MAP-21 Data Assessment Workshop

August 25, 2015

Freight Performance Measures

Why Freight Performance Measures?

- MAP-21 requires all state departments of transportation (DOTs) and Metropolitan Planning Organizations (MPOs) to track and report performance data.
- State performance targets, set in consultation with MPOs, must be established within one year after final federal rulemaking.

MAP-21
Moving Ahead for Progress in the 21st Century

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Background

- Section 1203 of MAP-21 – "U.S. DOT sets the measures for the National Highway Performance Program (NHPP), Highway Safety Improvement Program (HSIP), the Congestion Mitigation and Air Quality Improvement Program (CMAQ) and National Freight Movement for States to use to assess freight movement on the Interstate System."
- Currently, Caltrans does not report on specific freight performance measures, although interim measures were included in the December 2014 California Freight Mobility Plan.

Freight Information Challenges

- There is an overwhelming abundance of data and lack of complete data for many important freight system performance functions.
- No singular entity has the mandate or resources to develop and sustain a comprehensive freight performance measurement system and “no national infrastructure exists to define, collect, scrub, and deploy such comprehensive data.”

Association Recommendations

- An American Association of State Highway and Transportation Officials (AASHTO) affiliated freight Task Force noted that MAP-21 emphasizes "highways and trucks as opposed to a more mode neutral or multi-modal approach…" and recognized "the need to capture other aspects of freight movement, including system capacity and utilization…to reflect broader mobility and safety objectives."
- The Task Force made two performance measure recommendations:
  - **Annual Hours of Truck Delay (AHTD**)
  - **Truck Reliability Index (TRI)**.

Annual Hours of Truck Delay (AHTD)

AHTD is the amount of extra travel time (delay) in truck vehicle-hours along identified corridors beyond an Agency-determined congestion threshold.

Truck Reliability Index (TRI)

TRI reflects a measure of the consistency or dependability of travel times (including expected delay) between origin and destination, typically measured day-to-day or across different times of day.

Freight Performance Measures

- AASHTO recommends that DOTs and MPOs be given flexibility in target setting and that qualitative ratings such as good, fair, or poor should not be used in reporting.
- Within Caltrans, freight-related data associated with highways is mainly collected by the **Division of Traffic Operations** and the **Division of Transportation Planning, Office of Multi-Modal System Planning**.

Annual Hours of Truck Delay (AHTD) *Data*

- It is recommended that corridor segments be identified by DOTs and the Federal Highway Administration (FHWA).
- The Agency-specified general designated threshold speed should be determined by State DOTs or an MPO for the corridor segment, which may vary due to corridor characteristics and over time.
- According to the AASHTO Task Force, freight vehicle miles traveled (VMT) would "have to be calculated using the FHWA Highway Performance Monitoring System (HPMS) average annual daily truck traffic (AADTT) and modified by both a daily and hourly truck factor determined by the State DOT."

AHTD Methodology and Calculation
Input Data

- **Corridor Segment:** Section of highway with an origin and destination selected by DOTs and FHWA to be analyzed for truck activity.
- **Freight Vehicle Miles Traveled (VMT):** For AHTD, truck volume times the corridor length is the appropriate VMT measure.

AHTD Methodology and Calculation
Input Data (cont.)

- **Travel Speed:** Average speed of trucks during the time period along the corridor segment.
- **Agency-specified Threshold Speed:** This Agency-specified speed is for the analysis time period from which AHTD would be calculated and should account for the different aspects of slowing trucks on the highway including weather conditions, enforcement, work zones, congestion, and roadway geometrics.

Annual Hours of Truck Delay - Calculation

Procedure

1. Establish corridor segment(s).
2. For each corridor segment, determine the Agency-specified threshold speed.
3. For each day and corridor segment, calculate the Daily Truck-Hours of Delay:

$$\text{Daily Truck Hours of Delay} = \frac{\text{Freight VMT}}{\text{Travel Speed}} - \frac{\text{Freight VMT}}{\text{Agency-Specified Threshold Speed}}$$

4. Sum the Daily Truck-Hours of Delay for each day of a week to obtain the Weekly Truck-Hours of Delay per Corridor Segment.
5. Multiply Weekly Hours of Delay per corridor segment by 52 to obtain the Annual Truck-Hours of Delay per Corridor Segment.
6. Sum the Annual Hours of Delay per corridor segment to obtain the Annual Truck-Hours of Delay.

Truck Reliability Index (TRI)

- The ratio of the total truck travel time needed to ensure on-time arrival to the agency-determined threshold travel time (e.g., observed travel time or preferred travel time).
- It can be used to measure and compare corridors of any length and to compare segments of a corridor or system to determine if reliability has improved or declined.

Truck Reliability Index (TRI) Data

- Various federal and private sector data exists and can be used to compute the TRI.
- According to the AASHTO Task Force, implementation is dependent on the U.S. DOT providing private sector speed data and vehicle miles traveled from HPMS volume data and the respective analysis tools.
- A percentile is chosen to represent a typical congested freight travel time along urban corridors. The AASHTO Task Force chose the 80th percentile because the Strategic Highway Research Program 2 (SHRP2) determined that at the 95th percentile was more likely due to non-routine events.

TRI Methodology and Calculation
Input Data

- **Corridor Segment:** Section of highway with an origin and destination selected by DOTs and FHWA to be analyzed for truck activity.
- **Time Intervals:** The day is divided into 288 five-minute intervals [24 hours x (60/5) = 288 five minute intervals].
- **Travel Time:** Corridor segment length (miles) divided by average speed (mph).
- **Agency-specified Threshold Speed:** This Agency-specified speed is for the analysis time period and should account for the different aspects of slowing trucks on the highway including weather conditions, enforcement, work zones, congestion, and roadway geometrics.

Truck Reliability Index – Calculation

Procedure

1. Establish corridor segment(s)
2. For each corridor segment, determine the Agency-specified threshold speed and then calculate the agency travel time for that segment.
3. Calculate the travel time for each five-minute time interval for each day of the calendar year (365) from HPMS data.
4. For each time interval, array the travel time.
   a. From these 365 calendar days, travel times are arranged in ascending order.
   b. From this list, the 80th percent worst travel time is selected.
   c. This will be the Annual Average 80th Percentile Travel Time for that 5-minute interval across all days.
   d. Repeat the same process for the other 287 five-minute intervals.

Truck Reliability Index – Calculation (cont.)

5. From Step 4, arrange the 288 Annual Average 80th Percentile Travel Time values in ascending order.
   a. From this list, the 80th percent worst travel time is selected.
   b. This will be the 80th Percentile Travel Time.

6. Calculate corridor TRI.

$$\text{Truck Reliability Index}_{80} = \frac{80^{th}\ \text{Percentile Travel Time}}{\text{Agency Travel Time}}$$

7. Weigh the individual corridor TRI values by the number of truck-miles traveled in each corridor to determine a statewide average.

Resources

- *National Cooperative Freight Research Program Report (NCFRP), Report 10, Performance Measures for Freight Transportation, 2011.*

- *SCOPM Task Force Findings on National Level Performance Measures, AASHTO Standing Committee on Performance Management, Task Force on Performance Measure, Development, Coordination and Reporting, November 9, 2012.*

Questions

Thank You

Joanne McDermott
Caltrans, Division of Transportation
Office of Sustainable Community Planning
Joanne.mcdermott@dot.ca.gov.
916-653-8747