AMATS: Glenn Highway Integrated Corridor Management (ICM) Study

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DRAFT Existing Conditions Report: Part 6 Analysis of Delay

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DOT&PF

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Abbreviations

APD	Anchorage Police Department
DOT&PF	Alaska Department of Transportation and Public Facilities
ICM	Integrated Corridor Management Study
KE	Kinney Engineering
MPT	Milepoint
PDO	Property Damage Only

Definition of Terms

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): Factor associated with a safety treatment. Crashes for the condition without the safety treatment are multiplied by the crash modification factor to determine the number of crashes if the treatment is applied. CMFs are determined using a statistical analysis of sites with and without the treatment.

Integrated Corridor Management (ICM): Management of a transportation corridor to optimize use of available infrastructure by directing travelers to underutilized capacity (for example, shifting travel times, routes, or mode). Multijurisdictional partner agencies manage ICM corridors as collaborative, multimodal systems.

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).

Critical Accident Rate (CAR): 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.

1 Introduction

The Alaska Department of Transportation and Public Facilities (DOT&PF) has retained Kinney Engineering, LLC (KE) to prepare this Analysis of Delay as part of the Glenn Highway Integrated Corridor Management Study (ICM). The study corridor experiences non-recurring congestion due to unplanned events (such as crashes) and planned events (such as road construction), that require lane closures and have a significant negative impact on the movement of people and goods. The focus of the analysis of delay is to quantify the value of the delay due to non-recurring congestion. The analysis focuses on delay due to crashes.

DOT&PF provided traffic volume counts from the three continuous count stations along the Glenn Highway Corridor (at Bragaw, the Scale Houses, and Eklutna). For each year from 2005 to 2014, DOT&PF provided 24-hour volume counts (in one-hour bins) for 40 days of each year; 20 days on which a crash had occurred, and 20 days on which a crash had not occurred. DOT&PF also provided 24-hour speed data (in one-hour bins) for the same days at the Eklutna continuous count station. The data was analyzed to identify delay corresponding to the occurrence of crashes.

2 Historical Delay

Quantifying delay due to non-recurring congestion is an important part of understanding how to mitigate congestion. DOT&PF has traffic count stations located along the study corridor at Bragaw Street, at the Scale Houses (approximately MPT 11), and at Eklutna. Hourly traffic volumes are recorded at all three stations, while speed data is recorded at the Eklutna station. Near a crash location, both the volume and speed of traffic are decreased. For the crash days in the study period, available data was analyzed in an attempt to visualize the delay that results from this type of non-recurring congestion.

Since speed data was not available at Bragaw Street and at the Scale Houses, speed analysis was limited to crashes whose impact was recorded at the Eklutna count station. Analysis was also limited since speed data was only available in one-hour increments. With only one speed data collection point, delay between count stations during crash days as compared to non-crash days could not be estimated.

In general, the analysis showed that daily variation was too great to develop a good picture of the effect on vehicle delay of all but fatal crashes that occurred near a continuous count station during peak hours. At a stakeholder meeting, the Anchorage Police Department (APD) stated that when a fatal crash occurs, the traffic flow is affected for at least two hours.

Analysis of a fatal crash that occurred at milepoint 14 (near the North Eagle River Interchange) on Thursday, July 1, 2010 at 5:25 PM offers a good example of the effect a fatal crash has on the traffic flow. The crash occurred when a southbound vehicle crossed the median and struck two northbound vehicles. Figure 1 depicts hourly volumes during and after the PM peak on the crash day compared to hourly volumes for the same time-period on the next non-crash day. On the non-crash day (July 2), traffic volumes were highest from 4 PM to 5 PM, and slowly decreased each hour. On the crash day (July 1), traffic volumes were also highest from 4 PM to 5 PM, but then volumes dropped slightly more in the hour in which the crash occurred (between 5 PM and 6 PM) compared to the non-crash day. There was a significant decrease in traffic volumes between 6 PM and 8 PM on the crash day compared to the non-crash day. By 9 PM, traffic volumes on the crash day were higher than on the non-crash day, indicating that the road had been cleared and traffic that was delayed could flow freely. The volumes had dropped to approximately the same level on both days by the hour from 11 PM to Midnight.

