heart of a city without a residential sound barrier. My house was built in the 50s and we invested this last year in the best noise reducing windows but the noise is still overpowering inside my home. The other comment I would have is that West High School should have a way to get on Minnesota other than Spenard. Every day at 2:30 the high school lets out and traffic gets bottled necked on Hillcrest drive causing students to speed through the side streets. My neighborhood has lost more mailboxes than one could count and a fire hydrant due to this poor design.
1/6/2016	My only issues with Minnesota drive are the people driving 70 mph and the people driving to fast for conditions. It's Alaska and we experience bad driving conditions. I think certain traffic violations should have a fine of mandatory driver written retest.

1/8/2016	I am writing to provide input for the Minnesota Drive study. As someone who drives and bicycles frequently in that corridor, these are the major problems I see that updated designs should address: 1. Inadequate pedestrian and bicycle infrastructure along Minnesota Drive itself, including a lack of buffered bike lanes and narrow sidewalks of uneven width that are frequently interrupted by light posts. 2. Barriers to east-west bicycle and pedestrian travel. The blocks along Minnesota are too long in the Midtown area, leading to pedestrians crossing mid-block. The street and intersections should be redesigned with pedestrian and bicycle safety and convenience as a top priority, not as an afterthought as they are with so many DOTPF projects. This redesign must include bike lanes along major east-west connectors such as Raspberry, Dimond, Tudor, etc. The only problem I have from a driver's perspective is that the road is so unsafe that it puts pedestrians and bicyclists in dangerous spots in intersections and at midblock crossings, and I certainly don't want to hit someone when I'm driving.
1/8/2016	I regularly use Minnesota Dr for the entire length of this project and also frequently cross Minnesota Dr as a pedestrian. 1. The intersection with Benson quickly develops ruts so deep they can easily damage the suspension on any car that crosses unless you slow to a crawl. You need to develop a pavement that does not wear so quickly and can be easily replaced when it does. This is a high-traffic intersection as you no-doubt know and when it's closed for repairs it is a major PITA for drivers. 2. Presently, there is no safe way for a pedestrian to cross Minnesota Dr. Sure, there are cross-walks with lights and so on, but Anchorage drivers don't give a good goddamn about lights and stop signs. Plus, drivers go so fast that they don't even try to stop or slow at intersections, especially during winter when the roads are slick. Overpasses (yes, several overpasses) would help but they won't be used unless easy and convenient. Underpasses would be better. 3. The right-turn lane from westbound NLB onto northbound Minnesota Dr needs to be widened. There is far too little room for the right-hand lane and the turn lane. Combine that with all the jackasses that use that turn-lane and you've got trouble, which holds up traffic and encourages accidents. 4. Why the hell isn't there an overpass at Minnesota Dr intersection with Tudor? This is a major bottleneck. Yes, you have some westbound traffic on Tudor that needs to get onto Minnesota Dr, both north and southbound. Fix it so Minnesota Dr traffic does not need to stop at this intersection.
1/8/2016	The best thing you can do to improve Minnesota Dr is GET PEOPLE OUT OF THEIR CARS!!!! Give incentives to take public transportation. Develop a world class bus system. Buddy up. Almost every car you see commuting is a SOV. (single occupant vehicle) Just some thoughts from a non-driver. (bike, bus, walk)
1/8/2016	Regarding the upgrades to Minnesota Road...It is quite functional just the way it is. With current budget shortages, this is the LAST thing we should be spending money on. Stuff the idea away for some other decade in the future. It may not be perfect but it's functional and is serving its purpose. We can use it just the way it is for many years to come until this state figures out better industries to fund our needs and wants. If you feel we must upgrade it now, what are we going to cut to come up with the funding?
1/8/2016	It would be nice to have bike lanes in the shoulder and a path on both sides of the roadway. There are very few safe North to south corridors for bicyclist and pedestrians.

1/18/2016	Ms. Mitchell regarding the above referenced study. While it may not be a safety issue the one thing that I am greatly concerned about is the road noise. The noise at the current traffic flow level is unbearable during the spring, summer and fall. Not so much in the winter as traffic speeds slow during this time. Any additional traffic flow and higher speeds will only add to this problem. During the seasons mention my wife and I cannot enjoy our back deck and yard due to the noise. We have to literally shout at each other during peak traffic times while outside. During the hotter summers that Anchorage has been experiencing we have a choice, open the windows and try to sleep or close the windows and suffer from the heat. As South anchorage continues to grow the noise has increased, this was made worse when the speed limit was increased to 60 MPH. Please conceder this problem during your study and include some sound blocking remedies like fencing or earthen sound dikes of some type. We love being outdoors and enjoying our yard and deck but the noise at the current noise level is terrible. Please help.
1/13/2016	I drive the road many times a day in a semi the things I see to upgrade would be maybe better one way signs I have had more than once a car coming at me in the wrong direction. Walking over passes by the school more than once I have had kids darting through traffic. Minnesota and w 26th and over to Carrs grocery. I don't know if something could be done at Minnesota and Northern Light also benson there are a lot of homeless people that hang out there. The light at Minnesota and Tudor needs either bigger flashing hand signal so you can see if the light is going to change further away or some sort of warning device at the top of the hill heading north. Unless you put in a bridge to bypass that light. I don't think they consider trucker drivers when they go changing the roads here. A 53 foot trailer takes up a lot of room to get around a corner and trying to get out of town ir in with a set of doubles.
1/11/2016	Great going toscrew up some more streets. That is one of the main streets used by truckers unless your going to get rid of street lights don't screw with it
2/2/2016	I live on the corner of 32nd & Minnesota. Given the current budget crisis of the state, I do not think we need to do anything. Let it go until the budget is in better shape.
2/3/2016	Increase the speed limit
2/3/2016	No money do not fund
2/12/2016	(see file for complete comment) The Spenard area is ripe for redevelopment. Many structures are aging and blighted, and zoning supports a higher intensity than what exists currently. The state owned Minnesota Drive is an important part of the Municipality's efforts to redevelop in this area. Minnesota is needed for circulation of vehicles; east/west streets between Spenard and Minnesota have access only via Spenard and Minnesota. These streets cannot be turned into dead-end streets at Minnesota. In addition, Minnesota is an important link the pedestrian network. However, sidewalks along Minnesota are inadequate given the speed of travel (they are neither wide nor buffered from traffic), and due to lack of snow removal it is not uncommon to see pedestrians walking in Minnesota Drive as much as a week after a snow event. This is both dangerous and embarrassing for a city our size, and must be addressed during road improvements. Finally, much of the area between Spenard and Minnesota lacks storm drainage. As we look to develop this area in the future, it will be essential that upgrades to Minnesota also upgrade the storm water system to accommodate the Municipality's storm water needs to support future development.
2/12/2016	I understand that the memorandum of understanding between the DOT and MOA related to utilizing the agreed upon CSS process in state roadway designs has lapsed. I do not know if this is an oversight by the state or intentional. I cannot stress enough how important it will be for the state to follow the process on such a significant road project in our urban core.

2/10/2016	A person should be able to safely bike to and from downtown along the entire length of Minnesota and L/I Streets. There should be a bike lane or bike path that allows for this. Biking down Minnesota is way too dangerous now. Trying to bike on the sidewalks, in either direction, is not a good option and almost as unsafe.
2/8/2016	Minnesota is my back yard. I hate the noise every summer and my yard is unusable. We can't hear each other unless we are closer than 3 feet of so. Is there any way to improve the noise\fencing in the redesign?
2/5/2016	Thank you for the opportunity to comment on safety upgrades to the section of Minnesota between Westchester Lagoon and Tudor Road. As you know, Minnesota Drive bisects a densely populated mixed use zone through this entire stretch. As a daily commuter heading southbound in the morning and northbound in the afternoon, I frequently see pedestrians and bikers exposed to traffic dangers throughout this corridor. I regularly see bikes and pedestrians crossing midway between Northern Lights and Tudor, sometimes standing on the narrow median separating the lanes of high speed traffic, waiting for an opportunity to cross. Additionally, with no separation between the street and the sidewalk, pedestrians and bikers are exposed to high speed traffic and icy sidewalks that sometimes get buried by State snowplows. Given the number of apartment buildings and neighborhoods on both side of the road, as well as the number of shopping centers and malls between Fireweed and Tudor, more safety amenities need to be added at regular intervals along this route. 1. Cross walks need to be installed in all four directions at Northern Lights and Minnesota. 2. Separated pathways, with minimum six foot widths and lighting, need to be constructed on both sides of Minnesota that run the length of this corridor. 3. Pedestrian activated crossing lights, similar to the flashing light just east of the Goose Lake overpass on East Northern Lights, need to be installed at regular intervals between Benson and Spenard and between Spenard and Tudor to allow local residents, bus riders and bike commuters safe crossing locations. The distances between these intersections are far too great to expect pedestrians to use existing cross walks. 4. A pedestrian overpass or underpass between Benson and Spenard and another between Spenard and Tudor. The non-motorized use of this corridor is high, but almost no safety amenities exist through this section of Minnesota Blvd. Given the density of low income housing in the area, it's safe to assume that many residents are bus riders, bikers and walkers. If a bus rider lives on the west side of Minnesota and must ride the People Mover downtown to work, he/she must cross six lanes of traffic, often in the dark, to get to their bus stop on the east side of Minnesota. It's also important to consider the many businesses in the area, from Holiday stores to restaurants, and from Carrs to REI, banks, an athletic club, two schools, City Diner, and several strip malls. All of these businesses are destinations for residents who live in and around the area. The nonmotorized traffic transiting east-to-west across Minnesota Boulevard is alarmingly high and needs to be addressed.
1/13/2016	What improvements should be made: The traffic is bad only in the evening in the north to south direction. Even at that time, the traffic going north is fluid, and it also is in the morning. By constructing all kinds of turning points with medians and sidewalks in the middle of the road, you defeat one of the main possibilities used in larger cities; use overhead lights to direct traffic and use more lanes when and where needed. If you had open lanes, you could open a fourth one in the evening and also direct traffic that is not going to turn immediately on N. Lights or Spenard to stay on the left. The point is to keep track of new business developments, both downtown and on the way along Minnesota, that impact the overall volume of traffic. If you cannot build overpasses (cost, seismic areas), the easiest way is a flexible use of existing roads with overhead lights. A roundabout will only create more accidents; people don't know how to use them.
1/13/2016	My biggest concerns are from downtown to Tudor, and really from Northern Lights to Tudor. Pedestrian infrastructure along both sides of Minnesota is inadequate. Specifically, on the east side of Minnesota. Snow plows plow over sidewalks and traffic is too close. Transit users are unable to access bus stops in winter. We need wider, separated walkways to improve pedestrian safety in Spenard.

