

Date: July 11, 2014

To: Dahir Egal - FHWA

From: David Watt– CDOT Region 2, Project Director

Subject: I-25/Cimarron IAR Re-evaluation: Traffic Operations Analysis Methods & Assumptions

---

The following document outlines the methods and assumptions for conducting the traffic operations analyses to be used as the basis for preparing the Interchange Access Request (IAR) Re-evaluation for the proposed interim I-25/US 24/Cimarron interchange improvements. The Cimarron interchange is located on I-25 near mile post 141 (MP 141) and, in its current configuration, is a partial clover-leaf interchange. The original IAR was completed for the interchange in 2003 as a part of the *I-25 Environmental Assessment for Improvements Through the Colorado Springs Urbanized Area, March 2004 (I-25 EA)*. The IAR Re-evaluation is necessary to address proposed interchange improvements to be constructed in an upcoming project.

This memo addresses all comments received to date from The Federal Highway Administration (FHWA) as well as direction received from FHWA at coordination meetings on July 1, 2014 at FHWA Colorado Division Offices and July 2, 2014 at the Wilson & Company office in Denver.

## Project Description

The Project generally consists of the reconstruction of the I-25/US 24/Cimarron Interchange, including realignment of I-25 mainline from north of the Tejon Street interchange to Colorado Avenue; and realignment of US 24 from the US 24 bridge over Fountain Creek west of the interchange to the Cimarron Street bridge over Conejos Street east of the interchange.

FHWA, in cooperation with Colorado Department of Transportation (CDOT), is in the process of completing a reevaluation of the previous I-25 EA and Finding of No Significant Impact issued in 2004. The reevaluation will encompass the first decision document's project area along with elements of the preferred alternative for the interchange presented in the US 24 Environmental Assessment.

The preferred alternative presented in the *US 24 West Environmental Assessment and Section 4(f) Evaluation, May 2012 (US 24 EA)*, proposed an integrated interchange complex including I-25, US 24/Cimarron and 8<sup>th</sup> Street (crossing US 24 west of I-25). The complex includes single point interchanges at both US 24 and 8<sup>th</sup> Street and I-25 and US 24, with additional direct connection ramps to I-25. A detailed traffic analysis was performed validating the operational benefits of the proposed alternative. An IAR has not been completed for the ultimate interchange complex as the full improvements are not expected to be constructed until after the 8 year limit of IAR validity.

Funding has been obtained to construct initial improvements to the interchange. The project will be designed and constructed using Design-Build delivery. A formalized goal setting process has been completed for the project with the number one goal for the project being:

1. Maximize overall safety, capacity and operation of the interchange and the surrounding transportation network within the Project budget.

Within this goal are the primary objectives of:

- a. Maximize interchange safety, capacity and operational improvements.



- b. Correct existing safety and operational deficiencies along I-25 and US 24/Cimarron to ensure the smooth flow of traffic in the corridors.

To obtain this goal and these objectives the I-25 corridor will be reconstructed in the vicinity of the I-25 US 24/Cimarron interchange to improve its alignment and laneage, consistent with the improvements identified in the I-25 EA. This work will correct substandard mainline alignment issues and significantly improve the safety of the interstate highway at the location of the project.

The proposed interchange improvements will provide an interchange configuration that improves safety and operations between I-25 and the US 24 corridor to the west and Cimarron Street to the east. The improved interchange will provide the improved safety and operations until such a time that the US 24 corridor improvements (defined in the US 24 EA) can be constructed. At that time the US 24 corridor improvements will include the ultimate build out of the I-25, US 24/Cimarron, 8<sup>th</sup> Street interchange complex. As a result, the interchange improvements for the current project will need to be designed for compatibility with the future build-out to maximize both its near term and long term effectiveness.

