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INTEGRATED CORRIDOR MANAGEMENT – DES MOINES METRO AREA

ICM IMPLEMENTATION PLAN

QUEUE SPILLBACK MITIGATION

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v.2.0

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Introduction

PROJECT OVERVIEW

The Queue Spillback Mitigation project focuses on freeway ramp queues as part of the Infrastructure Enhancement strategy functional area identified within the Des Moines Metropolitan Area Integrated Corridor Management (ICM) Program. This pilot project will serve to highlight the benefits of infrastructure enhancements relative to corridor management and to refine the requirements needed for future Queue Spillback Mitigation projects.

DOCUMENT SCOPE

This Implementation Plan document details the approach used to identify a candidate freeway ramp location and initiate the funding request for a pilot project. As the initial implementation, it will serve as a guide for further efforts by defining the activities that are required and the roles and responsibilities of stakeholders. Due to the fact that this Implementation Plan evaluates the process for Queue Spillback Mitigation efforts, it includes more narrative and detail than required and it is not anticipated that each future project will require the same level of documentation.

Once the pilot project is complete, the ICM stakeholders will identify lessons-learned that will minimize risk (political, schedule, cost) within the Queue Spillback Mitigation process. These will be presented to the ICM Technical Committee for consideration.

Process and Approach

As part of the Infrastructure Enhancement strategy functional area identified within the Des Moines ICM Program, general background information and guidance on infrastructure enhancement can be found in the Program-Level Concept of Operations (June 24, 2019) document. For queue spillback mitigation, a target location is an exit ramp where queues extend to the freeway gore on several occasions within a single month, posing a safety risk regardless of whether a crash occurred. Once identified, funding would be requested through the ICM program to determine the applicable causes and required improvements related to queuing. Factors to be considered and evaluated during a traffic operations study include: traffic signal timing, intersection configurations, ramp geometry (including deceleration lanes), adjacent arterial access control, and land uses. Once the mitigation measures are determined, an additional funding request will be submitted for the implementation of the mitigation measures.

The management and oversight structure for the ICM Program has not been formalized as of the writing of this document. For this pilot implementation, candidate ramp locations were identified by the ICM stakeholders group. The base criteria for ramp identification was: the ramp queuing had to reach the freeway mainline or be in close proximity, had to be recurring, and had to have a known impact. Each of these locations were then compared based on evaluation criteria developed using input from the stakeholders group. By design, data sources for the evaluation criteria were all readily available from either Iowa DOT or Des Moines Area MPO websites with the exception of the travel time reliability which requires access to Inrix, or other probe data. For future evaluations, it is anticipated that agencies can obtain the reliability data through requests to Iowa DOT which currently has a data agreement in place with Inrix.

A preliminary scoring methodology was developed based on providing relatively equal weight across the main two categories (ramp traffic characteristics and traffic safety) with an additional point related to the presence of a deceleration lane. The crash data included in the traffic safety scoring is limited to mainline freeway crashes upstream of the ramp in the direction of concern and during the identified peak period. The scoring for most criteria is a relative score between corridor values and does not rely on defined metrics/thresholds. **Figure 1** shows the summary of the evaluation.

Figure 1 – Candidate Ramp Evaluation

	Score Weighting	NB I-35 @ Oralabor		EB I-235 @ MLK		EB I-235 @ University		EB I-80 @ HWY 65	
Ramp Characteristics									
Overall Length (ft)		1,750		1,400		2,400		3,100	
Number of Lanes		1		1		1		1	
Crossroad Traffic Control		Signal		Signal		n/a		n/a	
Mainline Deceleration Lane?	1	No	1	Auxiliary	0	Auxiliary	0	No	1
Length (ft)		n/a		1,200		1,000		n/a	
Traffic Characteristics									
Ramp Daily Traffic Volume (veh/day)	2	11,100	1	10,900	1	8,700	0	13,100	1
Ramp Freight Percent	1	4.4%	0	2.0%	0	3.1%	0	9.5%	1
Peak Hour of Concern		PM Peak		AM Peak		PM Peak		PM Peak	
Travel Time Reliability (Peak period)[1]	1	30%	1	11%	0	27%	0	59%	1
Travel Time Reliability (Peak 5-minutes)[1]	1	101%	1	n/a	0	n/a	0	78%	0
Traffic Safety (2014-2017) **Peak hour and direction of concern**		Mainline I-35		Mainline I-235		Mainline I-235		Mainline I-80	
Total Crashes		13		11		11		94	
Fatalities	1	0	0	0	0	0	0	0	0
Rear-End	1	10	0	5	0	8	0	71	1
Sideswipe	1	2	0	4	0	2	0	14	0
Mention of Slowing/Stopped Vehicles	1	5	1	1	0	6	1	31	1
TOTAL SCORE			**5**		**1**		**1**		**6**

[1] Inrix reliability is the buffer index for 90th % travel time copared to non-peak travel time

As shown, the Highway 65 exit ramp along Eastbound I-80 received the most points of the candidate ramps evaluated due to the higher volume and higher crash history on the mainline. However, this ramp is a free-flow ramp and field observations indicate that the operational issues are related to a bottleneck issue and not ramp queue spillback. The high volume of exiting traffic to Highway 65 combined with a heavy weave section between the Mixmaster and Highway 65, a slower speed ramp geometry, lack of deceleration lane, and uphill grade combine to reduce mainline speeds particularly when heavy truck percentages are high. While this regularly-recurring bottleneck should be further studied to identify mitigation measures, it will not be recommended as the pilot project for Queue Spillback Mitigation as any countermeasure may not be applicable to future ramp projects. Iowa DOT has a bridge widening project along this section of I-80 programmed for FY 19 that could be expanded to address this issue.