1/15/2016	I would like to see among the proposals, an option that provides for uninterrupted traffic flow along the length of Minnesota Drive. I had thought that this could be accomplished in two parts. Using the existing topography, construction of an underground bypass from Hillcrest to Tudor and an overpass at O'Malley and the Old Seward Highway with an on-ramp to the Seward Highway would allow for non-stop traffic flow from Downtown Anchorage to the Kenai Penninsula. The first and most substantial step would be to construct a cut-and-cover tunnel along the length of Minnesota Drive from Hillcrest to Tudor Road. By reducing the gradient on Southbound Minnesota drive as it approaches Hillcrest, the tunnel would enter the ground beneath Hillcrest drive. It would then continue along the current Minnesota Drive right-of-way and exit after Tudor Road. On-ramps and Off-ramps could be constructed at high-traffic intersections or in order to reduce cost and complexity, the on-ramps and off-ramps could be left out and the tunnel would be used strictly as a bypass for through-traffic. On the surface directly above the bypass, the existing infrastructure could be recreated to allow for local traffic. Secondly, as Minnesota Drive approaches the Old Seward Highway from the West it rises to meet the Old Seward then drops down again on the East side as it approaches the New Seward Highway. By simply reducing the uphill gradient to that approach, it would be relatively easy to reroute Minnesota underneath the Old Seward with exit ramps for turning onto and off of Old Seward. By bypassing Old Seward, a dedicated onramp to the Seward Highway would allow for non-stop through traffic from Downtown Anchorage to the Kenai Penninsula. I realize that this is extremely unlikely due to the current political and economic climate but I sincerely think that this is the best solution as it will alleviate the current congestion along Minnesota Drive and accomodate future growth. My concern is that we will spend far more money in the long term with several "quick fixes" than we would had we made a more substantial change to begin with.
2/11/2016	I'd like to submit comments on the Minnesota Drive study. I make my comments having lived near Minnesota Drive for over 9 years, including the past ~2 years on Greenland near 32nd, just a block from Minnesota. My first comment is that I would like to see pedestrian and bicycle routes given greater priority. Bicycles should have a designated route which closely follows Minnesota from Hillcrest Drive to Tudor and includes appropriate intersections with side streets and good visibility for riders and cars. This type of connection is critical to making good use of the dedicated bike trails. In this case, such a connection would greatly enhance access to the Chester Creek and Coastal Trail. Right now, access from areas south of Benson to Chester Creek requires crossing several dangerous intersections, riding on the sidewalk (which is never appropriate), and generally discourages biking. Second, I'd like to say that I support Alt D.4 to provide proper crosswalks on all 4 sides of the Minnesota-Northern Lights and Minnesota-Benson intersections. Third, I think that many of the backups at the intersections, especially Spenard and Minnesota, are caused by left turns. Prohibiting left turns which cross the main flow of rush hour traffic should be seriously considered. For example, left turns from north bound Minnesota onto Spenard could be prohibited from 4 to 6 pm. This would improve the flow of south bound traffic on Minnesota with minimal additional infrastructure. I've seen variations of this work well in other cities.
2/4/2016	Need for bike route N/S thru Anchorage. Bikers prefer separted pathways to bike lanes. Less meander in bike paths to promote serious commuter trips. Trunk Rd design is a good example of excellent design. S Curve NB thru lagoon area is a problem.
1/12/2016	I travel the Westchester lagoon to raspberry corridor every day for work..how about thinking about doing a study to start a tunnel southbound at the bottom of the lagoon just before you rise up to west high and go directly UNDER Minnesota all the way through to just the other side of International. Two lanes both ways will alleviate all the thru traffic as this is the main reason for the bottlenecks!

2/4/2016	keep bicycles separated from vehicular traffic. It would be nice if both could be plowed and the plowed snow would not impact where the bicycles are and not where the vehicles are.
2/12/2016	Please consider lowering the speed limit on Minnesota from 45 mph to 35 mph from Tudor to Westchester Lagoon.
2/7/2016	I recommend considering the entire stretch of MN from Tudor to Westchester to be a community roadway, rather than a highway. Prioritize safety for people on foot and in cars working to get to the neighborhoods of Spenard. Reducing speed, adding traffic calming, and allowing room for sidewalks and safe crossings are essential.
2/12/2016	I am a resident of Spenard. I live in the Evergreen Subdivision (north of Tudor, east of Minnesota). Please consider the following comments regarding the reconnaissance project: The speed limit should be lowered from West High School to Tudor Road. Minnesota Road has divided the neighborhood of Spenard, and it has become a very unsafe corridor to cross as a pedestrian. Pedestrian infrastructure along Minnesota Drive is inadequate and unsafe. In the winter, it has become a snow storage site. The sidewalks are too narrow for the amount and speed of traffic. Pedestrian crossings should be considered between Tudor Rd and Spenard Rd, and also between Spenard Rd. and Benson. The one-way couplet at Spenard ad 36th will harm the continuity of the rest of Spenard Road. The neighborhood residents and business community are committed to a new multi-user vision for Spenard Rd. and the one-way couplet would conflict with that vision.
2/4/2016	put trees in the medians to make them more like a boulevard
1/13/2016	Needs underpass for through traffic on Minnesota--Get plan and build it in pieces
1/13/2016	Remove the median from Tudor north and add a reversible lane
2/7/2016	The sidewalk along Minnesota is too narrow and right along the roadway. While walking or biking it feels dangerous being so close to 45-50mph cars. I\'d like a wider sidewalk, a grass buffer, or shoulder between the sidewalk and the roadway.
2/11/2016	summary of phone call to Edith McKee: Thank you for bearing with me on the phone today with my questions and concerns. My primary focus in making comments on the Study is to respond to concerns from my neighbors about Pedestrian Safety on the stretch of MInnesota Boulevard from Westchester Lagoon to Tudor Road. Which the exception of a few marginally signalized intersections, Minnesota Boulevard functions as an uncrosssable river or barrier to many of our citizens who are moving about on foot or in wheelchairs or on bicycles. I'd like to see the study address and incorporate more data on pedestrian/disabled/bicycle movements across non-signalized areas of Minnesota Boulevard between Westchester Lagoon and Tudor Road, particularly between Benson and Spenard and then between Spenard and Tudor. While such movements are not supported by any physical amenities other than a raised median, I believe they occur in numbers which merit consideration in this plan. If you can find data in the Anchorage Pedestrian Plan which would help me assess these movements, I'd greatly appreciate a copy so I can include that information in my comments.
1/14/2016	Mr. Foster called several times. He has many concerns about traffic in Anchorage but his big concern in the Minnesota Drive corridor is not being able to turn left from 33rd onto NB Minnesota. Other concerns included the high volume of cut thru traffic thru the neighborhood north of Spenard, west of Minnesota. He does not like school buses stopping on major roads and does not like their white strobe lights. He believes that vehicles are slow to accelerate at intersections beause of cell phone use so he suggests using something to jam cell phones at intersections.
1/8/2016	The entire corridor from Benson to the Hillcrest bridge continues to have increased pedestrians and bike use. The sidewalks should be redesigned for safety and better connectivity between the neighborhoods, commercial anchors, the schools and other trails.