Figure 2 compares the percentage of traffic traveling at different speed during the same time period on the crash and non-crash day. During the time when traffic was reduced due to the crash, vehicles tended to travel past the data collector at Eklutna at higher speeds. This is more likely due to impatience (drivers trying to make up lost time, for example) than due to the lower

traffic volumes during this time period, as there were fewer vehicles traveling the road between 11 PM and midnight, but the percentage of vehicles traveling at the highest speeds is lower.

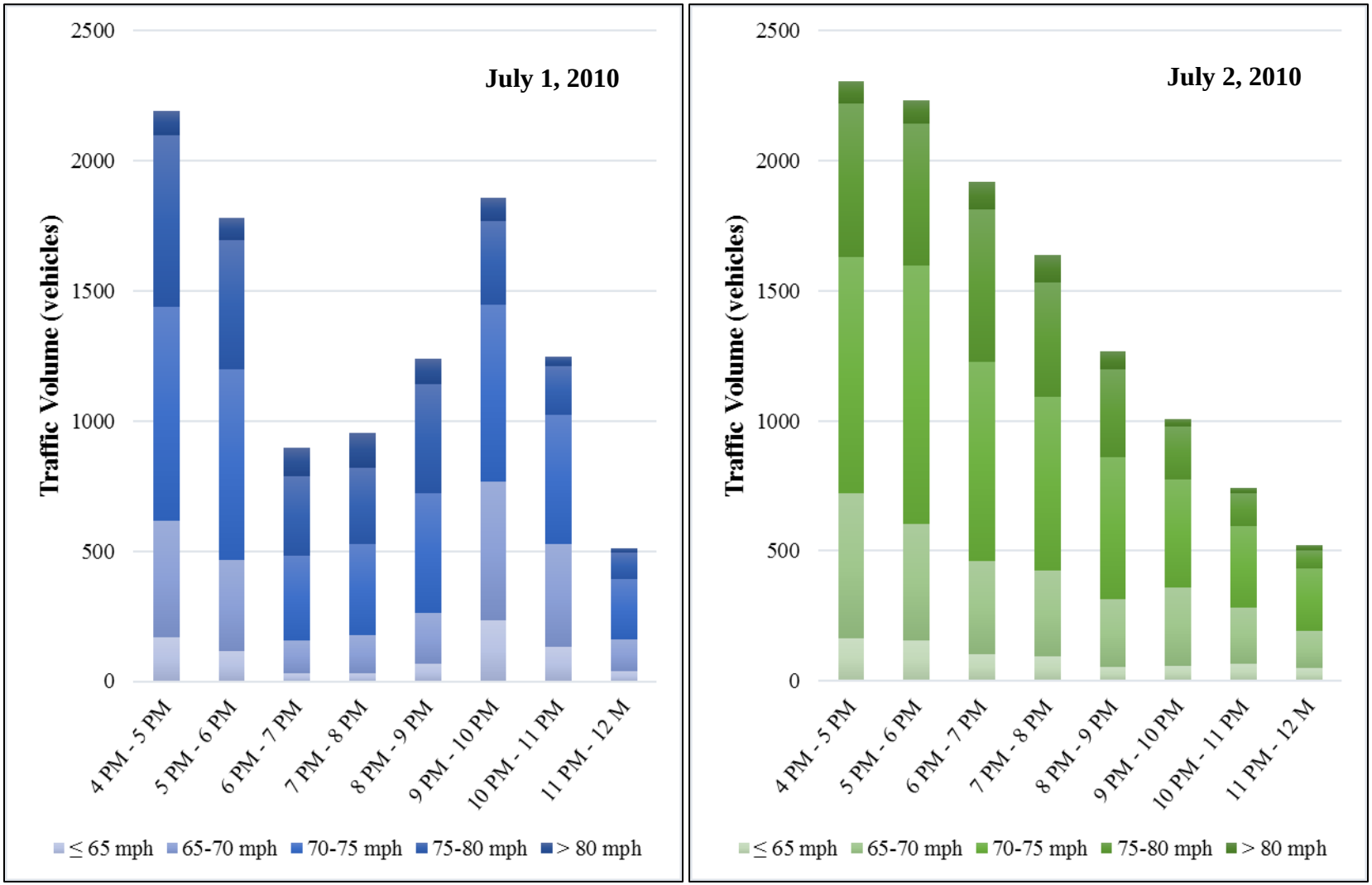

Figure 1: Traffic Volumes on a Crash Day (July 1, 2010) Compared to Non-Crash Day (July 2, 2010)

