

West Davis Corridor Technical Memorandum 4

Travel Demand Model and Operations Methodology

March 29, 2017

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November 16, 2009 (Incorporate comments from Draft Revision 1)
December 9, 2009 (Incorporate comments from Draft Revision 2)
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March 29, 2017 (Updated to account for TDM v8.1)

Purpose of This Technical Memorandum

The purpose of this technical memorandum is to explain the travel demand modeling and traffic operations analysis methodologies that were used for the West Davis Corridor Environmental Impact Statement (EIS). One of the primary goals is to identify the need for transportation improvements in the study area. Two critical components for identifying a need are traffic volume projections and traffic operations analysis. This memorandum explains the methodologies that were used in this process.

Project Overview

The Federal Highway Administration (FHWA), in cooperation with the Utah Department of Transportation (UDOT), is in the process of preparing an EIS on a proposed action to address projected transportation demand in western Davis and Weber Counties. The exact limits of the study area have been defined in Technical Memorandum 3. The area under evaluation includes the area west of and including Interstate 15 (I-15) in Davis and Weber Counties.

Alternatives considered include:

- Taking no action (no-build)
- Transportation system management
- Build alternatives for various modes of transportation
- Other alternatives identified during the study process

Travel Demand Modeling

The Wasatch Front Regional Council (WFRC) and the Mountainland Association of Governments (MAG) jointly maintain a travel demand forecasting model for the four-county metropolitan region (Weber, Davis, Salt Lake, and Utah Counties). The travel demand model (TDM) predicts future travel demand based on projections of land use, socioeconomic patterns, and transportation system characteristics. The model is based on the TP+/Cube software (currently version 6.4.2. References to “the model” in this memorandum refer to the scripts and data maintained by WFRC and MAG, not to the Cube software.

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Model Version and Study Years

The current WFRC/MAG official version of the TDM is v8.1, which is calibrated to 2011 and uses 2040 as the forecast year. This version of the model was used to perform the analysis including identifying the purpose of and need for the project and alternative screening. The West Davis Corridor EIS used 2040 as the forecast year

Coinciding with the WFRC/MAG calibration year, 2011 was modeled to provide a comparison with the traffic count data that have been collected in the study area. This was necessary for calculating intersection turn volumes as described in the UDOT document “Utah Travel Demand Forecasting,” which follows Chapter 8 of the National Cooperative Highway Research Program’s (NCHRP) Report 255. Also, the 2011 model was used to perform a root mean squared error analysis as described in the “Model Checks and Verification” section below.

Traffic Analysis Zones

The traffic analysis zones (TAZ) for the v8.1 model are relatively large through the study area. This is suitable for regional traffic forecasts but may not provide adequate detail for a smaller-scale EIS study. Therefore, the West Davis Corridor EIS team split the TAZ into smaller zones, which made the model more sensitive for a corridor-level study. In most cases, the TAZ for the EIS were split along barriers such as roads, rivers, railroads, or major land-use changes.

The same TAZ structure was used for both 2011 and 2040. Once the TAZ was split, the socioeconomic data from the original TAZ was distributed into the new zones. The distribution was based on TAZ developable area estimates and land use estimates.

Land Use

Land use data in the model includes population, dwelling units, household size, and 11 employment categories. The v8.1 model includes these socioeconomic inputs for each phase of the Regional Transportation Plan including 2011, 2019, 2024, 2034, and 2040. As mentioned previously, the forecast year for the EIS was 2040. This provides a roughly 25-year outlook for the study.

External Stations

External stations define traffic on links that extend outside the TDM boundaries. The TDM does not directly generate trips for these stations, but rather looks up trips in database files that correspond to the year being modeled. The West Davis Corridor EIS used the trip tables provided in the v8.1 input files for the external stations.

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Model Roadway Network

The regional TDM generally includes the large collector and arterial-type facilities in its roadway network. The West Davis Corridor EIS used this same network as a base but added additional existing roads as appropriate for the TAZ splits and for existing conditions. The future 2040 roadway network assumed that all current Regional Transportation Plan (RTP) improvements are implemented. This included the managed motorways ramp metering on the I-15 corridor. Within the study area boundaries, the 2040 no build condition assumed that the roadway labeled “West Davis” in the 2040 WFRC base network is removed.

In some instances, modifications to speed, capacity, area type, and/or functional type were made to the network links. This was done using best engineering judgment in cases where the existing 2011 model results were substantially different from the 2011 traffic count data. As appropriate, turn penalties were used to prevent illegal turn movements such as a left turn into a right-in/right-out intersection. Modifications to link speed, capacity, area type, and/or functional type were documented.

Transit Network

For the EIS, the 2040 RTP transit network provided in the v8.1 model was used for the 2040 model. Minor adjustments to the transit lines were required to accommodate link splits or other network changes.

Model Checks and Verification

The changes that were made to the base WFRC model were done in an effort to increase its accuracy within the study area. But given that changes to the model have been made, a check was performed to verify that the updated model is a valid tool. The West Davis Corridor EIS team did a root mean squared error (RMSE) analysis for the updated 2011 model. The WFRC/MAG documentation for v6.0 states, “The RMSE is used to calculate the effectiveness of individual link and node modifications, as well as general changes in trip generation and distribution and assignment parameters. RMSE should generally be less than 40%.” Revised RMSE values from the WDC 2011 base year model were compared with the RMSE values from the WFRC 2011 model. See Technical Report 6, Existing Conditions for detailed information on the RMSE analysis conducted for the project.

Capacity and Operations Analyses

For the most part, all necessary capacity analyses for the West Davis Corridor EIS were performed using the TDM and industry accepted highway capacity values. Additional data from the TDM such as vehicle miles traveled, vehicle hours traveled, delay, volume-to-capacity ratios, speeds, and others measures were utilized to determine purpose and need and alternative screening. The Highway Capacity Manual (HCM) 2010 methodologies were used to supplement the output from the TDM. As necessary, the HCS 2010 was used for additional analyses.