2/5/2016	I am a parent of a child attending Romig Middle School. The traffic on Minnesota Drive in the area of the school entrance and Benson and Northern Lights worries me. Several times, I have witnessed cars going through a red light at the school entrance or speeding through that intersection during the time when the speed limit is 20 and the lights are flashing for people to slow down. I was particularly disturbed to see people speeding during icy road conditions in November and December. Many children cross Minnesota or Northern lights Boulevard and Benson during the school day and after school. To me, it is one of the least safe school crossing areas in Anchorage. People coming from downtown are often speeding as they come up hill from Westchester Lagoon. I am not sure what the solution is as there is quite a bit of signage in the area. Perhaps, there could be a sign indicating the person's speed limit as they begin to approach the 20 mph zone during school hours. There should be a study done to see what speeds people are traveling on that road during school hours when the lights are flashing to slow down. I am going to guess there are quite a few people breaking the law when police enforcement is not present. This is extremely dangerous due to the level of young students coming in going in that area. That area maybe even warrant a pedestrian bridge, in my opinion, to cross over Minnesota.
1/13/2016	Upgrade trail – plus, add signage. I've redirected a number of tourists over the years walking on Minnesota - Dangerous!
1/13/2016	I like the access from Hillcrest to NL (bike/ped trail). Safer than any other route!
1/13/2016	Use pedestrian bridges to reduce crosswalks. Way safer.
2/7/2016	Since the only way to bike along MN is on the sidewalks, consider expanding them to 5-6 feet wide.
1/22/2016	I am a resident of midtown Spenard and use Minnesota on a daily basis to get to work downtown. Overall, Minnesota is one of my favorite roads and one of the most effective thoroughfares in town. When I heard there was a planning process underway, my first reaction was, "don't touch my road, it's the best." However, there are a few things about it that could be improved, primarily pedestrian and bike access through Spenard. The section of Minnesota from Benson to Spenard does not have adequate pedestrian crossing and I admit to being a frequent jaywalker because I don't want to go a quarter mile or more out of my way. Also, the sidewalks are miserable - too narrow and close to the fast traffic with a lot of ice and sludge thrown up by traffic. I really like and enjoy the Minnesota park along that stretch and would like to see more trees and landscaping between the park and the road. Otherwise, although traffic does back up during rush hour, I find it an effective road. Particularly the sections from downtown to Northern Lights and from Tudor to Old Seward are easy and fast to drive at all times of day, in my experience. Also, they feature alternative bike routes that travel nearby but not along the road, which is much much better than a sidewalk by a busy road.
1/13/2016	Why can\'t the lights be timed from downtown to Tudor to move traffic through more efficiently. Traffic flow can be adjusted to both commute directions as needed.
1/13/2016	Need better coordination between Muni/State for plowing so that the State doesn't plow snow onto recently plowed sidewalks
2/12/2016	Let\'s separate the sidewalk from Minnesota and reduce the speed limit to 35 mph.
1/13/2016	Widen sidewalk along east side of Minnesota from 27th to 26th for area-wide connectivity to the proposed bike/ped corridor on 27th

2/22/2016	Hello.I live at 4108 Hayes st.. One block east of Minnesota at 41st st. All of my travels on Minnesota involve Tudor, Spenard, Benson and NorthernLights. Somehow missed the postcard but am happy to know my opinion/input may be of help. At least once if not three times a day I travel the route. Mostly to Carrs Aurora Village but also City Dinner, Pie Stop in the strip mall and also Walgreens. following are my trouble spots. Sorry I am not very computer literate so you get what I can do. !. Southbound Minn. at Spenard. No space for left arrow onto Spenard as so many people want to be in "FAST" lane they clog up access. I see you have lots of space to install longer access lane. Thanks. 2. Northbound Minnesota at Spenard to turn left. Rush hours show cars backed up by many. Must wait through at least 3 cycles to get by. Better to go North and U-Turn at first opportunity. 3. Hate driving past Minnesota strip mall (City Dinner, Pie Stop, Dollar Zone and other business there. Is there some way to change that?
2/4/2016	Minnesota Drive divides the neighborhood of Spenard. A lower speed limit from Tudor to Northern Lights would be safer for pedestrians and also benefit a growing local business community. This project should consider speed remediation as one component of any proposed changes. Think about roundabouts at the intersections of Minnesota & Spenard and Minnesota & Benson/NL
3/12/2016	Why not use the correct name? The Walter J. Hickle Expressway!

A – Hillcrest Drive

Date	Comment
1/13/2016	Biggest Concerns: I agree with identifying the queue at Hillcrest as a major problem. I have lived in this vicinity for 21 years and watched it evolve, particularly between Romig and the high school and Tudor, with the worst snag at the intersection of Minnesota and Spenard. I work on Spendard behind the bowling alley, so I find it nice to walk to work, but waiting at the lights defeats the purpose. Then I also note that the most congested and slow lane is the right one, but only ½ of that traffic is ready to turn on N. Lights or Spenard
1/11/2016	Very heavily used crosswalk at the end of the offramp. The redesign of this crosswalk in Fall 2015 is very poor and limits functionality. The former crosswalk made pedestrians visible, while the new one puts them in harm\'s way and is much more inconvenient.
1/22/2016	Consider adding stop signs for the east and westbound traffic on either side of the Hillcrest Drive on-ramp instead of a round-about. Adding stop signs would be significantly cheaper than constructing the round-about, saving the city/state must needed money during this curret budget crisis. It would also ensure the safety of the pedestrians utilizing the crosswalks. Concerns about congestion forming in the round-about would also be alleviated. Why spend $3 million on a \"solution\" that may or may not work? Adding stop signs would probably cost no more than $5000.00 to implement. If the stop signs don\'t work to reduce the problem, build the round-about when the city/state are fiscally sound.
2/7/2016	Both crosswalks on A-2 or A-3 allow for clearer crossing of Hillcrest than is currently designed.
2/7/2016	The redesign of this crosswalk last year was terrible. It pushes trail users onto the oncoming ramp making it appear that one would continue east on HIllcrest, rather than needing to change direction and head south across Hillcrest. It\'s challenging for cars on Hillcrest to then stop to allow for crossing.
2/7/2016	I prefer option A-2 with the right/left turning lane rather than the roundabout. I\'d also support stop signs on Hillcrest because cars never stop for pedestrians/bicyclists since they feel like they don\'t have to. I usually use this after work (5pm) so don\'t catch school traffic or congestion.
	Add a stop sign for both eat and westbound traffic traveling on hill rest drive. This would likely reduce the potential of congestion in the round-about, concern of improper yielding, ensure safety of the pedstrians using the crosswalks, and be significantly cheaper than the round-about option, we are in a budget crisis.
1/13/2016	Concern: Pedestrian crossing of Hillcrest and ramp
1/13/2016	Keep homeless from setting up camps in woods
1/13/2016	Turnagain Community Council / Safe Routes to Schools initiated improvement movement for ped xing on Hillcrest at Ramp intersection. Still need flashing ped light - otherwise is good improvement. Roundabout would put ped traffic at more risk – remember demographic of drivers to high school
1/13/2016	Roundabout not a good investment. Traffic improvements would be nominal and short term (AM school hours)
1/13/2016	For the future- traffic light is essential
1/13/2016	Consider tunnel for bikes (where the ramp intersects Hillcrest)
1/13/2016	Yes — (for additional southbound approach lane A-2). This is easier for bikes to navigate, either turning or going straight on Hillcrest
1/13/2016	No-- (for roundabout option A-3) I like this, but as a biker on the road this feels less safe or forces me onto sidewalks
1/13/2016	Love this roundabout option
1/13/2016	Speed bumps needed on Hillcrest
1/13/2016	Prefer A-3

AB – Hillcrest Exit to 26th Avenue

1/11/2016	Raise the west high bridge for one and build a bullet line through the city. It's ridiculous that you have to drive through a city road to enter or exit. We need to replicate the "loop" sustem as used in Phoenix and Chicago for instance. It would reduce congestion and increase safety.
1/5/2016	The road under Hillcrest Dr. bridge needs lowered so the bridge is higher for taller traffic such as Semi Trailers.
1/13/2016	Yes, it is perfectly manageable in the winter but that doesn\'t mean it\'s not necessarily dangerous. For a lot of people, it\'s not a very easy curve to negotiate. I have no problem with it and I mostly agree that it\'s fine as far as safety specs go, but I wouldn\'t be disappointed if this part of the road was redesign, perhaps adding another lane if possible (when going North), to relieve congestion.
1/11/2016	It would be nice if the sidewalk could extend between W. 25th and Hillcrest
1/10/2016	Sorry, but I take exception to the \"slick and dangerous\" comments. Both the curve radius and the incline/decline grades are well within safety specs. The problem is that prevailing speeds through this area are too fast, something I believe traffic studies would bear out (i.e. people are speeding). A little caution for winter road conditions are all that is required here.
2/8/2016	Incorporate a drainage system in the middle of Minnesota in the lagoon area that does not require melting snow berms/water to drain across the road which then refreezes in the evening to create large patches of ice on an otherwise dry road.
2/8/2016	Connect the terminated sidewalk to hillcrest and have a you are here map clearly showing how to connect to the trail system to continue northbound by foot/bike. I don\'t know how many times I have seen people dangerously walking on the very small shoulder of Minnesota northbound between hillcrest and 15th, especially in the summer time by people that are unfamiliar with the trail system.
2/7/2016	This path from the high/middle school to Hillcrest is great. Consider resurfacing it. Please:)
2/7/2016	This path along the high school/middle school is a great connector to south on MN but needs some repaving. Please?
2/4/2016	Reduce the speed limit in this entire stretch to 30mph.
2/4/2016	Reduce the speed limit in this entire stretch to 30mph. Cars are still driving 50 mph up this curve making it really dangerous with the merge of Spenard Road.
1/6/2016	This curve can be slick and dangerous
	Can be an extremely slick and dangerous curve