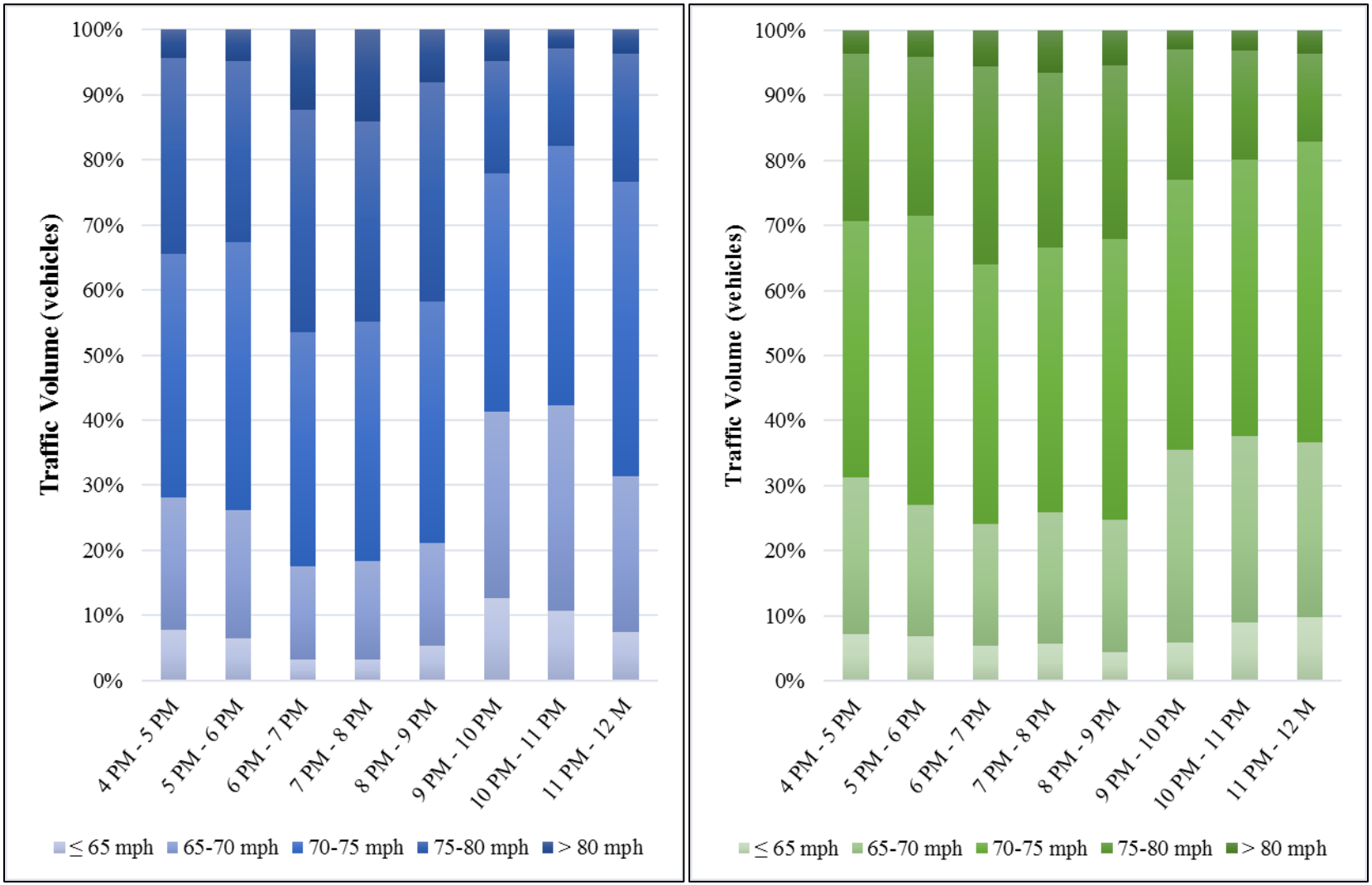

Figure 2: Traffic Speeds on a Crash Day (July 1, 2010) Compared to Non-Crash Day (July 2, 2010)

Figure 3 shows how the cumulative volume percentage differed between July 1, 2010 (the day with the fatal crash) and July 2, 2010. The difference between the two curves represents the delay experienced by vehicles affected by the crash on July 1, about 5,000 vehicle-hours of delay.