The next highest-scoring location was the Oralabor Road exit ramp along Northbound I-35. Field observations indicate that the queuing is not regularly-recurring but, when it occurs, can extend relatively quickly due to the high peaking traffic characteristic and high concentration of left-turn volumes. Anecdotal evidence from ICM stakeholders indicate that recent improvements to the interchange have improved the queuing but that current construction activity at adjacent interchanges may still cause sporadic queuing events. Due to the focused concern related to left-turn concentrations, additional pavement infrastructure is not recommended as dual left-turn lanes exist. The implementation funding request will consist of operational improvements including: traffic signal retiming (and required data collection) of the ramp

intersections and Oralabor/Delaware, installation of a detection loop beyond the termini of the ramp left-turn storage, and a flashing shoulder-mounted sign warning of queues.

While the I-235 and MLK Parkway ramp did not score high in the evaluation screening, stakeholder input suggests that the ramp may have more operational issues in the AM peak hour than the preliminary data captures. The candidate location scoring above consists solely of high-level screening criteria and does not include detailed analysis. Based on stakeholder input, the implementation funding request will include costs for detailed analysis and improvements to this location along the same level as I-35/Oralabor.

The scoring categories and weighting will be reviewed by the ICM stakeholders to determine if any changes are needed. Once reviewed, it is anticipated that the above evaluation criteria will form the majority of the submittal documentation for future Queue Spillback Mitigation requests. With minor modifications, a similar process could be tailored for other infrastructure enhancement requests.

Timeframe

The timeframe for this Implementation Plan will require adequate time for infrastructure improvements which may require right-of-way clearance, utility reviews, and plan development prior to construction. A formal project schedule should be developed using distinct phases for each discipline – planning/analysis, engineering design, project clearances, and construction. Use of outside resources (design consultant and/or construction contractor) will require administrative time for contracting purposes but could be accelerated with the use of existing on-call contracts if allowed. It is anticipated that the pilot projects at Northbound I-35/Oralabor Road exit ramp and Eastbound I-235/MLK Parkway exit ramp could be completed within 12 months from project initiation if administrative steps are in place to provide timely resources and improvements do not require utility relocations or additional right-of-way.

Audience

For the specific pilot project, this Implementation Plan is written for a narrow audience – those jurisdictions who oversee and manage the I-35/Oralabor Road and I-235/MLK Parkway. This includes Iowa DOT and the Cities of Ankeny and Des Moines.

For the broader intent of this document – to provide guidance to future infrastructure enhancement projects and the overall process – the audience includes all jurisdictions within the Des Moines Metropolitan Area ICM Program and the future Technical Committee which will oversee the process.

Queue Spillback Mitigation

Description	This pilot project will evaluate traffic operations on the Oralabor exit ramp from Northbound I-35, revise traffic signal timing of the ramp intersections and Oralabor/Delaware, and install mitigation measures including a detection loop beyond the termini of the ramp left-turn storage, and a shoulder-mounted sign warning of queues. The scope includes data collection, operational analysis, and construction costs. Similar scope is proposed for Eastbound I-235 and MLK Parkway exit ramp.			
Lead Agency	• Iowa DOT			
Supporting Agency	• City of Ankeny • City of Des Moines			
Location	• Oralabor Road exit ramp on Northbound I-35 • MLK Parkway exit ramp on Eastbound I-235			
Technology & Infrastructure Elements	• New detection loop on the exit ramp and associated conduit, pull boxes. • Shoulder-mounted traffic warning sign with flashing lights.			
Operational Responsibilities	• Operational responsibilities will remain the same as existing – Iowa DOT will maintain/operate the Interstate ramp, the City of Ankeny will maintain/operate Oralabor Road, and City of Des Moines will maintain/operate MLK Parkway.			
Funding Needs	• For each location, $38,000-$50,000 for data collection, traffic signal timing, and engineering design costs. Construction costs include $40,000-$50,000 for ramp detection and flashing warning sign.			
ROM Cost Estimate	**Planning & Design**	**Implementation**	**O&M (annual)**	**Total (10 Year Cost)**
	$76,000-$100,000	**$80,000-$100,000**	**$0**	**$156,000-$200,000**
Funding Opportunities	•			
Project Dependencies	• None			
Required Agreements	• None			
Other/Notes				