B – 26th Avenue

1/13/2016	Keep or upgrade the trail here! (*west sidewalk)*
1/5/2016	Minnesota needs a longer light at 25th avenue and romig middle school, the turn lane needs to be a 2 lane turning
1/5/2016	My response would be about pedestrian safety in the area around Romig Middle School. The crosswalks are quite dark and dangerous. The sidewalks are very close to the road. I would recommend moving the sidewalks away from the roadways and then updating the crosswalk area. More lights, flashing signage, etc for this intersection out in front of Romig.
1/14/2016	Add a second turn lane to alleviate school traffic
1/14/2016	Consider a raised or underground walkway for ped Xing

D – Northern Lights Boulevard/Benson Boulevard Couplet

1/24/2016	Due to budgetary constraints, I feel we will have to live with what we have and can't afford any large projects. The only part of this project that would be necessary is creating a right turn lane for the trucks turning right on to Tudor Rd and extending the left turn lane from Minnesota to Northern Lights as that backs up into traffic going north. A less expensive option to increase to improve traffic flow is coordinate the traffic lights and post a speed limit that will assist in making those green lights.
1/10/2016	As with the left-turn lane from southbound Minnesota to eastbound Benson, the left turn arrow here that serves the double left-turn lane from southbound Old Seward onto eastbound Minnesota is very poorly timed. The green arrow is not long enough to clear the waiting left turn lanes on a single cycle, and during off-peak times it is frequently necessary to wait through a red left-turn arrow even with no opposing through traffic on northbound Old Seward.
1/7/2016	It is highly inconvenient to cross from the REI mall area to the Carrs area. I find myself doing it quite often for various reasons, and often illegally and dangerously because of the no crossing leg of the Benson/NL intersections with Minnesota. This is a highly used pedestrian area, and not only would I change these two intersections to allow pedestrian crossing on all 4 sides, I would also consider diagonal pedestrian crossing.
1/8/2016	The pedestrian cross signal should not require users to push the \"beg\" button. The timing of the signals is sufficient to cross the street; requiring the user to push the button means that they may have to wait a full light cycle in order to cross. A crosswalk is needed at the SW to SE corners.
1/8/2016	Turning Carrs traffic makes this a dangerous driveway for pedestrians and cyclists. There is a lot of use of this area by all modes of transportation, it may be worthwhile to carve a dedicated turn lane with appropriate sidewalk protection out of the underused grocery store surface parking
1/8/2016	Pedestrians and bicyclist should be able to cross the street in all 4 directions, ie the SE to SW corner using a signal.
1/10/2016	While northbound on Minnesota, waiting for green arrow to turn left (eastbound) onto Benson, there is a long delay while the 2-way traffic signal on Minnesota is green in both directions. In off-peak hours, such as late evening, I often wait through an entire light cycle stopped at the red arrow and not a SINGLE northbound car passes through the intersection. This signal should be changed to a cyclical \"Yield on Green\" during off-peak hours, so northbound Minnesot traffic can turn left onto eastbound Benson without waiting unnecessarily.
1/10/2016	Northernmost lane of eastbound Benson has a funky curb (probably a remnant of the 80s-era expansion of this stretch) that creates a hazard when turning left onto Benson from the southbound lane of Minnesota. Basically, to turn left into the back entrance AK Club or Walgreen\'s (the first curb-cut E of Minnesota) you have to make a quick jog around a concrete curb that serves no obvious purpose.
1/11/2016	The intersection of Minnesota/Northern Lights is one that I dread for my middle school age student. It is usually populated by homeless persons and very, very busy in the AM. We live too close for a bus to pick him up, he's designated "walker". I'd love a bridge crosswalk there!
9/22/2015	While pedestrian safety has been repeatedly mentioned, pedestrian inconvenience in this intersection is a major problem for pedestrians and cyclists trying to go from the SE corner of Benson
1/29/2016	This intersection is quite dangerous for bicyclists. I have heard of several vehicle-bike collisions and many go unreported. I imagine that traffic leaving the grocery store parking lot may be a contributor as well.
2/7/2016	Agreed! 4-way crosswalk is necessary. Lots of illegal crossing occurs otherwise, putting people in cars at risk of a collision.
2/7/2016	The landscaping and placement of the sidewalk make it challenging for people pulling out of these parking lots to see people on foot or bike.

2/7/2016	All of the D 2-4 alternatives to make the cross walk on the southern part of this intersection is key. The 3-way cross walks are ridiculous, take a long time to cross, and encourage people to cross illegally.
1/5/2016	There is a large amount of pedestrian traffic in this area but to cross minnesotta at benson or northern lights to get between the very popular shopping mall (including the Alaska club) and the local grocery store, we have to cross something like 15 lanes or traffic and wait for three light changes. Crazy!!! An overpass is not an option since we have strollers and bicycle trailers. Please fix this.
1/13/2016	Restrict entrance/exit into side shops such as REI, Spenard Roadhouse, etc
1/13/2016	Ped overcross (*opposite the southwest corner of Carr's on Benson*)
1/13/2016	Tunnels for bikes/pedestrians.
1/13/2016	Wider separate ped path to prevent plow-over
1/13/2016	Ped overcross (*half way between Northern Lights and Benson*)
1/13/2016	Ped overcross (Benson at Safeway entrance)
1/13/2016	Bad idea to create 2nd dedicated left turn from WNL (*westbound Northern Lights*) onto Minnesota southbound. Thru west traffic on remaining two lanes will back up badly!
1/13/2016	Limit left turn access from WNL (West Northern Lights) between Spenard and Minnesota to one entry (REI area) and one exit (by bank).
1/13/2016	Do not close access – we need it for emergency (fire, etc.) (REI parking lot)
1/13/2016	Leave third lane as both straight thru and left turn (*Northern Lights*)
1/13/2016	If possible widen sidewalks
1/13/2016	Making 2nd dedicated two lane on WNL turning
1/13/2016	D ped overpass between Northern Lights and Benson

E – Benson Boulevard to Spenard Road

1/13/2016	Ped over crossing (*between Spenard and Benson*
2/12/2016	The Anchorage Pedestrian Plan, codified in October 2007 by Anchorage Assembly Ordinance (AO2007-96) lists Goal 1, Policy 1.1:"Create a safer, more walkable city that will encourage winter pedestrian activity and make walking a safer and more attractive activity. Improve pedestrian facilities and crossings in areas where there are documented safety conflicts with feasible opportunities for improvement. (Action Item) 2. Investigate use of mid-block crossings in areas where jaywalking frequently occurs and crashes have been recorded."Please include pedestrian \"jaywalking\" data for the block between Benson and Spenard and the block between Spenard and Tudor Road.
1/7/2016	We regularly cross Minnesota on foot here to visit neighbors, etc (Minnesota is splitting the community of Spenard here). It is too long to go to signaled intersections, and the sidewalks along the E side are narrow and too close to the road. If I had unlimited resources I would make the road underground here, and connect the neighborhood streets on top with parks and pedestrian/bike ways. Otherwise I would figure out good pedestrian improvements that will actually work.
1/11/2016	Sidewalks through the park are underused because a) they are in poor condition and b) they put pedestrians/cyclists in a dangerous position behind blind corners at the intersections.
1/11/2016	Agree with other comment regarding high rate of pedestrian crossings at this block. This calls for some sort of innovative crosswalk, similar to Northern Lights and Nichols Street to allow pedestrians to cross to a median refuge between traffic lights.
1/24/2016	In addition to the pedestrian comments, the businesses on either side of the road are difficult to access from the wrong direction unless you do a u-turn. That combined with poor lighting makes this section dangerous in winter.
2/12/2016	I do not like the one-way couplet idea. It really hurts the continuity of Spenard Road.
2/12/2016	A pedestrian cross walk is needed halfway between Spenard Road and Benson.
2/7/2016	The stretch of MN between Benson and Spenard is so long that a lot of people cross the street on foot or bikes illegally waiting on medians. It\'d be great to have a stairway/walking bridge to cross east-west.
2/7/2016	Walking on the western side of MN is really challenging because cars driving north on MN turning left onto 32nd do not yield to pedestrians/bikes--they\'re just trying to get across when there\'s a break in southbound traffic.
2/7/2016	The paths are great, but the crosswalks are so far in from the intersection that cars don\'t see people on bikes/foot crossing the street.
2/7/2016	The sidewalk needs to be wider, with a grass or shoulder between the driving lanes. Throughout the winter plows push snow/gravel onto the sidewalks making it dangerous to walk along MN in north and southbound directions.
2/7/2016	Cars pulling into this strip mall always cut off people on foot or bike, and cars pulling out of the parking lot should have signs to yield to people on foot/bike.
1/13/2016	Ped overpass across Minnesota at 36th Ave (between segments E & F