A Tight Urban Diamond Interchange (TUDI) was recommended in the previous IAR completed in 2003 for this interchange, associated with the I-25 EA. The primary purpose of this IAR Re-evaluation will be to update an IAR that has exceeded its 8 year limitation, and to confirm that a revised interchange configuration, that is consistent with the I-25 EA Reevaluation and US 24 EA, will provide equal or better performance than the original proposed TUDI, until such a time as additional improvements can be implemented with the build out of the US 24 Corridor.

## Study Limits

The study area to be evaluated for the IAR re-evaluation is generally focused on the I-25/US 24/Cimarron interchange and will extend from the entry/exit ramps at Tejon St to the south, to approximately ¼ mile north of Bijou Street on I-25 as well as one signalized intersection immediately to the east and west of the I-25/US 24/Cimarron interchange. The intersections evaluated and reported on within that study area are only those directly associated with the interchange; I-25 Northbound Ramps at US 24/Cimarron Street and I-25 Southbound Ramps at US 24/Cimarron Street.

## Proposed Current and Future Analysis Years

While the US 24 EA acknowledges the PPACG long range transportation plan has committed funding for the build out of the improvements identified in the EA, the proposed SPUI interchange is an interim condition until additional improvements can be constructed as a part of the US 24 corridor build out. Even with the proposed improvements being an interim condition, the analysis will still focus on an assessment of the interchange operation over the required twenty year horizon. Therefore, the analysis scenarios will include 2014 (existing) and 2035 (horizon). Additionally, Year 2014 will be utilized to determine the existing conditions of the I-25 and US 24/Cimarron interchange as well as to calibrate the traffic simulation model.

## Proposed Peak Period Analysis

Based on a review of daily traffic volumes from June 1, 2013 through May 31, 2014, collected by CDOT, as well as the future traffic volumes as reported in the I-25 and Cimarron IAR, and the US 24 EA, the evening peak period has consistently higher traffic volumes than the morning peak period and generally extends from approximately 3:00 pm to 6:00 pm. Average daily traffic counts were collected on April 24, 2014 on I-25 south of Cimarron Street and indicated that the traffic volumes were split almost evenly between the morning peak hour and the evening peak hour. The morning peak hour volume on I-25 was approximately 9,460 vehicles per hour (vph) or 49% of the total daily peak (AM and PM combined) traffic, while the evening peak hour traffic volume on I-25 was approximately 9,865 vph, or 51% of the total daily peak traffic. From a directional split the traffic volumes on I-25 south of Cimarron Street are as follows:



- Morning Peak Hour Northbound I-25 – 5,110 vph (54% of the total morning peak traffic)
- Morning Peak Hour Southbound I-25 – 4,352 vph (46% of the total morning peak traffic)
- Evening Peak Hour Northbound I-25 – 4,768 vph (48% of the total evening peak traffic)
- Evening Peak Hour Southbound I-25 – 5,097 vph (52% of the total evening peak traffic)

Furthermore, a review of the morning and evening peak hour turning movement counts at the I-25 and US 24/Cimarron Street interchange indicate that all of the left turn movements and the majority of the through movements are higher in the evening peak hour than the morning peak hour. There are a few right turn movements that are higher during the morning peak period, however these movements are not considered critical to the future design as they will more than likely become free movements in all future design scenarios.

Given the traffic volume information provided above, the evening peak period (3:00 pm to 6:00 pm) will be analyzed to determine the I-25 and Cimarron interchange study area operations. The results of this evening period analysis will be utilized to conduct an evaluation of the proposed interim SPUI interchange that is compatible with the ultimate interchange complex, and the No-Build alternative.

