

Date: May 6, 2014 (Revised May 27, 2014)

To: Dahir Egal - FHWA

From: Dave 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 to develop the Interchange Access Request (IAR) Re-evaluation for the proposed interim I-25/Cimarron interchange improvements. The Cimarron interchange is located on I-25 near mile post 141 (MP 141). The 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. The IAR Re-evaluation is necessary to address proposed interchange improvements to be constructed in an upcoming project.

## Project Description

The Project generally consists of the reconstruction of the I-25/US 24 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.

The Federal Highway Administration (FHWA), in cooperation with CDOT, is in the process of completing a reevaluation of the previous I-25 Environmental Assessment 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 Environmental Assessment proposed an integrated interchange complex including I-24, US 24 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. The number one goal for the project is:

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 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 Cimarron interchange to improve its alignment and laneage, consistent with the improvements identified in the I-25 Environmental Assessment. This work will correct substandard mainline alignments 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 new 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, 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 Environmental Assessment. 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 Environmental Assessment 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 Modification is generally focused on the I-25/Cimarron interchange and will include one interchange to the north and south of and one signalized intersection immediately to the east and west of the I-25 and Cimarron interchange. The intersections evaluated within that study area include the following:

1. I-25 Northbound Ramps at Cimarron Street
2. I-25 Southbound Ramps at Cimarron Street
3. I-25 Northbound Ramps at Bijou Street
4. I-25 Southbound Ramps at Bijou Street
5. I-25 Northbound Ramp at Tejon Street
6. I-25 Southbound Ramp at Tejon Street
7. I-25 Northbound Ramp at Nevada Avenue
8. I-25 Southbound Ramp at Nevada Avenue
9. Cimarron Street at 8<sup>th</sup> Street
10. Cimarron Street at Sierra Madre Street

All of the above intersections evaluated for the IAR Modification are signalized with the exception of the I-25 southbound on ramp at Cimarron Street, which is presently unsignalized.

## Proposed Current and Future Analysis Years

Per the US 24 EA, the PPACG long range transportation plan has committed funding for the build out of the improvements identified in the EA. However, the proposed interchange is an interim condition until additional improvements can be constructed as a part of the US 24 corridor build out, the analysis will focus on an assessment of the interchange operation over that interim period. The interim period for the analysis will extend from an opening year of 2017 to 2030. 2030 is identified as the limit of the interim operations because it provides a

reasonable time period after which funding may become available to commence the US 24 corridor build out. Year 2014 will be utilized to determine the existing conditions of the I-25 and Cimarron interchange as well as to calibrate the traffic simulation model. The Opening year of 2017 was selected based on the current schedule and expected completion date of the interim interchange improvements.

## Proposed Peak Period Analysis

Based up the current traffic volumes as well as the future traffic volumes reviewed in the I-25 and Cimarron IAR and the US 24 EIS, the evening peak period has consistently higher traffic volumes than the morning peak period. 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 period and the evening peak period. The morning peak period volume on I-25 was approximately 9,460 vehicles per hour (vph) or 49% of the total traffic, while the evening peak period traffic volume on I-25 was approximately 9,685 vph, or 51% of the total traffic. From a directional split the traffic volumes on I-25 south of Cimarron Street are as follows:

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

Furthermore, a review of the morning and evening peak period turning movement counts at the I-25 and Cimarron Street interchange indicate that all of the left turn movements, and the majority of the through movements are higher in the evening peak period than the morning peak period. 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, we propose to analyze only the evening peak period 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 Tight Diamond configuration in the original IAR and the proposed interim SPUI interchange that is compatible with the ultimate interchange complex, and a Diverging Diamond Interchange.

## Traffic Operations Analysis

Synchro/SimTraffic will be utilized to conduct the initial evaluation of the interchange alternatives, that includes the US 24/8<sup>th</sup> Street intersection as part of the network, and the results of the evaluation will be used to recommend a preferred alternative(s) that will be carried forward to a more detailed evaluation.

For the detailed evaluation we propose to utilize the VISSIM modeling software to analyze the operations for the recommended I-25 and Cimarron interchange alternative as well as the ten previously listed signalized intersections. VISSIM will be able to provide defensible performance measure such as delay, LOS 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 areas and 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)
- Opening Year (Year 2017) No Build
- Opening Year (Year 2017) for Recommended Alternative(s)
- Horizon Year (Year 2035) No Build
- Horizon Year (Year 2035) for Recommended Alternative(s)

## Required Traffic Data

The data required to develop and calibrate an accurate and reliable VISSIM modeling 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 two and a half 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 3:15 to 5:45 PM. From that data, the evening peak hour was calculated to occur from 4:30 to 5:30 PM.
- Travel Speeds on I-25, and Cimarron Street during the PM Peak hour from 4:30 to 5:30 PM. At least three travel time runs in each direction shall be collected to determine the average speed during the evening peak hour.
- Travel Times on key segments of I-25, and Cimarron Street during the PM Peak hour from 4:30 to 5:30 PM. At least three travel time runs in each direction shall be collected to determine the average travel time during the evening peak hour.
- Existing Queuing Data taken from video of the study area.

## Calibration Efforts

Calibration of the existing PM peak period conditions VISSIM model will be performed prior to beginning the analysis of future years 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.
  - HCM delay to VISSIM delay
  - HCM LOS and VISSIM LOS
  - VISSIM throughput volumes along I-25 and Cimarron Street to actual field measures traffic volumes.
- Existing Queuing Data taken from video of the study area to VISSIM Queue data. Comply with the principles contained in the FHWA's *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Micro Simulation Modeling Software*. We propose to use a level of confidence of 90 percent.
- When the VISSIM 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. These volumes will also be utilized to develop growth rates that will be applied to the 2014 traffic volumes to forecast projected opening day (2017) traffic volumes and the 2035 interim period traffic volumes that will be utilized for the evaluation of interchange configurations.