F – Spenard Road

2/11/2016	The concern for this road improvement project seems to be how to make it possible to get home faster. For me, when I come to the intersection of Spenard Road and Minnesota Drive, I am almost home, as I live a block away on McKinley Ave, and have, for 52 years. To get home, I never take Minnesota Drive, going south, from 4 pm to 6 pm, as the traffic is too backed up at that intersection. There have been may changes to both Spenard Rd. and Minnesota Dr. in my time in this area. Most have only made it more difficult for the people living near by. There is a long distance between stop lights on Minnesota Dr., between Spenard Rd. and Tudor Rd. I know of two who people who lost their lives crossing Minnesota Drive in that section. The Holliday, and liquor stores get a lot of foot traffic, as well a children crossing to visit there friends who live across the road. Poor lighting, and the 45 mile an hour speed limit, which is seems to be exceeded by most people, making the crossing very hazardous. When my house was purchased , Minnesota Drive was a dirt road of 2 lanes, which ended at Tudor Road. Spenard road was paved, but also only one lane each direction. With fumes and dirt in the air, sirens and traffic noise never ending, the people of this area have sacrificed a great deal for the growth of our town. I look forward to any improvement you might make.
2/7/2016	The Spenard Community Council has been hearing about the Northwood at the Park housing development proposal for months, which would build 680 units at Northwood and Spenard, and lots of traffic would funnel onto MN from Spenard or Tudor. I\'d recommend attending the community council to receive input on this study and also to meet with the developers who will present on a traffic study next month (March)
1/5/2016	Another area I notice is the Southbound traffic backlog due to Spenard/Minnesota intersection starting at 4:00pm-5:30pm
1/5/2016	my son walks this route everyday, i have concerns about the sidewalk being right next to the road, in the past, it hasnt been plowed so people are walking on top of hard packed snow for a few weeks, lighting is a small issue. i know that there is a sidewalk on the other side of the road but in the morning the park area is usually full of individuals that appear to be drinking and pose a safety issue. as well as people parking in the dark and involving them self with recreational drugs.
1/8/2016	The pedestrian cross signal should not require users to push the \"beg\" button. The timing of the signals is sufficient to cross the street; requiring the user to push the button means that they may have to wait a full light cycle in order to cross.
1/12/2016	there needs to be a way for the Spenard light/lanes to run at the same time like any other typical intersection, instead of the east and west side going one at a time. the Minnesota traffic sits through two light cycles at Spenard which causes a huge clog because the other light cycles on Minnesota are a normal one. the Spenard traffic does not flow with the other lights and I\'m convinced this intersection causes the huge strain flowing sometimes back to Romig!
1/11/2016	Sidewalks are very narrow along each road, and queuing area is especially tight between road and light poles. It is nearly impossible to walk past someone waiting to cross at a crosswalk.
2/12/2016	please do not do the couplet planned for this area. it will ruin the continuity of spenard which is an important cultural and historical part of the community. I totally understand the engineering and data of improving traffic flow, but this project would damage the neighborhood/place. not sure why traffic flow is more important than maintaining the character of neighborhoods.
2/11/2016	The lights need to be synchronized better whether it be east/west flow at the same time like another person posted or by extending the length of the northbound left turn lane light. I have had to wait through 3 lights to turn left onto Spenard from Minnesota northbound (to get to my house) because the light for turning only allows for about 6-8 cars. It also creates a danger of cars in left turn lane spilling into the non turn lane when it is backed up.I now go via Int\'l Airport Rd to Northwood to get to Spenard instead when going north to get home but not everyone can do that or else we would have a problem down Northwood!

2/9/2016	This intersection is one of the worst in town. While Minnesota is one of the principal north-south highways, Spenard Road is a legacy collector street. The back-ups at this intersection when headed southbound at 5 PM are embarrassing. North-South traffic should be afforded a priority over the Spenard traffic.
2/7/2016	The proposed improvements by Cook Inlet Housing in this section might be dependent on a clear future for Spenard and access from north/south Spenard. I\'d recommend working with CIH for this section.
2/7/2016	The one-way couplet seems like a recipe for disaster. If the public could be well educated on the benefits of this design it might have a shot, but so many people would go the wrong way, try to turn where they couldn\'t, etc. that it would be even more dangerous. with email address lhajduk@gmail.com
2/7/2016	Please, please, please reconsider the timing of this intersection regardless of whichever option is chosen. Prioritize pedestrian signals to cross without having to press the button.
2/12/2016	CIHA is adamantly opposed to the proposal to create one-way couplets with Spenard and 36th. To do so would be to significantly impact the viability of our retail and residential developments. Access is essential to retail in particular, and to require customers to circle around via Minnesota to reach properties along Spenard is unrealistic and damaging to the value of our commercial properties. The couplets would create an island that would be both difficult and undesirable to access. In addition, Spenard Road is designated by the Municipality as a transit oriented development corridor. To remove one way of bus service from this section of Spenard violates a basic premise of TOD. Finally, the bigger neighborhood between Spenard and Arctic, Chugach Way and Tudor, already struggles from access issues. The neighborhood, surrounded by arterial roads, ironically is inconvenienced as most ingress and egress is controlled right in right out. The couplet would exacerbate this situation.
2/4/2016	Need safe bike lane crossing E/W on Spenard. Connectivity of bike connection is essential.
1/13/2016	Biggest bottleneck is Spenard Road. Get westbound traffic over 36th to west side
1/13/2016	Seems too close to Spenard light. What is the point if WB 36th is a Do Not Enter?
1/13/2016	One way couplet may be contrary to future redevelopment plans, and potential N Spenard -> 36th Area defer to most Spenard Corridor Plan Recommendation
1/13/2016	Really important to consider business access
1/13/2016	Coordinate/Contact Cook Inlet Housing
1/13/2016	Support alt. F1 (*Reconfigure Spenard Rd Approaches to Allow Improved Timing Plan)* *adding more lanes* *higher cost to "fix" problem* *higher maintenance cost long term (more surface area)*
1/13/2016	The right solution to this intersection could be a catalyst for the reconstruction of Spenard. The area had great commercial potential.
1/13/2016	No F-4 (no more lights)
1/13/2016	Biggest concern is bottleneck at Spenard Road

G – Spenard Road to Tudor Road

2/12/2016	A pedestrian cross walk is needed halfway between Spenard Road and Tudor.
2/12/2016	This area might is a good place to consider an improved pedestrian crossing. A pedestrian/bicycle friendly bridge would be best.
2/7/2016	The sidewalks are so narrow, covered in snow/gravel from plows, and next to speeding traffic that I walk in people\'s yards. Expand the sidewalks, add a space between the sidewalks and roadways (shoulder, grass, etc.)

H – Tudor Road

1/13/2016	Very dangerous to slow from 50mph to stop at traffic light
1/13/2016	Very dangerous to slow from 50mph to stop at traffic light
1/13/2016	Add “Prepare to Stop” sign (*for NB traffic approaching the intersection)*
1/7/2015	I would like to suggest a half clover leaf at the intersection of Minnesota and Tudor roads. The two clover leaf curves would be on the NE and NW corners of the intersection. Southbound off ramp of Minnesota would align with Greenland drive with a traffic light at Greenland & Tudor. Sktech attached. Some private property would need to be bought: 1. Two or three single family homes at the NW corner; 2) Apartment building and two each single story business houses at the NE corner; 3)3. Possible a portion of the property at the SE corner.
1/8/2016	The Tudor/Minnesota intersection is unsafe for peds and offers queue area for peds waiting to cross. The nw corner includes a hill that drains water to and ices up at the intersection and is dangerous for peds,, bikes and cars in winter.The sidewalks need expansion to accommodate multi modes and for safety with less exposure to cars.
1/8/2016	Tudor Road is being studied for a designated bike route by AMATS. The intersection should take this into consideration.The pedestrian cross signal should not require users to push the \"beg\" button. The timing of the signals is sufficient to cross the street; requiring the user to push the button means that they may have to wait a full light cycle in order to cross.
1/17/2016	Until funding and a proposal is available I would like to see the Eastbound Tudor green light to be longer. Now if you want to turn right from Tudor onto Minnesota it may take a few cycles because of the truck traffic from AFF.
1/13/2016	Would be interesting, if financially feasible, if this became an over pass with on/off ramps. This is such a busy intersection, especially the Westbound Tudor side at rush hour. I don\'t know anything about road design but that\'s just an idea i had.
1/12/2016	there needs to be a right turn lane at Tudor and Minnesota in the south bound lane near SBS. there is enough open road between the preceding light, Spenard for people to really start getting up speed and the right line comes to a screeching halt when someone needs to turn at SBS. a right turn lane would be really helpful.
1/26/2016	I see the addition of a turn lane for turning west on Tudor at Minnesota—I support this as it would help alleviate a pretty significant delay issue and provide for consistent flow in the west traffic lane.
2/12/2016	The northboud right lane at this intersection is dangerous. A car traveling westbound on Tudor, stopped at the light and waiting to turn right on a red light can be deceived by the right-turn only on the south side of the intersection. While the lanes may match up on a plotted GIS map, the intersection can be an optical illusion. As a pedestrian at this corner, I have witnessed several near crashes because of this scenario.
2/7/2016	it might be ok to add a third left turning lane or overkill. Don\'t sacrifice adding sidewalks and spacing for adding another lane.
2/7/2016	Waiting at this intersection as a ped is dangerous to cross west cars along Tudor cannot see you. You\'re also standing just next to traffic that it\'s dangerous.
1/13/2016	Widen sidewalks on both sides of Minnesota (NW and NE corners of intersection downgrade for peds)
1/13/2016	Do we need this many turn lanes? (*Alt H-2, Triple Left Turn Lanes)*
1/13/2016	Like the SB right turn off Minnesota
1/13/2016	Would like to see Minnesota overpass at Tudor with roundabouts on Tudor
1/13/2016	I like the H-4 (*Add Southbound Right Turn Lane*)! Will get lots of traffic off
1/13/2016	Retain trees on northeast corner