## Traffic Operations Analysis

For the detailed evaluation we propose to utilize the VISSIM modeling software to analyze the operations for the recommended I-25 and US 24/Cimarron SPUI alternative. VISSIM will be able to provide defensible performance measure such as travel time, volume served, spot speeds, and queues that are required by FHWA. Furthermore, the VISSIM platform can provide a simulation of the existing and future year traffic operations within the study area to analyze weaving and queuing areas as well as provide a visual reference tool for individuals unfamiliar with traffic operations analysis, but familiar with the study area. VISSIM models will be developed for the following scenarios in the evening peak period:

- Existing Conditions (Year 2014) No Build
- Existing Conditions (Year 2014) SPUI
- Horizon Year (Year 2035) No Build
- Horizon Year (Year 2035) SPUI

The operational characteristics of the proposed action will be measured against the no-build alternative for several parameters or Measures of Effectiveness (MOEs). The MOEs for this analysis are as follows:

- Travel times through the analysis area
- Travel speeds through the analysis area
- Volume served at critical locations
- Queuing
- Speed differential by lanes
- Lane changes in the through lanes adjacent to the merge and diverge areas.

## Required Traffic Data

The data required to develop and calibrate an accurate and reliable VISSIM model include the following:

- Hourly traffic volumes, including vehicle classification, along I-25, and Cimarron Street broken down into 15 minutes intervals
- Peak period turning movement counts at all previously mentioned study intersections, collected on the same day as the hourly traffic volumes. Turning movements were collected for a three hour period determined by the peaks identified from the hourly traffic counts on I-25. Based upon the hourly traffic volumes that were collected in 15 minute intervals on I-25, the evening peak period occurs from 3:00 to 6:00 PM.
- Travel Speeds on I-25 and US 24/Cimarron Street during the core of the PM peak period from 3:30 to 5:30 PM. The number of travel speed runs will be determined utilizing the z-test method as outlined in the



publication *Guidance on the Level of Effort Required to Conduct Traffic Analysis Using Microsimulation*, FHWA, March 2014.

- Travel Times on key segments of I-25, and US 24/Cimarron Street during the core of the PM peak period from 3:30 to 5:30 PM. The number of travel time runs will be determined using the same method as for the travel speed runs.
- Existing Queuing Data taken from video of the study area.

## Calibration Efforts

Calibration of the existing PM peak period VISSIM model will be performed per the methodology identified in the *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software*, FHWA, July 2004, prior to beginning the analysis of future year for the recommended interchange configuration. Calibration of the existing PM peak period VISSIM model will be conducted utilizing the following procedures:

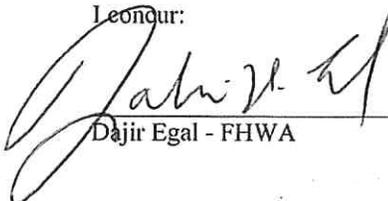
- Calibrate the existing condition VISSIM model to replicate existing conditions of the study area. The VISSIM model will be calibrated based upon a comparison of the model results to the following data:
  - Average Travel Speed along I-25 and Cimarron Street within the study area.
  - Average Travel Time along I-25 and Cimarron Street within the study area.
  - Observed queues
  - VISSIM throughput volumes (volume served) along I-25 and US 24/Cimarron Street to actual field measured traffic volumes.
- The Model will be calibrated and analyzed to a level of confidence of 90 percent.
- When any VISSIM parameters such as (but not limited to) default driver behavior parameters for lane change equations or car following equations are modified, provide a description of the modification and a justification of the modification

A visual inspection of the calibrated base model shall be performed and compared to observations of field operations to verify that the model is accurately replicating field conditions.

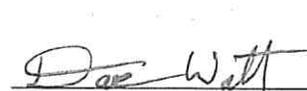
## Forecasted Volumes

The 2035 No Build Traffic volumes documented in the US 24 Environmental Assessment will be utilized to conduct the evaluation of the interchange alternatives. Use of the No Build volumes recognizes that the interim interchange configuration will only be in effect until additional improvements are provided as a part of the US 24 corridor build out.

I concur:

  
Dajir Egal - FHWA  
Date 7/16/14

I concur:

  
David Watt - CDOT  
Project Director  
Date 7/11/2014