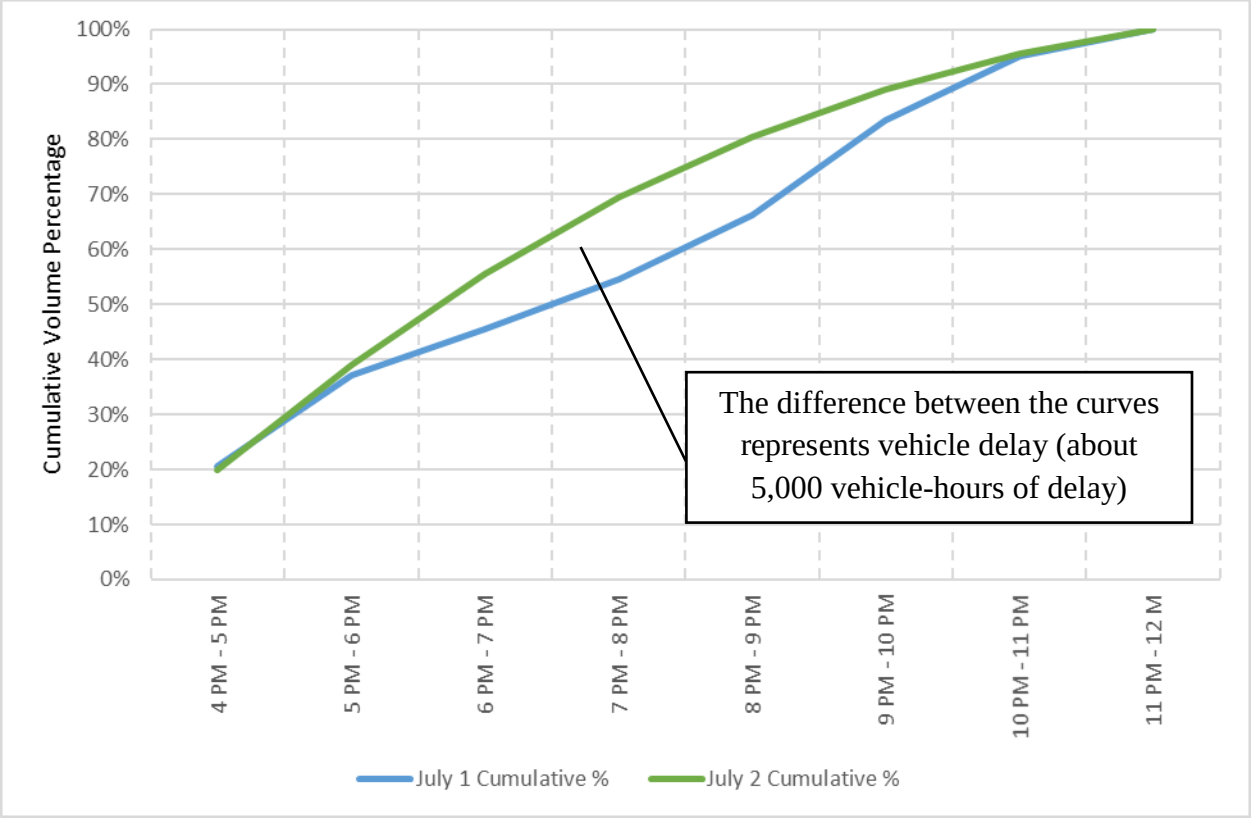

Figure 3: Comparison of Cumulative Vehicle Volume on a Crash Day Compared to a Non-Crash Day

3 Shockwave Analysis for Delay

The calculation of delay using historical volume data, as presented in the previous section, is limited by the sparsity of the data (volume counts are only available at 3 locations along the 30-mile corridor), the granularity of the data (volume counts are only available in hourly bins), and a lack of detailed information about the highway closures accompanying each crash (how many lanes of travel were closed, and for how long, etc.). Because of these limitations, it is difficult to identify the volume (and therefore delay) effects of each crash, especially for those that are cleared in a short amount of time.

To overcome these difficulties, a shockwave analysis is being performed. The shockwave analysis will be able to estimate the effect of a variety of lane closure conditions on vehicle delay, allowing a more complete estimate of annual vehicle delay due to non-recurring congestion due to crashes. This analysis has not been completed as of the time of writing this report.