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TO: Dave Parisi

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SUBJECT: **Post Processing Metro emme/2 Data**

PROJECT: **I-5 TRADE CORRIDOR**

PROJECT NO: ODOT0000-0364

This memorandum addresses the methodology behind manually adjusting Metro's emme/2 data for use in the I-5 Trade Corridor VISSIM models. Three processes have been developed. Process 1 was developed during Phase 1 of the I-5 Trade Corridor Study and utilizes existing traffic patterns to adjust forecast travel demands by segment to individual ramps. Process 2 differs only in that it applies future forecast traffic trends to adjust forecast travel demands by segment to individual ramps. Process 3 is similar but only applies the difference in forecast travel demand models to each individual ramp.

Background

During Phase 1 of the I-5 Trade Corridor study, a post processing methodology was applied to Metro's emme/2 data. Similar to the method of balancing volumes along screenlines used by Metro, a process was determined to first balance ramp volumes along freeway segments bounded by screenlines listed below based on 1999 traffic count data collected at each on and off-ramp within the study corridor.

- I-205 to SR 500
- SR 500 to Interstate Bridge
- Interstate Bridge to Portland Boulevard
- Portland Boulevard to I-84

For each freeway segment, the existing distribution of volume at each on and off-ramp was determined as a percentage of total segmental ramp volumes. On a segment basis, forecast growth in freeway volumes were applied to each ramp based on existing ramp distribution percentages.

Process 1

The first step of the process involves converting the 3-hour AM peak period and 4-hour PM peak period travel demand volumes from the 2000 and 2020 emme/2 models into hourly volumes within those periods. Hourly volumes are determined through the application of linear volume to capacity (v/c) trendlines that correlate variations in hourly volumes to prevailing roadway congestion. The v/c trendlines were calculated per the methodology proposed by Metro to develop 3-hour and 4-hour trends along the mainline. If a vertical line is dropped through the 3-hour or 4-hour trendlines the resulting hourly percentages add up to 100%. As the duration of congestion extends, variation in traffic flow across the peak periods levels out in recognition that traffic flow is limited to capacity, for example during the 4-hour PM peak period the 4 trendlines converge upon 25%.

In developing post processed numbers, entering the v/c curves at a 3-hour peak period or 4-hour peak period v/c of 80% resulted in peak hour percentages of 38% for the 3-hour AM peak period and 28% for the 4-hour PM peak period. Therefore, multiplying these percentages by the peak period volumes results in peak hour volumes.

For each of the hourly volumes, the process described above under Background was used to adjust the forecast growth at an individual ramp level. The difference in traffic volumes from the 2000 and 2020 emme/2 models was determined for each corridor on and off-ramp. The resulting total forecast growth in ramp volumes on a segment basis was distributed to individual ramps based on existing ramp distribution percentages. The resulting ramp growth was added to existing 1999 ramp volumes to result in an adjusted "post-processed" forecast ramp volume.

Process 2

The only difference between Process 1 and Process 2 is that the resulting total forecast growth in ramp volumes on a segment basis was distributed to individual ramps based on 2020 forecast future volumes, rather than existing ramp distribution percentages. This method appears to be more appropriate because it builds upon known traffic count data and adjusts these known volumes based on forecast growth trends that are linked to changes in land use and transportation associated with year 2020 conditions.

Process 3

Process 3 is similar to the other proposed processes except that volumes are post-processed on an individual ramp-by-ramp basis rather than segment basis. After converting the three-hour and four-hour volumes to peak hour volumes the difference in traffic volumes from the 2000 and 2020 emme/2 models was determined for each corridor on and off-ramp. The resulting ramp growth was added to existing 1999 ramp volumes to result in the post-processed volumes.

New Ramps

Further refinement of the post-processing methodology is needed when accounting for the effects of adding or removing corridor ramps. For example, in the southbound direction, new off-ramps at 134th and Columbia Boulevard are included in the year 2020 Priority Baseline model. Because these ramps do not exist today, distribution of forecast growth cannot be added to an existing volume. Therefore, forecast volumes at these ramps are assumed to apply. Manual adjustment of volumes at adjacent ramps is done to account for redistribution of traffic in response to the new ramps.

For example, consider the new 134th southbound off-ramp during the AM peak hour. The 2020 emme/2 peak hour volume is 315 vph. The total off-ramp volume difference for this segment between 2000 and 2020 is 1,636. To ensure that only 1,636 vehicles are added to the 1999 existing volumes (i.e., avoid double counting), 315 vehicles must be subtracted from nearby off-ramps. Considering the distances between existing nearby off-ramps, it was assumed that 80% of the 315 new trips using the 134th off-ramp were diverted from the I-205 off-ramp and 20% of the 315 new trips were diverted from the 99th Street off-ramp.

An example of the spreadsheet identifying the steps of each process as well as the process to avoid double counting is attached.

Route Assignment

Once the mainline freeway volumes and ramp volumes have been determined using the process discussed above they must be assigned to a route in the VISSIM model.

The assignment of traffic volume to routes was based on an Origin-Destination (O-D) table. The VISSIM O-D table uses a volume balancing methodology based on the assumption that the percentage of mainline traffic using any given off-ramp will remain constant regardless of where that traffic originated. For example if 10% of the freeway traffic approaching Off-ramp D uses that off-ramp, then 10% of the traffic originating from upstream on-ramps approaching Off-ramp D will exit the freeway at Off-ramp D. This methodology maintains the emme/2 based ramp volumes and generally replicates freeway traffic patterns.

The assignment of traffic volume within the O-D table was then adjusted at key locations using emme/2 select link (O-D) information to account for atypical freeway travel patterns, such as those created by short (i.e. local) on-ramp to off-ramp trips.

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