1/13/2016	Support H-3
1/13/2016	Wider, separated walkways that are not plowed over. This is necessary for transit users
1/13/2016	Prefer H-3 (ped overpass on north side of Tudor over Minnesota)

Freeway Segment General Comments

1/13/2016	In response to the speeding comments. It\'s safer to go the speed that traffic is moving than doing the speed limit sometimes. If most people are doing 75 then you\'re causing more danger going 60. If anything, the speed limit should be moved up. This road is almost always clear and dry pavement. It\'s only slick after a bad rain/snow fall, and even then it usually dries out by the end of the day due to how much traffic is on the road. Putting law enforcement isn\'t going to stop people and we shouldn\'t make criminals out of people who aren\'t really doing anything wrong. Most people are comfortable driving at 75 MPH. We don\'t need more cops or enforcement
1/10/2016	I echo the speeding concerns of other commenters. Back when APD still had motorcycle units, in summer months there were after motor-unit officers with radar \"hiding\" in the median, which were a significant deterrent to exceeding the posted 60 MPH limit. Now people regularly drive 65-75, impatiently passing cars obeying the 60 mph limit. Obviously an enforcement issue, not the highway.
1/10/2016	The addition (years ago) of an extra southbound lane on the west side of Minnesota made a huge improvement for traffic taking the International exit. Although still congested here during evening rush hour, it is much fast to get to the airport from Midtown now that the right lane feeds directly onto westbound International.
1/14/2016	Please leave the entire middle ditch. Every winter there are ditch divers. They need it to keep from hitting other cars. If too many lanes are added and a wall or barricade put up it would only cause more accidents. That is all I have. I drive it everyday. I have no problems. Everyone else whines too much. :-)
1/24/2016	There is a lot of noise from the highway in these neighborhoods. I\'d like to see the moose fence converted to noise barriers. Also, the addition of the bike lane on Raspberry is nice but it doesn\'t have continuity under the highway and the bike path through the tunnel is in poor repair
1/21/2016	Install acustifence noise reducing rubber to the newly installed chain link fence to protect moose from injury on fence and improve noise level in neighborhoods. Witnessed several moose chargING fence and getting stuck in fence because they didn't see it. Acustifence would prevent this and improve property values creating a larger tax revenue for muncipality. Raspberry and Minnesota stop lights are creating overburden some delays coming from artic heading to Minnesota on ramp. Their are now 3 untimed lights in a very short distance. I now drive down artic and take international to get on Minnesota because it is faster then raspebery.
2/21/2016	First, there is a long running issue with the 4 bridges over First, there is a long running issue with the 4 bridges over Campbell Creek with regards to the Campbell Creek Trail below them. The issue centers around the fact that the bridges all have "open" design railings that allow every form of debris to rain down on the trail below. Snow, sand, mud, garbage, water, all wind up on the trail below and area on either side of the trail. The trail has to be "demudded" with sweepers from time to time to clear the mud bog. This results in the grade on either side of the trail to become higher than the trail over time, channeling more mud and water back onto the trail. The bridge railings need to be closed or blocked to prevent this. A rehab of the Campbell Creek Trail is in the works, Maeve Nevins at Parks and Rec is currently the lead designer on the project. Second, there is a long standing need for the frontage road to be constructed from Dimond Blvd going Northbound to Raspberry Road. It was one of the Taku Campbell Community Councils prime construction requests dating back 15 or 20 years for the purpose of alleviating traffic to and from Arctic Blvd. Currently ALL traffic that goes to Minnesota or points west must go to Arctic Blvd first and then reverse direction on either Dimond, Raspberry or International Airport Rd to continue. A frontage road would allow for traffic to directly access Minnesota NB or SB via the Raspberry Rd interchange or proceed East or West via Raspberry Rd. At least three street facilities currently dead end within 500 feet of Minnesota; 76th Ave being the main one, 78th and 80th Avenues being two more.

J – International Airport Road

1/10/2016	Although already identified as an issue on the project website, I will add my 2 cents that the engineers who decided not to build an off-ramp from northbound Minnesota to Dimond should be condemned to a week on the Dowling roundabout! For examples of off-ramps along similar corridors that work well, see the northbound Minnesota ramp to International, and the northbound New Seward ramp to Tudor. For an example of how NOT to build a working ramp, see the northbound Minnesota cloverleaf off International (\"Now *which* way do I turn to get downtown?!\"), or the westbound Dimond ramp that feeds northbound New Seward (way too short a merge zone once you get on the highway).
1/14/2016	The onramp to the Northbound traffic is a sharp curve and it is difficult to get up to running speed, which is a lot more than the posted 45 mph, especially in winter. If the merge area were longer, or if there were an acceleration lane here, it would be helpful.
1/13/2016	Not an easy on ramp at all. After coming our of the curb you have to get up to 60 MPH (or however fast the traffic is moving) in a very short amount of time to be able to merge properly.
1/11/2016	Merging on to southbound MN from west bound Int AR, you are merging onto a roadway that is curving away from you. Almost impossible to view traffic with mirrors or by turning to look over your shoulder
1/18/2016	Enterance RAMP to Minnesota SOUTH from Int\'l Airport Rd needs a GUARD RAIL. It is on a sharp turn right next to a cliff onto the Minn traffic. Or you will roll
1/13/2016	Better to discourage ped/ non-motorized traffic at this large intersection. Redoing it to make it “safer” may just attract ~~~ by default, could make it more hazardous
1/13/2016	Never see non-motorized traffic use this area- No need
1/13/2016	Hawk Beacon (*western intersection of interchange*)
1/13/2016	I like this! (*pathway across International)*
1/13/2016	Could someone cross to Electron Drive safely at a light?
1/13/2016	I bike these (tunnel) trails regularly to drop off checks at Chugach Electric- don’t want to go to Arctic to cross and come back
1/13/2016	No adjustment needed. Leave it as it is
1/13/2016	For one pedestrian per year???
1/13/2016	No need to change. Leave as is
1/13/2016	Ped pathway yes! I concur. I bike this area but NEVER use tunnels. Not safe.
1/13/2016	gree with concept cars enter International from North Bound Minnesota also weave heading west and conflict with mergers
1/13/2016	Support for the the SB free right turn on the SB Minnesota to WB International Airport Ramp and being able to hop onto International quickly
1/13/2016	Support for eliminating the free right turn (SB Minnesota to WB International Ramp). He’s observed drivers turning left from the NB Minnesota-WB International off-ramp making decisions and changing lanes between the two signals about which lane they want to be on before reaching Northwood Dr
1/13/2016	Many concerns about there not being enough pedestrian/bicyclist use for a pathway to be added along International
1/13/2016	Concern with the 5 crossings pedestrians/bicyclists would need to cross on the new pedestrian pathway
1/13/2016	Someone mentioned that she has been crossing International from the pathway on the north side of the road to Electron Dr because she didn’t want to bike to the marked crosswalks on the International/Arctic intersection to get to her destination right near Electron Dr
1/13/2016	J-5 crosswalks on proposed pedestrian path especially for bikes—existing pathway is a pain

1/13/2016	Add signs on existing bike path to indicate that it continues onto International Airport Rd
1/13/2016	HAWK beacon to stop vehicles exiting WB International to SB Minnesota for peds/bikes to cross

K – International Airport Road to Raspberry Road

1/14/2016	Merge lane from East and West Int should be combined and extended to Northbound Rasberry exit.
1/13/2016	Very dangerous merging here in heavy traffic when other traffic is also merging from EB International to SB Minn. and traffic is fighting to get off at Raspberry. One idea would be to remove the WB Int\'l on ramp and use the SB on ramp instead (yes, I know a left turn for WB traffic), add another lane to the Raspberry exit so two lanes can exit. At least add the extra lane.
1/13/2016	Minnesota to C. STREET overpass on both sides have deep ruts that throw cars all over the road. Scary and dangerous. My commute from Jewel Lake to 3rd and Kenai is reasonable at 15 to 20 minutes.
1/24/2016	This interchange is a mess between people entering Minnesota northbound and people exiting to get onto International.
1/13/2016	This lane should be extended north to meet with NB on ramp, weaving problem here (EB International to on-ramp)
1/13/2016	Weaving between International and Raspberry a big problem, this new lane should really help (Alt. K1-Install SB weaving lane from International to Raspberry)
1/13/2016	Like both K options shown. Prefer K-3 first (dual lane off-ramp for NB Minnesota to International), K-1 second (SB weaving lane from International to Raspberry)
1/13/2016	Concur with suggestions
1/13/2016	Fantastic idea to connect the EB International–SB Minnesota Ramp on-ramp with the SB Minnesota-Raspberry off-ramp
1/13/2016	Prefer K-1 (yes, yes, yes). Combine with K-2

L – Raspberry Road

1/17/2016	Addition of light on raspberry at the SB Minnesota exit has created a huge morning rush hour problem with traffic backing up onto Northwood sometimes clear back to the strawberry and northwood stop light. Totally no foresight on the impact of this light to morning rush hour traffic.
1/15/2016	Improvements to the degrading ped path would be good - the tunnel is also not well lit
1/15/2016	The light at Raspberry just west of Minnesota makes it difficult for EB Raspberry traffic to merge to the NB Minnesota exit in the short distance between the concrete barrier and the light.
1/15/2016	The new lights at Raspberry and Minnesota off ramp are not clearly marked - confusion for those existing SB Minnesota to WB Raspberry create congestion when vehicles stop unexpectedly.
1/15/2016	The new lights at Raspberry and Minnesota off ramp are not clearly marked - confusion for those existing SB Minnesota to WB Raspberry create congestion when vehicles stop unexpectedly. with email address
1/14/2016	NEED Speed Bumps on Rasberry!
1/14/2016	New changes on Raspberry with lights have created a huge hazard for those driving eastbound to get on Minnesota. I like having the new lights, especially when coming off of northbound Minnesota to head west on Raspberry. But there\'s a mixed up jumble made worse by traffic lights with people trying to merge from Raspberry and Northwood to access the Minnesota lanes. Perhaps remove the long concrete barrier that separates those two lanes on Raspberry. Very little merging space to get into the lane to access southbound Minnesota in the morning. I drive it around 7 a.m., I\'m sure it\'s worse later as more are on the roads.
1/13/2016	Off onto Raspberry south, poor visibility on the ramp leaving Minnesota onto Raspberry. Difficult to see incoming traffic from east Raspberry
1/13/2016	Raspberry: lower the ramp half way to see incoming traffic better
3/12/2016	I take the southbound exit from Minnesota to head east on Raspberry every morning between 5:30am and 5:40am. The extremely low level of traffic at this time mixed with the usually 1-2 minute wait for the light make very little sense. Roundabouts would have been a better idea than the lights, but I doubt anyone would want to throw away the brand new lights. I would recommend during off hours that these lights are changed to flashing yellow and red to minimize the impact on drivers when there is no safety concerns.

M - Raspberry Road to Dimond Boulevard

1/8/2016	Many drivers exit at Strawberry going to fast, and collide with the concrete barriers at the corner. Many more \"SLOW DOWN\" warning signs could be added on the deceleration lane exit ramp before the sharp curve onto Strawberry Road. The radius of the curve could also be expanded, and the road surface could be sanded more regularly during the winter months.
1/13/2016	Add another inside lane here to Raspberry Road like the one on the west side of Minnesota.
1/13/2016	In the area between Dimond Blvd. and Raspberry heading NB right past the WIM slab, there seems to be many runoff the road incidents. The Raspberry destination sign is routinely hit early on in the winter time and I believe a light pole is down in this area. A truck managed to make it as far as the moose fence. The ruts seem to grab the car and make it wiggle toward the outside shoulder. After the last repave, the issue seemed to disappear for a couple of years but has become more pronounce as the pavement has aged. Not sure how many of these single vehicle runoffs are reported but I\'m sure M
1/13/2016	Would love for an exit out of (not into) W 76th Ave onto Minnesota Hwy
1/12/2016	Several residential subdivisions located west of Minnesota Dr between Strawberry Rd and Dimond Blvd have poor access to Minnesota Dr (indirect
1/20/2016	It is not so much the length or shortness of the on/off ramps drivers think that Minnesota Dr. is the Indy 500 Speedway 60 mph is way to high, they do not know to merge or exit
1/6/2016	I find it difficult to merge into south bound traffic from Raspberry without being forced to stay in Dimond exit lane, especially at 4 - 6 rush hour...it feels like a suicide run some times.
1/13/2016	Strawberry Exit a harsh curve. Reconfigure to soften curve
1/13/2016	Move Strawberry Exit north
1/13/2016	Move 'exit sign' to 1 mile ahead. ¼ mile not far enough (*Dimond Blvd. sign, for SB Minn traffic)*
1/13/2016	Move 'exit sign' to 1 mile ahead. ¼ mile not far enough (*Dimond Blvd. sign, for SB Minn traffic)*
1/13/2016	Like new sign designs (SB)
1/13/2016	Concur with recommendations (NB)
1/13/2016	M4 (*Dual lane on-ramp from Dimond to NB Minnesota*)
1/13/2016	M4 (*Dual lane on-ramp from Dimond to NB Minnesota*)
1/13/2016	Dual extended on-ramp makes merging more safe
1/13/2016	Someone had concerns with a NB frontage road between Dimond Blvd and Raspberry Road and with how many trees it would take out in the process. She did not want to live directly next to Minnesota without the trees acting as a buffer
1/13/2016	M-1 with access from Strawberry to the southbound off ramp (this eliminates traffic on Northwood – north and southbound)
1/13/2016	Strawberry Rd exit—horizontal curve is too sharp

N – Dimond Boulevard

1/26/2016	The 100th/Dimond Blvd exit needs to be segregated into 2 separate exits.
1/13/2016	Dimond exit ramp south: need to better separate Raspberry exit from Dimond exit. Then at Dimond, ensure that they cannot turn right at the red light, and those turning left turn into well marked lanes
1/13/2016	Dimond: Station cops at this intersection

O – Dimond Boulevard to 100th Avenue

1/13/2016	Add Alt O.2, a northbound off ramp from Minnesota to Dimond (see page 120 of report)

P – 100th Avenue

1/18/2016	The onramp from 100th south onto Minnersota/WJH Pkwy is short, uphill and located on a curve. As a result it is difficult to get up to speed in winter (when icy), but even more importantly you cannot see whether or not it is clear to merge in your side or read view mirrors (in your blind spot) and must twist your bodyy to look far over your shoulder to ascertain whether or not there is going to be a conflict. The strong body twist required is prone to the vehicle drifting sideways and (once you can see) provides little time to correct for existing traffic on WJH and vehicle drift. Give it a try and you will see for yourself!! I live of Southport and have taken that onramp daily for the last few years and it\'s still an uncomfortable merge. Likewise, traffic starts slowing the the C Street exit about there. Adding a third lane between the two would greatly increase safey for both. Please note that, unlike Dimond and International, the WJH cross-road is an underpass rather than an overpass.
2/4/2016	Redesign curve south of 100th (transition from n/s to e/w) for 65 mph speed limit instead of 60 mph.
1/6/2015	The on-ramp from 100th to Minnesota south bound does not provide a long enough merge lane. As you merge from 100th on to Minnesota south you are coming up a hill that blocks sight of traffic on Minnesota. By the time you reach Minnesota the merge lane is ending. This is a very tricky merge situation that I negotiate most days on my trip home from my work at Mears middle school....
1/7/2016	Fix 100th Avenue exit from Minnesota to 100th, which is south of Dimond Make sure when 100th Avenue from C Street to Minnesota is done, that the whole intersection is up graded
1/15/2016	I have been consistently using this 100th Ave intersection for years now on a daily basis. The intersection itself is consistently confusing, dangerous, and concerning. A year ago, one of my co-workers were headed to work and came from underneath the overpass to get slammed into from another motorist who decided not to stop at the stop sign. The urgency to get a better system for this intersection is a must.
1/13/2016	Traffic on 100th and Minnesota has increased past the capacity of the intersection. Roundabouts are proposed as part of the 100th Ave. extension but I would like to see them sooner than later. Too many close calls from traffic trying to enter 100th from all sides to poorly marked lanes resulting in left turn drivers going straight to the church property or changing lanes in the middle of the intersection. On the other side where the SB frontage road merges with the off ramp, a lot of drivers do not understand that they must yield to exiting traffic from Minn. More close calls.
1/13/2016	P (100th Ave) —Minnesota to C Street. Roundabout at C Street & 100th (no light)

Q – 100th Avenue to C Street

1/13/2016	Lots of off road accidents here from speeding drivers. Perhaps a large swale could be put in with a higher berm on the other side along the entire outside radius of the turn.
1/10/2016	Former ADN newspaper columnist Satch Carlson called this stretch \"Dead Man\'s Curve\" when it was built in the 80s, and to this day I am convinced the roadway surface is not banked sufficiently for a 60 MPH highway. I have been driving in Alaska for 35 years, I am cautious but not tentative, and I know the limits of tire adhesion under varying road conditions. Based on my experience, I often drive 40-50 MPH around this curve in slippery conditions (particularly west- and southbound, into town) with people passing me doing 65
2/3/2016	Surprised that this curve was not one of the issues identified in the initial stage. I suspect a reason for this is that many accidents involve a single car losing control and driving off the road. Thanks to the large catchment areas (on the outside of the curve and in the grassy median) many are able to drive away under their own power, they don\'t become a statistic in calculating accident frequency. Banking is insufficient for the curve at 60 mp/h. Anything less than a dry surface and 60 mp/h can often be too fast to guarantee traction. Satch was right, Dead Man\'s Curve. With no structural changes to the road, a speed reduction to 50 mp/h should be considered.

S - C Street to Old Seward Highway

9/21/2015	The Anchorage Bicycle Plan identifies a potential trail from Old Seward to C Street. This could be realized by providing a pathway under the ARRC bridge in this area and would provide a great link to the pathway (and future bike lanes) along C Street.

South Anchorage Teriminus General Comments

3/14/2016	I live beyond the eastern end of O\'Malley so frequently travel eastbound on O\'Malley through this area. Here\'s a run down of my choices -- all poor, and all with high risk of crashes -- as I try to get from Minnesota or Old Seward through O\'Malley to beyond Lake Otis.1) Lane choice at Old Seward on to eastbound O\'Malley problematic. If I stay left, I get trapped behind vehicles turning north on New Seward. They commonly stack up far beyond the dedicated left turn lane, almost to the Old Seward at busy times. But if I go right, it\'s stop and go past right turners into O\'Malley Centre Dr., plus risk of stops due to stacked traffic turning right on New Seward.2) Lights are not synchronized so just as you get going eastbound (uphill so lots of carbon burnt) from Old Seward intersection, you are likely to be stopped by lights on either or both sides of New Seward interchange. This not only wastes gas but makes lane changes difficult to impossible -- can\'t change lanes when traffic is stopped everywhere. Plus lots of AK Sand and Gravel trucks that can\'t accelerate fast with full loads, and RVs in summer.3) Congestion in both lanes plus the need to go right in order to get around vehicles stopped in the left lane to turn onto Commodore makes it hard to know which lane to get into if you want to stay eastbound on O\'Malley. Drivers weave back and forth. Traffic entering from Castle on O\'Malley/H20asis adds to the excitement. Location of two driveways into St. John\'s church, near top of hill but blind to drivers going both ways at 50 MPH is very dangerous. Need dedicated left turn lane for Commodore to reduce confusion, especially by people who don\'t drive this section often enough to know the ropes.
1/14/2016	East bound traffic backs up from Old Seward all the way back to C Street.. Build Overpasses and on/off ramps here and make it easier to get onto New Seward highway. New Ramps to do away with the left turn light at Northbound New Seward on ramp. Extend the work area to Commodore, which desperately needs a left turn lane.
1/13/2016	Would be nice to have a park and ride from south Anchorage to downtown in this corridor

V – Seward Highway

1/9/2016	Thank you for the opportunity to comment on the Minnesota Study. As we have stated previously, we have been very impressed with your company's ability to conduct studies of this nature. We wish to again reiterate our long standing support for the roundabouts which were depicted in your study of the O'Malley Upgrade project which scored exceptional high in that study. We notice from your street map that the current study reaches the intersection of O'Malley and New Seward Highway. We therefore wish to take this opportunity to again strongly support the roundabouts at this location. This will of course solve a very serious problem of access to 47 acres of property which we own and will be developed in the coming years. Most importantly, It will also provide the necessary access to the existing H2Oasis Waterpark and the Castle on O'Malley. Again thank you for this opportunity. If you have any questions, please feel free to contact me.
1/24/2016	There is a u turn planned at this intersection after the OMalley eastward upgrades are completed. Be sure to keep this u turn in any future plans
1/13/2016	Too many roundabouts. Any other solutions?
1/13/2016	We strongly support the roundabouts. (H2Oasis and Castle on O'Malley owners)
1/13/2016	From Old Seward to Lake Otis need a designated walking trail! Bike path on O'Malley (*heading east*)
1/13/2016	V (Seward Hwy) —prefer V-2 with overpasses
3/10/2016	The O\'Malley/Minnesota/Old Seward intersection is a massive bottleneck. It makes sense to take advantage of the grade differences approaching this intersection from the west to cut under Old Seward Hwy to eliminate the need to stop at this intersection when traveling east/westbound. It wouldn\'t totally eliminate the need for a light as traffic would still need to make lefts from Old Seward onto O\'Malley/Minnesota but it would make a huge difference in allowing traffic to move east and westbound. It would also be helpful to eliminate the left hand turn lane from westbound O\'Malley onto Center Drive and have access to those business instead come from the southbound Frontage Road

Outside of Corridor

1/14/2016	NEED Speed Bumps on Cranberry!
1/14/2016	Add a pre traffic light / control indicator for the light at 15th.
1/14/2016	Need to increase right of way of far right lane after the merge of Spenard. Gets really narrow in the winter time between here and 15th.
1/14/2016	Need more street lights and or reflective markers for winter time driving.
1/13/2016	Although this may be just outside the project scope, I\'m hoping it can be incorporated. The sign encourages merging into the left lane, but often cars in left lane are stopped waiting to turn left of Commodore Dr. It\'s dangerous as cars in the left try to go around stopped cars while right lane is also merging into a single lane.
1/13/2016	This works. Don\'t change how the merging of 15th to Minnesota is from current.
1/26/2016	I live in the South Addition neighborhood on just north of Westchester Lagoon. I have several concerns about Minnesota Road. My main concern is the access to this neighborhood from L St/Minnesota. I'd like to know why this isn't addressed in the study. The exit from southbound L/Minnesota onto W 15th doesn't have a dedicated right turn lane and when there's a lot of traffic (there are periods of the day when there can be lots), it can be quite dangerous turning west off L onto W 15th. Around the Inlet View Elementary School start and release times, W 13th, both directions, backs up and the light isn't long enough to allow for more than a couple of cars to get through the light. Given the priority for L Street, the wait time at the W 13th light can be quite significant (resulting in vehicles "jumping the light"). If the Hillcrest exit from southbound Minnesota is lengthened, then there would need to be a designated exit and entrance for W 15th (there used to be an entrance onto L/Minnesota from W 15th).
1/20/2016	Poor sight distance, clear trees/brush
2/9/2016	Drivers do not see the speed limit decrease at this point and are still going too fast as they enter downtown/residential area.
2/9/2016	Not a lot of room for merging to the right lane in order to turn east on 15th Ave at this time.
2/8/2016	Add noise barrier fences to both L st and I st between the park strip and the lagoon to reduce the ever increasing traffic noise impact on the surrounding neighborhood associated with Minnesota. Example is on C street between raspberry and diamond where there is far greater distance between the road and houses.
2/8/2016	At the termination of the southbound sidewalk have a large easy to read you are here map with it showing how to connect to the path beginning at the south end of N Street. I don\'t know how many times I have seen people walking on the very small shoulder of the road. Consider connecting the sidewalk on the west side of L street to the path at Chester creek two blocks south at the bottom of the hill to facilitate pedestrian traffic unfamiliar with the trail system.
2/8/2016	Repair/replace defective street lights between 13th and 15th. There are at least two that have been out or intermittently out all winter.
2/4/2016	Reduce speed to 35mph this whole stretch.

2/9/2016	At the intersection of West 13th Ave and L Street (Minnesota) (for travelers turning left (south) onto L Street, there needs to be an arrow. I've brought this up numerous times at our Community Council and nothing seems to get passed on to ADOT. For drivers coming from West 15th Ave or Inlet Place, there is no issue. No one stops at the stop sign at Inlet Place and West 13th, and there is no stop sign for drivers heading South on Inlet Place to the West 13th intersection. At times traffic is backed up to I Street. This may be problematic since drivers typically make a right on red off West 13th Ave heading South on L (Minnesota). SPEED: Once drivers traveling south on L Street (Minnesota) pass West 13th Ave it's like a video game. The next light is at Romig Junior High. Merging traffic is from West 15th Ave. I've witnessed too often erratic lane changing and speeds well above the posted 45 MPH. Drivers tend to speed up and cut off the west lane traffic as they speed onto the three lanes that is Minnesota.